Planning Commission

Planning Commission Meeting Agenda
Hartland Township Hall
Thursday, September 28, 2023
7:00 PM

1. Call to Order
2. Pledge of Allegiance
3. Roll Call
4. Approval of the Agenda
5. Approval of Meeting Minutes
   a. Planning Commission Minutes of August 24, 2023
6. Call to Public
7. Public Hearing
   a. Site Plan/PD Application #23-008, Highland Reserve Planned Development (PD) – Preliminary Site Plan
8. Call to Public
9. Planner's Report
10. Committee Reports
11. Adjournment

HARTLAND TOWNSHIP PLANNING COMMISSION DRAFT MEETING MINUTES

August 24, 2023– 7:00 PM

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1. **Call to Order: Chair Fox called the meeting to order at 7:00 p.m.**

2. **Pledge of Allegiance:**

3. **Roll Call and Recognition of Visitors:**
   Present – Commissioners Eckman, Fox, Grissim, Mayer, McMullen, Mitchell
   Absent – Commissioner Murphy

4. **Approval of the Meeting Agenda:**
   A Motion to approve the August 24, 2023 Planning Commission Meeting Agenda was made by Commissioner Mitchell and seconded by Commissioner Grissim. Motion carried unanimously.

5. **Approval of Meeting Minutes:**
   a. Planning Commission Meeting Minutes of July 27, 2023
   A Motion to approve the Planning Commission Meeting Minutes of July 27, 2023 was made by Commissioner Grissim and seconded by Commissioner Eckman. Motion carried unanimously.

6. **Call to the Public:**
   None

7. **Old and New Business**
   a. Site Plan #23-009 Climate controlled self-storage facility Planned Development (PD) Concept Plan

   Director Langer gave an overview of the scope and location of the request stating the following:
   - Located west of US 23, east of Old US 23, north of M-59; between Best Western and Arby's.
   - Requesting a Planned Development (PD) to construct a climate controlled self-storage facility.
   - PD process involves three steps; Conceptual, Preliminary, and Final at both the Planning Commission and the Township Board.
   - This is a Conceptual review; no decisions will be made but comments are encouraged.

   Reid Cooksey, P.E. of Stonefield Engineering and Design, and Ron Jona of the Ron Jona Collaborative, representing Joe Qonja, the Applicant, stated the following:
   - PD requested as self-storage is not a permitted use in the GC General Commercial zoning district.
   - Felt the PD process would be less cumbersome than the Rezoning process and better fits the scope of the project.
   - Proposing a 64,200 square foot, three-story, climate controlled self-storage which will meet a need in the Township as there are none at this time.
   - Parcel does not have frontage on M-59, only an access drive; other uses would not be viable.
   - Planning a nice product with high quality materials that will be aesthetically pleasing.

- Meets a need in Hartland, will be visually appealing in a great location near US 23, and a good use for this parcel.

Chair Fox referred to the staff memorandum dated August 17, 2023. On page 3, the Planning Commission should evaluate the proposed use and determine if the standards in Section 4.35 (Mini Warehouses) would apply.

Director Langer stated the following:
Most mini-warehouses have a row of units accessed by a vehicle via individual garage doors; this is a little different. There is also an indoor drive aisle with interior access to some units. Mini-warehouse is the closest use to what is being proposed but does not fit entirely. Typically screening is required for the mini garages which would not fit this project. The Director stated he is unsure if a resident manager on site is part of the proposal.

The Applicant stated there will be an employee on site to assist customers. Mini warehouse is close to what is being proposed but this is a new use to the community. Since everything is located within the building, he does not think some of the screening requirements will apply.

The Applicant stated the following:
- There are outside doors for access, but they intend to mask them architecturally using color and materials.
- A greenbelt will add screening.
- Traditional mini storage facilities are butler buildings that are not climate controlled, the owners do not spend the money to heat or cool them thus limiting what can be stored in them. Some items of value, without heating and cooling, will not remain intact.
- This concept of climate controlled storage is becoming more important to people in the community and society at large. Climate controlled simply means it is heated and cooled.
- Some units are accessed from the outside, others are only accessible from the inside via an interior drive aisle on the first floor; and by elevators and corridors on the second and third floors.

[The Applicant displayed a visual layout of the structure to while explaining the access.]
- The building will meet all Fire Codes and will be sprinkled.
- Customers cannot work out of the building, they can only store items.
- The office will include a restroom.
- Parking is located at the back of the building near the office.
- Used curtain wall glass for the staircases in the corners for visual appeal.
- Fully secured access with one attendant and cameras.
- No fences are needed as everything is inside.
- Security is taken seriously.
- Will be able to do some nice landscaping around the facility.

Chair Fox asked if Section 4.35 (Mini Warehouses) would apply. Commissioner Eckman responded he imagines it would be precedent setting if the Planning Commission said it would. He said it seems like a totally different scenario. The Planning Commission agreed.

PD Size Requirement
Chair Fox stated the following:

- The proposed PD site is 1.2 acres.
- The Planning Commission has approved other sites that were smaller than the 20-acre minimum for unique circumstances such as Walgreens and the bank.
- Those opportunities do exist upon recommendation to the Township Board.

Layout
Director Langer explained the vehicular traffic plan stating it is generally one way beginning at the southernmost access, wrapping around the building with two options; one is to turn left and enter the interior drive aisle which exits on the west side of the building with a driveway to the access road; the other is to follow the drive around the building to access the units on the north side, and exit the site using the northernmost exit.

Fire Department Access
Director Langer continued the Fire Department expressed concerns due to the height of the building and their ability to access the interior of the structure. The Applicant has addressed these concerns by adding a wider drive aisle access, a mountable curb and a proposed two-foot grass paver system for fire access.

Building Height
Director Langer stated the following:

- Building height is 43'-0" for the 3-story building.
- This height exceeds the maximum allowed height of thirty-five (35) feet in a Planned Development. A waiver request to exceed the maximum building height is required from the applicant at the Preliminary review.

Commissioner Mitchell asked about the height of Hartland High School and estimated it to be approximately the same height.

Commissioner Eckert commented he would not consider this a significant deviation as it would not be blocking the view of anything.

The Applicant stated he was aware of the limitation when designing the building and explained the first floor ceiling height is 16 feet as access is needed for taller vehicles. The 12 feet from floor to floor allows for a 10-foot ceiling height which is also desired. There is some play with the three (3) foot parapet wall on top of the structure, but their intent is to use that to screen rooftop equipment as required.

Chair Fox stated the height limit was originally driven by the fire equipment available and the community now has a ladder truck; also, the height at the interchange is already there so taller buildings should be located near the interchange area and not at other locations. He would not give up the screening from the parapet wall.

Director Langer stated this drawing is a concept drawing. If the project moves forward, they will need to show the HVAC units and how well they are screened by that parapet wall. Additionally,

he mentioned the Emagine Theater exceeds the PD height limitation which is also near the intersection of M-59 and US 23.

Chair Fox commented that a taller building makes screening the rooftop units easier due to the angles and line of sight.

Commissioner Mayer requested that the Applicant show on the next submittal a roof plan showing the locations of the HVAC units with dimensions.

Setbacks

Director Langer stated the PD process essentially eliminates all of the zoning ordinance regulations and establishes new ones. This is not typically discussed in detail at the Conceptual review, but it is very important at the Preliminary review level. The plans list building setbacks as required for GC (General Commercial) zoning, and parking setbacks per the Zoning Ordinance. Obviously, this building would not comply with the GC setbacks. He wanted to ensure the Planning Commission is aware the setbacks will need to be varied for this project to move forward. If the Planning Commission has concerns about setbacks, this would be the time to share them before the Applicant invests further resources into the project.

Chair Fox stated one example of a PD with smaller setbacks is Hartland Towne Square by Meijer. When it is fully developed it will be more apparent. When the Township allows for a variation of this sort, there is typically something offered in exchange such as excellent architecture.

The Applicant reiterated this parcel is unique; the site fronts on an access drive. It is behind Arby's. The only people driving on the access drive are going to Best Western. It will not be a hazard having the building a little closer to the access drive or property lines. They have been working with the Planning Director and Chair Fox on upscale architecture with a beefed up landscape plan; a 30-foot greenbelt is proposed where 10 feet is required.

Commissioner Eckert stated with the open space and the height, there are many variances from the standard, but it is a beautiful building on a difficult site. It is better than what is there now. He has a positive view of this proposal.

Director Langer clarified the following:

- The Applicant has been working with staff and the Site Plan Review Committee to prepare to come before the Planning Commission, as they do with many applicants.
- They met initially with just the idea and were encouraged to provide more information.
- When the first drawings came in, the Director explained what is being given up for this project on such a small parcel so the architecture will have to be stepped up.
- This plan is the result of those early meetings and conversations; it is not their first attempt.

The Applicant agreed stating that is why the early design meetings are there to get to this point. They do not want to keep coming back with revisions either. The Applicant stated they are working with the Township and desire to provide all they can. They want to be in Hartland where there is a need for this product.

Chair Fox stated at the next level there will be a traffic report required. The Applicant stated this project is a very low traffic generator, maybe nine (9) cars at the peak.

Public Road Access
Commissioner McMullen asked if the one-way portion of the access drive will be changed. She has no desire to make a left turn at that location. The Applicant stated it is a private access in not under the jurisdiction of Livingston County Road Commission; it can be altered. Access is intended to be two-way for this project.

Commissioner Mayer asked about the width of the access drive. The Applicant was unsure but stated it is adequate for two-way traffic with the rolled curbs and grass pavers. Chair Fox suggested improving that access could be one of their Recognizable Benefits to the community.

Director Langer stated one item that has not been addressed is an easement agreement. The Applicant currently owns three of the four properties that use the access road. He does not know if there is a recorded easement agreement that outlines how that private road is properly maintained or repaired in the future if the Applicant no longer owns all of these properties. The Applicant did contact staff after the memorandum was distributed with a document, but he has not had the opportunity to thoroughly review it. What was provided is not to the level he is looking for.

Chair Fox stated that would be beneficial in the future, if there were three different property owners, to have that all spelled out in advance. The Applicant stated they would provide one for the Final PD and add any language that needs to be included.

Design Details
Chair Fox asked the Planning Commission for their thoughts.

Commissioner Eckman stated he thinks it has the feel of a beautiful building in Detroit that has been restored. The Applicant commented masonry is timeless.

Commissioner Mayer asked if the composite panels were aluminum on the east and west elevations. The Applicant stated they are a pressboard product that is painted called Hardieboard.

Chair Fox stated the building is beautiful, a home run. It will be critical when the samples are presented that they are not smooth brick but rather new brick that looks like “old” brick. The Applicant concurred.

Open Space
Director Langer stated typically the open space requirement is twenty-five percent (25%.) He does not have any calculations at this time, but it looks like they will not meet that goal; that will be a waiver they will be seeking as part of the PD.

Landscaping
The Applicant stated they are proposing a nice mix of native species, shrubbery, flowering grasses as well as evergreens for screening purposes. They also are providing good screening to the south and a few trees to break up the masonry in the perimeter landscaping. Chair Fox asked about the vegetation to the north coming off of the US 23 ramp. The Applicant stated most of that vegetation

is located within the MDOT right of way. They intend to provide additional trees and shrubs along the property line to beef up the view from the highway.

Recognizable Benefits
Director Langer stated the following:

- a Recognizable Benefit is a requirement of the Planned Development process as the Township is forgoing all of its regular regulations to allow for a specific project.
- They will need to be stated in writing.
- A couple of items have been mentioned this evening such as the quality architecture and possibly improving the access road.
- Ultimately, the Planning Commission and the Township Board will need to decide if the Recognizable Benefits are enough to warrant the Township surrendering the existing zoning regulations and approving this Planned Development.
- Often it seems the Planning Commission and Township Board wrestle with this issue and desire objective standards; but as it stands, it is more subjective. Does this project and what is being proposed, in your eyes, warrant moving forward? There is no definitive criteria; each member must decide internally how they feel about the benefits being proposed and if they are sufficient to approve this PD.

The Applicant asked about the Lighting Plan; a preliminary one was included. They intend to light the building with wall sconces. A more detailed lighting plan will be provided at the Preliminary review.

Commissioner Mayer asked about the plan date referenced on the Spaulding DeDecker review. Director Langer stated he believes the date is an error as they would not have had those plans over one year ago.

Commissioner Mayer also asked for the turning radius for fire vehicles to be shown in the next set of plans. The Applicant stated they will put together a whole plan for the fire department. Commissioner Mayer asked if they could make that turn on the north side. The Applicant stated he believes with the additional grass paver area they can.

The Planning Commission briefly discussed the proposed landscaping on the north side.

Commissioner Mayer asked if there will be sidewalks. The Applicant state they do not anticipate much pedestrian traffic to a storage facility and there is no connectivity to M-59. Commissioner Mayer stated that maybe the patrons of the hotel might like access to the businesses along M-59. The Applicant stated if a stub had been provided, they might have been able to connect but it is not there. Until it gets redeveloped it would be a sidewalk to nowhere.

Planning Commission Comments
Commissioner Mayer stated it is a beautiful building, it fits that piece of property perfectly, it is a great place for it, it is a great looking building.

Commissioner Mitchell stated he agrees it is a very attractive building on a unique parcel, the two fit very nicely together. He asked about parking. The Applicant stated more information will be provided at the next level of review.

Commissioner Grissim stated she appreciates the effort on the architecture, there is no real visibility so some of it does not make sense with the commercial use. They are working the best they can with the site. She is looking forward to seeing more information on the underground storm drain detention. The Applicant stated they are working with Livingston County Drain Commission and the Township Engineer; more information will be provided at the next level of review.

Commissioner Eckman stated if you are going to put something there, this is a really nice looking building; it looks nice from all sides. He has a very positive view of the project.

Commissioner McMullen concurred.

Chair Fox also agreed and stated they have done a great job with the project.

The Applicant stated they appreciate the feedback, are excited to be here and fill the need locally in the Hartland community.

8. **Call to the Public:**
   None

9. **Planner Report:**
   None

10. **Committee Reports:**
    None

11. **Adjournment:**
    A Motion to adjourn was made by Commissioner Mitchell and seconded by Commissioner Mayer. Motion carried unanimously. The meeting was adjourned at approximately 8:02 PM.

Hartland Township Planning Commission Meeting Agenda Memorandum

Submitted By: Troy Langer, Planning Director

Subject: Site Plan/PD Application #23-008, Highland Reserve Planned Development (PD) – Preliminary Site Plan

Date: September 21, 2023

Recommended Action

Move to recommend approval of Site Plan/PD #23-008, the Preliminary Planned Development Site Plan for Highland Reserve Planned Development as outlined in the staff memorandum dated September 21, 2023.

Approval is subject to the following conditions:

1. The Preliminary Planned Development Site Plan for Highland Reserve Planned Development, SP/PD #23-008, is subject to the approval of the Township Board.

2. Waiver request for the substitution of evergreen trees for 50% of the required canopy trees in the greenbelt area of the residential section of the planned development along Highland Road, is approved.

3. Waiver request to deviate from the Livingston County Road Commission design standards regarding the roadway surface width for a private road, is approved.

4. The applicant shall adequately address the outstanding items noted in the Planning Department's memorandum, dated September 21, 2023, on the Construction Plan set, subject to an administrative review by Planning staff prior to the issuance of a land use permit.

5. As part of the Final Plan Review, the applicant shall provide a Planned Development (PD) Agreement that includes any access and maintenance agreements. Access and maintenance agreements will be required for the use of the Hartland Glen Lane and future road connections to the east (via Melsetter Street) and south (via Ardmore Avenue). The documents shall be in a recordable format and shall comply with the requirements of the Township Attorney.

6. Applicant complies with any requirements of the Township Engineering Consultant, Department of Public Works Director, the Fire Code requirements, and all other government agencies, as applicable.

7. (Any other conditions the Planning Commission deems necessary).

Discussion

Applicant: Michael West

Site Description

The subject property is south of Highland Road and east of Hartland Glen Lane/Hartland Glen Golf Course, in Section 26 of the Township. Redwood Living Planned Development has frontage along the west side of Hartland Glen Lane and is currently under construction. The subject parcel (Parcel ID #4708-26-200-002) is approximately 39.05 acres in size and zoned CA (Conservation Agricultural). The subject property is designated as Special Planning Area (SPA) on the 2020-2021 Comprehensive Plan and Future Land Use Map (FLUM) Amendment. The property is part of the M-59/Cundy/Hartland Glen Golf Course Special Planning Area.

Currently the property primarily consists of open fields which have historically been used for agricultural activities. Per the Wetland Delineation report submitted by the applicant (compiled by Fishbeck, dated May 19, 2023), three (3) wetland areas have been identified on the subject site. One wetland area is in the southeast corner. The other wetland area is on the west side of the parcel, and the third wetland area is in the northwest corner of the site. The applicant has not provided documentation that the wetland areas have been reviewed by the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) regarding their regulatory status or permit requirements.

Wooded areas occur along the M-59 boundary (west and northeast), and along the east and west sides of the property. A stand of trees exists in the southwest corner of the site.

The property to the south is part of Hartland Glen Golf Course, addressed as 12400 Highland Road and is zoned CA (Conservation Agricultural).

To the east, is property that has been historically associated with the Newberry Place Planned Development project, which is zoned CA (Conservation Agricultural). The property is undeveloped currently.

Per the site plan, access to the site is via Highland Road, a public road, which is under the jurisdiction of the Michigan Department of Transportation (MDOT).

An additional road connection is shown from Hartland Glen Lane, west of the subject site. Hartland Glen Lane was never formally approved as a private roadway and would be considered a non-conforming roadway. Historically this roadway has been the only access route to the clubhouse, golf course, and parking associated with Hartland Glen Golf Course. The approved plans for Redwood Living PD (SP PD #21-005 and SP PD #22-003) shows Hartland Glen Lane as paved (asphalt surfacing), twenty (20) feet wide, and without curb and gutter. Redwood Living PD has two (2) access points from Hartland Glen Lane. An access easement for ingress and egress would be required as part of the Final PD documents, allowing Highland Reserve PD to take access from Hartland Glen Lane.

Municipal water and sanitary sewer will be required for this project.

Site History

Per Township records, the property was occupied by a residential home, and addressed as 12690 Highland Road. The records do not indicate when the house was constructed. The house and detached building were demolished in 2000, under Land Use Permit #5344. The Township Assessing records indicate the property has been leased for agricultural purposes since 2007.

Historically, plans for the Newberry Place Planned Development have included the subject property as part of that development, under several applications from 2007 to 2016 (Newberry West). Conversely, other development plans for Newberry Place PD did not include this property. The Preliminary PD for Newberry Place PD was approved by the Township Board on July 6, 2021, under SP/PD #20-012, and did not include

the subject property.

Site Plan/PD Application #23-003 Highland Reserve Planned Development – Concept Plan
The Concept PD Plan was discussed under SP/PD Application #23-003. The Planning Commission reviewed the project on March 23, 2023, which was followed up by the Township Board's review on April 4, 2023.

Planned Development Procedure
Section 3.1.18 of the Township's Zoning Ordinance provides standards and approval procedures for a PD (Planned Development). Approval of a Planned Development is a three-step process. A Concept Plan, Preliminary Plan, and Final Plan are all reviewed by the Planning Commission and the Township Board, with the Planning Commission making a recommendation and the Board having final approval at each step. The process usually requires a rezoning from the existing zoning district to the Planned Development (PD) zoning district. As part of the rezoning, a public hearing is held before the Planning Commission consistent with the Michigan Zoning Enabling Act; this public hearing is held at the same meeting during which the Planning Commission reviews and makes a recommendation on the Preliminary PD. Approval of the Final Plan by the Township Board usually constitutes a rezoning of the subject property to PD (Planned Development).

Given the requirements for publishing a notice for the planned development, the public hearing has been scheduled for the September 28, 2023 Planning Commission meeting. Approval of the Final Plan by the Township Board usually constitutes a rezoning of the subject property to PD (Planned Development).

For all intents and purposes, the Preliminary Plan step is essentially the same as a preliminary site plan review for a conventional project in the Township. All the information and details required for a preliminary site plan approval must be provided for the Preliminary PD review and approval. Final PD review will involve detailed plans for those phases for which construction is intended to begin immediately, review of the Planned Development Agreement, and other written documents as applicable.

Overview of the Preliminary Plan and Proposed Uses
Currently the subject site (39.05 acres) is zoned CA (Conservation Agricultural). The proposed planned development is comprised of two (2) proposed parcels of land with two (2) different uses. An approximate 2.1-acre parcel, in the northwest corner of the site, is designated as Future Commercial Development. To be noted, the Project Narrative and Pattern Book dated August 31, 2023 (revised), states the parcel area as 1.9 acres in size.

The remaining portion of the property, approximately 36.95 acres, is shown as a single-family residential development with a total of one hundred and one (101) detached single-family homes. Thirty-five (35) of the detached homes are homes for rent. Sixty-six (66) homes are detached, single-family condominium units, as part of a site condominium development. The Concept Plan had shown sixty-five (65) condominium units. The residential portion of the project area is slightly different than the Concept Plan, regarding the layout of the residential units (rental and condominium units). The street plan is generally the same as the Concept Plan.

Following is a discussion of each component of the Planned Development.

Future Commercial Development Area
Per the applicant, the current landowner (Lexington Homes, LLC) intends to retain the northwest corner for a commercial project, essentially proposing to go through a land division process to create that parcel. The submitted plans do not show specific development plans for this parcel; essentially the proposed parcel

is considered a place holder for commercial use(s) to be determined. The commercial development area is part of the proposed planned development.

Per the Project Narrative, the applicant specifically proposes the following uses for the commercial parcel, which are based on uses listed in Section 3.1.14 of the Zoning Ordinance (GC- General Commercial):

- Gasoline station/convenience store
- Fast-food restaurant with drive-through service
- Retail center
- Professional/medical offices
- Financial institution
- Personal service establishment
- Child care center
- Personal fitness center
- Restaurant

These will be considered permitted principal uses, specifically for this planned development, even though some are listed as special land uses in Section 3.1.14 (GC). Future development plans for commercial area will be reviewed by the Planning Commission as a Site Plan application, and the plans will be subject to the approval of the Planning Commission. None of the proposed uses are considered a Special Land Use.

The applicant states the commercial site is to be developed using the GC (General Commercial) zoning standards and all applicable design standards in the Zoning Ordinance such as landscaping, lighting, architecture, building materials, parking, and signage. Staff has concerns about setbacks and other required design guidelines if using the GC standards and/or standards for a specific use.

Single-Family Residential Development

The remaining portion of the site, approximately 36.95 acres, is shown as a single-family residential development with a total of one hundred and one (101) detached single-family homes. Thirty-five (35) of the detached homes are homes for rent. The rental homes are situated along the northern portion of the site, along Highland Road frontage, and in the central area, generally on the west side of the residential development.

The remainder of the property will be developed as a site condominium subdivision with sixty-six (66) detached owner-occupied, single-family residential condominium units. The Concept Plan had shown sixty-five (65) condominium units, for a total count of 100 residential units.

The plan shows three (3) development phases for the residential portion of the project, which are summarized below:

Phase #	#Rental units	#Site condo units
Phase 1	25	6
Phase 2	10	34
Phase 3	0	26
TOTAL UNITS	35	66

Several housing options are available for both the rental and condominium units, and include a single-story ranch, two-story and/or bi-level homes. Individual floor plans range between 1,250 to 2,800 square feet in size. Options include homes with 3-4 bedrooms, 2-3 bathrooms, and an attached two-car or three-car garage.

Product information on the building materials is found in the Sample Portfolio of Houses and in Exhibit G.

For the rental homes, the plan states the typical unit envelope as fifty (50) feet wide and sixty-five (65) feet long, however there are some dimensional variations in unit sizes. Sheet 5 in the plan set has a chart listing the size of each rental unit envelope. The rental unit envelopes are all on the same parcel thus there are no true setbacks from a property line. The applicant has stated the rental units will not be permitted to have detached accessory structures, play structures, or boats according to the rental agreement. The assumption is that the residential structure, deck, and patios will be contained within the rental unit envelope.

Exhibit A of the Project Narrative (Sample Sketches) shows sample sketches of rental unit envelopes with varying sizes of houses, garages (2-stall or 3-stall), and features such as decks or patios. The distance between two (2) adjacent structures is stated. All elements are placed within the unit envelope. The driveway and front sidewalk extend beyond the unit envelope.

The minimum lot size within the condominium subdivision is shown as 60 feet wide by 120 feet long, and approximately 7,200 square feet in area. The largest lot size is approximately 12,978 square feet.

Exhibit A of the Project Narrative (Sample Sketches) also has sample sketches of condominium units, with varying sizes of the house, garage, deck, and patio. All site elements are shown within the building envelope. The building envelope is defined by the building setbacks. The distance between adjacent structures is stated on the sample sketches and varies from 10 feet to 22.7 feet depending on the size of the condominium unit (lot) and design details (house footprint size; 2 or 3-stall garage option). Exhibit B contains aerial and street photographs of similar residential developments in other cities. Distances between structures are stated. Exhibits A and B are intended to show possible site layout scenarios for the rental or condominium units.

Sheet 5 of the site plans shows a drawing of a typical condominium lot with setbacks that define the building envelope (Typical Site Condo Unit Detail). A drawing is also provided on Sheet 5 for a Typical Rental Unit, with separation requirements stated.

<u>Rental Unit - Setbacks and Building Separation Requirements:</u>

Interior Streets:	25 feet (measured from street ROW to leading edge of unit envelope)
Highland Road:	80 feet (Unit #1-13; measured from ROW to edge of unit envelope)
Side:	10 feet (minimum 10-foot separation between buildings, measured side-to-side)
Rear:	Not Applicable
Separation:	40 feet (minimum 40-foot separation between buildings, measured back-to-back)

(All structures, patios, decks, and other site improvements are to be placed within the rental unit envelope, except driveways and sidewalks)

<u>Condominium Unit – Building Setbacks/Building Envelope:</u>

Front: 25 feet
Side: 5 feet
Rear: 20 feet

(All structures, patios, decks, in-ground pools, and other site elements are to be placed within the building envelope, except driveways and sidewalks)

<u>Lot coverage.</u> Lot coverage is not stated on the plans. All structures and site elements are to be built within the rental unit envelope or within the buildable area of a site condominium unit, with the exception of driveways and sidewalks (from house to street). Site elements include hard surfacing (concrete patios, paver

patios, sidewalks, pool apron), deck, shed, pools, pavilion, gazebo, and other built structures.

Other Development Features
Internally, vehicular circulation is provided by a network of paved, private roads and includes two (2) cul-de-sacs. Two street stubs are shown, one on the east (Melsetter Street) and one on the south (Ardmore Avenue), which are intended to allow for future street extensions and connectivity to the adjacent properties. Ardmore Avenue extends to the south property line. Melsetter Street ends shy of the east property line. Per the applicant's explanation, off-site grading would be required to show Melsetter Street ending at the east property line. The applicant will need to work with the adjacent property owner to acquire permission to do off-site grading. Access easements for ingress and egress for the proposed road connections will be required as part of the Final PD documents.

The private roads in the proposed development will be required to meet the standards of Section 5.23 of the Zoning Ordinance. For a road serving twenty-five (25) or more units or parcels, private roads are to be constructed consistent with public road requirements of the Livingston County Road Commission (LCRC). The paved roadway portion is shown as thirty (30) feet wide with mountable concrete curb and gutter, and a 66-foot-wide right-of-way. Additional comments on the private roads are found in this memorandum under the section "Requirements for Preliminary Review".

Five (5) foot wide concrete sidewalks are shown on both sides of each private road. Natural, mowed paths are planned within the two larger open space areas of the site, with connections to the concrete sidewalks in several locations for walkability throughout the development. Benches are shown along the mowed paths**.** Details on the mowed path, split rail fencing, and benches are shown in Exhibit C.

Stormwater run-off from the residential portion of the project will be collected and conveyed to two (2) detention areas, in the west-central area of the site. Additionally, infiltration swales are shown in several areas, as required by the Livingston County Drain Commission. Stormwater run-off from the commercial portion of the project will be handled within the commercial site.

Approximately 15.72 acres of the site is designated as open space, equating to approximately 40.3% of the of the property, using the parcel size of 39.05 acres. Additional information is provided under the "Open Space" section of this memorandum.

Municipal water and sanitary sewer will be required for this project. The applicant will need to work with the Township and Livingston County regarding public water and sanitary sewer. They will also need to work with the Hartland Township Department of Public Works (DPW) to acquire the necessary Residential Equivalent Units (REU)'s for this development.

The parcel is approximately 39.05 acres, resulting in an estimated density of 2.59 dwelling units per acre (101 units ÷ 39.05 acres). More discussion on density is provided in the next section of this report.

Eligibility Criteria (Section 3.1.18.B.)
To be eligible for PD approval, the applicant must demonstrate that the criteria in Section 3.1.18.B. will be met.

1. **Recognizable Benefits.** *The planned development shall result in a recognizable and substantial benefit to the ultimate uses of the project and to the community and shall result in a higher quality of development than could be achieved under conventional zoning.*

The applicant has provided an explanation of the recognizable benefits in the Project Narrative dated August 31, 2023 (revised). Per the applicant, the recognizable benefits include the following:

- Substantial open space preservation (15.72 acres or 40% of overall property), which would exceed what could be achieved under conventional zoning.
- A sustainable and healthy walkable neighborhood design with approximately 9,900 lineal feet of concrete sidewalks; 1,850 lineal feet of natural walking paths; and neighborhood park with a pavilion, playground, and picnic tables.
- Quality housing for residents in Hartland Township in a price range that is more attainable for middle income individuals and families.

2. Minimum Size. *Planned Developments must be a minimum of 20 acres of contiguous land.*

The parcel is approximately 39.05 acres and complies with the minimum size for a planned development.

3. Use of Public Services. *The proposed type and density of use shall not result in an unreasonable increase in the use of public services, facilities, and utilities, and shall not place an unreasonable burden upon the subject site, surrounding land, property owners and occupants, or the natural environment.*

The residential development is accessed from Highland Road, which is under the jurisdiction of the Michigan Department of Transportation MDOT). Approval and permits from MDOT will be required for the proposed access point. A second proposed access to the residential development is via Hartland Glen Lane, an existing private roadway along the western edge of this development. Access from Hartland Glen Lane requires authorization from Redwood Living and Hartland Glen Development LLC. An ingress-egress easement agreement and road maintenance agreement between all parties are required as part of the Final PD submittal. Internally, a looped system of private roadways is proposed. The intent is that the private roads will be maintained by the Homeowner's Association per the applicant.

Access to the commercial development area will be determined when development plans are submitted for that parcel.

Regarding density, the FLUM designation for this property is Special Planning Area (SPA) which allows for a density that is flexible, but with an overall base density of four (4) dwellings per acre. Using this density, a maximum 156 dwelling units could be permitted (39.05 acres x 4 dwelling units per acre). In comparison, the proposed residential single-family development has 101 dwelling units and density of 2.59 dwelling units per acre, which could generate less traffic and have less impact on Highland Road.

Public water and sanitary sewer services will be required for the project. The Township Director of Public Works has provided comments in the review letter dated July 11, 2023. Extension of the municipal water and sanitary sewer services could benefit the adjacent properties to the east and south when they develop.

The Hartland Deerfield Fire Authority will provide fire protection and will review the proposed plans for fire hydrant placement and other safety issues. A review letter from the Fire Authority, dated March 2, 2023, is provided.

4. Compatibility with Comprehensive Plan. *The proposed development shall not have an adverse impact upon the Comprehensive Plan for the Township. Notwithstanding this requirement, the Township may approve a Planned Development proposal that includes uses which are not called for on the Future Land Use Map, provided that the Planning Commission and Township Board determine that such a deviation from the Future Land Use Map is justified in light of the current planning and development objectives of the Township.*

The subject property is designated as Special Planning Area (SPA) on the 2020-2021 Comprehensive Plan and Future Land Use Map (FLUM) Amendment. The property is part of the M-59/Cundy/Hartland Glen Golf Course Special Planning Area. This category designation envisions a density that is flexible. Overall, the SPA should have an overall density of four (4) dwelling units per acre, with a higher density being more desirable in the northern portion of the SPA and a lower density in the lower portion.

Using 39.05 acres for property size and allowing a density of four (4) units per acre, a maximum 156.2 (or 156) dwelling units could be permitted (39.05 acres x 4 dwelling units per acre). The Preliminary Plan proposes a density of 2.59 dwelling units per acre (101 dwellings ÷ 39.05 acres), which is consistent with the maximum allowed density for the Special Planning Area.

Specific principles were agreed upon for the Special Planning Area in the 2020-2021 Comprehensive Plan Amendment, as listed below.

1. Development within the Special Planning Area shall provide for a variety of housing forms (for example, single family, townhouses, condominium, apartments, and senior housing), along with retail, office, recreation, and entertainment space. *The applicant proposes a residential development comprised of a combination of detached single-family homes for lease/rent and single-family site condominium units. A variety of building styles are proposed. Per the applicant, the Hartland Reserve PD is intended to provide much needed and quality housing in a price range that is amenable for the middle-income individuals and families. A commercial component is proposed in the northwest corner of the site, with the specific use(s) to be determined at a future time.*

2. Development within the Special Planning Area shall provide for public facilities and other neighborhood amenities. *The proposed extension of the public watermain and sewer to serve this site could potentially serve adjacent sites in the future. This could be considered an asset to the Township. The design of the PD provides open space areas that can be enjoyed by the Hartland Reserve PD community, that include a covered pavilion, playground, and internal walking paths.*

3. Special Planning Area shall provide pedestrian and vehicular links between land uses and adjacent property (that may not be directly included within this Special Planning Area development). *The proposed plan shows 5-foot-wide concrete sidewalks on each side of each private road. The internal sidewalks connect to the proposed 5-foot-wided concrete sidewalk along the Highland Road frontage. Vehicular access points are provided from the PD site from Hartland Glen Lane, Highland Road, as well as future connections to the east and south.*

4. Special Planning Area shall also coordinate with the Township's goal of creating walkable pathways to the Township settlements and other public and private facilities. *The PD provides an internal system of sidewalks and walking paths. Additionally, the proposed 5-foot-wide concrete sidewalk along the frontage of Highland Road has the potential to connect to future developments to the east.*

5. Developments shall be developed in harmonious coexistence with pre-existing historical and natural features within the Township. *The intent of the PD is to retain portions of existing natural features such as the wetland areas and existing trees, as shown on the plans.*

6. Special Planning Area shall include landscape, streetscape, traffic and architectural solutions that are superior in design and visually enhancing the local community with sensitivity to the existing historic features in the Township. *The residential buildings are a mix of single-story and two-story detached houses which are in keeping with the surrounding neighborhoods. The proposed landscape plan provides buffering of the buildings on the north with a berm and plantings along Highland Road. A majority of the existing trees on the east and west boundaries are shown to be preserved, which can provide buffering in those areas. Street trees are shown for each residential unit. The rental units will have planting beds on the front of each house. Standard planting plans for the rental units are found in Exhibit F.*

5. Unified Control. *The proposed development shall be under single ownership or control such that there is a single person or entity having responsibility for completing the project, or assuring completion of the project, in conformity with the Ordinance.*

The commercial portion of the planned development, Commercial Split Area, will be developed by the current landowner (Lexington Homes, LLC). The individual homes and exterior grounds associated with the rental portion of the residential community will be professionally managed and maintained by the developer.

The site condominium subdivision portion of the PD will be governed by a Master Deed and Bylaws. A Homeowners Association (HOA) will be established which will oversee the maintenance of open space areas, private roads, and stormwater areas. Architectural review, enforcement of community restriction, and financial management will also be under the authority of the HOA. A thorough review of the condominium documents will occur with the Final Plan submittal.

Planned Development Design Standards (Section 3.1.18.C.)

This section outlines the design standards for a planned development. Additional site standards will be discussed from applicable sections of the Zoning Ordinance.

1. Permitted Uses. *The predominant use on the site shall be consistent with the uses specified for the parcel on the Township's Comprehensive Plan for Future Land Uses.*

The subject area for the planned development project is designated as Special Planning Area (SPA) on the adopted 2020-2021 Comprehensive Plan and Future Land Use Map (FLUM) Amendment. This land use category envisions a variety of housing (for example, single-family, townhouses, condominiums, apartments and senior housing), as well as retail, office, recreation, and entertainment space. The proposed planned development includes rental housing options, site condominium residential units, and the potential for commercial uses for the Commercial Development Area.

2. Residential Density. *Residential density in a planned development shall be consistent with the density designation within the Township's Comprehensive Plan.*

Section 3.1.18.C. of the Zoning Ordinance states the residential density in a planned development shall be consistent with the density designation within the Township's Comprehensive Plan. The subject property is designated as Special Planning Area (SPA) on the 2020-2021 Comprehensive Plan and

Future Land Use Map (FLUM) Amendment. This category designation envisions a flexible density, with an overall density of four (4) dwelling units per acre.

Using the subject site acreage of 39.05 acres and allowing a density of four (4) units per acre, approximately 156.2 (or 156) dwelling units could be permitted (39.05 acres x 4 dwelling units per acre). The Preliminary Plan proposes a density of 2.59 dwelling units per acre (101 dwellings ÷ 39.05 acres), which is consistent with the allowed density of the SPA.

Per Section 3.1.18.C.iv., the Planning Commission may agree to recommend up to a forty (40%) percent increase in units on a site in recognition of outstanding attributes as listed in this section. The Township Board in its sole discretion shall have the ability to approve such density increase up to forty (40%) percent subsequent to an affirmative recommendation from the Planning Commission. In this case if the Planned Development land area could accommodate 156.2 units (39.05 acres x 4 units per acre), in accordance with the Comprehensive Plan, the Planned Development plan could include up to 218 dwelling units (156 + 62 additional units) if a maximum bonus of 40% were awarded by the Planning Commission and Township Board. A density bonus is not being considered for this PD project.

The chart below outlines residential density as discussed in this section.

Residential Density	**Residential Units**
Proposed	101
Permitted	156
Bonus – maximum	218

3. **Design Details.** *The applicant shall prepare a detailed description of design details to be implemented in the proposed planned development, to be presented in a Pattern Book.*

   The design details are provided within the Project Narrative and Pattern Book and the Sample Portfolio of Houses as well as on the submitted site plans.

4. **Minimum Yard Requirements.** The minimum yard requirements are noted in the chart below per Section 3.1.18.C.vi.a. (Residential Use)

Yard Location	Minimum PD Standard	Proposed distance or setback*	Complies Yes/No
Along perimeter adjacent to public road (Highland Road)	50 ft.	84 ft. (closest point to a rental unit envelope on north) 70 ft. (Condo Unit 1)	Yes for both rental and condo units
Along perimeter, but not adjacent to a road (for rear yard, condo unit only)	40 ft.	20 ft.	No
Along an internal collector or local road – front yard	40 ft.	25 ft.	No

*As measured to closest point of a rental unit envelope or condo unit envelope

Section 3.1.18.C.vi.b.(2) states that minimum rear yard setback and minimum lot size for detached single-family structures in a planned development shall be based on good planning and design principles taking into account several variables as follows: degree of compatibility between adjoining uses; sensitivity to the characteristics of the site; the need for free access for emergency vehicles; the need for adequate amounts of light and air between buildings; and the need for proper amounts of open space for the exclusive use of residents on the site. The Planning Commission can evaluate the plans using those variables.

5. **Distances Between Buildings.** Spacing requirements for buildings in a planned development for any detached single-family structure are outlined in Section 3.1.18.C.vi.b.(1). *Any detached single-family structure shall be located at least thirty (30) feet from any other detached single-family structure and shall provide a minimum side yard setback of fifteen (15) feet on both sides.*

   The typical unit envelope for a rental home is fifty (50) feet by sixty-five (65) feet, with a minimum 10 -foot separation between buildings. Potentially, if adjacent homes were built to meet the outer boundaries of each rental unit envelope, the separation between structures could be ten (10) feet. This would not meet the minimum required spacing standards of thirty (30) feet between any other detached single-family structure. Per Section 3.1.18.C.vi.a., modification to yard requirements may be approved by the Township Board upon recommendation from the Planning Commission, upon making the determination other setbacks would be more appropriate.

   The typical lot detail drawing for the site condominium unit shows the building envelope as defined by the proposed setbacks. Based on the plans, the side yard setback is five (5) feet, which equates to ten (10) feet between two (2) structures. This would not meet the minimum required spacing standards of thirty (30) feet between any other detached single-family structure. Per Section 3.1.18.C.vi.a., modification to yard requirements may be approved by the Township Board upon recommendation from the Planning Commission, upon making the determination other setbacks would be more appropriate.

   The Hartland Deerfield Fire Authority has concerns with the proposed plans as noted in the review letter dated March 2, 2023.

6. **Building Height.** *No building in a planned development shall be greater than thirty-five (35) feet in height.*

   The sample house portfolio shows one-story and two-story structures however the building height is not stated. Additional details will be required as part of the Construction Plan set.

7. **Parking and Loading.** *Planned Developments shall comply with the parking and loading requirements specified in Section 5.8, Off-Street Parking requirements, and Section 5.9, Loading Space Requirements of the Zoning Ordinance.*

   Parking requirements are listed in Section 5.8.4.H (Table of Minimum Parking Space Requirements). For the category, Residential, Family, two (2) parking spaces are required for each dwelling unit.

   There are options for an attached 2-stall garage, or 3-stall garage per the sample house portfolio. This satisfies the parking requirement. Exhibit A (Sample Sketches of Rental Units and Condo Units) shows the residential driveway to be at least twenty-five (25) feet long, which could accommodate additional parking of vehicles.

8. Landscaping. Landscaping requirements are found in Section 3.1.18.C.vi.e. These are considered minimum design standards, typically for a commercial or office development. A more detailed review of the landscaping is provided in this memorandum using applicable landscape standards as outlined in Section 5.11 (Landscaping and Screening).

9. Open Space. *Open space shall be provided to complement and accentuate the high-quality design of the proposed planned development. At minimum the planned development shall provide open space consistent with the previous zoning designation for the site.*

Per this section of the Zoning ordinance (Section 3.1.18.C.vi.f,), the planned development shall provide open space consistent with the previous zoning designation for the site, at a minimum. Currently the site is zoned CA-Conservation Agricultural. In CA, the open space requirement is a minimum of 85%, for a single-family detached dwelling. The proposed plan states the overall open space is 40.3% of the site (using 39.05 acres) and thus would not comply. Historically, however, open space requirements outlined in Section 3.15 of the Zoning Ordinance have been applied for other single-family residential planned developments in the Township such as Walnut Ridge Estates and Fiddler Grove.

Section 3.15 of the Zoning Ordinance states residential condominium developments (in several zoning district classifications) should provide a minimum of 25% open space, with a minimum of 10% of the total open space to be usable open space ("usable open space" is defined as land area suitable for active recreation). For the proposed development consisting of 39.05 acres, this would equate to a minimum of 9.76 acres of open space, with a minimum of 0.976 acres of usable open space.

The Project Narrative provides a breakdown of the open space areas by category. Sheet 4 of the Site Plans shows the different categories of open space areas. All the open space areas are within the residential portion of the planned development, and none are shown in the Commercial Development Area. The open space areas include wetland and detention areas, upland areas, infiltration swales, and open areas adjacent to the rental homes on the north and center area of the site, as well as the open area in the southeast corner of the development. A series of mowed trails are proposed within the open space areas, adjacent to wetland areas, with benches along the trails. A playground and pavilion are shown in the southeast corner of the development.

Per the Project Narrative, the total open space is approximately 15.72 acres equating to 40.3% of the site (39.05 acres). The percentage of usable open space is stated as 4.69 acres or thirty (30) percent of the total open space. The useable open space includes active recreation areas such as mowed walking paths, the playground/park area, areas around the wetlands, and the Greenbelt along Highland Road.

10. Natural Features. *Consistent with the stated intentions for the creation of these regulations, the preservation of the natural features of the Township is an important planning consideration. A PD proposal must consider the natural topography and geologic features, scenic vistas, trees and other vegetation and natural drainage patterns that exist on the site and propose a development pattern which preserves and avoids disruption of those natural features as much as possible.*

A Topographic Survey and Tree Inventory are provided, which show the existing features of the site. A Tree Survey lists the tree species and condition of each tree on the Tree Inventory. Currently the site consists of an open field which has been farmed in the past. Wooded areas occur on the east and west boundaries of the site, and in the southwest and northwest corners. The plans indicate that trees will be preserved that are located in the east, west, and southwest areas of the site.

Three (3) wetland areas have been identified per the applicant's Wetland Delineation report. A small portion of the wetland in the southeast area will be impacted (0.176 acres). Approvals and permits from the State Department of Environment, Great Lakes and Energy (EGLE) may be required. The remaining wetland areas will be preserved and are shown as Open Space.

11. **Sidewalks and Pedestrian Access.** *The applicant must demonstrate the PD site, and all uses within the site, will be connected to any existing pedestrian and nonmotorized vehicle paths and trails within a public right-of-way or easement open to the public.*

    A proposed 5-foot-wide concrete, sidewalk is shown along the frontage of the residential portion of the PD site on Highland Road, with connections to the 5-foot-wide sidewalks in the PD along Lockerbie Lane. The internal sidewalks along Abernathy Street extend to Hartland Glen Lane on the west; however, no sidewalks are in place along Hartland Glen Lane. Future street and sidewalk connections could occur to adjacent properties to the south and east, where street stubs are shown on the plans.

Requirements for Preliminary Review (Section 3.1.18.E.ii)
The following section is a summary of items that have not been addressed in the previous review as part of the Design Standards section.

1. **Sewer and Water.**
   The Department of Public Works has provided a review letter dated July 11, 2023, which outlines the number of REU's required for the proposed development.

2. **Stormwater and Drainage Systems.**
   Stormwater from the residential; portion of the project will be collected and conveyed to two (2) detention areas. Additional collection of stormwater is via infiltration bioswales which are shown in several areas. The commercial portion of the project will have its own on-site stormwater management system.

3. **Traffic Impacts.**
   The applicant has provided a Traffic Impact Study, dated June 20, 2023, conducted by Fleis and Vandenbrink. Based on the email from the Michigan Department of Transportation (MDOT), dated August 16, 2023, MDOT has no concerns with the easterly M-59 access to the residential development (Lockerbie Lane). MDOT is working with the applicant regarding other access points from M-59 and/or Cundy Road.

4. **Vehicular Circulation.**
   The residential portion of the project area development has one (1) entrance from Highland Road and one (1) entrance from Hartland Glen Lane. Internal circulation is via private roads that include two (2) cul-de-sacs. Section 5.23.5 of the Zoning Ordinance states when a potential number of units or parcels served is twenty-five (25) or greater, the proposed private roads must be constructed consistent with public road requirements of the Livingston County Road Commission (LCRC). The minimum required roadway surface width shall not be less than thirty (30) feet, with the dimension measured from face of curb to face of curb.

   The plans show a typical cross section of the private road (half-section), and the roadway surface width is stated as thirty (30) feet, as measured from back of curb to back of curb. The curb is a mountable curb. A 66-foot wide private road right-of-way easement is shown. The roadway surface width in the cross section is not measured from face of curb to face of curb, and thus does not comply with the LCRC standards. Using the LCRC standards would add approximately four (4) feet of paved surface

area and would reduce the width of the planting area for street trees, between the back of curb and sidewalk. The deviation from the LCRC design standards is considered a waiver. The proposed road design has been approved for private roads in similar residential PD developments such as the Villas of Hartland PD and the Courtyards of Hartland PD.

Section 5.23.5.E.vi. of the Zoning Ordinance (Minimum Private Road Standards) states that private roads serving more than twenty-four (24) parcels or dwelling units or combination thereof equaling twenty-four (24) shall have at least two (2) points of access to a public road. In this case there is access to Highland Road (public road) via Lockerbie Lane. A second access is shown from Abernathy Street to Hartland Glen Lane, which is a private roadway. Hartland Glen Lane merges with Cundy Road, a public road, which intersects with Highland Road.

5. Fiscal Impacts.
The applicant has provided a response to this topic in the Project Narrative and Pattern Book dated August 31, 2023.

Landscaping (Section 5.11)
Applicable sections of Section 5.11 (Landscaping and Screening) will be applied to the PD, as outlined below.

A. Greenbelt Landscaping (Sec. 5.11.C.)
- Required – Within the first 30 feet of the property, 1 canopy tree for every 30 ft of lineal of frontage; Planning Commission may approve up to 50% substitution of canopy trees with evergreen trees; PLUS 3 small deciduous ornamental trees or large deciduous or evergreen shrubs for the initial 40 ft., and 1 per 20 ft. thereafter. Length of ROW frontage of Highland Road for residential portion of PD (1,081 lineal ft)
  EQUATES TO: 36 canopy trees and 55 additional ornamental trees, or large deciduous or evergreen shrubs or combination thereof REQUIRED
- Proposed – 18 canopy trees; 18 evergreen trees; 3 ornamental trees; and 54 large shrubs, generally within first 30 feet of the property; on a berm that runs parallel to frontage along Highland Road
- Meets Requirement? – 50% of the trees in the greenbelt are evergreen trees. Concerns with placement of trees under the overhead wires and future conflicts with tree height. The applicant has requested a waiver for 50% of the Greenbelt trees to be conifer trees.
- Comment – **Planning Commission may approve a substitution of evergreen trees for up to 50% of the canopy trees. Existing overhead power lines are in place within the Greenbelt. A utility easement is not shown. The applicant notes that the trees are placed outside a 30-foot-wide zone associated with the overhead power lines.**

B. Canopy trees along Internal Roadways (Sec. 5.11.2.C.ii.) –
- Required – 15-foot-wide landscaped area along the length of internal roadways, planted with a minimum of 1 canopy tree or evergreen tree for every 30 feet or portion thereof. Required canopy tree size is a minimum 3-inch caliper tree at the time of planting.
- Proposed – 10-foot-wide landscaped area between sidewalk and street (curb); generally, 1 canopy tree is shown per unit and to be spaced thirty-five (35) feet on center. Proposed canopy tree size is 3-inch caliper tree, with the exception of White Oak which is stated to be a two (2) inch caliper tree.
- Meets Requirement? – Yes, except for caliper size of White Oak
- Comment – **Plan to be revised to state White Oak tree is a three (3) inch caliper tree, on the Construction Plan set.**

C. Buffering or Screening (Sec. 5.11.2.G.i.) – Screening between Land Uses (east and south property lines where abutting single-family CA zoned properties)
   - Required – landscape buffer shall be provided to create a year-round visual screen at least eight (8) feet in height along all adjoining boundaries of a non-residential use or a residential use of higher density and abutting a single-family residential zoned property. Evergreen trees to be planted in a staggered or clustered pattern with varying tree heights.
   - Proposed – EAST: random groupings of existing deciduous trees to be preserved.
     Proposed – SOUTH: SW corner has wetland area and some existing deciduous trees to be preserved. Along the rear of Units 32-40, no landscaping is shown. SE area has wetland area, open space, and a few existing trees to be preserved.
   - Meets Requirement? – **TBD**
   - Comment – **Planning Commission to determine if the proposed plan meets the intent of the screening requirement.**

D. Detention/Retention Area Landscaping (Sec. 5.11.2.H.)
   - Required – Landscape materials shall be used to integrate the area with the overall landscape design; 1 canopy or evergreen tree must be planted for every 50 lineal ft. of basin perimeter as measured at the top of the bank elevation. The required trees shall be planted in a random pattern or in groupings.
     Northwest Basin Perimeter - approx. 650 lineal ft. EQUATES TO: 13 canopy or evergreen trees/combination of REQUIRED
     South/central Basin Perimeter – Approx. 866 lineal ft. EQUATES TO: 18 canopy or evergreen trees /combination of REQUIRED
   - Proposed –
     Northwest Basin: 12 canopy trees
     South/central Basin: 16 trees
   - Meets Requirement? – **TBD**
   - Comment – **Planning Commission to determine if the proposed planting plan meets the intent of the detention landscaping requirements. Trees should be planted in a random pattern or groupings.**

E. Requirements for Single Family Residential Districts (Sec. 5.11.6.B.)
   Single Family Residential properties are encouraged to plant and maintain landscaping which provides a good street side appearance. All unpaved portions of the front yard are to be planted with suitable live plan material (grass, groundcover, and shrubs) and extending to any abutting street pavement edge. Lawn is proposed around each unit as well as landscape beds in the front of the rental unit houses. A typical landscape plan is provided for these areas. Maintenance of the exterior grounds of the rental portion of the community will be professionally managed by the developer.

   Landscaping around each condominium unit is up to the discretion of the individual homeowner.

Other site details

Irrigation
Irrigation is provided on the landscape berm along Highland Road (Greenbelt area).

Lighting
Street lighting is proposed and detailed information is found in the Project Narrative and Patten Book. The total height of the pole and fixture is approximately 14’-8”.

Architecture/Building Materials (Sec. 5.24)
Architectural standards for façade materials are not provided in Section 5.24 for single-family buildings. The applicant provided a Sample Portfolio of Houses. The façade materials include vinyl siding and trim, dimensional shingles (roof), brick, and stone veneer. The color palette and material options are presented in Exhibit G. The vinyl products come in several colors including taupe, grey, blue, green, and red. Brick and stone veneer products are offered in earthtone colors. Additional information should be provided on the brick and stone products, such as manufacturers' name and product specifications. Façade material percentages are not required to be submitted. The applicant has been asked to bring a sample board of the façade materials to the public hearing.

Other Requirements-Zoning Ordinance Standards
Nothing additional at this time.

Hartland Township DPW Review
The DPW Director has provided a review letter dated July 11, 2023.

Hartland Township Engineer's Review (Spaulding DeDecker)
The Township Engineer (SDA) has provided a review letter dated July 24, 2023.

Hartland Deerfield Fire Authority Review
The Hartland Deerfield Fire Authority has provided comments in the review letter dated March 2, 2023.

Attachments:
1. DPW review letter 07.11.2023 – PDF version
2. Township Engineer (SDA) review letter 07.24.2023 – PDF version
3. Hartland Deerfield Fire Authority review letter 03.02.2023 – PDF version
4. Project Narrative and Pattern Book 08.31.2023 revised – PDF version
5. Traffic Impact Study 06.20.2023 – PDF version
6. Wetland Delineation 05.19.2023 – PDF version
7. Sample Portfolio of Houses 08.10.2023 – PDF version
8. Highland Reserve Greenbelt Plan 08.31.2023– PDF version
9. MDOT email 08.16.2023 – PDF version
10. Site Plans 08.29.2023 – PDF version

CC:
Spaulding DeDecker, Twp Engineer (via email)
Mike Luce, Twp DPW Director (via email)
A. Carroll, Hartland FD Fire Chief (via email)

T:\PLANNING DEPARTMENT\PLANNING COMMISSION\2023 Planning Commission Activity\Site Plan Applications\SP PD #23-008 Highland Reserve PD Preliminary\Staff reports\Planning Commission\SP PD #23-008 staff report PC 09.21.2023.docx

DEPARTMENT OF PUBLIC WORKS

Michael Luce, Public Works Director
2655 Clark Road
Hartland MI 48353
Phone: (810) 632-7498

TO: Planning Department
DATE: 7/11/2023
DEVELOPMENT NAME: Highland Reserve
PIN#:
APPLICATION #: SUP#
REVIEW TYPE: Site Plan

Site Plans for the proposed Highland Reserve Development Site Plan proposes 101 single family homes in with 1 REU is required in Water and Sewer for each lot. Thus totaling 101 REU's for the proposed project. Currently the parcel has 67 Sewer REU's and 0 Water REU's, sufficient REU's will need to be purchased prior to development. The proposed plan also depicts a commercial use property on the corner of Hartland Glenn Dr and M59, once it is determined what may occupy that space the correct REU determination can be provided.

	Sewer REUs	Water REUs
Owned	67	0
Required	101	101
REU Difference	34	101
Cost Each	$9,439.20	$5,816.10
Total Due Each	$320,932.80	$587,426.10
TOTAL REU COST	**$908,358.90**	

Hartland Township Public Works approves the Highland Reserve Development site plan subject to inclusion of the following details on the construction plans:

1. Sanitary sewer material and sizes and connection detail sheet
2. Monitoring manhole for sewer connection and location if required
3. Utility easements noted as public or private.
4. All watermain and leads installed to meet Township specifications
5. Approval of the Livingston County Drain Commission.

Please feel free to contact me with any further questions or comments regarding this matter.

Michael Luce
Public Works Director

SPALDING DEDECKER
Engineering & Surveying Excellence since 1954

Preliminary Site Plan Review

July 24, 2023

Troy Langer
Planning Director
Hartland Township, MI

Re: Highland Reserve – Preliminary Site Plan Review
SDA Review No. HL22-127

Dear Troy:

We have received the preliminary site plan submittal for the above referenced project prepared by Diffin Engineering & Surveying dated June 22, 2023 and received by our office on July 12, 2023. A concept review letter was provided on March 8, 2023. The plans were reviewed in accordance with Hartland Township Engineering Standards and the following comments are our observations.

Recommendation
Approval of the Preliminary Site Plan is recommended, with items to be addressed before Final Site Plan approval.

Comments:
The preliminary Site Plan meets the general requirements of the Hartland Township Code of Ordinances and the Engineering Design Manual.

Project Summary

- Construction of a Planned Development (PD) clustered residential site with 35 rental units and 66 condo units at 12685 Highland Road (M-59) east of US-23 on the south side of Highland Road. Site access would be provided via private streets with access drives from Highland Road (M-59) and Hartland Glen Lane. It is noted that the site is 39.05 acres.
- Water service would be provided by an 8-inch extension from the currently under construction 12-inch water main on the west side of Hartland Glen Lane. The proposed water main connects near the proposed entrance of Abernethy Street at GV-5, loops around the proposed units and connects near the southwest corner of the parcel at GV-20. It is assumed that a domestic lead and fire lead would be provided to serve the proposed units along with additional hydrants on-site.
- Sanitary sewer service would be provided by two connection points. A proposed 8-inch extension from the existing manhole (EX-40202) located on the south side of Highland Road to serve the northerly portion of the site. And an 8-inch extension from the currently under construction 8-inch sanitary sewer on the west side of Hartland Glen Lane, near the southwest corner of the parcel to serve the southerly portion of the site. It is assumed that a lead would be provided to serve the proposed units.
- Storm water would be collected by a single storm sewer collection system and discharged to two on-site detention basins and existing wetlands.

General

1. 2.1 acres of the original 39.05-acre parcel is shown as a proposed commercial split by others northwest of the proposed planned development. A parcel divided or split shall be required consistent with the provisions of the Michigan Land Division Act, the Hartland Township Land Division Ordinance and the Hartland Township Zoning Ordinance, shall have proper frontage on a public road or on an approved and legally recorded private road or shared driveway that is designed consistent with the requirements of the Ordinance and shall be in compliance with all minimum parcel requirements for the zoning district in which the property is located.

These comments are to assist in plan preparation in anticipation of your final site plan review submittal and are not required at this time for preliminary site plan approval:

1. The Redwood Living residential development is currently undergoing construction on the west side of Hartland Glen Lane. Future phases are expected for this project. Coordination with Township and the Redwood Living development will be required.
2. On site pavement, water main, sanitary sewer and storm sewer and quantities must be shown on the plans.
3. Drainage and SESC sheets shall be submitted for site plan review.
4. Hartland Township Standard Detail Sheets are to be attached to the proposed plans when applicable.
5. The existing site is located within wetlands areas. The current plans indicate that these areas will be impacted and disturbed. Plans do not indicate the regulatory status of the wetlands. EGLE Permits will be required for any proposed work within these areas. Plans revisions and layout changes may be required to address EGLE comments.

Water Main

1. Water mains in new developments shall be installed from boundary to boundary in abutting road rights-of-way, on roads the project fronts, on interior streets and at other locations as may be deemed necessary by the Township for future extensions. A proposed (12" or 16") watermain extension will be required along the south side of M-59.

These comments are to assist in plan preparation in anticipation of your final site plan review submittal and are not required at this time for preliminary site plan approval:

1. Water mains shall be located to provide a minimum of ten (10) feet horizontal clearance between the nearest edge of the water main and the nearest edge of any sanitary or storm sewer.
2. The proposed 8" water main shall be enclosed in a 20-foot easement if not located within the existing easement.
3. An EGLE Construction permit will be required for the proposed water main.
4. Gate valves shall be spaced at a maximum of 800 feet intervals on distribution lines.
5. Provide proposed water services and fire line location for the proposed units.
6. The Hartland Fire Marshall shall review and approve the hydrant coverage for the site.

Storm Drainage & Site Grading

1. No stormwater management calculations were provided. At this time, we are unable to determine if the stormwater management system is sized properly for the proposed development.

These comments are to assist in plan preparation in anticipation of your final site plan review submittal and are not required at this time for preliminary site plan approval:

1. Offsite surface runoff shall not be trapped along the development perimeter. If the existing runoff from adjacent properties pass onto the proposed site, the proposed storm sewer system must be sized to accommodate.
2. On-site drainage must be captured within the proposed development via the storm sewer network and will not be allowed to drain to adjacent properties.
3. Confirm that Livingston County Drain Commission will not require any additional water quality requirements before connection to the existing system.
4. All storm water design calculations are to follow Hartland Township and Livingston County Drain Commissioner standards and details.
5. Coordination with Livingston County and EGLE will be needed to confirm the outlet into the wetlands as acceptable.

Paving

1. Private roads and driveways shall meet the requirement of Hartland Township's Zoning Ordinance Article 30.00, unless amended herein. A note on the plan states that all public road requirements will be met which is consistent with the private road ordinance which states that LCRC requirements must be met when serving greater than 25 units.
2. Private roads longer than six-hundred (600) feet shall provide one or more additional easements which shall extend from the primary private road easement to the adjoining parcels, unless the Township determines that it would be impractical or not beneficial to connect to existing or future public or private roads on adjoining parcels. The purpose of this requirement is to facilitate the development of a continuous road network.
3. Provide a circulation plan demonstrating turning movement around the proposed unit. It shall be reviewed and approved by the Hartland Fire Marshall.

Sanitary Sewer

1. All sanitary sewer design requirements are to follow current Livingston County Drain Commissioner's (LCDC) standards and details. LCDC sanitary sewer detail sheets shall be attached to the proposed plans when applicable.

Permits and Agreements Required

Based on those improvements depicted on the plans, the following permits and agreements will need to be provided for review and approval:

Hartland Township:

Note - A current title policy for ownership verification shall be provided with all executed easement submittals. Easements must be on the Hartland Township Standard Easement document and include an exhibit.

- A draft copy of the Lot split must be submitted to our office.

- A draft copy of the Strom Drain Agreement. Agreement can be found in the LCDC book appendix K.
- A draft copy of the 20-foot wide easement for water main construction.
- A draft copy of the 20-foot wide easement for sanitary sewer construction.
- A Land Use Permit will be granted after the pre-construction meeting.

Livingston County:

- Livingston County Drain Commissioner approval and permit.
- Soil Erosion and Sedimentation permit from Livingston County Drain Commissioner.
- Livingston County Roads permit for any work within the County ROW.
- Genesee County Drain Commissioner's Office IPP Discharge Permit approval.

Michigan Department of Environment, Great Lakes, and Energy (EGLE) & Michigan Department of Transportation (MDOT):

- NPDES Notice of Coverage Documentation
- EGLE Permit for all public sanitary sewer installation.
- EGLE Permit for all public water main installation.
    - Basis of Design Check
    - Township DPW Check
    - Portal Submission Check
- MDOT Permit for any work within the Highland Road (M-59) ROW.

The following must be submitted with the Revised Site Plan:

A letter from either the applicant or the applicant's engineer must be submitted with the Site Plan highlighting the changes made to the plans addressing each of the comments listed above and indicating the revised sheets involved.

Please be aware that additional comments may arise with the submittal of the requested revisions and/or additional information.

The comments are not to be construed as approvals and are not necessarily conclusive. The final engineering plans for this development are to be prepared in accordance with the Hartland Township Engineering Design Standards and 2021 Hartland Township Standard Details. Sanitary sewer and water benefit fees may be applicable for this project.

If you have any questions regarding this letter, please contact Luisa Amici at (248) 844-5400 with any questions.

Sincerely,

SPALDING DEDECKER ASSOCIATES, INC.

Luisa Amici
Engineer

Mark Collins, PE
Municipal Project Manager

cc: Jeremy Schrot, Hartland Township Engineer (via email)
Troy Langer, Hartland Township Planning Director (via email)
Martha Wyatt, Hartland Township Planner – Landscape Architect (via email)

HARTLAND DEERFIELD FIRE AUTHORITY

HARTLAND AREA FIRE DEPT.

3205 Hartland Road
Hartland, MI. 48353-1825

Voice: (810) 632-7676
E-Mail: firemarshal@hartlandareafire.com

March 2, 2023

To: Hartland Township Planning Commission
c/o: Planning Department

Re: 12685 Highland Road

This review and the following comments are for the residential development in the area of Hartland Glen Lane and Highland Road, dated 2-24-2023. The development consists of roughly one hundred residential homes of various sizes and a two-acre parcel on the northwest portion of the complex for a future commercial development.

The residential portion of the development is proposed to include five-foot side setbacks (ten feet between homes), however, Hartland Township Ordinance 76 states minimum side setback requirements for High Density Residential is ten feet. One of the critical reasons for ten-foot setbacks is to aid in preventing the spread of fire from one structure to an adjacent structure, especially with radiant heat compromising the adjacent structure with potential flame spread to the combustible materials on the walls, eaves, and facia. This is a problem the fire service routinely encounters in the manufactured home environment with twice the distance (twenty feet) between homes with the same exterior finishes as proposed.

Most importantly, limiting fire spread reduces the potential for loss of life in adjacent homes. It is our position that if this precedent-setting request to remove a life safety and property conservation ordinance requirement that creates a non-compliant development is considered, it would necessitate reinstating a life safety protective measure that provides an equal or better level of protection, such as: residential sprinklers in accordance with NFPA 13R; 2-hour rated non-combustible exterior walls, eaves, and facia; or 2-hour rated non-combustible fence extending to the top of the facia. Should the better level of protection with residential sprinklers be selected, we would support longer hydrant spacing and reduced road widths within the development.

Jon Dehanke
Captain

Highland Reserve Planned Development
Preliminary PD Plan Review
Project Narrative & Pattern Book
August 31, 2023 (revised)

Project Objective/Overview

The subject property at 12685 Highland Road (Parcel #08-26-200-002) is approximately 39 acres and currently zoned CA, Conservation Agriculture. Under the PD, Planned Development zoning option (Section 3.1.18 of the Hartland Township Zoning Ordinance), a detached single family residential community, to be called "Highland Reserve", is proposed on 37.1 acres of the property. The intent of the Highland Reserve portion of the PD is to create a unique residential neighborhood that provides detached single family residential homes for both sale and lease. A 1.9 acre parcel located in the northwest corner of the overall property will be retained by the current land owner and developed separately for a future commercial project. This commercial parcel will provide compatible and supportive retail services to the proposed Highland Reserve neighborhood, along with the Redwood Apartments project which is currently under construction to the west.

The PD project also proposes preservation of natural features and valuable open space areas, while incorporating a sustainable and healthy walkable neighborhood design that includes concrete sidewalks along both sides of the private streets, natural walking paths and benches through the open space areas, and a neighborhood park/playground in the southeast corner of the site. The overall objective of the Highland Reserve project is to provide much needed and quality housing for residents in Hartland Township through a unique development concept. A further description is provided below.

Previous Conceptual Plan Review

The Hartland Township Planning Commission conducted a Conceptual Review of the proposed Highland Reserve PD on March 23, 2023. The Hartland Township Board of Trustees subsequently conducted a Conceptual Review of the proposed Highland Reserve PD on April 4, 2023. Comments and direction received during these conceptual reviews have been incorporated into the Preliminary Review application submittal.

Residential & Commercial Development Components (Minimum Design Details)

<u>Commercial Project</u> (1.9 Acres)

As stated above, the 1.9 acre commercial parcel located in the northwest corner of the property will be retained by the current owner (Lexington Homes, LLC) for future commercial development. While plans are conceptual at this point, the commercial portion of the PD envisions a gasoline station/convenience store and a fast food restaurant with drive-thru service. Alternatively, this parcel may be developed as a retail center, professional/medical offices, financial institution, personal service establishment, child care center, personal fitness center, and/or a restaurant. Minimum design details for this commercial parcel including

setbacks, building height, lot coverage, access/driveways, parking/loading, storm water management, signage, outdoor lighting, landscaping/screening/buffering and architectural features and materials will follow requirements for the GC, General Commercial zoning district. It is understood that future development of this commercial parcel, including access determination, will be subject to Site Plan review by the Township.

Detached Single Family Residential Project "Highland Reserve" (37.1 Acres)

The Highland Reserve single family residential community is proposed on 37.1 acres of the overall 39 acre property. The northern portion approximate 10.4 acres of the Highland Reserve project, adjacent Highland Road/M-59, is proposed to be developed as an exclusive rental community containing 35 detached single family homes. Individual homes and exterior grounds will be professionally managed and maintained by the developer's property management team. The remaining approximate 26.5 acres of the Highland Reserve residential community will be developed as a site condominium subdivision with a total of 66 detached single family residential units. The overall Highland Reserve neighborhood will consist of 101 detached single family homes on 37.1 acres with an overall development density of 2.7 units/per acre. The residential community is anticipated to be constructed in three development phases: Phase 1 (2024); Phase 2 (2025/26); and Phase 3 (2026/27).

Minimum lots sizes, setbacks, separations and homes sizes for the Highland Reserve detached single family residential community are summarized in the table below.

Highland Reserve – Rental Portion (35 homes)				
Lot Size	Front Setback	Rear Setback	Separation	Home Types & Sizes
NA	80' (Highland Road)	NA	10'	1,250 – 2,080 square feet
	25' (Interior Streets)		*(see comment below)	Mix of ranch, two-story, bi-level
- All structures within rental portion of project will be provided within the rental unit "envelope" area as depicted on Preliminary Plan.				
Highland Reserve – Site Condominium Portion (66 homes)				
Lot Size	Front Setback	Rear Setback	Side Setback	Home Types & Sizes
7,200 sf/60' wide	80' (Highland Road)	20'	5'	1,250 – 3,000 square feet
	25' (Interior Streets)		*(see comment below)	Mix of ranch, two-story, bi-level

* While minimum 10' home separations are proposed within the rental portion of the community and minimum 5' side yard setbacks are proposed within the site condominium portion of the community, it is envisioned that the majority of the homes in the residential community will greater than 10' apart. As shown on the Preliminary PD Plan, a 50' wide building "envelope" or "box" have been assumed for homes within both the rental and site condominium portions of the project. However, most of the home product offerings will range between 35'-45' wide. Having the extra building envelope width afforded by the 10' separations and 5' side setbacks will allow for greater variety in home product offerings and allow for the flexibility of adding a 3rd car garage on some homes, where desired. Sample sketches showing how homes will likely be oriented and separated throughout the neighborhood, along with aerial photos of similar neighborhoods constructed by the developer with minimum 10' separations are provided in Exhibits A and B. Homes constructed with a 10' separation, will include 1-hour fire rated exterior side walls. This additional construction requirement is being self-imposed beyond what is required by building codes for additional fire safety assurances.

Detached single family homes throughout the Highland Reserve community will consist of a mixture of ranch, two-story and/or bi-level homes with individual floor plans ranging between 1,250-3,000 square feet in size with 3-4 bedrooms, 2-3 bathrooms and an attached 2-3 car garage. Homes for retail sale are anticipated to range in value from the mid $300s and up, while homes for rent are anticipated to range between $2,200-$2,500/month with a minimum 12-month lease. A sample portfolio of homes with color elevations and floor plans depicting homes planned within the Highland Reserve neighborhood is included with the application package. A color palette of exterior siding and material options is also provided in Exhibit G.

Natural Feature & Open Space Preservation

A professional wetland delineation of the overall property was completed by Fishbeck in May 2023 and a copy of this report is attached with the application package. Two areas of regulated wetland were identified along the southeast and west-central portions of the property, and one small area (0.17 acre) of potentially regulated wetland was identified along the northwest corner of the property. These wetland areas are identified on the Preliminary PD Plan and serious consideration was taken to avoid these important natural features during the overall project design. While over 95% of the regulated wetlands present on the property will be preserved with the proposed project, a small area of wetland disturbance/fill (0.176 acre) will be necessary along the southeast portion of the site to accommodate Melsetter Street and related utilities, and a small area of temporary wetland disturbance (0.034 acre) will be necessary along the southwest portion of the site. Additionally, and if determined to be regulated a wetland, a small area of wetland fill (0.17 acre) will also be necessary along the northwest portion of the site to accommodate the proposed commercial project. All required approvals and permits will be secured from the Michigan Department of Energy, Great Lakes and Environment (EGLE) before any construction activities commence.

While the PD ordinance requires a minimum 25% open space, a total of 15.72 acres (40%) of the overall property is proposed to be preserved in perpetual open space consisting of wetlands, storm water basins, wooded areas, mature tree lines and open fields. Primary locations of open space preservation are concentrated in the southeast and west-central portions of the property, with additional perimeter areas provided along the northern and western portions of the site. The "useable" portion of the overall open space that is available for active recreation (walking/park) is 4.69 acres or 30% of the total open space area. A more specific breakdown of open space areas is provided on Sheet 4 of the Preliminary Site Plan set and summarized below:

Total Open Space Preservation:	15.72 acres (40% of overall 39 acre property)
Useable Open Space	4.69 acres (30% of total open space)
Other Upland Open Space:	5.48 acres (35% of total open space)
Wetlands:	4.51 acres (29% of total open space)
Storm Water Basins:	1.04 acres (6% of total open space)

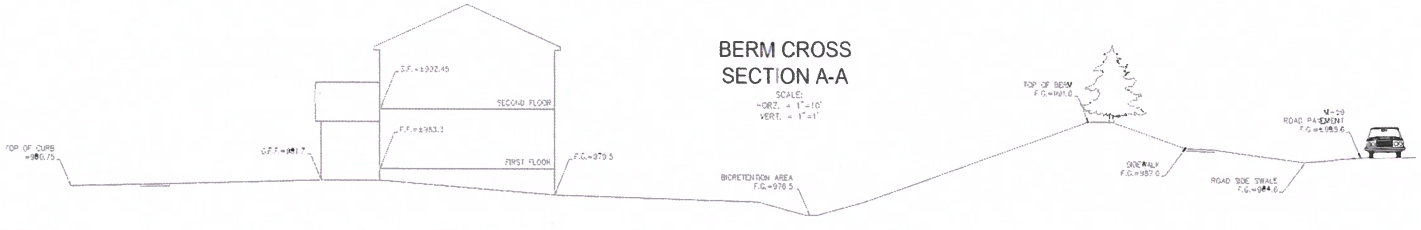
Open Space Amenities/Walkability

Five (5) foot wide concrete sidewalks will be installed along both sides of the interior private streets and along the Highland Road frontage. Additionally, a series of natural walking paths will be installed within the two large open space areas located in the southeast and west-central portions of the property. Benches will be strategically located along these walking paths to provide views of the preserved wetlands, woods and meadows. The natural walking paths will connect to the interior private street network at the west end of Abernethy Street (west side of House 14), west end of Carradale Court (between Units 27-28) and east end of Melsetter Street (east side of Unit 50). A detail of this natural walking path and split rail fencing which will define their entrances, along with a photograph of a path constructed in a similar neighborhood and benches proposed along the paths, is provided in Exhibit C. In total, the project will include approximately 9,900 lineal feet of concrete sidewalk and 1,850 lineal feet of natural walking paths.

Within the southeastern open space area (along the south side of Units 48-50), a neighborhood park is also proposed. This community amenity will consist of a covered pavilion (approximately 16' by 16') with picnic tables and an approximate 32' by 80' playground area consisting of swings, playset and associated children play equipment. Pedestrian access to the pavilion/playground area will be provided from the sidewalk located at the east end of Melsetter Street, along the east side of Unit 50. Examples of the pavilion and playground equipment proposed for this neighborhood park are provided in Exhibit D.

Landscaping, Buffering and Screening

A detailed inventory of existing trees present across the subject property, along with indications of which trees will be preserved with the project, is included on Sheets 2-3 of the Preliminary Site Plan set. Additionally, a Landscape Plan identifying required street trees and detention basin landscaping is provided on Sheet 8 of the Preliminary Site Plan set, while a separate Landscape Plan identifying required greenbelt landscaping along Highland Road/M-59 is provided in Exhibit E. Street trees and detention pond trees will be deciduous, a minimum 3" caliper at planting and include a mixture of Linden Greenspire, Autumn Blaze Maple, Red Maple, Princeton Elm, Tulip, White Oak, or other trees approved by the Township. Greenbelt landscaping along the Highland Road/M-59 frontage will include a combination of berming and canopy/evergreen/ornamental trees and large shrubs to screen the rear portions of Homes 1-13. Greenbelt trees/shrubs will be of appropriate size at planting and include a mixture of Norway Spruce, Giant Arborvitae, Redpointe Maple, Crimson Maple, Columnar Hornbeam, Red Oak, Serviceberry, Burning Bush, Viburnum, Forsythia, Summersweet or other trees/shrubs approved by the Township. A cross section of this landscaped berm and the typical elevation relationship between Highland Road and the back of the homes is provided below.



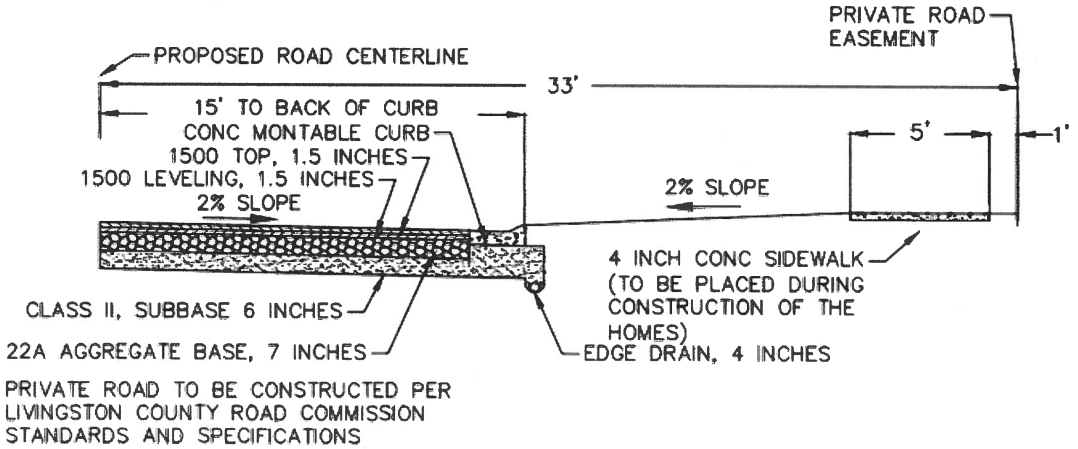
As shown on the Landscape Plan provided in Exhibit E, greenbelt landscaping along Highland Road/M-59 is proposed to consist of a 50% deciduous trees and 50% evergreen trees/shrubs. Pursuant to Section 5.1.1.2.C.i.b of the Hartland Township Zoning Ordinance, a modification from the 100% deciduous tree planting requirement within the Highland Reserve greenbelt is requested.

In addition to street trees along the private street frontage, individual homes within the rental portion of the residential community will be provided a standard landscape package around the front of the homes (refer to Exhibit F). Specific landscaping for homes/units within the site condominium portion of the project will be determined by the individual home owners.

Access/Private Streets

A professional Traffic Impact Study (TIS) of the overall PD project was completed by Fleis & Vanderbrink in June 2023 and a copy of this report is attached with the application package. Access to the Highland Reserve detached single family residential portion of the project is proposed through a private street connection (Lockerbee Lane) to Highland Road, along the eastern portion of the site, and a private street connection (Abernathy Street) to Hartland Glen Lane. Rights to connect to Hartland Glen Lane were included with the 2021 Redwood Living PD approval and details associated with this connection will be finalized with Redwood Living prior to Final PD approval. The location and spacing of the private driveway and private street connection to Highland Road have been confirmed by the traffic consultant to be acceptable using Michigan Department of Transportation (MDOT) Geometric Design Guidance. Formal review/approval along with any roadway related improvement requirement will not be determined by MDOT until detailed construction drawings and a formal application is submitted for review/approval.

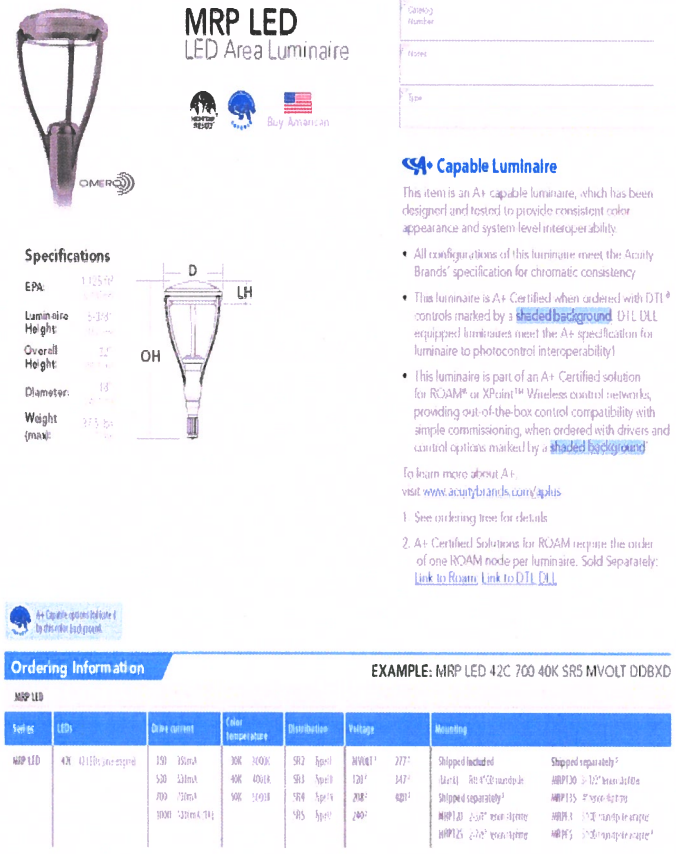
All internal streets serving the residential community (Lockerbee Lane, Abernethy Street, Ardmore Avenue, Kirkwall Court, Melsettter Street and Carradale Court) will be private, however, will be constructed in accordance with Livingston County Road Commission standards and specifications including mountable concrete curb & gutter and a 30' wide roadway (back-of-curb, back-of-curb). A typical road cross section detail is provided below.

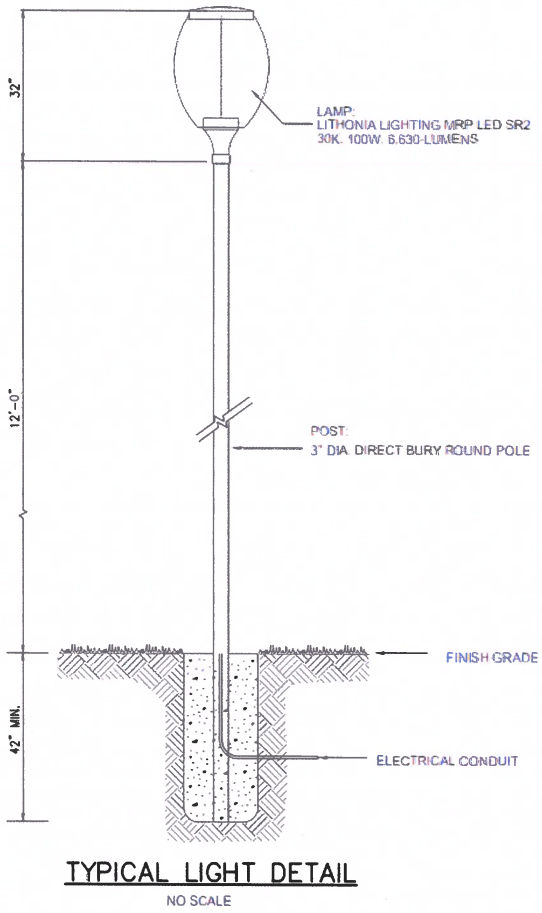


TYPICAL ROAD SECTION
NO SCALE

Since the project is bordered by large vacant parcels to the east and south, Melsetter Street will be extended to the eastern property line and Ardmore Avenue will be extended to southern property lines to allow for future street extensions and neighborhood connectivity. Legal right for these adjacent properties to connect to these private streets will be included in the PD Development Agreement and Community Master Deed and Bylaws.

Street lights will be installed along these private streets as depicted on the Sheet 10 of the Preliminary Site Plan set. LED fixtures will be installed on 12' tall poles as generally shown on the following details.





Public Utilities/Storm Water Management

The commercial project in the northwest corner of the property, along with all homes within the Highland Reserve neighborhood, will be served by municipal water and sanitary sewer. Storm water runoff from the residential portion of the project will be collected and conveyed to two detention basins located in the west-central portion of the site with additional infiltration swales constructed within the rear yards of homes as required by the Livingston County Drain Commission. Storm water runoff from the commercial portion of the project will be provided on-site and designed consistent with township and county requirements for the GC, General Commercial zoning district.

Residential Community Organization and Maintenance

As stated above, the individual homes and exterior grounds associated with the rental portion of the community will be professionally managed and maintained by the developer, similar to an apartment or townhome project. The site condominium subdivision portion of the project will be governed by a Master Deed and Bylaws. A Homeowner's Association (HOA) will be established with the scope of authority that includes maintenance of the private roads, open space areas-natural paths-playground, storm water areas, architectural review, enforcement of community restrictions, and financial management. Each homeowner will pay a modest annual fee for the operation of the HOA.

Fiscal and Community Impact Analysis

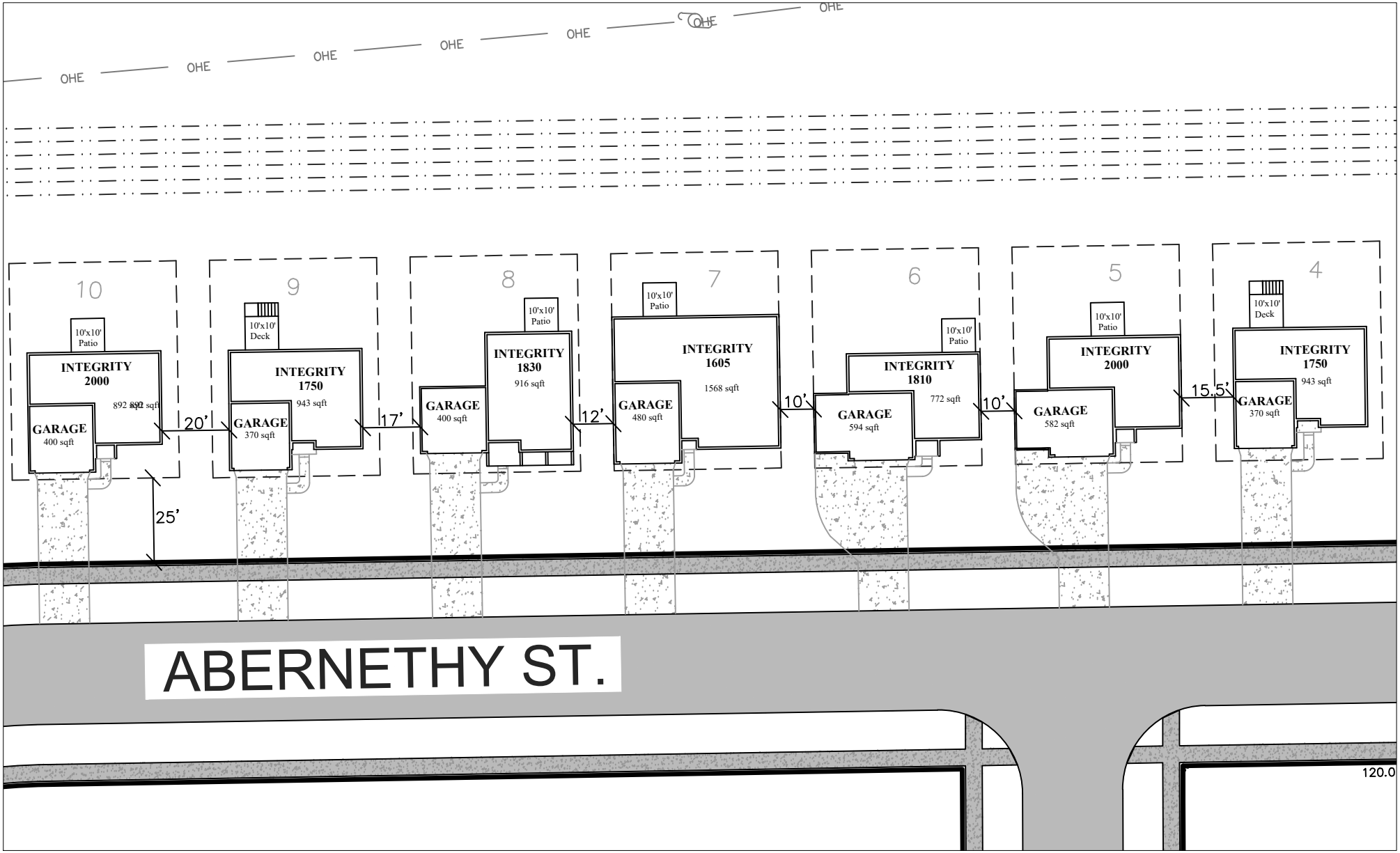
Upon full build-out, the 101 unit Highland Reserve residential neighborhood will add an estimated $35-40 million dollars in assessed value to Hartland Township. Property tax generation from each single family home is estimated at approximately $4,500/year per unit, which would translate into approximately $450,000/year in total tax generation upon full development. With each Highland Reserve home having a minimum of 3 bedrooms and 2 bathrooms, it is estimated the average household size will be 3.0-3.5 individuals/home, or 300-350 total residents at full build-out. While the exact number of children that will comprise these households is unknown, an assumption that 50% of the households will have between 1.0-2.0 children/home would equate to approximately 50-100 children upon full development. These additional children integrated into the public school system over several years is not anticipated to adversely impact the capacity of the Hartland Public School system which has lost enrollment over the past several years. Finally, the addition of 300-350 residents with this new neighborhood will help support the local economy and workforce, while adding to the vibrancy and growth of Hartland Township.

Summary/Conclusions

The Highland Reserve PD project proposes a unique development concept with a mix of single family detached homes both for retail sale and lease. The project is consistent and compatible with the Hartland Township Comprehensive Plan and surrounding land use pattern, and will not result in an unreasonable increase in the use of public services, facilities and utilities, and will not place an unreasonable burden upon the subject site, surrounding land, property owners and occupants, or the natural environment. The overall project design also incorporates recognizable and substantial benefits to the owners/occupants of the project and overall community beyond what would be achieved under conventional zoning including substantial open space preservation (15.72 acres or 40% of overall property), a sustainable and healthy walkable neighborhood design that includes approximately 9,900 lineal feet of concrete sidewalks and 1,850 lineal feet of natural walking paths, and a neighborhood park with a pavilion, picnic tables and playground. Finally, the Highland Reserve PD project will provide much needed and quality housing for residents in Hartland Township in a price band that is more attainable for middle income individuals and families.

EXHIBIT A
SAMPLE SKETCHES SHOWING HOW HOMES WILL LIKELY BE CONSTRUCTED WITH MINIMUM 10’ SEPARATIONS

HIGHLAND RESERVE
NEW HOME PLAN CONCEPT – RENTAL SAMPLE
8/28/2023
1" = 40'



HIGHLAND RESERVE
NEW HOME PLAN CONCEPT – SITE CONDO SAMPLE
8/28/2023
1" = 50'

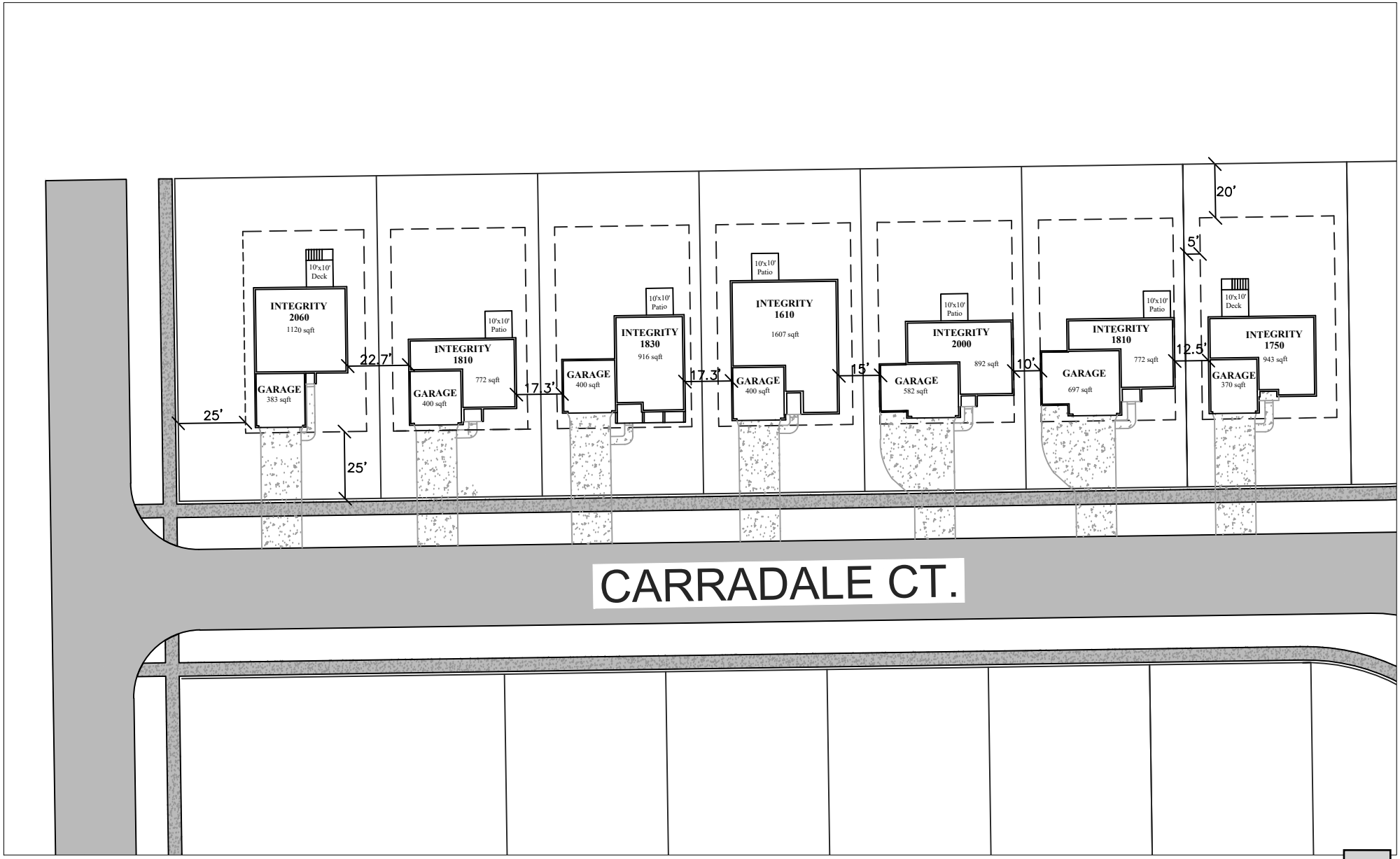
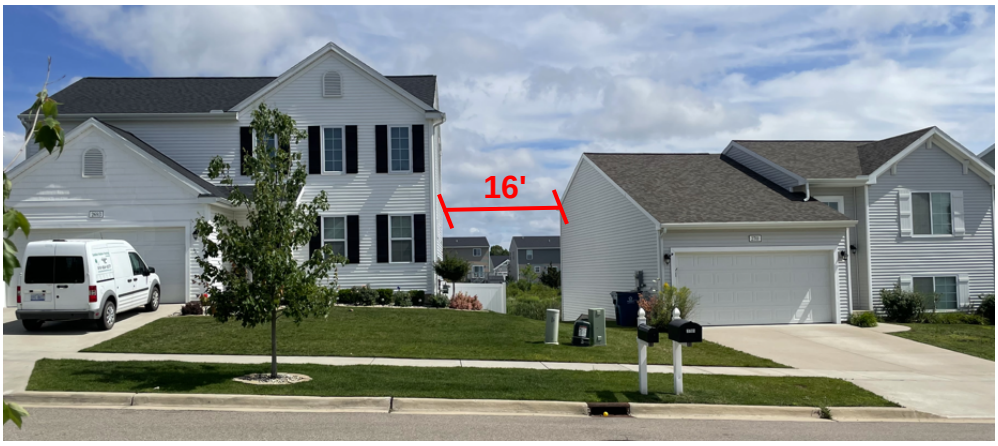


EXHIBIT B
AERIAL PHOTOS AND STREET VIEW PHOTOS OF SIMILAR NEIGHBORHOODS WITH MINIMUM 10’ SEPARATIONS

Bretonfield Preserve
City of Kentwood, Kent County, MI
2685 - 2745 Sage Wing Dr

Aerial View

2685 & 2693 Sage Wing Dr

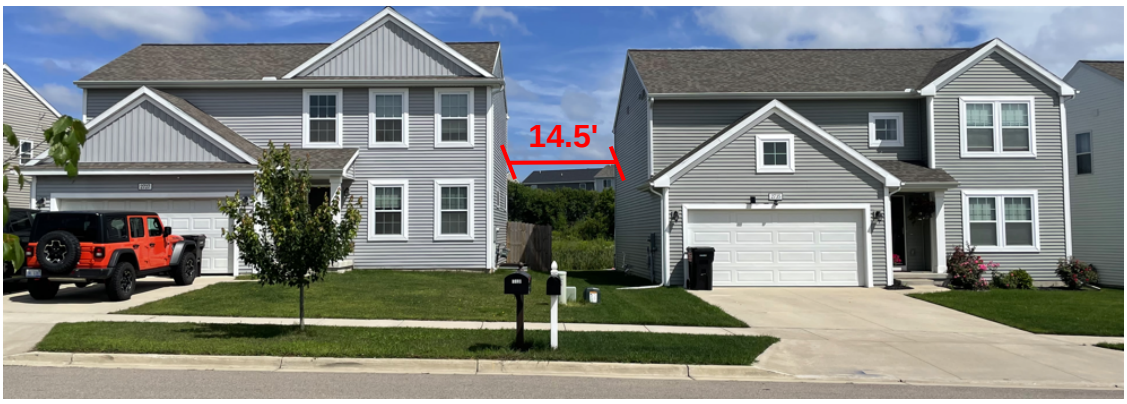


2693 & 2701 Sage Wing Dr

2701 & 2709 Sage Wing Dr

2709 & 2719 Sage Wing Dr

2719 & 2727 Sage Wing Dr



2727 & 2735 Sage Wing Dr

Centennial North
Village of Vicksburg, Kalamazoo County, MI
1529 - 1513 Notley Field Lane

Aerial View

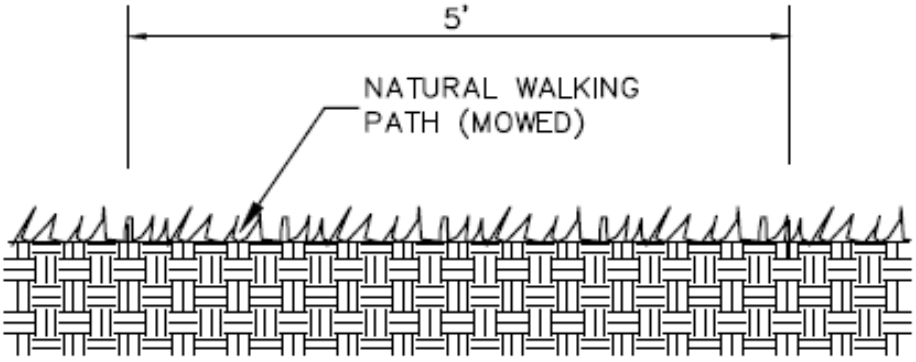
1529 -1525 Notley Field Lane

1525 - 1521 Notley Field Lane

1521 - 1517 Notley Field Lane

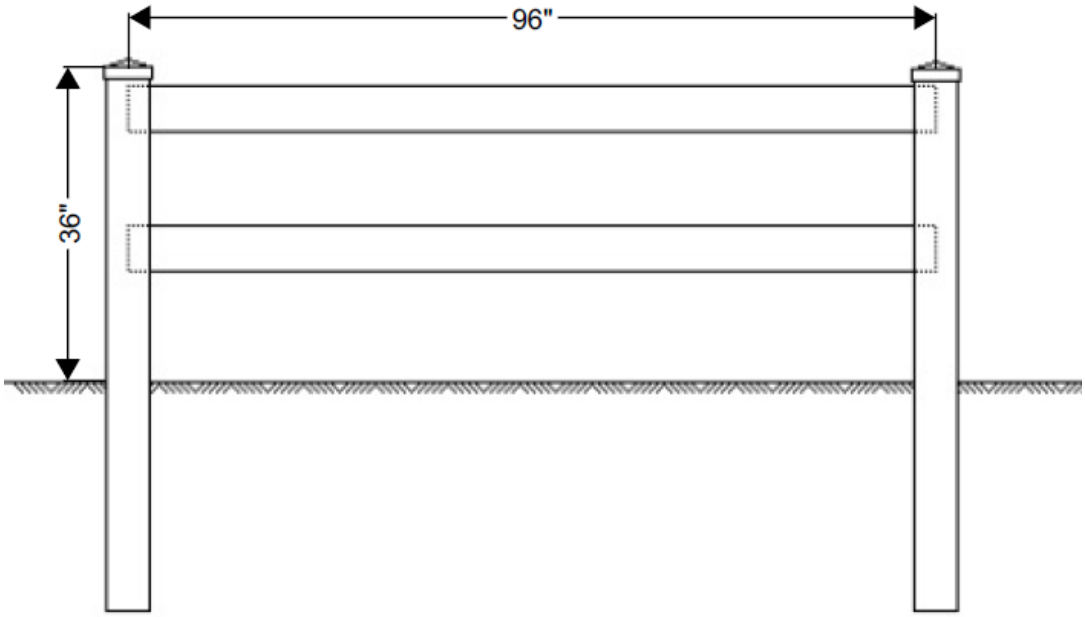
1517 - 1513 Notley Field Lane

EXHIBIT C
NATURAL WALKING PATH DETAILS/EXAMPLE



NATURAL WALKING PATH

NOT TO SCALE


96"
36"

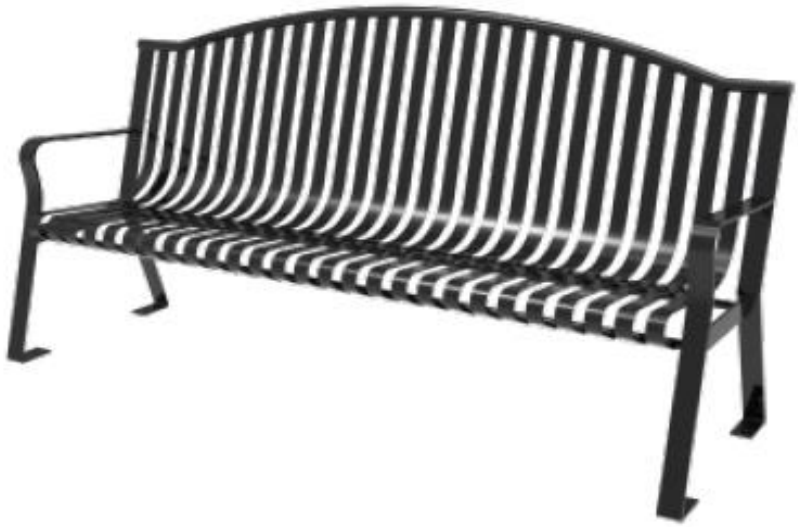
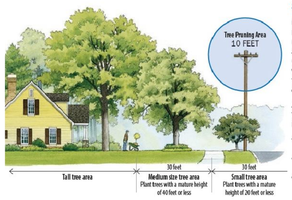


EXHIBIT D
PAVILION AND PLAYGROUND DETAILS/EXAMPLE

EXHIBIT E
LANDSCAPE PLAN – GREENBELT (HIGHLAND ROAD/M-59)

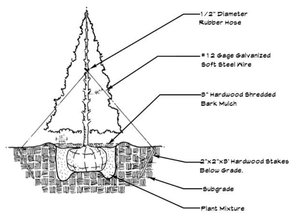


Smart planting

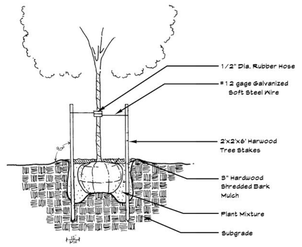
No trees should be planted near power lines. However, many trees are attractive additions to your yard and, under normal conditions, will not grow tall enough to interfere with our distribution lines.

Avoid planting tall-growing trees such as the following near or under power lines:

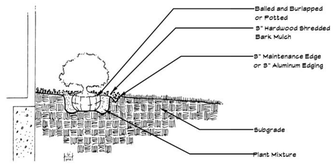
- Silver Maple
- Norway Maple
- Oak
- White Spruce
- Colorado Blue Spruce
- Most pines
- Willows



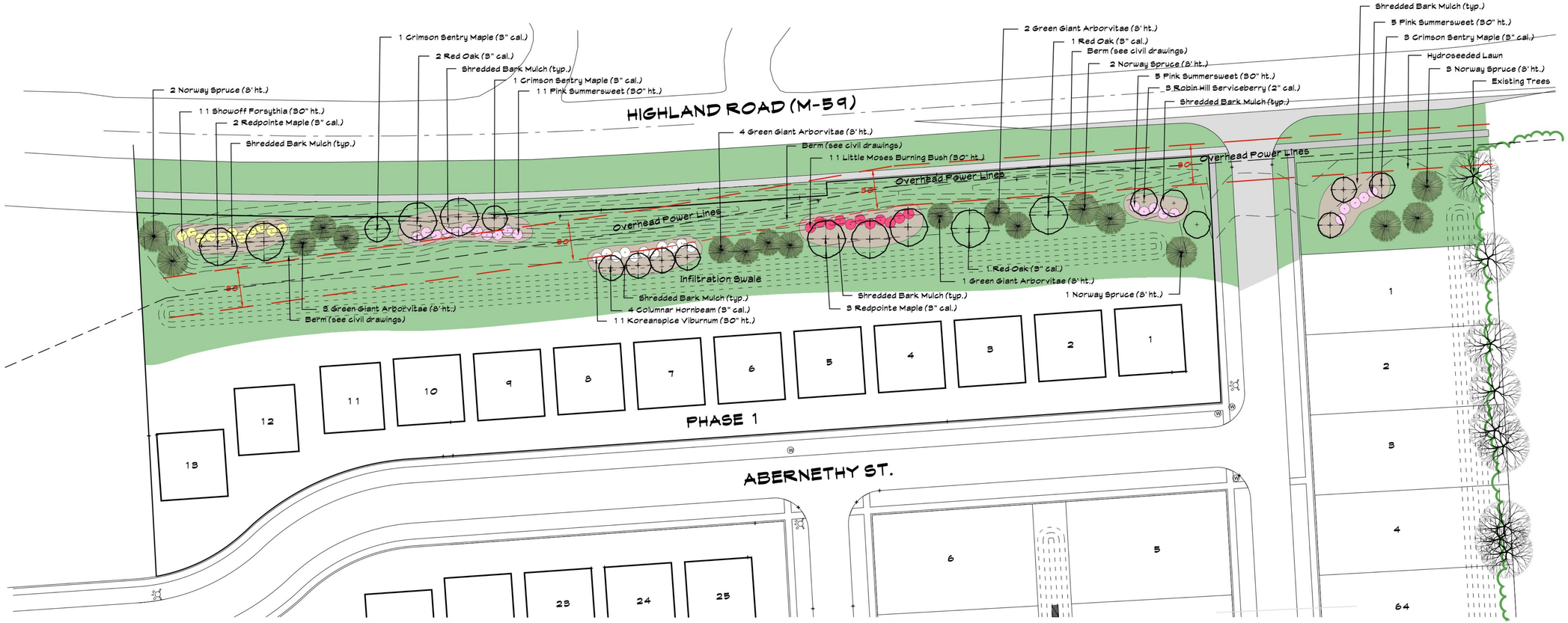
Evergreen Planting Detail-5' and Taller (as needed)



Deciduous Trees 3" Caliper and Smaller (as needed or required)



Shrub Planting Detail



Plant List

Quantity	Common Name	Latin Name	Planted Size
5	Redpointe Maple	Acer rubrum 'Frank Jr.'	3" cal.
5	Crimson Sentry Maple	Acer platanoides 'Crimson Sentry'	3" cal.
4	Red Oak	Quercus rubra	3" cal.
4	Columnar Hornbeam	Carpinus betulus 'Frans Fontaine'	3" cal.
8	Norway Spruce	Picea abies	8' ht.
10	Green Giant Arborvitae	Thuja standishii x plicata 'Green Giant'	8' ht.
3	Robin Hill Serviceberry	Amelanchier x grandiflora 'Robin Hill'	2" cal./TF
11	Little Moses Burning Bush	Euonymus alatus compactum "Little Moses'	30" ht.
11	Korean Spice Viburnum	Viburnum carlesii	30" ht.
11	Show Off Forsythia	Forsythia x intermedia 'Show Off'	30" ht.
21	Pink Summersweet	Clethra alnifolia 'Ruby Spice'	30" ht.

(note: Plant list for ordinance purposes only, the landscape contractor is responsible for plant quantities shown on the landscape plan)

North

811 Know what's below. Call before you dig.

Notes:

1. All landscaping shall be installed by a qualified Landscape Contractor. Plant sizes specified on the landscape plan shall be the size planted. Plants smaller then specified will be rejected. Substitutions of any kind must be approved by the Landscape Architect.
2. All plantings shall be mulched with 3" shredded premium hardwood bark mulch. Trees in lawn areas shall receive a 6' diameter bark ring 3" deep.
3. The landscape contractor shall remove any twine that is wrapped around the trunk of a tree or shrub as well as the top third of any burlap. Remove excess soil on the top of the root ball to expose the root flare or first layer of roots prior to planting. Use a wire cutter to make 3–5 cuts in the wire basket to allow roots to grow through.
4. When planting trees in the lawn area or on the berm the existing soil within a 10 foot diameter shall be loosened by tilling or similar and amended with composted manure or peat at a depth of 6–12".
5. Planting areas shall be edged with a mechanical bed edger to define a border for the shedded bark mulch.
6. Lawn areas shall recieve at least 4" of topsoil and hydroseeded. Check with specifications for topsoil availability or contact project manager. Topsoil for lawns shall be appropriate for growing and sustaining a healthy lawn. All lawns shall be hydroseeded with a seed blend consisting of 30% Kentucky Bluegrass, 20% Perennial Ryegrass, 10% Hard Fescue, 20% Creeping Red Fescue and 20% Chewings Fescue.
7. Maintenance of the landscape shall be provided for by the owner and include fertilizing of lawn and plant material, yearly pruning, top dressing of mulch areas every other year and provide 1" of water per week during the growing season.
8. Plant materials shall be chosen and installed in accordance with standards recommended by the County Cooperative Extension Service or American Nursery Association.

DJ's LANDSCAPE MANAGEMENT
D.J. Vander Stik
Grand Rapids Kalamazoo
Holland
Phone (616)698-2700 Fax (616)698-2900

Association of Grand Rapids Landscape Professionals

The Professional MCN Michigan Certified Nurseryman

PLANET Professional Landcare Network

STATE OF MICHIGAN
JOYCE E. WEISE
LANDSCAPE ARCHITECT
No. 1202
LICENSED LANDSCAPE ARCHITECT

Landscape Plan Drawn By:
Joyce E. Weise PLA, ASLA

PROPOSED LANDSCAPE PLAN FOR:

Highland Reserve

12685 Highland Rd. (M-59) Hartland Twp., Michigan

PROJECT NUMBER: 072723

DRAWN BY: Joyce E. Weise PLA, ASLA

DRAWING DATE: 080723

ISSUED FOR:

08/04/23	Site Plan Approval
08/31/23	Revision per Review

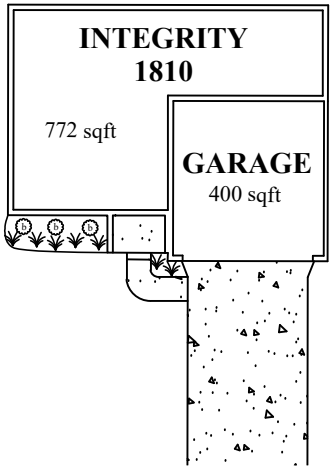
SCALE 1"=40'

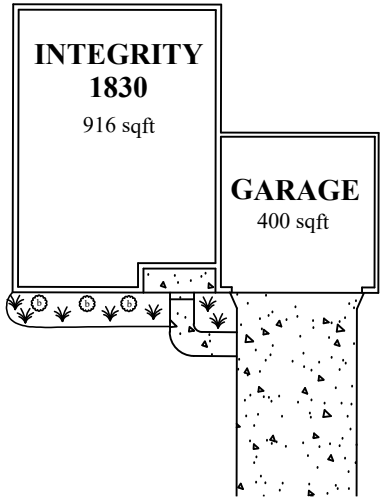
SHEET NUMBER L-1

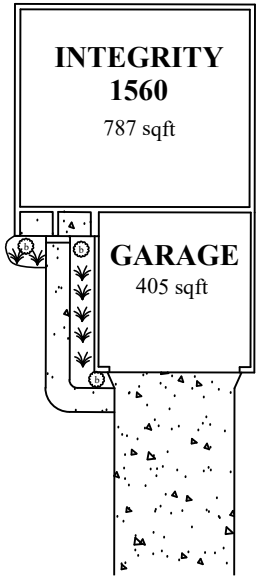
EXHIBIT F
STANDARD LANDSCAPE PACKAGE FOR RENTAL HOMES

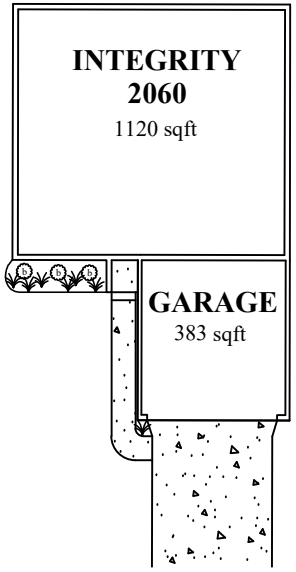
COPPER BAY LANDSCAPE STANDARDS

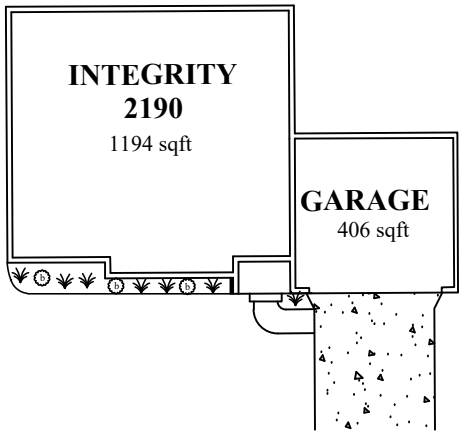
12/19/2022

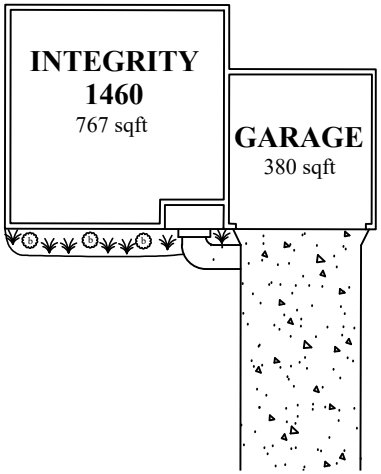


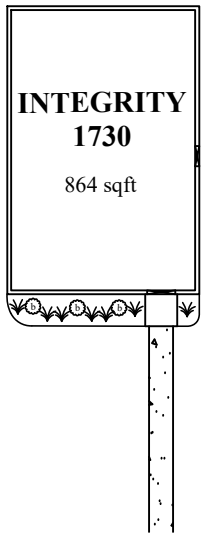


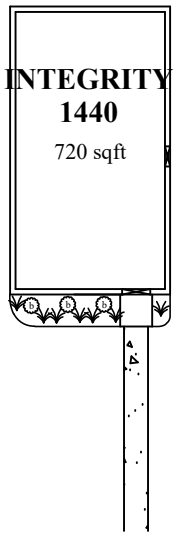












Floorplan	Day Lily	Boxwood	1" River Rock & Fabric	Metal Edging
Integrity 1440	7	3	60 sqft	22 lf
Integrity 1460	7	3	80 sqft	24 lf
Integrity 1560	7	3	80 sqft	8 lf
Integrity 1730	7	3	77 sqft	26 lf
Integrity 1810	7	3	65 sqft	16 lf
Integrity 1830	7	3	110 sqft	24 lf
Integrity 2060	7	3	55 sqft	16 lf
Integrity 2190	7	3	82 sqft	30 lf

* Quantity of materials subject to change

PLAN ATTRIBUTES

7 - Yellow Day Lily

3 - Boxwood

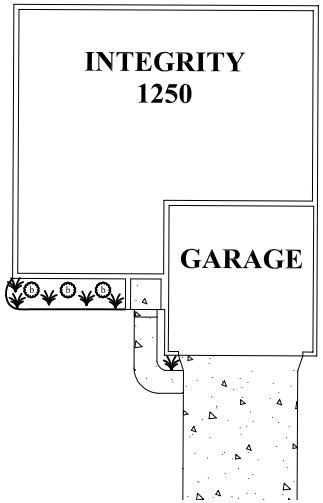
1" River Rock (3"-4" Depth)

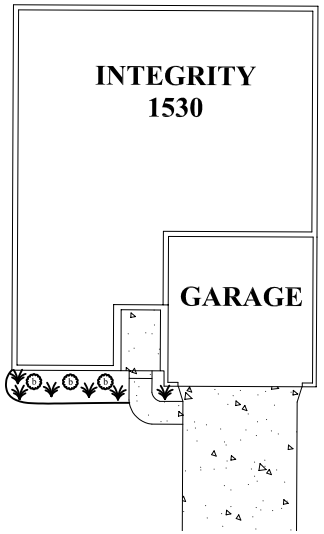
Landscape Fabric

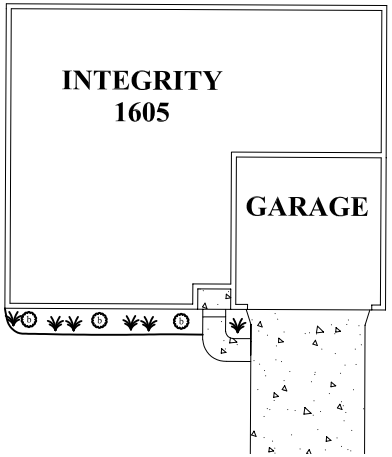
Metal Edging

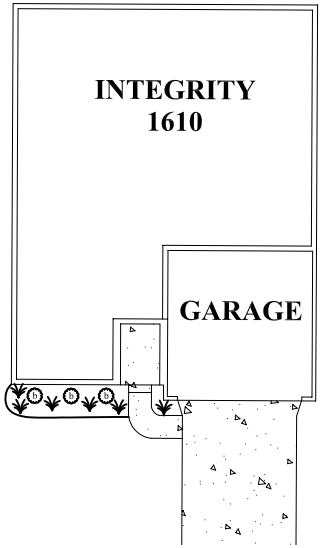
COPPER BAY LANDSCAPE STANDARDS

2/17/2023









Floorplan	Day Lily	Boxwood	1" River Rock & Fabric	Metal Edging
Integrity 1250	7	3	75 sqft	20 lf
Integrity 1530	7	3	80 sqft	20 lf
Integrity 1605	7	3	100 sqft	28 lf
Integrity 1610	7	3	75 sqft	20 lf

* Quantity of materials subject to change

PLAN ATTRIBUTES

7 - Yellow Day Lily

b 3 - Boxwood

1" River Rock (3"-4" Depth)

Landscape Fabric

Metal Edging

Hydroseeded Yard

ALLEN EDWIN HOMES

EXHIBIT G
EXTERIOR HOME COLOR PALETTE AND MATERIAL OPTIONS

Allen Edwin Homes Exterior Color Palette Options

Available Choices in Brick Color

Benton Queen
by Allen Edwin Homes

Brownstone
by Allen Edwin Homes

Crawford
by Allen Edwin Homes

Gibson Queen
by Allen Edwin Homes

Marshall Queen
by Allen Edwin Homes

Morgan Queen
by Allen Edwin Homes

Available Choices in Stone Level 1 - Drystack - Color

Country Ledgestone - Glacier
by Allen Edwin Homes

Country Ledgestone - Mojave
by Allen Edwin Homes

Country Ledgestone - Tuscany
by Allen Edwin Homes

Country Ledgestone-Midnight
by Allen Edwin Homes

Rustic Ledgestone - Autumn
by Allen Edwin Homes

Rustic Ledgestone - Bella
by Allen Edwin Homes

Rustic Ledgestone - Frost
by Allen Edwin Homes

Rustic Ledgestone - Onyx
by Allen Edwin Homes

Country Ledgestone - Timber Ridge
by Allen Edwin Homes

Rustic Ledgestone - Carbon Graphite
by Allen Edwin Homes

Rustic Ledgstone-Pebble Beach
by Allen Edwin Homes

Drystack Ledgestone - Shadow
by Allen Edwin Homes

Available Choices in Stone with Mortar - Color

QR - Cobblestone - Autumn
by Allen Edwin Homes

QR - Cobblestone - Buckingham
by Allen Edwin Homes

QR - Cobblestone - Chardonnay
by Allen Edwin Homes

QR - Cobblestone - Slate
by Allen Edwin Homes

QR - Ledgestone - Desert
by Allen Edwin Homes

QR - Weathered Edge - Bay Harbor
by Allen Edwin Homes

QR - Weathered Edge - Manistee
by Allen Edwin Homes

QR - Weathered Edge - Petosky
by Allen Edwin Homes

Weathered Edge - Lakeshore Linen
by Allen Edwin Homes

Available Choices in Level 1 Exterior Siding - Horizontal

Vytec - Smokestone
by Allen Edwin Homes

CT - Expresso
by Allen Edwin Homes

CT - Midnight Blue
by Allen Edwin Homes

CT - Slate
by Allen Edwin Homes

Vytec - Canyon Ridge
by Allen Edwin Homes

Vytec - Forest
by Allen Edwin Homes

Vytec - Harbour
by Allen Edwin Homes

Vytec - Lakeshore Blue
by Allen Edwin Homes

Vytec - Redwood
by Allen Edwin Homes

Vytec - Rustic Oak
by Allen Edwin Homes

Vytec - Shoreline
by Allen Edwin Homes

Vytec - Smoky Steel
by Allen Edwin Homes

Vytec - Spring Meadow
by Allen Edwin Homes

Available Choices in Standard Siding Color

Vytec - Castle Stone
by Allen Edwin Homes

Vytec - Classic Gray
by Allen Edwin Homes

Vytec - Grasslands
by Allen Edwin Homes

Vytec - Maplewood
by Allen Edwin Homes

Vytec - Natural Sand
by Allen Edwin Homes

Vytec - Rustic Clay
by Allen Edwin Homes

Vytec - Sand Drift
by Allen Edwin Homes

Vytec - Sierra Brown
by Allen Edwin Homes

Vytec - Tundra Moss
by Allen Edwin Homes

Vytec - Twilight Gray
by Allen Edwin Homes

Vytec - White
by Allen Edwin Homes

Available Trim Options

Vytec - White
by Allen Edwin Homes

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

MEMO

VIA EMAIL ckohane@allenedwin.com

To:	**Chris Kohane** **Allen Edwin Homes**
From:	**Jacob Swanson, PE** **Salman Ahmad** **Fleis & VandenBrink Engineering**
Date:	**June 20, 2023**
Re:	**Proposed Highland Reserve PUD** **Hartland Township, Michigan** **Traffic Impact Study**

1 INTRODUCTION

This memorandum presents the results of the Traffic Impact Study (TIS) for the proposed Highland Reserve Planned Unit Development (PUD) in Hartland Township, Michigan. The project site is located on vacant property, generally located in the southeast quadrant of the Highland Road (M-59) & Hartland Glen Lane / Cundy Road intersection, as shown in the attached **Figure 1**. The proposed PUD includes a mixed-used development consisting of two (2) phases; Phase 1 includes residential units and Phase 2 includes a gas station with convenience store and a fast-food restaurant with drive-through. Site access is proposed via two (2) right-in/right-out (RIRO) driveways on Highland Road (M-59) and two (2) full-access driveways on Hartland Glen Lane. Highland Road (M-59) is under the jurisdiction of the Michigan Department of Transportation (MDOT); Hartland Glen Lane and Cundy Road are both under the jurisdiction of the Livingston County Road Commission (LCRC). Hartland Township has required the completion of a TIS as part of the site plan approval process and MDOT and LCRC have required the completion of a TIS for the permitting of site access.

F&V has performed this TIS to evaluate the impact of the proposed development on the adjacent roadway network. The scope of the study was developed based on Fleis & VandenBrink's (F&V) understanding of the development program, accepted traffic engineering practice, requirements of Hartland Township, MDOT, and LCRC, and professional experience. The TIS was completed using Synchro/SimTraffic (Version 11) traffic analysis software. Sources of data for this study include F&V subconsultant Quality Counts, LLC (QC), the Southeast Michigan Council of Governments (SEMCOG), the Institute of Transportation Engineers (ITE), MDOT, and LCRC.

2 BACKGROUND DATA

2.1 EXISTING ROAD NETWORK

The lane use and traffic control at the study intersections are shown on the attached **Figure 2** and the study roadways are further described below. For the purposes of this study, minor streets, crossovers, and site driveways were assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted.

Highland Road (M-59) generally runs in the east and west directions, adjacent to the north side of the project site. The study section of Highland Road (M-59) is classified as an *Other Principal Arterial*, is under the jurisdiction of MDOT, has a posted speed limit of 55 mph, and has an Annual Average Daily Traffic (AADT) volume of approximately of 23,975 (MDOT 2022) vehicles per day. Highland Road (M-59), adjacent to the project site, provides a median-divided four-lane cross-section, with two (2) lanes of travel in each direction; left turn movements are accommodated via the median U-turns (crossovers).

27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.53
F: 248.53
www.fven

Hartland Glen Lane runs in north and south directions, adjacent to the west side of project site. The study section of Hartland Glen Lane is a *Private Roadway*. The study section of roadway provides a typical two-lane cross-section, with one (1) lane of travel in each direction.

Cundy Road generally runs in east and west directions, adjacent to the west side of the project site. The study section of Cundy Road is classified as a *Local Road*, is under the jurisdiction of LCRC, and has a posted speed limit of 40 mph. The study section of roadway provides a typical two-lane cross-section, with one (1) lane of travel in each direction.

2.2 EXISTING TRAFFIC VOLUMES

F&V subconsultant QC collected existing Turning Movement Count (TMC) data on Wednesday May 17, 2023, during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods at the study intersections:

- EB Highland Road (M-59) & WB-to-EB X/O, West of Hartland Glen Lane / Cundy Road
- EB Highland Road (M-59) & Hartland Glen Lane / Cundy Road
- WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane / Cundy Road
- EB Highland Road (M-59) & WB-to-EB X/O, East of Hartland Glen Lane / Cundy Road
- WB Highland Road (M-59) & EB-to-WB X/O, West of Pleasant Valley / Fenton Road

During collection of the turning movement counts, Peak Hour Factors (PHFs), pedestrian and bike volumes, and commercial truck percentages were recorded and used in the traffic analysis. The peak hours of the study intersections were utilized and the through volumes were carried through the roadway network and balanced upwards at the proposed site driveway. Therefore, the traffic volumes used in the analysis and shown on the attached traffic volume figures may not match the raw traffic volumes shown in the data collection.

The peak periods for the adjacent streets were observed to generally occur during the AM and PM peak hours, from 7:45 AM to 8:45 AM and from 5:00 PM to 6:00 PM, respectively. F&V collected an inventory of the existing lane use and traffic controls, as shown on the attached **Figure 2**. The existing 2023 peak hour traffic volumes utilized in this TIS analysis are shown on the attached **Figure 3**. All applicable background data referenced in this memorandum is attached.

3 EXISTING CONDITIONS (2023)

The existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 11) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached **Figure 2**, the existing peak hour traffic volumes shown on the attached **Figure 3**, and the methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM6).

Descriptions of LOS "A" through "F", as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. Additionally, SimTraffic network simulations were reviewed to evaluate network operations and vehicle queues. The results for the existing conditions analysis are attached and summarized in **Table 1**.

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better during both the AM and PM peak periods, with the exception of the following.

WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane

- During the PM peak hour: The eastbound to westbound U-turn (NBL) approach is currently operating at LOS E.

  Although the Synchro intersection LOS analysis indicates poor operations, review of SimTraffic network simulation indicates generally acceptable operation. Occasional periods of vehicle queues were observed; however, the vehicle queues were observed to dissipate and were not present throughout the PM peak hour. Crossover traffic was observed to find sufficient gaps within the through traffic, without experiencing significant delays or excessive vehicle queuing.

Review of the SimTraffic network simulations at the remaining study intersections indicates acceptable traffic operations throughout the study roadway network during both the AM and PM peak hours.

Table 1: Existing Intersection Operations

Intersection		Control	Approach	Existing Conditions			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB Highland Road (M-59) & WB-to-EB X/O, W. of Hartland Glen Lane	Stop (Minor)	EB	Free			
			SBL	15.4	C	19.9	C
20	EB Highland Road (M-59) & Hartland Glen/Cundy Road	Stop (Minor)	EB	Free			
			NBR	19.9	C	21.1	C
30	WB Highland Road (M-59) & EB-to-WB X/O, E. of Hartland Glen Lane	Stop (Minor)	WB	Free			
			NBL	15.2	C	35.1	E
40	EB Highland Road (M-59) & WB-to-EB X/O, E. of Hartland Glen Lane	Stop (Minor)	EB	Free			
			SBL	14.9	B	16.5	C
50	WB Highland Road (M-59) & EB-to-WB X/O, W. of Fenton Road	Stop (Minor)	WB	Free			
			NBL	14.6	B	16.6	C

4 BACKGROUND CONDITIONS (2028 NO BUILD)

Historical population and employment community profile data was obtained for Hartland Township from the Southeast Michigan Council of Government (SEMCOG), in order to calculate a background growth rate to project the existing 2023 traffic volumes to the site buildout year of 2028. Population and employment projections from 2020 to 2050 were reviewed and indicated an average annual growth of 0.94% and 1.08%, respectively. Therefore, a conservative annual background growth rate of **1.08%** per year was applied to the existing peak hour traffic volumes to forecast the background 2028 traffic volumes.

In addition to the background traffic growth, it is important to account for traffic that will be generated by developments within the vicinity of the study area that are currently under construction or will be within the buildout year. At the time of this study, no planned background developments were identified by Hartland Township or LCRC, within the vicinity of the project site.

Background peak hour vehicle delays and LOS ***without the proposed development*** were calculated at the study intersections based on the existing lane use and traffic control shown on the attached **Figure 2**, the background peak hour traffic volumes shown on the attached **Figure 4**, and the methodologies presented in the HCM6. The results of the background conditions analysis are attached and summarized in **Tables 2**.

Table 2: Background Intersection Operations

Intersection		Control	Approach	Existing Conditions				Background Conditions				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB M-59 & WB-to-EB X/O, W. of Hartland Glen	Stop (Minor)	EB	Free				Free				Free			
			SBL	15.4	C	19.9	C	16.0	C	21.5	C	0.6	-	1.6	-
20	EB M-59 & Hartland Glen Lane	Stop (Minor)	EB	Free				Free				Free			
			NBR	19.9	C	21.1	C	21.0	C	22.8	C	1.1	-	1.7	-
30	WB M-59 & EB-to-WB X/O, E. of Hartland Glen	Stop (Minor)	WB	Free				Free				Free			
			NBL	15.2	C	35.1	E	15.8	C	44.4	E	0.6	-	9.3	-
40	EB M-59 & WB-to-EB X/O, E. of Hartland Glen	Stop (Minor)	EB	Free				Free				Free			
			SBL	14.9	B	16.5	C	15.5	C	17.2	C	0.6	B→C	0.7	-
50	WB M-59 & EB-to-WB X/O, W. of Fenton	Stop (Minor)	WB	Free				Free				Free			
			NBL	14.6	B	16.6	C	15.1	C	17.5	C	0.5	B→C	0.9	-

The results of the background conditions analysis indicates that all approaches and movements at the study intersections are expected to continue operating in a manner similar to the existing conditions analysis, with minor increases in delays.

Review of SimTraffic network simulations throughout the study roadway network indicates generally acceptable operations during both peak periods, with the exception of the EB-to-WB crossover, East of Hartland Glen Lane. These queues were observed to occasionally spill back onto EB Highland Road (M-59) and block the through traffic during the PM peak hour. However, these queues were not present throughout the peak period.

5 SITE TRIP GENERATION

The number of weekday peek hour (AM and PM) and daily vehicle trips that would be generated by the proposed development were calculated using the rates and equations published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual, 11th Edition*. The proposed PUD includes a mixed-used development consisting of two (2) phases:

- **Phase 1:** 100 single family residential units
- **Phase 2:** A gas station / convenience store with 12 vehicle fueling positions (VFP) and a fast-food restaurant with a drive-through.

However, for the purpose of this TIS analysis, the full site buildout of the proposed development was evaluated. The trip generation forecast utilized for the proposed development is summarized in **Table 3**.

Table 3: Site Trip Generation Summary

Scenario	Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
						In	Out	Total	In	Out	Total
Phase 1	Single-Family Detached	210	100	DU	1,009	19	55	74	62	37	99
Phase 2	Fast Food Restaurant w/Drive Through	934	2,400	SF	1,122	55	52	107	41	38	79
	Pass-By (50% AM, 55% PM)				*398*	*27*	*27*	*54*	*21*	*21*	*42*
	New Trips				724	28	25	53	20	17	37
	Gas Station with Convenience Market	945	12	VFP	3,086	162	162	324	137	136	273
	Pass-By (76% AM, 75% PM)				*2,330*	*123*	*123*	*246*	*102*	*102*	*204*
	New Trips				756	39	39	78	35	34	69
Buildout	Total Trips				5,217	236	269	505	240	211	451
	Total Pass-By				*2,728*	*150*	*150*	*300*	*123*	*123*	*246*
	Total New Trips				**2,489**	**86**	**119**	**205**	**117**	**88**	**205**

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roadway network based on the proposed site access plan and driveway configurations, the existing peak hour traffic patterns in the adjacent roadway network, and the methodologies published by ITE. The ITE trip distribution methodology assumes that new trips are home-to-work based, and will enter the network and access the development, then leave the development and return to their direction of origin, whereas pass-by trips will enter and exit the development and continue on their original direction of travel. The site trip distributions utilized in this analysis are summarized in **Table 4**.

Table 4: Site Trip Distribution

To/From	Via	Commercial		Commercial Pass-By		Residential	
		AM	PM	AM	PM	AM	PM
East	Highland Road (M-59)	49%	48%	51% (EB)	53% (EB)	51%	48%
West	Highland Road (M-59)	51%	52%	49% (WB)	47% (WB)	49%	52%
Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

The vehicular traffic volumes shown in **Table 3** were distributed to the study roadway network according to the distribution shown in **Table 4**. The site-generated trips shown on the attached **Figure 5** were added to the background peak hour traffic volumes shown on the attached **Figure 4**, in order to calculate the future peak hour traffic volumes, with the addition of the proposed development. Future peak hour traffic volumes are shown on the attached **Figure 6**.

7 FUTURE CONDITIONS (2028)

Future peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on the future lane use and traffic control shown on the attached **Figure 2**, the proposed site access plan, the future peak hour traffic volumes shown on the attached **Figure 6**, and the methodologies presented in the HCM6. The results of the future conditions analysis are attached and summarized in **Table 6.**

Table 5: Future Intersection Operations

Intersection		Control	Approach	Background Conditions				Future Conditions				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
10	EB M-59 & WB-to-EB X/O, W. of Hartland Glen	Stop (Minor)	EB	Free				Free				Free			
			SBL	16.0	C	21.5	C	22.6	C	33.1	D	6.6	-	11.6	C→D
20	EB M-59 & Hartland Glen Lane	Stop (Minor)	EB	Free				Free				Free			
			NBR	21.0	C	22.8	C	22.2	C	29.3	D	1.2	-	6.5	C→D
30	WB M-59 & EB-to-WB X/O, E. of Hartland Glen	Stop (Minor)	WB	Free				Free				Free			
			NBL	15.8	C	44.4	E	23.4	C	58.6	F	7.6	-	14.2	E→F
40	EB M-59 & WB-to-EB X/O, E. of Hartland Glen	Stop (Minor)	EB	Free				Free				Free			
			SBL	15.5	C	17.2	C	16.2	C	19.1	C	0.7	-	1.9	-
50	WB M-59 & EB-to-WB X/O, W. of Fenton	Stop (Minor)	WB	Free				Free				Free			
			NBL	15.1	C	17.5	C	15.8	C	18.3	C	0.7	-	0.8	-
60	EB M-59 & Site Drive #1	Stop (Minor)	EB	N/A				Free				N/A			
			NBR					35.9	E	49.0	E				
70	EB M-59 & Site Drive #2	Stop (Minor)	EB	N/A				Free				N/A			
			NBR					17.8	C	19.4	C				
80	Hartland Glen / Cundy Road & Site Drive #4	Stop (Minor)	EB	N/A				0.0*	A	0.0*	A	N/A			
			WB					8.5	A	8.5	A				
			NBL					0.0*	A	0.0*	A				
			SBL					7.4	A	7.4	A				
90	Hartland Glen / Cundy Road & Site Drive #3	Stop (Minor)	WBR	N/A				8.4	A	8.6	A	N/A			
			NB					Free							
			SBL					7.2	A	7.3	A				

** Indicates no vehicle volume present*

The result of the future conditions analysis indicates that all study intersection approaches and movements are expected to continue operating in a manner similar to the background conditions analysis, with the exception of the following:

WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane

- <u>During the PM peak hour:</u> The eastbound to westbound U-turn (NBL) approach is expected to operate at LOS F.

  Review of SimTraffic microsimulations indicates periods of long vehicle queues which were observed to exceed the available crossover storage area, spilling back onto EB Highland Road (M-59) and block the through traffic during the PM peak hour.

EB Highland Road (M-59) & Site Drive #1

- During the AM and PM peak hour: The Site Drive approach is expected to operate at LOS E.

  Review of SimTraffic microsimulations indicates acceptable operation during the AM peak hour, with a 95th percentile queue length of approximately 124-ft (4-5 vehicles), which is not significant. However, review of SimTraffic network simulations indicates that the overflow queues generated at the adjacent EB-to-WB crossover, east of Hartland Glen Lane were observed to occasionally block the operations at the proposed site driveway.

8 ACCESS MANAGEMENT

8.1 AUXILIARY TURN LANE EVALUATION

MDOT auxiliary turn lane warranting criteria charts were utilized to determine the need for auxiliary turn lanes at the proposed site driveways on Highland Road (M-59); the analysis was based on the future peak hour traffic volumes, shown on the attached **Figure 6**. The study section of Highland Road (M-59) is median-divided and left-turns are accommodated via median U-turns (crossovers); therefore, the warranting criteria for auxiliary left-turn lanes was not evaluated. The results of the analysis are shown on the attached MDOT warranting charts and are summarized in **Table 6**.

Table 6: Auxiliary Turn Lane Warrant Analysis Summary

Site Driveway Intersection	Right-Turn Treatment
Highland Road (M-59) & Site Drive #1	**Right-Turn Lane**
Highland Road (M-59) & Site Drive #2	**Right-Turn Lane**

The results of the auxiliary turn lane evaluation indicates that right-turn deceleration lanes are recommended on Highland Road (M-59) at both the proposed site driveways.

8.2 DRIVEWAY SPACING EVALUATION

The MDOT Geometric Design Guidance (Section 1.2.2) was utilized to evaluate the location of the proposed site driveways, in relation to nearby intersections and driveways within close proximity to the project site. The MDOT driveway spacing and intersection corner clearance criteria were evaluated for the 55-mph section of Highland Road (M-59). The proposed development plans include two (2) right-in/right-out (RIRO) driveways on Highland Road (M-59). The distance of the proposed site driveways from nearby access points and the warranting criteria are displayed in **Exhibit 1** and summarized in **Table 7**.

Exhibit 1: Site Driveway Spacing

Table 7: Desirable Driveway Spacing Summary

Adjacent Driveways & Intersections			Distance	Criteria	Meets
Site Drive #1	to	Hartland Glen Lane / Cundy Road	320 feet	230 feet	**YES**
Site Drive #1	to	EB-to-WB X/O, East of Hartland Glen Lane	260 feet	150 feet	**YES**
Site Drive #2	to	WB-to-EB X/O, East of Hartland Glen Lane	430 feet	150 feet	**YES**
Site Drive #2	to	EB-to-WB X/O, West of Fenton Road	600 feet	150 feet	**YES**

The results of the analysis indicates that both of the proposed site driveways are expected to meet the MDOT desirable spacing criteria in relation to the nearby roadways and access points.

9 FUTURE (2028) CONDITIONS WITH IMPROVEMENTS

9.1 SIGNAL WARRANT EVALUATION

In order to mitigate the future intersection delays at the study intersection of WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane, intersection signalization is recommended. Therefore, a signal warrant analysis was performed in accordance with the *Michigan Manual on Uniform traffic Control Devices (MMUTCD)* which documents eight warrants by which traffic signal control are considered. Warrant 1 (8-Hour Vehicular Volume), Warrant 2 (4-Hour Vehicular Volume), and Warrant 3 (Peak-Hour) were evaluated at the study intersection based on the projected future traffic volumes.

F&V only collected 4-hours (7-9AM and 4-6PM) of turning movement counts (TMCs); therefore, available historical traffic volume data along Highland Road (M-59) was utilized to evaluate all 24 hours of the signal warrant analysis spreadsheet. The results of the signal warrant analysis are summarized in **Table 8** and discussed below; the signal warrant charts are attached for reference.

Table 8: Signal Warrant Analysis Summary

WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane		
Warrant 1: Eight Hour		**Future**
		YES
Condition A	*Hours Met*	**1**
	Warrant Met	**NO**
Condition B	*Hours Met*	**12**
	Warrant Met	**YES**
Warrant 2: Four-Hour	*Hours Met*	**7**
	Warrant Met	**YES**
Warrant 3: Peak-Hour	*Hours Met*	**3**
	Warrant Met	**YES**

The results of the signal warrant analysis indicates that the study intersection of WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen is expected to meet Warrant 1B (Eight-Hour), Warrant 2 (Four-Hour), and Warrant 3 (Peak-Hour) based on future traffic volumes. Therefore, a fully actuated traffic signal is recommended. However, it is recommended to continue monitoring this intersection as the proposed development progresses, to determine if/when a traffic signal would be recommended.

9.2 INTERSECTION OPERATIONS

In order to improve traffic operations under future conditions and mitigate the impact of the proposed development, mitigation measures were investigated. These mitigation measures included geometric improvements and traffic control modifications. The proposed improvements and their impact to intersection operations are summarized below.

WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane

Review of the intersection operations during the PM peak hour indicates long vehicle queues for the northbound (U-turn) approach; theses vehicle queues were the result of limited gaps within the through traffic along WB Highland Road (M-59), due to the high volume of through traffic. Therefore, mitigation measures were investigated, including geometric improvements and signalization. The results of the signal warrant analysis indicates a traffic signal is warranted at this location, based on the future traffic volumes. Therefore, the following mitigation measures are recommended at this intersection:

- Install a fully actuated traffic signal

EB Highland Road (M-59) & Site Drive #1 & #2

Review of SimTraffic microsimulations, with the implementation of the recommended traffic signal, indicates that the proposed site driveways will operate acceptably during both peak periods. The 95th percentile queue length for the northbound (egress) approach is projected to be approximately 140-ft (5-6 vehicles) or less during both peak periods, which is not significant based on the volume of egress traffic. Therefore, the following mitigation measures are recommended at these site driveway intersections:

- Provide a right-turn deceleration lane along EB Highland Road at Site Drive #1 and Site Drive #2.

The results of the future improvements conditions analysis, with the implementation of the recommended mitigation measures, are attached and summarized in **Table 7**.

Table 9: Future Intersection Operations with Improvements

Intersection		Control	Approach	Future Conditions				Future w/ IMP				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
30	WB M-59 & EB-to-WB X/O, E. of Hartland Glen	Stop (Minor) Signal [IMP]	WB	Free				14.0	B	19.7	B	N/A			
			NBL	23.4	C	58.6	F	20.7	C	24.6	C	-2.7	-	-34.0	F→C
			Overall	**N/A**				**14.5**	**B**	**20.3**	**C**	**N/A**			
60	EB M-59 & Site Drive # 1	Stop (Minor)	EB	Free				Free				Free			
			NBR	35.9	E	49.0	E	29.8	D	41.3	E	-6.1	E→D	-7.7	-
70	EB M-59 & Site Drive # 2	Stop (Minor)	EB	Free				Free				Free			
			NBR	17.8	C	19.4	C	17.6	C	18.8	C	-0.2	-	-0.6	-

With the implementation of the recommended intersection improvements, all study intersection approaches and movements are expected to operate acceptably, at LOS D or better during both peak periods, with the exception of Site Drive #1; however, review of microsimulations indicates acceptable operations. Occasional periods of vehicles queues were observed at the southbound (U-turn) approach at the intersection of WB Highland Road (M-59) & WB-to-EB X/O, West of Hartland Glen Lane during the PM peak hour; however, the queues were observed to dissipate and were not present throughout the peak hour. Review of SimTraffic network simulations indicates acceptable operations throughout the remaining study roadway network.

10 CONCLUSIONS

The conclusions of this TIS are as follows:

1. Existing (2023) Conditions

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better during the AM and PM peak hours, with the exception of following:

- WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane: The northbound (U-turn) approach is currently operating at LOS E during the PM peak hour.

  Occasional periods of vehicle queues were observed; however, the vehicle queues were observed to dissipate and were not present throughout the PM peak hour.

2. Background (2028) Conditions

- Historical population and employment data in the area were reviewed to determine a conservative annual growth rate of **1.08%** per year, to apply to the existing 2023 peak hour traffic volumes, in order to forecast the 2028 background peak hour traffic volumes, without the proposed development.
- The results of the background conditions analysis indicates that all approaches and movements at the study intersections are expected to continue operating in a manner similar to the existing conditions analysis, with minor increases in delays.
- Review of SimTraffic network simulations throughout the study roadway network indicates generally acceptable operations during both peak periods, with the exception of the EB-to-WB crossover, East of Hartland Glen Lane. These queues were observed to occasionally spill back onto EB Highland Road (M-59) and block the through traffic during the PM peak hour. The queues were not present throughout the peak period.

3. Future (2028) Conditions

The result of the future conditions analysis indicates that all study intersection approaches and movements are expected to continue operating in a manner similar to the background conditions analysis, with the following exceptions:

- WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane: The northbound (U-turn) approach is expected to operate at LOS F during the PM peak hour.

  Review of SimTraffic microsimulations indicates periods of long vehicle queues which were observed to exceed the available crossover storage area, spilling back onto EB Highland Road (M-59) and block the through traffic during the PM peak hour.

- EB Highland Road (M-59) & Site Drive #1: The northbound approach is expected to operate at LOS E during both the AM and PM peak hours.

  Review of SimTraffic network simulations indicates acceptable operation during the AM peak hour, with a 95th percentile queue length of approximately 124-ft (4-5 vehicles), which is not significant. However, review of SimTraffic microsimulations indicates that the adjacent EB-to-WB crossover intersection is expected to impact the operations of the site driveway intersection.

4. Access Management

- MDOT auxiliary turn lane warranting criteria charts were evaluated to determine the need for right-turn treatments at the proposed site driveways on Highland Road (M-59). The results indicates that full width right-turn deceleration lanes are warranted along eastbound Highland Road (M-59) at the proposed Site Drive #1 and Site Drive #2.
- The results of the driveway spacing evaluation indicates that the proposed site driveways on Highland Road (M-59) are expected to meet the MDOT desirable spacing criteria, in relation to the nearby roadways, crossovers, and access points.

5. Future (2028) Conditions with Improvements

WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane

- In order to mitigate intersection projected future delays at the study intersection of WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane, a signal warrant evaluation was performed. The results of the signal warrant analysis indicates that the study intersection is expected to meet Warrant 1B (Eight-Hour), Warrant 2 (Four-Hour), and Warrant 3 (Peak-Hour), based on future traffic volumes.

EB Highland Road (M-59) & Site Drive #1

- The results of the future improvements analysis, with the implementation of the recommended mitigation measures indicates that proposed Site Drive #1 is expected to operate at LOS D during the AM peak hour; however, the PM peak hour is expected to continue operating at LOS E. The 95th percentile queue length for the northbound (egress) approach is approximately 140-ft (5-6 vehicles) or less during both peak periods.

11 RECOMMENDATIONS

The recommendations of this TIS are as follows:

Intersections and Recommended Mitigation Measures	Phase 1	Buildout
30. WB Highland Road (M-59) & EB-to-WB X/O, East of Hartland Glen Lane		
Install a fully actuated traffic signal. *(It is recommended to continue monitoring this intersection as the proposed development progresses, to determine if/when a traffic signal is warranted).*		✓
60. EB Highland Road (M-59) & Site Drive #1		
Provide an eastbound right-turn deceleration lane along EB Highland Road (M-59) at the proposed Site Drive #1.		✓
70. EB Highland Road (M-59) & Site Drive #2		
Provide an eastbound right-turn deceleration lane along EB Highland Road (M-59) at the proposed Site Drive #2.	✓	

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

Digitally signed by Jacob Swanson
Date: 2023.06.20 16:51:25 -04'00'

Attached:
Figure 1-6
Proposed Site/Concept Plan
Traffic Volume Data
SEMCOG Information
Synchro / SimTraffic Results
Auxiliary Turn Lane Criteria
Signal Warrants

FIGURE 1

SITE LOCATION

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

SITE SITE LOCATION

NORTH
SCALE: NOT TO

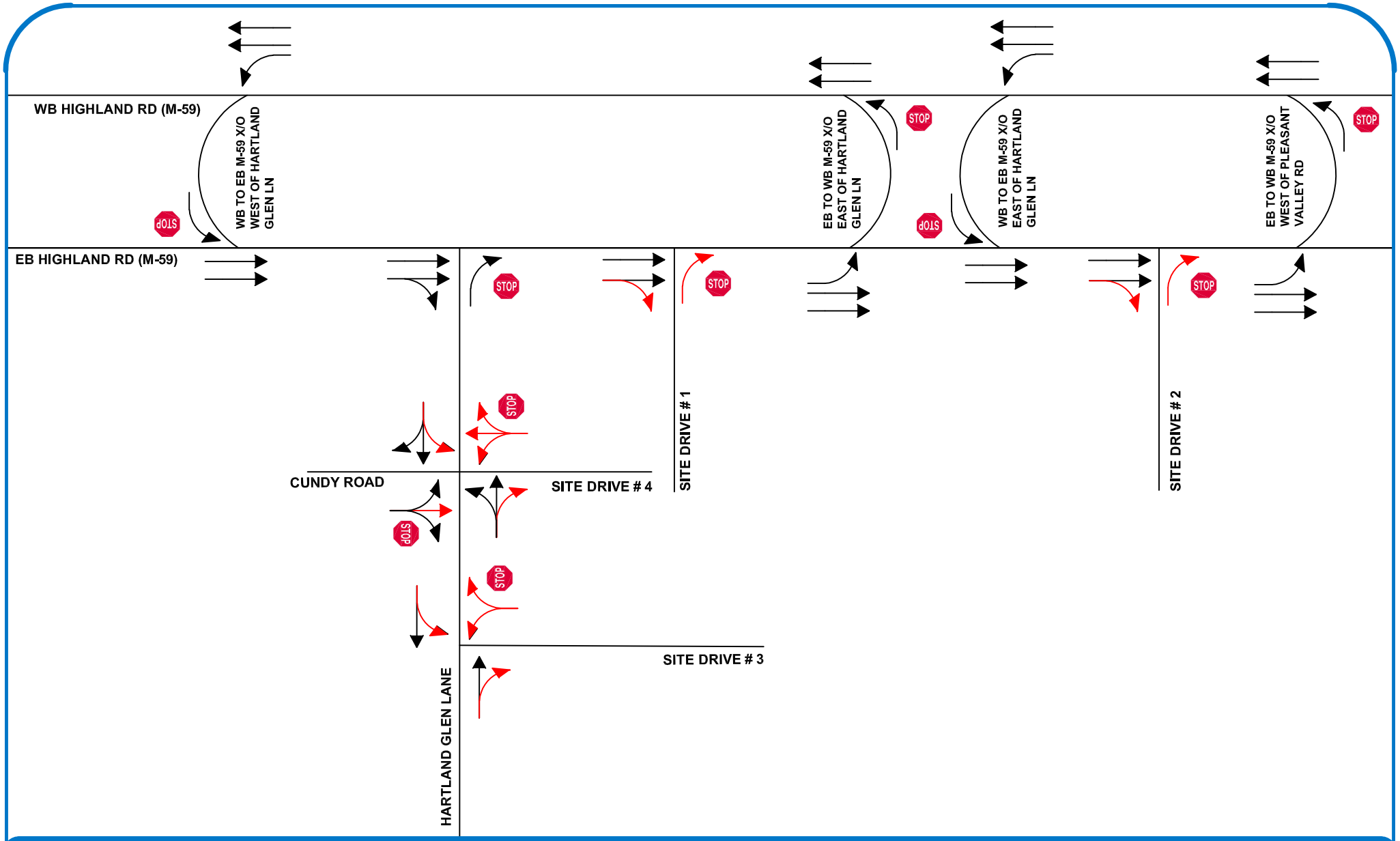


FIGURE 2

LANE USE AND TRAFFIC CONTROL

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

ROADS — PROPOSED ROADS

LANE USE — PROPOSED LANE USE

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

NORTH

SCALE: NOT TO

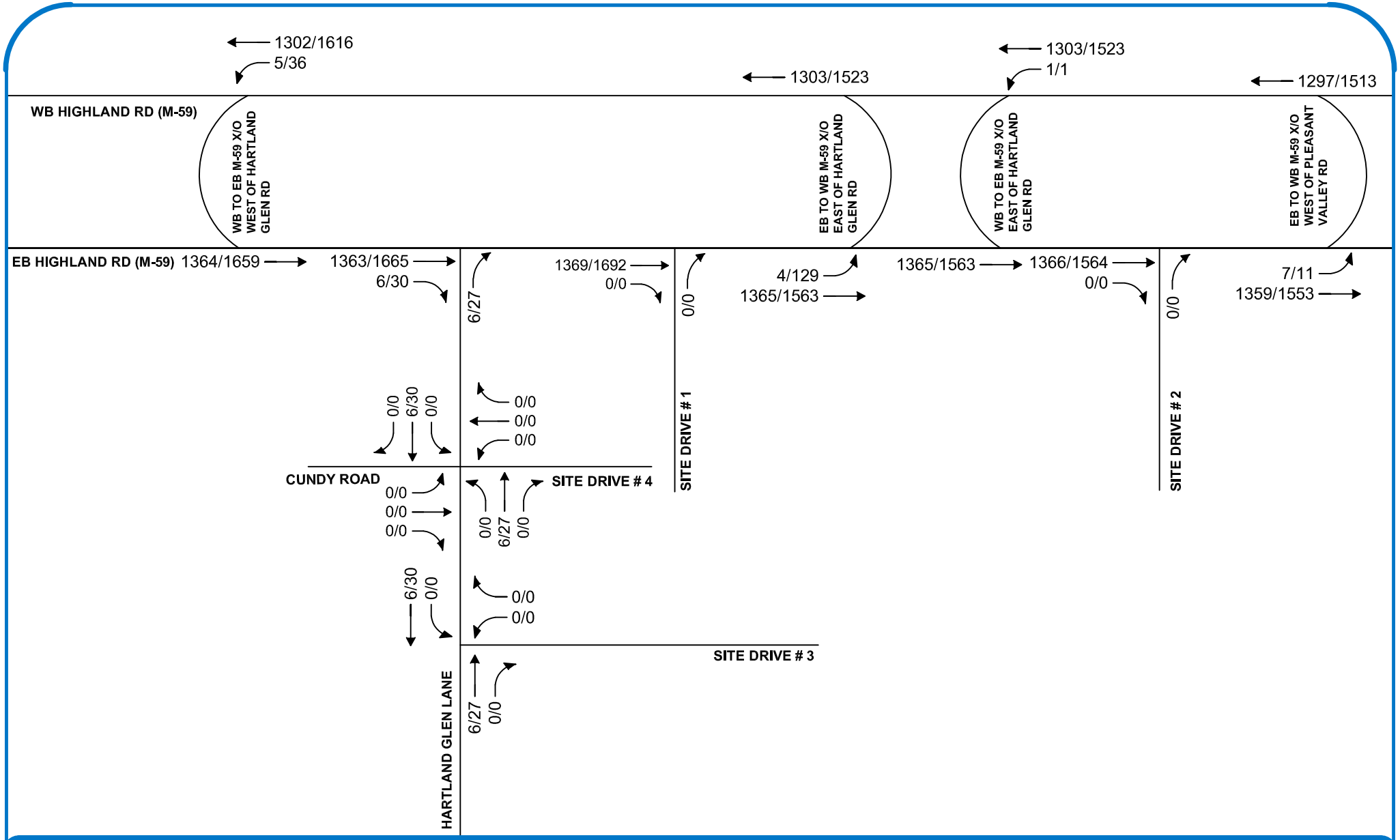


FIGURE 3

EXISTING TRAFFIC VOLUMES

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO

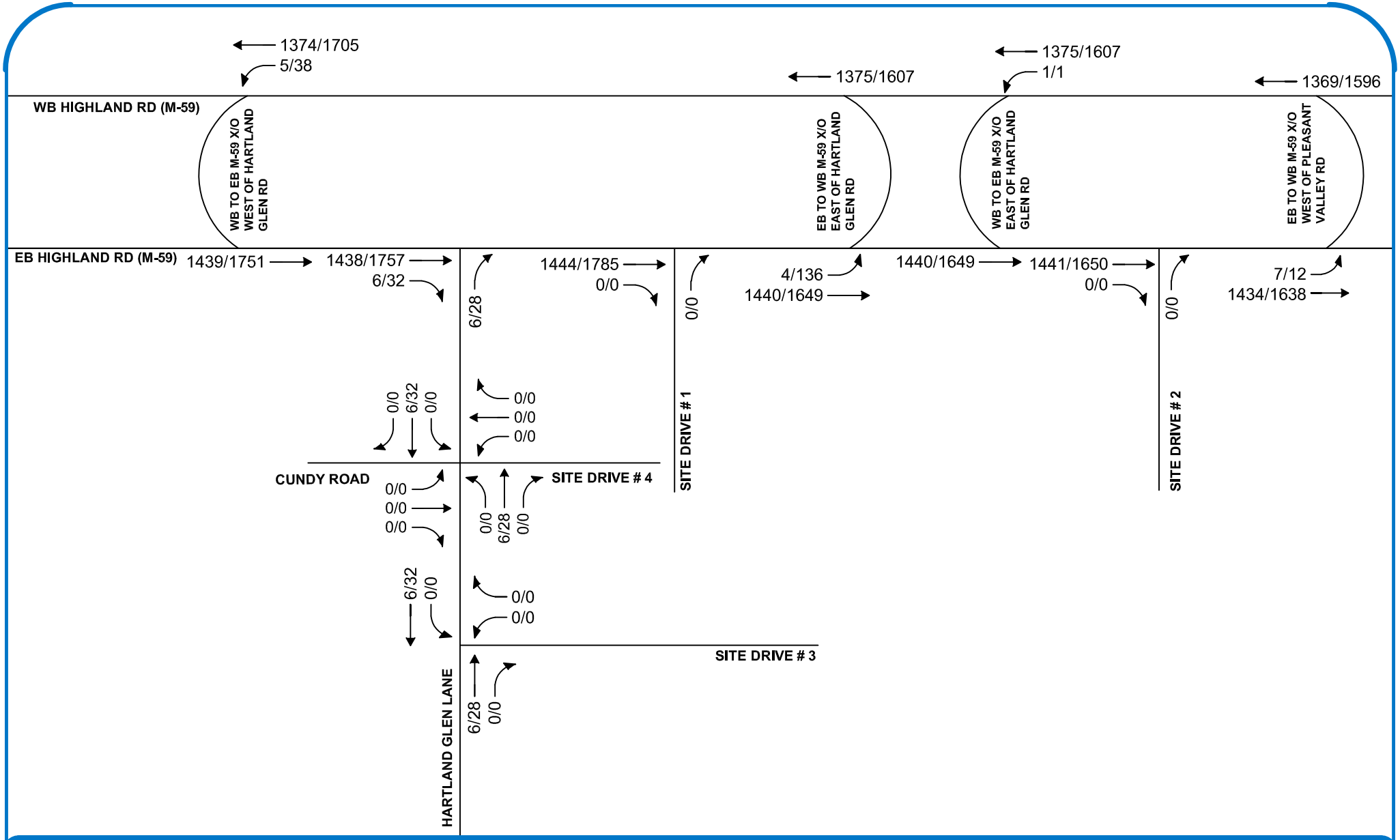


FIGURE 4

BACKGROUND TRAFFIC VOLUMES

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO

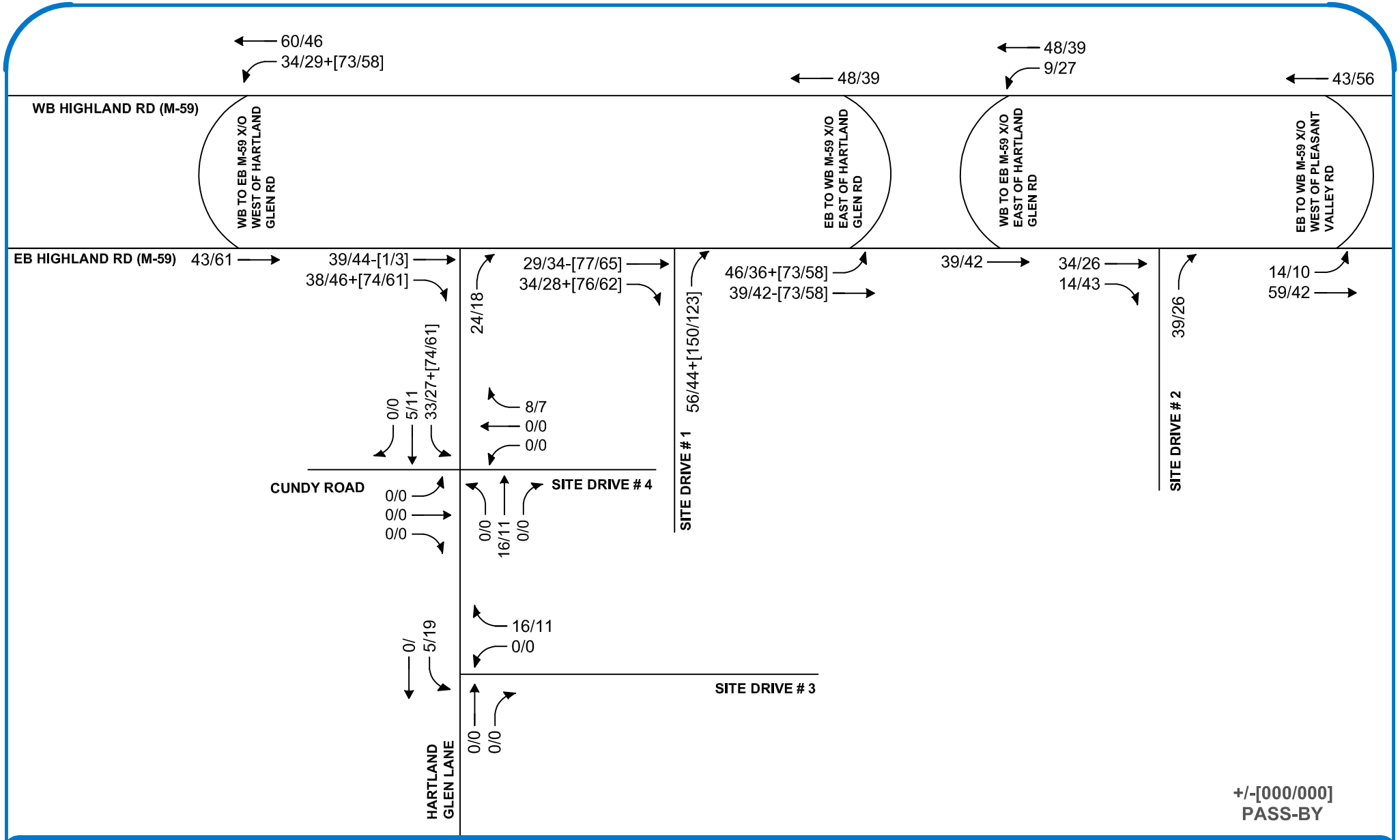


FIGURE 5

SITE-GENERATED TRAFFIC VOLUMES

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO

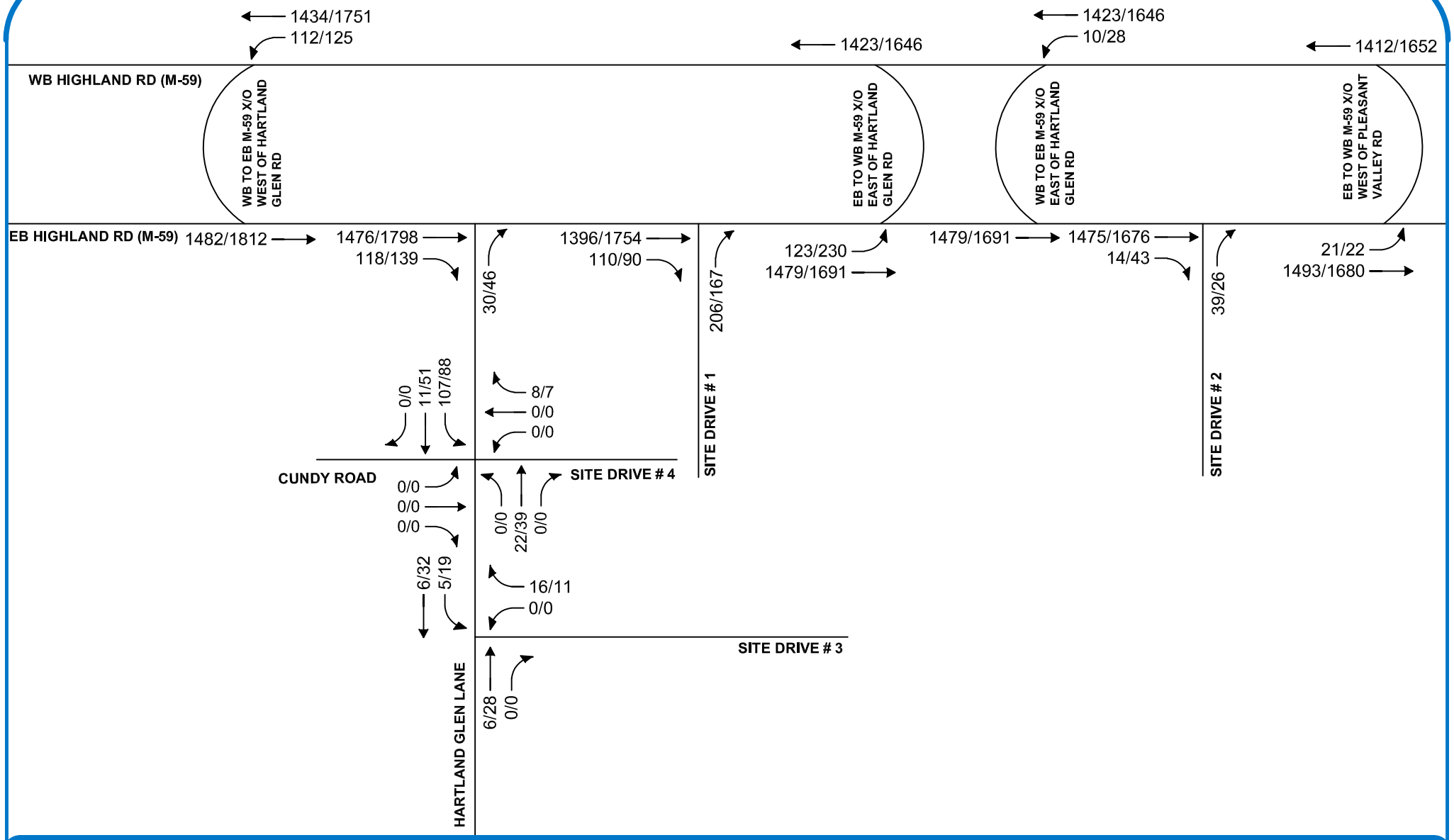


FIGURE 6

FUTURE TRAFFIC VOLUMES

Highland Reserve PUD TIS - Hartland Township, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO

SITE DATA

OVERALL PARCEL AREA = ±39.05-ACRES
COMMERCIAL PARCEL AREA = ±1.913-ACRES
RESIDENTIAL SINGLE DEED RENTALS = ±10.98-ACRES
RESIDENTIAL SITE CONDO = ±19.10-ACRES
PROPOSED STREET R.O.W. = ±7.06-ACRES

EXISTING ZONE = SPECIAL PLANNING AREA (SPA)
PROPOSED ZONING (PD) CLUSTER OPTION
PROPOSED NO. RENTAL UNITS = 35
PROPOSED NO. CONDO UNITS = 65
UNIT DENSITY = 100/39.05 = 2.56 UNITS/ACRE
PD OPEN SPACE REQUIREMENT = 25%
PROVIDED OPEN SPACE = 15.931-ACRES 40.8%
MINIMUM LOT SIZE 60'(W)x120'(L)
MINIMUM LOT AREA = 7,200-SQ.FT
FRONT BUILDING SETBACK = 25-FT.
REAR BUILDING SETBACK = 20-FT.
SIDE BUILDING SETBACK = 5-FT EACH SIDE
80-FT. BUILDING SETBACK REQUIRED ALONG M-59 R.O.W.

TYPICAL LOT DETAIL

SCALE: 1"=20'

PLANNED DEVELOPMENT NOTES

1. SITE ACCESS & ROADWAYS
   THE DEVELOPMENT WILL BE SERVED BY PUBLIC ROADS MEETING THE REQUIREMENTS OF THE LIVINGSTON COUNTY ROAD COMMISSION.
2. UTILITIES
   PROPOSED PROJECT WILL BE SERVED BY PUBLIC SEWER AND PUBLIC WATER.
   PRIVATE UTILITIES (GAS, ELECTRIC, PHONE) SHALL BE UNDERGROUND.
3. SITE LIGHTING
   STREET LIGHTING TO BE IN ACCORDANCE WITH DELHI TOWNSHIP ORDINANCES.
4. STORM WATER MANAGEMENT
   STORM WATER RUNOFF WILL BE COLLECTED IN THE STORM SEWER SYSTEM AND DETAINED IN ACCORDANCE WITH THE LIVINGSTON COUNTY DRAIN COMMISSION STORM WATER ORDINANCE.
5. SIDEWALKS
   SIDEWALKS WILL BE IN ACCORDANCE WITH TOWNSHIP ORDINANCES.
6. FLOODPLAIN
   THE SITE IS NOT AFFECTED BY A REGULATED 100-YEAR FLOODPLAIN.
7. WETLANDS
   WETLAND SHOWN AS PROVIDED BY ENVIROLOGIC ENVIRONMENTAL CONSULTING AND SERVICES.
8. SANITARY SEWER
   SANITARY SEWER TO BE IN ACCORDANCE WITH TOWNSHIP STANDARDS.
9. WATER MAIN
   WATER MAIN TO BE IN ACCORDANCE WITH TOWNSHIP STANDARDS.
10. PUBLIC SERVICES
    POLICE: TOWNSHIP POLICE DEPARTMENT
    FIRE: TOWNSHIP FIRE DEPARTMENT
    SCHOOL: PUBLIC SCHOOLS

LEGEND

- PR. COMMERCIAL PARCEL
- PR. CONDOMINIUM UNITS
- PR. RENTAL UNITS
- OPEN SPACE AREA (UPLAND)
- EX. WETLANDS PR. PRESERVATION AREAS
- STORM WATER PONDS
- EXISTING WOODLANDS TO REMAIN
- EXISTING REGULATED TREE TO REMAIN
- CONDOMINIUM GENERAL COMMON ELEMENT
- CONDOMINIUM LIMITED COMMON ELEMENT

STATE OF MICHIGAN
MATTHEW A. DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

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REVISIONS

CLIENT: ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

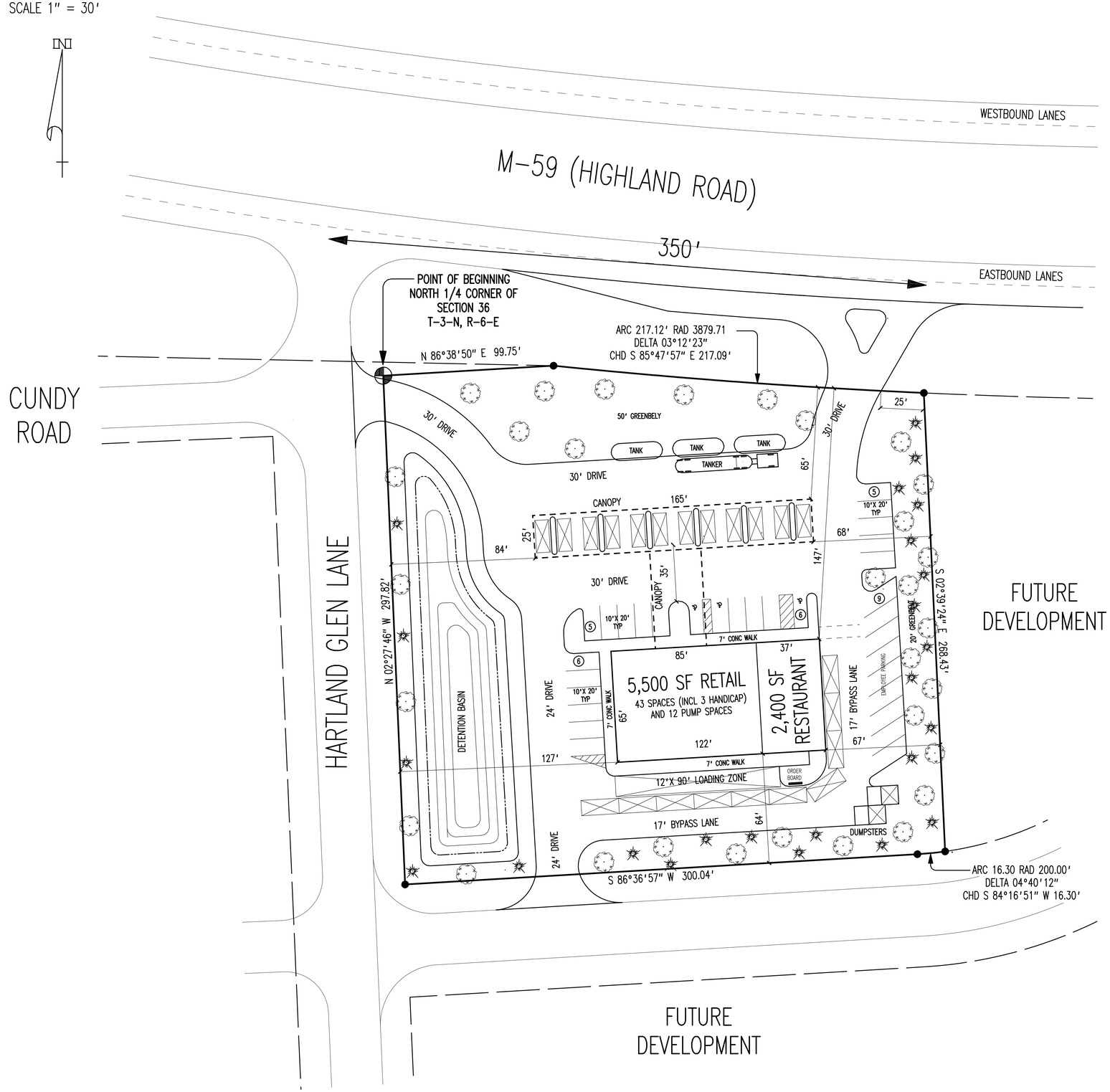
SITE PLAN
HARTLAND RESERVE

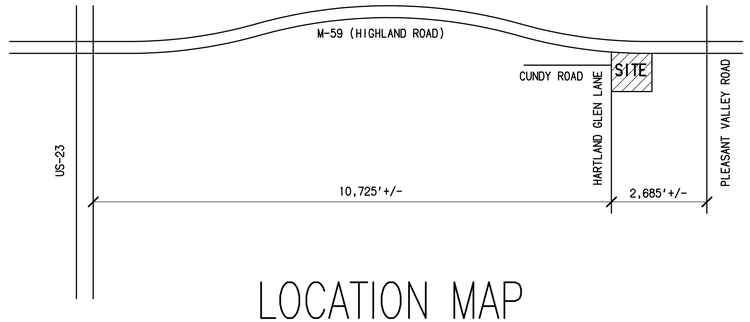
SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 2-24-23
Drawn By: XX
P.E.: MD
1" = 60'
Job No.: 221215
Sheet No. 3

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 2-25-23.DWG

SCALE 1" = 30'





LOCATION MAP

DESCRIPTION
(A PART OF PARCEL 4708-26-200-003)

A PART OF THE NORTHEAST 1/4 OF SECTION 26, T-3-N, R-6-E, HARTLAND TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN BEING MORE PARTICULARLY DESCRIBED AS BEGINNING AT THE NORTH 1/4 CORNER OF SAID SECTION 26; THENCE N 86°38'50" E 99.75 FEET TO A POINT ON THE SOUTH RIGHT OF WAY LINE OF M-59 (HIGHALND ROAD; THENCE ALONG A CURVE TO THE LEFT 217.12 FEET, SAID CURVE HAVING A RADIUS OF 3879.71 FEET, A CENTRAL ANGLE OF 03°12'23" AND A LONG CHORD BEARING OF S 85°47'57" E 217.09 FEET; THENCE S 02°39'24" E 268.43 FEET; THENCE ALONG A CURVE TO THE RIGHT 16.30 FEET, SAID CURVE HAVING A RADIUS OF 200.00 FEET, A CENTRAL ANGLE OF 04°40'12" AND A LONG CHORD BEARING OF S 84°16'51" W 16.30 FEET; THENCE S 86°36'57" W 300.04 FEET; THENCE N 02°27'46" W 297.82 FEET TO THE POINT OF BEGINNING. CONTAINING 2.08 ACRES, MORE OR LESS.

SITE DATA

1) PART OF PARCEL 4708-26-200-003
2) SITE AREA - 2.08+/- ACRES
3) EXISTING ZONING - CA - CONSERVATION AGRICULTURE
4) MASTER PLAN DESIGNATION - SPECIAL PLANNING AREA
5) PROPOSED ZONING - GC - GENERAL COMMERCIAL
6) PROPOSED USE GAS STATION/RETAIL W/DRIVE THRU
7) MINIMUM LOT WIDTH - 200 FEET
   PROPOSED LOT WIDTH - 316'+/- (HIGHLAND ROAD)
8) SETBACKS PER GC - GENERAL COMMERCIAL ZONING

REQUIRED		PROPOSED
50 FEET	FRONT	147 FEET (BUILDING)
	FRONT	65 FEET (CANOPY)
15 FEET	SIDE	67 FEET EAST (BUILDING)
		84 FEET WEST (BUILDING)
		68 FEET EAST (CANOPY)
		84 FEET WEST (CANOPY)
40 FEET	REAR	64 FEET

CONCEPT PLAN FOR
PART OF PARCEL 4708-26-200-002
AT THE SOUTHEAST CORNER OF
HIGHLAND ROAD AND HARTLAND GLEN LANE

DATE	REVISION	DATE	REVISION	DATE	REVISION

72 HOURS (3 WORKING DAYS) BEFORE YOU DIG CALL MISS DIG 800-482-7171 (TOLL FREE)

YALDO CONSTRUCTION
31000 NORTHWESTERN HIGHWAY, SUITE 110
FARMINGTON HILLS, MICHIGAN 48334
PH (248) 521-0978

PROPRIETOR:
MR. ISAM YALDO
31000 NORTHWESTERN HIGHWAY, SUITE 110
FARMINGTON HILLS, MICHIGAN 48334
PH (248) 521-0978

PROPOSED FILLING STATION/ CONVENIENCE STORE

HARTLAND TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN

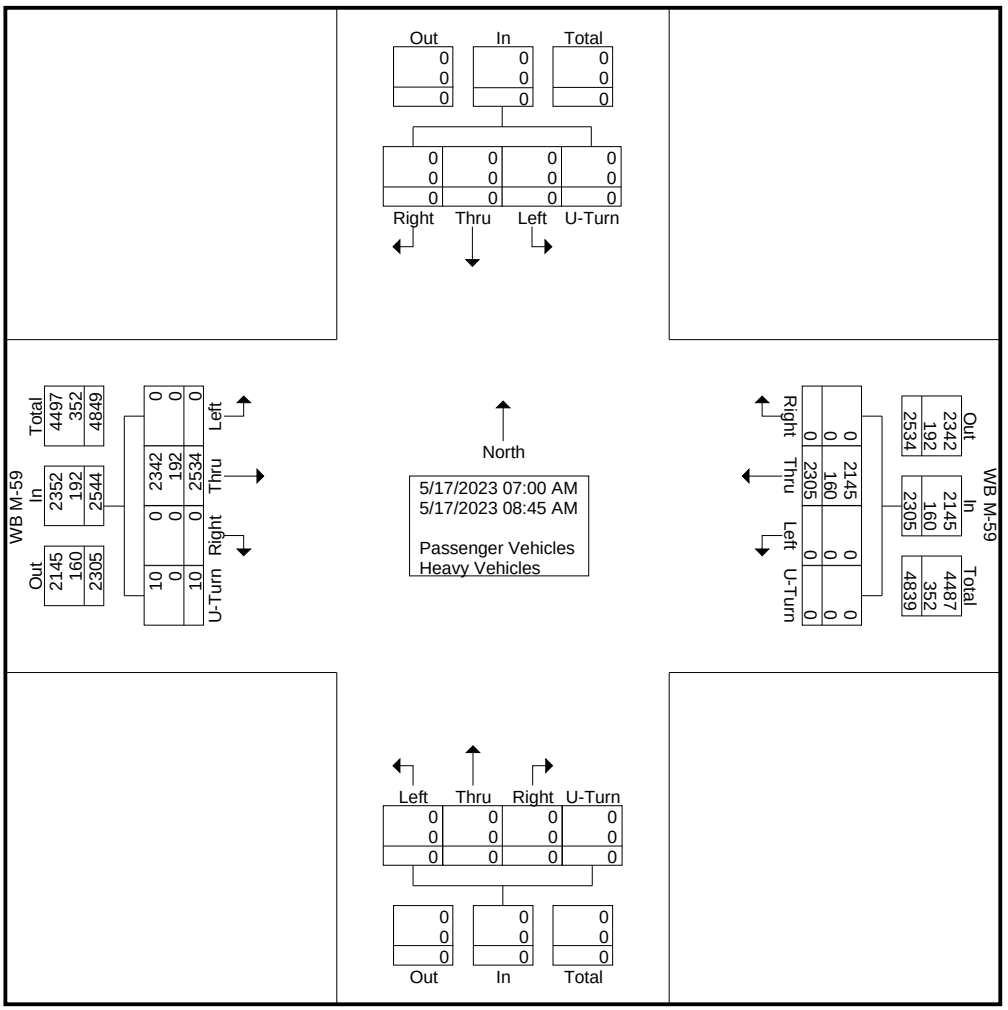
DRAWN IY	DATE MARCH 2023
DESIGN IY	SCALE 1" = 30'
SECTION 26	SHEET 1 OF 1
T- 3 -N. R- 6 -E.	NO. 1477-38

Quality Counts

File Name : 16209801 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209801
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

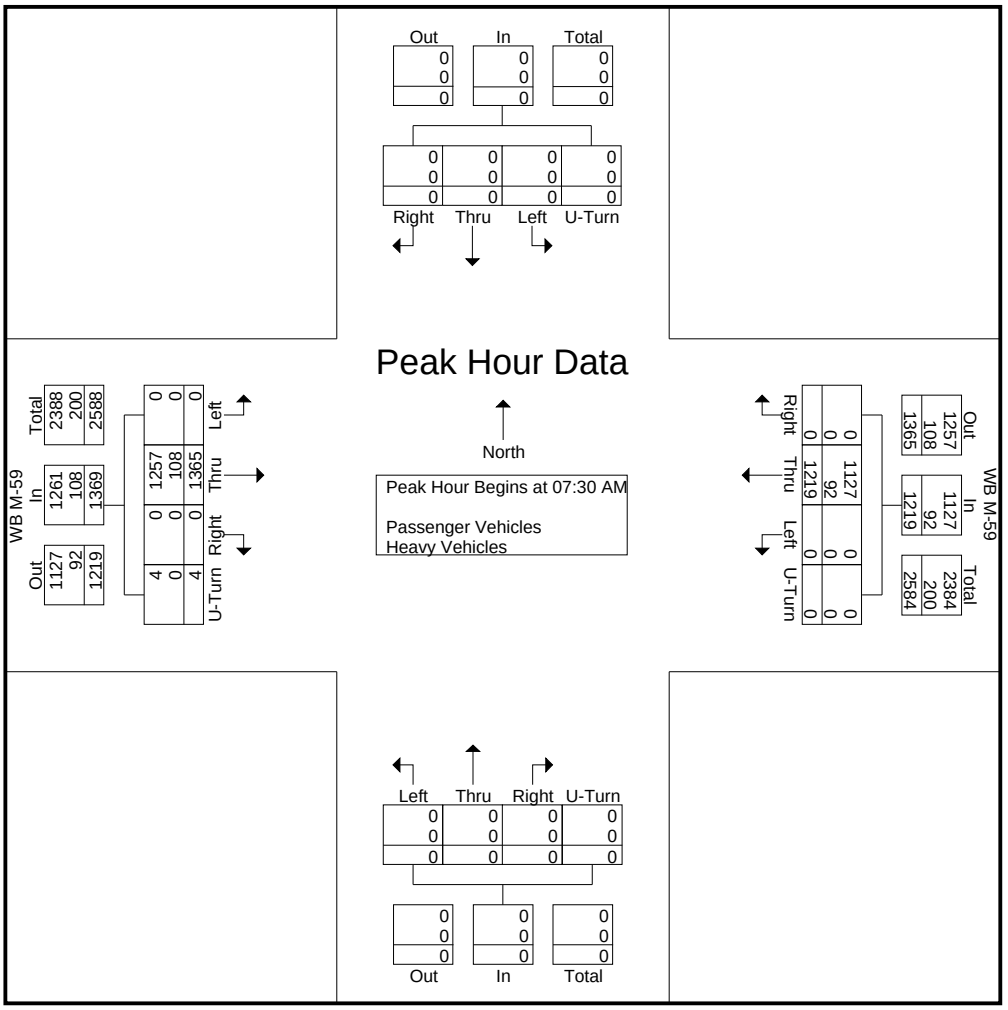
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	250	0	1	251	0	228	0	0	228	0	0	0	0	0	0	0	0	0	0	479
07:15 AM	0	314	0	4	318	0	253	0	0	253	0	0	0	0	0	0	0	0	0	0	571
07:30 AM	0	365	0	0	365	0	269	0	0	269	0	0	0	0	0	0	0	0	0	0	634
07:45 AM	0	357	0	1	358	0	342	0	0	342	0	0	0	0	0	0	0	0	0	0	700
Total	0	1286	0	6	1292	0	1092	0	0	1092	0	0	0	0	0	0	0	0	0	0	2384
08:00 AM	0	313	0	3	316	0	269	0	0	269	0	0	0	0	0	0	0	0	0	0	585
08:15 AM	0	330	0	0	330	0	339	0	0	339	0	0	0	0	0	0	0	0	0	0	669
08:30 AM	0	296	0	0	296	0	337	0	0	337	0	0	0	0	0	0	0	0	0	0	633
08:45 AM	0	309	0	1	310	0	268	0	0	268	0	0	0	0	0	0	0	0	0	0	578
Total	0	1248	0	4	1252	0	1213	0	0	1213	0	0	0	0	0	0	0	0	0	0	2465
Grand Total	0	2534	0	10	2544	0	2305	0	0	2305	0	0	0	0	0	0	0	0	0	0	4849
Apprch %	0	99.6	0	0.4		0	100	0	0		0	0	0	0		0	0	0	0		
Total %	0	52.3	0	0.2	52.5	0	47.5	0	0	47.5	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2342	0	10	2352	0	2145	0	0	2145	0	0	0	0	0	0	0	0	0	0	4497
% Passenger Vehicles	0	92.4	0	100	92.5	0	93.1	0	0	93.1	0	0	0	0	0	0	0	0	0	0	92.7
Heavy Vehicles	0	192	0	0	192	0	160	0	0	160	0	0	0	0	0	0	0	0	0	0	352
% Heavy Vehicles	0	7.6	0	0	7.5	0	6.9	0	0	6.9	0	0	0	0	0	0	0	0	0	0	7.3



Quality Counts

File Name : 16209801 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209801
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	**365**	0	0	**365**	0	269	0	0	269	0	0	0	0	0	0	0	0	0	0	634
07:45 AM	0	357	0	1	358	0	**342**	0	0	**342**	0	0	0	0	0	0	0	0	0	0	**700**
08:00 AM	0	313	0	**3**	316	0	269	0	0	269	0	0	0	0	0	0	0	0	0	0	585
08:15 AM	0	330	0	0	330	0	339	0	0	339	0	0	0	0	0	0	0	0	0	0	669
Total Volume	0	1365	0	4	1369	0	1219	0	0	1219	0	0	0	0	0	0	0	0	0	0	2588
% App. Total	0	99.7	0	0.3		0	100	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.935	.000	.333	.938	.000	.891	.000	.000	.891	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.924
Passenger Vehicles	0	1257	0	4	1261	0	1127	0	0	1127	0	0	0	0	0	0	0	0	0	0	2388
% Passenger Vehicles	0	92.1	0	100	92.1	0	92.5	0	0	92.5	0	0	0	0	0	0	0	0	0	0	92.3
Heavy Vehicles	0	108	0	0	108	0	92	0	0	92	0	0	0	0	0	0	0	0	0	0	200
% Heavy Vehicles	0	7.9	0	0	7.9	0	7.5	0	0	7.5	0	0	0	0	0	0	0	0	0	0	7.7

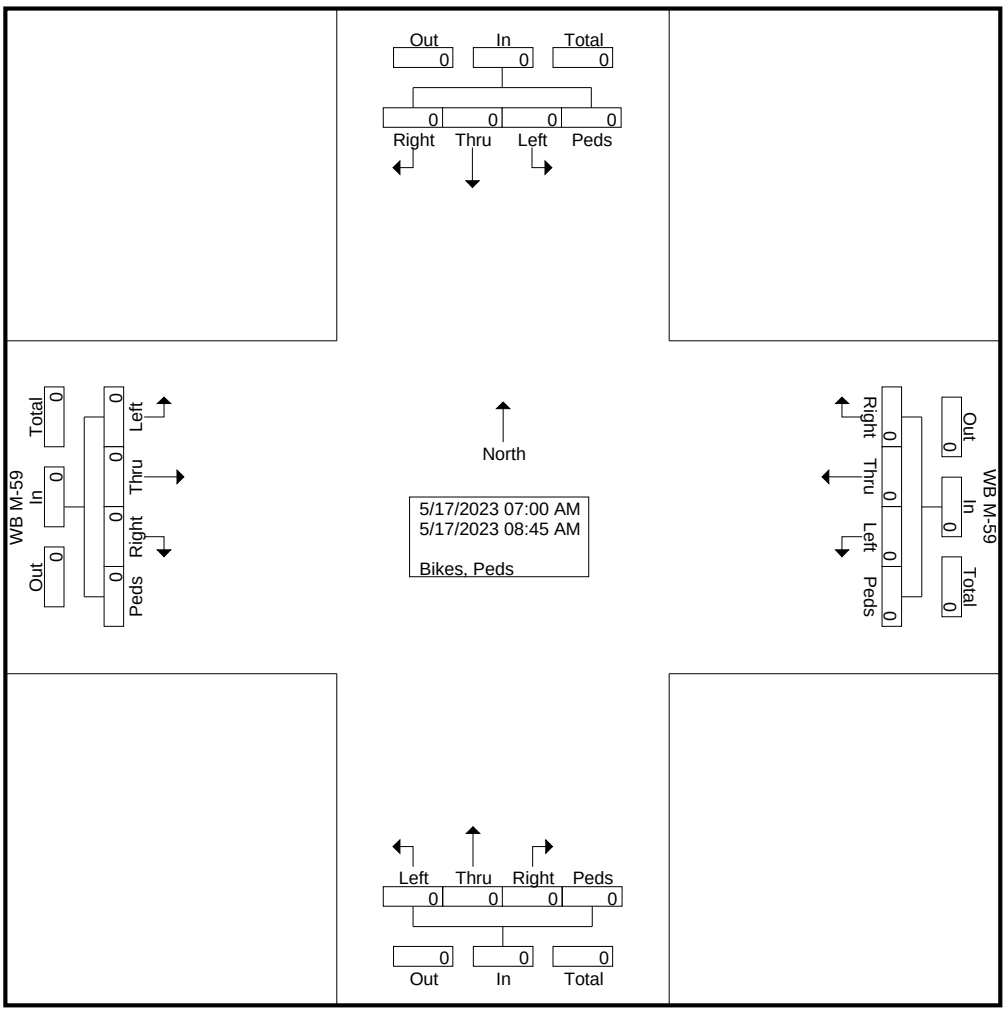


Quality Counts

File Name : 16209801 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209801
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

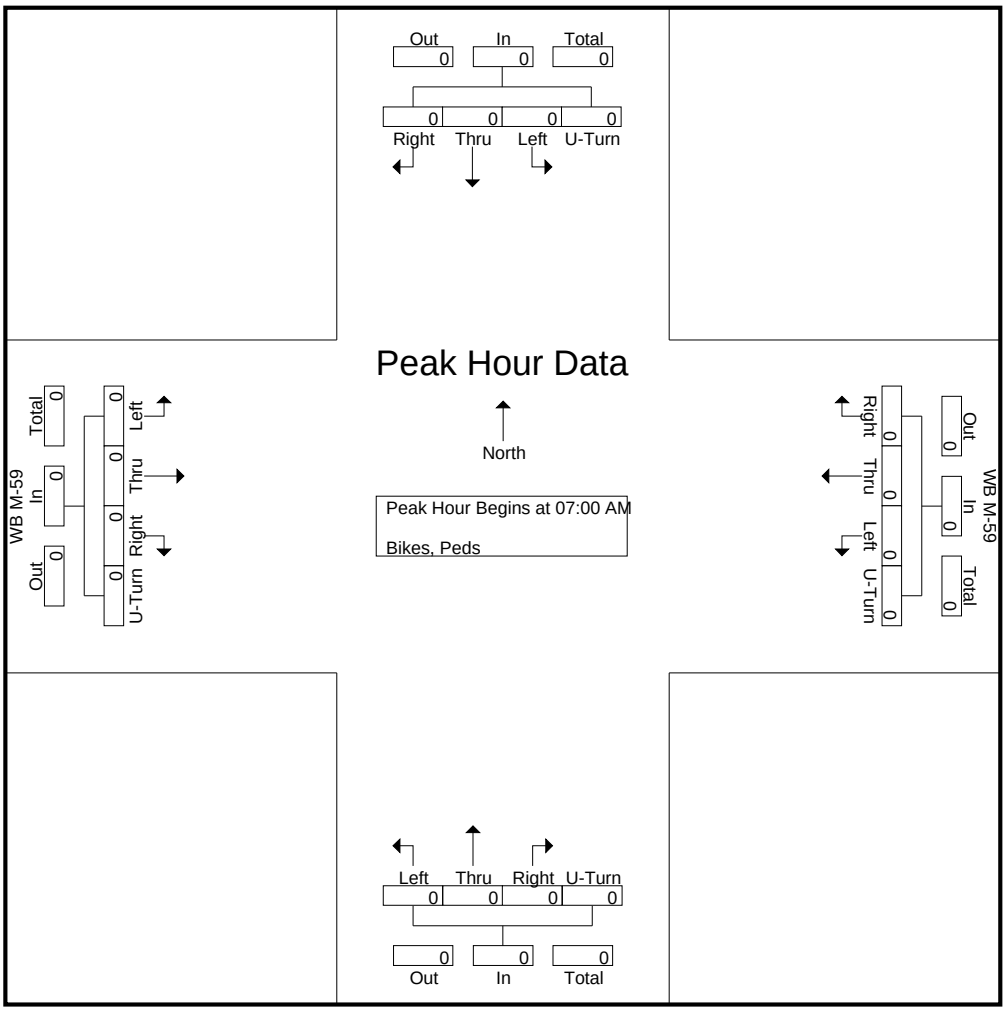
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209801 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209801
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

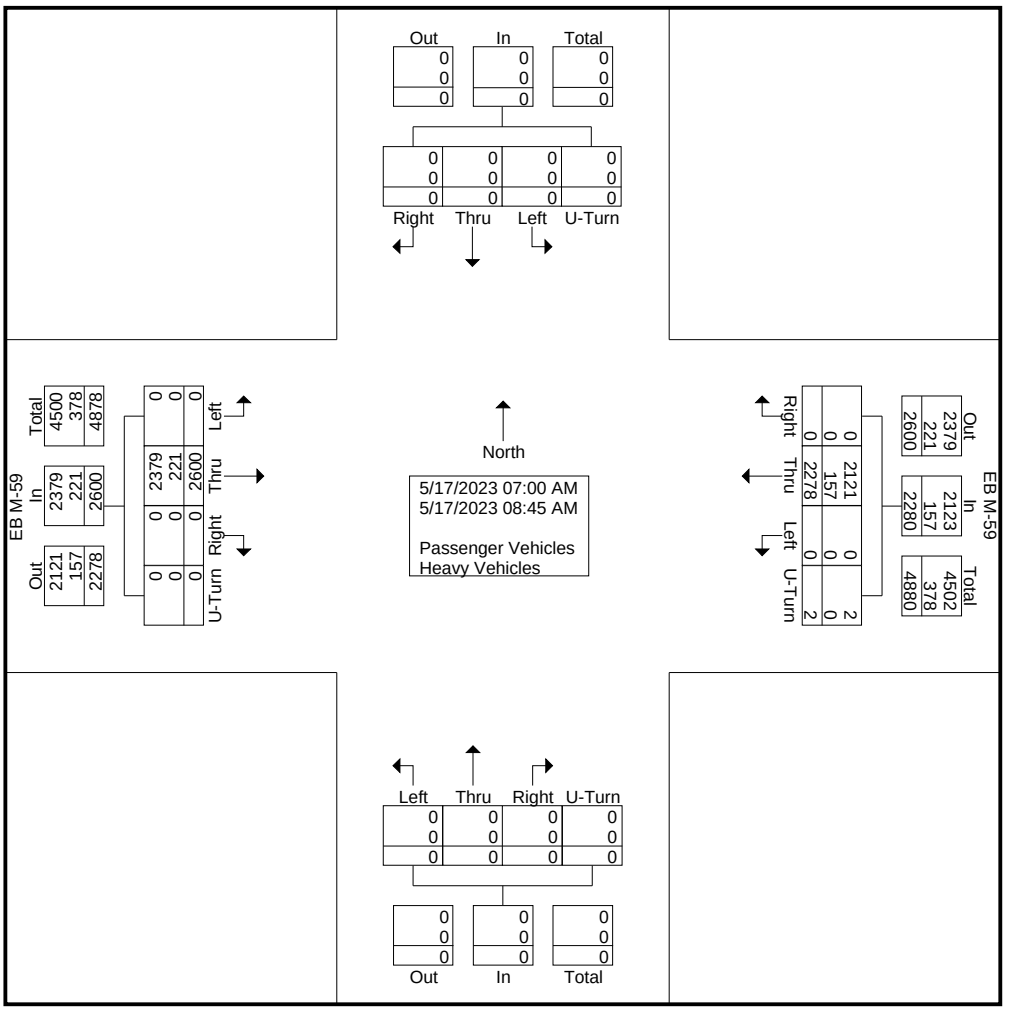


Quality Counts

File Name : 16209803 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209803
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

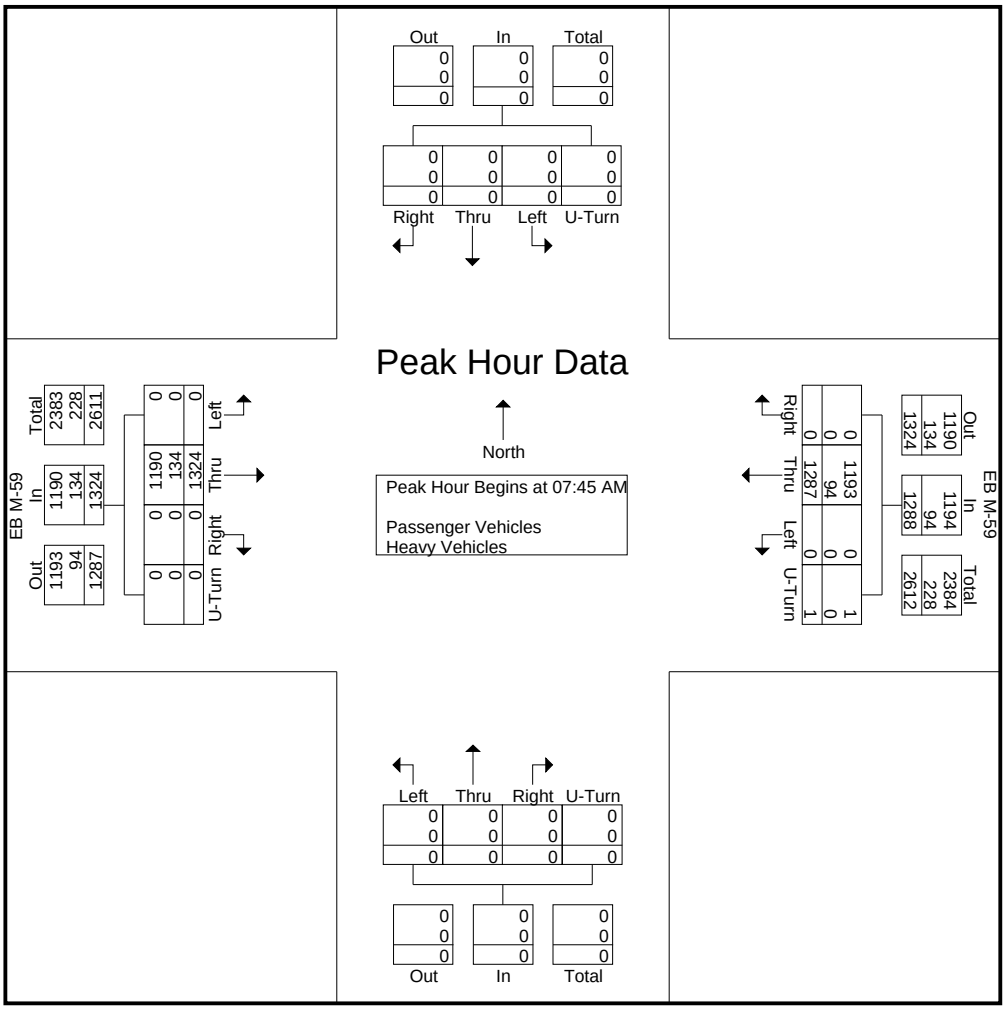
	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	270	0	0	270	0	232	0	0	232	0	0	0	0	0	0	0	0	0	0	502
07:15 AM	0	326	0	0	326	0	241	0	0	241	0	0	0	0	0	0	0	0	0	0	567
07:30 AM	0	378	0	0	378	0	259	0	0	259	0	0	0	0	0	0	0	0	0	0	637
07:45 AM	0	354	0	0	354	0	337	0	0	337	0	0	0	0	0	0	0	0	0	0	691
Total	0	1328	0	0	1328	0	1069	0	0	1069	0	0	0	0	0	0	0	0	0	0	2397
08:00 AM	0	321	0	0	321	0	263	0	1	264	0	0	0	0	0	0	0	0	0	0	585
08:15 AM	0	340	0	0	340	0	342	0	0	342	0	0	0	0	0	0	0	0	0	0	682
08:30 AM	0	309	0	0	309	0	345	0	0	345	0	0	0	0	0	0	0	0	0	0	654
08:45 AM	0	302	0	0	302	0	259	0	1	260	0	0	0	0	0	0	0	0	0	0	562
Total	0	1272	0	0	1272	0	1209	0	2	1211	0	0	0	0	0	0	0	0	0	0	2483
Grand Total	0	2600	0	0	2600	0	2278	0	2	2280	0	0	0	0	0	0	0	0	0	0	4880
Apprch %	0	100	0	0		0	99.9	0	0.1		0	0	0	0		0	0	0	0		
Total %	0	53.3	0	0	53.3	0	46.7	0	0	46.7	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2379	0	0	2379	0	2121	0	2	2123	0	0	0	0	0	0	0	0	0	0	4502
% Passenger Vehicles	0	91.5	0	0	91.5	0	93.1	0	100	93.1	0	0	0	0	0	0	0	0	0	0	92.3
Heavy Vehicles	0	221	0	0	221	0	157	0	0	157	0	0	0	0	0	0	0	0	0	0	378
% Heavy Vehicles	0	8.5	0	0	8.5	0	6.9	0	0	6.9	0	0	0	0	0	0	0	0	0	0	7.7



Quality Counts

File Name : 16209803 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209803
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**354**	0	0	**354**	0	337	0	0	337	0	0	0	0	0	0	0	0	0	0	**691**
08:00 AM	0	321	0	0	321	0	263	0	**1**	264	0	0	0	0	0	0	0	0	0	0	585
08:15 AM	0	340	0	0	340	0	342	0	0	342	0	0	0	0	0	0	0	0	0	0	682
08:30 AM	0	309	0	0	309	0	**345**	0	0	**345**	0	0	0	0	0	0	0	0	0	0	654
Total Volume	0	1324	0	0	1324	0	1287	0	1	1288	0	0	0	0	0	0	0	0	0	0	2612
% App. Total	0	100	0	0		0	99.9	0	0.1		0	0	0	0		0	0	0	0		
PHF	.000	.935	.000	.000	.935	.000	.933	.000	.250	.933	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.945
Passenger Vehicles	0	1190	0	0	1190	0	1193	0	1	1194	0	0	0	0	0	0	0	0	0	0	2384
% Passenger Vehicles	0	89.9	0	0	89.9	0	92.7	0	100	92.7	0	0	0	0	0	0	0	0	0	0	91.3
Heavy Vehicles	0	134	0	0	134	0	94	0	0	94	0	0	0	0	0	0	0	0	0	0	228
% Heavy Vehicles	0	10.1	0	0	10.1	0	7.3	0	0	7.3	0	0	0	0	0	0	0	0	0	0	8.7

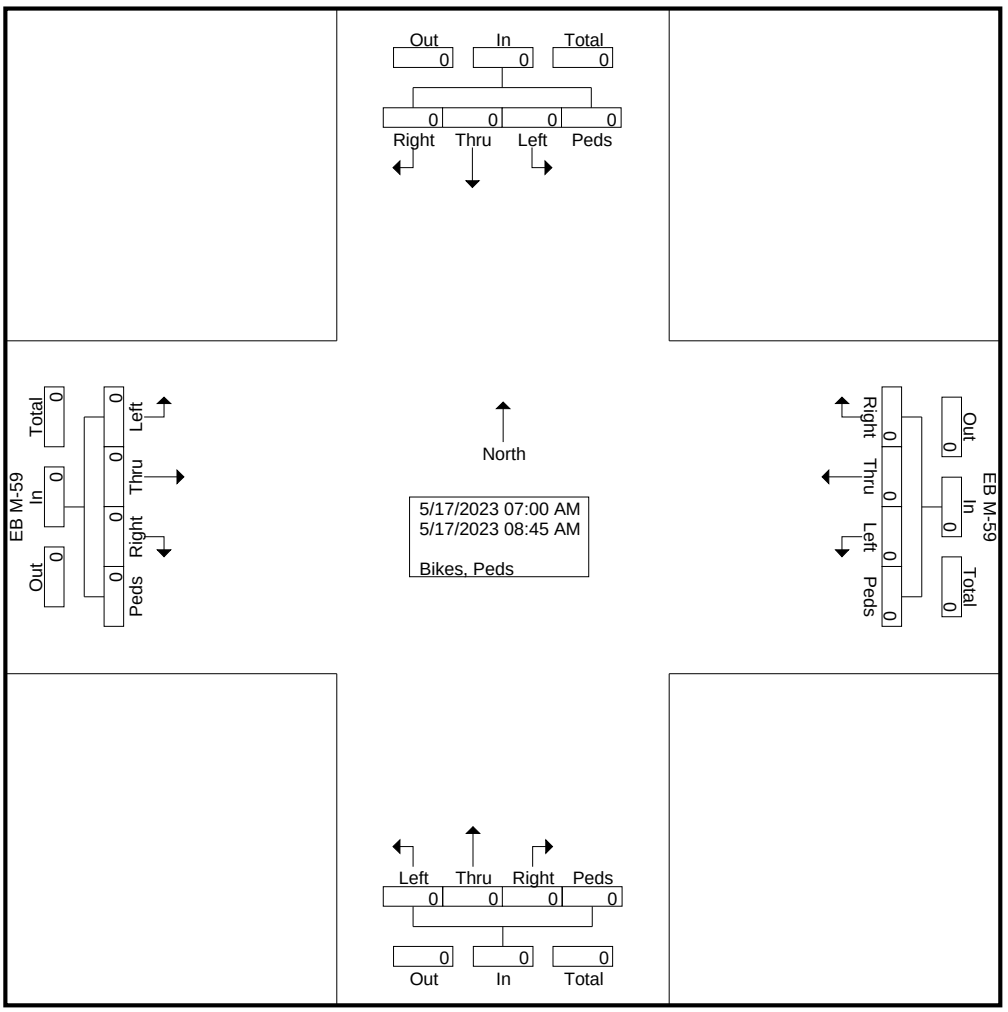


Quality Counts

File Name : 16209803 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209803
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

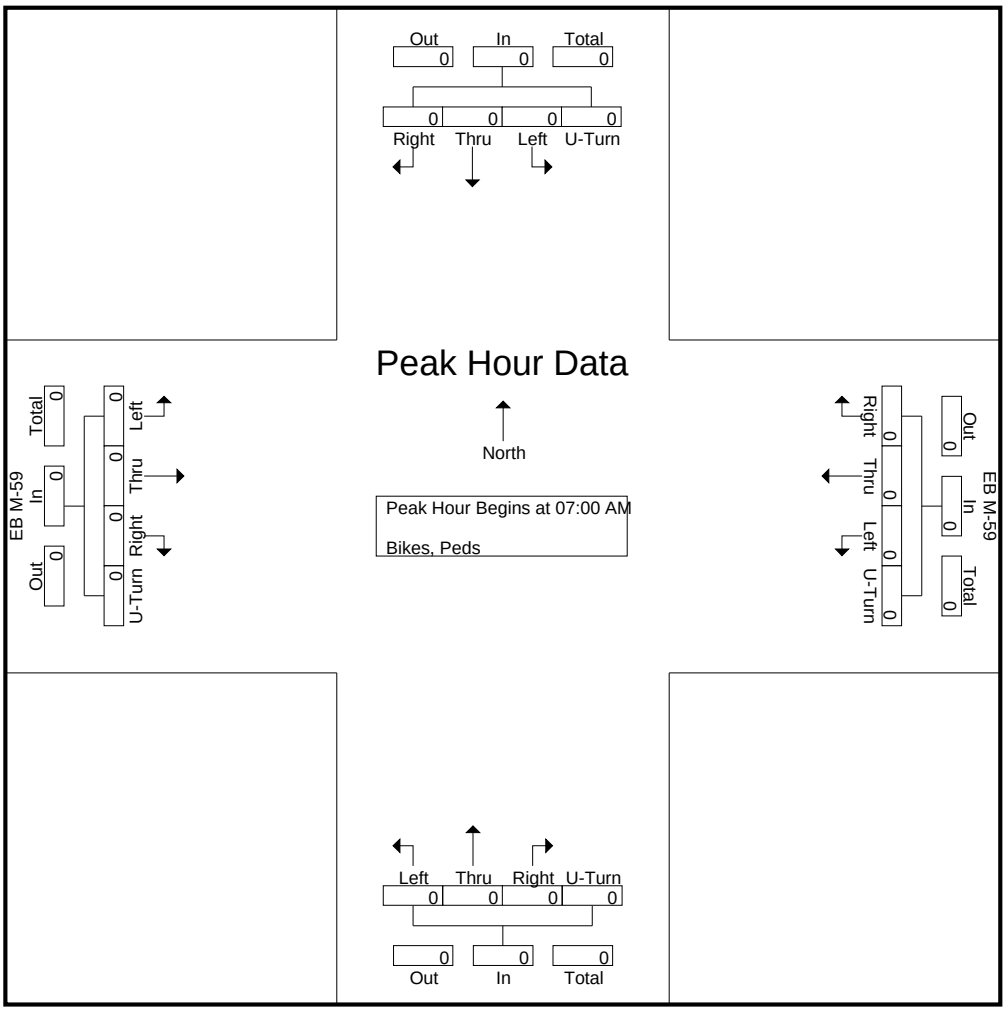
	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209803 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209803
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

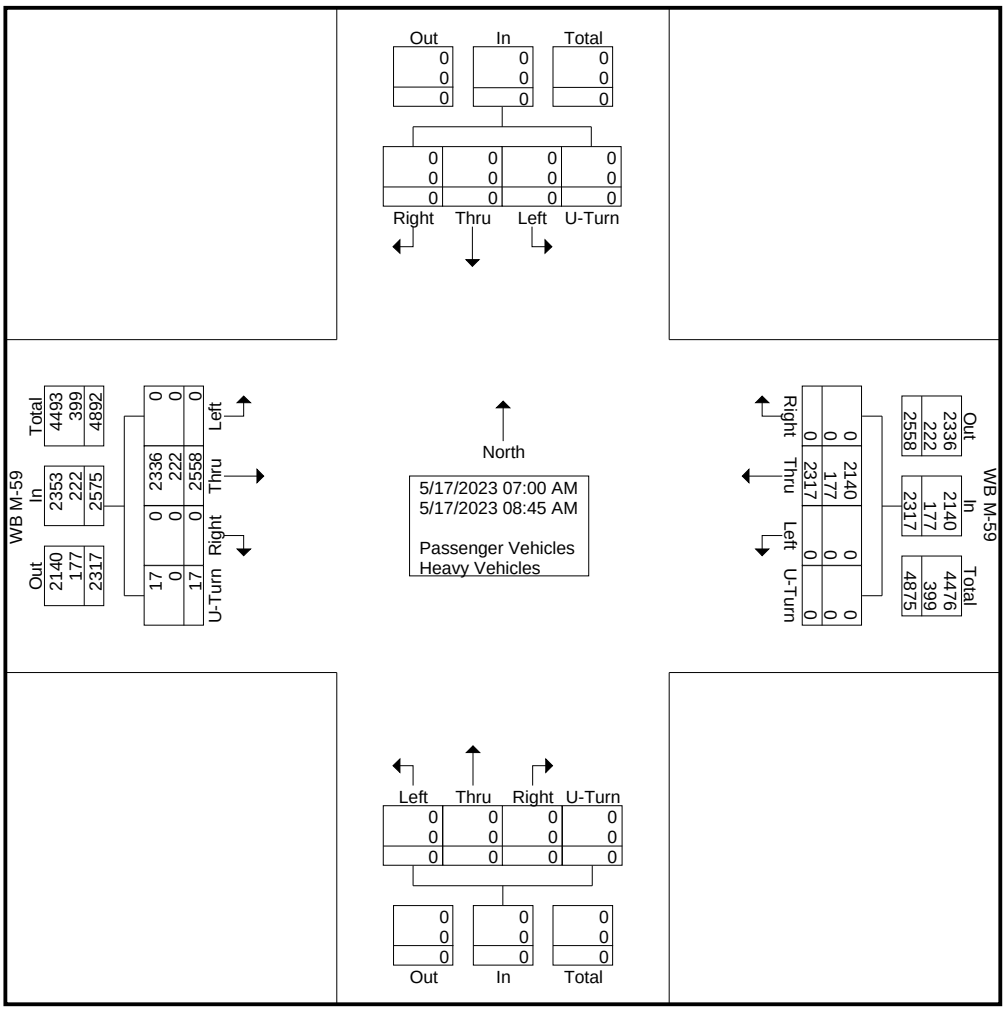


Quality Counts

File Name : 16209807 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209807
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

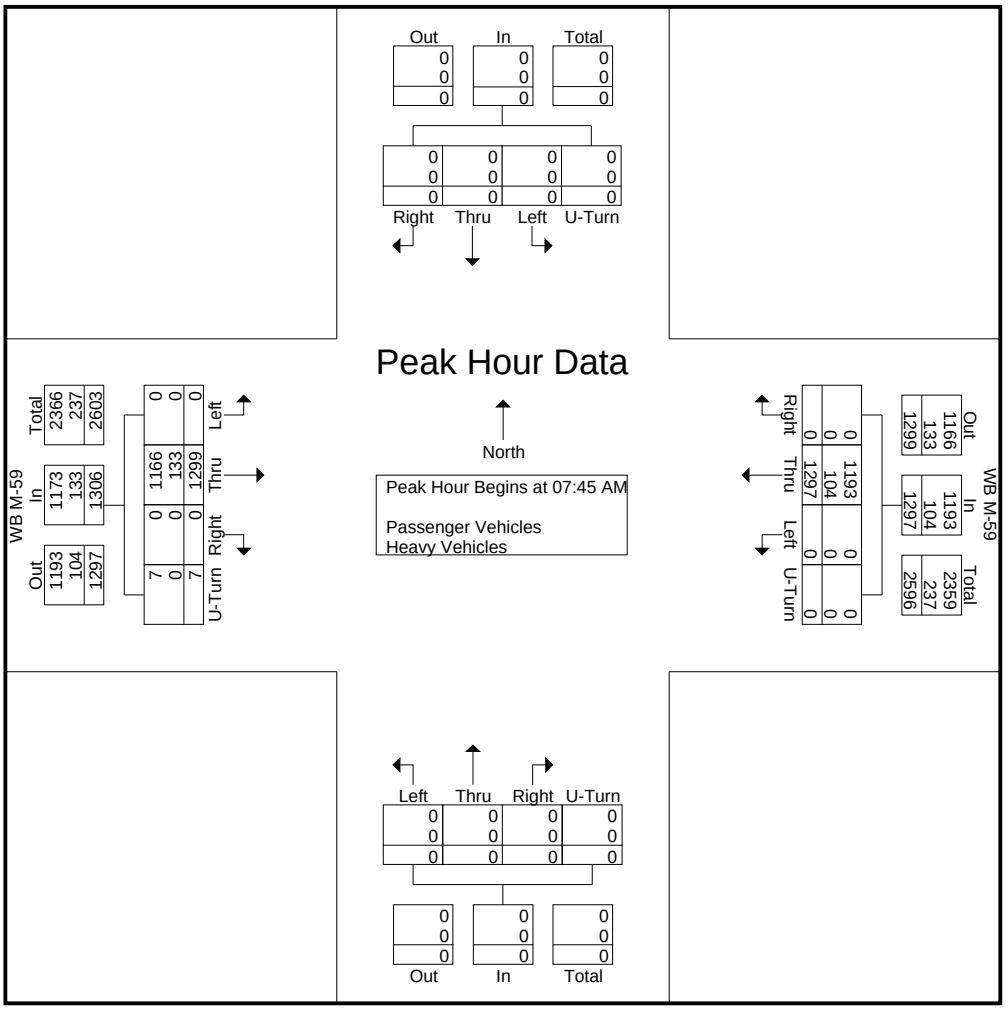
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	270	0	1	271	0	239	0	0	239	0	0	0	0	0	0	0	0	0	0	510
07:15 AM	0	320	0	0	320	0	255	0	0	255	0	0	0	0	0	0	0	0	0	0	575
07:30 AM	0	364	0	0	364	0	262	0	0	262	0	0	0	0	0	0	0	0	0	0	626
07:45 AM	0	350	0	1	351	0	341	0	0	341	0	0	0	0	0	0	0	0	0	0	692
Total	0	1304	0	2	1306	0	1097	0	0	1097	0	0	0	0	0	0	0	0	0	0	2403
08:00 AM	0	321	0	0	321	0	273	0	0	273	0	0	0	0	0	0	0	0	0	0	594
08:15 AM	0	329	0	0	329	0	340	0	0	340	0	0	0	0	0	0	0	0	0	0	669
08:30 AM	0	299	0	6	305	0	343	0	0	343	0	0	0	0	0	0	0	0	0	0	648
08:45 AM	0	305	0	9	314	0	264	0	0	264	0	0	0	0	0	0	0	0	0	0	578
Total	0	1254	0	15	1269	0	1220	0	0	1220	0	0	0	0	0	0	0	0	0	0	2489
Grand Total	0	2558	0	17	2575	0	2317	0	0	2317	0	0	0	0	0	0	0	0	0	0	4892
Apprch %	0	99.3	0	0.7		0	100	0	0		0	0	0	0		0	0	0	0		
Total %	0	52.3	0	0.3	52.6	0	47.4	0	0	47.4	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2336	0	17	2353	0	2140	0	0	2140	0	0	0	0	0	0	0	0	0	0	4493
% Passenger Vehicles	0	91.3	0	100	91.4	0	92.4	0	0	92.4	0	0	0	0	0	0	0	0	0	0	91.8
Heavy Vehicles	0	222	0	0	222	0	177	0	0	177	0	0	0	0	0	0	0	0	0	0	399
% Heavy Vehicles	0	8.7	0	0	8.6	0	7.6	0	0	7.6	0	0	0	0	0	0	0	0	0	0	8.2



Quality Counts

File Name : 16209807 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209807
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**350**	0	1	**351**	0	341	0	0	341	0	0	0	0	0	0	0	0	0	0	**692**
08:00 AM	0	321	0	0	321	0	273	0	0	273	0	0	0	0	0	0	0	0	0	0	594
08:15 AM	0	329	0	0	329	0	340	0	0	340	0	0	0	0	0	0	0	0	0	0	669
08:30 AM	0	299	0	**6**	305	0	**343**	0	0	**343**	0	0	0	0	0	0	0	0	0	0	648
Total Volume	0	1299	0	7	1306	0	1297	0	0	1297	0	0	0	0	0	0	0	0	0	0	2603
% App. Total	0	99.5	0	0.5		0	100	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.928	.000	.292	.930	.000	.945	.000	.000	.945	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.940
Passenger Vehicles	0	1166	0	7	1173	0	1193	0	0	1193	0	0	0	0	0	0	0	0	0	0	2366
% Passenger Vehicles	0	89.8	0	100	89.8	0	92.0	0	0	92.0	0	0	0	0	0	0	0	0	0	0	90.9
Heavy Vehicles	0	133	0	0	133	0	104	0	0	104	0	0	0	0	0	0	0	0	0	0	237
% Heavy Vehicles	0	10.2	0	0	10.2	0	8.0	0	0	8.0	0	0	0	0	0	0	0	0	0	0	9.1

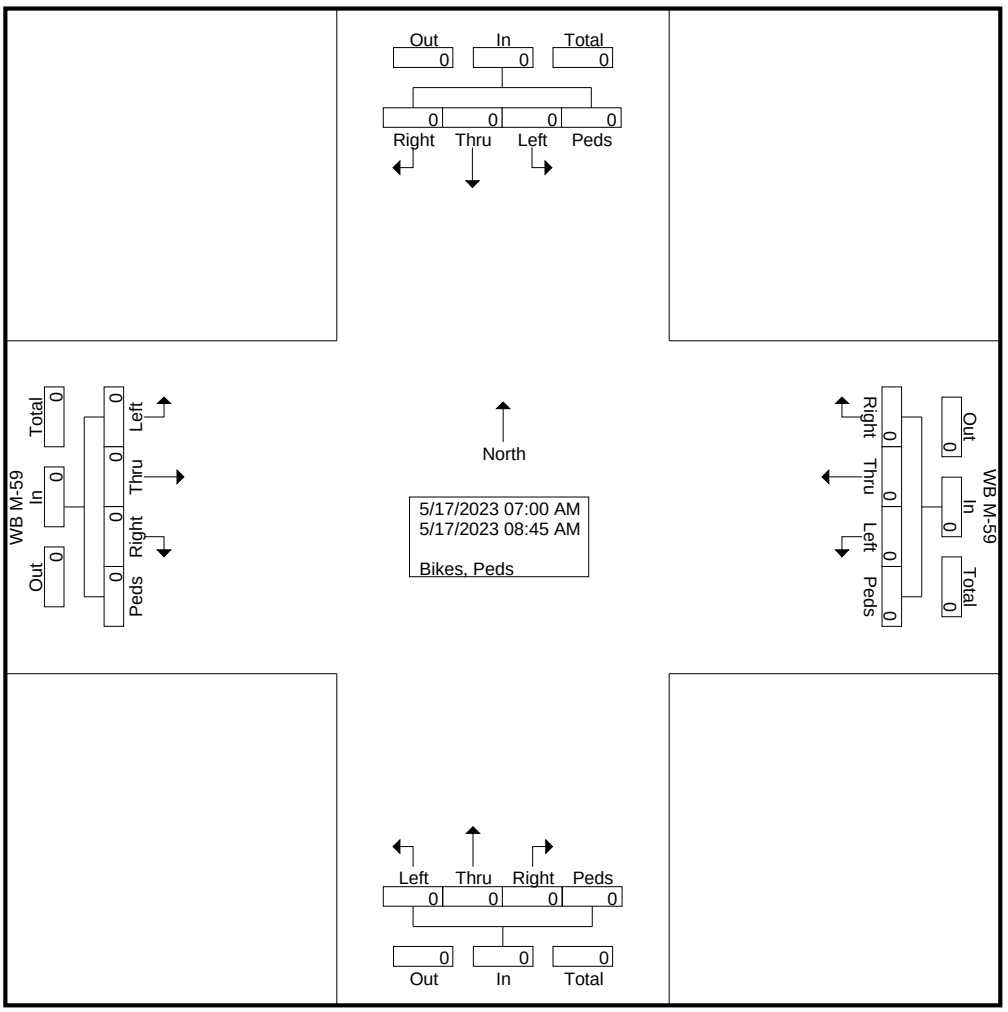


Quality Counts

File Name : 16209807 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209807
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

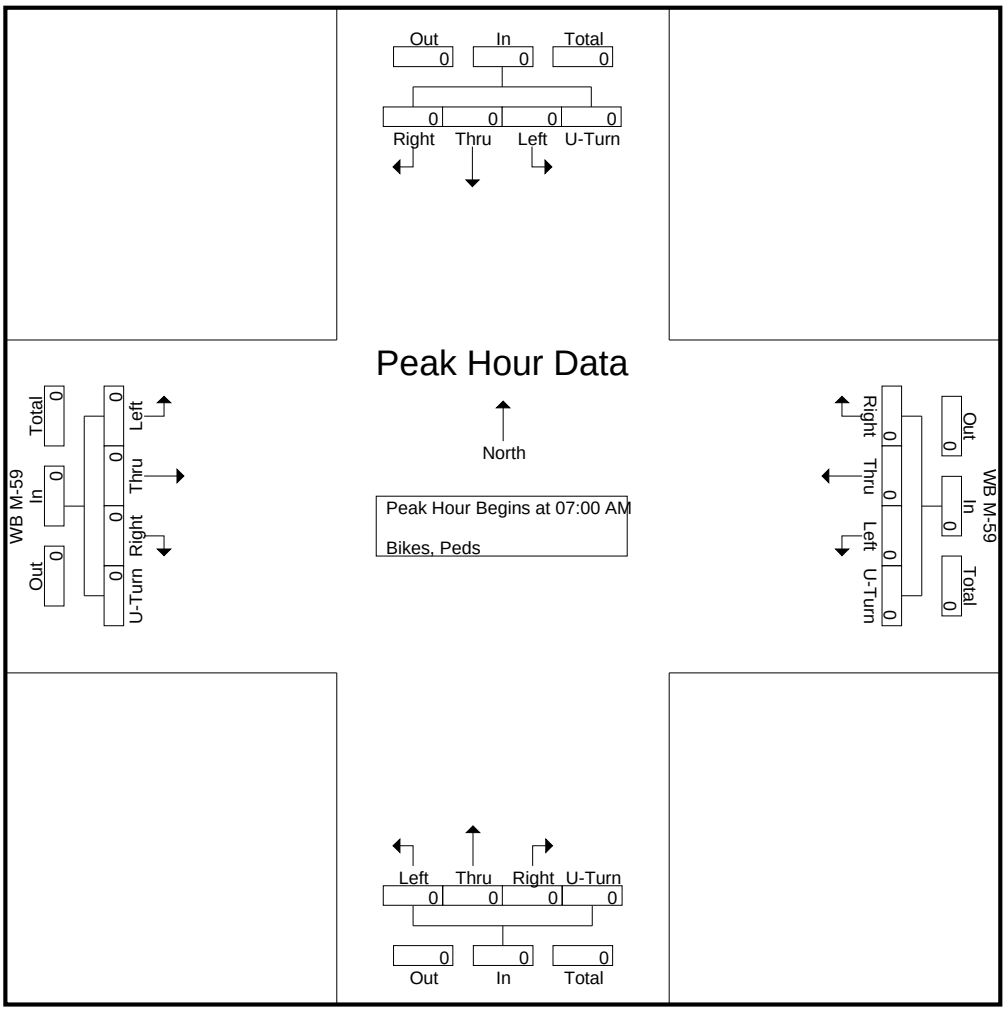
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209807 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209807
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

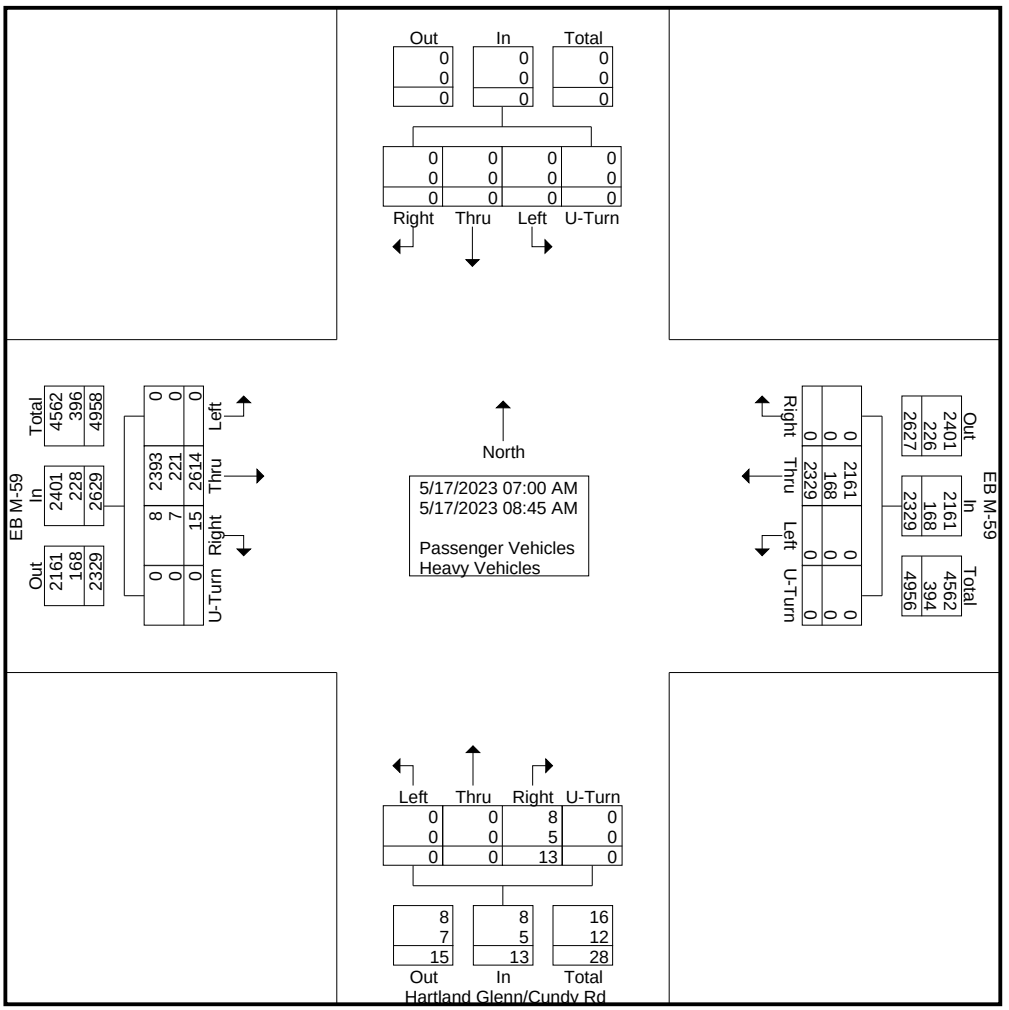


Quality Counts

File Name : 16209809 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209809
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

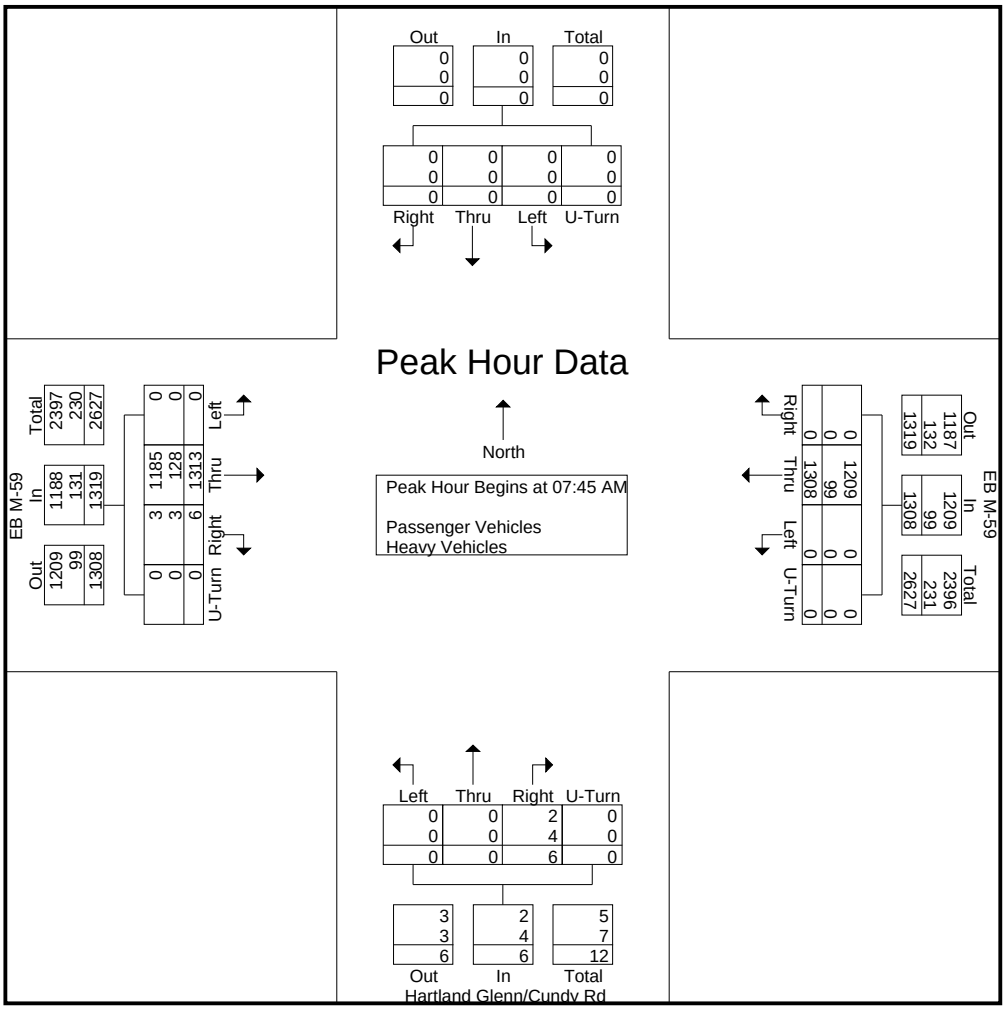
	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	276	2	0	278	0	240	0	0	240	0	0	1	0	1	0	0	0	0	0	519
07:15 AM	0	337	1	0	338	0	258	0	0	258	0	0	1	0	1	0	0	0	0	0	597
07:30 AM	0	370	2	0	372	0	260	0	0	260	0	0	3	0	3	0	0	0	0	0	635
07:45 AM	0	347	1	0	348	0	341	0	0	341	0	0	1	0	1	0	0	0	0	0	690
Total	0	1330	6	0	1336	0	1099	0	0	1099	0	0	6	0	6	0	0	0	0	0	2441
08:00 AM	0	321	3	0	324	0	277	0	0	277	0	0	3	0	3	0	0	0	0	0	604
08:15 AM	0	338	1	0	339	0	345	0	0	345	0	0	1	0	1	0	0	0	0	0	685
08:30 AM	0	307	1	0	308	0	345	0	0	345	0	0	1	0	1	0	0	0	0	0	654
08:45 AM	0	318	4	0	322	0	263	0	0	263	0	0	2	0	2	0	0	0	0	0	587
Total	0	1284	9	0	1293	0	1230	0	0	1230	0	0	7	0	7	0	0	0	0	0	2530
Grand Total	0	2614	15	0	2629	0	2329	0	0	2329	0	0	13	0	13	0	0	0	0	0	4971
Apprch %	0	99.4	0.6	0		0	100	0	0		0	0	100	0		0	0	0	0		
Total %	0	52.6	0.3	0	52.9	0	46.9	0	0	46.9	0	0	0.3	0	0.3	0	0	0	0	0	
Passenger Vehicles	0	2393	8	0	2401	0	2161	0	0	2161	0	0	8	0	8	0	0	0	0	0	4570
% Passenger Vehicles	0	91.5	53.3	0	91.3	0	92.8	0	0	92.8	0	0	61.5	0	61.5	0	0	0	0	0	91.9
Heavy Vehicles	0	221	7	0	228	0	168	0	0	168	0	0	5	0	5	0	0	0	0	0	401
% Heavy Vehicles	0	8.5	46.7	0	8.7	0	7.2	0	0	7.2	0	0	38.5	0	38.5	0	0	0	0	0	8.1



Quality Counts

File Name : 16209809 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209809
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**347**	1	0	**348**	0	341	0	0	341	0	0	1	0	1	0	0	0	0	0	**690**
08:00 AM	0	321	**3**	0	324	0	277	0	0	277	0	0	**3**	0	**3**	0	0	0	0	0	604
08:15 AM	0	338	1	0	339	0	**345**	0	0	**345**	0	0	1	0	1	0	0	0	0	0	685
08:30 AM	0	307	1	0	308	0	345	0	0	345	0	0	1	0	1	0	0	0	0	0	654
Total Volume	0	1313	6	0	1319	0	1308	0	0	1308	0	0	6	0	6	0	0	0	0	0	2633
% App. Total	0	99.5	0.5	0		0	100	0	0		0	0	100	0		0	0	0	0		
PHF	.000	.946	.500	.000	.948	.000	.948	.000	.000	.948	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.954
Passenger Vehicles	0	1185	3	0	1188	0	1209	0	0	1209	0	0	2	0	2	0	0	0	0	0	2399
% Passenger Vehicles	0	90.3	50.0	0	90.1	0	92.4	0	0	92.4	0	0	33.3	0	33.3	0	0	0	0	0	91.1
Heavy Vehicles	0	128	3	0	131	0	99	0	0	99	0	0	4	0	4	0	0	0	0	0	234
% Heavy Vehicles	0	9.7	50.0	0	9.9	0	7.6	0	0	7.6	0	0	66.7	0	66.7	0	0	0	0	0	8.9

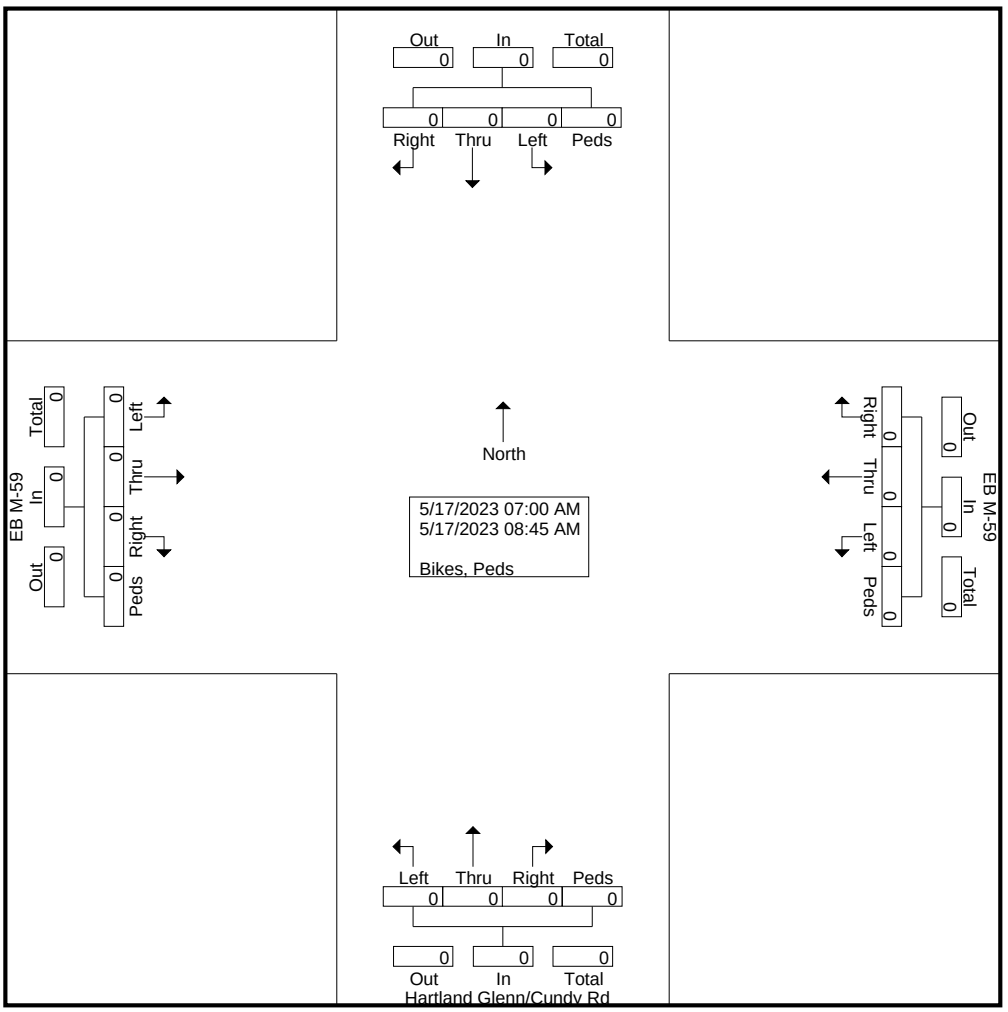


Quality Counts

File Name : 16209809 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209809
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

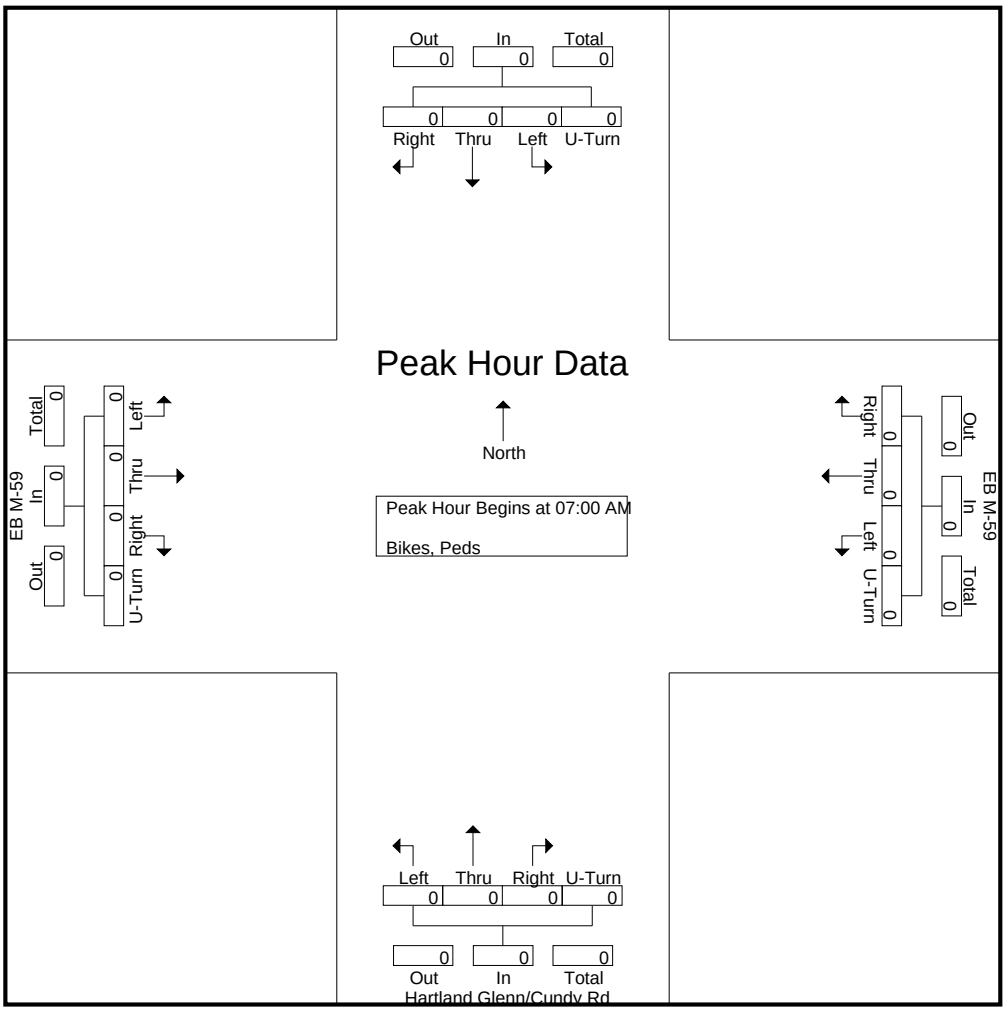
	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209809 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209809
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

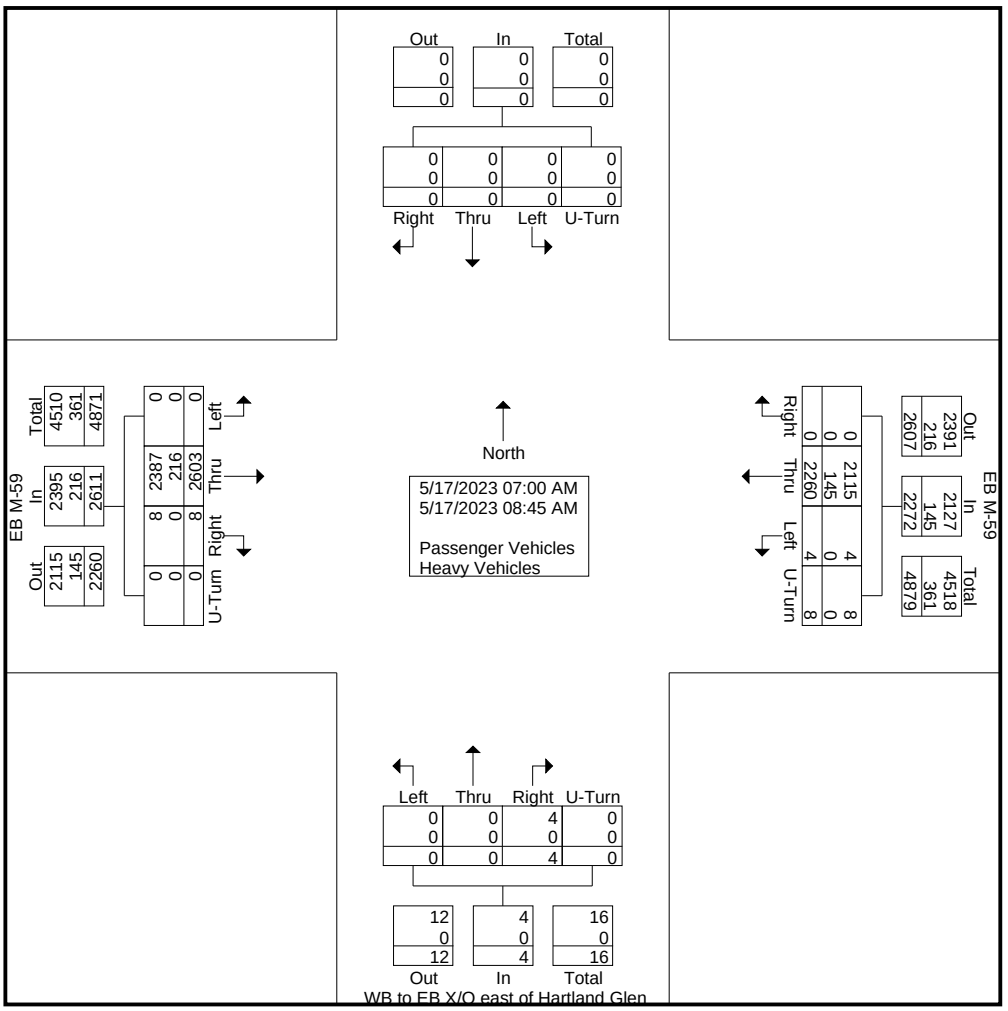


Quality Counts

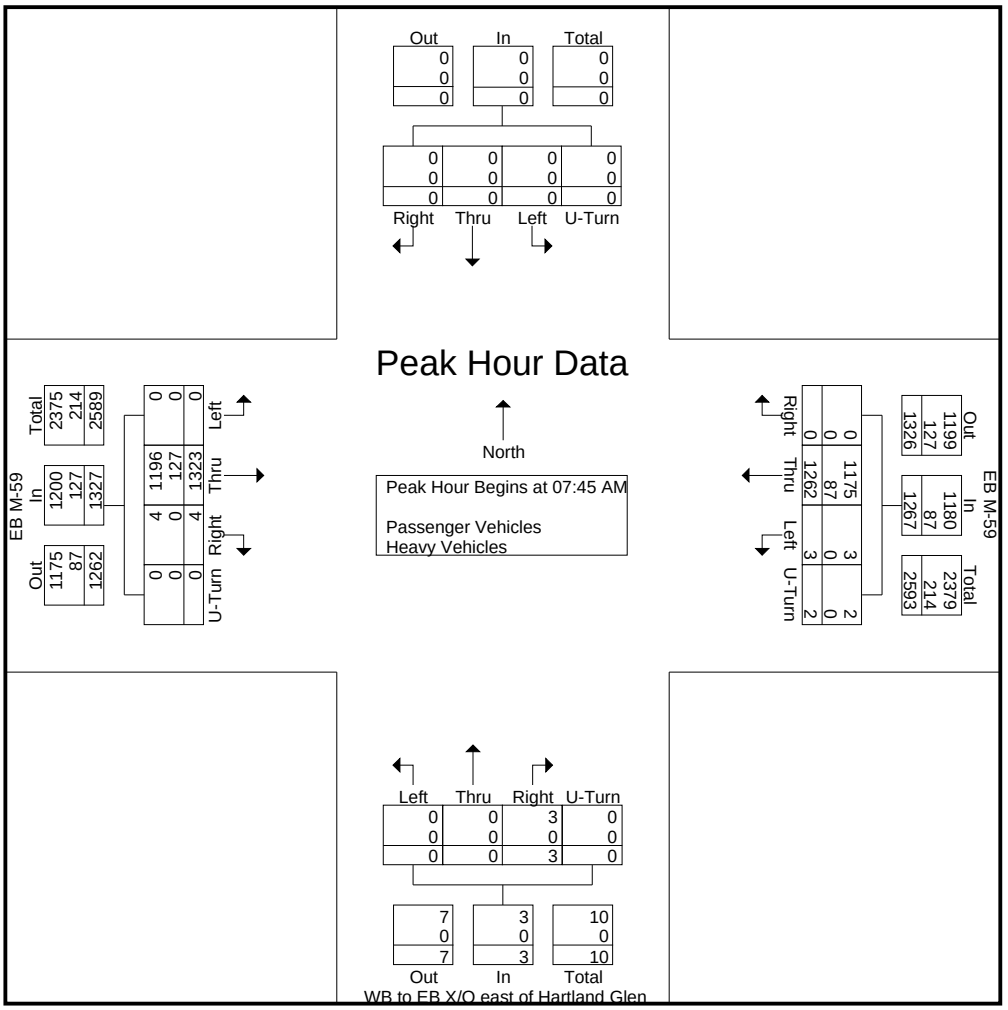
File Name : 16209811 - WB to EB X_O west of Hartland Glen -- EB M-59
Site Code : 16209811
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	0	268	0	0	268	0	232	0	1	233	0	0	0	0	0	0	0	0	0	0	501
07:15 AM	0	328	0	0	328	1	241	0	0	242	0	0	0	0	0	0	0	0	0	0	570
07:30 AM	0	368	0	0	368	0	256	0	2	258	0	0	0	0	0	0	0	0	0	0	626
07:45 AM	0	358	1	0	359	1	327	0	1	329	0	0	0	0	0	0	0	0	0	0	688
Total	0	1322	1	0	1323	2	1056	0	4	1062	0	0	0	0	0	0	0	0	0	0	2385
08:00 AM	0	326	2	0	328	1	269	0	0	270	0	0	0	0	0	0	0	0	0	0	598
08:15 AM	0	336	0	0	336	0	340	0	0	340	0	0	0	0	0	0	0	0	0	0	676
08:30 AM	0	303	1	0	304	1	326	0	1	328	0	0	3	0	3	0	0	0	0	0	635
08:45 AM	0	316	4	0	320	0	269	0	3	272	0	0	1	0	1	0	0	0	0	0	593
Total	0	1281	7	0	1288	2	1204	0	4	1210	0	0	4	0	4	0	0	0	0	0	2502
Grand Total	0	2603	8	0	2611	4	2260	0	8	2272	0	0	4	0	4	0	0	0	0	0	4887
Apprch %	0	99.7	0.3	0		0.2	99.5	0	0.4		0	0	100	0		0	0	0	0		
Total %	0	53.3	0.2	0	53.4	0.1	46.2	0	0.2	46.5	0	0	0.1	0	0.1	0	0	0	0	0	
Passenger Vehicles	0	2387	8	0	2395	4	2115	0	8	2127	0	0	4	0	4	0	0	0	0	0	4526
% Passenger Vehicles	0	91.7	100	0	91.7	100	93.6	0	100	93.6	0	0	100	0	100	0	0	0	0	0	92.6
Heavy Vehicles	0	216	0	0	216	0	145	0	0	145	0	0	0	0	0	0	0	0	0	0	361
% Heavy Vehicles	0	8.3	0	0	8.3	0	6.4	0	0	6.4	0	0	0	0	0	0	0	0	0	0	7.4



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	**358**	1	0	**359**	**1**	327	0	**1**	329	0	0	0	0	0	0	0	0	0	0	**688**
08:00 AM	0	326	**2**	0	328	1	269	0	0	270	0	0	0	0	0	0	0	0	0	0	598
08:15 AM	0	336	0	0	336	0	**340**	0	0	**340**	0	0	0	0	0	0	0	0	0	0	676
08:30 AM	0	303	1	0	304	1	326	0	1	328	0	0	**3**	0	**3**	0	0	0	0	0	635
Total Volume	0	1323	4	0	1327	3	1262	0	2	1267	0	0	3	0	3	0	0	0	0	0	2597
% App. Total	0	99.7	0.3	0		0.2	99.6	0	0.2		0	0	100	0		0	0	0	0		
PHF	.000	.924	.500	.000	.924	.750	.928	.000	.500	.932	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.944
Passenger Vehicles	0	1196	4	0	1200	3	1175	0	2	1180	0	0	3	0	3	0	0	0	0	0	2383
% Passenger Vehicles	0	90.4	100	0	90.4	100	93.1	0	100	93.1	0	0	100	0	100	0	0	0	0	0	91.8
Heavy Vehicles	0	127	0	0	127	0	87	0	0	87	0	0	0	0	0	0	0	0	0	0	214
% Heavy Vehicles	0	9.6	0	0	9.6	0	6.9	0	0	6.9	0	0	0	0	0	0	0	0	0	0	8.2

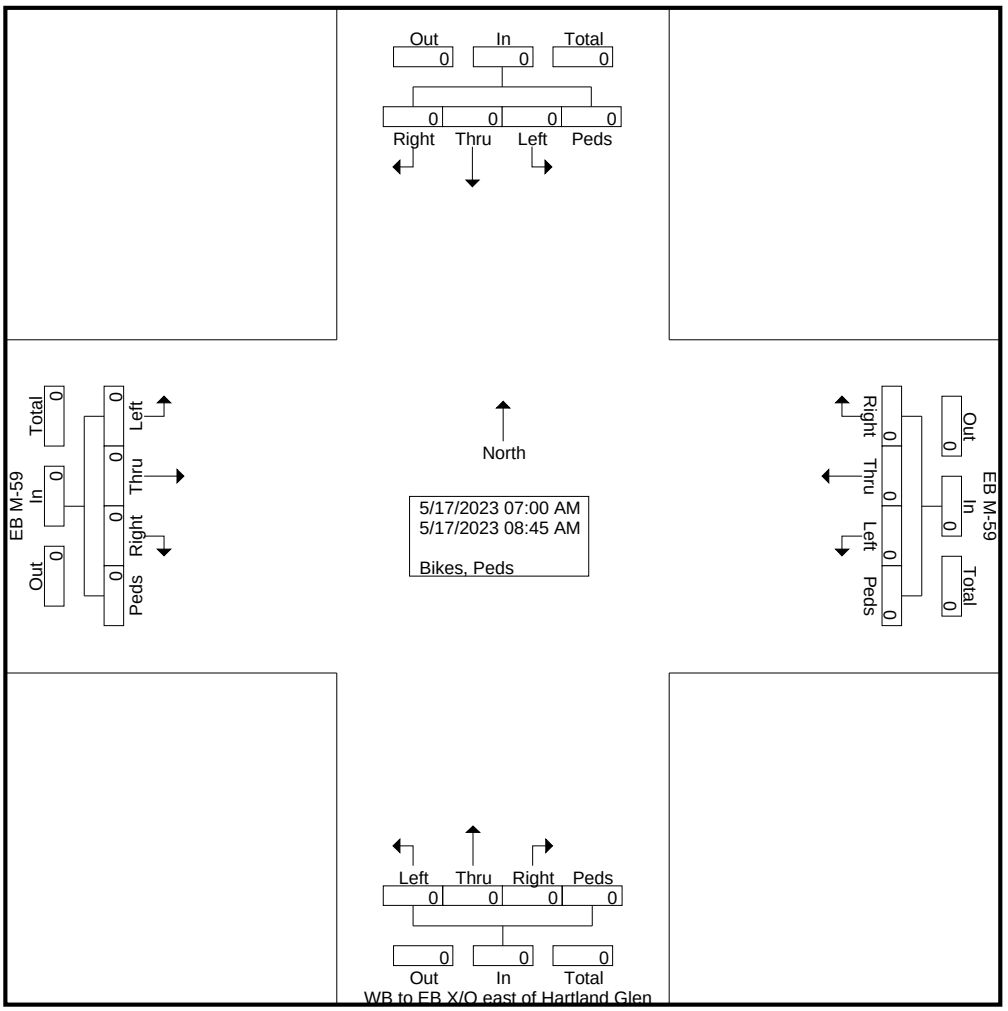


Quality Counts

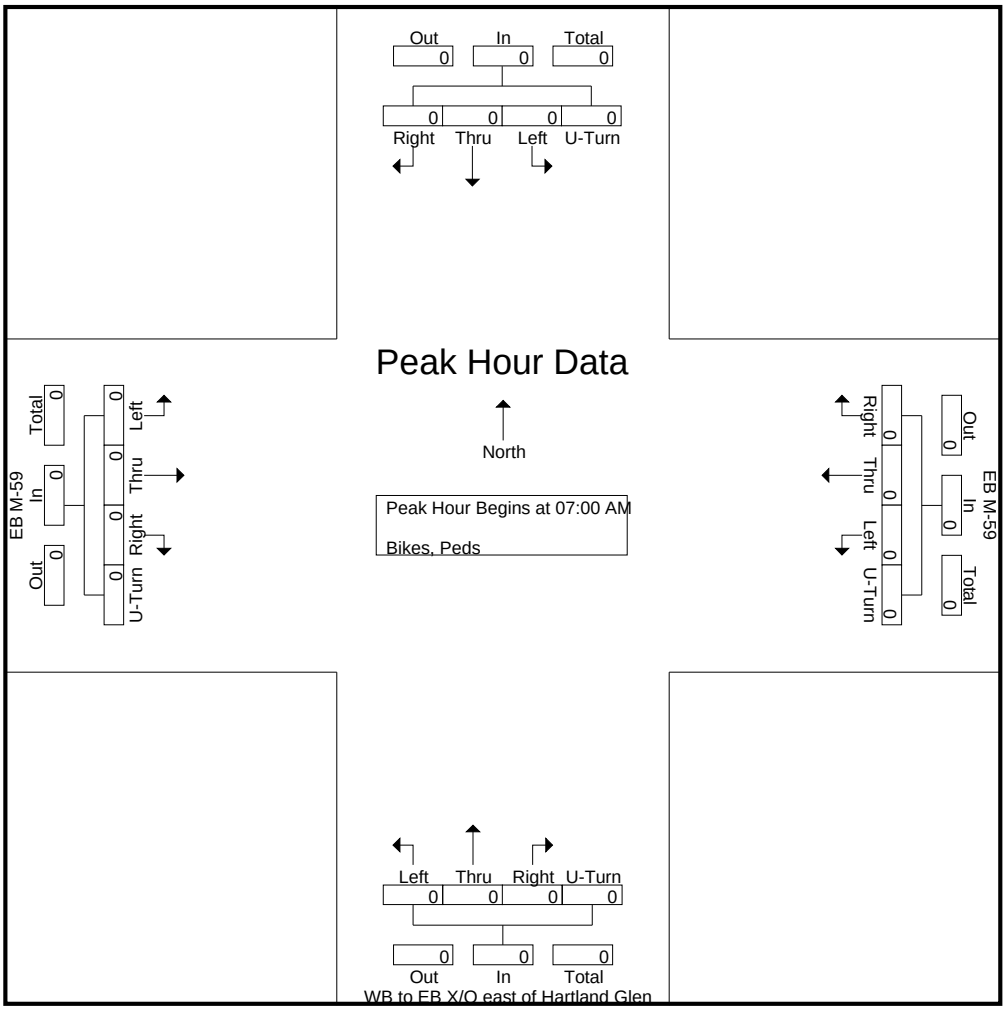
File Name : 16209811 - WB to EB X_O west of Hartland Glen -- EB M-59
Site Code : 16209811
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

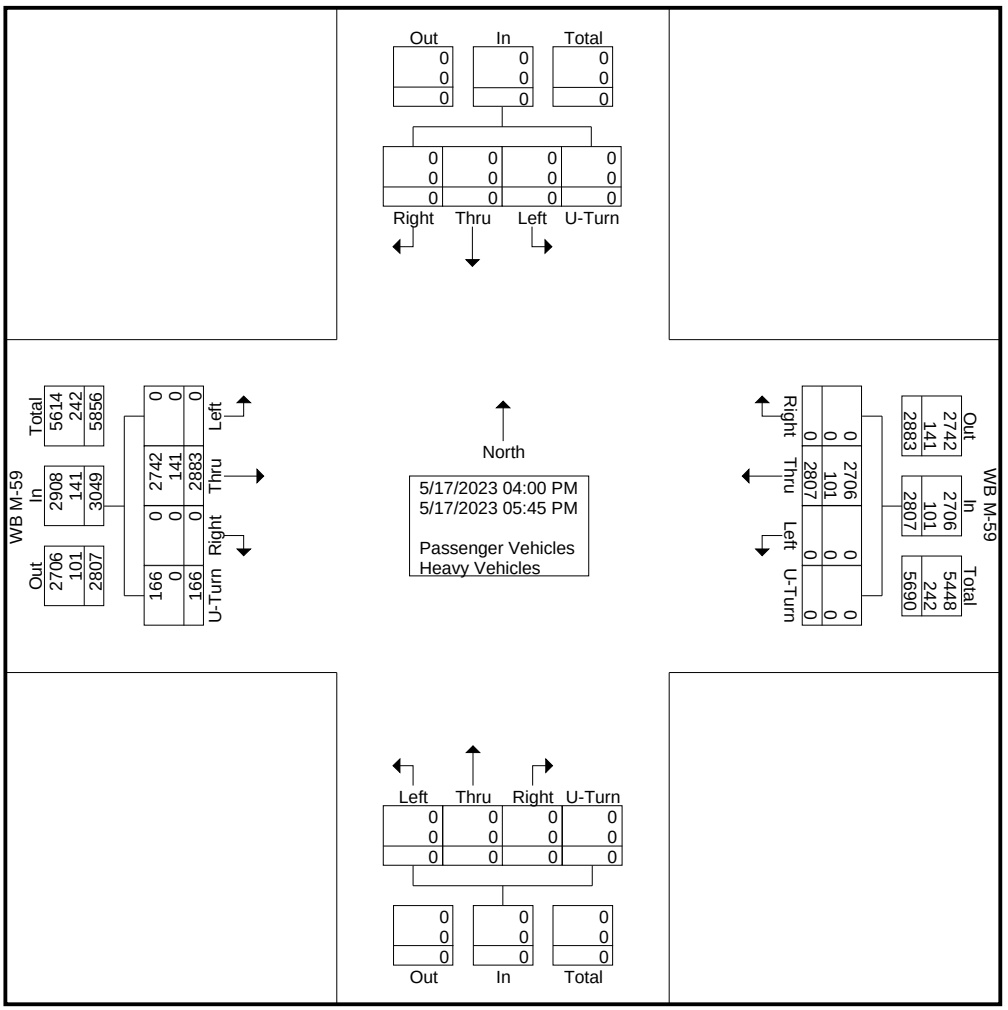


Quality Counts

File Name : 16209802 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209802
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

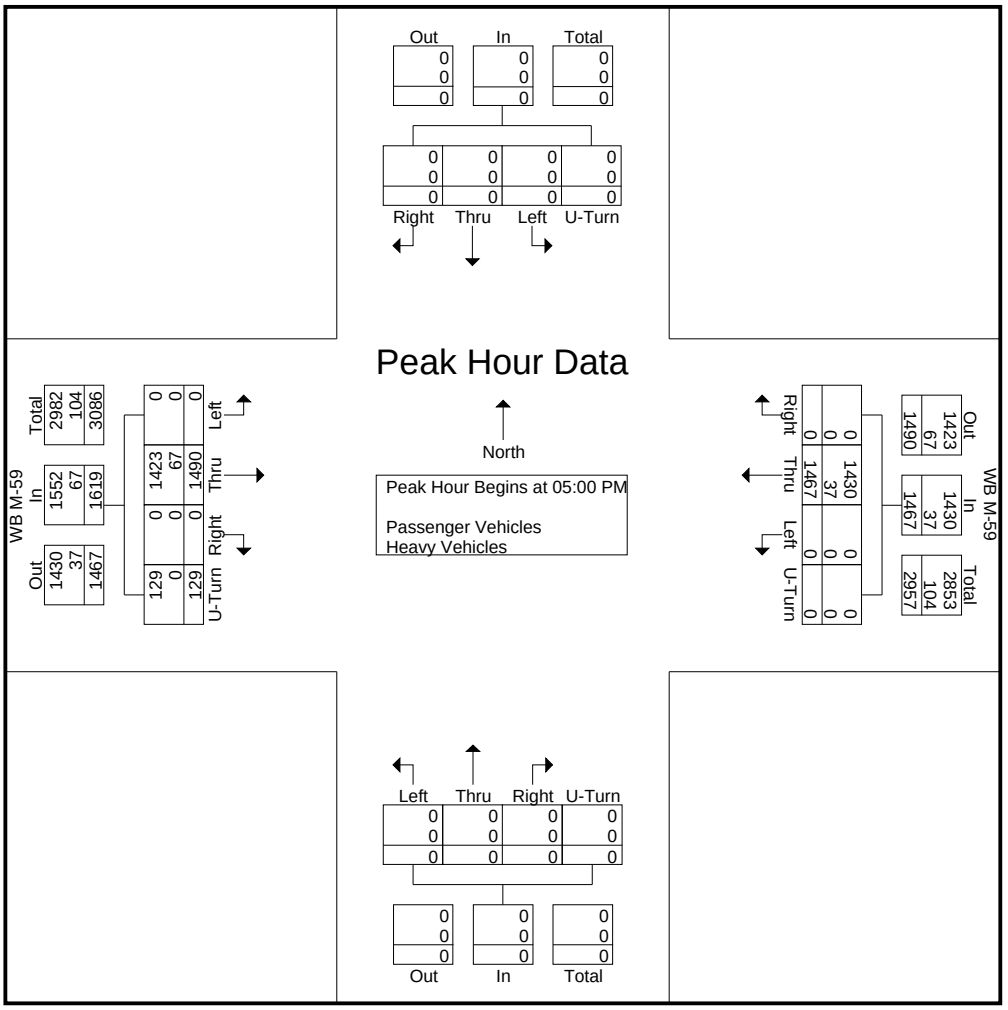
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	370	0	9	379	0	333	0	0	333	0	0	0	0	0	0	0	0	0	0	712
04:15 PM	0	347	0	3	350	0	328	0	0	328	0	0	0	0	0	0	0	0	0	0	678
04:30 PM	0	338	0	8	346	0	362	0	0	362	0	0	0	0	0	0	0	0	0	0	708
04:45 PM	0	338	0	17	355	0	317	0	0	317	0	0	0	0	0	0	0	0	0	0	672
Total	0	1393	0	37	1430	0	1340	0	0	1340	0	0	0	0	0	0	0	0	0	0	2770
05:00 PM	0	378	0	15	393	0	360	0	0	360	0	0	0	0	0	0	0	0	0	0	753
05:15 PM	0	401	0	12	413	0	375	0	0	375	0	0	0	0	0	0	0	0	0	0	788
05:30 PM	0	374	0	26	400	0	349	0	0	349	0	0	0	0	0	0	0	0	0	0	749
05:45 PM	0	337	0	76	413	0	383	0	0	383	0	0	0	0	0	0	0	0	0	0	796
Total	0	1490	0	129	1619	0	1467	0	0	1467	0	0	0	0	0	0	0	0	0	0	3086
Grand Total	0	2883	0	166	3049	0	2807	0	0	2807	0	0	0	0	0	0	0	0	0	0	5856
Apprch %	0	94.6	0	5.4		0	100	0	0		0	0	0	0		0	0	0	0		
Total %	0	49.2	0	2.8	52.1	0	47.9	0	0	47.9	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2742	0	166	2908	0	2706	0	0	2706	0	0	0	0	0	0	0	0	0	0	5614
% Passenger Vehicles	0	95.1	0	100	95.4	0	96.4	0	0	96.4	0	0	0	0	0	0	0	0	0	0	95.9
Heavy Vehicles	0	141	0	0	141	0	101	0	0	101	0	0	0	0	0	0	0	0	0	0	242
% Heavy Vehicles	0	4.9	0	0	4.6	0	3.6	0	0	3.6	0	0	0	0	0	0	0	0	0	0	4.1



Quality Counts

File Name : 16209802 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209802
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	378	0	15	393	0	360	0	0	360	0	0	0	0	0	0	0	0	0	0	753
05:15 PM	0	**401**	0	12	**413**	0	375	0	0	375	0	0	0	0	0	0	0	0	0	0	788
05:30 PM	0	374	0	26	400	0	349	0	0	349	0	0	0	0	0	0	0	0	0	0	749
05:45 PM	0	337	0	**76**	413	0	**383**	0	0	**383**	0	0	0	0	0	0	0	0	0	0	**796**
Total Volume	0	1490	0	129	1619	0	1467	0	0	1467	0	0	0	0	0	0	0	0	0	0	3086
% App. Total	0	92	0	8		0	100	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.929	.000	.424	.980	.000	.958	.000	.000	.958	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.969
Passenger Vehicles	0	1423	0	129	1552	0	1430	0	0	1430	0	0	0	0	0	0	0	0	0	0	2982
% Passenger Vehicles	0	95.5	0	100	95.9	0	97.5	0	0	97.5	0	0	0	0	0	0	0	0	0	0	96.6
Heavy Vehicles	0	67	0	0	67	0	37	0	0	37	0	0	0	0	0	0	0	0	0	0	104
% Heavy Vehicles	0	4.5	0	0	4.1	0	2.5	0	0	2.5	0	0	0	0	0	0	0	0	0	0	3.4

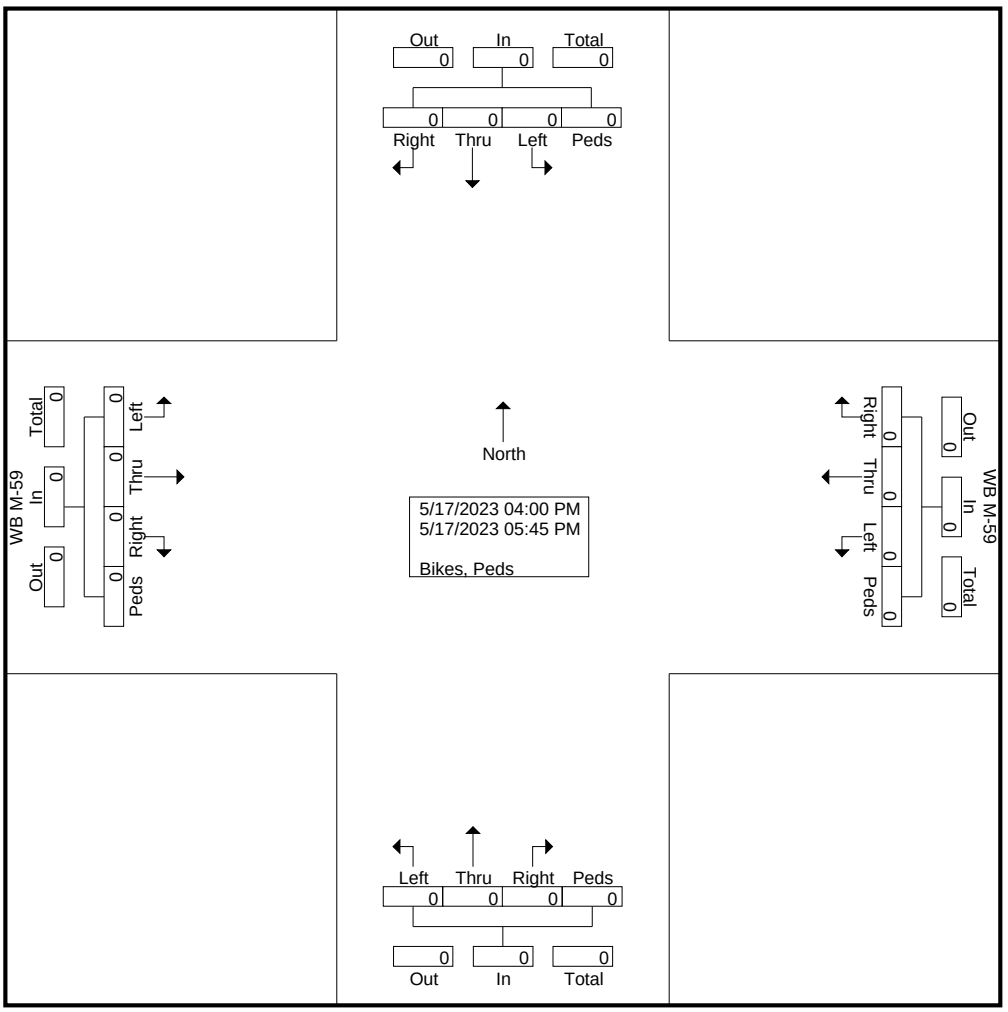


Quality Counts

File Name : 16209802 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209802
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

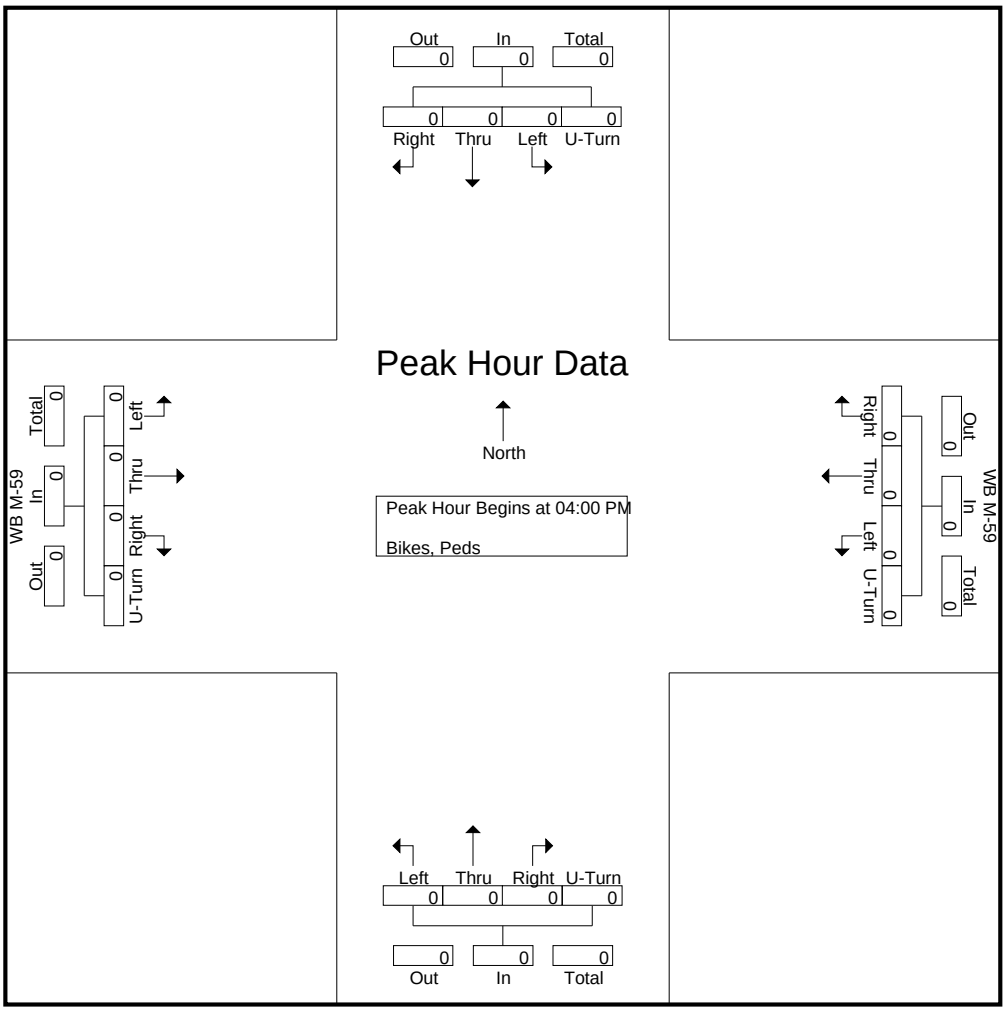
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209802 - EB to WB XO east of Hartland Glen -- WB M-59
Site Code : 16209802
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

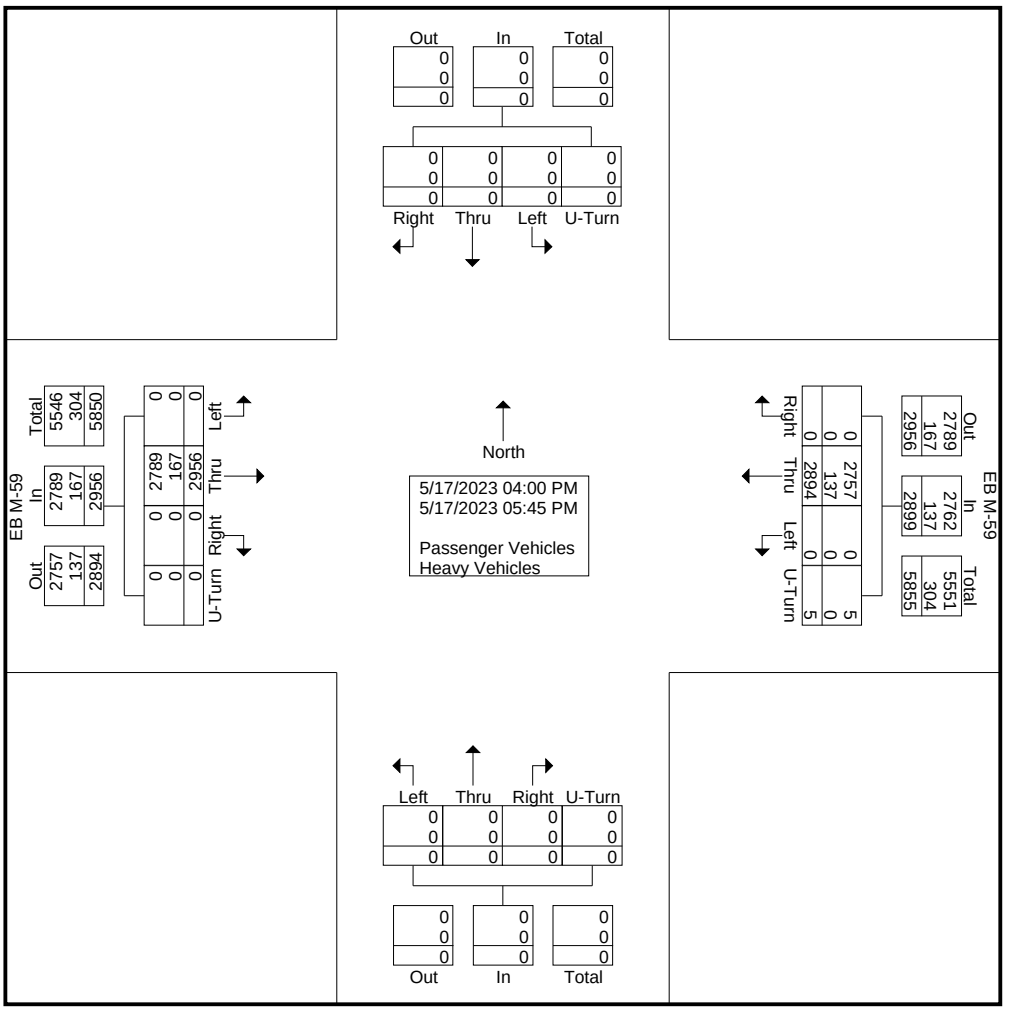


Quality Counts

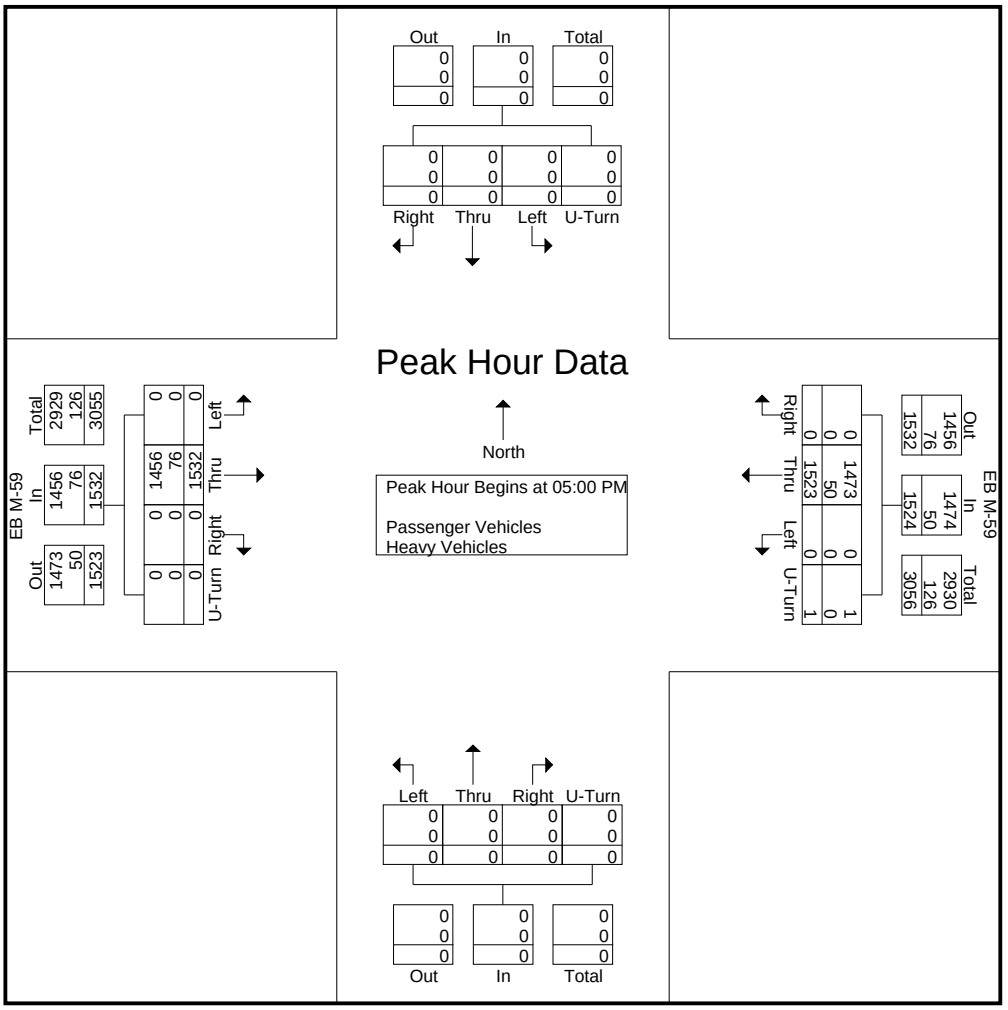
File Name : 16209804 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209804
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	389	0	0	389	0	341	0	0	341	0	0	0	0	0	0	0	0	0	0	730
04:15 PM	0	342	0	0	342	0	336	0	3	339	0	0	0	0	0	0	0	0	0	0	681
04:30 PM	0	350	0	0	350	0	362	0	0	362	0	0	0	0	0	0	0	0	0	0	712
04:45 PM	0	343	0	0	343	0	332	0	1	333	0	0	0	0	0	0	0	0	0	0	676
Total	0	1424	0	0	1424	0	1371	0	4	1375	0	0	0	0	0	0	0	0	0	0	2799
05:00 PM	0	401	0	0	401	0	363	0	1	364	0	0	0	0	0	0	0	0	0	0	765
05:15 PM	0	396	0	0	396	0	390	0	0	390	0	0	0	0	0	0	0	0	0	0	786
05:30 PM	0	389	0	0	389	0	371	0	0	371	0	0	0	0	0	0	0	0	0	0	760
05:45 PM	0	346	0	0	346	0	399	0	0	399	0	0	0	0	0	0	0	0	0	0	745
Total	0	1532	0	0	1532	0	1523	0	1	1524	0	0	0	0	0	0	0	0	0	0	3056
Grand Total	0	2956	0	0	2956	0	2894	0	5	2899	0	0	0	0	0	0	0	0	0	0	5855
Apprch %	0	100	0	0		0	99.8	0	0.2		0	0	0	0		0	0	0	0		
Total %	0	50.5	0	0	50.5	0	49.4	0	0.1	49.5	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2789	0	0	2789	0	2757	0	5	2762	0	0	0	0	0	0	0	0	0	0	5551
% Passenger Vehicles	0	94.4	0	0	94.4	0	95.3	0	100	95.3	0	0	0	0	0	0	0	0	0	0	94.8
Heavy Vehicles	0	167	0	0	167	0	137	0	0	137	0	0	0	0	0	0	0	0	0	0	304
% Heavy Vehicles	0	5.6	0	0	5.6	0	4.7	0	0	4.7	0	0	0	0	0	0	0	0	0	0	5.2



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	**401**	0	0	**401**	0	363	0	**1**	364	0	0	0	0	0	0	0	0	0	0	765
05:15 PM	0	396	0	0	396	0	390	0	0	390	0	0	0	0	0	0	0	0	0	0	**786**
05:30 PM	0	389	0	0	389	0	371	0	0	371	0	0	0	0	0	0	0	0	0	0	760
05:45 PM	0	346	0	0	346	0	**399**	0	0	**399**	0	0	0	0	0	0	0	0	0	0	745
Total Volume	0	1532	0	0	1532	0	1523	0	1	1524	0	0	0	0	0	0	0	0	0	0	3056
% App. Total	0	100	0	0		0	99.9	0	0.1		0	0	0	0		0	0	0	0		
PHF	.000	.955	.000	.000	.955	.000	.954	.000	.250	.955	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.972
Passenger Vehicles	0	1456	0	0	1456	0	1473	0	1	1474	0	0	0	0	0	0	0	0	0	0	2930
% Passenger Vehicles	0	95.0	0	0	95.0	0	96.7	0	100	96.7	0	0	0	0	0	0	0	0	0	0	95.9
Heavy Vehicles	0	76	0	0	76	0	50	0	0	50	0	0	0	0	0	0	0	0	0	0	126
% Heavy Vehicles	0	5.0	0	0	5.0	0	3.3	0	0	3.3	0	0	0	0	0	0	0	0	0	0	4.1

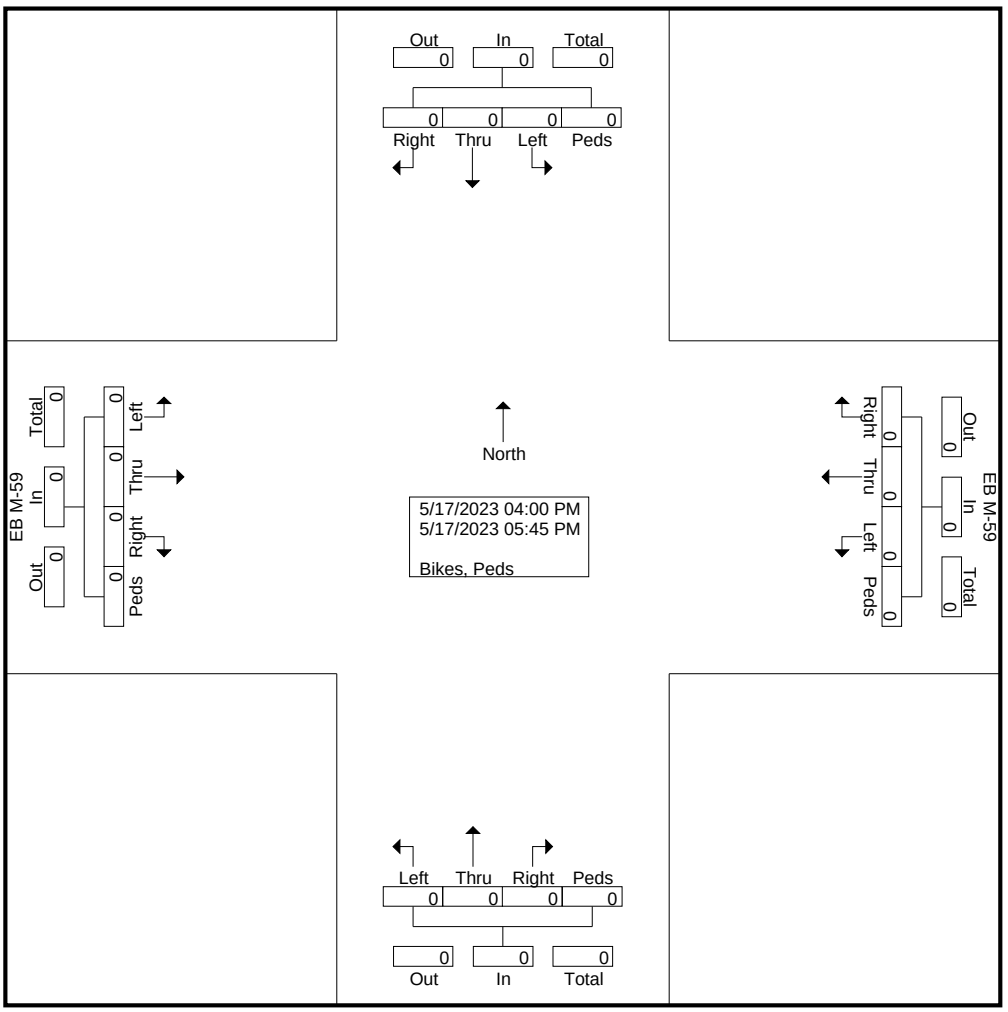


Quality Counts

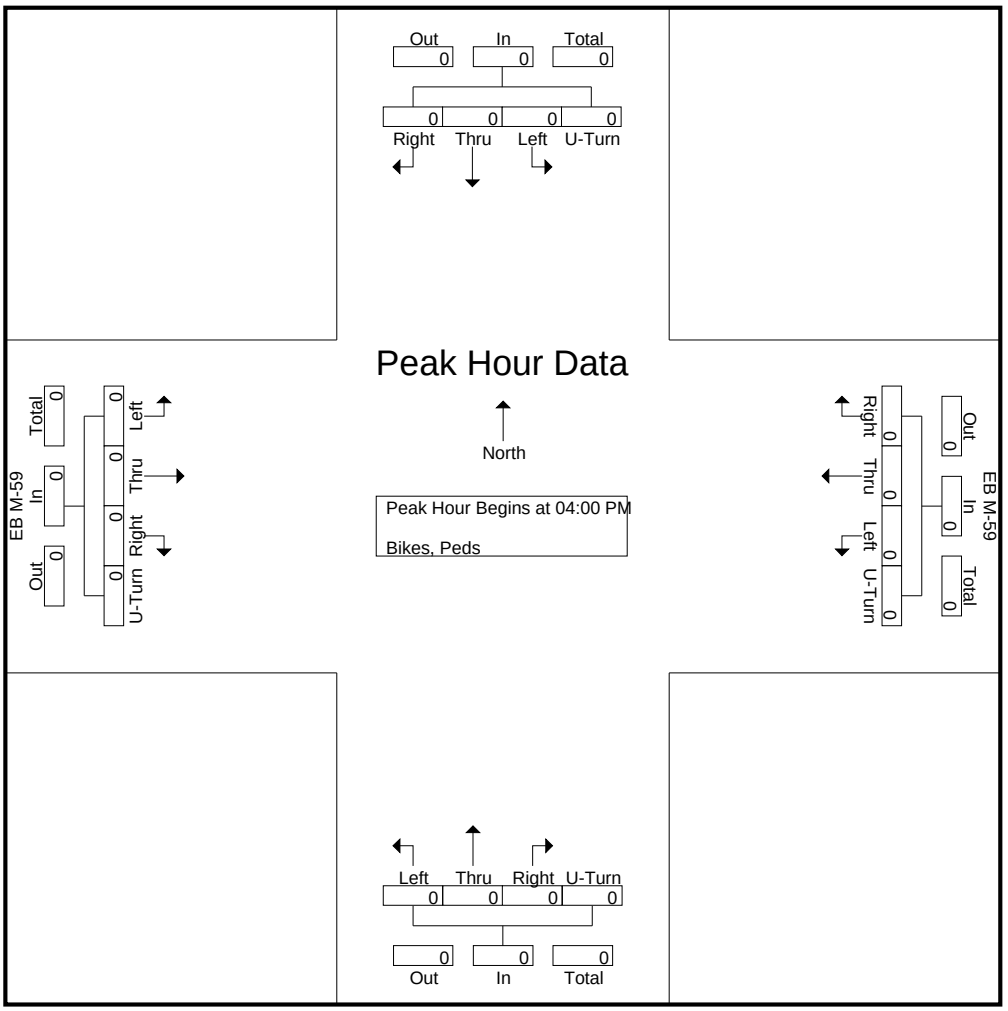
File Name : 16209804 - WB to EB XO east of Hartland Glen -- EB M-59
Site Code : 16209804
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

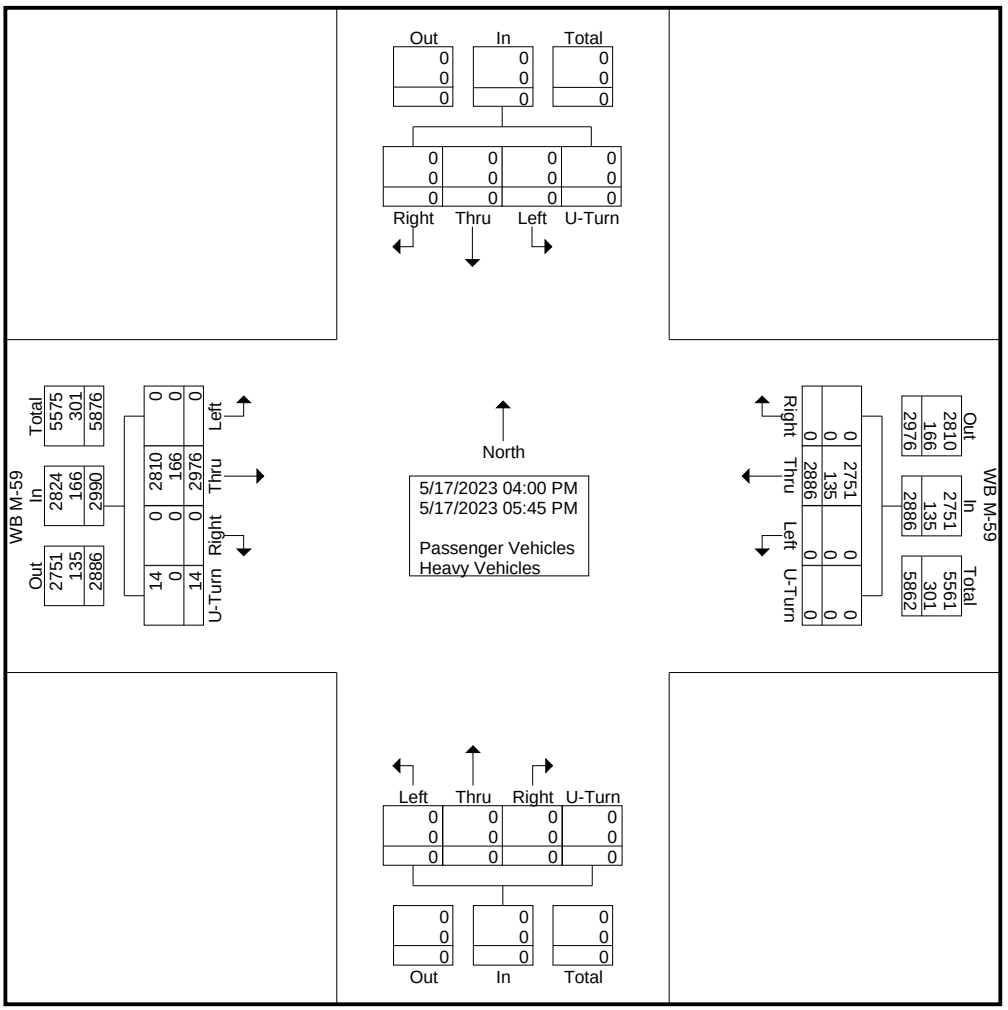


Quality Counts

File Name : 16209808 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209808
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

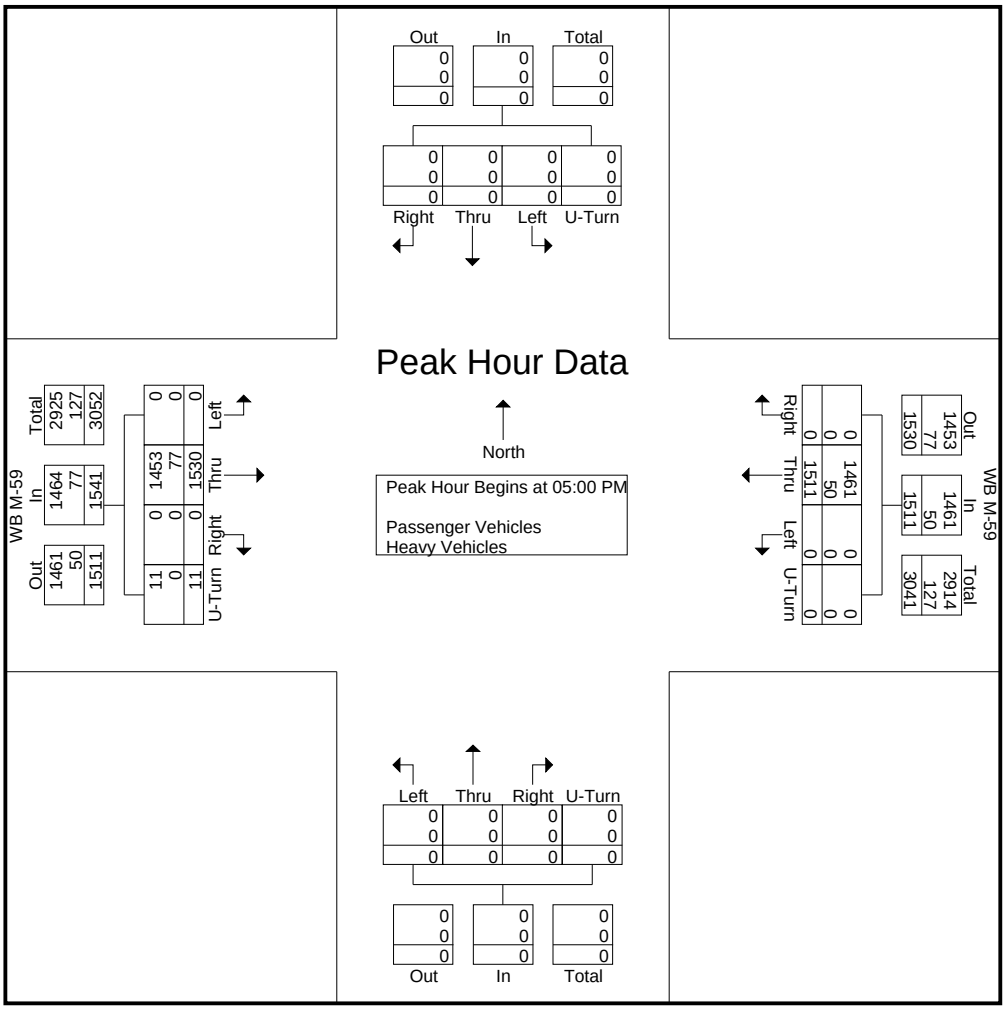
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	387	0	1	388	0	342	0	0	342	0	0	0	0	0	0	0	0	0	0	730
04:15 PM	0	363	0	1	364	0	337	0	0	337	0	0	0	0	0	0	0	0	0	0	701
04:30 PM	0	354	0	1	355	0	365	0	0	365	0	0	0	0	0	0	0	0	0	0	720
04:45 PM	0	342	0	0	342	0	331	0	0	331	0	0	0	0	0	0	0	0	0	0	673
Total	0	1446	0	3	1449	0	1375	0	0	1375	0	0	0	0	0	0	0	0	0	0	2824
05:00 PM	0	397	0	1	398	0	360	0	0	360	0	0	0	0	0	0	0	0	0	0	758
05:15 PM	0	402	0	1	403	0	386	0	0	386	0	0	0	0	0	0	0	0	0	0	789
05:30 PM	0	389	0	2	391	0	375	0	0	375	0	0	0	0	0	0	0	0	0	0	766
05:45 PM	0	342	0	7	349	0	390	0	0	390	0	0	0	0	0	0	0	0	0	0	739
Total	0	1530	0	11	1541	0	1511	0	0	1511	0	0	0	0	0	0	0	0	0	0	3052
Grand Total	0	2976	0	14	2990	0	2886	0	0	2886	0	0	0	0	0	0	0	0	0	0	5876
Apprch %	0	99.5	0	0.5		0	100	0	0		0	0	0	0		0	0	0	0		
Total %	0	50.6	0	0.2	50.9	0	49.1	0	0	49.1	0	0	0	0	0	0	0	0	0	0	
Passenger Vehicles	0	2810	0	14	2824	0	2751	0	0	2751	0	0	0	0	0	0	0	0	0	0	5575
% Passenger Vehicles	0	94.4	0	100	94.4	0	95.3	0	0	95.3	0	0	0	0	0	0	0	0	0	0	94.9
Heavy Vehicles	0	166	0	0	166	0	135	0	0	135	0	0	0	0	0	0	0	0	0	0	301
% Heavy Vehicles	0	5.6	0	0	5.6	0	4.7	0	0	4.7	0	0	0	0	0	0	0	0	0	0	5.1



Quality Counts

File Name : 16209808 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209808
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	397	0	1	398	0	360	0	0	360	0	0	0	0	0	0	0	0	0	0	758
05:15 PM	0	**402**	0	1	**403**	0	386	0	0	386	0	0	0	0	0	0	0	0	0	0	**789**
05:30 PM	0	389	0	2	391	0	375	0	0	375	0	0	0	0	0	0	0	0	0	0	766
05:45 PM	0	342	0	**7**	349	0	**390**	0	0	**390**	0	0	0	0	0	0	0	0	0	0	739
Total Volume	0	1530	0	11	1541	0	1511	0	0	1511	0	0	0	0	0	0	0	0	0	0	3052
% App. Total	0	99.3	0	0.7		0	100	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.951	.000	.393	.956	.000	.969	.000	.000	.969	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.967
Passenger Vehicles	0	1453	0	11	1464	0	1461	0	0	1461	0	0	0	0	0	0	0	0	0	0	2925
% Passenger Vehicles	0	95.0	0	100	95.0	0	96.7	0	0	96.7	0	0	0	0	0	0	0	0	0	0	95.8
Heavy Vehicles	0	77	0	0	77	0	50	0	0	50	0	0	0	0	0	0	0	0	0	0	127
% Heavy Vehicles	0	5.0	0	0	5.0	0	3.3	0	0	3.3	0	0	0	0	0	0	0	0	0	0	4.2

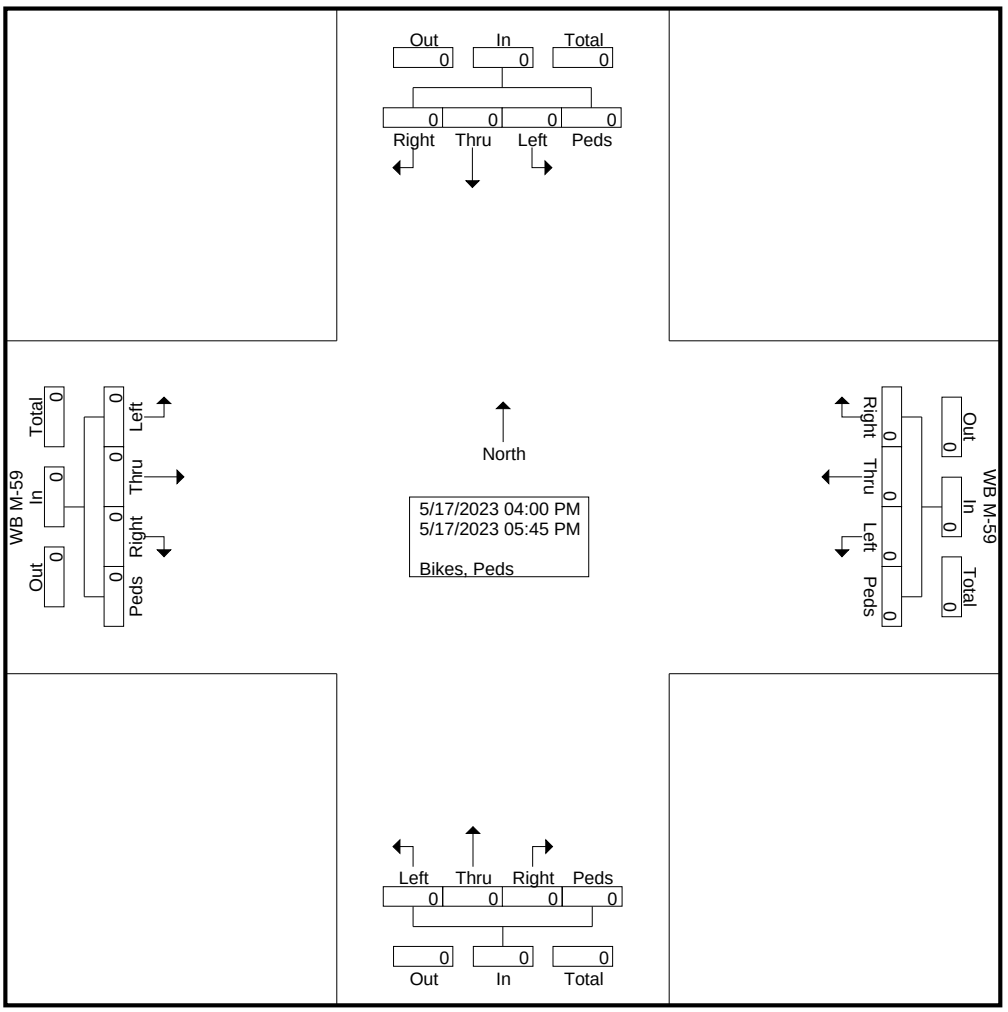


Quality Counts

File Name : 16209808 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209808
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

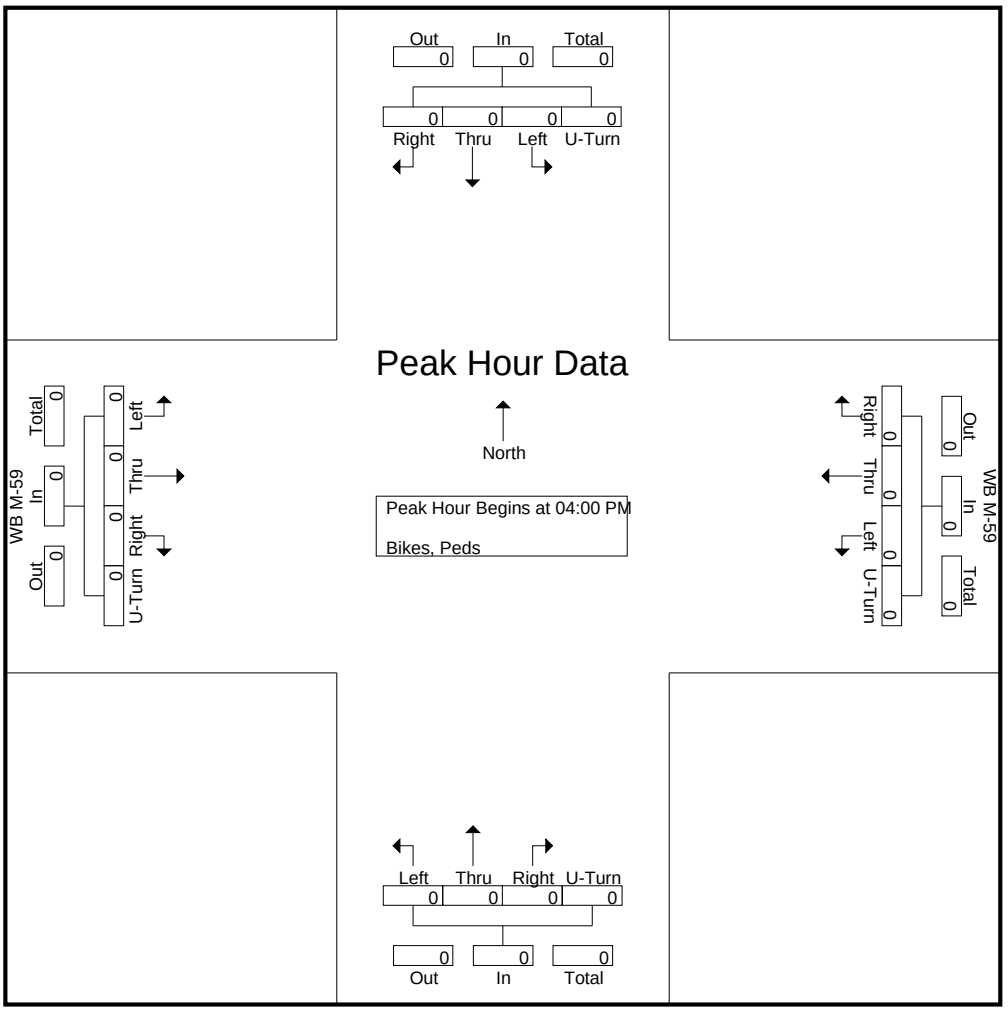
	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209808 - EB to WB XO west of Pleasant Valley -- WB M-59
Site Code : 16209808
Start Date : 5/17/2023
Page No : 2

	WB M-59 Eastbound					WB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

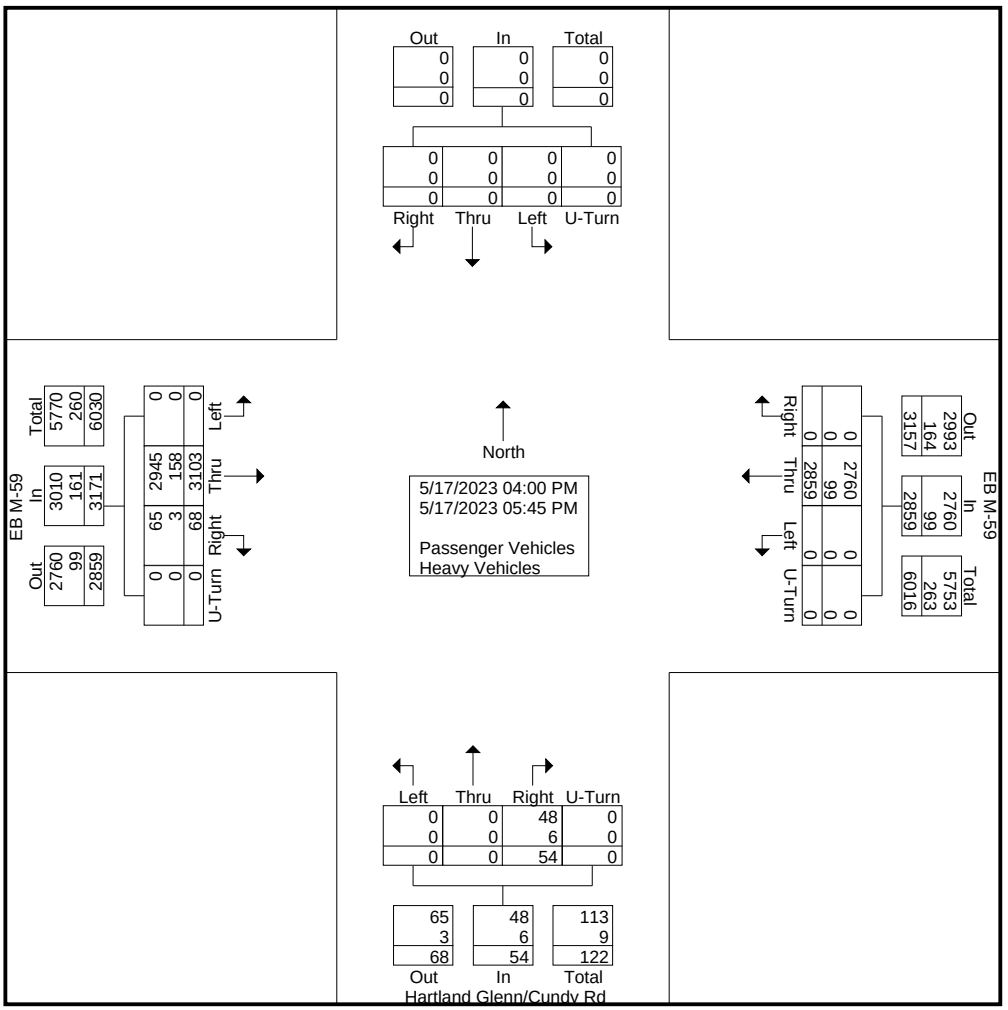


Quality Counts

File Name : 16209810 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209810
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

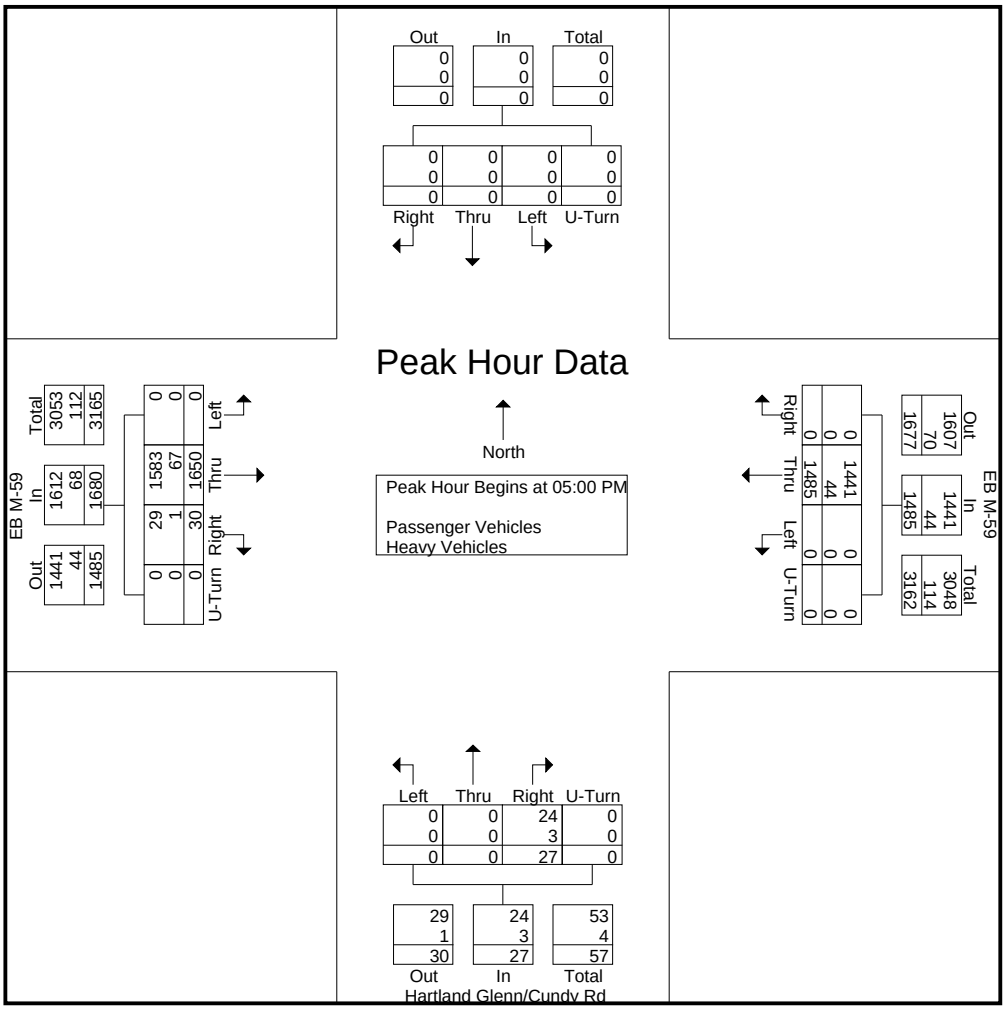
	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	388	11	0	399	0	336	0	0	336	0	0	10	0	10	0	0	0	0	0	745
04:15 PM	0	342	7	0	349	0	342	0	0	342	0	0	11	0	11	0	0	0	0	0	702
04:30 PM	0	358	10	0	368	0	361	0	0	361	0	0	4	0	4	0	0	0	0	0	733
04:45 PM	0	365	10	0	375	0	335	0	0	335	0	0	2	0	2	0	0	0	0	0	712
Total	0	1453	38	0	1491	0	1374	0	0	1374	0	0	27	0	27	0	0	0	0	0	2892
05:00 PM	0	406	6	0	412	0	362	0	0	362	0	0	5	0	5	0	0	0	0	0	779
05:15 PM	0	410	8	0	418	0	391	0	0	391	0	0	3	0	3	0	0	0	0	0	812
05:30 PM	0	418	6	0	424	0	367	0	0	367	0	0	11	0	11	0	0	0	0	0	802
05:45 PM	0	416	10	0	426	0	365	0	0	365	0	0	8	0	8	0	0	0	0	0	799
Total	0	1650	30	0	1680	0	1485	0	0	1485	0	0	27	0	27	0	0	0	0	0	3192
Grand Total	0	3103	68	0	3171	0	2859	0	0	2859	0	0	54	0	54	0	0	0	0	0	6084
Apprch %	0	97.9	2.1	0		0	100	0	0		0	0	100	0		0	0	0	0		
Total %	0	51	1.1	0	52.1	0	47	0	0	47	0	0	0.9	0	0.9	0	0	0	0	0	
Passenger Vehicles	0	2945	65	0	3010	0	2760	0	0	2760	0	0	48	0	48	0	0	0	0	0	5818
% Passenger Vehicles	0	94.9	95.6	0	94.9	0	96.5	0	0	96.5	0	0	88.9	0	88.9	0	0	0	0	0	95.6
Heavy Vehicles	0	158	3	0	161	0	99	0	0	99	0	0	6	0	6	0	0	0	0	0	266
% Heavy Vehicles	0	5.1	4.4	0	5.1	0	3.5	0	0	3.5	0	0	11.1	0	11.1	0	0	0	0	0	4.4



Quality Counts

File Name : 16209810 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209810
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	406	6	0	412	0	362	0	0	362	0	0	5	0	5	0	0	0	0	0	779
05:15 PM	0	410	8	0	418	0	**391**	0	0	**391**	0	0	3	0	3	0	0	0	0	0	**812**
05:30 PM	0	**418**	6	0	424	0	367	0	0	367	0	0	**11**	0	**11**	0	0	0	0	0	802
05:45 PM	0	416	**10**	0	**426**	0	365	0	0	365	0	0	8	0	8	0	0	0	0	0	799
Total Volume	0	1650	30	0	1680	0	1485	0	0	1485	0	0	27	0	27	0	0	0	0	0	3192
% App. Total	0	98.2	1.8	0		0	100	0	0		0	0	100	0		0	0	0	0		
PHF	.000	.987	.750	.000	.986	.000	.949	.000	.000	.949	.000	.000	.614	.000	.614	.000	.000	.000	.000	.000	.983
Passenger Vehicles	0	1583	29	0	1612	0	1441	0	0	1441	0	0	24	0	24	0	0	0	0	0	3077
% Passenger Vehicles	0	95.9	96.7	0	96.0	0	97.0	0	0	97.0	0	0	88.9	0	88.9	0	0	0	0	0	96.4
Heavy Vehicles	0	67	1	0	68	0	44	0	0	44	0	0	3	0	3	0	0	0	0	0	115
% Heavy Vehicles	0	4.1	3.3	0	4.0	0	3.0	0	0	3.0	0	0	11.1	0	11.1	0	0	0	0	0	3.6

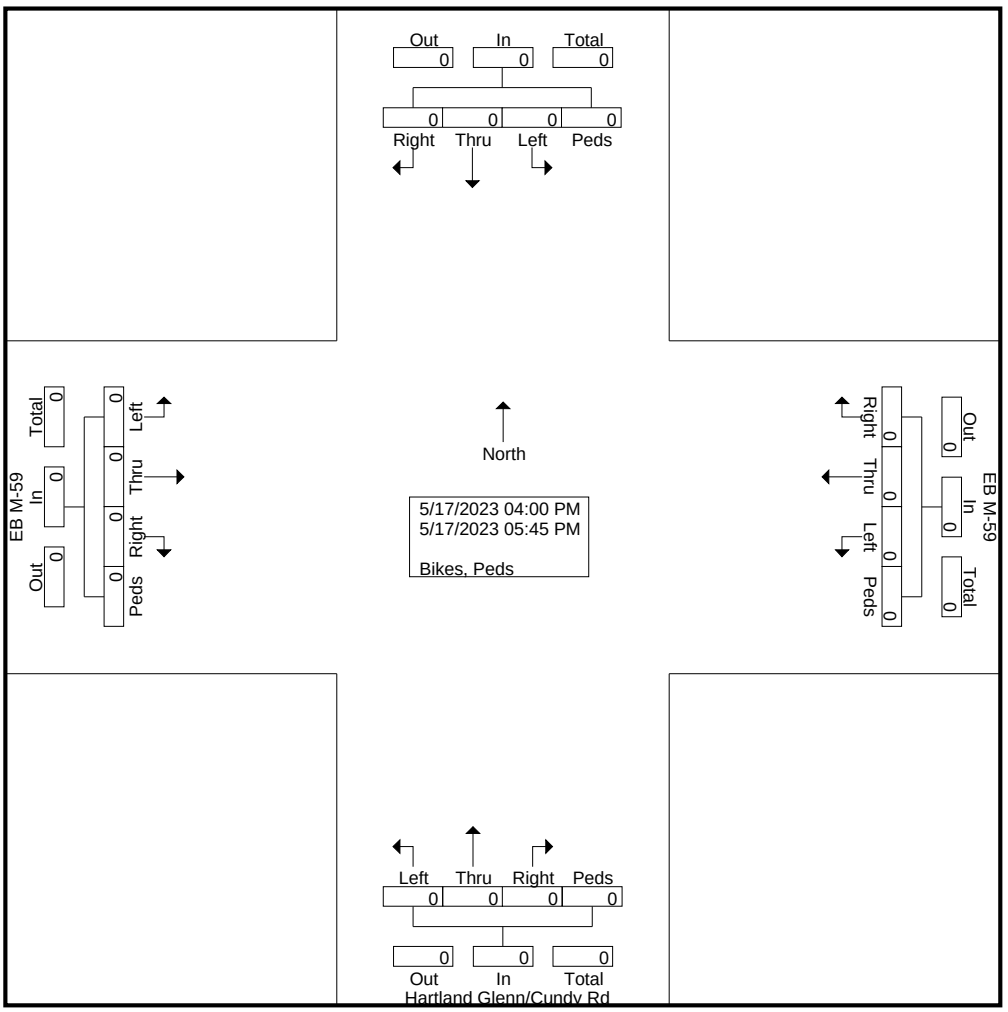


Quality Counts

File Name : 16209810 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209810
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

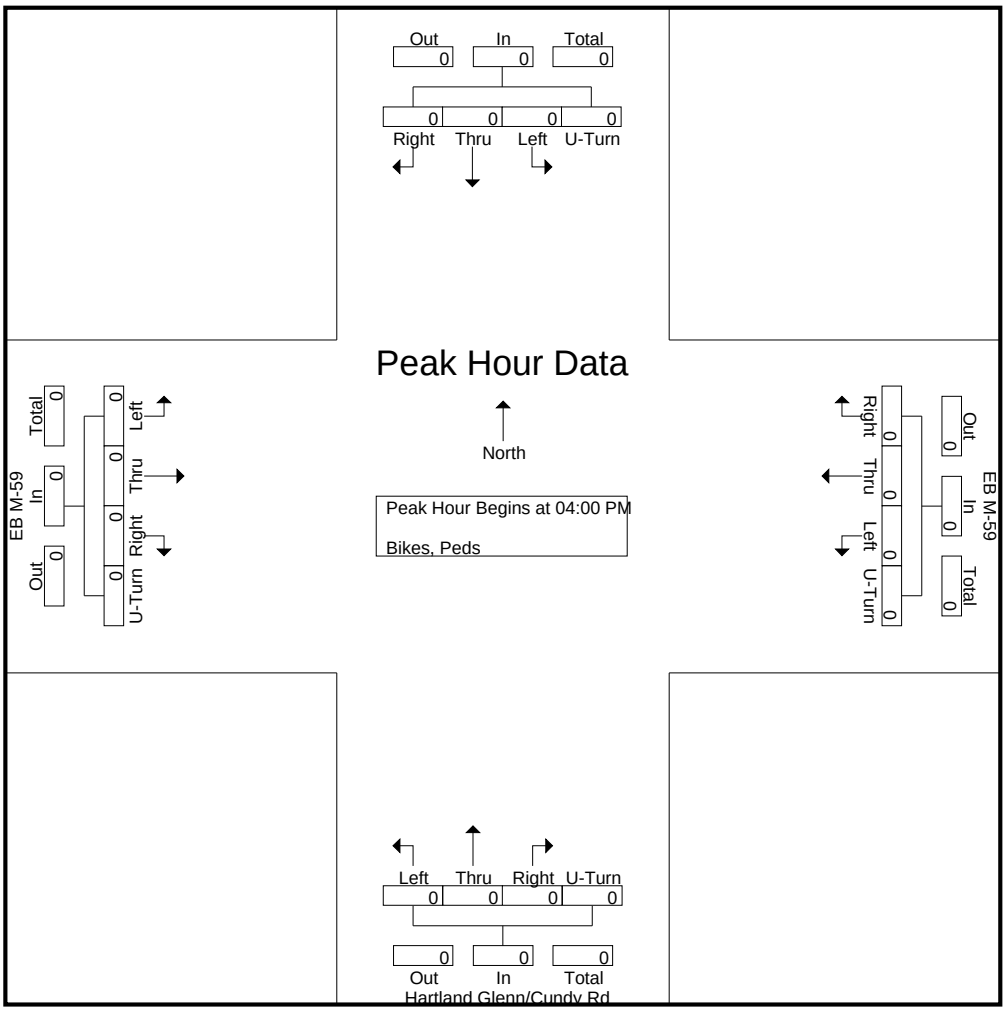
	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



Quality Counts

File Name : 16209810 - Hartland Glenn_Cundy Rd -- EB M-59
Site Code : 16209810
Start Date : 5/17/2023
Page No : 2

	EB M-59 Eastbound					EB M-59 Westbound					Hartland Glenn/Cundy Rd Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

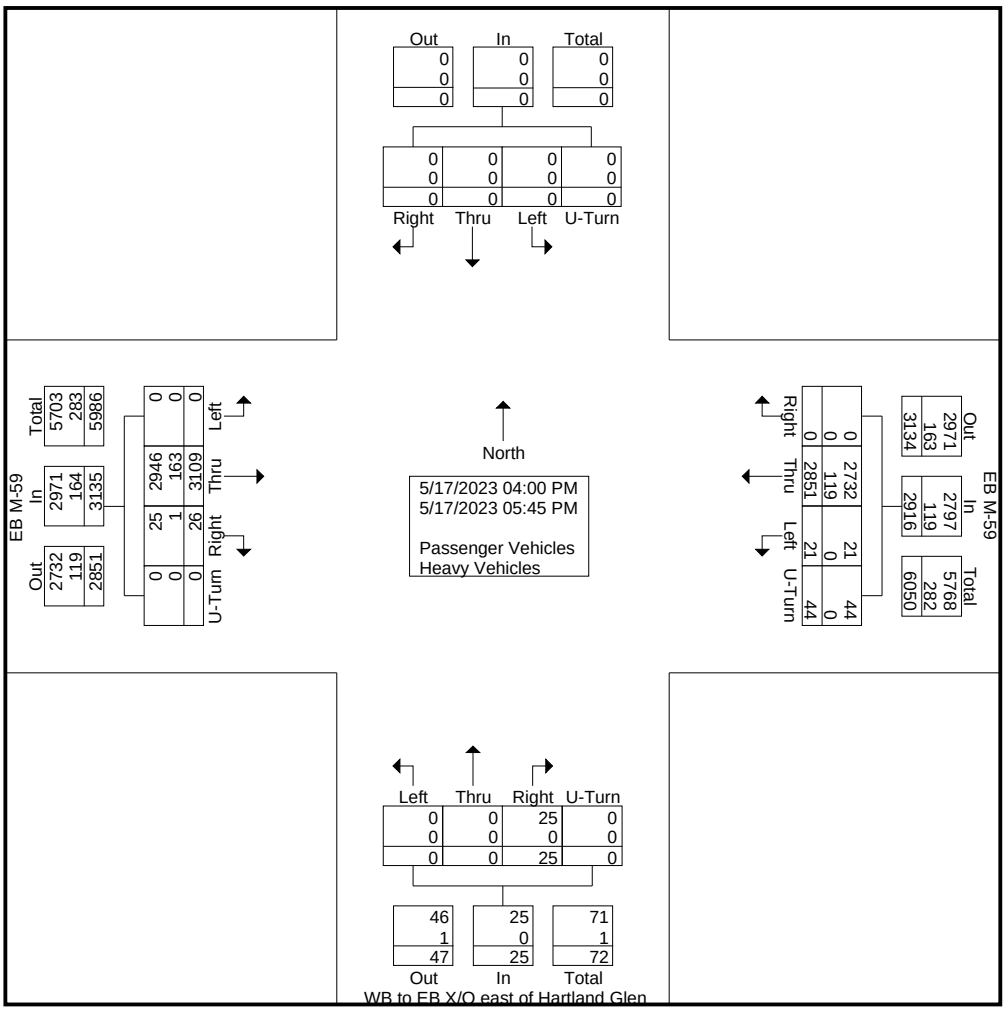


Quality Counts

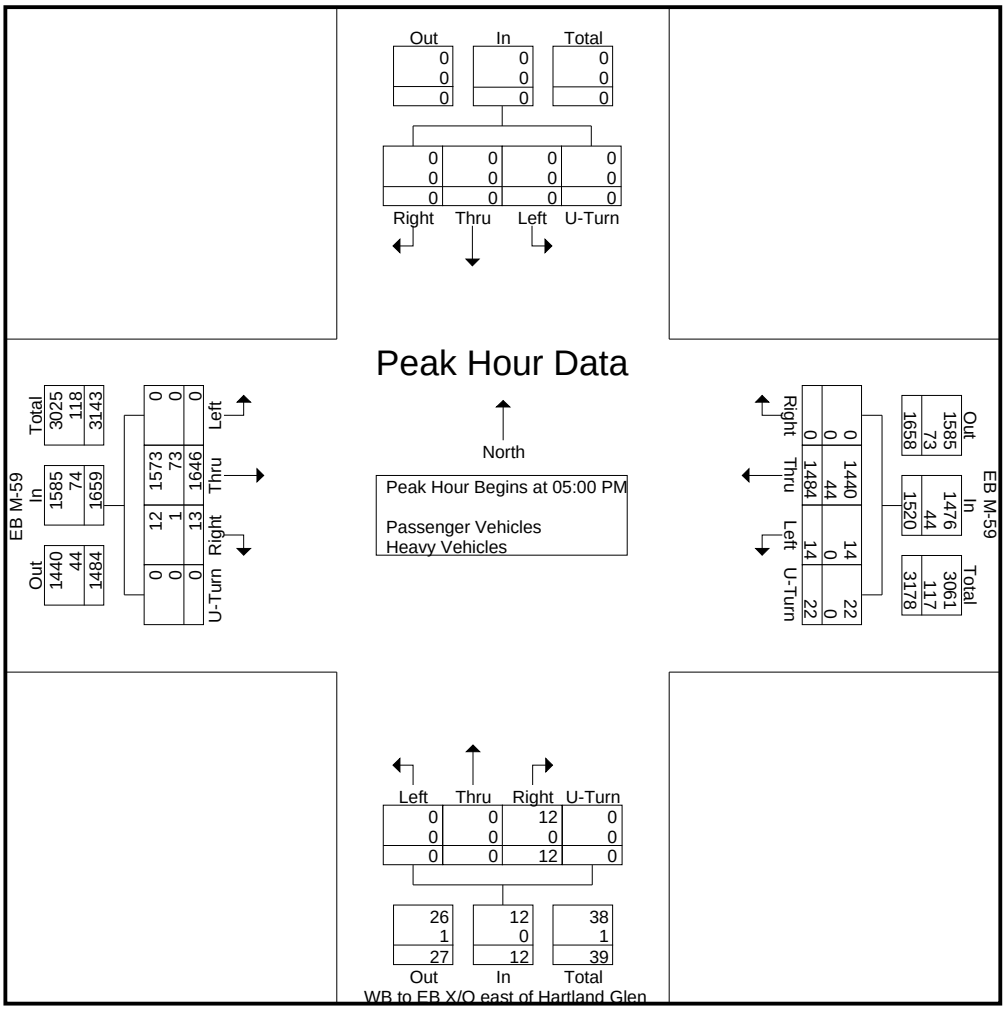
File Name : 16209812 - WB to EB X_O west of Hartland Glen -- EB M-59
Site Code : 16209812
Start Date : 5/17/2023
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
04:00 PM	0	391	0	0	391	4	346	0	3	353	0	0	4	0	4	0	0	0	0	0	748
04:15 PM	0	354	8	0	362	1	335	0	5	341	0	0	2	0	2	0	0	0	0	0	705
04:30 PM	0	355	4	0	359	0	354	0	6	360	0	0	4	0	4	0	0	0	0	0	723
04:45 PM	0	363	1	0	364	2	332	0	8	342	0	0	3	0	3	0	0	0	0	0	709
Total	0	1463	13	0	1476	7	1367	0	22	1396	0	0	13	0	13	0	0	0	0	0	2885
05:00 PM	0	403	4	0	407	1	366	0	4	371	0	0	2	0	2	0	0	0	0	0	780
05:15 PM	0	409	1	0	410	6	385	0	6	397	0	0	4	0	4	0	0	0	0	0	811
05:30 PM	0	410	4	0	414	5	359	0	4	368	0	0	2	0	2	0	0	0	0	0	784
05:45 PM	0	424	4	0	428	2	374	0	8	384	0	0	4	0	4	0	0	0	0	0	816
Total	0	1646	13	0	1659	14	1484	0	22	1520	0	0	12	0	12	0	0	0	0	0	3191
Grand Total	0	3109	26	0	3135	21	2851	0	44	2916	0	0	25	0	25	0	0	0	0	0	6076
Apprch %	0	99.2	0.8	0		0.7	97.8	0	1.5		0	0	100	0		0	0	0	0		
Total %	0	51.2	0.4	0	51.6	0.3	46.9	0	0.7	48	0	0	0.4	0	0.4	0	0	0	0	0	
Passenger Vehicles	0	2946	25	0	2971	21	2732	0	44	2797	0	0	25	0	25	0	0	0	0	0	5793
% Passenger Vehicles	0	94.8	96.2	0	94.8	100	95.8	0	100	95.9	0	0	100	0	100	0	0	0	0	0	95.3
Heavy Vehicles	0	163	1	0	164	0	119	0	0	119	0	0	0	0	0	0	0	0	0	0	283
% Heavy Vehicles	0	5.2	3.8	0	5.2	0	4.2	0	0	4.1	0	0	0	0	0	0	0	0	0	0	4.7



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	403	**4**	0	407	1	366	0	4	371	0	0	2	0	2	0	0	0	0	0	780
05:15 PM	0	409	1	0	410	**6**	**385**	0	6	**397**	0	0	**4**	0	**4**	0	0	0	0	0	811
05:30 PM	0	410	4	0	414	5	359	0	4	368	0	0	2	0	2	0	0	0	0	0	784
05:45 PM	0	**424**	4	0	**428**	2	374	0	**8**	384	0	0	4	0	4	0	0	0	0	0	**816**
Total Volume	0	1646	13	0	1659	14	1484	0	22	1520	0	0	12	0	12	0	0	0	0	0	3191
% App. Total	0	99.2	0.8	0		0.9	97.6	0	1.4		0	0	100	0		0	0	0	0		
PHF	.000	.971	.813	.000	.969	.583	.964	.000	.688	.957	.000	.000	.750	.000	.750	.000	.000	.000	.000	.000	.978
Passenger Vehicles	0	1573	12	0	1585	14	1440	0	22	1476	0	0	12	0	12	0	0	0	0	0	3073
% Passenger Vehicles	0	95.6	92.3	0	95.5	100	97.0	0	100	97.1	0	0	100	0	100	0	0	0	0	0	96.3
Heavy Vehicles	0	73	1	0	74	0	44	0	0	44	0	0	0	0	0	0	0	0	0	0	118
% Heavy Vehicles	0	4.4	7.7	0	4.5	0	3.0	0	0	2.9	0	0	0	0	0	0	0	0	0	0	3.7

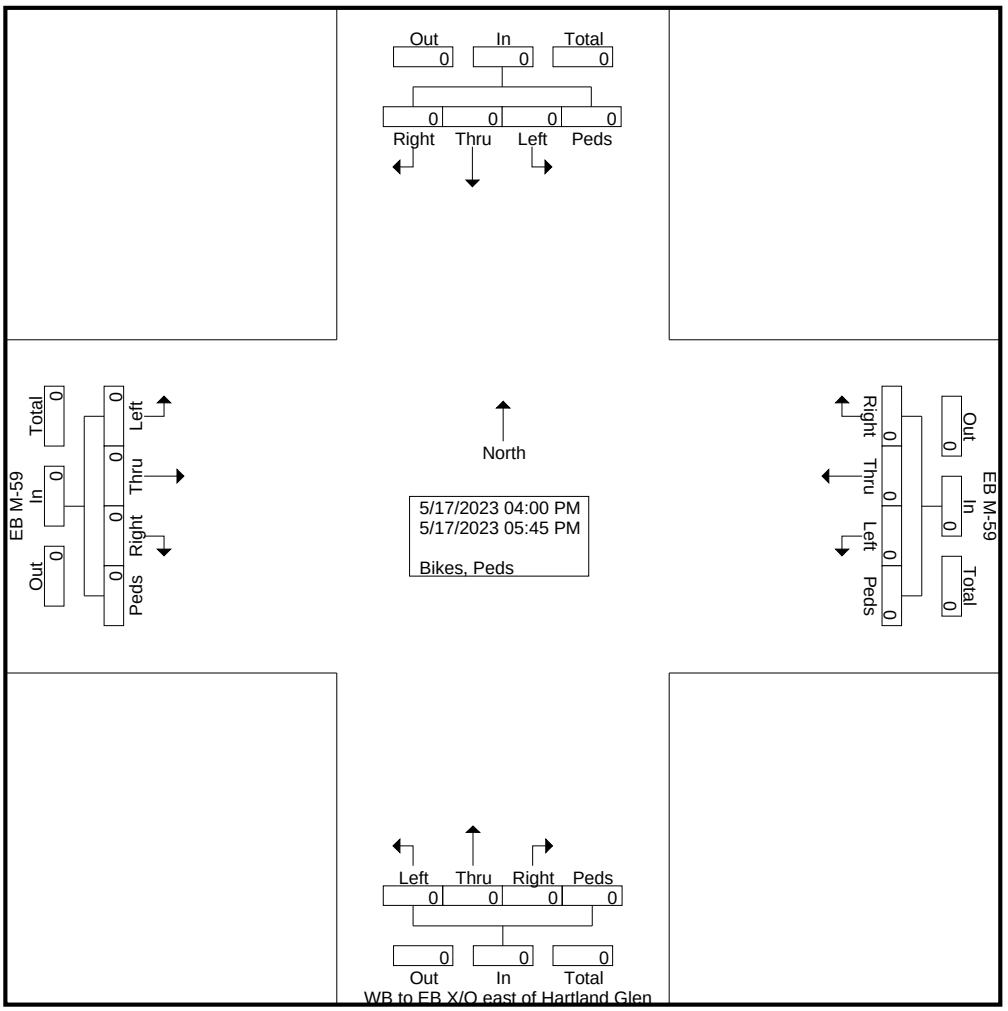


Quality Counts

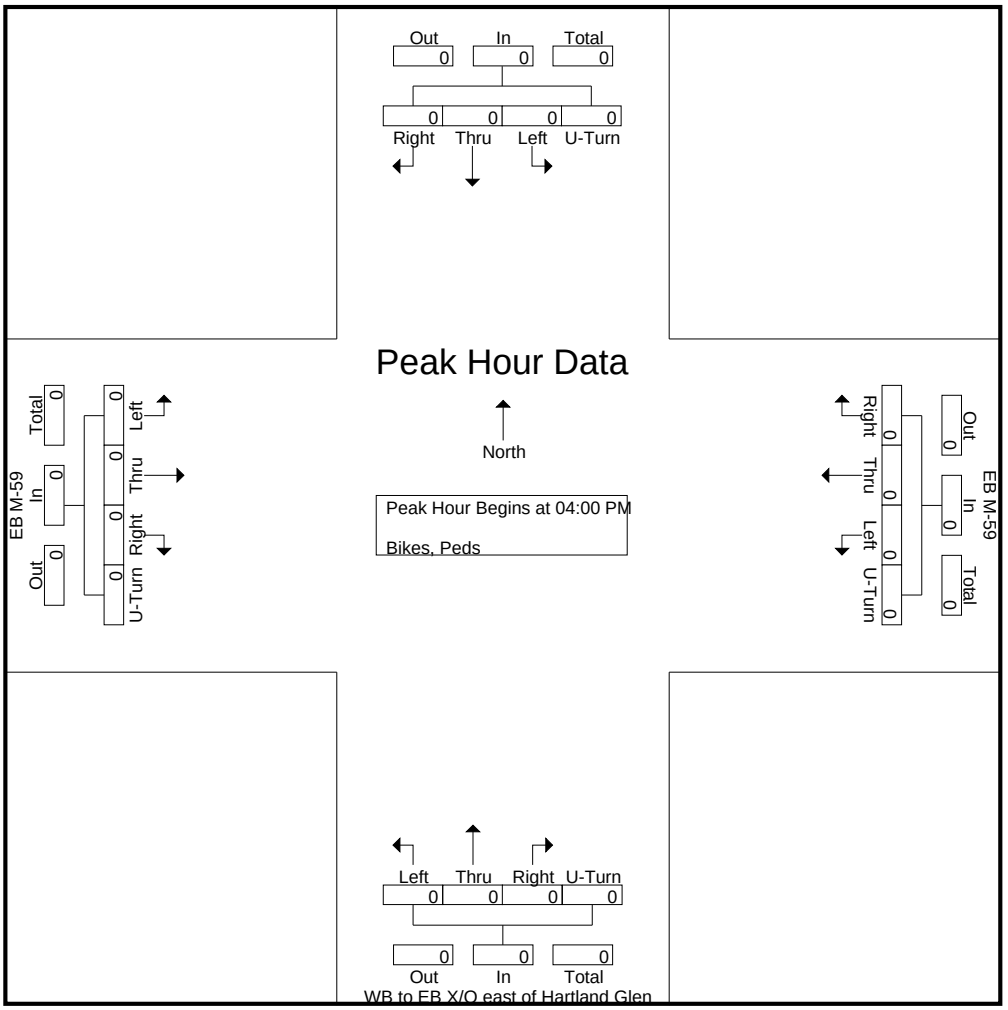
File Name : 16209812 - WB to EB X_O west of Hartland Glen -- EB M-59
Site Code : 16209812
Start Date : 5/17/2023
Page No : 1

Groups Printed- Bikes, Peds

	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					



	EB M-59 Eastbound					EB M-59 Westbound					Northbound					Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000



MDOT Michigan Department of Transportation

MS2

Transportation Data Management System

Disclaimer: The Michigan Department of Transportation (MDOT) works with individual agencies (cities/villages, counties, metropolitan planning organizations (MPOs), regional planning organizations (RPOs), and other areas of MDOT) to identify existing traffic count programs and/or traffic data. ... more

List View | All DIRs | Report Center

Record 1 of 2 Goto Record go

Location ID	47-0550	**MPO ID**	3011
Type	SPOT	**HPMS ID**	
On NHS	No	**On HPMS**	No
LRS ID	0934502	**LRS Loc Pt.**	0.7052841
SF Group	Local Road	**Route Type**	
AF Group	NoFactor	**Route**	
GF Group	Local Road	**Active**	Yes
Class Dist Grp	NTL_7	**Category**	
Seas Clss Grp			
WIM Group			
QC Group	Default		
Fnct'l Class	(7) Local Road or Street	**Milepost**	
Located On	Cundy Rd		
Loc On Alias			
BETWEEN	Bullard Rd AND Hartland Glen Ln		
More Detail			

STATION DATA

Directions: 2-WAY | EB | WB

AADT

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2022	304[3]		9		289 (95%)	15 (5%)	Grown from 2021
2021	307[3]		9		260 (85%)	47 (15%)	Grown from 2020
2020	274	26	9		247 (90%)	27 (10%)	

VOLUME COUNT

	Date	Int	Total
	Mon 6/8/2020	60	274

VOLUME TREND

Year	Annual Growth
2022	-1%
2021	12%

CLASSIFICATION

	Date	Int	Total
No Data			

NOTES/FILES

	Note	Date	

SEMCOG | Southeast Michigan Council of Governments

Search...

Crash and Road Data

Road Segment Report

Highland Rd, (PR Number 933209)

From:	Hartland Rd 12.996 BMP
To:	Fenton Rd 15.296 EMP
Jurisdiction:	State
FALINK ID:	5285
Community:	Hartland Township
County:	Livingston
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	2.300 miles
Number of Lanes:	2
Posted Speed:	55 (source: TCO)
Route Classification:	M-36
Annual Crash Average 2017-2021:	15
Traffic Volume (2020)*:	15,100 (Observed AADT)
Pavement Type (2021):	Asphalt
Pavement Rating (2021):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**

Street View

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Hartland Township

2655 Clark Rd
Hartland, MI 48353-2614
http://www.hartlandtwp.com/

LEARN ABOUT SEMCOG MEMBERSHIP

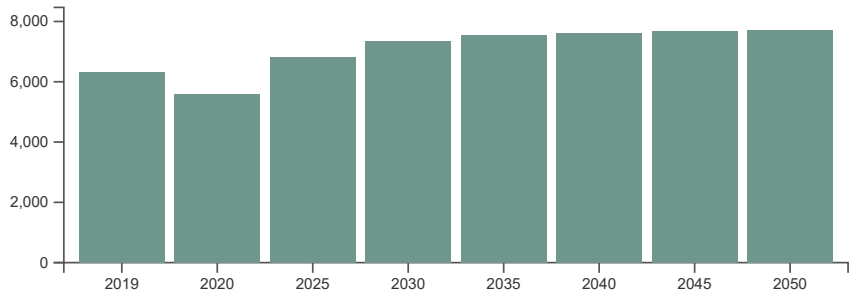
Census 2020 Population: 15,256
Area: 37.3 square miles

VIEW COMMUNITY EXPLORER MAP | VIEW 2020 CENSUS MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2017-2021 **Economic**

Forecasted Jobs



Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: **SEMCOG 2050 Regional Development Forecast**

Forecasted Jobs by Industry Sector

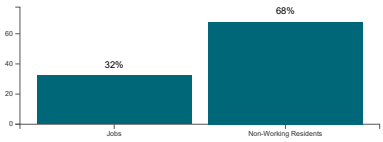
Forecasted Jobs By Industry Sector	2019	2020	2025	2030	2035	2040	2045	2050	Change 2019-2050	Pct Change 2019-2050
Natural Resources, Mining, & Construction	590	565	776	804	816	822	836	834	244	41.4%
Manufacturing	467	437	494	483	465	444	413	403	-64	-13.7%
Wholesale Trade	106	102	119	137	138	134	137	132	26	24.5%
Retail Trade	900	838	943	1,006	976	951	934	920	20	2.2%
Transportation, Warehousing, & Utilities	103	95	124	134	135	135	138	144	41	39.8%
Information & Financial Activities	832	724	828	885	918	932	949	959	127	15.3%
Professional and Technical Services & Corporate HQ	498	413	516	541	566	588	593	606	108	21.7%
Administrative, Support, & Waste Services	252	200	233	255	274	286	305	321	69	27.4%
Education Services	509	485	538	568	587	598	601	602	93	18.3%
Healthcare Services	389	339	369	445	495	508	547	557	168	43.2%
Leisure & Hospitality	1,166	937	1,363	1,566	1,638	1,658	1,677	1,692	526	45.1%
Other Services	383	331	384	402	400	403	402	390	7	1.8%
Public Administration	112	108	121	130	133	138	138	137	25	22.3%
Total Employment Numbers	6,307	5,574	6,808	7,356	7,541	7,597	7,670	7,697	1,390	22%

Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: **SEMCOG 2050 Regional Development Forecast**

Daytime Population

Daytime Population	ACS 2016
Jobs	3,663
Non-Working Residents	7,661
Age 15 and under	3,505
Not in labor force	3,626
Unemployed	530
Daytime Population	11,324



Source: **2012-2016 American Community Survey 5-Year Estimates** and **2012-2016 Census Transportation Planning Products Program (CTPP)**. For additional information, visit SEMCOG's **Interactive Commuting Patterns Map**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Hartland Township

2655 Clark Rd
Hartland, MI 48353-2614
http://www.hartlandtwp.com/

LEARN ABOUT SEMCOG MEMBERSHIP

Census 2020 Population: 15,256
Area: 37.3 square miles

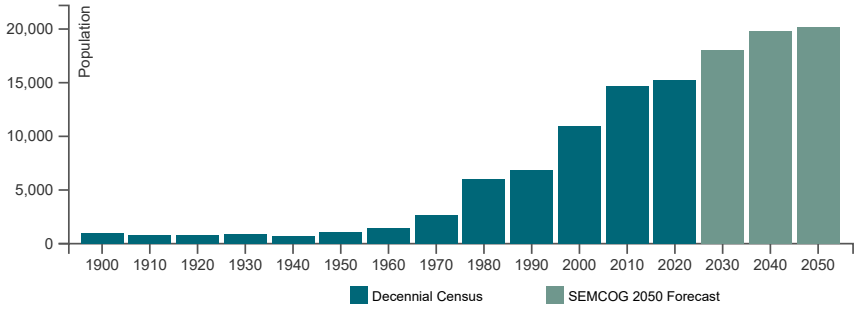
VIEW COMMUNITY EXPLORER MAP | VIEW 2020 CENSUS MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2017-2021 **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2022

Population Forecast



Population and Households

Population and Households	Census 2020	Census 2010	Change 2010-2020	Pct Change 2010-2020	SEMCOG Jul 2022	SEMCOG 2050
Total Population	15,256	14,663	593	4.0%	15,234	20,180
Group Quarters Population	13	5	8	160.0%	82	93
Household Population	15,243	14,658	585	4.0%	15,152	20,087
Housing Units	5,813	5,442	371	6.8%	5,952	-
Households (Occupied Units)	5,496	5,154	342	6.6%	5,494	7,848
Residential Vacancy Rate	5.5%	5.3%	0.2%	-	7.7%	-
Average Household Size	2.77	2.84	-0.07	-	2.76	2.56

Source: **U.S. Census Bureau** and **SEMCOG 2050 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2018 Avg.
Natural Increase (Births - Deaths)	103	49	15
Births	174	111	118
Deaths	71	62	103
Net Migration (Movement In - Movement Out)	498	83	180
Population Change (Natural Increase + Net Migration)	601	132	195

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

Household Types

Household Types	Census 2010	ACS 2021	Change 2010-2021	Pct Change 2010-2021	SEMCOG 2050
With Seniors 65+	1,082	1,737	655	60.5%	-
Without Seniors	4,072	4,005	-67	-1.6%	-
Live Alone, 65+	309	700	391	126.5%	-
Live Alone, <65	565	766	201	35.6%	-
2+ Persons, With children	2,142	1,793	-349	-16.3%	-
2+ Persons, Without children	2,138	2,483	345	16.1%	-
Total Households	5,154	5,742	588	11.4%	-

Source: **U.S. Census Bureau**, **Decennial Census**, **2017-2021 American Community Survey 5-Year Estimates**, and **SEMCOG 2050 Regional Development Forecast**

Level of Service Criteria for Stop Sign Controlled Intersections

The level of service criteria are given in Exhibit 20-2. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in queue.

The average total delay for any particular controlled movement is a function three (capacity) factors: distribution of gaps in the major-street traffic stream, driver judgment in selecting gaps through which to execute the desired maneuvers, and the follow-up headways required by each driver in a queue.

The basic capacity model assumes gaps in the conflicting movements are randomly distributed. When traffic signals are present on the major street, upstream of the subject intersection, flows may not be random but will likely have some platoon structure. Although the procedures in this chapter provide a method for approximating the operations of a TWSC intersection with an upstream signal, the operations of such an intersection is arguably best handled by including it in a complete simulation

Exhibit 20-2. Level of Service Criteria for Stop-Controlled Intersections (Motor Vehciles)

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (sec/veh)
A	$\leq$ 10
B	> 10 and $\leq$ 15
C	> 15 and $\leq$ 25
D	> 25 and $\leq$ 35
E	> 35 and $\leq$ 50
F	> 50

Average total delay less than 10 sec/veh is defined as Level of Service (LOS) A. Follow-up times of less than 5 sec have been measured when there is no conflicting traffic for a minor street movement, so control delays of less than 10 sec/veh are appropriate for low flow conditions. A total delay of 50 sec/veh is assumed as the break point between LOS E and F.

The LOS criteria for TWSC intersections differ somewhat from the criteria used in Chapter 19 for signalized intersections, primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, where drivers on the minor approaches to unsignalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized than signalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection.

LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queueing on the minor approaches. The method, however, is based on a constant critical gap size - that is, the critical gap remains constant, no matter how long the side street motorist waits. LOS F may also appear in the form of side street vehicles' selecting smaller-than-usual gaps. In such cases, safety may be a problem and some disruption to the major traffic stream may result. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal gap acceptance behavior. The latter is more difficult to observe on the field than queueing, which is more obvious.

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle. The criteria are given in Exhibit 19-8. Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

LOS A describes operations with a control delay of 10 s/veh or less. This level is typically assigned when the volume-to-capacity ratio is low and either progression is extremely favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during a green indication and travel through the intersection without stopping.

LOS B describes operations with control delay between 10 and 20 s/veh. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

Exhibit 19.8. Level-of-Service Criteria for Signalized Intersections (Motorized Vehicles)

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (SEC)
A	≤10.0
B	> 10.0 and ≤20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	>80.0

1. If the v/c ratio for a lane group exceeds 1.0, a LOS F is assigned to the individual lane group. LOS for approach-based and intersection-wide assessments are determined solely by the control delay.

LOS C describes operations with control delay between 20 and 35 s/veh. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e. one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number if vehicle stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D describes operations with control delay between 35 and 55 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E describes operations with control delay between 55 and 80 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level, considered to be unacceptable to most drivers, often occurs with over-saturation, that is, when arrival flow rates exceed the capacity of the intersection. This level is typically assigned when the volume-to-capacity ratio is high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1364	0	0	5	0
Future Vol, veh/h	0	1364	0	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	63	63
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1483	0	0	8	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	742	-
Stage 1	-	-	0	-
Stage 2	-	-	742	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	355	0
Stage 1	0	-	-	0
Stage 2	0	-	437	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	355	-
Mov Cap-2 Maneuver	-	-	355	-
Stage 1	-	-	-	-
Stage 2	-	-	437	-

Approach	EB	SB
HCM Control Delay, s	0	15.4
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	355
HCM Lane V/C Ratio	-	0.022
HCM Control Delay (s)	-	15.4
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1363	6	0	0	0	6
Future Vol, veh/h	1363	6	0	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	60	60
Heavy Vehicles, %	10	10	2	2	67	67
Mvmt Flow	1435	6	0	0	0	10

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	721
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	8.24
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.97
Pot Cap-1 Maneuver	-	-		0	252
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	252
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	19.9
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	252	-	-
HCM Lane V/C Ratio	0.04	-	-
HCM Control Delay (s)	19.9	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1303	4	0
Future Vol, veh/h	0	0	0	1303	4	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	89	89	60	60
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1464	7	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	732	-
Stage 1	-	-	0	-
Stage 2	-	-	732	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	361	0
Stage 1	0	-	-	0
Stage 2	0	-	442	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	361	-
Mov Cap-2 Maneuver	-	-	361	-
Stage 1	-	-	-	-
Stage 2	-	-	442	-

Approach	WB	NB
HCM Control Delay, s	0	15.2
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	361	-
HCM Lane V/C Ratio	0.018	-
HCM Control Delay (s)	15.2	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1365	0	0	1	0
Future Vol, veh/h	0	1365	0	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	92	92	60	60
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1452	0	0	2	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	726	-
Stage 1	-	-	0	-
Stage 2	-	-	726	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	364	0
Stage 1	0	-	-	0
Stage 2	0	-	445	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	364	-
Mov Cap-2 Maneuver	-	-	364	-
Stage 1	-	-	-	-
Stage 2	-	-	445	-

Approach	EB	SB
HCM Control Delay, s	0	14.9
HCM LOS		B

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	364
HCM Lane V/C Ratio	-	0.005
HCM Control Delay (s)	-	14.9
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1297	7	0
Future Vol, veh/h	0	0	0	1297	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1365	12	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	683	-
Stage 1	-	-	0	-
Stage 2	-	-	683	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	387	0
Stage 1	0	-	-	0
Stage 2	0	-	468	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	387	-
Mov Cap-2 Maneuver	-	-	387	-
Stage 1	-	-	-	-
Stage 2	-	-	468	-

Approach	WB	NB
HCM Control Delay, s	0	14.6
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	387	-
HCM Lane V/C Ratio	0.03	-
HCM Control Delay (s)	14.6	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1659	0	0	36	0
Future Vol, veh/h	0	1659	0	0	36	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	69	69
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1746	0	0	52	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	873	-
Stage 1	-	-	0	-
Stage 2	-	-	873	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	293	0
Stage 1	0	-	-	0
Stage 2	0	-	374	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	293	-
Mov Cap-2 Maneuver	-	-	293	-
Stage 1	-	-	-	-
Stage 2	-	-	374	-

Approach	EB	SB
HCM Control Delay, s	0	19.9
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	293
HCM Lane V/C Ratio	-	0.178
HCM Control Delay (s)	-	19.9
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.6

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1665	30	0	0	0	27
Future Vol, veh/h	1665	30	0	0	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	61	61
Heavy Vehicles, %	4	4	2	2	11	11
Mvmt Flow	1753	32	0	0	0	44

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	893
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.12
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.41
Pot Cap-1 Maneuver	-	-		0	267
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	267
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	21.1
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	267	-	-
HCM Lane V/C Ratio	0.166	-	-
HCM Control Delay (s)	21.1	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.6	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1523	129	0
Future Vol, veh/h	0	0	0	1523	129	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1603	215	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	802	-
Stage 1	-	-	0	-
Stage 2	-	-	802	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	326	0
Stage 1	0	-	-	0
Stage 2	0	-	407	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	326	-
Mov Cap-2 Maneuver	-	-	326	-
Stage 1	-	-	-	-
Stage 2	-	-	407	-

Approach	WB	NB
HCM Control Delay, s	0	35.1
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	326	-
HCM Lane V/C Ratio	0.66	-
HCM Control Delay (s)	35.1	-
HCM Lane LOS	E	-
HCM 95th %tile Q(veh)	4.4	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1563	0	0	1	0
Future Vol, veh/h	0	1563	0	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	60	60
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1645	0	0	2	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	823	-
Stage 1	-	-	0	-
Stage 2	-	-	823	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	316	0
Stage 1	0	-	-	0
Stage 2	0	-	397	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	316	-
Mov Cap-2 Maneuver	-	-	316	-
Stage 1	-	-	-	-
Stage 2	-	-	397	-

Approach	EB	SB
HCM Control Delay, s	0	16.5
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	316
HCM Lane V/C Ratio	-	0.005
HCM Control Delay (s)	-	16.5
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1513	11	0
Future Vol, veh/h	0	0	0	1513	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1593	18	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	797	-
Stage 1	-	-	0	-
Stage 2	-	-	797	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	328	0
Stage 1	0	-	-	0
Stage 2	0	-	409	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	328	-
Mov Cap-2 Maneuver	-	-	328	-
Stage 1	-	-	-	-
Stage 2	-	-	409	-

Approach	WB	NB
HCM Control Delay, s	0	16.6
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	328	-
HCM Lane V/C Ratio	0.056	-
HCM Control Delay (s)	16.6	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.2	-

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	42
Average Queue (ft)	6
95th Queue (ft)	27
Link Distance (ft)	27
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	69
Average Queue (ft)	10
95th Queue (ft)	42
Link Distance (ft)	58
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	25
Average Queue (ft)	3
95th Queue (ft)	16
Link Distance (ft)	50
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	27
Average Queue (ft)	2
95th Queue (ft)	12
Link Distance (ft)	52
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	28
Average Queue (ft)	7
95th Queue (ft)	27
Link Distance (ft)	40
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	67
Average Queue (ft)	24
95th Queue (ft)	53
Link Distance (ft)	27
Upstream Blk Time (%)	14
Queuing Penalty (veh)	5
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	3
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	59
Average Queue (ft)	21
95th Queue (ft)	52
Link Distance (ft)	58
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	95
Average Queue (ft)	58
95th Queue (ft)	98
Link Distance (ft)	50
Upstream Blk Time (%)	26
Queuing Penalty (veh)	40
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	76	31
Average Queue (ft)	7	0
95th Queue (ft)	41	7
Link Distance (ft)		299
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	17
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	52
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	37
Average Queue (ft)	9
95th Queue (ft)	30
Link Distance (ft)	40
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1439	0	0	5	0
Future Vol, veh/h	0	1439	0	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	60	60
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1564	0	0	8	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	782	-
Stage 1	-	-	0	-
Stage 2	-	-	782	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	335	0
Stage 1	0	-	-	0
Stage 2	0	-	417	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	335	-
Mov Cap-2 Maneuver	-	-	335	-
Stage 1	-	-	-	-
Stage 2	-	-	417	-

Approach	EB	SB
HCM Control Delay, s	0	16
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	335
HCM Lane V/C Ratio	-	0.025
HCM Control Delay (s)	-	16
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1438	6	0	0	0	6
Future Vol, veh/h	1438	6	0	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	60	60
Heavy Vehicles, %	10	10	2	2	67	67
Mvmt Flow	1514	6	0	0	0	10

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	760
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	8.24
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.97
Pot Cap-1 Maneuver	-	-		0	235
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	235
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	21
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	235	-	-
HCM Lane V/C Ratio	0.043	-	-
HCM Control Delay (s)	21	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1375	4	0
Future Vol, veh/h	0	0	0	1375	4	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	89	89	60	60
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1545	7	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	773	-
Stage 1	-	-	0	-
Stage 2	-	-	773	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	340	0
Stage 1	0	-	-	0
Stage 2	0	-	421	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	340	-
Mov Cap-2 Maneuver	-	-	340	-
Stage 1	-	-	-	-
Stage 2	-	-	421	-

Approach	WB	NB
HCM Control Delay, s	0	15.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	340	-
HCM Lane V/C Ratio	0.02	-
HCM Control Delay (s)	15.8	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.1	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1440	0	0	1	0
Future Vol, veh/h	0	1440	0	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	92	92	60	60
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1532	0	0	2	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	766	-
Stage 1	-	-	0	-
Stage 2	-	-	766	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	343	0
Stage 1	0	-	-	0
Stage 2	0	-	425	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	343	-
Mov Cap-2 Maneuver	-	-	343	-
Stage 1	-	-	-	-
Stage 2	-	-	425	-

Approach	EB	SB
HCM Control Delay, s	0	15.5
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	343
HCM Lane V/C Ratio	-	0.005
HCM Control Delay (s)	-	15.5
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1369	7	0
Future Vol, veh/h	0	0	0	1369	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1441	12	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	721	-
Stage 1	-	-	0	-
Stage 2	-	-	721	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	367	0
Stage 1	0	-	-	0
Stage 2	0	-	448	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	367	-
Mov Cap-2 Maneuver	-	-	367	-
Stage 1	-	-	-	-
Stage 2	-	-	448	-

Approach	WB	NB
HCM Control Delay, s	0	15.1
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	367	-
HCM Lane V/C Ratio	0.032	-
HCM Control Delay (s)	15.1	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1751	0	0	38	0
Future Vol, veh/h	0	1751	0	0	38	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	69	69
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1843	0	0	55	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	922	-
Stage 1	-	-	0	-
Stage 2	-	-	922	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	273	0
Stage 1	0	-	-	0
Stage 2	0	-	353	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	273	-
Mov Cap-2 Maneuver	-	-	273	-
Stage 1	-	-	-	-
Stage 2	-	-	353	-

Approach	EB	SB
HCM Control Delay, s	0	21.5
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	273
HCM Lane V/C Ratio	-	0.202
HCM Control Delay (s)	-	21.5
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1757	32	0	0	0	28
Future Vol, veh/h	1757	32	0	0	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	61	61
Heavy Vehicles, %	4	4	2	2	11	11
Mvmt Flow	1849	34	0	0	0	46

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	942
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.12
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.41
Pot Cap-1 Maneuver	-	-		0	248
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	248
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	22.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	248	-	-
HCM Lane V/C Ratio	0.185	-	-
HCM Control Delay (s)	22.8	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.7	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1607	136	0
Future Vol, veh/h	0	0	0	1607	136	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1692	227	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	846	-
Stage 1	-	-	0	-
Stage 2	-	-	846	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	305	0
Stage 1	0	-	-	0
Stage 2	0	-	386	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	305	-
Mov Cap-2 Maneuver	-	-	305	-
Stage 1	-	-	-	-
Stage 2	-	-	386	-

Approach	WB	NB
HCM Control Delay, s	0	44.4
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	305	-
HCM Lane V/C Ratio	0.743	-
HCM Control Delay (s)	44.4	-
HCM Lane LOS	E	-
HCM 95th %tile Q(veh)	5.5	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1649	0	0	1	0
Future Vol, veh/h	0	1649	0	0	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	60	60
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1736	0	0	2	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	868	-
Stage 1	-	-	0	-
Stage 2	-	-	868	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

Approach	EB	SB
HCM Control Delay, s	0	17.2
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	296
HCM Lane V/C Ratio	-	0.006
HCM Control Delay (s)	-	17.2
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1596	12	0
Future Vol, veh/h	0	0	0	1596	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	60
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1680	20	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	840	-
Stage 1	-	-	0	-
Stage 2	-	-	840	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	308	0
Stage 1	0	-	-	0
Stage 2	0	-	389	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	308	-
Mov Cap-2 Maneuver	-	-	308	-
Stage 1	-	-	-	-
Stage 2	-	-	389	-

Approach	WB	NB
HCM Control Delay, s	0	17.5
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	308	-
HCM Lane V/C Ratio	0.065	-
HCM Control Delay (s)	17.5	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.2	-

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	30
Average Queue (ft)	3
95th Queue (ft)	17
Link Distance (ft)	27
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	64
Average Queue (ft)	8
95th Queue (ft)	38
Link Distance (ft)	58
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	40
Average Queue (ft)	3
95th Queue (ft)	19
Link Distance (ft)	50
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	52
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	21
Link Distance (ft)	40
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	68
Average Queue (ft)	30
95th Queue (ft)	63
Link Distance (ft)	27
Upstream Blk Time (%)	24
Queuing Penalty (veh)	10
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB
Directions Served	L
Maximum Queue (ft)	21
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	65
Average Queue (ft)	19
95th Queue (ft)	50
Link Distance (ft)	58
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	95
Average Queue (ft)	62
95th Queue (ft)	108
Link Distance (ft)	50
Upstream Blk Time (%)	38
Queuing Penalty (veh)	63
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB	EB	EB
Directions Served	L	T	T
Maximum Queue (ft)	190	156	122
Average Queue (ft)	37	21	17
95th Queue (ft)	157	135	119
Link Distance (ft)		299	299
Upstream Blk Time (%)	1	1	0
Queuing Penalty (veh)	0	7	1
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	2	0	
Queuing Penalty (veh)	18	0	

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	22
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	52
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	46
Average Queue (ft)	10
95th Queue (ft)	33
Link Distance (ft)	40
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1482	0	0	112	0
Future Vol, veh/h	0	1482	0	0	112	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1611	0	0	122	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	806	-
Stage 1	-	-	0	-
Stage 2	-	-	806	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	324	0
Stage 1	0	-	-	0
Stage 2	0	-	405	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	324	-
Mov Cap-2 Maneuver	-	-	324	-
Stage 1	-	-	-	-
Stage 2	-	-	405	-

Approach	EB	SB
HCM Control Delay, s	0	22.6
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	324
HCM Lane V/C Ratio	-	0.376
HCM Control Delay (s)	-	22.6
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	1.7

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1476	118	0	0	0	30
Future Vol, veh/h	1476	118	0	0	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	60	60
Heavy Vehicles, %	10	10	2	2	29	29
Mvmt Flow	1554	124	0	0	0	50

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	839
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.48
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.59
Pot Cap-1 Maneuver	-	-		0	259
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	259
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	22.2
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	259	-	-
HCM Lane V/C Ratio	0.193	-	-
HCM Control Delay (s)	22.2	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.7	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1423	123	0
Future Vol, veh/h	0	0	0	1423	123	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	89	89	92	92
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1599	134	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	800	-
Stage 1	-	-	0	-
Stage 2	-	-	800	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	327	0
Stage 1	0	-	-	0
Stage 2	0	-	408	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	327	-
Mov Cap-2 Maneuver	-	-	327	-
Stage 1	-	-	-	-
Stage 2	-	-	408	-

Approach	WB	NB
HCM Control Delay, s	0	23.4
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	327	-
HCM Lane V/C Ratio	0.409	-
HCM Control Delay (s)	23.4	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.9	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1479	0	0	10	0
Future Vol, veh/h	0	1479	0	0	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	92	92	92	92
Heavy Vehicles, %	10	10	2	2	0	0
Mvmt Flow	0	1573	0	0	11	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	787	-
Stage 1	-	-	0	-
Stage 2	-	-	787	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	333	0
Stage 1	0	-	-	0
Stage 2	0	-	414	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	333	-
Mov Cap-2 Maneuver	-	-	333	-
Stage 1	-	-	-	-
Stage 2	-	-	414	-

Approach	EB	SB
HCM Control Delay, s	0	16.2
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	333
HCM Lane V/C Ratio	-	0.033
HCM Control Delay (s)	-	16.2
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1412	21	0
Future Vol, veh/h	0	0	0	1412	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	8	8	0	0
Mvmt Flow	0	0	0	1486	23	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	743	-
Stage 1	-	-	0	-
Stage 2	-	-	743	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	355	0
Stage 1	0	-	-	0
Stage 2	0	-	436	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	355	-
Mov Cap-2 Maneuver	-	-	355	-
Stage 1	-	-	-	-
Stage 2	-	-	436	-

Approach	WB	NB
HCM Control Delay, s	0	15.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	355	-
HCM Lane V/C Ratio	0.064	-
HCM Control Delay (s)	15.8	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.2	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1396	110	0	0	0	206
Future Vol, veh/h	1396	110	0	0	0	206
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	10	10	2	2	2	2
Mvmt Flow	1469	116	0	0	0	224

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	793
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	331
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	331
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	35.9
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	331	-	-
HCM Lane V/C Ratio	0.676	-	-
HCM Control Delay (s)	35.9	-	-
HCM Lane LOS	E	-	-
HCM 95th %tile Q(veh)	4.7	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1475	14	0	0	0	39
Future Vol, veh/h	1475	14	0	0	0	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1603	15	0	0	0	42

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	809
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	323
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	323
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	17.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	323	-	-
HCM Lane V/C Ratio	0.131	-	-
HCM Control Delay (s)	17.8	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.4	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	8	0	22	0	107	11	0
Future Vol, veh/h	0	0	0	0	0	8	0	22	0	107	11	0
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	9	0	24	0	116	12	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	273	268	12	268	268	24	12	0	0	24	0	0
Stage 1	244	244	-	24	24	-	-	-	-	-	-	-
Stage 2	29	24	-	244	244	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	679	638	1069	685	638	1052	1607	-	-	1591	-	-
Stage 1	760	704	-	994	875	-	-	-	-	-	-	-
Stage 2	988	875	-	760	704	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	636	591	1069	647	591	1052	1607	-	-	1591	-	-
Mov Cap-2 Maneuver	636	591	-	647	591	-	-	-	-	-	-	-
Stage 1	760	653	-	994	875	-	-	-	-	-	-	-
Stage 2	980	875	-	705	653	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	8.5	0	6.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1607	-	-	-	1052	1591	-	-
HCM Lane V/C Ratio	-	-	-	-	0.008	0.073	-	-
HCM Control Delay (s)	0	-	-	0	8.5	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	16	6	0	5	6
Future Vol, veh/h	0	16	6	0	5	6
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	67	67	2	2
Mvmt Flow	0	17	7	0	5	7

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	24	7	0	0	7	0
Stage 1	7	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	992	1075	-	-	1614	-
Stage 1	1016	-	-	-	-	-
Stage 2	1006	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	989	1075	-	-	1614	-
Mov Cap-2 Maneuver	989	-	-	-	-	-
Stage 1	1016	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.4	0	3.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1075	1614	-
HCM Lane V/C Ratio	-	-	0.016	0.003	-
HCM Control Delay (s)	-	-	8.4	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1812	0	0	125	0
Future Vol, veh/h	0	1812	0	0	125	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1907	0	0	136	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	954	-
Stage 1	-	-	0	-
Stage 2	-	-	954	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	260	0
Stage 1	0	-	-	0
Stage 2	0	-	339	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	260	-
Mov Cap-2 Maneuver	-	-	260	-
Stage 1	-	-	-	-
Stage 2	-	-	339	-

Approach	EB	SB
HCM Control Delay, s	0	33.1
HCM LOS		D

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	260
HCM Lane V/C Ratio	-	0.523
HCM Control Delay (s)	-	33.1
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	2.8

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1798	139	0	0	0	46
Future Vol, veh/h	1798	139	0	0	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	61	61
Heavy Vehicles, %	4	4	2	2	9	9
Mvmt Flow	1893	146	0	0	0	75

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	1020
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	7.08
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.39
Pot Cap-1 Maneuver	-	-		0	222
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	222
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	29.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	222	-	-
HCM Lane V/C Ratio	0.34	-	-
HCM Control Delay (s)	29.3	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	1.4	-	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1646	230	0
Future Vol, veh/h	0	0	0	1646	230	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1733	250	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	867	-
Stage 1	-	-	0	-
Stage 2	-	-	867	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	377	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	377	-

Approach	WB	NB
HCM Control Delay, s	0	58.6
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	296	-
HCM Lane V/C Ratio	0.845	-
HCM Control Delay (s)	58.6	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	7.2	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↰	
Traffic Vol, veh/h	0	1691	0	0	28	0
Future Vol, veh/h	0	1691	0	0	28	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	5	5	2	2	0	0
Mvmt Flow	0	1780	0	0	30	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	890	-
Stage 1	-	-	0	-
Stage 2	-	-	890	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	286	0
Stage 1	0	-	-	0
Stage 2	0	-	366	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	286	-
Mov Cap-2 Maneuver	-	-	286	-
Stage 1	-	-	-	-
Stage 2	-	-	366	-

Approach	EB	SB
HCM Control Delay, s	0	19.1
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	286
HCM Lane V/C Ratio	-	0.106
HCM Control Delay (s)	-	19.1
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.4

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Vol, veh/h	0	0	0	1652	22	0
Future Vol, veh/h	0	0	0	1652	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	3	3	0	0
Mvmt Flow	0	0	0	1739	24	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	-	-	870	-
Stage 1	-	-	0	-
Stage 2	-	-	870	-
Critical Hdwy	-	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.8	-
Follow-up Hdwy	-	-	3.5	-
Pot Cap-1 Maneuver	0	-	295	0
Stage 1	0	-	-	0
Stage 2	0	-	375	0
Platoon blocked, %		-		
Mov Cap-1 Maneuver	-	-	295	-
Mov Cap-2 Maneuver	-	-	295	-
Stage 1	-	-	-	-
Stage 2	-	-	375	-

Approach	WB	NB
HCM Control Delay, s	0	18.3
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	295	-
HCM Lane V/C Ratio	0.081	-
HCM Control Delay (s)	18.3	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.3	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1754	90	0	0	0	167
Future Vol, veh/h	1754	90	0	0	0	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	1846	95	0	0	0	182

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	971
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	252
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	252
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	49
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	252	-	-
HCM Lane V/C Ratio	0.72	-	-
HCM Control Delay (s)	49	-	-
HCM Lane LOS	E	-	-
HCM 95th %tile Q(veh)	4.9	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1676	43	0	0	0	26
Future Vol, veh/h	1676	43	0	0	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	5	5	2	2	2	2
Mvmt Flow	1764	45	0	0	0	28

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	905
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	279
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	279
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	19.4
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	279	-	-
HCM Lane V/C Ratio	0.101	-	-
HCM Control Delay (s)	19.4	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.3	-	-

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	7	0	39	0	88	51	0
Future Vol, veh/h	0	0	0	0	0	7	0	39	0	88	51	0
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	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	8	0	42	0	96	55	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	293	289	55	289	289	42	55	0	0	42	0	0
Stage 1	247	247	-	42	42	-	-	-	-	-	-	-
Stage 2	46	42	-	247	247	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	659	621	1012	663	621	1029	1550	-	-	1567	-	-
Stage 1	757	702	-	972	860	-	-	-	-	-	-	-
Stage 2	968	860	-	757	702	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	623	582	1012	631	582	1029	1550	-	-	1567	-	-
Mov Cap-2 Maneuver	623	582	-	631	582	-	-	-	-	-	-	-
Stage 1	757	658	-	972	860	-	-	-	-	-	-	-
Stage 2	961	860	-	709	658	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	8.5	0	4.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1550	-	-	-	1029	1567	-	-
HCM Lane V/C Ratio	-	-	-	-	0.007	0.061	-	-
HCM Control Delay (s)	0	-	-	0	8.5	7.4	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	28	0	19	32
Future Vol, veh/h	0	11	28	0	19	32
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	92	92	61	61	92	92
Heavy Vehicles, %	2	2	11	11	2	2
Mvmt Flow	0	12	46	0	21	35

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	123	46	0	0	46	0
Stage 1	46	-	-	-	-	-
Stage 2	77	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	872	1023	-	-	1562	-
Stage 1	976	-	-	-	-	-
Stage 2	946	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	860	1023	-	-	1562	-
Mov Cap-2 Maneuver	860	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	933	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	2.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1023	1562	-
HCM Lane V/C Ratio	-	-	0.012	0.013	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	73
Average Queue (ft)	49
95th Queue (ft)	79
Link Distance (ft)	27
Upstream Blk Time (%)	45
Queuing Penalty (veh)	51
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB
Directions Served	L
Maximum Queue (ft)	107
Average Queue (ft)	14
95th Queue (ft)	61
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	5	68
Average Queue (ft)	0	24
95th Queue (ft)	4	62
Link Distance (ft)	501	58
Upstream Blk Time (%)		1
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	95
Average Queue (ft)	56
95th Queue (ft)	97
Link Distance (ft)	50
Upstream Blk Time (%)	24
Queuing Penalty (veh)	30
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	84	7
Average Queue (ft)	8	0
95th Queue (ft)	48	5
Link Distance (ft)		299
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	38
Average Queue (ft)	10
95th Queue (ft)	34
Link Distance (ft)	52
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	52
Average Queue (ft)	15
95th Queue (ft)	40
Link Distance (ft)	40
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Site Drive # 1 & EB M-59

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	14	159
Average Queue (ft)	0	68
95th Queue (ft)	7	124
Link Distance (ft)	286	240
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 70: Site Drive # 2 & EB M-59

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	11	61
Average Queue (ft)	0	27
95th Queue (ft)	8	56
Link Distance (ft)	393	575
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 80: Hartland Glen Lane/ Cundy Road & Cundy Road/Site Drive # 4

Movement	WB	SB
Directions Served	LTR	LTR
Maximum Queue (ft)	29	22
Average Queue (ft)	7	1
95th Queue (ft)	27	13
Link Distance (ft)	209	58
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 90: Hartland Glen Lane/ Cundy Road & Site Drive # 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	11
95th Queue (ft)	34
Link Distance (ft)	259
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 82

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	1564	1562	73
Average Queue (ft)	766	766	65
95th Queue (ft)	1934	1939	77
Link Distance (ft)	1517	1517	27
Upstream Blk Time (%)	37	36	100
Queuing Penalty (veh)	0	0	124
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB	WB	WB
Directions Served	L	T	T
Maximum Queue (ft)	300	1178	1189
Average Queue (ft)	267	789	564
95th Queue (ft)	370	1550	1436
Link Distance (ft)		1147	1147
Upstream Blk Time (%)		31	10
Queuing Penalty (veh)		283	96
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	81	0	
Queuing Penalty (veh)	714	0	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (ft)	519	562	87
Average Queue (ft)	349	213	52
95th Queue (ft)	714	617	85
Link Distance (ft)	501	501	58
Upstream Blk Time (%)	47	14	62
Queuing Penalty (veh)	455	139	29
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	WB	WB	NB
Directions Served	T	T	L
Maximum Queue (ft)	142	165	95
Average Queue (ft)	58	42	90
95th Queue (ft)	160	150	101
Link Distance (ft)	120	120	50
Upstream Blk Time (%)	28	8	100
Queuing Penalty (veh)	228	67	230
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB	EB	EB
Directions Served	L	T	T
Maximum Queue (ft)	299	349	264
Average Queue (ft)	280	305	58
95th Queue (ft)	339	396	248
Link Distance (ft)		299	299
Upstream Blk Time (%)	69	80	1
Queuing Penalty (veh)	0	768	7
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	90	3	
Queuing Penalty (veh)	759	6	

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	35
Average Queue (ft)	17
95th Queue (ft)	41
Link Distance (ft)	52
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement	WB	WB	WB
Directions Served	L	T	T
Maximum Queue (ft)	210	760	767
Average Queue (ft)	29	224	228
95th Queue (ft)	188	754	762
Link Distance (ft)		1035	1035
Upstream Blk Time (%)		5	5
Queuing Penalty (veh)		38	38
Storage Bay Dist (ft)	300		
Storage Blk Time (%)		24	
Queuing Penalty (veh)		7	

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	WB	WB	NB
Directions Served	T	T	L
Maximum Queue (ft)	392	382	48
Average Queue (ft)	59	58	9
95th Queue (ft)	511	505	33
Link Distance (ft)	1459	1459	40
Upstream Blk Time (%)	3	3	1
Queuing Penalty (veh)	0	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Site Drive # 1 & EB M-59

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (ft)	302	352	253
Average Queue (ft)	244	101	213
95th Queue (ft)	399	328	305
Link Distance (ft)	286	286	240
Upstream Blk Time (%)	63	7	82
Queuing Penalty (veh)	574	63	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 70: Site Drive # 2 & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	56
Average Queue (ft)	22
95th Queue (ft)	50
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 80: Hartland Glen Lane/ Cundy Road & Cundy Road/Site Drive # 4

Movement	WB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	79	233	43
Average Queue (ft)	16	95	4
95th Queue (ft)	58	255	23
Link Distance (ft)	209	231	58
Upstream Blk Time (%)		21	0
Queuing Penalty (veh)		7	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 90: Hartland Glen Lane/ Cundy Road & Site Drive # 3

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	52	129	6
Average Queue (ft)	12	19	0
95th Queue (ft)	42	105	4
Link Distance (ft)	259	930	231
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 4630

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↰	
Traffic Volume (vph)	0	0	0	1423	123	0
Future Volume (vph)	0	0	0	1423	123	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.5	8.1	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				3343	1805	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				3343	1805	
Peak-hour factor, PHF	0.92	0.92	0.89	0.89	0.92	0.92
Adj. Flow (vph)	0	0	0	1599	134	0
RTOR Reduction (vph)	0	0	0	0	13	0
Lane Group Flow (vph)	0	0	0	1599	121	0
Heavy Vehicles (%)	2%	2%	8%	8%	0%	0%
Turn Type				NA	Prot	
Protected Phases				8	2	
Permitted Phases						
Actuated Green, G (s)				29.6	8.8	
Effective Green, g (s)				29.6	8.8	
Actuated g/C Ratio				0.56	0.17	
Clearance Time (s)				6.5	8.1	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				1867	299	
v/s Ratio Prot				c0.48	c0.07	
v/s Ratio Perm						
v/c Ratio				0.86	0.41	
Uniform Delay, d1				9.9	19.8	
Progression Factor				1.00	1.00	
Incremental Delay, d2				4.1	0.9	
Delay (s)				14.0	20.7	
Level of Service				B	C	
Approach Delay (s)	0.0			14.0	20.7	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	53.0	Sum of lost time (s)	14.6
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1396	110	0	0	0	206
Future Vol, veh/h	1396	110	0	0	0	206
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	10	10	2	2	2	2
Mvmt Flow	1469	116	0	0	0	224

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	735
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	362
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	362
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	29.8
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	362	-	-
HCM Lane V/C Ratio	0.619	-	-
HCM Control Delay (s)	29.8	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	4	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1475	14	0	0	0	39
Future Vol, veh/h	1475	14	0	0	0	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	250	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1603	15	0	0	0	42

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	802
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	327
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	327
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	17.6
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	327	-	-
HCM Lane V/C Ratio	0.13	-	-
HCM Control Delay (s)	17.6	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.4	-	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	1646	230	0
Future Volume (vph)	0	0	0	1646	230	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.5	8.1	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				3505	1805	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				3505	1805	
Peak-hour factor, PHF	0.92	0.92	0.95	0.95	0.92	0.92
Adj. Flow (vph)	0	0	0	1733	250	0
RTOR Reduction (vph)	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	1733	244	0
Heavy Vehicles (%)	2%	2%	3%	3%	0%	0%
Turn Type				NA	Prot	
Protected Phases				6	8	
Permitted Phases						
Actuated Green, G (s)				32.8	13.1	
Effective Green, g (s)				32.8	13.1	
Actuated g/C Ratio				0.54	0.22	
Clearance Time (s)				6.5	8.1	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				1900	390	
v/s Ratio Prot				c0.49	c0.14	
v/s Ratio Perm						
v/c Ratio				0.91	0.62	
Uniform Delay, d1				12.5	21.5	
Progression Factor				1.00	1.00	
Incremental Delay, d2				7.1	3.1	
Delay (s)				19.7	24.6	
Level of Service				B	C	
Approach Delay (s)	0.0			19.7	24.6	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	14.6
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1754	90	0	0	0	167
Future Vol, veh/h	1754	90	0	0	0	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	1846	95	0	0	0	182

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	923
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	272
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	272
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	41.3
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	272	-	-
HCM Lane V/C Ratio	0.667	-	-
HCM Control Delay (s)	41.3	-	-
HCM Lane LOS	E	-	-
HCM 95th %tile Q(veh)	4.3	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1676	43	0	0	0	26
Future Vol, veh/h	1676	43	0	0	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	250	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	5	5	2	2	2	2
Mvmt Flow	1764	45	0	0	0	28

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	882
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.94
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.32
Pot Cap-1 Maneuver	-	-		0	289
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	289
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	18.8
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	289	-	-
HCM Lane V/C Ratio	0.098	-	-
HCM Control Delay (s)	18.8	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.3	-	-

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	73
Average Queue (ft)	51
95th Queue (ft)	78
Link Distance (ft)	27
Upstream Blk Time (%)	44
Queuing Penalty (veh)	50
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB
Directions Served	L
Maximum Queue (ft)	85
Average Queue (ft)	11
95th Queue (ft)	49
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	31	68
Average Queue (ft)	1	25
95th Queue (ft)	13	62
Link Distance (ft)	501	45
Upstream Blk Time (%)		2
Queuing Penalty (veh)		1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	WB	WB	NB
Directions Served	T	T	L
Maximum Queue (ft)	157	162	95
Average Queue (ft)	103	103	59
95th Queue (ft)	155	160	95
Link Distance (ft)	120	120	50
Upstream Blk Time (%)	3	4	17
Queuing Penalty (veh)	24	28	21
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB
Directions Served	L
Maximum Queue (ft)	46
Average Queue (ft)	4
95th Queue (ft)	23
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	SB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	12
95th Queue (ft)	39
Link Distance (ft)	52
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement	WB	WB
Directions Served	T	T
Maximum Queue (ft)	100	109
Average Queue (ft)	18	17
95th Queue (ft)	67	67
Link Distance (ft)	1035	1035
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	47
Average Queue (ft)	15
95th Queue (ft)	40
Link Distance (ft)	40
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 60: Site Drive # 1 & EB M-59

Movement	EB	NB
Directions Served	T	R
Maximum Queue (ft)	9	132
Average Queue (ft)	0	60
95th Queue (ft)	6	107
Link Distance (ft)	286	232
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 70: Site Drive # 2 & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	55
Average Queue (ft)	20
95th Queue (ft)	44
Link Distance (ft)	562
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 80: Hartland Glen Lane/ Cundy Road & Cundy Road/Site Drive # 4

Movement	WB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	29	10	35
Average Queue (ft)	7	0	3
95th Queue (ft)	27	5	18
Link Distance (ft)	209	231	45
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 90: Hartland Glen Lane/ Cundy Road & Site Drive # 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	12
95th Queue (ft)	36
Link Distance (ft)	259
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 124

Intersection: 10: EB M-59 & WB to EB XO W. of Hartland Glen

Movement	SB
Directions Served	L
Maximum Queue (ft)	73
Average Queue (ft)	66
95th Queue (ft)	87
Link Distance (ft)	27
Upstream Blk Time (%)	83
Queuing Penalty (veh)	104
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 11: WB to EB XO W. of Hartland Glen & WB M-59

Movement	WB	WB	WB
Directions Served	L	T	T
Maximum Queue (ft)	253	283	301
Average Queue (ft)	103	57	45
95th Queue (ft)	272	308	279
Link Distance (ft)		1147	1147
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	13	0	
Queuing Penalty (veh)	110	0	

Intersection: 20: Hartland Glen Lane/ Cundy Road & EB M-59

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	4	56
Average Queue (ft)	0	27
95th Queue (ft)	3	55
Link Distance (ft)	501	45
Upstream Blk Time (%)		4
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: EB to WB XO E. of Hartland Glen & WB M-59

Movement	WB	WB	NB
Directions Served	T	T	L
Maximum Queue (ft)	156	157	95
Average Queue (ft)	125	131	81
95th Queue (ft)	154	162	112
Link Distance (ft)	120	120	50
Upstream Blk Time (%)	13	15	34
Queuing Penalty (veh)	109	122	79
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 31: EB M-59 & EB to WB XO E. of Hartland Glen

Movement	EB
Directions Served	L
Maximum Queue (ft)	85
Average Queue (ft)	23
95th Queue (ft)	67
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: EB M-59 & WB to EB XO E. of Hartland Glen Lane

Movement	EB	SB
Directions Served	T	L
Maximum Queue (ft)	5	52
Average Queue (ft)	0	18
95th Queue (ft)	3	45
Link Distance (ft)	124	52
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: WB to EB XO E. of Hartland Glen Lane & WB M-59

Movement	WB	WB
Directions Served	T	T
Maximum Queue (ft)	240	259
Average Queue (ft)	80	82
95th Queue (ft)	195	202
Link Distance (ft)	1035	1035
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 50: EB to WB XO W. of Fenton Road & WB M-59

Movement	NB
Directions Served	L
Maximum Queue (ft)	59
Average Queue (ft)	19
95th Queue (ft)	46
Link Distance (ft)	40
Upstream Blk Time (%)	3
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 51: EB M-59 & EB to WB XO W. of Fenton Road

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	3
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Site Drive # 1 & EB M-59

Movement	EB	NB
Directions Served	T	R
Maximum Queue (ft)	9	170
Average Queue (ft)	0	73
95th Queue (ft)	6	137
Link Distance (ft)	286	232
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 70: Site Drive # 2 & EB M-59

Movement	NB
Directions Served	R
Maximum Queue (ft)	47
Average Queue (ft)	14
95th Queue (ft)	37
Link Distance (ft)	562
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 80: Hartland Glen Lane/ Cundy Road & Cundy Road/Site Drive # 4

Movement	WB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	29	42	30
Average Queue (ft)	5	2	3
95th Queue (ft)	23	20	18
Link Distance (ft)	209	231	45
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

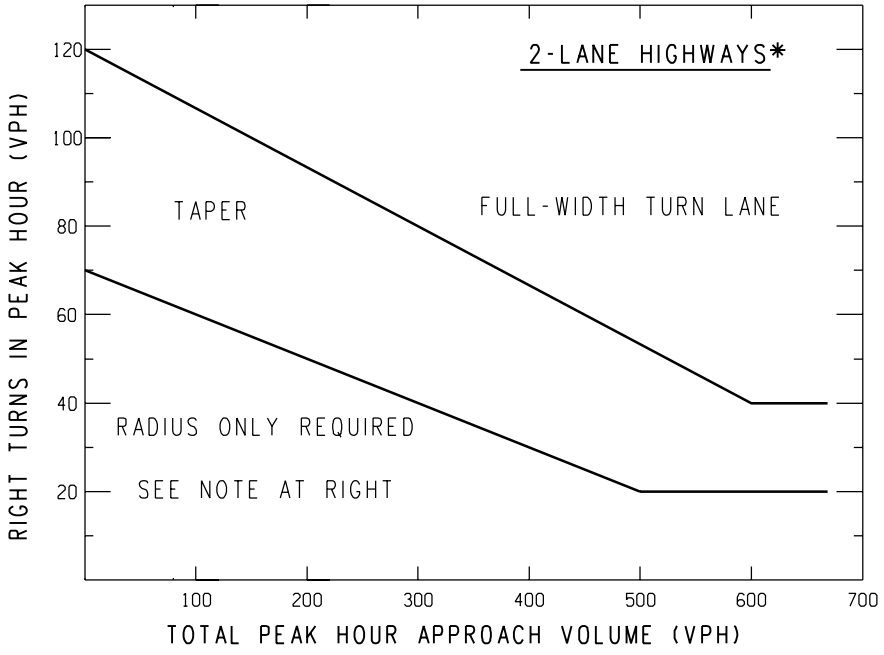
Intersection: 90: Hartland Glen Lane/ Cundy Road & Site Drive # 3

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	31	23
Average Queue (ft)	10	1
95th Queue (ft)	33	9
Link Distance (ft)	259	231
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

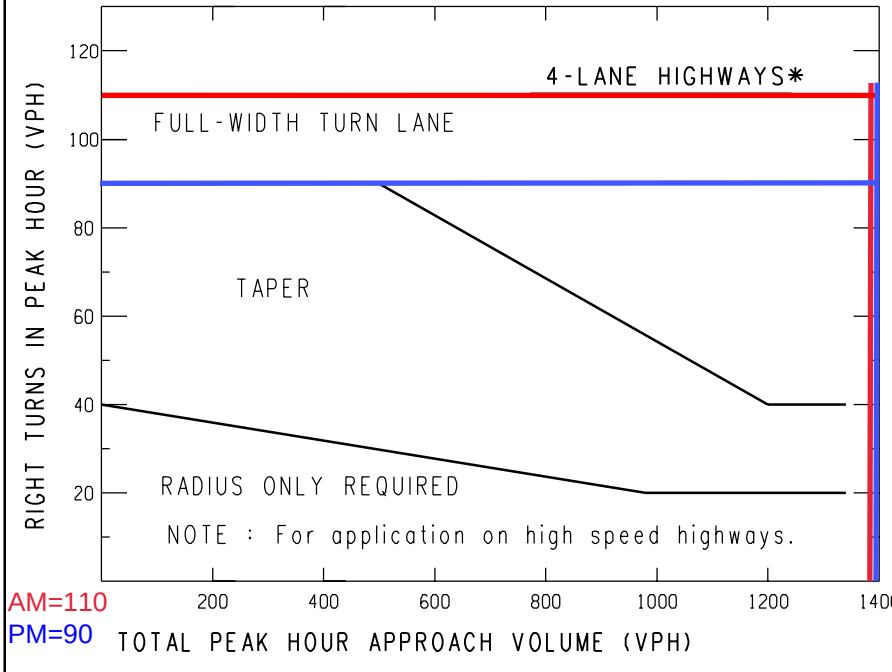
Zone wide Queuing Penalty: 525

EB M-59 & Site Drive # 1



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



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

AM=110
PM=90

AM=1506
PM=1844

Full-Width RT Lane Recommended

Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour 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.

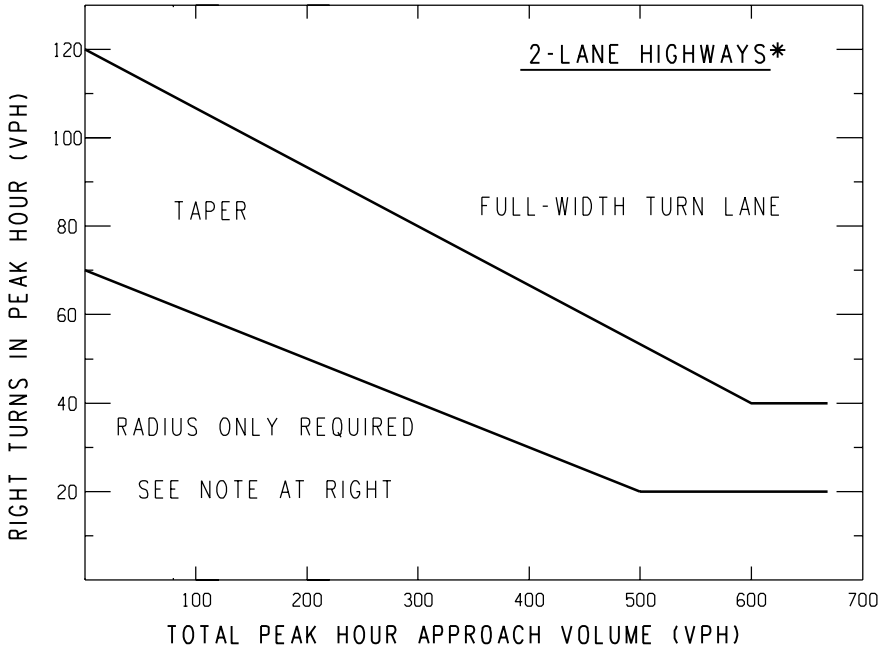
MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY NOTE

TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS

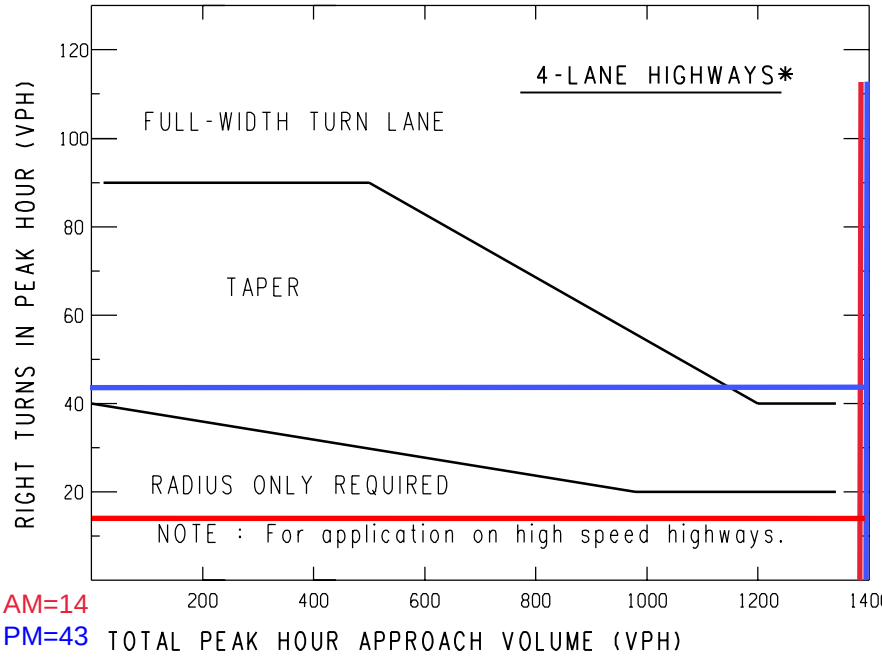
DRAWN BY: MTS	08/05/2004	604A	SHEET 2 OF 2
CHECKED BY: JAT	PLAN DATE:		
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

EB M-59 & Site Drive # 2



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



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

AM=1489
PM=1719

Full-width RT Lane Recommended

Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour 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.

MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY NOTE

TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS

DRAWN BY: MTS	08/05/2004	604A	SHEET 2 OF 2
CHECKED BY: JAT	PLAN DATE:		
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

Summary of Warrants

Spot Number:	Future Conditions		
Major Street:	WB (M-59)	Minor Street:	EB-to-WB X/O, E. of H
Intersection:	WB (M-59) at EB-to-WB X/O, E. of Hartland Glen Ln		
City/Twp:	Hartland Township		
Date Performed:	6/19/2023	Performed By:	F&V
Date Volumes Collected:	5/17/2023		

Warrant	Condition	Is Warrant Met
Data Validation Error		**NO**
WARRANT 1: Eight-Hour Vehicular Volume		**YES**
	Condition A	NO
	Condition B	YES
	Condition A&B	N/A
WARRANT 2: Four-Hour Vehicular Volume	(70%)	**YES**
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	**YES**
	Condition A	**N/A**
	Condition B	**YES**
WARRANT 4: Pedestrian Volume	(70%)	**NO**
	Four Hour	N/A
	Peak Hour	N/A
(Threshold)	HAWK	NO
(Threshold)	RRFB	NO
WARRANT 5: School Crossing		**NO**
WARRANT 6: Coordinated Signal System		**NO**
WARRANT 7: Crash Experience		**NO**
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		**NO**
WARRANT 9: Intersection Near a Grade Crossing		**#N/A**

Issue to Be Addressed by Signalization:

0

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 1: Eight-Hour Vehicular Volume

Intersection:	WB (M-59) @ EB-to-WB X/O, E. of Hartland Glen Ln		
Date	6/19/2023	by	F&V

2	**: No. of Lanes on Major St?**
1	**: No. of Lanes on Minor St?**
55	**: Speed limit or 85th Percentile? (MPH)**
NO	**: Is the intersection within an Isolated community?**
0	**: if answer 4 is Yes, then what is the of the population isolated community?**
NO	**: Have other remedial measures been tried?**

USE 70% WARRANTS 1A AND 1B. DO NOT USE COMBINATION OF A & B

	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?	
Time	**E-W**	N-S												
00:01 - 01:00	70	14	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
01:00 - 02:00	42	8	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
02:00 - 03:00	39	7	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
03:00 - 04:00	56	7	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
04:00 - 05:00	112	14	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
05:00 - 06:00	397	30	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
06:00 - 07:00	834	53	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
07:00 - 08:00	1117	76	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
08:00 - 09:00	1043	80	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
09:00 - 10:00	934	68	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
10:00 - 11:00	941	68	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
11:00 - 12:00	1001	55	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
12:00 - 13:00	1002	68	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
13:00 - 14:00	938	57	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
14:00 - 15:00	1086	54	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
15:00 - 16:00	1055	59	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
16:00 - 17:00	969	82	420	105	**NO**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
17:00 - 18:00	1041	151	420	105	**YES**	630	53	**YES**	N/A	N/A	N/A	N/A	**N/A**	
18:00 - 19:00	830	52	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
19:00 - 20:00	631	40	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
20:00 - 21:00	516	35	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
21:00 - 22:00	315	27	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
22:00 - 23:00	183	20	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	
23:00 - 00:00	104	16	420	105	**NO**	630	53	**NO**	N/A	N/A	N/A	N/A	**N/A**	

Number of Hours that met the warrant 1A =	**1**
Number of Hours that met the warrant 1B =	**12**
Number of Hours that met the warrant 1 A & B =	**0**

A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)	**NO**
B. Is the Interruption of Continuous Traffic Met? (Condition B)	**YES**
C. Combination of Warrants A and B Criteria Met?	**N/A**

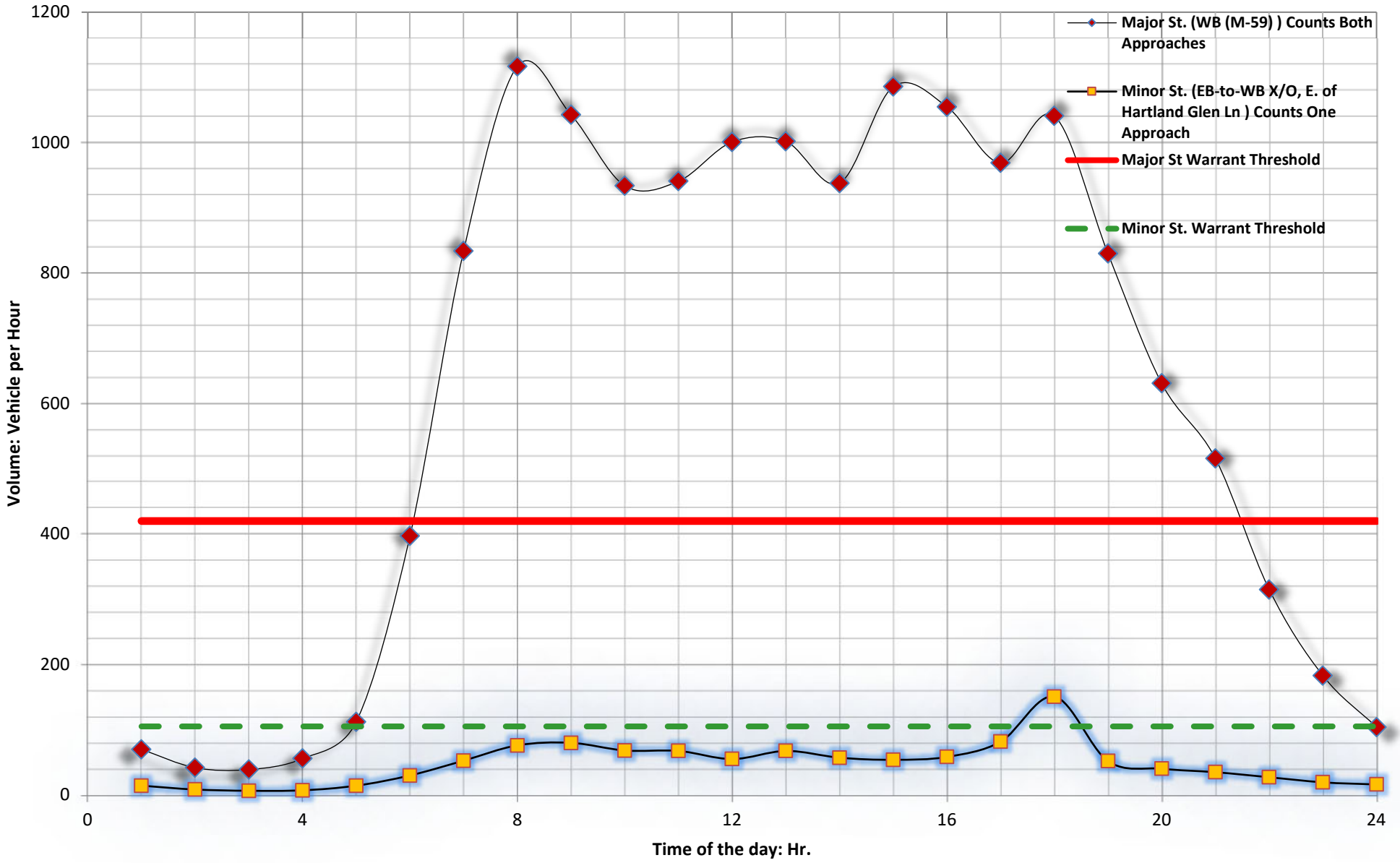


FIGURE 1: WARRANT **1A**

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? **YES**

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? **NO**

Spot Number: **Future Conditions**

WB (M-59) @ EB-to-WB X/O, E. of Hartland Glen Ln

NO. OF LANES ON MAJOR ST.? **2**

NO. OF LANES ON MINOR ST.? **1**

Number of Hours that met the Warrant: **1**

Does this intersection meet Warrant 1A for signal installation? **NO**

Data Collection Date: **5/17/20**

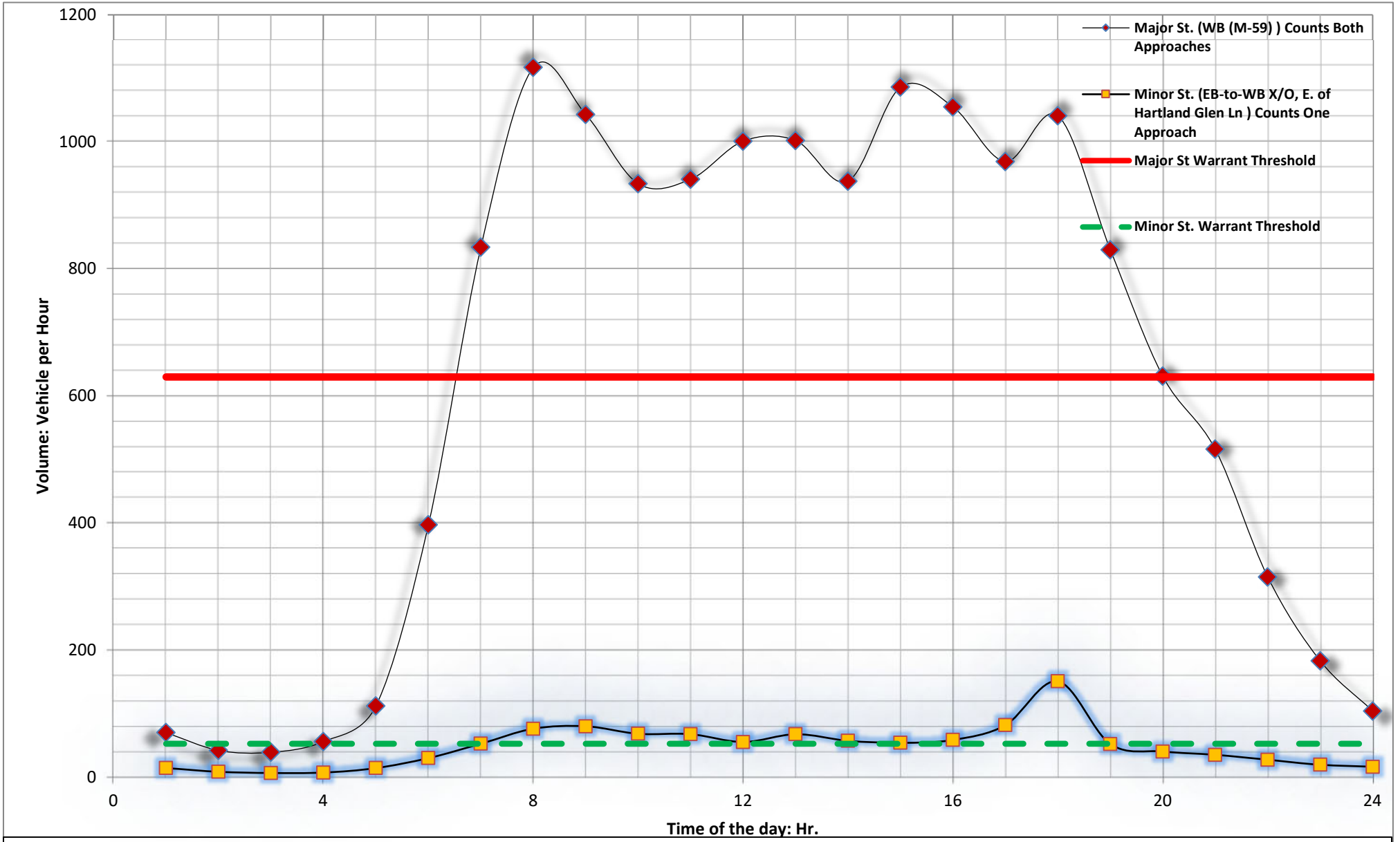


FIGURE 1: WARRANT **1B**

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? YES

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number: Future Conditions

WB (M-59) @ EB-to-WB X/O, E. of Hartland Glen Ln

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 12

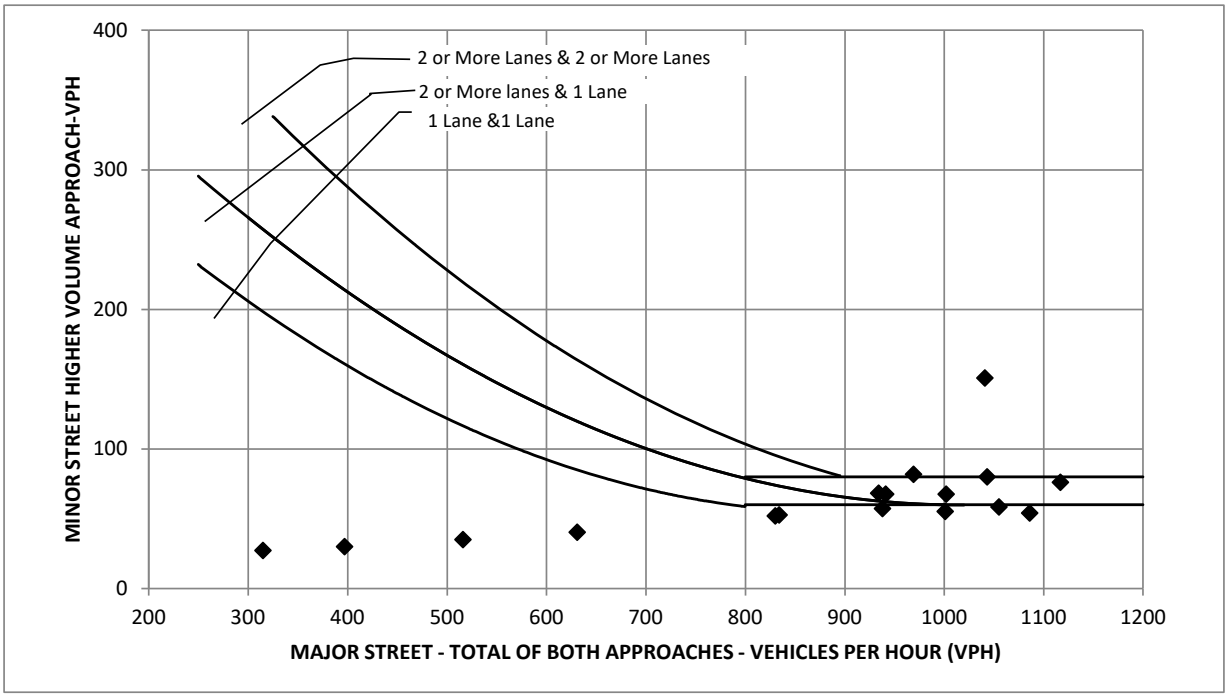
Does this intersection meet Warrant 1B for signal installation? YES

Data Collection Date: 5/17/20

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	Future Conditions		
Intersection:	WB (M-59) @ EB-to-WB X/O, E. of Hartland Glen Ln		
Date	6/19/2023	by	F&V

2	**: No. of Lanes on Major St.**
1	**: No. of Lanes on Minor St.**
55	**: Speed limit or 85th Percentile? (MPH)**
NO	**: Is the intersection within an Isolated community?**
0	**: What is the of the population isolated community?**

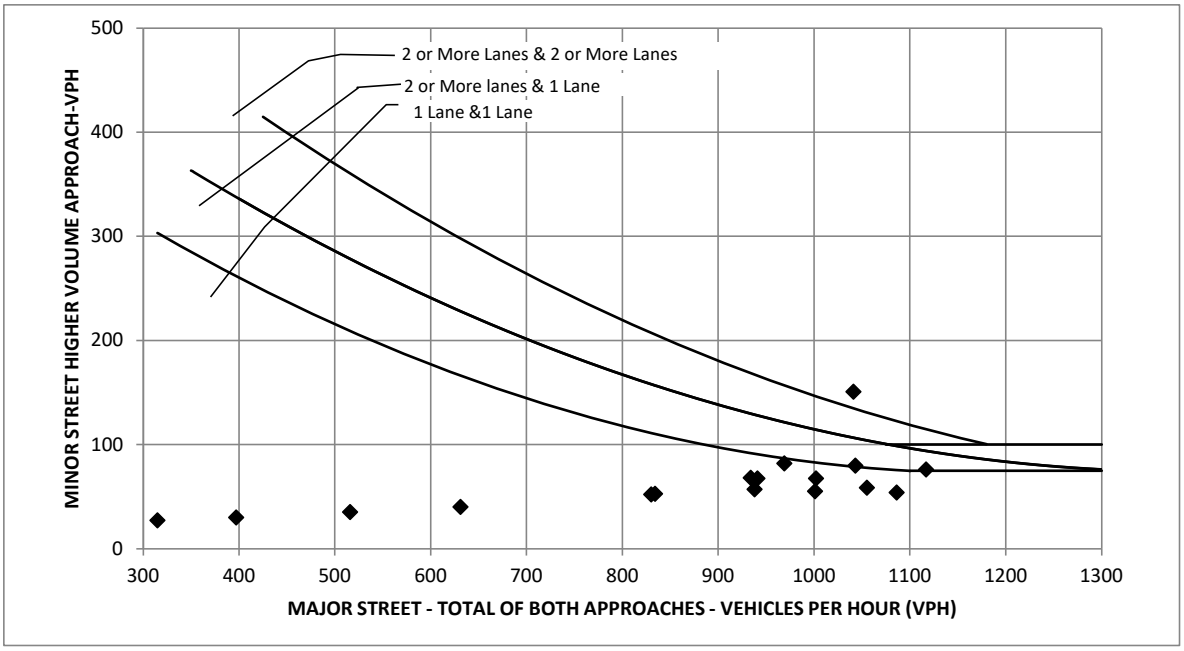


How Many Hours Are Met	**7**
Is Warrant (70%) Met?	**YES**

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(70%): Peak-Hour Vehicular Volume

Spot Number:	Future Conditions		
Intersection:	WB (M-59) @ EB-to-WB X/O, E. of Hartland Glen Ln		
Date	6/19/2023	by	F&V

2	**: No. of Lanes on Major St.**
1	**: No. of Lanes on Minor St.**
55	**: Speed limit or 85th Percentile? (MPH)**
NO	**: Is the intersection within an Isolated community?**
0	**: What is the of the population isolated community?**



How Many Hours Are Met	**3**
Is Warrant (70%) Met?	**YES**

fishbeck
Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

616.575.3824 | fishbeck.com

May 19, 2023
Project No. 230838

Mike West
Allen Edwin Homes
2186 East Centre Avenue
Portage, MI 49002

Wetland Delineation – 40-acre Parcel, 12685 Highland Road
Hartland Township, Livingston County, Michigan

On May 3, 2023, Fishbeck staff conducted a field investigation and delineated wetlands on an approximately 40-acre property (Parcel No. 4708-26-200-002) located at 12685 Highland Road in Section 26 of Hartland Township (Town 03 North, Range 06 East), Livingston County, Michigan (the Site). The Site is situated in a relatively rural residential and commercial area of Hartland Township, scattered with undeveloped land, including forested habitat. Hartland Glen Golf Course is directly south and west of the Site (see Figure 1).

This letter summarizes the results of the wetlands investigation. The wetlands investigation was conducted consistent with the 1987 *US Army Corps of Engineers (USACE) Wetlands Delineation Manual* and the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual- Northcentral Northeast* (Version 2.0). The wetlands identification and delineation procedures outlined in these manuals require evaluating site vegetation, soils, and hydrologic characteristics. Hydrophytic vegetation decisions are based on the wetland indicator status of dominant species in the plant community. Species with indicator statuses of obligate wetland (OBL), facultative wetland (FACW), and facultative (FAC) are considered wetland species, while species with indicator statuses of facultative upland (FACU) and upland (UPL) are considered upland species. FAC species are also commonly present in upland plant communities. An area must contain dominant wetland vegetation, hydric (wetland) soil, and wetland hydrology to be classified as a wetland.

Literature Review

According to the U.S. Department of Agriculture Natural Resources Conservation Service *Web Soil Survey*, most of the Site contains soil series with low hydric ratings (≤6% hydric). However, Carlisle muck, 0 to 2 percent slopes (CarabA, 100% hydric rating) is mapped at the southeast end of the Site and Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil (Gd, 95% hydric rating), is mapped at the northwest end of the Site (Attachment 1).

The National Wetlands Inventory map indicates no wetlands on the Site, but several wetlands are mapped in the surrounding area, primarily south of the Site (Attachment 2).

Site Investigation

Fishbeck staff traversed the area of investigation on May 3, 2023. Most of the Site contained agricultural (harvested corn) fields, which were generally flat, with elevations roughly 960 to 990 feet above mean sea level (AMSL). A roadside ditch originates from a concrete culvert in the Site's northwest corner and runs south along the east side of Highland Glen Lane. The Site also contained wetland, upland forest, and tree lines.

Fishbeck staff identified three wetlands (Wetlands A, B, and C) within the area of investigation, as described below. Fishbeck flagged the wetland boundaries with pink ribbons labeled A.1 through A.8, B.1 to B.75, and C.1

through C.32 open, CC.1 open through CC.6 connect to C.1. Wetland B continued south along a stream between wetland flags B.62 and B.63. Wetland boundary flags were surveyed with a handheld Trimble R1 GNSS receiver with submeter accuracy. Wetland boundaries are noted on Figure 2.

Soil, vegetation, and hydrology data were collected at wetland sampling points WSPA, WSP.B, and WSP.C, and adjacent upland sampling points (USP.A, USP.B, and USP.C). These data are summarized on USACE Wetland Determination Data Forms (Attachment 3). Site photographs are included as Attachment 4.

Wetland A (Emergent Wetland)

Wetland A is a 0.17-acre, emergent wetland in a small depression within the Site's northwest quadrant near the overhead electric utility. An overland flow (surface water connection) may exist to the roadside ditch.

Wetland hydrology, dominant hydrophytic vegetation, and hydric soils were confirmed at Sampling Point WSP.A. Several hydrology indicators were identified, including surface water (A1), high water table (A2), saturation (A3), water-stained leaves (B9), saturation visible on aerial imagery (C9), stunted or stressed plants (D1), geomorphic position (D2), and FAC-Neutral Test (D5). Dominant species observed included *Typha angustifolia* (narrow-leaf cattail, OBL), *Typha latifolia* (broadleaf cattail, OBL), and *Phalaris arundinacea* (reed canary grass, FACW). Other less commonly observed species included *Lamium purpureum* (purple dead nettle, UPL), *Solidago gigantea* (late goldenrod, FACW), *Rumex crispus* (curly dock, FAC), and *Symphyotrichum lateriflorum* (calico aster, FAC). A soil pit dug within Wetland A revealed a very dark gray (10YR 3/1) silty clay loam with prominent iron concentrations (10YR 4/6, dark yellowish brown) to a depth of 8 inches, confirming hydric soil indicator F6 (redox dark surface). A hard clay pan restrictive layer was identified at 8 inches below the ground surface.

Upland conditions were verified adjacent to Wetland A at Sampling Point USP.A. A soil pit dug to a depth of 6 inches contained dark brown (10YR 3/3) fine sandy loam, which does not indicate hydric soil. A roots-restrictive layer was identified at 6 inches below the ground surface. The dominant species observed at USP.A included *Carya ovata* (shagbark hickory, FACU), *Prunus serotina* (black cherry, FACU), *Rhus typhina* (staghorn sumac, UPL), *Lonicera tatarica* (Tartarian honeysuckle, FACU), *Elaeagnus umbellata* (autumn-olive, UPL), *Bromus inermis* (smooth brome, UPL), *Poa compressa,* and *P. pratensis* (bluegrasses, FACU). Other less commonly observed species included *Taraxacum officinale* (dandelion, FACU), *Barbarea vulgaris* (yellow rocket, FAC), *Daucus carota* (wild carrot, UPL), *Verbascum thapsus* (mullein, UPL). Fishbeck did not observe wetland hydrology, hydric soils, or dominant wetland vegetation at this location.

Wetland B (Emergent/Scrub-shrub)

Wetland B includes the roadside ditch along the east side of Highland Glen Lane and extends east into the agricultural field. Portions of the wetland were historically dredged, and spoils were piled just outside the wetland near the farm field. The ditch continues south within the east roadside and into the Site's forested southwest corner. The ditch becomes more stream-like south of the Site's southwest corner. Some tree clearing was observed in the surrounding upland.

Wetland hydrology, dominant hydrophytic vegetation, and hydric soils were confirmed at sampling point WSP.B. Several hydrology indicators were identified, including surface water (A1), high water table (A2), saturation (A3), water marks (B1), saturation visible on aerial imagery (C9), geomorphic position (D2), microtopographic relief (D4), and FAC-Neutral Test (D5). Dominant species observed at WSP.B included *Salix nigra* (black willow, OBL), *Populus deltoides* (cottonwood, FAC), Salix *interior/exigua* (sandbar willow, FACW), *Cornus racemosa* (gray dogwood, FAC), *Cornus amomum* (silky dogwood, FACW), *Salix eriocephala* (Missouri willow, FACW), reed canary grass (FACW), *Toxicodendron radicans* (poison-ivy, FAC), and *Vitis riparia* (riverbank grape, FAC). Other less commonly observed species included *Rubus strigosus* (red raspberry, FAC), calico aster (FACW), and late goldenrod (FACW). A soil pit dug revealed a black (10YR 2/1) silty clay loam with prominent iron concentrations (10YR 3/3, dark brown) to a depth of 12 inches, confirming hydric soil indicator F8 (redox depressions).

Upland conditions adjacent to Wetland B were confirmed at sampling point USP.B. A soil pit dug to a depth of 12 inches contained brown (10YR 4/3) fine sandy loam, which did not indicate hydric soil. The dominant species observed at USP.B was *Tilia americana* (basswood, FACU), *Quercus rubra* (red oak, FACU*), Prunus virginiana* (chokecherry, FACU), *Ostrya virginiana* (hop-hornbeam, FACU), *Carex pensylvanica* (penn sedge, UPL), *Erythronium rostratum* (yellow trout-lily, UPL), and *Podophyllum peltatum* (may-apple, FACU). Fishbeck did not observe wetland hydrology, hydric soils, or dominant wetland vegetation at this location.

Wetland C (Emergent/Forested Wetland)

Wetland C is in the Site's southeast quadrant, extends into the agricultural field, and continues off-site to the south and east. A ditch containing wetland vegetation connected two broader wetland areas along the Site's southern boundary. Wetland hydrology, dominant hydrophytic vegetation, and hydric soils were confirmed at sampling point WSP.C. Several hydrology indicators were identified and included surface water (A1), high water table (A2), saturation (A3), water-stained leaves (B9), crayfish burrows (C8), saturation visible on aerial imagery (C9), stunted or stressed plants (D1), geomorphic position (D2), microtopographic relief (D4), and FAC-Neutral Test (D5). Dominant species observed at WSP.C included *Salix amygdaloides* (peachleaf willow, FACW), *Salix discolor* (pussy willow, FACW), reed canary grass (FACW), *Carex lacustris* (lake sedge, OBL), and riverbank grape (FAC). Other less commonly observed species included cattails (OBL), *Doellingeria umbellata* (white-top, FACW), calico aster (FACW), late goldenrod (FACW), and *Phragmites australis ssp. australis* (common reed, FACW). A soil pit dug to a depth of 16 inches revealed a black (10YR 2/1) mucky loamy clay, verifying hydric indicator F1 (loamy mucky mineral).

Upland conditions adjacent to Wetland C were confirmed at Sampling Point USP.C. A soil pit dug to a depth of 12 inches contained dark brown (10YR 3/3) fine sandy loam, which lacked a hydric soil indicator. The dominant vegetation consisted of basswood (FACU), black cherry (FACU), prickly-ash, FACU), Pennsylvania sedge (UPL), may-apple (FACU), dandelion (FACU), and *Parthenocissus quinquefolia* (Virginia creeper, FACU). Therefore, Fishbeck did not observe wetland hydrology, hydric soils, or dominant wetland vegetation.

Upland Sampling Point (USP.1)

Upland conditions were confirmed at Sampling Point USP.1 in a forested area near the Site's northern boundary. A soil pit dug to a depth of 12 inches contained brown (10YR 4/3) sandy clay loam, which lacked a hydric soil indicator. The dominant species observed at USP.1 include *Quercus macrocarpa* (bur oak, FACU), *Ulmus pumila* (Siberian elm, FACU), Tartarian honeysuckle (FACU), *Rosa multiflora* (multiflora rose, FACU), *Rubus occidentalis* (black raspberry, UPL), *Acer negundo* (box-elder, FAC), smooth brome (UPL), *Parthenocissus quinquefolia* (Virginia creeper, FACU). Therefore, Fishbeck did not observe wetland hydrology, hydric soils, or dominant wetland vegetation.

Regulatory Review and Conclusions

Part 303, Wetlands Protection

According to Section 30301(d) of Michigan's Natural Resources and Environmental Protection Act (NREPA), Act 451, wetlands "contiguous to the Great Lakes or Lake St. Clair, an inland lake or pond, or a river or stream" or "more than 5 acres in size" are regulated by the State of Michigan. "Contiguous" is defined as being within 500 feet of an inland lake, pond, river, or stream. A stream is defined as having a defined bed, banks, and evidence of flow. A pond is defined as an area of "natural or permanent artificial" open water with "more than one acre, but less than five acres" in size.

Wetlands B and C are contiguous to regulating features (e.g., streams) and, therefore, are regulated under Part 303 of the NREPA. Wetlands B and C also continue off-site and may be more than 5 acres in size.

Upland is present between Wetland A and the roadside ditch to its west. The ditch appeared to consist of linear wetland in the vicinity of Wetland A because its bed was well vegetated. Fishbeck staff did not identified stream morphology in the ditch until the Site's southern boundary. The roadside ditch conveys water from a storm pipe (from under Hartland Road) in the Site's northwest corner and water flows slowly south through the linear emergent wetland (Wetland B). However, if EGLE decides the ditch has a defined enough bed/bank and evidence of flow, the ditch may be considered an EGLE-regulated stream under Part 301 of the NREPA. In that case, Wetland A would be a regulated wetland due to its proximity to the ditch.

A permit would be required from EGLE for any of the following activities within the Site's regulated wetland:

- Placing fill or permitting the placement of fill.
- Dredging, removing, or permitting the removal of soil or minerals.
- Constructing, operating, or maintaining any use or development.
- Draining surface water.

According to the EGLE's MiWaters website (EGLE 2023), Hartland Township does not appear to have a wetland protection ordinance. Contact Hartland Township's Zoning and Planning Commission for more information on any building setbacks or authorizations on the local level.

If you have any questions or require additional information, please contact Elise at 616-464-3738 or ehtripp@fishbeck.com.

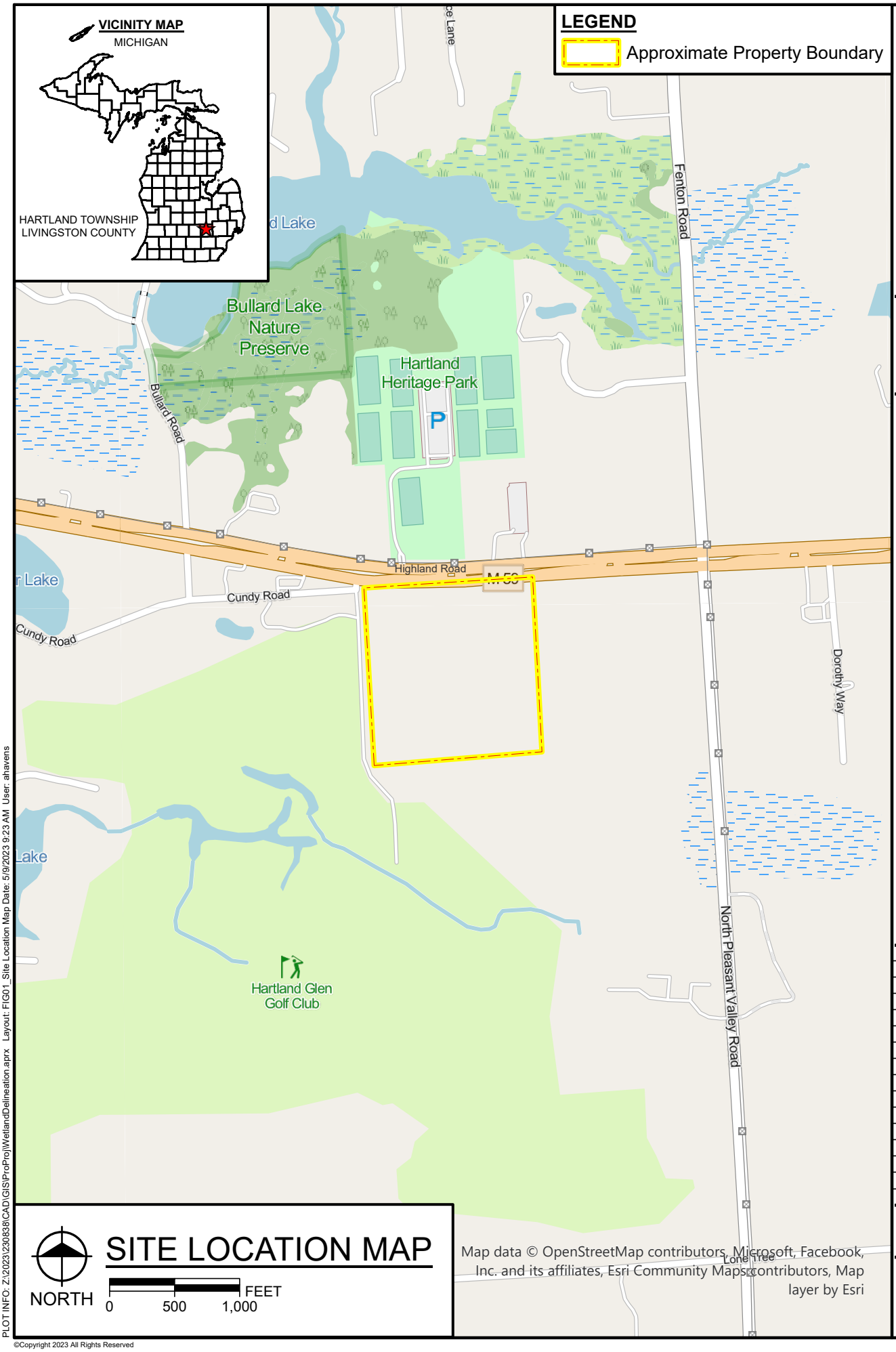
Sincerely,

Bryana J. Guevara
Wetland Scientist/Arborist

Elise Hansen Tripp, PWS
Senior Wetland Scientist and Ecologist

Attachments
By email

Figures



SITE LOCATION MAP

NORTH

0 500 1,000 FEET

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.

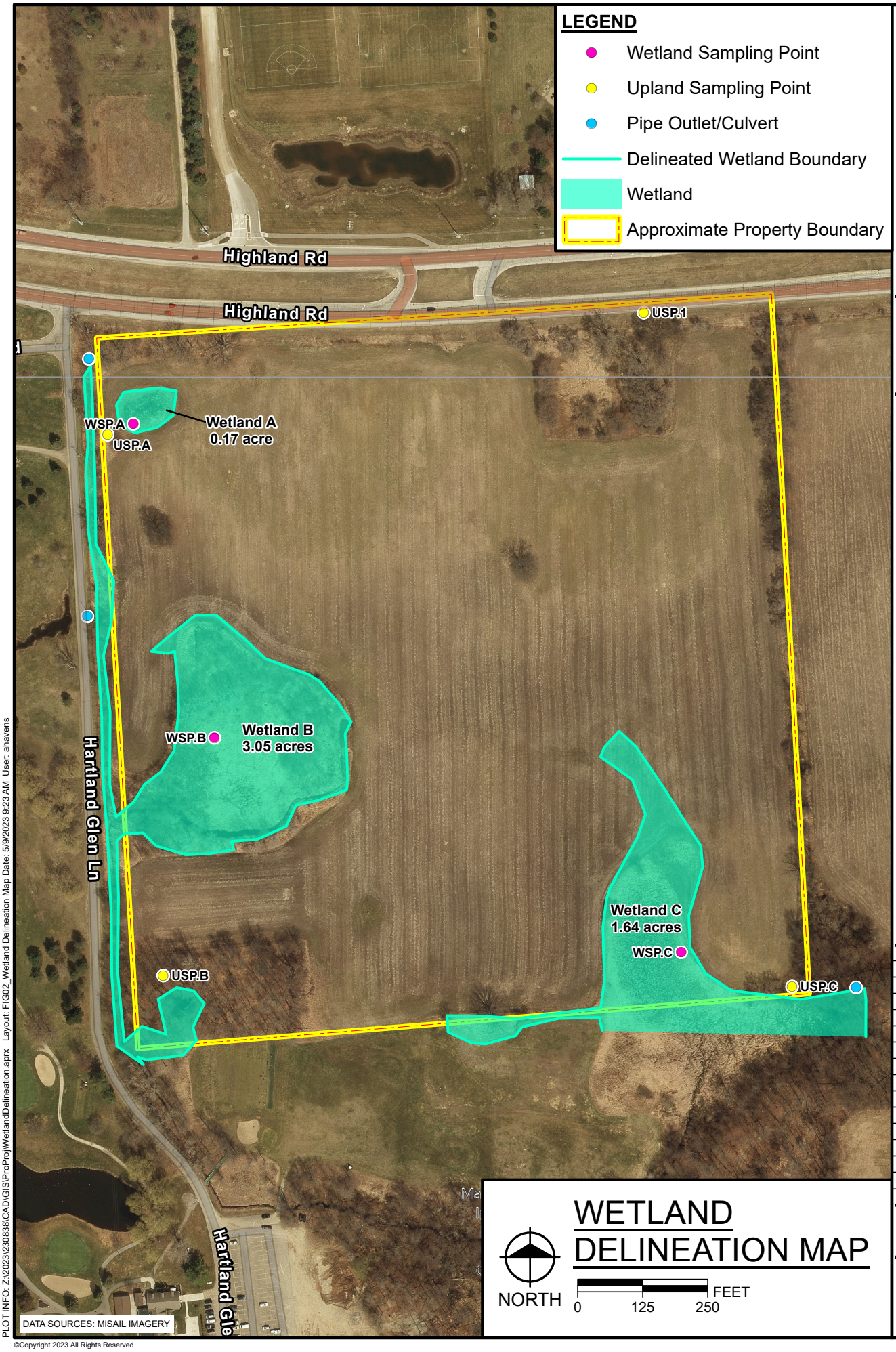
Allen Edwin Homes
Hartland Township, Livingston County, Michigan

Wetland Delineation

PROJECT NO.
230838

FIGURE NO.
1

PLOT INFO: Z:\2023\230838\CAD\GIS\ProProj\WetlandDelineation.aprx Layout: FIG01_Site Location Map Date: 5/9/2023 9:23 AM User: ahavens



WETLAND DELINEATION MAP

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.

Allen Edwin Homes
Hartland Township, Livingston County, Michigan

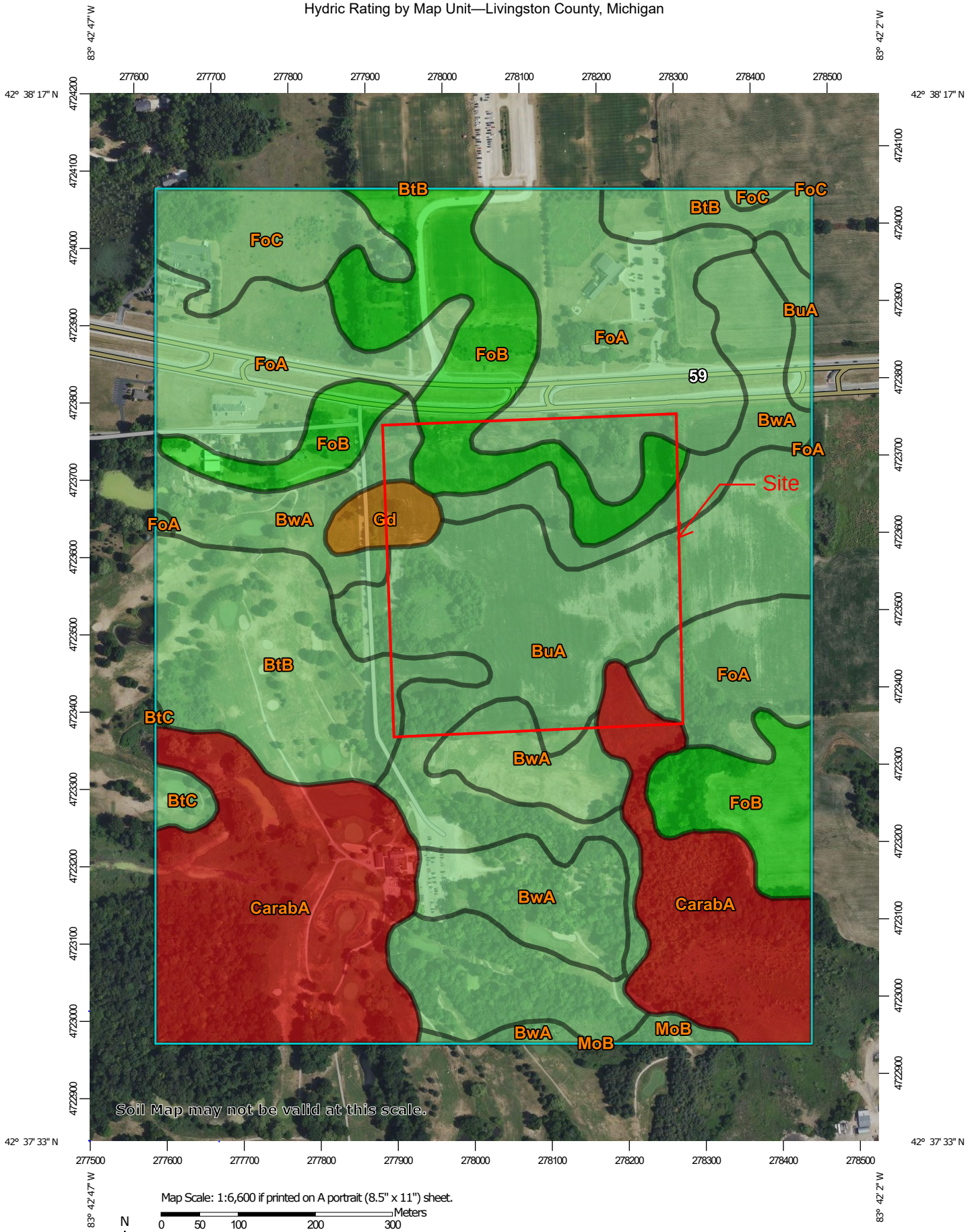
Wetland Delineation

PROJECT NO.
230838

FIGURE NO.
2

PLOT INFO: Z:\2023\230838\CAD\GIS\ProProj\WetlandDelineation.aprx Layout: FIG02_Wetland Delineation Map Date: 5/9/2023 9:23 AM User: ahavens

Attachment 1



Map Scale: 1:6,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

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

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Livingston County, Michigan
Survey Area Data: Version 20, Aug 26, 2022

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

Date(s) aerial images were photographed: Jun 29, 2020—Jul 28, 2020

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

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BtB	Boyer-Oshtemo loamy sands, 2 to 6 percent slopes	4	23.4	10.0%
BtC	Boyer-Oshtemo loamy sands, 6 to 12 percent slopes	5	1.4	0.6%
BuA	Brady loamy sand, 0 to 2 percent slopes	6	44.9	19.2%
BwA	Bronson loamy sand, 0 to 2 percent slopes	4	32.9	14.1%
CarabA	Carlisle muck, 0 to 2 percent slopes	100	43.7	18.7%
FoA	Fox sandy loam, 0 to 2 percent slopes	2	45.2	19.3%
FoB	Fox sandy loam, 2 to 6 percent slopes	0	29.4	12.6%
FoC	Fox sandy loam, 6 to 12 percent slopes	5	9.3	4.0%
Gd	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	95	2.6	1.1%
MoB	Wawasee loam, 2 to 6 percent slopes	5	1.0	0.4%
Totals for Area of Interest			**233.9**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Attachment 2

U.S. Fish and Wildlife Service
National Wetlands Inventory

Wetlands

December 14, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Attachment 3

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: USP.1
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Roadside Local relief (concave, convex, none): convex Slope (%): 5-8
Subregion (LRR or MLRA): LRR L Lat: 42.63451554 Long: -83.70493651 Datum: WGS 1984
Soil Map Unit Name: Fox sandy loam, 0 to 2 percent slopes (FoA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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**		
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ 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:

VEGETATION - Use scientific names of plants. Sampling Point: USP.1

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus macrocarpa* / Bur oak	10	Yes	FACU
2. *Ulmus pumila* / Siberian elm	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Lonicera tatarica* / Tatarian honeysuckle	20	Yes	FACU
2. *Rubus occidentalis* / Black raspberry	10	Yes	UPL
3. *Rosa multiflora* / Multiflora rose, Multiflora rosa	10	Yes	FACU
4. *Acer negundo* / Boxelder, Box elder	10	Yes	FAC
5. *Rhus typhina* / Staghorn sumac	5	No	NI
6.			
7.			
	55	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Bromus inermis* / Smooth brome, Smooth brome, Hungarian	70	Yes	UPL
2. *Cirsium arvense* / Canada thistle	10	No	FACU
3. *Daucus carota* / Carrot, Carrot, Queen anne's lace	10	No	UPL
4. *Cichorium intybus* / Chicory	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. *Parthenocissus quinquefolia* / Virginia creeper	10	Yes	FACU
2. *Vitis riparia* / River-bank grape	10	Yes	FAC
3.			
4.			
	20	= 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: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 22.2 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	80	x 4 =	320
UPL species	95	x 5 =	475
Column Totals:	195 (A)		855 (B)

Prevalence Index = B/A = 4.38

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: USP.1

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
0-12	10YR 4/3	100					Sndy Clay Lm	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ 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:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: USP.A
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Hillside Local relief (concave, convex, none): convex Slope (%): 5-8
Subregion (LRR or MLRA): LRR L Lat: 42.63388783 Long: -83.708609 Datum: WGS 1984
Soil Map Unit Name: Bronson loamy sand, 0 to 2 percent slopes (BwA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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**		
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ 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:

VEGETATION - Use scientific names of plants. Sampling Point: USP.A

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carya ovata* / Shag-bark hickory	10	Yes	FACU
2. *Prunus serotina* / Black cherry	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Rhus typhina* / Staghorn sumac	40	Yes	UPL
2. *Elaeagnus umbellata* / Autumn olive	20	Yes	UPL
3. *Lonicera tatarica* / Tatarian honeysuckle	15	Yes	FACU
4.			
5.			
6.			
7.			
	75	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Bromus inermis* / Smooth brome, Smooth brome, Hungarian	30	Yes	UPL
2. *Poa compressa* / Canada blue grass, Canadian blue grass	25	Yes	FACU
3. *Poa pratensis* / Kentucky blue grass	25	Yes	FACU
4. *Verbascum thapsus* / Woolly mullein	15	No	UPL
5. *Taraxacum officinale* / Red seeded dandelion, Common dan	10	No	FACU
6. *Barbarea vulgaris* / Yellow rocket	10	No	FAC
7.			
8.			
9.			
10.			
11.			
12.			
	115	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	10	x 3 =	30	
FACU species	95	x 4 =	380	
UPL species	105	x 5 =	525	
Column Totals:	210	(A)	935	(B)

Prevalence Index = B/A = 4.45

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: USP.A

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 3/3	100					Fine Sndy Lm	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Roots

Depth (inches): 6

Hydric Soil Present? Yes ___ No X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: USP.B
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Hillside Local relief (concave, convex, none): convex Slope (%): 5-6
Subregion (LRR or MLRA): LRR L Lat: 42.63097783 Long: -83.70842433 Datum: WGS 1984
Soil Map Unit Name: Boyer-Oshtemo loamy sands, 2 to 6 percent slopes (BtB) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ 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:

VEGETATION - Use scientific names of plants. Sampling Point: USP.B

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Tilia americana* / American basswood	30	Yes	FACU
2. *Quercus rubra* / Northern red oak	20	Yes	FACU
3. *Quercus velutina* / Black oak	10	No	NI
4. *Carya ovata* / Shag-bark hickory	5	No	FACU
5.			
6.			
7.			
	65	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Prunus virginiana* / Chokecherry	20	Yes	FACU
2. *Ostrya virginiana* / Eastern hop-hornbeam	15	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	35	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Erythronium rostratum* / Yellow trout-lily	35	Yes	NI
2. *Carex pensylvanica* / Pennsylvania sedge	20	Yes	UPL
3. *Podophyllum peltatum* / May-apple	20	Yes	FACU
4. *Cardamine concatenata* / Cut-leaf toothwort	10	No	FACU
5. *Carya cordiformis* / Bitter-nut hickory	5	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	5	x 3 =	15	
FACU species	120	x 4 =	480	
UPL species	65	x 5 =	325	
Column Totals:	190	(A)	820	(B)

Prevalence Index = B/A = 4.32

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: USP.B

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
0-12	10YR 4/3	100					Fine Sndy Lm	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ 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:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: USP.C
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Hillside Local relief (concave, convex, none): convex Slope (%): 4-6
Subregion (LRR or MLRA): LRR L Lat: 42.630889 Long: -83.70393283 Datum: WGS 1984
Soil Map Unit Name: Fox sandy loam, 0 to 2 percent slopes (FoA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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**		
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ 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:

VEGETATION - Use scientific names of plants. Sampling Point: USP.C

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Tilia americana* / American basswood	30	Yes	FACU
2. *Prunus serotina* / Black cherry	15	Yes	FACU
3. *Quercus rubra* / Northern red oak	10	No	FACU
4. *Acer rubrum* / Red maple	10	No	FAC
5. *Acer negundo* / Boxelder, Box elder	5	No	FAC
6.			
7.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Zanthoxylum americanum* / Toothachetree	20	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Podophyllum peltatum* / May-apple	20	Yes	FACU
2. *Carex pensylvanica* / Pennsylvania sedge	20	Yes	NI
3. *Taraxacum officinale* / Red seeded dandelion, Common dan	15	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. *Parthenocissus quinquefolia* / Virginia creeper	15	Yes	FACU
2.			
3.			
4.			
	15	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	125	x 4 =	500
UPL species	20	x 5 =	100
Column Totals:	160 (A)		645 (B)

Prevalence Index = B/A = 4.03

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: USP.C

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
0-12	10YR 3/3	100					Fine Sndy Lm	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ 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:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: WSP.A
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR L Lat: 42.633886 Long: -83.70861067 Datum: WGS 1984
Soil Map Unit Name: Bronson loamy sand, 0 to 2 percent slopes (BwA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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 ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____
If yes, optional Wetland Site ID: Wetland A

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X 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)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 1
Water Table Present? Yes X No ____ Depth (inches): 5
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: WSP.A

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Typha angustifolia* / Narrow leaf cattail, Narrow-leaved cattai	30	Yes	OBL
2. *Typha latifolia* / Broadleaf cattail, Broad-leaved cattail	30	Yes	OBL
3. *Phalaris arundinacea* / Reed canary grass	20	No	FACW
4. *Rumex crispus* / Curly dock	15	No	FAC
5. *Lamium purpureum* / Purple dead nettle	10	No	UPL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1.			
2.			
3.			
4.			
	0	= 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: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	20	x 2 =	40
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	10	x 5 =	50
Column Totals:	105 (A)		195 (B)

Prevalence Index = B/A = 1.86

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: WSP.A

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 3/1	80	10YR 4/6	20	C	PL,M	Slty Clay Loam	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: hard clay pan

Depth (inches): 8

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: WSP.B
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR L Lat: 42.63222533 Long: -83.70804533 Datum: WGS 1984
Soil Map Unit Name: Brady loamy sand, 0 to 2 percent slopes (BuA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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 ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____
If yes, optional Wetland Site ID: Wetland B

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X 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)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 0.5
Water Table Present? Yes X No ____ Depth (inches): 6
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 6

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: WSP.B

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Populus deltoides* / Eastern cottonwood	20	Yes	FAC
2. *Salix nigra* / Black willow	10	Yes	OBL
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Salix eriocephala* / Missouri willow	30	Yes	FACW
2. *Cornus racemosa* / Gray dogwood	15	Yes	FAC
3. *Cornus amomum* / Silky dogwood	15	Yes	FACW
4. *Salix interior* / Sandbar willow	15	Yes	FACW
5. *Rubus idaeus ssp. strigosus* / Grayleaf red raspberry	10	No	FAC
6.			
7.			
	85	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Phalaris arundinacea* / Reed canary grass	80	Yes	FACW
2. *Solidago gigantea* / Smooth goldenrod	15	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. *Toxicodendron radicans* / Eastern poison ivy	30	Yes	FAC
2. *Vitis riparia* / River-bank grape	30	Yes	FAC
3.			
4.			
	60	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	155	x 2 =	310
FAC species	105	x 3 =	315
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	270 (A)		635 (B)

Prevalence Index = B/A = 2.35

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: WSP.B

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
0-12	10YR 2/1	80	10YR 3/3	20	C	PL,M	Slty Clay Loam	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ 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:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 1268 Highland Road City/County: Hartland/Livingston County Sampling Date: 05/03/2023
Applicant/Owner: Allen Edwin Homes State: Michigan Sampling Point: WSP.C
Investigator(s): B.Guevara; Fishbeck Section, Township, Range: S26, Hartland Twp (T3N, R6E)
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR L Lat: 42.632167 Long: -83.70503717 Datum: WGS 1984
Soil Map Unit Name: Carlisle muck, 0 to 2 percent slopes (CarabA) NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ 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 ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? Yes X No ____
If yes, optional Wetland Site ID: Wetland C

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X 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)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ 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)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 1
Water Table Present? Yes X No ____ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: WSP.C

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix amygdaloides* / Peachleaf willow	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Salix discolor* / Pussy willow	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Carex lacustris* / Lakebank sedge	40	Yes	OBL
2. *Phalaris arundinacea* / Reed canary grass	25	Yes	FACW
3. *Typha angustifolia* / Narrow leaf cattail, Narrow-leaved cattai	20	No	OBL
4. *Typha latifolia* / Broadleaf cattail, Broad-leaved cattail	20	No	OBL
5. *Solidago gigantea* / Smooth goldenrod	10	No	FACW
6. *Doellingeria umbellata* / Parasol white-top	5	No	FACW
7. *Phragmites australis ssp. australis* / European common reed	5	No	FACW
8.			
9.			
10.			
11.			
12.			
	125	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. *Vitis riparia* / River-bank grape	10	Yes	FAC
2.			
3.			
4.			
	10	= 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: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	70	x 2 =	140
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	160 (A)		250 (B)

Prevalence Index = B/A = 1.56

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL Sampling Point: WSP.C

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
0-16	10YR 2/1	100					Muck Lm Clay	

[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)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R,MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- X Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ 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:

Attachment 4

Upland Habitats

Typical Harvested Corn Field

Upland Forest

Wetland A: Emergent Wetland

Wetland A/Intermittent Streams

Typical Hydric Soil Indicator (WSP.A).

Wetland B: Farmed Portion

Wetland B: Roadside Ditch

Wetland B/Roadside ditch

Concrete pipe at Site's northwest corner.

Wetland C: Emergent/Forested Wetland

East-facing view of ditch within Wetland C

Typical Upland Soils

USP.A: Upland Sampling Point adjacent to Wetland A

USP.C: Upland Sampling Point adjacent to Wetland C

Wetland (Hydric) Soils

WSP.B: Wetland Sampling Point in Wetland B

WSP.C: Wetland Sampling Point in Wetland C

HIGHLAND RESERVE
SINGLE FAMILY RESIDENTIAL NEIGHBORHOOD
SAMPLE PORTFOLIO OF HOMES
8/10/23

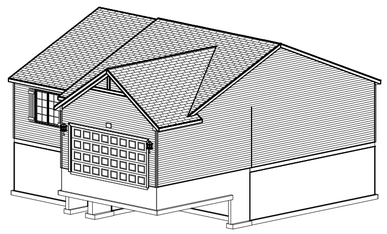
The following plans represent a sample set of homes that may be constructed in the Highland Reserve Single Family Residential Neighborhood:

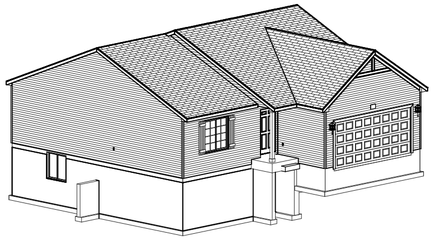
INTEGRITY 1250 - 1252 Square Foot Ranch
INTEGRITY 1530 - 1,526 Square Foot Ranch
INTEGRITY 1610 - 1,607 Square Foot Ranch
INTEGRITY 1810 - 1,822 Square Foot Two-Story
INTEGRITY 2000 - 2,022 Square Foot Two-Story
INTEGRITY 2060 - 2,060 Square Foot Bi-Level
INTEGRITY 2080 - 2,062 Square Foot Two-Story

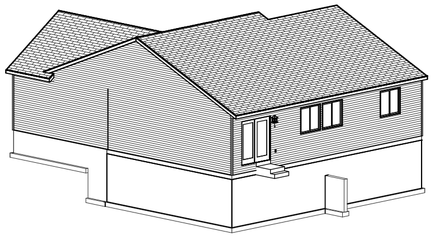
integrity 1250

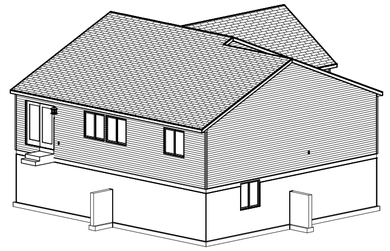
1,252 SF

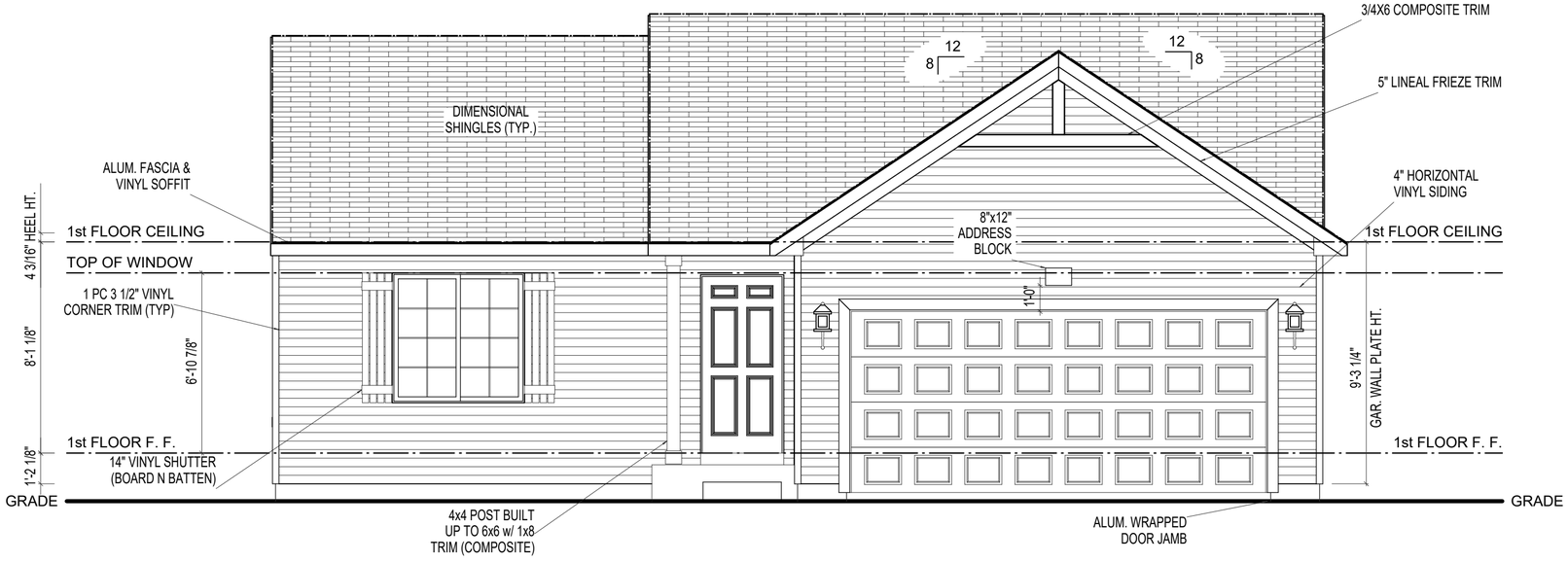
2-4 bedrooms
1-2 bathrooms
2-3 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

ALLEN EDWIN HOMES
2186 E. Centre Street
Portage, MI 49002
(269) 321-2600
www.allenedwin.com

PRINT DATE: 05/25/2023

i1250

FOR: Allen Edwin Homes

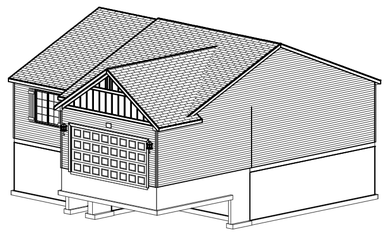
LOT #:

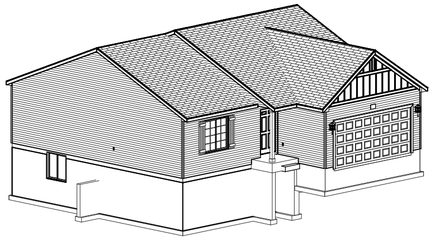
LOCATION:

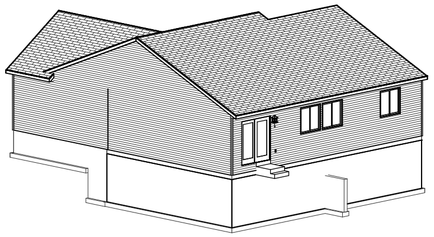
SHEET NUMBER

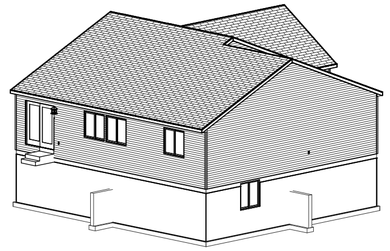
A-01.00

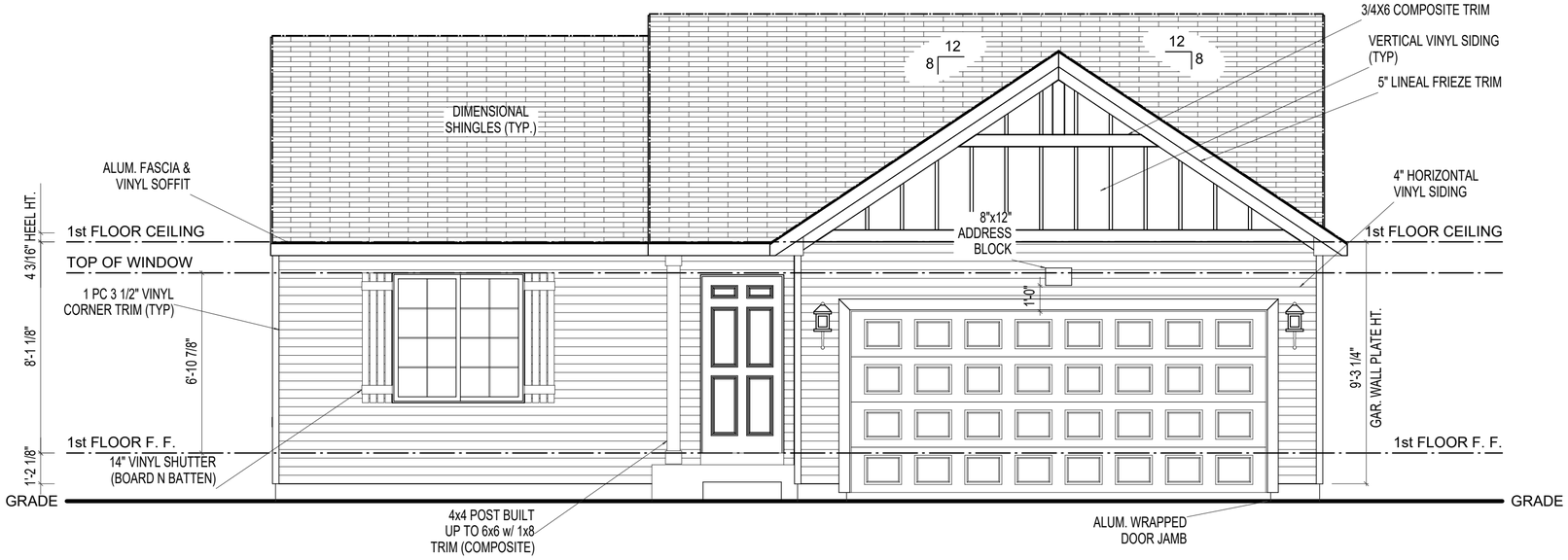
ms/A-01.00.vxp











FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

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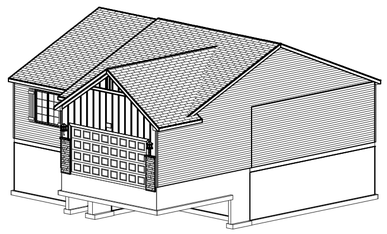

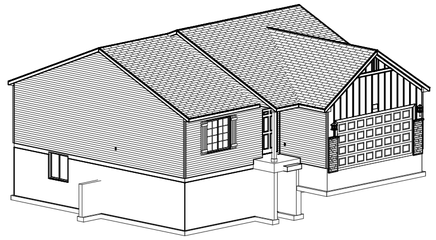

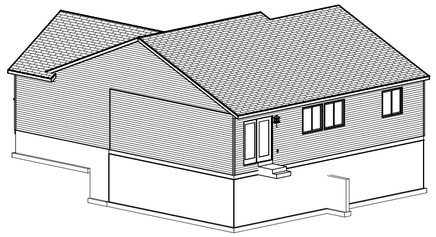

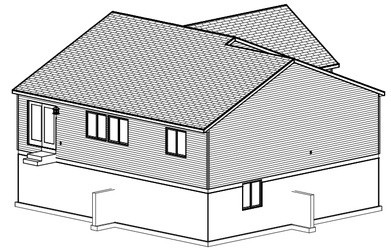

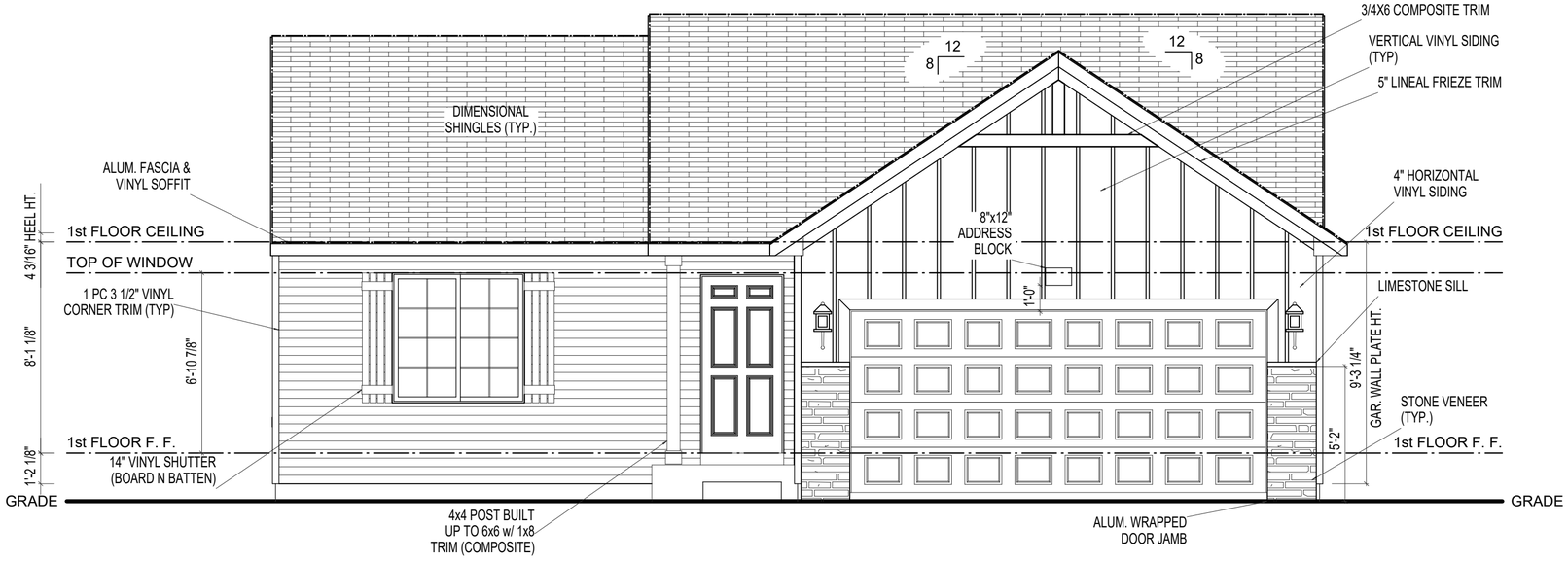

FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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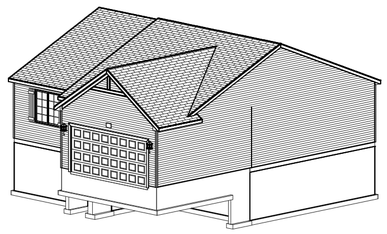

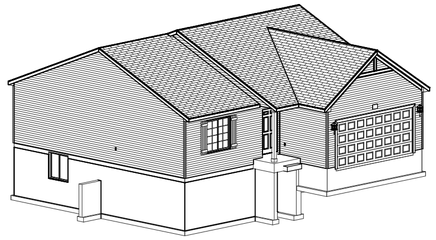

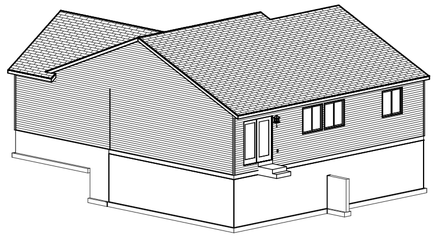

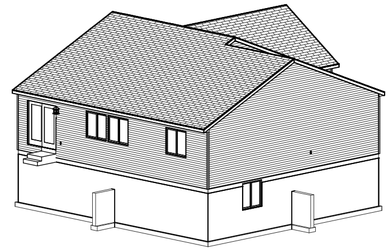

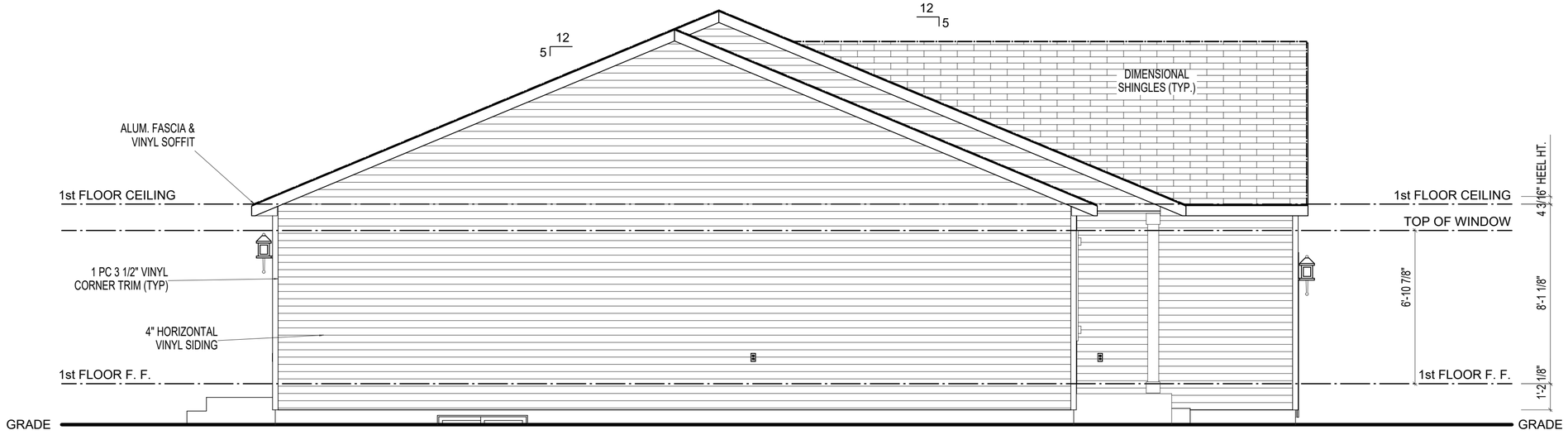

LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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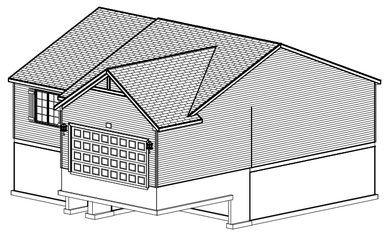

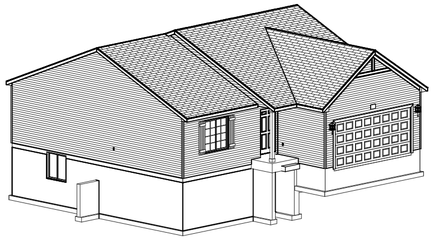

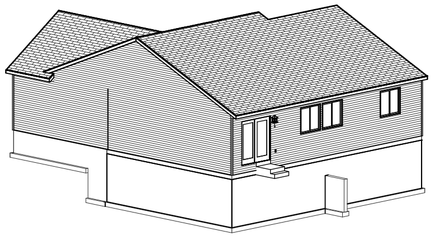

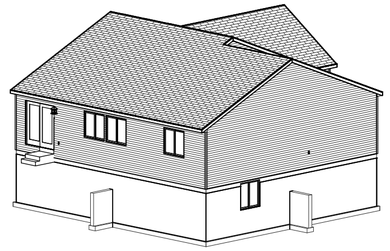

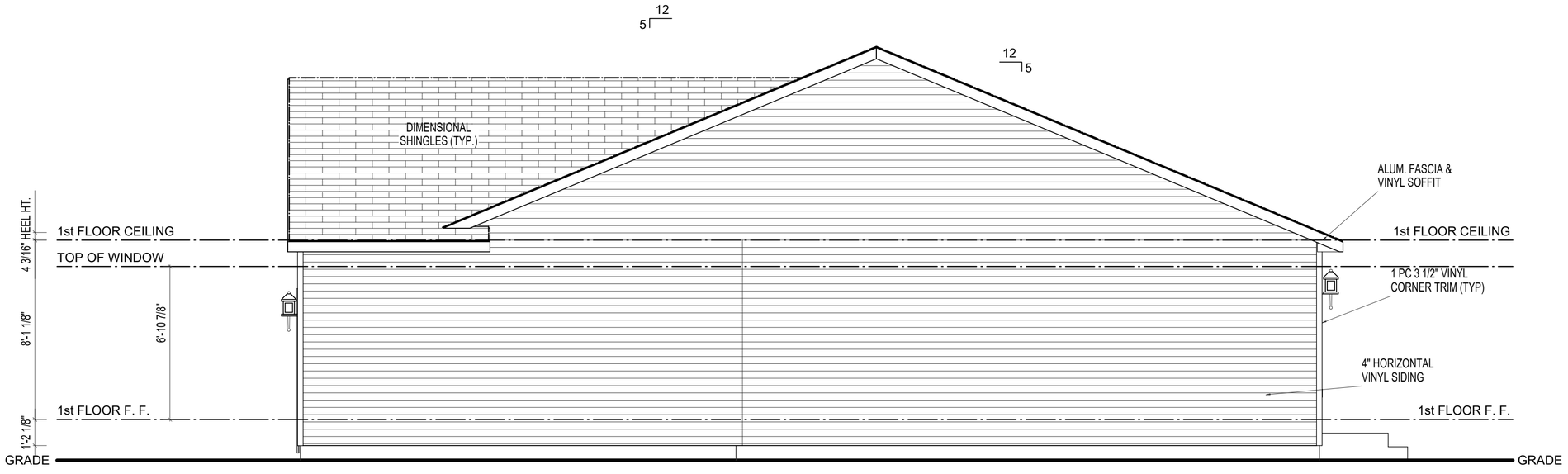

RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

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SHEET NUMBER
A-03.00

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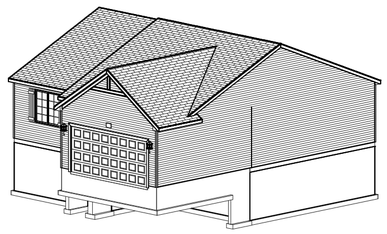

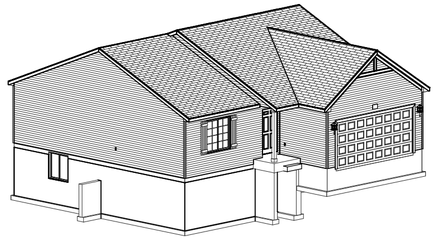

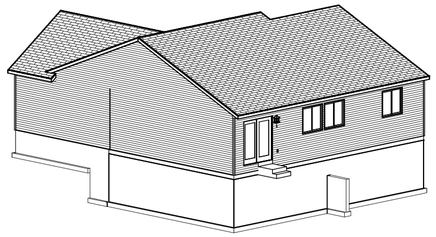

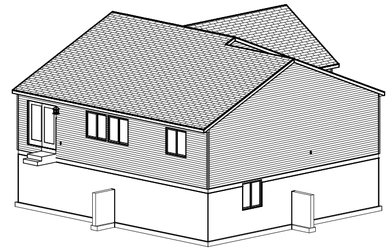

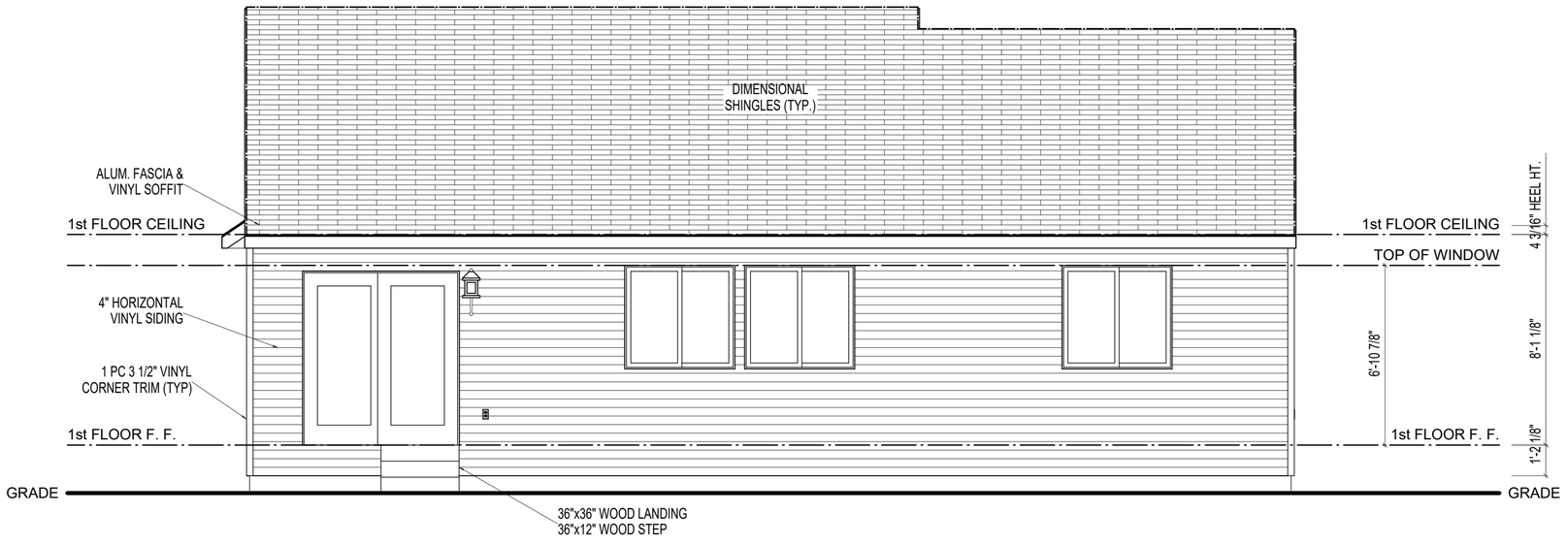

REAR ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

REV. NO.	DATE	REMARKS

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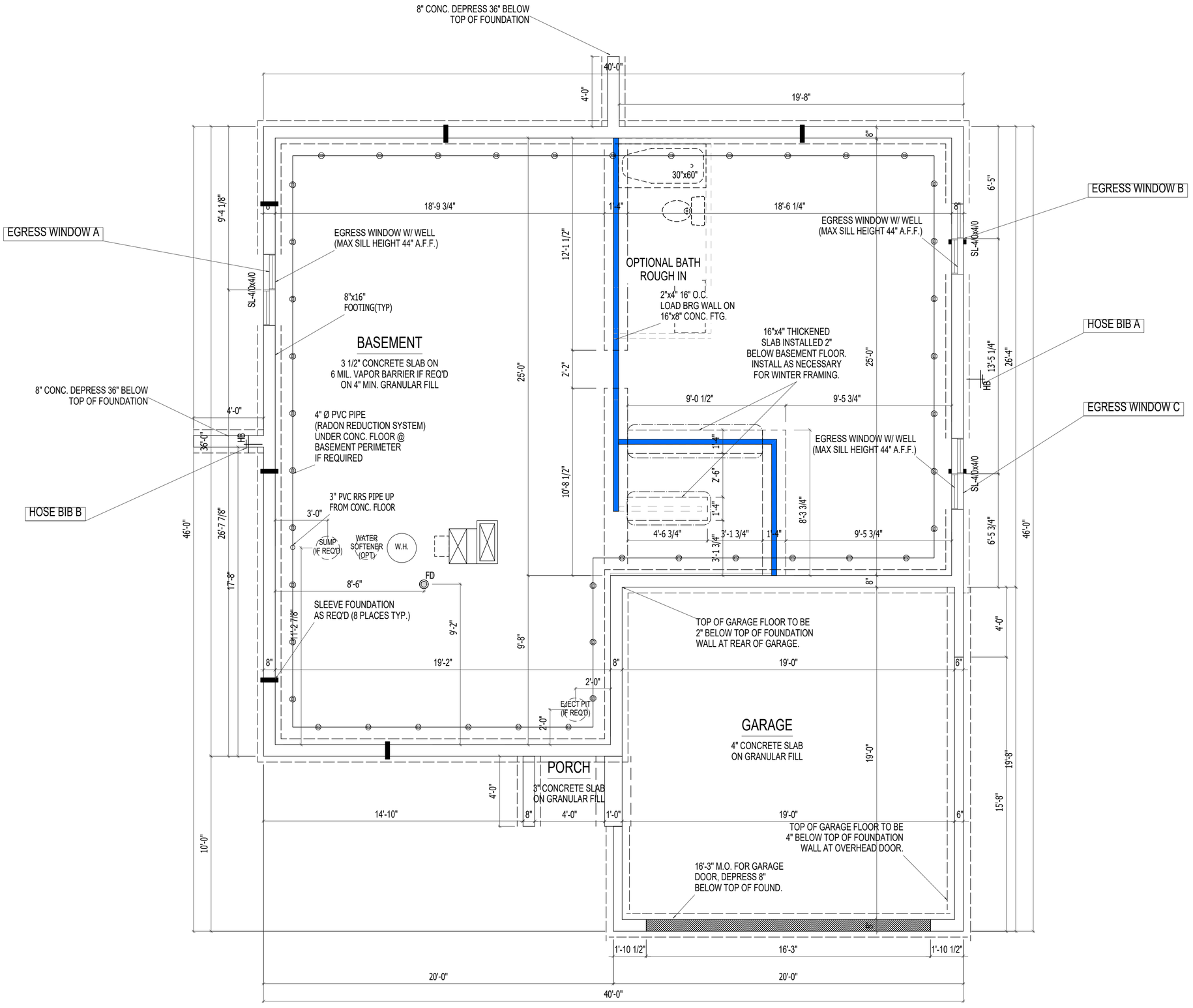
LOCATION:

SHEET NUMBER
A-04.00

ms/A-04.00.vxp



BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"

REMARKS

REV. NO.	DATE

ELEVATION A1
GARAGE RIGHT
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SHEET NUMBER
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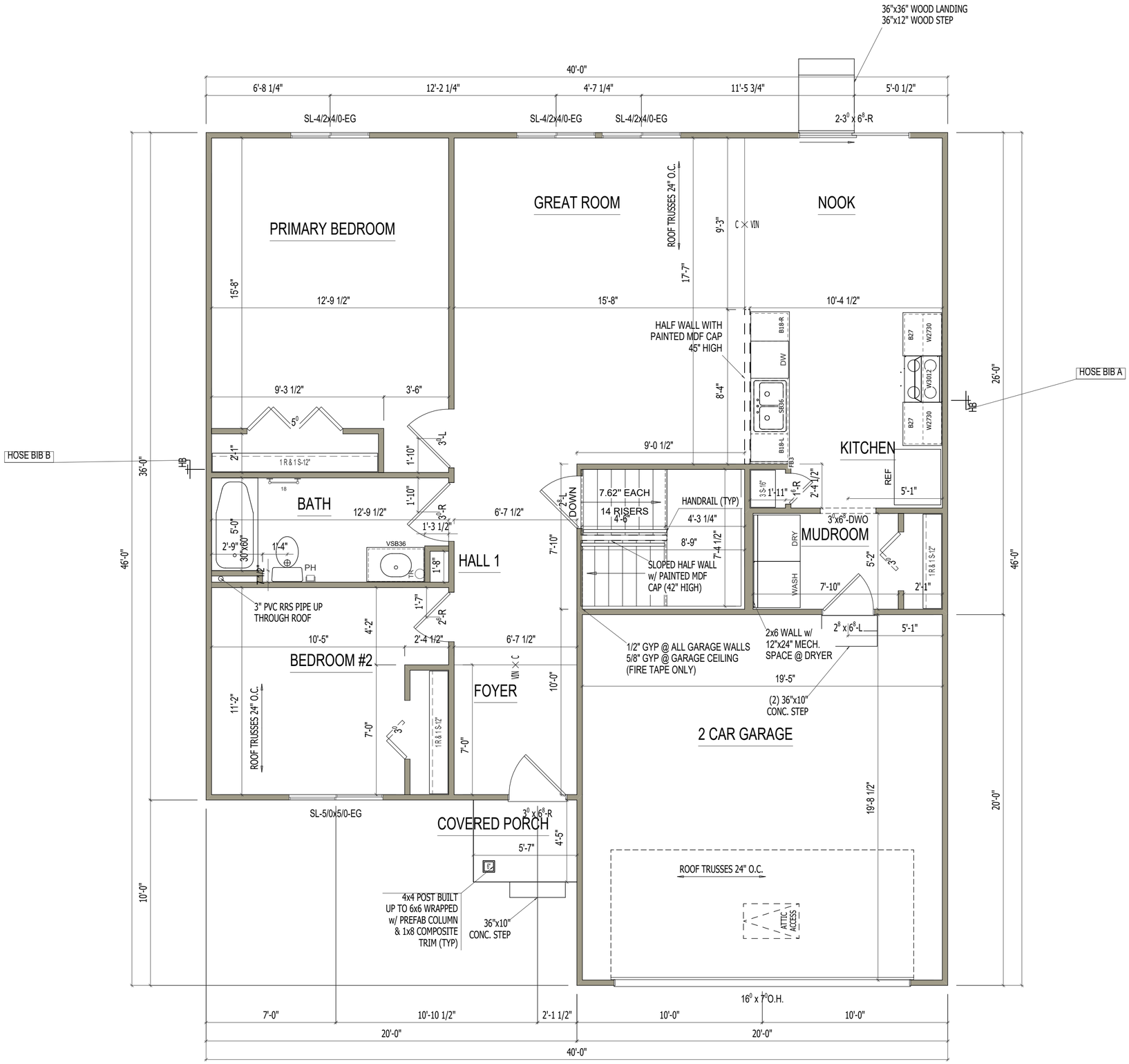
ms/A-06.00.vxp



FIRST FLOOR i1250

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

ELEVATION A1
GARAGE RIGHT
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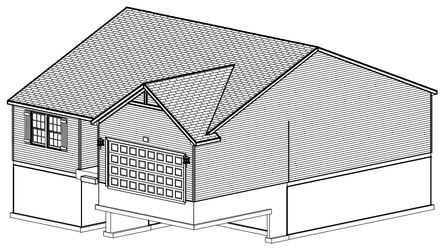
integrity 1530

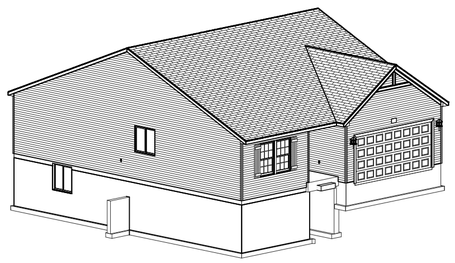
1,526 SF

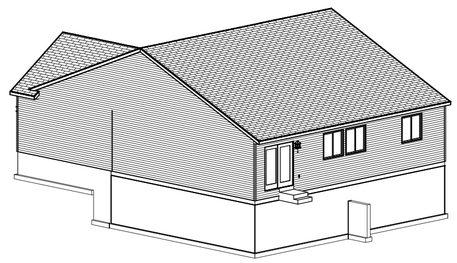
3-5 bedrooms
1-3 bathrooms
2-3 car attached garage

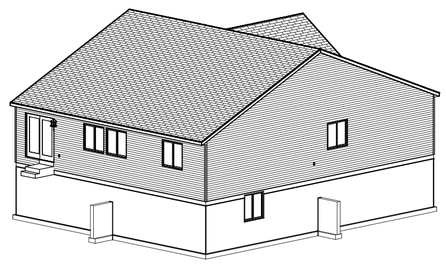
RESNET EnergySmart Builder

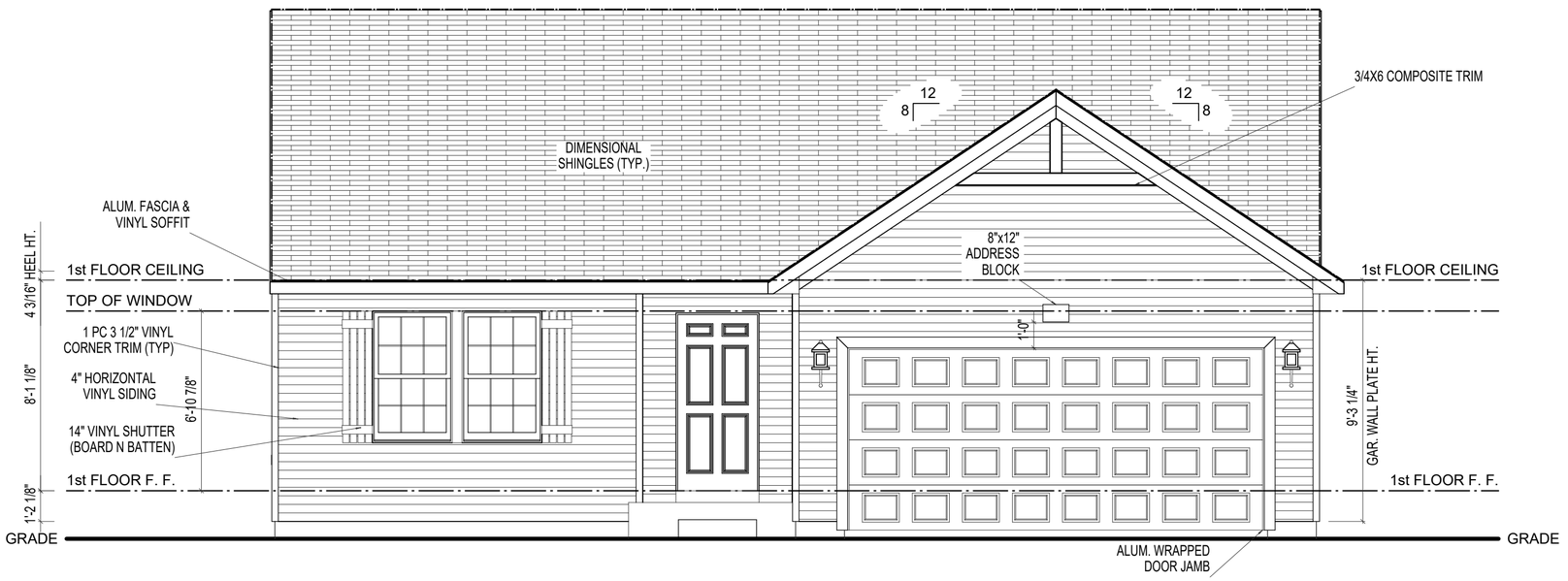
EQUAL HOUSING OPPORTUNITY











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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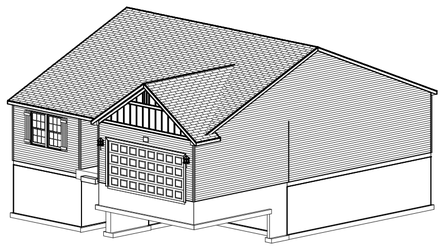

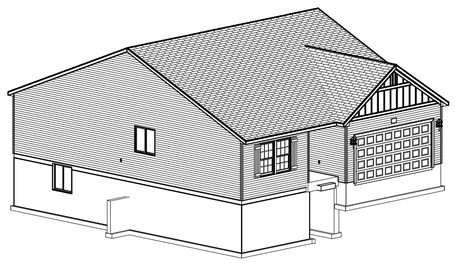

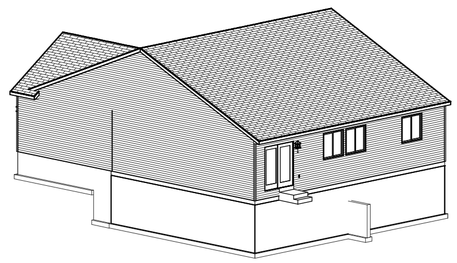

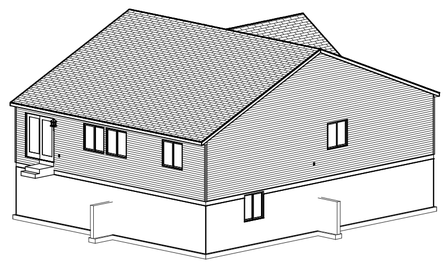

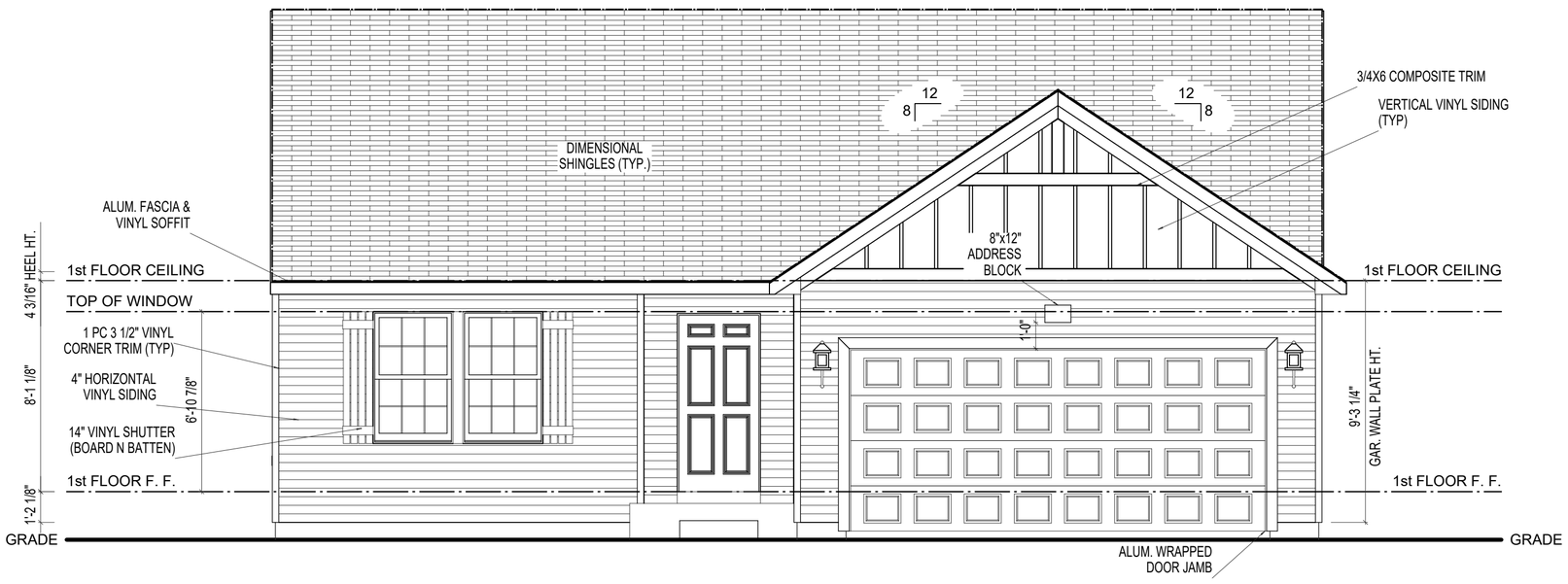

FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

REV. NO.	DATE	REMARKS

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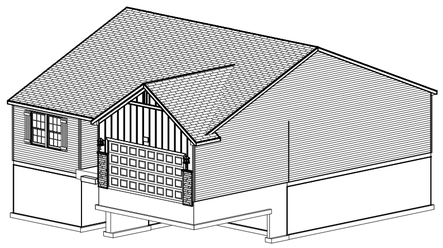

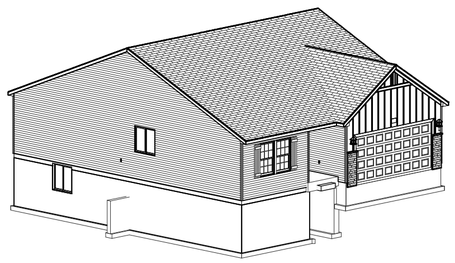

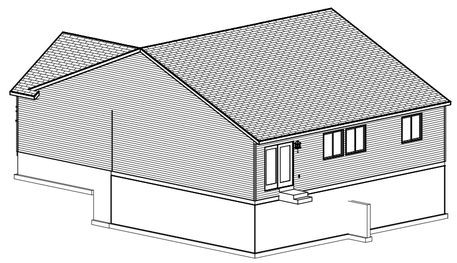

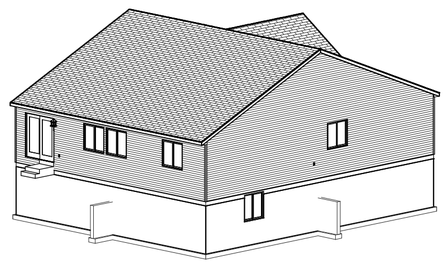

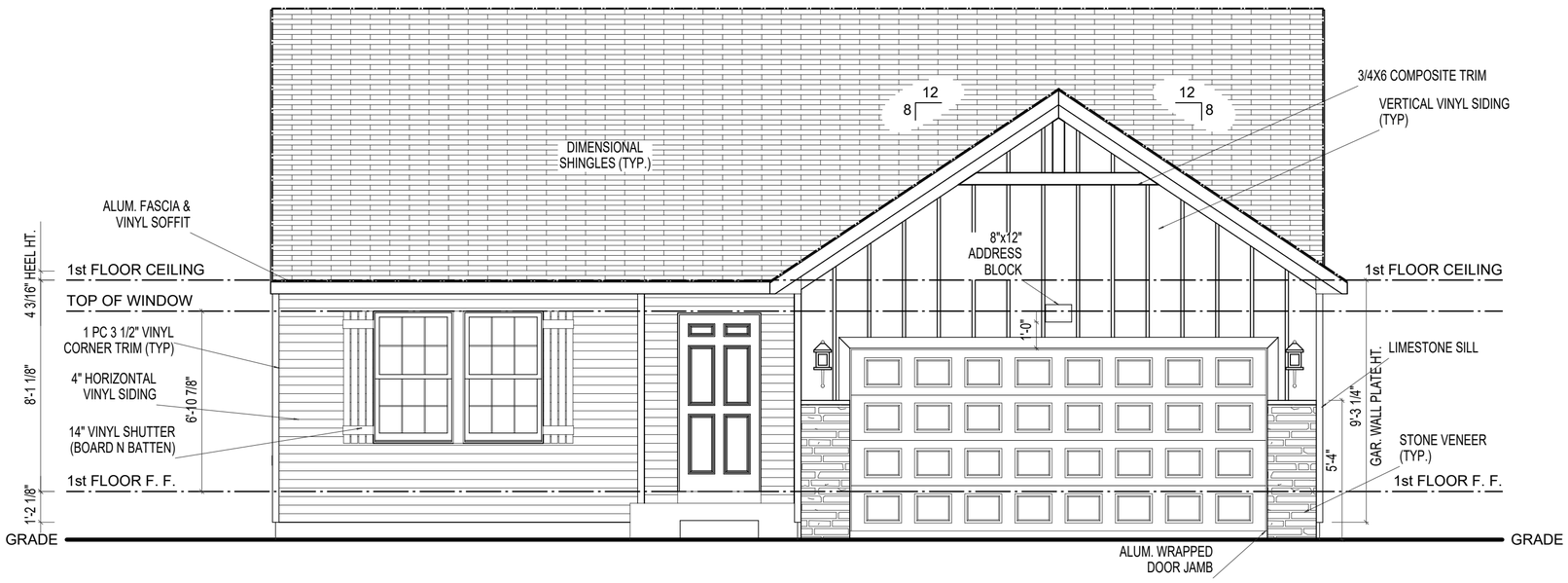

FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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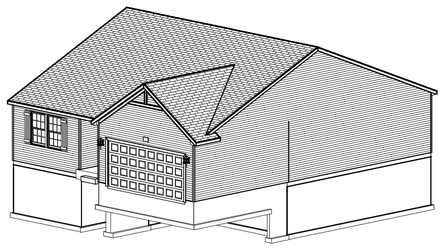

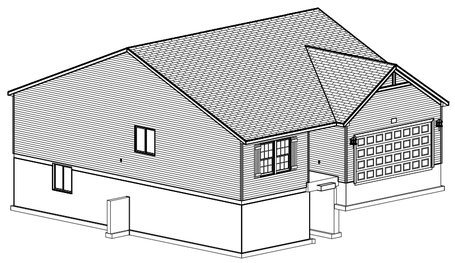

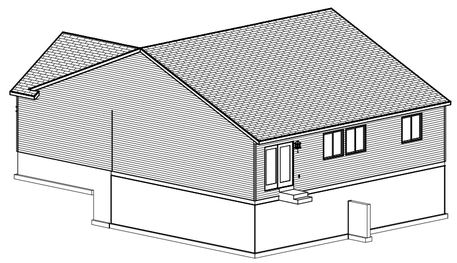

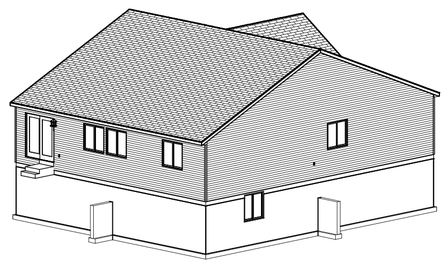

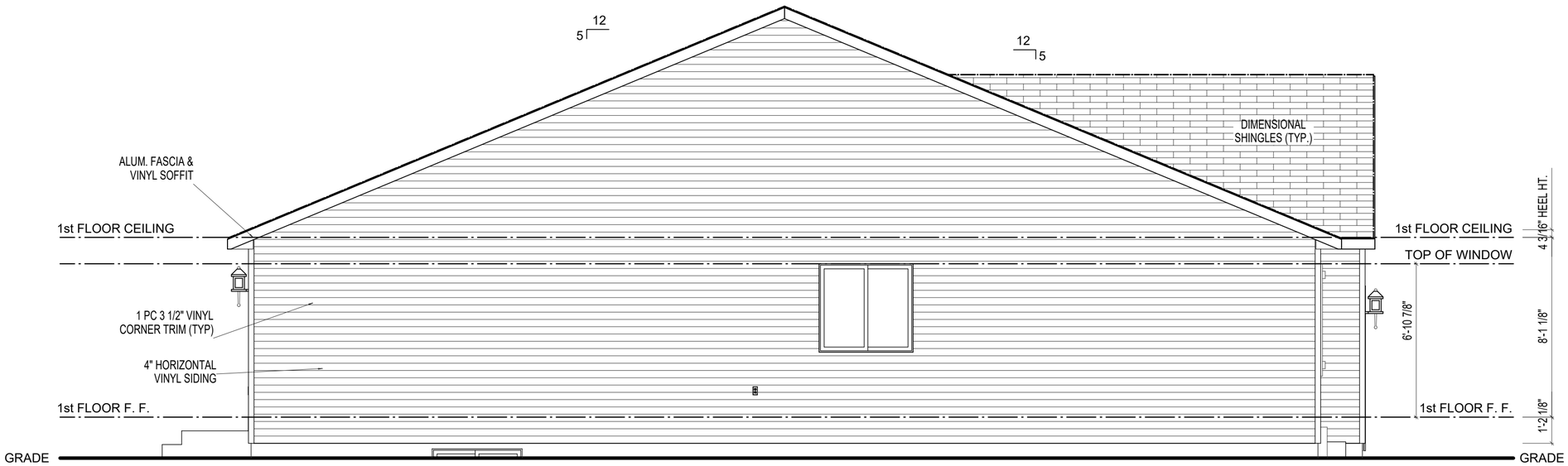

LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
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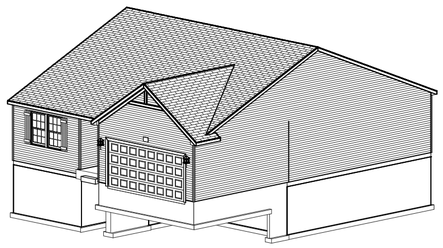
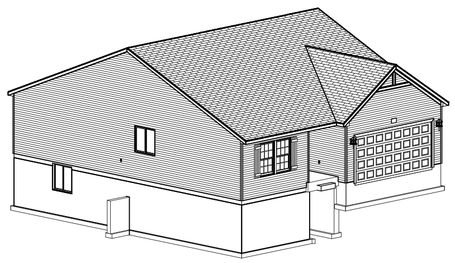
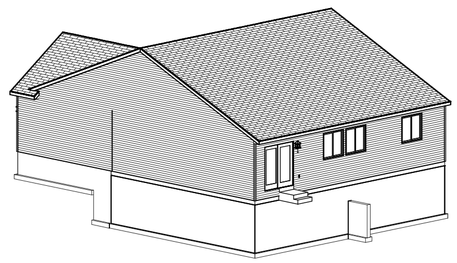
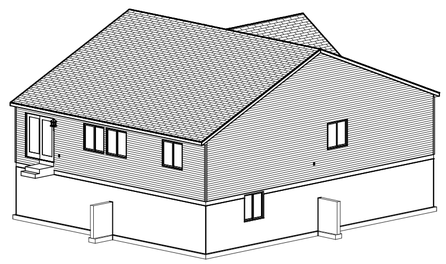
A-02.00

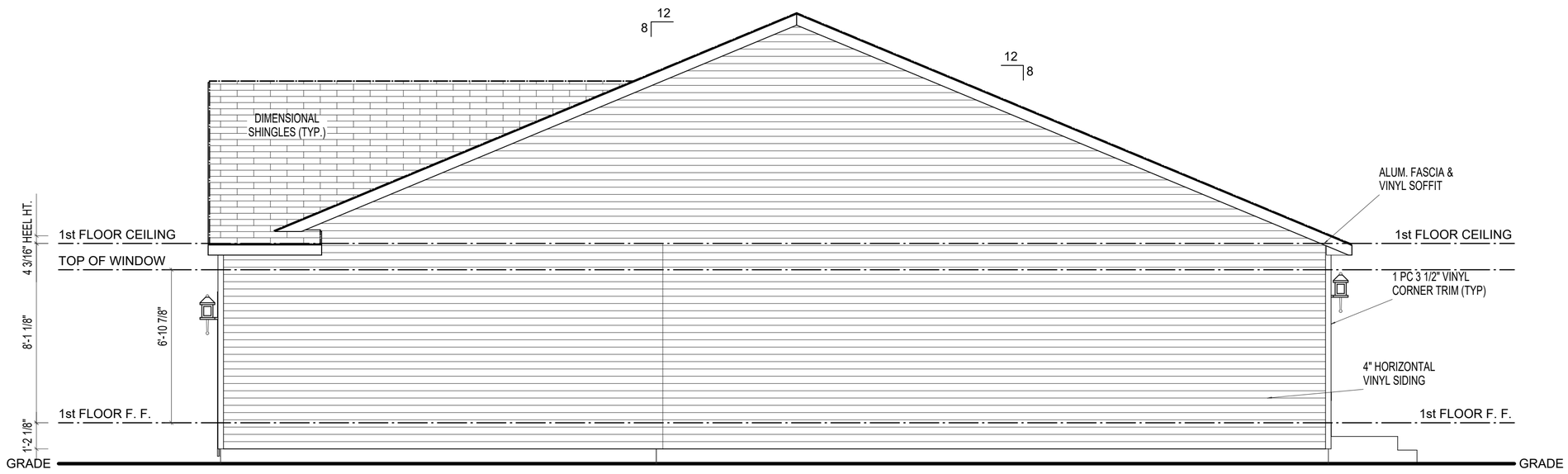
ms/A-02.00.vxp











RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

ALLEN EDWIN HOMES
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Portage, MI 49002
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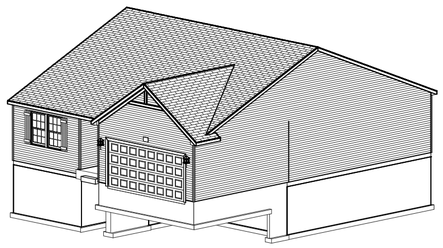
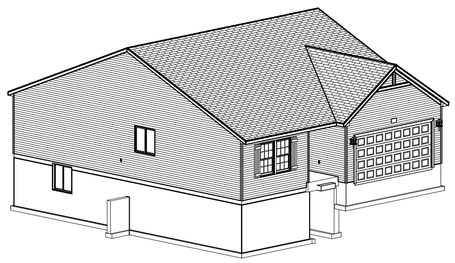
PRINT DATE:
05/25/2023

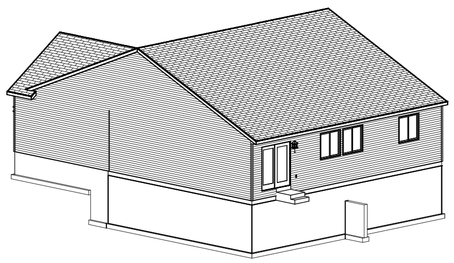
i1530
FOR: Allen Edwin Homes
LOT #:
LOCATION:

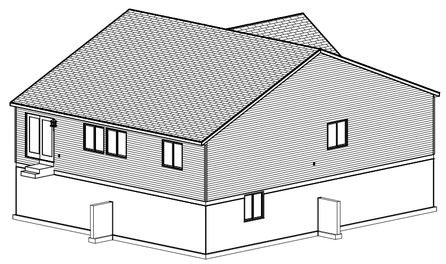
SHEET NUMBER
A-03.00

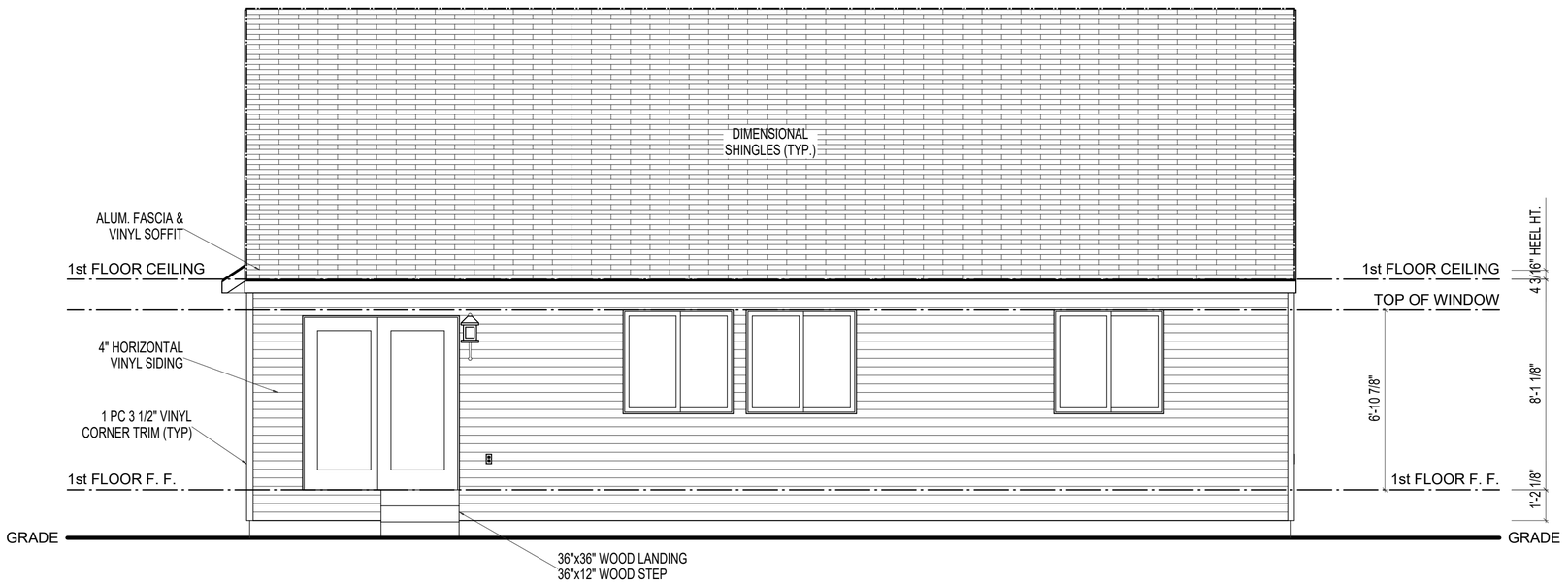
ms/A-03.00.vxp











REAR ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

REV. NO.	DATE	REMARKS

ALLEN EDWIN HOMES
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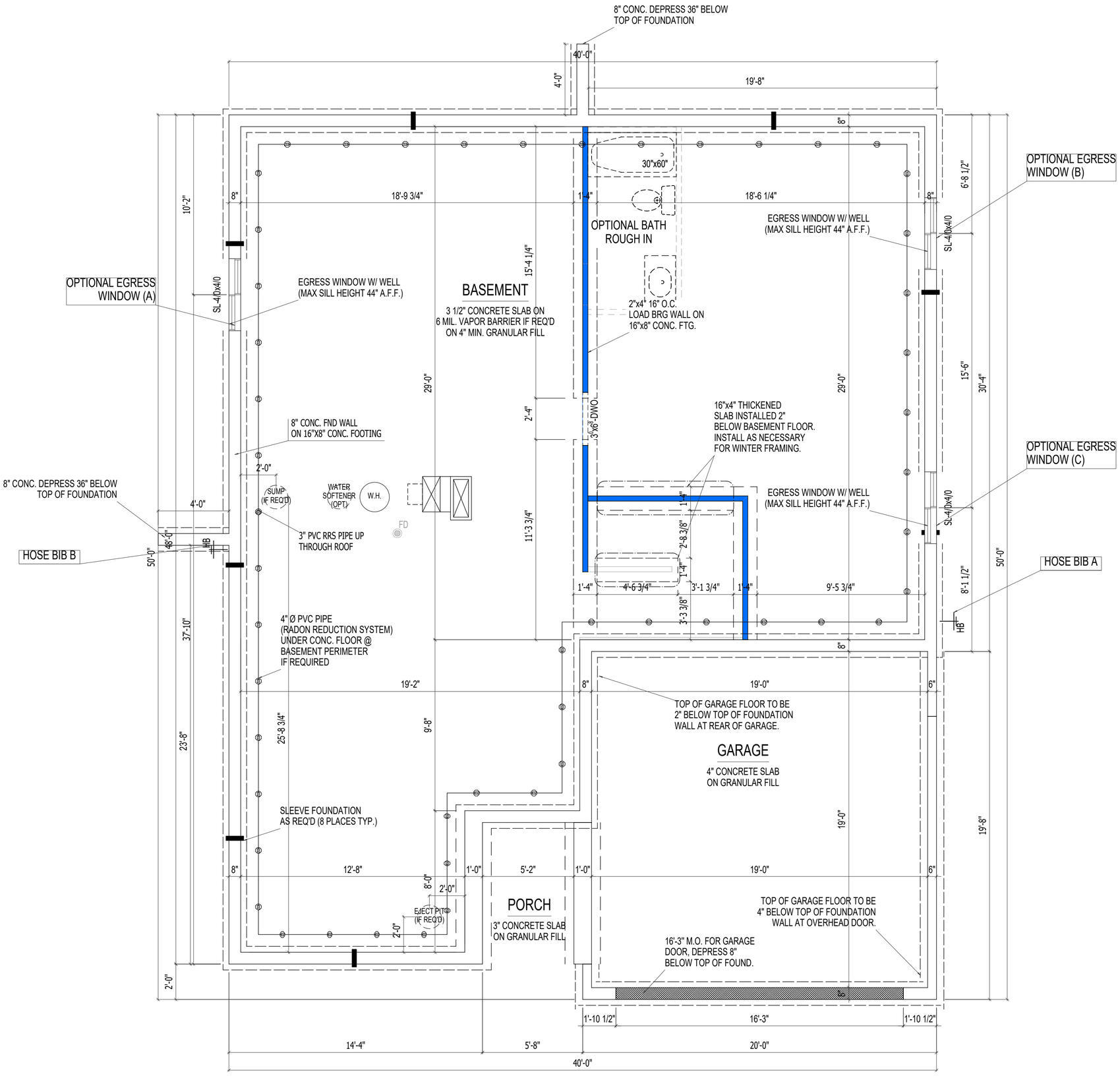
05/25/2023

i1530
FOR: Allen Edwin Homes
LOT #:
LOCATION:

SHEET NUMBER
A-04.00

ms/A-04.00.vxp



BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"

ms/A-06.00.vxp

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
REVISION
V8.0a

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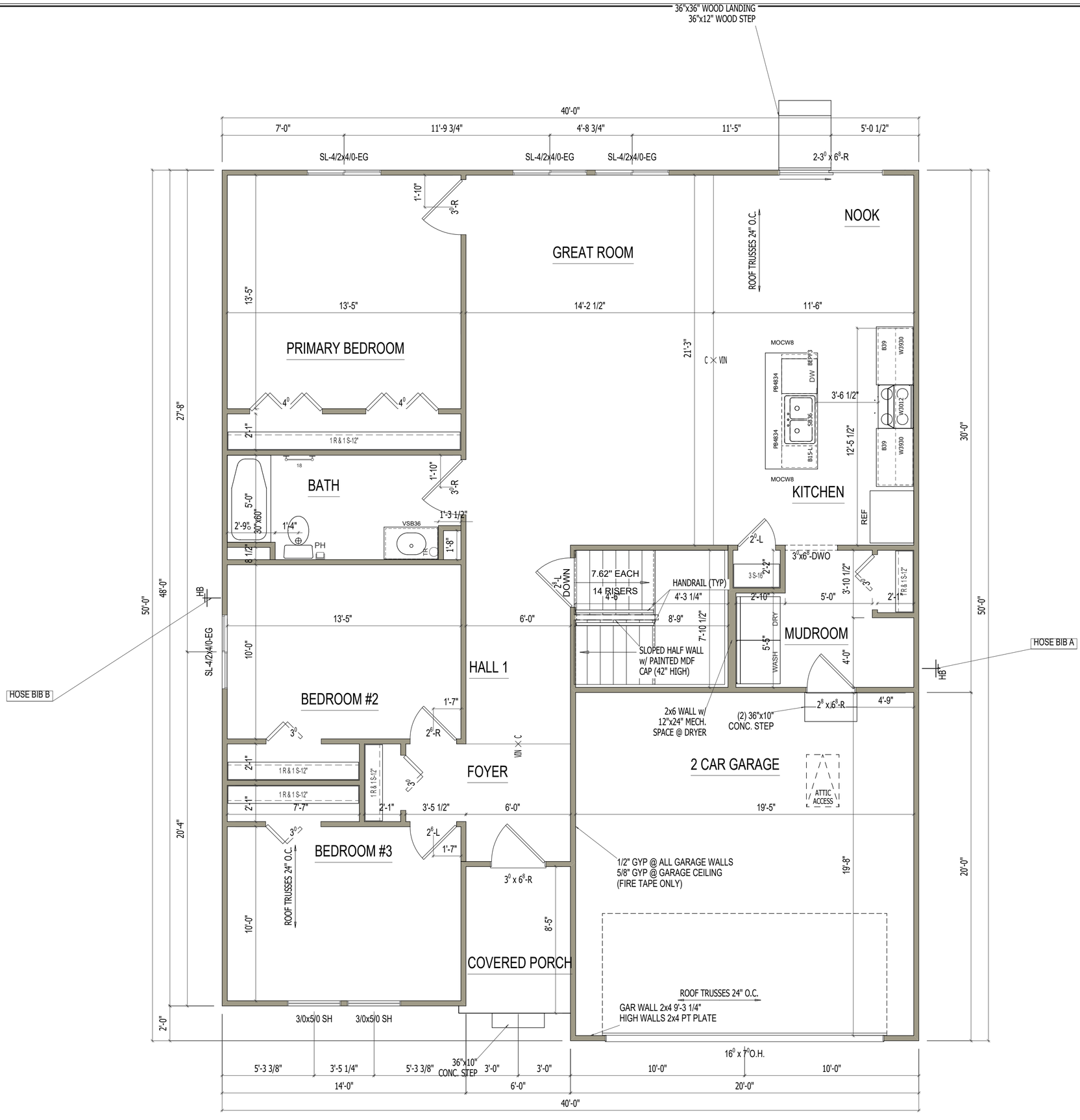
PRINT DATE:
05/25/2023

i1530
FOR: Allen Edwin Homes
LOT #:
LOCATION:

SHEET NUMBER
A-06.00



FIRST FLOOR i1530

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

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PRINT DATE:
05/25/2023

i1530
FOR: Allen Edwin Homes
LOT #:
LOCATION:

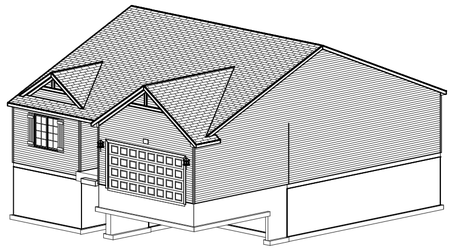
SHEET NUMBER
A-07.00

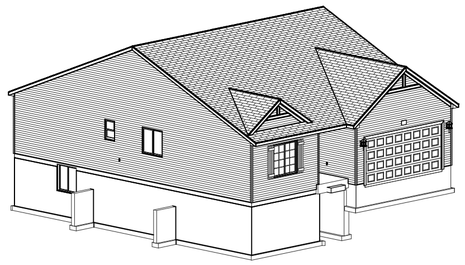
ms/A-07.00.vxp

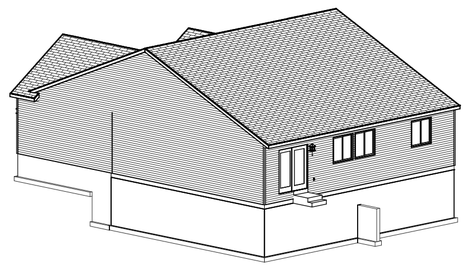
integrity 1610

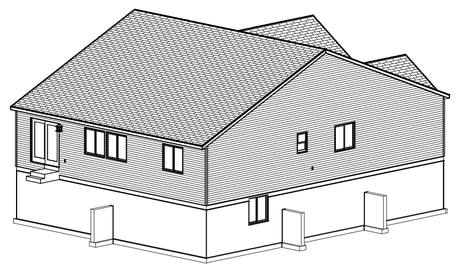
1,607 SF

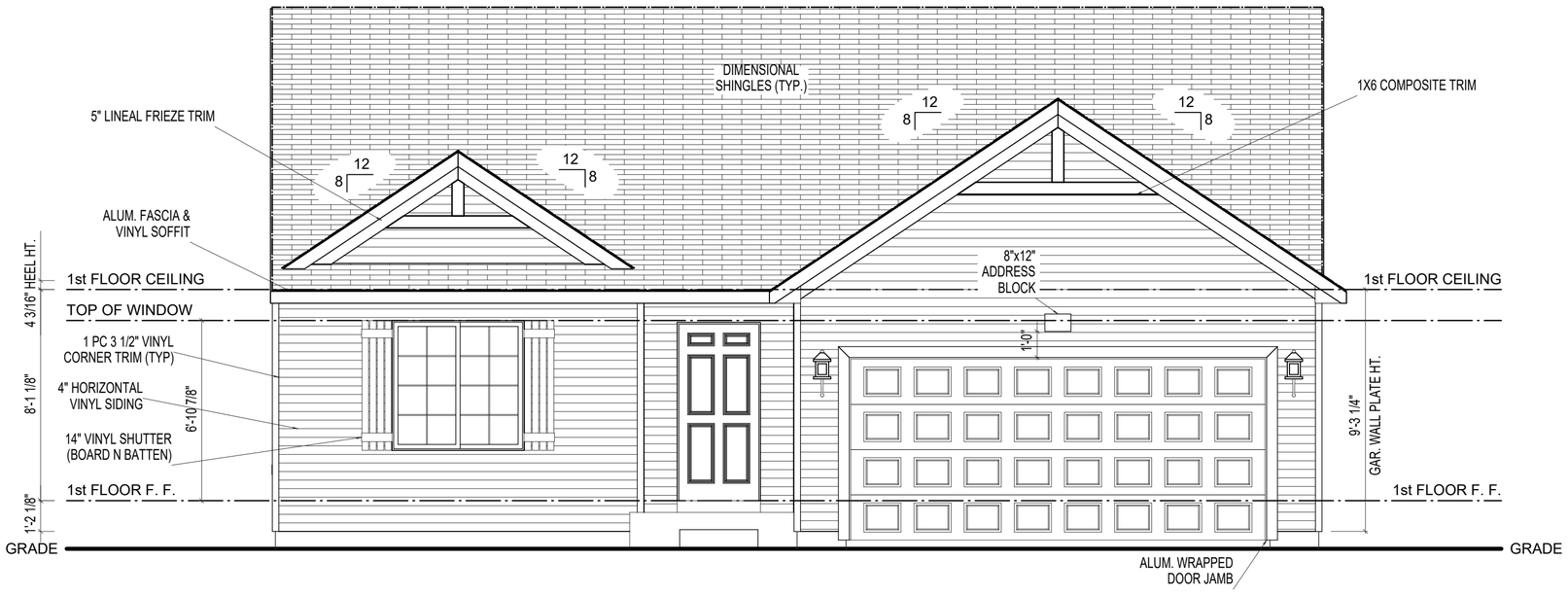
3-5 bedrooms
2-3 bathrooms
2-3 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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05/25/2023

i1610

FOR: Allen Edwin Homes

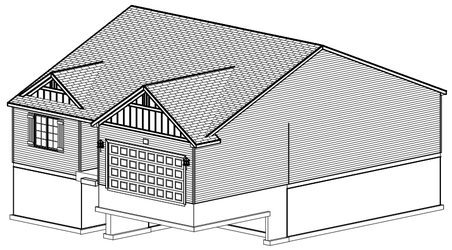
LOT #:

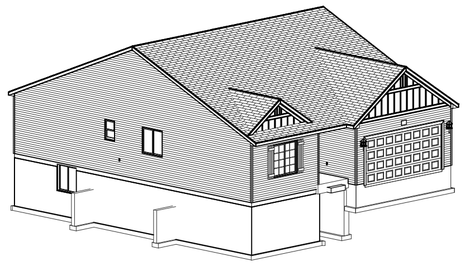
LOCATION:

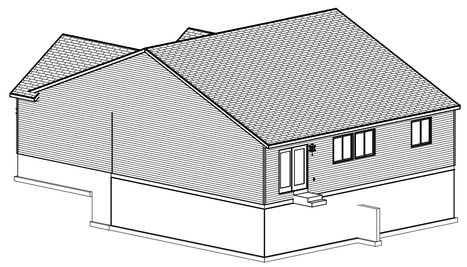
SHEET NUMBER

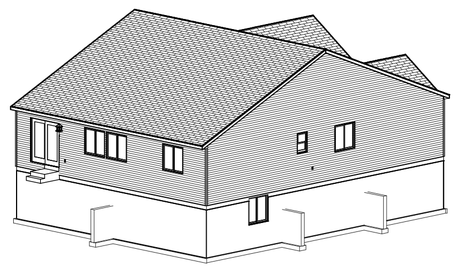
A-01.00

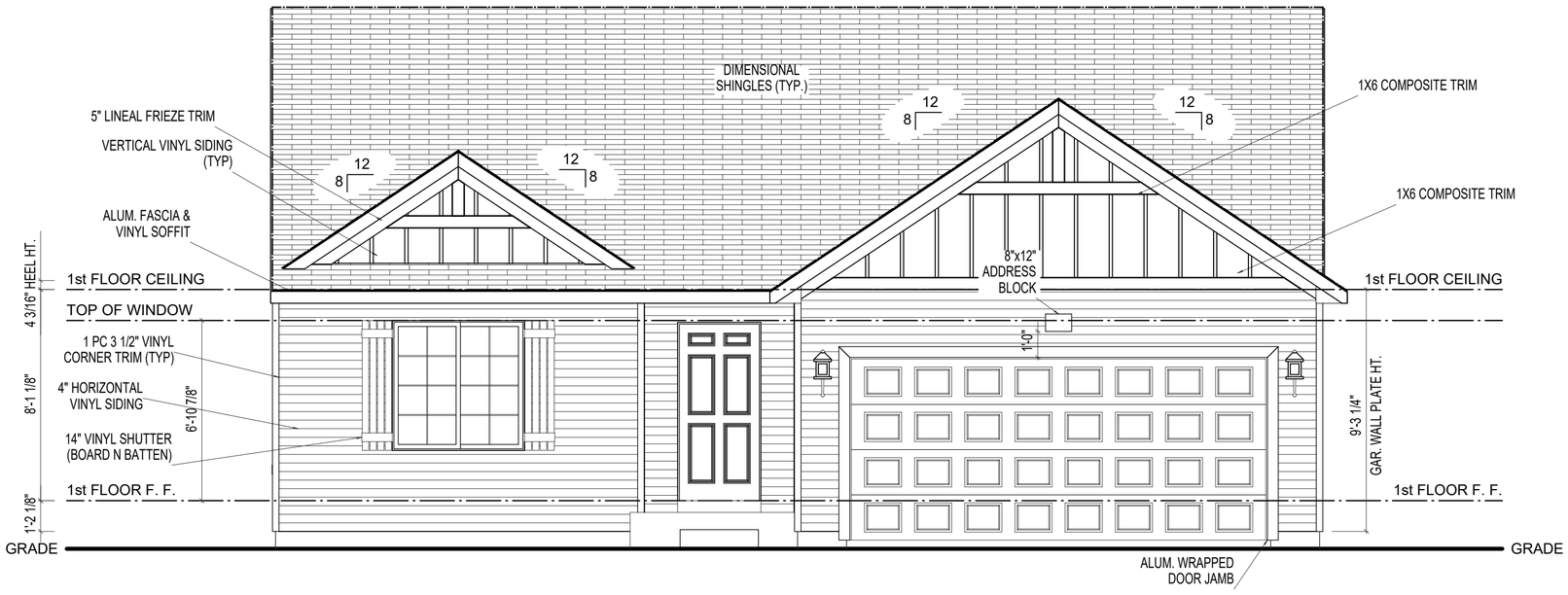
ms/A-01.00.vxp











FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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PRINT DATE: 05/25/2023

i1610

FOR: Allen Edwin Homes

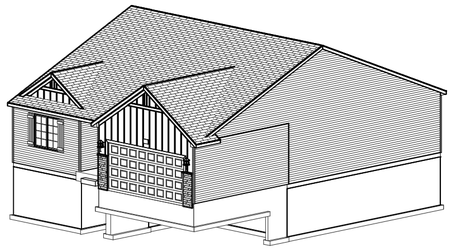
LOT #:

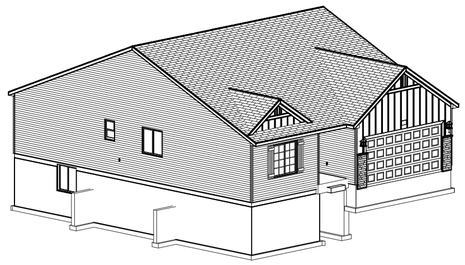
LOCATION:

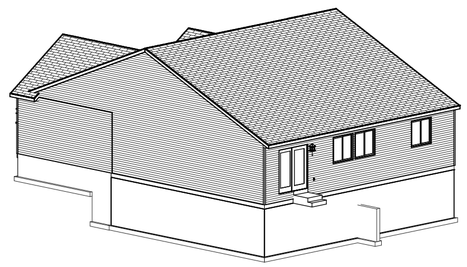
SHEET NUMBER

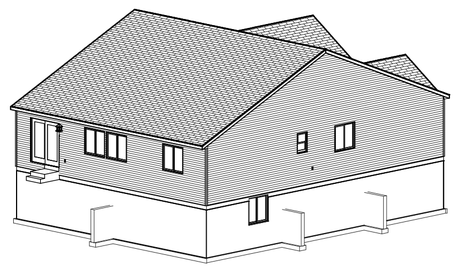
A-01.01

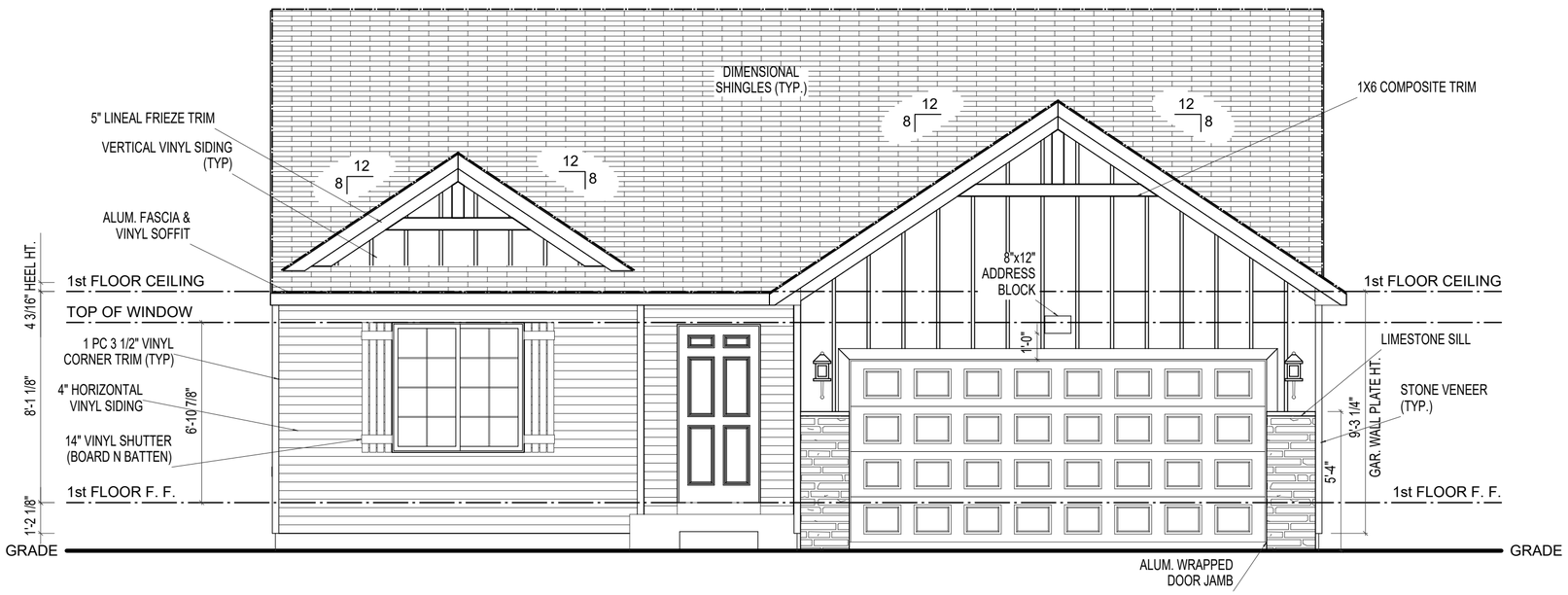
ms/A-01.01.vxp











FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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PRINT DATE: 05/25/2023

i1610

FOR: Allen Edwin Homes

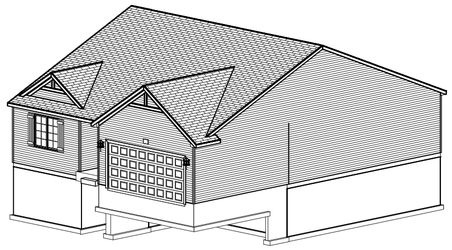
LOT #:

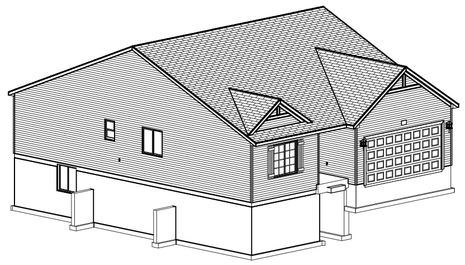
LOCATION:

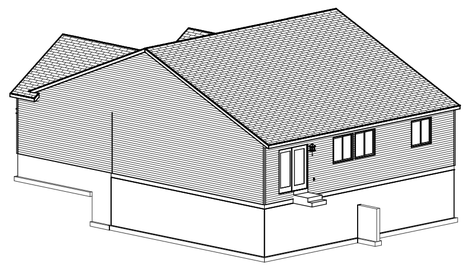
SHEET NUMBER

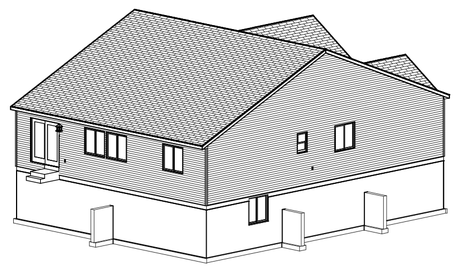
A-01.02

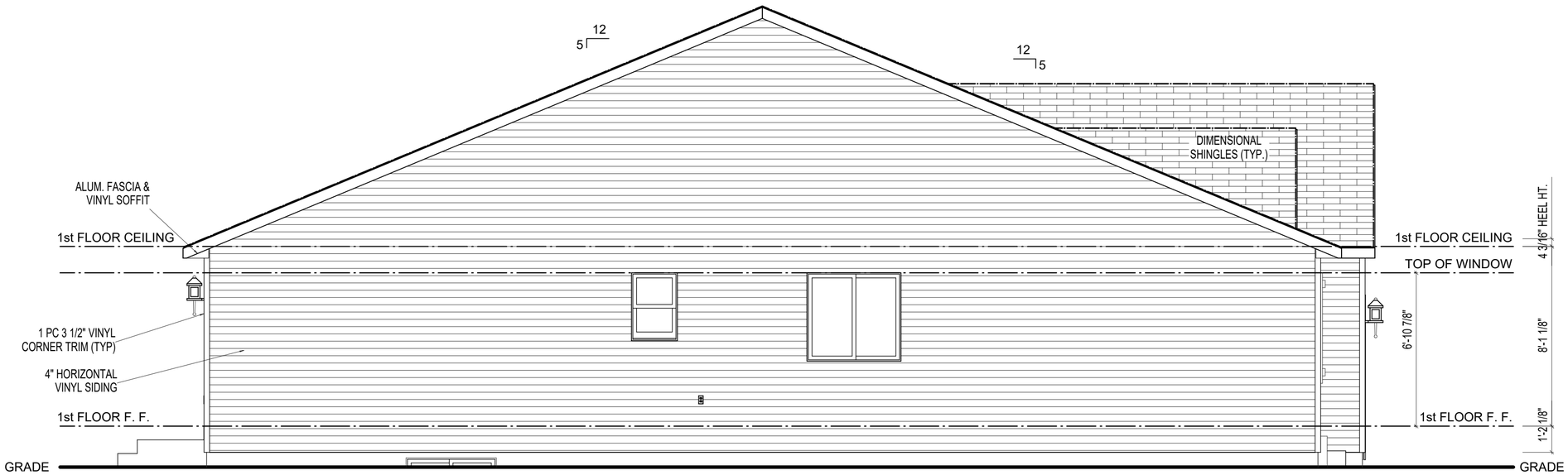
ms/A-01.02.vxp











LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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05/25/2023

i1610

FOR: Allen Edwin Homes

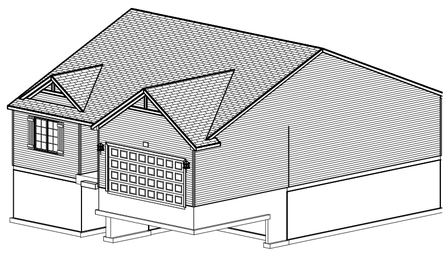
LOT #:

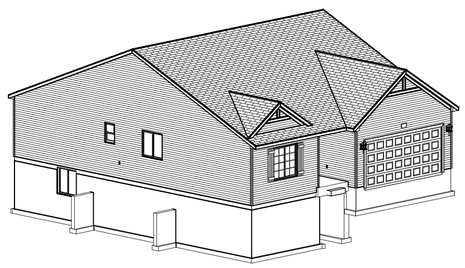
LOCATION:

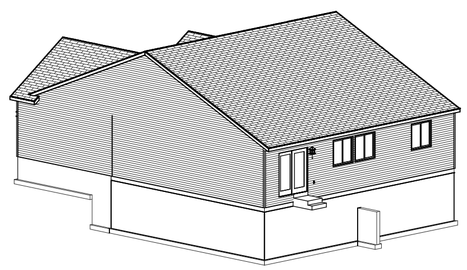
SHEET NUMBER

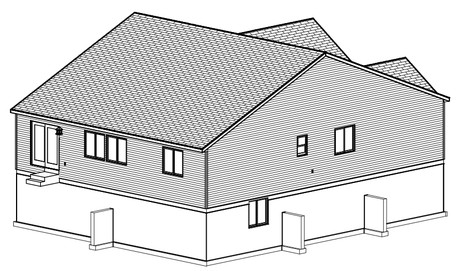
A-02.00

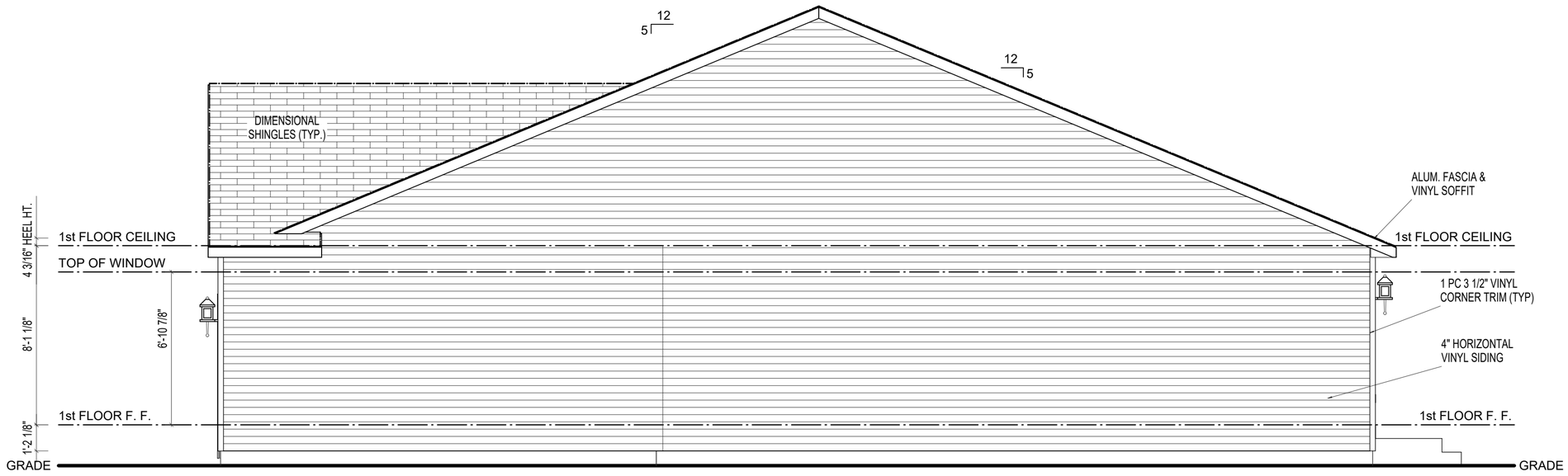
ms/A-02.00.vxp











RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

ELEVATION A1	REV. NO.	DATE	REMARKS
GARAGE RIGHT			
REVISION V8.0a			

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05/25/2023

i1610

FOR: Allen Edwin Homes

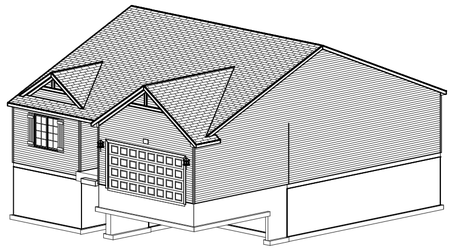
LOT #:

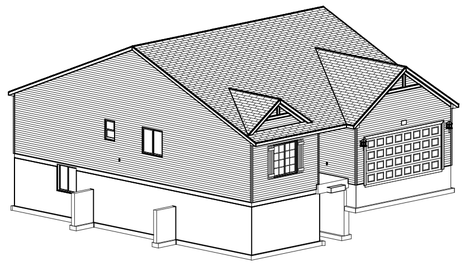
LOCATION:

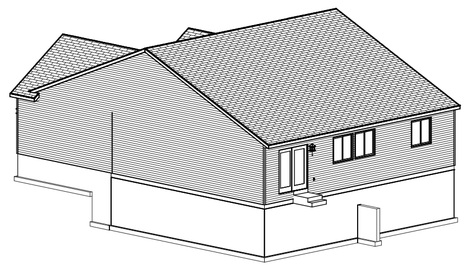
SHEET NUMBER

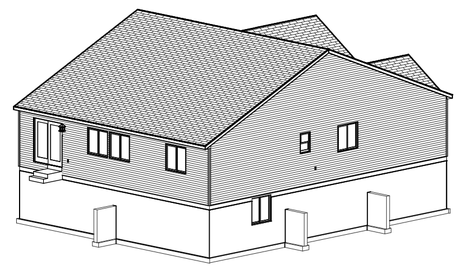
A-03.00

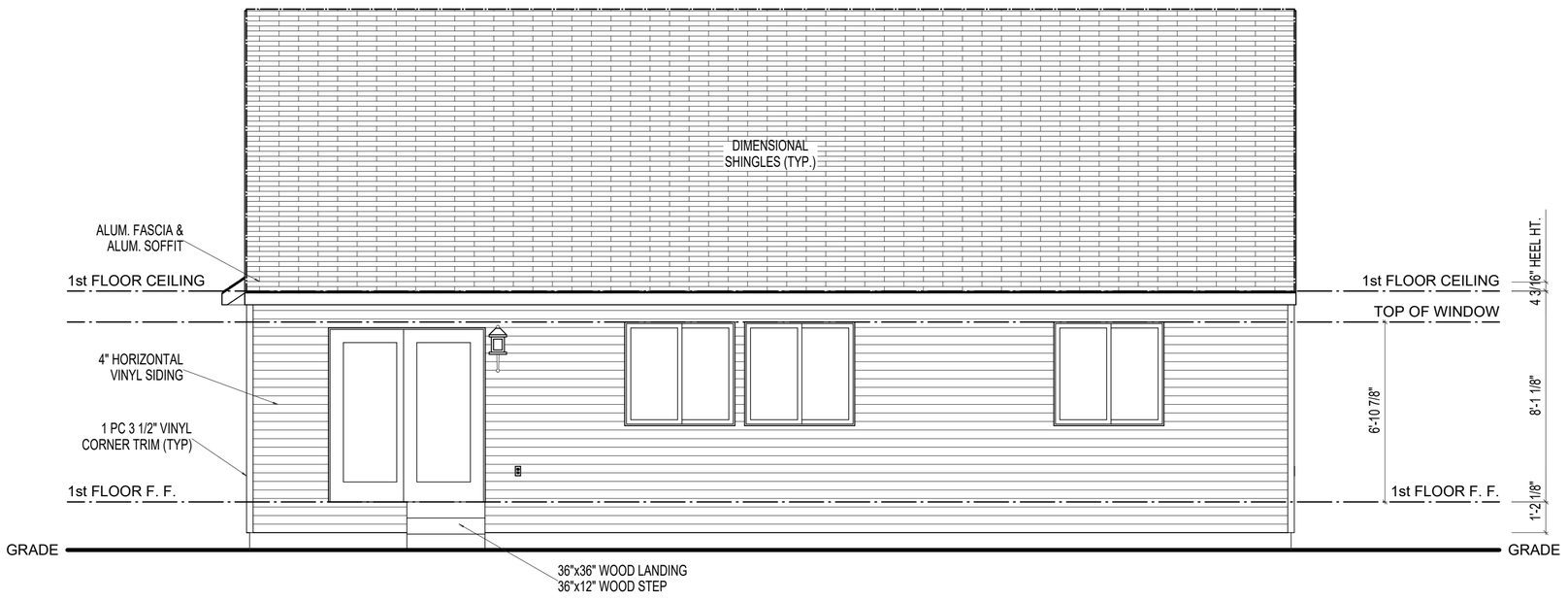
ms/A-03.00.vxp











REAR ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

ALLEN EDWIN HOMES
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Portage, MI 49002
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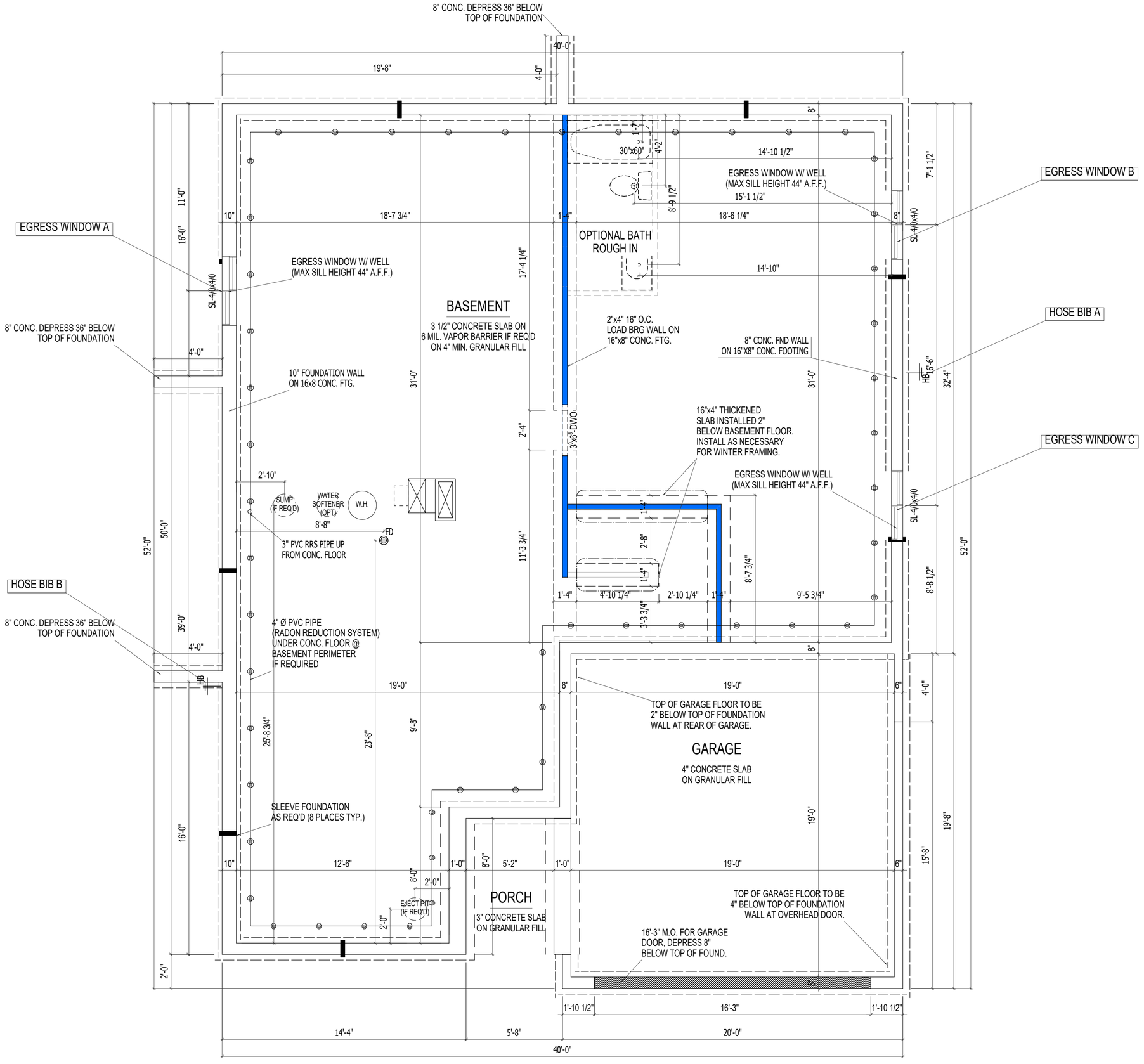
PRINT DATE:
05/25/2023

i1610
FOR: Allen Edwin Homes
LOT #:
LOCATION:

SHEET NUMBER
A-04.00

ms/A-04.00.vxp



BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"

ms/A-06.00.vxp

REMARKS	DATE	REV. NO.

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

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i1610
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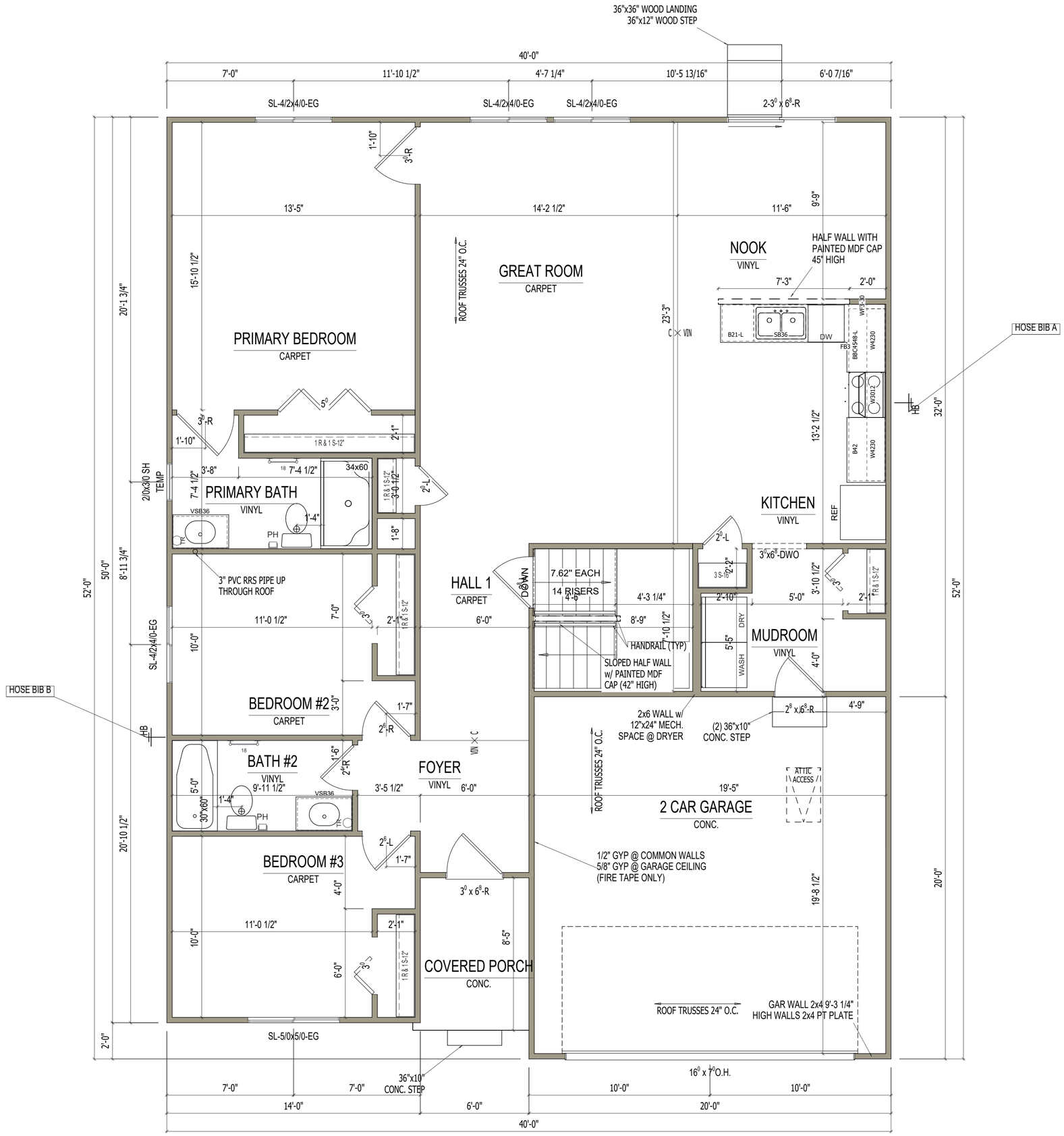
SHEET NUMBER
A-06.00



FIRST FLOOR i1610

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

ELEVATION A1
GARAGE RIGHT
REVISION V8.0a

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i1610
FOR: Allen Edwin Homes
LOT #:
LOCATION:

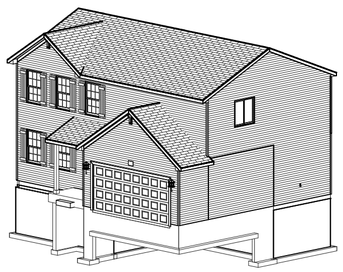
SHEET NUMBER
A-07.00

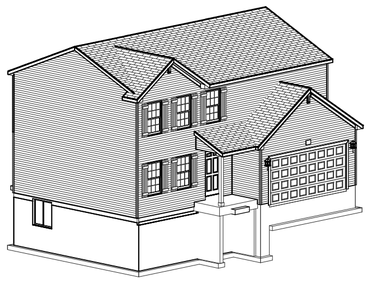
ms/A-07.00.vxp

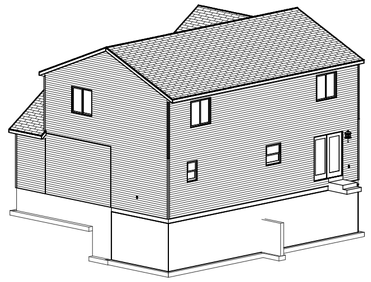
integrity 1810

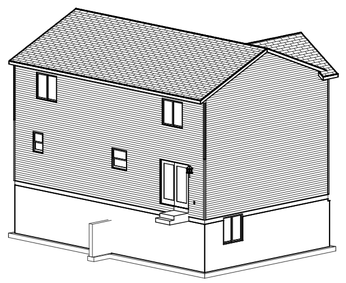
1,822 SF

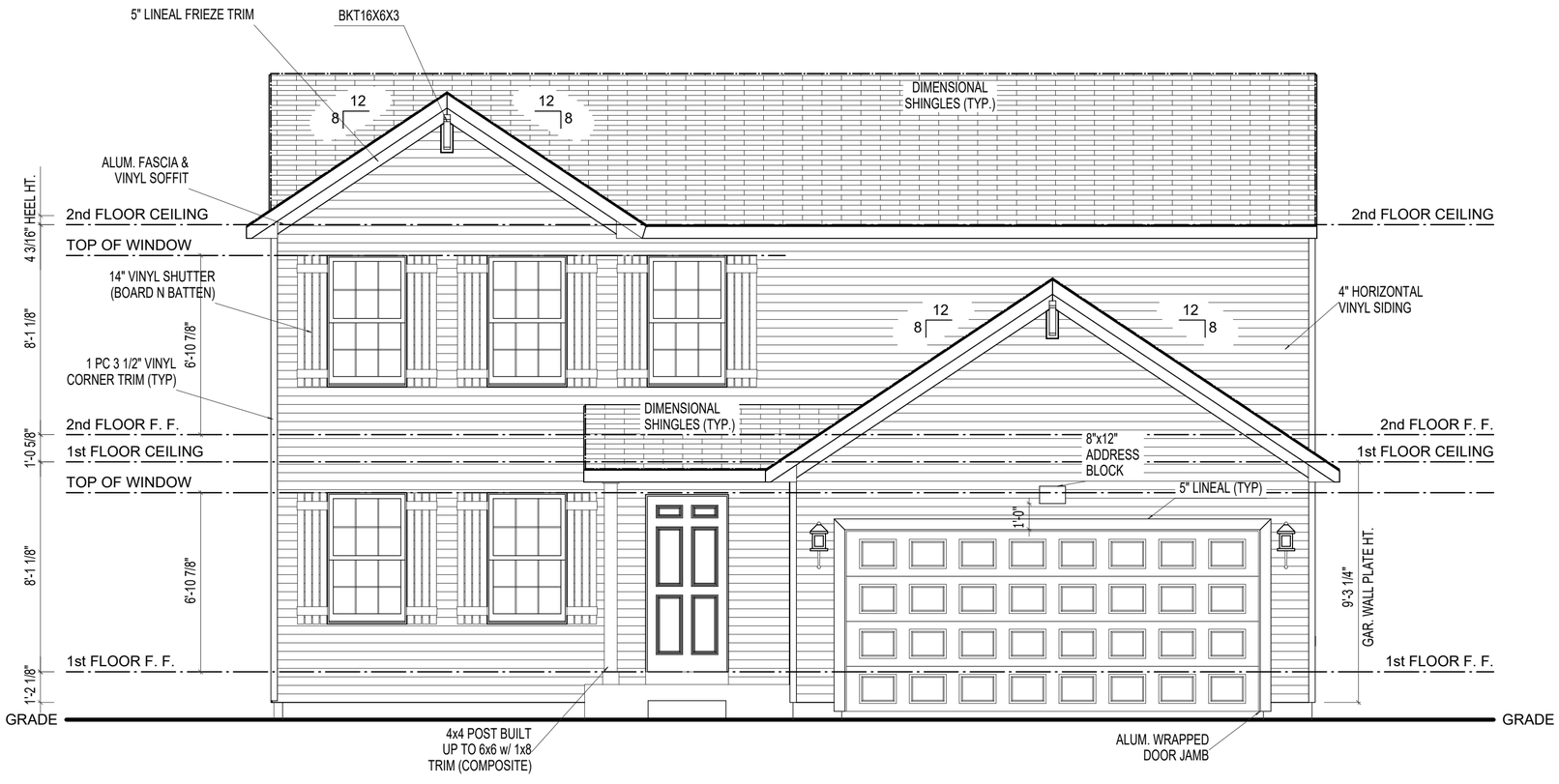
4 bedrooms
2.5-3.5 bathrooms
2-3 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.	REVISION
			V8.1a

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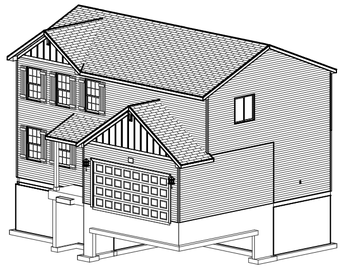

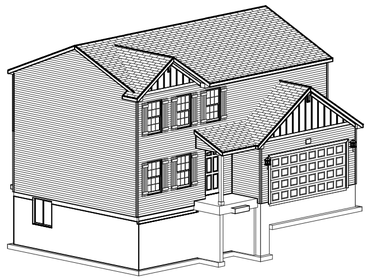

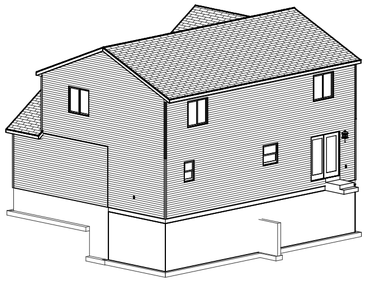

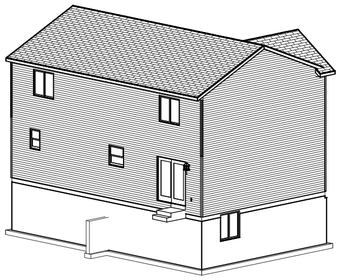

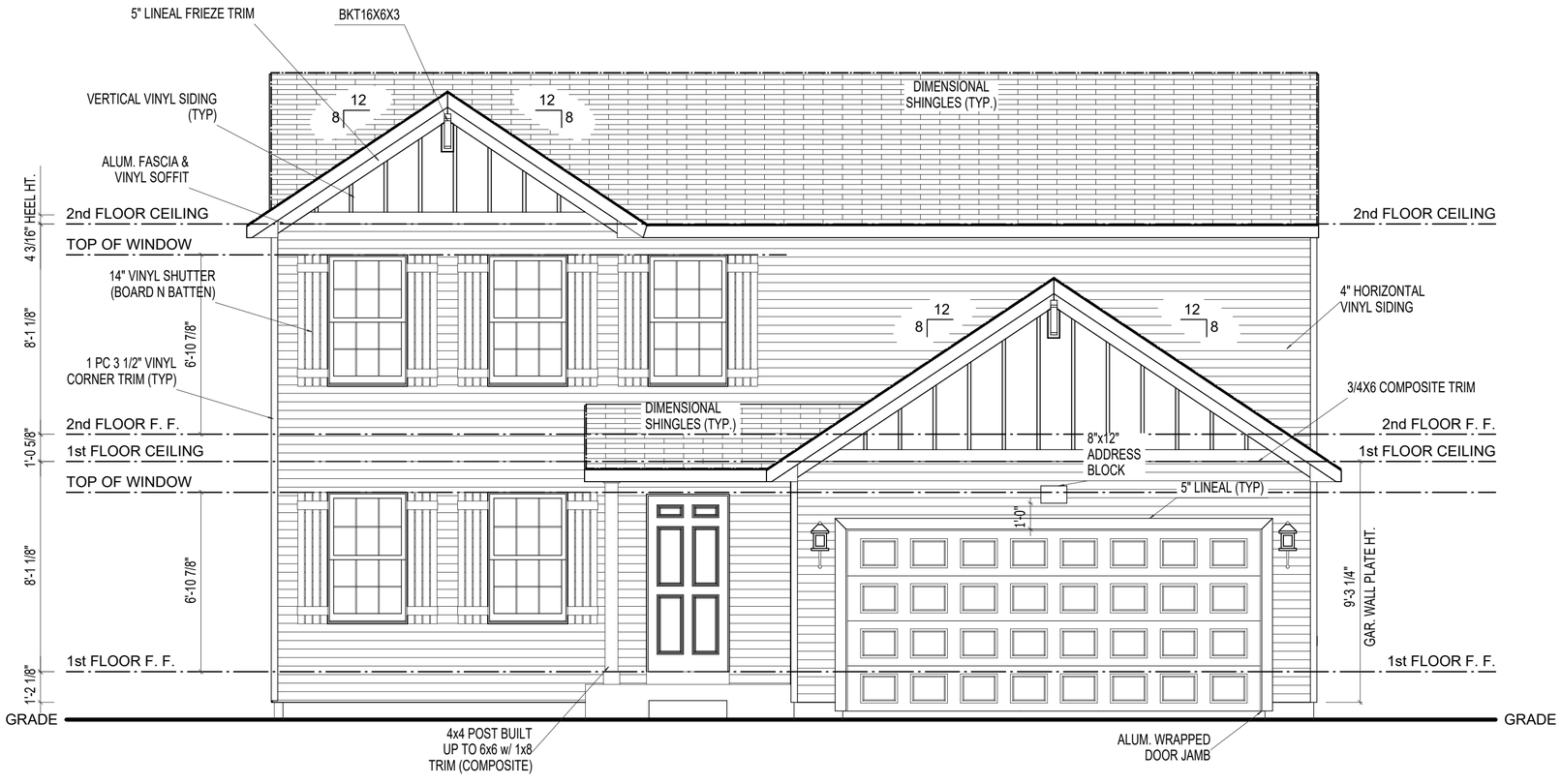

FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

REMARKS

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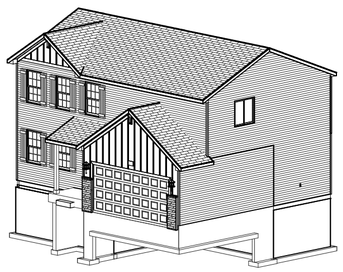

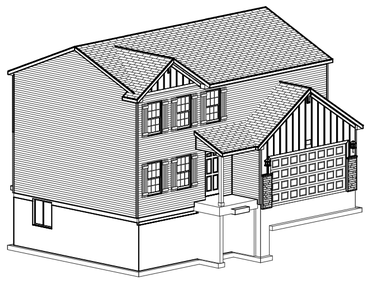

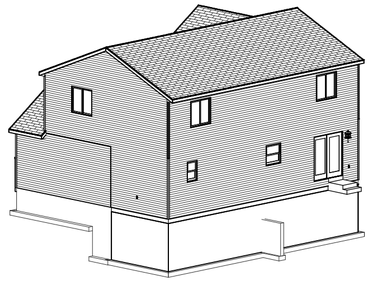

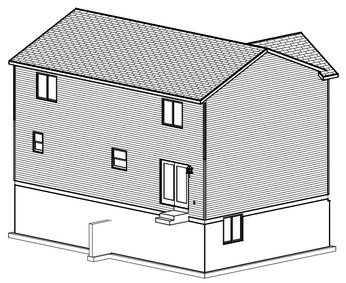

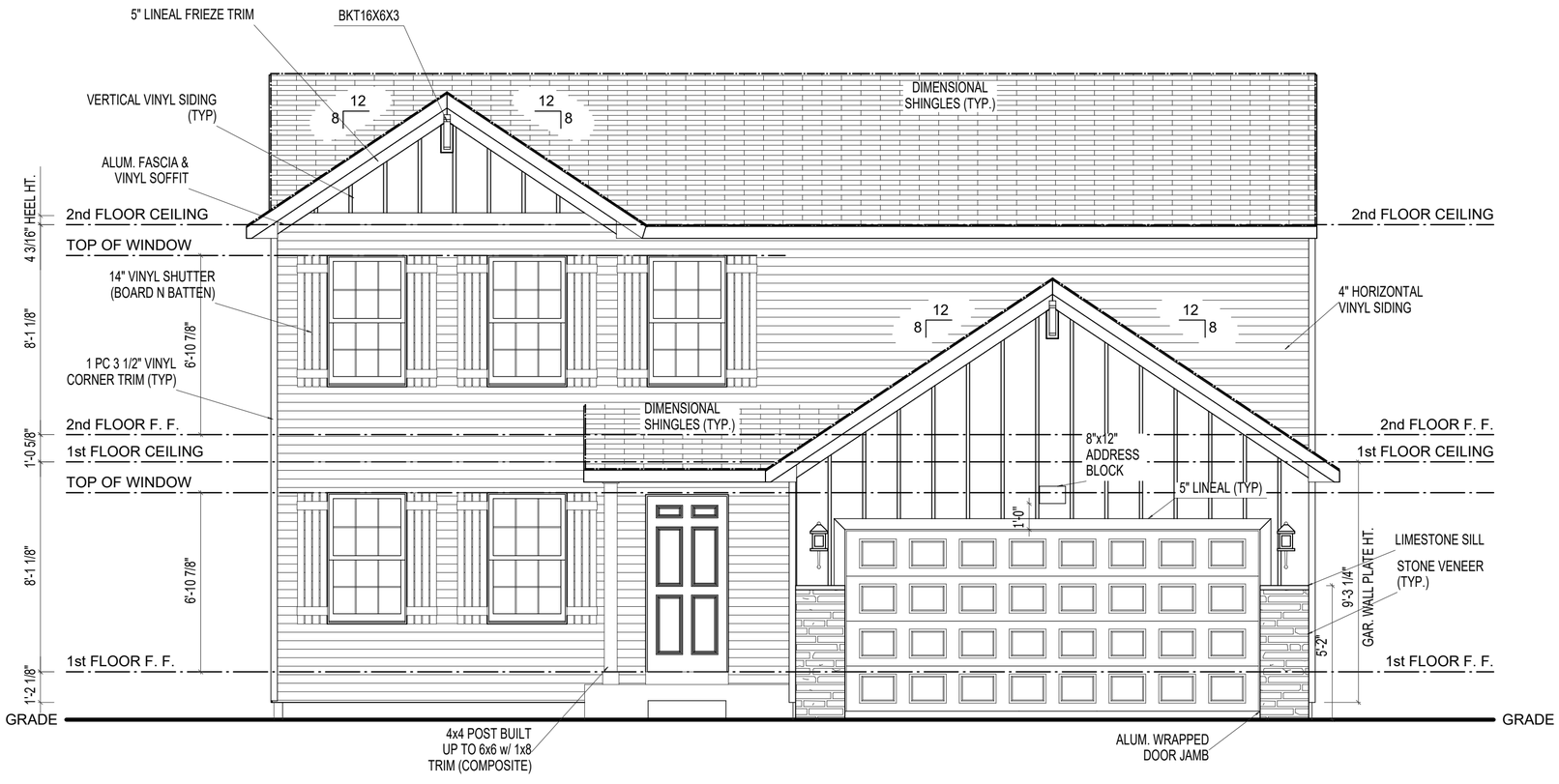

FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.	REVISION
			V8.1a

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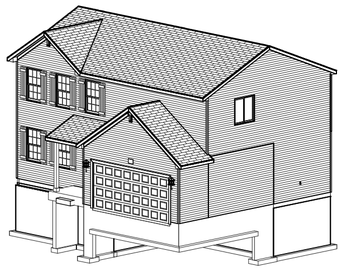

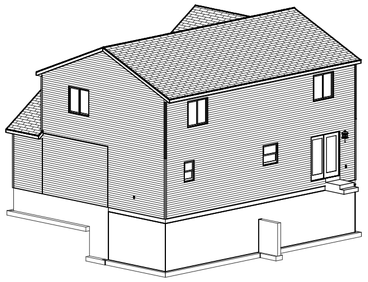

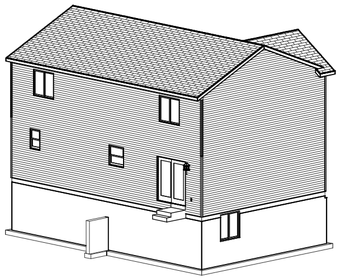

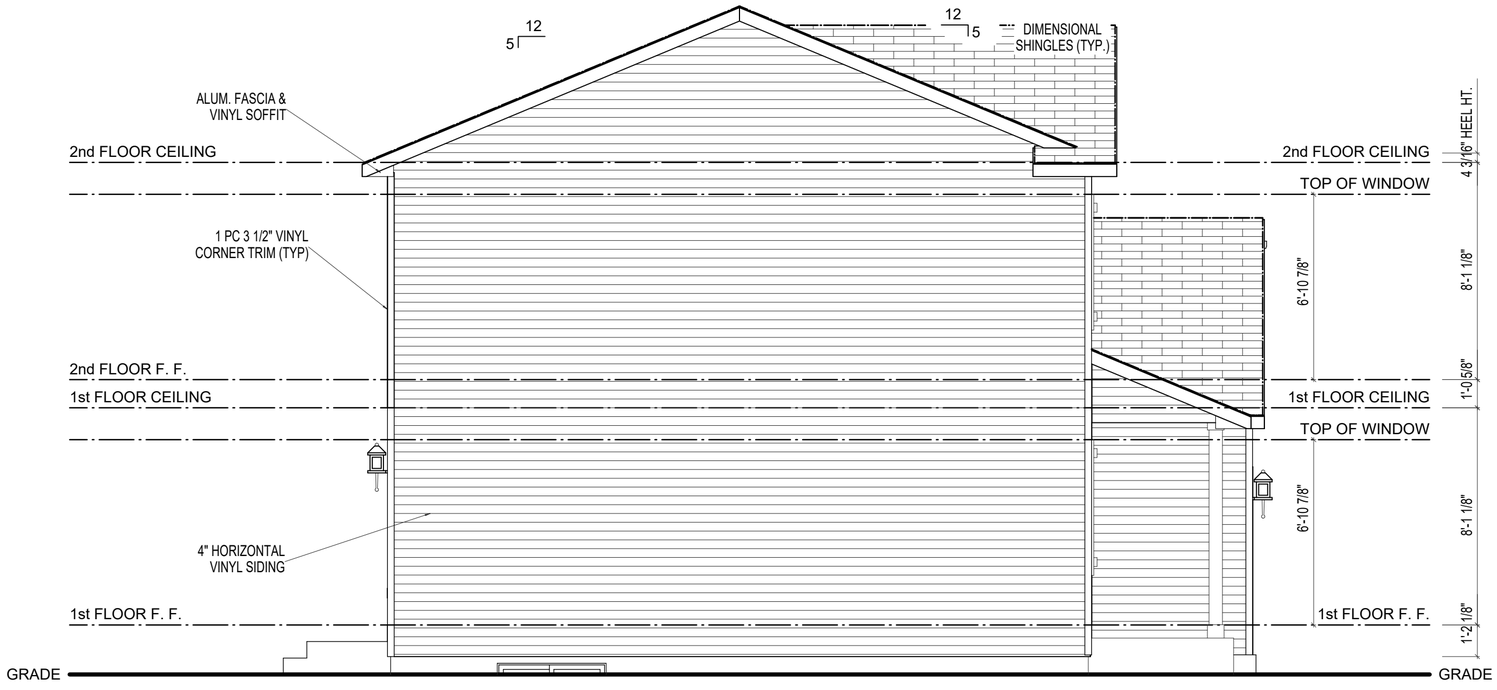

LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.	REVISION
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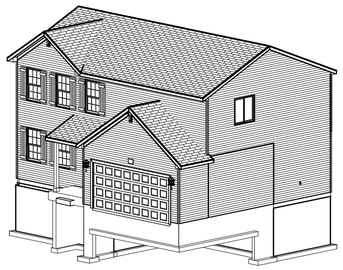

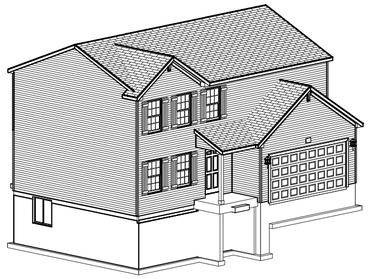

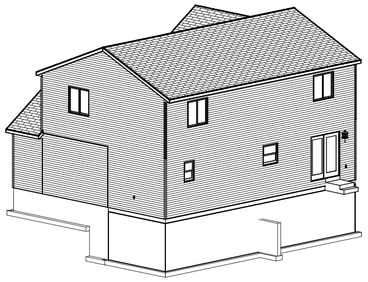

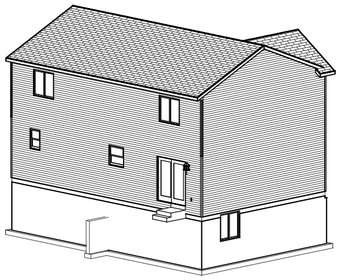

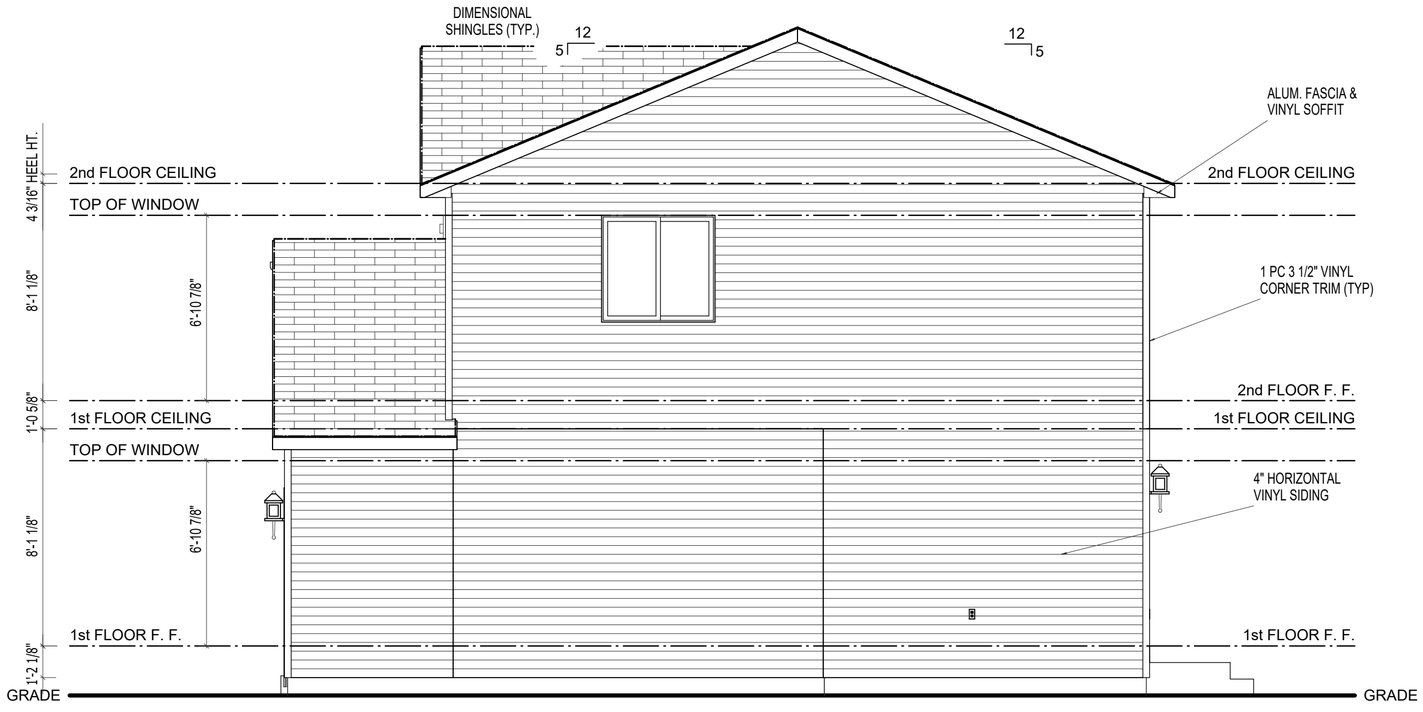

RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS								
REV. NO.								
DATE								
i1810	REVISION	V8.1a						

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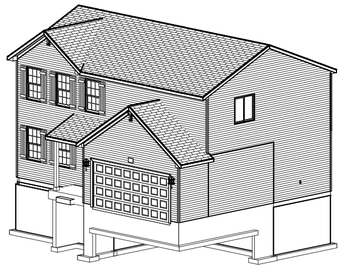
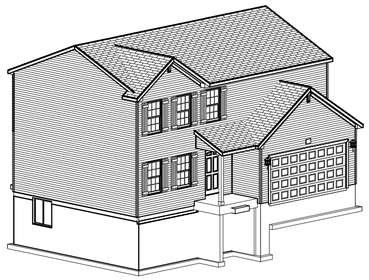
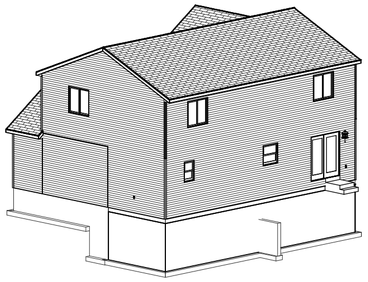
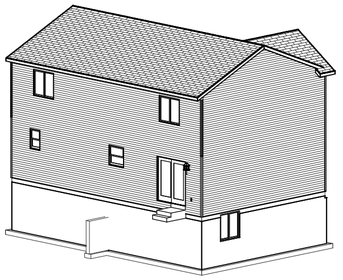
A-03.00

ms/A-03.00.vxp









REAR ELEVATION A1

SCALE: 1/4"=1'-0"

REVISION	REV. NO.	DATE	REMARKS
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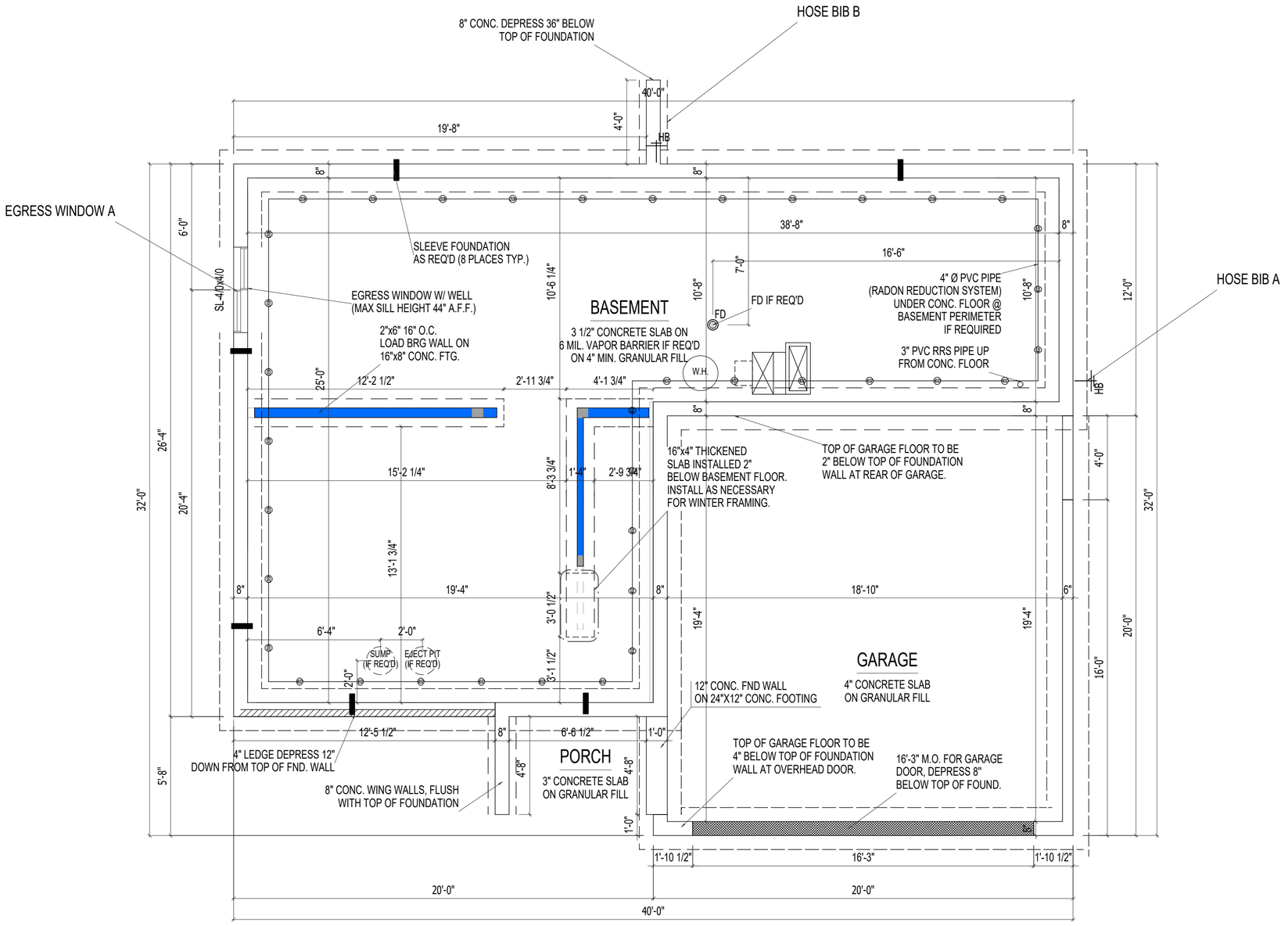
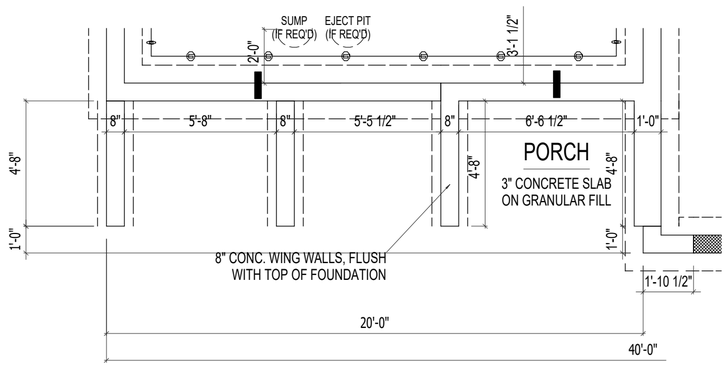


BASEMENT FOUNDATION

SCALE: 1/4"=1'-0"



C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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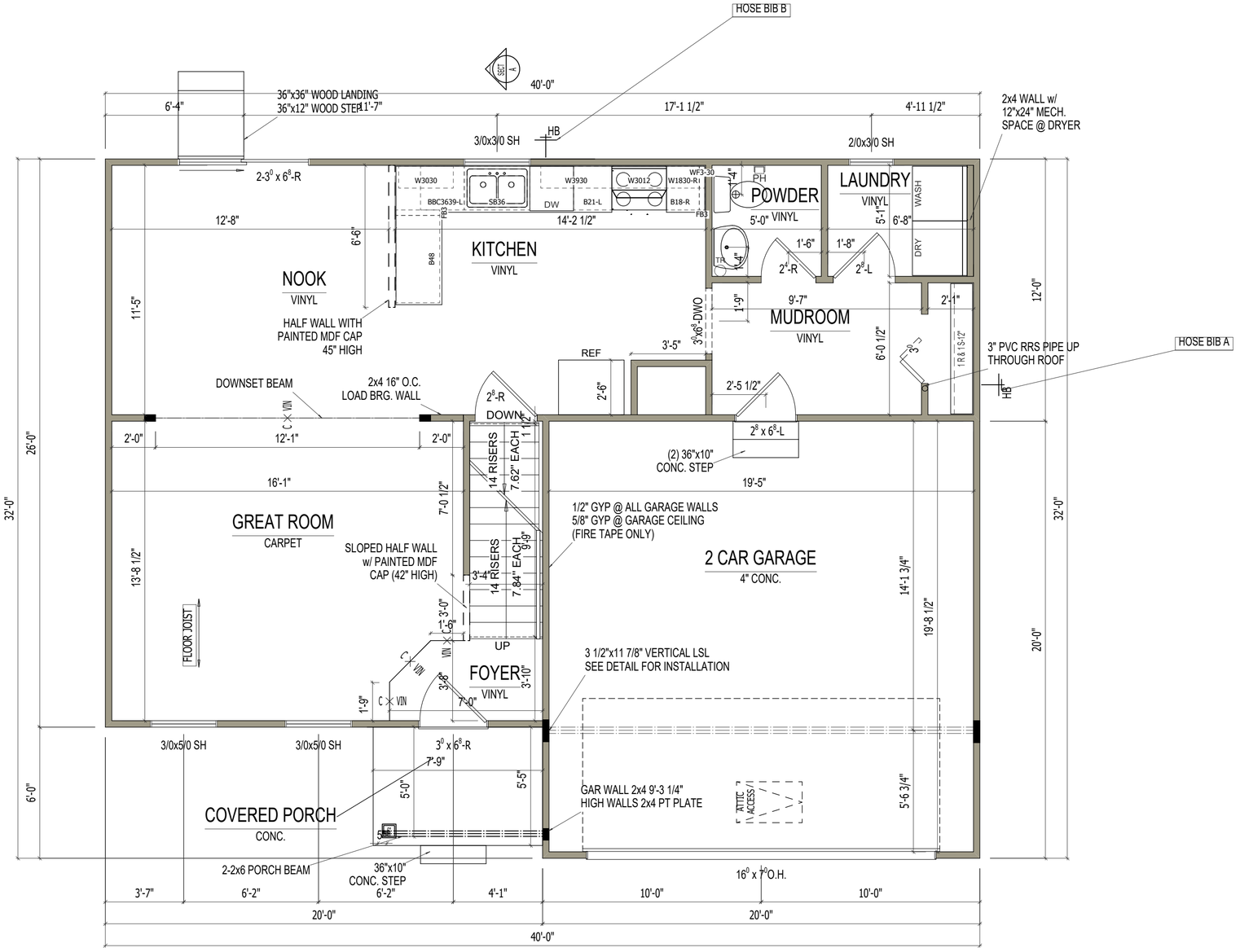

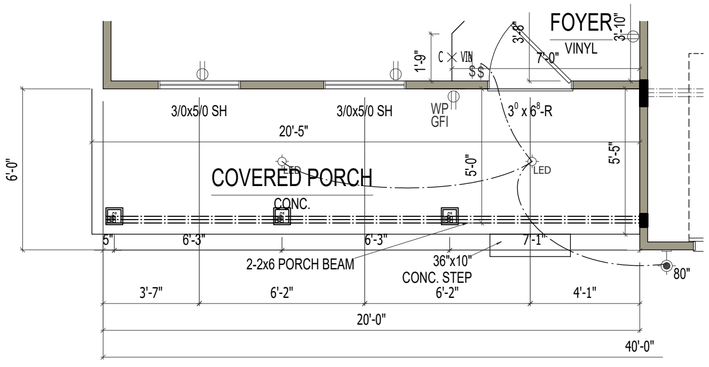

C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

FIRST FLOOR i1810

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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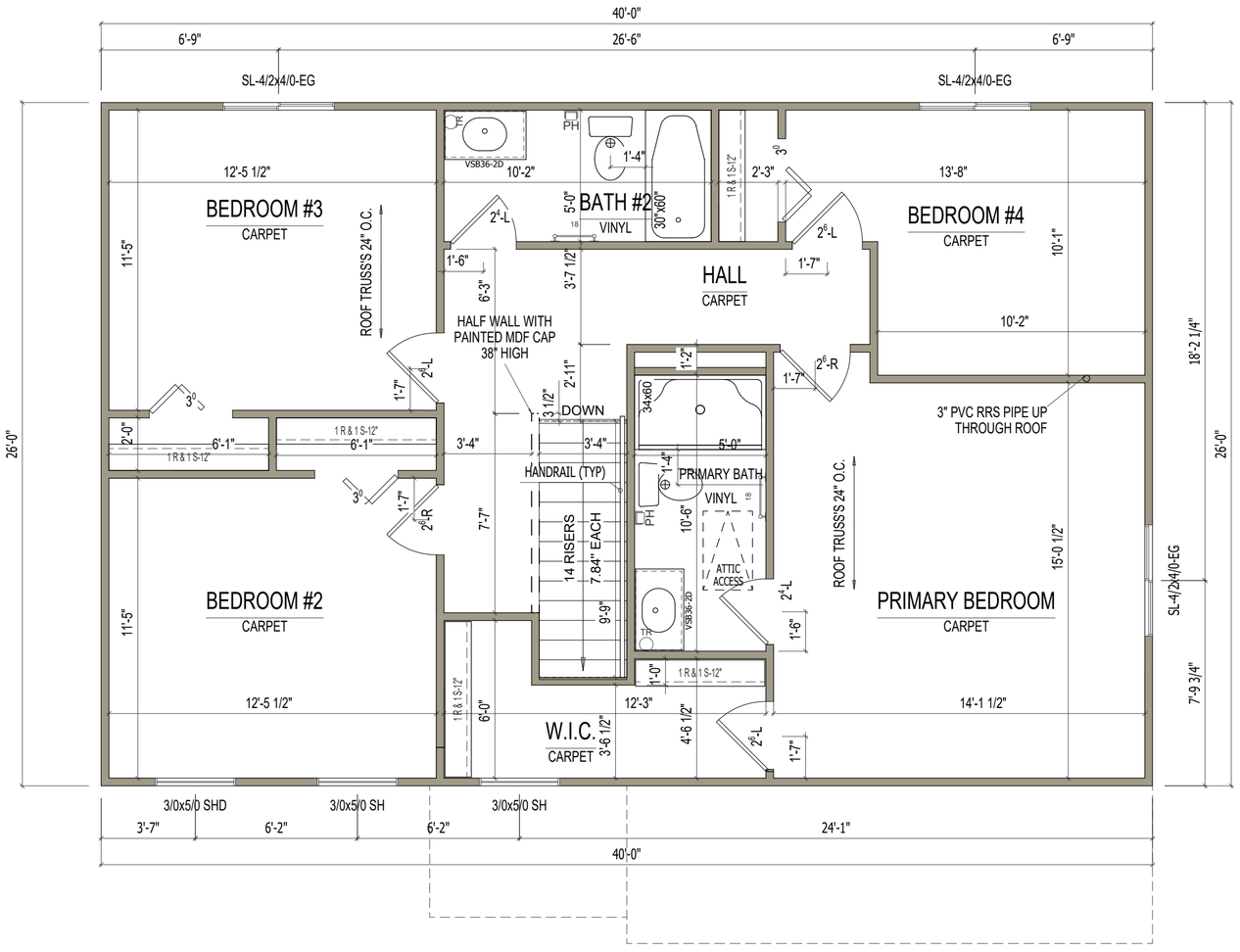

SECOND FLOOR i1810

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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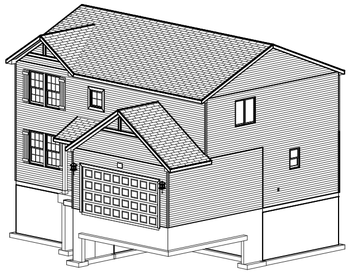
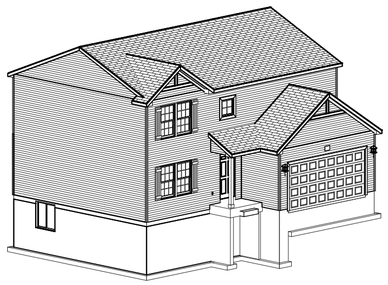
ms/A-08.00.vxp

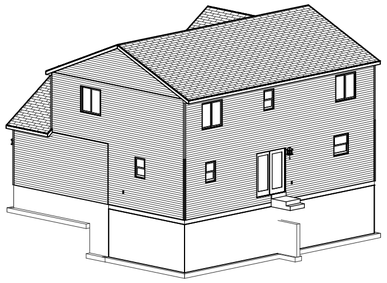
integrity 2000

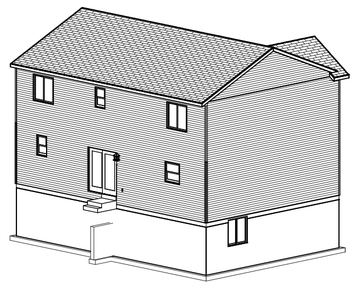
2,022 SF

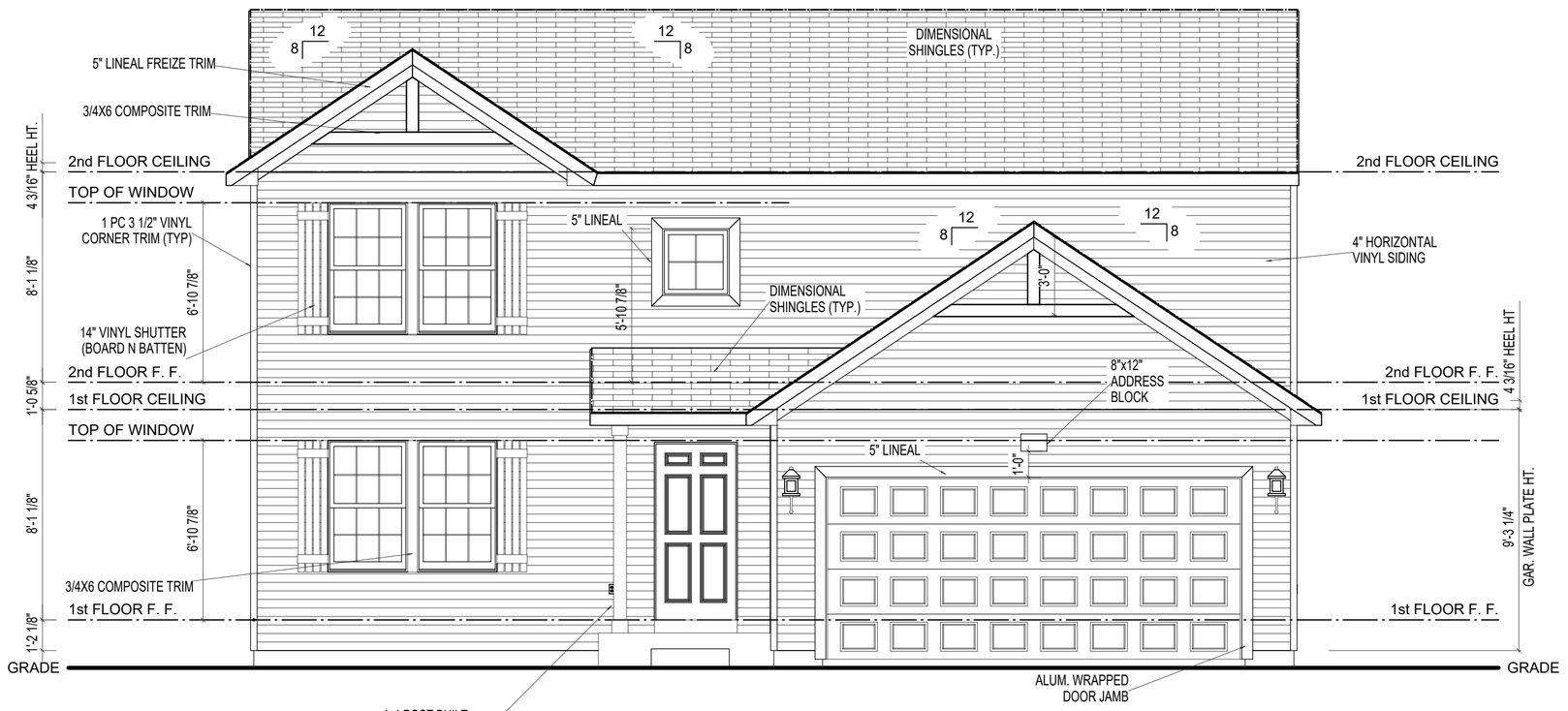
4-5 bedrooms
2.5-3.5 bathrooms
2-3 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2000 GARAGE RIGHT V8.0c

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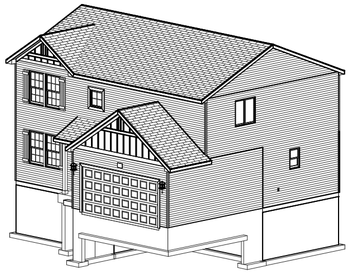

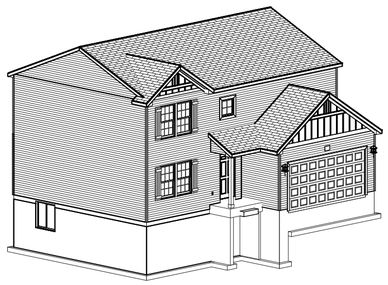

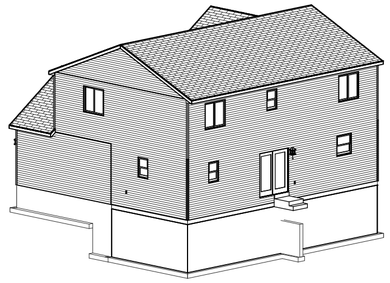

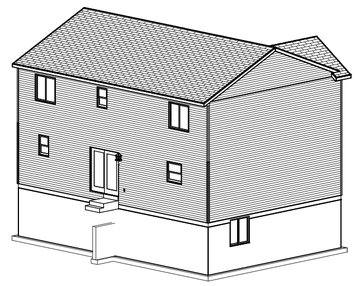

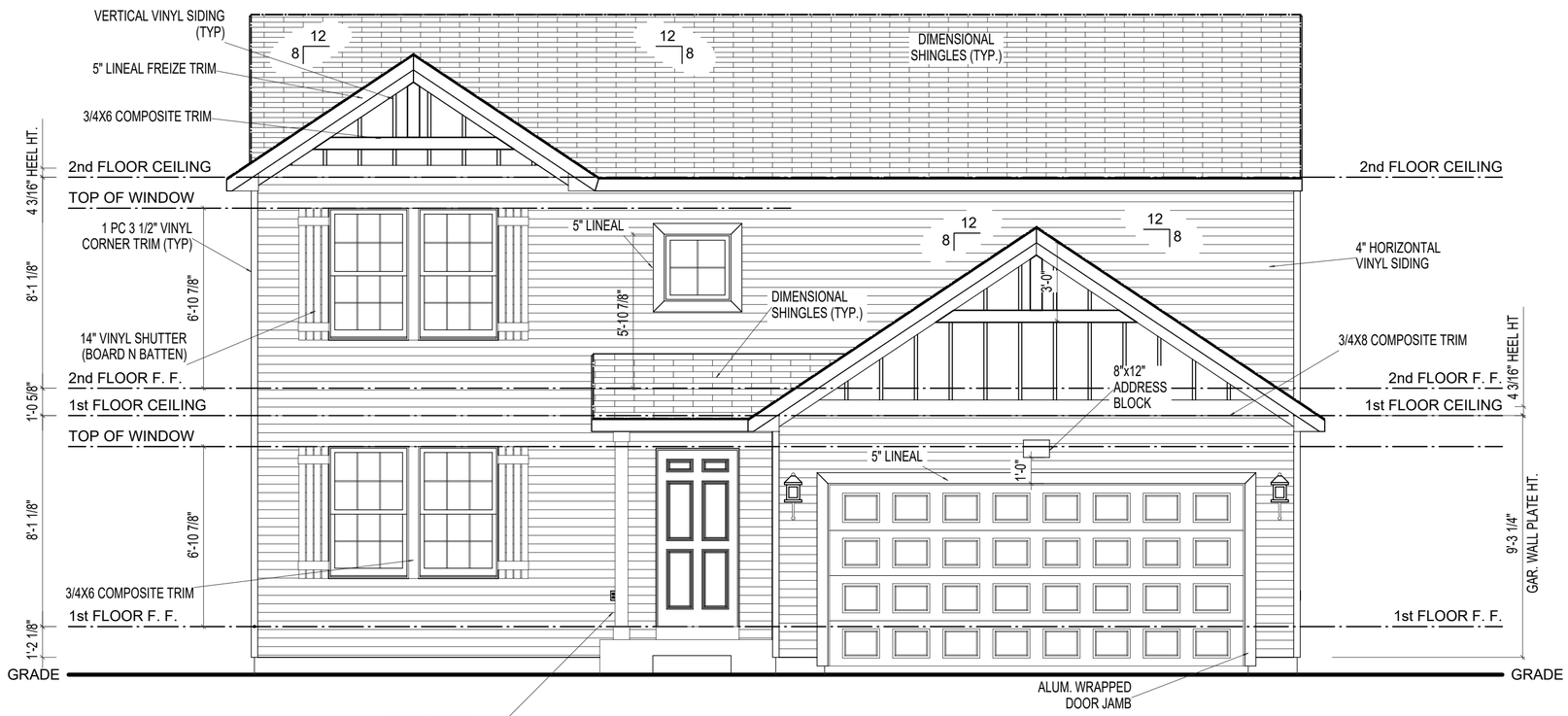

FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2000 GARAGE RIGHT V8.0c

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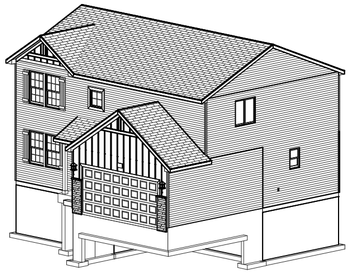

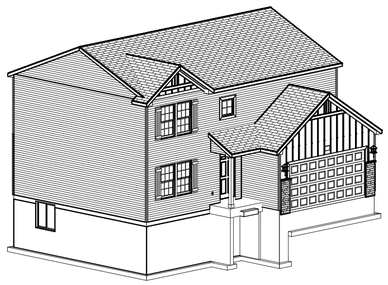

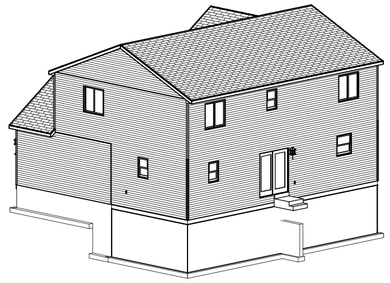

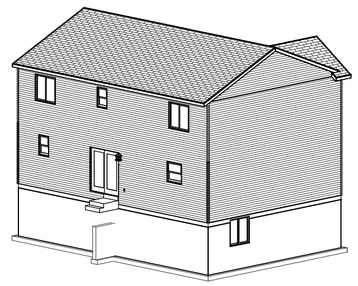

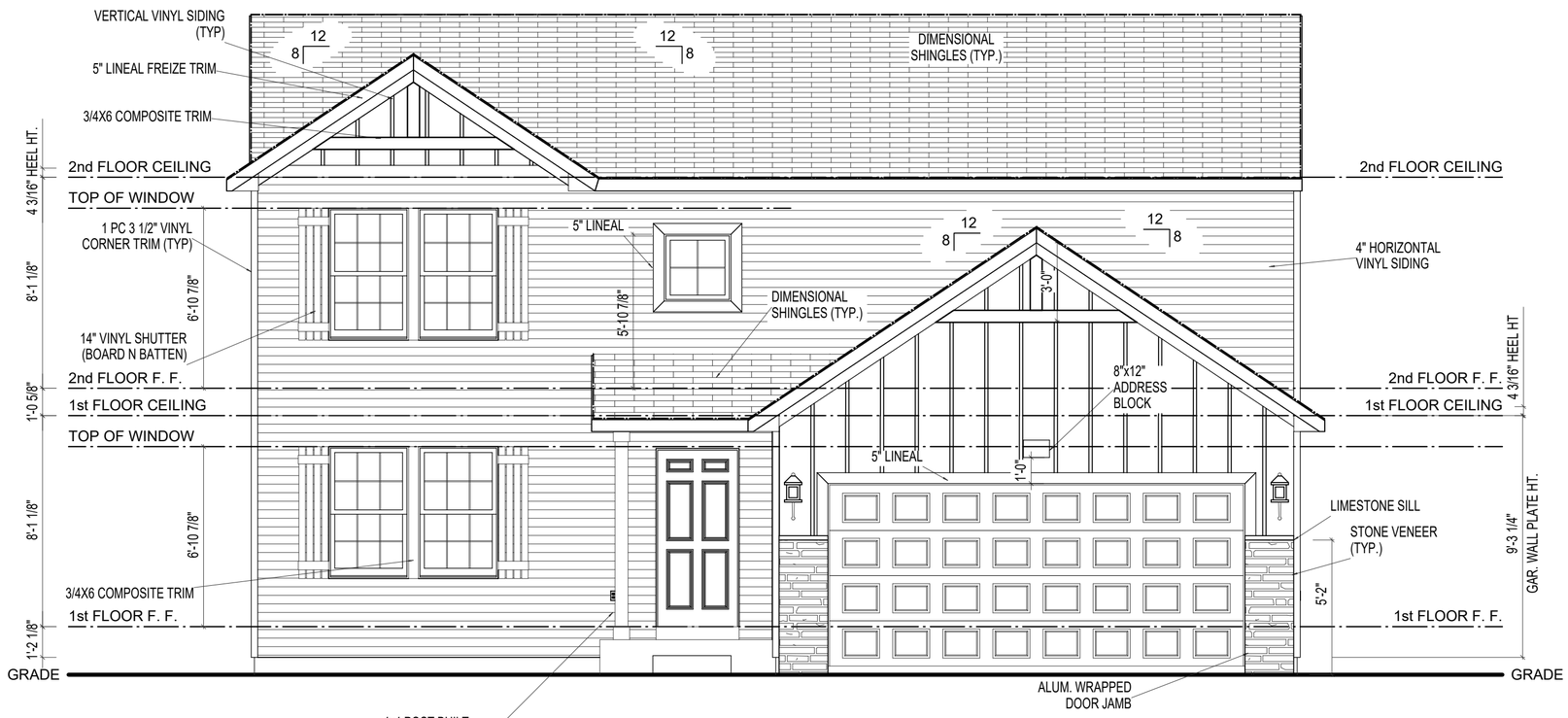

FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

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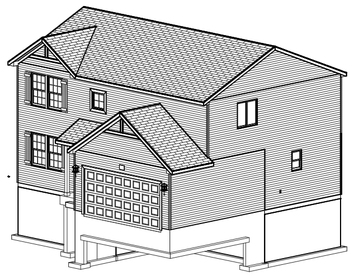
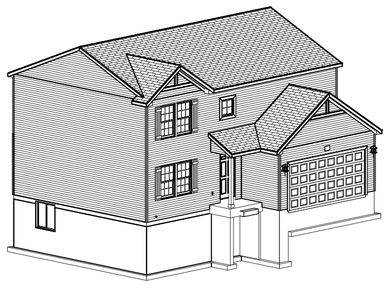
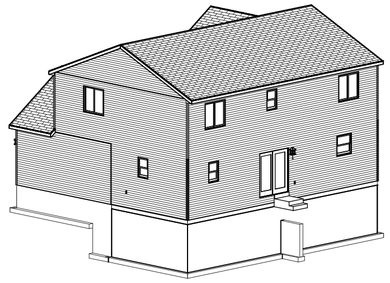
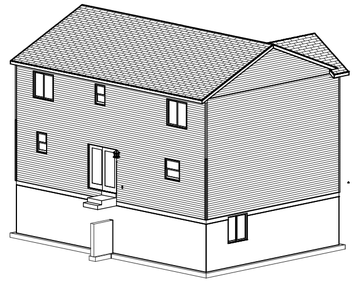
A-01.02

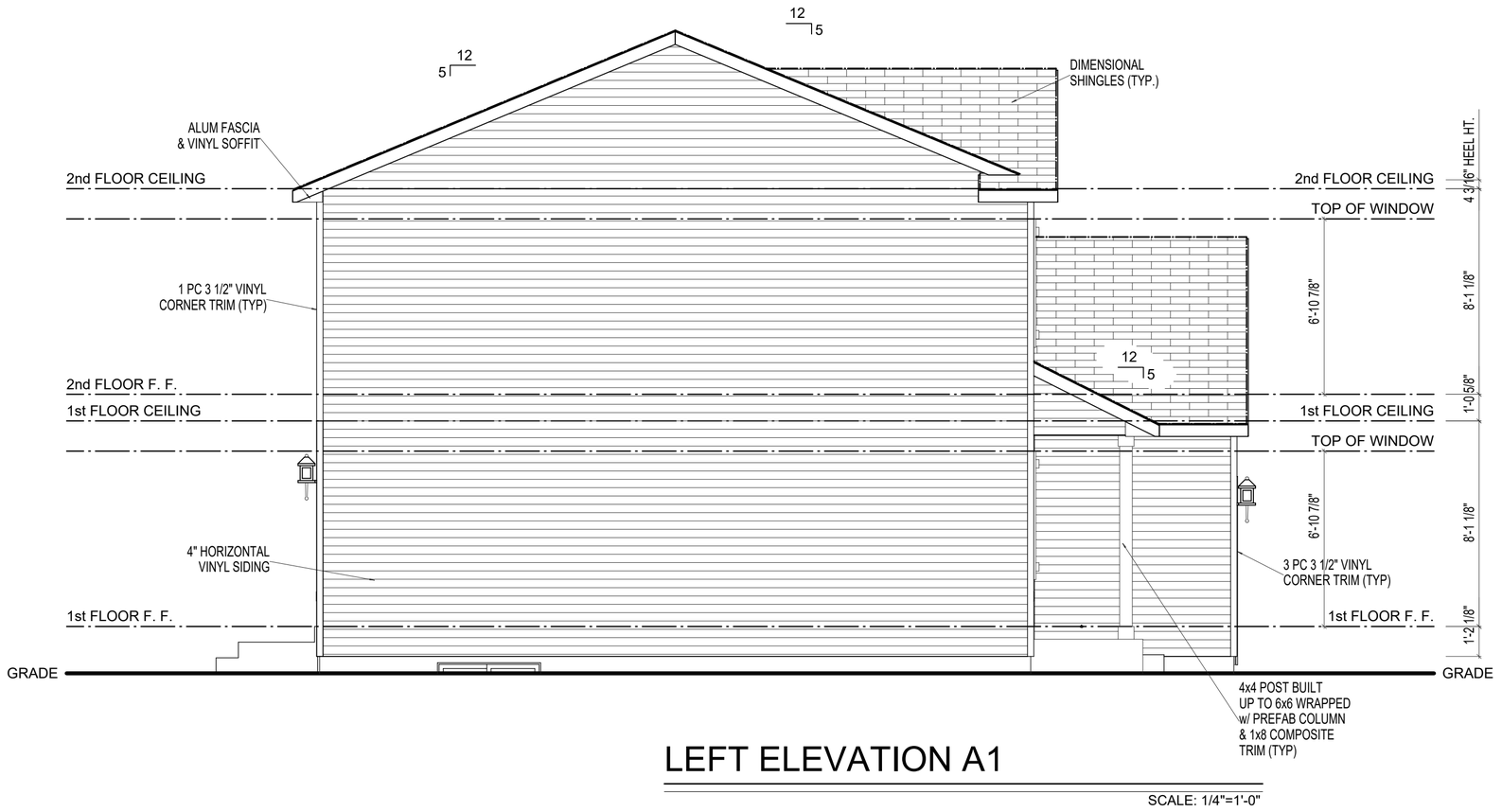
ms/A-01.02.vxp











LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2000 GARAGE RIGHT V8.0c

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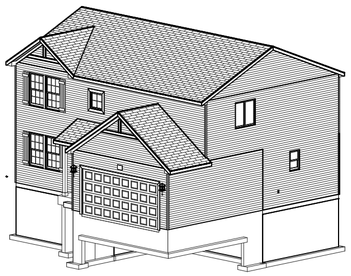
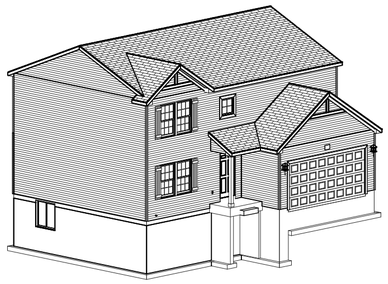
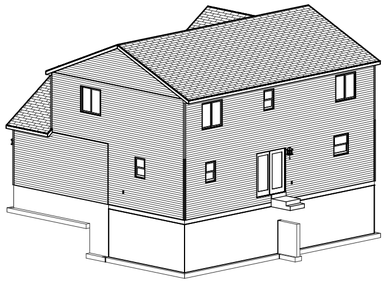
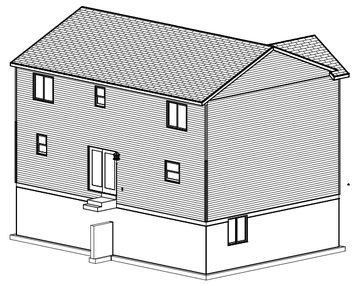
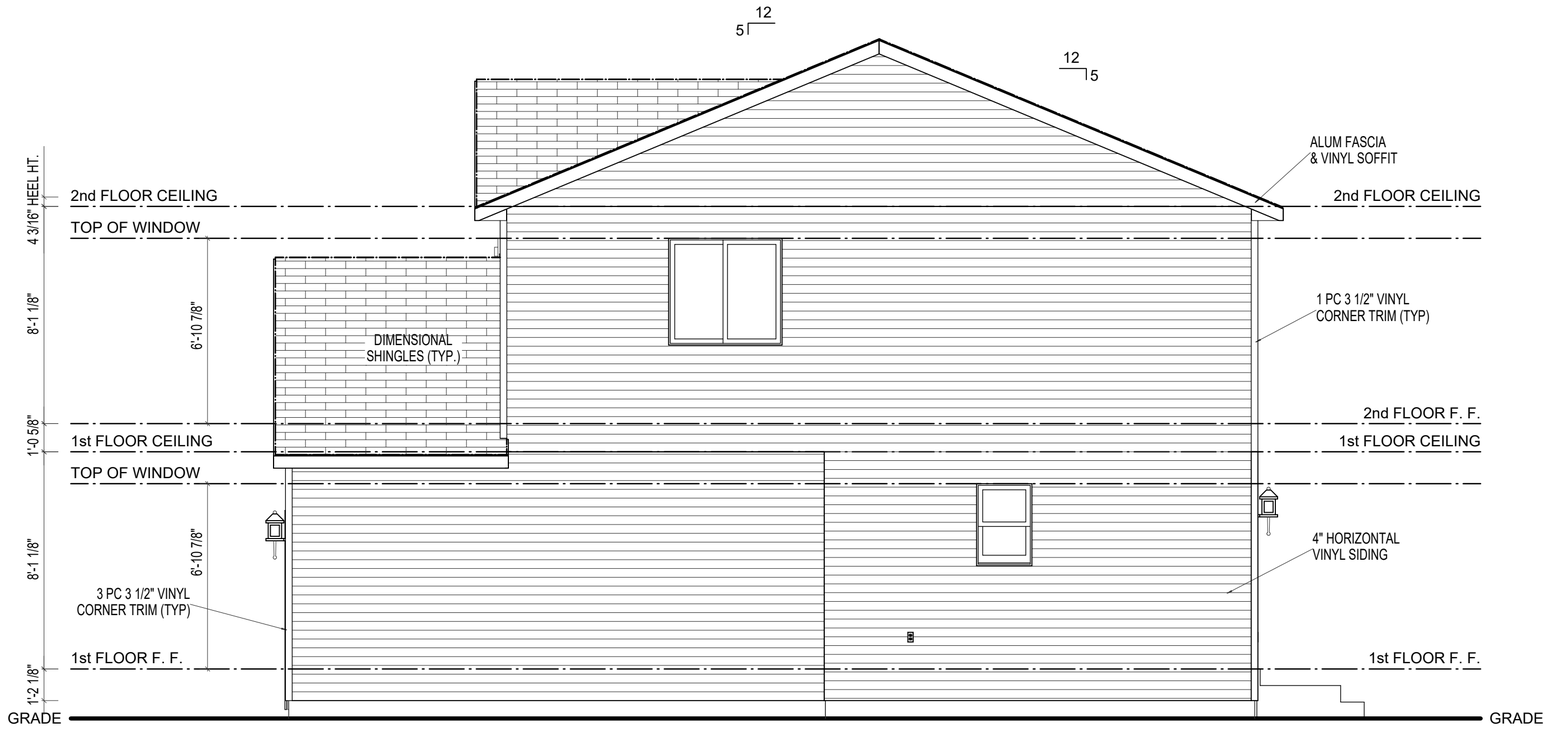
ms/A-02.00.vxp











RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2000
GARAGE RIGHT
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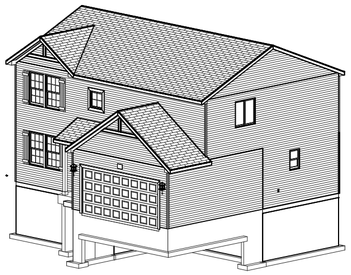

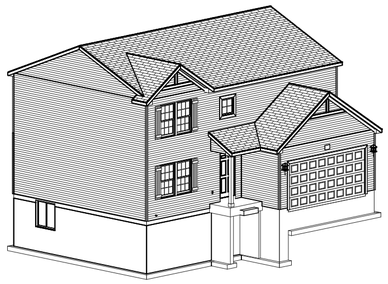

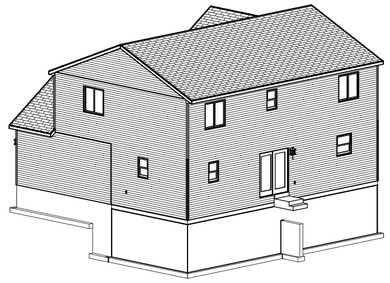

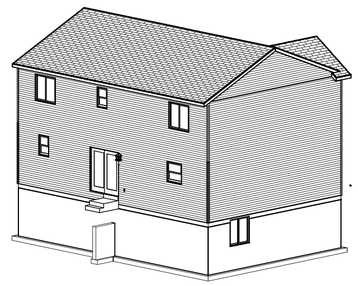

REAR ELEVATION A1

SCALE: 1/4"=1'-0"

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GARAGE RIGHT V8.0c			
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SHEET NUMBER

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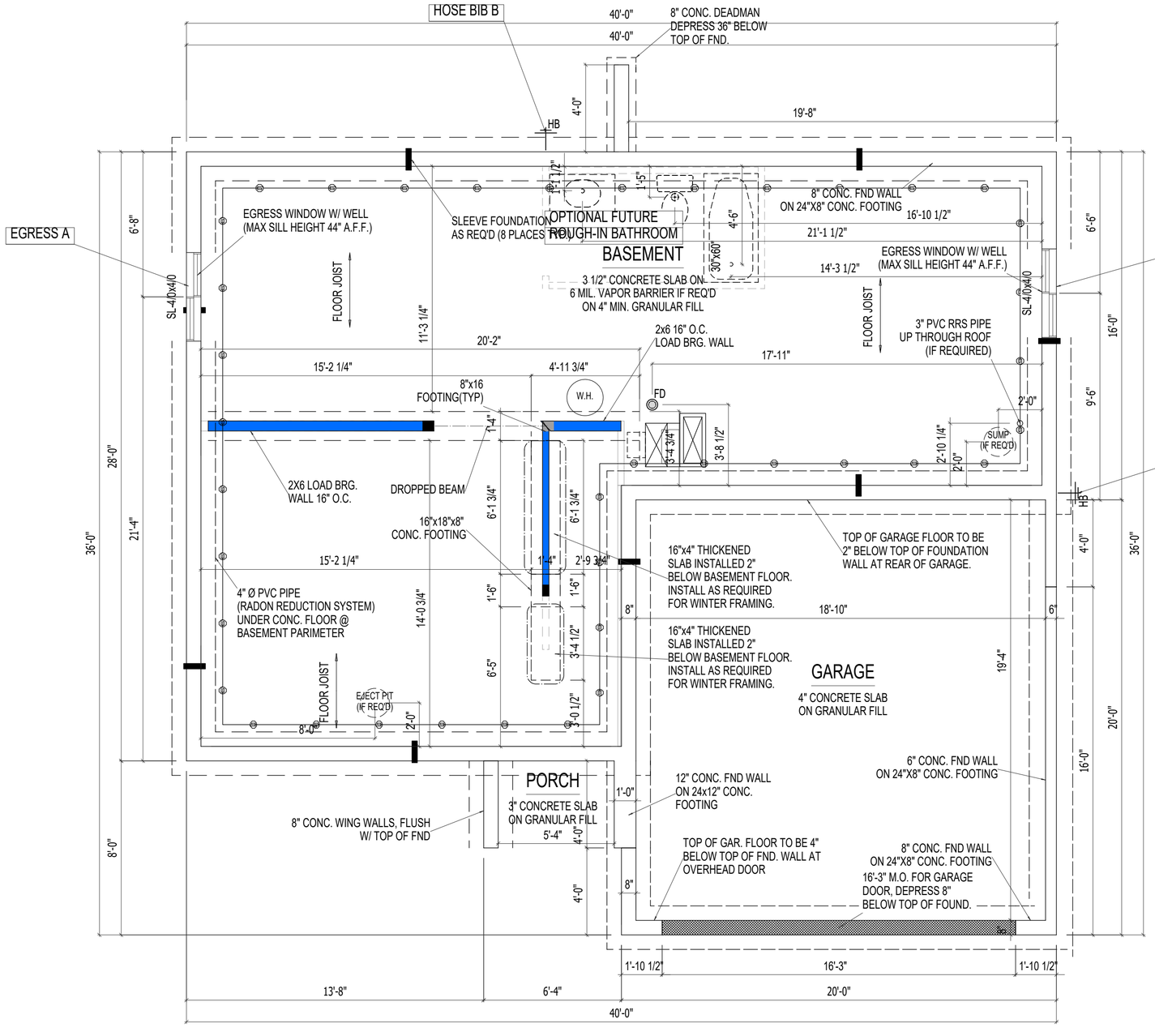
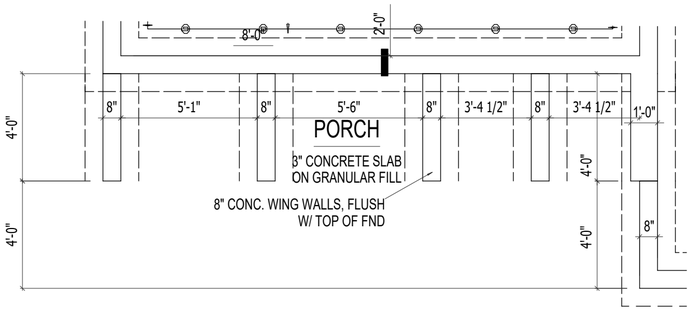
ms/A-04.00.vxp



BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"



C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

REMARKS

REV. NO.	DATE

i2000

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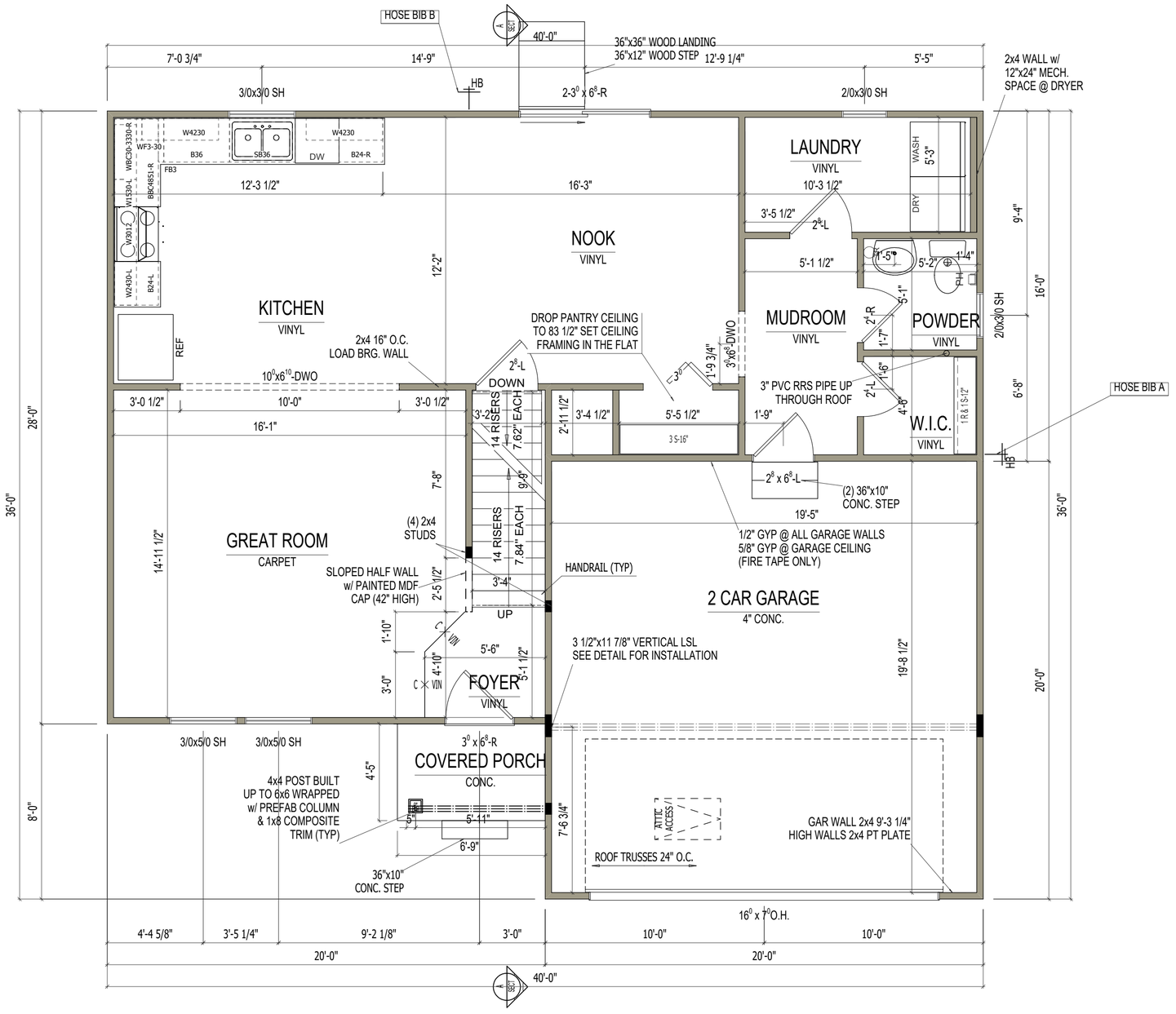
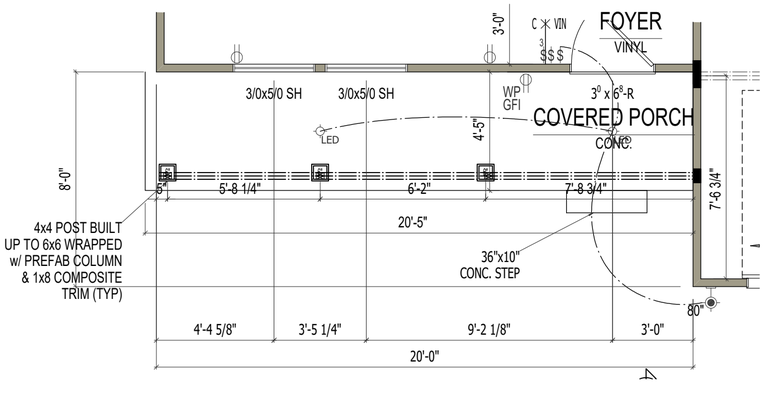
ms/A-06.00.vxp



FIRST FLOOR i2000

SCALE: 1/4"=1'-0"



C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

ms/A-07.00.vxp

REMARKS

REV. NO.	DATE

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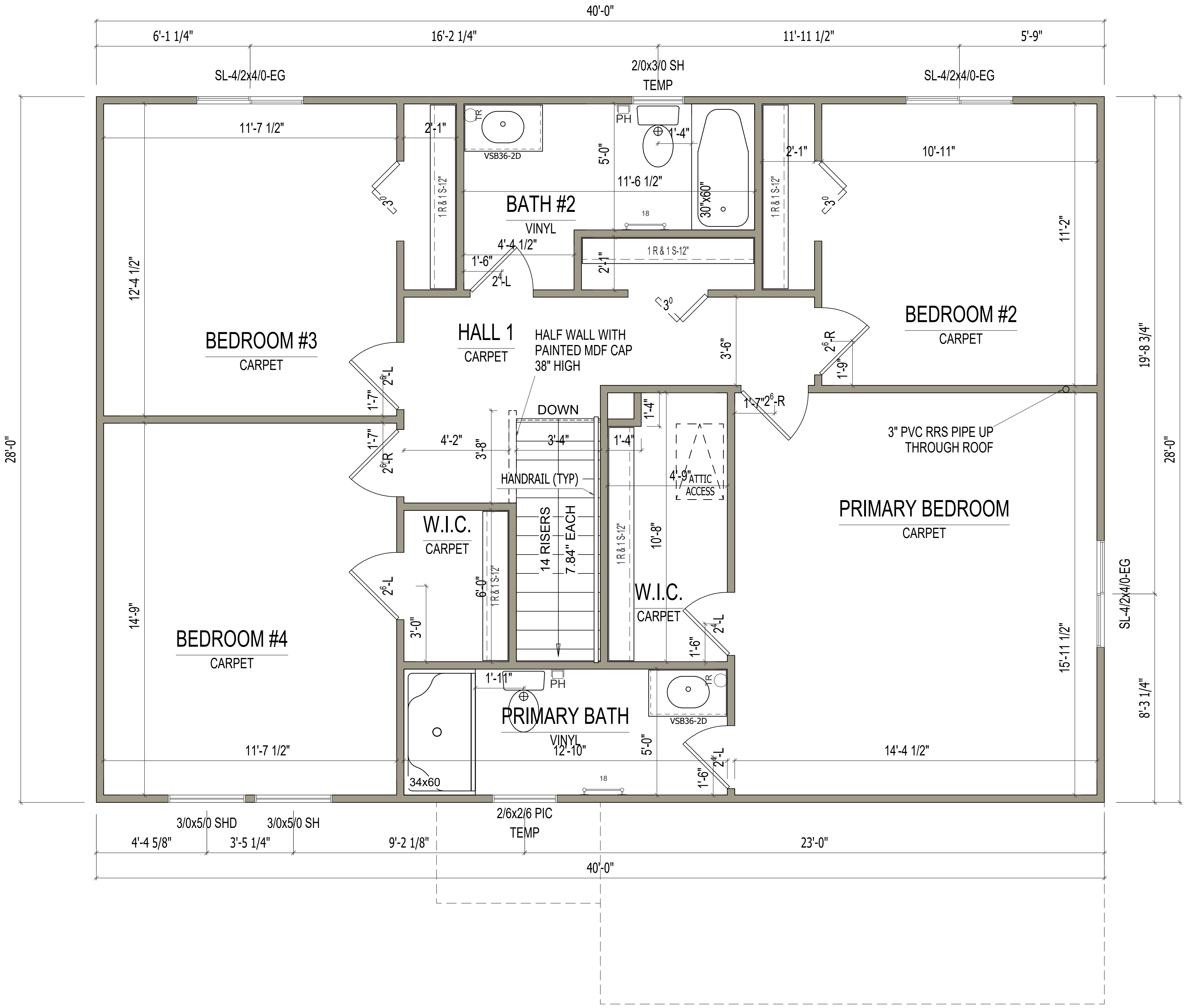

SECOND FLOOR i2000

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

i2000

GARAGE RIGHT

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SHEET NUMBER

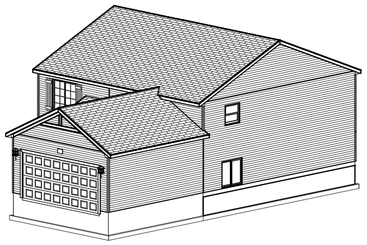
A-08.00

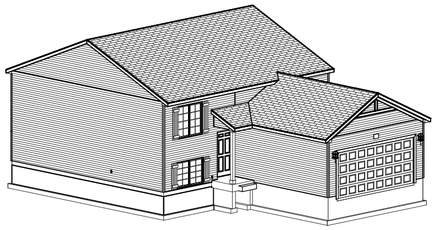
ms/A-08.00.vxp

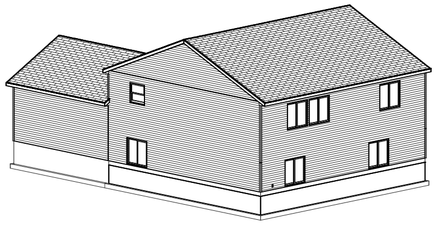
integrity 2060

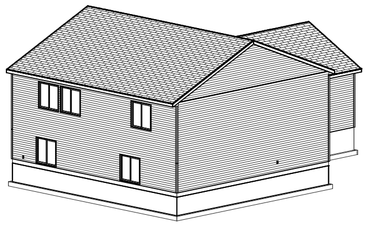
2,060 SF

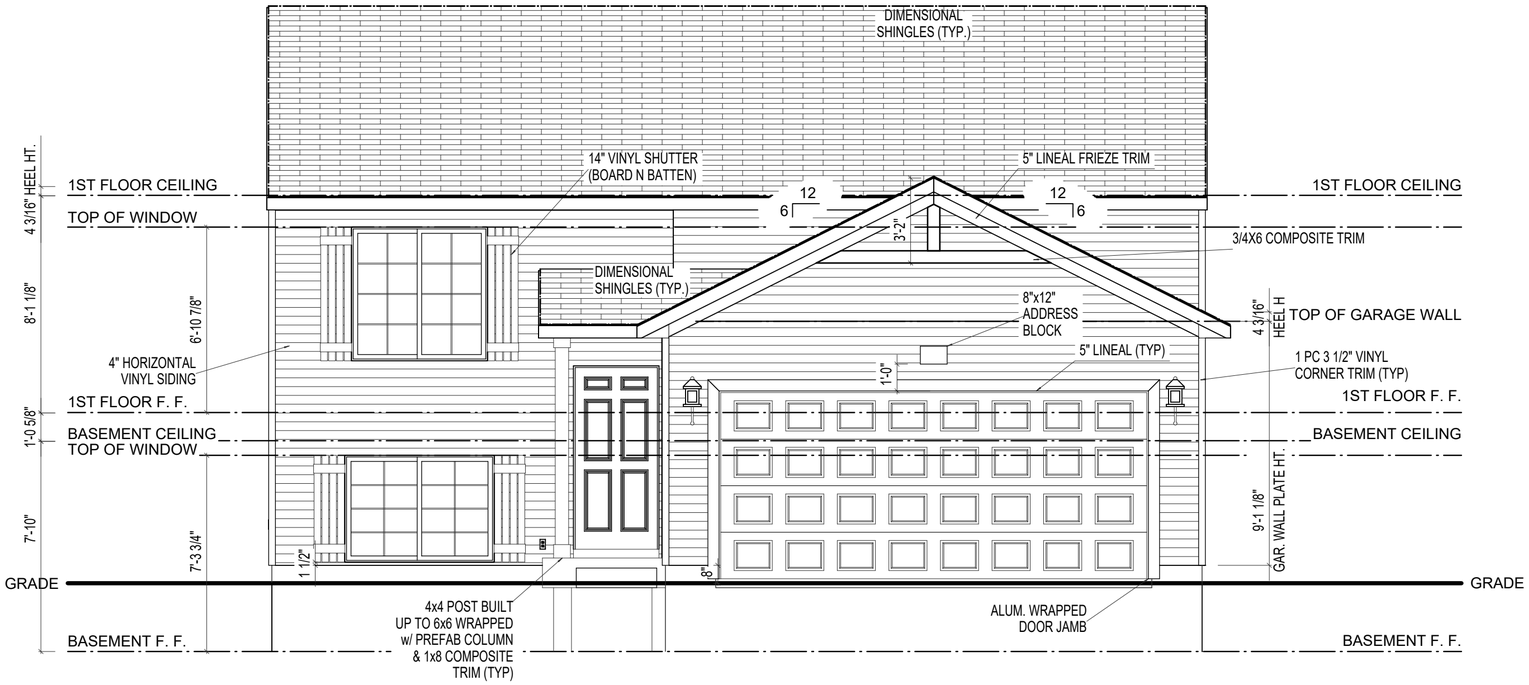
3-4 bedrooms
2-2.5 bathrooms
2 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2060
GARAGE RIGHT
V8.1a
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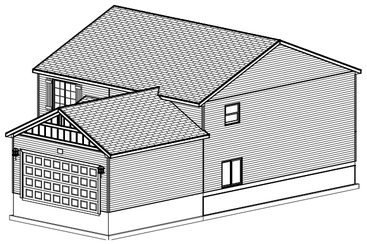
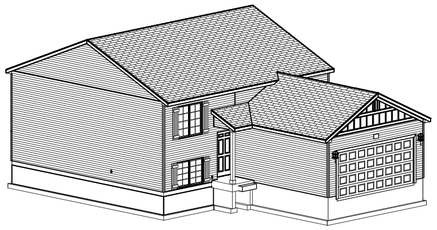
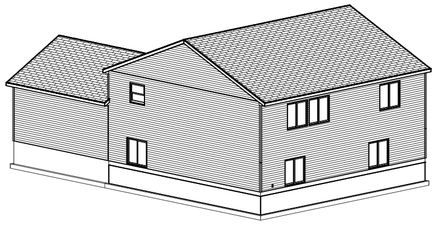
LOCATION:

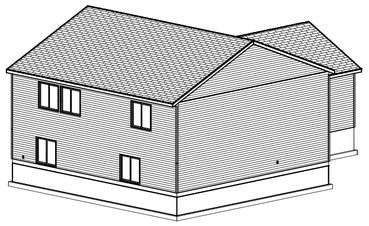
SHEET NUMBER
A-01.00

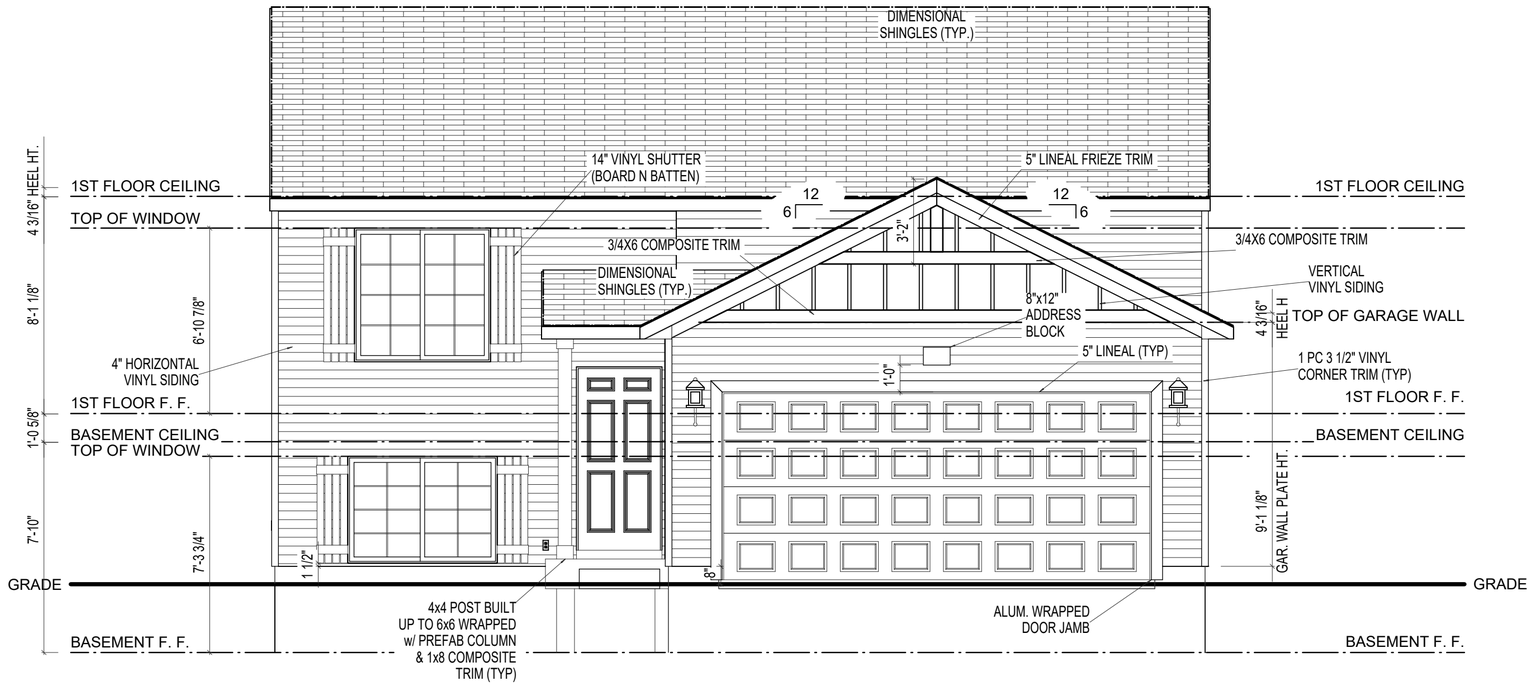
ms/A-01.00.vxp











FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2060
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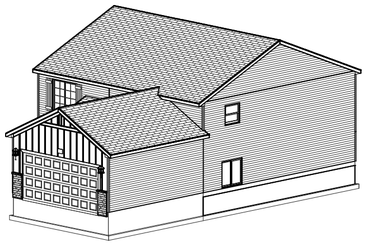
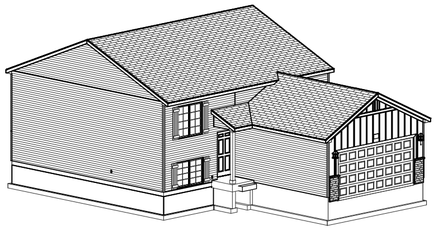
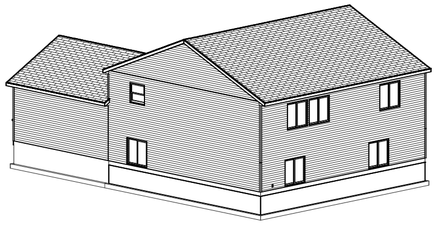
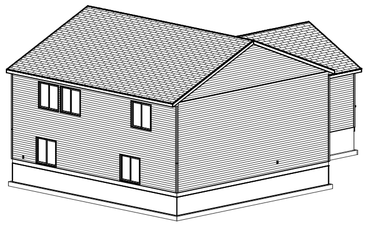
A-01.01

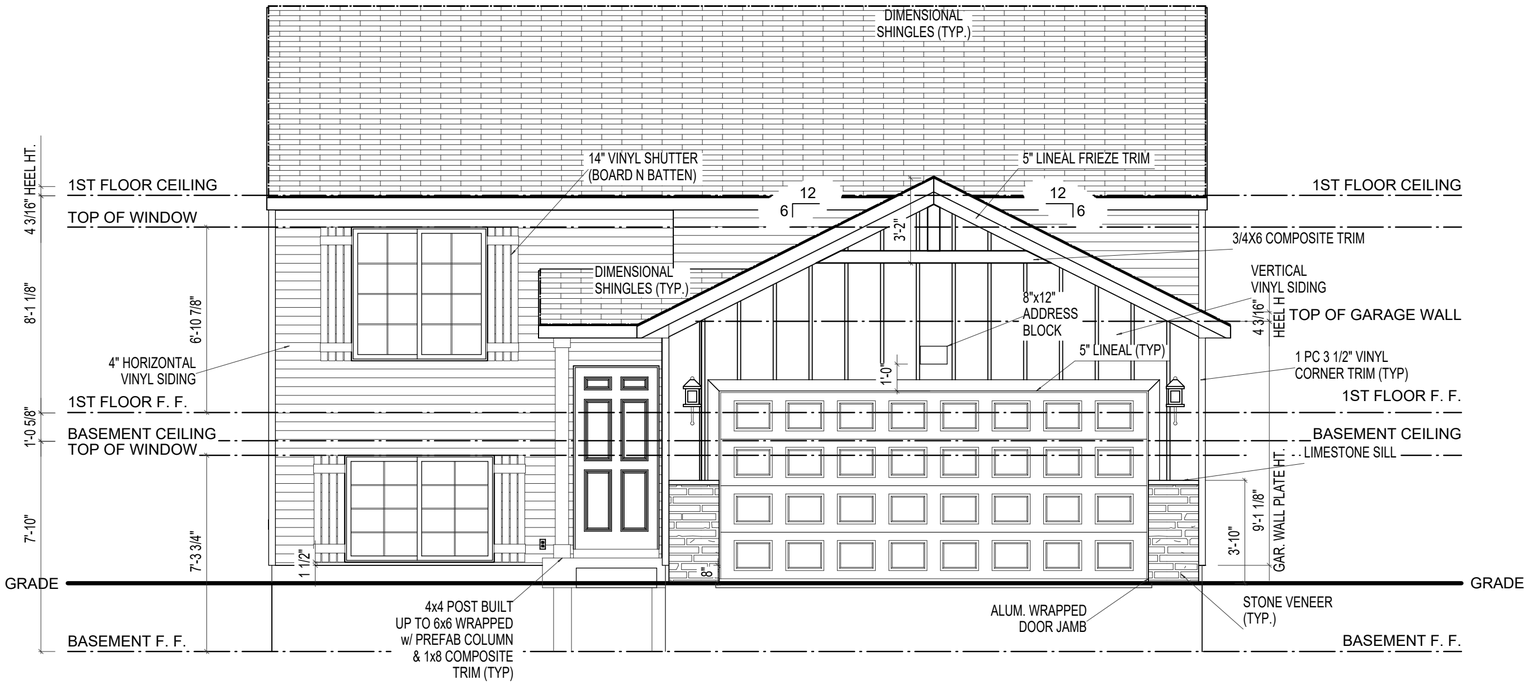
ms/A-01.01.vxp











FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

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LOCATION:

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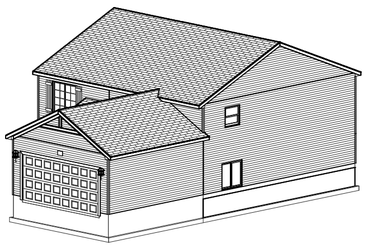

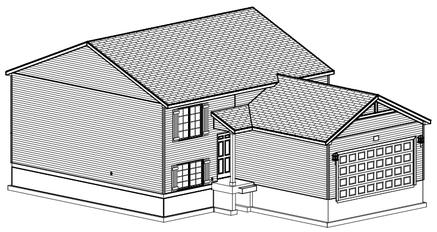

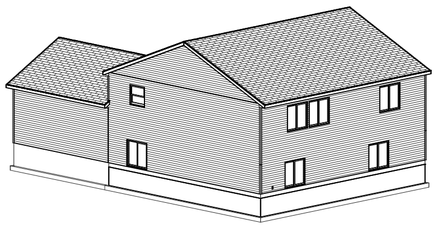

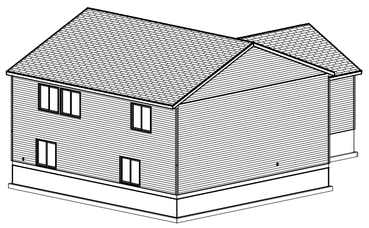

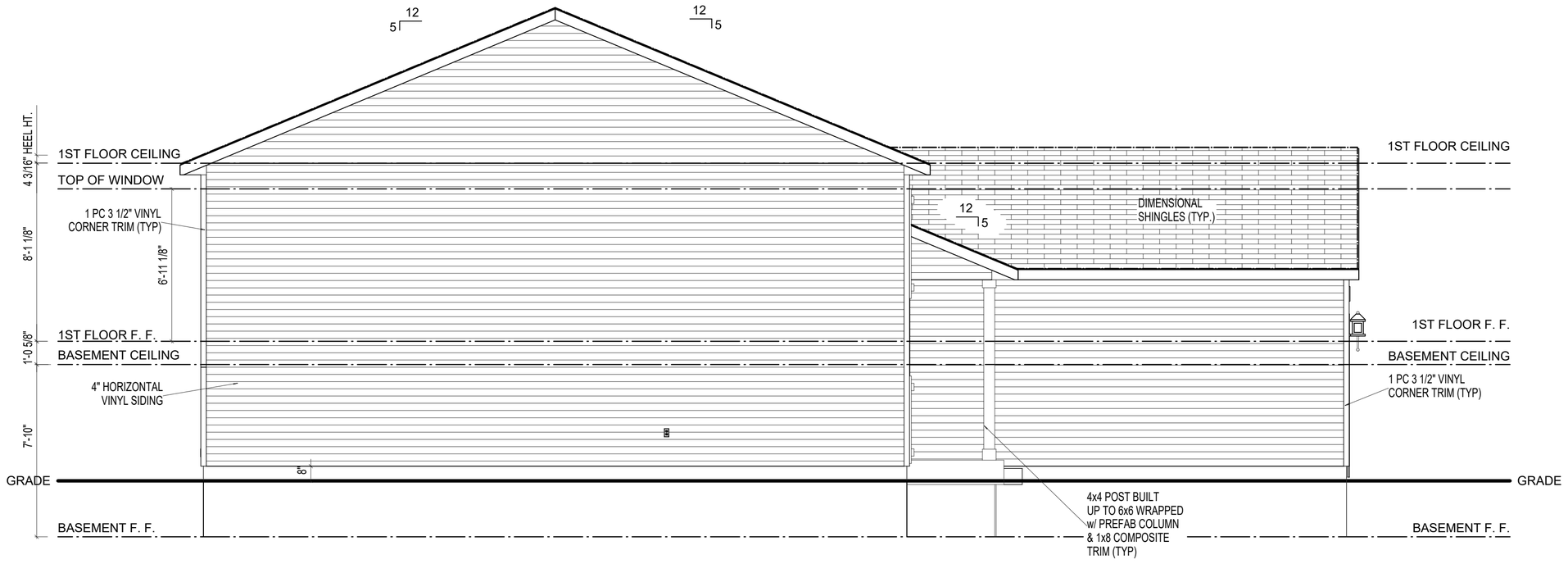

LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS

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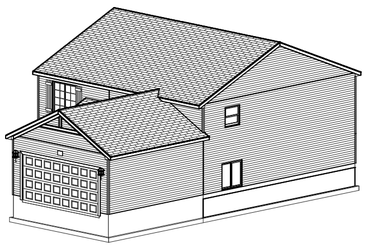

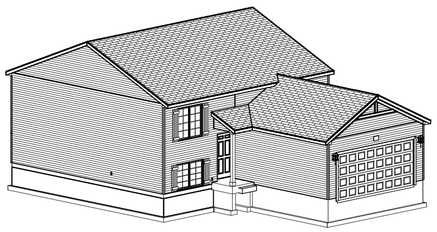

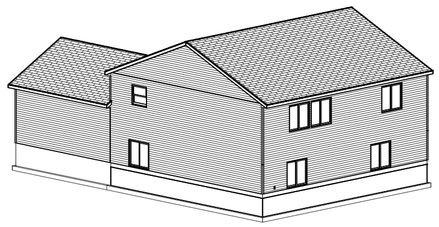

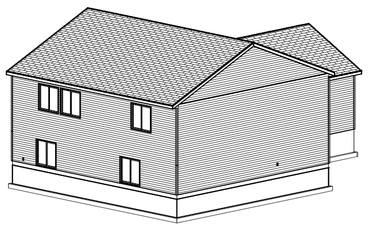

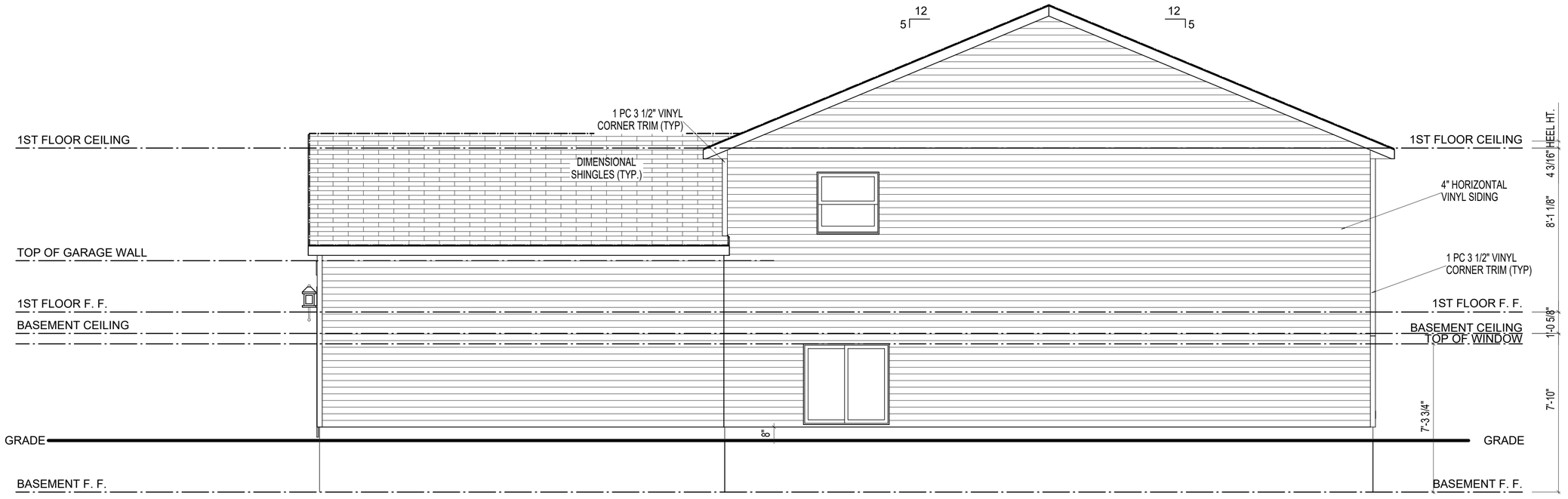

RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS			
i2060	REV. NO.	DATE	
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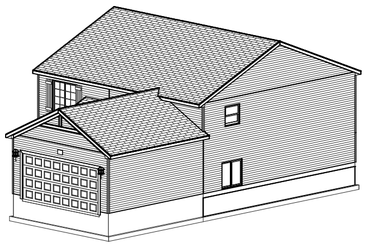

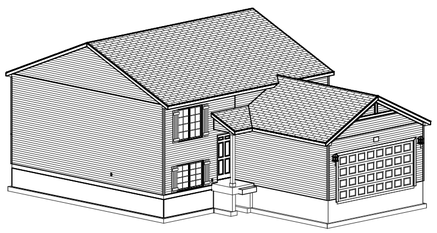

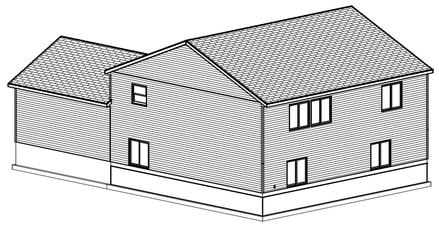

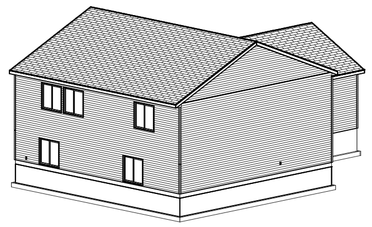

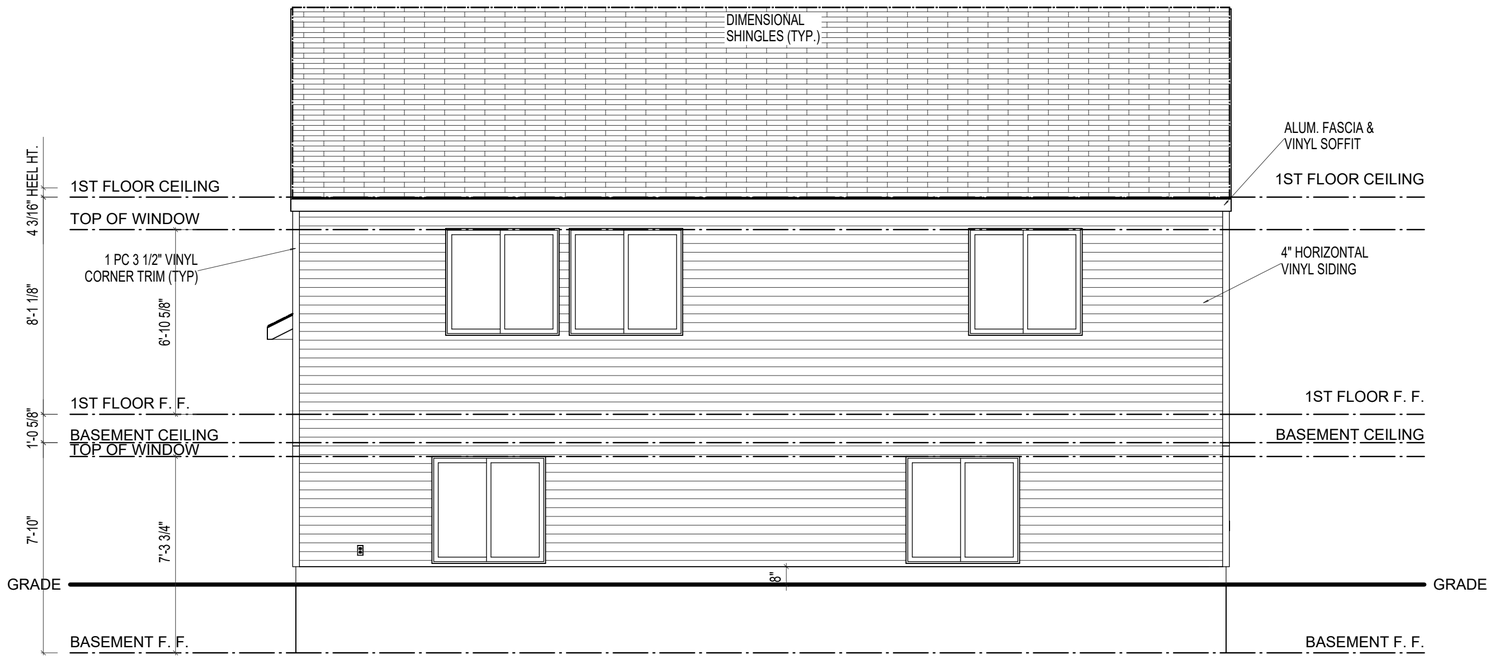

REAR ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.	i2060
			GARAGE RIGHT
			REVISION V8.1a

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LOCATION:

SHEET NUMBER
A-04.00

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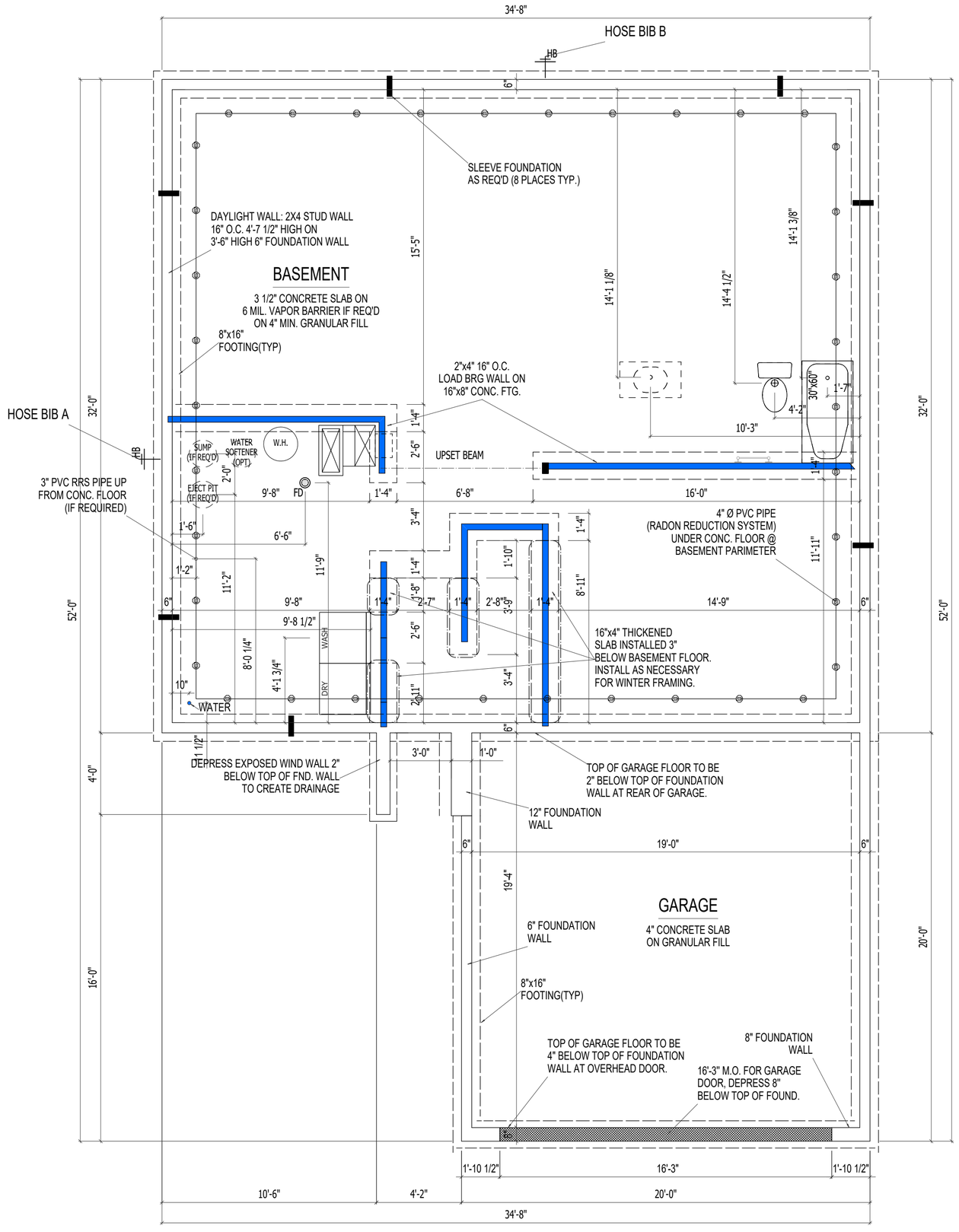

BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

i2060
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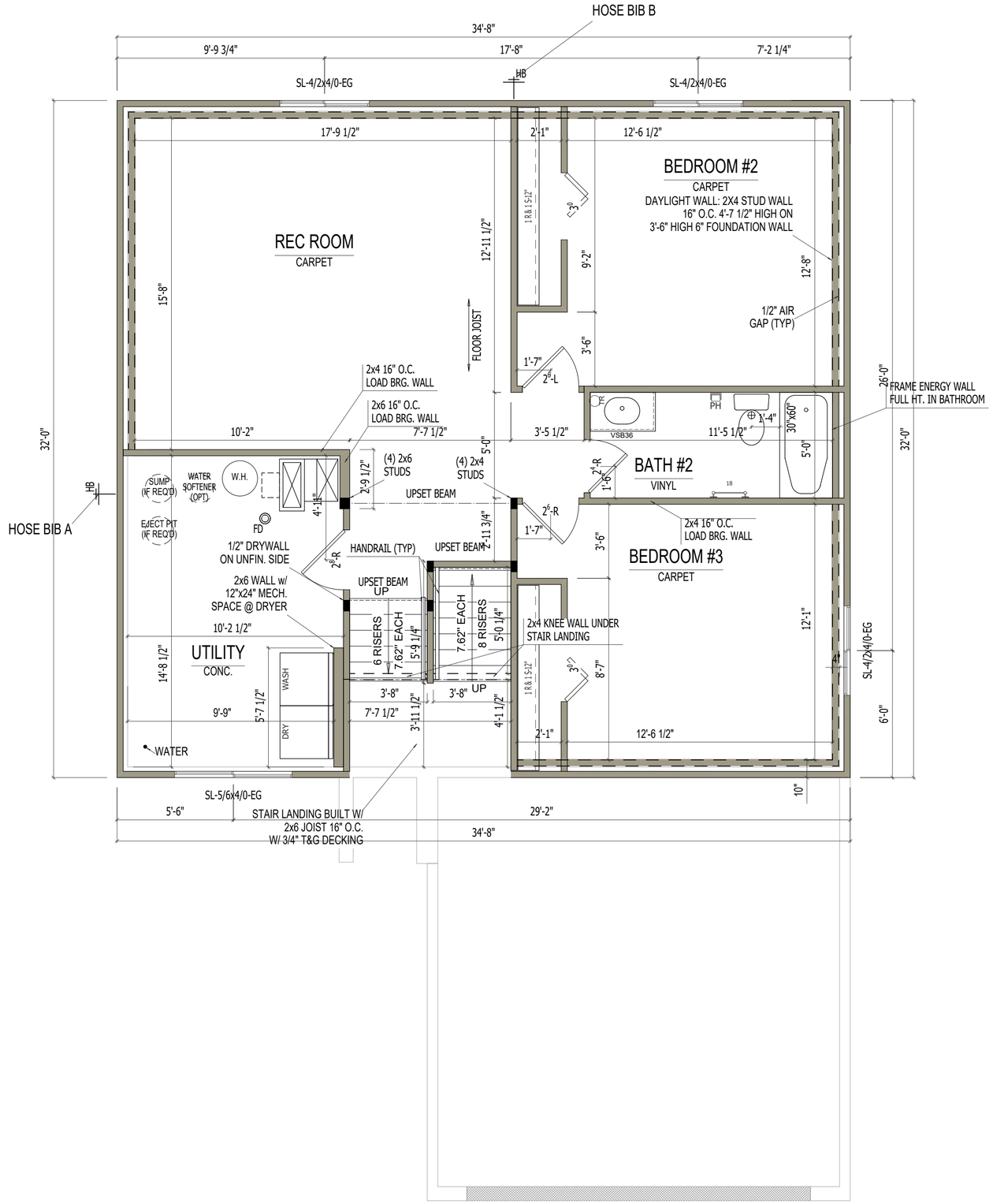

BASEMENT FLOOR PLAN

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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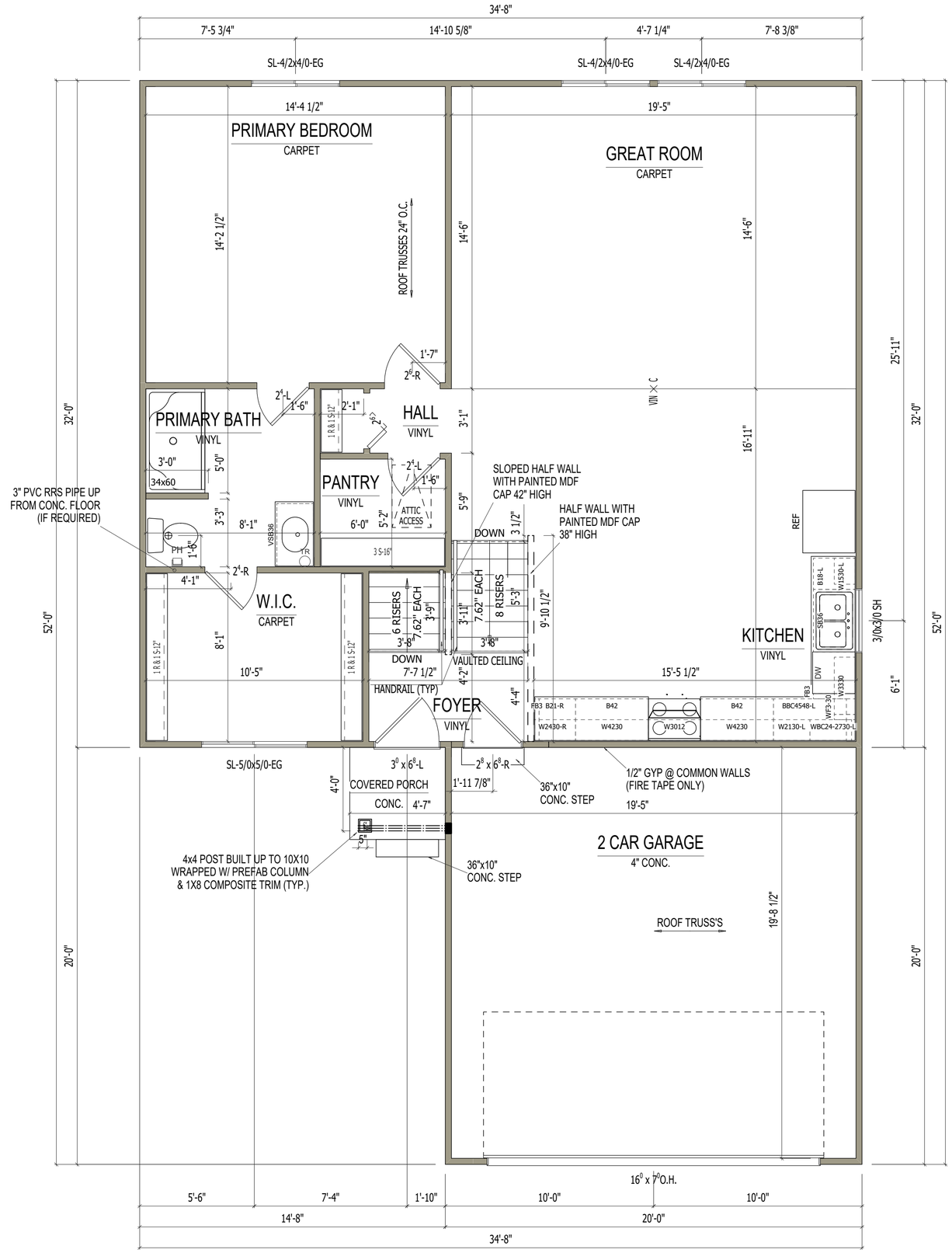

FIRST FLOOR PLAN

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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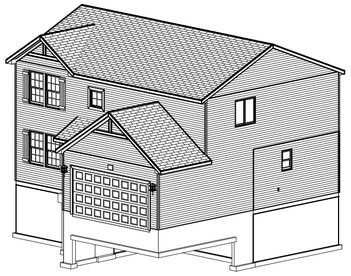
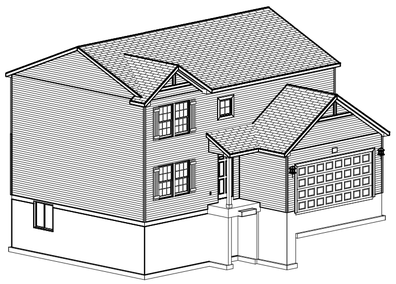
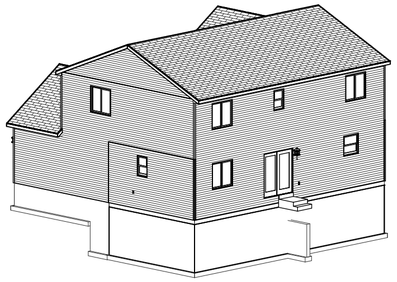
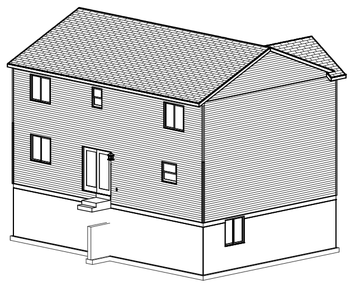
2,062 SF

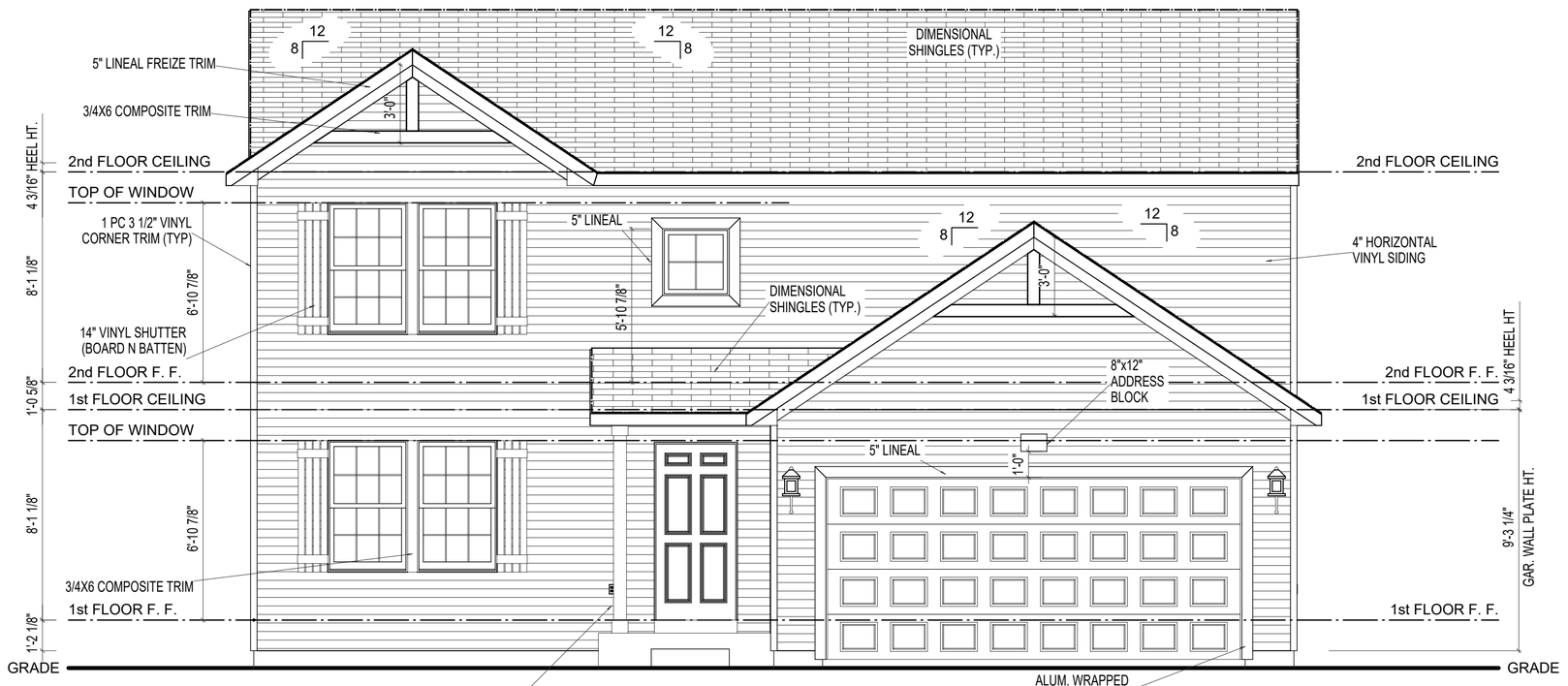
4-5 bedrooms
2.5 - 3.5 baths
2 - 3 car attached garage











FRONT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2080 GARAGE RIGHT V8.0a

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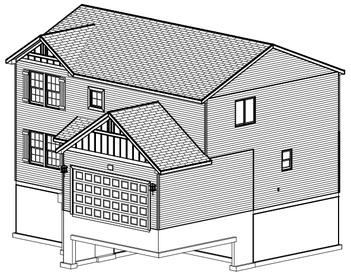

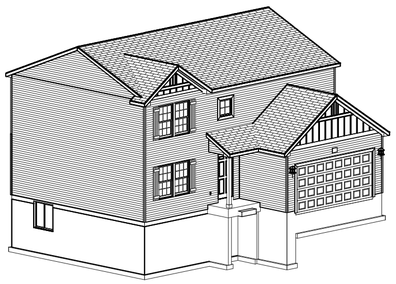

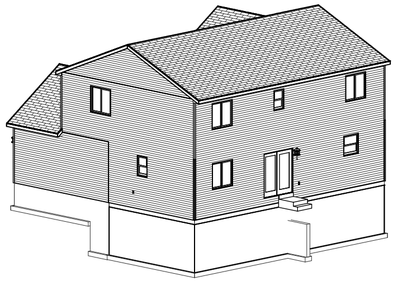

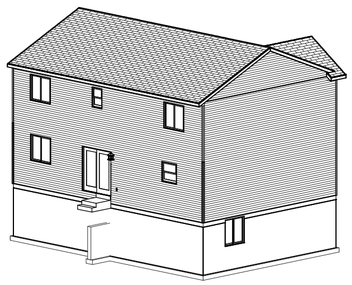

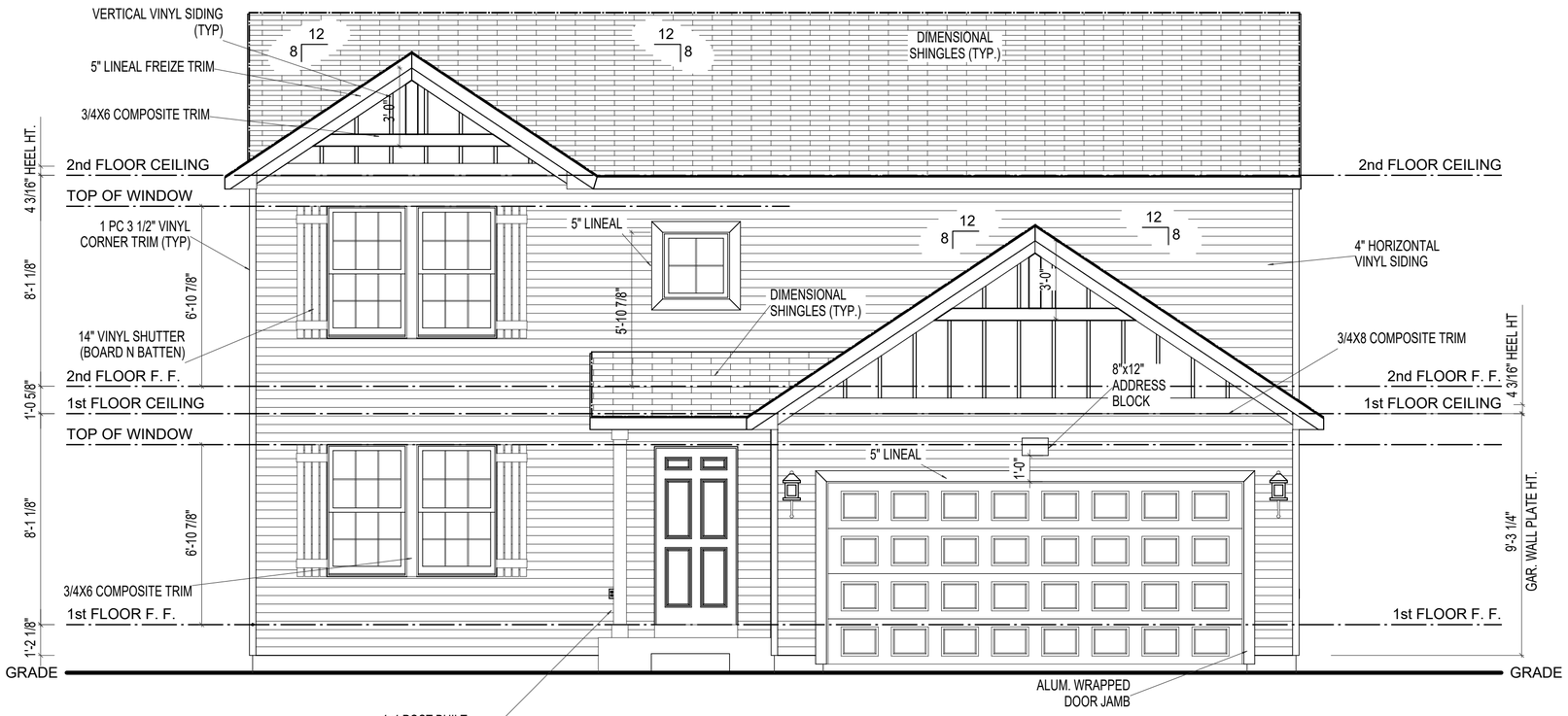

FRONT ELEVATION A2

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2080 GARAGE RIGHT V8.0a

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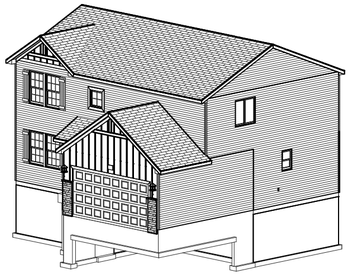

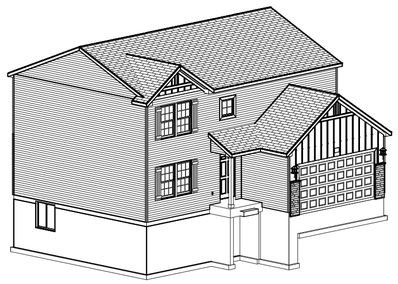

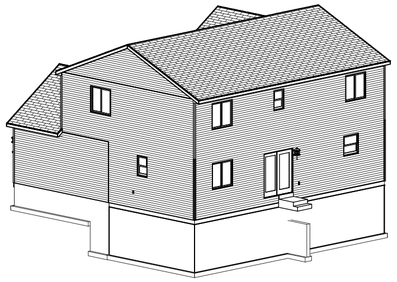

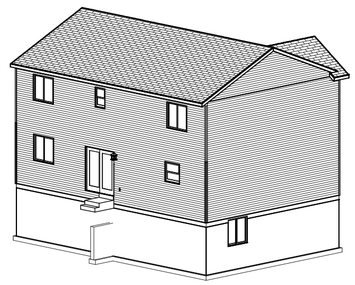

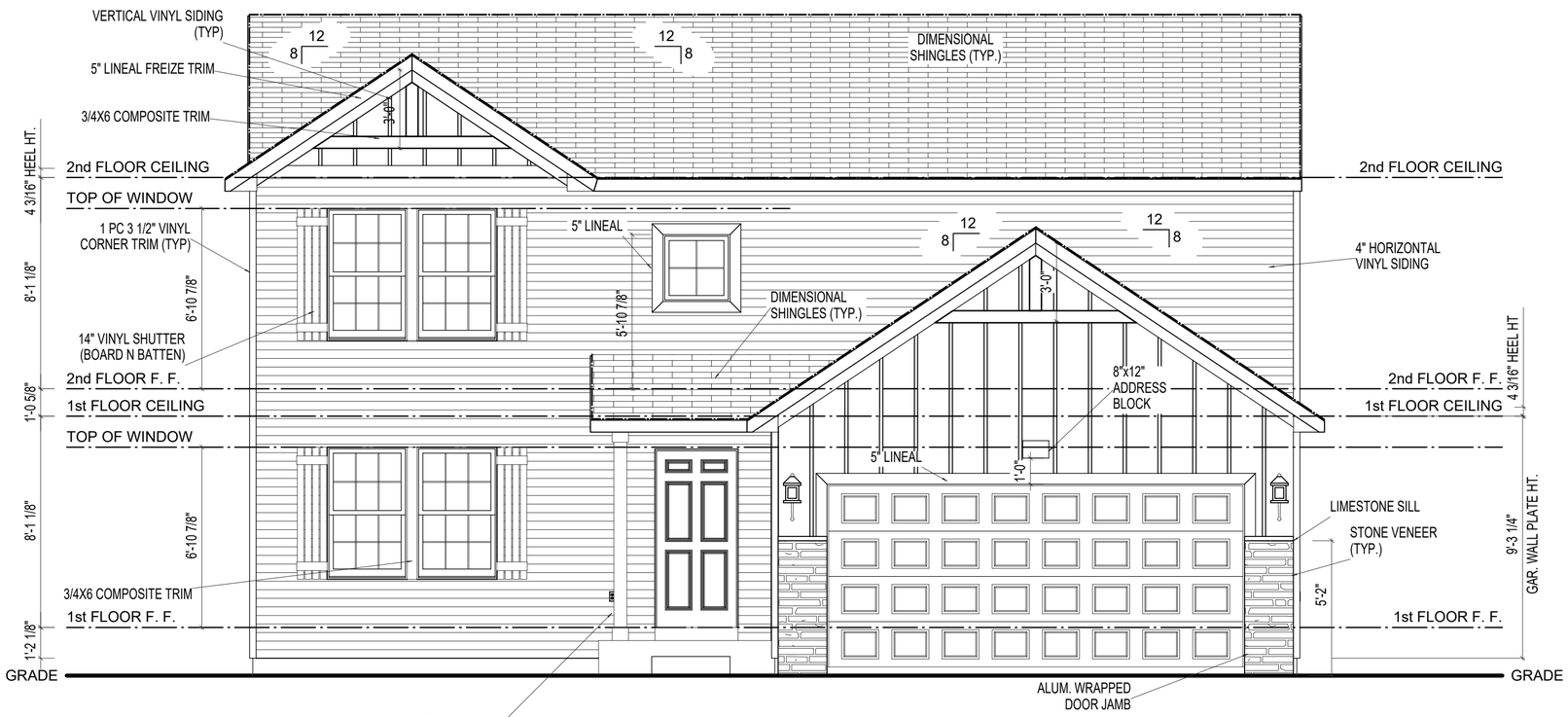

FRONT ELEVATION A3

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

i2080 GARAGE RIGHT V8.0a

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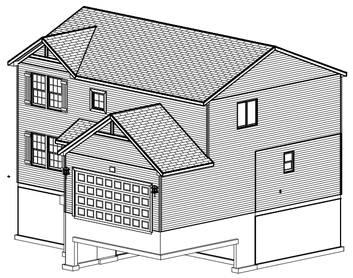

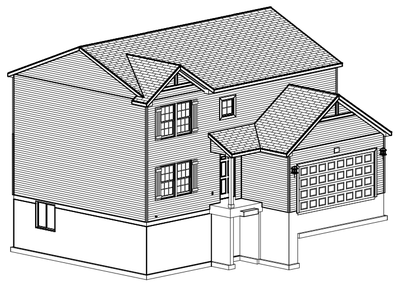

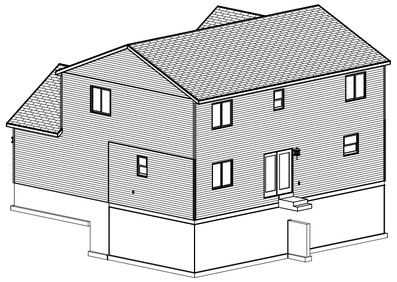

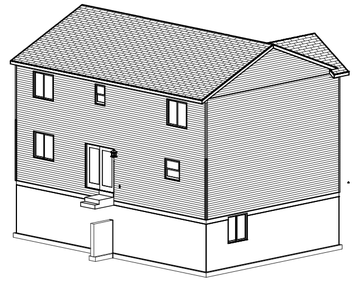

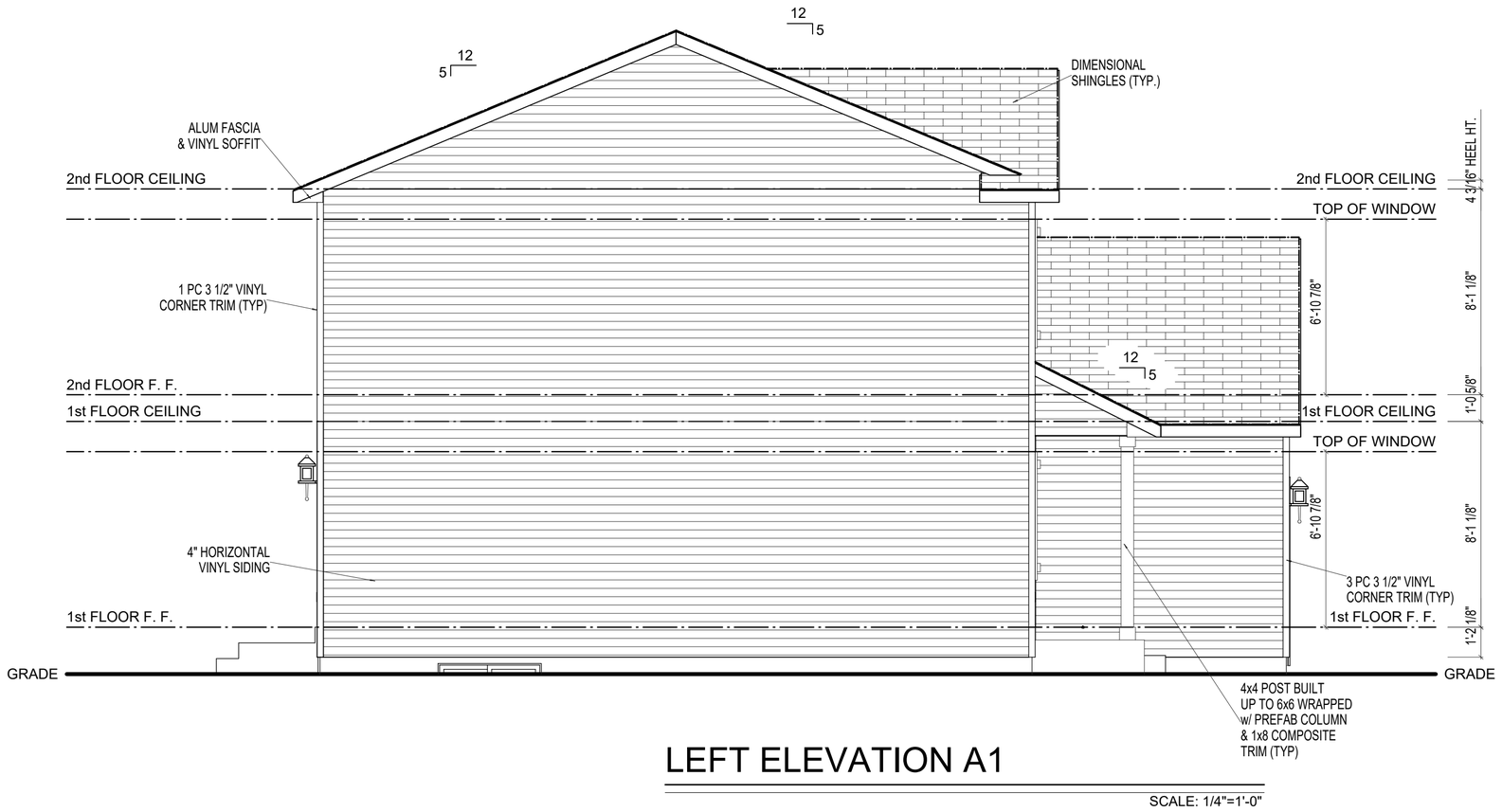

LEFT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS								
REV. NO.	DATE							
i2080								
GARAGE RIGHT								
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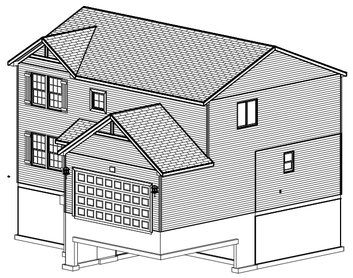

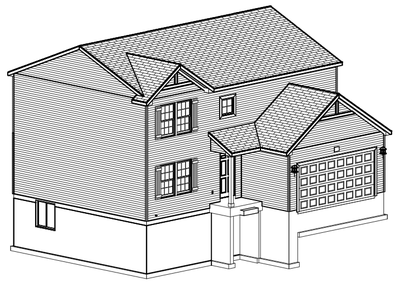

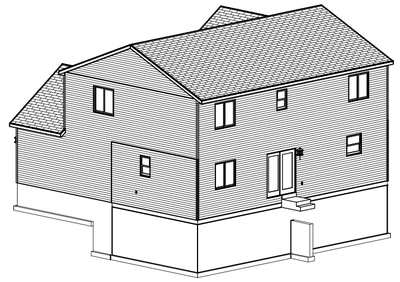

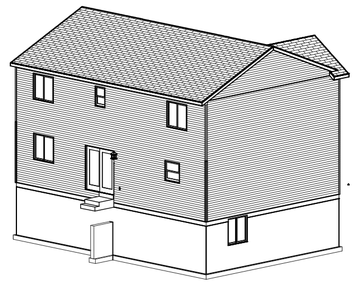

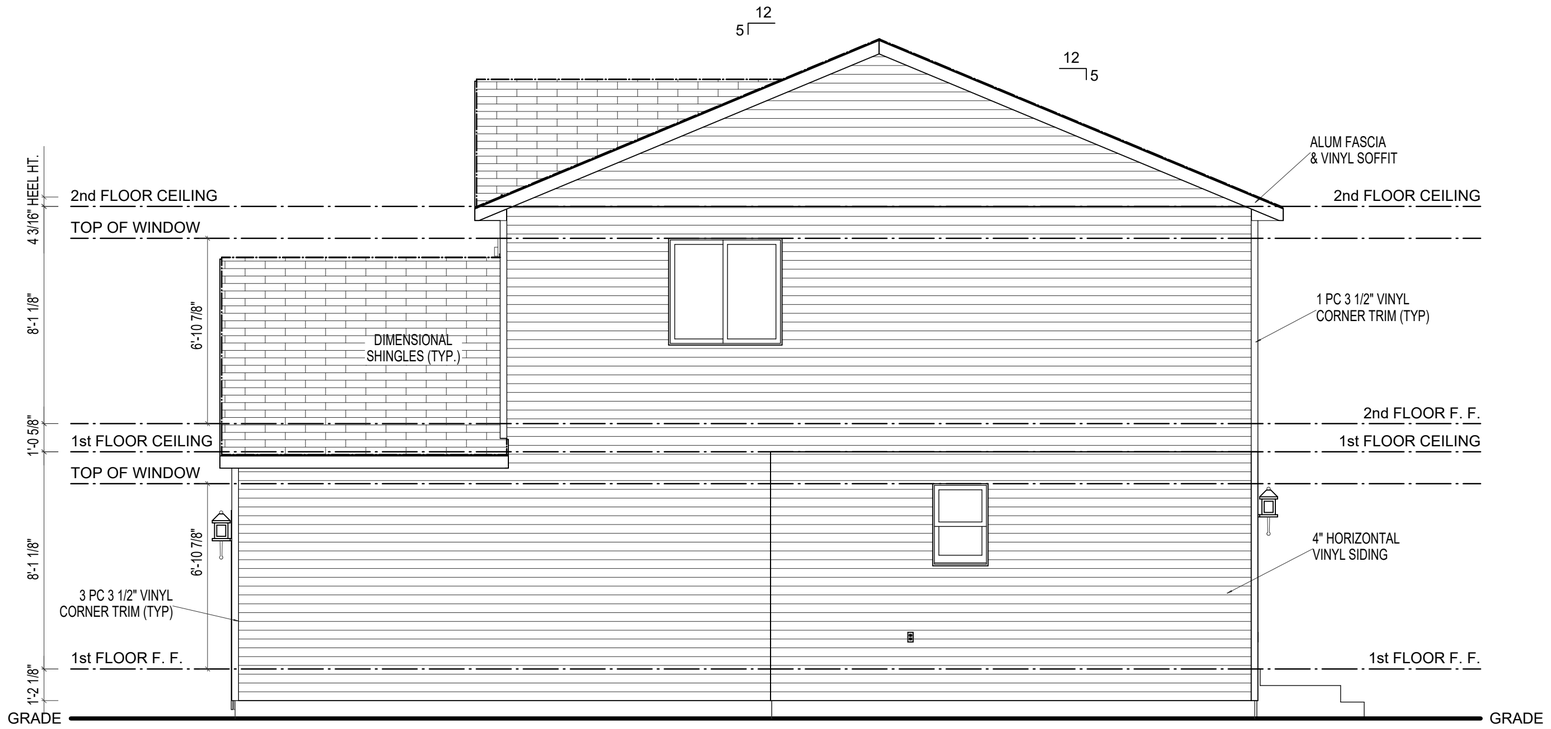

RIGHT ELEVATION A1

SCALE: 1/4"=1'-0"

REMARKS	DATE	REV. NO.

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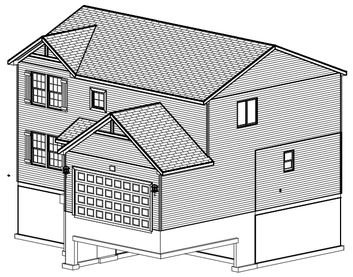

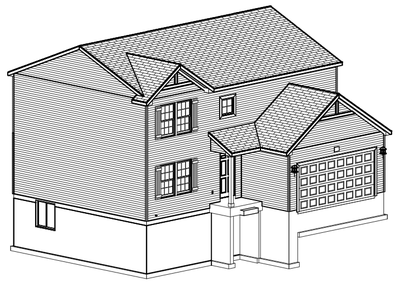

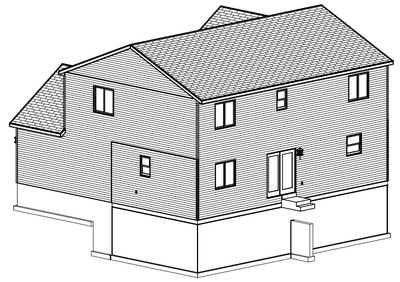

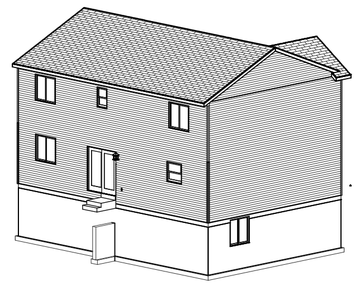

REAR ELEVATION A1

SCALE: 1/4"=1'-0"

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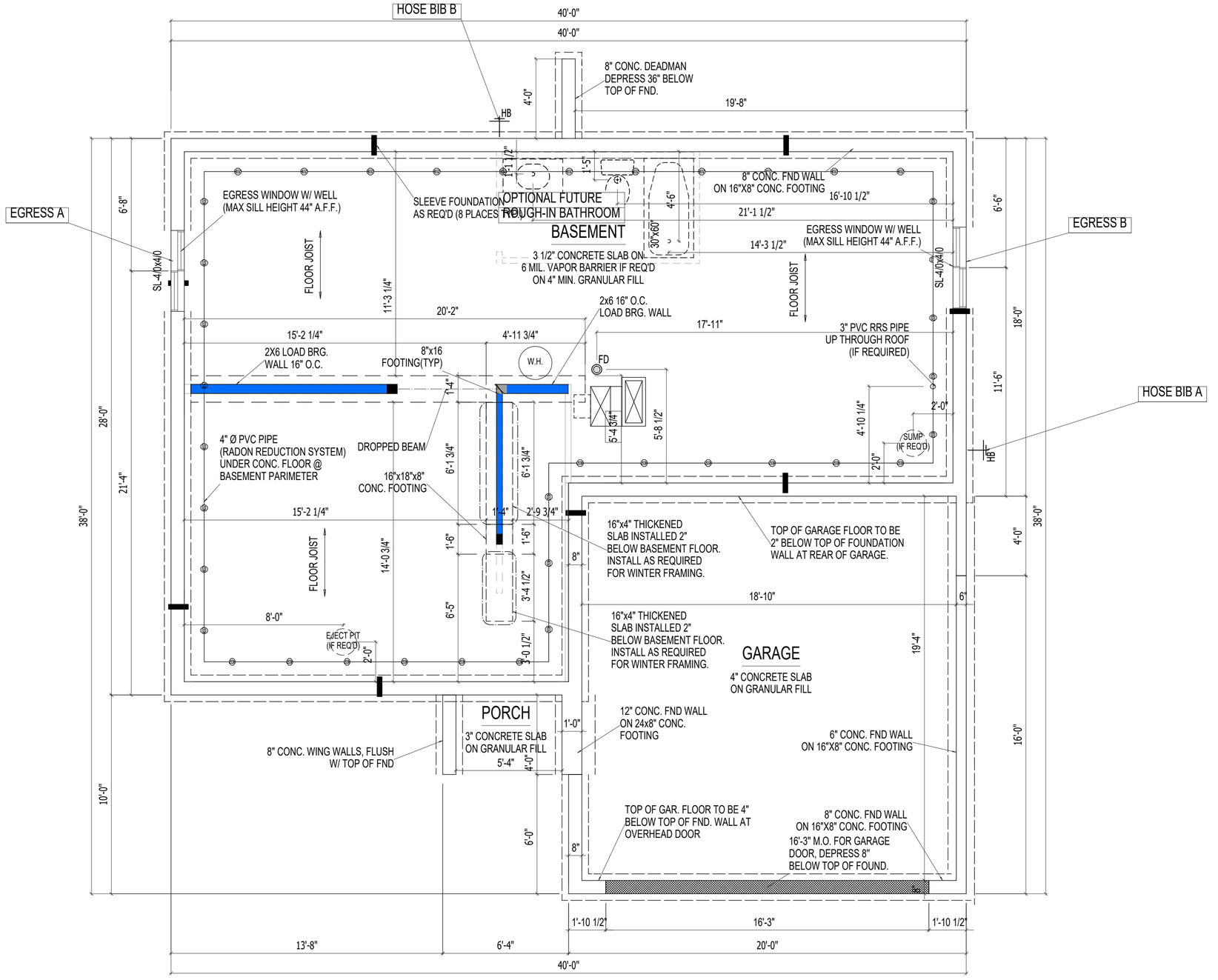
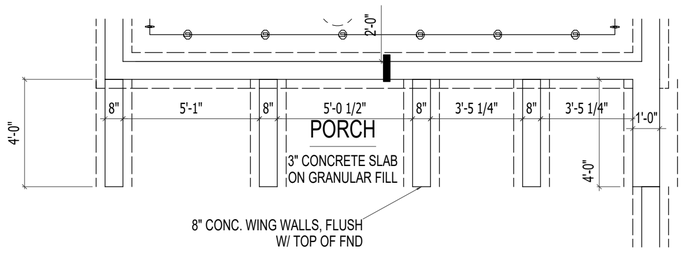


BASEMENT FOUNDATION: STANDARD A ELEVATION

SCALE: 1/4"=1'-0"



C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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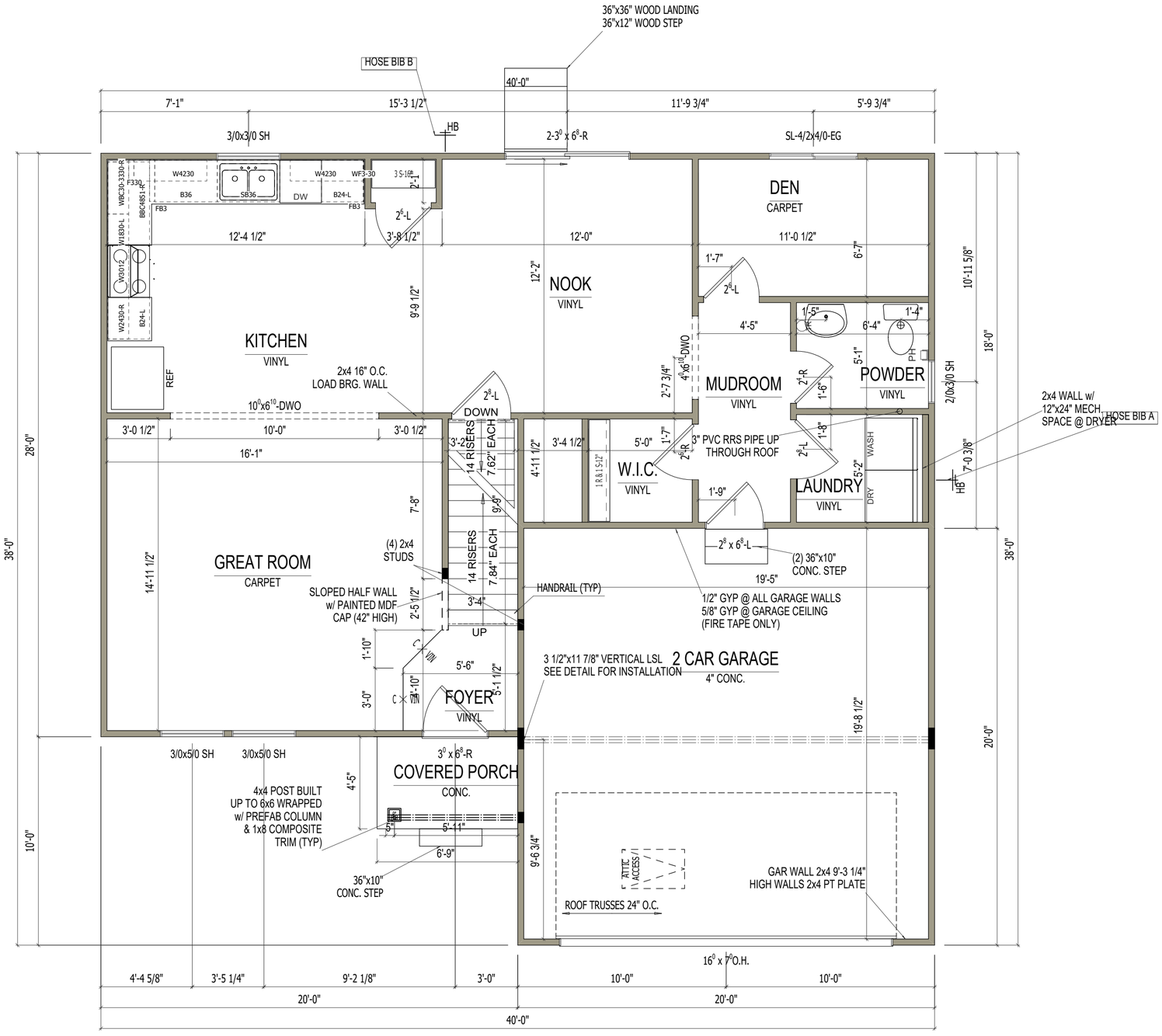
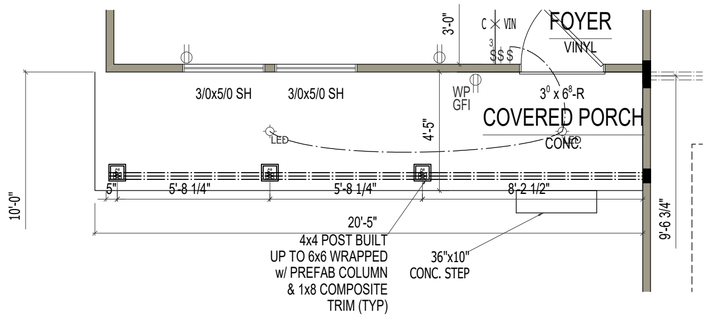


FIRST FLOOR i2080

SCALE: 1/4"=1'-0"



C/D ELEVATION OPTIONS

SCALE: 1/4"=1'-0"

REMARKS

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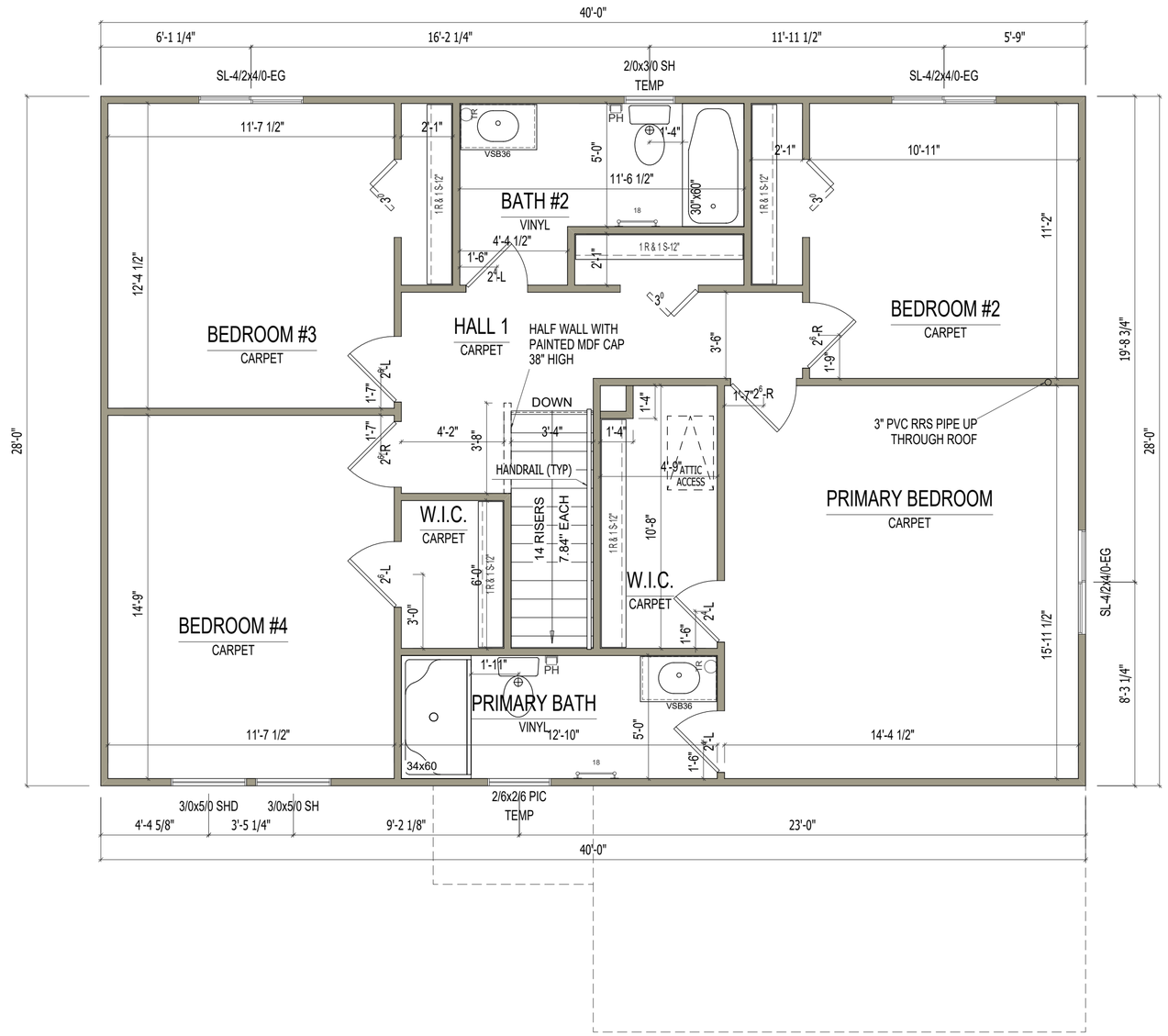

SECOND FLOOR i2080

SCALE: 1/4"=1'-0"

REV. NO.	DATE	REMARKS

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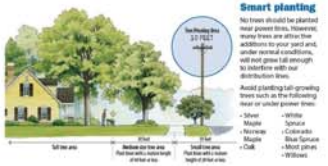
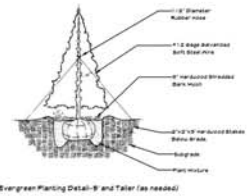
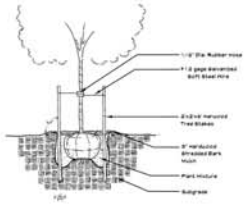
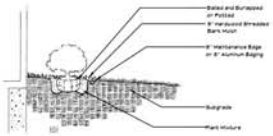




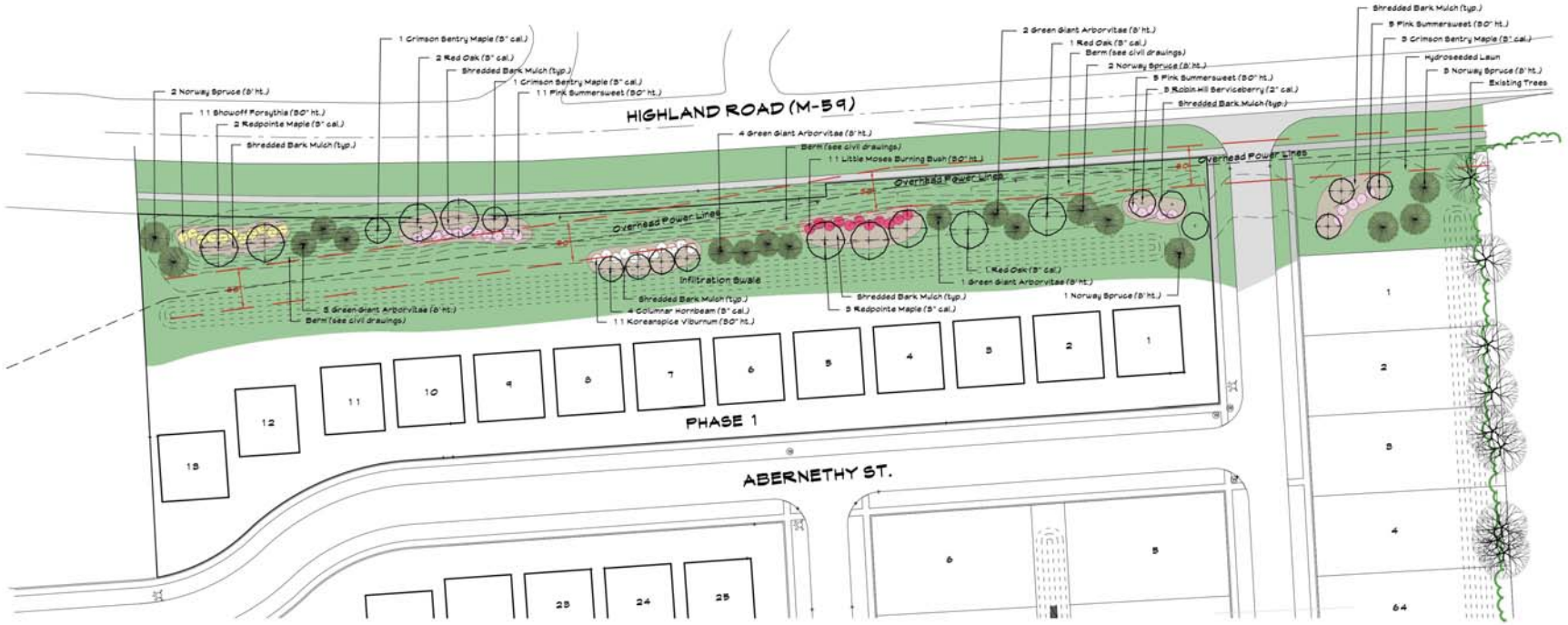
Evergreen Planting Detail-9' and Taller (as needed)



Deciduous Trees 3" Caliper and Smaller (as needed or required)



Shrub Planting Detail



Plant List

Quantity	Common Name	Latin Name	Planted Size
5	Redpointe Maple	Acer rubrum 'Frank Jr.'	3" cal.
5	Crimson Sentry Maple	Acer platanoides 'Crimson Sentry'	3" cal.
4	Red Oak	Quercus rubra	3" cal.
4	Columnar Hornbeam	Carpinus betulus 'Frans Fontaine'	3" cal.
8	Norway Spruce	Picea abies	8' Ht.
10	Green Giant Arborvitae	Thuja standishii x plicata 'Green Giant'	8' Ht.
5	Robin Hill Serviceberry	Amelanchier x grandiflora 'Robin Hill'	2" cal./TP
11	Little Moses Burning Bush	Euonymus alatus compactum 'Little Moses'	30" Ht.
11	Korean Spice Viburnum	Viburnum carlesii	30" Ht.
11	Show Off Forsythia	Forsythia x intermedia 'Show Off'	30" Ht.
21	Pink Summersweet	Clethra alnifolia 'Ruby Spice'	30" Ht.

(note: Plant list for ordinance purposes only, the landscape contractor is responsible for plant quantities shown on the landscape plan)

Notes:

1. All landscaping shall be installed by a qualified Landscape Contractor. Plant sizes specified on the landscape plan shall be the size planted. Plants smaller than specified will be rejected. Substitutions of any kind must be approved by the Landscape Architect.
2. All plantings shall be mulched with 3" shredded premium hardwood bark mulch. Trees in lawn areas shall receive a 6' diameter bark ring 3" deep.
3. The landscape contractor shall remove any twine that is wrapped around the trunk of a tree or shrub as well as the top third of any burlap. Remove excess soil on the top of the root ball to expose the root flare or first layer of roots prior to planting. Use a wire cutter to make 3-5 cuts in the wire basket to allow roots to grow through.
4. When planting trees in the lawn area or on the berm the existing soil within a 10 foot diameter shall be loosened by tilling or similar and amended with composted manure or peat at a depth of 6-12".
5. Planting areas shall be edged with a mechanical bed edger to define a border for the shedded bark mulch.
6. Lawn areas shall recieve at least 4" of topsoil and hydroseeded. Check with specifications for topsoil availability or contact project manager. Topsoil for lawns shall be appropriate for growing and sustaining a healthy lawn. All lawns shall be hydroseeded with a seed blend consisting of 30% Kentucky Bluegrass, 20% Perennial Ryegrass, 10% Hard Fescue, 20% Creeping Red Fescue and 20% Chewings Fescue.
7. Maintenance of the landscape shall be provided for by the owner and include fertilizing of lawn and plant material, yearly pruning, top dressing of mulch areas every other year and provide 1" of water per week during the growing season.
8. Plant materials shall be chosen and installed in accordance with standards recommended by the County Cooperative Extension Service or American Nursery Association.

North

811 Know what's below. Call before you dig.

DJ's LANDSCAPE MANAGEMENT
DJ Vander Slik
Grand Rapids
Kalamazoo
Holland
Phone (616)698-2700 Fax (616)698-2900

Landscape Professionals
MCN
PLANET

JOYCE E. WEISE LANDSCAPE ARCHITECT No. 1301 STATE OF MICHIGAN REGISTERED LANDSCAPE ARCHITECT

Landscape Plan Drawn By:
Joyce E. Weise PLA, ASLA

PROPOSED LANDSCAPE PLAN FOR:

Highland Reserve

12685 Highland Rd. (M-59) Hartland Twp., Michigan

PROJECT NUMBER: 072725

DRAWN BY: Joyce E. Weise PLA, ASLA

DRAWING DATE: 080725

ISSUED FOR:

09/04/25	Site Plan Approval
09/11/25	Revision per Review

SCALE 1"=40'

SHEET NUMBER L-1

Troy Langer

From: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Sent: Wednesday, August 16, 2023 10:53 AM
To: Troy Langer
Cc: Martha Wyatt; Fournier, Laurent (MDOT); Seif, George (MDOT)
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Troy,

At this point in our review, we don't have a concern with the easterly M-59 access (Lockerie Lane). Th residential access has much lower traffic volumes than the gas station, and is better located across from the cross over. So I think we are safe in saying that access is acceptable.

FYI, besides the gas station driveway location, the other thing we are looking at is whether the cross over needs to be signalized. That is still being discussed.

Thank you
Craig

From: Troy Langer <TLanger@hartlandtwp.com>
Sent: Wednesday, August 16, 2023 10:31 AM
To: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>; Fournier, Laurent (MDOT) <FournierL@michigan.gov>; Seif, George (MDOT) <SeifG@michigan.gov>
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Thanks Craig.

I think we could move forward with this project and not worry about the access points of the gas station. The proposed Lockerbie Lane, as it connects to M-59 (Highland Road) is more important. If we have to move this road, it impacts the development.

Unofficially, do you feel this location is pretty close?

Troy Langer
Planning Director
810.632.7498
2655 Clark Road
Hartland, MI 48353
www.hartlandtwp.com

From: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Sent: Wednesday, August 16, 2023 10:29 AM

To: Troy Langer <TLanger@hartlandtwp.com>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>; Fournier, Laurent (MDOT) <FournierL@michigan.gov>; Seif, George (MDOT) <SeifG@michigan.gov>
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Hello Troy,

We have been reviewing the traffic models and access locations. We haven't completed our review, but hope to have something soon.

To let you know unofficially, as far as access, we possibly may request that the gas station driveway on M-59 to be moved a little further west, due to the backups projected in the models in the cross over. But like I mentioned, it is still under review.

Sorry for the delay. Let you know
Thank you
Craig

From: Troy Langer <TLanger@hartlandtwp.com>
Sent: Thursday, August 10, 2023 4:03 PM
To: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>; Fournier, Laurent (MDOT) <FournierL@michigan.gov>; Seif, George (MDOT) <SeifG@michigan.gov>
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Craig,

Just checking on the status of this.

In reality, the Township is focused on the location of the access points (if they are even permitted). The Township is less concerned about any improvements, such as de-acceleration lanes, turn lanes, signalized intersections. The Township figures those items can be part of the project, but once we know the location of the access lanes to M-59 (Highland Road), we can move forward with the rest of the project. Otherwise, the entire project is on hold waiting.

Let me know your thoughts.

Thanks.

Troy Langer
Planning Director
810.632.7498
2655 Clark Road
Hartland, MI 48353
www.hartlandtwp.com

From: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Sent: Monday, July 10, 2023 4:17 PM
To: Troy Langer <TLanger@hartlandtwp.com>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>; Fournier, Laurent (MDOT) <FournierL@michigan.gov>; Seif, George (MDOT) <SeifG@michigan.gov>
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Hello Troy,

I sent the below email but never received notification that it didn't go through. Then I responded to your last two emails, once on 7/6 and once today. Then today I received notification my email didn't go through because I induced both attachments. My guess is your email can not receive both attachments at once but mine can send them.

So to answer your question again, but you should receive this time since I didn't include the pdf attachments, yes MDOT received both of your emails. And see below for that first original response.

Sorry it took so long to figure out the issue.
Thank you

Craig Heidelberg, P.E.
MDOT Brighton TSC
Operations Engineer
810-623-8341 C

From: Heidelberg, Craig (MDOT)
Sent: Tuesday, June 27, 2023 2:22 PM
To: Troy Langer <TLanger@hartlandtwp.com>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>; Fournier, Laurent (MDOT) <FournierL@michigan.gov>; Seif, George (MDOT) <SeifG@michigan.gov>
Subject: RE: Traffic Study - Highland Reserve - Hartland Township

Hello Troy,

MDOT has received both emails (plans and TIS). Thank you for sharing with us.

Traffic Studies can be time consuming to review. It roughly takes 3-4 weeks to complete a TIS review with all of my Traffic Engineer's other duties. We will get back to you with any comments once the review is complete.

MDOT will need a permit submitted at some point by the developer for any of the work in MDOT Right of Way.

Thank you

Craig Heidelberg, P.E.
MDOT Brighton TSC
Operations Engineer
810-623-8341 C

From: Troy Langer <TLanger@hartlandtwp.com>
Sent: Tuesday, June 27, 2023 11:33 AM
To: Heidelberg, Craig (MDOT) <HeidelbergC@michigan.gov>
Cc: Martha Wyatt <MWyatt@hartlandtwp.com>
Subject: Traffic Study - Highland Reserve - Hartland Township

Craig,

Please find attached the traffic report for the development.

Let me know your thoughts.

Thank you.

Troy Langer
Planning Director
810.632.7498
2655 Clark Road
Hartland, MI 48353
www.hartlandtwp.com

PRELIMINARY SITE PLAN
HIGHLAND RESERVE
RESIDENTIAL HOUSING DEVELOPMENT
HARTLAND TOWNSHIP, LIVINGSTON COUNTY, MICHIGAN
SECTION 16, TOWN 4 SOUTH, RANGE 10 EAST

CONTACT INFORMATION

HARTLAND TOWNSHIP
ROBERT M. WEST, MANAGER
PHONE: (810) 632-7498
2655 CLARK ROAD
HARTLAND, MI 48353

HARTLAND TOWNSHIP
TROY LANGER, DIRECTOR PLANNING & ZONING
PHONE: (810) 632-7498
2655 CLARK ROAD
HARTLAND, MI 48353

HARTLAND TOWNSHIP
MICHAEL LUCE, DIRECTOR PUBLIC WORKS
PHONE: (810) 632-7498
2655 CLARK ROAD
HARTLAND, MI 48353

HARTLAND DEERFIELD FIRE AUTHORITY
ADAM CARROLL, CHIEF
PHONE: (810) 632-7676
3205 HARTLAND ROAD
HARTLAND, MI 48353

NOT APPROVED-PERMIT LIST

TWP. PRELIMINARY SITE PLAN \ CLUSTER DEVELOPMENT APPROVAL
TOWNSHIP ZBA (NOT REQUIRED)
TOWNSHIP FINAL ENGINEERING PLAN APPROVAL
M.D.O.T. RIGHT-OF-WAY PERMIT
COUNTY SOIL EROSION PERMIT
EGLE NPDES NOTICE OF COVERAGE
EGLE PART 41 WASTEWATER PERMIT
EGLE ACT 399 WATER SYSTEM PERMIT
EGLE WETLAND PERMIT
TOWNSHIP WOODLAND PERMIT

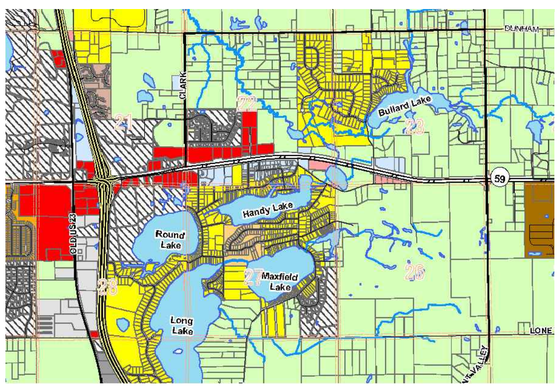
APPROVED-PERMIT LIST

AERIAL MAP
1" = 200'

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BtB	Boyer-Oshtemo loamy sands, 2 to 6 percent slopes	2.4	4.9%
BuA	Brady loamy sand, 0 to 2 percent slopes	21.0	42.3%
BwA	Bronson loamy sand, 0 to 2 percent slopes	7.7	15.5%
CarabA	Carlisle muck, 0 to 2 percent slopes	1.9	3.9%
FoA	Fox sandy loam, 0 to 2 percent slopes	7.9	16.0%
FoB	Fox sandy loam, 2 to 6 percent slopes	6.8	13.6%
Gd	Gilford sandy loam, 0 to 2 percent slopes, gravelly subsoil	1.9	3.8%
Totals for Area of Interest		**49.7**	**100.0%**

SOILS MAP
NOT TO SCALE

SOILS LEGEND



- CA - Conservation Agricultural
- RUR - Rural Residential
- RR - Residential Recreational
- STR - Settlement Residential
- RE- Rural Estate District
- SR - Suburban Residential
- MDR - Medium Density Residential
- HDR - High Density Residential
- MR - Multiple Family Residential
- MR-2 - Mobile Home Park
- OS - Office Service
- LC - Limited Commercial
- NSC - Neighborhood Service Commercial
- GC - General Commercial
- RDP - Research and Development Park
- LI - Light Industrial
- I - Industrial
- PD - Planned Development

ZONING MAP
NOT TO SCALE

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	TOPOGRAPHIC SURVEY
3	TREE SURVEY
4	SITE PLAN
5	SITE DETAILS
6	SITE GRADING & UTILITY PLAN NO.1 - NORTHEAST
7	SITE GRADING & UTILITY PLAN NO.2 - SOUTHEAST
8	SITE GRADING & UTILITY PLAN NO. 3 - WEST
9	LANDSCAPE PLAN
10	LIGHTING PLAN

CITY \ COUNTY STANDARD DETAILS

COUNTY STORM SEWER STANDARD DETAILS
CITY SANITARY SEWER STANDARD DETAILS
CITY WATER MAIN STANDARD DETAILS
COUNTY SESC STANDARD DETAILS

ENGINEER/SURVEYOR
DIFFIN Engineering & Surveying
Matthew A Diffin, P.E.
Principal
24353 Tara Drive
South Lyon, MI 48178
Phone: (248) 943-8244
Fax: (248) 378-2564
E-mail: mdiffin@diffin-eng.com
Web: www.diffin-eng.com

OWNER \ DEVELOPER
CONTACT: MIKE WEST
GREEN DEVELOPMENT VENTURES, LLC
ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MI 49002
Ph: (269) 365-8548
Email: mwest@allenedwin.com

SEAL
STATE OF MICHIGAN
MATTHEW A DIFFIN
ENGINEER
No. 49037
LICENSED PROFESSIONAL ENGINEER

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Landscape Architecture
Land Surveying
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Engineering & Surveying
24353 Tara Drive
South Lyon, MI 48178
P: 248.943.8244
F: 248.378.2564
www.Diffin-Eng.com

REVISIONS

CLIENT: ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

COVER SHEET
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
INGHAM COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD
AS SHOWN
Job No.: 230213
Sheet No.
1

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 6-15-23.DWG

HIGHLAND ROAD (M-59)

(VARIABLE WIDTH M.D.O.T. R.O.W.)

N. LINE SEC. 26

HARTLAND GLEN LANE

REDWOOD HARTLAND HIGHLAND RD, P1 LLC
TAX ID #4708-26-100-020
ZONED: SPA
(UNDER CONSTRUCTION - MULTI-FAMILY RESIDENTIAL DEVELOPMENT)

HARTLAND GLEN LANE

P.O.B.
N. 1/4 CORNER
SECTION 26
T.3N., R.6.E.

N86° 38' 50"E
99.75'

N2° 39' 24"W
10.00'

N86° 36' 57"E
286.00'

S2° 39' 24"E
10.00'

N86° 36' 57"E
210.00'

N2° 27' 46"W
1330.13'

S2° 39' 24"E
1262.07'

S86° 41' 45"W
1315.86'

L=622.15'
R=3879.71'
CB=S88°47'24"E
CD=621.48'

M.D.O.T. R.O.W. WIDTH VARIES
L181, P286

SAN MH
RIM=983.27
N=±966.4

EXISTING OVERHEAD ELECTRIC (EASEMENT NOT LISTED IN TITLE WORK)

POTENTIAL WETLANDS

EXISTING TREES TO BE REMOVED

EXISTING TREES TO REMAIN (INSTALL SILT FENCE)

VACANT
(EXISTING FARM FIELD)
TAX ID # 4708-26-200-002
LOT
AREA=±39.05-ACRES
ZONED: SPA

HARTLAND NORTH & SOUTH LAND
TAX ID #4708-26-200-007
ZONED: AGRICULTURAL
(EXISTING FARM FIELD)

EXISTING WETLANDS ±1.19-ACRES

EXISTING WETLANDS ±1.67-ACRES

EXISTING WETLANDS ±0.125-ACRES

EXISTING WETLANDS ±1.518-ACRES

PROPOSED WETLAND DISTURBANCE ±0.176-ACRES

PROPOSED WETLAND DISTURBANCE ±0.034-ACRES

PROPOSED WETLAND DISTURBANCE ±0.029-ACRES

SB#1
SB#2
SB#3
SB#4
SB#5
SB#6
SB#7
SB#8
SB#9
SB#10
SB11
SB#12

NORTH

PROPERTY DESCRIPTION:

Land situated in the Township of Hartland, County of Livingston in the State of Michigan and described as follows:

A part of the West 1/2 of the Northeast 1/4 of Section 26, Town 3 North, Range 6 East, Hartland Township, Livingston County, Michigan, more particularly described as commencing at the North 1/4 corner of said Section 26 for a point of beginning; thence North 86 degrees 38 minutes 50 seconds East, 99.75 feet along the North line of said Section 26, to a point on the Southerly right-of-way of M-59 Highway; thence 622.15 feet along a curve to the left, said curve having a radius 3879. 71 feet, a central angle of 09 degrees 11 minutes 16 seconds and a chord bearing and distance of South 88 degrees 47 minutes 24 seconds East, 621 .48 feet, along the Southerly right-of-way of said M-59 Highway; thence North 86 degrees 36 minutes 57 seconds East, 95.52 feet, along Southerly right-of-way of said M-59 Highway; thence North 02 degrees 39 minutes 24 seconds West 10.00 feet, along Southerly right-of-way line of said M-59 Highway; thence North 86 degrees 36 minutes 57 seconds East, 286.00 feet, along Southerly right-of-way of said M-59 Highway; thence South 02 degrees 39 minutes 24 seconds East, 10.00 feet along Southerly right-of-way of said M-59 Highway; thence North 86 degrees 36 minutes 57 seconds East, 210.00 feet, along Southerly right-of-way of said M-59 Highway; thence South 02 degrees 39 minutes 24 seconds East, 1282.07 feet; thence South 86 degrees 41 minutes 45 seconds West, 1315.86 feet to a point on the North and South 1/4 line of said Section 26; thence North 02 degrees 27 minutes 46 seconds West, 1330.13 feet along said North and South 1/4 line of said Section 26, to the point of beginning.

TAX ID# 4708-26-200-002

PARCEL AREA = ±39.05-ACRES

LEGEND

SYMBOL	DESCRIPTION
× 656.5	EX. SPOT ELEVATION
656	EX. CONTOUR
	EX. E DITCH
	EX. GRAVEL
	EX. WATER MAIN
	EX. WATER VALVE
	EX. WATER SERVICE VALVE
	EX. HYDRANT
	EX. WATER MANHOLE
	EX. WATER GV
	EX. WATER METER
	EX. STORM SEWER
	EX. STORM INLET/CATCH BASIN
	EX. ROUND STORM CATCH BASIN
	EX. STORM MANHOLE
	EX. STORM END SECTION
	EX. DOWN SPOUT
	EX. SANITARY SEWER
	EX. SANITARY MANHOLE
	EX. CLEAN OUT
	EX. SANITARY VENT
	EX. UNDERGROUND GAS
	EX. GAS VALVE
	EX. GAS METER
	EX. UNDERGROUND TELEPHONE
	EX. UNDERGROUND FIBER OPTIC
	EX. TELEPHONE MANHOLE
	EX. TELEPHONE RISER
	EX. TELEPHONE HANDHOLE
	EX. UNDERGROUND ELECTRIC
	EX. ELECTRIC MANHOLE
	EX. ELECTRIC RISER
	EX. ELECTRIC HANDHOLE
	EX. ELECTRIC TRANSFORMER
	EX. ELECTRIC METER
	EX. GENERATOR
	EX. ASPHALT
	EX. CONCRETE
	EX. GRAVEL
	EX. TREELINE
	EX. WATER MARKER
	EX. GAS MARKER
	EX. COMM. MARKER
	EX. TELE. MARKER
	EX. FIBER MARKER
	EX. MEDIA MARKER
OHC	EX. OVERHEAD CABLE
OHF	EX. OVERHEAD FIBER
OHE	EX. OVERHEAD ELECTRIC
	EX. UNDERGROUND CABLE
	EX. COMMUNICATION RISER
	EX. COMMUNICATION HANDHOLE
	EX. UTILITY POLE
	EX. GUY ANCHOR
	EX. SIGNAL POLE
	EX. LIGHT POLE
	EX. GROUND LIGHT
	EX. DOUBLE LIGHT POLE
	EX. SINGLE POLE SIGN
	EX. DOUBLE POLE SIGN
	EX. MAILBOX
	EX. FLAGPOLE
	EX. SPEAKER
	EX. UNKNOWN MANHOLE
	EX. COMBO MANHOLE
	EX. SECTION LINE
	EX. PARCELS
	EX. EASEMENT
	EX. CENTERLINE
	EX. WETLAND LIMITS
	EX. CURB/PAVEMENT
	EX. FENCE
	EX. GUARDRAIL
	FOUND IRON
RR	FOUND RR SPIKE
PK NAIL	FOUND PK NAIL
	FOUND CONC. MONUMENT
	SET IRON ROD
MAG NAIL	SET MAG NAIL
	SECTION CORNER
	POST
	BOLLARD
	RECORDED BEARING
	MEASURED BEARING
	EX. TREE
	DEMO TREE

STATE OF MICHIGAN
MATTHEW A. DIFFIN
ENGINEER
No. 49007
LICENSED PROFESSIONAL ENGINEER

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Land Surveying
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REVISIONS

CLIENT:
ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

TOPOGRAPHIC SURVEY
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD

1" = 60'

Job No.: 221215
Sheet No.
2

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 6-15-23.DWG

Tag No.	Scientific Name	Common Name	DBH(s)	Condition	TREES REMOVED
4001	Quercus rubra	Red Oak	24''	Good	X
4002	Quercus rubra	Red Oak	48''	Good	X
4003	Quercus rubra	Red Oak	36''	Good	X
4004	Quercus rubra	Red Oak	30''	Good	X
4005	Quercus rubra	Red Oak	52''	Good	X
4006	Quercus rubra	Red Oak	24''	Good	X
4007	Ulmus	Elm	8''	Good	X
4008	Prunus pensylvanica	Pin Cherry	10'', 8''	Good	X
4009	Prunus pensylvanica	Pin Cherry	10''	Good	X
4010	Prunus pensylvanica	Pin Cherry	10'', 10''	Good	X
4011	Prunus pensylvanica	Pin Cherry	10'', 8''	Good	X
4012	Prunus pensylvanica	Pin Cherry	9'', 8'', 5'', 4''	Good	X
4013	Prunus pensylvanica	Pin Cherry	15''	Good	X
4014	Prunus pensylvanica	Pin Cherry	10''	Good	X
4015	Prunus pensylvanica	Pin Cherry	8''	Good	X
4016	Prunus pensylvanica	Pin Cherry	10''	Good	X
4017	Quercus rubra	Red Oak	48''	Good	X
4018	Ulmus	Elm	10''	Good	X
4019	Tilia	Basswood	20'', 9'', 6'', 4''	Good	
4020	Carya glabra	Pignut Hickory	16''	Good	X
4021	Salix alba	Willow	17''	Good	
4022	Salix alba	Willow	15''	Good	
4023	Acer rubrum	Red Maple	20'', 20''	Good	
4024	Acer saccharinum	Silver Maple	12''	Good	
4025	Acer rubrum	Red Maple	17'', 18''	Good	
4026	Prunus pensylvanica	Pin Cherry	8'', 4''	Good	
4027	Ulmus	Elm	10''	Good	
4028	Prunus pensylvanica	Pin Cherry	10''	Good	
4029	Prunus pensylvanica	Pin Cherry	8''	Good	
4030	Prunus pensylvanica	Pin Cherry	12''	Good	
4032	Salix alba	Willow	10'', 10'', 8''	Good	
4033	Salix alba	Willow	12''	Good	
4034	Prunus pensylvanica	Pin Cherry	12''	Good	
4035	Prunus pensylvanica	Pin Cherry	8''	Good	
4036	Prunus pensylvanica	Pin Cherry	8''	Good	
4037	Prunus pensylvanica	Pin Cherry	8''	Good	
4038	Prunus pensylvanica	Pin Cherry	15''	Good	
4039	Salix alba	Willow	14''	Good	
4040	Salix alba	Willow	13''	Good	
4041	Populus	Poplar	14''	Good	
4042	Populus	Poplar	11''	Good	
4043	Populus	Poplar	8''	Good	
4044	Populus	Poplar	8''	Good	
4045	Populus	Poplar	8''	Good	
4046	Populus	Poplar	10''	Good	
4047	Populus	Poplar	9''	Good	
4048	Populus	Poplar	9''	Good	
4049	Salix alba	Willow	8''	Good	
4050	Ulmus	Elm	9''	Good	
4051	Prunus pensylvanica	Pin Cherry	16'', 12''	Good	
4052	Ulmus	Elm	10'', 9''	Good	

Tag No.	Scientific Name	Common Name	DBH(s)	Condition	TREES REMOVED
4053	Prunus pensylvanica	Pin Cherry	32'', 30''	Good	
4054	Ulmus	Elm	8''	Good	
4055	Ulmus	Elm	8'', 7''	Good	
4056	Ulmus	Elm	8''	Good	
4057	Ulmus	Elm	8''	Good	
4058	Ulmus	Elm	11''	Good	
4059	Carya glabra	Pignut Hickory	24''	Good	
4060	Prunus pensylvanica	Pin Cherry	12''	Good	
4061	Prunus pensylvanica	Pin Cherry	10''	Good	
4062	Carya glabra	Pignut Hickory	22''	Good	
4063	Prunus pensylvanica	Pin Cherry	10''	Good	
4064	Carya glabra	Pignut Hickory	8''	Good	
4065	Carya glabra	Pignut Hickory	36''	Good	
4066	Carya glabra	Pignut Hickory	11''	Good	
4067	Carya glabra	Pignut Hickory	26''	Good	
4068	Ulmus	Elm	18''	Good	
4069	Carya glabra	Pignut Hickory	10''	Good	
4070	Ulmus	Elm	12''	Good	
4071	Ulmus	Elm	18''	Good	
4072	Ulmus	Elm	30''	Good	
4073	Prunus pensylvanica	Pin Cherry	9''	Good	X
4074	Malus	Apple	8'', 7''	Good	
4075	Prunus pensylvanica	Pin Cherry	12''	Good	
4076	Prunus pensylvanica	Pin Cherry	12''	Good	
4077	Prunus pensylvanica	Pin Cherry	12''	Good	
4078	Prunus pensylvanica	Pin Cherry	18'', 18'', 16''	Good	
4079	Salix alba	Willow	10''	Good	
4081	Ulmus	Elm	11''	Good	
4082	Prunus pensylvanica	Pin Cherry	16''	Good	
4083	Ulmus	Elm	12''	Good	
4084	Ulmus	Elm	8''	Good	
4085	Acer rubrum	Red Maple	32''	Good	
4086	Tilia	Basswood	12''	Good	
4087	Prunus pensylvanica	Pin Cherry	14''	Good	
4088	Acer Negundo	Box Elder	12'', 12'', 12''	Good	
4089	Acer Negundo	Box Elder	12'', 5''	Good	
4091	Ulmus	Elm	24'', 24'', 18'', 12''	Good	X
4092	Ulmus	Elm	12''	Good	X
4093	Ulmus	Elm	28'', 24''	Good	X
4094	Ulmus	Elm	8''	Good	X
4095	Ulmus	Elm	8''	Good	X
4096	Ulmus	Elm	26''	Good	X
4097	Ulmus	Elm	36''	Good	X
4098	Ulmus	Elm	52''	Good	X
4099	Ulmus	Elm	48''	Good	X
4100	Acer rubrum	Red Maple	18''	Good	X
4101	Malus	Apple	36''	Poor	X
4102	Malus	Apple	16'', 14''	Poor	X
4103	Morus rubus	Mulberry	12'', 9'', 9''	Good	X
4104	Malus	Apple	17''	Poor	X
4105	Malus	Apple	19''	Poor	X

Tag No.	Scientific Name	Common Name	DBH(s)	Condition	TREES REMOVED
4106	Ulmus	Elm	18''	Good	X
4107	Ulmus	Elm	7''	Good	X
4108	Ulmus	Elm	11''	Good	X
4109	Ulmus	Elm	9''	Good	X
4110	Ulmus	Elm	10''	Good	X
4111	Ulmus	Elm	9''	Good	X
4112	Ulmus	Elm	12''	Good	X
4113	Ulmus	Elm	28''	Good	X
4114	Ulmus	Elm	16'', 12''	Good	X
4115	Ulmus	Elm	15''	Good	X
4116	Acer rubrum	Red Maple	12'', 10'', 10''	Good	X
4117	Acer rubrum	Red Maple	10''	Good	X
4118	Acer rubrum	Red Maple	18''	Good	X
4119	Malus	Apple	20''	Poor	X
4120	Malus	Apple	17''	Poor	X
4121	Acer rubrum	Red Maple	16''	Good	X
4122	Populus deltoids	Cottonwood	15''	Good	
4123	Populus deltoids	Cottonwood	10''	Good	
4124	Populus deltoids	Cottonwood	15''	Good	
4125	Populus deltoids	Cottonwood	12''	Good	
4126	Populus deltoids	Cottonwood	11''	Good	
4127	Populus deltoids	Cottonwood	12''	Good	
4128	Populus deltoids	Cottonwood	12''	Good	
4129	Populus deltoids	Cottonwood	16''	Good	
4130	Ulmus	Elm	8''	Good	
4131	Ulmus	Elm	12'', 10''	Good	
4132	Ulmus	Elm	12''	Good	
4133	Malus	Apple	9''	Good	
4134	Prunus pensylvanica	Pin Cherry	10'', 10''	Good	
4135	Ulmus	Elm	14'', 6''	Good	
4136	Ulmus	Elm	16''	Good	
4137	Ulmus	Elm	9''	Good	
4138	Prunus pensylvanica	Pin Cherry	10''	Good	
4139	Tilia	Basswood	8''	Good	
4140	Tilia	Basswood	16''	Good	
4141	Quercus rubra	Red Oak	16''	Good	
4142	Tilia	Basswood	8''	Good	X
4143	Prunus pensylvanica	Pin Cherry	18''	Good	X
4144	Populus	Poplar	9''	Good	
4145	Populus	Poplar	16'', 8''	Good	
4146	Salix alba	Willow	24'', 16'', 12''	Good	
4147	Salix alba	Willow	12''	Good	X
4150	Acer rubrum	Red Maple	16''	Good	X
4151	Acer rubrum	Red Maple	20''	Good	X
4152	Acer rubrum	Red Maple	30''	Good	X
4153	Acer rubrum	Red Maple	10''	Good	X
4154	Acer rubrum	Red Maple	10'', 8'', 8''	Good	X
4155	Acer rubrum	Red Maple	14'', 14'', 14''	Good	X
4156	Tilia	Basswood	8'', 8'', 6''	Good	X
4157	Tilia	Basswood	8''	Good	X
4158	Tilia	Basswood	10''	Good	X

Tag No.	Scientific Name	Common Name	DBH(s)	Condition	TREES REMOVED
4106	Ulmus	Elm	18''	Good	X
4107	Ulmus	Elm	7''	Good	X
4108	Ulmus	Elm	11''	Good	X
4109	Ulmus	Elm	9''	Good	X
4110	Ulmus	Elm	10''	Good	X
4111	Ulmus	Elm	9''	Good	X
4112	Ulmus	Elm	12''	Good	X
4113	Ulmus	Elm	28''	Good	X
4114	Ulmus	Elm	16'', 12''	Good	X
4115	Ulmus	Elm	15''	Good	X
4116	Acer rubrum	Red Maple	12'', 10'', 10''	Good	X
4117	Acer rubrum	Red Maple	10''	Good	X
4118	Acer rubrum	Red Maple	18''	Good	X
4119	Malus	Apple	20''	Poor	X
4120	Malus	Apple	17''	Poor	X
4121	Acer rubrum	Red Maple	16''	Good	X
4122	Populus deltoids	Cottonwood	15''	Good	
4123	Populus deltoids	Cottonwood	10''	Good	
4124	Populus deltoids	Cottonwood	15''	Good	
4125	Populus deltoids	Cottonwood	12''	Good	
4126	Populus deltoids	Cottonwood	11''	Good	
4127	Populus deltoids	Cottonwood	12''	Good	
4128	Populus deltoids	Cottonwood	12''	Good	
4129	Populus deltoids	Cottonwood	16''	Good	
4130	Ulmus	Elm	8''	Good	
4131	Ulmus	Elm	12'', 10''	Good	
4132	Ulmus	Elm	12''	Good	
4133	Malus	Apple	9''	Good	
4134	Prunus pensylvanica	Pin Cherry	10'', 10''	Good	
4135	Ulmus	Elm	14'', 6''	Good	
4136	Ulmus	Elm	16''	Good	
4137	Ulmus	Elm	9''	Good	
4138	Prunus pensylvanica	Pin Cherry	10''	Good	
4139	Tilia	Basswood	8''	Good	
4140	Tilia	Basswood	16''	Good	
4141	Quercus rubra	Red Oak	16''	Good	
4142	Tilia	Basswood	8''	Good	X
4143	Prunus pensylvanica	Pin Cherry	18''	Good	X
4144	Populus	Poplar	9''	Good	
4145	Populus	Poplar	16'', 8''	Good	
4146	Salix alba	Willow	24'', 16'', 12''	Good	
4147	Salix alba	Willow	12''	Good	X
4150	Acer rubrum	Red Maple	16''	Good	X
4151	Acer rubrum	Red Maple	20''	Good	X
4152	Acer rubrum	Red Maple	30''	Good	X
4153	Acer rubrum	Red Maple	10''	Good	X
4154	Acer rubrum	Red Maple	10'', 8'', 8''	Good	X
4155	Acer rubrum	Red Maple	14'', 14'', 14''	Good	X
4156	Tilia	Basswood	8'', 8'', 6''	Good	X
4157	Tilia	Basswood	8''	Good	X
4158	Tilia	Basswood	10''	Good	X

Tag No.	Scientific Name	Common Name	DBH(s)	Condition	TREES REMOVED
4210	Tilia	Basswood	15''	Good	X
4211	Carya glabra	Pignut Hickory	16''	Good	X
4212	Acer rubrum	Red Maple	9''	Good	X
4213	Tilia	Basswood	16''	Good	X
4214	Acer rubrum	Red Maple	15''	Good	X
4215	Acer rubrum	Red Maple	20''	Good	X
4216	Acer rubrum	Red Maple	14''	Good	X
4217	Tilia	Basswood	18''	Good	X
4218	Tilia	Basswood	20''	Good	X
4219	Acer rubrum	Red Maple	10''	Good	X
4220	Acer rubrum	Red Maple	10''	Good	X
4221	Carya glabra	Pignut Hickory	19''	Good	X
4222	Carya glabra	Pignut Hickory	13''	Good	X
4223	Tilia	Basswood	8''	Good	X
4224	Tilia	Basswood	10'', 5''	Good	X
4225	Acer rubrum	Red Maple	46''	Good	X
4226	Acer rubrum	Red Maple	16''	Good	X
4227	Tilia	Basswood	42''	Good	X
4228	Acer rubrum	Red Maple	22''	Good	X
4229	Acer rubrum	Red Maple	22''	Good	X
4230	Acer rubrum	Red Maple	15''	Good	X
4231	Quercus rubra	Red Oak	26''	Good	X
4232	Acer rubrum	Red Maple	17''	Good	X
4233	Fagus	Beech	26''	Good	
4234	Acer rubrum	Red Maple	18''	Good	
4235	Acer rubrum	Red Maple	12''	Good	
4236	Acer rubrum	Red Maple	16''	Good	
4237	Acer rubrum	Red Maple	15''	Good	X
4238	Acer rubrum	Red Maple	17''	Good	
4239	Acer rubrum	Red Maple	11''	Good	
4240	Acer rubrum	Red Maple	15''	Good	
4241	Acer rubrum	Red Maple	15''	Good	
4242	Tilia	Basswood	18''	Good	
4243	Ulmus	Elm	15'', 12'', 12''	Good	

TREE FENCE NOTE:

1. EITHER PLASTIC OR WOOD ORANGE SNOW FENCING SHALL BE INSTALLED AT OR BEYOND THE DRIPLINE, UNLESS MORE SUBSTANTIAL FENCING IS REQUIRED.

2. STAKES SHALL BE METAL "T" POLES SPACED NO FURTHER APART THAN 5' ON CENTER.

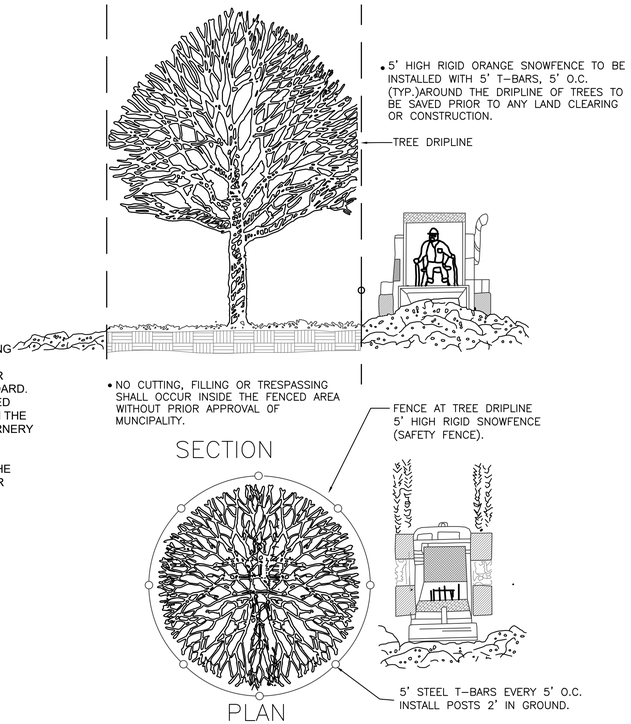
3. FENCING SHALL NOT BE INSTALLED CLOSER TO THE TREE THAN THE DRIPLINE OF THOSE TREES TO BE SAVED. SPECIAL CIRCUMSTANCES SHALL BE REVIEWED BY THE CITY.

4. ALL FENCING SHALL BE ERECTED PRIOR TO CONSTRUCTION. THE CITY SHALL BE NOTIFIED ONCE THE FENCING IS INSTALLED FOR INSPECTION.

5. UNDER NO CIRCUMSTANCES SHALL THE PROTECTIVE FENCING BE REMOVED WITHOUT PROPER APPROVAL FROM THE CITY.

6. NO PERSON SHALL CONDUIT ANY ACTIVITY WITHIN THE ARES PROPOSED TO REMAIN. THIS SHALL INCLUDE, BUT NOT LIMITED TO: a) NOSOLVENTS OR CHEMICALS WITHIN PROTECTIVE AREA. b) NO BUILDING MATERIALS OR CONSTRUCTION EQUIPMENT WITHIN THE PROTECTED AREA. c) NO GRADE CHANGES, INCLUDING FILL, WITHIN PROTECTIVE AREA. d) NO REMOVAL OF VEGITATION FROM THE GROUND UP WITHOUT PERMISSION FROM THE PROPER REVEIWING AUTHORITY, INCLUDING THE WOODLANDS REVIEW BOARD. e) ANY REQUIRED SWALE ARE APPROVED THROUGH A PROTECTED AREAS. IN INSTANCES WHERE SWALES ARE APPROVED THROUGH THE PROTECTED AREA, THE SWALES NEED TO BE HAND DUG. MACHERNERY OF ANY KIND IS PROHIBITED.

7. REGULATED WOOLANDS OR REGULATED TREES ADJACENT TO THE PROPERTY ARE ALSO REQUIRED TO BE PROTECTED WHETHER OR NOT THEY ARE SHOWN ON THE PLAN.



TREE PROTECTION FENCE DETAIL

STATE OF MICHIGAN
MATTHEW A DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

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Landscape Architecture
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REVISIONS

CLIENT: ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

TREE SURVEY
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD
1" = 60'
Job No.: 221215
Sheet No.
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HIGHLAND ROAD (M-59)

(VARIABLE WIDTH M.D.O.T. R.O.W.)

N. LINE SEC. 26

N86° 38' 50"E 99.75'

P.O.B. N. 1/4 CORNER SECTION 26 T.3N., R.6.E.

NORTH

L=622.15' R=3879.71' CB=S88°47'24"E CD=621.48'

60' WIDE M.D.O.T. R.O.W. L187, P.286

PR. 5' WIDE CONC. WALK

N86° 36' 57"E 95.52'

N2° 39' 24"W 10.00'

N86° 36' 57"E 286.00'

50' WIDE M.D.O.T. R.O.W. L187, P.286

S2°39'24"E 10.00'

80' ROAD SETBACK

EXISTING OVERHEAD ELECTRIC (EASEMENT NOT LISTED IN TITLE WORK)

"FUTURE COMMERCIAL DEVELOPMENT" PARCEL AREA ±2.1-ACRES (BY OTHERS)

USEABLE OPEN SPACE AREA =±1.121-ACRES

PR. BIORETENTION INFILTRATION SWALE

RENTAL PARCEL 1 LOT AREA =±3.40-ACRES

PHASE 1

ABERNETHY ST.

PR. 66' PRIVATE R.O.W.

30' B-B

PR. 5' WIDE CONCRETE WALK

USEABLE OPEN SPACE ±0.232-ACRES

PR. 5' WIDE CONC. WALK

N86° 36' 57"E 210.00'

PR. 66' PRIVATE R.O.W.

PR. 5' WIDE CONCRETE WALK

REDWOOD APARTMENTS (UNDER CONSTRUCTION)

HARTLAND GLEN LANE

TYPICAL UNIT ENVELOPE 50'W x 65'L SHOWN

80' MIN. SHOWN

PHASE LINE

RENTAL PARCEL 2 LOT AREA =±7.02-ACRES

PR. BIORETENTION INFILTRATION SWALE

DETENTION BASIN #1

100-YR DETENTION PER COUNTY REQUIREMENTS ±0.32-ACRES

PROPOSED BENCH

OPEN SPACE AREA =±5.60-ACRES

EXISTING WETLANDS ±1.19-ACRES

KIRK WALL

R50'

R75'

ARDMORE AVE.

LOCKERBIE LANE

OPEN SPACE ±0.33-ACRES

PHASE 3

HARTLAND NORTH & SOUTH LAND TAX ID #4708-26-200-007 ZONED: AGRICULTURAL (EXISTING FARM FIELD)

USEABLE OPEN SPACE ±1.944-ACRES

PROPOSED LIMITS OF SINGLE DEED RENTAL UNITS

PROPOSED SITE CONDOMINIUM

EXISTING WETLANDS ±1.67-ACRES

OPEN SPACE ±3.61-ACRES

PROPOSED BENCH

PHASE 2

100-YR DETENTION PER COUNTY REQUIREMENTS ±0.72-ACRES

DETENTION BASIN #2

MELSETTER ST.

PROPOSED WETLAND DISTURBANCE ±0.176-ACRES

PHASE LINE

PROPOSED 32' x 80' PLAYGROUND WITH PLAYSET, WHIZZY DIZZY, SWERVING SPINDLE, 2-BAY SINGLE POST SWING

36' SAFETY ZONE

13.5' RADIUS SAFETY ZONE

PROPOSED 16' x 16' PAVILION

PR. NATURAL MOWED PATHWAY

USEABLE OPEN SPACE ±1.393-ACRES

PROPOSED BENCH

OPEN SPACE ±3.09-ACRES

EXISTING WETLANDS ±1.518-ACRES

CARRADALE CT.

PROPOSED WETLAND DISTURBANCE ±0.034-ACRES

EXISTING WETLANDS ±0.125-ACRES

OPEN SPACE ±0.30-ACRES

PROPOSED WETLAND DISTURBANCE ±0.029-ACRES

S86° 41' 45"W 1315.86'

S2° 39' 24"E 1282.07'

REDWOOD HARTLAND HIGHLAND RD P1 LLC TAX ID #4708-26-100-020 ZONED:SPA (UNDER CONSTRUCTION - MULTI-FAMILY RESIDENTIAL DEVELOPMENT)

HARTLAND GLEN LANE

SITE DATA

OVERALL PARCEL AREA = ±39.05-ACRES
COMMERCIAL PARCEL AREA = ±2.1-ACRES
EXISTING ZONE = SPECIAL PLANNING AREA (SPA)
PROPOSED ZONING (PD) CLUSTER OPTION
PROPOSED NO. RENTAL UNITS = 35
PROPOSED NO. CONDO UNITS = 66
UNIT DENSITY = 101/39.05 = 2.59 UNITS/ACRE
PD TOTAL OPEN SPACE REQUIREMENT = 25% OR 9.763-ACRES
PD USABLE OPEN SPACE REQUIREMENT = 10% OR 3.905-ACRES
PROVIDED TOTAL OPEN SPACE = ±15.72-ACRES 40.3%
OPEN SPACE WETLANDS = ±4.50-ACRES 12%
OPEN SPACE DETENTION = ±1.04-ACRES 3%
OPEN SPACE UPLANDS = ±10.18-ACRES 26%
COMMON USEABLE OPEN SPACE = ±4.69-ACRES 12.01%
MINIMUM LOT SIZE 60'(W)x120'(L)
MINIMUM LOT AREA = 7,200-SQ.FT
FRONT BUILDING SETBACK = 25-FT.
REAR BUILDING SETBACK = 20-FT.
SIDE BUILDING SETBACK = 5-FT EACH SIDE
80-FT. BUILDING SETBACK REQUIRED ALONG M-59 R.O.W.

RESIDENTIAL SINGLE DEED RENTALS
AREA=±10.42-ACRES
OPEN SPACE=±8.16-ACRES
EX. WETLANDS=±1.19-ACRES
PR. WETLAND DISTURBANCE=±0.0-ACRES
PR. DETENTION BASIN=±0.32-ACRES

RESIDENTIAL SITE CONDO
AREA=±26.53-ACRES
OPEN SPACE=±7.56-ACRES
EX. WETLANDS=±3.318-ACRES
PR. WETLAND DISTURBANCE=±0.24-ACRES
PR. DETENTION BASIN=±0.72-ACRES

LEGEND

- PR. COMMERCIAL PARCEL
- PR. CONDOMINIUM UNITS
- PR. RENTAL UNITS
- COMMON USEABLE OPEN SPACE AREA (UPLAND)
- UNIT OPEN SPACE AREA
- EX. WETLANDS PR. PRESERVATION AREAS
- STORM WATER PONDS
- EXISTING WOODLANDS TO REMAIN
- EXISTING REGULATED TREE TO REMAIN
- CONDOMINIUM GENERAL COMMON ELEMENT
- CONDOMINIUM UNITS

PLANNED DEVELOPMENT NOTES

1. SITE ACCESS & ROADWAYS
THE DEVELOPMENT WILL BE SERVED BY PRIVATE ROADS MEETING LIVINGSTON COUNTY ROAD COMMISSION STANDARDS AND SPECIFICATIONS.
2. UTILITIES
PROPOSED PROJECT WILL BE SERVED BY PUBLIC SEWER AND PUBLIC WATER. PRIVATE UTILITIES (GAS, ELECTRIC, PHONE) SHALL BE UNDERGROUND.
3. SITE LIGHTING
STREET LIGHTING TO BE IN ACCORDANCE WITH TOWNSHIP ORDINANCES.
4. STORM WATER MANAGEMENT
STORM WATER RUNOFF WILL BE COLLECTED IN THE STORM SEWER SYSTEM AND DETAINED IN ACCORDANCE WITH THE LIVINGSTON COUNTY DRAIN COMMISSION STORM WATER ORDINANCE.
5. SIDEWALKS
SIDEWALKS WILL BE IN ACCORDANCE WITH TOWNSHIP ORDINANCES.
6. FLOODPLAIN
THE SITE IS NOT AFFECTED BY A REGULATED 100-YEAR FLOODPLAIN
7. WETLANDS
WETLAND SHOWN AS PROVIDED BY ENVIROLOGIC ENVIRONMENTAL CONSULTING AND SERVICES.
8. SANITARY SEWER
SANITARY SEWER TO BE IN ACCORDANCE WITH TOWNSHIP STANDARDS.
9. WATER MAIN
WATER MAIN TO BE IN ACCORDAN WITH TOWNSHIP STANDARDS.
10. PUBLIC SERVICES
POLICE: TOWNSHIP POLICE
DEPARTMENT FIRE: TOWNSHIP FIRE DEPARTMENT SCHOOL: PUBLIC SCHOOLS

STATE OF MICHIGAN
MATTHEW A. DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

Civil Engineering
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Land Surveying
Construction Services

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REVISIONS
Added final wetland delineation 6-1-23

CLIENT:
ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

SITE PLAN
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD

1" = 60'

Job No.: 221215
Sheet No. 4

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Rental Portion Building Envelope Dimensions

Unit Number	Width (Ft)	Depth (Ft)
1	48	65
2	48	65
3	48	65
4	48	65
5	48	65
6	48	65
7	48	65
8	45	65
9	48	65
10	45	65
11	45	65
12	45	65
13	45	65
14	45	65
15	45	65
16	50	65
17	50	65
18	50	65
19	50	65
20	50	65
21	50	55
22	50	55
23	50	55
24	50	55
25	50	55
26	50	55
27	50	55
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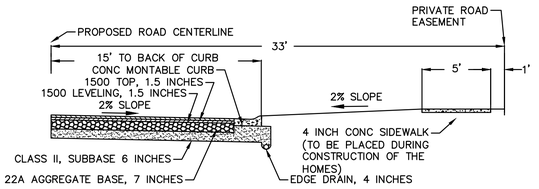
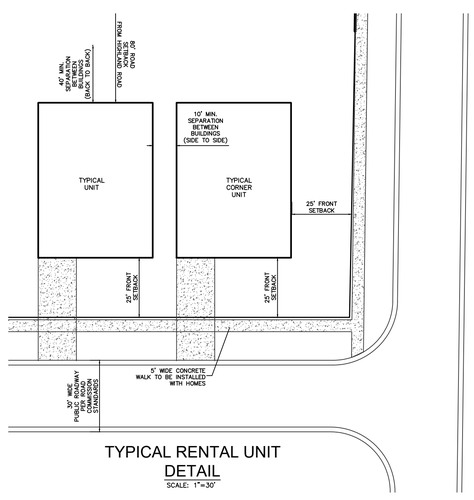
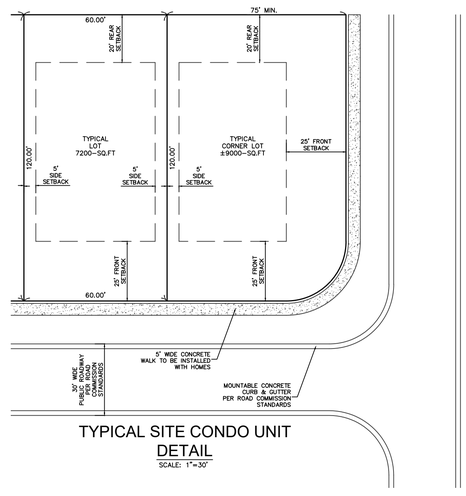
33	50	55
34	42	55
35	50	55



TYPICAL ROAD SECTION
NO SCALE



TYPICAL RENTAL UNIT
DETAIL
SCALE: 1"=30'



TYPICAL SITE CONDO UNIT
DETAIL
SCALE: 1"=30'

Civil Engineering
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REVISIONS
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SITE DETAILS
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
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1" = 60'

Job No.: 221215
Sheet No.
5

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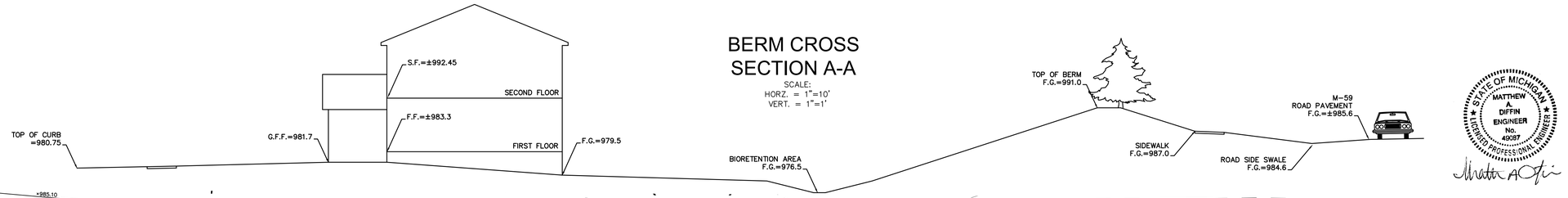
NORTH

BERM CROSS SECTION A-A

SCALE:
HORZ. = 1"=10'
VERT. = 1"=1'



(VARIABLE WIDTH M.D.O.T. R.O.W.)

COMMERCIAL SPLIT PARCEL AREA ±2.1-ACRES (BY OTHERS)

PHASE 1

PHASE 3

PHASE LINE

PHASE LINE

INFILTRATION SWALE PER COUNTY REQUIREMENTS

100-YR DETENTION PER COUNTY REQUIREMENTS

OUTLET STR499 RIM 977.00

EX-4020 RIM 986.46

SB#1 SB#2 SB#3 SB#4 SB#5 SB#6 SB#7

LEGEND

EX. CONTOUR	979
PR. CONTOUR	979
PR. TOP OF CURB	TC 979.0
PR. TOP OF WALK	TW 979.0
PR. SWALE	SW 979.0
PR. MINIMUM FINISHED GRADE	FG 979.0
PR. MINIMUM VIEW-OUT GRADE	VO. 974.0
PR. MINIMUM WALK-OUT GRADE	WO. 970.0
PR. SANITARY SEWER	SS
PR. WATER MAIN	W
PR. STORM SEWER	ST
EX. ELEVATION	×977.42
PR. SILT FENCING \ TREE PROTECTION	

CONSTRUCTION SITE SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR. NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

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Engineering & Surveying
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South Lyon, MI 48178
P: 248.943.8244
F: 248.378.2564
www.Diffin-Eng.com

STATE OF MICHIGAN
MATTHEW A DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

REVISIONS

CLIENT: ALLEN EDWIN HOMES
2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

GRADING & UTILITY PLAN NO. 1
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD

1" = 40'

Job No.: 221215
Sheet No. 6

NORTH

STATE OF MICHIGAN
MATTHEW A DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

LEGEND

EX. CONTOUR 979
PR. CONTOUR 979
PR. TOP OF CURB TC 979.0
PR. TOP OF WALK TW 979.0
PR. SWALE SW 979.0
PR. MINIMUM FINISHED GRADE FG 979.0
PR. MINIMUM VIEW-OUT GRADE V.O. 974.0
PR. MINIMUM WALK-OUT GRADE W.O. 970.0
PR. SANITARY SEWER SS
PR. WATER MAIN W
PR. STORM SEWER ST
EX. ELEVATION ×877.42
PR. SILT FENCING
TREE PROTECTION

EXISTING WETLANDS ±1.67-ACRES

PROPOSED WETLAND DISTURBANCE ±0.034-ACRES

PROPOSED WETLAND DISTURBANCE ±0.176-ACRES

EXISTING WETLANDS ±1.518-ACRES

100-YR DETENTION PER COUNTY REQUIREMENTS

INFILTRATION SWALE PER COUNTY REQUIREMENTS

DEVELOPER TO GET TEMPORARY GRADING EASEMENT FOR PLACEMENT OF PROPOSED ROAD ALONG THE PROPERTY LINE

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REVISIONS

CLIENT:
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2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

GRADING | UTILITY PLAN NO. 2
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E. MD
1" = 40'
Job No.: 221215
Sheet No. 7

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 6-15-23.DWG

NORTH

HARTLAND GLEN LANE

REDWOOD HARTLAND HIGHLAND RD P1 LLC TAX ID #4708-22-100-[illegible] ZONED: SPA (UNDER CONSTRUCTION)

MULTI-FAMILY RESIDENTIAL DEVELOPMENT

REDWOOD APARTMENTS (UNDER CONSTRUCTION)

EXISTING WETLANDS ±1.67-ACRES

PROPOSED WETLAND DISTURBANCE ±0.029-ACRES

PROPOSED WETLAND DISTURBANCE ±0.034-ACRES

EXISTING WETLANDS ±0.125-ACRES

EXISTING WETLANDS ±1.19-ACRES

COMMERCIAL SPLIT PARCEL AREA ±2.1-ACRES (BY OTHERS)

P.O.B. N. 1/4 CORNER SECTION 26 T.3N., R.6E.

OUTLET STR699 RIM 975.00

CB704 RIM 976.41

CB705 RIM 976.31

CB513 RIM 978.00

CB503 RIM 978.00

CB505 RIM 978.60

SS201 RIM 978.70

SS200 RIM 962.12

SS1041 RIM 978.50

SS1042 RIM 978.50

SS1043 RIM 980.70

MH504 RIM

MH503 RIM 983.27 INV. 6" N= 1966.4

YB514 RIM 975.22

YB501 RIM 976.50

YB500 RIM 977.00

INFILTRATION SWALE PER COUNTY REQUIREMENTS

100-YR DETENTION PER COUNTY REQUIREMENTS

OUTLET STR499 RIM 977.00

SB#1

SB#7

SB11

ES-698

ES-500

W.M. BENDS

HYD-10 EL 978.7

HYD-4 EL 980.4

CONNECT TO EX. MH-B RIM 971.53

CONNECT TO EX. SW-20 RIM 972.1

BM #1205 ELEV=971.56

DEVELOPER SHALL OBTAIN PUBLIC WATER AND SEWER EASEMENTS FOR CONNECTION OF UTILITIES FROM REDWOOD APARTMENTS PRIOR TO THE START OF CONSTRUCTION

CONNECT TO EX. 12" WATER WITH 12"x12" TEE, VALVE & WELL GV-5 RIM 974.2

369-LF of 8" PVC SDR-26 @ 0.42%

149-LF of 8" PVC SDR-26 @ 0.40%

134-LF of 8" PVC SDR-26 @ 0.40%

234-LF of 8" PVC SDR-26 @ -0.41%

150-LF of 8" PVC SDR-26 @ 0.40%

28 29 30 31 27 26 25 32 33 34 35 12 13 14 15 16 17 18 19 20

LEGEND

EX. CONTOUR	979
PR. CONTOUR	979
PR. TOP OF CURB	TC 979.0
PR. TOP OF WALK	TW 979.0
PR. SWALE	SW 979.0
PR. MINIMUM FINISHED GRADE	FG 979.0
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PR. MINIMUM WALK-OUT GRADE	W.O. 970.0
PR. SANITARY SEWER	SS
PR. WATER MAIN	W
PR. STORM SEWER	ST
EX. ELEVATION	×877.42
PR. SILT FENCING \ TREE PROTECTION	

STATE OF MICHIGAN MATTHEW A DIFFIN ENGINEER No. 49037 LICENSED PROFESSIONAL ENGINEER

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REVISIONS

CLIENT: ALLEN EDWIN HOMES 2186 E. CENTRE STREET PORTAGE, MICHIGAN 49002

GRADING & UTILITY PLAN NO. 3

HARTLAND RESERVE

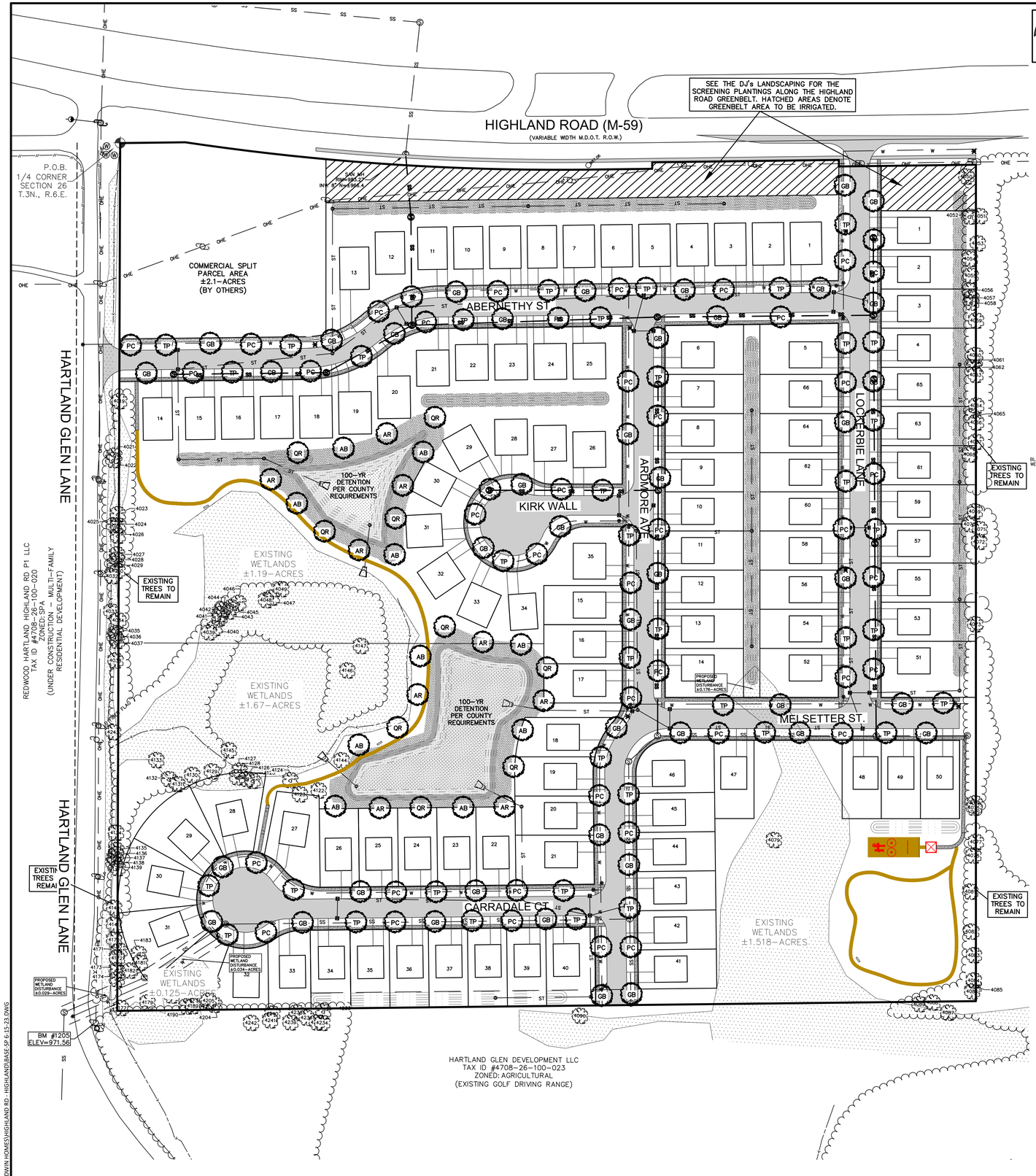
SECTION 26 TOWN 3 NORTH, RANGE 6 EAST HARTLAND TOWNSHIP LIVINGSTON COUNTY, MICHIGAN

DATE: 8-29-23
Drawn By: XX
P.E.: MD

1" = 40'

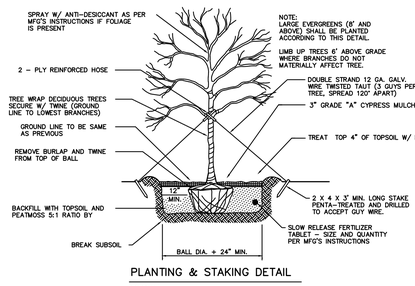
Job No.: 221215
Sheet No. 8

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 6-15-23.DWG



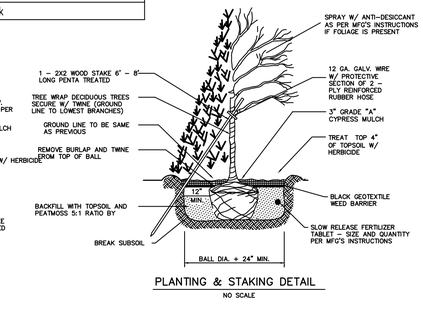
NORTH

PLANTING SCHEDULE FOR SITE LANDSCAPING				
KEY	QUAN.	SIZE	BOTANICAL NAME	COMMON NAME
PP	12	8'	Picea Strobus	Eastern White Pine
PN	12	8'	Thuja standishii ? plicata	Giant Green Aborvitae
PS	18	8'	Picea abies	Norway Spruce
TP	40	3.0" Cal.	Tilia cordata "greenspire"	Linden Greenspire
AB	10	3.0" Cal.	Acer x freemanii 'jeffsred'	Autum Blaze Maple
AR	10	3.0" Cal.	Acer rubrum	Red Maple
PC	41	3.0" Cal.	Ulmaceae 'Princeton'	Pinceton Elm
GB	41	3.0" Cal.	Magnoliaceae	Tulip
QR	10	2.0" Cal.	Qurcus alba	White Oak



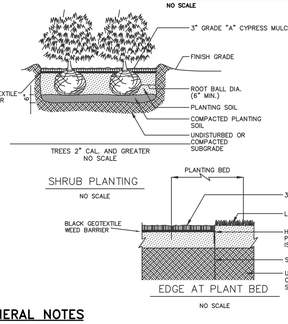
PLANTING & STAKING DETAIL

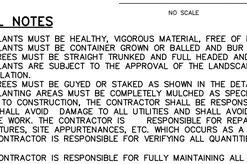
NO SCALE



PLANTING & STAKING DETAIL

NO SCALE





GENERAL NOTES

1. ALL PLANTS MUST BE HEALTHY, VIGOROUS MATERIAL, FREE OF PESTS AND DISEASE.
2. ALL PLANTS MUST BE CONTAINER GROWN OR BALLED AND BUR LAPPED AS INDICATED IN THE PLANT LIST.
3. ALL TREES MUST BE STRAIGHT TRUNKED AND FULL HEADED AND MEET ALL REQUIREMENTS SPECIFIED.
4. ALL PLANTS ARE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT BEFORE, DURING, AND AFTER INSTALLATION.
5. ALL TREES MUST BE GUYED OR STAKED AS SHOWN IN THE DETAILS.
6. ALL PLANTING AREAS MUST BE COMPLETELY MULCHED AS SPECIFIED.
7. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL AVOID DAMAGE TO ALL UTILITIES AND SHALL AVOID DAMAGE TO ALL UTILITIES DURING THE COURSE OF THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY AND ALL DAMAGE TO UTILITIES, STRUCTURES, SITE APPURTENANCES, ETC. WHICH OCCURS AS A RESULT OF THE LANDSCAPE CONSTRUCTION.
8. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL QUANTITIES SHOWN ON THESE PLANS BEFORE PRICING THE WORK.
9. THE CONTRACTOR IS RESPONSIBLE FOR FULLY MAINTAINING ALL PLANTING (INCLUDING BUT NOT LIMITED TO: WATERING, SPRAYING, MULCHING, FERTILIZING, ETC.) OF THE PLATING AREAS AND LAWN UNTIL THE WORK IS ACCEPTED IN TOTAL BY THE OWNER.
10. THE CONTRACTOR SHALL COMPLETELY GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE (1) YEAR BEGINNING ON THE DATE OF TOTAL ACCEPTANCE. THE CONTRACTOR SHALL PROMPTLY MAKE ALL REPLACEMENTS BEFORE OR AT THE END OF THE GUARANTEE PERIOD.
11. THE DEVELOPER SHALL APPROVE THE STAKING LOCATION OF ALL PLANT MATERIAL PRIOR TO INSTALLATION.
12. AFTER BEING DUG AT THE NURSERY SOURCE, ALL TREES IN LEAF SHALL BE ACCLIMATED FOR TWO (2) WEEKS UNDER A MIST SYSTEM PRIOR TO INSTALLATION.
13. ANY PLANT MATERIAL WHICH DIES, TURNS BROWN, OR DEFOLIATES (PRIOR TO TOTAL ACCEPTANCE OF THE WORK) SHALL BE PROMPTLY REMOVED FROM THE SITE AND REPLACED WITH MATERIAL OF THE SAME SPECIES, QUANTITY, AND SIZE AND MEETING ALL PLANT LIST SPECIFICATIONS.
14. STANDARDS SET FORTH IN "AMERICAN STANDARD FOR NURSERY STOCK" REPRESENT GUIDELINE SPECIFICATIONS ONLY AND SHALL CONSTITUTE MINIMUM QUALITY REQUIREMENTS FOR PLANT MATERIAL.
15. ALL SHRUB, GROUND COVER AND SEASONAL COLOR ANNUAL PLANTING BEDS ARE TO BE COMPLETELY COVERED WITH PINE BARK MULCH TO A MINIMUM DEPTH OF FOUR INCHES.
16. LOCATIONS OF EXISTING BURIED UTILITY LINES SHOWN ON THE PLANS ARE BASED UPON BEST AVAILABLE INFORMATION AND ARE TO BE CONSIDERED APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATIONS OF UTILITY LINES AND ADJACENT TO THE WORK AREA. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL UTILITY LINES DURING THE CONSTRUCTION PERIOD.
17. SAFE, CLEARLY MARKED PEDESTRIAN AND VEHICULAR ACCESS TO ALL ADJACENT PROPERTIES MUST BE MAINTAINED THROUGHOUT THE CONSTRUCTION PROCESS.
18. DURING THE GROWING SEASON ALL ANNUALS SHALL REMAIN IN A HEALTHY, VITAL CONDITION THROUGHOUT THE CONSTRUCTION PERIOD.
19. ALL PLANT MATERIALS QUANTITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETE COVERAGE OF ALL PLANTING BEDS AT SPACING SHOWN.
20. ALL DISTURBED AREAS ARE TO RECEIVE 4" OF TOP SOIL, MULCH, AND WATER UNTIL A HEALTHY STAND OF GRASS IS OBTAINED. THIS IS EXCLUDING ALL LANDSCAPED ISLANDS AND ENTRANCE AREAS.

PLANTING NOTES

1. LOAM USED IN PLANTING BEDS SHALL BE UNIFORM IN COMPOSITION, FREE OF STONES LARGER THAN 1", AND SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH.
2. CREATE A PLANTING MIX COMPRISED OF 2/3 SCREENED LOAM AND 1/3 PEAT MOSS OR LEAF COMPOST. AMEND WITH "PLANTONE" ORGANIC FERTILIZER, OR EQUAL, AT THE RATE RECOMMENDED BY MANUFACTURER.
3. THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE THE PLANTING SHOWN ON THIS DRAWING.
4. ALL PLANT MATERIALS SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
5. PLANT PITS SHALL BE DUG TWICE THE WIDTH OF THE ROOTBALL. PLANT PITS AND PLANTING BEDS SHALL BE BACKFILLED WITH THE AMENDED PLANTING MIX IN LIFTS TO AVOID AIR POCKETS IN BACKFILL.
6. ALL PLANT MATERIAL TO BE SET PLUMB, AND TO BEAR NATURAL RELATIONSHIP WITH FINISHED GRADE.
7. ALL BIODEGRADABLE BURLAP SHALL BE UNTIED AND PULLED DOWN ON THE BALL. WIRE BASKETS AND OTHER NON BIODEGRADABLE MATERIALS ATTACHED TO PLANTS SHALL BE REMOVED PRIOR TO PLANTING. CARE SHALL BE TAKEN NOT TO BREAK OR DISTURB ROOTBALL OF PLANTS.
8. ALL PLANTS SHALL BE WATERED IMMEDIATELY AFTER PLANTING.
9. 3" OF COMPOSTED PINE BARK MULCH SHALL BE SPREAD OVER ALL PLANT BEDS.
10. THE CONTRACTOR SHALL MAINTAIN ALL PLANTS FOR 90 DAYS AFTER THE COMPLETION OF PLANT INSTALLATION. MAINTENANCE SHALL CONSIST OF KEEPING ALL PLANTS IN A HEALTHY GROWING CONDITION.
11. PLANTS SHALL BE GUARANTEED FOR A PERIOD OF 1 YEAR AFTER ACCEPTANCE OF THE PROJECT AND SHALL BE ALIVE AND IN SATISFACTORY GROWTH AT THE END OF THE GUARANTEE PERIOD. THE CONTRACTOR SHALL BE RESPONSIBLE TO REMOVE ALL FAILING PLANT MATERIALS, AND REPLACE THEM WITH THE SAME KIND AND SIZE OF MATERIAL AS SPECIFIED IN THE PLANT LIST, WITH THE SAME GUARANTEE AS INITIAL PLANTING.
12. ANY PROPOSED SUBSTITUTIONS OF PLANT SPECIES SHALL BE MADE WITH PLANTS OF EQUIVALENT OVERALL FORM, HEIGHT, BRANCHING HABIT, FLOWER, LEAF, COLOR, FRUIT AND CULTURE, AND ONLY AFTER WRITTEN APPROVAL OF THE OWNER, AND THE CITY OF ROMULUS PLANNING DEPARTMENT
13. CONTRACTOR SHALL LOCATE AND VERIFY ALL EXISTING UTILITY LINES PRIOR TO PLANTING AND SHALL REPORT ANY CONFLICTS TO THE OWNER.
14. ALL PLANTING BEDS AND GREENBELT AREAS SHALL RECEIVE SIX INCHES (6") OF SCREENED TOPSOIL, MEASURED AFTER COMPACTION, PRIOR TO INSTALLATION OF PLANTS, SEEDING, OR SODDING.
15. ALL LANDSCAPE ISLANDS SHALL BE FILLED SUCH THAT THEY ARE CROWNED IN THE MIDDLE TO PROVIDE POSITIVE DRAINAGE AND TO PREVENT POOLING WITHIN THE LANDSCAPED AREA (TYP.)
16. STREET TREES TO BE INSTALLED WITH A MINIMUM 35' OF SEPARATION ON CENTER.

DETENTION BASIN & FORE BAYS SEEDING NOTES:
Undeveloped portion of the site surrounding the detention basins and fore bays, shall be seeded with a "Mesic-To-Dry Prairie Seed Mix" by Cardno Native Plant Nursery, (128 Sunset Dr., Walkerton, IN 46574, 574-586-2412, nurserysales@cardno.com) at 38.84 PLS pounds/acre.

The upland zone of the fore bays and detention basins shall be seeded with "Sedge Meadow Seed Mix" by Cardno Native Plant Nursery (see info in note #12) at 39.84 PLS pounds per acre. This seed mix consists of 13 of 17 native permanent grass, sedge and rush species and 27 of 30 native forb and shrub species.

The edge zone of the fore bays and detention basins shall be seeded with "Wetland Edge Seed Mix" by Cardno Native Plant Nursery (see info in note #12) at approximately 35 PLS pounds per acre. This seed mix consists of 10 of 12 native permanent grass, sedge and rush species and 7 of 20 native forb species.

Native seed shall be planted above the permanent water elevation.

Native seed mixes shall contain a cover crop consisting of 10 pounds per acre of annual rye and 30 pounds per acre of seed oats.

All sloped native seed areas adjacent to wetlands and drains shall be stabilized with a mulch blanket pegged-in-place.

DETENTION BASINS & FORE BAYS

- PRAIRIE SEED
- POND ZONE PLANTINGS
- EDGE ZONE SEED
- UPLAND ZONE SEED

NOTE:
STREET TREES SHALL BE PLANTED 35-FT ON CENTER

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REVISIONS

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2186 E. CENTRE STREET
PORTAGE, MICHIGAN 49002

LANDSCAPE PLAN
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

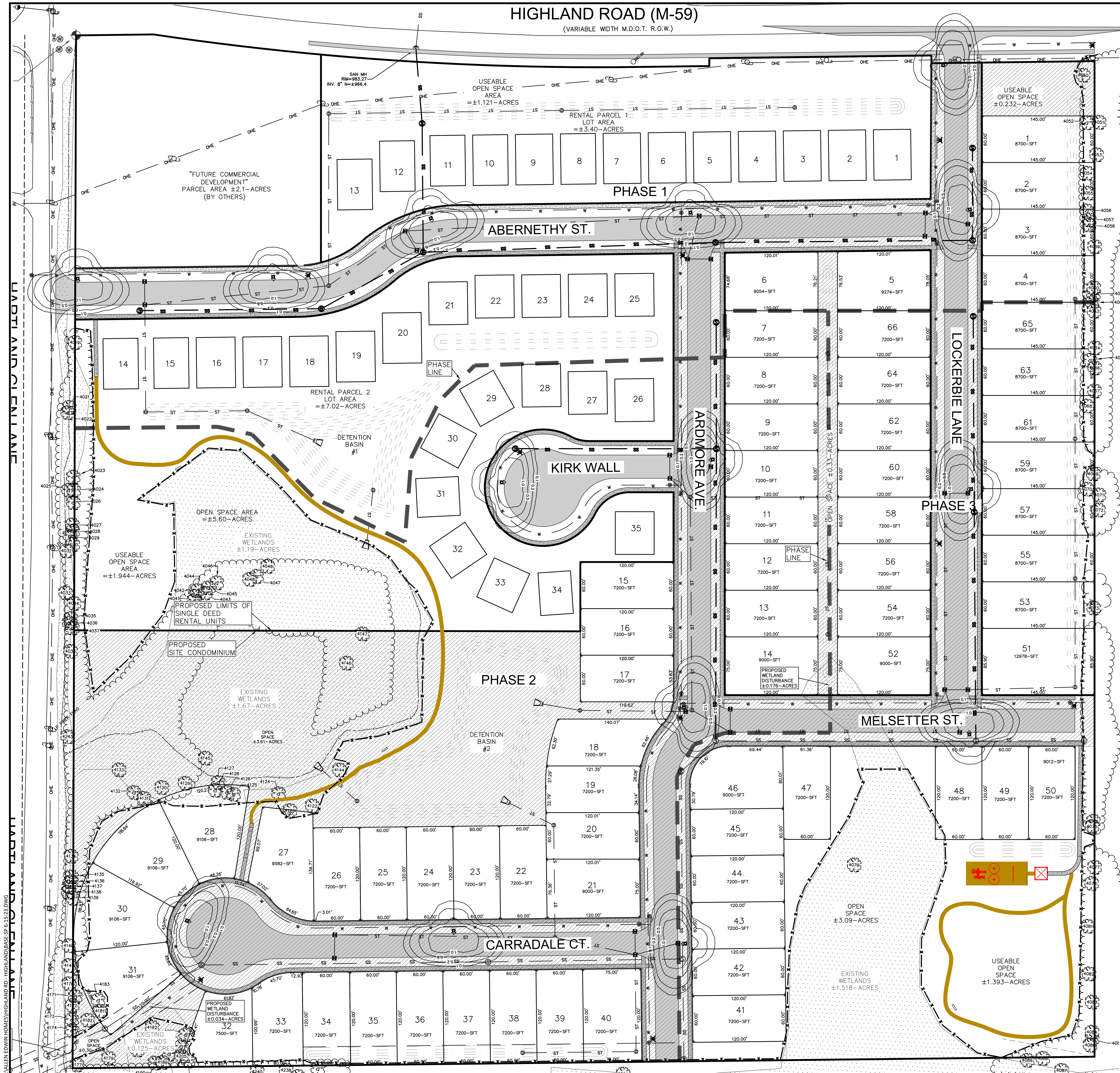
DATE: 8-29-23
Drawn By: XX
P.E.: MD

1" = 80'

Job No.: 221215
Sheet No.
9

STATE OF MICHIGAN
MATTHEW A DIFFIN
ENGINEER
No. 49097
LICENSED PROFESSIONAL ENGINEER

Z:\ALLEN EDWIN HOMES\HIGHLAND RD - HIGHLAND\BASE-SP 6-15-23.DWG



MRP LED
LED Area Luminaire

Buy American

Catalog Number

Notes

Type

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

EPA:	1.125 ft² (0.105 m²)
Luminaire Height:	6-3/8" (16.2 cm)
Overall Height:	32" (81.3 cm)
Diameter:	18" (45.7 cm)
Weight (max):	37.5 lbs (17 kg)

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

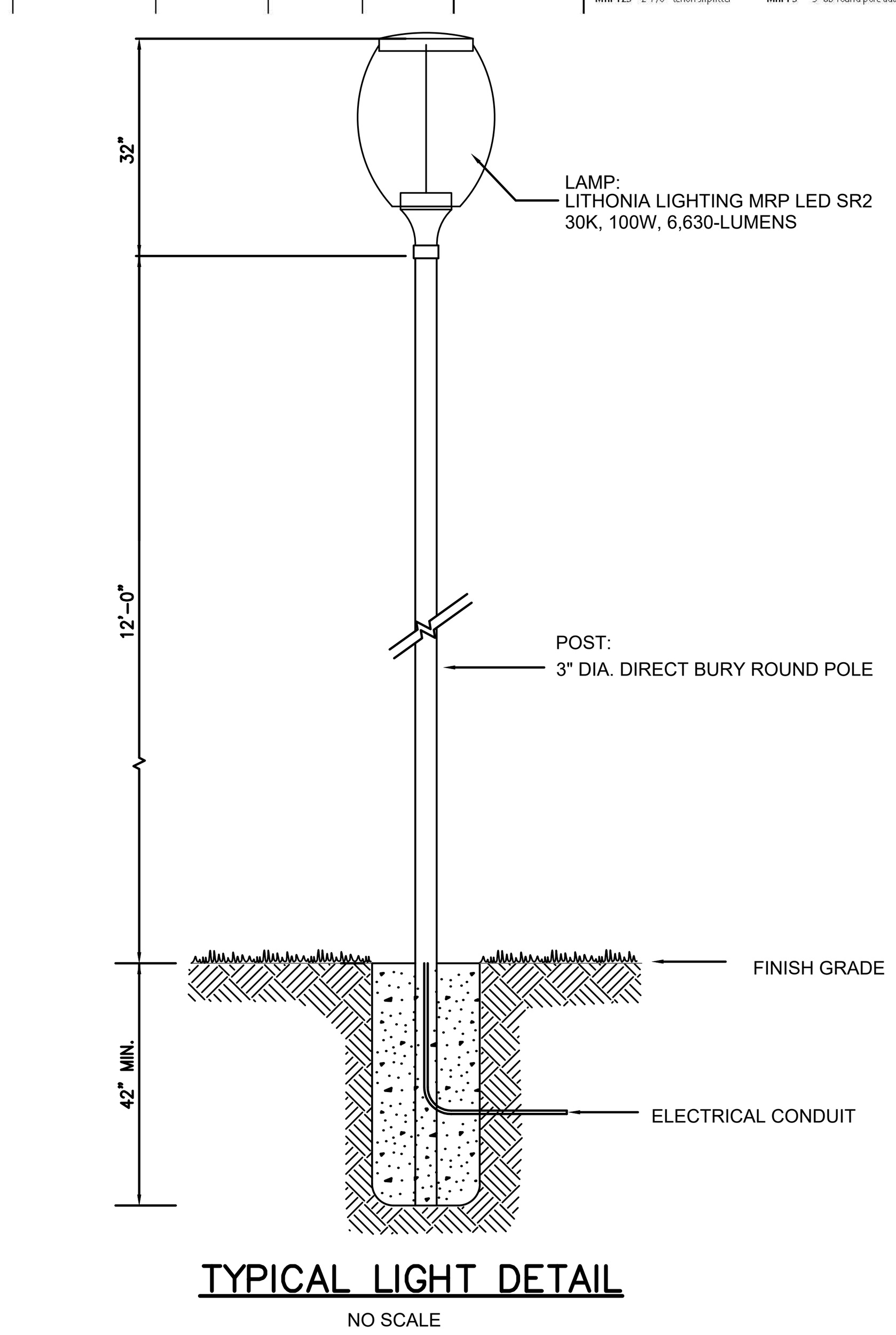
1. See ordering tree for details.
2. A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: MRP LED 42C 700 40K SR5 MVOLT DDBXD

MRP LED						
Series	LEDs	Drive current	Color temperature	Distribution	Voltage	Mounting
MRP LED	42C 42 LEDs (one engine)	350 350mA 530 530mA 700 700mA 1000 1000mA (1A)	30K 3000K 40K 4000K 50K 5000K	SR2 Type II SR3 Type III SR4 Type IV SR5 Type V	MVOLT[1] 277[2] 120[2] 347[2] 208[2] 480[2] 240[2]	Shipped included: (blank) Fits 4" OD round pole Shipped separately[3]: MRPT20 2-3/8" tenon slipfitter; MRPT25 2-7/8" tenon slipfitter Shipped separately[3]: MRPT30 3-1/2" tenon slipfitter; MRPT35 4" tenon slipfitter; MRPF3 3" OD round pole adapter; MRPF5 5" OD round pole adapter[4]



TYPICAL LIGHT DETAIL
NO SCALE

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LIGHTING PLAN
HARTLAND RESERVE

SECTION 26
TOWN 3 NORTH, RANGE 6 EAST
HARTLAND TOWNSHIP
LIVINGSTON COUNTY, MICHIGAN

STATE OF MICHIGAN
MATTHEW A. DIFFIN
ENGINEER
No. 49087
LICENSED PROFESSIONAL ENGINEER

DATE: 8-29-23
Drawn By: XX
P.E.: MD
1" = 60'
Job No.: 221215
Sheet No. 10

Z:\ALLEN EDWIN HOMES\HIGHLAND RD-HIGHLAND\BASE-SP 6-15-23.DWG