

AGENDA
Cascade Charter Township Planning Commission
Monday, July 15, 2019
7:00 pm
Cascade Library Wisner Center
2870 Jacksmith Ave. SE

- ARTICLE 1. Call the meeting to order
Record the attendance**
- ARTICLE 2. Pledge of Allegiance to the flag**
- ARTICLE 3. Approve the current Agenda**
- ARTICLE 4. Approve the Minutes of the July 1st, 2019 meeting**
- ARTICLE 5. Acknowledge visitors and those wishing to speak to non-agenda items. (Comments are limited to five minutes per speaker.)**
- ARTICLE 6. Case # 19-3534 Cascade TLC
Public Hearing
Property Address: 5333 Cascade Rd SE
Requested Action: The Applicant is requesting a Type II Special Use Permit for Day Care Center.**
- ARTICLE 7. Case # 17-3392 Freedom Reins Farm (Hickory Ridge)
Property Address: 8613 52nd St SE
Requested Action: Final Preliminary Plan to develop into 12 detached single-family site condominium projects.**
- ARTICLE 8. Case # 19-3533 Chick-fil-A; Jennifer Santelli
Property Address: 5525 28th St SE
Requested Action: The Applicant is requesting a recommendation to the Township Board for approval of the PUD Amendment and site plan.**
- ARTICLE 9. Case # 19-3519 Golden Valley
Property Address: 5800 Thornapple River Dr
Requested Action: Tentative Preliminary Plan to develop into 27 detached single-family site condominium project.**
- ARTICLE 10. Any other business**
- ARTICLE 11. Adjournment**

Meeting format

1. **Staff presentation-** *Staff report and recommendation*
2. **Project presentation-** *Applicant presentation and explanation of project*
 - a. **PUBLIC HEARINGS**
 - i. *Open Public Hearing. Comments are limited to five minutes per speaker; exception may be granted by the chair for representative speakers and applicants*
 - ii. *Close public hearing*
3. **Commission discussion –** *May ask for clarification from applicant, staff or public*
4. **Commission decision - Options**
 - a. *Table the decision*
 - b. *Deny*
 - c. *Approve*
 - d. *Approve with conditions*
 - e. *Recommendation to Township Board*

MINUTES
Cascade Charter Township
Planning Commission
Monday, July 1st, 2019
7:00 P.M.

ARTICLE 1. Chairman Sperla called the meeting to order at 7:00 P.M.
Members Present: Johnson, Krieter, Lewis, Pennington, Rissi and Sperla
Members Absent: Katsma, Noordyke, and Moxley
Others Present: Community Development Director, Steve Peterson and those listed on the sign in sheet.

ARTICLE 2. **Pledge of Allegiance.**

ARTICLE 3. **Approve the current Agenda.**

Motion was made by Member Pennington to approve the Agenda. Supported by Member Lewis. Motion carried 6 to 0.

ARTICLE 4. **Approve the Minutes of the June 17, 2019 meeting.**

Motion was made by Member Johnson to approve the minutes of June 17, 2019. Supported by Member Pennington. Motion carried 6 to 0.

ARTICLE 5. **Acknowledge visitors and those wishing to speak to non-agenda items.**

No visitors came forward.

ARTICLE 6. **Case #19-3531 Mark Beatson**

Public Hearing

Property Address: 9100 Cascade Road SE

Requested Action: The Applicant is requesting a special use permit to construct an accessory building over 832 sq ft.

Director Peterson stated that Applicant is requesting to build an 80x40 ft building, totaling 3,200 sq ft. It is just over 17 feet tall to the midpoint, requiring 40 ft setbacks. The property is 15 acres in size, and the nearest property line is 174 feet away. Director Peterson stated that there is another building on the property, but since the Applicant has over 6 acres of land, he is allowed to add one more accessory building at least 10 feet away from the existing building. This building will be used for general storage and hobby shop area. Director Peterson stated although the building is large, it is normal for this area of the Township on that much property. Director Peterson then states that it will have a metal roof, and metal siding. Director Peterson then states that Staff approves this project under the normal conditions that the building may not be used to live in, run a business out of, and any lighting must meet the Township regulations.

Chairman Sperla invited the Applicant to come forward with any comments.

Mr. Beatson came forward to state that he is close to retirement, so wants to have a new hobby building.

Motion was made by Member Rissi to open public hearing. Supported by Member Krieter. Motion carried 6 to 0.

No members of the public came forward with any questions or comments on this matter.

Motion was made by Member Rissi to close public hearing. Supported by Member Lewis. Motion carried 6 to 0.

Motion was made by Member Rissi to approve applicants request for the the special use permit to construct an accessory building over 832 sq ft, with the conditions previously outlined by Director Peterson. Supported by Member Johnson. Motion carried 6 to 0.

ARTICLE 7.

Case #19-3532 Randy Carpenter

Public Hearing

Property Address: 8650 36th St SE

Requested Action: The Applicant is requesting a modification of their special use permit to add 576 sq ft to their accessory building.

Director Peterson stated that this special use permit was approved not too long ago, they are now asking to add a small addition off the back of the building. This property is close to 15 acres in size. Director Peterson states the Staff recommends approval of this project.

Chairman Sperla invited the Applicant to come forward with any comment.

Mr. Carpenter came forward to state that the addition will house hay, straw and other small equipment for his sheep and their lamb. He then stated that the addition will be on the south side of the existing barn, away from the road. It will be made out of the same materials as the existing barn, and also match the house.

Motion was made by Member Rissi to open public hearing. Supported by Member Johnson. Motion carried 6 to 0.

No members of the public came forward with any questions or comments on this matter.

Motion was made by Member Rissi to close public hearing. Supported by Member Johnson. Motion carried 6 to 0.

Motion was made by Member Rissi to approve the applicants request to add 576 sq ft to an existing accessory building under the normal rules that it not be used to live in, run a business out of, and any lighting must meet Township regulations. Supported by Member Johnson. Motion carried 6 to 0.

ARTICLE 8. Case #19-3533 Jennifer Santelli; Chick-fil-A

Property Address: 5528 28th St SE

Requested Action: The Applicant is requesting a preliminary plan approval for an amendment to the PUD to accommodate Chick-fil-A.

Director Peterson stated that this is an out lot in front of Meijer, the old Macaroni Grill. The Meijer property is into a PUD; the original restaurant did not have the allowance for a drive thru. The amendment is for the inclusion of a drive thru service, parking (they are once space short of the required 75 spaces), and signage. The applicant would like to be able to follow the updated sign ordinance allowing them multiple wall signs as long as the total square footage is not exceeded.

Director Peterson referred to the packet of information provided by the applicant that compares it to other stores in the nearby area. Director Peterson states that they are comparable in size around 5,000 sq ft, parking on those sites ranges from 59-80 spots available, and the stacking area proposed at this Cascade location is significantly larger than any other in the area. Director Peterson stated that his assessment is that there is enough parking and stacking space for this site in comparison to other stores nearby.

The lighting plan has ben updated to meet Cascade Township requirements, Director Peterson states, and does not need to be included in the amendment.

Director Peterson then states that Staff is recommending a positive recommendation be forwarded to the Township Board. If this plan is positively recommended, it will then come back to the Planning Commission one more time for the PUD ordinance amendment to be written, and then forwarded once again to the Township Board for their consideration.

Member Rissi states to Director Peterson that it looks like there is enough room for the applicant to add an additional parking space to meet the requirement of 75 spaces, Director Peterson states that he does not believe it is necessary with the large stacking area, along with the Meijer lot for overflow if needed.

Chairman Sperla invited the Applicant to come forward with any comment.

Mr. Justin Lurk (Development Consultant for Chick-fil-A, from St. Louis, MO) came forward to state the slight relocation of the building will put it more perpendicular to the main road, as well as take the drive thru out of an existing electrical easement. Mr. Lurk stated that they are confident that the one less than required parking space will not have an effect on parking as 60% of their business is served through the drive thru.

Member Rissi asked if this location will have an indoor play area, Mr. Lurk stated that yes, it will.

Motion was made by Member Johnson to open public hearing. Supported by Member Rissi. Motion carried 6 to 0.

No members of the public came forward with any questions or comments on this matter.

Motion was made by Member Johnson to close public hearing. Supported by Member Rissi. Motion carried 6 to 0.

Motion was made by Member Johnson to approve the amendment to accommodate Chick-fil-A. Supported by Member Rissi. Motion carried 6 to 0.

ARTICLE 9. Any other business

ARTICLE 10. Adjournment

Motion was made by Member Pennington to adjourn. Supported by Member Krieter. Motion carried 6 to 0. The meeting was adjourned at 7:22 p.m.

Respectfully submitted,
Phil Johnson, Secretary

STAFF REPORT: Case # 19-3534
REPORT DATE: June 21, 2019
PREPARED FOR: Cascade Charter Township Planning Commission
MEETING DATE: July 15, 2019
PREPARED BY: Steve Peterson, Planning Director

APPLICANT:
Cascade TLC
16920 Ferris St
Grand Haven MI 49417

STATUS

OF APPLICANT: Developer.

REQUESTED ACTION: Type II Special Use Permit for Day Care center.

EXISTING ZONING OF
SUBJECT PARCEL: R1, Residential

GENERAL LOCATION: Southeast corner of Cascade Rd and Hall St.

PARCEL SIZE: Approximately 1.5 Acres

EXISTING LAND USE
ON THE PARCEL: vacant

ADJACENT AREA
LAND USES: N – Single Family Residential – Ada Twp
S – Single Family Residential
E – Single Family Residential
W – Consumer Power

ZONING ON ADJOINING
PARCELS: N – PUD – Ada Twp
S – R1
E – R1
W – R-1

STAFF COMMENTS:

1. The applicant is requesting a Type II Special Use Permit to construct a new 10,000 Sq.ft daycare center. They have submitted a couple sets of plans indicated different capacity for the center. This is important because the capacity determines the amount of outside play area that is required. The plans should be consistent on the capacity for the facility.
2. This property is zoned residential and is identified as Suburban Residential in the Master Plan. This designation is mainly a recognition of the residential zoning district.
3. The master plan does not contemplate expanding the office and commercial uses in the suburban residential zoning districts. The daycare center is a use that is allowed in the residential zone as a special use.
4. The plan does include a new access to Hall St. the applicant has provided a traffic study to show the impacts and any possible improvements as a result of the new day car. This report is attached. The report indicated that the current configuration of the roads are capable of handling the day care but that the KCRC will need to continue to monitor for possible timing changes for the Hall/Cascade Rd intersection. Email from KCRC is also attached.
5. The Township fire dept has reviewed and approved the plan.
6. The Township engineer has not approved the plan as of the time this report was written. Both the engineer and I are concerned about putting the playground area above the underground detention system. This seems like a potential conflict for maintenance of the underground system.
7. They have submitted a lighting plan in compliance with our lighting standards. However, it does not appear that the plan takes into account the wallpack lights. This should be verified and plan revised if it does not.
8. Section 17.06 as well as 17.07 of the zoning ordinance requires the Planning Commission to review several factors before making a recommendation to the Township Board. I have listed those items for your consideration followed by my comments for each. I have also followed that with the recommendations from the Cascade Rd Corridor study.

Factors	Comments
Be designed, constructed, operated and maintained so as to be harmonious and	This building is 10,000 sq ft which is quite a bit larger than the homes in the area. It is being

appropriate in appearance with the existing or intended character of the area in which the use is proposed.	built consistent with the Cascade Rd corridor study which was developed to be harmonious with the residential standards. That is also the same size of the similar use on Macnider Ave.
Be adequately served by essential facilities and services such as highways, streets, police and fire protection, drainage, refuse disposal, water and sewer facilities and schools.	This daycare would be connected to public sewer and water. Sewer would be served from Ada Township and water from Cascade. This is not unprecedented in this are and we most recently did a similar setup with the assisted living facility off from Spaulding.
Not create excessive additional requirements at public cost for public facilities and services.	This site would not cause excessive additional requirements at the expense of the public.
Not cause traffic congestion, conflict or movement in greater proportion to that normally prevailing for the use in the particular zoning district.	The fact that this use will generate the majority of its traffic during peak travel times is a major reason for the traffic study. The KCRC does not believe any improvements are necessary would indicate that the traffic is not in greater proportion for the district.
Not involve uses, activities, processes, materials, equipment or conditions of operation that will be detrimental to any persons, property, or the general welfare by reason of noxious or offensive production of noise, smoke, fumes, glare, vibration, odor or traffic.	This is an accepted residential use, like parks, churches and schools that are also permitted in the residential zone.
...must be situated such that the proposed site has direct primary access on at least one collector or arterial street as classified by the Major Street Plan	The Cascade Rd corridor study suggests that access to Cascade Rd be limited. Providing access off from Hall St would be better from a traffic management perspective.
A minimum lot size of 40,000 square feet.	The site is a little less than 2 acres.
Dormitory facilities are not permitted.	This facility is not a dormitory
Based upon the established capacity of the facility, there shall be provided and maintained, on the premises, a minimum of 150 square feet of outdoor play area per child with not less than 5,000 square feet per facility.	They are now showing a 21,375 sq ft playground area. This provides a maximum of 142 kids for the site. The playground wraps around the building and is on top of the underground storm sewer system. The floor plans for e building only show the original 5,000 sq ft playground area. Those plans should be revised to show the new playground.

The outdoor play area shall be enclosed by a chainlink fence not less than four (4) feet in height, and screened by natural or planted vegetation to a height of at least five (5) feet.	They have not provided any details on the screening that is required and the landscape plan is the original site plan with the smaller playground area. All plans should be revised to show what is being requested so there is no confusion about what they are requesting.
Signs shall be subject to the regulations relative to signs for the district in which the use is to be located.	The sign permit will be separate permit.
Such facilities must be registered with the Township and licensed by the State.	The license by the state can be obtained before a building permit is issued.

STAFF RECOMMENDATION

Staff recommends that this project is tabled until the applicant can provide the following:

- a. Approval from the township engineer.
- b. Relocated the underground detention to the parking lot area instead of the playground.
- c. Revised all plans so they are consistent with the updated site plans.
- d. Updated landscape plan that includes the landscape around the playground fence.
- e. Updated lighting plan to include the wall pack lighting.

Once these items are provided it can come back to review by the planning commission before a recommendation is made.

Attachments: Application
 Site Plan



CASCADE CHARTER TOWNSHIP

2865 Thornhills SE Grand Rapids, Michigan
49546-7140

PLANNING & ZONING APPLICATION

APPLICANT: Name: CASCADE TLC, LLC
Address: 16920 FERREIS STREET
City & Zip Code: GRAND HAVEN, MI 49417
Telephone: (616) 638-8844
Email Address: Swilson

OWNER: * (If different from Applicant)
Name: M. KASRA ZARBINIAN
Address: 2580 MEADOW WOODS DR
City & Zip Code: EAST LANSING, MI 48823
Telephone: (517) 862-7437
Email Address: ZARBINIAUK@MICHIGAN.GOV

NATURE OF THE REQUEST: (Please check the appropriate box or boxes)

<input type="checkbox"/>	Administrative Appeal	<input type="checkbox"/>	Administrative Site Plan Review
<input type="checkbox"/>	Deferred Parking	<input type="checkbox"/>	P.U.D. - Rezoning *
<input type="checkbox"/>	P.U.D. - Site Condominium *	<input type="checkbox"/>	Rezoning
<input checked="" type="checkbox"/>	Site Plan Review *	<input type="checkbox"/>	Sign Variance
<input checked="" type="checkbox"/>	Special Use Permit <u>Type II</u>	<input type="checkbox"/>	Subdivision Plat Review *
<input type="checkbox"/>	Zoning Variance	<input type="checkbox"/>	Other: _____ *

** Requires an initial submission of 5 copies of the completed site plan*

BRIEFLY DESCRIBE YOUR REQUEST:**

REQUESTING A SPECIAL USE PERMIT FOR THE OPERATION OF
A CHILDREN'S DAYCARE FACILITY.

(**Use Attachments if Necessary)

-SEE OTHER SIDE-

LEGAL DESCRIPTION OF PROPERTY**:

SEE ATTACHED

(**Use Attachments if Necessary)

PERMANENT PARCEL (TAX) NUMBER: 41-19-00-226-039

ADDRESS OF PROPERTY: 5333 CASCADE RD

PRESENT USE OF THE PROPERTY: VACANT LAND

NAME(S) & ADDRESS(ES) OF ALL OTHER PERSONS, CORPORATIONS, OR FIRMS HAVING A LEGAL OR EQUITABLE INTEREST IN THE PROPERTY:

Name(s)

Address(es)

REZA REJAEI

2580 MEADOW WOODS DR

EAST LANSING, MI 48023

SIGNATURES

I (we) the undersigned certify that the information contained on this application form and the required documents attached hereto are to the best of my (our) knowledge true and accurate. I (we) also agree to reimburse the Cascade Charter Township for all costs, including consultant costs, to review this request in a timely manner. I (we) understand that these costs may also include administrative reviews which may occur after the Township has taken action on my (our) request.

I (we) the undersigned also acknowledge that the proposed project does not violate any known property restrictions (i.e. plat restrictions, deed restrictions, covenants, etc.)

M. KASRA ZARBINIAN

CASCADE TLC, LLC

Owner - Print or Type Name (*If different from Applicant)

Applicant - Print or Type Name

* [Signature]

Owner's Signature & Date (*If different from Applicant)

Applicant's Signature & Date

PLEASE ATTACH ALL REQUIRED DOCUMENTS NOTED IN THE PROCESS REVIEW SHEET - THANK YOU

Steve

From: Haagsma, Tim <thaagsma@kentcountyroads.net>
Sent: Thursday, July 11, 2019 7:36 AM
To: Steve
Subject: RE: Learning Center Traffic Study

Steve

I agree with the conclusions.



Tim Haagsma, PE

Director of Traffic and Safety

(616) 242.6923

thaagsma@kentcountyroads.net

Kent County Road Commission

1500 Scribner Avenue NW, Grand Rapids, MI 49504

kentcountyroads.net

From: Steve [mailto:Steve@cascadetwp.com]
Sent: Wednesday, July 10, 2019 12:17 PM
To: Haagsma, Tim; Jacob Swanson; Julie M. Kroll
Cc: Doug Stalsonburg; Wollner, Shirley; Harrall, Wayne; dluccas@teamfcc.com
Subject: RE: Learning Center Traffic Study

Tim, I'm not sure I ever got a response whether or not you agreed with the conclusions.

Steve Peterson

Cascade Charter Township

Community Development Director

2865 Thornhills SE

Cascade MI 49546

616-949-0224

From: Haagsma, Tim <thaagsma@kentcountyroads.net>
Sent: Monday, June 17, 2019 3:18 PM
To: Steve <Steve@cascadetwp.com>; Jacob Swanson <jswanson@fveng.com>; Julie M. Kroll <jkroll@fveng.com>
Cc: Doug Stalsonburg <dstalsonburg@exxelengineering.com>; Wollner, Shirley <swollner@kentcountyroads.net>; Harrall, Wayne <wharrall@kentcountyroads.net>; dluccas@teamfcc.com
Subject: RE: Learning Center Traffic Study

Steve,

There is no cost for the retiming. The signal head that was just added as part of our overall signal improvement program helps even more than a small timing shift.

We routinely monitor and retime traffic signals to keep them in step with changes in traffic volumes.

TITLE



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Printed 6/17/2019 11:21:59 AM

DAYCARE CENTER COMMERCIAL DEVELOPMENT TRAFFIC IMPACT STUDY

CASCADE TOWNSHIP, MICHIGAN

JUNE 17, 2019

PREPARED FOR:



FCC CONSTRUCTION, INC.
8182 BROADMOOR AVE. SE
CALEDONIA, MI 49316

PREPARED BY:



27725 STANSBURY BLVD., SUITE 195
FARMINGTON HILLS, MI 48834

#840040
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Agency Review	Date	Comments
KCRC	6/13/2019	Revisions to the signal timing to add right-turn overlap phase.

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- A. BACKGROUND INFORMATION
- B. EXISTING TRAFFIC CONDITIONS
- C. FUTURE TRAFFIC CONDITIONS

REFERENCES

- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO). (2011). *A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS*. WASHINGTON DC.
- FEDERAL HIGHWAY ADMINISTRATION, MICHIGAN DEPARTMENT OF TRANSPORTATION, MICHIGAN STATE POLICE. (2011). *MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES*.
- INSTITUTE OF TRANSPORTATION ENGINEERS. (2017). *TRIP GENERATION MANUAL, 10TH EDITION*. WASHINGTON DC.
- NATIONAL RESEARCH COUNCIL (U.S.) TRANSPORTATION RESEARCH BOARD. (2016). *HIGHWAY CAPACITY MANUAL, 6TH EDITION (HCM6)*. WASHINGTON, D.C.: TRANSPORTATION RESEARCH BOARD.
- PAPACOSTAS, & PREVEDOUROS. (2001). *TRANSPORTATION ENGINEERING AND PLANNING*.
- STOVER, V. G., & KOEPKE, F. J. (2006). *TRANSPORTATION AND LAND DEVELOPMENT (VOL. 2ND EDITION)*. WASHINGTON DC: INSTITUTE OF TRANSPORTATION ENGINEERS (ITE).

1 INTRODUCTION

This report presents the results of the Traffic Impact Study (TIS) for the proposed daycare center development in Cascade Township, Michigan. The project site is located in the southeast quadrant of the Cascade Road and Hall Street intersection. The proposed project is located on vacant property and includes the construction of a 10,000 SF daycare center that will provide classroom space for a maximum occupancy of 160 students. Site access is proposed via one driveway to Hall Street, opposite the existing Balsam Hill Avenue. The proposed development is planned to be completed within the next year. Cascade Township has required a TIS as part of the site plan approval process.

The purpose of this study is to evaluate the impact of the proposed development on the adjacent roadway network and provide recommendations for roadway and intersection geometry. Specific tasks undertaken for this study include the following:

- 1) **Study Area:** Provide a description of the study area including: surrounding land uses, intersection and roadway geometries, speed limits, functional classifications and traffic volume data (where available). In addition, a study area site map showing the site location and the study intersections will also be provided.
- 2) **Proposed Land Use:** Obtain and review the proposed site plan which includes the proposed land uses, densities, and desired site access locations. A description of the current and proposed land use, including the number of students, will be accompanied with a complete project site plan (with buildings identified as to proposed use).
- 3) **Existing Conditions:**
 - a) Provide an analysis of the traffic-related impacts of the proposed development at the following study intersections:
 - Cascade Road & Hall Street
 - Hall Street & Balsam Hill Ave/Proposed Site Driveway
 - b) Collect AM (7:00 AM to 9:00 AM), School PM (2:00 PM to 4:00 PM) and PM (4:00 PM to 6:00 PM) peak period turning movement counts at the study intersections. Traffic counts will be taken when school is in session.
 - c) Identify the Existing AM, School PM, and PM peak hour traffic volumes at the study intersections based on turning movement count data.
 - d) Calculate the Existing vehicle delays, LOS, and vehicle queues at the study intersections during the Existing AM, School PM, and PM. The analysis will be performed at each of the study intersections. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.
 - e) Identify improvements (if any) for the study road network that would be required to accommodate the existing traffic volumes.
- 4) **Trip Generation:**
 - a) Forecast the number of Existing AM, School PM, and PM hour trips that would be generated by the proposed development based on data published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 10th Edition* and/or local development data as approved for use in the study by Cascade Township.
 - b) A table will be provided in the report outlining the categories and quantities of land uses, with the corresponding trip generation rates or equations, and the resulting number of trips.
- 5) **Trip Distribution and Traffic Assignment:**
 - a) Assign the trips that would be generated by the proposed development to the adjacent road network based on existing traffic patterns. The distribution of the estimated trip generation to the adjacent street network and nearby intersections shall be included in the report and the basis will be explained.
 - b) Combine the site-generated traffic assignments with the background traffic forecasts to establish the Existing AM, School PM, and PM peak hour traffic volumes.

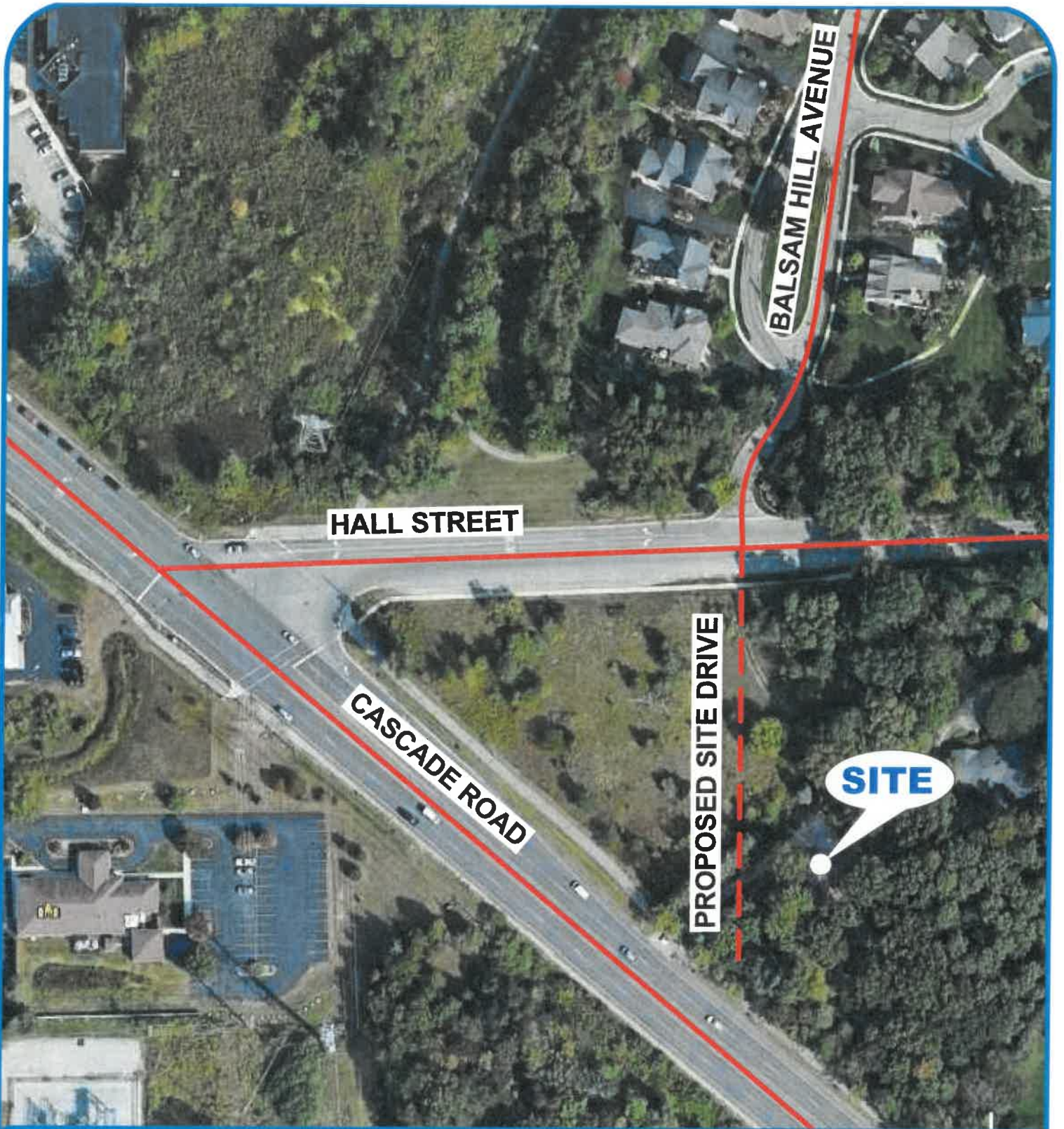


FIGURE 1 SITE LOCATION MAP

PROPOSED DAYCARE TIS - CASCADE TOWNSHIP, MI

LEGEND



SITE LOCATION



NORTH
SCALE: NOT TO SCALE

6) Future Conditions:

- a) Calculate the **Future (with the proposed development)** vehicle delays, LOS, and vehicle queues at the study intersections. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.
- b) Identify improvements (if any) for the study road network that would be required to accommodate the site-generated traffic volumes.

The scope of the study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practice and methodologies published by the Institute of Transportation Engineers (ITE). In addition, Cascade Township provided input regarding the scope of the study included herein. Sources of data for this study include traffic counts conducted by F&V and information provided by ITE. All background information is provided in **Appendix A**.

2 BACKGROUND DATA

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided by Cascade Road and Hall Street. The study intersection of Cascade Road and Hall Street is signalized, and Hall Street and Balsam Hill Avenue/Proposed Site Drive is a stop-controlled intersection on the minor approaches. The lane use and traffic control at the study intersections are shown on **Figure 2**, and the study roadways are further described below. For the purposes of this study, all minor streets and driveways are assumed to have an operating speed of 25 miles per hour (mph).

Cascade Road runs generally in the northwest and southeast directions with a posted speed limit of 55 mph. Cascade Road is under the jurisdiction of KCRC and is classified as an Urban Minor Arterial with an average daily traffic (ADT) volume of approximately 17,850 vehicles per day (GVMC 2018). The study section of Cascade Road has a typical five-lane cross-section, with two lanes in each direction and a center two-way left-turn lane. At the intersection with Hall Street, Cascade Road widens to provide an exclusive northbound right-turn lane.

Hall Street runs in the east and west directions with a posted speed limit of 40 mph. Hall Street is under the jurisdiction of KCRC and is classified as a Local Road with an ADT volume of approximately 5,000 vehicles per day (GVMC 2019). The study section of Hall Street has a typical two-lane cross section, with one lane in each direction. At the signalized intersection with Cascade Road, Hall Street widens to provide an exclusive left-turn lane and an exclusive right-turn lane.

2.2 EXISTING TRAFFIC VOLUMES

The existing weekday turning movement traffic volume data at the study intersections were collected by F&V subconsultant TDC on Thursday, May 23, 2019. The data was collected on a typical weekday with fair weather conditions and trace amounts of rain, while school was in session. Intersection turning movement counts were collected during the weekday AM (7:00 AM to 9:00 AM), School PM (2:00 PM to 4:00 PM), and PM (4:00 PM to 6:00 PM) peak periods at the study intersections. F&V also collected an inventory of existing lane use and traffic controls at the study intersections and obtained existing traffic signal timing information from KCRC. The existing AM, School PM, and PM peak hour traffic volumes were identified based on the data collected.

These data were used as a baseline to establish the current peak hour traffic volumes for the analysis of existing traffic conditions. During collection of the turning movement counts, pedestrian data and commercial truck percentages were recorded and used in the traffic analysis. Peak Hour Factors (PHFs) were also calculated for each study intersection approach.

The peak hour volumes for each intersection were utilized for this study and the volumes were balanced upward through the study network. The AM, School PM, and PM peak hours of existing network traffic were identified to generally occur between 7:15 AM to 8:15 AM, 2:45 PM to 3:45 PM, and 4:30 PM to 5:30 PM, respectively, for a typical weekday. The traffic volume data are included in **Appendix A** and the existing peak hour traffic volumes are summarized on **Figure 3**.

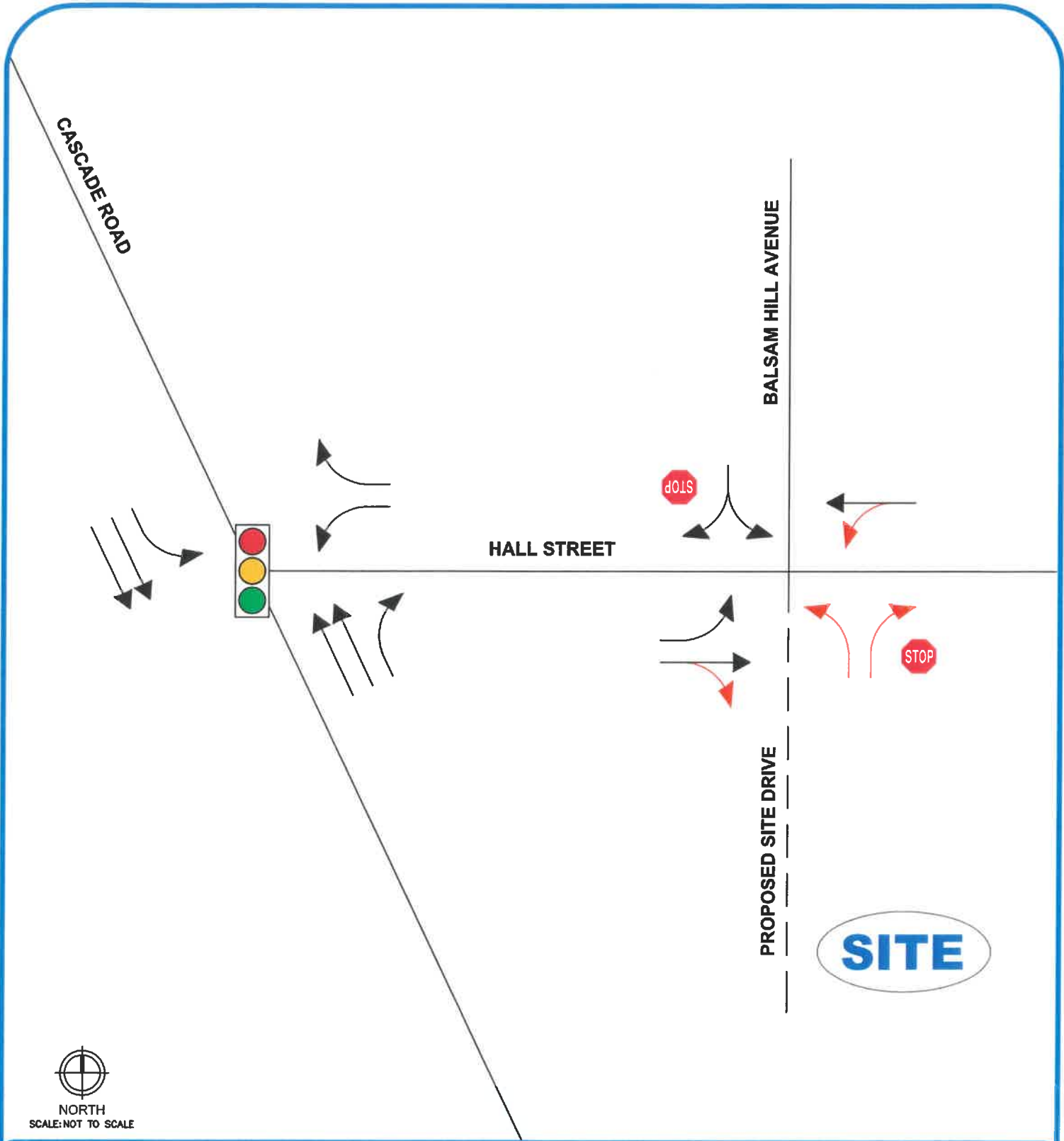






FIGURE 2
LANE USE AND TRAFFIC CONTROL
 PROPOSED DAYCARE TIS - CASCADE TOWNSHIP, MI

LEGEND

-  ROADS
-  LANE USE
-  SIGNALIZED INTERSECTION
-  UNSIGNALIZED INTERSECTION

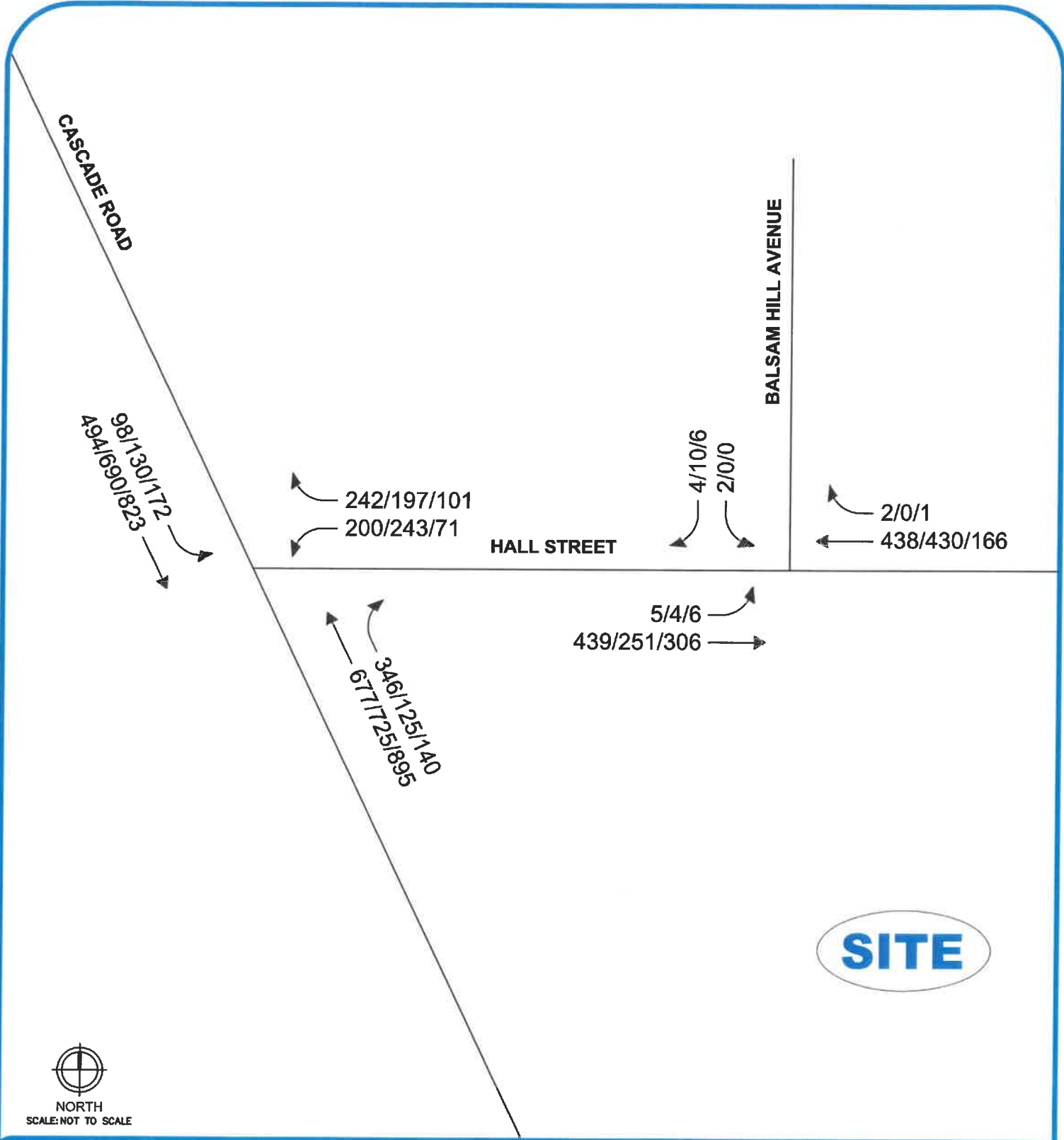


FIGURE 3 EXISTING TRAFFIC VOLUMES

PROPOSED DAYCARE TIS - CASCADE TOWNSHIP, MI

LEGEND

- ROADS
- TRAFFIC VOLUMES (AM/MD/PM)
- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION

3 ANALYSIS

3.1 EXISTING CONDITIONS

The existing AM, School PM, and PM peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 10) traffic analysis software. The results of the analysis of existing conditions were based on the existing lane use and traffic control shown on Figure 2, the existing traffic volumes provided in Figure 3, and the methodologies presented in the HCM6.

Descriptions of LOS “A” through “F”, as defined in the HCM, are provided in Appendix B for signalized and unsignalized intersections. Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. The results of the analysis of existing conditions are presented in Appendix B and are summarized in Table 1. Microsimulation was also conducted at the study intersections using SimTraffic to further evaluate the network performance.

Table 1: Existing Intersection Operations

Intersection	Control	Approach	Existing Conditions 2019					
			AM Peak		School Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Cascade Road & Hall Street	Signalized	WBL	54.8	D	41.5	D	51.1	D
		WBR	39.8	D	18.3	B	19.2	B
		NBT	17.7	B	26.8	C	28.2	C
		NBR	21.2	C	21.9	C	20.8	C
		SBL	27.0	C	26.5	C	15.9	B
		SBT	6.9	A	9.5	A	0.1	A
		Overall	23.5	C	22.6	C	17.1	B
2 Hall Street & Balsam Hill Avenue / Site Drive	Stop (Minor)	EBL	9.2	A	9.1	A	7.6	A
		WB	Free		Free		Free	
		SB	23.5	C	14.0	B	9.2	A
Intersection	Control	Approach	Average (ft)	95 th % (ft)	Average (ft)	95 th % (ft)	Average (ft)	95 th % (ft)
1 Cascade Road & Hall Street	Signalized	WBL	95	210	97	194	20	54
		WBR	33	121	16	56	5	29
		NBT	76	185	105	178	112	182
		NBR	99	205	44	93	38	82
		SBL	62	123	83	158	111	190
		SBT	22	59	82	202	8	34
2 Hall Street & Balsam Hill Avenue / Site Drive	Stop (Minor)	EBL	1	11	1	11	2	13
		WB	Free		Free		Free	
		SB	8	33	9	35	4	21

The results of the existing conditions analysis indicate that all study intersection approaches and movements will operate at a LOS D or better during all peak periods. A review of network simulations indicates acceptable operations during all peak periods.

3.2 BACKGROUND CONDITIONS

The proposed development is anticipated to be constructed within the next year; therefore, background conditions were assumed to be equal to existing conditions.

3.3 SITE TRIP GENERATION ANALYSIS

The number of daily vehicle trips and AM, School PM, and PM peak hour vehicle trips that would be generated by the proposed development was forecast based on data published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition*. ITE hourly distribution data for the Day Care Center land use was utilized in order to determine the number of trips generated during the school peak hour, which corresponds to the peak hour identified from the turning movement counts. The site trip generation forecast is summarized in **Table 2**.

Table 2: Site Trip Generation Summary

Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			School PM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total	In	Out	Total
Day Care Center	565	160	Students	617	60	54	114	32	32	64	52	59	111

3.4 SITE TRIP DISTRIBUTION

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on existing peak hour traffic patterns and the methodologies published by ITE. This methodology indicates that new trips will return to their direction of origin. The site trip distributions used in the analysis are summarized in **Table 3**.

Table 3: Site Trip Distribution Summary

New Trips				
To/From	Via	AM	School	PM
North	Cascade Road	29%	44%	45%
South	Cascade Road	50%	44%	41%
East	Hall Street	21%	12%	14%
Total		100%	100%	100%

The site-generated traffic volumes in **Table 2** were distributed to the adjacent roadway network based on the distribution shown in **Table 3**. The site generated traffic volumes are shown in **Figure 4** and were added to the existing traffic volumes to calculate the future traffic volumes with the proposed development. Future traffic volumes are provided in **Figure 5**.

3.5 FUTURE CONDITIONS

Future peak hour vehicle delays and LOS *with the proposed development* were calculated based on the existing and proposed lane use and traffic control shown on **Figure 2**, the proposed site access plan, the future traffic volumes shown on **Figure 5**, and the methodologies presented in the HCM6. The results of the future conditions analysis are presented in **Appendix C** and are summarized in **Table 4**.

Table 4: Future Intersection Operations and Vehicle Queuing

Intersection	Control	Approach	Existing Conditions 2019						Future Conditions 2020					
			AM Peak		School Peak		PM Peak		AM Peak		School 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
1 Cascade Road & Hall Street	Signalized	WBL	54.8	D	41.5	D	51.1	D	64.8	E	42.1	D	50.3	D
		WBR	39.8	D	18.3	B	19.2	B	47.3	D	18.8	B	19.6	B
		NBT	17.7	B	26.8	C	28.2	C	17.7	B	26.8	C	28.2	C
		NBR	21.2	C	21.9	C	20.8	C	22.8	C	22.3	C	21.3	C
		SBL	27.0	C	26.5	C	15.9	B	29.2	C	27.9	C	17.5	B
		SBT	6.9	A	9.5	A	0.1	A	3.0	A	10.1	B	0.1	A
		Overall	23.5	C	22.6	C	17.1	B	25.9	C	23.2	C	17.7	B
2 Hall Street & Balsam Hill Avenue / Site Drive	Stop (Minor)	EBL	9.2	A	9.1	A	7.6	A	9.2	A	9.1	A	7.6	A
		WBL	N/A		N/A		N/A		9.4	A	8.1	A	8.0	A
		NB	N/A		N/A		N/A		62.6	F	26.6	D	14.1	B
		SB	23.5	C	14.0	B	9.2	A	26.2	D	14.0	B	9.2	A
Intersection	Control	Approach	Avg. (ft)	95 th % (ft)	Avg. (ft)	95 th % (ft)	Avg. (ft)	95 th % (ft)	Avg. (ft)	95 th % (ft)	Avg. (ft)	95 th % (ft)	Avg. (ft)	95 th % (ft)
1 Cascade Road & Hall Street	Signalized	WBL	95	210	97	194	20	54	118	257	101	215	32	73
		WBR	33	121	16	56	5	29	56	204	18	67	6	30
		NBT	76	185	105	178	112	182	83	219	106	182	115	187
		NBR	99	205	44	93	38	82	108	218	44	98	46	104
		SBL	62	123	83	158	111	190	73	157	92	172	126	209
		SBT	22	59	82	202	8	34	19	53	85	214	8	34
2 Hall Street & Balsam Hill Avenue / Site Drive	Stop (Minor)	EBL	1	11	1	11	2	13	2	13	2	13	1	8
		WBL	N/A		N/A		N/A		20	166	2	20	2	15
		NB	N/A		N/A		N/A		33	87	22	52	27	54
		SB	8	33	9	35	4	21	8	38	7	29	6	26

The results of the future conditions analysis indicate that all study intersection approaches and movements will operate similar to existing conditions, with the following exceptions.

Cascade Road & Hall Street (#1)

The westbound left-turn movement is expected to operate at LOS E during the AM peak hour. A review of network simulations indicates the vehicle queues for the westbound left-turn movements were observed to be processed within each cycle length, and extended queue lengths were not observed.

Hall Street & Balsam Hill Ave./Site Drive (#2)

The northbound egress approach on the proposed site driveway is expected to operate at LOS F during the AM peak period. A review of the network simulations indicates a 95th percentile vehicle queue length of approximately 3-4 vehicles, which is not significant.

Additionally, microsimulations indicate that the northbound egress vehicles have sufficient gaps in traffic to make a turn onto Hall Street. Further review of network simulations indicate that the vehicle queues from Cascade Road on Hall Street are expected to extend to Balsam Hill Avenue/ Site Drive intersection for less than 2 minutes out of the AM peak hour, which is not significant.

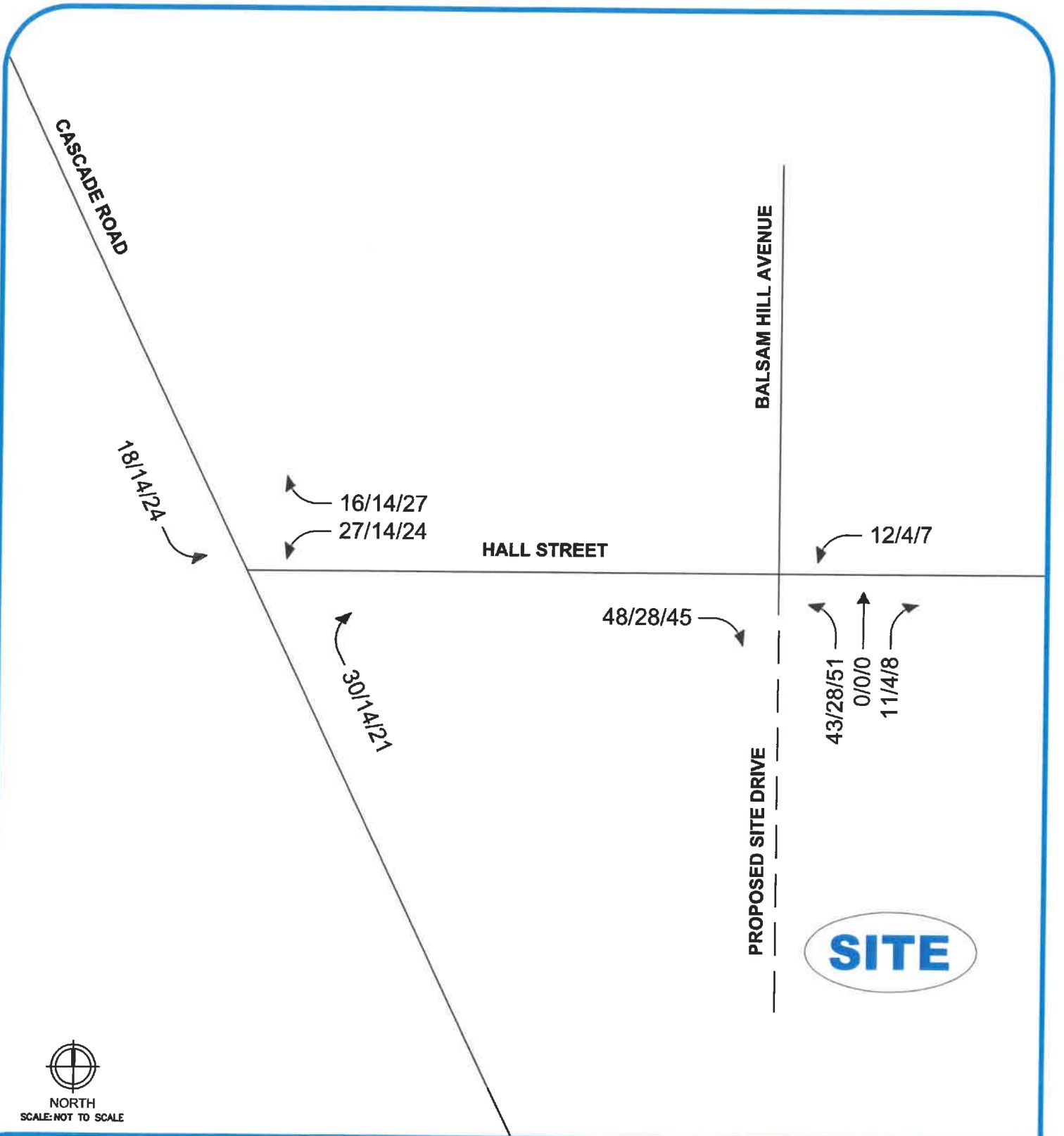






FIGURE 4
SITE-GENERATED
TRAFFIC VOLUMES
 PROPOSED DAYCARE TIS - CASCADE TOWNSHIP, MI

LEGEND

-  ROADS
-  TRAFFIC VOLUMES (AM/MD/PM)
-  SIGNALIZED INTERSECTION
-  UNSIGNALIZED INTERSECTION

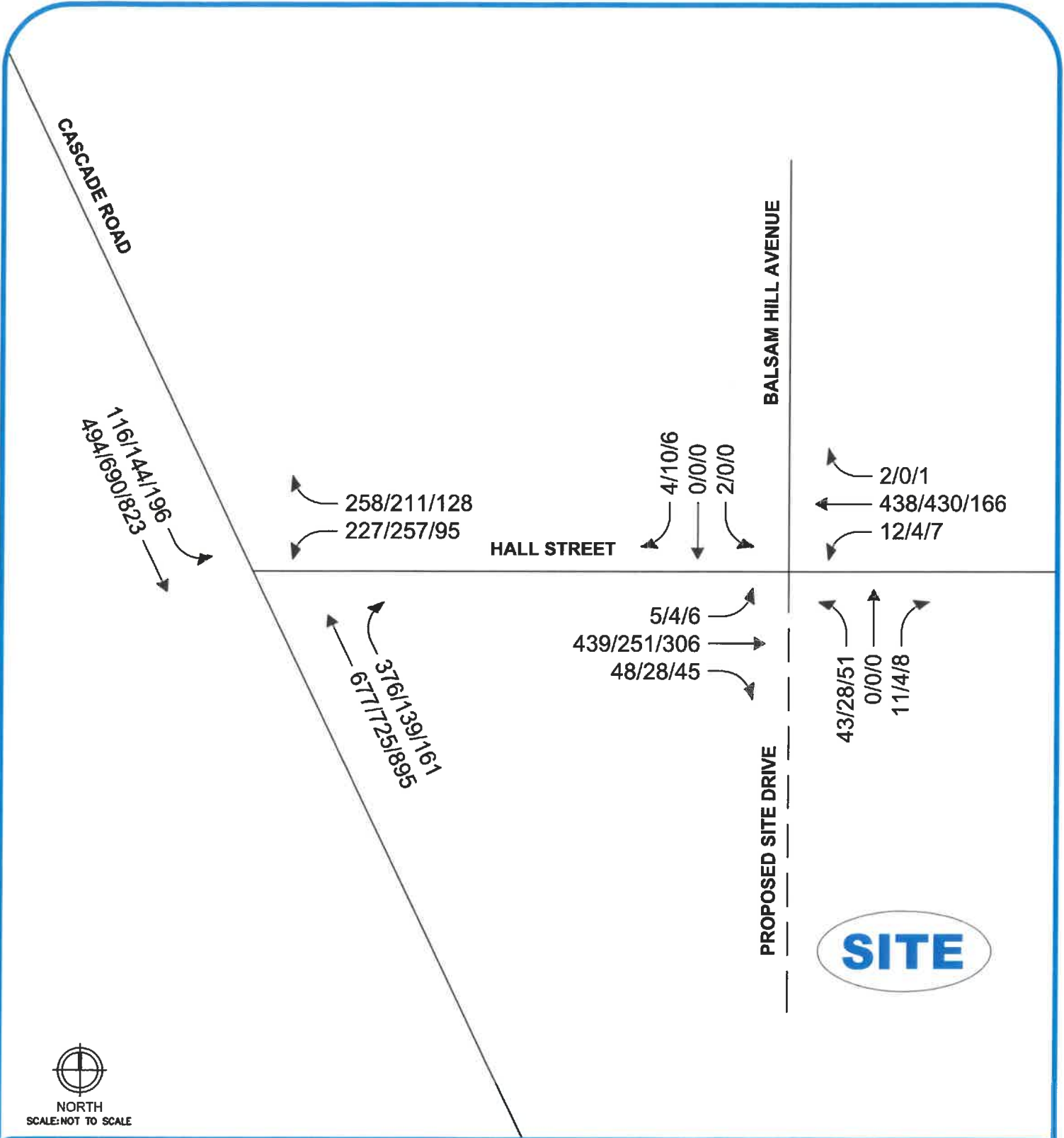


FIGURE 5 FUTURE TRAFFIC VOLUMES

PROPOSED DAYCARE TIS - CASCADE TOWNSHIP, MI

LEGEND

- ROADS
- TRAFFIC VOLUMES (AM/MD/PM)
- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION



3.1 FUTURE IMPROVEMENTS

In order to improve traffic operations to LOS D or better for all intersection approaches and movements under future conditions, mitigation measures were investigated at the Cascade Road and Hall Street intersection. This evaluation included: signal timing adjustments, geometric improvements, and traffic control modifications, as necessary. The results of this analysis with the mitigation measure applied are summarized in **Table 5** and indicate that signal timing optimization (i.e. providing an additional two seconds of green time for the westbound approach) alone is enough to improve all approaches to operating at a LOS D or better during the AM peak period.

A review of network simulations also indicates reduced vehicle queue lengths on the westbound approach. A further review of the microsimulations indicate that, with the implementation of the proposed mitigation measure, the westbound vehicle queues will no longer back up and block ingress/egress movements from Balsam Hill Avenue and/or the proposed Site Drive.

Table 5: Future Intersection Operations with Improvements

Intersection	Control	Approach	Future Conditions		Future Conditions (With Improvements)	
			AM Peak		AM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Cascade Road & Hall Street	Signalized	WBL	64.8	E	54.7	D
		WBR	47.3	D	37.7	D
		NBT	17.7	B	19.3	B
		NBR	22.8	C	25.4	C
		SBL	29.2	C	29.6	C
		SBT	3.0	A	3.4	A
		Overall	25.9	C	24.4	C
Intersection	Control	Approach	Average (ft)	95th % (ft)	Average (ft)	95th % (ft)
1 Cascade Road & Hall Street	Signalized	WBL	118	257	99	224
		WBR	56	204	41	178
		NBT	83	219	74	193
		NBR	108	218	114	219
		SBL	73	157	72	136
		SBT	19	53	20	55

4 CONCLUSIONS

The conclusions of this TIS are as follows:

- The results of the existing conditions analysis showed that all study intersection approaches and movements currently operate acceptably at a LOS D or better during all peak periods. A review of network simulations indicates acceptable operations during all peak periods.
- The proposed development is anticipated to be constructed within the next year; therefore, background conditions were assumed to be equal to existing conditions.
- The results of the future conditions analysis indicate the following:
 - **Cascade Road & Hall Street:** The westbound left-turn movement is expected to operate at LOS E during the AM peak period. A review of network simulations indicates similar operations to that observed in the existing conditions analysis, with the vehicle queues typically being processed within each cycle length.
 - **Hall Street and Balsam Hill Avenue / Site Drive:** The northbound egress approach on the Site Drive is expected to operate at LOS F during the AM peak period. Network simulations were reviewed and indicate a 95th percentile vehicle queue length of approximately 3-4 vehicles, which is not significant. Additionally, microsimulations indicate that there are sufficient gaps in traffic along Hall Street for egress vehicles to make their turning movements. Further review of network simulations indicate that the vehicle queues from Cascade Road on Hall Street are expected to extend to Balsam Hill Avenue/ Site Drive intersection for less than 2 minutes out of the AM peak hour, which is not significant.

5 RECOMMENDATIONS

- **Cascade Road & Hall Street:** Optimize the signal timing during AM peak period; this will improve the intersection operations and reduce the queue lengths on Hall Street. It is recommended that the KCRC monitor the operations of this intersection after the proposed development opens to determine if/when the signal timing changes should be implemented.

Appendix A

BACKGROUND INFORMATION

Traffic Data Collection, LLC

www.tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By Miovision Video VCU 5DW SE

File Name : TMC_1 Cascade SE & Hall SE_5-23-19
Site Code : TMC_1
Start Date : 5/23/2019
Page No : 1

6 Hour traffic study was conducted during typical weekday (Thursday) from 7:00 AM - 9:00 AM morning & 2:00 PM - 6:00 PM afternoon peak hours, while school was in session.

Groups Printed- Pass Cars - Single Units - Heavy Trucks - Peds

Start Time	Cascade Rd. SE Southbound				Hall St. SE Westbound				Cascade Rd. SE Northbound				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
07:00 AM	65	35	0	100	29	3	0	32	26	128	0	154	286
07:15 AM	78	32	0	110	56	30	0	86	167	183	1	351	547
07:30 AM	106	29	0	135	97	85	0	182	103	175	0	278	595
07:45 AM	131	20	0	151	52	52	0	104	44	181	1	226	481
Total	380	116	0	496	234	170	0	404	340	667	2	1009	1909
08:00 AM	179	11	0	190	37	33	1	71	12	138	3	153	414
08:15 AM	144	13	0	157	25	16	0	41	40	155	0	195	393
08:30 AM	167	21	0	188	32	23	0	55	29	205	0	234	477
08:45 AM	164	19	0	183	38	18	1	57	16	168	0	184	424
Total	654	64	0	718	132	90	2	224	97	666	3	766	1708
*** BREAK ***													
02:00 PM	117	29	0	146	17	9	0	26	13	172	0	185	357
02:15 PM	118	41	0	159	25	7	0	32	13	140	0	153	344
02:30 PM	110	32	0	142	40	8	1	49	55	186	2	243	434
02:45 PM	134	40	0	174	63	119	0	182	54	165	0	219	575
Total	479	142	0	621	145	143	1	289	135	663	2	800	1710
03:00 PM	190	31	0	221	58	60	0	118	20	155	2	177	516
03:15 PM	171	23	0	194	39	38	0	77	18	204	0	222	493
03:30 PM	195	23	0	218	37	26	1	64	20	201	0	221	503
03:45 PM	206	28	0	234	24	26	0	50	18	202	0	220	504
Total	762	105	0	867	158	150	1	309	76	762	2	840	2016
04:00 PM	207	21	0	228	25	13	1	39	12	220	0	232	499
04:15 PM	223	41	0	264	25	23	1	49	18	185	0	203	516
04:30 PM	188	42	0	230	32	17	0	49	35	195	0	230	509
04:45 PM	210	42	0	252	30	14	0	44	29	217	0	246	542
Total	828	146	0	974	112	67	2	181	94	817	0	911	2066
05:00 PM	223	39	1	263	15	20	1	36	35	259	0	294	593
05:15 PM	202	41	0	243	23	20	1	44	34	224	0	258	545
05:30 PM	197	51	0	248	18	16	0	34	28	193	0	221	503
05:45 PM	176	40	0	216	25	19	0	44	39	157	0	196	456
Total	798	171	1	970	81	75	2	158	136	833	0	969	2097
Grand Total	3901	744	1	4646	862	695	8	1565	878	4408	9	5295	11506
Apprch %	84	16	0		55.1	44.4	0.5		16.6	83.2	0.2		
Total %	33.9	6.5	0	40.4	7.5	6	0.1	13.6	7.6	38.3	0.1	46	
Pass Cars	3838	684	0	4522	816	671	0	1487	839	4321	0	5160	11169
% Pass Cars	98.4	91.9	0	97.3	94.7	96.5	0	95	95.6	98	0	97.5	97.1
Single Units	55	57	0	112	46	24	0	70	39	77	0	116	298
% Single Units	1.4	7.7	0	2.4	5.3	3.5	0	4.5	4.4	1.7	0	2.2	2.6
Heavy Trucks	8	3	0	11	0	0	0	0	0	10	0	10	21
% Heavy Trucks	0.2	0.4	0	0.2	0	0	0	0	0	0.2	0	0.2	0.2
Peds	0	0	1	1	0	0	8	8	0	0	9	9	18
% Peds	0	0	100	0	0	0	100	0.5	0	0	100	0.2	0.2

TDC Traffic Comments: Signalized "Y" skewed intersection. push button ped. signals for south & east legs. Video VCU camera was located within SE intersection quadrant. Note: Peds. are excluded from peak hour reports. Traffic study was performed for Cascade Twp. Traffic Impact Study for Fleis & Vandenbrink.

Traffic Data Collection, LLC

www.tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

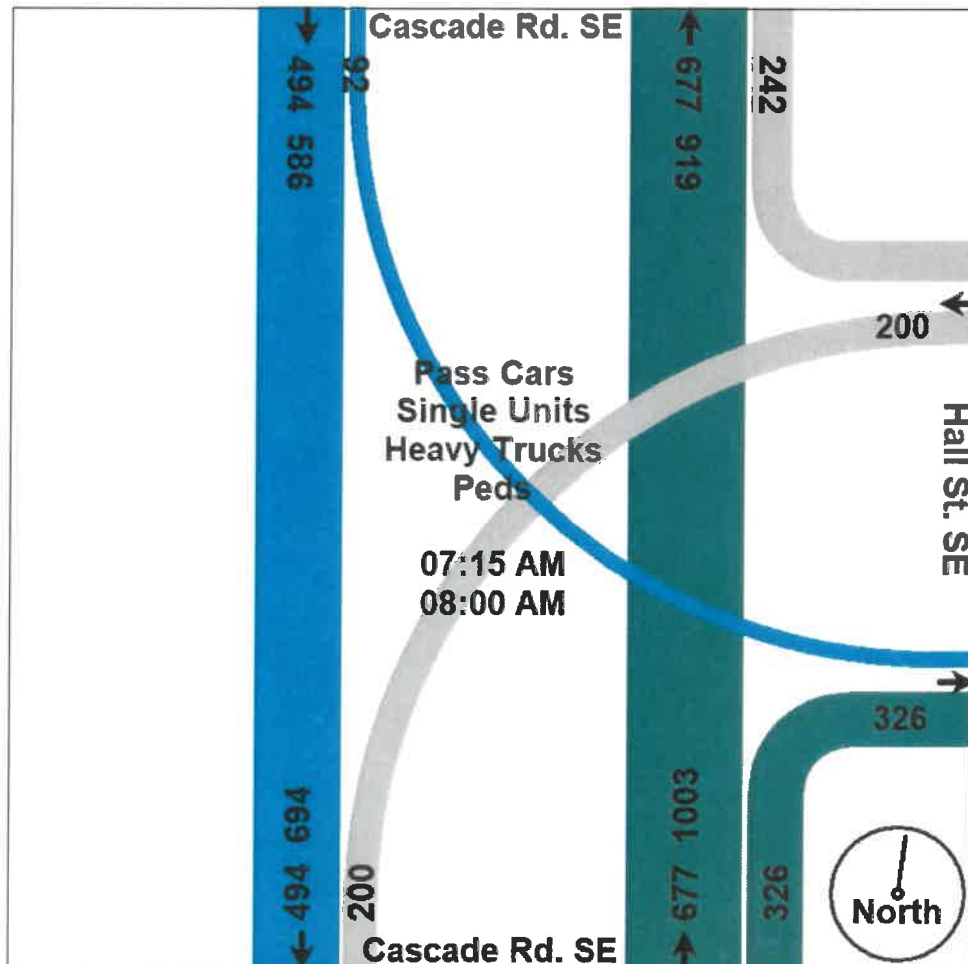
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By Miovision Video VCU 5DW SE

File Name : TMC_1 Cascade SE & Hall SE_5-23-19
Site Code : TMC_1
Start Date : 5/23/2019
Page No : 3

Start Time	Cascade Rd. SE Southbound			Hall St. SE Westbound			Cascade Rd. SE Northbound			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15 AM										
07:15 AM	78	32	110	56	30	86	167	183	350	546
07:30 AM	106	29	135	97	85	182	103	175	278	595
07:45 AM	131	20	151	52	52	104	44	181	225	480
08:00 AM	179	11	190	37	33	70	12	138	150	410
Total Volume	494	92	586	242	200	442	326	677	1003	2031
% App. Total	84.3	15.7		54.8	45.2		32.5	67.5		
PHF	.690	.719	.771	.624	.588	.607	.488	.925	.716	.853
Pass Cars	482	84	566	238	188	426	318	673	991	1983
% Pass Cars	97.6	91.3	96.6	98.3	94.0	96.4	97.5	99.4	98.8	97.6
Single Units	10	8	18	4	12	16	8	2	10	44
% Single Units	2.0	8.7	3.1	1.7	6.0	3.6	2.5	0.3	1.0	2.2
Heavy Trucks	2	0	2	0	0	0	0	2	2	4
% Heavy Trucks	0.4	0	0.3	0	0	0	0	0.3	0.2	0.2
Peds	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0



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www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

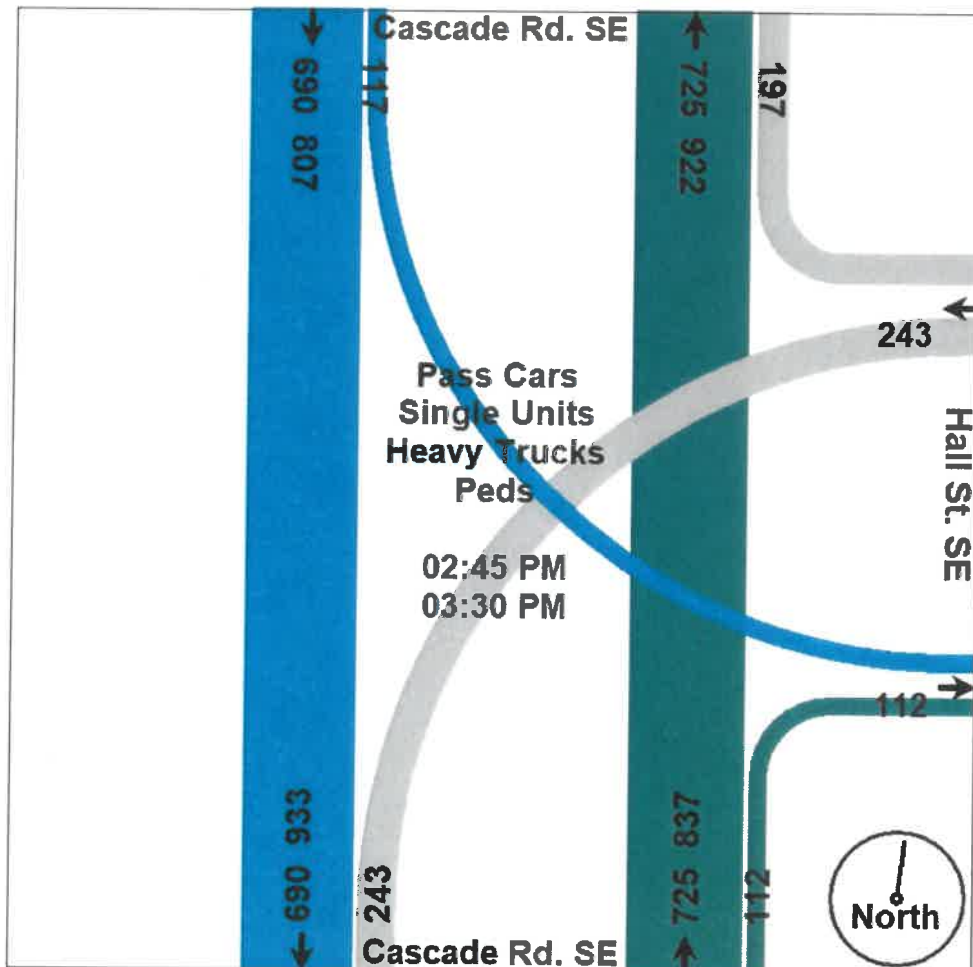
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
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Page No : 4

Start Time	Cascade Rd. SE Southbound			Hall St. SE Westbound			Cascade Rd. SE Northbound			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
Peak Hour Analysis From 02:00 PM to 03:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 02:45 PM										
02:45 PM	134	40	174	63	119	182	54	165	219	575
03:00 PM	190	31	221	58	60	118	20	155	175	514
03:15 PM	171	23	194	39	38	77	18	204	222	493
03:30 PM	195	23	218	37	26	63	20	201	221	502
Total Volume	690	117	807	197	243	440	112	725	837	2084
% App. Total	85.5	14.5		44.8	55.2		13.4	86.6		
PHF	.885	.731	.913	.782	.511	.604	.519	.888	.943	.906
Pass Cars	675	114	789	192	235	427	111	706	817	2033
% Pass Cars	97.8	97.4	97.8	97.5	96.7	97.0	99.1	97.4	97.6	97.6
Single Units	13	3	16	5	8	13	1	18	19	48
% Single Units	1.9	2.6	2.0	2.5	3.3	3.0	0.9	2.5	2.3	2.3
Heavy Trucks	2	0	2	0	0	0	0	1	1	3
% Heavy Trucks	0.3	0	0.2	0	0	0	0	0.1	0.1	0.1
Peds	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0



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Phone: 586.786-5407

Traffic Study Performed For:

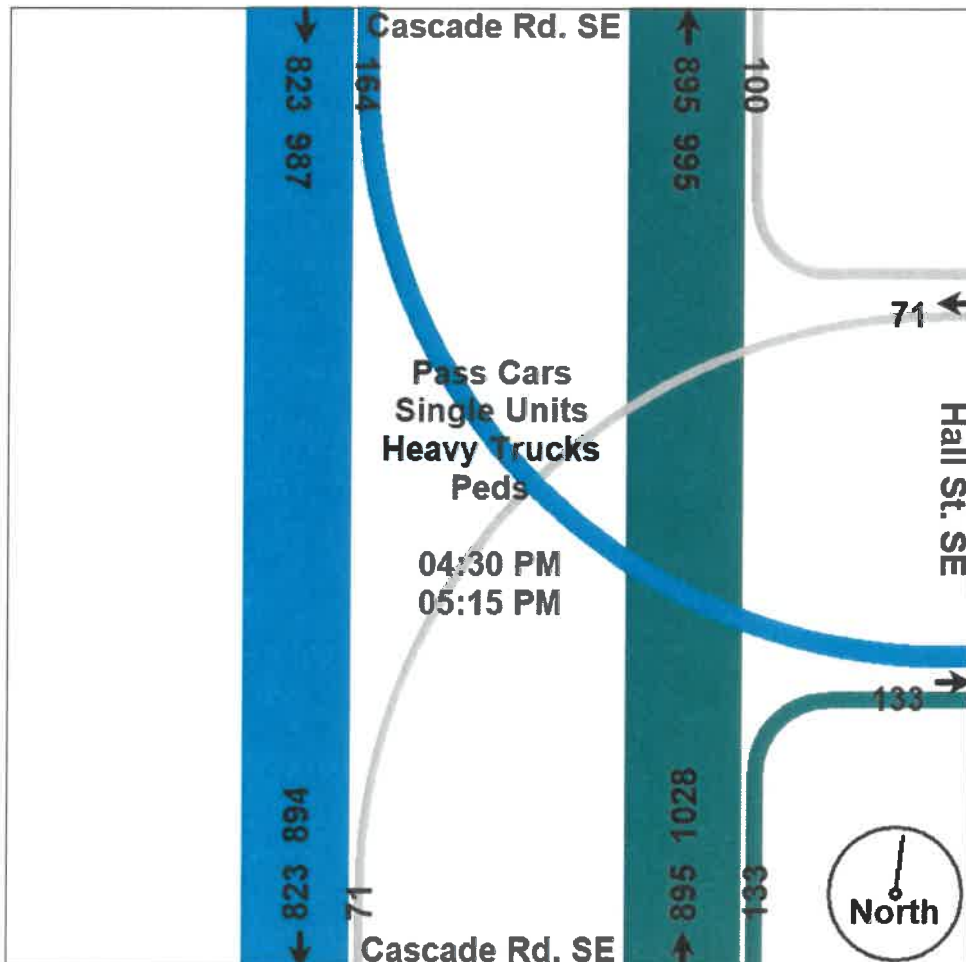
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Miovision Video VCU 5DW SE

File Name : TMC_1 Cascade SE & Hall SE_5-23-19
Site Code : TMC_1
Start Date : 5/23/2019
Page No : 5

Start Time	Cascade Rd. SE Southbound			Hall St. SE Westbound			Cascade Rd. SE Northbound			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	188	42	230	32	17	49	35	195	230	509
04:45 PM	210	42	252	30	14	44	29	217	246	542
05:00 PM	223	39	262	15	20	35	35	259	294	591
05:15 PM	202	41	243	23	20	43	34	224	258	544
Total Volume	823	164	987	100	71	171	133	895	1028	2186
% App. Total	83.4	16.6		58.5	41.5		12.9	87.1		
PHF	.923	.976	.942	.781	.888	.872	.950	.864	.874	.925
Pass Cars	820	146	966	98	70	168	123	886	1009	2143
% Pass Cars	99.6	89.0	97.9	98.0	98.6	98.2	92.5	99.0	98.2	98.0
Single Units	3	18	21	2	1	3	10	8	18	42
% Single Units	0.4	11.0	2.1	2.0	1.4	1.8	7.5	0.9	1.8	1.9
Heavy Trucks	0	0	0	0	0	0	0	1	1	1
% Heavy Trucks	0	0	0	0	0	0	0	0.1	0.1	0.0
Peds	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0



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Traffic Study Performed For:

Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Jamar Ultra Board #23, DM

File Name : TMC_2 Cascade SE & Balsam Hill_5-23-19
Site Code : TMC_2
Start Date : 5/23/2019
Page No : 1

6 Hour traffic study was conducted during typical weekday (Thursday from 7:00 AM - 9:00 AM morning & 2:00 PM - 6:00 PM afternoon peak hours, while school was in session).

Groups Printed- Pass Cars - Single Units - Heavy Trucks

Start Time	Balsam Hill Ave. SE Southbound				Cascade Rd. SE Westbound				Cascade Rd. SE Eastbound				Int. Total
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	
07:00 AM	0	0	0	0	0	39	0	39	81	0	0	81	120
07:15 AM	0	0	0	0	0	99	0	99	171	0	0	171	270
07:30 AM	1	1	0	2	1	183	0	184	129	2	0	131	317
07:45 AM	3	1	0	4	1	91	0	92	58	3	0	61	157
Total	4	2	0	6	2	412	0	414	439	5	0	444	864
08:00 AM	0	0	0	0	0	66	0	66	25	0	0	25	91
08:15 AM	0	0	0	0	0	44	0	44	52	2	0	54	98
08:30 AM	4	1	0	5	0	48	0	48	47	1	0	48	101
08:45 AM	0	0	0	0	0	60	0	60	34	0	0	34	94
Total	4	1	0	5	0	218	0	218	158	3	0	161	384
*** BREAK ***													
02:00 PM	1	0	0	1	0	24	0	24	42	2	0	44	69
02:15 PM	2	0	0	2	1	37	0	38	51	0	0	51	91
02:30 PM	4	0	0	4	0	37	0	37	83	1	0	84	125
02:45 PM	3	0	0	3	0	196	0	196	82	0	0	82	281
Total	10	0	0	10	1	294	0	295	258	3	0	261	566
03:00 PM	2	0	0	2	0	116	0	116	49	0	0	49	167
03:15 PM	1	0	0	1	0	72	0	72	37	3	0	40	113
03:30 PM	2	0	0	2	0	60	0	60	41	1	0	42	104
03:45 PM	1	1	0	2	0	44	0	44	40	3	0	43	89
Total	6	1	0	7	0	292	0	292	167	7	0	174	473
04:00 PM	0	0	0	0	1	45	0	46	33	0	0	33	79
04:15 PM	4	0	0	4	0	37	0	37	57	2	0	59	100
04:30 PM	0	0	0	0	2	49	0	51	73	3	0	76	127
04:45 PM	1	1	0	2	0	41	0	41	67	2	0	69	112
Total	5	1	0	6	3	172	0	175	230	7	0	237	418
05:00 PM	0	0	0	0	1	45	0	46	72	2	0	74	120
05:15 PM	3	0	0	3	0	34	0	34	78	2	0	80	117
05:30 PM	2	0	0	2	0	40	0	40	80	1	0	81	123
05:45 PM	1	0	0	1	0	47	0	47	76	1	0	77	125
Total	6	0	0	6	1	166	0	167	306	6	0	312	485
Grand Total	35	5	0	40	7	1554	0	1561	1558	31	0	1589	3190
Apprch %	87.5	12.5	0		0.4	99.6	0		98	2	0		
Total %	1.1	0.2	0	1.3	0.2	48.7	0	48.9	48.8	1	0	49.8	
Pass Cars	31	5	0	36	6	1486	0	1492	1465	30	0	1495	3023
% Pass Cars	88.6	100	0	90	85.7	95.6	0	95.6	94	96.8	0	94.1	94.8
Single Units	4	0	0	4	1	68	0	69	93	1	0	94	167
% Single Units	11.4	0	0	10	14.3	4.4	0	4.4	6	3.2	0	5.9	5.2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0

TDC Traffic Comments: Non-signalized "T" intersection. Local street is stop controlled. Video VCU camera was located within NW intersection quadrant. Traffic study was performed for Cascade Township Traffic Impact Study for Fleis & Vandenbrink.

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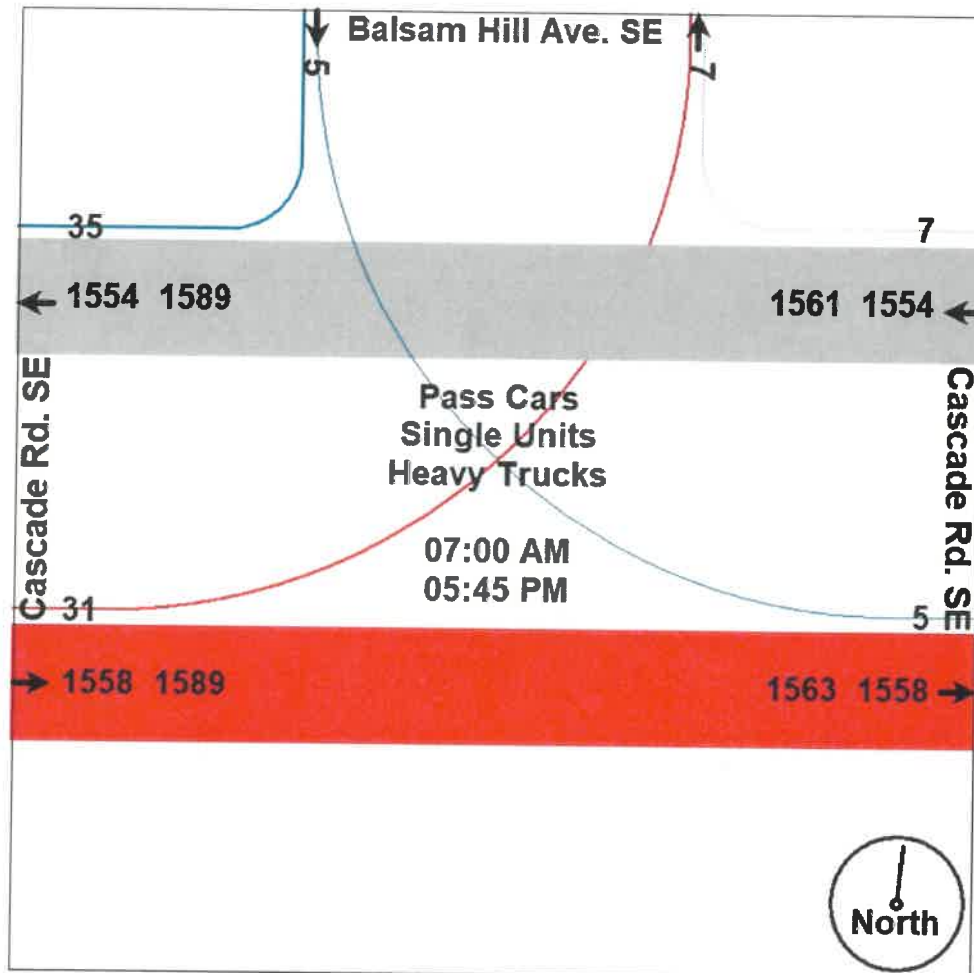
Traffic Study Performed For:

Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Jamar Ultra Board #23, DM

File Name : TMC_2 Cascade SE & Balsam Hill_5-23-19
Site Code : TMC_2
Start Date : 5/23/2019
Page No : 2



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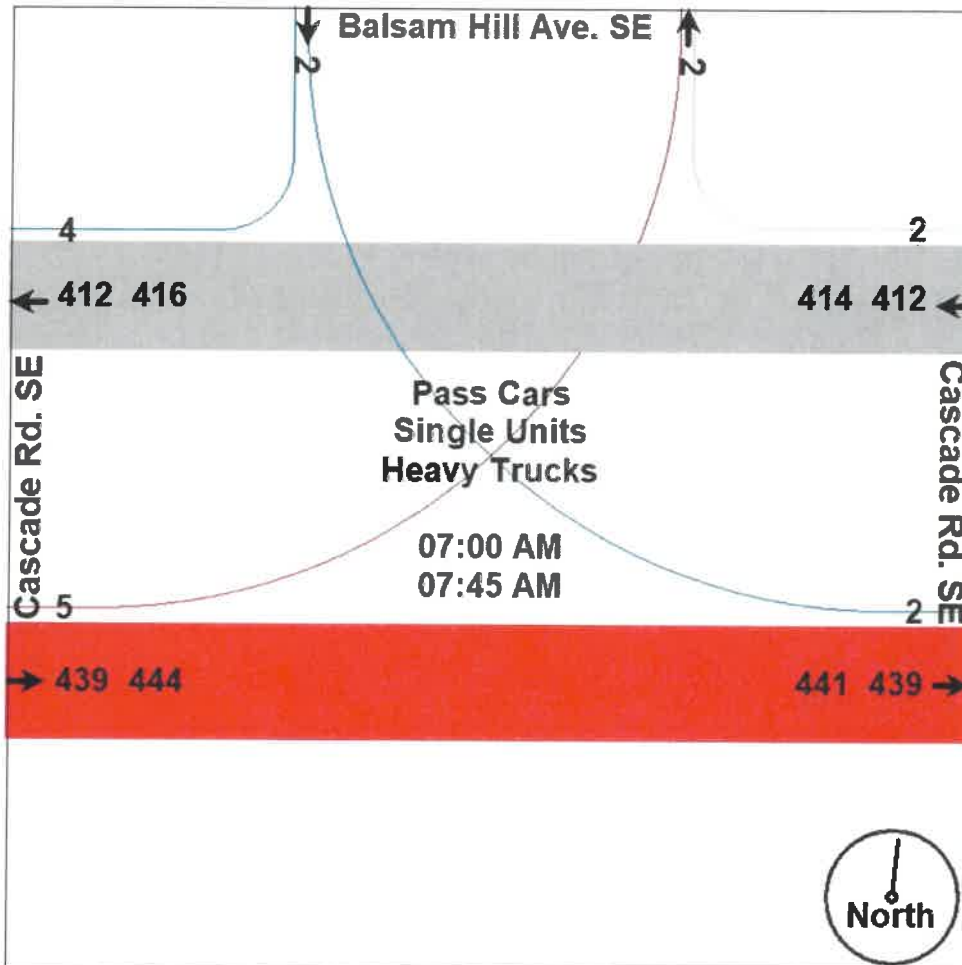
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Jamar Ultra Board #23, DM

File Name : TMC_2 Cascade SE & Balsam Hill_5-23-19
Site Code : TMC_2
Start Date : 5/23/2019
Page No : 3

Start Time	Balsam Hill Ave. SE Southbound			Cascade Rd. SE Westbound			Cascade Rd. SE Eastbound			Int. Total
	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	0	0	0	39	39	81	0	81	120
07:15 AM	0	0	0	0	99	99	171	0	171	270
07:30 AM	1	1	2	1	183	184	129	2	131	317
07:45 AM	3	1	4	1	91	92	58	3	61	157
Total Volume	4	2	6	2	412	414	439	5	444	864
% App. Total	66.7	33.3		0.5	99.5		98.9	1.1		
PHF	.333	.500	.375	.500	.563	.563	.642	.417	.649	.681
Pass Cars	3	2	5	2	393	395	425	4	429	829
% Pass Cars	75.0	100	83.3	100	95.4	95.4	96.8	80.0	96.6	95.9
Single Units	1	0	1	0	19	19	14	1	15	35
% Single Units	25.0	0	16.7	0	4.6	4.6	3.2	20.0	3.4	4.1
Heavy Trucks	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0



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Traffic Study Performed For:

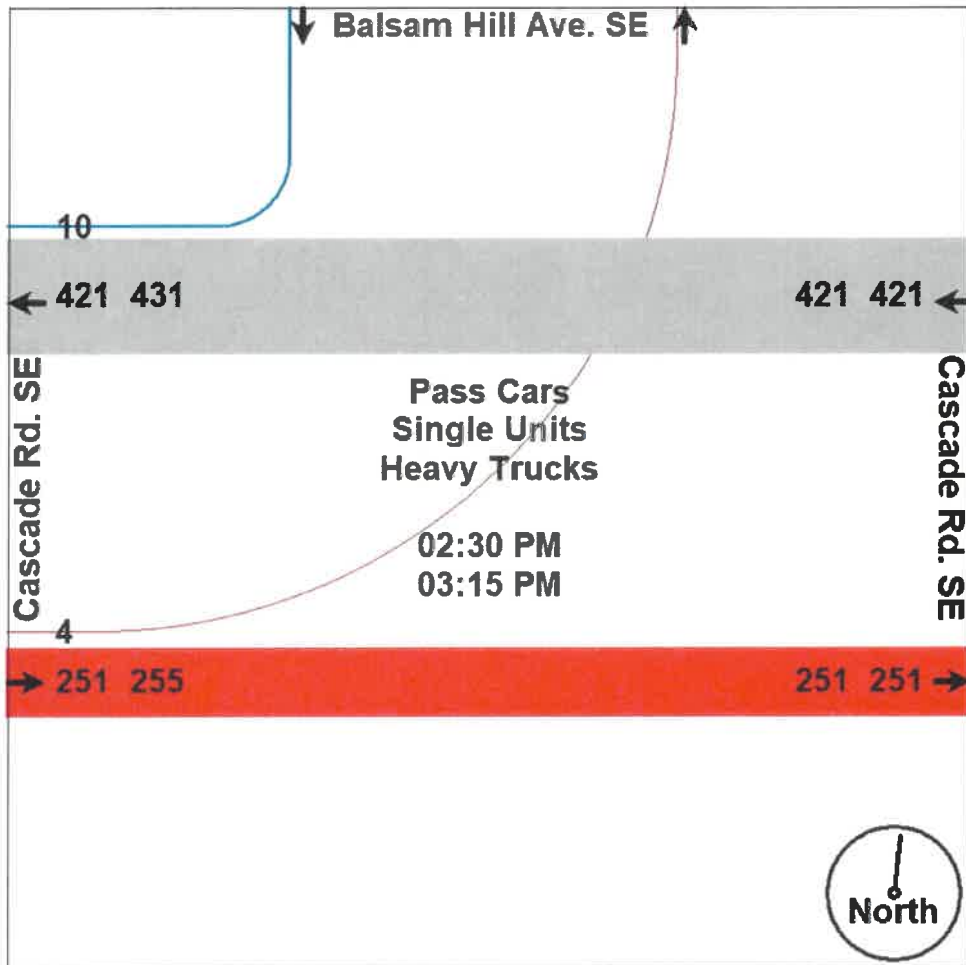
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Jamar Ultra Board #23, DM

File Name : TMC_2 Cascade SE & Balsam Hill_5-23-19
Site Code : TMC_2
Start Date : 5/23/2019
Page No : 4

Start Time	Balsam Hill Ave. SE Southbound			Cascade Rd. SE Westbound			Cascade Rd. SE Eastbound			Int. Total
	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	
Peak Hour Analysis From 02:00 PM to 03:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 02:30 PM										
02:30 PM	4	0	4	0	37	37	83	1	84	125
02:45 PM	3	0	3	0	196	196	82	0	82	281
03:00 PM	2	0	2	0	116	116	49	0	49	167
03:15 PM	1	0	1	0	72	72	37	3	40	113
Total Volume	10	0	10	0	421	421	251	4	255	686
% App. Total	100	0		0	100		98.4	1.6		
PHF	.625	.000	.625	.000	.537	.537	.756	.333	.759	.610
Pass Cars	9	0	9	0	398	398	249	4	253	660
% Pass Cars	90.0	0	90.0	0	94.5	94.5	99.2	100	99.2	96.2
Single Units	1	0	1	0	23	23	2	0	2	26
% Single Units	10.0	0	10.0	0	5.5	5.5	0.8	0	0.8	3.8
Heavy Trucks	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0



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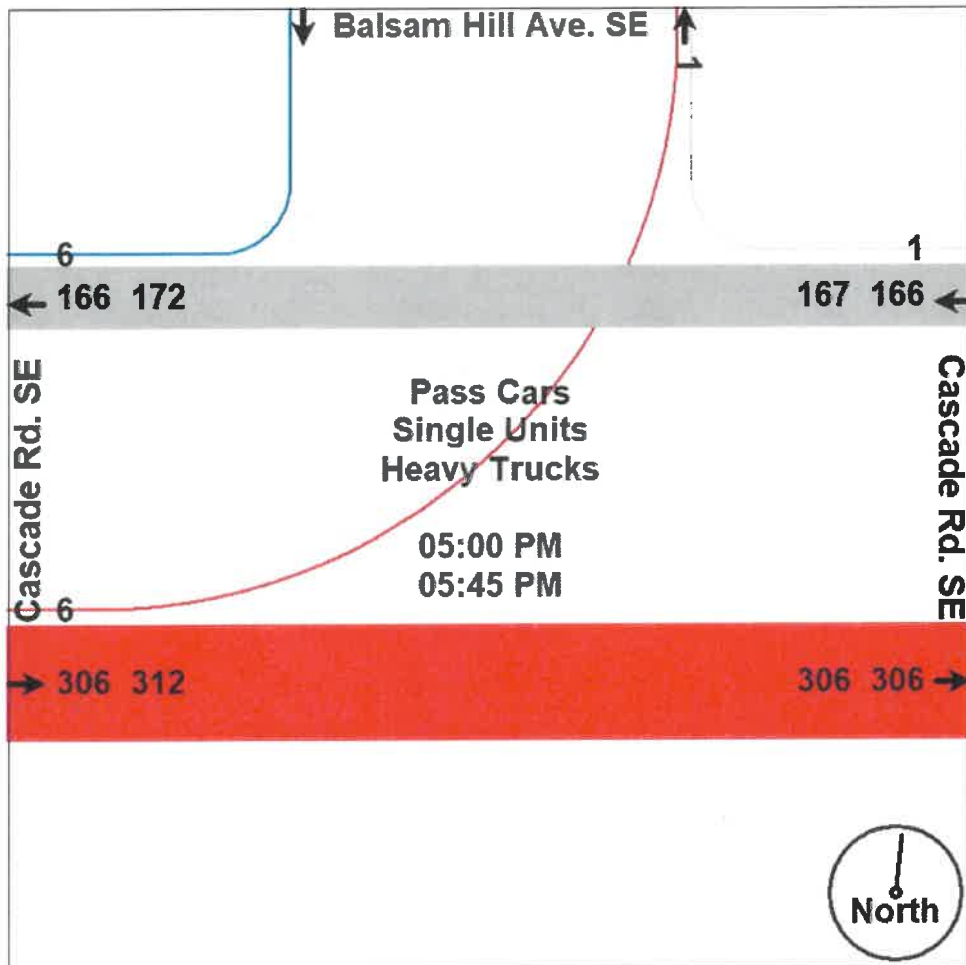
Traffic Study Performed For:
Fleis & VandenBrink



Project: Cascade Twp Traffic Impact Study
Study: 6 Hr. Video Turning Movement Count
Weather: Lt. Rain AM/ Sunny PM Deg's 60s
Count By: Jamar Ultra Board #23, DM

File Name : TMC_2 Cascade SE & Balsam Hill_5-23-19
Site Code : TMC_2
Start Date : 5/23/2019
Page No : 5

Start Time	Balsam Hill Ave. SE Southbound			Cascade Rd. SE Westbound			Cascade Rd. SE Eastbound			Int. Total
	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. 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	0	0	1	45	46	72	2	74	120
05:15 PM	3	0	3	0	34	34	78	2	80	117
05:30 PM	2	0	2	0	40	40	80	1	81	123
05:45 PM	1	0	1	0	47	47	76	1	77	125
Total Volume	6	0	6	1	166	167	306	6	312	485
% App. Total	100	0		0.6	99.4		98.1	1.9		
PHF	.500	.000	.500	.250	.883	.888	.956	.750	.963	.970
Pass Cars	6	0	6	1	164	165	300	6	306	477
% Pass Cars	100	0	100	100	98.8	98.8	98.0	100	98.1	98.4
Single Units	0	0	0	0	2	2	6	0	6	8
% Single Units	0	0	0	0	1.2	1.2	2.0	0	1.9	1.6
Heavy Trucks	0	0	0	0	0	0	0	0	0	0
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0





Volume Count Report

LOCATION INFO	
Location ID	136
Type	SPOT
Funct'l Class	-
Located On	Cascade Road
Loc On Alias	
SOUTH OF	Hall
Direction	2-WAY
County	Kent
Community	Cascade Township
MPO ID	8050
HPMS ID	
Agency	GVMC

COUNT DATA INFO					
Count Status	Accepted				
Start Date	Tue 9/18/2018				
End Date	Wed 9/19/2018				
Start Time	8:30:00 AM				
End Time	8:30:00 AM				
Direction	2-WAY				
Notes					
Station	136				
Study					
Speed Limit					
Description					
Sensor Type					
Source	CombineVolumeCountsIncremental				
Latitude,Longitude					

INTERVAL: 15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	9	10	5	7	31
1:00-2:00	5	2	3	1	11
2:00-3:00	2	2	1	5	10
3:00-4:00	5	3	3	4	15
4:00-5:00	3	5	14	14	36
5:00-6:00	14	21	47	55	137
6:00-7:00	58	92	137	176	463
7:00-8:00	230	449	431	369	1,479
8:00-9:00	328	363	268	317	1,276
9:00-10:00	246	265	235	245	991
10:00-11:00	225	188	229	225	867
11:00-12:00	244	248	271	269	1,032
12:00-13:00	265	279	276	277	1,097
13:00-14:00	267	251	252	250	1,020
14:00-15:00	233	282	264	383	1,162
15:00-16:00	353	313	334	317	1,317
16:00-17:00	371	366	411	464	1,612
17:00-18:00	434	463	451	497	1,845
18:00-19:00	352	367	321	265	1,305
19:00-20:00	210	226	298	218	952
20:00-21:00	179	169	189	130	667
21:00-22:00	115	74	67	52	308
22:00-23:00	37	41	35	26	139
23:00-24:00	23	15	18	17	73
Total					17,845
AADT					17,845
AM Peak					07:15-08:15 1,577
PM Peak					17:00-18:00 1,845



Volume Count Report

LOCATION INFO	
Location ID	4279
Type	SPOT
Funct'l Class	-
Located On	HALL
Loc On Alias	
EAST OF	CASCADE
Direction	2-WAY
County	Kent
Community	Ada Township
MPO ID	
HPMS ID	
Agency	GVMC

COUNT DATA INFO	
Count Status	Accepted
Start Date	Mon 3/11/2019
End Date	Tue 3/12/2019
Start Time	10:00:00 AM
End Time	10:00:00 AM
Direction	2-WAY
Notes	
Station	4279
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	1	1	0	2	4
1:00-2:00	0	1	0	0	1
2:00-3:00	2	1	1	0	4
3:00-4:00	0	0	1	0	1
4:00-5:00	0	1	4	7	12
5:00-6:00	4	5	20	17	46
6:00-7:00	27	38	78	64	207
7:00-8:00	93	313	295	153	854
8:00-9:00	83	93	97	86	359
9:00-10:00	60	49	34	36	179
10:00-11:00	47	31	47	54	179
11:00-12:00	58	64	59	43	224
12:00-13:00	62	64	55	58	239
13:00-14:00	47	50	41	52	190
14:00-15:00	67	64	109	287	527
15:00-16:00	172	108	71	78	429
16:00-17:00	91	107	107	151	456
17:00-18:00	117	111	82	108	418
18:00-19:00	88	72	64	55	279
19:00-20:00	42	74	65	39	220
20:00-21:00	47	32	18	24	121
21:00-22:00	21	13	23	14	71
22:00-23:00	13	7	7	1	28
23:00-24:00	6	1	1	3	11
Total					5,059
AADT					5,059
AM Peak					07:00-08:00 854
PM Peak					14:30-15:30 676

Appendix B

EXISTING TRAFFIC CONDITIONS

Level of Service Criteria for Stop Sign Controlled Intersections

The level of service criteria are given in Table 17-2. 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 minor movement is a function of the service rate or capacity of the approach and the degree of saturation. . . .

Exhibit 17-2. Level of Service Criteria for TWSC Intersections

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 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. To remain consistent with the AWSC intersection analysis procedure described later in this chapter, a total delay of 50 sec/veh is assumed as the break point between LOS E and F.

The proposed level of service criteria for TWSC intersections are somewhat different from the criteria used in Chapter 16 for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes 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 queuing 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 queuing, which is more obvious.

Source: Highway Capacity Manual, 2010. 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. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle for a 15-min analysis period. The criteria are given in Exhibit 16-2. 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 very low delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

LOS B describes operations with delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.

Exhibit 16-2. Level-of-Service Criteria for Signalized Intersections

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

LOS C describes operations with delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.













LOS E describes operations with delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: Highway Capacity Manual, 2010. Transportation Research Board, National Research Council

HCM 6th Signalized Intersection Summary
 1: Cascade Road (Push-Button) & Hall Street

Existing Conditions
 AM Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	200	242	677	346	98	494	
Future Volume (veh/h)	200	242	677	346	98	494	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1885	1885	1856	1856	
Adj Flow Rate, veh/h	328	397	940	481	127	642	
Peak Hour Factor	0.61	0.61	0.72	0.72	0.77	0.77	
Percent Heavy Veh, %	4	4	1	1	3	3	
Cap, veh/h	369	478	1723	768	353	2298	
Arrive On Green	0.21	0.21	0.48	0.48	0.10	0.65	
Sat Flow, veh/h	1753	1560	3676	1596	1767	3618	
Grp Volume(v), veh/h	328	397	940	481	127	642	
Grp Sat Flow(s),veh/h/ln	1753	1560	1791	1596	1767	1763	
Q Serve(g_s), s	16.4	12.6	16.6	20.1	0.0	7.0	
Cycle Q Clear(g_c), s	16.4	12.6	16.6	20.1	0.0	7.0	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	369	478	1723	768	353	2298	
V/C Ratio(X)	0.89	0.83	0.55	0.63	0.36	0.28	
Avail Cap(c_a), veh/h	395	502	1723	768	353	2298	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.88	0.88	
Uniform Delay (d), s/veh	34.5	29.0	16.4	17.3	26.8	6.7	
Incr Delay (d2), s/veh	20.3	10.8	1.2	3.8	0.2	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	8.7	15.4	6.0	7.0	2.3	1.9	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	54.8	39.8	17.7	21.2	27.0	6.9	
LnGrp LOS	D	D	B	C	C	A	
Approach Vol, veh/h	725		1421			769	
Approach Delay, s/veh	46.6		18.9			10.3	
Approach LOS	D		B			B	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		24.6		65.4		15.4	50.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 20		* 57		* 7.3	* 43
Max Q Clear Time (g_c+I1), s		18.4		9.0		2.0	22.1
Green Ext Time (p_c), s		0.6		0.6		0.1	0.7
Intersection Summary							
HCM 6th Ctrl Delay			23.5				
HCM 6th LOS			C				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Existing Conditions
AM Peak Hour

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	439	0	0	438	2	0	0	0	2	0	4
Future Vol, veh/h	5	439	0	0	438	2	0	0	0	2	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	65	65	65	60	60	60	92	92	92	60	60	60
Heavy Vehicles, %	3	3	3	5	5	5	2	2	2	17	17	17
Mvmt Flow	8	675	0	0	730	3	0	0	0	3	0	7













Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	733	0	0	675	0	0	1426	1424	675	1423	1423	732
Stage 1	-	-	-	-	-	-	691	691	-	732	732	-
Stage 2	-	-	-	-	-	-	735	733	-	691	691	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.12	6.52	6.22	7.27	6.67	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.27	5.67	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.27	5.67	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.518	4.018	3.318	3.653	4.153	3.453
Pot Cap-1 Maneuver	867	-	-	902	-	-	113	136	454	105	126	397
Stage 1	-	-	-	-	-	-	435	446	-	390	405	-
Stage 2	-	-	-	-	-	-	411	426	-	412	424	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	867	-	-	902	-	-	110	135	454	104	125	397
Mov Cap-2 Maneuver	-	-	-	-	-	-	110	135	-	104	125	-
Stage 1	-	-	-	-	-	-	431	442	-	386	405	-
Stage 2	-	-	-	-	-	-	404	426	-	408	420	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	23.5
HCM LOS			A	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	867	-	-	902	-	-	205
HCM Lane V/C Ratio	-	-	0.009	-	-	-	-	-	0.049
HCM Control Delay (s)	0	0	9.2	-	-	0	-	-	23.5
HCM Lane LOS	A	A	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	-	-	0	-	-	0	-	-	0.2

HCM 6th Signalized Intersection Summary
1: Cascade Road (Push-Button) & Hall Street

Existing Conditions
 School Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	243	197	725	125	130	690	
Future Volume (veh/h)	243	197	725	125	130	690	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1870	1870	1870	1870	
Adj Flow Rate, veh/h	405	328	771	133	143	758	
Peak Hour Factor	0.60	0.60	0.94	0.94	0.91	0.91	
Percent Heavy Veh, %	3	3	2	2	2	2	
Cap, veh/h	464	692	1236	550	485	2130	
Arrive On Green	0.26	0.26	0.35	0.35	0.18	0.60	
Sat Flow, veh/h	1767	1572	3647	1583	1781	3647	
Grp Volume(v), veh/h	405	328	771	133	143	758	
Grp Sat Flow(s),veh/h/ln	1767	1572	1777	1583	1781	1777	
Q Serve(g_s), s	19.7	0.0	16.3	5.4	0.0	9.8	
Cycle Q Clear(g_c), s	19.7	0.0	16.3	5.4	0.0	9.8	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	464	692	1236	550	485	2130	
V/C Ratio(X)	0.87	0.47	0.62	0.24	0.29	0.36	
Avail Cap(c_a), veh/h	634	843	1236	550	485	2130	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.71	0.71	
Uniform Delay (d), s/veh	31.7	17.8	24.4	20.9	26.4	9.2	
Incr Delay (d2), s/veh	9.8	0.5	2.4	1.0	0.1	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	9.2	8.3	6.5	1.9	2.4	3.0	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	41.5	18.3	26.8	21.9	26.5	9.5	
LnGrp LOS	D	B	C	C	C	A	
Approach Vol, veh/h	733		904			901	
Approach Delay, s/veh	31.1		26.1			12.2	
Approach LOS	C		C			B	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		29.4		60.6		22.6	38.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 32		* 45		* 7.3	* 31
Max Q Clear Time (g_c+I1), s		21.7		11.8		2.0	18.3
Green Ext Time (p_c), s		1.9		0.7		0.1	0.6
Intersection Summary							
HCM 6th Ctrl Delay			22.6				
HCM 6th LOS			C				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Existing Conditions
School Peak Hour

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷			↕			↶	↷		↕	
Traffic Vol, veh/h	4	251	0	0	430	0	0	0	0	0	0	10
Future Vol, veh/h	4	251	0	0	430	0	0	0	0	0	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	60	60	60	92	92	92	63	63	63
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	10	10	10
Mvmt Flow	5	330	0	0	717	0	0	0	0	0	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	717	0	0	330	0	0	1065	1057	330	1057	1057	717
Stage 1	-	-	-	-	-	-	340	340	-	717	717	-
Stage 2	-	-	-	-	-	-	725	717	-	340	340	-
Critical Hdwy	4.11	-	-	4.15	-	-	7.12	6.52	6.22	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.2	5.6	-
Follow-up Hdwy	2.209	-	-	2.245	-	-	3.518	4.018	3.318	3.59	4.09	3.39
Pot Cap-1 Maneuver	888	-	-	1213	-	-	200	225	712	196	218	416
Stage 1	-	-	-	-	-	-	675	639	-	408	422	-
Stage 2	-	-	-	-	-	-	416	434	-	658	625	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	888	-	-	1213	-	-	192	224	712	195	217	416
Mov Cap-2 Maneuver	-	-	-	-	-	-	192	224	-	195	217	-
Stage 1	-	-	-	-	-	-	671	635	-	406	422	-
Stage 2	-	-	-	-	-	-	400	434	-	654	621	-













Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	14
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	888	-	-	1213	-	-	416
HCM Lane V/C Ratio	-	-	0.006	-	-	-	-	-	0.038
HCM Control Delay (s)	0	0	9.1	-	-	0	-	-	14
HCM Lane LOS	A	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	-	0	-	-	0	-	-	0.1

HCM 6th Signalized Intersection Summary

1: Cascade Road (Push-Button) & Hall Street

Existing Conditions
PM Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	71	101	895	140	172	823	
Future Volume (veh/h)	71	101	895	140	172	823	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	
Adj Flow Rate, veh/h	82	116	1029	161	183	876	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.94	0.94	
Percent Heavy Veh, %	2	2	2	2	2	2	
Cap, veh/h	125	644	1432	637	736	2865	
Arrive On Green	0.07	0.07	0.40	0.40	0.45	1.00	
Sat Flow, veh/h	1781	1585	3647	1581	1781	3647	
Grp Volume(v), veh/h	82	116	1029	161	183	876	
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1581	1781	1777	
Q Serve(g_s), s	4.5	0.0	24.3	6.8	0.0	0.0	
Cycle Q Clear(g_c), s	4.5	0.0	24.3	6.8	0.0	0.0	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	125	644	1432	637	736	2865	
V/C Ratio(X)	0.66	0.18	0.72	0.25	0.25	0.31	
Avail Cap(c_a), veh/h	486	965	1432	637	736	2865	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.33	1.33	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.50	0.50	
Uniform Delay (d), s/veh	45.3	19.0	25.1	19.8	15.8	0.0	
Incr Delay (d2), s/veh	5.8	0.1	3.1	1.0	0.0	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	2.1	3.2	9.7	2.4	2.2	0.1	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	51.1	19.2	28.2	20.8	15.9	0.1	
LnGrp LOS	D	B	C	C	B	A	
Approach Vol, veh/h	198		1190			1059	
Approach Delay, s/veh	32.4		27.2			2.9	
Approach LOS	C		C			A	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		12.7		87.3		40.3	47.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 27		* 60		* 13	* 40
Max Q Clear Time (g_c+I1), s		6.5		2.0		2.0	26.3
Green Ext Time (p_c), s		0.5		0.8		0.2	0.9
Intersection Summary							
HCM 6th Ctrl Delay			17.1				
HCM 6th LOS			B				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Existing Conditions
PM Peak Hour

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	306	0	0	166	1	0	0	0	0	0	6
Future Vol, veh/h	6	306	0	0	166	1	0	0	0	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	89	89	89	92	92	92	60	60	60
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	0	0	0
Mvmt Flow	6	322	0	0	187	1	0	0	0	0	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	188	0	0	322	0	0	527	522	322	522	188	188
Stage 1	-	-	-	-	-	-	334	334	-	188	188	-
Stage 2	-	-	-	-	-	-	193	188	-	334	334	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.12	6.52	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.518	4.018	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1386	-	-	1244	-	-	462	459	719	468	462	859
Stage 1	-	-	-	-	-	-	680	643	-	818	748	-
Stage 2	-	-	-	-	-	-	809	745	-	684	647	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1386	-	-	1244	-	-	455	457	719	467	460	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	455	457	-	467	460	-
Stage 1	-	-	-	-	-	-	677	640	-	815	748	-
Stage 2	-	-	-	-	-	-	800	745	-	681	644	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	1386	-	-	1244	-	-	859
HCM Lane V/C Ratio	-	-	0.005	-	-	-	-	-	0.012
HCM Control Delay (s)	0	0	7.6	-	-	0	-	-	9.2
HCM Lane LOS	A	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	-	-	0	-	-	0	-	-	0

Queuing and Blocking Report

Existing Conditions

AM Peak Hour

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	258	194	195	264	246	160	65	78
Average Queue (ft)	95	33	93	76	99	62	14	22
95th Queue (ft)	210	121	169	185	205	123	47	59
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0	1			
Queuing Penalty (veh)				1	5			

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	23	49
Average Queue (ft)	1	8
95th Queue (ft)	11	33
Link Distance (ft)		353
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 6

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	258	89	207	188	107	195	241	258
Average Queue (ft)	97	16	105	83	44	83	74	82
95th Queue (ft)	194	56	178	156	93	158	192	202
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)	0						0	0
Queuing Penalty (veh)	0						0	0
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0				
Queuing Penalty (veh)				0				

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	30	48
Average Queue (ft)	1	9
95th Queue (ft)	11	35
Link Distance (ft)		353
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

Queuing and Blocking Report

Existing Conditions
PM Peak Hour

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	73	54	191	193	98	233	18	56
Average Queue (ft)	20	5	112	93	38	111	1	8
95th Queue (ft)	54	29	182	174	82	190	11	34
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0				
Queuing Penalty (veh)				0				

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	SB
Directions Served	L	LTR
Maximum Queue (ft)	24	29
Average Queue (ft)	2	4
95th Queue (ft)	13	21
Link Distance (ft)		353
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0













Appendix C

FUTURE TRAFFIC CONDITIONS

HCM 6th Signalized Intersection Summary

1: Cascade Road (Push-Button) & Hall Street

Future Conditions
AM Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	227	258	677	376	116	494	
Future Volume (veh/h)	227	258	677	376	116	494	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1885	1885	1856	1856	
Adj Flow Rate, veh/h	372	423	940	522	151	642	
Peak Hour Factor	0.61	0.61	0.72	0.72	0.77	0.77	
Percent Heavy Veh, %	4	4	1	1	3	3	
Cap, veh/h	395	478	1723	768	322	2245	
Arrive On Green	0.23	0.23	0.48	0.48	0.11	0.85	
Sat Flow, veh/h	1753	1560	3676	1596	1767	3618	
Grp Volume(v), veh/h	372	423	940	522	151	642	
Grp Sat Flow(s),veh/h/ln	1753	1560	1791	1596	1767	1763	
Q Serve(g_s), s	18.8	15.9	16.6	22.7	0.0	3.3	
Cycle Q Clear(g_c), s	18.8	15.9	16.6	22.7	0.0	3.3	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	395	478	1723	768	322	2245	
V/C Ratio(X)	0.94	0.88	0.55	0.68	0.47	0.29	
Avail Cap(c_a), veh/h	395	478	1723	768	322	2245	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.33	1.33	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.87	0.87	
Uniform Delay (d), s/veh	34.3	29.7	16.4	18.0	28.8	2.8	
Incr Delay (d2), s/veh	30.6	17.6	1.2	4.8	0.3	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	10.9	17.9	6.0	8.0	2.8	0.8	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	64.8	47.3	17.7	22.8	29.2	3.0	
LnGrp LOS	E	D	B	C	C	A	
Approach Vol, veh/h	795		1462			793	
Approach Delay, s/veh	55.5		19.5			8.0	
Approach LOS	E		B			A	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		26.0		64.0		14.0	50.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 20		* 57		* 7.3	* 43
Max Q Clear Time (g_c+I1), s		20.8		5.3		2.0	24.7
Green Ext Time (p_c), s		0.0		0.6		0.1	0.7
Intersection Summary							
HCM 6th Ctrl Delay			25.9				
HCM 6th LOS			C				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Future Conditions
AM Peak Hour

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↖	↗		↕	
Traffic Vol, veh/h	5	439	48	12	438	2	43	0	11	2	0	4
Future Vol, veh/h	5	439	48	12	438	2	43	0	11	2	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	65	65	65	60	60	60	92	92	92	60	60	60
Heavy Vehicles, %	3	3	3	5	5	5	2	2	2	17	17	17
Mvmt Flow	8	675	74	20	730	3	47	0	12	3	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	733	0	0	749	0	0	1503	1501	712	1506	1537	732
Stage 1	-	-	-	-	-	-	728	728	-	772	772	-
Stage 2	-	-	-	-	-	-	775	773	-	734	765	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.12	6.52	6.22	7.27	6.67	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.27	5.67	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.27	5.67	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.518	4.018	3.318	3.653	4.153	3.453
Pot Cap-1 Maneuver	867	-	-	846	-	-	100	122	432	92	107	397
Stage 1	-	-	-	-	-	-	415	429	-	370	388	-
Stage 2	-	-	-	-	-	-	391	409	-	389	391	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	867	-	-	846	-	-	95	116	432	86	102	397
Mov Cap-2 Maneuver	-	-	-	-	-	-	95	116	-	86	102	-
Stage 1	-	-	-	-	-	-	411	425	-	367	372	-
Stage 2	-	-	-	-	-	-	369	393	-	375	387	-













Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.2	62.6	26.2
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	95	432	867	-	-	846	-	-	180
HCM Lane V/C Ratio	0.492	0.028	0.009	-	-	0.024	-	-	0.056
HCM Control Delay (s)	75.1	13.6	9.2	-	-	9.4	0	-	26.2
HCM Lane LOS	F	B	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	2.1	0.1	0	-	-	0.1	-	-	0.2

HCM 6th Signalized Intersection Summary

1: Cascade Road (Push-Button) & Hall Street

Future Conditions
School Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	257	211	725	139	144	690	
Future Volume (veh/h)	257	211	725	139	144	690	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1870	1870	1870	1870	
Adj Flow Rate, veh/h	428	352	771	148	158	758	
Peak Hour Factor	0.60	0.60	0.94	0.94	0.91	0.91	
Percent Heavy Veh, %	3	3	2	2	2	2	
Cap, veh/h	487	692	1236	550	461	2085	
Arrive On Green	0.28	0.28	0.35	0.35	0.16	0.59	
Sat Flow, veh/h	1767	1572	3647	1583	1781	3647	
Grp Volume(v), veh/h	428	352	771	148	158	758	
Grp Sat Flow(s),veh/h/ln	1767	1572	1777	1583	1781	1777	
Q Serve(g_s), s	20.8	0.0	16.3	6.1	0.0	10.1	
Cycle Q Clear(g_c), s	20.8	0.0	16.3	6.1	0.0	10.1	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	487	692	1236	550	461	2085	
V/C Ratio(X)	0.88	0.51	0.62	0.27	0.34	0.36	
Avail Cap(c_a), veh/h	634	823	1236	550	461	2085	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.69	0.69	
Uniform Delay (d), s/veh	31.2	18.2	24.4	21.1	27.8	9.8	
Incr Delay (d2), s/veh	10.9	0.6	2.4	1.2	0.1	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	9.8	8.9	6.5	2.2	2.7	3.2	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	42.1	18.8	26.8	22.3	27.9	10.1	
LnGrp LOS	D	B	C	C	C	B	
Approach Vol, veh/h	780		919			916	
Approach Delay, s/veh	31.6		26.1			13.2	
Approach LOS	C		C			B	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		30.5		59.5		21.5	38.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 32		* 45		* 7.3	* 31
Max Q Clear Time (g_c+I1), s		22.8		12.1		2.0	18.3
Green Ext Time (p_c), s		2.0		0.7		0.1	0.6
Intersection Summary							
HCM 6th Ctrl Delay			23.2				
HCM 6th LOS			C				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Future Conditions
School Peak Hour

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↖	↗		↕	
Traffic Vol, veh/h	4	251	28	4	430	0	28	0	4	0	0	10
Future Vol, veh/h	4	251	28	4	430	0	28	0	4	0	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75								50			
Veh in Median Storage, #	-	0			0			0			0	
Grade, %	-	0			0			0			0	
Peak Hour Factor	76	76	76	60	60	60	92	92	92	63	63	63
Heavy Vehicles, %	1	1	1	5	5	5	2	2	2	10	10	10
Mvmt Flow	5	330	37	7	717	0	30	0	4	0	0	16













Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	717	0	0	367	0	0	1098	1090	349	1092	1108	717
Stage 1	-	-	-	-	-	-	359	359	-	731	731	-
Stage 2	-	-	-	-	-	-	739	731	-	361	377	-
Critical Hdwy	4.11	-	-	4.15	-	-	7.12	6.52	6.22	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.2	5.6	-
Follow-up Hdwy	2.209	-	-	2.245	-	-	3.518	4.018	3.318	3.59	4.09	3.39
Pot Cap-1 Maneuver	888	-	-	1175	-	-	190	215	694	185	203	416
Stage 1	-	-	-	-	-	-	659	627	-	401	416	-
Stage 2	-	-	-	-	-	-	409	427	-	641	602	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	888	-	-	1175	-	-	181	212	694	182	200	416
Mov Cap-2 Maneuver	-	-	-	-	-	-	181	212	-	182	200	-
Stage 1	-	-	-	-	-	-	655	623	-	399	412	-
Stage 2	-	-	-	-	-	-	389	423	-	633	598	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	26.6	14
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	181	694	888	-	-	1175	-	-	416
HCM Lane V/C Ratio	0.168	0.006	0.006	-	-	0.006	-	-	0.038
HCM Control Delay (s)	28.9	10.2	9.1	-	-	8.1	0	-	14
HCM Lane LOS	D	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	0	-	-	0	-	-	0.1

HCM 6th Signalized Intersection Summary
 1: Cascade Road (Push-Button) & Hall Street

Future Conditions
 PM Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	95	128	895	161	196	823	
Future Volume (veh/h)	95	128	895	161	196	823	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	
Adj Flow Rate, veh/h	109	147	1029	185	209	876	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.94	0.94	
Percent Heavy Veh, %	2	2	2	2	2	2	
Cap, veh/h	154	644	1432	637	705	2806	
Arrive On Green	0.09	0.09	0.40	0.40	0.42	1.00	
Sat Flow, veh/h	1781	1585	3647	1581	1781	3647	
Grp Volume(v), veh/h	109	147	1029	185	209	876	
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1581	1781	1777	
Q Serve(g_s), s	6.0	0.0	24.3	7.9	0.0	0.0	
Cycle Q Clear(g_c), s	6.0	0.0	24.3	7.9	0.0	0.0	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	154	644	1432	637	705	2806	
V/C Ratio(X)	0.71	0.23	0.72	0.29	0.30	0.31	
Avail Cap(c_a), veh/h	486	939	1432	637	705	2806	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.33	1.33	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.46	0.46	
Uniform Delay (d), s/veh	44.4	19.4	25.1	20.2	17.4	0.0	
Incr Delay (d2), s/veh	5.9	0.2	3.1	1.2	0.0	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	2.8	4.1	9.7	2.8	2.6	0.1	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	50.3	19.6	28.2	21.3	17.5	0.1	
LnGrp LOS	D	B	C	C	B	A	
Approach Vol, veh/h	256		1214			1085	
Approach Delay, s/veh	32.7		27.2			3.5	
Approach LOS	C		C			A	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		14.3		85.7		38.7	47.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 27		* 60		* 13	* 40
Max Q Clear Time (g_c+I1), s		8.0		2.0		2.0	26.3
Green Ext Time (p_c), s		0.7		0.8		0.2	0.9
Intersection Summary							
HCM 6th Ctrl Delay			17.7				
HCM 6th LOS			B				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

HCM 6th TWSC
2: Site Drive/Balsam Hill Avenue & Hall Street

Future Conditions
PM Peak Hour

Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Vol, veh/h	6	306	45	7	166	1	51	0	8	0	0	6
Future Vol, veh/h	6	306	45	7	166	1	51	0	8	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	50	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	89	89	89	92	92	92	60	60	60
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	0	0	0
Mvmt Flow	6	322	47	8	187	1	55	0	9	0	0	10

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	188	0	0	369	0	0	567	562	346	566	585	188
Stage 1	-	-	-	-	-	-	358	358	-	204	204	-
Stage 2	-	-	-	-	-	-	209	204	-	362	381	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.12	6.52	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.518	4.018	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1386	-	-	1195	-	-	434	436	697	438	426	859
Stage 1	-	-	-	-	-	-	660	628	-	803	737	-
Stage 2	-	-	-	-	-	-	793	733	-	661	617	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1386	-	-	1195	-	-	425	431	697	429	421	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	425	431	-	429	421	-
Stage 1	-	-	-	-	-	-	657	625	-	800	732	-
Stage 2	-	-	-	-	-	-	778	728	-	650	615	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	14.1	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	425	697	1386	-	-	1195	-	-	859
HCM Lane V/C Ratio	0.13	0.012	0.005	-	-	0.007	-	-	0.012
HCM Control Delay (s)	14.7	10.2	7.6	-	-	8	0	-	9.2
HCM Lane LOS	B	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.4	0	0	-	-	0	-	-	0

Queuing and Blocking Report

Future Conditions

AM Peak Hour

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	317	281	238	306	254	182	56	60
Average Queue (ft)	118	56	97	83	108	73	11	19
95th Queue (ft)	257	204	187	219	218	157	41	53
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)	0	3				0		
Queuing Penalty (veh)	1	8				0		
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0	2			
Queuing Penalty (veh)				1	11			

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	LTR	LT	R	LTR
Maximum Queue (ft)	28	28	199	122	39	58
Average Queue (ft)	2	0	20	33	9	8
95th Queue (ft)	13	3	166	87	33	38
Link Distance (ft)		344	1677	333		353
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75				50	
Storage Blk Time (%)		0		8		
Queuing Penalty (veh)		0		1		

Zone Summary

Zone wide Queuing Penalty: 22

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	299	114	207	209	114	193	260	262
Average Queue (ft)	101	18	106	89	44	92	76	85
95th Queue (ft)	215	67	182	170	98	172	204	214
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)	0							0
Queuing Penalty (veh)	1							0
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0				
Queuing Penalty (veh)				0				

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	WB	NB	NB	SB
Directions Served	L	LTR	LT	R	LTR
Maximum Queue (ft)	24	45	66	30	41
Average Queue (ft)	2	2	22	4	7
95th Queue (ft)	13	20	52	21	29
Link Distance (ft)		1677	333		353
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	75			50	
Storage Blk Time (%)			1		
Queuing Penalty (veh)			0		

Zone Summary

Zone wide Queuing Penalty: 1

Queuing and Blocking Report

Future Conditions
PM Peak Hour

Intersection: 1: Cascade Road (Push-Button) & Hall Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	90	59	220	211	150	224	35	53
Average Queue (ft)	32	6	115	102	46	126	2	8
95th Queue (ft)	73	30	187	181	104	209	16	34
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)					200			
Storage Blk Time (%)					0			
Queuing Penalty (veh)					1			

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street













Movement	EB	WB	NB	NB	SB
Directions Served	L	LTR	LT	R	LTR
Maximum Queue (ft)	18	37	58	44	28
Average Queue (ft)	1	2	27	9	6
95th Queue (ft)	8	15	54	33	26
Link Distance (ft)		1677	333		353
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	75			50	
Storage Blk Time (%)			1	0	
Queuing Penalty (veh)			0	0	

Zone Summary

Zone wide Queuing Penalty: 1

HCM 6th Signalized Intersection Summary
 1: Cascade Road (Push-Button) & Hall Street

Future Conditions - w/Improvement
 AM Peak Hour

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	227	258	677	376	116	494	
Future Volume (veh/h)	227	258	677	376	116	494	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1885	1885	1856	1856	
Adj Flow Rate, veh/h	372	423	940	522	151	642	
Peak Hour Factor	0.61	0.61	0.72	0.72	0.77	0.77	
Percent Heavy Veh, %	4	4	1	1	3	3	
Cap, veh/h	412	513	1644	732	334	2211	
Arrive On Green	0.23	0.23	0.46	0.46	0.12	0.83	
Sat Flow, veh/h	1753	1560	3676	1596	1767	3618	
Grp Volume(v), veh/h	372	423	940	522	151	642	
Grp Sat Flow(s),veh/h/ln	1753	1560	1791	1596	1767	1763	
Q Serve(g_s), s	18.5	14.0	17.3	23.7	0.0	3.6	
Cycle Q Clear(g_c), s	18.5	14.0	17.3	23.7	0.0	3.6	
Prop In Lane	1.00	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	412	513	1644	732	334	2211	
V/C Ratio(X)	0.90	0.82	0.57	0.71	0.45	0.29	
Avail Cap(c_a), veh/h	434	533	1644	732	334	2211	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.33	1.33	
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.87	0.87	
Uniform Delay (d), s/veh	33.4	27.8	17.9	19.6	29.3	3.1	
Incr Delay (d2), s/veh	21.2	9.9	1.5	5.8	0.3	0.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	9.9	16.4	6.4	8.6	2.7	0.9	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	54.7	37.7	19.3	25.4	29.6	3.4	
LnGrp LOS	D	D	B	C	C	A	
Approach Vol, veh/h	795		1462			793	
Approach Delay, s/veh	45.6		21.5			8.4	
Approach LOS	D		C			A	
Timer - Assigned Phs		2		4		7	8
Phs Duration (G+Y+Rc), s		26.8		63.2		15.2	48.0
Change Period (Y+Rc), s		* 5.7		* 6.7		* 6.7	* 6.7
Max Green Setting (Gmax), s		* 22		* 55		* 7.3	* 41
Max Q Clear Time (g_c+I1), s		20.5		5.6		2.0	25.7
Green Ext Time (p_c), s		0.6		0.6		0.1	0.7
Intersection Summary							
HCM 6th Ctrl Delay			24.4				
HCM 6th LOS			C				
Notes							
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.							

Queuing and Blocking Report

Future Conditions - w/Improvement

AM Peak Hour

Intersection: 1: Cascade Road (Push-Button) & Hall Street

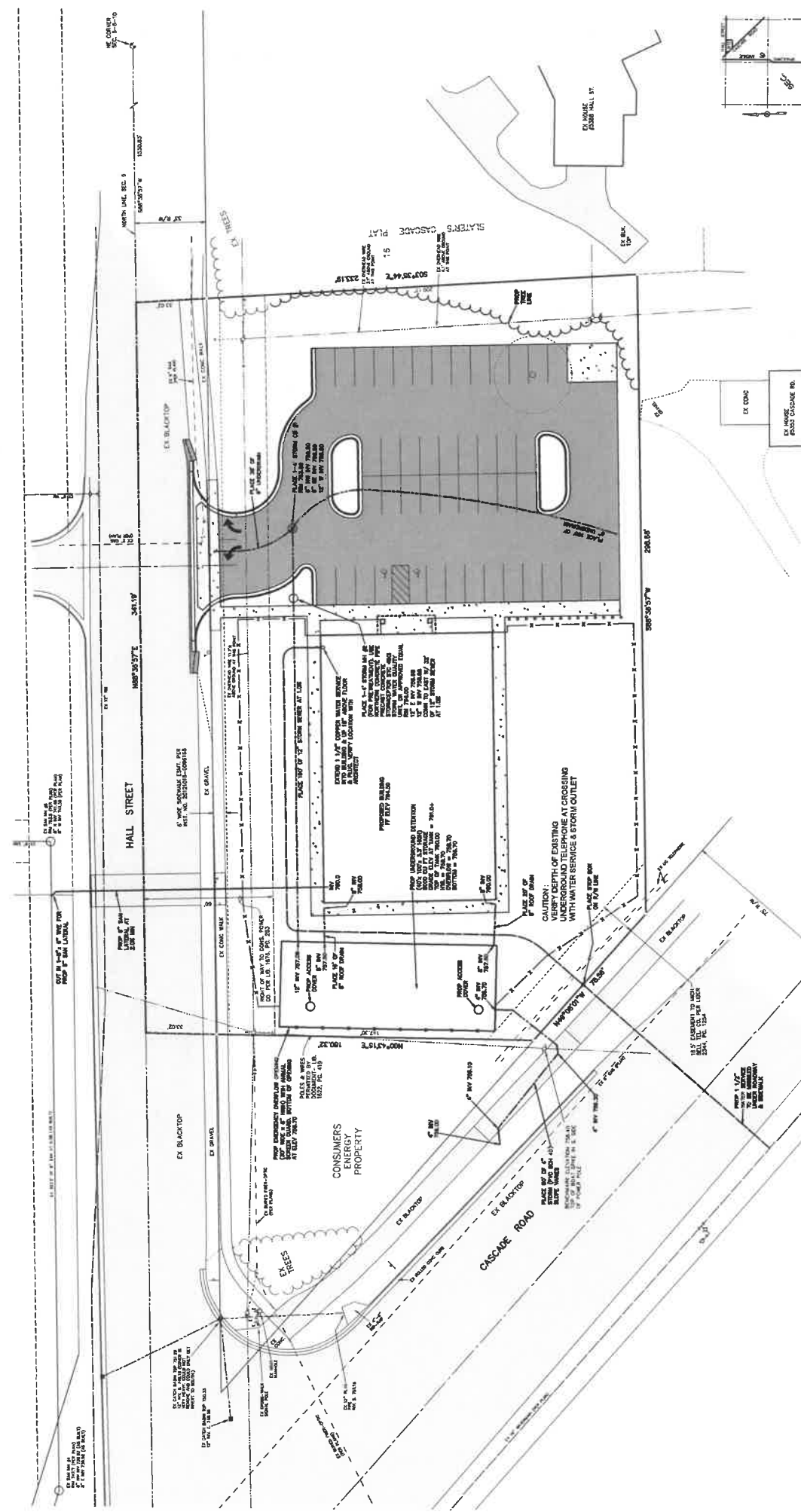
Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	314	206	232	315	260	153	57	66
Average Queue (ft)	99	41	95	74	114	72	13	20
95th Queue (ft)	224	178	184	193	219	136	43	55
Link Distance (ft)	344	344	2304	2304		309	309	309
Upstream Blk Time (%)	0	2						
Queuing Penalty (veh)	1	7						
Storage Bay Dist (ft)					200			
Storage Blk Time (%)				0	2			
Queuing Penalty (veh)				1	10			

Intersection: 2: Site Drive/Balsam Hill Avenue & Hall Street

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	LTR	LT	R	LTR
Maximum Queue (ft)	18	8	139	85	47	55
Average Queue (ft)	1	0	13	34	10	9
95th Queue (ft)	7	4	80	68	37	35
Link Distance (ft)		344	1677	333		353
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75				50	
Storage Blk Time (%)				7	0	
Queuing Penalty (veh)				1	0	

Zone Summary

Zone wide Queuing Penalty: 20



UTILITY PLAN
 THE LEARNING EXPERIENCE - 5333 CASCADE ROAD SE
 FOR CASADENA LLC
 1820 FERRELL STREET
 GRAND HAVEN, MICHIGAN 49417
 IN: PART OF THE NE 1/4 OF SECTION 16, T14N, R10W,
 CASCADE TOWNSHIP, KENT COUNTY, MICHIGAN.

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

LEGEND

- = 18" RIBBON ROADS
- = 18" RIBBON SHT
- = UTILITY POLE & CITY WRE
- = 6" WATER MAIN VALVE
- = 6" CATCH BASIN
- = 6" RIBBON ELECTRIC MARKER
- = TELEPHONE BOX
- = OVERHEAD WIRES

SCALE: 1"=20'

LOCATION MAP

GENERAL NOTES:

1. ALL 18" RIBBON ROADS SHALL HAVE C.I. NO. 2000 CASTING & 2" SHT.
2. ALL 18" RIBBON SHT SHALL HAVE C.I. NO. 1000 CASTING WITH 2" SHT.
3. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
4. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
5. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
6. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
7. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
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9. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.
10. ALL 18" RIBBON SHT SHALL BE 15' MIN. OR APPROVED EQUAL.

CONSUMERS PROPERTY

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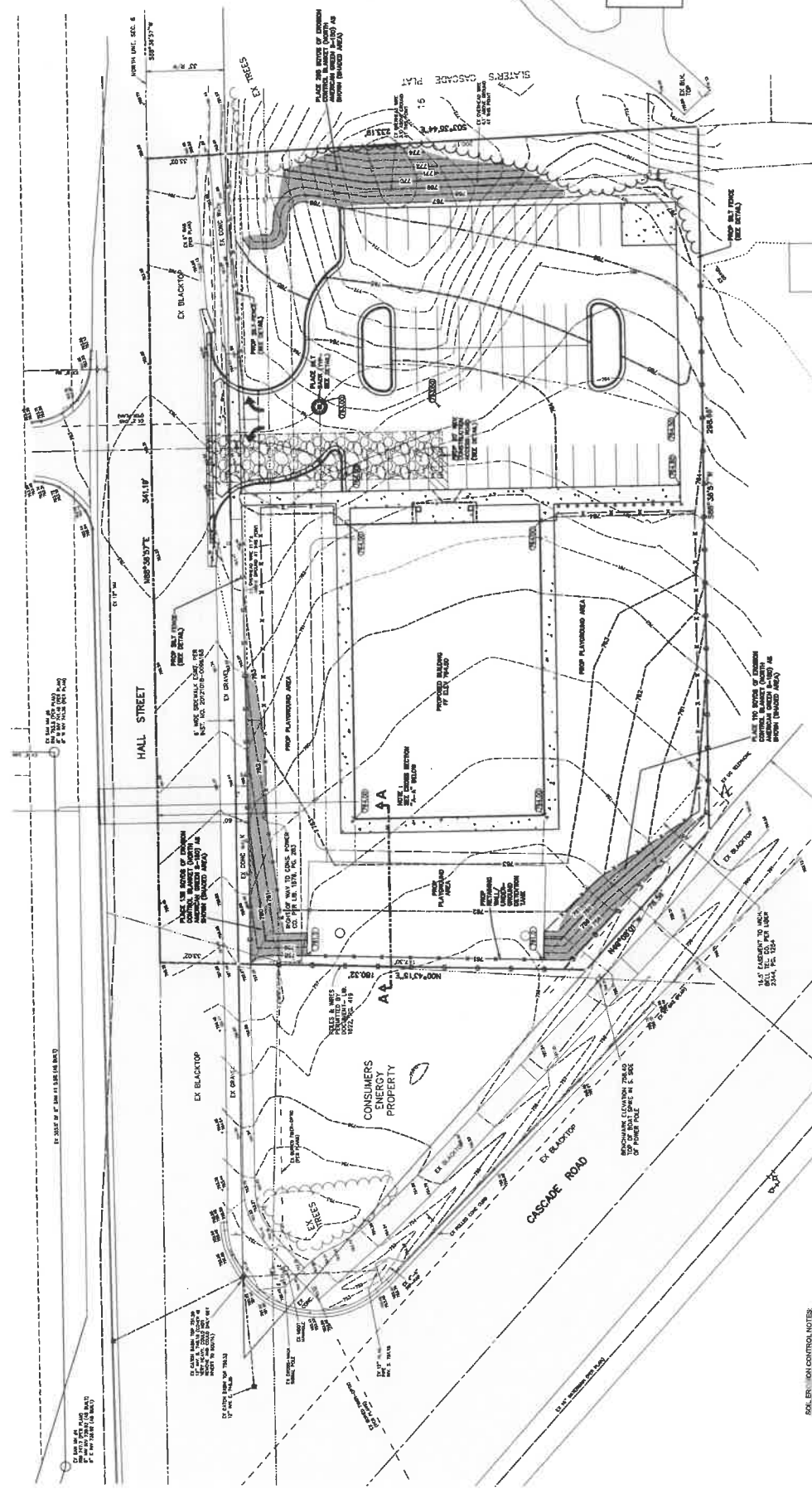
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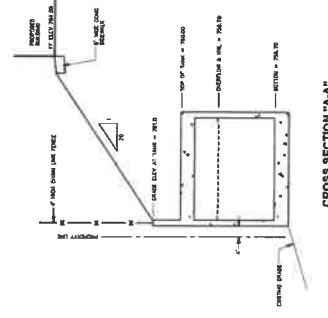
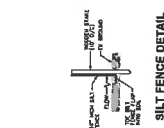
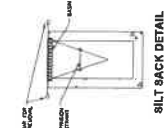
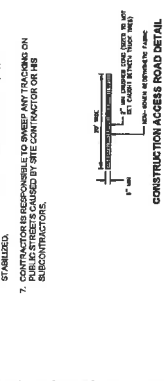
SCALE : 1"=20'
 1" CONTOUR INTERVAL
LEGEND
 ○ = HIGH STAKE FOUND
 ○ = HIGH STAKE SET
 ○ = UTILITY POLE & CRY WIRE
 ○ = SIGN
 ○ = CHAIN MARK
 ○ = MANHOLE
 ○ = BUMPED ELECTRIC MARKER
 ○ = TELEPHONE BOX
 ○ = TELEPHONE WIRE
 ○ = DITCH
 ○ = EXISTING SPOT ELEVATION
 ○ = PROPOSED SPOT ELEVATION
 ○ = EXISTING CONDUIT
 ○ = EXISTING CONDUIT



Know what's below
 Call before you dig.



- SOIL EROSION CONTROL NOTES:**
- TOTAL AREA OF DISTURBANCE - 1.6 ACRES
 - ALL SOIL EROSION CONTROL MEASURES ARE TO BE IN PLACE PRIOR TO THE START OF ANY GRADING.
 - INSPECT & MAINTAIN ALL TEMPORARY SOIL EROSION CONTROL MEASURES UNTIL ALL EXISTING SOIL EROSION CONTROL MEASURES HAVE BEEN PERMANENTLY STABILIZED.
 - ALL NON PAVED AREAS TO BE TOPGRADED (IF ANY) & SEEDED
 - PLACE SILT FENCE AS SHOWN ON PLAN & PER DETAIL.
 - PROTECT 1 NEW STORMWATER SILT SACKS AS SHOWN ON PLAN & PER DETAIL & REMOVE WHEN SITE IS STABILIZED.
 - CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL TRACKING ON PUBLIC STREET CAUSED BY SITE CONTRACTOR OR HIS SUBCONTRACTORS.



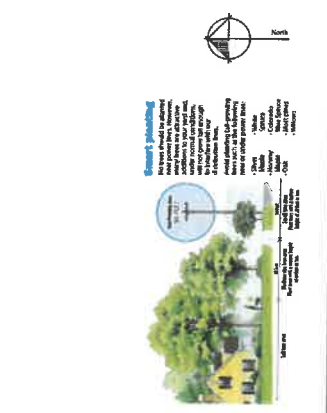
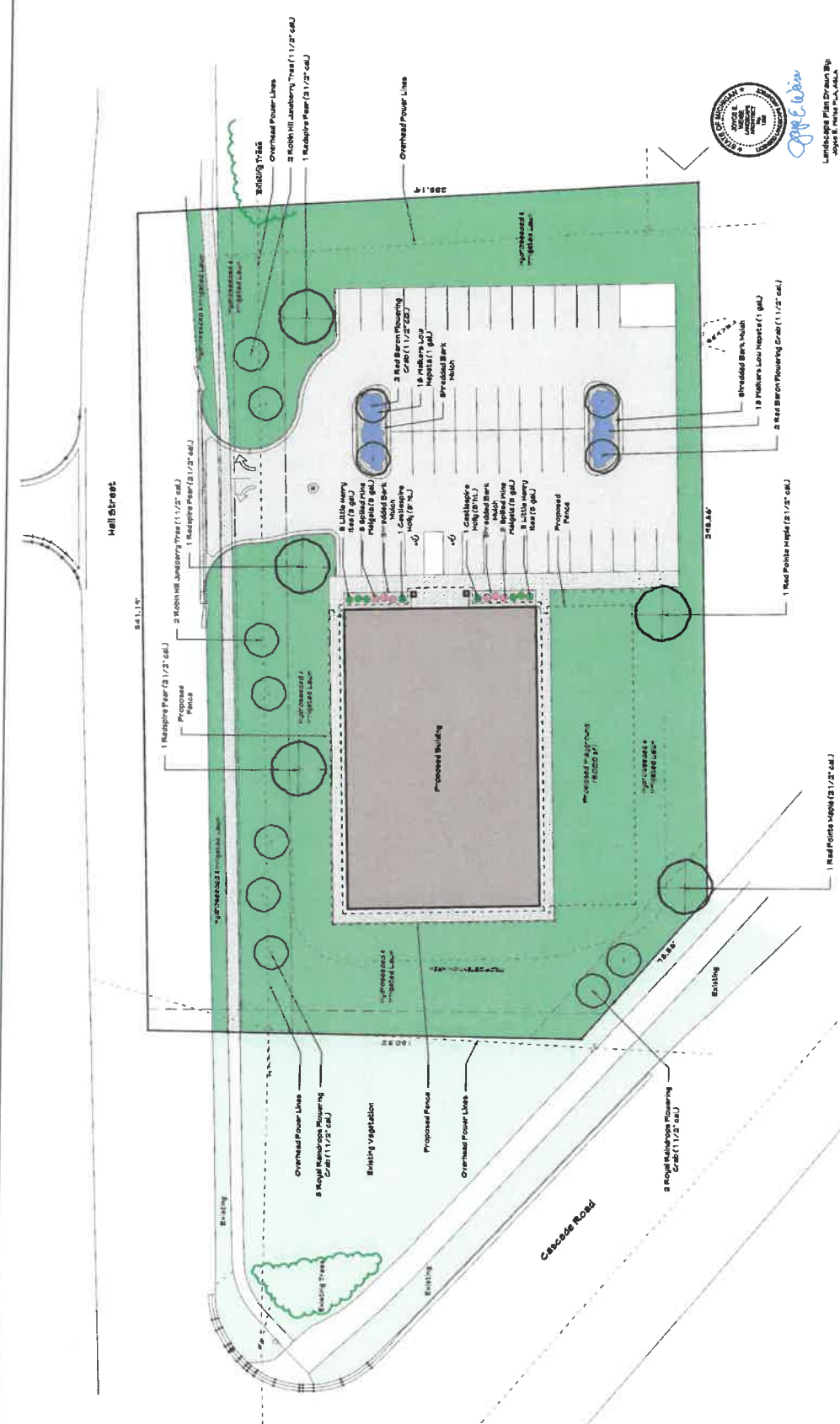
LOCATION MAP

GRADING & SOIL EROSION CONTROL PLAN
 THE LEARNING EXPERIENCE - 5333 CASCADE ROAD SE
 FOR: CASCADE TIG LLC
 1900 FERRIS STREET
 GRAND HAVEN, MICHIGAN 49417
 IN: PART OF THE 1/4 OF SECTION 8, T8N, R10W,
 CASCADE TOWNSHIP, KENT COUNTY, MICHIGAN.

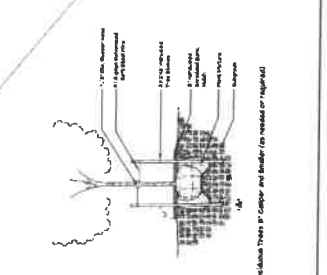
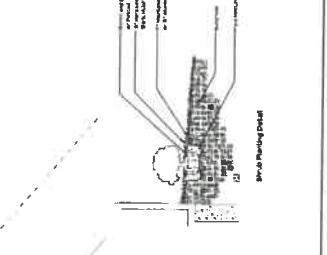
excel engineering, inc.
 charles - engineers - surveyors
 1900 FERRIS STREET
 GRAND HAVEN, MI 49417
 PH: 616.851.2500
 WWW.EXCEL-ENGINEERING.COM

PROJECT NO.:	11-11-11	SHEET NO.:	3 OF 3
DRAWN BY:	JL	CHECKED BY:	JL
DATE:	11/11/11	SCALE:	AS SHOWN

NOTES:
 1. All drawings shall be read in conjunction with the project description and specifications.
 2. The contractor shall be responsible for obtaining all necessary permits and approvals.
 3. The contractor shall be responsible for protecting all existing utilities and structures.
 4. The contractor shall be responsible for maintaining access to all adjacent properties.
 5. The contractor shall be responsible for maintaining all existing trees and structures.
 6. The contractor shall be responsible for maintaining all existing utilities and structures.
 7. The contractor shall be responsible for maintaining all existing trees and structures.
 8. The contractor shall be responsible for maintaining all existing utilities and structures.



811
 Call before you dig.
 Michigan
 Call before you dig.
 Michigan
 Call before you dig.
 Michigan



Planting Detail
 Planting Detail
 Planting Detail

MEMORANDUM

To: Steve Peterson
From: Doug Stalsonburg
RE: The Learning Experience
Date: July 3, 2019

Here is a PDF of our site plans with the following revisions since our June 24 Site Plan Review Committee meeting.

1. Adjusted building and parking lot location slightly in order to maximize the playground area. The playground size shown will limit the student count to 142.
2. Water service is now shown off Cascade Road as required by joint meeting with Ada and Cascade water/sewer departments.
3. Sidewalk connection to Hall Street sidewalk added.
4. More detail added to plan for stormwater pretreatment and detention.
5. Outlet relocated to Cascade Road ditch as suggested by FTCH and approved by KCRC.
6. Two manholes added to detention tank for maintenance access.

I have also put 1 copy of the plans in the mail along with drainage calculations to Nate. Lighting, Landscaping, and building elevations will be updated early next week and provided to you.

cc: Byrne Harmon
Dave Lucas
Nate Torrey

STAFF REPORT

TO: Cascade Charter Township Planning Commission
FROM: Steve Peterson, Community Development Director
REPORT DATE: June 28, 2019
MEETING DATE: July 15, 2019
CASE: #17-3392/ Freedom Reins Farm (aka Hickory Ridge)

GENERAL INFORMATION

- A. Applicant: Jim Morgan RJM Design
1971 East Beltline Ave
Suite 217
Grand Rapids MI 49525
Telephone: 336-6071
Email: jmorgan@rjm-design.com
- B. Status of Applicant: designer for owner
- C. General Location: The property is located on the north side of 52nd st just east of Whitneyville Ave.
- D. Requested Action: develop into 12 detached single-family site condominium project.
- E. Existing Zoning on Subject Parcels: ARC
- F. Zoning on Adjoining Parcels: ARC
- G. Parcel Size: Approximately 43 acres
- H. Existing Land Use on Subject Parcel: Vacant
- I. Adjacent Area Land Uses:
- | | | |
|-------|---|-------------|
| North | - | I-96 |
| East | - | Residential |
| South | - | Residential |
| West | - | Residential |

STAFF ANALYSIS

1. The applicant is requesting Final Preliminary approval. The development would allow for a new site condominium subdivision for 12 single family detached homes on a new private road.
2. You reviewed and approved the tentative preliminary plan in March of this year. The developer has now submitted all of the required materials to proceed to final preliminary approval. Essentially, that entails of the other government approval.
3. A site condominium subdivision that is not asking for exceptions does not require a public hearing. The development will not be seeking any deviations from our subdivision ordinance.
4. The property is zoned ARC and is Master planned Suburban Residential, which is essentially an extension of the residential zoning district.
5. The area is not served by water and sewer. The KCHD has approved the plans.
6. The KCRC has issued a drive permit for access to 52nd St. The KCRC has also already issued the SESC permit.
7. There are no projects in the Capital Improvement Plan that would be activated as a result of this project.
8. The applicant has chosen the "50% private open space" method for determining minimum lot size. This method requires a minimum lot size of 50,000 sq.ft. The open space provided is calculated after removing the non-buildable portion of the property.
9. The lots range in size from 50,042 to almost 65,661 sq ft. with an average lot size of 50,707 sq ft.
10. This plan meets our subdivision ordinance for density and lot size requirements.
11. For this stage you are again providing a recommendation to the Township Board for their consideration.
12. As with all of our residential developments, the developer has installed an airport recognition statement in the deed restrictions.

13. The applicant has indicated the type of light poles and street trees on the plan.
14. The subdivision is located outside the utility service area.
15. The applicant has submitted the master deed and bylaws which have been reviewed to ensure no inconsistency with township ordinance.
16. The Township Engineer has reviewed and approved the plans. A storm water maintenance agreement will be required.
17. Final Preliminary Approval essentially approves the project and allows the developer 2 years to get it started. Such tentative approval may be extended if applied for by the subdivider and granted by the Township Board in writing.

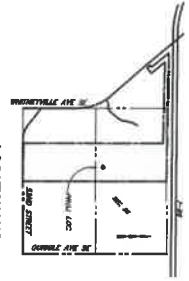
STAFF RECOMMENDATION

Staff believes this project meets the requirements for Final preliminary approval of our subdivision ordinance is consistent with the Master Plan.

If you approve the plan, the development will go before the Township Board for Final Preliminary approval. Once approved by the Township Board.

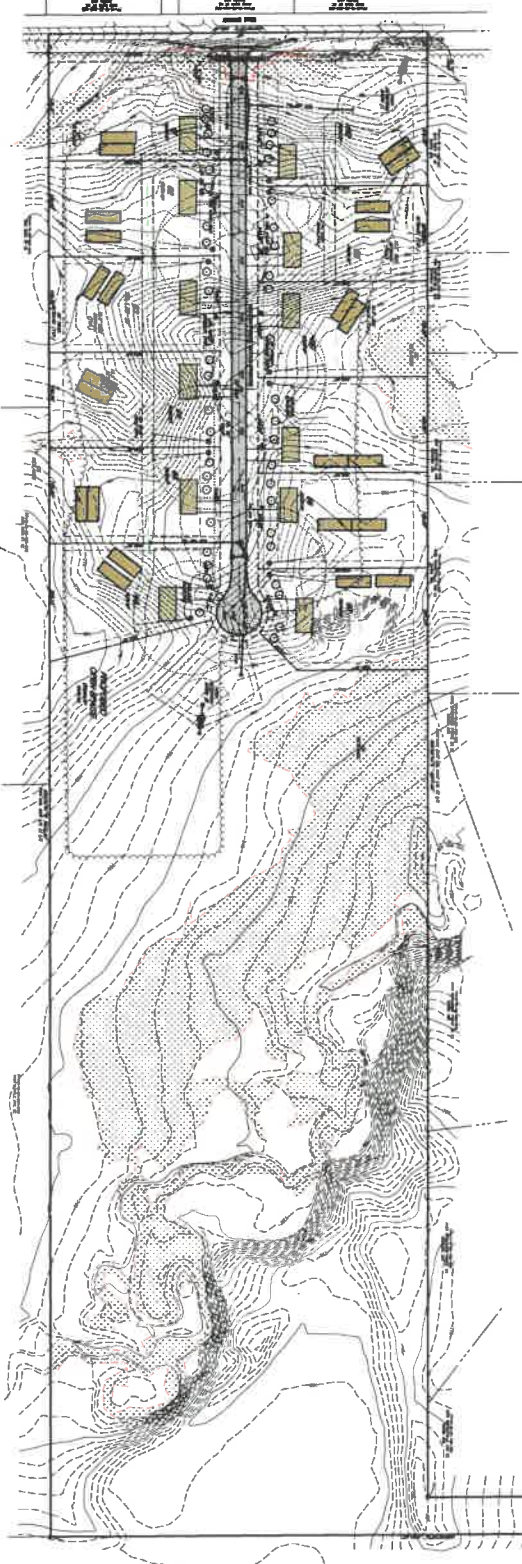
811 - CALL BEFORE YOU DIG

PROPOSED 12-UNIT RESIDENTIAL SITE CONDOMINIUM
PRELIMINARY SITE PLAN
SEC. 26, T6N, R10W, CASCADE CHTR. TWP.



REGISTRATION NO. 1 E.L. = 23432 NAWD08
 NS 26 260828

- LEGEND**
- 1. EXISTING CONTOUR LINE
 - 2. EXISTING BR. PAVEMENT
 - 3. EXISTING CONC. PAVEMENT
 - 4. EXISTING CONC. WALK
 - 5. EXISTING STORM SEWER
 - 6. EXISTING SANITARY SEWER
 - 7. EXISTING WATERMAIN
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 - 100. EXISTING WATERSHED



CLIENT:
FREEDOM FENS FARMS, LLC
ATTN: DOUG LEE
9633 52ND STREET SE
ADA, MI 49801

OVERALL SITE PLAN
HICKORY PONTE WOODS
 PART OF SECTION 26, T6N, R10W
 CASCADE CHARTER TOWNSHIP, KENT COUNTY, MI

Reardon & Associates
 ENGINEERS AND ARCHITECTS

2020 PLAINFIELD AVE. SE
 GRAND RAPIDS, MI 49503

TEL: (616) 391-7200
 FAX: (616) 391-4822

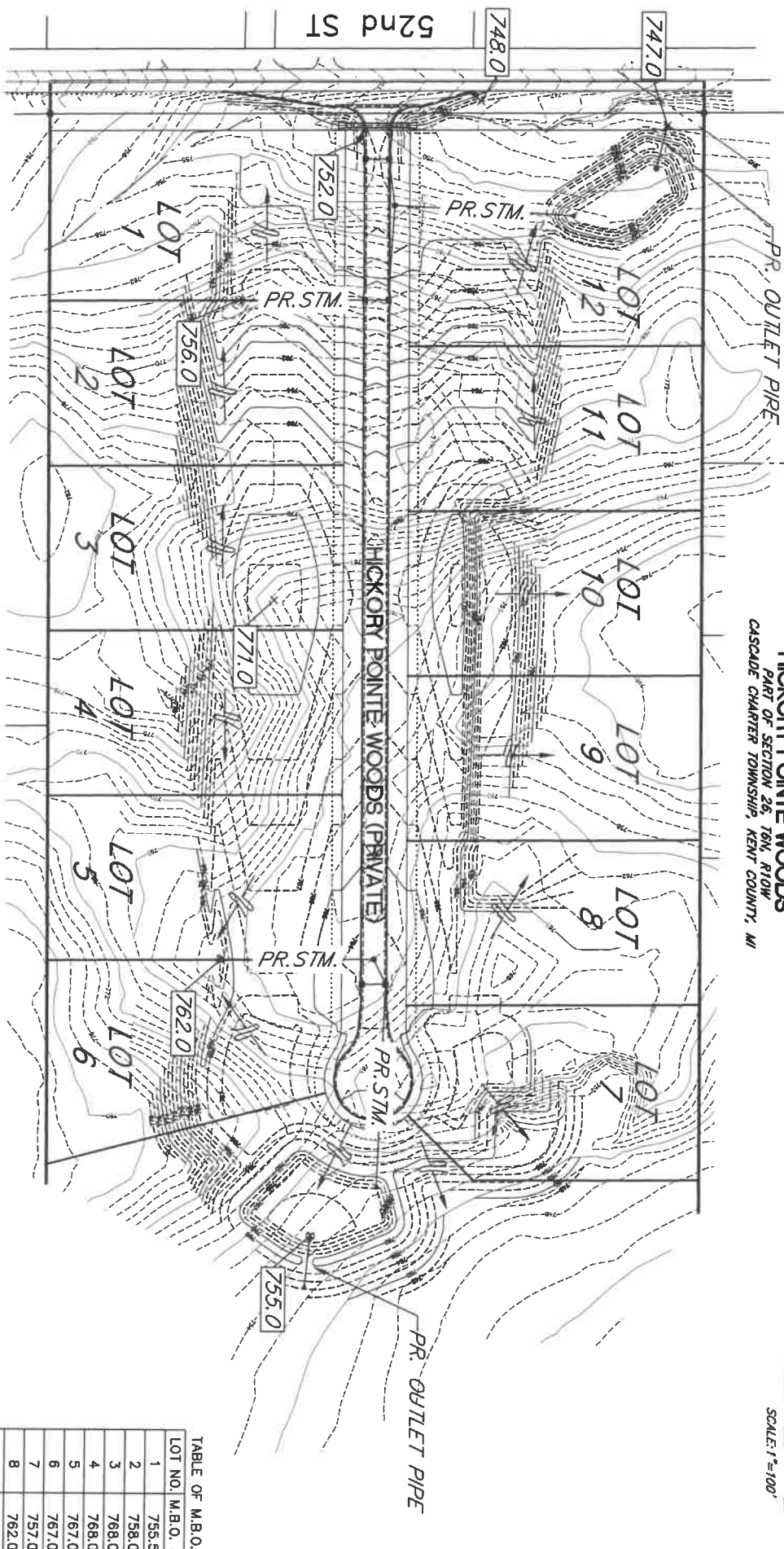
DATE	REVISION
APPROVED BY:	
DATE: SEPT. 12, 2016	
REVISIONS SEPT. 12, 2016: ISSUED FOR TWP. REV.	
DEC. 29, 2016: FOR THE APPROVAL	
02/26/17: REMISED PER TWP. LETTER 02/16/17	

SHEET
C2.1

BLOCK GRADING PLAN

"HICKORY POINTE WOODS"
 PART OF SECTION 26, T6N, R10W
 CASCADE CHARTER TOWNSHIP, KENT COUNTY, MI

SCALE: 1" = 100'



- LEGEND**
- IRON STAKE - SET
 - IRON FOUND
 - WOOD STAKE
 - RECORDED DIMENSION
 - PLATTED DIMENSION
 - DEED DIMENSION
 - MEASURED DIMENSION
 - SURVEILANCE
 - FENCE LINE
- LEGEND**
- EXIST. CONTOUR
 - PROP. CONTOUR
 - DIRECTION OF SURFACE DRAINAGE
 - M.B.O. = MINIMUM BUILDING OPENING ELEV.
 - 755.0 SPOT ELEVATION

Roosten & Associates
 SURVEYING AND ENGINEERING

5005 PLANTERS AVE. NE
 GRAND RAPIDS, MI 49503
 TEL: (616) 391-1222
 FAX: (616) 391-1222

BLOCK GRADING PLAN
 IN
 S26, T6N, R10W, CASCADE TWP.
 KENT COUNTY, MICHIGAN

PREPARED FOR:
 FREEDOM REINS FARMS, LLC
 ATTN: DOUG LEE
 9613 52ND STREET SE
 ADA, MI 49301

SHEET 1 of 1
 DATE:
 05/30/19

171386-BLOCKGRD.dwg

TABLE OF M.B.O.'S

LOT NO.	M.B.O. EL.
1	755.5
2	758.0
3	768.0
4	768.0
5	767.0
6	767.0
7	757.0
8	762.0
9	758.0
10	758.0
11	761.0
12	755.0

KENT COUNTY HEALTH DEPARTMENT

ENVIRONMENTAL HEALTH
700 Fuller Avenue N.E.
Grand Rapids, Michigan 49503-1918
Phone: 616-632-6900
Fax: 616-632-6892
Email: KCEHmail@kentcountymi.gov
Website: www.accesskent.com



Adam London, RS, MPA
Administrative Health Officer

January 15, 2019

Doug Lee
8585 52nd St. SE
Ada, MI 49301

RE: Proposed Hickory Pointe Woods Site Condominium, Units 1-12
Single Family Residential
Cascade Charter Township

Dear Mr. Lee:

The Environmental Health Division of the Kent County Health Department (KCHD) has completed its review of the submittal for the Proposed Hickory Pointe Site Condominium. This review was conducted in accordance with Michigan Land Division Act PA 288 of 1967 Section 560.105.

Prior to issuing a final approval, we request the following statements be incorporated into the Master Deed and Bylaws.

In addition, upon completion of roads, utilities, and grading, this Department may request additional soil evaluations to determine that site conditions still exist after construction activities. Failure to maintain the site as approved will result in modification or reversal of this preliminary approval.

WASTEWATER DISPOSAL SYSTEMS

- KCHD may require site evaluations prior to issuing septic system permits when the proposed initial and/or replacement wastewater disposal system is outside of those areas already approved and on file with KCHD
- With the application to obtain a permit from KCHD for a septic tank and disposal areas, the applicant will submit to KCHD a lot development plan drawn to scale that will locate the dwelling, drives and right-of-ways, utilities, unit boundary lines, building site and proposed septic location. As part of the application, KCHD may require a topographical map showing existing and proposed contours. Contour intervals shall not exceed two (2) feet.
- Utilities, buildings, drives, or other structures that may interfere with the installation and operation of the on-site sewage disposal system shall not be permitted within the designated initial and replacement sewage disposal areas as indicated on the permit issued by KCHD.
- Site modification in the area of the initial and replacement wastewater disposal systems may be required by KCHD. Site modification would typically include soil removal and backfill with approved washed sand (2NS) otherwise known as "cut-down" type sewage disposal systems.
- Designated initial and replacement sewage disposal areas shall not be located within any drainage way and must be isolated a minimum of 100 feet from any perennial surface water drains, 50 feet from any water well, 50 feet from intermittent surface water, 25 feet from foundation walls containing subsurface drains, 25 feet from storm sewer catch basins, 10 feet from solid storm sewers and open drains, 10' from unit boundaries, and outside any easement or right-of-way.

Continued

WATER SYSTEMS

- Individual water supply systems will be permitted on a unit solely to provide water for domestic consumption at the residence, for irrigation purposes, swimming pools, or other nondomestic uses on the unit.
- A permit from KCHD is required prior to the installation or major repair of any on-site water supply. As part of the application, KCHD may require a site plan of the property upon which the water supply is or will be located. Required features may include property boundaries, elevations, buildings, sewage disposal system, surface water bodies, wells, underground fuel storage tanks, chemical storage areas, driveways, and other significant details.
- All wells installed for private water supply must penetrate an adequate protective continuous clay overburden of at least ten (10) feet. This overburden is to be located greater than twenty-five (25) feet below the ground surface. A test well on Unit 3, drilled to a depth of 135 feet, found a suitable clay barrier with adequate water quality and quantity.
- All wells are to be grouted in accordance with the Michigan Department of Environmental Quality water well grouting requirements.
- Except as otherwise approved by KCHD, all wells must be located on the unit being served, horizontally isolated 50 feet from sources of contamination including any component of the septic system, septic tanks, and sewage lift vaults. All wells must be 10 feet from property boundaries, buried sewers, easements, right-of-way, and building drains.
- It will be the responsibility of the co-owner to install and maintain the water supply system in good order and working condition and comply with all applicable governmental regulations and neither the developer nor the association will have any responsibility with respect to the same.
- Due to elevated levels of hardness and iron, water treatment systems may be necessary. Discharge of said water treatment system backwash cannot be directed into the building sewer, septic tanks, or disposal areas. The owner of each unit shall make provisions for a separate drainage system to properly dispose of water treatment system backwash.

KCHD requests that this portion (well/septic language) of the document not be recorded until approved and stamped by this office. Upon receipt of the approved, recorded document (well/septic language), final Health Department approval can be granted. If you have any questions, please contact me at 616-204-2375.

Sincerely,



Jason E. Buck, REHS
Sanitarian Specialist
Environmental Health Division

cc: Steve Peterson, Cascade Charter Township Planner
Kendall Beck, P.E., Roosien and Associates

February 27, 2019
Project No. 170168

Mr. Steve Peterson
Cascade Charter Township
2865 Thornhills Avenue, SE
Grand Rapids, MI 49546-7192

Re: Freedom Farms
Site Plan Review

Dear Steve:

We have reviewed the site plan for Freedom Farms, prepared by Roosien & Associates. The current site plan and basis of this review are dated October 29, 2018. The proposed project is a new private road, lot split, and associated stormwater improvements. The site is located in the Thornapple River watershed, sub-drainage district Cascade Southeast

Stormwater and Drainage

Flood Control

The Cascade Charter Township Storm Water Ordinance (SWO), Section 1.04, states the Ordinance shall apply to all development that requires any permit for work which will alter the stormwater drainage characteristics of the development site. The site is located in Stormwater Management Zone A, which requires retention of the 100-year storm event and infiltration to the greatest extent possible. Where soil conditions or other factors do not allow for adequate infiltration, the SWO requires detention of the 25-year storm event with a controlled release and a direct connection for stormwater runoff for the 100-year storm event, or detention of the 100-year storm event. The SWO also requires the first 0.5-inch of stormwater runoff be detained and released over a 24-hour period (Water Quality Control) and the 2-year storm event release rate be limited to 0.05 cfs/acre (Bank Erosion Control).

The applicant provided the results of a geotechnical investigation including soil borings and infiltration tests. The soil borings indicate the existing soils at the proposed detention basin locations are predominately heavy with loamy sand and clay present. Four double-ring infiltrometer tests were performed with results ranging from 0.4 to 8.3 inches/hour. It was determined the existing soils are not favorable for stormwater infiltration.

Therefore, the stormwater detention basins were designed with a controlled release for the 100-year storm event. Two detention basins are proposed for the site, one at the south end of the site and the other at the north end. Stormwater runoff from the development will be collected by a series of catch basins and conveyed by storm pipe to the detention basins. The proposed stormwater management design is in accordance with the SWO.

Water Quality Control and Bank Erosion Control

The SWO requires the first 0.5 inch of stormwater runoff be detained and infiltrated where conditions permit, or released over a 24-hour period, and the 2-year storm event release rate be limited to 0.05 cfs/acre. The proposed detention basins include an outlet control structure with three separate orifice openings, one each for the water quality control, bank erosion control, and flood control discharges. The applicant provided design details and stormwater calculations indicating this SWO requirement has been met.

Stormwater Runoff

The applicant provided stormwater calculations to size the proposed detention basins. All stormwater runoff from the private street and developed site will discharge to the detention basin. Therefore, the site will not see an increase in rate of stormwater leaving the site.

Drainage Plan

The applicant has submitted drawings, calculations, and additional documentation as required in the SWO Section 2.03, Drainage Plan. Please refer to the attached checklist for items and comments on each item. Please note a maintenance agreement is required before construction begins. The agreement should be submitted to the Township for review. The maintenance agreement and plan should include at a minimum removal of accumulated sediment from catch basins, detention basins, and outlet structures as well as landscape maintenance of the detention basins.

Private Street Requirements

The proposed private street is required to meet the design standards outlined in the Township Ordinance for private streets. FTCH reviewed the proposed private road for right-of-way width, road and travel lane width, road grade, pavement cross section including aggregate base and subbase design, stormwater drainage, etc. The proposed private road was found to meet the requirements outlined in the Township Ordinance for private streets.

Utilities

The residential lots will have onsite water wells and septic systems. A permit from the Kent County Health Department will be required prior to construction of the houses taking place. Construction of the private road may take place without the health department permit.

Soil Erosion and Sedimentation Control

Soil Erosion and Sedimentation Control (SESC) measures are provided on the plan drawings. The applicant has included silt fence along the limits of disturbance, silt sacks in catch basins, and erosion control matting on disturbed slopes. SESC falls under the review and approval of the Kent County Road Commission and a permit is required before construction can begin. The SESC measures indicated on the drawings appear appropriate given the expected work.

Summary

The proposed stormwater management design meets the Township SWO requirements for new developments. The applicant will need to apply for and obtain an SESC permit prior to road construction. A permit from the Kent County Health Department will also be required for the onsite water wells and septic systems prior to house construction. We recommend approval of the site plan from an engineering standpoint. If you have any questions or require additional information, please contact me at 616.464.3786 or nrtorrey@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.



Nathan R. Torrey, PE

jlk

Attachment

By email

cc: Michael L. Berrevoets, PE – FTCH



Cascade Charter Township

Storm Water Ordinance, Ordinance 7 of 2002, as amended by Ordinance No. 2 of 2008, 5/14/2008

Reviewing Engineer Comments are Italicized

OK – Received and Acceptable

NA – Not Applicable

NR – Not Received, Needs Follow-up, See Comments

Freedom Farms

Drainage Plan Checklist

- OK (1) Location of the development site and water bodies that will receive storm water runoff
Stormwater runoff from the new private street and developed area will be collected in a series of catch basins and discharged to one of two detention basins.

- OK (2) Existing and proposed topography of the development site, including the alignment and boundary of the natural drainage courses, with contours having a maximum interval of one foot (using USGS datum). The information shall be superimposed on the pertinent Kent County soil map
Existing and proposed contours for the private drive have been provided.

- OK (3) Development tributary area to each point of discharge from the development
Stormwater calculations and tributary areas were provided by the applicant.

- OK (4) Calculations for the final peak discharge rates
The applicant provided calculations for the design of the onsite storm sewer system and detention basins.

- OK (5) Calculations for any facility or structure size and configuration
The applicant provided calculations for the design of the onsite storm sewer system and detention basins.

- OK (6) Drawing showing all proposed storm water runoff facilities with existing and final grades
The applicant provided a utility plan showing all proposed stormwater runoff facilities.

- OK (7) The sizes and locations of upstream and downstream culverts serving the major drainage routes flowing into and out of the development site. Any significant off-site and on-site drainage outlet restrictions other than culverts should be noted on the drainage map
There are no culverts or significant offsite flows indicated on the site plan.

- OK (8) An implementation plan for construction and inspection of all storm water runoff facilities necessary to the overall drainage plan, including a schedule of the estimated dates of completing construction of the storm water runoff facilities shown on the plan and an identification of the proposed inspection procedures to ensure that the storm water runoff facilities are constructed in accordance with the approved drainage plan
A construction schedule was included on the plans.

- OK (9) Plan to ensure the effective control of construction site storm water runoff and sediment track-out onto roadways
The SESC measures shown on the plan appear appropriate given the expected work. SESC falls under the review and approval of the KCRC and a permit is needed before construction can begin.



- OK (10) Drawings, profiles, and specifications for the construction of the storm water runoff facilities reasonably necessary to ensure that storm water runoff will be drained, stored, or otherwise controlled in accordance with this ordinance
The applicant provided calculations and design details for construction of the onsite storm sewer system.
- NR (11) Maintenance agreement, in form and substance acceptable to the Township, for ensuring maintenance of any privately owned storm water runoff facilities. The maintenance agreement shall include the developer's written commitment to provide routine, emergency, and long-term maintenance of the facilities and, in the event that the facilities are not maintained in accordance with the approved drainage plan, the agreement shall authorize the Township to maintain any on-site storm water runoff facility as reasonably necessary, at the developer's expense
Maintenance agreement was not provided and is required.
- OK (12) Name of the engineering firm and the registered professional engineer that designed the drainage plan and that will inspect final construction of the storm water runoff facilities
- NA (13) All design information must be compatible for conversion to Grand Valley Regional Geographic Information System (REGIS)
This is a privately owned system and will not be uploaded to REGIS.
- OK (14) Other information necessary for the Township to verify that the drainage plan complies with the Township's design and performance standards for drains and storm water management systems

Memorandum

To: Cascade Charter Township Planning Commission
From: Steve Peterson, Community Development Director
Subject: #19-3533/Meijer/Romano PUD Amendments
Meeting date: July 15, 2019

At the Public hearing on July 1, 2019 the Planning Commission awarded preliminary approval of the site plan and instructed staff to write the PUD amendment for the project.

The PUD Ordinance has been reviewed by the applicant and addresses all of their comments as well as the approval from July 1. I recommend that you forward a positive recommendation to the Township Board for approval of the PUD amendment and site plan.

The Township Board will hold an additional public hearing to consider your recommendation.

Attachments: Proposed PUD Ordinance
Site Plan

CASCADE CHARTER TOWNSHIP
Ordinance # of 2019
AN ORDINANCE TO AMEND ORDINANCE #11 OF 2002, THE
MEIJER/ROMANO
PLANNED UNIT DEVELOPMENT PROJECT

CASCADE CHARTER TOWNSHIP ORDAINS:

Section 1. Amendment to the Meijer/Romano PUD Ordinance

Section IV. Purpose

This section will be amended to read as follows:

The Project occupies approximately 36.92 acres of land that currently contains a Meijer retail store, Meijer Gas Station, a fast food restaurant with drive thru service several retail stores, hotel and automotive service use. The Planned Unit Development technique has been chosen by the Developer to provide more control over the Project's aesthetics and appearance.

The regulations contained herein are established to define the procedures necessary to insure high quality development of the Project. Additionally, they are designed to achieve integration of this development with adjacent land uses.

Section VI. Permitted uses

This section will be amended to add the following use:

3. A 4,988 sq ft fast food restaurant with drive-thru service

Section VII. Design Guidelines, Requirements and Limitations.

This section shall be amended to read as follows:

B. Parking-

Per schedule 19-D of the Zoning Ordinance as amended.

1. the fast food restaurant shall be allowed 74 parking spaces.

C. Setbacks -

1. Minimum for Gas station and Fast Food Restaurant. Canopy set back shall match Meijer Gas Station Canopy set back.

D. Signs

A. The following signs are permitted for the fast food restaurant site

1. One (1) freestanding sign, with a maximum height of 30 feet and a total sign area equal to two (2) square feet for each five (5) feet of lot frontage as measured at the building setback line. In no event shall the sign exceed one hundred twenty-five

(125) square feet in sign area. Up to fifty (50) percent of such a sign may be a changeable copy sign.

Wall signage or marquee signage per building, not to exceed one-hundred (100) square feet in total sign area.

2. Window signs and displays, provided permanent window sign(s) shall not cover more than twenty-five (25) percent of the total window surface and temporary window signs shall not cover more than fifteen (15) percent of the total window surface.
3. One (1) directory wall sign per building, not to exceed twenty (20) square feet in total sign area.
4. Directional signs up to ten (10) square feet in sign area. Each zone lot or development shall not have more than two (2) directional signs.
5. One (1) incidental sign not to exceed twelve (12) square feet.
6. Flags of any nation, state, or entity provided they do not exceed thirty-two (32) square feet in area. A zone lot will be limited to three (3) flags. Flagpole height may not exceed the height restrictions for the zoning district as found in the Zoning Ordinance.

Section 2. Effective Date

This PUD Ordinance amendment shall become effective upon publication in the Grand Rapids Press, a newspaper of general circulation within Cascade Charter Township.

Section 3. Effect

The Cascade Charter Township Zoning Ordinance, as amended, and the remainder of Ordinance #11 of 2002, as amended, except as otherwise expressly amended herein, shall remain in full force and effect.

The foregoing Ordinance amendment was offered by Board Member McDonald supported by Board Member Shipley. The roll call vote being as follows:

YEAS:

NAYS:

ABSENT:

ABSTAIN:

ORDINANCE DECLARED ADOPTED.

Sue Slater
Cascade Charter Township Clerk

CERTIFICATION

I hereby certify the foregoing to be a true copy of an Ordinance adopted at a Regular Meeting of the Cascade Charter Township Board on the day of August 2019.

Sue Slater
Cascade Charter Township Clerk

STAFF REPORT

TO: Cascade Charter Township Planning Commission
FROM: Steve Peterson, Community Development Director
REPORT DATE: July 1, 2019
MEETING DATE: July 15, 2019
CASE: #19-3519/ Golden Valley

GENERAL INFORMATION

- A. Applicant: Don Kamphuis
6115 28th St
Grand Rapids MI 49546
Telephone: 291-4070
Email: dank@kpc4.com
- B. Status of Applicant: Owner
- C. General Location: The property is located on the north east corner of Thornapple River Dr and 60th.
- D. Requested Action: develop into 27 detached single-family site condominium project.
- E. Existing Zoning on Subject Parcels: R1
- F. Zoning on Adjoining Parcels: R1/ARC
- G. Parcel Size: Approximately 72 acres
- H. Existing Land Use on Subject Parcel: Vacant
- I. Adjacent Area Land Uses: Residential

STAFF ANALYSIS

1. The applicant is requesting Tentative Preliminary Plan approval. The development would allow for a new subdivision for 27 single family detached homes.

2. The property is zoned R1, and is Master Planned as Suburban Residential.
3. The applicant has drawn a plan showing how the property developed with 27 lots using no open space. This method requires a minimum of 80,000 sq ft per lot. The lots range in size from just over 80,000 sq ft to just over 210,000 sq ft.
4. The development will be served by wells and septic. They will need approval from the KCHD. The project is inside the utility service boundary but is miles away from any existing sewer/water lines. They have indicated they would be using community drainfield. This may allow for the conversion to public sewer if and when it becomes available. I would also suggest that they agree to a future SAD for public sewer and water. This is typical for project that are inside the utility boundary.
5. The applicant is attempting to do this subdivision "by-right" and therefore does not need to rezone the property. The applicant will demonstrate how they meet the subdivision ordinance as the project proceeds.
6. The development will be utilizing two new private streets. The developer will need to comply with our private street ordinance as well as the KCRC for the names of the streets. The location of the curb cut will also need to be approved by the KCRC. We allow private streets to serve up to 19 homes before a second access is required. Neither street serves more than 19 homes. The new streets do have a couple of dead ends that are in close proximity and we should discuss the possibility of connecting the two streets to avoid dead streets.
7. There are no projects in the Capital Improvement Plan that would be activated as a result of this project.
8. Township engineer will need to approve the engineering for storm water. This will be required before final preliminary approval.
9. KCRC has approved curb cuts and street names for the new private roads.
10. Since the project was first introduced, they have connected the end of each private road with a pedestrian connection. The applicant should provide details on when the path will be built as well as how they intend to ensure that the pathway will go in. In other situations we

have had them fence off the pathway and provide a timeline for the trail.

11. The process follows the platting process since they are not seeking any deviations. The platting process does not require a public hearing but does require the applicant to submit more detailed information each time. For this stage you are simply providing a recommendation to the Township for their consideration.
12. They will have to enter into an agreement for maintenance of the storm water system.
13. As with all of our residential developments, the developer will be required to install an airport recognition statement in the deed restrictions.
14. The applicant has indicated light poles and street trees on the plan.
15. Tentative Approval of a Preliminary Plat shall guarantee that the general terms and conditions under which approval was granted will not be changed by the Township, and further, shall confer upon the subdivider approval of lot sizes, lot orientation, and street layout for a period of one (1) year from the date of tentative approval. Such tentative approval may be extended if applied for by the subdivider and granted by the Township Board in writing.

STAFF RECOMMENDATION

Staff believes this project meets the requirements for tentative preliminary plat approval of our subdivision ordinance is consistent with the Master Plan. Staff Recommends approval of the plan with the following conditions:

1. Submit the required information for Final Preliminary Plat approval.
2. Copy of the proposed deed restrictions, including the airport recognition statement and sewer and water SAD agreement.
3. Block grading plan for storm water runoff from home sites.
4. Provide details for the pathway construction.

If you approve the plan, the development will go before the Township Board for tentative preliminary approval. Once approved by the Township Board, it will come back to you again with additional information for final preliminary plat approval.

Attachments: Site Plan
 Location Map
 Attachments from the applicant

