

**INVER GROVE HEIGHTS
PLANNING COMMISSION AGENDA
TUESDAY, OCTOBER 18, 2022 - 7:00 p.m.
City Council Chambers - 8150 Barbara Avenue**

1. CALL TO ORDER

2. PLANNING COMMISSION MINUTES FOR OCTOBER 4, 2022, ARE NOT YET AVAILABLE AND WILL BE DISTRIBUTED AT THE NEXT MEETING.

3. APPLICANT REQUESTS AND PUBLIC HEARINGS

- A. Consider the following requests for the property generally located at Diffley Court and South Robert Trail. (IGH Partners, LLC - Case No. 22-40SV):
1. Rezoning of the property from Planned Unit Development to R-3B, Multiple Family Residential District and R-3C, Multiple Family Residential District/Planned Unit Development.
 2. Preliminary Plat for a three-lot plat to be known as Robert Curve 4th Addition.
 3. Preliminary Planned Unit Development for a 244-unit multiple family project.
 4. Vacation of drainage and utility easements within the plat of Robert Curve 3rd Addition.

4. OTHER BUSINESS

5. ADJOURN

This document is available upon 3 business day request in alternate formats such as Braille, large print, audio recording, etc. Please contact Stacy Bodsberg at 651-450-2545 or sbodsberg@ighmn.gov



PLANNING REPORT

CASE NO.: 22-40SV

APPLICANT: IGH Partners, LLC

PROPERTY OWNER: Robert Curve Development, LLC

REQUEST: Rezoning, Preliminary plat, Preliminary Planned Unit Development, Vacation of easements

LOCATION: Agate Trail and 72nd Street

HEARING DATE: October 18, 2022

COMPREHENSIVE PLAN: Mixed Use

ZONING: Planned Unit Development

REVIEWING DIVISIONS: Planning
Engineering

PREPARED BY: Allan Hunting
City Planner

BACKGROUND

The applicant is proposing to develop the balance of the Robert Curve subdivision with a new 3 lot plat containing one apartment building of 190 units and 10 townhome buildings containing 54 total units. The existing drainage and utility easements in the plat are proposed to be vacated and rededicated on the new plat. A multiple family planned unit development is proposed as the developer seeks some flexibility in design of the project over standard zoning requirements. The project would provide both underground and surface parking for the units. Walking trails and other amenities are proposed for the project.

In 2000, a planned unit development was proposed for the entire area. The original project was never started, and those approvals have expired. To date, a gas/convenience store and auto repair business have been developed on the site. The mix of the existing commercial and proposed residential is consistent with the current comp plan guiding of the property.

REQUESTS

The specific requests for the project include the following:

1. Rezoning of the property from Planned Unit Development to R-3B, Multiple Family Residential District and R-3C, Multiple Family Residential District/Planned Unit Development.
2. Preliminary Plat for a three-lot plat to be known as Robert Curve Fourth Addition.
3. Preliminary Planned Unit Development for a 244-unit multiple family project.
4. Vacation of drainage and utility easements within the plat of Robert Curve Third Addition

EVALUATION OF THE REQUEST

Surrounding Uses.

The subject property is surrounded by:

North: Commercial uses; zoned B-3; guided Community Commercial.
East: Large lot residential; zoned A, Agricultural; guided RDR.
West: City of Eagan commercial and single family residential
South: NSP storage facility; zoned I-2; guided General Industrial.

Rezoning

The applicant is proposing to rezone the property to R-3B and R-3C. The total acreage for the site is 15.5 acres. The overall density of the project would be 15.7 units per acre which would be consistent with comprehensive guiding for the property.

Planned Unit Development and Plat

Chapter 13. Article A of the zoning ordinance provides for performance standards for a planned unit development (PUD). The purpose of a PUD from ordinance is as follows:

A. Providing the means for greater creativity and flexibility in environmental design than is proposed under the strict application of this title while at the same time preserving the health, safety, order, convenience, prosperity and general welfare of the city and its inhabitants.

B. Recognizing the economic and cultural advantages that will accrue to the residents of a planned community.

C. Encouraging a more creative and efficient approach to the use of the land.

D. Encouraging the preservation and enhancement of desirable site characteristics and open space.

E. Encouraging a development pattern in harmony with land use density, transportation facilities and community facilities, and objectives of the comprehensive plan.

Minimum Area.

Ordinance requires minimum total area required for a planned unit development to be 10 acres of contiguous land. The subject site is 15.5 acres in size which satisfies this requirement.

Vacation of easements.

The previous replating of the Robert Curve development has retained the drainage and utility easements that were dedicated with the original plat of Jubilation. The design of the project necessitates the need to vacate the original easements and then new easements would be dedicated with the new plat.

MnDOT Review.

The plat has been sent to MnDOT for their comment. No comments have been received today. MnDOT has reviewed the previous 3 versions of the plat so no significant comments are expected.

Site Coverage.

Ordinance requires total ground area occupied by buildings in a planned unit development shall not exceed twenty percent (20%) of the net land area.

The plan shows building pad areas for the apartment building and townhouses at 17% of the site area. As proposed, the project would comply with the 20 percent limit on building area.

Residential Unit Densities.

Total number of dwelling units allowed in a development shall be determined by either:

- a. the area standard of the underlying zoning district; or
- b. the density specified by the comprehensive plan land use category.

Lot 1 contains the proposed apartment building and is to be zoned R-3C, Multiple Family Development.

Lot 1 lot area	R-3C min lot size	Maximum Density per Zoning Category	Proposed unit count
7.75 acres	2,000 sq ft	169	190

Lot 1 lot area	Land Use Category MU (15-35 units/acre)	Maximum Density per Land Use	Proposed Density
7.75 acres		271	24.5

The applicant is requesting to develop with an increased density as allowed in 10-13A-6 of the Planned Unit Development requirements. The R-3C category allows densities greater than 12 units per acre. The applicant is proposing increased open space, trails and amenities to offset the density based on zoning standards. The project narrative provides more detail amenities and rationale for request. The lot complies with the density standards of the Mixed Use category.

Lots 2 and 3 contain the 54 units of townhomes and are to be zoned R-3B, Multiple Family Residential.

Lots 2&3 lot area	R-3B min lot size	Maximum Density per Zoning Category	Proposed unit count
7.8 acres	3,630 sq ft	94	54

Lots 2&3 lot area	Land Use Category MU (15-35 units/acre)	Maximum Density per Land Use	Proposed Density
7.8 acres		273	6.9 units per acre

The unit count proposed for Lots 2 and 3 would be consistent with both zoning and comp plan designations.

Lot size and Width.

Lot 1 is designed at 7.75 acres, Lot 2 at 6.6 acres and Lot 3 at 1.2 acres. Lots 1 and 3 have direct access to a public street. Lot 2 would have access through the apartment building parking lot and drive. The design of the lots would be approved as part of the PUD.

Building Setbacks.

The project complies with perimeter and internal setbacks except for two townhome buildings at the cul-de-sac. The required setback along a public street in a townhome project is 40 feet. The two buildings near Street C and D are setback at 21 and 25 feet. The width of the project at this location is constrained by the cul-de-sac bubble and the setbacks from the easements on the east side of the lot. The units closest to the street would gain access via the internal driveways and so the front setback for the unit would not be affected. PUD's are allowed flexibility provided the plan spells out specific setbacks.

Impervious surface coverage.

Impervious surface standards for multiple family allow up to 40 percent coverage. The applicant has provided data on the open area exhibit plan with the proposed impervious coverage for each lot. Overall, the project is proposed with coverage of 44% or about 25,000 square feet of additional hard surface.

The applicant is requesting through the PUD process flexibility to allow the additional impervious surface. The applicant is providing more sidewalk and pedestrian access that was recommended by staff to make the development more pedestrian friendly and safer. There will be public sidewalk on the east side of Diffley Court and other trail connections, so pedestrians are not forced to walk across the street avoiding conflicts with the traffic from the convenience store or repair shop.

Open Space.

The ordinance requires a minimum of 15% of the site be preserved in open space. The applicant is proposing open space throughout the project primarily around the perimeter which contains much of the trail system. Total area would be 27% of the site. This area will have to be protected permanently with some type of easement to ensure the open space remains. This would be addressed in the developer's agreement for the project.

Parking.

Code requires 2.5 spaces/unit for both the apartment building and townhomes. The apartment building would require 475 stalls. The townhouses would require 135 spaces including both garages, driveways and guest parking.

The applicant is proposing 383 spaces for the apartment building which is 92 stalls short of the requirement. The applicant is requesting flexibility through the PUD to allow this reduced number based on unit type of building. The apartment proposed with 21 studio units, 84 one-bedroom units, 75 two-bedroom units and 10 three-bedroom units. The parking stall ratio provided would be 2.0 stalls per unit. The applicant indicates in the narrative that with a large number of studio and one-bedroom units, the parking demand will be lower, and the number provided is adequate for the unit types proposed.

Tree Preservation/Landscaping.

The site has been disturbed in the past and is currently a platted lot, so the tree preservation ordinance does not apply. There is only a small amount of vegetation along the north boundary and around the wetland ponding area. The majority of the site will be graded and disturbed except for the area around the wetland which will be part of the stormwater system.

A landscaping plan has been provided which shows a mixture of overstory, ornamental and shrub plantings. A total of 244 trees or an equivalent is required. The landscape plan provided shows a total of 323 trees containing a mix of overstory, deciduous, coniferous, ornamental and shrubs. There are also the required 19 trees planted in and around the parking lot. Plan complies with code standard.

Building Height.

Maximum building height for multiple family is 35 feet which is measured to the mid-point of the roof. Standard zoning allows greater height by CUP. The applicant is proposing a 4 story building with a pitched roof. Building height at midpoint of peak would be 50 feet. The applicant is requesting flexibility from building height through the PUD application.

Park Dedication.

The project area lies within the area of the Joint Powers Agreement with Eagan. The area would be served by Eagan sewer and water. A condition of the JPA is that developments must pay Eagan park dedication and trail fees. Fees will be calculated with the final PUD and will be listed in the Developers Agreement.

Access/Streets/Traffic.

The project would be served by the existing public street Diffley Court. There will be an additional four curb cuts onto the street for the access points.

All of the necessary traffic improvements have been installed at the Diffley/Hwy 3 interchange to address traffic that would be generated by the site based on a development plan back in 2017 which was never built. At that time the anticipated land use consisted of a mix of residential and commercial. Fewer residential units were anticipated but a greater mix if retail was planned. A traffic study was done around 2017 from the previous project which gave some existing and forecasted traffic generation.

The applicant has conducted an updated traffic study to determine proposed volumes from this proposal to existing volumes and projected from the 2017 study. In general, overall traffic would be a little less from this development than the previous projected development. The original and recent traffic studies are included with this report which provide analysis and traffic numbers.

Wetlands.

There is one wetland in the northwest corner of the site. This would be protected and is part of the overall stormwater system for the project.

Grading, drainage, stormwater and utilities.

The City Engineer has drafted a memo with his comments. These comments are required to be addressed with the final PUD plan submittal. These comments would be included in the condition that the plans must be approved by the City Engineer. Generally, Engineering has not identified any issues with the plans.

Development contract.

The Developer and Owner shall enter into a Development Contract and other associated agreements with the City. The list of agreements and details of the contract will be discussed with the applicant, city attorney and staff as part of the final PUD review. All the agreements will be approved by the City Council as part of the final PUD review.

ALTERNATIVES

The Planning Commission has the following actions available on the proposed project:

A. Approval:

If the proposed requests are found to be acceptable, approval of the applicable following actions should be taken:

- Approval of the Rezoning to multiple family residential subject to the following condition:
 1. The rezoning shall not become effective until a final plat has been approved by the city council.
- Approval of the Preliminary Plat, Preliminary PUD and Vacation of easements subject to the following conditions:
 1. The final plat and accompanying site plans shall be in substantial conformance with the following plans on file with the Planning Department except as may be modified by the conditions below.

Preliminary Plat	9/23/22
Preliminary Site Plan	9/32/22
Preliminary Open Area Exhibit	9/23/22
Preliminary Grading & Erosion Control Plan	9/23/22
Preliminary Landscape Plan	9/23/22
Building Elevations	

***The final list of approved plans and date of plans shall be identified in the development contract.**

2. The PUD shall be approved with the following specific standards:
 - a. Structure setbacks allowed for buildings along Street C and D as shown on the Preliminary Site Plan.
 - b. Reduced parking for the apartment building to allow 383 spaces.
 - c. Impervious surface to be 44%.

- d. Density for Lot 1 to be determined by the comp plan land use category which would allow 190 units with a proposed density of 24.5 units/acre.
 - e. Building height for the apartment building to be 50 feet.
3. Prior to final plat and plan approval, the final grading, drainage and erosion control, and utility plans shall be approved by the Director of Public Works.
 4. Plat and plans are subject to review of MnDOT.
 5. Drainage and utility easements shall be provided on the final plat as required by the Director of Public Works.
 6. Park dedication shall consist of a cash contribution equaling the higher amount of either Eagan or Inver Grove Heights fees for multiple family development.
 7. All plans shall be subject to the review and approval of the Fire Marshal.
 8. The developer shall be responsible to insure the open space as shown on the Open Area Exhibit remains in open space and is controlled by an association. An agreement suitable to the city shall be filed by the owner to assure the continued operation and maintenance of the open space areas and amenities.
 9. The Developer and Owner shall execute an Acknowledgement of Planned Unit Development Zoning. This Acknowledgement shall state that property within the plat is subject to the approved PUD plans and PUD zoning and that the development on the property must conform to the PUD plans and PUD zoning. This Acknowledgement shall be recorded when the plat is recorded.
 10. The Developer and Owner shall enter into a development contract and storm water maintenance agreement with the City. The form of Development Contract shall substantially comply with the model development contract, which is part of the Administrative Code, considering the requirements of the Planned Unit Development plans.
 11. The approved plans shall be subject to the conditions of the Inver Grove Heights/Eagan joint powers agreement.
- B. Denial:** Should the proposed request, or portions thereof, not be found to be acceptable, the appropriate requests described above should be denied. The basis for denial must be stated in any such motion.

RECOMMENDATION

A technical review of the project shows that it meets performance standards except those requested through the Planned Unit Development process. The flexibility requested through the PUD include:

- a. Structure setbacks allowed for buildings along Street C and D as shown on the Preliminary Site Plan.
- b. Reduced parking for the apartment building to allow 383 spaces.
- c. Impervious surface to be 44%.
- d. Density for Lot 1 to be determined by the comp plan land use category which would allow 190 units with a proposed density of 24.5 units/acre.
- e. Building height for the apartment building to be 50 feet.

Staff would recommend approval of the rezoning, preliminary plat, easement vacation and preliminary PUD with the conditions listed.

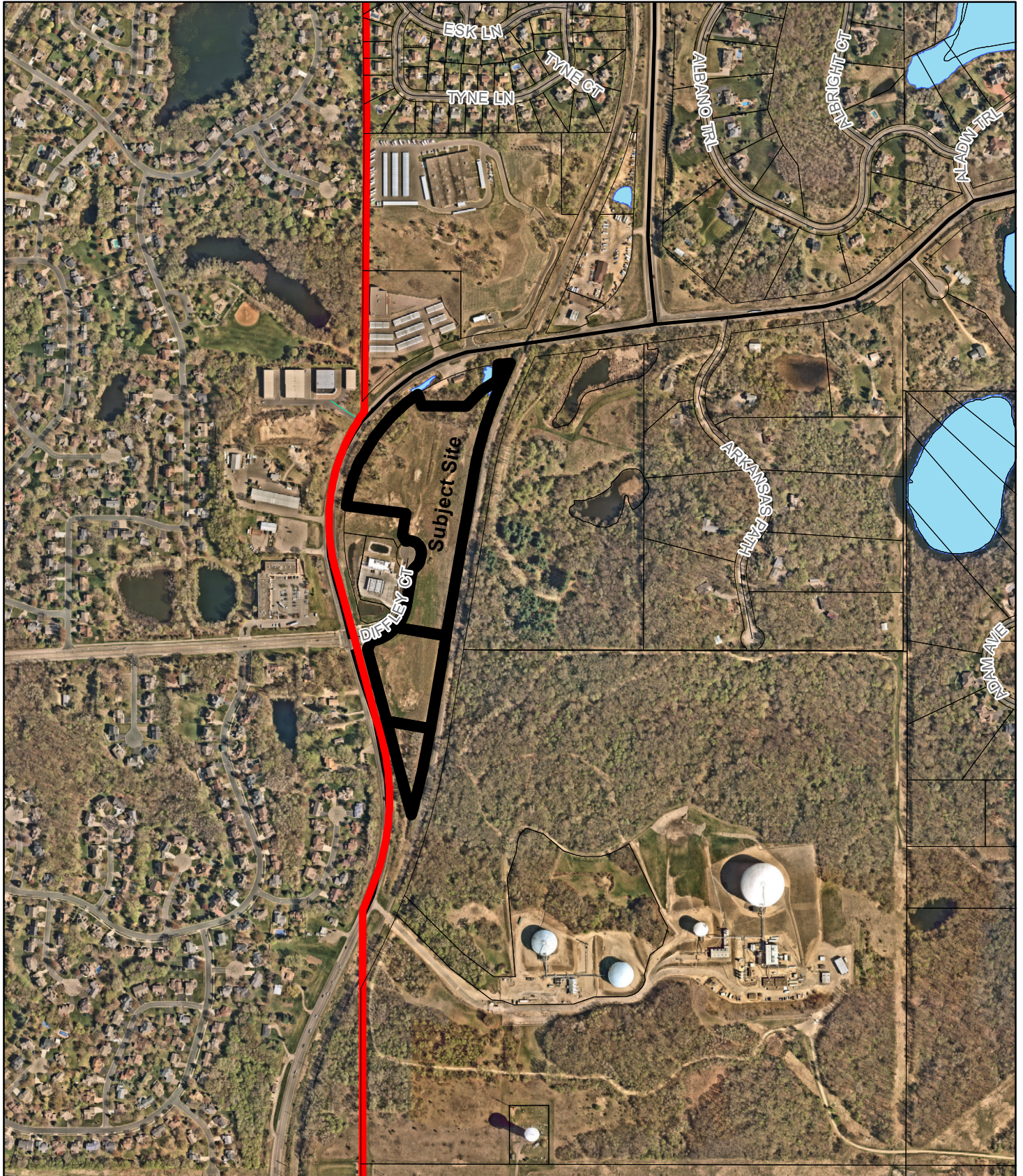
Attachments:

Location Map
Comp Plan Map
Zoning Map
Applicant Narrative
Preliminary Plat
Preliminary Site Plan
Preliminary Open Area Exhibit
Preliminary Grading Plan
Preliminary Landscape Plan
Building Elevations
Traffic Study
Traffic Study from Westgate Project
Engineering Comments
Resident emails (2)



Location Map

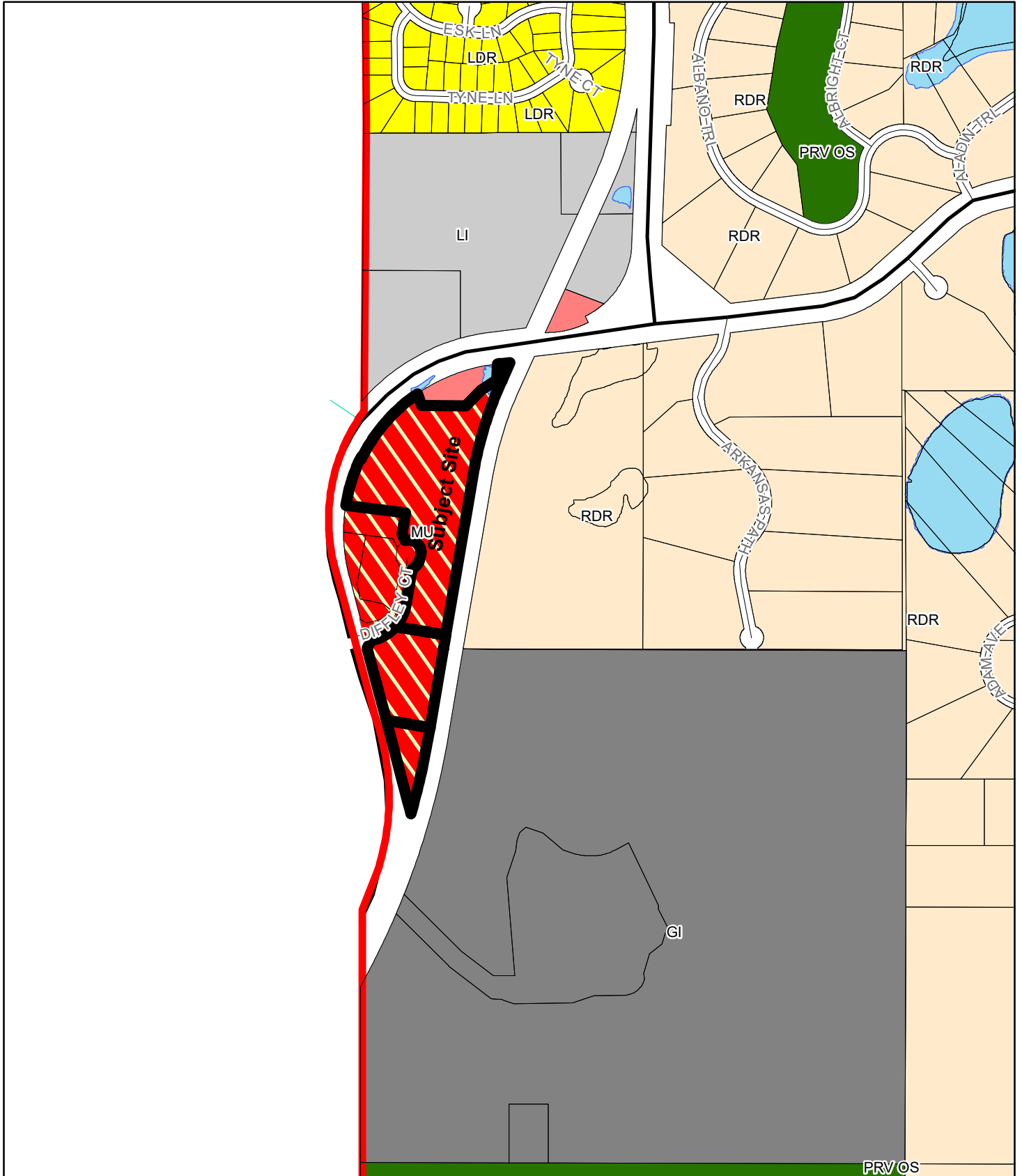
Case No. 22-40SV





Comprehensive Plan Map

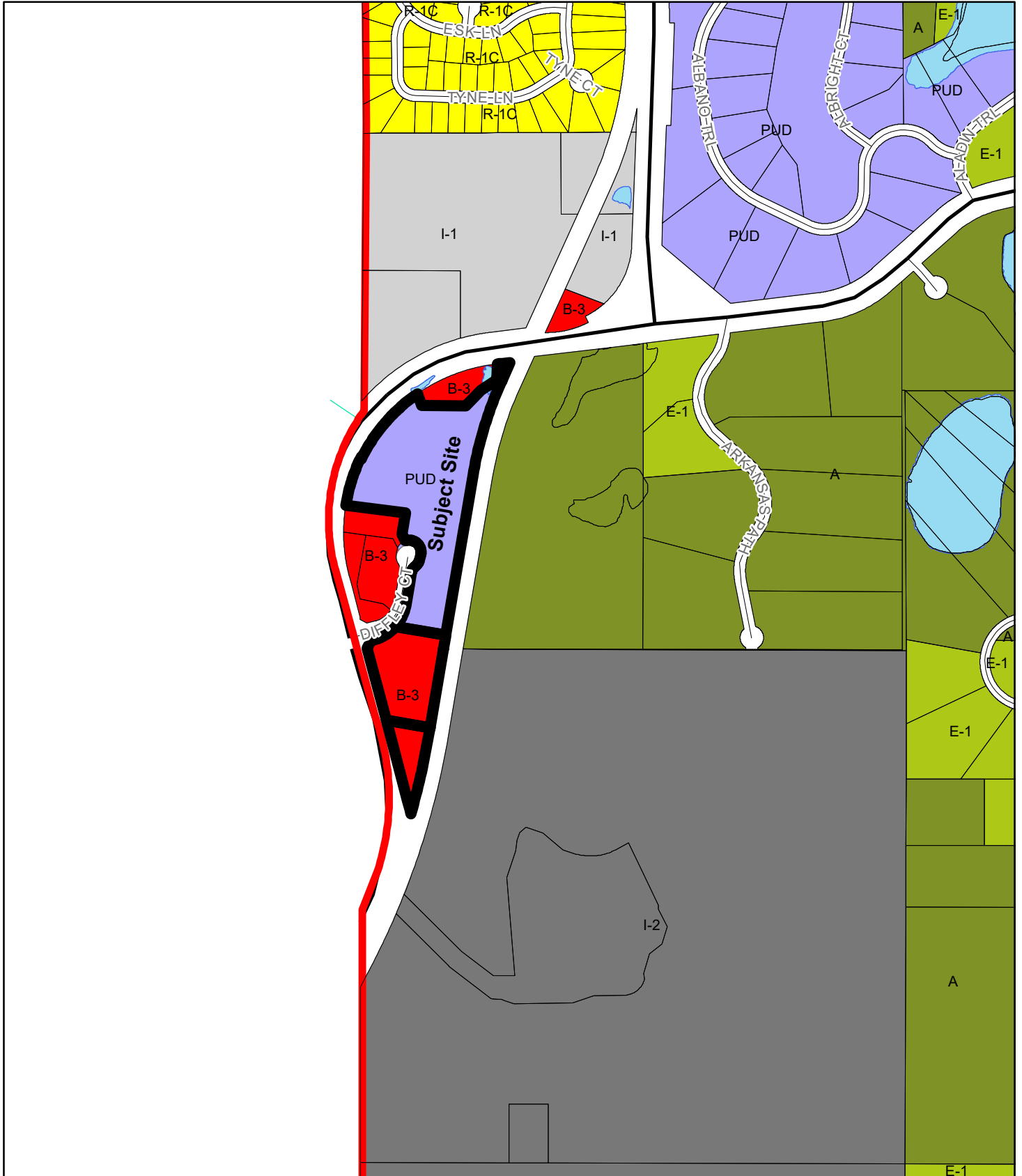
Case No. 22-40SV





Zoning Map

Case No. 22-40SV





1200 25th Avenue South • St. Cloud, MN 56301
Phone: 320.258.4438 • Fax: 320.252.3603

Revised September 23, 2022

Mr. Allan Hunting, City Planner
Members of the City Staff Development Team
City of Inver Grove Heights
8150 Barbara Avenue
Inver Grove Heights, MN 55077

**RE: DIFFLEY COURT/ROBERT CURVE DEVELOPMENT—
PLANNING APPLICATION REQUESTED UPDATES- SEPTEMBER 2022**

Mr. Hunting and Members of the City Staff Development Team,

Trident Development, LLC is pleased to present the plan revisions and correspondence for Preliminary Planned Unit Development, Rezoning to R-3B and R-3C/Multiple Family, Preliminary Plat for 3 Lot Subdivision and Utility Easement Vacation for a proposed apartment and townhome development located near the intersection of State Highway No. 3 (South Robert Trail) and Diffley Road (CSAH 30) in Inver Grove Heights, Minnesota.

OVERVIEW:

One (1) Apartment Building

- 190 units
- 4-stories above ground
- 190 surface parking stalls
- 193 total covered stalls (166 underground plus 27 at grade)

Ten (10) Townhome Buildings

- 54 individual townhome units. Four (5 unit) townhomes, one (4 unit) townhome and five (6 unit townhomes)
- 2-stories above-ground, slab-on-grade
- Two stall garages (108 total parking stalls) plus an additional 27 parking stalls

This development is designed to be a cohesive rental community complimented with attractive on-site amenities and generous landscaping features. All dwelling units will be furnished with stainless steel appliances, solid wood cabinetry, granite countertops, luxury vinyl plank flooring, LED lighting and window treatments. Unit heating and cooling is provided by individual 'magic-pak' gas-fired, HVAC equipment. Each unit comes complete with washer/dryer appliances, high-speed wifi and

balcony/patio. All rental units are intended to be “market-rate” with no subsidized rents or retail uses contemplated within the buildings. This amenity-rich community will include an outdoor pool area, a children’s playground area (tot lot), furnished and covered patios with barbeque area, fire pit, putting green, fenced pet exercise area, walking trails and open greenspace. The apartment will also include a two-story main lobby, a fitness room, golf simulator and lounge areas.

The gross total size of the development area is 15.56 acres; which currently contains three (3) individual parcels. The land seller is Robert Curve Development, LLC. The buyer is IGH Partners, LLC, which may be transferred to a related party prior to closing.

Trident Development, LLC will be the project manager, developer and intends to remain an owner in the project. Trident has a long history of successfully developing, owning, and operating multi-family communities. Because Trident retains an ownership position, additional care is given to the design/quality of the building, how it will last the test-of-time, how the project fits within the community and serves the needs of residents.

BACKGROUND:

On September 14, 2022, a plan review meeting was conducted with the City of Inver Grove Heights (City) planning staff to discuss submitted plans and applications to date. According to the City, the site currently includes two zoning districts: B3-General Business District and Planned Unit Development (PUD). The overall density of the site is 15.68 units/acre based on 244 units on approximately 15.56 acres, which is consistent with the comprehensive plan for mixed use (12-35 units/acre).

The City provided the following zoning density comments on September 14th:

- Lot 1 has 190 apartment units proposed on approximately 7.75 acres = 24.5 units/acre. Maximum number of units based on R-3C zoning standards allows greater than 12 units/acre. R-3C zoning is further controlled by requiring 2,000 square feet of land per unit. Because of the 2,000 square feet of land requirement, Lot 1 unit count exceeds density allowed by lot size and therefore will be addressed through the PUD process.
- Lot 2 has 45 townhome units proposed on approximately 6.6 acres = 6.81 units/acre. Lot 2 would be zoned R-3B based on unit mix which allows up to 12 units/acre. The unit count is consistent with density of straight R-3B zoning.
- Lot 3 has 9 townhome units proposed on 1.2 acres = 7.5 units/acre. The unit count is consistent with density of straight R-3B zoning which allows up to 12 units/acre.

Based on the above, the overall density for the site falls within the comprehensive plan guidelines. Lot sizing for the 190 apartment units proposed on Lot 1 will have to be addressed through the PUD process, which allows densities higher than straight zoning if it’s consistent with the comprehensive plan. The proposed density will not negatively impact the existing public facilities and neighboring properties because of the generous amenities provided on-site, along with ample walking paths.

Further, the traffic study prepared for the development acknowledges that the existing roadway infrastructure can handle the additional vehicular traffic and will not over-burden neighboring properties.

The number of total dwelling units proposed (244) is designed to take advantage of “economies of scale”. It is critical to achieve larger project scale so that a greater number of resident amenities can be supported economically. In other words, the cost of expensive amenities such as a swimming pool, can be spread over a greater number of rental units. An amenity-rich multi-family community offers a better-quality resident experience and makes the development more sustainable in the long-run. A lower unit count would likely result in a reduction in the amenity package.

On September 14th, the City provided the following development standards regarding minimum building setbacks at the site:

	<u>Required</u>	<u>Proposed</u>
Side to street:	40 feet	40 feet
Side along perimeter:	30 feet	30 feet *(see below)
Sidewall separation:	30 feet	30 feet

The above setbacks were successfully incorporated into the current plans with the exception of two townhome buildings located near the cul-de-sac found immediately south of the apartment building. Flexibility for minimum setback for these two buildings is sought through the PUD process. The minimum building setbacks from the existing R-O-W are proposed to be 21 feet and 25 feet rather than required 30 feet. Due to the gas line easement located along the eastern side of the site, moving the townhomes is not feasible.

The City provided the following comments regarding the parking at the Site on September 14th:

The apartment and townhomes require 2.5 spaces per unit, which equates to 475 required parking stalls for the apartment. The conceptual plan proposes 383 total parking stalls which is 92 stalls short of the requirement. The current plan depicts a parking ratio of approximately 2.0 spaces per unit for the apartment. The updated townhomes plan achieves the 2.5 spaces per unit and currently meets the parking requirement.

The proposed apartment building proposes a unit mix of 21 studio units, 84 one-bedroom units, 75 two-bedroom units and 10 three-bedroom units. This translates to a total of 285 bedrooms. Studio and one-bedroom apartments are more likely to be occupied by a single resident, hence only one vehicle. Two and three-bedroom units are more likely to generate multiple vehicles. Previous parking demand analysis reports, prepared by third-party professionals applying ITE standards, have indicated that parking ratios from 1.2 per unit to 2.0 per unit are acceptable, depending on the unit mix of the property. With the high concentration of studio and one-bedroom units (55%) it is reasonable to assume that a parking ratio of 2.0 would be sufficient for the proposed apartment building. The proposed 383 parking spaces translates to 1.34 per bedroom. While a parking demand assessment has not been performed for this project, Trident Development has successfully developed and operates similar apartment properties in other Metro cities that operate at the 2.0 per unit ratio or less.

According to the most recent plans submitted, the Site does not meet the City requirement of a maximum of 40% impervious for the Site.

The City Code for R-3B and R-3C zoning districts requires that there is a maximum of 40% impervious coverage on the site. The current site plan shows an overall impervious percentage of approximately 44% for the combined Lots 1, 2, and 3, which is approximately 25,000 square feet over the maximum allowable impervious area. Site trails and sidewalks, added to allow for more useable open space, walkable areas, and safe pedestrian movement, amount to approximately 25,000 square feet of impervious surface and are the cause of the exceedance of impervious area. Trident requests a variance to the 40% impervious coverage requirement to maintain the more resident friendly development that is currently proposed.

REQUEST:

Trident Development, LLC is seeking Planning Commission and City Council review and approval of the preliminary plat application, as currently updated and submitted herewith, together with the applications for land use changes.

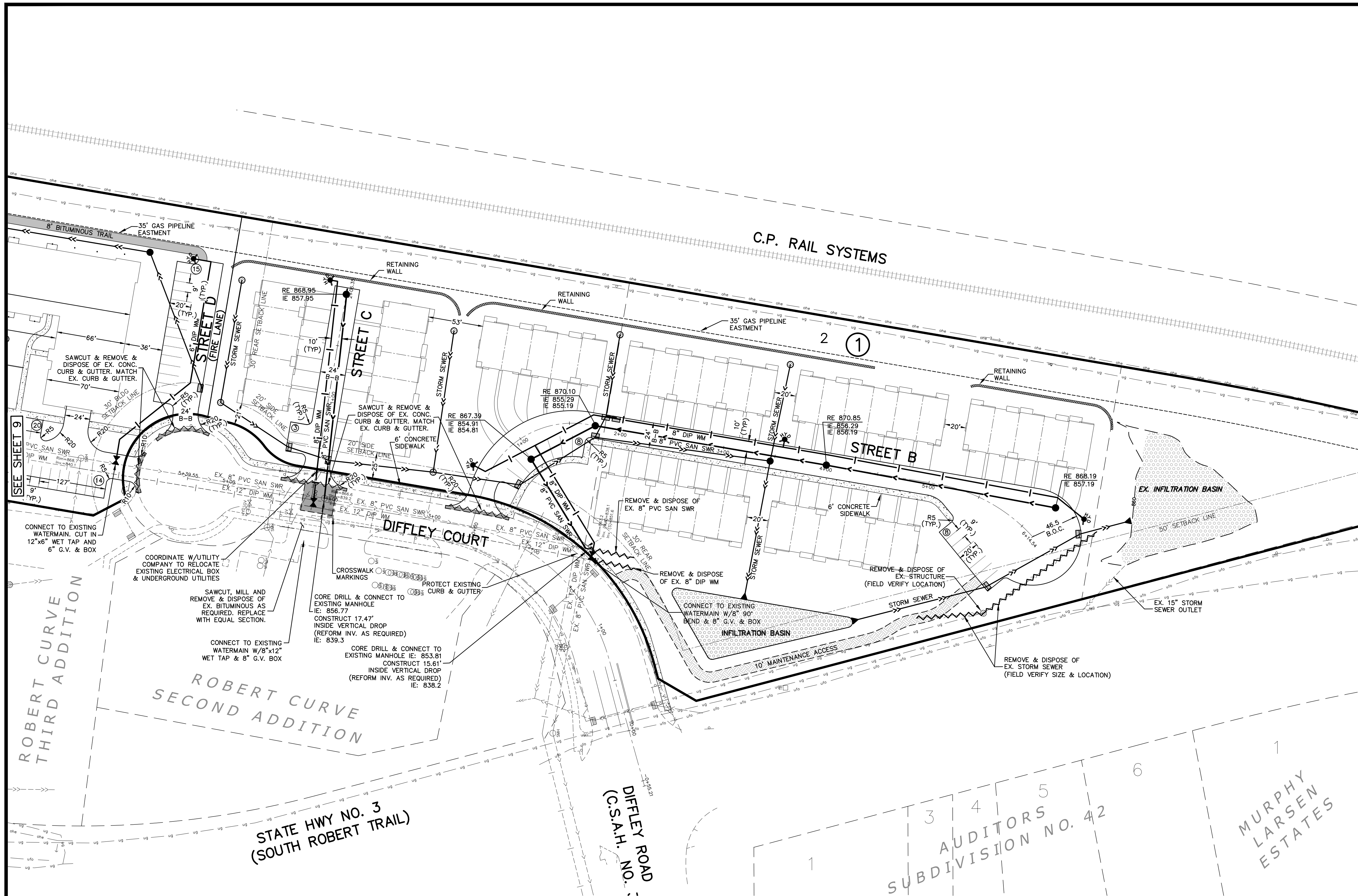
On behalf of our team, we are excited to partner with City of Inver Grove Heights to bring a high-quality mixed residential development to the community.

Respectfully Submitted,
Trident Development, LLC

Andy Brummer
Andrew J. Brummer
Development Manager

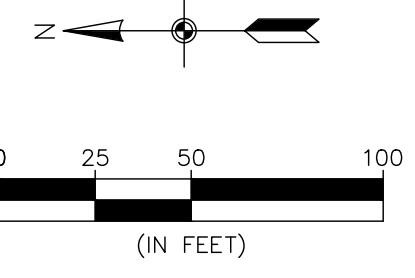
Enclosures

C: Roger D. Fink, Trident Development, LLC



SITE PLAN LEGEND

EXISTING	PROPOSED
LIGHT POLE	
SANITARY MANHOLE	
MISCELLANEOUS SIGN	
EXISTING SPOT ELEVATION	
EXISTING TREE	
TELEVISION BOX	
FIRE HYDRANT	
GATE VALVE	
CLEANOUT	
ELECTRIC BOX	
GAS METER	
CATCH BASIN	
RAIN GUARDIAN	
ELECTRIC METER	
TELEPHONE BOX	
UTILITY POLE	
FLARED END SECTION	
STORM MANHOLE	
SERVICE	
SOIL BORING/TEST HOLE	
RETAINING WALL	
WATERMAIN	
SANITARY SEWER	
STORM SEWER	
PROPERTY LINE	
SETBACK LINE	
CURB	
WETLAND	
DITCH	
UNDERGROUND TELEPHONE	
UNDERGROUND ELECTRIC	
UNDERGROUND GAS	
UNDERGROUND FIBEROPTIC	
FENCE	
OVERHEAD ELECTRIC	
CONCRETE SURFACE	
BITUMINOUS SURFACE	
BITUMINOUS REMOVAL	
SAWCUT	
CURB REMOVAL	
PIPE REMOVAL	



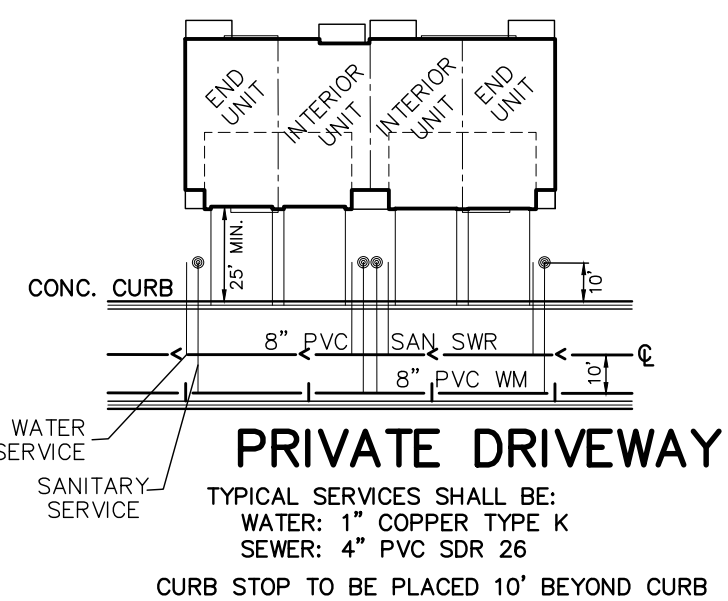
BENCHMARK
1. MnDot Geodetic GSD Station No. 101772 (MnDot Name 1916 A) - Elevation 863.71 ft. (NAVD88)
2. MnDot Geodetic GSD Station No. 103185 (MnDot Name 1921 W) - Elevation 923.60 ft. (NAVD88)

PARKING ANALYSIS

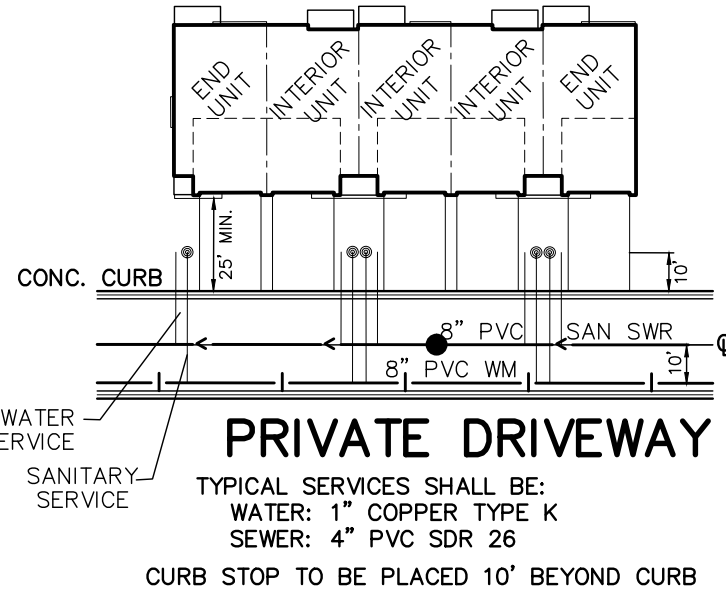
PARKING PROVIDED APARTMENT PARKING LOT		
STANDARD STALLS	=	186 STALLS
HANDICAP STALLS	=	4 STALLS
TOTAL	=	190 STALLS
PARKING PROVIDED IN APARTMENT BUILDING		
190 UNIT APARTMENT		
STANDARD STALLS	=	187 STALLS
HANDICAP STALLS	=	6 STALLS
TOTAL	=	193 STALLS
ROW HOMES (54 UNITS)		
STANDARD STALLS	=	27 STALLS
GARAGE STALLS (2 PER UNIT)	=	108 STALLS
TOTAL	=	135 STALLS

*SEE COLE GROUP BUILDING FLOOR PLANS

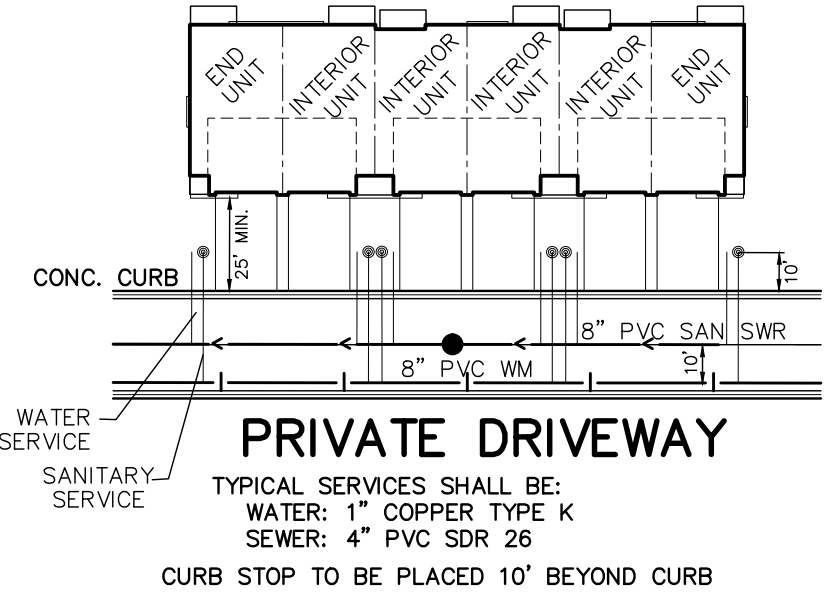
MULTI-FAMILY
4 UNIT ROW HOME



MULTI-FAMILY
5 UNIT ROW HOME



MULTI-FAMILY
6 UNIT ROW HOME



The subsurface utility information shown on this plan is utility Quality Level D. This quality level was determined according to the guidelines of C/ASCE 38-02, entitled "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data."

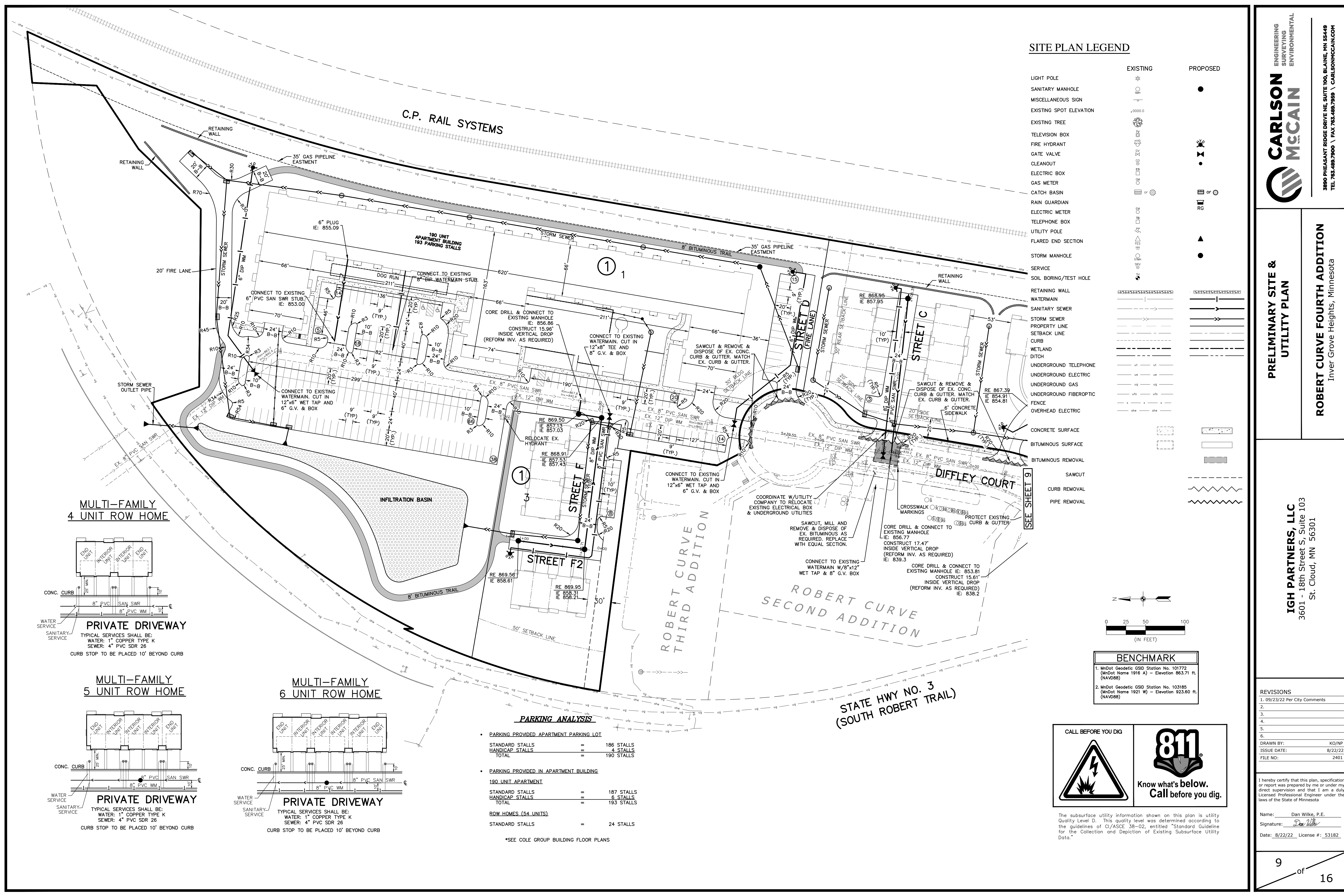
CARLSON McCAIN
ENGINEERING
SURVEYING
ENVIRONMENTAL
3890 PHEASANT RIDGE DRIVE NE, SUITE 100, BLAINE, MN 55449
TEL. 763.485.7500 \ FAX 763.485.7959 \ CARLSONMCCAIN.COM

PRELIMINARY SITE &
UTILITY PLAN
ROBERT CURVE FOURTH ADDITION
Inver Grove Heights, Minnesota

IGH PARTNERS, LLC
3601 - 18th Street S, Suite 103
St. Cloud, MN 56301

REVISIONS
1. 09/23/22 Per City Comments
2.
3.
4.
5.
6.

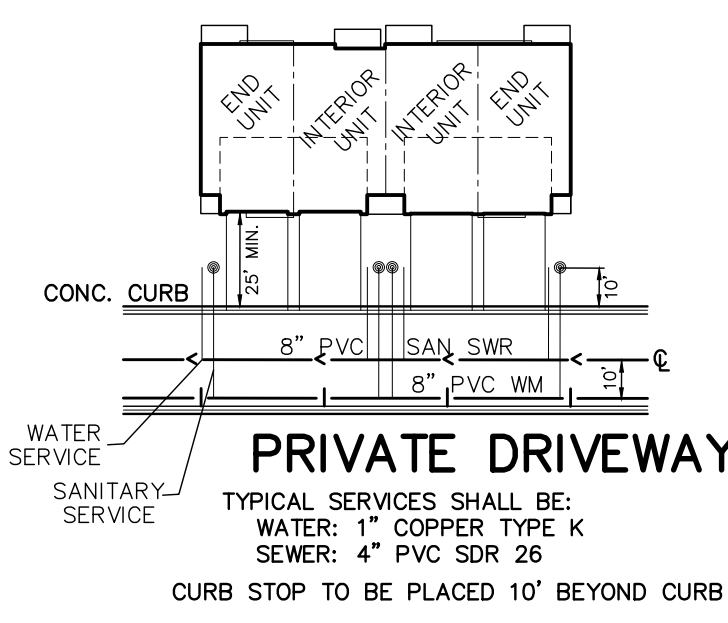
DRAWN BY: KO/MP
ISSUE DATE: 8/22/22
FILE NO: 2401
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota
Name: Dan Wilke, P.E.
Signature: *Dan Wilke*
Date: 8/22/22 License #: 53182



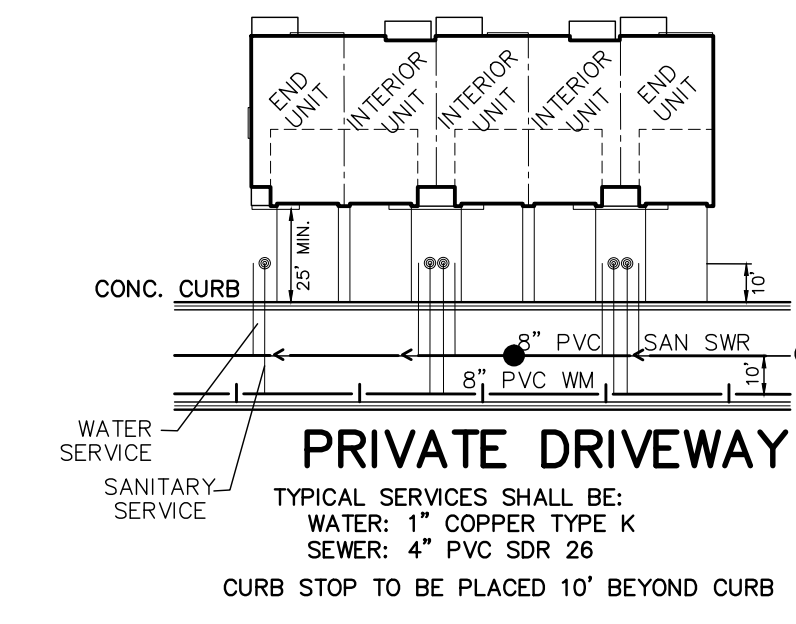
SITE PLAN LEGEND

EXISTING	PROPOSED
LIGHT POLE	●
SANITARY MANHOLE	●
MISCELLANEOUS SIGN	●
EXISTING SPOT ELEVATION	●
EXISTING TREE	●
TELEVISION BOX	●
FIRE HYDRANT	●
GATE VALVE	●
CLEANOUT	●
ELECTRIC BOX	●
GAS METER	●
CATCH BASIN	●
RAIN GUARDIAN	●
ELECTRIC METER	●
TELEPHONE BOX	●
UTILITY POLE	●
FLARED END SECTION	●
STORM MANHOLE	●
SERVICE	●
SOIL BORING/TEST HOLE	●
RETAINING WALL	●
WATERMAIN	●
SANITARY SEWER	●
STORM SEWER	●
PROPERTY LINE	●
SETBACK LINE	●
CURB	●
WETLAND	●
DITCH	●
UNDERGROUND TELEPHONE	●
UNDERGROUND ELECTRIC	●
UNDERGROUND GAS	●
UNDERGROUND FIBEROPTIC	●
FENCE	●
OVERHEAD ELECTRIC	●
CONCRETE SURFACE	●
BITUMINOUS SURFACE	●
BITUMINOUS REMOVAL	●
SAWCUT	●
CURB REMOVAL	●
PIPE REMOVAL	●

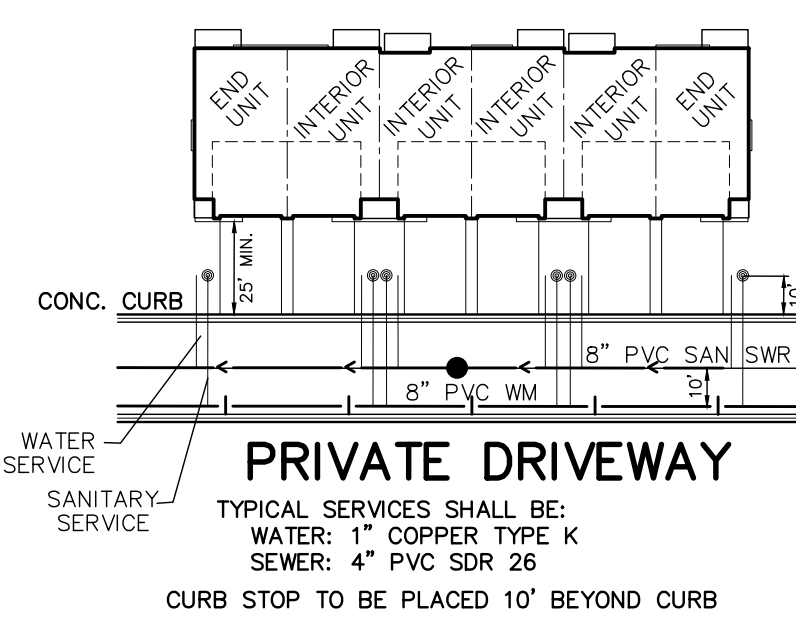
MULTI-FAMILY
4 UNIT ROW HOME



MULTI-FAMILY
5 UNIT ROW HOME



MULTI-FAMILY
6 UNIT ROW HOME



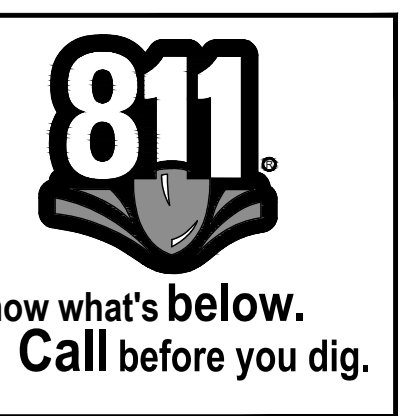
PARKING ANALYSIS

PARKING PROVIDED APARTMENT PARKING LOT	
STANDARD STALLS	186 STALLS
HANDICAP STALLS	4 STALLS
TOTAL	190 STALLS
PARKING PROVIDED IN APARTMENT BUILDING	
190 UNIT APARTMENT	
STANDARD STALLS	187 STALLS
HANDICAP STALLS	6 STALLS
TOTAL	193 STALLS
ROW HOMES (54 UNITS)	
STANDARD STALLS	24 STALLS

*SEE COLE GROUP BUILDING FLOOR PLANS

BENCHMARK

1. MnDot Geodetic GSID Station No. 101772 (MnDot Name 1916 A) - Elevation 863.71 ft. (NAVD88)
2. MnDot Geodetic GSID Station No. 103185 (MnDot Name 1921 W) - Elevation 923.60 ft. (NAVD88)



The subsurface utility information shown on this plan is utility Quality Level D. This quality level was determined according to the guidelines of C/ASCE 38-02, entitled "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data."

3890 PHEASANT RIDGE DRIVE NE, SUITE 100, BLAINE, MN 55449
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PRELIMINARY SITE &
UTILITY PLAN

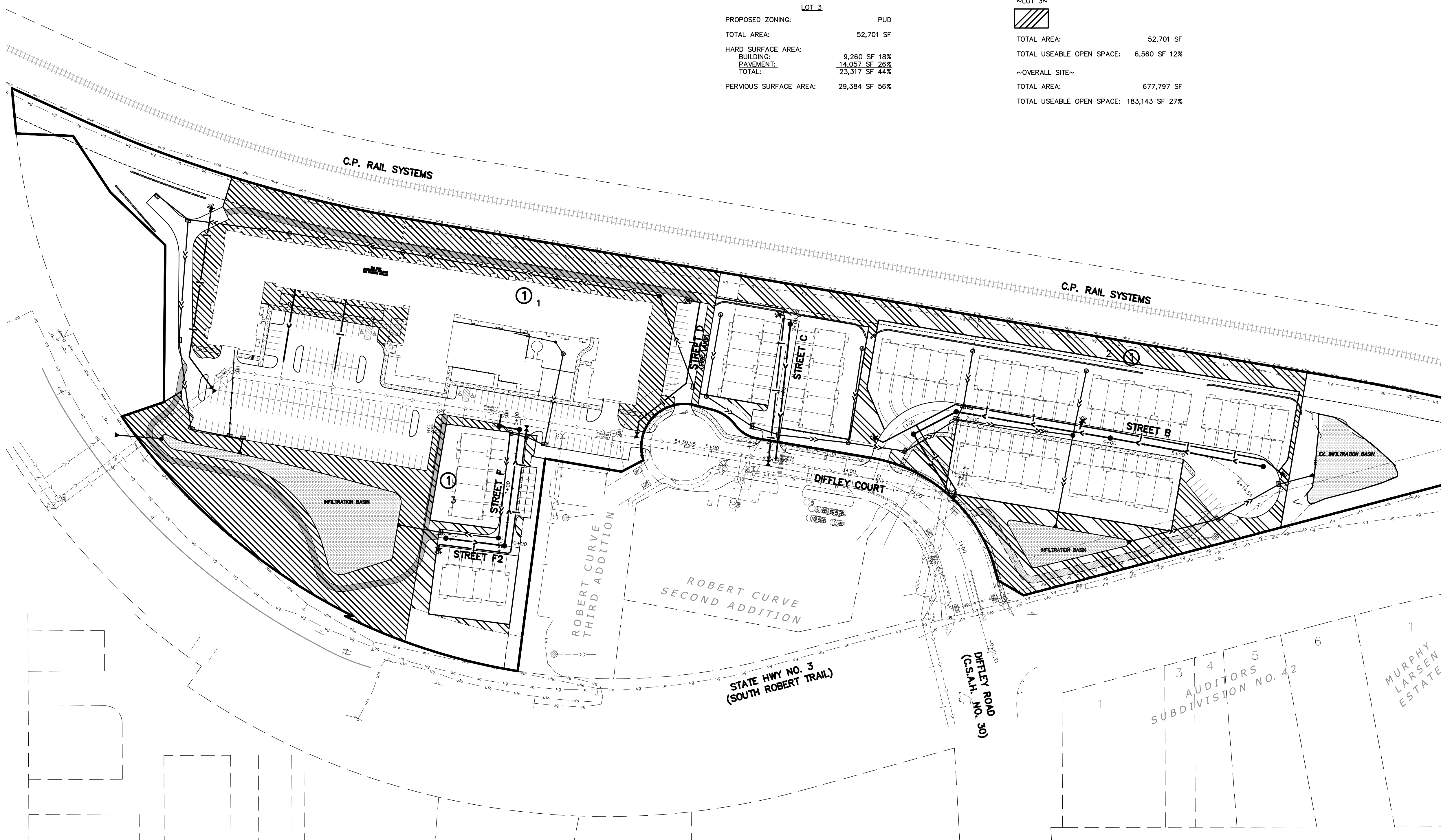
ROBERT CURVE FOURTH ADDITION
Inver Grove Heights, Minnesota

IGH PARTNERS, LLC
3601 - 18th Street S, Suite 103
St. Cloud, MN 56301

REVISIONS	
1.	09/23/22 Per City Comments
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DRAWN BY:	KO/NP
ISSUE DATE:	8/22/22
FILE NO:	2401

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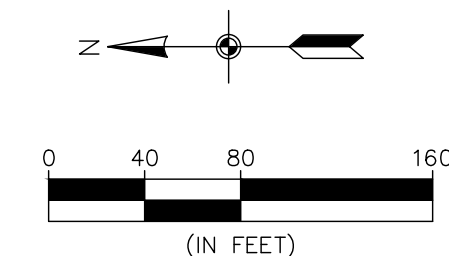


SITE DATA		
LOT 1		
PROPOSED ZONING:	PUD	
TOTAL AREA:	337,435 SF	
HARD SURFACE AREA:		
BUILDING:	59,984 SF	18%
PAVEMENT:	107,460 SF	32%
TOTAL:	167,444 SF	50%
PERVIOUS SURFACE AREA:	169,991 SF	50%
LOT 2		
PROPOSED ZONING:	PUD	
TOTAL AREA:	287,426 SF	
HARD SURFACE AREA:		
BUILDING:	46,142 SF	16%
PAVEMENT:	61,866 SF	22%
TOTAL:	108,008 SF	38%
PERVIOUS SURFACE AREA:	179,418 SF	62%
LOT 3		
PROPOSED ZONING:	PUD	
TOTAL AREA:	52,701 SF	
HARD SURFACE AREA:		
BUILDING:	9,260 SF	18%
PAVEMENT:	14,057 SF	26%
TOTAL:	23,317 SF	44%
PERVIOUS SURFACE AREA:	29,384 SF	56%

USEABLE OPEN SPACE CALCULATIONS		
~LOT 1~		
TOTAL AREA:	337,671 SF	
TOTAL USEABLE OPEN SPACE:	113,357 SF	34%
~LOT 2~		
TOTAL AREA:	287,425 SF	
TOTAL USEABLE OPEN SPACE:	63,226 SF	22%
~LOT 3~		
TOTAL AREA:	52,701 SF	
TOTAL USEABLE OPEN SPACE:	6,560 SF	12%
~OVERALL SITE~		
TOTAL AREA:	677,797 SF	
TOTAL USEABLE OPEN SPACE:	183,143 SF	27%

SITE PLAN LEGEND

EXISTING	PROPOSED
LIGHT POLE	●
SANITARY MANHOLE	●
MISCELLANEOUS SIGN	●
EXISTING SPOT ELEVATION	●
EXISTING TREE	●
TELEVISION BOX	●
FIRE HYDRANT	●
GATE VALVE	●
CLEANOUT	●
ELECTRIC BOX	●
GAS METER	●
CATCH BASIN	●
RAIN GUARDIAN	●
ELECTRIC METER	●
TELEPHONE BOX	●
UTILITY POLE	●
FLARED END SECTION	●
STORM MANHOLE	●
SERVICE	●
SOIL BORING/TEST HOLE	●
RETAINING WALL	●
WATERMAIN	●
SANITARY SEWER	●
STORM SEWER	●
PROPERTY LINE	●
SETBACK LINE	●
CURB	●
WETLAND	●
DITCH	●
UNDERGROUND TELEPHONE	●
UNDERGROUND ELECTRIC	●
UNDERGROUND GAS	●
UNDERGROUND FIBEROPTIC	●
FENCE	●
OVERHEAD ELECTRIC	●
CONCRETE SURFACE	●
BITUMINOUS SURFACE	●



BENCHMARK	
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2. MnDot Geodetic GSID Station No. 103185 (MnDot Name 1921 W) - Elevation 923.60 ft. (NAVD88)	

CALL BEFORE YOU DIG

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OPEN AREA EXHIBIT

ROBERT CURVE FOURTH ADDITION
Inver Grove Heights, Minnesota

IGH PARTNERS, LLC
3601 - 18th Street S, Suite 103
St. Cloud, MN 56301

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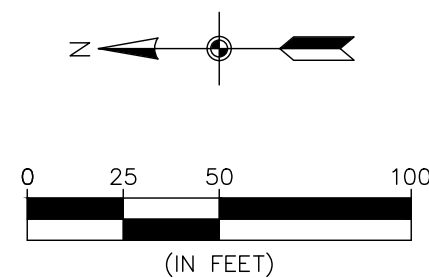
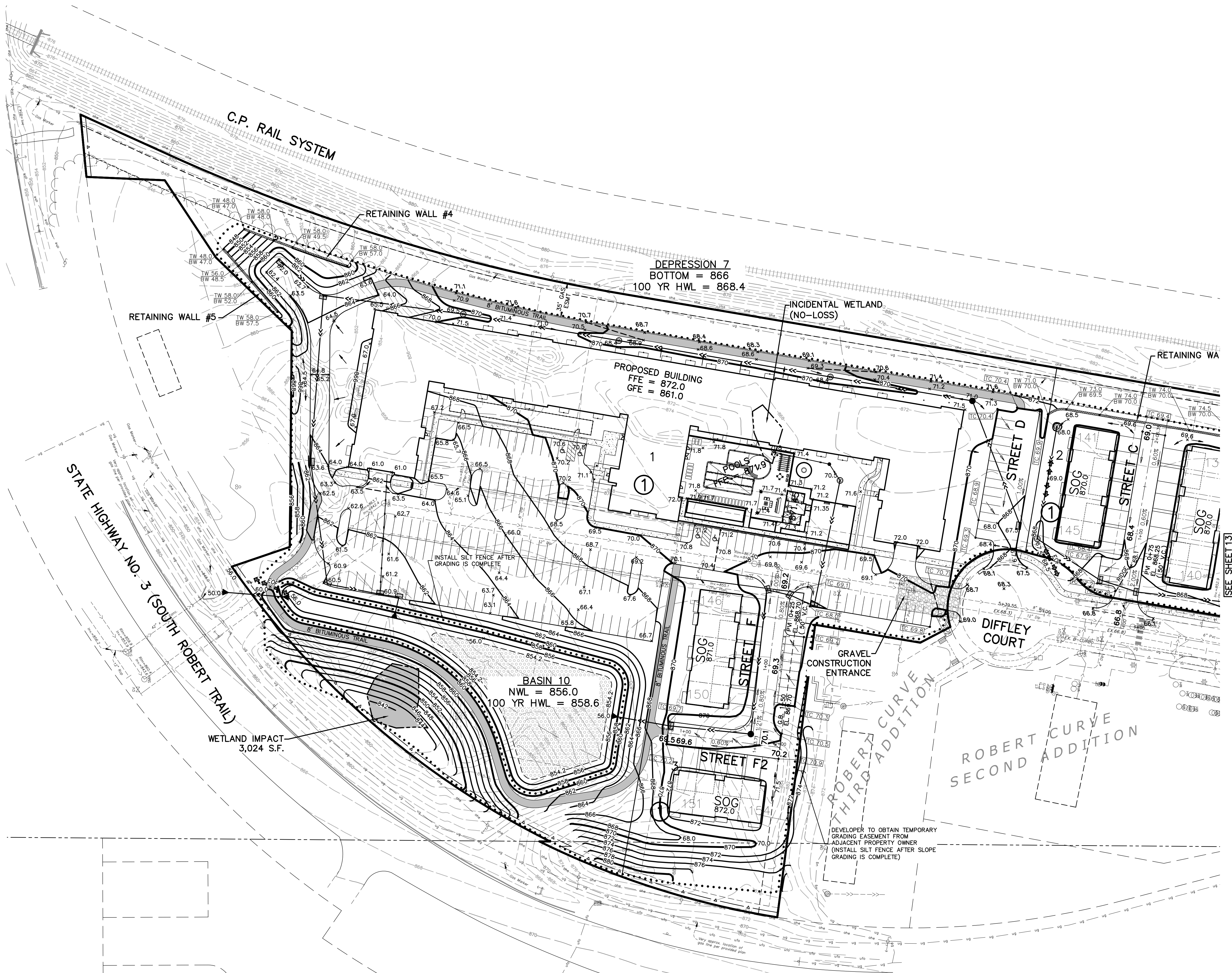
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Signature: *Dan Wilke*
Date: 8/22/22 License #: 53182

10 of 16

Base File: 09/23/22 11:03:03 0921 - 9640/0923 - robert curve 3rd additional CarlsonEngineering.dgn 0923.dwg



BENCHMARK	
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PRELIMINARY GRADING & EROSION CONTROL PLAN

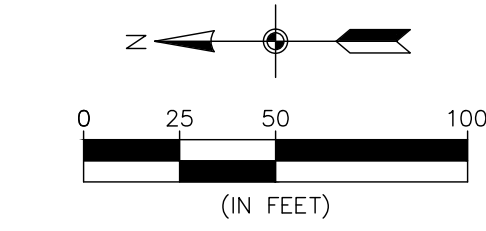
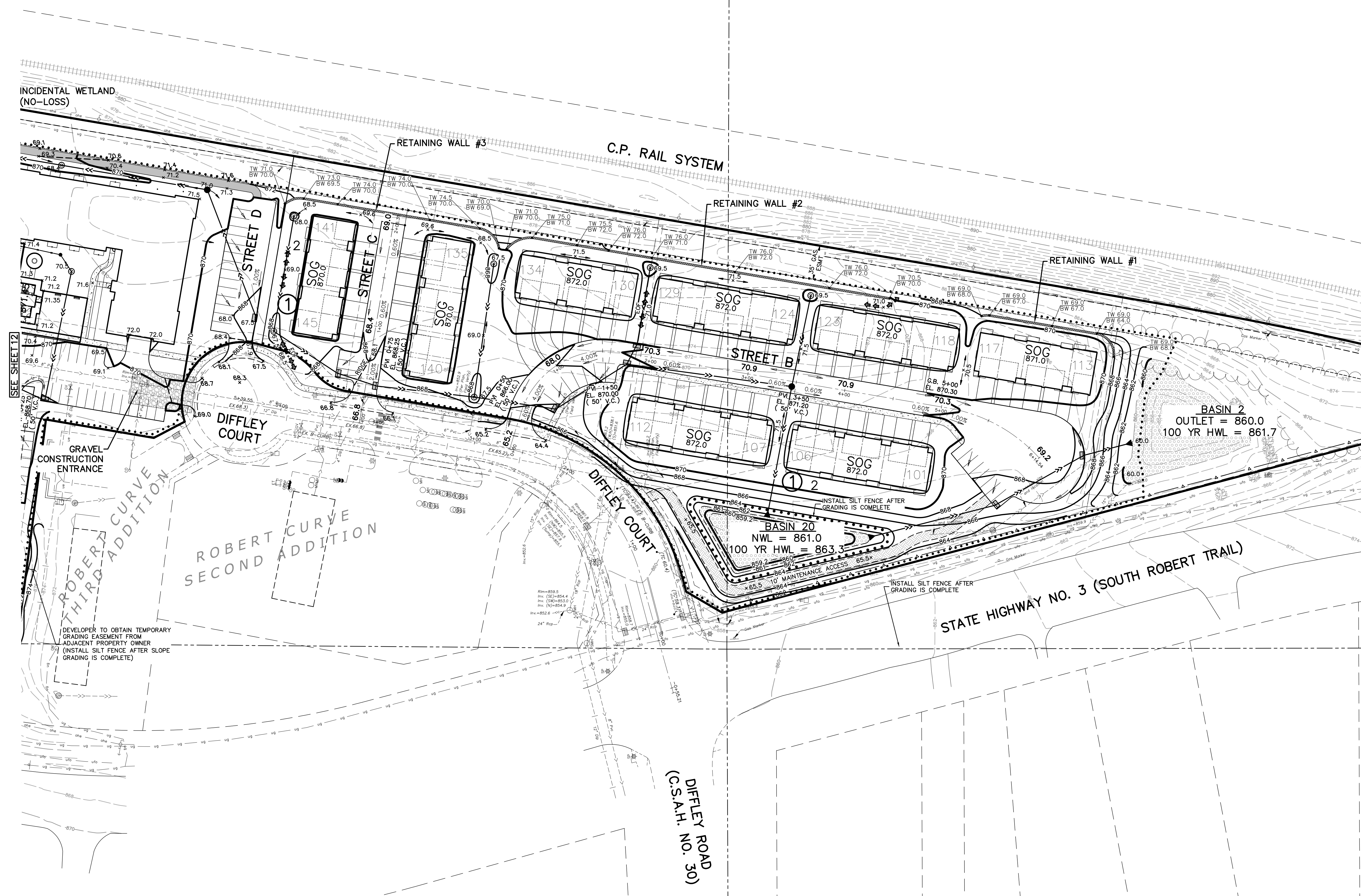
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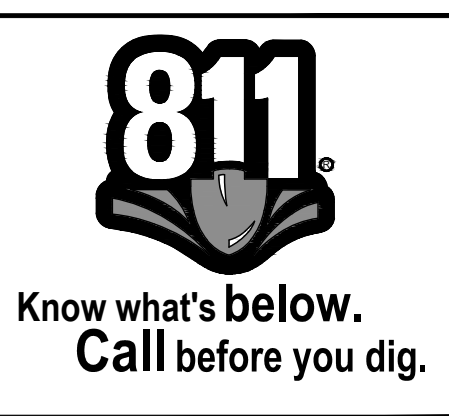
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BENCHMARK	
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2. MnDot Geodetic GSD Station No. 103185 (MnDot Name 1921 W) - Elevation 923.60 ft. (NAVD88)	



PRELIMINARY GRADING
& EROSION CONTROL PLAN

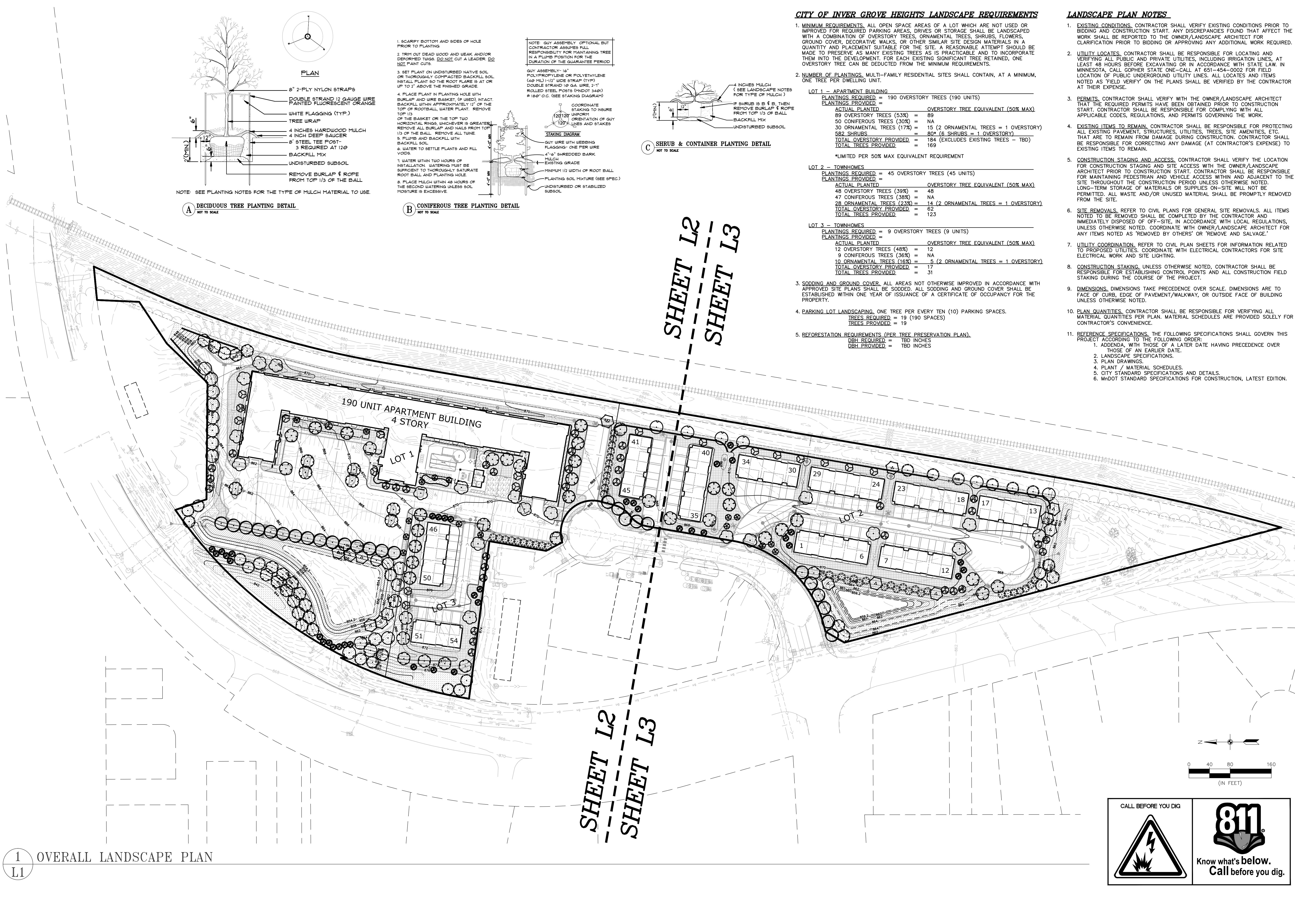
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Date: 8/22/22 License #: 53182



1 OVERALL LANDSCAPE PLAN
L1

CITY OF INVER GROVE HEIGHTS LANDSCAPE REQUIREMENTS

- MINIMUM REQUIREMENTS. ALL OPEN SPACE AREAS OF A LOT WHICH ARE NOT USED OR IMPROVED FOR REQUIRED PARKING AREAS, DRIVES OR STORAGE SHALL BE LANDSCAPED WITH A COMBINATION OF OVERSTORY TREES, ORNAMENTAL TREES, SHRUBS, FLOWERS, GROUND COVER, DECORATIVE WALKS, OR OTHER SIMILAR SITE DESIGN MATERIALS IN A QUANTITY AND PLACEMENT SUITABLE FOR THE SITE. A REASONABLE ATTEMPT SHOULD BE MADE TO PRESERVE AS MANY EXISTING TREES AS IS PRACTICABLE AND TO INCORPORATE THEM INTO THE DEVELOPMENT. FOR EACH EXISTING SIGNIFICANT TREE RETAINED, ONE OVERSTORY TREE CAN BE DEDUCTED FROM THE MINIMUM REQUIREMENTS.
- NUMBER OF PLANTINGS. MULTI-FAMILY RESIDENTIAL SITES SHALL CONTAIN, AT A MINIMUM, ONE TREE PER DWELLING UNIT.

LOT 1 - APARTMENT BUILDING			
PLANTINGS REQUIRED =	190 OVERSTORY TREES (190 UNITS)		
PLANTINGS PROVIDED =			
ACTUAL PLANTED		OVERSTORY TREE EQUIVALENT (50% MAX)	
89 OVERSTORY TREES (53%)	=	89	
50 CONIFEROUS TREES (30%)	=	NA	
30 ORNAMENTAL TREES (17%)	=	15 (2 ORNAMENTAL TREES = 1 OVERSTORY)	
582 SHRUBS	=	80* (6 SHRUBS = 1 OVERSTORY)	
TOTAL OVERSTORY PROVIDED =	184 (EXCLUDES EXISTING TREES - TBD)		
TOTAL TREES PROVIDED =	169		
*LIMITED PER 50% MAX EQUIVALENT REQUIREMENT			

LOT 2 - TOWNHOMES			
PLANTINGS REQUIRED =	45 OVERSTORY TREES (45 UNITS)		
PLANTINGS PROVIDED =			
ACTUAL PLANTED		OVERSTORY TREE EQUIVALENT (50% MAX)	
48 OVERSTORY TREES (39%)	=	48	
47 CONIFEROUS TREES (38%)	=	NA	
28 ORNAMENTAL TREES (23%)	=	14 (2 ORNAMENTAL TREES = 1 OVERSTORY)	
TOTAL OVERSTORY PROVIDED =	62		
TOTAL TREES PROVIDED =	123		

LOT 3 - TOWNHOMES			
PLANTINGS REQUIRED =	9 OVERSTORY TREES (9 UNITS)		
PLANTINGS PROVIDED =			
ACTUAL PLANTED		OVERSTORY TREE EQUIVALENT (50% MAX)	
12 OVERSTORY TREES (48%)	=	12	
9 CONIFEROUS TREES (36%)	=	NA	
10 ORNAMENTAL TREES (18%)	=	5 (2 ORNAMENTAL TREES = 1 OVERSTORY)	
TOTAL OVERSTORY PROVIDED =	17		
TOTAL TREES PROVIDED =	31		

- SODDING AND GROUND COVER. ALL AREAS NOT OTHERWISE IMPROVED IN ACCORDANCE WITH APPROVED SITE PLANS SHALL BE SODDED. ALL SODDING AND GROUND COVER SHALL BE ESTABLISHED WITHIN ONE YEAR OF ISSUANCE OF A CERTIFICATE OF OCCUPANCY FOR THE PROPERTY.
- PARKING LOT LANDSCAPING. ONE TREE PER EVERY TEN (10) PARKING SPACES.
TREES REQUIRED = 19 (190 SPACES)
TREES PROVIDED = 19
- REFORESTATION REQUIREMENTS (PER TREE PRESERVATION PLAN).
DBH REQUIRED = TBD INCHES
DBH PROVIDED = TBD INCHES

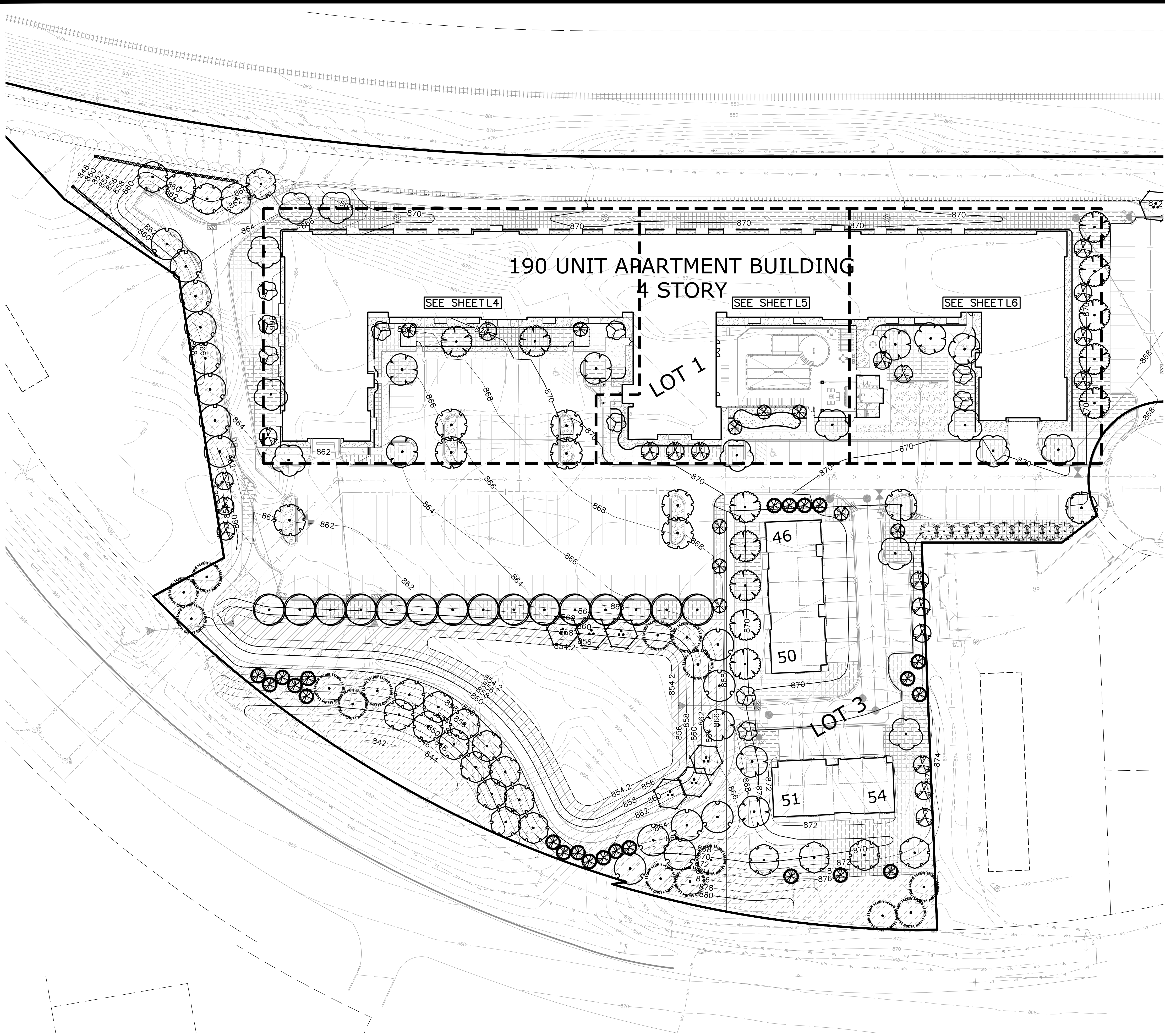
LANDSCAPE PLAN NOTES

- EXISTING CONDITIONS. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO BIDDING AND CONSTRUCTION START. ANY DISCREPANCIES FOUND THAT AFFECT THE WORK SHALL BE REPORTED TO THE OWNER/LANDSCAPE ARCHITECT FOR CLARIFICATION PRIOR TO BIDDING OR APPROVING ANY ADDITIONAL WORK REQUIRED.
- UTILITY LOCATES. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND VERIFYING ALL PUBLIC AND PRIVATE UTILITIES, INCLUDING IRRIGATION LINES, AT LEAST 48 HOURS BEFORE EXCAVATING OR IN ACCORDANCE WITH STATE LAW. IN MINNESOTA, CALL GOPHER STATE ONE-CALL AT 651-454-0002 FOR FIELD LOCATION OF PUBLIC UNDERGROUND UTILITY LINES. ALL LOCATES AND ITEMS NOTED AS 'FIELD VERIFY' ON THE PLANS SHALL BE VERIFIED BY THE CONTRACTOR AT THEIR EXPENSE.
- PERMITS. CONTRACTOR SHALL VERIFY WITH THE OWNER/LANDSCAPE ARCHITECT THAT THE REQUIRED PERMITS HAVE BEEN OBTAINED PRIOR TO CONSTRUCTION START. CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE CODES, REGULATIONS, AND PERMITS GOVERNING THE WORK.
- EXISTING ITEMS TO REMAIN. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING PAVEMENT, STRUCTURES, UTILITIES, TREES, SITE AMENITIES, ETC. THAT ARE TO REMAIN FROM DAMAGE DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTING ANY DAMAGE (AT CONTRACTOR'S EXPENSE) TO EXISTING ITEMS TO REMAIN.
- CONSTRUCTION STAGING AND ACCESS. CONTRACTOR SHALL VERIFY THE LOCATION FOR CONSTRUCTION STAGING AND SITE ACCESS WITH THE OWNER/LANDSCAPE ARCHITECT PRIOR TO CONSTRUCTION START. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING PEDESTRIAN AND VEHICLE ACCESS WITHIN AND ADJACENT TO THE SITE THROUGHOUT THE CONSTRUCTION PERIOD UNLESS OTHERWISE NOTED. LONG-TERM STORAGE OF MATERIALS OR SUPPLIES ON-SITE WILL NOT BE PERMITTED. ALL WASTE AND/OR UNUSED MATERIAL SHALL BE PROMPTLY REMOVED FROM THE SITE.
- SITE REMOVALS. REFER TO CIVIL PLANS FOR GENERAL SITE REMOVALS. ALL ITEMS NOTED TO BE REMOVED SHALL BE COMPLETED BY THE CONTRACTOR AND IMMEDIATELY DISPOSED OF OFF-SITE, IN ACCORDANCE WITH LOCAL REGULATIONS, UNLESS OTHERWISE NOTED. COORDINATE WITH OWNER/LANDSCAPE ARCHITECT FOR ANY ITEMS NOTED AS 'REMOVED BY OTHERS' OR 'REMOVE AND SALVAGE.'
- UTILITY COORDINATION. REFER TO CIVIL PLAN SHEETS FOR INFORMATION RELATED TO PROPOSED UTILITIES. COORDINATE WITH ELECTRICAL CONTRACTORS FOR SITE ELECTRICAL WORK AND SITE LIGHTING.
- CONSTRUCTION STAKING. UNLESS OTHERWISE NOTED, CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING CONTROL POINTS AND ALL CONSTRUCTION FIELD STAKING DURING THE COURSE OF THE PROJECT.
- DIMENSIONS. DIMENSIONS TAKE PRECEDENCE OVER SCALE. DIMENSIONS ARE TO FACE OF CURB, EDGE OF PAVEMENT/WALKWAY, OR OUTSIDE FACE OF BUILDING UNLESS OTHERWISE NOTED.
- PLAN QUANTITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL MATERIAL QUANTITIES PER PLAN. MATERIAL SCHEDULES ARE PROVIDED SOLELY FOR CONTRACTOR'S CONVENIENCE.
- REFERENCE SPECIFICATIONS. THE FOLLOWING SPECIFICATIONS SHALL GOVERN THIS PROJECT ACCORDING TO THE FOLLOWING ORDER:
 - ADDENDA, WITH THOSE OF A LATER DATE HAVING PRECEDENCE OVER THOSE OF AN EARLIER DATE.
 - LANDSCAPE SPECIFICATIONS.
 - PLAN DRAWINGS.
 - PLANT / MATERIAL SCHEDULES.
 - CITY STANDARD SPECIFICATIONS AND DETAILS.
 - MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, LATEST EDITION.

REVISIONS	
1.	09/23/22 Per City Comments
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DRAWN BY:	RJR
ISSUE DATE:	8/23/22
FILE NO:	2401

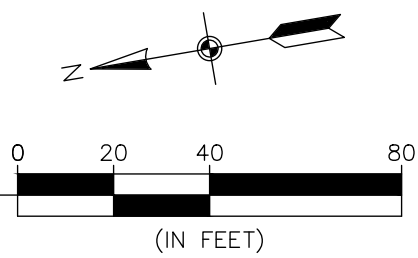
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Name: Ryan J. Ruttger, RLA
Signature:
Date: 8/22/22 License #: 56346



TREES	BOTANICAL NAME	COMMON NAME
	Acer rubrum `Northwood`	Northwood Red Maple
	Acer x freemanii `Sienna`	Sienna Glen Maple
	Betula nigra Clump Form, 2.5" Cal Equivalent	River Birch Multi-Trunk
	Gleditsia triacanthos inermis `Harve`	Northern Acclaim Thornless Honey Locust
	Gymnocladus dioica `Espresso`	Kentucky Coffeetree
	Quercus bicolor	Swamp White Oak
	Tilia americana `Boulevard`	Boulevard Linden
	Ulmus americana `Jefferson`	Jefferson American Elm
CONIFEROUS TREES	BOTANICAL NAME	COMMON NAME
	Abies balsamea	Balsam Fir
	Picea glauca densata	Black Hills Spruce
	Pinus strobus	White Pine
ORNAMENTAL TREES	BOTANICAL NAME	COMMON NAME
	Amelanchier x grandiflora `Autumn Brilliance` Clump Form, Red Fall Color, 1.5" Cal Equivalent	Autumn Brilliance Serviceberry
	Malus x `Prairifire` Red Flowers	Prairifire Crabapple
	Syringa reticulata `Ivory Silk` White Flowers	Ivory Silk Japanese Tree Lilac
GROUND COVERS	BOTANICAL NAME	COMMON NAME
	Engineered Wood Fiber Mulch	Play Area Surfacing
	Putting Green Refer to Architectural Specifications	Artificial Turf
	Rock Mulch Non-Woven Geotextile Incidental	1.5" Trap Rock Mulch
	Turf Sod Bluegrass	Kentucky Bluegrass
	Type I - Native Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 50.0 lb/ac	MnDOT Seed Mix 35-221
	Type II - Wet Meadow Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 18.0 lb/ac	MnDOT Seed Mix 34-271

1 LANDSCAPE PLAN - LOTS 1&3
L2



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SURVEYING
ENVIRONMENTAL

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LANDSCAPE PLAN

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Signature:

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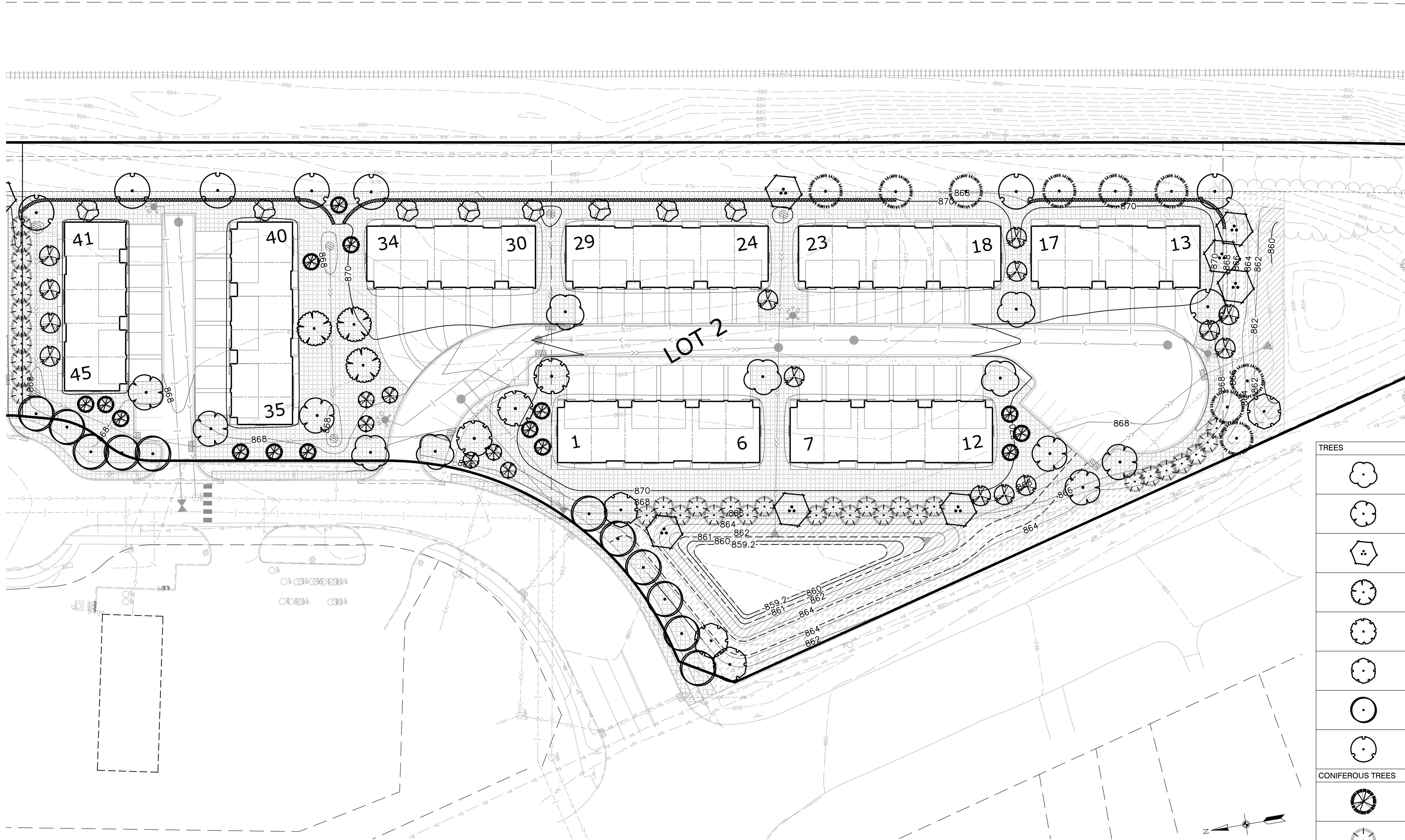
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56346

L2

of

L7



1 LANDSCAPE PLAN - LOT 2
L3

TREES	BOTANICAL NAME	COMMON NAME
	Acer rubrum `Northwood`	Northwood Red Maple
	Acer x freemanii `Sienna`	Sienna Glen Maple
	Betula nigra Clump Form, 2.5" Cal Equivalent	River Birch Multi-Trunk
	Gleditsia triacanthos inermis `Harve`	Northern Acclaim Thornless Honey Locust
	Gymnocladus dioica `Espresso`	Kentucky Coffeetree
	Quercus bicolor	Swamp White Oak
	Tilia americana `Boulevard`	Boulevard Linden
	Ulmus americana `Jefferson`	Jefferson American Elm
CONIFEROUS TREES	BOTANICAL NAME	COMMON NAME
	Abies balsamea	Balsam Fir
	Picea glauca densata	Black Hills Spruce
	Pinus strobus	White Pine
ORNAMENTAL TREES	BOTANICAL NAME	COMMON NAME
	Amelanchier x grandiflora `Autumn Brilliance` Clump Form, Red Fall Color, 1.5" Cal Equivalent	Autumn Brilliance Serviceberry
	Malus x `Prairifire` Red Flowers	Prairifire Crabapple
	Syringa reticulata `Ivory Silk` White Flowers	Ivory Silk Japanese Tree Lilac
GROUND COVERS	BOTANICAL NAME	COMMON NAME
	Engineered Wood Fiber Mulch	Play Area Surfacing
	Putting Green Refer to Architectural Specifications	Artificial Turf
	Rock Mulch Non-Woven Geotextile Incidental	1.5" Trap Rock Mulch
	Turf Sod Bluegrass	Kentucky Bluegrass
	Type I - Native Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 50.0 lb/ac	MnDOT Seed Mix 35-221
	Type II - Wet Meadow Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 18.0 lb/ac	MnDOT Seed Mix 34-271

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LANDSCAPE PLAN

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Inver Grove Heights, Minnesota

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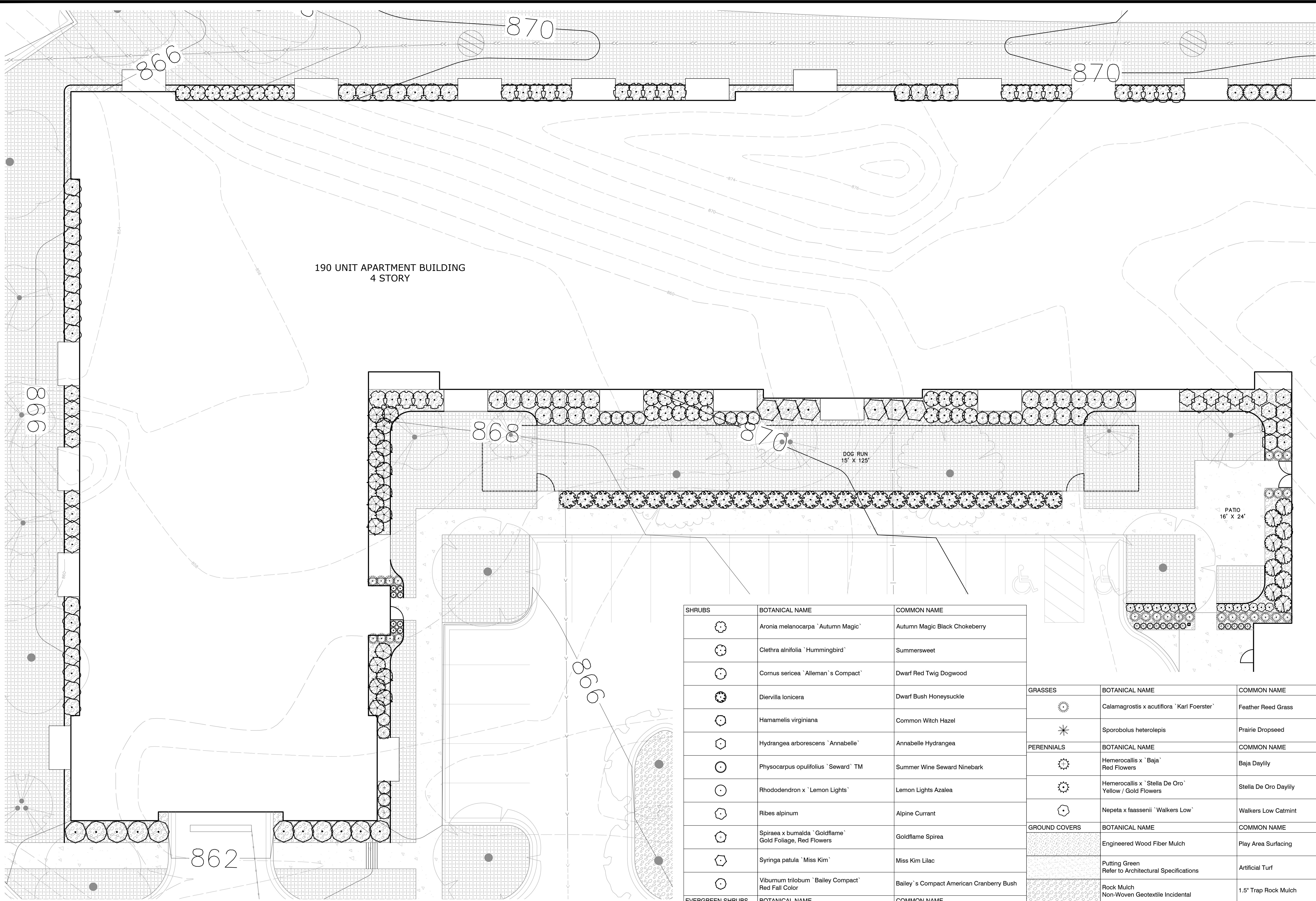
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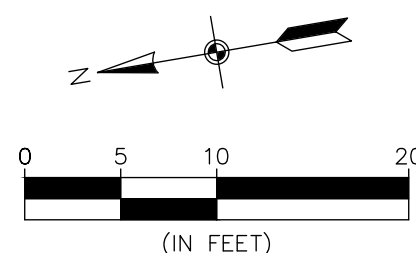
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L3 of L7



1 LANDSCAPE PLAN ENLARGEMENT
L4



SHRUBS	BOTANICAL NAME	COMMON NAME
	Aronia melanocarpa 'Autumn Magic'	Autumn Magic Black Chokeberry
	Clethra alnifolia 'Hummingbird'	Summersweet
	Cornus sericea 'Alleman's Compact'	Dwarf Red Twig Dogwood
	Diervilla lonicera	Dwarf Bush Honeysuckle
	Hamamelis virginiana	Common Witch Hazel
	Hydrangea arborescens 'Annabelle'	Annabelle Hydrangea
	Physocarpus opulifolius 'Seward' TM	Summer Wine Seward Ninebark
	Rhododendron x 'Lemon Lights'	Lemon Lights Azalea
	Ribes alpinum	Alpine Currant
	Spiraea x bumalda 'Goldflame' Gold Foliage, Red Flowers	Goldflame Spirea
	Syringa patula 'Miss Kim'	Miss Kim Lilac
	Viburnum trilobum 'Bailey Compact' Red Fall Color	Bailey's Compact American Cranberry Bush
EVERGREEN SHRUBS	BOTANICAL NAME	COMMON NAME
	Buxus x 'Green Velvet'	Green Velvet Boxwood
	Juniperus chinensis 'Sea Green'	Sea Green Juniper
	Taxus x media 'Tauntonii'	Tauton Yew

GRASSES	BOTANICAL NAME	COMMON NAME
	Calamagrostis x acutiflora 'Karl Foerster'	Feather Reed Grass
	Sporobolus heterolepis	Prairie Dropseed
PERENNIALS	BOTANICAL NAME	COMMON NAME
	Hemerocallis x 'Baja' Red Flowers	Baja Daylily
	Hemerocallis x 'Stella De Oro' Yellow / Gold Flowers	Stella De Oro Daylily
	Nepeta x faassenii 'Walkers Low'	Walkers Low Catmint
GROUND COVERS	BOTANICAL NAME	COMMON NAME
	Engineered Wood Fiber Mulch	Play Area Surfacing
	Putting Green Refer to Architectural Specifications	Artificial Turf
	Rock Mulch Non-Woven Geotextile Incidental	1.5" Trap Rock Mulch
	Turf Sod Bluegrass	Kentucky Bluegrass
	Type I - Native Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 50.0 lb/ac	MnDOT Seed Mix 35-221
	Type II - Wet Meadow Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 18.0 lb/ac	MnDOT Seed Mix 34-271

ENGINEERING
SURVEYING
ENVIRONMENTAL

3890 PHEASANT RIDGE DRIVE NE, SUITE 100, BLAINE, MN 55449
TEL 763.485.7500 \ FAX 763.485.7559 \ CARLSONMCCAIN.COM

LANDSCAPE PLAN

ROBERT CURVE FOURTH ADDITION
Inver Grove Heights, Minnesota

IGH PARTNERS, LLC
3601 - 18th Street S, Suite 103
St. Cloud, MN 56301

REVISIONS

1. 09/23/22 Per City Comments

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DRAWN BY: RJR

ISSUE DATE: 8/23/22

FILE NO: 2401

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota

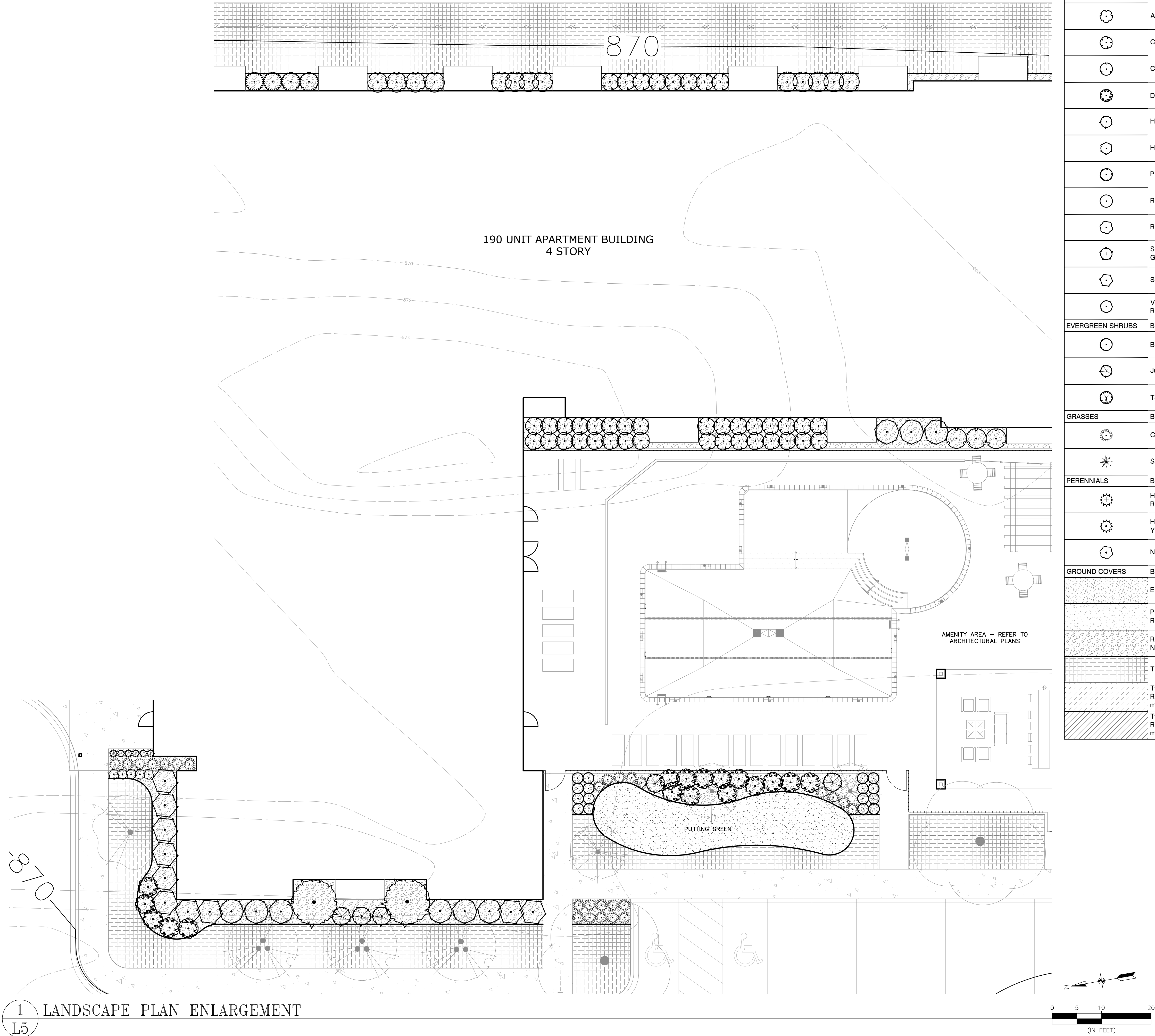
Name: Ryan J. Ruttger, RLA

Signature:

Date: 8/22/22 License #: 56346

L4 of L7

Start Date: 09/23/22 11:05am 08/21 - 8/24/2023 - robert curve 3rd addendum C:\Bldg\Bldg\W03_Landscape.dwg



SHRUBS	BOTANICAL NAME	COMMON NAME
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	Clethra alnifolia 'Hummingbird'	Summersweet
	Cornus sericea 'Alleman's Compact'	Dwarf Red Twig Dogwood
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LANDSCAPE PLAN

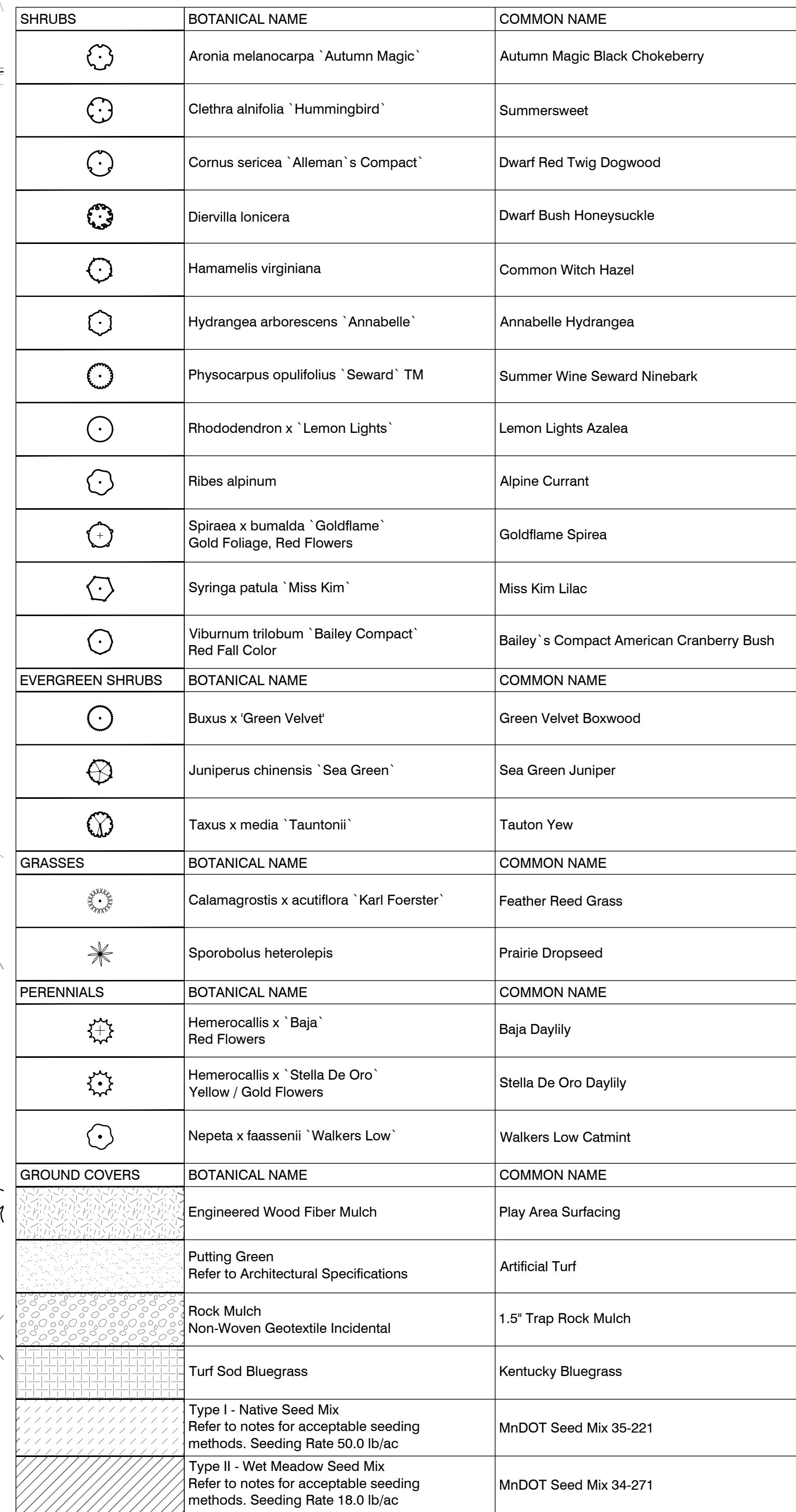
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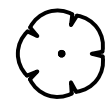
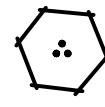
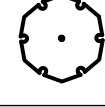
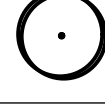
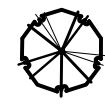
REVISIONS
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DRAWN BY: RJR
ISSUE DATE: 8/23/22
FILE NO: 2401

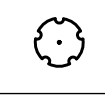
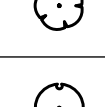
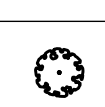
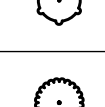
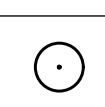
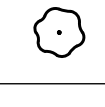
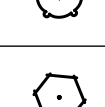
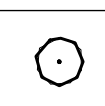
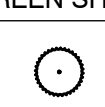
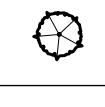
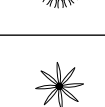
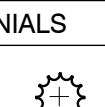
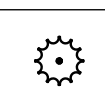
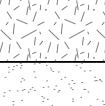
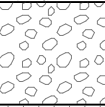
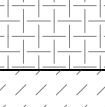
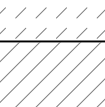
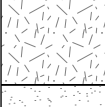
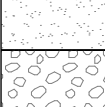
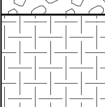
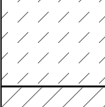
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota
Name: Ryan J. Ruttger, RLA
Signature:
Date: 8/22/22 License #: 56346

L5 of L7



PLANT SCHEDULE

TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	RM	18	Acer rubrum `Northwood`	Northwood Red Maple	2.5" Cal.	B&B
	FM	15	Acer x freemanii `Sienna`	Sienna Glen Maple	2.5" Cal.	B&B
	RB	14	Betula nigra Clump Form, 2.5" Cal Equivalent	River Birch Multi-Trunk	10' Ht.	B&B
	HL	15	Gleditsia triacanthos inermis `Harve`	Northern Acclaim Thornless Honey Locust	2.5" Cal.	B&B
	KC	12	Gymnocladus dioica `Espresso`	Kentucky Coffeetree	2.5" Cal.	B&B
	WO	26	Quercus bicolor	Swamp White Oak	2.5" Cal.	B&B
	BL	26	Tilia americana `Boulevard`	Boulevard Linden	2.5" Cal.	B&B
	AE	23	Ulmus americana `Jefferson`	Jefferson American Elm	2.5" Cal.	B&B
CONIFEROUS TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	BF	38	Abies balsamea	Balsam Fir	6' Ht.	B&B
	BH	44	Picea glauca densata	Black Hills Spruce	6' Ht.	B&B
	WP	24	Pinus strobus	White Pine	6' Ht.	B&B
ORNAMENTAL TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	SB	34	Amelanchier x grandiflora `Autumn Brilliance` Clump Form, Red Fall Color, 1.5' Cal Equivalent	Autumn Brilliance Serviceberry	7' Ht.	B&B
	CA	18	Malus x `Prairifire` Red Flowers	Prairifire Crabapple	1.5" Cal.	B&B
	JL	16	Syringa reticulata `Ivory Silk` White Flowers	Ivory Silk Japanese Tree Lilac	1.5" Cal.	B&B

SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	BCB	43	Aronia melanocarpa `Autumn Magic`	Autumn Magic Black Chokeberry	#5 Cont.	
	SSC	74	Clethra alnifolia `Hummingbird`	Summersweet	#5 Cont.	
	RTD	59	Cornus sericea `Alleman`'s Compact`	Dwarf Red Twig Dogwood	#5 Cont.	
	DBH	60	Diervilla lonicera	Dwarf Bush Honeysuckle	#5 Cont.	
	CWH	2	Hamamelis virginiana	Common Witch Hazel	#5 Cont.	
	ABH	33	Hydrangea arborescens `Annabelle`	Annabelle Hydrangea	#5 Cont.	
	NBS	28	Physocarpus opulifolius `Seward` TM	Summer Wine Seward Ninebark	#5 Cont.	
	LLA	8	Rhododendron x `Lemon Lights`	Lemon Lights Azalea	#5 Cont.	
	APC	32	Ribes alpinum	Alpine Currant	#5 Cont.	
	SPG	17	Spiraea x bumalda `Goldflame` Gold Foliage, Red Flowers	Goldflame Spirea	#5 Cont.	
	MKL	28	Syringa patula `Miss Kim`	Miss Kim Lilac	#5 Cont.	
	VBC	34	Viburnum trilobum `Bailey Compact` Red Fall Color	Bailey`s Compact American Cranberry Bush	#5 Cont.	
EVERGREEN SHRUBS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	GVB	95	Buxus x `Green Velvet`	Green Velvet Boxwood	#5 Cont.	
	JSG	57	Juniperus chinensis `Sea Green`	Sea Green Juniper	#5 Cont.	
	YEW	12	Taxus x media `Tauntonii`	Tauton Yew	#5 Cont.	
GRASSES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	KFG	78	Calamagrostis x acutiflora `Karl Foerster`	Feather Reed Grass	#5 Cont.	
	PDS	10	Sporobolus heterolepis	Prairie Dropseed	#5 Cont.	
PERENNIALS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	DLB	19	Hemerocallis x `Baja` Red Flowers	Baja Daylily	#1 Cont.	
	DLS	16	Hemerocallis x `Stella De Oro` Yellow / Gold Flowers	Stella De Oro Daylily	#1 Cont.	
	WLC	20	Nepeta x faassenii `Walkers Low`	Walkers Low Catmint	#1 Cont.	
GROUND COVERS	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER
	EEWF	1,833 sf	Engineered Wood Fiber Mulch	Play Area Surfacing	12" Depth	
	PG	546 sf	Putting Green Refer to Architectural Specifications	Artificial Turf	---	
	ROCK	9,804 sf	Rock Mulch Non-Woven Geotextile Incidental	1.5" Trap Rock Mulch	4" Depth	
	SOD	141,277 sf	Turf Sod Bluegrass	Kentucky Bluegrass	sod	
	TI	72,243 sf	Type I - Native Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 50.0 lb/ac	MnDOT Seed Mix 35-221	seed	
	TIi	21,792 sf	Type II - Wet Meadow Seed Mix Refer to notes for acceptable seeding methods. Seeding Rate 18.0 lb/ac	MnDOT Seed Mix 34-271	seed	

LANDSCAPE SPECIFICATIONS

- TREE PROTECTION.** ALL TREES NOT SPECIFICALLY NOTED OR MARKED ON SITE FOR REMOVAL SHALL REMAIN PROTECTED AND UNDISTURBED DURING CONSTRUCTION. TREE PROTECTION SHALL EXTEND TO THE DRIP LINE, WITHIN WHICH NO CONSTRUCTION ACTIVITY, MATERIAL STORAGE, OR VEHICLE PARKING SHALL BE PERMITTED. TREE PROTECTION FENCING SHALL BE ERECTED PRIOR TO CONSTRUCTION START PER PLANS OR AS DIRECTED BY OWNER/LANDSCAPE ARCHITECT AND SHALL CONSIST OF 4' TALL HEAVY DUTY ORANGE CONSTRUCTION FENCING WITH 6" STEEL FENCE POSTS SPACED 6' O.C. MAX.
- EROSION CONTROL.** REFER TO CIVIL PLAN SHEETS FOR STORMWATER POLLUTION PREVENTION PLAN (SWPPP), AND TEMPORARY AND PERMANENT STORMWATER BMPS, INCLUDING SILT FENCE, BIO-ROLLS, INLET PROTECTION, EROSION CONTROL BLANKETING, DUST CONTROL, SWEEPING AND ROCK CONSTRUCTION ENTRANCE. ALL DISTURBED AREAS SHALL RECEIVE PERMANENT STABILIZATION IN ACCORDANCE WITH THE LANDSCAPE PLAN WITHIN 7 DAYS AFTER CONSTRUCTION ACTIVITY IN THE DISTURBED AREA HAS CEASED. IN THE EVENT PERMANENT STABILIZATION CANNOT BE IMPLEMENTED WITHIN 7 DAYS, TEMPORARY STABILIZATION BMPS MUST BE IMPLEMENTED WITHIN 7 DAYS USING.
- CLEARING AND GRUBBING.** CONTRACTOR SHALL BE RESPONSIBLE FOR CLEARING AND GRUBBING ALL AREAS INDICATED AS BEING DISTURBED OR OTHERWISE SHOWN ON PLANS. CLEARING AND GRUBBING SHALL INCLUDE REMOVAL AND DISPOSAL OF ALL TREES, STUMPS, BRUSH, GRASS, ROOTS AND OTHER ORGANIC MATERIAL AT AN APPROVED OFF-SITE DISPOSAL LOCATION.
- SOIL PREPARATION.** REFER TO GEOTECHNICAL REPORT FOR ANY REQUIRED SOIL CORRECTIONS, AMENDMENTS OR ADDITIONAL INFORMATION (IF APPLICABLE). EXISTING TOPSOIL SHALL BE STRIPPED FROM ALL DISTURBED AREAS AND STOCKPILED IN AN APPROVED LOCATION FOR RE-SPREAD. ALL AREAS WHERE SOIL HAS BEEN COMPACTED BY CONSTRUCTION ACTIVITY AND THAT ARE INDICATED TO BE SODDED, SEEDED OR PLANTING BED SHALL BE DE-COMPACTED TO A MINIMUM DEPTH OF 12 INCHES BY SOIL RIPPING, TILLING OR OTHER APPROVED SOIL LOOSENING METHOD.
- TOPSOIL MATERIAL.** ALL EXISTING, AMENDED OR IMPORTED TOPSOIL SHALL MEET THE REQUIREMENTS OF MNDOT TOPSOIL TYPE A. A MINIMUM 4 INCH DEPTH OF TOPSOIL SHALL BE PLACED ON ALL AREAS TO BE SODDED OR SEEDDED. A MINIMUM 12 INCH DEPTH OF TOPSOIL SHALL BE PLACED WITHIN ALL PLANTING BED AREAS. ALL TOPSOIL SHALL BE FINE GRADED, RAKED AND DRAGGED TO PROVIDE A SMOOTH, UNIFORM SURFACE. TOPSOIL GRADES SHALL BE WITHIN 1 FEET OF INDICATED FINISHED GRADE AND SHALL BE TRUE TO GRADIENTS SHOWN ON PLANS. REFER TO CIVIL PLAN SHEETS FOR FILTRATION BASIN SOIL REQUIREMENTS.
- SEEDING AND TURF ESTABLISHMENT.** CONTRACTOR SHALL OBTAIN OWNER/LANDSCAPE ARCHITECT'S APPROVAL OF FINAL GRADES AND TOPSOIL PREP PRIOR TO SEEDING. APPLY 12-12-12 GRANULAR STARTER FERTILIZER AT A RATE OF 250 LBS PER ACRE PRIOR TO SEEDING. SEEDS SHALL BE SOWN IN 2 PERPENDICULAR PASSES, EACH PASS AT ONE-HALF THE INDICATED RATE, VIA BROADCAST SPREADER, DROP SEEDER OR DRILL SEEDER. FOLLOWING SEED APPLICATION, INSTALL TYPE 3N EROSION CONTROL BLANKET ON ALL SLOPES GREATER THAN 4:1. IN ALL OTHER AREAS, APPLY HYDROMULCH COVER (MUST BE A SEPARATE OPERATION FROM SEEDING) AT A TARGETED DRY WEIGHT RATE OF 3500 LBS PER ACRE. SOIL SHALL BE KEPT MOIST DURING ESTABLISHMENT WITH ADDITIONAL RE-SEEDING AS NECESSARY TO ACHIEVE A HEALTHY, UNIFORM STAND OF GRASS, FREE OF WEEDS AND WITH COVERAGE EXCEEDING 75% IN ANY 10'X10' AREA PRIOR TO FINAL ACCEPTANCE.
- SODDING.** CONTRACTOR SHALL OBTAIN OWNER/LANDSCAPE ARCHITECT'S APPROVAL OF FINAL GRADES AND TOPSOIL PREP PRIOR TO SODDING. APPLY 12-12-12 GRANULAR STARTER FERTILIZER AT A RATE OF 250 LBS PER ACRE PRIOR TO SODDING AND ROLL TOPSOIL TO CREATE A UNIFORM SURFACE FOR LAYING SOD. SOD SHALL NOT BE CUT MORE THAN 24-HOURS IN ADVANCE OF INSTALLATION. CONTRACTOR SHALL KEEP SOD MOIST FOR A MINIMUM OF 30 DAYS AND SHALL BE RESPONSIBLE FOR MAINTAINING THE SOD UNTIL FINAL ACCEPTANCE.
- PLANT MATERIAL.** ALL PLANTING STOCK SHALL CONFORM TO THE "AMERICAN STANDARD FOR NURSERY STOCK," ANSI-Z60, LATEST EDITION, OF THE AMERICAN ASSOCIATION OF NURSERYMEN, INC. AND SHALL CONSTITUTE MINIMUM QUALITY REQUIREMENTS FOR PLANT MATERIALS. OWNER/LANDSCAPE ARCHITECT RESERVE THE RIGHT TO REJECT ANY PLANTS WHICH ARE DEEMED UNSATISFACTORY BEFORE, DURING, OR AFTER INSTALLATION. NO SUBSTITUTION OF PLANT MATERIAL SHALL BE ACCEPTED UNLESS APPROVED IN WRITING BY THE OWNER/LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
- PLANT MATERIAL SUBSTITUTIONS.** ALL REQUESTS FOR PLANT SUBSTITUTIONS SHALL BE MADE IN WRITING TO THE OWNER/LANDSCAPE ARCHITECT AND MUST BE APPROVED BY THE CITY.
- PLANT INSTALLATION AND ESTABLISHMENT.** REFER TO STANDARD PLANTING DETAILS. CONTRACTOR SHALL STAKE TREE LOCATIONS FOR APPROVAL BY OWNER/LANDSCAPE ARCHITECT PRIOR TO PLANTING. ANY PLANT MATERIAL WHICH DIES, TURNS BROWN, OR DEFOLIATES (PRIOR TO TOTAL ACCEPTANCE OF THE WORK) SHALL BE PROMPTLY REMOVED FROM THE SITE AND REPLACED WITH MATERIAL OF THE SAME SPECIES, QUANTITY, AND SIZE.
- MULCH MATERIAL.** DOUBLE SHREDDED HARDWOOD MULCH OR ROCK MULCH AS INDICATED ON PLANS. ALL MULCH SHALL BE CLEAN AND FREE OF NOXIOUS WEEDS, SOIL, OR OTHER DELETERIOUS MATERIAL, AND SHALL BE INSTALLED OVER A NON-WOVEN GEOTEXTILE FABRIC (INCIDENTAL) OR OTHER APPROVED WEED BARRIER TO A MINIMUM SETTLED DEPTH OF 4". MULCH SHALL BE HELD BACK FROM PLANT STEMS/TRUNKS A MINIMUM OF 3". WOOD MULCH SHALL BE PLACED AROUND INDIVIDUAL TREES TO A 4' MINIMUM DIAMETER. MULCH SHALL BE INSTALLED WITHIN 48-HOURS OF PLANT INSTALLATION.

- LANDSCAPE EDGING.** INSTALL LANDSCAPE EDGING BETWEEN ALL MULCH AREAS AND TURF. EDGING SHALL BE COMMERCIAL GRADE BLACK POLYETHYLENE OR VINYL EDGING, 0.1 INCH THICK BY 5 INCHES DEEP, V-LIPPED BOTTOM, HORIZONTALLY GROOVED, 1-INCH ROUND TOP, EXTRUDED IN STANDARD LENGTHS, WITH 9-INCH STEEL ANGLE STAKES.
- IRRIGATION.** DESIGN, FURNISH AND INSTALL A COMPLETE UNDERGROUND IRRIGATION SYSTEM FROM APPROVED POINT(S)-OF-CONNECTION WITHIN THE SITE COVERING ALL TURF AND PLANTING AREAS AS SHOWN ON THE LANDSCAPE PLAN. INCLUDES FLOW/PRESSURE TESTING, PLANS WITH DESIGN CALCULATIONS, AS-BUILT DRAWINGS, LABOR, MATERIALS, EQUIPMENT, AND SERVICES FOR THE TESTING, ADJUSTING, RETESTING AND READJUSTING AS REQUIRED TO PLACE THE SYSTEM IN AN APPROVED OPERATING CONDITION. THE IRRIGATION SYSTEM SHALL INCLUDE THE DESIGN AND INSTALLATION OF THE FOLLOWING: PIPING, METER AND BACKFLOW ASSEMBLIES, SPRINKLER HEADS, CABINETS, VALVES AND VALVE BOXES, CONTROLLERS, CONTROL WIRING, FITTINGS, ELECTRICAL CONNECTIONS, QUICK-COUPERS, ALL OTHER NECESSARY ACCESSORIES, SYSTEM MANUALS, 1-YEAR MAINTENANCE PERIOD INCLUDING 1 FALL WINTERIZATION AND 1 SPRING START-UP. IRRIGATION PLANS TO BE PREPARED BY A QUALIFIED IRRIGATION DESIGNER AND SUBMITTED TO OWNER/LANDSCAPE ARCHITECT FOR APPROVAL.
- MAINTENANCE.** MAINTENANCE SHALL BEGIN IMMEDIATELY AFTER EACH PORTION OF THE WORK IS IN PLACE. PLANT MATERIAL SHALL BE PROTECTED AND MAINTAINED UNTIL THE INSTALLATION OF THE PLANTS IS COMPLETE. INSPECTION HAS BEEN MADE, AND PLANTINGS ARE ACCEPTED EXCLUSIVE OF THE GUARANTEE. MAINTENANCE SHALL INCLUDE MOWING, TRIMMING, WATERING, FERTILIZING, WEED AND PESTICIDE CONTROL, MULCHING, REMOVAL OF DEAD MATERIALS, RE-SETTING PLANTS TO PROPER GRADE AND KEEPING PLANTS IN A PLUMB POSITION. AFTER ACCEPTANCE, THE OWNER SHALL ASSUME MAINTENANCE RESPONSIBILITIES. HOWEVER, THE CONTRACTOR SHALL RETAIN RESPONSIBILITY FOR ALL PLANT MATERIAL THROUGH THE COMPLETION OF THE WARRANTY PERIOD.
- WATERING.** UPON ESTABLISHMENT OF SEED AND INSTALLATION OF PLANTS, CONTRACTOR SHALL MAINTAIN A WATERING SCHEDULE WHICH WILL THOROUGHLY WATER ALL PLANTS AND TURF AREAS A MINIMUM OF ONCE A WEEK. MORE FREQUENT WATERING MAY BE REQUIRED DURING PERIODS OF HOT, DRY WEATHER. CONTRACTOR SHALL MAKE THE NECESSARY ARRANGEMENTS FOR WATER. IN THE ABSENCE OF PERMANENT IRRIGATION, TEMPORARY IRRIGATION, TREE WATERING BAGS, OR HAND-WATERING ARE ACCEPTABLE.
- NATIVE PLANT ESTABLISHMENT.** THIS PROJECT INCLUDES ONE OR MORE NATIVE PLANT SEED MIXES CONSISTING OF A VARIETY OF GRASSES, SEDGES AND FLOWERING FORBS. BECAUSE THESE PLANTS TYPICALLY HAVE A LONGER GERMINATION PERIOD, A COVER CROP SPECIES IS REQUIRED TO PROVIDE TEMPORARY COVER AND STABILIZATION. MAINTENANCE OF THESE SEEDER AREAS IS CRITICAL DURING THE FIRST SEVERAL YEARS TO ESTABLISH A SUCCESSFUL NATIVE PLANT COMMUNITY. SEEDER AREAS SHALL BE MOWED / WEED-WHIPPED TO A HEIGHT OF 6-10 INCHES IN MID-JULY AND EARLY SEPTEMBER DURING THE FIRST 2-3 YEARS OF ESTABLISHMENT. IN ADDITION, ALL NON-NATIVE SPECIES / WEEDS SHALL BE SPOT SPRAYED NO LESS THAN 3 TIMES A YEAR WITH HERBICIDE BY A LICENSED APPLICATOR. RE-SEEDING AS NECESSARY SHALL OCCUR IN MAY. A NATIVE PLANT COMMUNITY SHALL BE CONSIDERED SUCCESSFULLY ESTABLISHED NO SOONER THAT 3 YEARS AFTER INITIAL SEEDING - ONCE THE COVER CROP HAS BEEN SUFFICIENTLY REPLACED BY NATIVE PLANTS AND THE AREA IS FREE OF ALL NON-NATIVE AND INVASIVE SPECIES. AT THIS TIME, MAINTENANCE CAN BE REDUCED TO MOWING / WEED-WHIPPING TO A HEIGHT OF 6-10 INCHES ONCE A YEAR IN EARLY SEPTEMBER AND SPOT SPRAYING OF HERBACIDE ONLY AS NEEDED.
- FINAL ACCEPTANCE.** UPON SUBSTANTIAL COMPLETION OF THE WORK, CONTRACTOR SHALL REQUEST FINAL ACCEPTANCE OF THE WORK IN WRITING BY THE OWNER/LANDSCAPE ARCHITECT. IF ANY WORK IS FOUND TO BE INCOMPLETE OR UNSATISFACTORY IN THE OPINION OF THE OWNER/LANDSCAPE ARCHITECT, A WRITTEN PUNCH LIST WILL BE PREPARED LISTING ALL ITEMS THAT REQUIRE COMPLETING OR CORRECTING BEFORE FINAL ACCEPTANCE.
- WARRANTY.** ALL PLANTS, MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR TWO (2) YEARS FROM THE DATE OF FINAL ACCEPTANCE, UNLESS OTHERWISE SPECIFIED. THE GUARANTEE SHALL COVER THE FULL COST OF REPLACEMENT INCLUDING LABOR AND MATERIAL.

ENGINEERING
SURVEYING
ENVIRONMENTAL

CARLSON
McCAIN



3890 PHEASANT RIDGE DRIVE NE, SUITE 100, BLAINE, MN 55449
TEL 763.488.7500 \ FAX 763.488.7959 \ CARLSONMCCAIN.COM

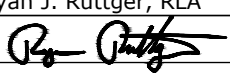
LANDSCAPE PLAN

ROBERT CURVE FOURTH ADDITION
Inver Grove Heights, Minnesota

IGH PARTNERS, LLC
3601 - 18th Street S, Suite 103
St. Cloud, MN 56301

REVISIONS	
1.	09/23/22 Per City Comments
2.	
3.	
4.	
5.	
6.	
DRAWN BY:	RJR
ISSUE DATE:	8/22/22
FILE NO:	2401

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota

Name: Ryan J. Ruttger, RLA
Signature: 
Date: 8/22/22 License #: 56346

L7 of L7

Save Date: 09/23/22 11:05am 0621 - 96409823 - robert curve 3rd additioinal CarlsonMcCainW03_Landscape.dwg

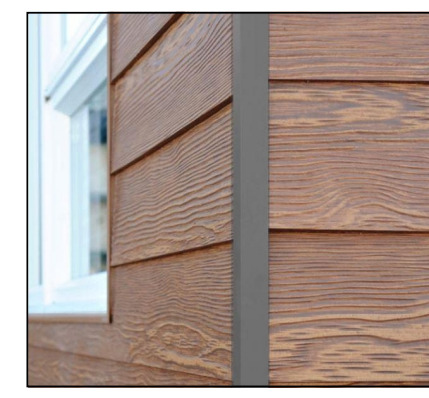
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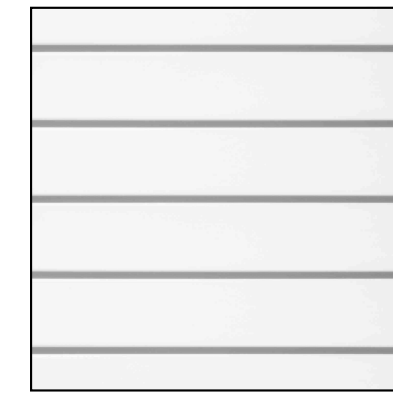
BLACK MANUFACTURED
STONE



GRAY VERTICAL SIDING



CEDAR TEXTURE SIDING



WHITE HORIZONTAL
SIDING



BLACK HORIZONTAL
SIDING



RIGHT ELEV. - 5 UNIT BLDG.
SCALE: 1/8" = 1'-0"



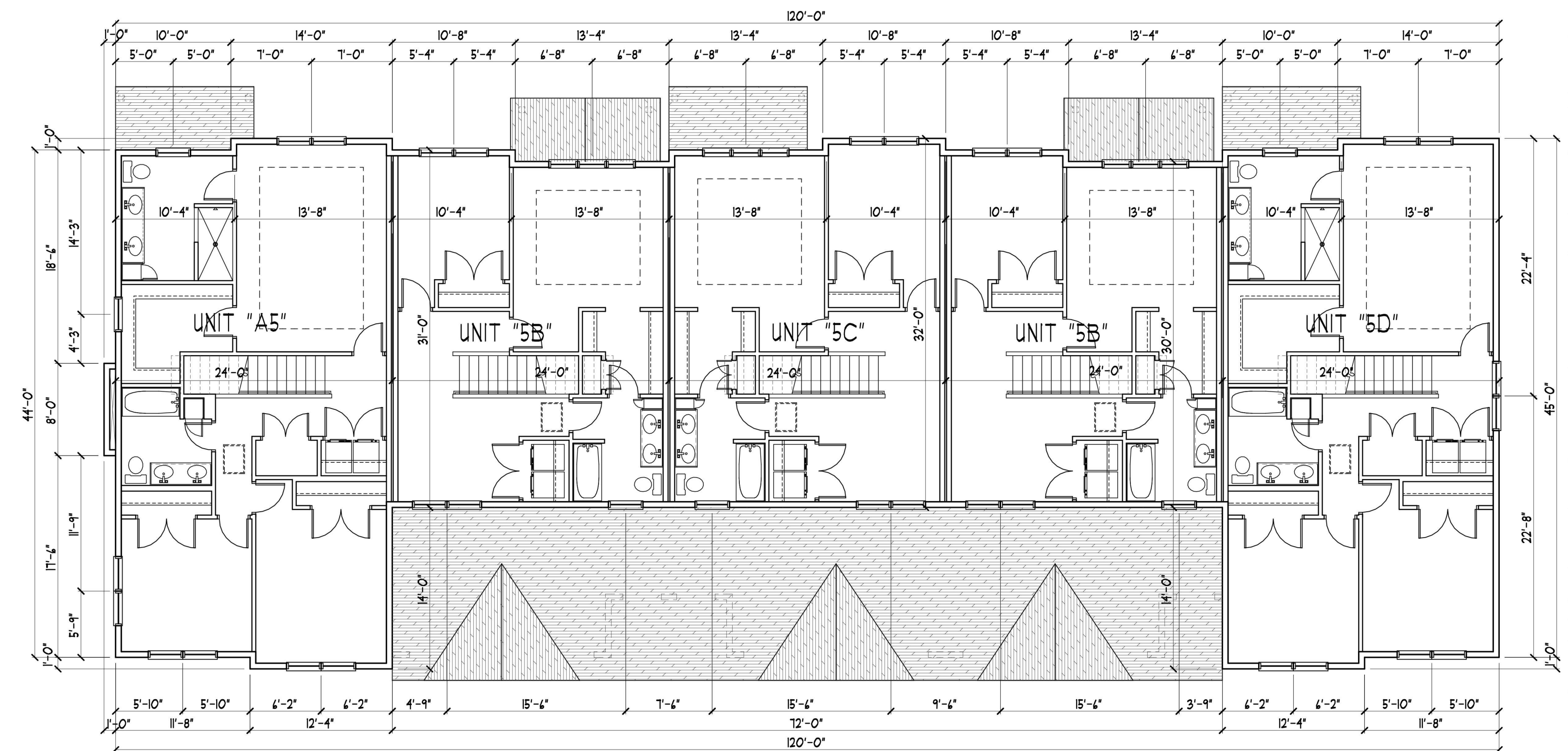
REAR ELEV. - 5 UNIT BLDG.
SCALE: 1/8" = 1'-0"



LEFT ELEV. - 5 UNIT BLDG.
SCALE: 1/8" = 1'-0"

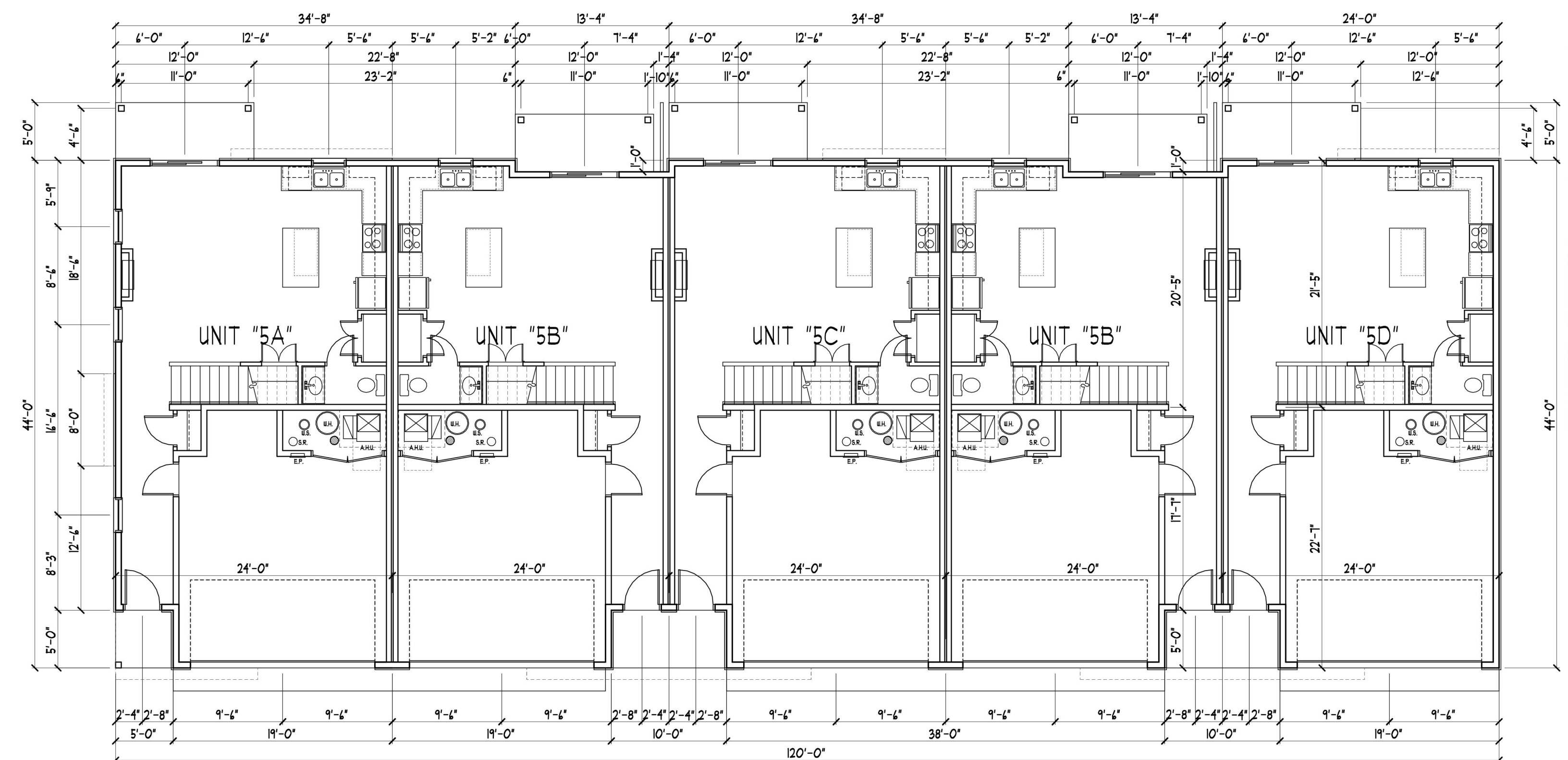


FIRST FLOOR
ELEV. 100'-0"



TYPICAL UNITS	
SECOND FLOOR 3 BR. UNIT "A 1 D" -	1,082 SF
SECOND FLOOR 2 BR. UNIT "B" -	132 SF
SECOND FLOOR 2 BR. UNIT "C" -	155 SF

SECOND FLOOR PLAN - 5 UNIT BLDG.
SCALE: 1/8" = 1'-0" BLDG. AREA THIS FLOOR = 4,382 S.F.



TYPICAL UNITS
 FIRST FLOOR 3 BR. UNIT "A & D" - 616 SF
 FIRST FLOOR 2 BR. UNIT "B" - 603 SF
 FIRST FLOOR 2 BR. UNIT "C" - 616 SF
 TYP. UNIT GARAGE - 415 SF

FIRST FLOOR PLAN - 5 UNIT BLDG.
SCALE: 1/8" = 1'-0" BLDG. AREA THIS FLOOR = 5,128 S.F.

OPTION 3 COLOR PALETTE
6-PLEX



RIGHT ELEV. - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0"



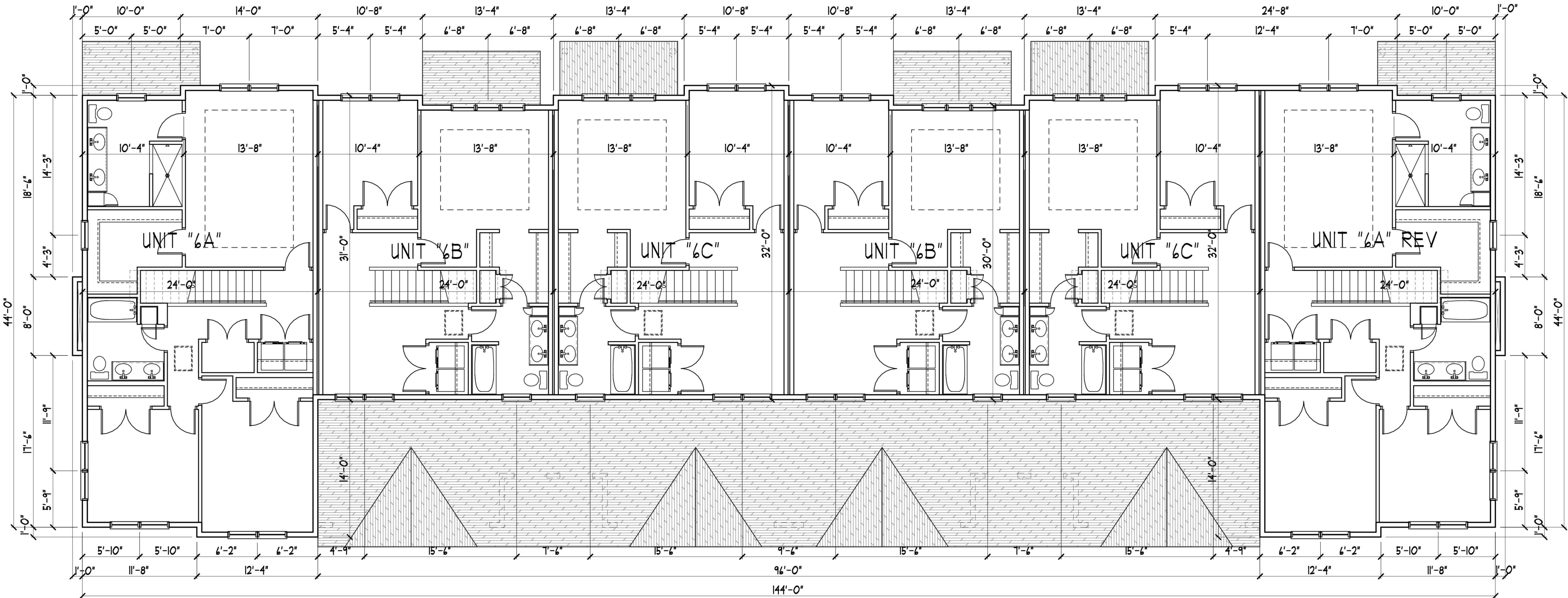
REAR ELEV. - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0"



LEFT ELEV. - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0"

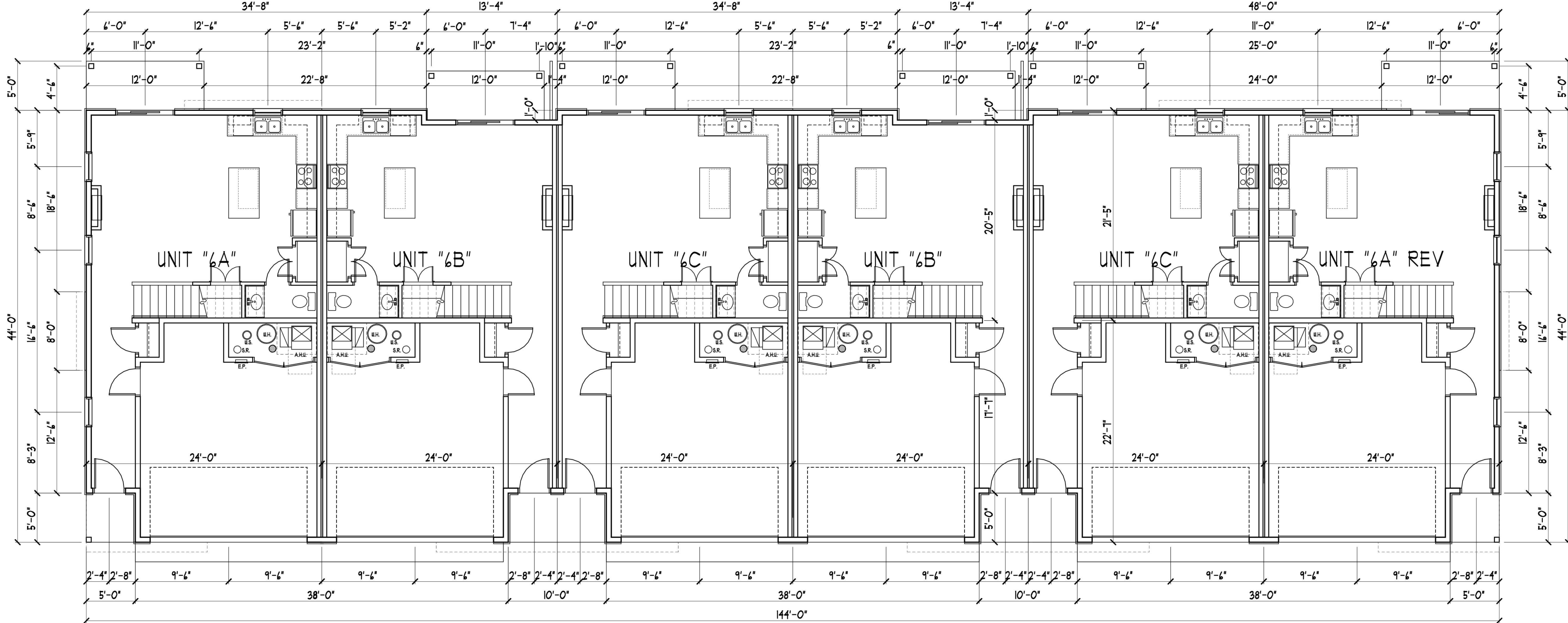


FRONT ELEV. - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0"



TYPICAL UNITS
SECOND FLOOR 3 BR. UNIT 'A' & 'A' REV' - 1082 SF
SECOND FLOOR 2 BR. UNIT 'B' - 132 SF
SECOND FLOOR 2 BR. UNIT 'C' - 155 SF

SECOND FLOOR PLAN - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0" BLDG. AREA THIS FLOOR = 5195 S.F.



TYPICAL UNITS
FIRST FLOOR 3 BR. UNIT 'A' & 'A' REV' - 416 SF
FIRST FLOOR 2 BR. UNIT 'B' - 403 SF
FIRST FLOOR 2 BR. UNIT 'C' - 416 SF
TYP. UNIT GARAGE - 415 SF

FIRST FLOOR PLAN - 6 UNIT BLDG.
SCALE: 1/8" = 1'-0" BLDG. AREA THIS FLOOR = 4159 S.F.

COLE GROUP ARCHITECTS LLC.

214 Park Avenue South
Suite 102
Inver Grove Heights, MN 56001
(952) 454-4510
www.colegrouparchitects.com

PROJECT NO. 220111

SUBMITTAL DATE: AUGUST 19TH, 2022

DOCUMENT SET: CITY SUBMITTAL

A101

PROPOSED 6 UNIT:
INVER GROVE HEIGHTS
TOWNHOMES

INVER GROVE HEIGHTS, MN

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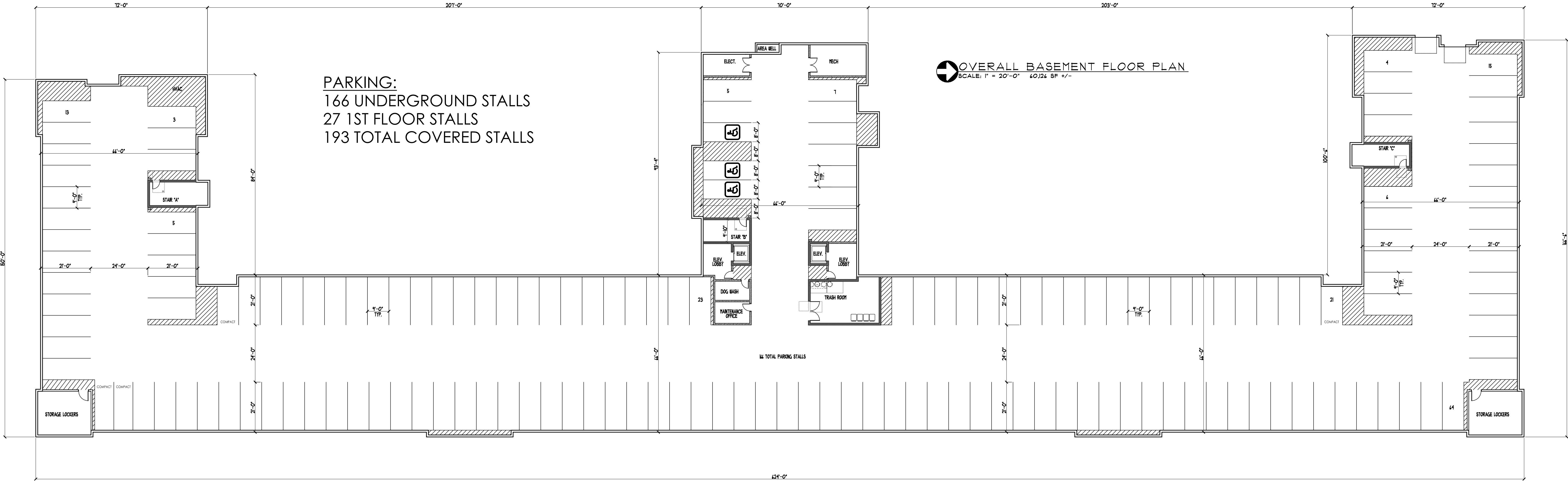
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I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Architect under the laws of the state of MINNESOTA.

Name DAVID MACHIRZAK

TRIDENT DEVELOPMENT

PLOTTED: 08-17-22 FILE: 220111P COM: 3



PARKING:
166 UNDERGROUND STALLS
27 1ST FLOOR STALLS
193 TOTAL COVERED STALLS

OVERALL BASEMENT FLOOR PLAN
SCALE: 1" = 20'-0" 60,124 SF +/-

PROJECT INFORMATION

Project No.

22055

Submittal Date:

August 19th, 2022

Document Set:

City Submittal

REVISIONS COMMENTS

REVISIONS COMMENTS

REVISIONS COMMENTS

PROPOSED:

INVER GROVE HEIGHTS APARTMENTS

INVER GROVE HEIGHTS, MN

DEVELOPER:

TRIDENT DEVELOPMENT

STATE OF MINNESOTA

DIVID MAJCHREK

ARCHITECT

88891

COLE GROUP ARCHITECTS LLC.

216 Park Avenue South

St. Paul, MN 55101

651-451-4570

www.colegrouparchitects.com

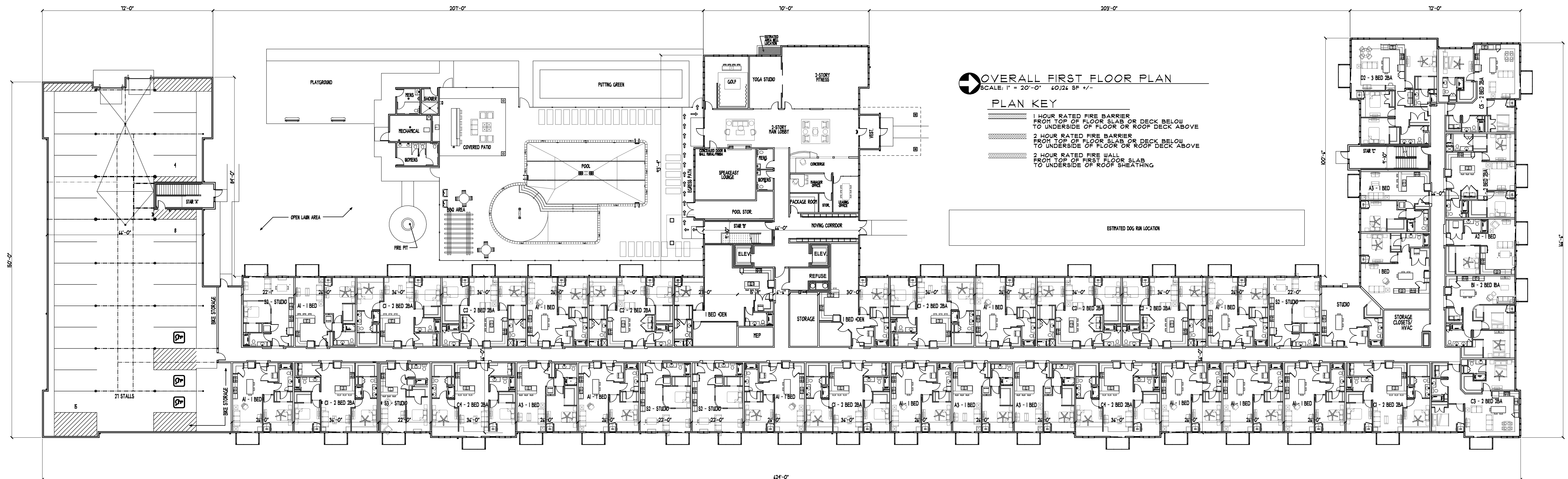
COLE GROUP ARCHITECTS LLC.

216 Park Avenue South

St. Paul, MN 55101

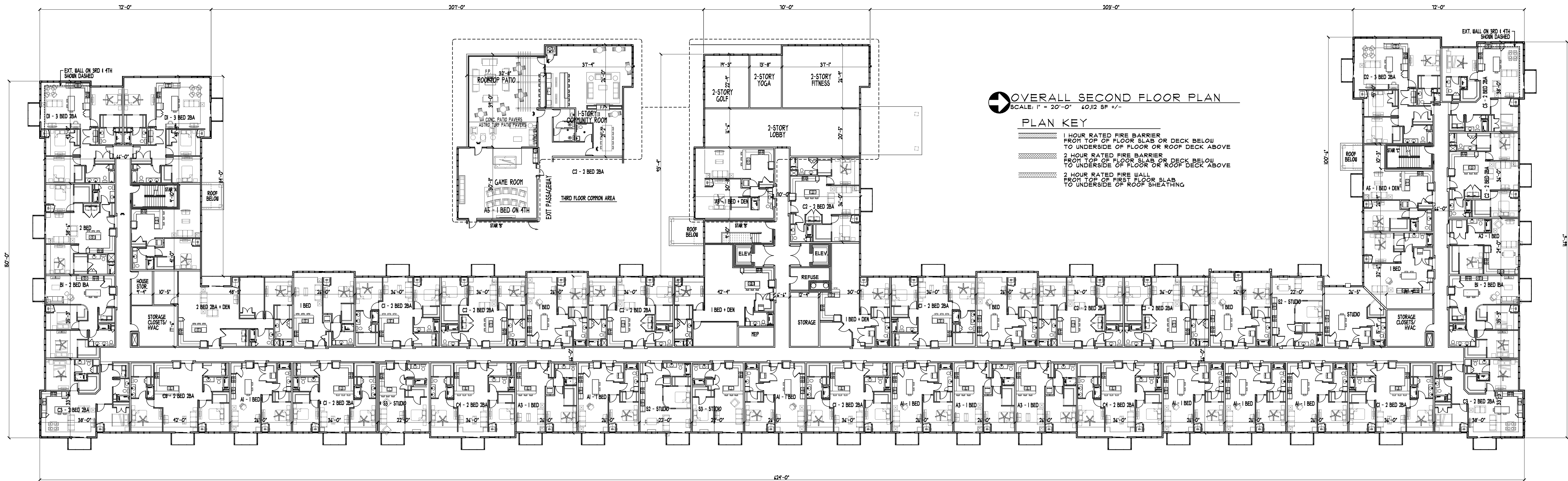
651-451-4570

www.colegrouparchitects.com



UNIT MIX						
UNIT TYPE	1ST FLR.	2ND FLR.	3RD FLR.	4TH FLR.	TOTAL	(%)
STUDIOS	6	5	5	5	21	(11%)
1 BEDROOM	19	22	21	22	84	(44.25%)
2 BEDROOM	15	20	20	20	75	(39.5%)
3 BEDROOM	1	3	3	3	10	(5.25%)
TOTAL	41	50	49	50	190	

[illegible]



UNIT MIX						
UNIT TYPE	1ST FLR.	2ND FLR.	3RD FLR.	4TH FLR.	TOTAL	(%)
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3 BEDROOM	1	3	3	3	10	(5.25%)
TOTAL	41	50	49	50	190	

OVERALL SECOND FLOOR PLAN
SCALE: 1" = 20'-0" 1/2" SF +/-

PLAN KEY

- 1 HOUR RATED FIRE BARRIER FROM TOP OF FLOOR SLAB OR DECK BELOW TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE
- 2 HOUR RATED FIRE BARRIER FROM TOP OF FLOOR SLAB OR DECK BELOW TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE
- 2 HOUR RATED FIRE WALL FROM TOP OF FIRST FLOOR SLAB TO UNDERSIDE OF ROOF SHEATHING

COLE GROUP ARCHITECTS LLC
216 Park Avenue South
Saint Cloud, MN 56301
19201 651-4570
www.colegrouparchitects.com

DAVID MAJCHEZAK
LICENSED ARCHITECT
STATE OF MINNESOTA
68361

COLE GROUP ARCHITECTS LLC
216 Park Avenue South
Saint Cloud, MN 56301
19201 651-4570
www.colegrouparchitects.com

DEVELOPER:
TRIDENT DEVELOPMENT

PROPOSED:
INVER GROVE HEIGHTS APARTMENTS
INVER GROVE HEIGHTS, MN

REVISIONS COMMENTS
REVISIONS COMMENTS

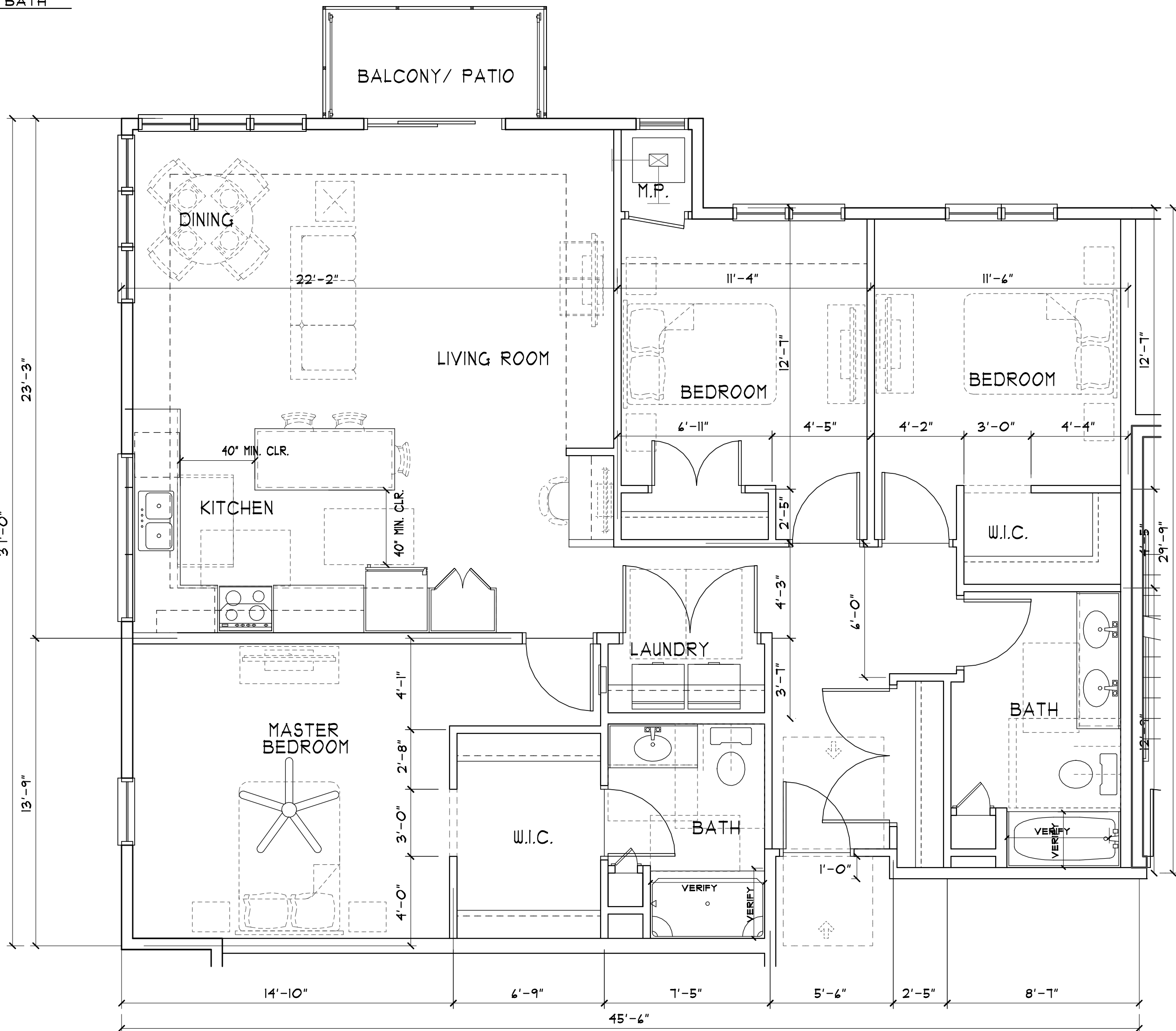
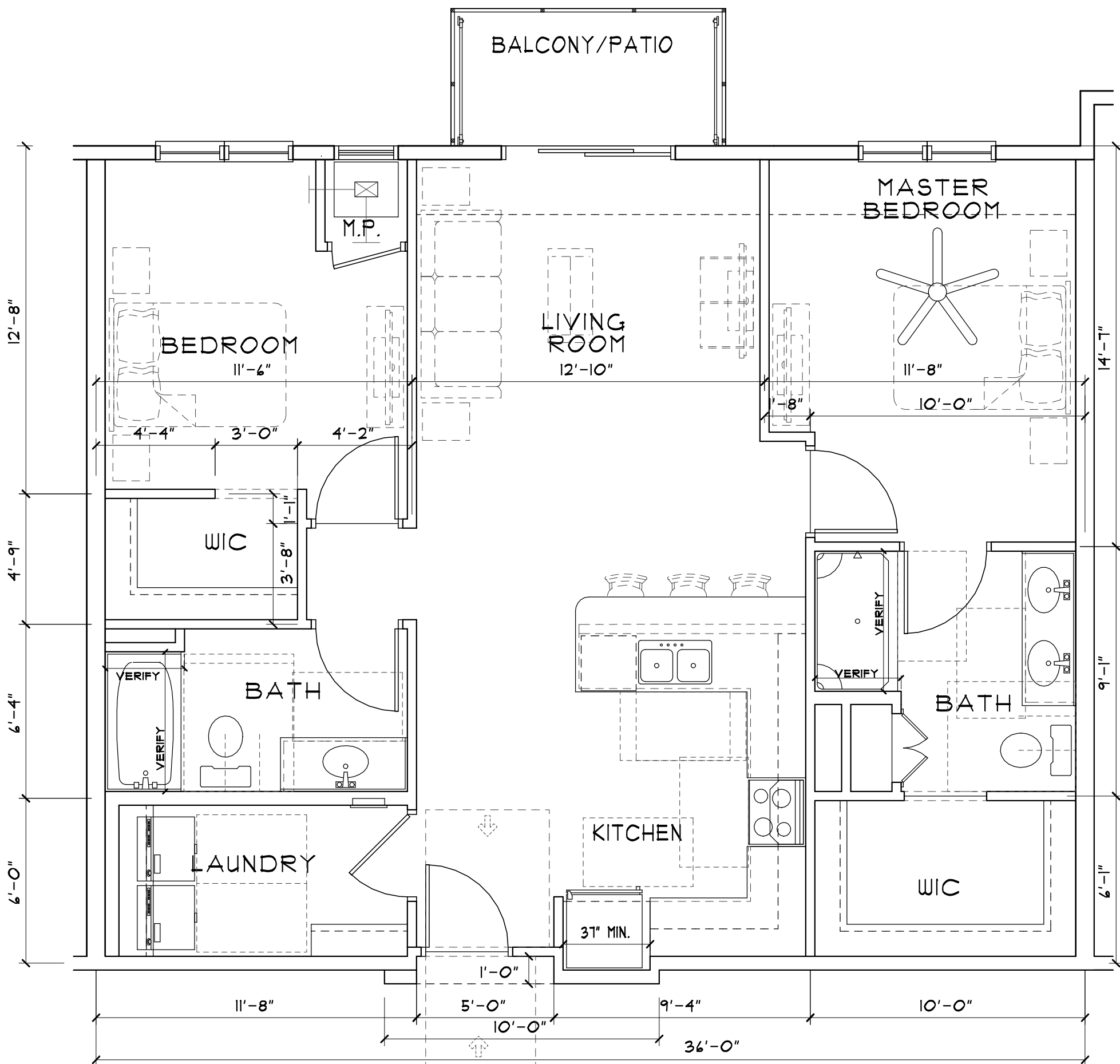
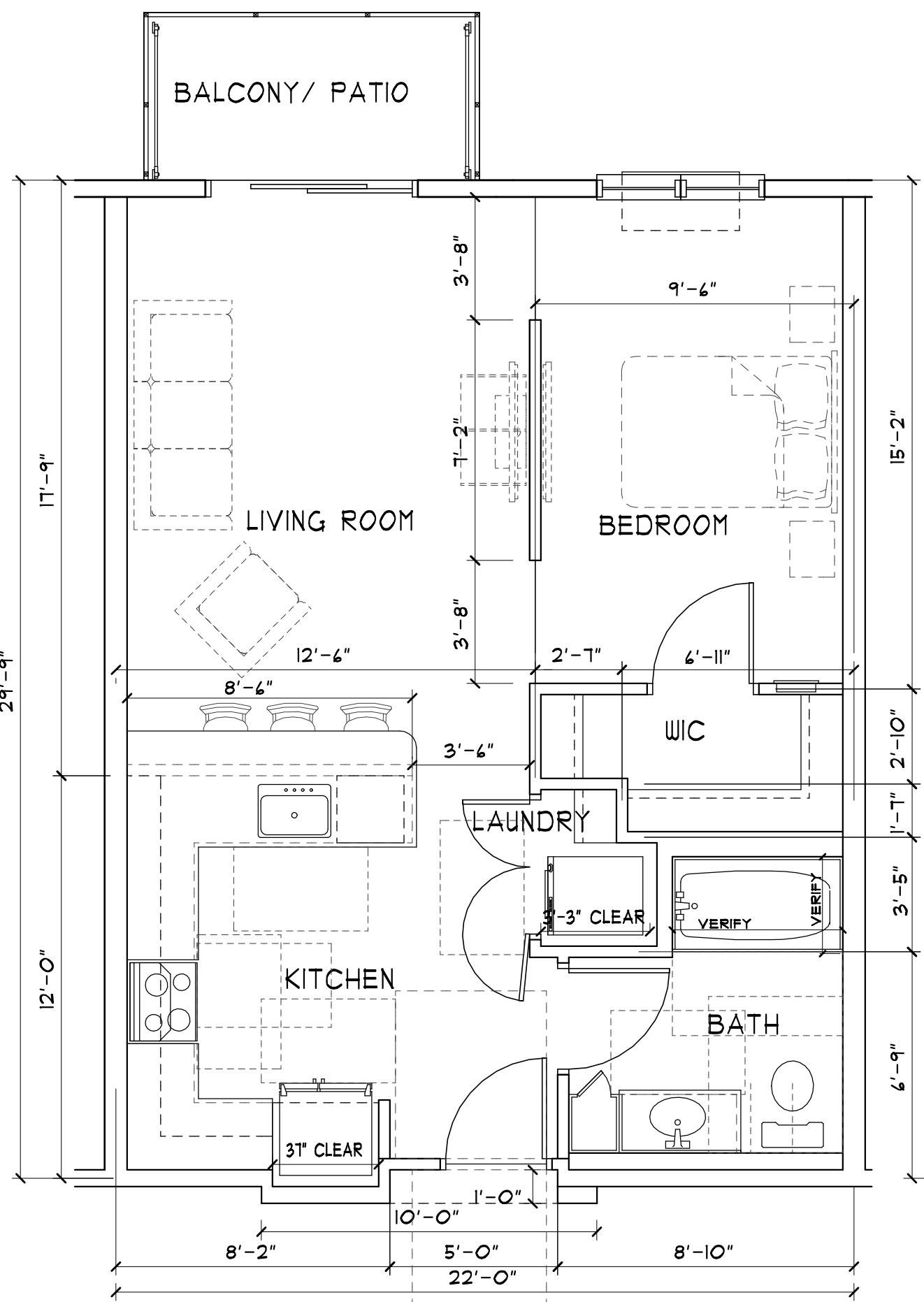
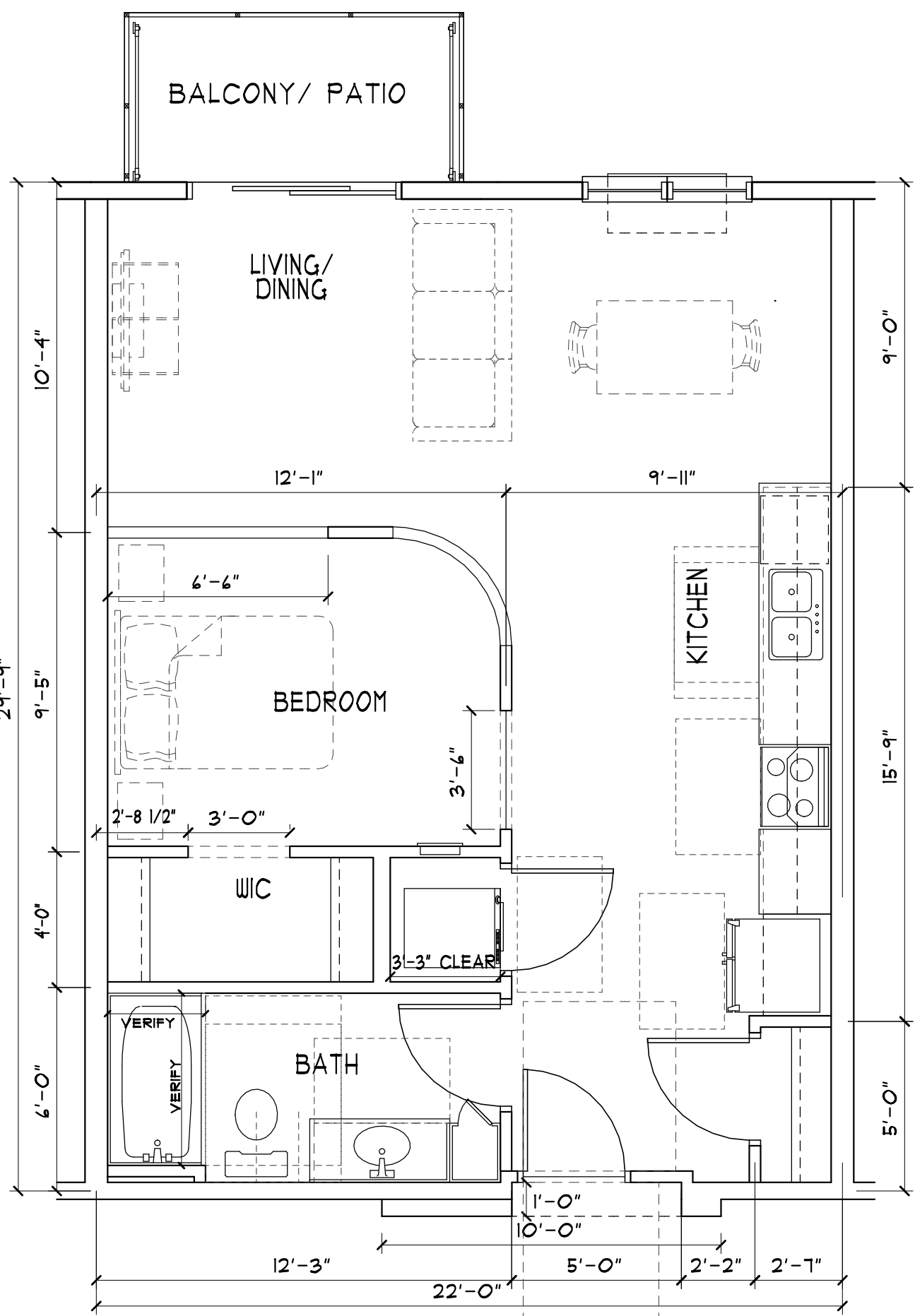
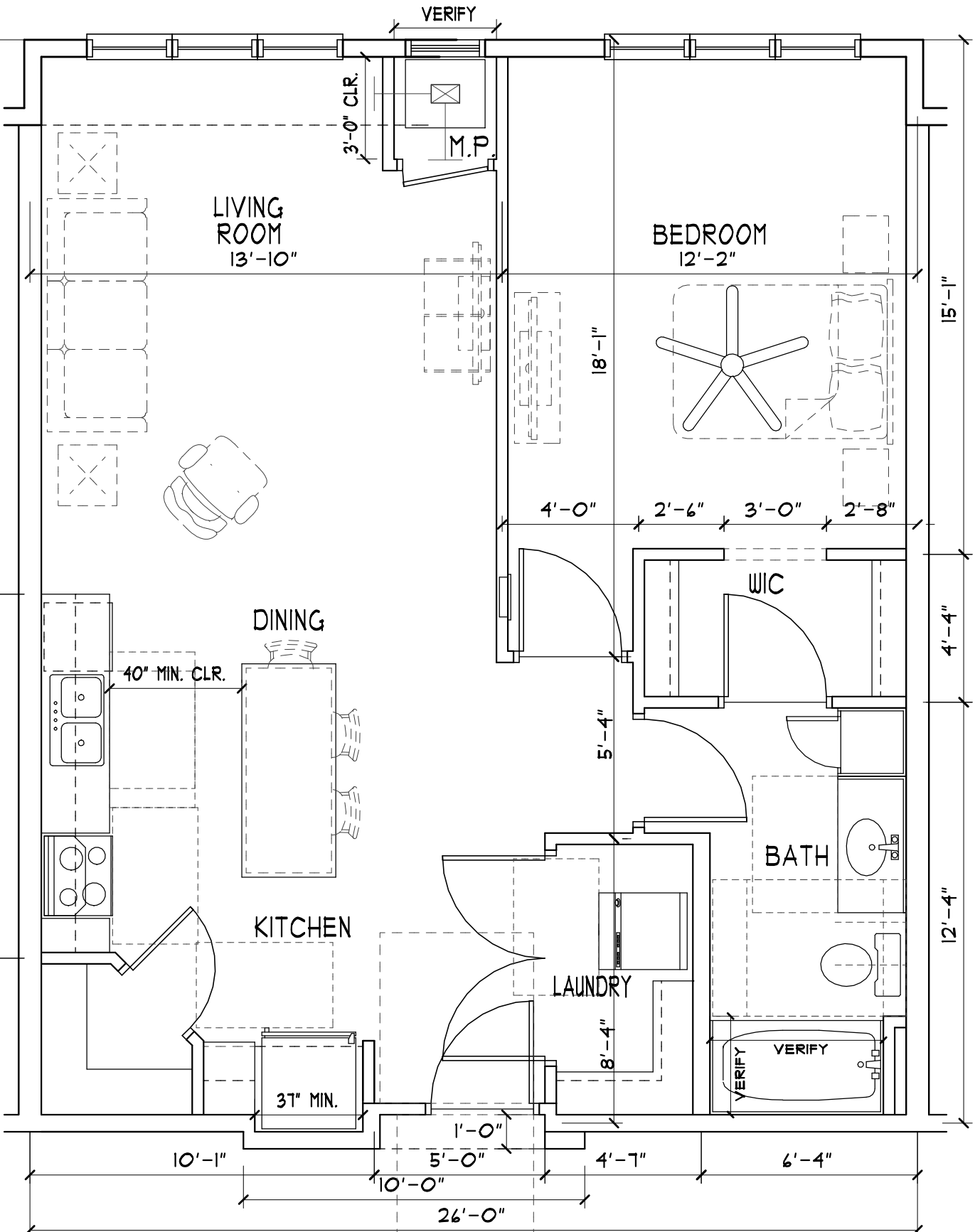
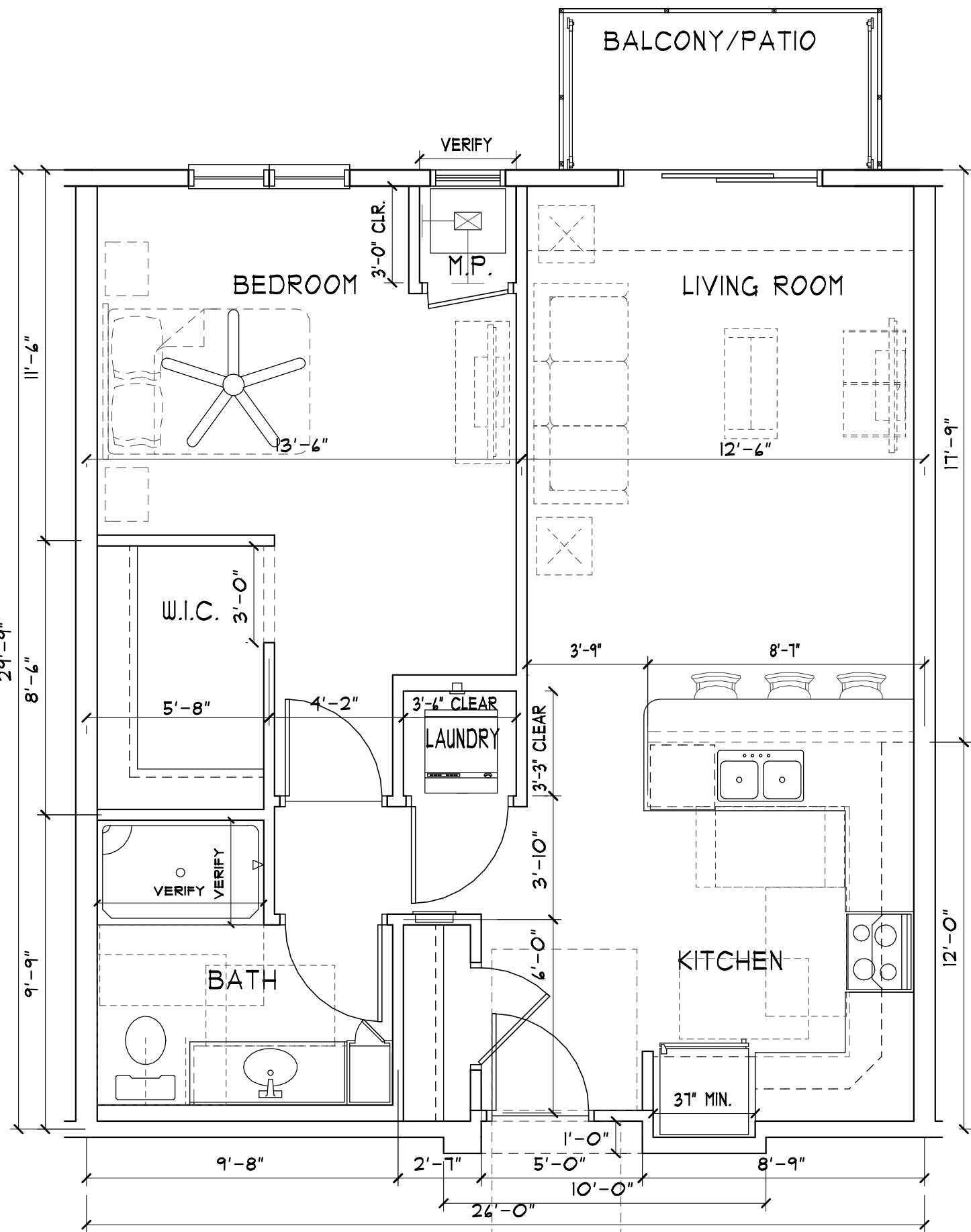
Project No. 22055
Submission Date: August 19th, 2022
Document Set: City Submittal

A102

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Name: DAVID J. MAJCHEZAK



COLE GROUP ARCHITECTS LLC
214 Park Avenue South
Saint Cloud, MN 56301
(320) 451-4570
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Project No. 22055
Submit Date: August 19th, 2022
Document Set: City Submittal

PROPOSED:
INVER GROVE HEIGHTS
APARTMENTS
INVER GROVE HEIGHTS, MN

DEVELOPER:
TRIDENT
DEVELOPMENT

REVISIONS COMMENTS
1

REVISIONS COMMENTS

PLOTTED: 08-19-22 FILE: 22055U.COM-5

A201

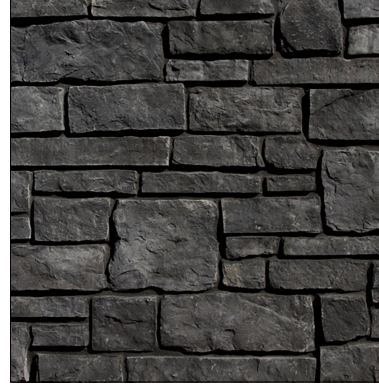
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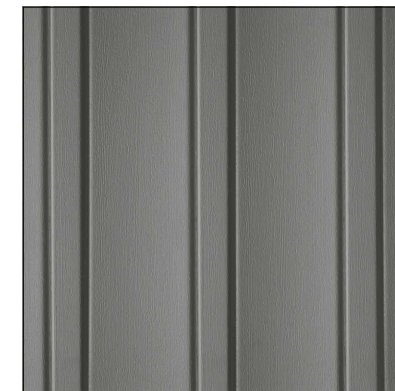
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Architect under the laws of the state of MINNESOTA

Name: DAVID J. MAJCHERZAK

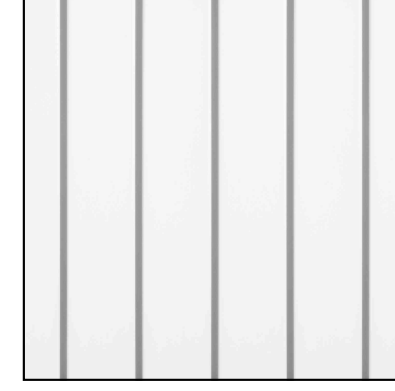
PROPOSED MATERIALS



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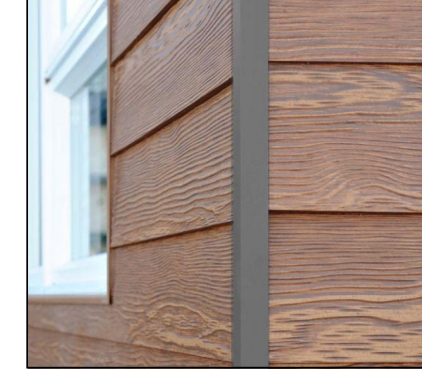
GRAY VERTICAL SIDING



WHITE VERTICAL SIDING



BLACK HORIZONTAL
SIDING



CEDAR TEXTURE SIDING



INVER GROVE HEIGHTS APARTMENTS



September 13, 2022

To: Andy Brummer, Trident Development

From: Vernon Swing, PE

Re: Traffic Analysis – Diffley Court Residential, Inver Grove Heights, MN

Per your request, SSTS LLC has conducted an update to the traffic study conducted by Spack Consulting, LLC for the Westgate Development located on the east side of TH 3 at Diffley Road in Inver Grove Heights. This updated traffic study reflects the new proposed land uses associated with the Diffley Court Residential project (hereafter referred to as the Proposed Project) and compares the traffic operations at the study area intersections reviewed in the earlier study. The Proposed Project will include 54 townhouse units and 190 Mid-Rise Multi-Family units, and will utilize the Diffley Ct approach to TH 3 as its access. **Figure 1**, Vicinity Map, depicts the location. **Figure 2**, Site Plan, illustrates the site layout and access locations.

This memorandum replicates the scope of the earlier study and is focused on the traffic conditions at the study area intersections identified below.

- Diffley Rd/Diffley Ct & TH 3
- TH 3 & TH 149

The existing AM and PM peak hour traffic conditions were documented through new turning movement traffic counts at the listed intersections. Further, forecasts for the 2025 traffic conditions (year after build out) and 2040 traffic conditions (future design year consistent with the earlier study) at these intersections without the development, forecasts of the trip generation potential for the proposed residential land uses and distribution of these trips through the study area is documented. Traffic operations at the study area intersections are reviewed with and without the project, and the results are compared with the results of the earlier study.

Existing Conditions

The existing conditions of the roadways and intersection providing direct and indirect access to the Proposed Project were documented and are noted in **Table 1**. Additionally, **Figure 3** shows the existing lane geometry and traffic control at the study intersections.

Table 1. Study Roadway Characteristics

Roadway	Functional Class	Typical Section	Posted Speed	AADT (Year)
Robert Tr S (TH 3)	A Minor Arterial	2-Lane Undivided Rural	45 mph	11,145 (2021) (MnDOT)*
Jefferson Tr W (TH 149)	A Minor Arterial	2-Lane Undivided Rural	55 mph	6,653 (2021) (MnDOT)*
Diffley Rd (CSAH 30)	B Minor Arterial	3-Land Undivided Rural	45 mph	5,700 (2019) (MnDOT)*

Existing Traffic Volumes

AM and PM peak hour turning movement counts were conducted at the study area intersections on Tuesday August 23, 2022. The following notes the peak hour timeframes:

- AM: 7:00 AM to 8:00 AM
- PM: 4:45 PM to 5:45 PM

Figure 4 illustrates the existing peak hour traffic volumes. It is noted the historical traffic volumes included in Table 1 reflect the change in traffic patterns associated with the COVID pandemic, and show the daily traffic volume has declined by 5-10 percent. Also, the peak hour turning movement counts reflect the new post COVID pattern with AM peak traffic volume down approximately 35 percent from the counts taken in 2015, while the PM peak traffic volume is down approximately 10 percent. This reduction is similar to the current traffic patterns throughout the Twin City Metro.

Future Conditions

To quantify the impacts of a development on the surrounding roadway system, it is necessary to first forecast and analyze traffic conditions that would be present on the roadway system without the inclusion of the proposed project. It is anticipated that the Proposed Project will be completed in 2024, thus year 2025 was selected for analysis to compare traffic conditions after initial traffic patterns to and from the Proposed Project have become established, and again forecasts have been completed for the year 2040 to be consistent with the earlier study. As mentioned above, the historical traffic data suggests traffic volumes are declining; however, to remain consistent with the earlier study this analysis has adopted the same one percent annual growth rate to adjust the existing traffic to the 2025 and 2040 design years. **Figure 5** illustrates the No-Build traffic volumes for year 2025, and **Figure 6** illustrates the 2040 No-Build traffic volumes, with the growth applied to existing traffic volumes.

Trip Generation and Distribution

As mentioned earlier, in 2015 a traffic study was conducted by Spack Consulting for the potential development of this site plus two outlots. In the earlier study the anticipated development included a 135 mid-rise multi-family, 25,000 square feet of office space, a 28,000 square foot shopping center, plus a Gas and Convenience Store. The trip generation of the earlier development plan was estimated, as shown in "Table 2" copied below, based on the methods described by the Institute of Transportation Engineers (ITE), in Trip Generation, 9th Edition.

Table 2 – New and Pass-By Trip Generation

ITE Land Use	Description & Size	Daily			AM Peak Hour			PM Peak Hour		
		Total In	Total Out	Pass by	Total In	Total Out	Pass by	Total In	Total Out	Pass by
220	Apartment (135 dwelling units)	382	382	0	13	52	0	44	23	0
710	General Office (25,000 square feet)	117	117	0	33	4	0	5	25	0
820 ¹	Shopping Center (28,000 square feet)	335	335	346	10	6	9	26	29	28
946	Gas Station w/Conv. Mkt & Carwash (12 fueling positions)	343	343	873	30	29	76	30	29	75
TOTALS		1,177	1,177	1,219	86	91	85	105	106	103

The earlier development plan would have resulted in 3,573 daily trips, 262 AM Peak hour trips, and 314 PM Peak hour trips. (Some of these trips were already on the road as pass-by trips but all would have used the Diffley Ct intersection.) It is noted, the outlots described in the earlier analysis included the Shopping Center

and the Gas/Convenience Store, and these sites are currently developed as a Christianson Automotive garage, and a Casey's Store Gas and Convenience Market and their traffic is part of the existing turning movement counts shown on Figure 4.

The new trip generation estimates reflect the land uses discussed for the Proposed Project including 54 townhomes, and 190 multi-family units. The volume of vehicle trips generated by the Proposed Project has been estimated for the weekday AM and PM peak hours and on a daily basis using the data methodology described in the Institute of Transportation Engineers' *Trip Generation Manual*¹, 11th Edition. ITE's Land Use Codes corresponding to proposed uses are Townhomes Code 215, and Mid-Rise Multi-Family Code 221. Table 2 summarizes the trip generation estimate for the Proposed Project.

Table 2 - Trip Generation

Land Use	Type	Block No.	Land Use Code	Size	Trips Generated:							
					AM peak		PM Peak		Weekday ADT			
					Enter	Exit	Enter	Exit				
Townhome	Residential	1	215	54 units	R	8	18	R	18	13	R	389
Mid-Rise Apartment/Suburban	Residential	1	221	190 units	R	16	52	R	45	29	R	863
-	-			-	N			N			N	
Totals - Net*						24	70		63	42		1,251
						94			105			

As shown in Table 2, the Proposed Project will generate 94 trips (24 entering and 70 exiting) during the morning traffic peak hour, 105 trips (63 entering and 42 exiting) during the evening traffic peak hour and 1,251 daily trips.

To compare this with earlier study, the traffic for the AM peak as estimated for the Proposed Project includes 94 trips, and the current uses, based on the turning movement traffic count, generate 154 trips for a total of 248 trips, or 14 fewer trips than previously anticipated. In the PM peak, the Proposed Project combined with the existing use results in 105 new trips plus 155 existing trips for a total of 260 trips or 54 fewer trips than previously anticipated.

The new trips have been assigned to the surrounding roadways according to the traffic pattern assumed in the earlier study. The distribution from the earlier study is reproduced as follows:

- i. 35% of the generated traffic to/from the south on TH 3.
- ii. 20% of the generated traffic to/from the west on CSAH 30.
- iii. 25% of the generated traffic to/from the north on TH 149.
- iv. 20% of the generated traffic to/from the east on TH 3.

Figure 7 illustrates the trip assignment. **Figures 8 & 9** illustrates the 2025 and 2040 Build conditions, respectively, by combining No-Build traffic with the trip assignment volumes.

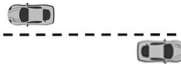
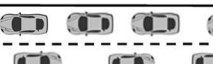
Traffic Operations

The operating conditions of transportation facilities, such as roadways, traffic signals, roundabouts and stop-controlled intersections, are evaluated based on the relationship of the theoretical capacity of a facility to the actual traffic volume on that facility. Various factors affect capacity including travel speed, roadway geometry, grade, number of travel lanes, and intersection control. The current standards for evaluating capacity and operating conditions are contained in *Highway Capacity Manual*². The procedures describe

¹ **Trip Generation Manual**, Institute of Transportation Engineers (ITE), 11th Edition

² **Highway Capacity Manual (HCM)**, Transportation Research Board, 6th Edition

operating conditions in terms of driver delay represented as a Level of Service (LOS). Operations are given letter designations with "A" representing the best operating conditions and "F" representing the worst. Generally, level of service "D" represents the threshold for acceptable overall intersection operating conditions during a peak hour. The Chart on the following page summarizes the level of service and delay criteria for signalized and unsignalized intersections.

Level of Service	Description	Delay (sec)	
		Signalized	Unsignalized/ Roundabout
A	 Primarily free-flow operation.	0-10	0-10
B	 Reasonably unimpeded operation.	>10-20	>10-15
C	 Stable operation. The ability to maneuver is more restricted than LOS B.	>20-35	>15-25
D	 Less stable operation. Small increases in flow may cause large increases in delay and reduced speeds.	>35-55	>25-35
E	 Unstable operation. Low speeds and considerable delay.	>55-80	>35-50
F	 Congested operation. High delay and extensive queuing.	>80	>50

For side street stop-controlled intersections special emphasis is given to providing an estimate for the level of service of the minor approaches. Traffic operations at an unsignalized intersection with side street stop-control can be described two ways. First, consideration is given to the overall intersection level of service. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support these volumes. Second, it is important to consider the delay on the minor approaches, since the mainline does not have to stop. It is common for intersections with higher mainline traffic volumes to experience increased levels of delay and poor level of service on the side streets.

A final fundamental component of operational analyses is a study of vehicular queuing, or the line of vehicles waiting to pass through an intersection. An intersection can operate with an acceptable Level of Service, but if queues from the intersection extend back to block entrances to turn lanes or accesses to adjacent land uses, unsafe operating conditions could result. In this report, the Industry Design Standard 95th percentile queue length is used. The 95th Percentile Queue Length refers to that length of vehicle queue that has only a five-percent probability of occurring during an analysis hour.

This study has utilized the industry current Synchro/SimTraffic software package (11th Edition) to analyze the 2025 and 2040 No-Build and Build conditions for the AM and PM peak hours. It is noted, the reported results are from the aggregate of 10 SimTraffic simulations which use a random number generator to seed the network with vehicles. These results reflect dynamic conditions and are more accurate than the results of the static analysis reported by Synchro. Due to the random number generator results can sometimes show slightly better operations on minor movements under higher traffic conditions when the intersections

are operating well. This can be seen when delays and queues noted in the Build Scenario are slightly less than the No-Build Scenarios.

Analysis Results

Tables 3 summarizes the results of the operational analysis for the 2025 No-Build and Build Conditions. Note the 2025 No-Build and Build operations reflect the additional traffic associated with the annual growth rate applied to existing traffic volumes. Additionally, the Build operations include the net new traffic forecast for the Proposed Project.

Table 3
2025 No-Build and Build Traffic Operations

Intersection	Criteria	Measure of Effectiveness (Delay in Sec and Queue in Ft)					
		2025 No-Build			2025 Build		
		AM Pk Hr		PM Pk Hr		AM Pk Hr	
TH 3 & Diffley Rd/Ct (Signal)	Overall LOS & Delay	B	10.2	B	15.0	B	11.0
	Worst Mvmt. LOS & Delay	C	30.6 (WBT)	D	39.5 (WBT)	C	28.5 (WBT)
	95th Percentile Queue	NBT - 131'		SBT - 272'		NBT - 176'	
TH 3 & TH 149 (Stop Control)	Overall LOS & Delay	A	4.6	B	14.0	A	4.8
	Worst Mvmt. LOS & Delay	B	11.4 (SBL)	E	35.1 (SBL)	C	18.5 (SBL)
	95th Percentile Queue	EBL - 85'		SBR - 311'		EBL - 107'	

The results shown in Table 3 indicate the 2025 No-Build operations of the study area intersections are acceptable with LOS B or better for overall operations, and acceptable operations for directional and individual travel lane operations, with manageable vehicle queuing. Further, the results in Table 3 indicate the 2025 Build overall operations and travel lane operations of the study area intersections and site access are the same with acceptable LOS B or better for overall operations and acceptable operations for directional and individual travel lane operations, with manageable vehicle queuing. These results are better than the results reported in the earlier study, essentially due to the lower existing volume levels as well as the reduced site generated traffic forecasts.

Table 4
2040 No-Build and Build Traffic Operations

Intersection	Criteria	Measure of Effectiveness (Delay in Sec and Queue in Ft)					
		2040 No-Build			2040 Build		
		AM Pk Hr		PM Pk Hr		AM Pk Hr	
TH 3 & Diffley Rd/Ct (Signal)	Overall LOS & Delay	B	10.8	C	24.3	B	12.7
	Worst Mvmt. LOS & Delay	D	42.1 (WBT)	E	55.4 (EBT)	C	32.8 (WBT)
	95th Percentile Queue	NBT - 211'		SBT - 502'		NBT - 227'	
TH 3 & TH 149 (Stop Control)	Overall LOS & Delay	A	5.4	F	55.4	A	5.7
	Worst Mvmt. LOS & Delay	C	17.9 (SBL)	F	180.7 (SBR)	B	12.6 (SBL)
	95th Percentile Queue	EBL - 122'		SBR - 1182'		EBL - 107'	

The results shown in Table 4 indicate the AM Peak 2040 No-Build and Build operations of the study area intersections are acceptable with LOS B or better for overall operations, and acceptable operations for directional and individual travel lane operations, with manageable vehicle queuing. However, the results of the 2040 PM Peak No-Build and Build operations indicated that the intersection of TH 3 and TH 149 will be over capacity. This is due in part to the side street stop control on the southbound approach which carries a large magnitude of traffic. The earlier study had similar results and tested whether a future traffic signal or a roundabout may resolve the operational issues. The earlier study concluded that a future roundabout should be planned for this intersection. We have reviewed the analysis conducted in earlier study regarding

mitigation for the TH 3 and TH 149 intersection and concur with the findings that by 2040 the TH 3 and TH 149 intersection should be controlled with a Roundabout, whether or not the Proposed Project goes forward.

Further, the results in Table 4 indicate the southbound 95th percentile traffic queue in the PM Peak at the TH 3 and Diffley Rd/Diffley Ct intersection may block access to the designated turn lanes, potentially hindering the traffic operations at the intersection, without or with the Proposed Project. It is suggested that the intersection operations continue to be monitored, and if long vehicle queues do develop by 2040 that consideration be given to altering the intersection geometry to extend the turn lane length in the southbound and eastbound directions to approximately 300 feet which will allow turning traffic to escape the through lane, thus providing additional through traffic capacity on these approaches.

Summary and Conclusions

The following provides a summary of the study, traffic operations and recommendations:

- AM and PM peak hour traffic operations were analyzed for the 2025 and 2040 conditions without and with the Proposed Project.
- The Proposed Project will generate 94 trips (24 entering and 70 exiting) during the morning traffic peak hour, 105 trips (63 entering and 42 exiting) during the evening traffic peak hour and 1,251 daily trips.
- Results of the traffic analysis for year 2025 without the Proposed Project indicate acceptable operations with minimal vehicle delay and back-ups at adjacent intersections.
- Results of the traffic analysis for year 2025 with the Proposed Project indicate acceptable operations with minimal vehicle delay and back-ups.
- Results of the traffic analysis for year 2040 AM Peak with and without the Proposed Project indicate acceptable operations with minimal vehicle delay and back-ups.
- Results of the traffic analysis for year 2040 PM Peak with and without the Proposed Project indicate poor operations with long vehicle delay and back-ups at the TH 3 and TH 149 intersection.
- Results of the traffic analysis for year 2040 PM Peak with and without the Proposed Project indicates vehicle queues may hinder operations at the TH 3 and Diffley Rd intersection. Extending existing turn lanes on the southbound and eastbound approaches by the year 2040 will create additional capacity on these approaches and enhance traffic operations.
- The TH 3/TH 149 will meet all signal and roundabout warrants in the 2040 No-Build scenario. It is suggested that right of way be preserved for future improvements.

Attachments: Figures 1-9

(The earlier study by Spack Consulting, and the Appendices with Traffic Counts and Synchro/Simtraffic Worksheets are available upon request.)

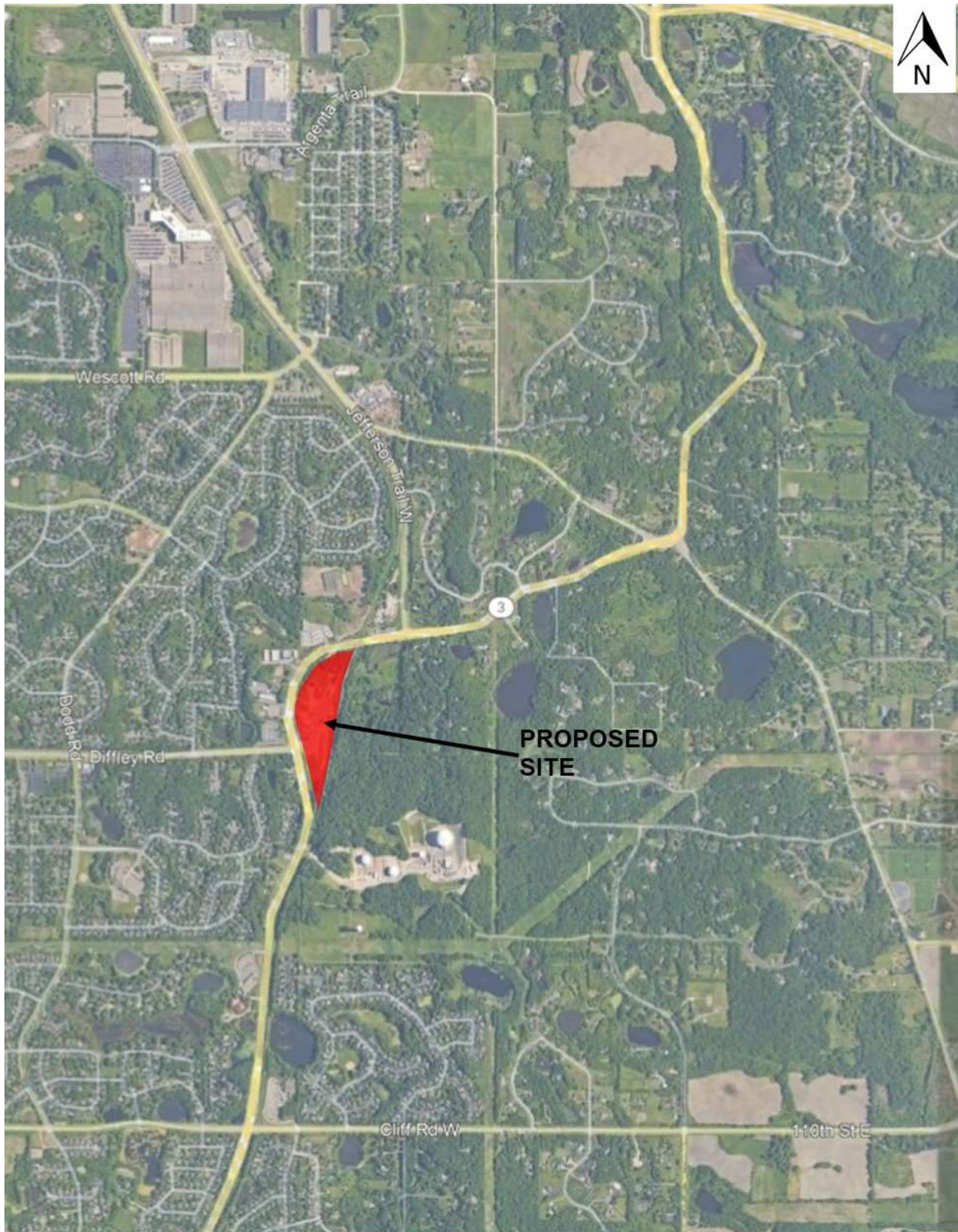


Figure 1 - Vicinity Map

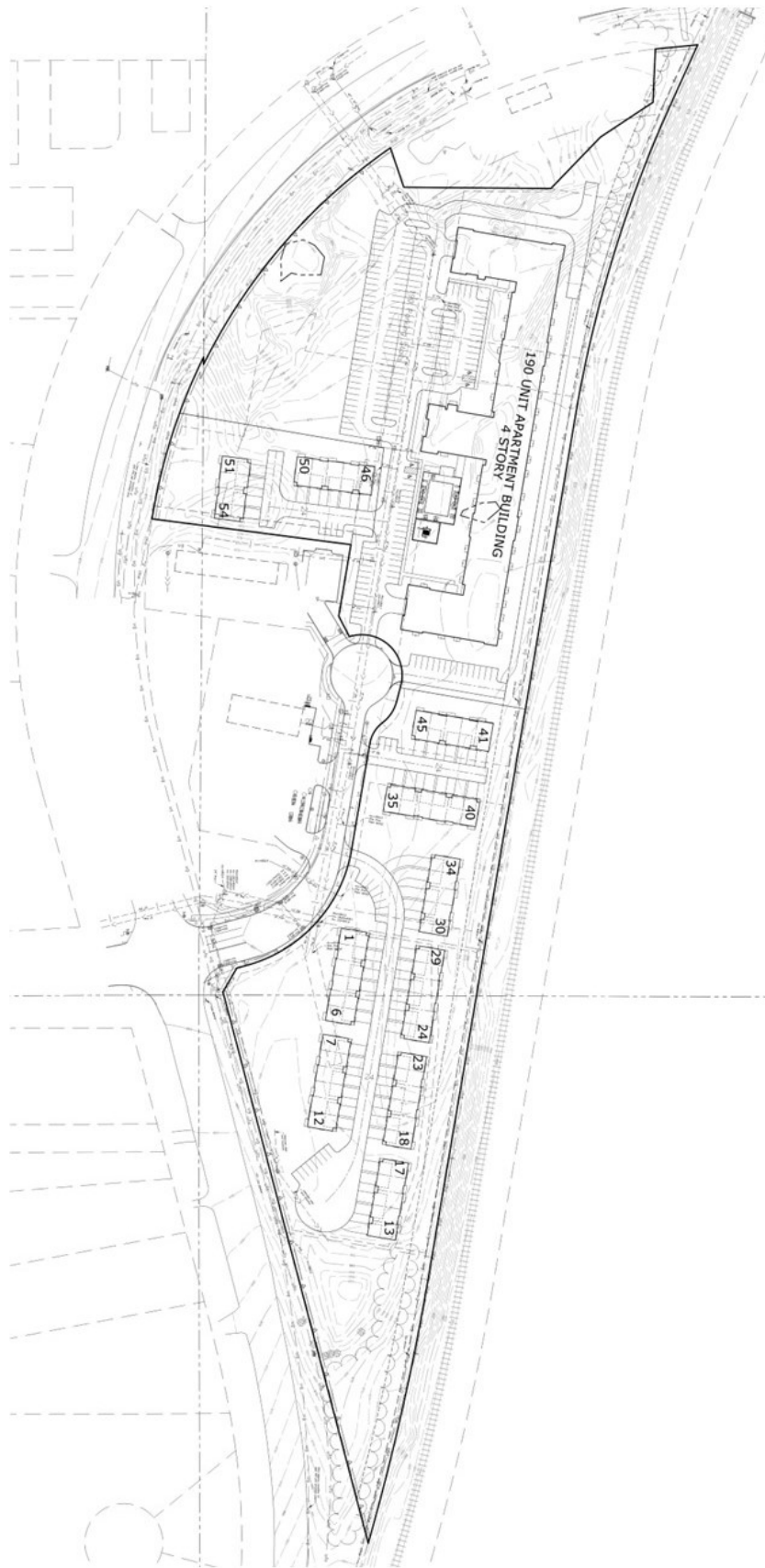
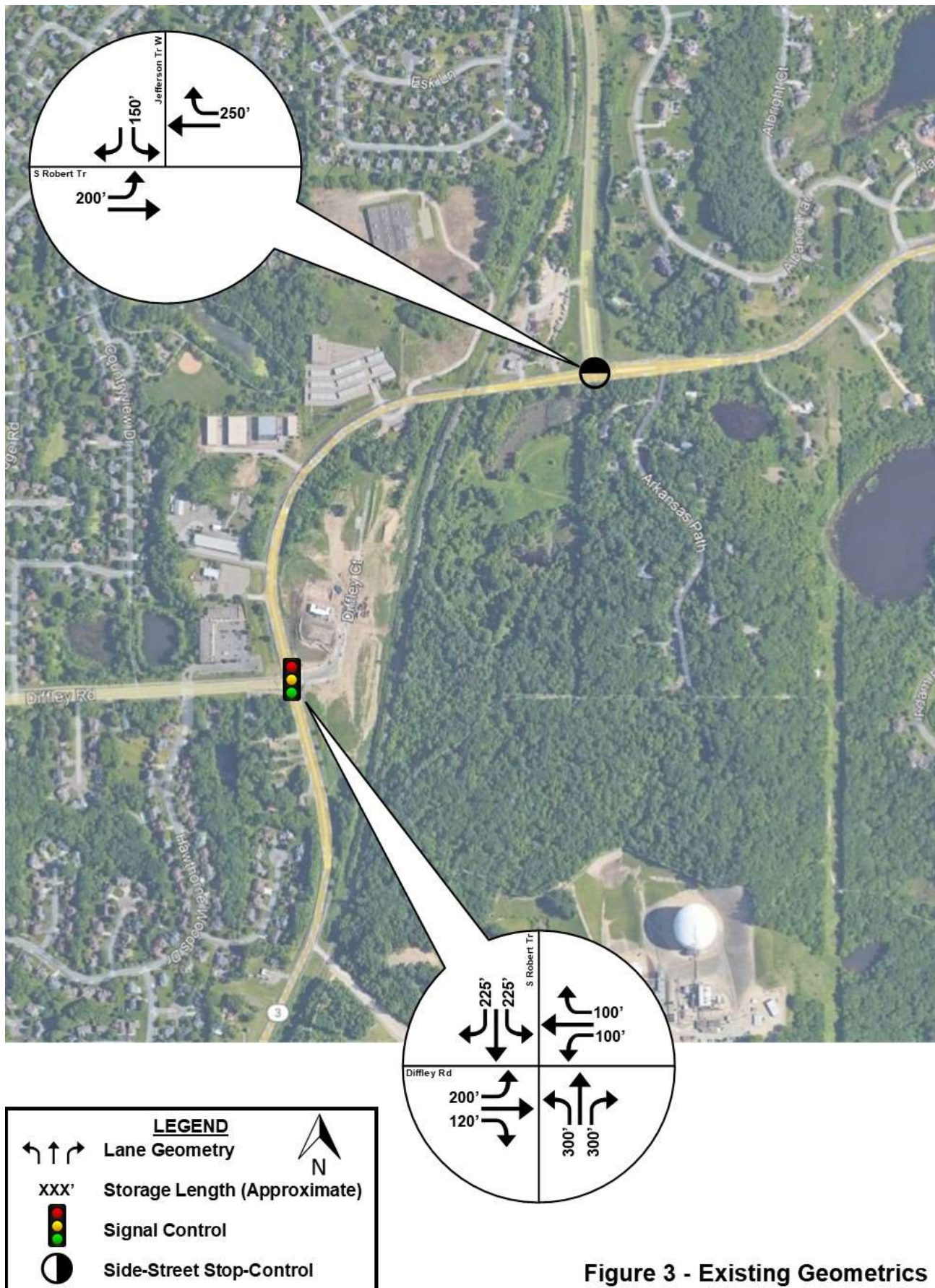


Figure 2 - Conceptual Site Plan (From Others)



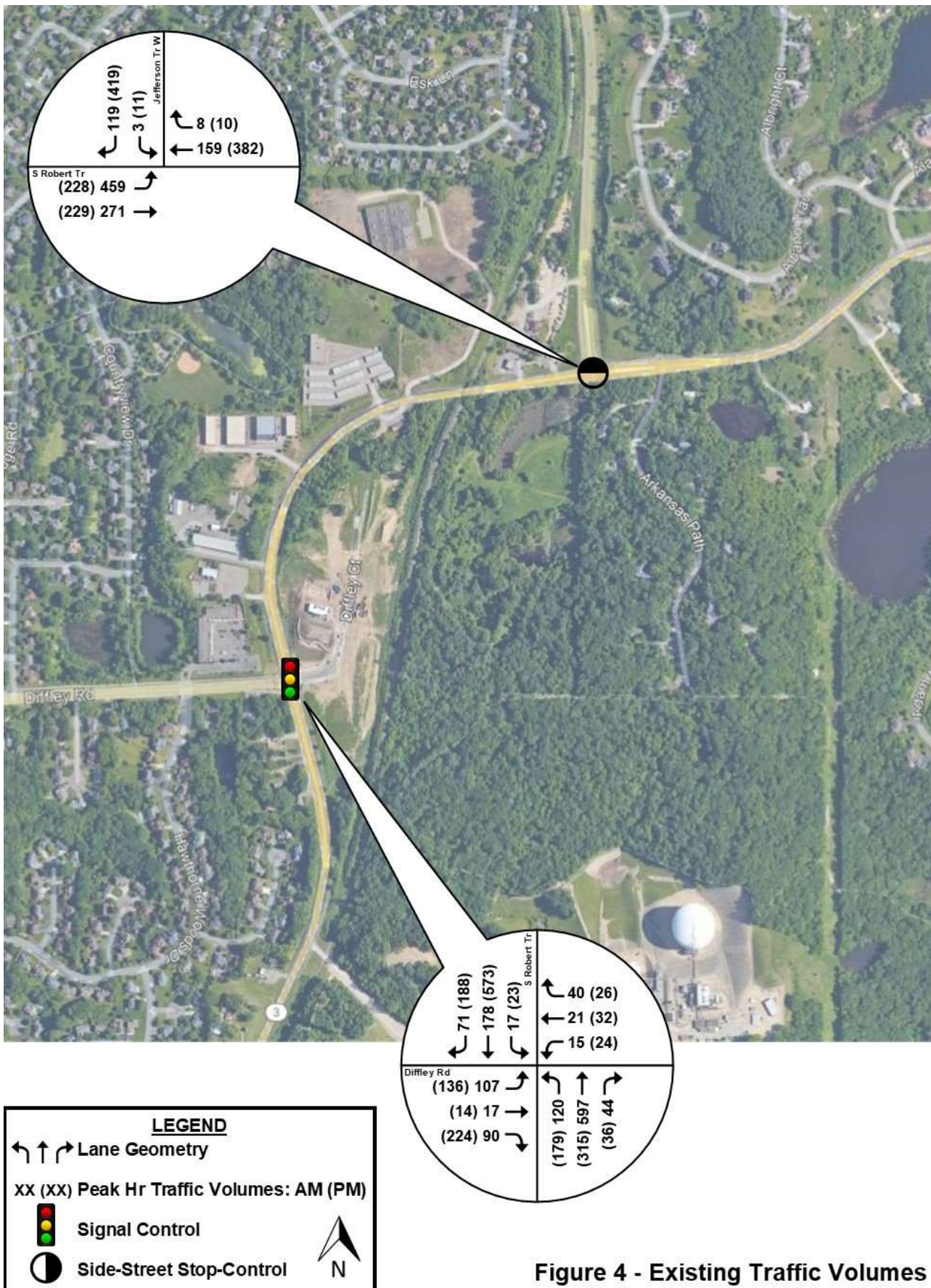


Figure 4 - Existing Traffic Volumes

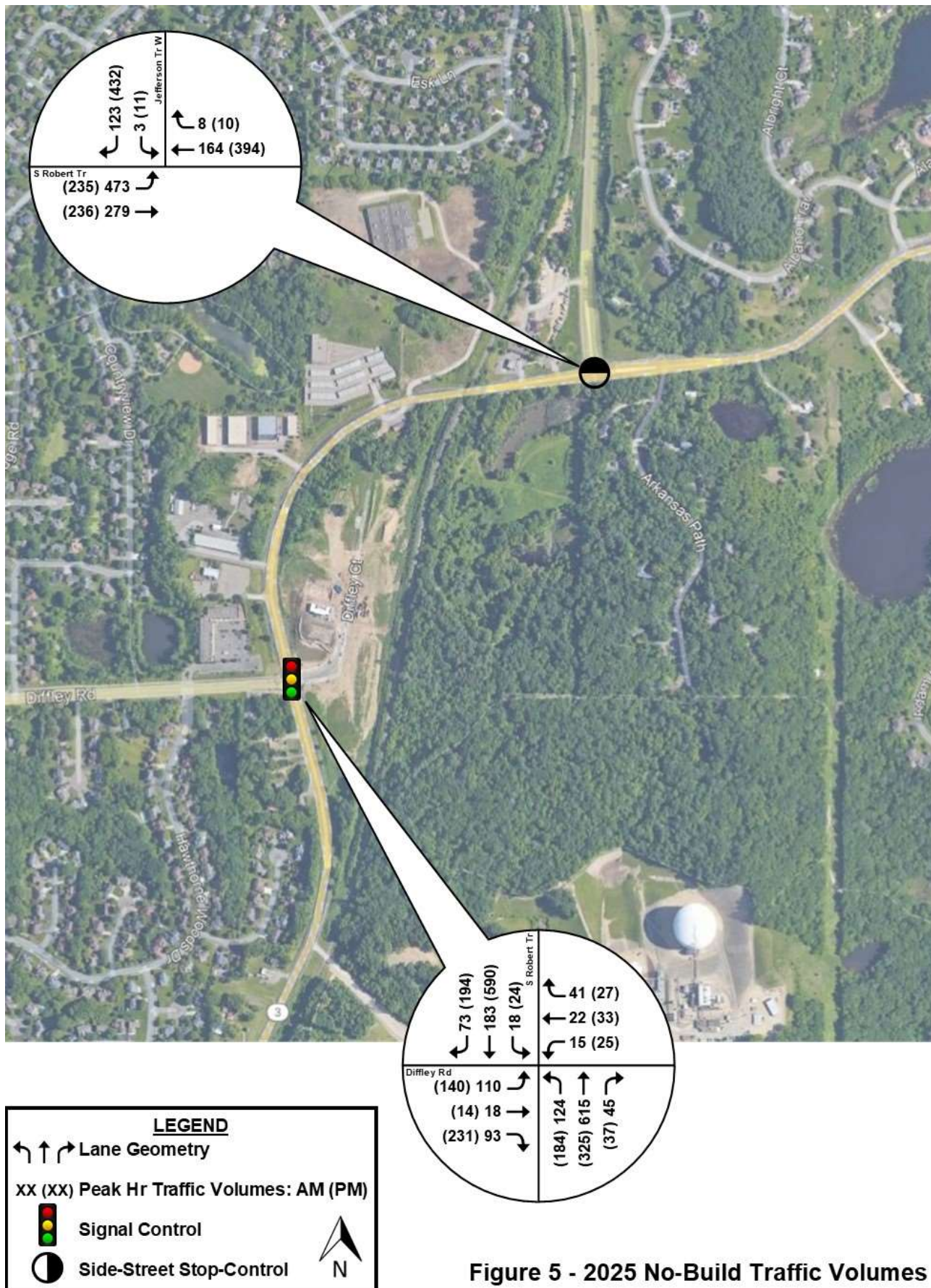
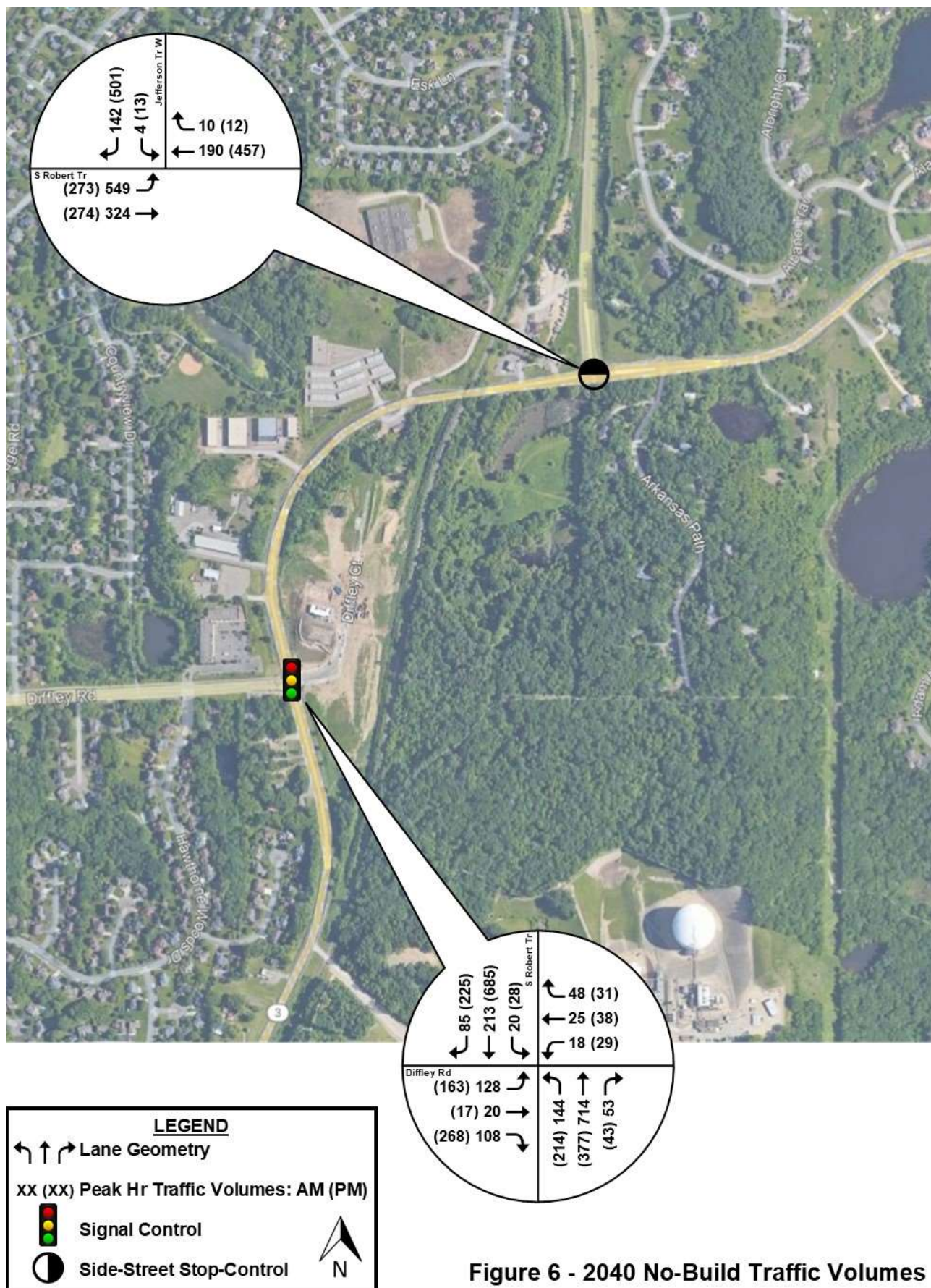


Figure 5 - 2025 No-Build Traffic Volumes



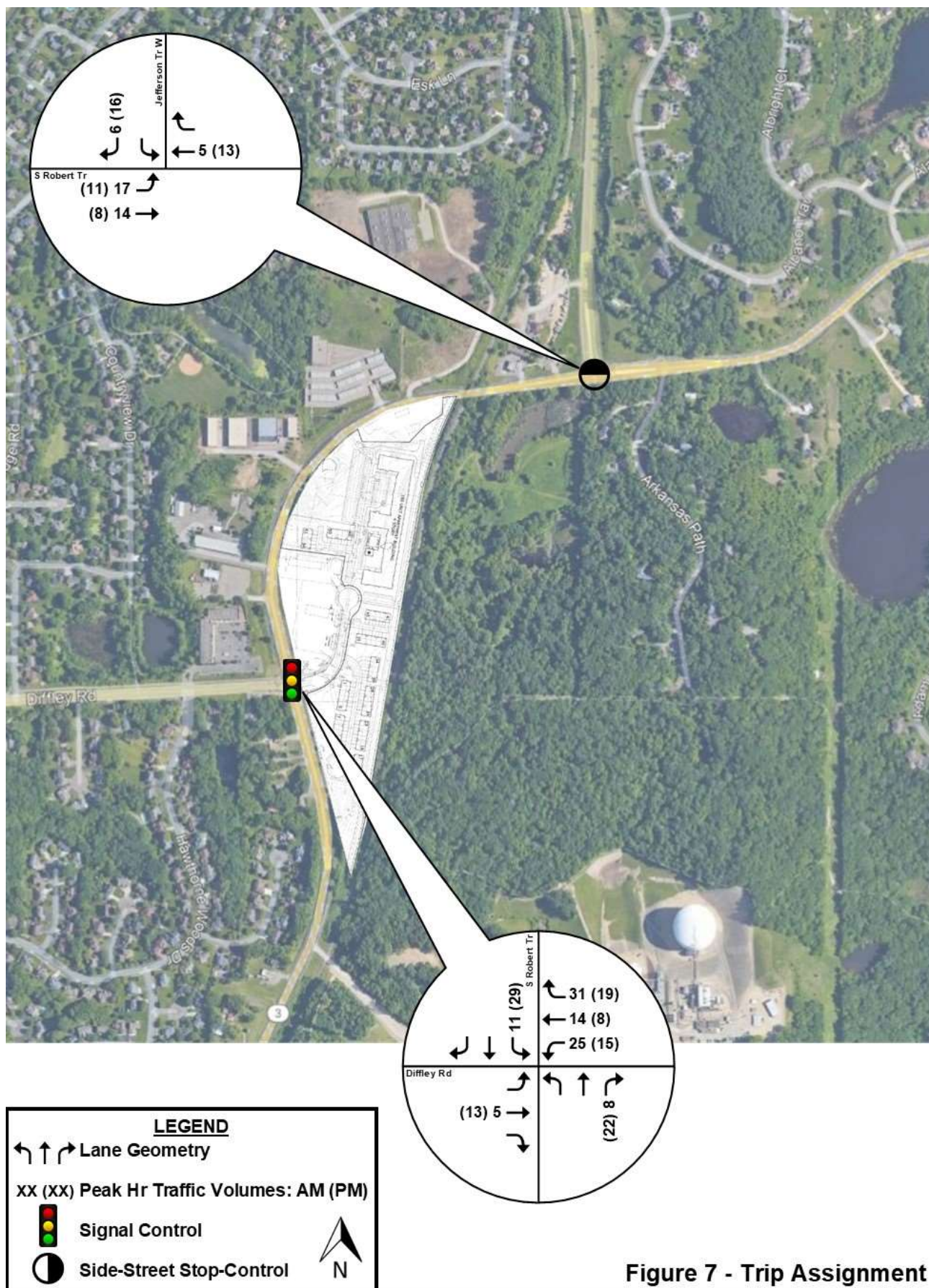


Figure 7 - Trip Assignment

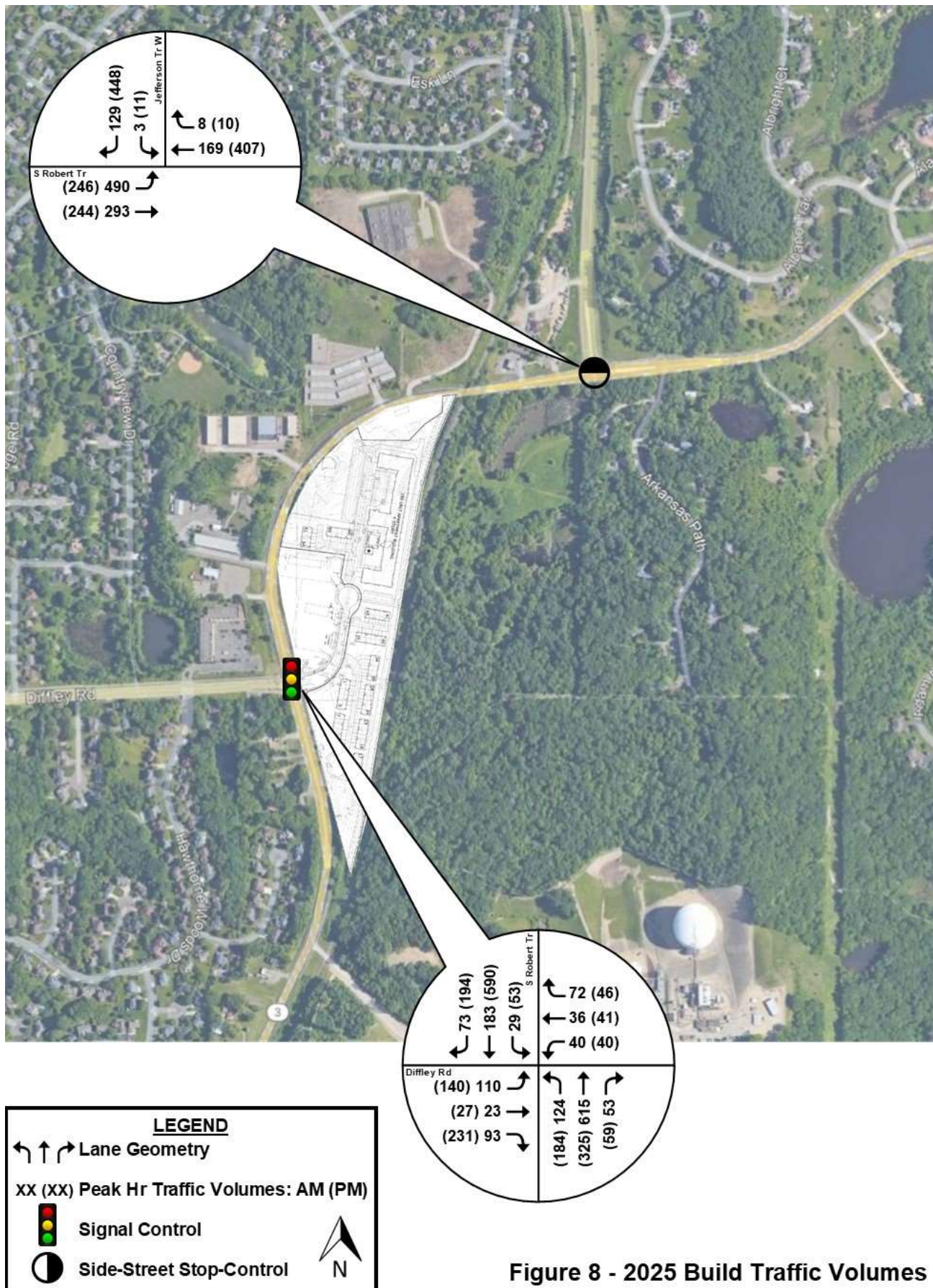


Figure 8 - 2025 Build Traffic Volumes

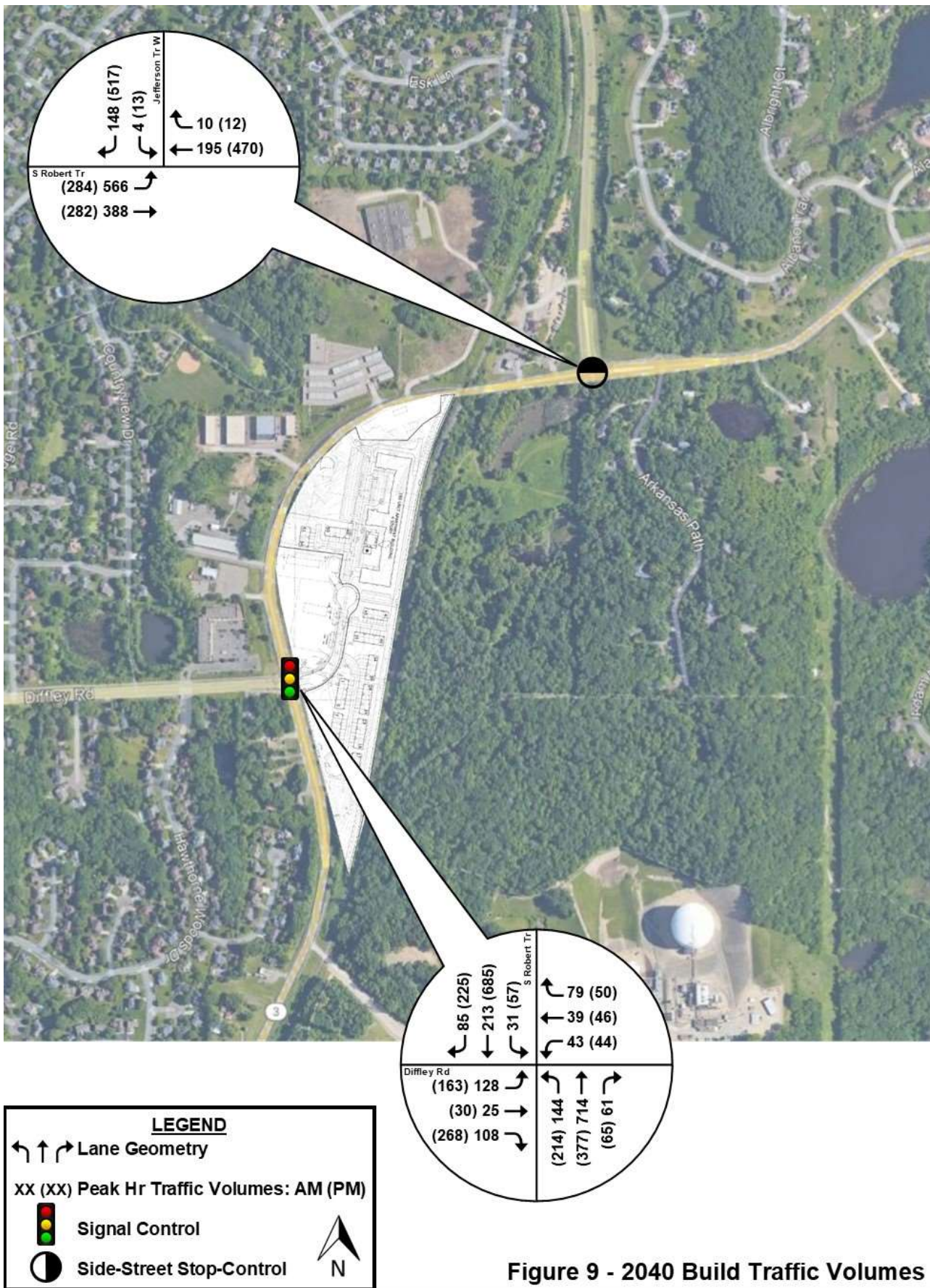


Figure 9 - 2040 Build Traffic Volumes



Traffic Impact Study

Westgate Development

Inver Grove Heights, Minnesota

I hereby certify this report was prepared by me or under my direct supervision, and I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By: _____
Bryant J. Ficek, P.E., P.T.O.E.
License No. 42802

Date: _____

Executive Summary

Background:

A new development is proposed on the southeast corner of the Minnesota Trunk Highway (TH) 3 and Dakota County State Aid Highway (CSAH) 30 intersection in Inver Grove Heights, Minnesota. The purpose of this study is to determine the traffic impacts associated with the build out of the proposed development and other site outlots on the study intersections where significant impact is anticipated.

Results:

The principal findings of this traffic study are:

- The proposed Westgate development is expected to generate approximately 670 new trips and 345 pass-by trips during an average weekday, approximately 15 new trips and 10 pass-by trips during the a.m. peak hour and approximately 55 new trips and 30 pass-by trips during the p.m. peak hour.
- The proposed Westgate development with the addition of the site outlots is expected to generate approximately 2,355 new trips and 1,220 pass-by trips during an average weekday, approximately 260 new trips and 85 pass-by trips during the a.m. peak hour and approximately 315 new trips and 105 pass-by trips during the p.m. peak hour.
- The TH 3/CSAH 30 intersection is forecast to operate with acceptable overall delays through 2040 except in the 2040 Build a.m. peak hour scenario.
- The TH 3/CSAH 30 intersection is forecast to have some significant queues, specifically the eastbound left and northbound thru movements in the a.m. peak hour and the southbound thru movement in the p.m. peak hour.
- The TH 3/TH 149 intersection currently has large queues on the southbound right turn movement in the p.m. peak hour.
- The TH 3/TH 149 intersection is forecast to have some significant queues, specifically the eastbound left movement in the a.m. peak hour and the southbound right movement in the p.m. peak hour.
- The TH 3/TH 149 currently meets peak hour signal warrants and is forecast to meet all volume based signal warrants by the 2040 No-Build scenario.
- Any mitigation needed at the study intersections outside of adding a westbound approach would be needed without the addition of traffic from the Westgate development and surrounding outlots.

Recommendations:

The following items are recommended based on the analyses contained in this study:

- Include pedestrian and bicycle facilities within the site and tie into the existing sidewalk on the north side of CSAH 30 west of TH 3.
- Monitor the TH 3/CSAH 30 intersection and preserve right-of-way allowing this intersection to be altered with to have two northbound/southbound thru lanes or be conversion to a roundabout.
- Monitor the TH 3/TH 149 intersection and preserve right-of-way to convert this intersection to a roundabout in the future.

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1. Introduction

a. *Proposed Development*

A new development is proposed for the southeast corner of the Minnesota Trunk Highway (TH) 3 and Dakota County State Aid Highway (CSAH) 30 intersection in Inver Grove Heights, Minnesota. This development is proposed to include a 28,000 square foot mixed commercial building. A preliminary concept plan is in the Appendix.

Currently, the east leg of the TH 3/CSAH 30 intersection is not constructed, but the intersection and signal are set up to accommodate the construction of that leg of the intersection. The development of this site will require the construction of that intersection approach.

In addition to the Westgate development, the plat east of the TH 3/CSAH 30 intersection, and adjacent to Westgate, includes several other outlots that may be developed in the future. Current estimates of these outlot developments are:

- A 12-fueling position gas station with convenience market and carwash
- 25,000 square feet of office
- 135 apartment units

b. *Purpose of Study*

The purpose of this study is to determine the traffic impacts associated with the build out of the proposed development. The traffic impacts are studied on the roads and intersections where significant impact is anticipated and improvements are recommended where mitigation is needed. For those not familiar with the general concepts and terms associated with traffic engineering, *The Language of Traffic Engineering* guide is included in the Appendix.

c. *Study Objectives*

The objectives of this study are:

- i. Document how the study intersections and roadways currently operate.
- ii. Forecast the amount of traffic expected to be generated by the proposed development.
- iii. Determine how the study intersections and roadways will operate in the future years 2020 and 2040 with and without the proposed development.
- iv. Recommend appropriate mitigation measures if poor operations are identified.

For the purposes of this traffic study, the study intersections where the greatest impact is expected were chosen for review and include:

- i. TH 3/CSAH 30
- ii. TH 3/TH 149

2. Existing Conditions

a. Corridor Characteristics

As mentioned, the proposed site is located on the southeast corner of the TH 3/CSAH 30 intersection. Table 1 shows the characteristics of the key roadway corridors around this site and within the study area.

Table 1 – Study Corridor Characteristics

Name	Designation ¹	Classification ²	Speed Limit	Lanes	Transit	Peds/ Bicycles
Robert Trail S	MN TH 3	A Minor Arterial	45 mph, 55 mph	2 undivided	None near site	No facilities
Jefferson Trail W	MN TH 149	A Minor Arterial	55 mph	2 undivided	None near site	No facilities
Diffley Road	Dakota CSAH 30	B Minor Arterial	45 mph	3 undivided	None near site	Sidewalk on north side

¹ I = Interstate, TH = Trunk Highway, CSAH = County State Aid Highway, CR = County Road, MSA = Municipal State Aid Route.

² Dakota County 2030 Transportation Plan

b. Traffic Volumes

Intersection videos were collected at the two existing study intersections under weekday conditions in February 2017. Using these videos, 48-hour turning movement counts were obtained at the study intersections. Counts for the two days were averaged to smooth out possible irregularities in the data.

The a.m. and p.m. peak hours for the two study intersections were found to be from 7:00 to 8:00 a.m. and 4:30 to 5:30 p.m. The counts from these two peak hours were used for analysis. The turning movement count data from the counts are contained in fifteen minute intervals in the Appendix.

3. Forecasted Traffic

a. Site Traffic Forecasting

The *Institute of Transportation Engineers (ITE)* provides the *Trip Generation Manual, 9th Edition*, the standard document for determining expected traffic for proposed land uses. Using this ITE information, trip generation forecasts can be made for the development site.

The Westgate development is proposed as a mixed commercial development, to include office, retail or a combination of both land uses. ITE trip generation information shows that retail land uses generally have higher rates than a comparable-sized office land use. To present a conservatively high estimate for the purposes of this study, this trip generation analysis assumes all retail.

In addition to the Westgate development, a trip generation analysis is also included for the potential outlot developments on the plat. As mentioned, these outlots are currently expected to be a gas station, apartment units and office space.

For the trip generation analysis, the raw trip generation was divided among three types of trips – new, pass-by, and internal. Pass-by trips are those vehicles already on the adjacent roads which will stop at the development site in the future. Internal trips are those vehicles within the site visiting two or more locations, such as the gas station and the office space. New trips represent traffic increasing the overall number of vehicles at the intersections. To help determine the split between these types of trips, the data and methods for estimating multi-use trip generation in the *ITE Trip Generation Handbook, 3rd Edition* was used.

The resultant new and pass-by trips generated by the proposed Westgate development and other outlots are shown in Table 2. A detailed trip generation table showing the exact breakdown for all types of trips is provided in the Appendix.

A trip distribution pattern was then developed for the generated traffic going to and from the site. This pattern is based on the existing traffic volumes and access to the regional transportation system. The general trip distribution pattern for this study is:

- i. 35% of the generated traffic to/from the south on TH 3.
- ii. 20% of the generated traffic to/from the west on CSAH 30.
- iii. 25% of the generated traffic to/from the north on TH 149.
- iv. 20% of the generated traffic to/from the east on TH 3.

Traffic generated by the site development was assigned to the area roadways per this distribution pattern.

Table 2 – New and Pass-By Trip Generation

ITE Land Use	Description & Size	Daily			AM Peak Hour			PM Peak Hour		
		Total In	Total Out	Pass by	Total In	Total Out	Pass by	Total In	Total Out	Pass by
220	Apartment (135 dwelling units)	382	382	0	13	52	0	44	23	0
710	General Office (25,000 square feet)	117	117	0	33	4	0	5	25	0
820 ¹	Shopping Center (28,000 square feet)	335	335	346	10	6	9	26	29	28
946	Gas Station w/Conv. Mkt & Carwash (12 fueling positions)	343	343	873	30	29	76	30	29	75
TOTALS		1,177	1,177	1,219	86	91	85	105	106	103

¹ Trip Generation for the Westgate development is entirely included in the Shopping Center. Trip generation for the other land uses is for the potential development of the other outlots.

b. Non-site Traffic Forecasting

To forecast future traffic volumes for the years 2020 and 2040 in the study area outside of the proposed development's traffic, general growth in traffic was added.

Using volume forecasts for the year 2030 from the Dakota County 2030 Transportation Plan and comparing those to previously collected data, as well as looking at historic traffic volumes on the study roads between 2000 and 2015, a background growth rate was developed. Based on this information, an annual growth rate of 1.0 percent per year was determined. For the year 2020, this annual growth equates to a total three percent increase of existing traffic. For the year 2040, this growth rate equates to a 26 percent total increase of existing traffic. This growth was applied to all existing movements in the study network to establish the No-Build forecasts.

c. Total Traffic

Traffic forecasts were developed for the 2020 and 2040 Build scenarios by adding the traffic generated by the proposed Westgate development and other outlots to the No-Build forecast volumes. Peak hour forecasts are shown in the Appendix.

d. Non-Vehicular Traffic

There are currently limited pedestrian facilities in the study area with only a sidewalk on the north side of CSAH 30. As the site develops, especially with the addition of residential, pedestrian and bicycle usage in the area may increase. Therefore, it is recommended that pedestrian and bicycle facilities be included within the site to accommodate possible future connections with public facilities and encourage non-automobile trips.

4. Analyses

a. Intersection Analysis

The initial scenarios analyzed in this study for both the a.m. and p.m. peak hours were the existing, 2020 No-Build, 2020 Build, 2040 No-Build and 2040 Build scenarios.

The existing and forecasted turning movement volumes were used to develop the average delay per intersection in each study scenario. At the TH 3/CSAH 30 intersection in the Build scenarios, the east leg of the intersection was added with the approach configuration of a left turn lane and a shared thru/right turn lane and one receiving lane. The west leg approach was also modeled as having a left turn lane and shared thru/right turn lane. No change to the existing striping is necessary for this configuration. Northbound and southbound approaches at this intersection already have exclusive left, thru and right turn lanes in place. Signal timing for the westbound traffic was set to match eastbound, assuming permissive phasing for the left turn movements. Protected only left turn phasing remains for the northbound and southbound approaches.

The site plan also shows no access within approximately 200 feet of the study intersection, which is appropriate to allow for vehicle stacking without conflicts.

The delay calculations were done in accordance with the *Highway Capacity Manual, 6th Edition* using the Vistro software package. The full calculations for each study scenario, including Level of Service (LOS) grades and queue lengths, are included in the Appendix. Also, included in the Appendix is a guide explaining the Level of Service grade concept.

Chart 1 (a.m. peak hour) and Chart 2 (p.m. peak hour) show the average peak hour delay for signal controlled TH 3/CSAH 30 intersection for each study scenario. The LOS D/E boundary of 55 seconds of delay per vehicle is considered the threshold between acceptable and unacceptable traffic signal operation in Minnesota. The initial signal timing for the existing conditions was provided by the Minnesota Department of Transportation (MnDOT).

Chart 3 (a.m. peak hour) and Chart 4 (p.m. peak hour) show the 95th percentile queue lengths of the primary movements at the signalized TH 3/CSAH 30 intersection.

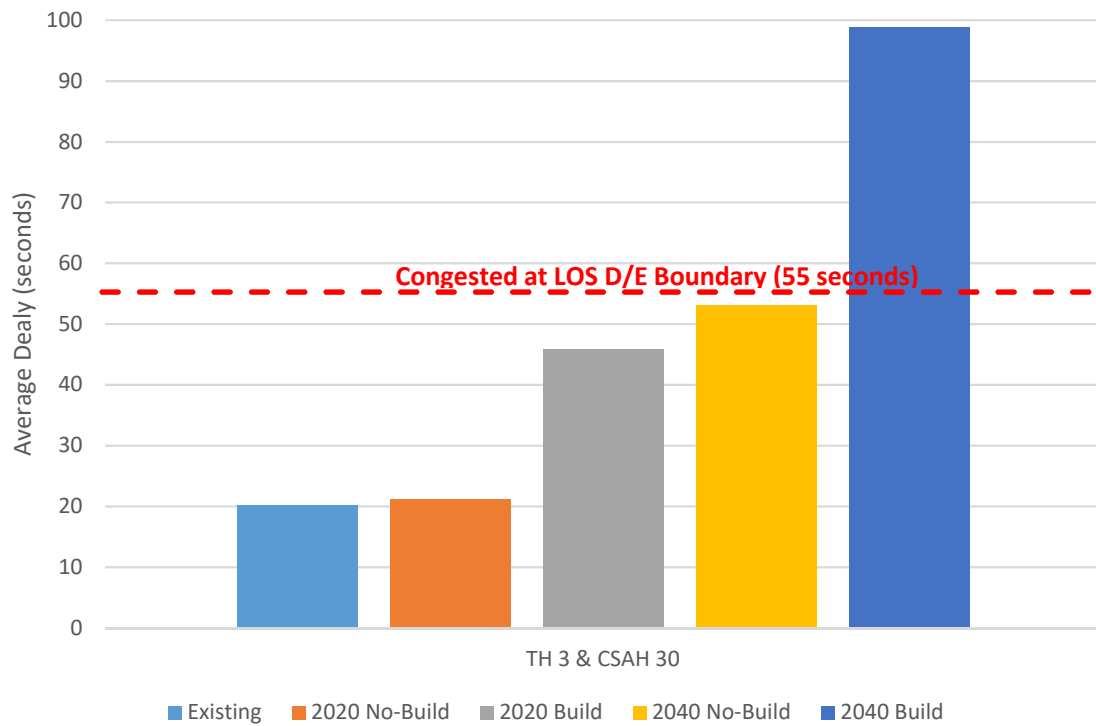
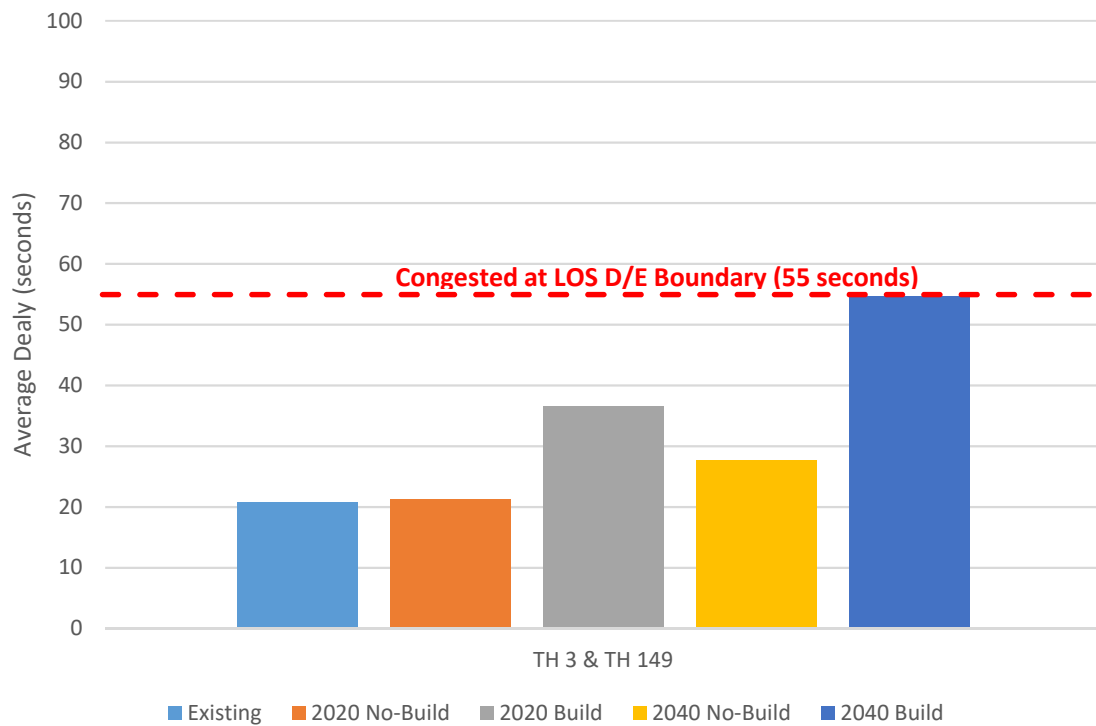
Chart 1 – A.M. Peak Hour Delays: Signal Controlled Intersection**Chart 2 – P.M. Peak Hour Delays: Signal Controlled Intersection**

Chart 3 – A.M. Peak Hour Queues: Signal Controlled Intersection

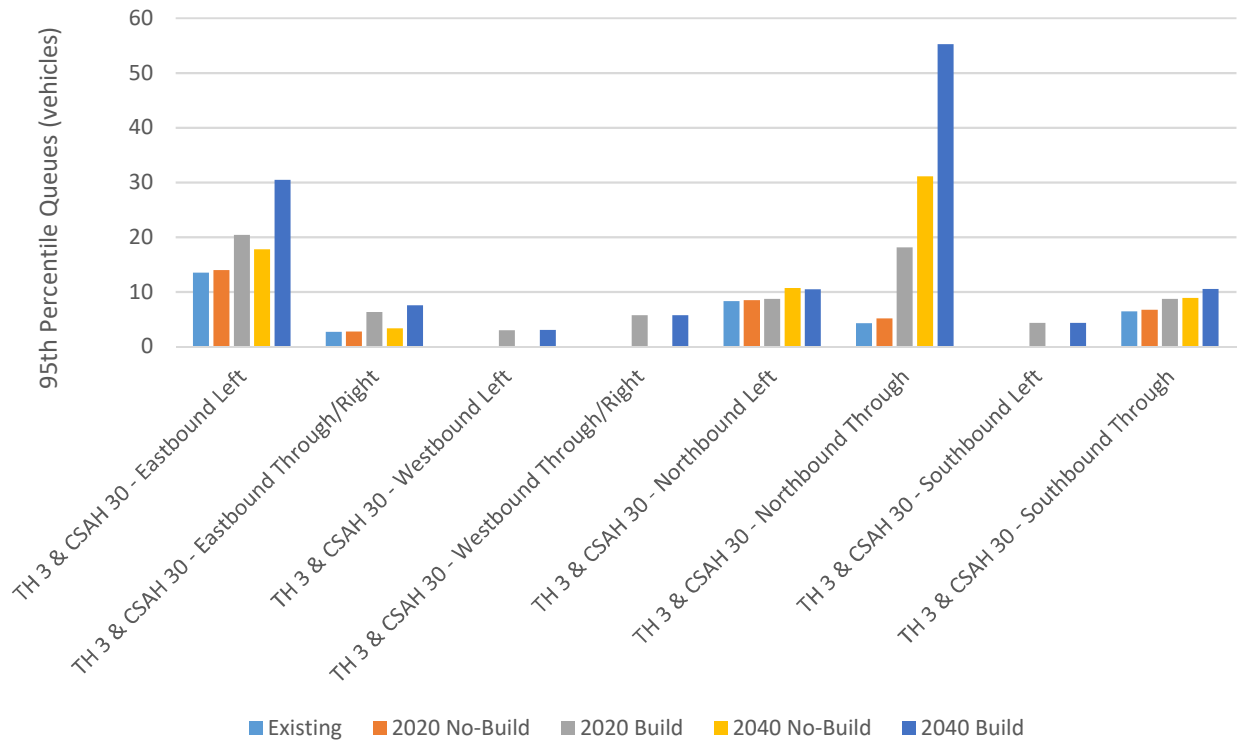


Chart 4 – P.M. Peak Hour Queues: Signal Controlled Intersection

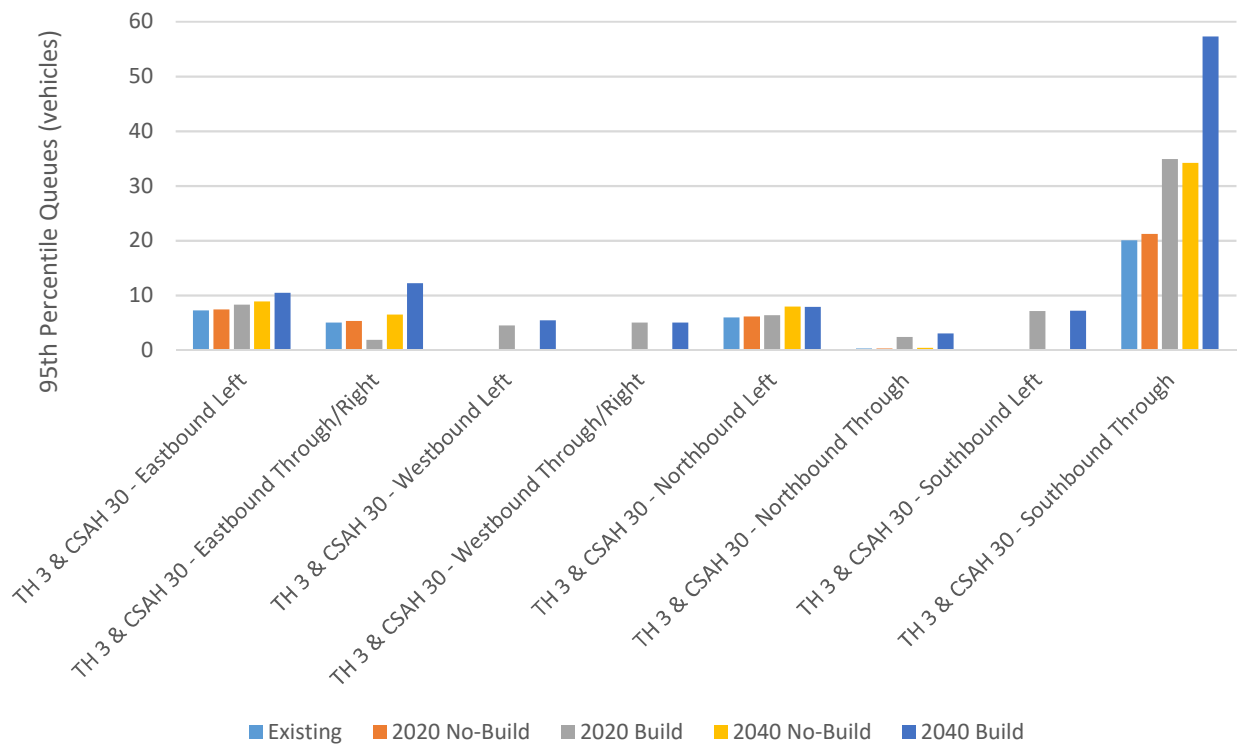


Chart 5 (a.m. peak hour) and Chart 6 (p.m. peak hour) show the 95th percentile queue lengths as the measures of effectiveness at intersections with side street stop sign control. For this type of control, vehicle queues are a better measure than LOS or delay, which can be poor with even a handful of vehicles. Queues are presented for the southbound left and right turn lanes as well as the eastbound left turn lanes at the side street stop sign controlled TH 3/TH 149 intersection. Based on our experience, improvements are not warranted at these types of intersections until the 95th percentile queue at a stop sign is in the five to ten vehicle range.

Chart 5 – A.M. Peak Hour Queues: Side Street Stop Sign Controlled Intersection

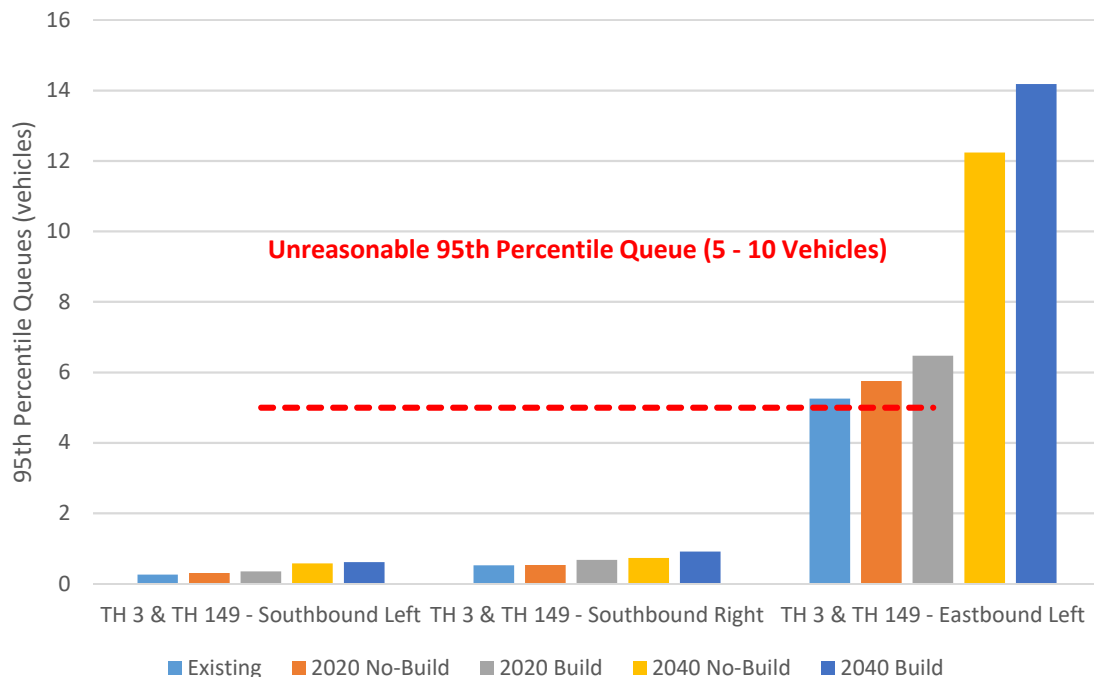
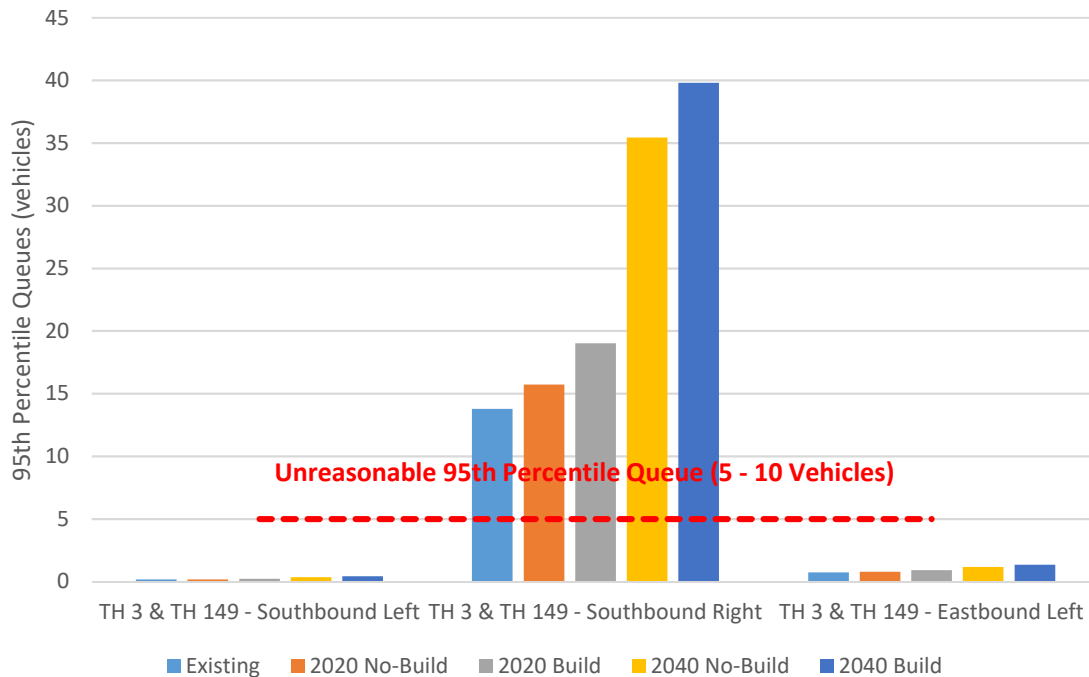


Chart 6 – P.M. Peak Hour Queues: Side Street Stop Sign Controlled Intersection



b. Mitigation Analysis

Per the above analyses, the TH 3/CSAH 30 intersection is expected to operate with acceptable overall delays in both peak hours through the 2040 Build scenario, except for in the 2040 Build a.m. peak hour scenario. There are forecast to be some significant queues, specifically the eastbound and northbound approaches in the a.m. peak hour and the southbound approach in the p.m. peak hour. The Build scenarios are also showing considerable more delays and queues than the No-Build scenarios.

At the TH 3/TH 149 intersection, there is expected to be significant queueing for eastbound left turns in the a.m. peak hour and southbound right turns in the p.m. peak hour. The a.m. peak hour eastbound left turn queues are forecast to be acceptable through the 2020 Build scenario, but significantly increase by the 2040 No-Build scenario. The p.m. peak hour southbound right turn queues are currently at a higher than desired level and are forecast to significantly increase by the 2040 No-Build scenario. In this case, the Build scenarios, while worse, are not significantly different from the No Build scenarios.

Different mitigation options are analyzed for each of the study intersections in the following sections.

i. TH 3/CSAH 30

The projected delays in year 2020 at the TH 3/CSAH 30 are expected to be acceptable. Therefore, the intersection should be able to accommodate the increase in traffic volume from the proposed development and other background growth. No mitigation is likely to be needed in this near-term period outside of adding the westbound approach left turn and thru/right turn lanes to provide access.

However, with large delays forecast in the 2040 Build a.m. peak hour scenario and large queues forecast on some of the approaches, the intersection may need upgrades in the future. Due to the locations of the forecast long queue lengths, different mitigation measures were considered to improve operations. The first mitigation is adding would be regarding the eastbound left turn queues. With the addition of the westbound leg, this approach has more conflicting traffic, leading to the low results.

The initial evaluation of the traffic signal at this intersection was setup with permissive only phasing for the eastbound and westbound left turn movements. Adding permissive-protected left turn phasing for these two approaches would allow the eastbound left turns to operate better through the intersection.

A second mitigation option is to provide additional geometry. The northbound and southbound approaches currently provide exclusive left, thru, and right turn lanes. The westbound and eastbound approaches currently or will provide a left turn lane and thru/right turn lane. Given the relatively low amount of thru traffic on the westbound and eastbound approaches, an additional lane here would not significantly impact the results. Instead, the addition of a second thru lane could provide improved intersection operations and could be completed through a conversion of the exclusive northbound and southbound right turn lanes into thru/right turn lanes. This change allows for two thru vehicles to sit side-by-side while waiting for a green light.

A third mitigation option would be to convert the intersection to a modern roundabout. It is anticipated two approach lanes on TH 3 and one approach lane on CSAH 30/site access would improve the queues and delays at the intersection.

Charts 7 through 10 illustrate the impacts of these mitigation measures on the queues and delays at the TH 3/CSAH 30 intersection in the 2040 Build scenarios. Chart 7 looks at the average a.m. peak hour delays, Chart 8 looks at the average p.m. peak hour delays, Chart 9 looks at the a.m. peak hour 95th percentile queues, and Chart 10 looks at the p.m. peak hour 95th percentile queues. Full delay and capacity results are in the capacity analysis section of the Appendix.

Chart 7 – A.M. Peak Hour Delays: Signal Controlled Intersection - Mitigation

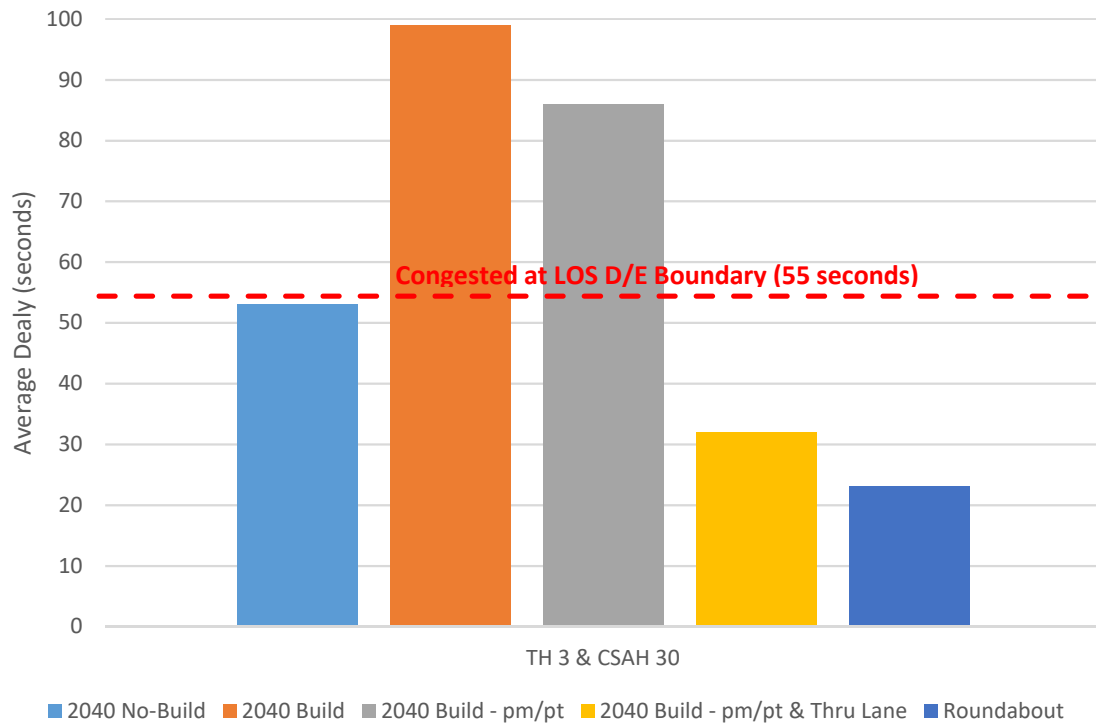


Chart 8 – P.M. Peak Hour Delays: Signal Controlled Intersection - Mitigation

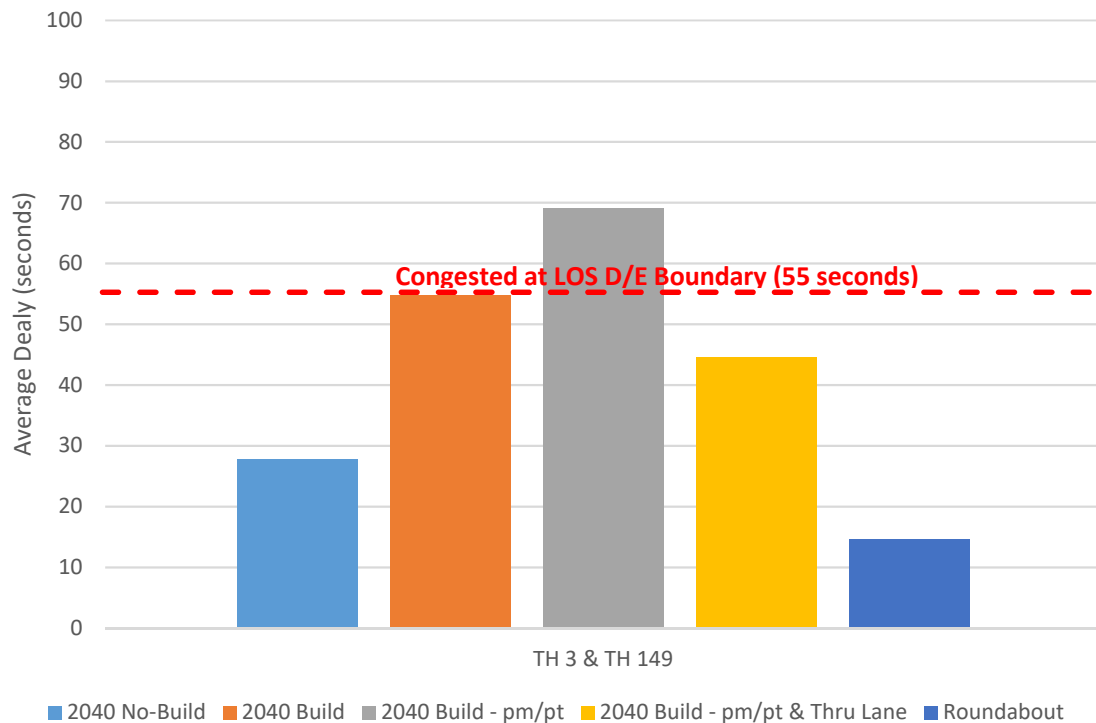


Chart 9 – A.M. Peak Hour Queues: Signal Controlled Intersection - Mitigation

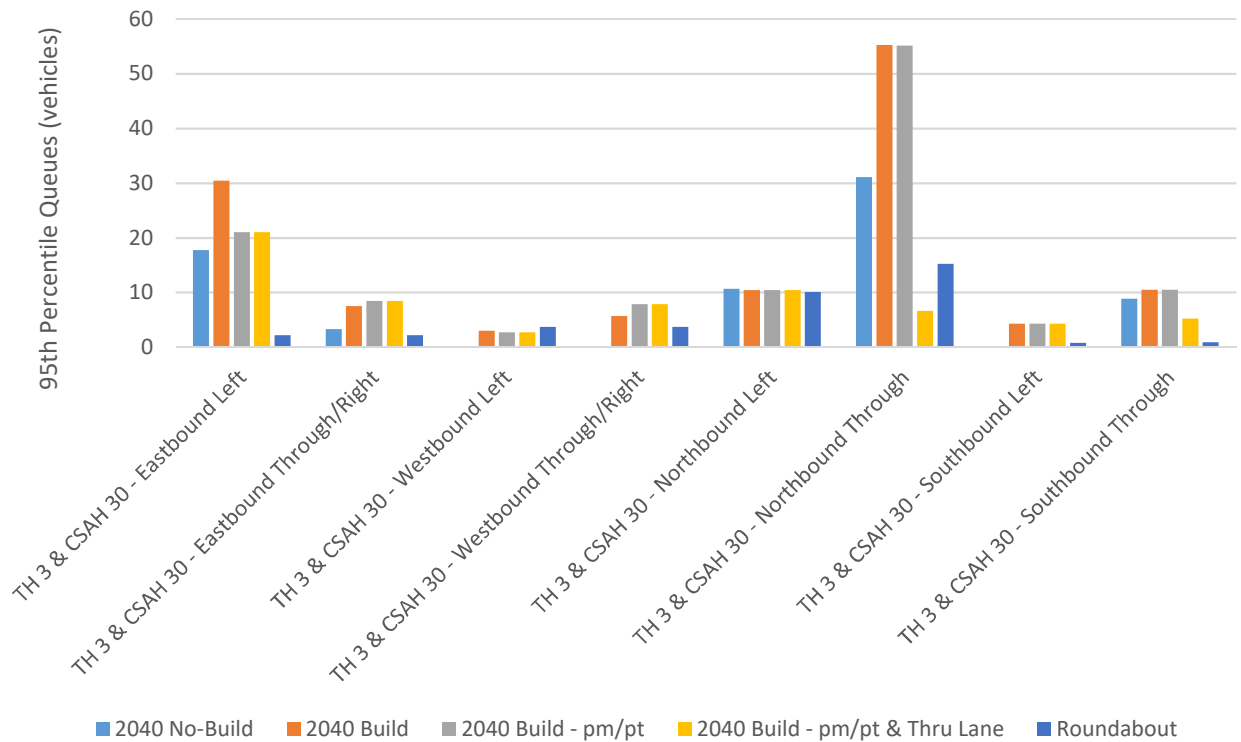
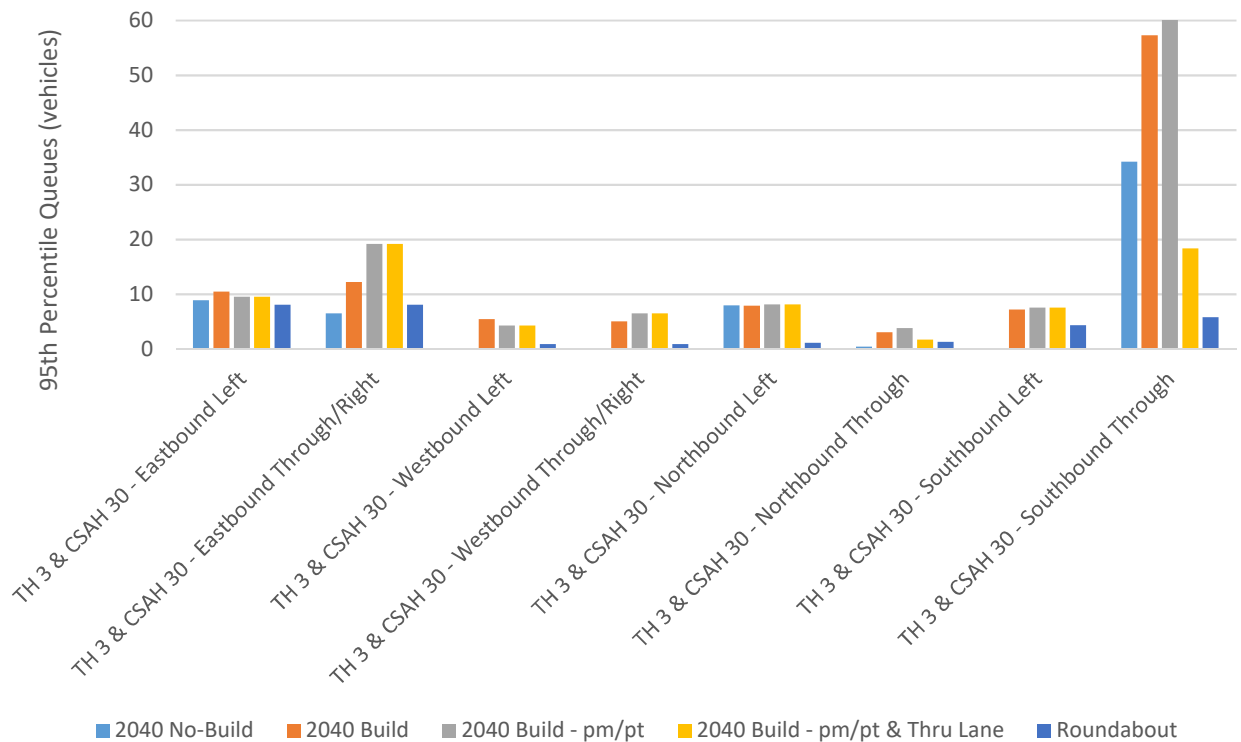


Chart 10 – P.M. Peak Hour Queues: Signal Controlled Intersection - Mitigation



As shown in Charts 7 through 10, the addition of permissive-protected left turn phasing for the TH 3/CSAH 30 intersection provides some improvement, but no significant impact on the intersection. The addition of the second thru lane has a significant positive impact on the vehicle operations at the intersection, notably on the northbound thru queues in the a.m. peak hour and the southbound thru queues in the p.m. peak hour.

Conversion to a roundabout also has significant positive impacts on the intersection, reducing both queues and delays. A roundabout would require more space, but there appears to be sufficient open area around the intersection to be feasible.

Based on these results, it is recommended that the TH 3/CSAH 30 intersection be monitored and right-of-way be preserved so improvements can be made in the future. These improvements could be providing two northbound/southbound thru lanes or conversion to a roundabout. A formal justification or intersection control evaluation report will be necessary in future with this change to further justify the improvement.

ii. TH 3/TH 149

The eastbound left turns in the a.m. peak hour currently experience 95th percentile queue lengths of just over five vehicles and small increases are forecast through the 2020 Build scenario. It is from the growth in the 2040 No-Build scenario that pushes those queues to extend well beyond the storage lane.

The southbound right turns in the p.m. peak hour currently experience 95th percentile queue lengths of nearly 15 vehicles. Some increases are forecast through the 2020 Build scenario, but similar to the eastbound queues, the growth in the 2040 No-Build scenario is what pushes the queues to over 35 vehicles.

The addition of growth from the proposed development and outlots has an impact on these queues, but only a relatively small amount and any mitigation measures taken would not necessarily be due to the development.

With this intersection being under side street stop control and already having exclusive turn lanes, mitigation would likely involve a change in traffic control. Providing traffic signal control is the first mitigation considered for this intersection.

To evaluate the potential for a signal, the intersection traffic signal warrants based on the method in the Manual on Uniform Traffic Control Devices (MUTCD) were reviewed. Warrants 1-3 focus on the intersection volumes to determine if a signal may be needed and were used in this study. Meeting

signal warrants does not automatically mean a signal is justified at the intersection, but is a helpful indicator of when an intersection would likely benefit from signal control.

Using the existing, 2020 No-Build and 2040 No-Build volumes, signal warrants 1-3 were analyzed. Warrant 1 is met if at least eight hours of the day are above the warrant threshold. Warrant 2 is met with four hours and Warrant 1 is met with a single hour above the threshold. Since right turn movements have their own lane and are not significantly impacted due to right turn on red, all right turn volume was removed from traffic on TH 3 and a 50 percent reduction applied to the right turn traffic on TH 149. Table 3 shows a summary of the results of this warrant analyses. Full results are shown in the Appendix.

Table 3 – TH 3/TH 149 Signal Warrant Analyses

Scenario	Warrant 1 8-Hour Volumes	Warrant 2 4-Hour Volumes	Warrant 3 Peak Hour Volumes
Existing	Not Met (4 hours met A) (2 hours met B)	Not Met (3 hours met)	Met (2 hours met)
2020 No-Build	Not Met (4 hours met A) (2 hours met B)	Not Met (3 hours met)	Met (2 hours met)
2040 No-Build	Met (6 hours met A) (8 hours met B)	Met (8 hours met)	Met (5 hours met)

As shown in Table 3, the peak hour volume warrant is met with existing vehicle volumes. The four hour and eight hour warrants are not expected to be met until the 2040 No-Build scenario. In general, MnDOT uses the eight-hour warrant as a guide to signal installation, suggesting a traffic signal could be justified in the distant future.

Another option for the intersection would be the conversion to a roundabout. The roughly equal volumes on conflicting movements are a strength of roundabout operations.

Charts 11 and 12 illustrate the impacts of these mitigation measures on the queues and delays at the TH 3/TH 149 intersection in the 2040 Build scenarios. Chart 11 looks at the a.m. peak hour 95th percentile queues and Chart 12 looks at the p.m. peak hour 95th percentile queues. Full delay and capacity results are in the capacity analysis section of the Appendix.

Chart 11 – A.M. Peak Hour Queues: Side Street Stop Sign Controlled Intersection - Mitigation

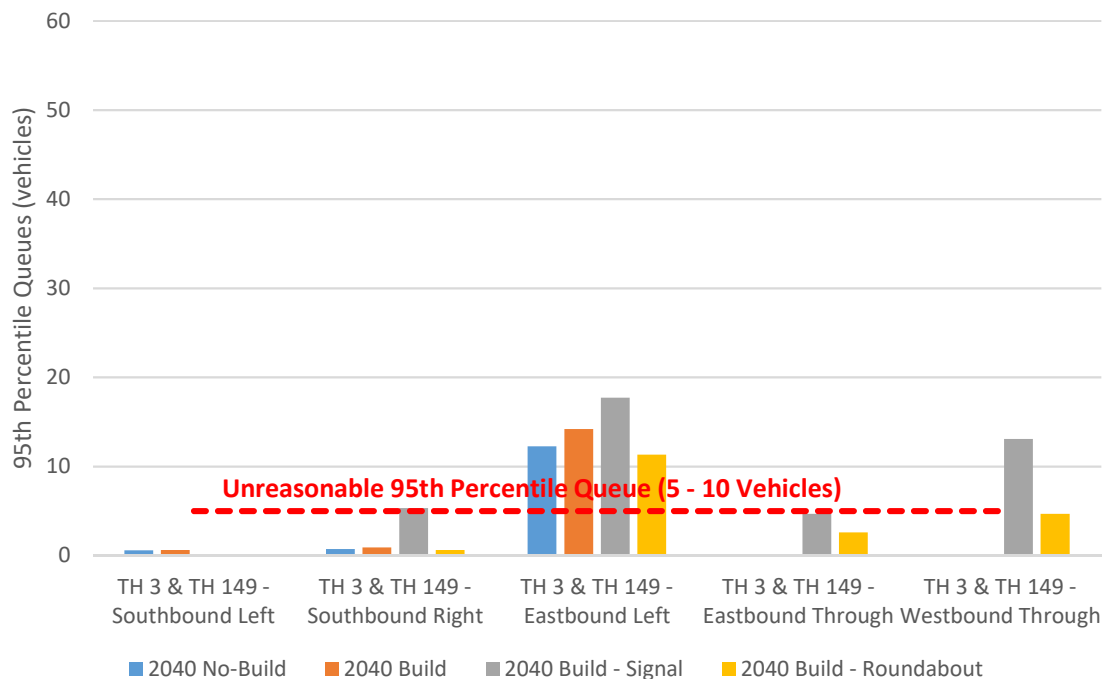
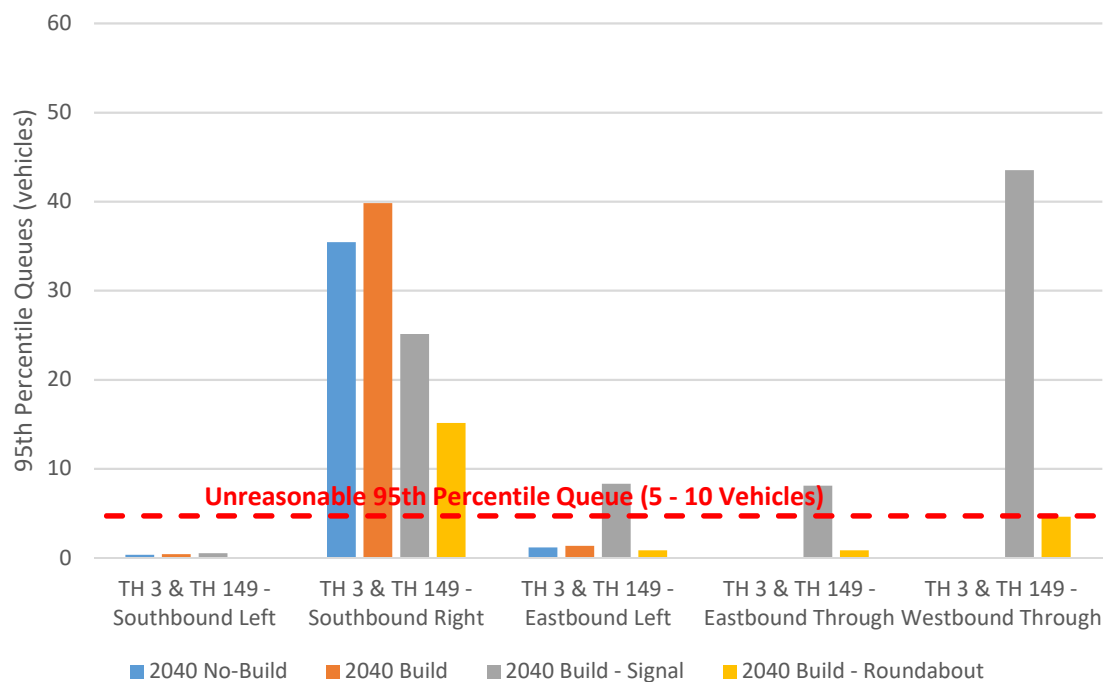


Chart 12 – P.M. Peak Hour Queues: Side Street Stop Sign Controlled Intersection - Mitigation



The addition of a signal at TH 3/TH 149 in the 2040 Build improves the p.m. peak hour southbound right turn queue, but has a negative impact on all other queues. This is most notable at the p.m. peak hour westbound thru movement which would go from a free flow movement to stopping with a significant queue length. Comparable results in the a.m. and p.m. peak hour 2040 Build scenarios as the current traffic control is likely due to large volume of conflicting movements in peak hour times.

The option of a roundabout at this intersection would have a positive improvement on all existing queue lengths. There is still forecast to be larger than desired 95th percentile queue lengths on the a.m. peak hour eastbound left turns and the p.m. peak hour southbound right turns. However, this does present overall improvement.

Based on these results, it is recommended that the TH 3/TH 149 intersection be monitored and right-of-way be preserved to convert this intersection to a roundabout when delays and queues become excessive.

5. Conclusions and Recommendations

The traffic impacts of the proposed development were thoroughly studied and the principal findings are:

- The proposed Westgate development is expected to generate approximately 670 new trips and 345 pass-by trips during an average weekday, approximately 15 new trips and 10 pass-by trips during the a.m. peak hour and approximately 55 new trips and 30 pass-by trips during the p.m. peak hour.
- The proposed Westgate development with the addition of other site outlots is expected to generate approximately 2,355 new trips and 1,220 pass-by trips during an average weekday, approximately 260 new trips and 85 pass-by trips during the a.m. peak hour and approximately 315 new trips and 105 pass-by trips during the p.m. peak hour.
- The TH 3/CSAH 30 intersection is forecast to operate with acceptable overall delays through 2040 except in the 2040 Build a.m. peak hour scenario.
- The TH 3/CSAH 30 intersection is forecast to have some significant queues, specifically the eastbound left and northbound thru movements in the a.m. peak hour and the southbound thru movement in the p.m. peak hour.
- The TH 3/TH 149 intersection currently has large queues on the southbound right turn movement in the p.m. peak hour.
- The TH 3/TH 149 intersection is forecast to have some significant queues, specifically the eastbound left movement in the a.m. peak hour and the southbound right movement in the p.m. peak hour.
- The TH 3/TH 149 currently meets peak hour signal warrants and is forecast to meet all volume-based signal warrants by the 2040 No-Build scenario.
- Any mitigation needed at the study intersections outside of adding a westbound approach would be needed without the addition of traffic from the Westgate development and surrounding outlots.

The following recommendations are made based on the above findings:

- Include pedestrian and bicycle facilities within the site and tie into the existing sidewalk on the north side of CSAH 30 west of TH 3.
- Construct the westbound leg with one left turn lane, one thru/right turn lane and an inbound lane.
- The TH 3/CSAH 30 intersection be monitored and right-of-way be preserved so that in the future this intersection can either be altered to have two northbound/southbound thru lanes or be converted to a roundabout.
- Monitor the TH 3/TH 149 intersection and preserve right-of-way to allow conversion of this intersection to a roundabout before 2040.

6. Appendix

A. Preliminary Concept Plan

B. The Language of Traffic Engineering

C. Traffic Counts

D. Trip Generation Table

E. Peak Hour Volumes

F. Level of Service (LOS)

G. Warrant Analyses

H. Capacity Analysis Backup

- AM Existing
- PM Existing
- AM 2020 No-Build
- PM 2020 No-Build
- AM 2020 Build
- PM 2020 Build
- AM 2040 No-Build
- PM 2040 No-Build
- AM 2040 Build
- PM 2040 Build
- AM 2040 Build – TH 3/CSAH 30 Mitigation – pm/pt
- PM 2040 Build – TH 3/CSAH 30 Mitigation – pm/pt
- AM 2040 Build – TH 3/CSAH 30 Mitigation – pm/pt & NB/SB Thru Lane
- PM 2040 Build – TH 3/CSAH 30 Mitigation – pm/pt & NB/SB Thru Lane
- AM 2040 Build – TH 3/CSAH 30 Mitigation – Roundabout
- PM 2040 Build – TH 3/CSAH 30 Mitigation – Roundabout
- AM 2040 Build – TH 3/TH 149 Mitigation – Signal
- AM 2040 Build – TH 3/TH 149 Mitigation – Roundabout
- PM 2040 Build – TH 3/TH 149 Mitigation – Signal
- PM 2040 Build – TH 3/TH 149 Mitigation – Roundabout

SEE SHEET C1 FOR GENERAL NOTES & LEGEND
SEE SHEET C4.1 & C4.2 FOR DETAILS

WARNING!!

KOCH REFINING COMPANY
HIGH PRESSURE PIPELINE
Before Excavating Contact:

KOCH REFINING
P.O. BOX 2256
WICHITA, KANSAS 67201
info@kochind.com

DRAWN BY: C.W.P.
CHKD BY: C.W.P.
PROJ. NO. 16-1643

ORIGINAL DATE:
OCTOBER 24, 2016

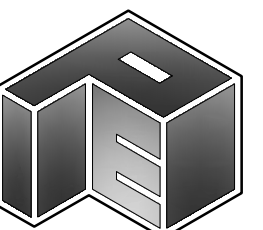
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11/21/16	ADD BORING LOCATIONS
11/30/16	SITE PLAN REVISION
12/22/16	SITE PLAN REVISION
01/04/17	SITE PLAN REVISION

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Charles W. Plowe
CHARLES W. PLOWE
DATE: 01-04-2017 LIC. NO. 18327

WEST GATE
INVER GROVE HEIGHTS, MN
GRADING, DRAINAGE & EROSION
CONTROL PLAN

PREPARED FOR:
**EXCEL
DEVELOPMENT**

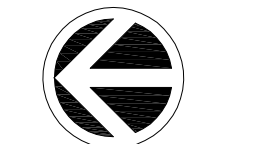


SITE PLANNING
& ENGINEERING

**PLOWE
ENGINEERING, INC.**

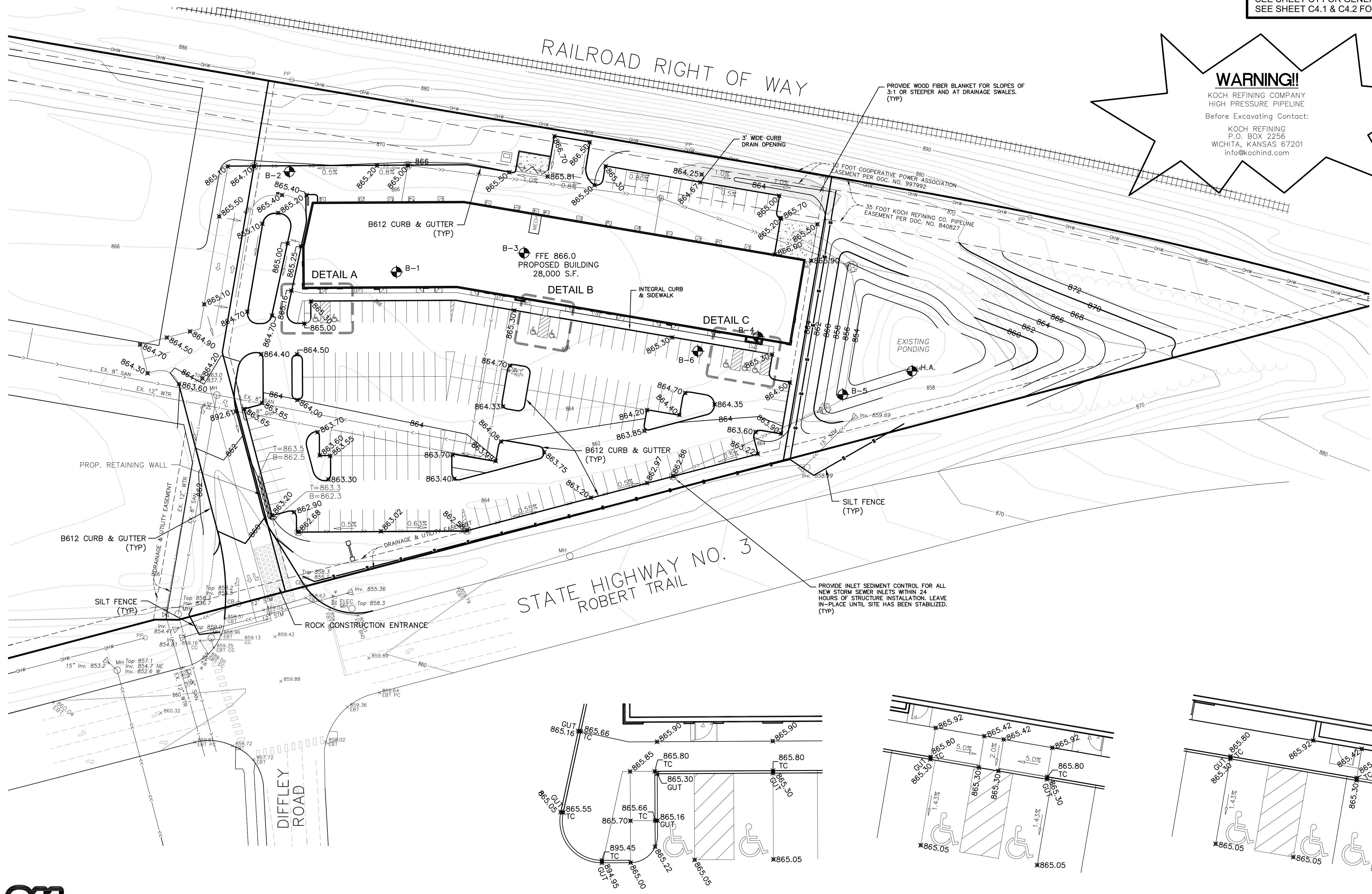
6776 LAKE DRIVE
SUITE 110
LINO LAKES, MN 55014
PHONE: (651) 361-8210
FAX: (651) 361-8701

NORTH



0 20 40
1 INCH = 40 FEET

C2



NOTE:
T = TOP OF WALL
B = GROUND ELEV AT
BOTTOM OF WALL
TC = TOP OF CURB
G = GUTTER

DETAIL A

1 INCH = 10 FEET

DETAIL B

1 INCH = 10 FEET

DETAIL C

1 INCH = 10 FEET

GRADING, DRAINAGE & EROSION CONTROL PLAN WEST GATE



Know what's below.
Call before you dig.

The Language of Traffic Engineering

Traffic Engineering, and Traffic Engineers, often use technical terms or jargon that may be confusing or tough to understand even within the context of a sentence. Key terms and acronyms that can generally be found in all types of traffic studies are defined in this document.

Types of Studies

Access Management – The practice of government agencies limiting the amount of intersections (both public roadway crossings and private driveways) along a roadway corridor based on the function of the roadway to improve safety and mobility while streamlining access.

Corridor Study – A transportation review and analysis of the existing and future traffic operations of a roadway segment. Varies in length from a couple blocks to a few miles and typically covers all modes of travel.

Intersection Control Evaluation (ICE) Report – A document that examines and determines the most appropriate type of control (stop sign, signal, roundabout, or other) at one or more intersections.

Safety Study – An examination of crash records to identify potential trends, issues, and problem intersections/corridors. Usually includes potential mitigation options expected to decrease crash rates in the future.

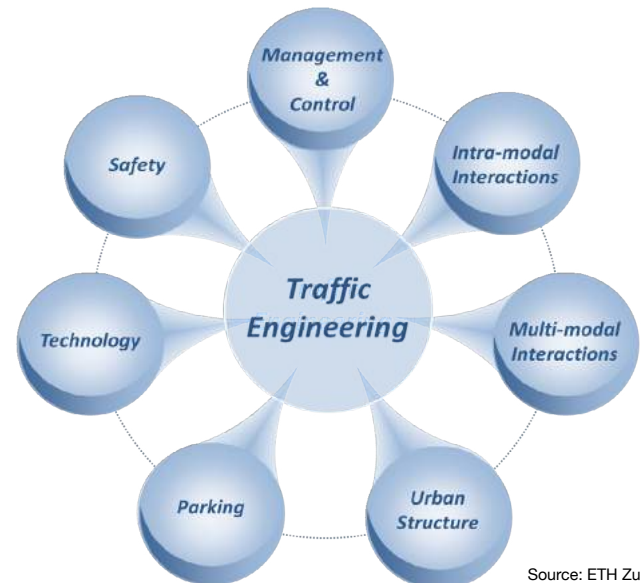
Speed Study – A review of existing travel speeds and the corridor characteristics to determine if speeding is an issue, the appropriate speed to post as the limit, and/or areas to provide reduced speed warnings.

Traffic Impact Study (TIS) – A document that addresses the expected traffic impacts of a development and, if necessary, mitigation options that will reduce or eliminate negative impacts. Also referred to as a Traffic Impact Analysis.

Transportation Plan – A document developed by a government agency to take inventory of their transportation network, identify concerns or issues and lay out the path for improvement of the system.

Travel Demand Management Plan (TDMP) – A plan that documents the existing infrastructure around a site, including transit and non-motorized vehicle options, and develops measures to be implemented to encourage those alternative modes of travel.

Warrant Evaluation – Review of traffic volumes and other characteristics at an intersection against thresholds to determine if a traffic signal or other traffic control option is needed/warranted.



Source: ETH Zurich

Traffic Engineering is a branch of civil engineering that focuses on the safe and efficient movement of people and vehicles. It is part science and part art, requiring not only technical skills for analysis but an understanding of motivations in choosing travel routes.

Key Organizations

AASHTO – American Association of State Highway and Transportation Officials. A nonprofit, nonpartisan association representing transportation departments with a primary goal of fostering the development, operation, and maintenance of an integrated national transportation system.

DOT – Department of Transportation. Government organizations within federal and state agencies dedicated to serving the transportation needs of the community and typically responsible for study, design, operation, and maintenance of all facets of transportation.

FHWA – Federal Highway Administration. An agency within the US Department of Transportation that supports State and local governments in the design, construction, and maintenance of the highway system.

ITE – Institute of Transportation Engineers. An international educational and scientific association of transportation professionals who are responsible for meeting mobility and safety needs.

Results

85th Percentile Speed – Speed at which 85 percent of drivers are traveling at or below. Speed limits are typically set at the 85th percentile speed.

95th Percentile Queue – The distance, generally measured in feet or number of vehicles, which will be exceeded in a lane, typically at an intersection, only five percent of the time. Usually used to help determine intersection turn lane lengths.

Control Delay – The total amount of time a motorist takes to get through a road segment or intersection minus the time it would take without stopping due to traffic controls (like stop signs or traffic signals). Control delay includes decelerating and accelerating back to full driving speed.

Functional Classification – the grouping of streets and highways into categories according to their characteristics and emphasis on mobility or access. Generally, categories include arterials (emphasizing mobility and fast travel), local roads (emphasizing access to adjoining properties), and collector roads (emphasizing a balance between the two and usually connecting arterials to local roads).

Intersection Delay – The average amount of time, usually expressed in seconds, experienced by any vehicle traveling through an intersection.

Level of Service (LOS) – Qualitative measure of traffic operations related to the amount of average delay experienced. Expressed in letter grades with LOS A representing the best operations with little to no delay and LOS F representing the worst operations with excessive delays and congestion.

Measures of Effectiveness – Performance measures that define how well traffic is moving along a corridor or thru an intersection. The common MOEs are travel time, corridor speed, delay, and queues.

Mitigation – Measures intended to reduce the impact of a development or improve an identified traffic issue by either improving capacity (like adding lanes) or reducing demand (like encouraging carpooling).

Queue – Length of line of cars waiting at an intersection or at a bottleneck in a corridor, typically measured for each individual lane of traffic in feet or number of vehicles.

Volume to Capacity (v/c) ratio – the number of vehicles through an intersection or roadway segment in a specific amount of time divided by the expected capacity of the road. Less than 1.0 indicates available capacity and above 1.0 indicates more vehicles than can be accommodated. Typically, a v/c ratio above 0.85 suggests operational issues.

Trip Generation – The amount of vehicle traffic generated by a land use. One trip is equal to one vehicle traveling from an origin to a destination (traveling to and from work equals two trips).

Warrants – Criteria based on volumes and other Measures of Effectiveness for determining when all way stop signs, roundabouts, traffic signals, or other type of control should be installed.

Important Manuals/Guides

HCM – Highway Capacity Manual (released by the Transportation Research Board, or TRB). The guide for engineers and planners to assess traffic and environmental effects of highway projects. This manual presents the foundation of traffic analysis procedures in the US.

MUTCD – Manual of Uniform Traffic Control Devices. A document that sets minimum standards and provides guidance to ensure uniformity of traffic control devices (such as messages, location, size, shapes, and colors) across the nation. All roads are subject to its jurisdiction.

HSM – Highway Safety Manual (released by AASHTO). A guide that presents a variety of methods for quantitatively estimating crash frequency or severity.

Resources

[MUTCD, 2009 Edition, published by FHWA](#)

[Highway Capacity Manual, HCM2010](#)

[Highway Safety Manual, HSM](#)

About This Brief

Spack Consulting prepared this brief as part of our company's vision to significantly improve the practice of traffic engineering and transportation planning. Transportation professionals from around the world have assisted us in developing this document. We are providing this brief under the Creative Commons Attribution License. Feel free to use-modify-share this guide, but please give us some credit in your document. To request our whole series of Design Briefs and to be included on our distribution list for new materials, please email mspack@spackconsulting.com. And please reach out if you have any comments or questions related to this Design Brief.

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-14-17

Site Code : 1

Start Date : 2/14/2017

Page No : 1

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	12	4	0	16	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	2	0	3	20
12:15 AM	0	0	8	2	0	10	0	0	0	0	0	0	0	0	2	0	0	2	0	1	0	1	0	2	14
12:30 AM	0	0	6	10	0	16	0	0	0	0	0	0	0	1	1	0	0	2	0	2	0	1	0	3	21
12:45 AM	0	0	7	2	0	9	0	0	0	0	0	0	0	0	2	0	0	2	0	2	0	0	0	2	13
Total	0	0	33	18	0	51	0	0	0	0	0	0	0	1	6	0	0	7	0	6	0	4	0	10	68
01:00 AM	0	0	1	5	0	6	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	8
01:15 AM	0	0	3	4	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
01:30 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	1	3	0	0	4	0	1	0	0	0	1	7
01:45 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	5
Total	0	0	9	9	0	18	0	0	0	0	0	0	0	1	5	0	0	6	0	1	0	2	0	3	27
02:00 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0	0	0	2	5
02:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	2	0	1	0	0	0	1	4
02:30 AM	0	0	6	0	0	6	0	0	0	0	0	0	0	1	9	0	0	10	0	2	0	2	0	4	20
02:45 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	0	8	0	0	8	0	0	0	1	0	1	12
Total	0	0	12	0	0	12	0	0	0	0	0	0	0	1	20	0	0	21	0	5	0	3	0	8	41
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03:30 AM	0	0	4	0	0	4	0	0	0	0	0	0	0	1	3	0	0	4	0	0	0	1	0	1	9
03:45 AM	0	0	4	1	0	5	0	0	0	0	0	0	0	2	6	0	0	8	0	0	0	1	0	1	14
Total	0	0	18	1	0	19	0	0	0	0	0	0	0	4	22	0	0	26	0	1	0	3	0	4	49
04:00 AM	0	0	1	2	0	3	0	0	0	0	0	0	0	1	3	0	0	4	0	0	0	1	0	1	8
04:15 AM	0	0	6	3	0	9	0	0	0	0	0	0	0	1	9	0	0	10	0	0	0	1	0	1	20
04:30 AM	0	0	4	5	0	9	0	0	0	0	0	0	0	6	14	0	0	20	0	0	0	0	0	0	29
04:45 AM	0	0	3	2	0	5	0	0	0	0	0	0	0	0	22	0	0	22	0	3	0	1	0	4	31
Total	0	0	14	12	0	26	0	0	0	0	0	0	0	8	48	0	0	56	0	3	0	3	0	6	88
05:00 AM	0	0	6	1	0	7	0	0	0	0	0	0	0	5	24	0	0	29	0	3	0	1	0	4	40
05:15 AM	0	0	11	2	0	13	0	0	0	0	0	0	0	6	26	0	0	32	0	5	0	1	0	6	51
05:30 AM	0	0	7	2	0	9	0	0	0	0	0	0	0	6	50	0	0	56	0	6	0	2	0	8	73
05:45 AM	0	0	4	5	0	9	0	0	0	0	0	0	0	7	61	0	0	68	0	4	0	10	0	14	91
Total	0	0	28	10	0	38	0	0	0	0	0	0	0	24	161	0	0	185	0	18	0	14	0	32	255
06:00 AM	0	0	12	2	0	14	0	0	0	0	0	0	0	13	74	0	0	87	0	6	0	5	0	11	112
06:15 AM	0	0	23	7	0	30	0	0	0	0	0	0	0	10	94	0	0	104	0	19	0	7	0	26	160
06:30 AM	0	0	40	20	0	60	0	0	0	0	0	0	0	17	135	0	0	152	0	25	0	11	0	36	248
06:45 AM	0	0	35	19	0	54	0	0	0	0	0	0	0	37	161	0	0	198	0	17	0	12	0	29	281
Total	0	0	110	48	0	158	0	0	0	0	0	0	0	77	464	0	0	541	0	67	0	35	0	102	801
07:00 AM	0	0	33	34	0	67	0	0	0	0	0	0	0	41	193	0	0	234	0	45	0	17	0	62	363
07:15 AM	0	0	41	21	0	62	0	0	0	0	0	0	0	32	255	0	0	287	0	55	0	21	0	76	425
07:30 AM	0	0	38	22	0	60	0	0	0	0	0	0	0	36	260	0	0	296	0	63	0	14	0	77	433

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-14-17

Site Code : 1

Start Date : 2/14/2017

Page No : 2

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
07:45 AM	0	0	64	31	0	95	0	0	0	0	0	0	0	39	296	0	0	335	0	25	0	27	0	52	482
Total	0	0	176	108	0	284	0	0	0	0	0	0	0	148	1004	0	0	1152	0	188	0	79	0	267	1703
08:00 AM	0	0	39	15	0	54	0	0	0	0	0	0	0	31	208	0	0	239	0	55	0	22	0	77	370
08:15 AM	0	0	31	14	0	45	0	0	0	0	0	0	0	20	171	0	0	191	0	23	0	13	0	36	272
08:30 AM	0	0	34	14	0	48	0	0	0	0	0	0	0	19	140	0	0	159	0	32	0	7	0	39	246
08:45 AM	0	0	48	20	0	68	0	0	0	0	0	0	0	23	107	0	0	130	0	24	0	8	0	32	230
Total	0	0	152	63	0	215	0	0	0	0	0	0	0	93	626	0	0	719	0	134	0	50	0	184	1118
09:00 AM	0	0	77	18	0	95	0	0	0	0	0	0	0	16	98	0	0	114	0	17	0	7	0	24	233
09:15 AM	0	0	44	25	0	69	0	0	0	0	0	0	0	22	112	0	0	134	0	25	0	23	0	48	251
09:30 AM	0	0	38	8	0	46	0	0	0	0	0	0	0	18	92	0	0	110	0	18	0	11	0	29	185
09:45 AM	0	0	29	12	0	41	0	0	0	0	0	0	0	10	68	0	0	78	0	16	0	11	0	27	146
Total	0	0	188	63	0	251	0	0	0	0	0	0	0	66	370	0	0	436	0	76	0	52	0	128	815
10:00 AM	0	0	32	15	0	47	0	0	0	0	0	0	0	7	57	0	0	64	0	10	0	10	0	20	131
10:15 AM	0	0	26	12	0	38	0	0	0	0	0	0	0	6	46	0	0	52	0	15	0	13	0	28	118
10:30 AM	0	0	27	18	0	45	0	0	0	0	0	0	0	10	50	0	0	60	0	20	0	6	0	26	131
10:45 AM	0	0	42	6	0	48	0	0	0	0	0	0	0	12	51	0	0	63	0	9	0	10	0	19	130
Total	0	0	127	51	0	178	0	0	0	0	0	0	0	35	204	0	0	239	0	54	0	39	0	93	510
11:00 AM	0	0	42	14	0	56	0	0	0	0	0	0	0	11	52	0	0	63	0	12	0	14	0	26	145
11:15 AM	0	0	43	10	0	53	0	0	0	0	0	0	0	16	36	0	0	52	0	22	0	9	0	31	136
11:30 AM	0	0	34	10	0	44	0	0	0	0	0	0	0	18	57	0	0	75	0	10	0	19	0	29	148
11:45 AM	0	0	45	12	0	57	0	0	0	0	0	0	1	17	46	0	0	64	0	14	0	13	0	27	148
Total	0	0	164	46	0	210	0	0	0	0	0	0	1	62	191	0	0	254	0	58	0	55	0	113	577
12:00 PM	0	0	65	22	0	87	0	0	0	0	0	0	1	11	46	0	0	58	0	13	0	14	0	27	172
12:15 PM	0	0	36	23	0	59	0	0	0	0	0	0	0	13	61	0	0	74	0	17	0	19	0	36	169
12:30 PM	0	0	50	17	0	67	0	0	0	0	0	0	0	10	58	0	0	68	0	18	0	20	0	38	173
12:45 PM	0	0	47	21	0	68	0	0	0	0	0	0	0	11	56	0	0	67	0	19	0	9	0	28	163
Total	0	0	198	83	0	281	0	0	0	0	0	0	1	45	221	0	0	267	0	67	0	62	0	129	677
01:00 PM	0	0	35	19	0	54	0	0	0	0	0	0	0	10	54	0	0	64	0	16	0	17	0	33	151
01:15 PM	0	0	69	12	0	81	0	0	0	0	0	0	0	15	34	0	0	49	0	10	0	12	0	22	152
01:30 PM	0	0	49	16	0	65	0	0	0	0	0	0	0	14	43	0	0	57	0	12	0	15	0	27	149
01:45 PM	0	0	58	14	0	72	0	0	0	0	0	0	0	14	47	0	0	61	0	16	0	7	0	23	156
Total	0	0	211	61	0	272	0	0	0	0	0	0	0	53	178	0	0	231	0	54	0	51	0	105	608
02:00 PM	0	0	74	23	0	97	0	0	0	0	0	0	0	23	47	0	0	70	0	18	0	12	0	30	197
02:15 PM	0	0	58	14	0	72	0	0	0	0	0	0	0	36	60	0	0	96	0	21	0	37	0	58	226
02:30 PM	0	0	76	24	0	100	0	0	0	0	0	0	0	18	44	0	0	62	0	19	0	31	0	50	212
02:45 PM	0	0	77	29	0	106	0	0	0	0	0	0	0	27	48	0	0	75	0	17	0	27	0	44	225
Total	0	0	285	90	0	375	0	0	0	0	0	0	0	104	199	0	0	303	0	75	0	107	0	182	860

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-14-17

Site Code : 1

Start Date : 2/14/2017

Page No : 3

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	0	81	26	0	107	0	0	0	0	0	0	0	22	61	0	0	83	0	32	0	32	0	64	254
03:15 PM	0	0	104	26	0	130	0	0	0	0	0	0	0	24	57	0	0	81	0	19	0	40	0	59	270
03:30 PM	0	0	124	38	0	162	0	0	0	0	0	0	0	28	65	0	0	93	0	32	0	46	0	78	333
03:45 PM	0	0	152	42	0	194	0	0	0	0	0	0	0	24	52	0	0	76	0	31	0	32	0	63	333
Total	0	0	461	132	0	593	0	0	0	0	0	0	0	98	235	0	0	333	0	114	0	150	0	264	1190
04:00 PM	0	0	146	36	0	182	0	0	0	0	0	0	0	25	50	0	0	75	0	35	0	34	0	69	326
04:15 PM	0	0	213	44	0	257	0	0	0	0	0	0	0	22	74	0	0	96	0	22	0	37	0	59	412
04:30 PM	0	0	210	59	0	269	0	0	0	0	0	0	0	22	84	0	0	106	0	28	0	41	0	69	444
04:45 PM	0	0	209	43	0	252	0	0	0	0	0	0	0	38	96	0	0	134	0	27	0	43	0	70	456
Total	0	0	778	182	0	960	0	0	0	0	0	0	0	107	304	0	0	411	0	112	0	155	0	267	1638
05:00 PM	0	0	180	59	0	239	0	0	0	0	0	0	0	32	68	0	0	100	0	22	0	36	0	58	397
05:15 PM	0	0	224	59	0	283	0	0	0	0	0	0	0	20	100	0	0	120	0	31	0	49	0	80	483
05:30 PM	0	0	186	77	0	263	0	0	0	0	0	0	0	21	76	0	0	97	0	29	0	28	0	57	417
05:45 PM	0	0	155	49	0	204	0	0	0	0	0	0	0	27	72	0	0	99	0	40	0	37	0	77	380
Total	0	0	745	244	0	989	0	0	0	0	0	0	0	100	316	0	0	416	0	122	0	150	0	272	1677
06:00 PM	0	0	126	48	0	174	0	0	0	0	0	0	0	27	53	0	0	80	0	22	0	25	0	47	301
06:15 PM	0	0	111	31	0	142	0	0	0	0	0	0	0	22	51	0	0	73	0	25	0	37	0	62	277
06:30 PM	0	0	86	18	0	104	0	0	0	0	0	0	0	13	46	0	0	59	0	22	0	19	0	41	204
06:45 PM	0	0	66	28	0	94	0	0	0	0	0	0	0	22	28	0	0	50	0	11	0	23	0	34	178
Total	0	0	389	125	0	514	0	0	0	0	0	0	0	84	178	0	0	262	0	80	0	104	0	184	960
07:00 PM	0	0	72	25	0	97	0	0	0	0	0	0	0	12	36	0	0	48	0	16	0	25	0	41	186
07:15 PM	0	0	63	19	0	82	0	0	0	0	0	0	0	17	30	0	0	47	0	10	0	30	0	40	169
07:30 PM	0	0	37	13	0	50	0	0	0	0	0	0	0	10	40	0	0	50	0	13	0	22	0	35	135
07:45 PM	0	0	64	24	0	88	0	0	0	0	0	0	0	18	29	0	0	47	0	10	0	10	0	20	155
Total	0	0	236	81	0	317	0	0	0	0	0	0	0	57	135	0	0	192	0	49	0	87	0	136	645
08:00 PM	0	0	50	21	0	71	0	0	0	0	0	0	0	26	50	0	0	76	0	20	0	7	0	27	174
08:15 PM	0	0	50	11	0	61	0	0	0	0	0	0	0	11	21	0	0	32	0	10	0	19	0	29	122
08:30 PM	0	0	32	13	0	45	0	0	0	0	0	0	0	20	42	0	0	62	0	7	0	16	0	23	130
08:45 PM	0	0	26	16	0	42	0	0	0	0	0	0	0	7	41	0	0	48	0	12	0	12	0	24	114
Total	0	0	158	61	0	219	0	0	0	0	0	0	0	64	154	0	0	218	0	49	0	54	0	103	540
09:00 PM	0	0	37	7	0	44	0	0	0	0	0	0	0	8	36	0	0	44	0	5	0	17	0	22	110
09:15 PM	0	0	51	11	0	62	0	0	0	0	0	0	0	11	28	0	0	39	0	7	0	8	0	15	116
09:30 PM	0	0	39	11	0	50	0	0	0	0	0	0	0	3	20	0	0	23	0	10	0	5	0	15	88
09:45 PM	0	0	30	13	0	43	0	0	0	0	0	0	0	13	20	0	0	33	0	6	0	9	0	15	91
Total	0	0	157	42	0	199	0	0	0	0	0	0	0	35	104	0	0	139	0	28	0	39	0	67	405
10:00 PM	0	0	46	12	0	58	0	0	0	0	0	0	0	6	22	0	0	28	0	7	0	13	0	20	106
10:15 PM	0	0	40	14	0	54	0	0	0	0	0	0	0	9	26	0	0	35	0	6	0	2	0	8	97
10:30 PM	0	0	29	5	0	34	0	0	0	0	0	0	0	5	16	0	0	21	0	5	0	3	0	8	63

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-14-17

Site Code : 1

Start Date : 2/14/2017

Page No : 4

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

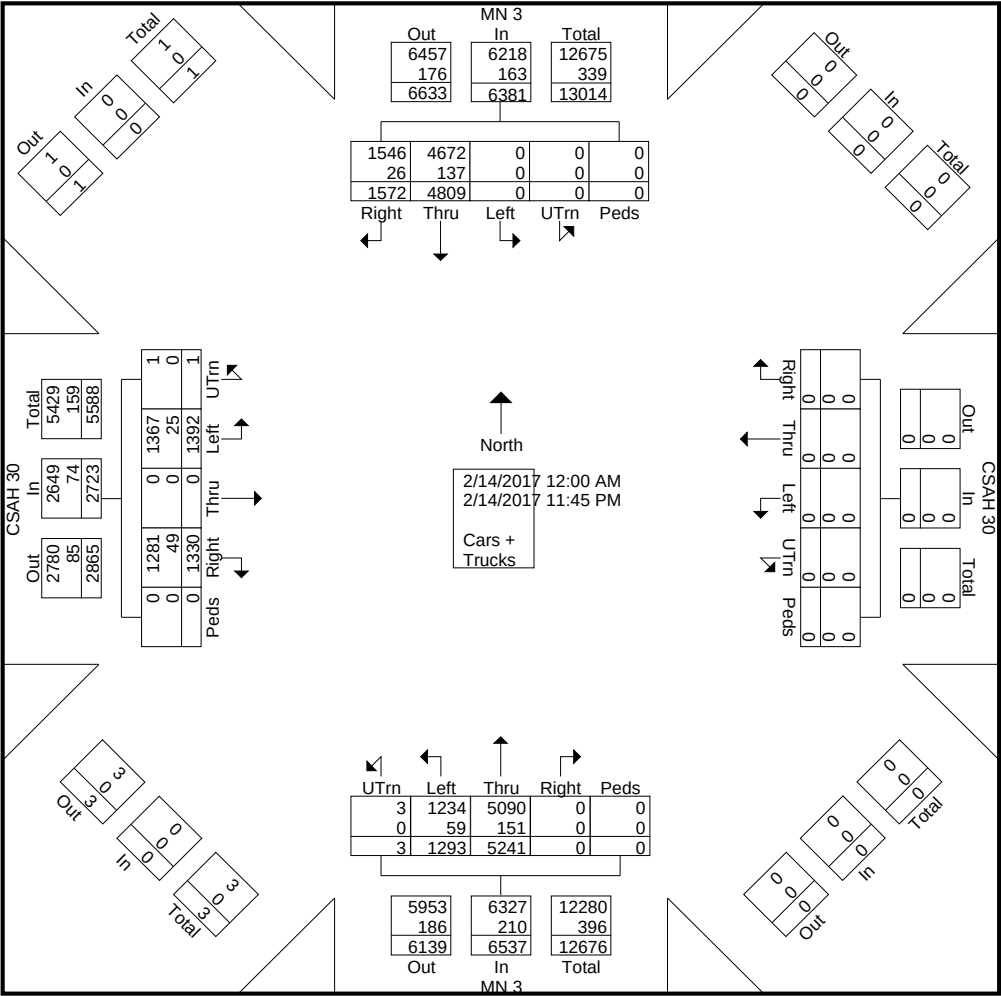
Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
10:45 PM	0	0	10	2	0	12	0	0	0	0	0	0	0	1	11	0	0	12	0	1	0	1	0	2	26
Total	0	0	125	33	0	158	0	0	0	0	0	0	0	21	75	0	0	96	0	19	0	19	0	38	292
11:00 PM	0	0	9	1	0	10	0	0	0	0	0	0	1	2	6	0	0	9	1	2	0	9	0	12	31
11:15 PM	0	0	12	2	0	14	0	0	0	0	0	0	0	2	6	0	0	8	0	7	0	3	0	10	32
11:30 PM	0	0	7	4	0	11	0	0	0	0	0	0	0	0	3	0	0	3	0	2	0	1	0	3	17
11:45 PM	0	0	7	2	0	9	0	0	0	0	0	0	0	1	6	0	0	7	0	1	0	0	0	1	17
Total	0	0	35	9	0	44	0	0	0	0	0	0	1	5	21	0	0	27	1	12	0	13	0	26	97
Grand Total	0	0	4809	1572	0	6381	0	0	0	0	0	0	3	1293	5241	0	0	6537	1	1392	0	1330	0	2723	15641
Apprch %	0	0	75.4	24.6	0		0	0	0	0	0		0	19.8	80.2	0	0		0	51.1	0	48.8	0		
Total %	0	0	30.7	10.1	0	40.8	0	0	0	0	0	0	0	8.3	33.5	0	0	41.8	0	8.9	0	8.5	0	17.4	
Cars +	0	0	4672	1546	0	6218	0	0	0	0	0	0	3	1234	5090	0	0	6327	1	1367	0	1281	0	2649	15194
% Cars +	0	0	97.2	98.3	0	97.4	0	0	0	0	0	0	100	95.4	97.1	0	0	96.8	100	98.2	0	96.3	0	97.3	97.1
Trucks	0	0	137	26	0	163	0	0	0	0	0	0	0	59	151	0	0	210	0	25	0	49	0	74	447
% Trucks	0	0	2.8	1.7	0	2.6	0	0	0	0	0	0	0	4.6	2.9	0	0	3.2	0	1.8	0	3.7	0	2.7	2.9

Appendix C - Traffic Counts



MN 3 & CSAH 30
Inver Grove Heights, MN

File Name : 1 - MN 3 & CSAH 30, 2-14-17
Site Code : 1
Start Date : 2/14/2017
Page No : 5



Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-14-17

Site Code : 1

Start Date : 2/14/2017

Page No : 6

MN 3 & CSAH 30
Inver Grove Heights, MN

	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound							
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:15 AM																										
07:15 AM	0	0	41	21	0	62	0	0	0	0	0	0	0	32	255	0	0	287	0	55	0	21	0	76	425	
07:30 AM	0	0	38	22	0	60	0	0	0	0	0	0	0	36	260	0	0	296	0	63	0	14	0	77	433	
07:45 AM	0	0	64	31	0	95	0	0	0	0	0	0	0	39	296	0	0	335	0	25	0	27	0	52	482	
08:00 AM	0	0	39	15	0	54	0	0	0	0	0	0	0	31	208	0	0	239	0	55	0	22	0	77	370	
Total Volume	0	0	182	89	0	271	0	0	0	0	0	0	0	138	1019	0	0	1157	0	198	0	84	0	282	1710	
% App. Total	0	0	67.2	32.8	0		0	0	0	0	0	0	0	11.9	88.1	0	0		0	70.2	0	29.8	0			
PHF	.000	.000	.711	.718	.000	.713	.000	.000	.000	.000	.000	.000	.000	.885	.861	.000	.000	.863	.000	.786	.000	.778	.000	.916	.887	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 12:00 PM																										
12:00 PM	0	0	65	22	0	87	0	0	0	0	0	0	1	11	46	0	0	58	0	13	0	14	0	27	172	
12:15 PM	0	0	36	23	0	59	0	0	0	0	0	0	0	13	61	0	0	74	0	17	0	19	0	36	169	
12:30 PM	0	0	50	17	0	67	0	0	0	0	0	0	0	10	58	0	0	68	0	18	0	20	0	38	173	
12:45 PM	0	0	47	21	0	68	0	0	0	0	0	0	0	11	56	0	0	67	0	19	0	9	0	28	163	
Total Volume	0	0	198	83	0	281	0	0	0	0	0	0	1	45	221	0	0	267	0	67	0	62	0	129	677	
% App. Total	0	0	70.5	29.5	0		0	0	0	0	0	0	0.4	16.9	82.8	0	0		0	51.9	0	48.1	0			
PHF	.000	.000	.762	.902	.000	.807	.000	.000	.000	.000	.000	.000	.250	.865	.906	.000	.000	.902	.000	.882	.000	.775	.000	.849	.978	
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:30 PM																										
04:30 PM	0	0	210	59	0	269	0	0	0	0	0	0	0	22	84	0	0	106	0	28	0	41	0	69	444	
04:45 PM	0	0	209	43	0	252	0	0	0	0	0	0	0	38	96	0	0	134	0	27	0	43	0	70	456	
05:00 PM	0	0	180	59	0	239	0	0	0	0	0	0	0	32	68	0	0	100	0	22	0	36	0	58	397	
05:15 PM	0	0	224	59	0	283	0	0	0	0	0	0	0	20	100	0	0	120	0	31	0	49	0	80	483	
Total Volume	0	0	823	220	0	1043	0	0	0	0	0	0	0	112	348	0	0	460	0	108	0	169	0	277	1780	
% App. Total	0	0	78.9	21.1	0		0	0	0	0	0	0	0	24.3	75.7	0	0		0	39	0	61	0			
PHF	.000	.000	.919	.932	.000	.921	.000	.000	.000	.000	.000	.000	.000	.737	.870	.000	.000	.858	.000	.871	.000	.862	.000	.866	.921	

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-15-17

Site Code : 1

Start Date : 2/15/2017

Page No : 1

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	7	1	0	8	0	0	0	0	0	0	0	0	3	0	0	3	0	1	0	0	0	1	12
12:15 AM	0	0	11	3	0	14	0	0	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	19
12:30 AM	0	0	7	2	0	9	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	11
12:45 AM	0	0	7	2	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Total	0	0	32	8	0	40	0	0	0	0	0	0	0	1	8	0	0	9	0	2	0	0	0	2	51
01:00 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1	5
01:15 AM	0	0	3	1	0	4	0	0	0	0	0	0	0	0	2	0	0	2	0	1	0	1	0	2	8
01:30 AM	0	0	2	3	0	5	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	2	0	2	10
01:45 AM	0	0	3	1	0	4	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	1	0	1	9
Total	0	0	11	5	0	16	0	0	0	0	0	0	0	1	9	0	0	10	0	2	0	4	0	6	32
02:00 AM	0	0	7	0	0	7	0	0	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	12
02:15 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	0	4	0	0	4	0	1	0	1	0	2	9
02:30 AM	0	0	4	2	0	6	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	8
02:45 AM	0	0	3	2	0	5	0	0	0	0	0	0	0	1	12	0	0	13	0	1	0	0	0	1	19
Total	0	0	17	4	0	21	0	0	0	0	0	0	0	2	22	0	0	24	0	2	0	1	0	3	48
03:00 AM	0	0	8	0	0	8	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	1	0	1	14
03:15 AM	0	0	1	1	0	2	0	0	0	0	0	0	0	2	16	0	0	18	0	1	0	1	0	2	22
03:30 AM	0	0	4	1	0	5	0	0	0	0	0	0	0	1	3	0	0	4	0	0	0	1	0	1	10
03:45 AM	0	0	4	2	0	6	0	0	0	0	0	0	0	1	6	0	0	7	0	0	0	1	0	1	14
Total	0	0	17	4	0	21	0	0	0	0	0	0	0	4	30	0	0	34	0	1	0	4	0	5	60
04:00 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	1	4	0	0	5	0	1	0	1	0	2	10
04:15 AM	0	0	6	0	0	6	0	0	0	0	0	0	0	2	13	0	0	15	0	1	0	1	0	2	23
04:30 AM	0	0	3	1	0	4	0	0	0	0	0	0	0	3	13	0	0	16	0	1	0	0	0	1	21
04:45 AM	0	0	4	3	0	7	0	0	0	0	0	0	0	1	23	0	0	24	0	1	0	1	0	2	33
Total	0	0	16	4	0	20	0	0	0	0	0	0	0	7	53	0	0	60	0	4	0	3	0	7	87
05:00 AM	0	0	3	3	0	6	0	0	0	0	0	0	0	2	21	0	0	23	0	2	0	0	0	2	31
05:15 AM	0	0	7	0	0	7	0	0	0	0	0	0	0	5	30	0	0	35	0	2	0	2	0	4	46
05:30 AM	0	0	5	2	0	7	0	0	0	0	0	0	0	7	41	0	0	48	0	5	0	4	0	9	64
05:45 AM	0	0	4	0	0	4	0	0	0	0	0	0	0	9	70	0	0	79	0	6	0	3	0	9	92
Total	0	0	19	5	0	24	0	0	0	0	0	0	0	23	162	0	0	185	0	15	0	9	0	24	233
06:00 AM	0	0	10	4	0	14	0	0	0	0	0	0	0	13	64	0	0	77	0	12	0	5	0	17	108
06:15 AM	0	0	20	6	0	26	0	0	0	0	0	0	0	11	99	0	0	110	0	10	0	3	0	13	149
06:30 AM	0	0	26	10	0	36	0	0	0	0	0	0	0	19	141	0	0	160	0	27	0	8	0	35	231
06:45 AM	0	0	25	24	0	49	0	0	0	0	0	0	0	45	215	0	0	260	0	31	0	12	0	43	352
Total	0	0	81	44	0	125	0	0	0	0	0	0	0	88	519	0	0	607	0	80	0	28	0	108	840
07:00 AM	0	0	43	42	0	85	0	0	0	0	0	0	0	45	198	0	0	243	0	39	0	10	0	49	377
07:15 AM	0	0	34	24	0	58	0	0	0	0	0	0	0	31	247	0	0	278	0	49	0	20	0	69	405
07:30 AM	0	0	41	17	0	58	0	0	0	0	0	0	0	32	276	0	0	308	0	58	0	28	0	86	452

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-15-17

Site Code : 1

Start Date : 2/15/2017

Page No : 2

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
07:45 AM	0	0	68	21	0	89	0	0	0	0	0	0	0	36	304	0	0	340	0	67	0	28	0	95	524
Total	0	0	186	104	0	290	0	0	0	0	0	0	0	144	1025	0	0	1169	0	213	0	86	0	299	1758
08:00 AM	0	0	42	19	0	61	0	0	0	0	0	0	0	31	205	0	0	236	0	40	0	21	0	61	358
08:15 AM	0	0	28	28	0	56	0	0	0	0	0	0	0	23	172	0	0	195	0	31	0	9	0	40	291
08:30 AM	0	0	46	9	0	55	0	0	0	0	0	0	0	14	120	0	0	134	0	38	0	8	0	46	235
08:45 AM	0	0	51	22	0	73	0	0	0	0	0	0	0	24	133	0	0	157	0	17	0	15	0	32	262
Total	0	0	167	78	0	245	0	0	0	0	0	0	0	92	630	0	0	722	0	126	0	53	0	179	1146
09:00 AM	0	0	49	25	0	74	0	0	0	0	0	0	0	16	98	0	0	114	0	17	0	12	0	29	217
09:15 AM	0	0	41	15	0	56	0	0	0	0	0	0	0	27	105	0	0	132	0	26	0	15	0	41	229
09:30 AM	0	0	31	16	0	47	0	0	0	0	0	0	0	23	90	0	0	113	0	20	0	12	0	32	192
09:45 AM	0	0	36	16	0	52	0	0	0	0	0	0	0	13	90	0	0	103	0	16	0	11	0	27	182
Total	0	0	157	72	0	229	0	0	0	0	0	0	0	79	383	0	0	462	0	79	0	50	0	129	820
10:00 AM	0	0	30	12	0	42	0	0	0	0	0	0	0	11	62	0	0	73	0	10	0	12	0	22	137
10:15 AM	0	0	33	14	0	47	0	0	0	0	0	0	0	13	55	0	0	68	0	9	0	13	0	22	137
10:30 AM	0	0	45	7	0	52	0	0	0	0	0	0	0	4	46	0	0	50	0	10	0	14	0	24	126
10:45 AM	0	0	41	15	0	56	0	0	0	0	0	0	0	13	53	0	0	66	0	7	0	10	0	17	139
Total	0	0	149	48	0	197	0	0	0	0	0	0	0	41	216	0	0	257	0	36	0	49	0	85	539
11:00 AM	0	0	34	23	0	57	0	0	0	0	0	0	0	8	37	0	0	45	0	17	0	11	0	28	130
11:15 AM	0	0	55	13	0	68	0	0	0	0	0	0	0	21	51	0	0	72	0	9	0	9	0	18	158
11:30 AM	0	0	43	15	0	58	0	0	0	0	0	0	0	8	42	0	0	50	0	12	0	9	0	21	129
11:45 AM	0	0	52	15	0	67	0	0	0	0	0	0	0	21	48	0	0	69	0	19	0	19	0	38	174
Total	0	0	184	66	0	250	0	0	0	0	0	0	0	58	178	0	0	236	0	57	0	48	0	105	591
12:00 PM	0	0	50	16	0	66	0	0	0	0	0	0	0	15	39	0	0	54	0	14	0	11	0	25	145
12:15 PM	0	0	49	16	0	65	0	0	0	0	0	0	0	20	47	0	0	67	0	11	0	22	0	33	165
12:30 PM	0	0	57	22	0	79	0	0	0	0	0	0	0	8	33	0	0	41	0	16	0	22	0	38	158
12:45 PM	0	0	49	19	0	68	0	0	0	0	0	0	0	14	53	0	0	67	0	15	0	13	0	28	163
Total	0	0	205	73	0	278	0	0	0	0	0	0	0	57	172	0	0	229	0	56	0	68	0	124	631
01:00 PM	0	0	44	16	0	60	0	0	0	0	0	0	0	11	58	0	0	69	0	11	0	14	0	25	154
01:15 PM	0	0	46	18	0	64	0	0	0	0	0	0	0	16	39	0	0	55	0	16	0	15	0	31	150
01:30 PM	0	0	44	17	0	61	0	0	0	0	0	0	0	10	36	0	0	46	0	19	0	15	0	34	141
01:45 PM	0	0	60	11	0	71	0	0	0	0	0	0	0	16	48	0	0	64	0	9	0	7	0	16	151
Total	0	0	194	62	0	256	0	0	0	0	0	0	0	53	181	0	0	234	0	55	0	51	0	106	596
02:00 PM	0	0	66	20	0	86	0	0	0	0	0	0	0	21	41	0	0	62	0	11	0	21	0	32	180
02:15 PM	0	0	57	24	0	81	0	0	0	0	0	0	0	40	64	0	0	104	0	21	0	29	0	50	235
02:30 PM	0	0	71	23	0	94	0	0	0	0	0	0	0	30	54	0	0	84	0	21	0	28	0	49	227
02:45 PM	0	0	84	40	0	124	0	0	0	0	0	0	0	27	56	0	0	83	0	19	0	19	0	38	245
Total	0	0	278	107	0	385	0	0	0	0	0	0	0	118	215	0	0	333	0	72	0	97	0	169	887

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-15-17

Site Code : 1

Start Date : 2/15/2017

Page No : 3

MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	0	79	26	0	105	0	0	0	0	0	0	0	27	49	0	0	76	0	24	0	29	0	53	234
03:15 PM	0	0	89	31	0	120	0	0	0	0	0	0	0	16	60	0	0	76	0	33	0	41	0	74	270
03:30 PM	0	0	116	39	0	155	0	0	0	0	0	0	0	25	66	0	0	91	0	17	0	41	0	58	304
03:45 PM	0	0	151	43	0	194	0	0	0	0	0	0	0	32	50	0	0	82	0	31	0	42	0	73	349
Total	0	0	435	139	0	574	0	0	0	0	0	0	0	100	225	0	0	325	0	105	0	153	0	258	1157
04:00 PM	0	0	147	45	0	192	0	0	0	0	0	0	0	22	58	0	0	80	0	24	0	39	0	63	335
04:15 PM	0	0	200	38	0	238	0	0	0	0	0	0	0	24	71	0	0	95	0	30	0	44	0	74	407
04:30 PM	0	0	180	57	0	237	0	0	0	0	0	0	0	25	71	0	0	96	0	17	0	36	0	53	386
04:45 PM	0	0	203	60	0	263	0	0	0	0	0	0	0	36	72	0	0	108	0	38	0	44	0	82	453
Total	0	0	730	200	0	930	0	0	0	0	0	0	0	107	272	0	0	379	0	109	0	163	0	272	1581
05:00 PM	0	0	203	66	0	269	0	0	0	0	0	0	0	24	74	0	0	98	0	38	0	40	0	78	445
05:15 PM	0	0	203	49	0	252	0	0	0	0	0	0	0	23	90	0	0	113	0	30	0	49	0	79	444
05:30 PM	0	0	162	62	0	224	0	0	0	0	0	0	0	22	77	0	0	99	0	28	0	46	0	74	397
05:45 PM	0	0	160	54	0	214	0	0	0	0	0	0	0	22	68	0	0	90	0	25	0	39	0	64	368
Total	0	0	728	231	0	959	0	0	0	0	0	0	0	91	309	0	0	400	0	121	0	174	0	295	1654
06:00 PM	0	0	134	55	0	189	0	0	0	0	0	0	0	16	55	0	0	71	0	34	0	45	0	79	339
06:15 PM	0	0	128	38	0	166	0	0	0	0	0	0	0	32	81	0	0	113	0	36	0	31	0	67	346
06:30 PM	0	0	91	42	0	133	0	0	0	0	0	0	0	24	59	0	0	83	0	30	0	27	0	57	273
06:45 PM	0	0	75	37	0	112	0	0	0	0	0	0	0	27	68	0	0	95	0	25	0	45	0	70	277
Total	0	0	428	172	0	600	0	0	0	0	0	0	0	99	263	0	0	362	0	125	0	148	0	273	1235
07:00 PM	0	0	66	15	0	81	0	0	0	0	0	0	0	23	48	0	0	71	0	23	0	25	0	48	200
07:15 PM	0	0	69	17	0	86	0	0	0	0	0	0	0	27	50	0	0	77	0	18	0	31	0	49	212
07:30 PM	0	0	66	19	0	85	0	0	0	0	0	0	0	18	57	0	0	75	0	19	0	15	0	34	194
07:45 PM	0	0	48	21	0	69	0	0	0	0	0	0	0	14	40	0	0	54	0	14	0	17	0	31	154
Total	0	0	249	72	0	321	0	0	0	0	0	0	0	82	195	0	0	277	0	74	0	88	0	162	760
08:00 PM	0	0	53	21	0	74	0	0	0	0	0	0	0	13	33	0	0	46	0	17	0	16	0	33	153
08:15 PM	0	0	60	31	0	91	0	0	0	0	0	0	0	17	22	0	0	39	0	24	0	21	0	45	175
08:30 PM	0	0	49	11	0	60	0	0	0	0	0	0	0	13	29	0	0	42	0	18	0	28	0	46	148
08:45 PM	0	0	38	23	0	61	0	0	0	0	0	0	0	29	34	0	0	63	0	15	0	22	0	37	161
Total	0	0	200	86	0	286	0	0	0	0	0	0	0	72	118	0	0	190	0	74	0	87	0	161	637
09:00 PM	0	0	94	19	0	113	0	0	0	0	0	0	0	14	18	0	0	32	0	12	0	15	0	27	172
09:15 PM	0	0	74	16	0	90	0	0	0	0	0	0	0	7	21	0	0	28	0	6	0	7	0	13	131
09:30 PM	0	0	54	17	0	71	0	0	0	0	0	0	0	5	25	0	0	30	0	11	0	9	0	20	121
09:45 PM	0	0	38	11	0	49	0	0	0	0	0	0	0	6	17	0	0	23	0	4	0	3	0	7	79
Total	0	0	260	63	0	323	0	0	0	0	0	0	0	32	81	0	0	113	0	33	0	34	0	67	503
10:00 PM	0	0	24	17	0	41	0	0	0	0	0	0	0	5	18	0	0	23	0	2	0	10	0	12	76
10:15 PM	0	0	31	5	0	36	0	0	0	0	0	0	0	2	22	0	0	24	0	4	0	6	0	10	70
10:30 PM	0	0	19	5	0	24	0	0	0	0	0	0	0	5	16	0	0	21	0	0	0	2	0	2	47

Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-15-17

Site Code : 1

Start Date : 2/15/2017

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MN 3 & CSAH 30
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

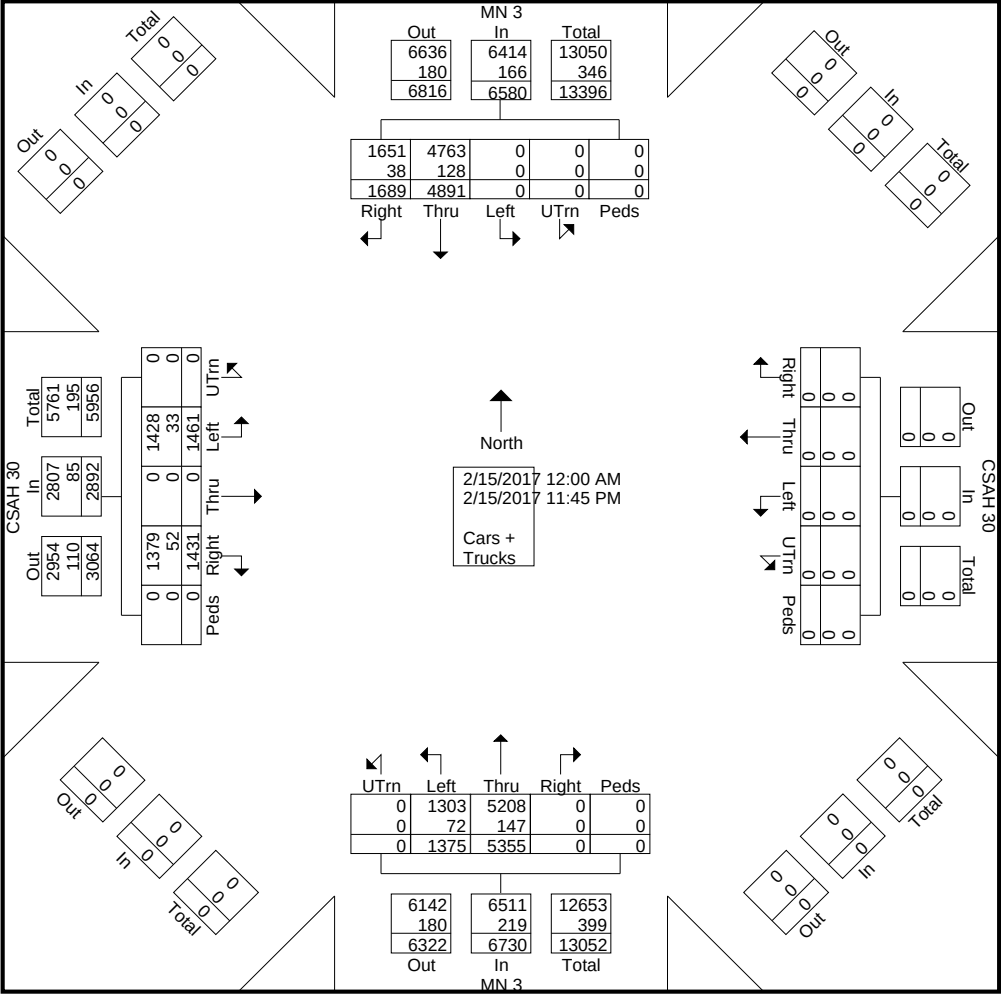
Start Time	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
10:45 PM	0	0	25	5	0	30	0	0	0	0	0	0	0	2	8	0	0	10	0	1	0	5	0	6	46
Total	0	0	99	32	0	131	0	0	0	0	0	0	0	14	64	0	0	78	0	7	0	23	0	30	239
11:00 PM	0	0	20	2	0	22	0	0	0	0	0	0	0	3	6	0	0	9	0	5	0	3	0	8	39
11:15 PM	0	0	12	2	0	14	0	0	0	0	0	0	0	3	13	0	0	16	0	8	0	2	0	10	40
11:30 PM	0	0	12	4	0	16	0	0	0	0	0	0	0	4	2	0	0	6	0	0	0	3	0	3	25
11:45 PM	0	0	5	2	0	7	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	2	0	2	13
Total	0	0	49	10	0	59	0	0	0	0	0	0	0	10	25	0	0	35	0	13	0	10	0	23	117
Grand Total	0	0	4891	1689	0	6580	0	0	0	0	0	0	0	1375	5355	0	0	6730	0	1461	0	1431	0	2892	16202
Apprch %	0	0	74.3	25.7	0		0	0	0	0	0		0	20.4	79.6	0	0		0	50.5	0	49.5	0		
Total %	0	0	30.2	10.4	0	40.6	0	0	0	0	0	0	0	8.5	33.1	0	0	41.5	0	9	0	8.8	0	17.8	
Cars +	0	0	4763	1651	0	6414	0	0	0	0	0	0	0	1303	5208	0	0	6511	0	1428	0	1379	0	2807	15732
% Cars +	0	0	97.4	97.8	0	97.5	0	0	0	0	0	0	0	94.8	97.3	0	0	96.7	0	97.7	0	96.4	0	97.1	97.1
Trucks	0	0	128	38	0	166	0	0	0	0	0	0	0	72	147	0	0	219	0	33	0	52	0	85	470
% Trucks	0	0	2.6	2.2	0	2.5	0	0	0	0	0	0	0	5.2	2.7	0	0	3.3	0	2.3	0	3.6	0	2.9	2.9

Appendix C - Traffic Counts



MN 3 & CSAH 30
Inver Grove Heights, MN

File Name : 1 - MN 3 & CSAH 30, 2-15-17
Site Code : 1
Start Date : 2/15/2017
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Appendix C - Traffic Counts



File Name : 1 - MN 3 & CSAH 30, 2-15-17

Site Code : 1

Start Date : 2/15/2017

Page No : 6

MN 3 & CSAH 30
Inver Grove Heights, MN

	MN 3 Southbound						CSAH 30 Westbound						MN 3 Northbound						CSAH 30 Eastbound							
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:00 AM																										
07:00 AM	0	0	43	42	0	85	0	0	0	0	0	0	0	45	198	0	0	243	0	39	0	10	0	49	377	
07:15 AM	0	0	34	24	0	58	0	0	0	0	0	0	0	31	247	0	0	278	0	49	0	20	0	69	405	
07:30 AM	0	0	41	17	0	58	0	0	0	0	0	0	0	32	276	0	0	308	0	58	0	28	0	86	452	
07:45 AM	0	0	68	21	0	89	0	0	0	0	0	0	0	36	304	0	0	340	0	67	0	28	0	95	524	
Total Volume	0	0	186	104	0	290	0	0	0	0	0	0	0	144	1025	0	0	1169	0	213	0	86	0	299	1758	
% App. Total	0	0	64.1	35.9	0		0	0	0	0	0	0	0	12.3	87.7	0	0		0	71.2	0	28.8	0			
PHF	.000	.000	.684	.619	.000	.815	.000	.000	.000	.000	.000	.000	.000	.800	.843	.000	.000	.860	.000	.795	.000	.768	.000	.787	.839	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 11:45 AM																										
11:45 AM	0	0	52	15	0	67	0	0	0	0	0	0	0	21	48	0	0	69	0	19	0	19	0	38	174	
12:00 PM	0	0	50	16	0	66	0	0	0	0	0	0	0	15	39	0	0	54	0	14	0	11	0	25	145	
12:15 PM	0	0	49	16	0	65	0	0	0	0	0	0	0	20	47	0	0	67	0	11	0	22	0	33	165	
12:30 PM	0	0	57	22	0	79	0	0	0	0	0	0	0	8	33	0	0	41	0	16	0	22	0	38	158	
Total Volume	0	0	208	69	0	277	0	0	0	0	0	0	0	64	167	0	0	231	0	60	0	74	0	134	642	
% App. Total	0	0	75.1	24.9	0		0	0	0	0	0	0	0	27.7	72.3	0	0		0	44.8	0	55.2	0			
PHF	.000	.000	.912	.784	.000	.877	.000	.000	.000	.000	.000	.000	.000	.762	.870	.000	.000	.837	.000	.789	.000	.841	.000	.882	.922	
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	0	0	203	60	0	263	0	0	0	0	0	0	0	36	72	0	0	108	0	38	0	44	0	82	453	
05:00 PM	0	0	203	66	0	269	0	0	0	0	0	0	0	24	74	0	0	98	0	38	0	40	0	78	445	
05:15 PM	0	0	203	49	0	252	0	0	0	0	0	0	0	23	90	0	0	113	0	30	0	49	0	79	444	
05:30 PM	0	0	162	62	0	224	0	0	0	0	0	0	0	22	77	0	0	99	0	28	0	46	0	74	397	
Total Volume	0	0	771	237	0	1008	0	0	0	0	0	0	0	105	313	0	0	418	0	134	0	179	0	313	1739	
% App. Total	0	0	76.5	23.5	0		0	0	0	0	0	0	0	25.1	74.9	0	0		0	42.8	0	57.2	0			
PHF	.000	.000	.950	.898	.000	.937	.000	.000	.000	.000	.000	.000	.000	.729	.869	.000	.000	.925	.000	.882	.000	.913	.000	.954	.960	

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17

Site Code : 2

Start Date : 2/14/2017

Page No : 1

MN 3 & MN 149

Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	0	11	0	11	0	0	4	0	0	4	0	0	0	0	0	0	0	2	2	0	0	4	19
12:15 AM	0	0	0	7	0	7	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	10
12:30 AM	0	0	0	14	0	14	0	0	2	0	0	2	0	0	0	0	0	0	0	2	1	0	0	3	19
12:45 AM	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3	6
Total	0	0	0	35	0	35	0	0	7	0	0	7	0	0	0	0	0	0	0	8	4	0	0	12	54
01:00 AM	0	0	0	2	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	2	1	0	0	3	6
01:15 AM	0	1	0	7	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
01:30 AM	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	4	7
01:45 AM	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	5
Total	0	1	0	14	0	15	0	0	1	0	0	1	0	0	0	0	0	0	0	5	5	0	0	10	26
02:00 AM	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	7
02:15 AM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	4
02:30 AM	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7	2	0	0	9	11
02:45 AM	0	0	0	3	0	3	0	0	2	0	0	2	0	0	0	0	0	0	0	8	0	0	0	8	13
Total	0	0	0	8	0	8	0	0	2	0	0	2	0	0	0	0	0	0	0	22	3	0	0	25	35
03:00 AM	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	9
03:15 AM	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2	0	0	10	13
03:30 AM	0	0	0	3	0	3	0	0	1	0	0	1	0	0	0	0	0	0	0	4	0	0	0	4	8
03:45 AM	0	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	12
Total	0	0	0	18	0	18	0	0	1	0	0	1	0	0	0	0	0	0	0	21	2	0	0	23	42
04:00 AM	0	0	0	4	0	4	0	0	1	1	0	2	0	0	0	0	0	0	0	3	0	0	0	3	9
04:15 AM	0	0	0	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	11	19
04:30 AM	0	0	0	5	0	5	0	0	2	0	0	2	0	0	0	0	0	0	0	13	2	0	0	15	22
04:45 AM	0	0	0	4	0	4	0	0	3	0	0	3	0	0	0	0	0	0	0	17	9	0	0	26	33
Total	0	0	0	21	0	21	0	0	6	1	0	7	0	0	0	0	0	0	0	43	12	0	0	55	83
05:00 AM	0	0	0	4	0	4	0	0	1	1	0	2	0	0	0	0	0	0	0	26	6	0	0	32	38
05:15 AM	0	0	0	8	0	8	0	0	8	0	0	8	0	0	0	0	0	0	1	28	4	0	0	33	49
05:30 AM	0	0	0	5	0	5	0	0	3	0	0	3	0	0	0	0	0	0	0	48	12	0	0	60	68
05:45 AM	0	0	0	6	0	6	0	0	7	0	0	7	0	0	0	0	0	0	0	40	18	0	0	58	71
Total	0	0	0	23	0	23	0	0	19	1	0	20	0	0	0	0	0	0	1	142	40	0	0	183	226
06:00 AM	0	0	0	12	0	12	0	0	7	0	0	7	0	0	0	0	0	0	0	66	25	0	0	91	110
06:15 AM	0	0	0	17	0	17	0	0	18	1	0	19	0	0	0	0	0	0	0	89	28	0	0	117	153
06:30 AM	0	0	0	26	0	26	0	0	36	1	0	37	0	0	0	0	0	0	0	114	57	0	0	171	234
06:45 AM	0	0	0	22	0	22	0	0	36	2	0	38	0	0	0	0	0	0	0	165	72	0	0	237	297
Total	0	0	0	77	0	77	0	0	97	4	0	101	0	0	0	0	0	0	0	434	182	0	0	616	794
07:00 AM	0	0	0	22	0	22	0	0	48	0	0	48	0	0	0	0	0	0	0	157	92	0	0	249	319
07:15 AM	0	0	0	28	0	28	0	0	31	1	0	32	0	0	0	0	0	0	0	196	110	0	0	306	366
07:30 AM	0	0	0	24	0	24	0	0	46	0	0	46	0	0	0	0	0	0	0	225	114	0	0	339	409

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17

Site Code : 2

Start Date : 2/14/2017

Page No : 2

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
07:45 AM	0	0	0	32	0	32	0	0	50	1	0	51	0	0	0	0	0	0	0	210	129	0	0	339	422
Total	0	0	0	106	0	106	0	0	175	2	0	177	0	0	0	0	0	0	0	788	445	0	0	1233	1516
08:00 AM	0	0	0	28	0	28	0	0	26	2	0	28	0	0	0	0	0	0	0	164	90	0	0	254	310
08:15 AM	0	2	0	15	0	17	0	0	30	2	0	32	0	0	0	0	0	0	0	133	59	0	0	192	241
08:30 AM	0	3	0	27	0	30	0	0	22	0	0	22	0	0	0	0	0	0	0	95	62	0	0	157	209
08:45 AM	0	0	0	45	0	45	0	0	33	1	0	34	0	0	0	0	0	0	1	84	51	0	0	136	215
Total	0	5	0	115	0	120	0	0	111	5	0	116	0	0	0	0	0	0	1	476	262	0	0	739	975
09:00 AM	0	0	0	48	0	48	0	0	36	3	0	39	0	0	0	0	0	0	0	68	49	0	0	117	204
09:15 AM	0	1	0	28	0	29	0	0	40	1	0	41	0	0	0	0	0	0	0	82	52	0	0	134	204
09:30 AM	0	2	0	22	0	24	0	0	27	1	0	28	0	0	0	0	0	0	0	54	45	0	0	99	151
09:45 AM	0	1	0	14	0	15	0	0	23	1	0	24	0	0	0	0	0	0	0	36	40	0	0	76	115
Total	0	4	0	112	0	116	0	0	126	6	0	132	0	0	0	0	0	0	0	240	186	0	0	426	674
10:00 AM	0	1	0	26	0	27	0	0	25	1	0	26	0	0	0	0	0	0	0	38	32	0	0	70	123
10:15 AM	0	1	0	13	0	14	0	0	18	0	0	18	0	0	0	0	0	0	0	41	20	0	0	61	93
10:30 AM	0	1	0	26	0	27	0	0	23	3	0	26	0	0	0	0	0	0	0	38	34	0	0	72	125
10:45 AM	1	1	0	26	0	28	0	0	25	2	0	27	0	0	0	0	0	0	0	32	25	0	0	57	112
Total	1	4	0	91	0	96	0	0	91	6	0	97	0	0	0	0	0	0	0	149	111	0	0	260	453
11:00 AM	0	1	0	25	0	26	0	0	34	0	0	34	0	0	0	0	0	0	0	44	27	0	0	71	131
11:15 AM	0	2	0	37	0	39	0	0	20	3	0	23	0	0	0	0	0	0	0	33	27	0	0	60	122
11:30 AM	0	0	0	29	0	29	0	0	21	5	0	26	0	0	0	0	0	0	0	31	34	0	0	65	120
11:45 AM	0	1	0	31	0	32	0	0	33	3	0	36	0	0	0	0	0	0	0	31	29	0	0	60	128
Total	0	4	0	122	0	126	0	0	108	11	0	119	0	0	0	0	0	0	0	139	117	0	0	256	501
12:00 PM	0	2	0	49	0	51	0	0	40	2	0	42	0	0	0	0	0	0	0	25	25	0	0	50	143
12:15 PM	0	1	0	33	0	34	0	0	29	2	0	31	0	0	0	0	0	0	0	41	41	0	0	82	147
12:30 PM	1	2	0	24	0	27	0	0	40	1	0	41	0	0	0	0	0	0	1	29	45	0	0	75	143
12:45 PM	0	1	0	31	0	32	0	0	35	0	0	35	0	0	0	0	0	0	0	53	34	0	0	87	154
Total	1	6	0	137	0	144	0	0	144	5	0	149	0	0	0	0	0	0	1	148	145	0	0	294	587
01:00 PM	0	0	0	29	0	29	0	0	34	0	0	34	0	0	0	0	0	0	0	37	32	0	0	69	132
01:15 PM	1	2	0	36	0	39	0	0	38	0	0	38	0	0	0	0	0	0	0	23	26	0	0	49	126
01:30 PM	0	5	0	34	0	39	0	0	33	1	0	34	0	0	0	0	0	0	0	29	28	0	0	57	130
01:45 PM	0	2	0	39	0	41	0	0	34	2	0	36	0	0	0	0	1	1	0	34	32	0	0	66	144
Total	1	9	0	138	0	148	0	0	139	3	0	142	0	0	0	0	1	1	0	123	118	0	0	241	532
02:00 PM	0	3	0	42	0	45	0	0	55	0	0	55	0	0	0	0	0	0	0	39	26	0	0	65	165
02:15 PM	0	2	0	43	0	45	0	0	33	3	0	36	0	0	0	0	0	0	0	43	46	0	0	89	170
02:30 PM	0	0	0	66	0	66	0	0	46	0	0	46	0	0	0	0	0	0	0	26	28	0	0	54	166
02:45 PM	0	4	0	67	0	71	0	0	33	2	0	35	0	0	0	0	0	0	0	33	34	0	0	67	173
Total	0	9	0	218	0	227	0	0	167	5	0	172	0	0	0	0	0	0	0	141	134	0	0	275	674

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17

Site Code : 2

Start Date : 2/14/2017

Page No : 3

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	1	0	64	0	65	0	0	57	1	0	58	0	0	0	0	0	0	0	44	57	0	0	101	224
03:15 PM	0	1	0	82	0	83	0	0	68	1	0	69	0	0	0	0	0	0	0	38	33	0	0	71	223
03:30 PM	0	4	0	91	0	95	0	0	72	1	0	73	0	0	0	0	0	0	0	40	56	0	0	96	264
03:45 PM	0	1	0	119	0	120	0	0	65	4	0	69	0	0	0	0	0	0	0	43	54	0	0	97	286
Total	0	7	0	356	0	363	0	0	262	7	0	269	0	0	0	0	0	0	0	165	200	0	0	365	997
04:00 PM	1	4	0	121	0	126	0	0	85	3	0	88	0	0	0	0	0	0	1	26	58	0	0	85	299
04:15 PM	0	3	0	169	0	172	0	0	109	1	0	110	0	0	0	0	0	0	0	46	46	0	0	92	374
04:30 PM	0	3	0	144	0	147	0	0	120	1	0	121	0	0	0	0	0	0	0	43	73	0	0	116	384
04:45 PM	0	3	0	139	0	142	0	0	110	0	0	110	0	0	0	0	0	0	0	60	63	0	0	123	375
Total	1	13	0	573	0	587	0	0	424	5	0	429	0	0	0	0	0	0	1	175	240	0	0	416	1432
05:00 PM	0	2	0	149	0	151	0	0	101	2	0	103	0	0	0	0	0	0	0	53	41	0	0	94	348
05:15 PM	0	0	0	156	0	156	0	0	135	2	0	137	0	0	0	0	0	0	0	75	58	0	0	133	426
05:30 PM	0	3	0	129	0	132	0	0	120	3	0	123	0	0	0	0	0	0	0	38	74	0	0	112	367
05:45 PM	0	2	0	98	0	100	0	0	84	5	0	89	0	0	0	0	0	0	0	39	63	0	0	102	291
Total	0	7	0	532	0	539	0	0	440	12	0	452	0	0	0	0	0	0	0	205	236	0	0	441	1432
06:00 PM	0	2	0	88	0	90	0	0	80	3	0	83	0	0	0	0	0	0	1	34	44	0	0	79	252
06:15 PM	0	2	0	77	0	79	0	0	53	1	0	54	0	0	0	0	0	0	0	42	39	0	0	81	214
06:30 PM	0	1	0	68	0	69	0	0	40	1	0	41	0	0	0	0	0	0	0	39	23	0	0	62	172
06:45 PM	0	0	0	58	0	58	0	0	53	1	0	54	0	0	0	0	0	0	1	36	17	0	0	54	166
Total	0	5	0	291	0	296	0	0	226	6	0	232	0	0	0	0	0	0	2	151	123	0	0	276	804
07:00 PM	0	1	0	39	0	40	0	0	34	2	0	36	0	0	0	0	0	0	0	19	28	0	0	47	123
07:15 PM	0	0	0	48	0	48	0	0	29	2	0	31	0	0	0	0	0	0	0	18	25	0	0	43	122
07:30 PM	0	2	0	33	0	35	0	0	20	1	0	21	0	0	0	0	0	0	0	22	29	0	0	51	107
07:45 PM	0	1	0	39	0	40	0	0	42	1	0	43	0	0	0	0	0	0	0	20	19	0	0	39	122
Total	0	4	0	159	0	163	0	0	125	6	0	131	0	0	0	0	0	0	0	79	101	0	0	180	474
08:00 PM	0	1	0	34	0	35	0	0	36	0	0	36	0	0	0	0	0	0	0	8	24	0	0	32	103
08:15 PM	0	1	0	31	0	32	0	0	22	0	0	22	0	0	0	0	0	0	0	18	14	0	0	32	86
08:30 PM	0	0	0	27	0	27	0	0	17	0	0	17	0	0	0	0	0	0	0	25	25	0	0	50	94
08:45 PM	0	0	0	16	0	16	0	0	21	1	0	22	0	0	0	0	0	0	0	29	28	0	0	57	95
Total	0	2	0	108	0	110	0	0	96	1	0	97	0	0	0	0	0	0	0	80	91	0	0	171	378
09:00 PM	0	0	0	34	0	34	0	0	19	0	0	19	0	0	0	0	0	0	0	18	25	0	0	43	96
09:15 PM	0	0	0	40	0	40	0	0	18	0	0	18	0	0	0	0	0	0	0	19	12	0	0	31	89
09:30 PM	0	0	0	30	0	30	0	0	16	1	0	17	0	0	0	0	0	0	0	22	11	0	0	33	80
09:45 PM	0	0	0	20	0	20	0	0	26	2	0	28	0	0	0	0	0	0	0	15	13	0	0	28	76
Total	0	0	0	124	0	124	0	0	79	3	0	82	0	0	0	0	0	0	0	74	61	0	0	135	341
10:00 PM	0	0	0	36	0	36	0	0	25	0	0	25	0	0	0	0	0	0	0	22	11	0	0	33	94
10:15 PM	0	2	0	19	0	21	0	0	21	0	0	21	0	0	0	0	0	0	2	18	14	0	0	34	76
10:30 PM	0	0	0	19	0	19	0	0	14	1	0	15	0	0	0	0	0	0	0	12	3	0	0	15	49

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17

Site Code : 2

Start Date : 2/14/2017

Page No : 4

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

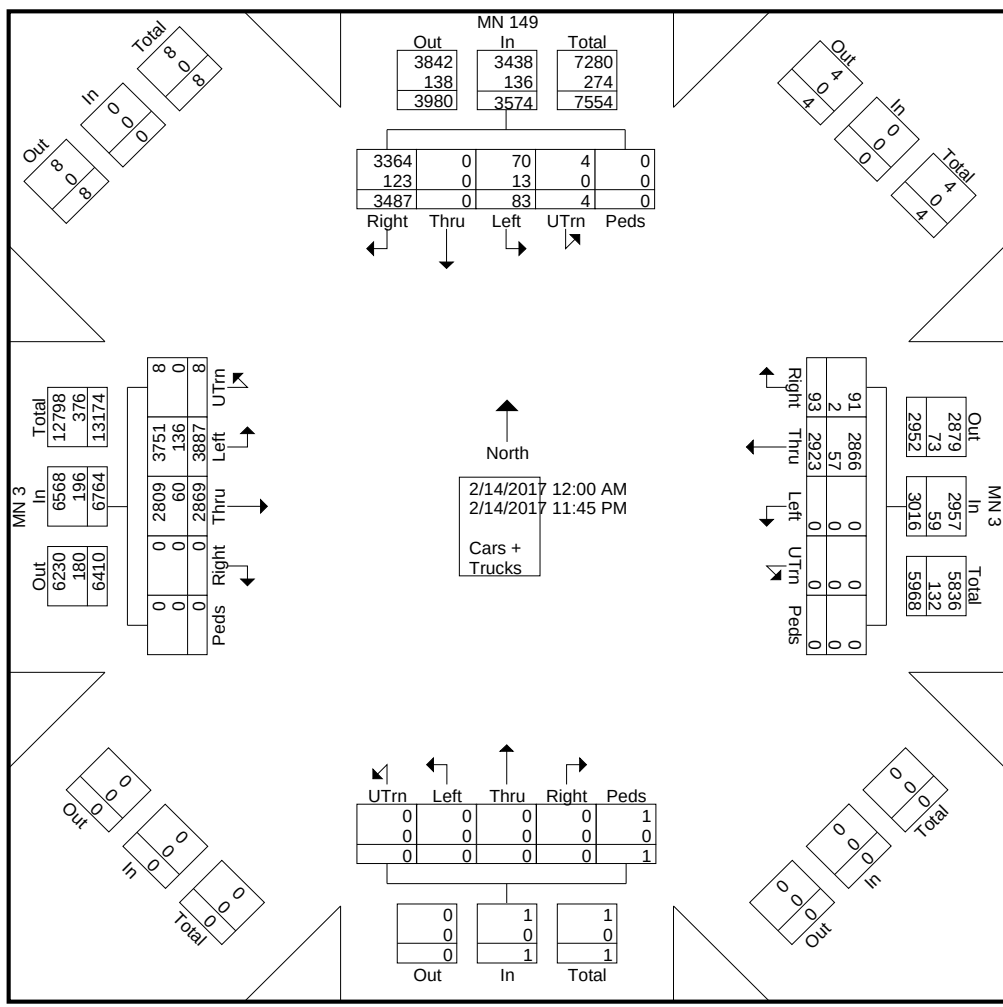
Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
10:45 PM	0	0	0	9	0	9	0	0	3	1	0	4	0	0	0	0	0	0	0	8	9	0	0	17	30
Total	0	2	0	83	0	85	0	0	63	2	0	65	0	0	0	0	0	0	2	60	37	0	0	99	249
11:00 PM	0	1	0	6	0	7	0	0	1	2	0	3	0	0	0	0	0	0	0	3	2	0	0	5	15
11:15 PM	0	0	0	11	0	11	0	0	4	0	0	4	0	0	0	0	0	0	0	6	7	0	0	13	28
11:30 PM	0	0	0	6	0	6	0	0	6	0	0	6	0	0	0	0	0	0	0	6	3	0	0	9	21
11:45 PM	0	0	0	3	0	3	0	0	3	0	0	3	0	0	0	0	0	0	0	4	2	0	0	6	12
Total	0	1	0	26	0	27	0	0	14	2	0	16	0	0	0	0	0	0	0	19	14	0	0	33	76
Grand Total	4	83	0	3487	0	3574	0	0	2923	93	0	3016	0	0	0	0	1	1	8	3887	2869	0	0	6764	13355
Apprch %	0.1	2.3	0	97.6	0		0	0	96.9	3.1	0		0	0	0	0	100		0.1	57.5	42.4	0	0		
Total %	0	0.6	0	26.1	0	26.8	0	0	21.9	0.7	0	22.6	0	0	0	0	0	0	0.1	29.1	21.5	0	0	50.6	
Cars +	4	70	0	3364	0	3438	0	0	2866	91	0	2957	0	0	0	0	1	1	8	3751	2809	0	0	6568	12964
% Cars +	100	84.3	0	96.5	0	96.2	0	0	98	97.8	0	98	0	0	0	0	100	100	100	96.5	97.9	0	0	97.1	97.1
Trucks	0	13	0	123	0	136	0	0	57	2	0	59	0	0	0	0	0	0	0	136	60	0	0	196	391
% Trucks	0	15.7	0	3.5	0	3.8	0	0	2	2.2	0	2	0	0	0	0	0	0	0	3.5	2.1	0	0	2.9	2.9

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17
Site Code : 2
Start Date : 2/14/2017
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MN 3 & MN 149
Inver Grove Heights, MN



Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-14-17

Site Code : 2

Start Date : 2/14/2017

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MN 3 & MN 149

Inver Grove Heights, MN

	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound							
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 12:00 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	22	0	22	0	0	48	0	0	48	0	0	0	0	0	0	0	0	157	92	0	0	249	319
07:15 AM	0	0	0	28	0	28	0	0	31	1	0	32	0	0	0	0	0	0	0	0	196	110	0	0	306	366
07:30 AM	0	0	0	24	0	24	0	0	46	0	0	46	0	0	0	0	0	0	0	0	225	114	0	0	339	409
07:45 AM	0	0	0	32	0	32	0	0	50	1	0	51	0	0	0	0	0	0	0	0	210	129	0	0	339	422
Total Volume	0	0	0	106	0	106	0	0	175	2	0	177	0	0	0	0	0	0	0	0	788	445	0	0	1233	1516
% App. Total	0	0	0	100	0		0	0	98.9	1.1	0		0	0	0	0	0	0	0	0	63.9	36.1	0	0		
PHF	.000	.000	.000	.828	.000	.828	.000	.000	.875	.500	.000	.868	.000	.000	.000	.000	.000	.000	.000	.000	.876	.862	.000	.000	.909	.898

Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 12:00 PM

12:00 PM	0	2	0	49	0	51	0	0	40	2	0	42	0	0	0	0	0	0	0	0	25	25	0	0	50		143
12:15 PM	0	1	0	33	0	34	0	0	29	2	0	31	0	0	0	0	0	0	0	0	41	41	0	0	82		147
12:30 PM	1	2	0	24	0	27	0	0	40	1	0	41	0	0	0	0	0	0	0	1	29	45	0	0	75		143
12:45 PM	0	1	0	31	0	32	0	0	35	0	0	35	0	0	0	0	0	0	0	0	53	34	0	0	87		154
Total Volume	1	6	0	137	0	144	0	0	144	5	0	149	0	0	0	0	0	0	0	1	148	145	0	0	294		587
% App. Total	0.7	4.2	0	95.1	0		0	0	96.6	3.4	0		0	0	0	0	0	0	0	0.3	50.3	49.3	0	0			
PHF	.250	.750	.000	.699	.000	.706	.000	.000	.900	.625	.000	.887	.000	.000	.000	.000	.000	.000	.000	.250	.698	.806	.000	.000	.845		.953

Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM

04:30 PM	0	3	0	144	0	147	0	0	120	1	0	121	0	0	0	0	0	0	0	0	43	73	0	0	116		384
04:45 PM	0	3	0	139	0	142	0	0	110	0	0	110	0	0	0	0	0	0	0	0	60	63	0	0	123		375
05:00 PM	0	2	0	149	0	151	0	0	101	2	0	103	0	0	0	0	0	0	0	0	53	41	0	0	94		348
05:15 PM	0	0	0	156	0	156	0	0	135	2	0	137	0	0	0	0	0	0	0	0	75	58	0	0	133		426
Total Volume	0	8	0	588	0	596	0	0	466	5	0	471	0	0	0	0	0	0	0	0	231	235	0	0	466		1533
% App. Total	0	1.3	0	98.7	0		0	0	98.9	1.1	0		0	0	0	0	0	0	0	0	49.6	50.4	0	0			
PHF	.000	.667	.000	.942	.000	.955	.000	.000	.863	.625	.000	.859	.000	.000	.000	.000	.000	.000	.000	.000	.770	.805	.000	.000	.876		.900

Appendix C - Traffic Counts

File Name : 2 - MN 3 & MN 149, 2-15-17

Site Code : 2

Start Date : 2/15/2017

Page No : 1

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	0	6	0	6	0	0	2	0	0	2	0	0	0	0	0	0	0	2	2	0	0	4	12
12:15 AM	0	0	0	10	0	10	0	0	5	0	0	5	0	0	0	0	0	0	0	3	1	0	0	4	19
12:30 AM	0	0	0	7	0	7	0	0	5	0	0	5	0	0	0	0	0	0	0	3	2	0	0	5	17
12:45 AM	0	0	0	2	0	2	0	0	2	0	0	2	0	0	0	0	0	0	0	1	2	0	0	3	7
Total	0	0	0	25	0	25	0	0	14	0	0	14	0	0	0	0	0	0	0	9	7	0	0	16	55
01:00 AM	0	1	0	2	0	3	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
01:15 AM	0	0	0	2	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	6
01:30 AM	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	4	8
01:45 AM	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	4	0	0	0	4	6
Total	0	1	0	9	0	10	0	0	3	0	0	3	0	0	0	0	0	0	0	10	1	0	0	11	24
02:00 AM	0	0	0	6	0	6	0	0	1	0	0	1	0	0	0	0	0	0	0	1	2	0	0	3	10
02:15 AM	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	9
02:30 AM	0	0	0	4	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	5	0	0	0	5	10
02:45 AM	0	0	0	6	0	6	0	0	2	0	0	2	0	0	0	0	0	0	0	11	1	0	0	12	20
Total	0	0	0	20	0	20	0	0	4	0	0	4	0	0	0	0	0	0	0	22	3	0	0	25	49
03:00 AM	0	0	0	4	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	6	0	0	0	6	11
03:15 AM	0	0	0	1	0	1	0	0	2	0	0	2	0	0	0	0	0	0	0	12	3	0	0	15	18
03:30 AM	0	0	0	4	0	4	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	8
03:45 AM	0	0	0	5	0	5	0	0	1	1	0	2	0	0	0	0	0	0	0	6	0	0	0	6	13
Total	0	0	0	14	0	14	0	0	5	1	0	6	0	0	0	0	0	0	0	27	3	0	0	30	50
04:00 AM	0	0	0	2	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	5	1	0	0	6	9
04:15 AM	0	0	0	6	0	6	0	0	1	0	0	1	0	0	0	0	0	0	0	14	2	0	0	16	23
04:30 AM	0	0	0	1	0	1	0	0	1	1	0	2	0	0	0	0	0	0	0	12	4	0	0	16	19
04:45 AM	0	0	0	5	0	5	0	0	2	0	0	2	0	0	0	0	0	0	0	16	5	0	0	21	28
Total	0	0	0	14	0	14	0	0	5	1	0	6	0	0	0	0	0	0	0	47	12	0	0	59	79
05:00 AM	0	0	0	3	0	3	0	0	3	0	0	3	0	0	0	0	0	0	0	21	7	0	0	28	34
05:15 AM	0	0	0	7	0	7	0	0	6	0	0	6	0	0	0	0	0	0	0	29	3	0	0	32	45
05:30 AM	0	0	0	4	0	4	0	0	2	1	0	3	0	0	0	0	0	0	0	44	11	0	0	55	62
05:45 AM	0	0	0	1	0	1	0	0	4	0	0	4	0	0	0	0	0	0	0	48	21	0	0	69	74
Total	0	0	0	15	0	15	0	0	15	1	0	16	0	0	0	0	0	0	0	142	42	0	0	184	215
06:00 AM	0	0	0	9	0	9	0	0	9	0	0	9	0	0	0	0	0	0	0	58	21	0	0	79	97
06:15 AM	0	1	0	12	0	13	0	0	17	1	0	18	0	0	0	0	0	0	0	93	29	0	0	122	153
06:30 AM	0	1	0	17	0	18	0	0	27	0	0	27	0	0	0	0	0	0	0	130	58	0	0	188	233
06:45 AM	0	0	0	23	0	23	0	0	44	3	0	47	0	0	0	0	0	0	0	172	68	0	0	240	310
Total	0	2	0	61	0	63	0	0	97	4	0	101	0	0	0	0	0	0	0	453	176	0	0	629	793
07:00 AM	0	1	0	25	0	26	0	0	52	0	0	52	0	0	0	0	0	0	0	161	92	0	0	253	331
07:15 AM	0	0	0	29	0	29	0	0	29	1	0	30	0	0	0	0	0	0	0	194	103	0	0	297	356
07:30 AM	0	0	0	29	0	29	0	0	33	4	0	37	0	0	0	0	0	0	0	232	126	0	0	358	424

Appendix C - Traffic Counts

File Name : 2 - MN 3 & MN 149, 2-15-17

Site Code : 2

Start Date : 2/15/2017

Page No : 2

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
07:45 AM	0	1	0	32	0	33	0	0	51	1	0	52	0	0	0	0	0	0	0	226	123	0	0	349	434
Total	0	2	0	115	0	117	0	0	165	6	0	171	0	0	0	0	0	0	0	813	444	0	0	1257	1545
08:00 AM	0	0	0	28	0	28	0	0	29	1	0	30	0	0	0	0	0	0	0	160	69	0	0	229	287
08:15 AM	0	0	0	25	0	25	0	0	29	2	0	31	0	0	0	0	0	0	0	126	68	0	0	194	250
08:30 AM	0	1	0	27	0	28	0	0	34	1	0	35	0	0	0	0	0	0	0	103	68	0	0	171	234
08:45 AM	0	2	0	37	0	39	0	0	34	1	0	35	0	0	0	0	0	0	0	81	51	0	0	132	206
Total	0	3	0	117	0	120	0	0	126	5	0	131	0	0	0	0	0	0	0	470	256	0	0	726	977
09:00 AM	0	1	0	41	0	42	0	0	32	1	0	33	0	0	0	0	0	0	0	70	44	0	0	114	189
09:15 AM	0	2	0	28	0	30	0	0	32	1	0	33	0	0	0	0	0	0	0	80	49	0	0	129	192
09:30 AM	0	6	0	16	0	22	0	0	26	2	0	28	0	0	0	0	0	0	0	51	57	0	0	108	158
09:45 AM	0	3	0	21	0	24	0	0	28	1	0	29	0	0	0	0	0	0	0	57	42	0	0	99	152
Total	0	12	0	106	0	118	0	0	118	5	0	123	0	0	0	0	0	0	0	258	192	0	0	450	691
10:00 AM	0	2	0	26	0	28	0	0	27	1	0	28	0	0	0	0	0	0	0	43	30	0	0	73	129
10:15 AM	0	0	0	19	0	19	0	0	22	0	0	22	0	0	0	0	0	0	0	33	33	0	0	66	107
10:30 AM	0	4	0	29	0	33	0	0	23	3	0	26	0	0	0	0	0	0	0	26	30	0	0	56	115
10:45 AM	0	0	0	40	0	40	0	0	23	2	0	25	0	0	0	0	0	0	0	30	26	0	0	56	121
Total	0	6	0	114	0	120	0	0	95	6	0	101	0	0	0	0	0	0	0	132	119	0	0	251	472
11:00 AM	0	1	0	31	0	32	0	0	34	4	0	38	0	0	0	0	0	0	0	27	32	0	0	59	129
11:15 AM	0	0	0	36	0	36	0	0	28	2	0	30	0	0	0	0	0	0	0	41	23	0	0	64	130
11:30 AM	0	2	0	30	0	32	0	0	36	2	0	38	0	0	0	0	0	0	1	29	27	0	0	57	127
11:45 AM	0	4	0	39	0	43	0	0	22	2	0	24	0	0	0	0	0	0	0	34	27	0	0	61	128
Total	0	7	0	136	0	143	0	0	120	10	0	130	0	0	0	0	0	0	1	131	109	0	0	241	514
12:00 PM	0	3	0	42	0	45	0	0	43	2	0	45	0	0	0	0	0	0	1	31	26	0	0	58	148
12:15 PM	0	1	0	41	0	42	0	0	31	1	0	32	0	0	0	0	0	0	0	37	32	0	0	69	143
12:30 PM	0	2	0	40	0	42	0	0	36	3	0	39	0	0	0	0	0	0	1	23	25	0	0	49	130
12:45 PM	0	1	0	30	0	31	0	0	26	3	0	29	0	0	0	0	0	0	0	42	27	0	0	69	129
Total	0	7	0	153	0	160	0	0	136	9	0	145	0	0	0	0	0	0	2	133	110	0	0	245	550
01:00 PM	0	0	0	33	0	33	0	0	34	2	0	36	0	0	0	0	0	0	0	41	29	0	0	70	139
01:15 PM	0	2	0	25	0	27	0	0	32	4	0	36	0	0	0	0	0	0	0	33	23	0	0	56	119
01:30 PM	0	3	0	40	0	43	0	0	39	2	0	41	0	0	0	0	0	0	0	37	19	0	0	56	140
01:45 PM	0	3	0	39	0	42	0	0	31	2	0	33	0	0	0	0	0	0	0	36	21	0	0	57	132
Total	0	8	0	137	0	145	0	0	136	10	0	146	0	0	0	0	0	0	0	147	92	0	0	239	530
02:00 PM	0	1	0	43	0	44	0	0	45	2	0	47	0	0	0	0	0	0	0	28	30	0	0	58	149
02:15 PM	0	3	0	41	0	44	0	0	35	2	0	37	0	0	0	0	0	0	1	59	33	0	0	93	174
02:30 PM	0	2	0	58	0	60	0	0	58	1	0	59	0	0	0	0	0	0	0	35	43	0	0	78	197
02:45 PM	0	3	0	57	0	60	0	0	64	3	0	67	0	0	0	0	0	0	0	41	36	0	0	77	204
Total	0	9	0	199	0	208	0	0	202	8	0	210	0	0	0	0	0	0	1	163	142	0	0	306	724

Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-15-17

Site Code : 2

Start Date : 2/15/2017

Page No : 3

MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	1	0	65	0	66	0	0	37	4	0	41	0	0	0	0	0	0	0	34	53	0	0	87	194
03:15 PM	0	1	0	82	0	83	0	0	64	2	0	66	0	0	0	0	0	0	0	29	45	0	0	74	223
03:30 PM	0	3	0	100	0	103	0	0	64	1	0	65	0	0	0	0	0	0	0	49	37	0	0	86	254
03:45 PM	1	2	0	99	0	102	0	0	82	1	0	83	0	0	0	0	0	0	0	35	52	0	0	87	272
Total	1	7	0	346	0	354	0	0	247	8	0	255	0	0	0	0	0	0	0	147	187	0	0	334	943
04:00 PM	0	7	0	126	0	133	0	0	77	3	0	80	0	0	0	0	0	0	0	36	50	0	0	86	299
04:15 PM	1	2	0	148	0	151	0	0	102	5	0	107	0	0	0	0	0	0	0	45	57	0	0	102	360
04:30 PM	0	2	0	128	0	130	0	0	104	0	0	104	0	0	0	0	0	0	0	42	50	0	0	92	326
04:45 PM	1	3	0	150	0	154	0	0	124	3	0	127	0	0	0	0	0	0	0	42	59	0	0	101	382
Total	2	14	0	552	0	568	0	0	407	11	0	418	0	0	0	0	0	0	0	165	216	0	0	381	1367
05:00 PM	0	3	0	146	0	149	0	0	138	1	0	139	0	0	0	0	0	0	0	61	54	0	0	115	403
05:15 PM	0	0	0	141	0	141	0	0	106	2	0	108	0	0	0	0	0	0	0	56	56	0	0	112	361
05:30 PM	0	1	0	121	0	122	0	0	107	4	0	111	0	0	0	0	0	0	0	51	48	0	0	99	332
05:45 PM	0	2	0	104	0	106	0	0	96	1	0	97	0	0	0	0	0	0	0	35	48	0	0	83	286
Total	0	6	0	512	0	518	0	0	447	8	0	455	0	0	0	0	0	0	0	203	206	0	0	409	1382
06:00 PM	0	1	0	112	0	113	0	0	78	3	0	81	0	0	0	0	0	0	1	47	59	0	0	107	301
06:15 PM	0	0	0	79	0	79	0	0	63	0	0	63	0	0	0	0	0	0	0	45	63	0	0	108	250
06:30 PM	0	1	0	53	0	54	0	0	75	3	0	78	0	0	0	0	0	0	0	37	56	0	0	93	225
06:45 PM	0	0	0	51	0	51	0	0	49	1	0	50	0	0	0	0	0	0	0	37	60	0	0	97	198
Total	0	2	0	295	0	297	0	0	265	7	0	272	0	0	0	0	0	0	1	166	238	0	0	405	974
07:00 PM	0	0	0	42	0	42	0	0	32	1	0	33	0	0	0	0	0	0	0	27	40	0	0	67	142
07:15 PM	0	2	0	54	0	56	0	0	43	0	0	43	0	0	0	0	0	0	0	32	35	0	0	67	166
07:30 PM	0	2	0	41	0	43	0	0	35	1	0	36	0	0	0	0	0	0	0	30	39	0	0	69	148
07:45 PM	0	2	0	41	0	43	0	0	30	0	0	30	0	0	0	0	0	0	0	34	25	0	0	59	132
Total	0	6	0	178	0	184	0	0	140	2	0	142	0	0	0	0	0	0	0	123	139	0	0	262	588
08:00 PM	0	1	0	41	0	42	0	0	36	1	0	37	0	0	0	0	0	0	0	21	23	0	0	44	123
08:15 PM	0	1	0	51	0	52	0	0	28	0	0	28	0	0	0	0	0	0	0	18	33	0	0	51	131
08:30 PM	0	0	0	37	0	37	0	0	22	1	0	23	0	0	0	0	0	0	0	18	25	0	0	43	103
08:45 PM	0	1	0	29	0	30	0	0	49	0	0	49	0	0	0	0	0	0	0	27	26	0	0	53	132
Total	0	3	0	158	0	161	0	0	135	2	0	137	0	0	0	0	0	0	0	84	107	0	0	191	489
09:00 PM	0	3	0	41	0	44	0	0	60	0	0	60	0	0	0	0	0	0	0	11	17	0	0	28	132
09:15 PM	0	0	0	45	0	45	0	0	38	1	0	39	0	0	0	0	0	0	0	27	12	0	0	39	123
09:30 PM	0	2	0	23	0	25	0	0	40	0	0	40	0	0	0	0	0	0	0	14	14	0	0	28	93
09:45 PM	0	0	0	21	0	21	0	0	20	1	0	21	0	0	0	0	0	0	0	11	10	0	0	21	63
Total	0	5	0	130	0	135	0	0	158	2	0	160	0	0	0	0	0	0	0	63	53	0	0	116	411
10:00 PM	0	0	0	29	0	29	0	0	7	0	0	7	0	0	0	0	0	0	0	15	7	0	0	22	58
10:15 PM	0	2	0	21	0	23	0	0	10	0	0	10	0	0	0	0	0	0	0	24	7	0	0	31	64
10:30 PM	0	0	0	18	0	18	0	0	8	0	0	8	0	0	0	0	0	0	0	10	6	0	0	16	42

Appendix C - Traffic Counts

File Name : 2 - MN 3 & MN 149, 2-15-17

Site Code : 2

Start Date : 2/15/2017

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MN 3 & MN 149
Inver Grove Heights, MN

Groups Printed- Cars + - Trucks

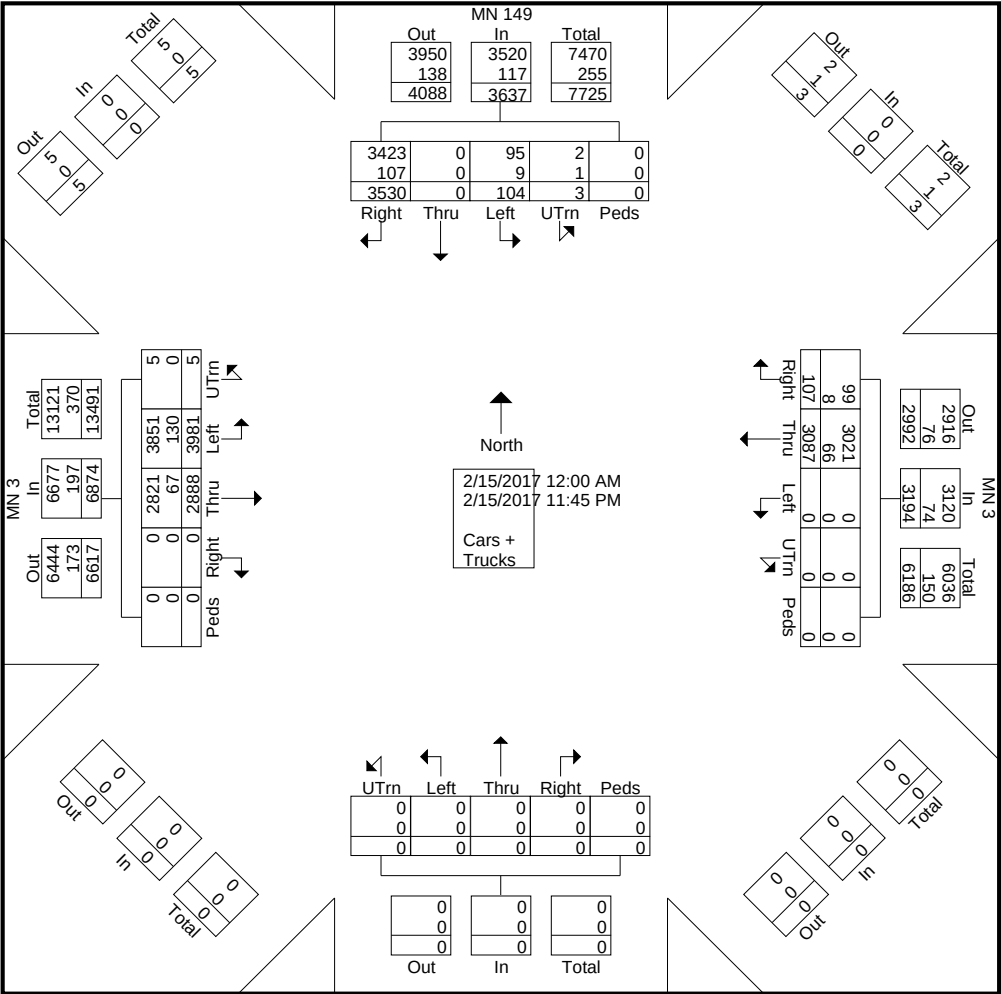
Start Time	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound						Int. Total
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	
10:45 PM	0	0	0	19	0	19	0	0	7	0	0	7	0	0	0	0	0	0	0	7	2	0	0	9	35
Total	0	2	0	87	0	89	0	0	32	0	0	32	0	0	0	0	0	0	0	56	22	0	0	78	199
11:00 PM	0	0	0	13	0	13	0	0	4	1	0	5	0	0	0	0	0	0	0	6	5	0	0	11	29
11:15 PM	0	1	0	11	0	12	0	0	5	0	0	5	0	0	0	0	0	0	0	7	4	0	0	11	28
11:30 PM	0	1	0	7	0	8	0	0	4	0	0	4	0	0	0	0	0	0	0	2	1	0	0	3	15
11:45 PM	0	0	0	6	0	6	0	0	2	0	0	2	0	0	0	0	0	0	0	2	2	0	0	4	12
Total	0	2	0	37	0	39	0	0	15	1	0	16	0	0	0	0	0	0	0	17	12	0	0	29	84
Grand Total	3	104	0	3530	0	3637	0	0	3087	107	0	3194	0	0	0	0	0	0	5	3981	2888	0	0	6874	13705
Apprch %	0.1	2.9	0	97.1	0		0	0	96.6	3.4	0		0	0	0	0	0		0.1	57.9	42	0	0		
Total %	0	0.8	0	25.8	0	26.5	0	0	22.5	0.8	0	23.3	0	0	0	0	0	0	0	29	21.1	0	0	50.2	
Cars +	2	95	0	3423	0	3520	0	0	3021	99	0	3120	0	0	0	0	0	0	5	3851	2821	0	0	6677	13317
% Cars +	66.7	91.3	0	97	0	96.8	0	0	97.9	92.5	0	97.7	0	0	0	0	0	0	100	96.7	97.7	0	0	97.1	97.2
Trucks	1	9	0	107	0	117	0	0	66	8	0	74	0	0	0	0	0	0	0	130	67	0	0	197	388
% Trucks	33.3	8.7	0	3	0	3.2	0	0	2.1	7.5	0	2.3	0	0	0	0	0	0	0	3.3	2.3	0	0	2.9	2.8



Appendix C - Traffic Counts

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MN 3 & MN 149
Inver Grove Heights, MN



Appendix C - Traffic Counts



File Name : 2 - MN 3 & MN 149, 2-15-17

Site Code : 2

Start Date : 2/15/2017

Page No : 6

MN 3 & MN 149

Inver Grove Heights, MN

	MN 149 Southbound						MN 3 Westbound						Northbound						MN 3 Eastbound							
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:00 AM																										
07:00 AM	0	1	0	25	0	26	0	0	52	0	0	52	0	0	0	0	0	0	0	161	92	0	0	253	331	
07:15 AM	0	0	0	29	0	29	0	0	29	1	0	30	0	0	0	0	0	0	0	194	103	0	0	297	356	
07:30 AM	0	0	0	29	0	29	0	0	33	4	0	37	0	0	0	0	0	0	0	232	126	0	0	358	424	
07:45 AM	0	1	0	32	0	33	0	0	51	1	0	52	0	0	0	0	0	0	0	226	123	0	0	349	434	
Total Volume	0	2	0	115	0	117	0	0	165	6	0	171	0	0	0	0	0	0	0	813	444	0	0	1257	1545	
% App. Total	0	1.7	0	98.3	0		0	0	96.5	3.5	0		0	0	0	0	0	0	0	64.7	35.3	0	0			
PHF	.000	.500	.000	.898	.000	.886	.000	.000	.793	.375	.000	.822	.000	.000	.000	.000	.000	.000	.000	.876	.881	.000	.000	.878	.890	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 12:00 PM																										
12:00 PM	0	3	0	42	0	45	0	0	43	2	0	45	0	0	0	0	0	0	1	31	26	0	0	58	148	
12:15 PM	0	1	0	41	0	42	0	0	31	1	0	32	0	0	0	0	0	0	0	37	32	0	0	69	143	
12:30 PM	0	2	0	40	0	42	0	0	36	3	0	39	0	0	0	0	0	0	1	23	25	0	0	49	130	
12:45 PM	0	1	0	30	0	31	0	0	26	3	0	29	0	0	0	0	0	0	0	42	27	0	0	69	129	
Total Volume	0	7	0	153	0	160	0	0	136	9	0	145	0	0	0	0	0	0	2	133	110	0	0	245	550	
% App. Total	0	4.4	0	95.6	0		0	0	93.8	6.2	0		0	0	0	0	0	0	0.8	54.3	44.9	0	0			
PHF	.000	.583	.000	.911	.000	.889	.000	.000	.791	.750	.000	.806	.000	.000	.000	.000	.000	.000	.500	.792	.859	.000	.000	.888	.929	
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	1	3	0	150	0	154	0	0	124	3	0	127	0	0	0	0	0	0	0	42	59	0	0	101	382	
05:00 PM	0	3	0	146	0	149	0	0	138	1	0	139	0	0	0	0	0	0	0	61	54	0	0	115	403	
05:15 PM	0	0	0	141	0	141	0	0	106	2	0	108	0	0	0	0	0	0	0	56	56	0	0	112	361	
05:30 PM	0	1	0	121	0	122	0	0	107	4	0	111	0	0	0	0	0	0	0	51	48	0	0	99	332	
Total Volume	1	7	0	558	0	566	0	0	475	10	0	485	0	0	0	0	0	0	0	210	217	0	0	427	1478	
% App. Total	0.2	1.2	0	98.6	0		0	0	97.9	2.1	0		0	0	0	0	0	0	0	49.2	50.8	0	0			
PHF	.250	.583	.000	.930	.000	.919	.000	.000	.861	.625	.000	.872	.000	.000	.000	.000	.000	.000	.000	.861	.919	.000	.000	.928	.917	

Appendix D - Trip Generation Table



Table D1
Forecast Trip Generation - Using ITE Data

Weekday Daily Volumes

LAND USE	ITE CODE #	DEVELOPMENT UNITS	QUANTITY	DAILY RATE	ENTER PERCENT	EXIT PERCENT	INTERNAL PERCENT	INTERNAL TRIPS	PASSBY PERCENT	PASSBY TRIPS	NEW TRIPS	
											ENTER	EXIT
Apartment	220	Dwelling Units	135.0	6.65	50%	50%	15%	135	0%	0	382	382
General Office	710	GFA	25.0	11.03	50%	50%	15%	41	0%	0	117	117
Shopping Center	820	GFA	28.0	42.70	50%	50%	15%	179	34%	346	335	335
Gas Station w/Conv Mkt & Carwash	946	Fuel Positions	12.0	152.84	50%	50%	15%	275	56%	873	343	343
Total								630		1,219	1,177	1,177

Weekday AM Peak Hour

LAND USE	ITE CODE #	DEVELOPMENT UNITS	QUANTITY	AM RATE	ENTER PERCENT	EXIT PERCENT	INTERNAL PERCENT	INTERNAL TRIPS	PASSBY PERCENT	PASSBY TRIPS	NEW TRIPS	
											ENTER	EXIT
Apartment	220	Dwelling Units	135.0	0.51	20%	80%	5%	3	0%	0	13	52
General Office	710	GFA	25.0	1.56	88%	12%	5%	2	0%	0	33	4
Shopping Center	820	GFA	28.0	0.96	62%	38%	5%	1	34%	9	10	6
Gas Station w/Conv Mkt & Carwash	946	Fuel Positions	12.0	11.84	51%	49%	5%	7	56%	76	30	29
Total								14		84	86	91

Weekday PM Peak Hour

LAND USE	ITE CODE #	DEVELOPMENT UNITS	QUANTITY	PM RATE	ENTER PERCENT	EXIT PERCENT	INTERNAL PERCENT	INTERNAL TRIPS	PASSBY PERCENT	PASSBY TRIPS	NEW TRIPS	
											ENTER	EXIT
Apartment	220	Dwelling Units	135.0	0.62	65%	35%	20%	17	0%	0	44	23
General Office	710	GFA	25.0	1.49	17%	83%	20%	7	0%	0	5	25
Shopping Center	820	GFA	28.0	3.71	48%	52%	20%	21	34%	28	26	29
Gas Station w/Conv Mkt & Carwash	946	Fuel Positions	12.0	13.86	51%	49%	20%	33	56%	75	30	29
Total								78		103	105	106

NOTES:

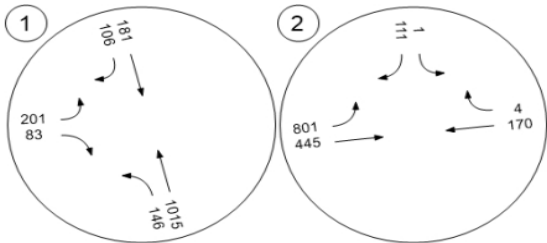
1. GFA = Gross Floor Area
2. All trip generation rates based on "Trip Generation", Institute of Transportation Engineers, 9th Edition unless otherwise noted.
3. A.M. Trip Generation is for the peak hour of adjacent street traffic (one hour between 7 and 9 a.m.).
4. P.M. Trip Generation is for the peak hour of adjacent street traffic (one hour between 4 and 6 p.m.).
5. Reduction for internal trips (Internal Percent) is based on "Trip Generation Handbook", Institute of Transportation Engineers, 3rd Edition.
6. Reduction for pass-by trips (Passby Percent) is based on "Trip Generation Handbook", Institute of Transportation Engineers, 3rd Edition.
7. Passby reduction for ITE land use 946 based off of the similar ITE land use 945, Service Station with Convenience Market.

Appendix E - Peak Hour Volumes

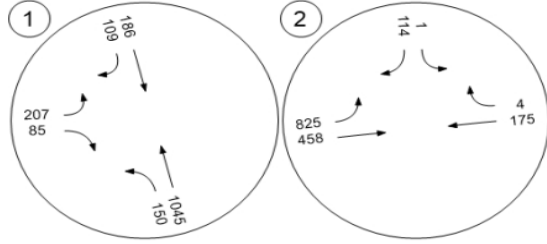
Table E1
AM Peak Hour Volumes



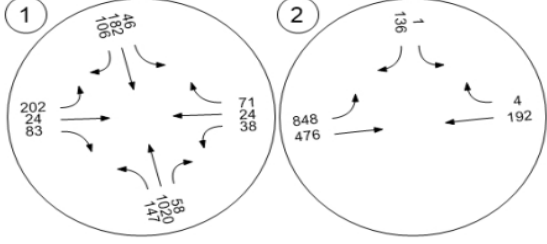
AM Existing



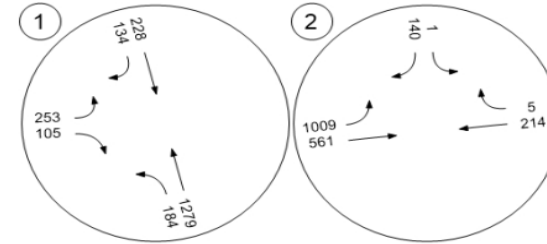
AM 2020 No-Build



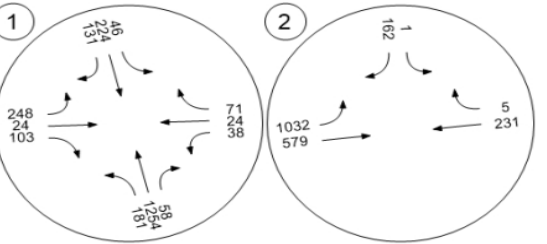
AM 2020 Build



AM 2040 No-Build



AM 2040 Build

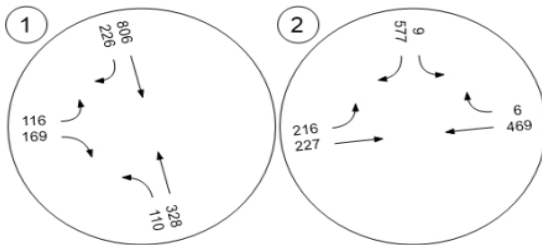


Appendix E - Peak Hour Volumes

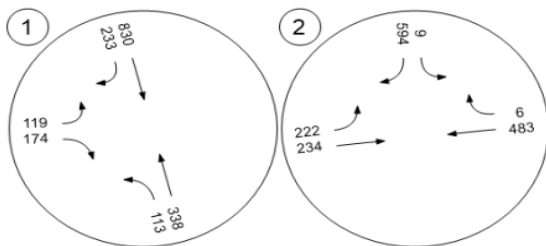
Table E2
PM Peak Hour Volumes



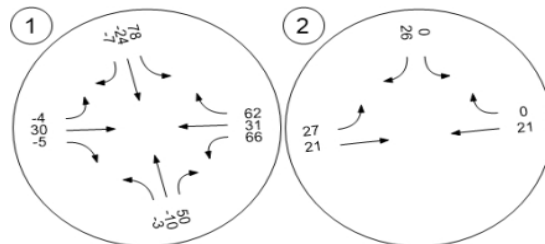
PM Existing



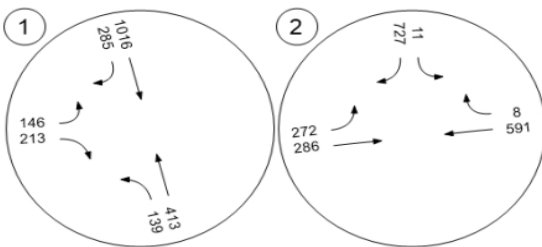
PM 2020 No-Build



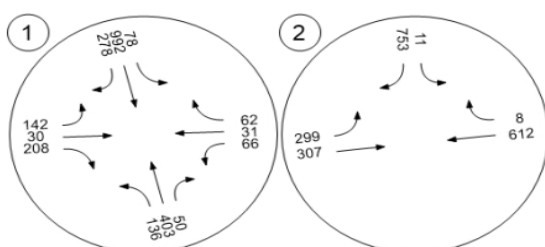
PM 2020 Build



PM 2040 No-Build



PM 2040 Build



Level of Service (LOS)

Level of Service (LOS) is a qualitative description, similar to typical school grades, that traffic engineers use to communicate how good or bad traffic operations are on a corridor, intersection, or interchange.

Common Factors

Traffic can be a hard thing to quantify as everyone has a different tolerance for congestion. What seems excessively long to one person may seem good enough for another. These differences are readily apparent when comparing small towns or rural areas, where five cars an hour can be the norm, to big cities or downtowns, where less than hundred cars an hour, even in the middle of night, is rare.

To combat this issue and provide a consistent measuring tool for traffic studies, a “Level of Service” rating was developed. Level of Service ratings are based on the roadway or intersection characteristics and the amount of traffic. Just like grade school, LOS A represents the best traffic operations, where traffic flows freely. LOS F, on the other hand, represents failing operations, where the road or intersection is congested and running beyond maximum capacity. LOS E is typically considered “at capacity” which means the amount of traffic is right at the level the roadway or intersection can adequately accommodate. Using Level of Service letter grades provides an easy way to convey road operations to the general public and has been adopted across the United States.

Level of Service criteria have been developed for multiple types of traffic operations including:

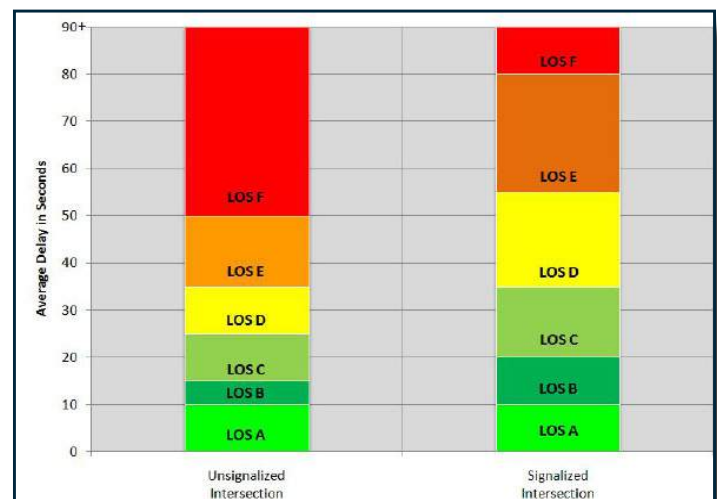
- Intersections
- Urban Corridors
- Freeways
- Transit Service
- Bicycle Operations
- Pedestrian Operations

The most common LOS criteria used is for car operations at intersections; both signalized and unsignalized. For an intersection Level of Service analysis, average delay for cars travelling through the intersection is used to determine the appropriate grade. A high delay results in a poor LOS rating and equates to poor operations. Similarly, low delay results in a good LOS rating and equates to good or great operations.

LOS can be determined for the intersection as a whole, or for individual movements. It is common during peak periods in major population areas for an intersection to have an acceptable overall LOS rating, but fail to achieve a good grade for individual movements.

Common Factors Impacting Level of Service

- Number of Lanes.
- Traffic Volumes.
- Intersection Control (stop sign, signal, roundabout, interchange.)
- Amount of access on a corridor.
- Percentage of turning traffic.
- Traffic signal cycle length (green time devoted to each approach) and phasing (one green for all approach movements or separate green arrows.)
- Percentage of heavy trucks.
- Roadway Grades.
- Distribution of traffic within a peak hour as well as over the course of a day.
- Pedestrian activity.
- Bicycle activity.





LOS A



LOS C



LOS D = Acceptable



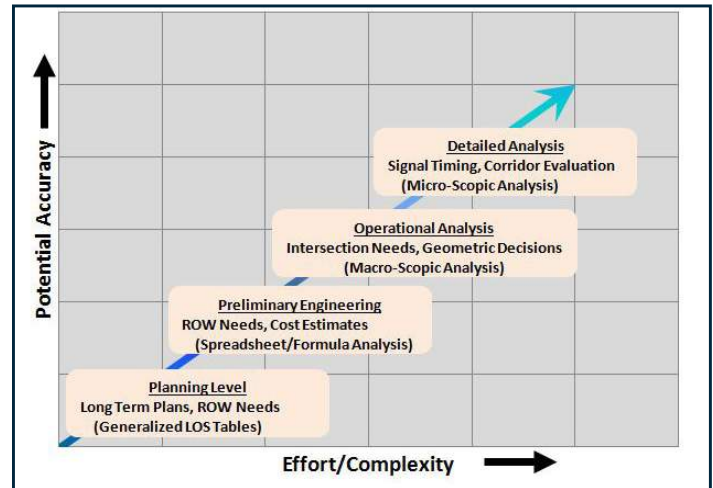
LOS F = Unacceptable

Source: City of San Jose, CA.

Although a Level of Service rating of A represents the best traffic operations, it is not always the most desirable. Providing LOS A for all corridors and all operations at all times would require a significant amount of land to be devoted to the road infrastructure, which makes it extremely costly to build and maintain. During non-peak times, like overnight, much of that infrastructure would sit unused.

On the opposite side of the spectrum, a Level of Service rating of E and F represent traffic operations close to breaking down, or that already have. These ratings mean high delays, long queues, and slow speeds, not to mention driver frustration. Instead of trying to achieve one or the other, government agencies try to strike a balance between providing acceptable operations, neither falling nor flowing too freely. Because of this, **LOS D is typically considered the lowest LOS acceptable by government agencies** and is reflective of a balanced approach between cost and benefit.

There are many tools and guidelines used to determine a road's Level of Service rating. Simple tools like generalized roadway capacities allow for planning-level efforts. While inexpensive and quick to complete, they are not as accurate as other options. More complicated tools, such as micro-simulations, provide more accurate results, but cost more and take more time. It is important to understand the trade-offs between the analysis types as well as the purpose of the study.



Source: Florida Department of Transportation

Resources

• [Highway Capacity Manual, fifth edition](#)

• Nation Cooperative Highway Research Program Report 616; Multimodal Level of Service Analysis for Urban Streets

• http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_616.pdf

• Florida Department of Transportation Quality/Level of Service Handbook

• http://www.dot.state.fl.us/planning/systems/programs/sm/los/pdfs/2009FDOTQLOS_Handbook.pdf

About This Brief

Spack Consulting prepared this brief as part of our company's vision to significantly improve the practice of traffic engineering and transportation planning. Transportation professionals from around the world have assisted us in developing this document. We are providing this brief under the Creative Commons Attribution License. Feel free to use-modify-share this guide, but please give us some credit in your document. To request our whole series of Design Briefs and to be included on our distribution list for new materials, please email mspack@spackconsulting.com. And please reach out if you have any comments or questions related to this Design Brief.

Warrants 1 - 3 (Volume Warrants)

Project Name	Westgate Development
Project/File #	421-17-01
Scenario	Existing

Intersection Information			
Major Street (E/W Road)	TH 3	Minor Street (N/S Road)	TH 149
Analyzed with	2 or more approach lanes	Analyzed with	2 or more approach lanes
Total Approach Volume	9928.5 vehicles	Total Approach Volume	3609.5 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	50 percent applied

Reduction applied to Volume Warrant thresholds due to high speeds on TH 3.

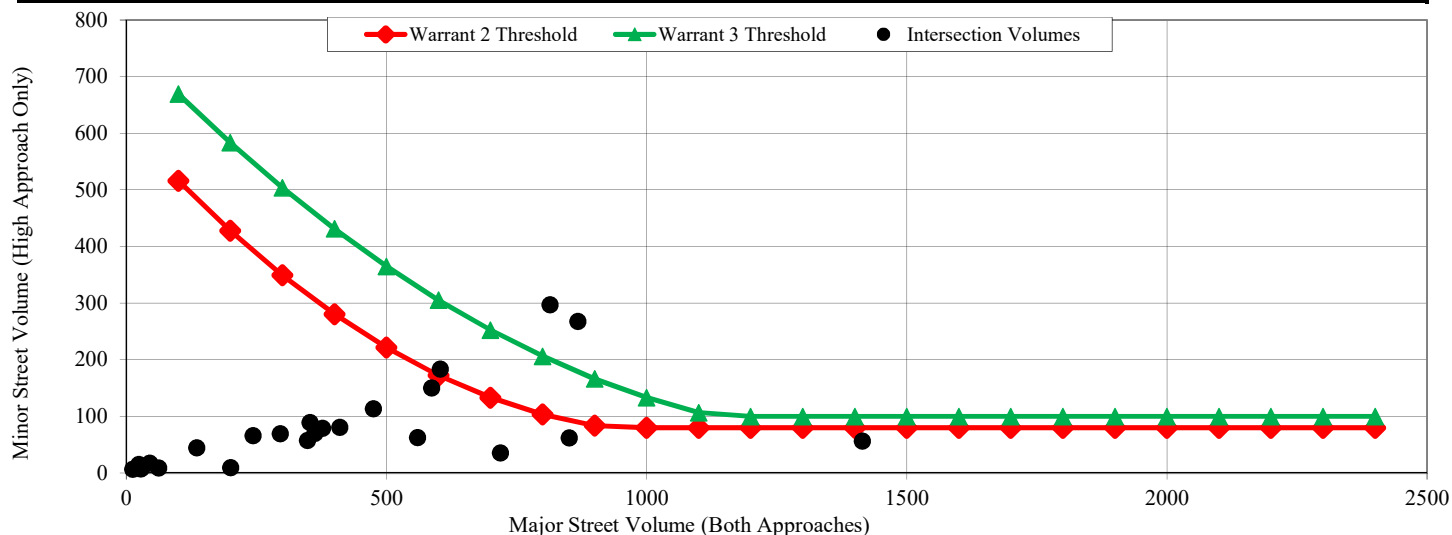
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	4 hours	2 hours	5 (Cond. A) & 7 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	140	70	112 (Cond. A) & 56 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	3 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Examined	Satisfied
Required values reached for		2 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	150	
Criteria - Minor Street High Side Delay (veh-hrs)	5	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



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Warrants 1 - 3 (Volume Warrants)

Project Name	Westgate Development
Project/File #	421-17-01
Scenario	2020 No-Build

Intersection Information			
Major Street (E/W Road)	TH 3	Minor Street (N/S Road)	TH 149
Analyzed with	2 or more approach lanes	Analyzed with	2 or more approach lanes
Total Approach Volume	10226.355 vehicles	Total Approach Volume	3717.785 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	50 percent applied

Reduction applied to Volume Warrant thresholds due to high speeds on TH 3.

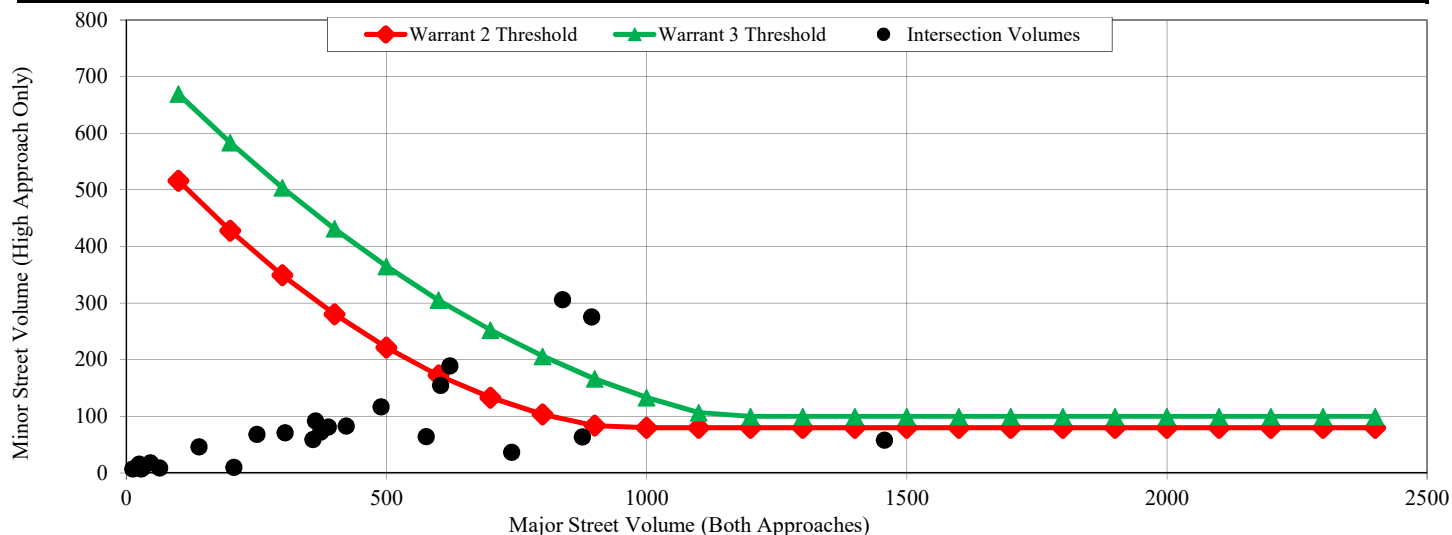
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Not Satisfied	Not Satisfied
Required values reached for	4 hours	2 hours	5 (Cond. A) & 7 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	140	70	112 (Cond. A) & 56 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not Satisfied
Required values reached for	3 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Examined	Satisfied
Required values reached for		2 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	150	
Criteria - Minor Street High Side Delay (veh-hrs)	5	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



Warrants 1 - 3 (Volume Warrants)

Project Name	Westgate Development
Project/File #	421-17-01
Scenario	2040 No-Build

Intersection Information			
Major Street (E/W Road)	TH 3	Minor Street (N/S Road)	TH 149
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	12509.91 vehicles	Total Approach Volume	4547.97 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	100 percent applied	Right turn reduction of	50 percent applied

Reduction applied to Volume Warrant thresholds due to high speeds on TH 3.

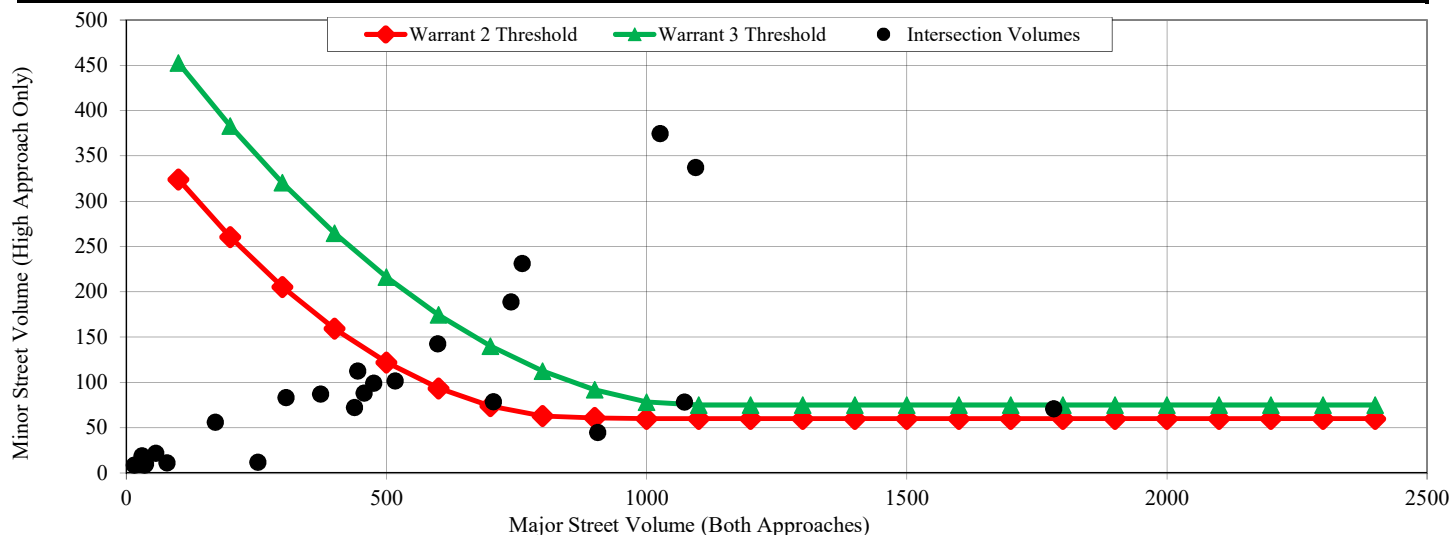
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not Satisfied	Satisfied	Satisfied
Required values reached for	6 hours	8 hours	10 (Cond. A) & 14 (Cond. B)
Criteria - Major Street (veh/hr)	350	525	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Satisfied
Required values reached for	8 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Examined	Satisfied
Required values reached for		5 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	150	
Criteria - Minor Street High Side Delay (veh-hrs)	5	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



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Appendix H - Capacity Analysis Backup

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Westgate Development

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Scenario 1 AM Existing

Report File: C:\...\IAM Existing.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.768	20.1	C
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Left	0.098	390.9	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	20.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.768

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	1	0
Pocket Length [ft]	275.00	100.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	146	1015	181	106	201	83
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	53	0	42
Total Hourly Volume [veh/h]	146	1015	181	53	201	41
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	42	295	53	15	58	12
Total Analysis Volume [veh/h]	170	1180	210	62	234	48
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Westgate Development

Scenario 1: 1 AM Existing

Traffic Impact Study

H2

Westgate Development

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	40	105	73	0	30	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	45	111	79	0	36	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	138	138	138	138	138	138
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	27	105	73	73	20	20
g / C, Green / Cycle	0.20	0.76	0.53	0.53	0.15	0.15
(v / s)_i Volume / Saturation Flow Rate	0.10	0.64	0.11	0.04	0.13	0.03
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	341	1412	981	841	264	231
d1, Uniform Delay [s]	45.17	0.00	17.27	15.94	57.68	51.68
k, delay calibration	0.11	0.50	0.50	0.50	0.13	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.13	5.99	0.50	0.17	11.31	0.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.84	0.21	0.07	0.89	0.21
d, Delay for Lane Group [s/veh]	46.30	5.99	17.77	16.11	68.99	52.12
Lane Group LOS	D	A	B	B	E	D
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	4.70	2.35	3.56	0.97	8.66	1.47
50th-Percentile Queue Length [ft]	117.50	58.71	89.02	24.32	216.61	36.72
95th-Percentile Queue Length [veh]	8.26	4.23	6.41	1.75	13.49	2.64
95th-Percentile Queue Length [ft]	206.39	105.68	160.23	43.78	337.29	66.09

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	46.30	5.99	17.77	16.11	68.99	52.12
Movement LOS	D	A	B	B	E	D
d_A, Approach Delay [s/veh]	11.06		17.39		66.12	
Approach LOS	B		B		E	
d_I, Intersection Delay [s/veh]	20.12					
Intersection LOS	C					
Intersection V/C	0.768					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	69.38	69.38
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.224	2.324
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	80.00	80.00	80.00
I_b,int, Bicycle LOS Score for Intersection	6.298	3.718	4.024
Bicycle LOS	F	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type:	Two-way stop	Delay (sec / veh):	390.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.098

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	111	801	445	170	4
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	31	225	125	48	1
Total Analysis Volume [veh/h]	1	125	900	500	191	4
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.10	0.15	0.66	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	390.93	9.98	12.47	0.00	0.00	0.00
Movement LOS	F	A	B	A	A	A
95th-Percentile Queue Length [veh]	0.26	0.52	5.25	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	6.60	12.89	131.31	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	13.00		8.02		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	7.48					
Intersection LOS	F					

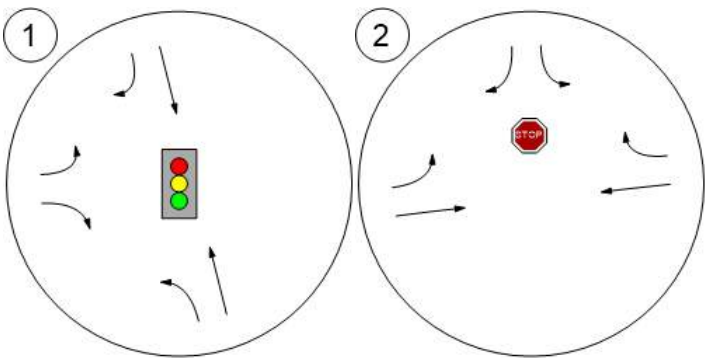
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Lane Configuration and Traffic Control



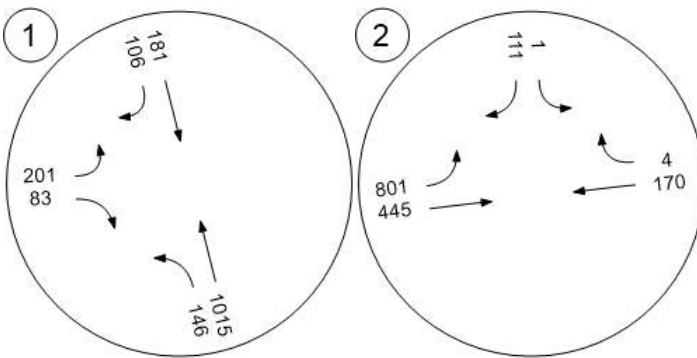
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Traffic Volume - Base Volume



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Vistro File: C:\...\Westgate Vistro.vistro

Scenario 2 PM Existing

Report File: C:\...\PM Existing.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.592	20.8	C
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Right	0.974	57.2	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	20.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.592

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	1	0
Pocket Length [ft]	275.00	100.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	110	328	806	226	116	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	93	0	85
Total Hourly Volume [veh/h]	110	328	806	133	116	84
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	86	212	35	31	22
Total Analysis Volume [veh/h]	116	345	848	140	122	88
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Westgate Development

Scenario 2: 2 PM Existing

Traffic Impact Study

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Westgate Development

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	27	101	82	0	24	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	32	107	88	0	30	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	124	124	124	124	124	124
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	14	101	82	82	11	11
g / C, Green / Cycle	0.11	0.81	0.66	0.66	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.46	0.09	0.07	0.06
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	197	1507	1222	1047	156	137
d1, Uniform Delay [s]	50.14	0.00	13.35	7.95	55.65	54.93
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.79	0.35	3.26	0.27	8.34	4.99
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.59	0.23	0.69	0.13	0.78	0.64
d, Delay for Lane Group [s/veh]	52.93	0.35	16.62	8.21	63.99	59.91
Lane Group LOS	D	A	B	A	E	E
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh]	3.31	0.15	13.92	1.34	4.02	2.80
50th-Percentile Queue Length [ft]	82.78	3.71	347.95	33.40	100.62	69.95
95th-Percentile Queue Length [veh]	5.96	0.27	20.04	2.40	7.24	5.04
95th-Percentile Queue Length [ft]	149.01	6.68	500.91	60.12	181.12	125.91

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

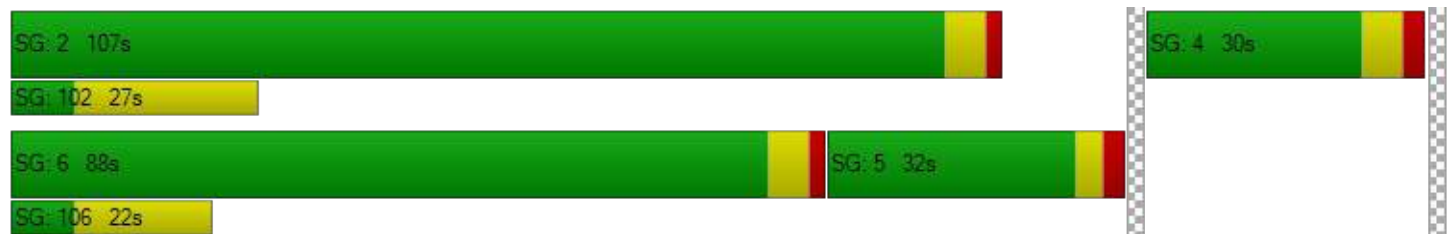
d_M, Delay for Movement [s/veh]	52.93	0.35	16.62	8.21	63.99	59.91
Movement LOS	D	A	B	A	E	E
d_A, Approach Delay [s/veh]	13.58		15.43		62.28	
Approach LOS	B		B		E	
d_I, Intersection Delay [s/veh]	20.85					
Intersection LOS	C					
Intersection V/C	0.592					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	64.40
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.025	2.399
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	75.00	75.00	75.00
I_b,int, Bicycle LOS Score for Intersection	4.831	4.965	4.024
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 57.2
Level Of Service: F
Volume to Capacity (v/c): 0.974

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	577	216	227	469	6
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	144	54	57	117	2
Total Analysis Volume [veh/h]	9	577	216	227	469	6
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.97	0.20	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	26.97	57.24	9.16	0.00	0.00	0.00
Movement LOS	D	F	A	A	A	A
95th-Percentile Queue Length [veh]	0.16	13.79	0.74	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	4.09	344.72	18.58	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	56.78		4.46		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	23.44					
Intersection LOS	F					

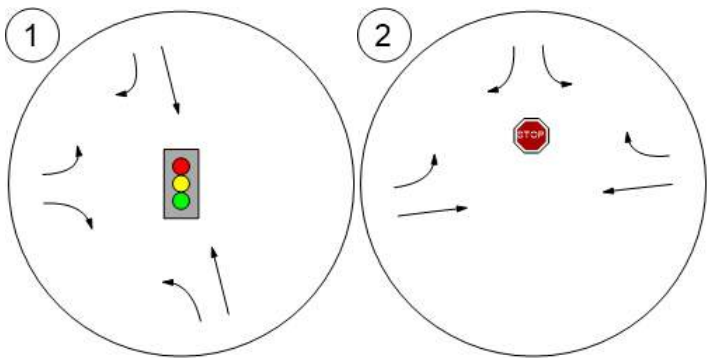
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Lane Configuration and Traffic Control



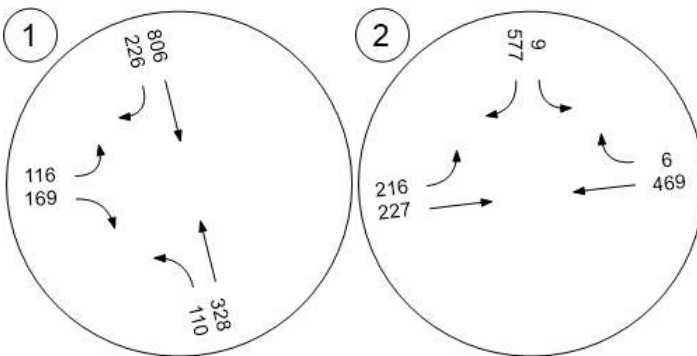
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Traffic Volume - Base Volume



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Vistro File: C:\...\Westgate Vistro.vistro

Scenario 3 AM 2020 No-Build

Report File: C:\...\AM 2020 No-Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.790	21.1	C
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Left	0.117	475.8	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	21.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.790

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	0	1	1	0
Pocket Length [ft]	100.00	275.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	146	1015	181	106	201	83
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	55	0	43
Total Hourly Volume [veh/h]	150	1045	186	54	207	42
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	44	304	54	16	60	12
Total Analysis Volume [veh/h]	174	1215	216	63	241	49
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

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Scenario 3: 3 AM 2020 No-Build

Traffic Impact Study

H20

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Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	40	105	73	0	30	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	45	111	79	0	36	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	139	139	139	139	139	139
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	27	105	73	73	21	21
g / C, Green / Cycle	0.20	0.76	0.53	0.53	0.15	0.15
(v / s)_i Volume / Saturation Flow Rate	0.10	0.65	0.12	0.04	0.14	0.03
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	340	1406	977	837	270	237
d1, Uniform Delay [s]	45.61	0.00	17.59	16.18	57.68	51.49
k, delay calibration	0.11	0.50	0.50	0.50	0.14	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.20	7.27	0.52	0.18	12.42	0.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.51	0.86	0.22	0.08	0.89	0.21
d, Delay for Lane Group [s/veh]	46.81	7.27	18.11	16.36	70.10	51.91
Lane Group LOS	D	A	B	B	E	D
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	4.86	2.84	3.72	1.00	9.04	1.50
50th-Percentile Queue Length [ft]	121.45	71.01	92.98	25.02	226.00	37.49
95th-Percentile Queue Length [veh]	8.47	5.11	6.69	1.80	13.97	2.70
95th-Percentile Queue Length [ft]	211.82	127.81	167.36	45.03	349.27	67.48

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	46.81	7.27	18.11	16.36	70.10	51.91
Movement LOS	D	A	B	B	E	D
d_A, Approach Delay [s/veh]	12.22		17.72		67.03	
Approach LOS	B		B		E	
d_I, Intersection Delay [s/veh]	21.12					
Intersection LOS	C					
Intersection V/C	0.790					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	69.38	69.38
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.261	2.333
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	80.00	80.00	80.00
I_b,int, Bicycle LOS Score for Intersection	6.362	3.733	4.024
Bicycle LOS	F	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 475.8
Level Of Service: F
Volume to Capacity (v/c): 0.117

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	114	825	458	175	4
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	32	232	129	49	1
Total Analysis Volume [veh/h]	1	128	927	515	197	4
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.15	0.68	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	475.77	10.04	13.02	0.00	0.00	0.00
Movement LOS	F	B	B	A	A	A
95th-Percentile Queue Length [veh]	0.30	0.53	5.75	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	7.53	13.37	143.63	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	13.65		8.37		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	7.80					
Intersection LOS	F					

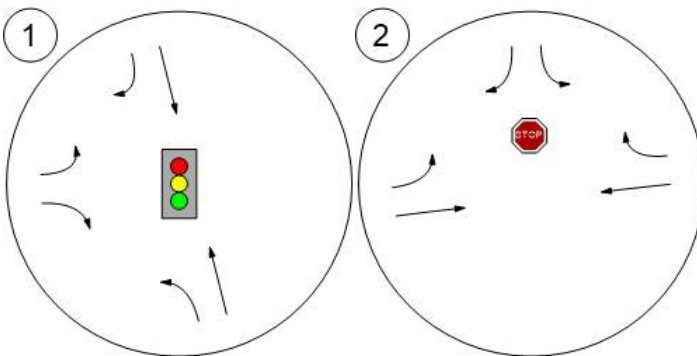
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Lane Configuration and Traffic Control



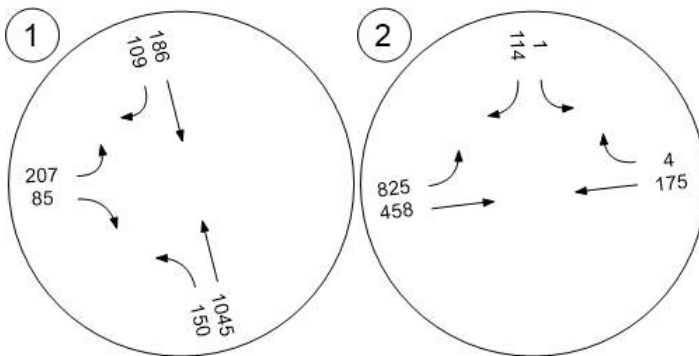
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Traffic Volume - Future Total Volume



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 4 PM 2020 No-Build

Report File: C:\...\PM 2020 No-Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.610	21.3	C
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Right	1.021	69.6	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	21.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.610

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	0	1	1	0
Pocket Length [ft]	100.00	275.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	110	328	806	226	116	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	96	0	87
Total Hourly Volume [veh/h]	113	338	830	137	119	87
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	30	89	218	36	31	23
Total Analysis Volume [veh/h]	119	356	874	144	125	92
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	27	101	82	0	24	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	32	107	88	0	30	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

Generated with **PTV VISTRO**



Version 5.00-00

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	125	125	125	125	125	125
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	14	101	82	82	11	11
g / C, Green / Cycle	0.11	0.81	0.66	0.66	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.47	0.09	0.07	0.06
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	197	1504	1220	1045	159	139
d1, Uniform Delay [s]	50.36	0.00	13.83	8.04	55.64	54.97
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.99	0.37	3.63	0.28	8.35	5.24
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.24	0.72	0.14	0.79	0.66
d, Delay for Lane Group [s/veh]	53.35	0.37	17.46	8.32	64.00	60.21
Lane Group LOS	D	A	B	A	E	E
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh]	3.42	0.15	14.89	1.39	4.13	2.94
50th-Percentile Queue Length [ft]	85.44	3.87	372.27	34.72	103.23	73.44
95th-Percentile Queue Length [veh]	6.15	0.28	21.22	2.50	7.43	5.29
95th-Percentile Queue Length [ft]	153.79	6.97	530.48	62.49	185.82	132.19

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

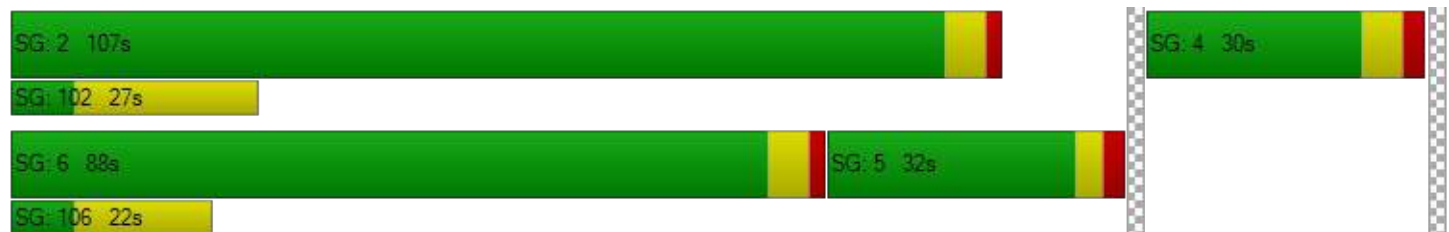
d_M, Delay for Movement [s/veh]	53.35	0.37	17.46	8.32	64.00	60.21
Movement LOS	D	A	B	A	E	E
d_A, Approach Delay [s/veh]	13.64		16.17		62.39	
Approach LOS	B		B		E	
d_I, Intersection Delay [s/veh]	21.33					
Intersection LOS	C					
Intersection V/C	0.610					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	64.40
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.056	2.412
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	75.00	75.00	75.00
I_b,int, Bicycle LOS Score for Intersection	4.854	5.020	4.024
Bicycle LOS	E	F	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 69.6
Level Of Service: F
Volume to Capacity (v/c): 1.021

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	594	222	234	483	6
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	149	56	59	121	2
Total Analysis Volume [veh/h]	9	594	222	234	483	6
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	1.02	0.21	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	28.32	69.58	9.25	0.00	0.00	0.00
Movement LOS	D	F	A	A	A	A
95th-Percentile Queue Length [veh]	0.17	15.72	0.78	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	4.33	393.12	19.51	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	68.96		4.50		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	28.19					
Intersection LOS	F					

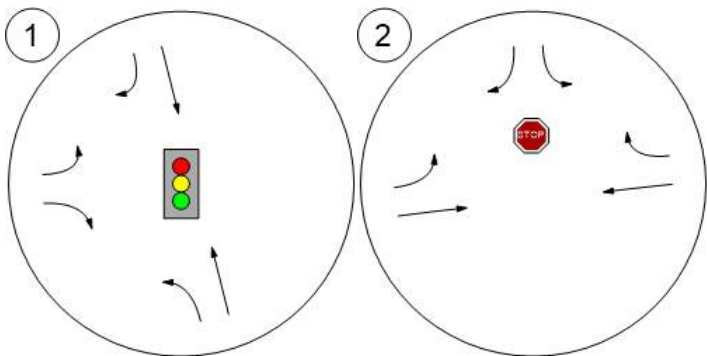
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Spack
CONSULTING

Lane Configuration and Traffic Control



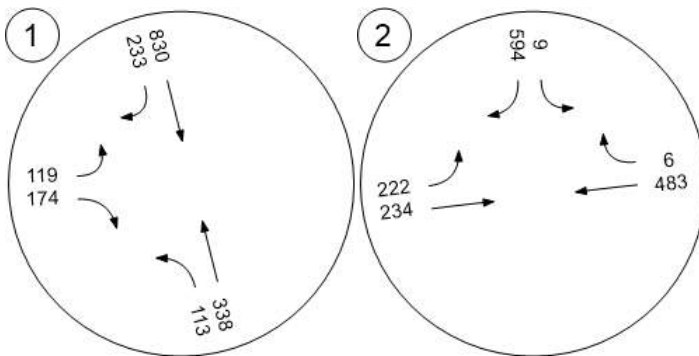
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Traffic Volume - Future Total Volume



Appendix H - Capacity Analysis Backup

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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 5 AM 2020 Build

Report File: C:\...\AM 2020 Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.849	45.9	D
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Left	0.148	615.8	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 45.9
Level Of Service: D
Volume to Capacity (v/c): 0.849

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	146	1015	0	0	181	106	201	0	83	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	30	39	0	0	0	17	0	32	18	41
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-25	28	7	-4	-3	-5	7	-2	6	6	30
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	18	0	0	53	0	0	21	0	0	18
Total Hourly Volume [veh/h]	147	1020	40	46	182	53	202	24	62	38	24	53
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	43	297	12	13	53	15	59	7	18	11	7	15
Total Analysis Volume [veh/h]	171	1186	47	53	212	62	235	28	72	44	28	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	15	0	7	15	0	0	7	0	0	7	0
Maximum Green [s]	40	105	0	8	73	0	0	30	0	0	30	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	0.0	4.5	0.0	0.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	45	111	0	13	79	0	0	36	0	0	36	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	4.5	0.0	0.0	4.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00



Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	159	159	159	159	159	159	159	159	159	159
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	4.50	4.50	4.50	4.50
g_i, Effective Green Time [s]	38	105	105	6	73	73	30	30	30	30
g / C, Green / Cycle	0.24	0.66	0.66	0.04	0.46	0.46	0.19	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.10	0.64	0.03	0.03	0.11	0.04	0.18	0.06	0.03	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1306	1659	1295	1667
c, Capacity [veh/h]	420	1225	1050	72	852	730	215	313	206	315
d1, Uniform Delay [s]	44.96	8.10	3.25	75.41	26.23	24.17	71.30	55.65	63.07	55.28
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.37	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.63	19.06	0.08	13.46	0.70	0.23	79.10	0.58	0.51	0.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.41	0.97	0.04	0.74	0.25	0.08	1.09	0.32	0.21	0.29
d, Delay for Lane Group [s/veh]	45.59	27.16	3.33	88.87	26.93	24.40	150.40	56.23	63.58	55.78
Lane Group LOS	D	C	A	F	C	C	F	E	E	E
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No
50th-Percentile Queue Length [veh]	5.01	12.35	0.21	2.39	5.02	1.36	13.47	3.48	1.66	3.17
50th-Percentile Queue Length [ft]	125.24	308.75	5.14	59.72	125.55	33.89	336.65	87.02	41.45	79.37
95th-Percentile Queue Length [veh]	8.68	18.11	0.37	4.30	8.70	2.44	20.36	6.27	2.98	5.71
95th-Percentile Queue Length [ft]	217.00	452.84	9.25	107.50	217.43	60.99	509.03	156.64	74.60	142.86

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Movement, Approach, & Intersection Results

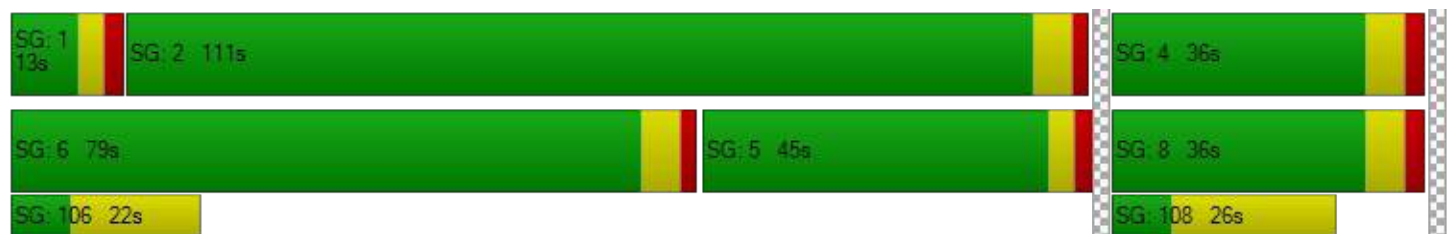
d_M, Delay for Movement [s/veh]	45.59	27.16	3.33	88.87	26.93	24.40	150.40	56.23	56.23	63.58	55.78	55.78
Movement LOS	D	C	A	F	C	C	F	E	E	E	E	E
d_A, Approach Delay [s/veh]	28.61			36.49			122.29			58.34		
Approach LOS	C			D			F			E		
d_I, Intersection Delay [s/veh]	45.85											
Intersection LOS	D											
Intersection V/C	0.849											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			69.38			69.38			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.256			2.324			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1313			913			369			369		
d_b, Bicycle Delay [s]	9.45			23.65			53.22			53.22		
I_b,int, Bicycle LOS Score for Intersection	3.844			1.236			2.039			2.943		
Bicycle LOS	D			A			B			C		

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type:	Two-way stop	Delay (sec / veh):	615.8
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.148

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	22	23	18	17	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	136	848	476	192	4
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	38	238	134	54	1
Total Analysis Volume [veh/h]	1	153	953	535	216	4
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.15	0.19	0.71	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	615.77	10.38	13.92	0.00	0.00	0.00
Movement LOS	F	B	B	A	A	A
95th-Percentile Queue Length [veh]	0.35	0.68	6.47	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	8.77	17.03	161.68	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	14.31		8.92		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	8.31					
Intersection LOS	F					

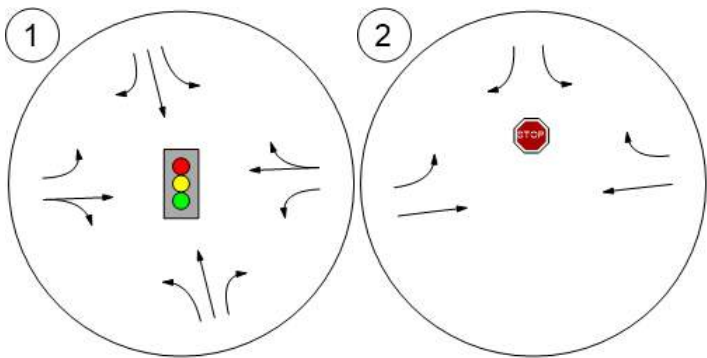
Appendix H - Capacity Analysis Backup

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Lane Configuration and Traffic Control



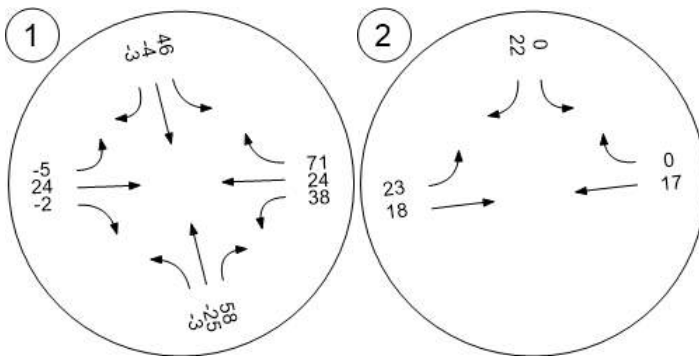
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Traffic Volume - Net New Site Trips



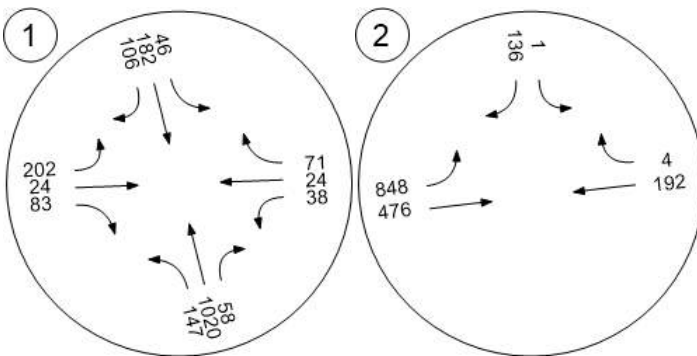
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Traffic Volume - Future Total Volume



Appendix H - Capacity Analysis Backup

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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 6 PM 2020 Build

Report File: C:\...\PM 2020 Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	SB Left	0.616	36.6	D
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Right	1.096	92.9	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 36.6
Level Of Service: D
Volume to Capacity (v/c): 0.616

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	110	328	0	0	806	226	116	0	169	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	37	47	0	0	0	21	0	37	21	48
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-10	13	31	-24	-7	-4	9	-5	29	10	14
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	14	0	0	93	0	0	422	0	0	16
Total Hourly Volume [veh/h]	110	328	36	78	806	133	115	30	0	66	31	46
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	86	9	21	212	35	30	8	0	17	8	12
Total Analysis Volume [veh/h]	116	345	38	82	848	140	121	32	0	69	33	48
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	15	0	7	15	0	0	7	0	0	7	0
Maximum Green [s]	27	101	0	8	82	0	0	24	0	0	24	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	0.0	4.5	0.0	0.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	32	107	0	13	88	0	0	30	0	0	30	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	4.5	0.0	0.0	4.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00



Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	4.50	4.50	4.50	4.50
g_i, Effective Green Time [s]	27	101	101	8	82	82	24	24	24	24
g / C, Green / Cycle	0.18	0.67	0.67	0.05	0.55	0.55	0.16	0.16	0.16	0.16
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.02	0.05	0.46	0.09	0.09	0.02	0.05	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1317	1870	1377	1693
c, Capacity [veh/h]	312	1246	1068	95	1012	867	183	297	227	269
d1, Uniform Delay [s]	50.11	2.78	2.60	70.65	28.64	17.05	66.72	54.13	59.95	55.88
k, delay calibration	0.11	0.50	0.50	0.21	0.50	0.50	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.74	0.55	0.06	33.11	8.28	0.40	4.07	0.16	0.75	0.62
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.37	0.28	0.04	0.87	0.84	0.16	0.66	0.11	0.30	0.30
d, Delay for Lane Group [s/veh]	50.84	3.33	2.66	103.76	36.92	17.45	70.80	54.29	60.70	56.50
Lane Group LOS	D	A	A	F	D	B	E	D	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	Yes	No	No	No
50th-Percentile Queue Length [veh]	3.53	1.33	0.14	3.97	26.46	2.47	4.73	1.04	2.48	2.79
50th-Percentile Queue Length [ft]	88.34	33.19	3.43	99.15	661.39	61.69	118.20	26.02	61.96	69.76
95th-Percentile Queue Length [veh]	6.36	2.39	0.25	7.14	34.89	4.44	8.29	1.87	4.46	5.02
95th-Percentile Queue Length [ft]	159.01	59.73	6.17	178.46	872.27	111.03	207.35	46.84	111.52	125.57

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Movement, Approach, & Intersection Results

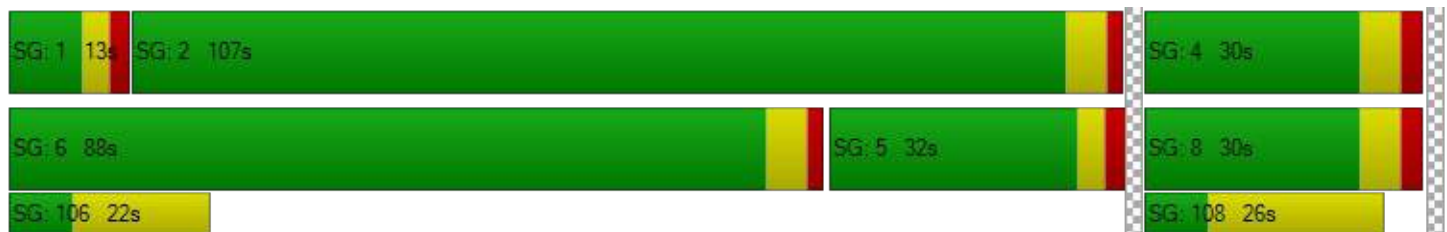
d_M, Delay for Movement [s/veh]	50.84	3.33	2.66	103.76	36.92	17.45	70.80	54.29	54.29	60.70	56.50	56.50
Movement LOS	D	A	A	F	D	B	E	D	D	E	E	E
d_A, Approach Delay [s/veh]	14.33			39.49			67.34			58.43		
Approach LOS	B			D			E			E		
d_I, Intersection Delay [s/veh]	36.58											
Intersection LOS	D											
Intersection V/C	0.616											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			64.40			64.40			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.079			3.031			0.000		
Crosswalk LOS	F			C			C			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1347			1093			313			313		
d_b, Bicycle Delay [s]	8.00			15.41			53.34			53.34		
I_b,int, Bicycle LOS Score for Intersection	2.344			2.528			2.400			2.966		
Bicycle LOS	B			B			B			C		

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 92.9
Level Of Service: F
Volume to Capacity (v/c): 1.096

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.03	1.03	1.03	1.03	1.03	1.03
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	26	27	21	21	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	620	249	255	504	6
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	155	62	64	126	2
Total Analysis Volume [veh/h]	9	620	249	255	504	6
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	1.10	0.24	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	33.03	92.92	9.49	0.00	0.00	0.00
Movement LOS	D	F	A	A	A	A
95th-Percentile Queue Length [veh]	0.21	19.01	0.92	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	5.19	475.13	23.10	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	92.06		4.69		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	36.68					
Intersection LOS	F					

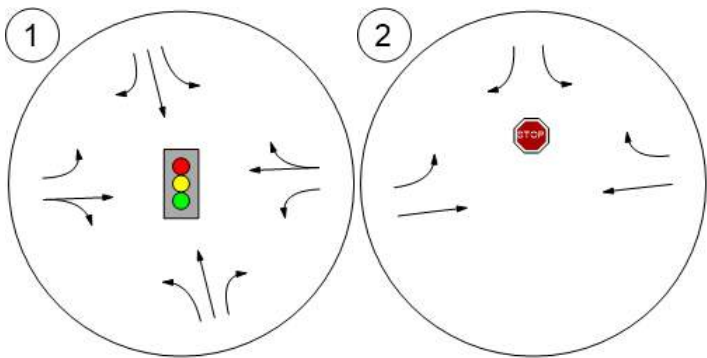
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Lane Configuration and Traffic Control



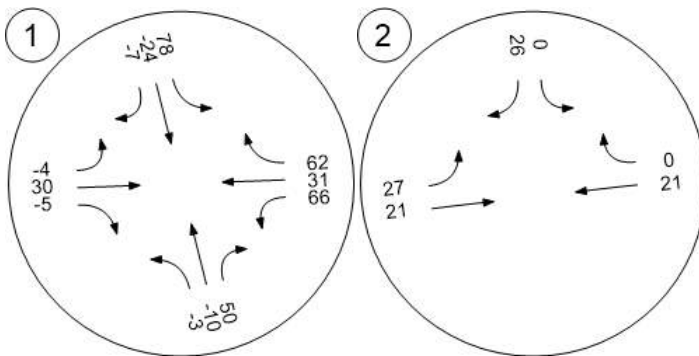
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Traffic Volume - Net New Site Trips



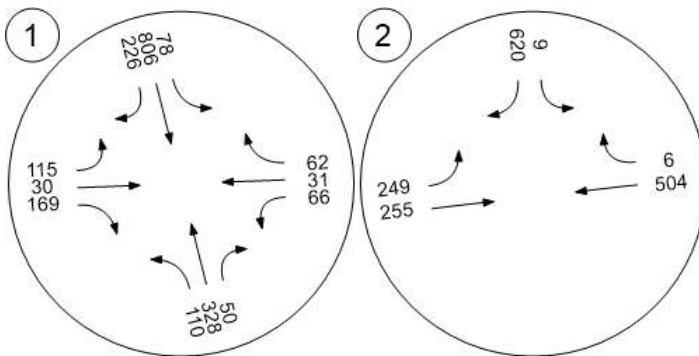
Appendix H - Capacity Analysis Backup

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Traffic Volume - Future Total Volume



Appendix H - Capacity Analysis Backup

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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 7 AM 2040 No-Build

Report File: C:\...\AM 2040 No-Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.967	53.0	D
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Left	0.654	3,118.3	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	53.0
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.967

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	0	1	1	0
Pocket Length [ft]	100.00	275.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	146	1015	181	106	201	83
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	67	0	53
Total Hourly Volume [veh/h]	184	1279	228	67	253	52
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	53	372	66	19	74	15
Total Analysis Volume [veh/h]	214	1487	265	78	294	60
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Westgate Development

Scenario 7: 7 AM 2040 No-Build

Traffic Impact Study

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Westgate Development

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	40	105	73	0	30	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	45	111	79	0	36	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	143	143	143	143	143	143
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	27	105	73	73	26	26
g / C, Green / Cycle	0.19	0.73	0.51	0.51	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.12	0.80	0.14	0.05	0.17	0.04
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	328	1360	944	809	320	281
d1, Uniform Delay [s]	49.41	1.63	20.16	18.17	57.76	50.15
k, delay calibration	0.11	0.50	0.50	0.50	0.25	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.18	54.21	0.74	0.24	20.46	0.37
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.65	1.09	0.28	0.10	0.92	0.21
d, Delay for Lane Group [s/veh]	51.59	55.84	20.90	18.41	78.22	50.52
Lane Group LOS	D	F	C	B	E	D
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	6.49	21.28	5.13	1.36	12.06	1.84
50th-Percentile Queue Length [ft]	162.34	531.89	128.20	34.05	301.61	46.10
95th-Percentile Queue Length [veh]	10.67	31.06	8.84	2.45	17.76	3.32
95th-Percentile Queue Length [ft]	266.81	776.47	221.04	61.30	444.01	82.99

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.59	55.84	20.90	18.41	78.22	50.52
Movement LOS	D	F	C	B	E	D
d_A, Approach Delay [s/veh]	55.31		20.34		73.53	
Approach LOS	E		C		E	
d_I, Intersection Delay [s/veh]	53.00					
Intersection LOS	D					
Intersection V/C	0.967					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	69.38	69.38
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.549	2.416
Crosswalk LOS	F	D	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	80.00	80.00	80.00
I_b,int, Bicycle LOS Score for Intersection	6.877	3.858	4.024
Bicycle LOS	F	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 3,118.3
Level Of Service: F
Volume to Capacity (v/c): 0.654

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	140	1009	561	214	5
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	39	283	158	60	1
Total Analysis Volume [veh/h]	1	157	1134	630	240	6
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.65	0.20	0.86	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	3118.27	10.63	21.79	0.00	0.00	0.00
Movement LOS	F	B	C	A	A	A
95th-Percentile Queue Length [veh]	0.58	0.73	12.24	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	14.51	18.25	305.90	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	30.30		14.01		0.00	
Approach LOS	D		B		A	
d_I, Intersection Delay [s/veh]	13.60					
Intersection LOS	F					

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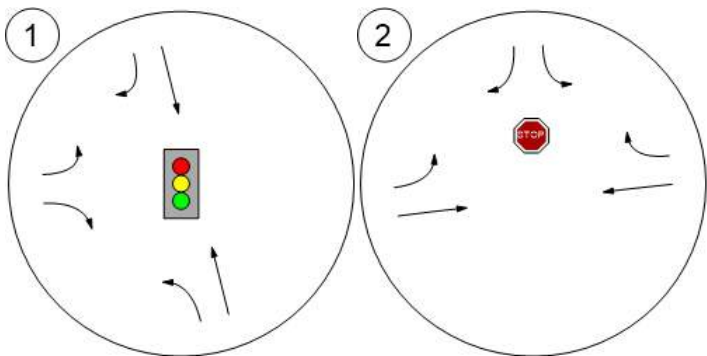


Lane Configuration and Traffic Control

②



①



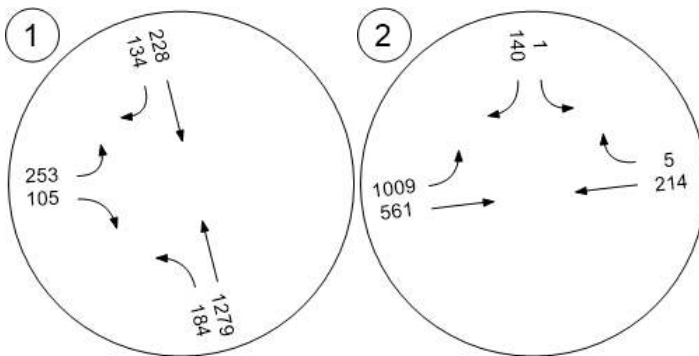
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Traffic Volume - Future Total Volume



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Vistro File: C:\...\Westgate Vistro.vistro

Scenario 8 PM 2040 No-Build

Report File: C:\...\PM 2040 No-Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.747	27.7	C
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Right	1.440	231.0	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type:	Signalized	Delay (sec / veh):	27.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.747

Intersection Setup

Name	MN 3		MN 3		CSAH 30	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	0	1	1	0
Pocket Length [ft]	100.00	275.00	100.00	150.00	175.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		Yes	
Crosswalk	No		Yes		Yes	

Volumes

Name	MN 3		MN 3		CSAH 30	
Base Volume Input [veh/h]	110	328	806	226	116	169
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	3.00	2.00	2.00	4.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	118	0	107
Total Hourly Volume [veh/h]	139	413	1016	167	146	106
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	37	109	267	44	38	28
Total Analysis Volume [veh/h]	146	435	1069	176	154	112
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

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Scenario 8: 8 PM 2040 No-Build

Traffic Impact Study

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Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Permissive
Signal group	5	2	6	0	4	0
Auxiliary Signal Groups						
Lead / Lag	Lag	-	-	-	Lead	-
Minimum Green [s]	7	15	15	0	7	0
Maximum Green [s]	27	101	82	0	24	0
Amber [s]	3.0	4.5	4.5	0.0	4.5	0.0
All red [s]	2.0	1.5	1.5	0.0	2.0	0.0
Split [s]	32	107	88	0	30	0
Vehicle Extension [s]	3.0	5.0	5.0	0.0	3.0	0.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	20	15	0	19	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	4.0	0.0	4.5	0.0
Minimum Recall	No	No	No		No	
Maximum Recall	No	Yes	Yes		No	
Pedestrian Recall	No	No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	127	127	127	127	127	127
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	6.00	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	4.00	4.50	4.50
g_i, Effective Green Time [s]	14	101	82	82	13	13
g / C, Green / Cycle	0.11	0.80	0.65	0.65	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.08	0.23	0.58	0.11	0.09	0.07
s, saturation flow rate [veh/h]	1738	1855	1855	1589	1781	1564
c, Capacity [veh/h]	193	1477	1198	1027	187	165
d1, Uniform Delay [s]	52.43	0.00	18.79	8.95	55.63	54.74
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.93	0.51	10.27	0.36	8.62	4.86
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.76	0.29	0.89	0.17	0.82	0.68
d, Delay for Lane Group [s/veh]	58.37	0.51	29.07	9.32	64.25	59.60
Lane Group LOS	E	A	C	A	E	E
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh]	4.47	0.21	25.85	1.86	5.16	3.60
50th-Percentile Queue Length [ft]	111.87	5.21	646.34	46.58	129.12	89.94
95th-Percentile Queue Length [veh]	7.94	0.38	34.19	3.35	8.89	6.48
95th-Percentile Queue Length [ft]	198.60	9.38	854.81	83.85	222.30	161.88

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

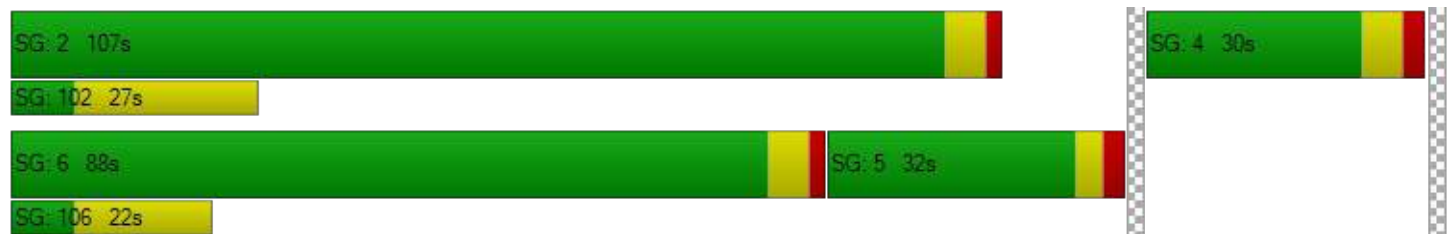
d_M, Delay for Movement [s/veh]	58.37	0.51	29.07	9.32	64.25	59.60
Movement LOS	E	A	C	A	E	E
d_A, Approach Delay [s/veh]	15.05		26.28		62.29	
Approach LOS	B		C		E	
d_I, Intersection Delay [s/veh]	27.74					
Intersection LOS	C					
Intersection V/C	0.747					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	64.40
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.303	2.513
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	75.00	75.00	75.00
I_b,int, Bicycle LOS Score for Intersection	5.029	5.431	4.024
Bicycle LOS	F	F	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type:	Two-way stop	Delay (sec / veh):	231.0
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.440

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	727	272	286	591	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	182	68	72	148	2
Total Analysis Volume [veh/h]	11	727	272	286	591	8
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	1.44	0.28	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	44.16	231.05	10.13	0.00	0.00	0.00
Movement LOS	E	F	B	A	A	A
95th-Percentile Queue Length [veh]	0.35	35.44	1.15	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	8.72	886.06	28.72	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	228.26		4.94		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	90.35					
Intersection LOS	F					

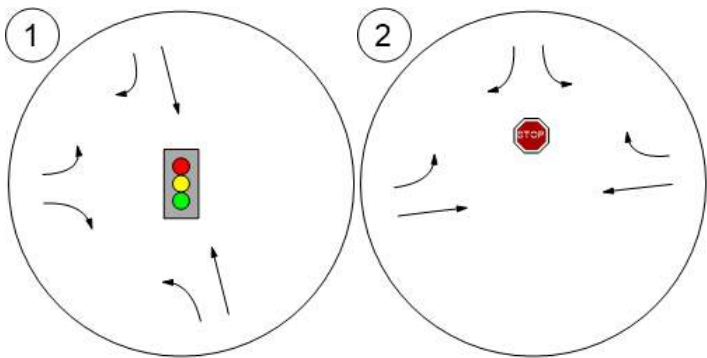
Appendix H - Capacity Analysis Backup

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Lane Configuration and Traffic Control



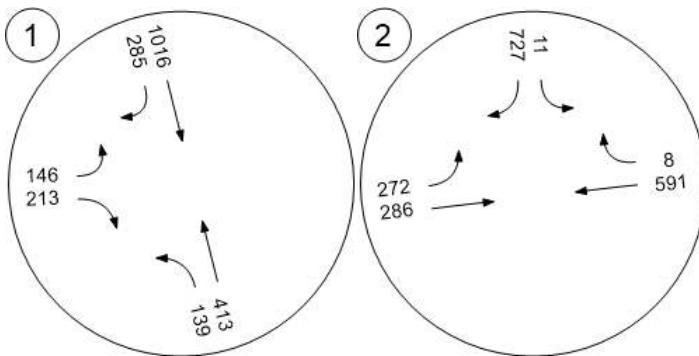
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Traffic Volume - Future Total Volume



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 9 AM 2040 Build

Report File: C:\...\AM 2040 Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	1.036	98.8	F
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Left	1.013	4,941.9	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 98.8
Level Of Service: F
Volume to Capacity (v/c): 1.036

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	146	1015	0	0	181	106	201	0	83	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	30	39	0	0	0	17	0	32	18	41
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-25	28	7	-4	-3	-5	7	-2	6	6	30
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	18	0	0	66	0	0	26	0	0	18
Total Hourly Volume [veh/h]	181	1254	40	46	224	65	248	24	77	38	24	53
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	53	365	12	13	65	19	72	7	22	11	7	15
Total Analysis Volume [veh/h]	210	1458	47	53	260	76	288	28	90	44	28	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	15	0	7	15	0	0	7	0	0	7	0
Maximum Green [s]	40	105	0	8	73	0	0	30	0	0	30	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	0.0	4.5	0.0	0.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	45	111	0	13	79	0	0	36	0	0	36	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	4.5	0.0	0.0	4.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	159	159	159	159	159	159	159	159	159	159
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	4.50	4.50	4.50	4.50
g_i, Effective Green Time [s]	38	105	105	6	73	73	30	30	30	30
g / C, Green / Cycle	0.24	0.66	0.66	0.04	0.46	0.46	0.19	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.12	0.79	0.03	0.03	0.14	0.05	0.22	0.07	0.03	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1306	1648	1274	1667
c, Capacity [veh/h]	420	1225	1050	72	852	730	215	311	190	315
d1, Uniform Delay [s]	46.08	9.47	3.25	75.41	27.02	24.40	71.30	56.33	64.63	55.28
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.50	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.92	93.76	0.08	13.46	0.93	0.29	179.88	0.76	0.61	0.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	1.19	0.04	0.74	0.31	0.10	1.34	0.38	0.23	0.29
d, Delay for Lane Group [s/veh]	47.00	103.23	3.33	88.87	27.94	24.68	251.18	57.09	65.24	55.78
Lane Group LOS	D	F	A	F	C	C	F	E	E	E
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	No
50th-Percentile Queue Length [veh]	6.30	38.03	0.21	2.39	6.35	1.68	19.49	4.16	1.68	3.17
50th-Percentile Queue Length [ft]	157.62	950.85	5.14	59.72	158.86	41.94	487.34	104.07	42.08	79.37
95th-Percentile Queue Length [veh]	10.42	55.23	0.37	4.30	10.49	3.02	30.46	7.49	3.03	5.71
95th-Percentile Queue Length [ft]	260.57	1380.65	9.25	107.50	262.21	75.49	761.60	187.33	75.74	142.86

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

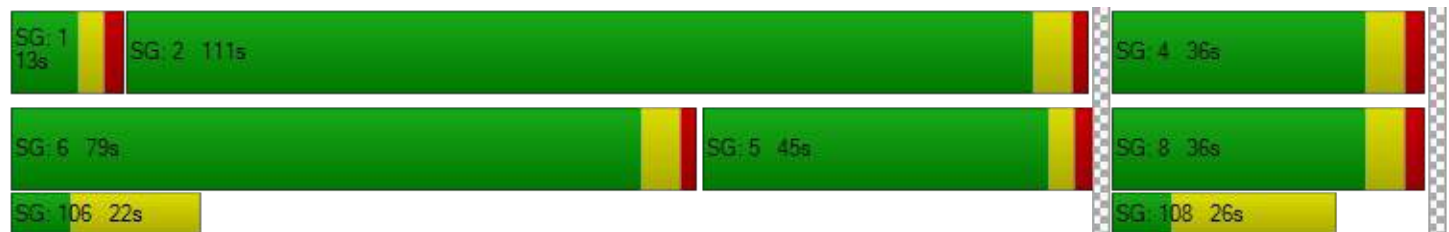
d_M, Delay for Movement [s/veh]	47.00	103.23	3.33	88.87	27.94	24.68	251.18	57.09	57.09	65.24	55.78	55.78
Movement LOS	D	F	A	F	C	C	F	E	E	E	E	E
d_A, Approach Delay [s/veh]	93.61			35.61			194.77			58.88		
Approach LOS	F			D			F			E		
d_I, Intersection Delay [s/veh]	98.85											
Intersection LOS	F											
Intersection V/C	1.036											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	69.38	69.38	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	3.496	2.400	0.000
Crosswalk LOS	F	C	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1313	913	369	369
d_b, Bicycle Delay [s]	9.45	23.65	53.22	53.22
I_b,int, Bicycle LOS Score for Intersection	4.357	1.360	2.164	2.943
Bicycle LOS	E	A	B	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 4,941.9
Level Of Service: F
Volume to Capacity (v/c): 1.013

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	22	23	18	17	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	162	1032	579	231	5
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	46	290	163	65	1
Total Analysis Volume [veh/h]	1	182	1160	651	260	6
Pedestrian Volume [ped/h]	0		0		0	

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.01	0.23	0.90	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	4941.86	11.05	25.46	0.00	0.00	0.00
Movement LOS	F	B	D	A	A	A
95th-Percentile Queue Length [veh]	0.61	0.91	14.18	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	15.33	22.69	354.38	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	38.00		16.31		0.00	
Approach LOS	E		C		A	
d_I, Intersection Delay [s/veh]	16.15					
Intersection LOS	F					

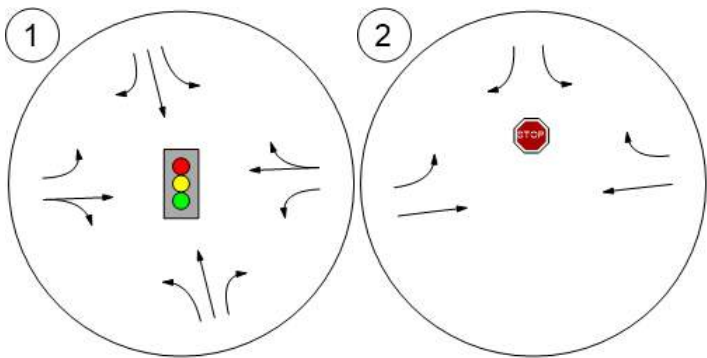
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Lane Configuration and Traffic Control



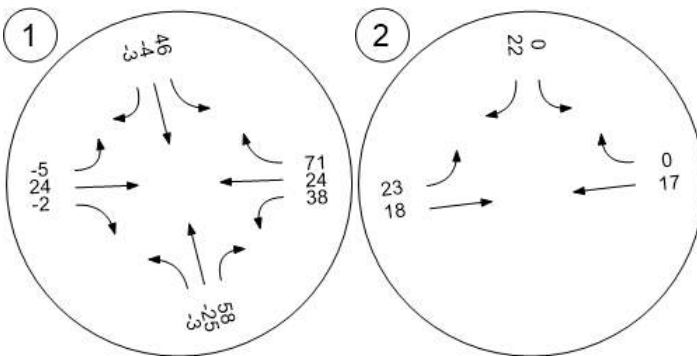
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Traffic Volume - Net New Site Trips



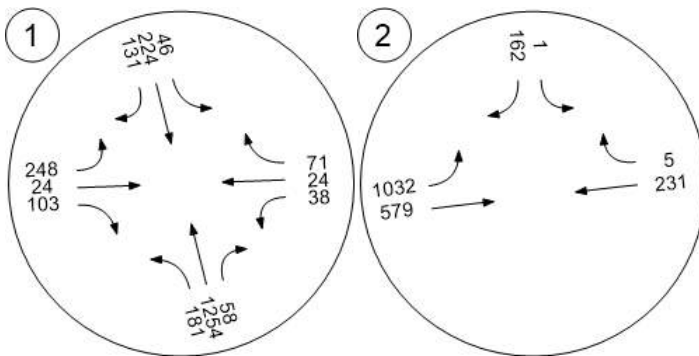
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Traffic Volume - Future Total Volume



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 10 PM 2040 Build

Report File: C:\...\PM 2040 Build.pdf

3/19/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	SB Left	0.765	54.7	D
2	MN 3 & MN 149	Two-way stop	HCM 6th Edition	SB Right	1.533	271.6	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 54.7
Level Of Service: D
Volume to Capacity (v/c): 0.765

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	110	328	0	0	806	226	116	0	169	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	37	47	0	0	0	21	0	37	21	48
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-10	13	31	-24	-7	-4	9	-5	29	10	14
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	14	0	0	115	0	0	52	0	0	16
Total Hourly Volume [veh/h]	136	403	36	78	992	163	142	30	156	66	31	46
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	36	106	9	21	261	43	37	8	41	17	8	12
Total Analysis Volume [veh/h]	143	424	38	82	1044	172	149	32	164	69	33	48
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	7	15	0	7	15	0	0	7	0	0	7	0
Maximum Green [s]	27	101	0	8	82	0	0	24	0	0	24	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	0.0	4.5	0.0	0.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	32	107	0	13	88	0	0	30	0	0	30	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	4.5	0.0	0.0	4.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	151	151	151	151	151	151	151	151	151	151
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	4.50	4.50	4.50	4.50
g_i, Effective Green Time [s]	27	101	101	8	82	82	24	24	24	24
g / C, Green / Cycle	0.18	0.67	0.67	0.05	0.54	0.54	0.16	0.16	0.16	0.16
(v / s)_i Volume / Saturation Flow Rate	0.08	0.23	0.02	0.05	0.56	0.11	0.11	0.12	0.06	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1317	1629	1186	1693
c, Capacity [veh/h]	312	1245	1067	95	1011	866	187	260	89	270
d1, Uniform Delay [s]	51.00	2.88	2.62	70.72	34.25	17.48	67.82	60.43	73.68	55.84
k, delay calibration	0.11	0.50	0.50	0.21	0.50	0.50	0.18	0.21	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.05	0.75	0.06	33.28	37.13	0.51	12.26	8.46	13.19	0.62
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.34	0.04	0.87	1.03	0.20	0.80	0.75	0.77	0.30
d, Delay for Lane Group [s/veh]	52.06	3.62	2.69	104.00	71.38	17.99	80.09	68.89	86.87	56.45
Lane Group LOS	D	A	A	F	F	B	F	E	F	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh]	4.44	1.68	0.14	3.97	44.76	3.11	6.32	7.65	3.01	2.79
50th-Percentile Queue Length [ft]	110.95	42.03	3.44	99.28	1119.00	77.65	157.99	191.13	75.31	69.75
95th-Percentile Queue Length [veh]	7.89	3.03	0.25	7.15	57.31	5.59	10.44	12.18	5.42	5.02
95th-Percentile Queue Length [ft]	197.32	75.65	6.19	178.70	1432.78	139.77	261.06	304.49	135.56	125.56

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

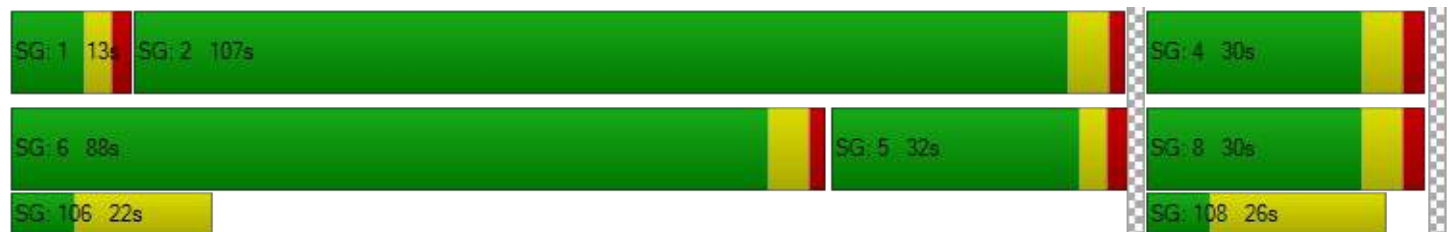
d_M, Delay for Movement [s/veh]	52.06	3.62	2.69	104.00	71.38	17.99	80.09	68.89	68.89	86.87	56.45	56.45
Movement LOS	D	A	A	F	F	B	F	E	E	F	E	E
d_A, Approach Delay [s/veh]	15.01			66.37			73.73			70.44		
Approach LOS	B			E			E			E		
d_I, Intersection Delay [s/veh]	54.72											
Intersection LOS	D											
Intersection V/C	0.765											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			64.40			64.40			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.280			2.458			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1347			1093			313			313		
d_b, Bicycle Delay [s]	8.00			15.41			53.34			53.34		
I_b,int, Bicycle LOS Score for Intersection	2.519			2.940			2.107			2.966		
Bicycle LOS	B			C			B			C		

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Two-way stop
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 271.6
Level Of Service: F
Volume to Capacity (v/c): 1.533

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	26	27	21	21	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	753	299	307	612	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	188	75	77	153	2
Total Analysis Volume [veh/h]	11	753	299	307	612	8
Pedestrian Volume [ped/h]	0		0		0	

Appendix H - Capacity Analysis Backup

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Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.13	1.53	0.31	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	53.23	271.55	10.47	0.00	0.00	0.00
Movement LOS	F	F	B	A	A	A
95th-Percentile Queue Length [veh]	0.42	39.81	1.34	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	10.59	995.20	33.60	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	268.41		5.17		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	104.62					
Intersection LOS	F					

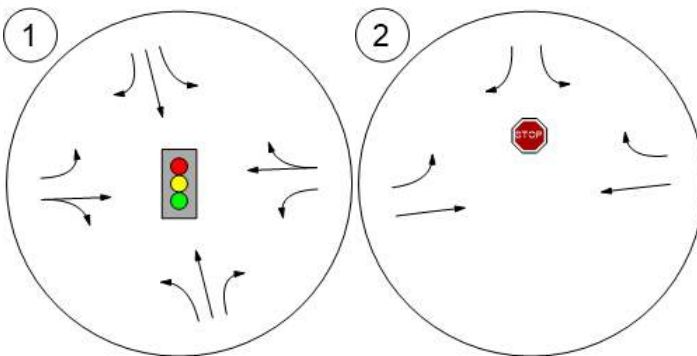
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Lane Configuration and Traffic Control



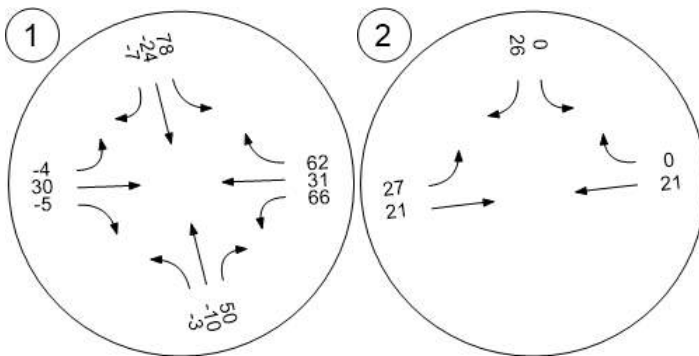
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Traffic Volume - Net New Site Trips



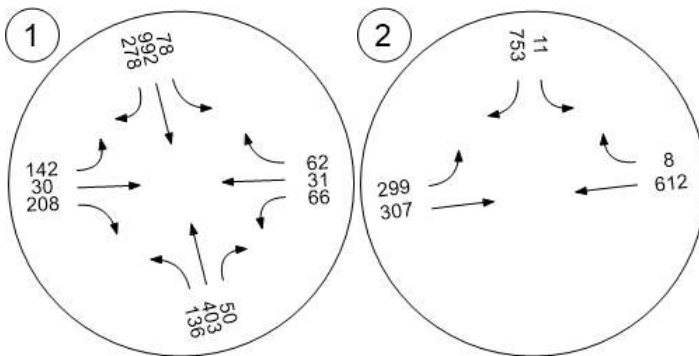
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Traffic Volume - Future Total Volume



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 11 AM 2040 Build - Mitigation

Report File: C:\...\11 - AM 2040 Build - Mitigation, Pm-Pt at
TH 3-CSAH 30.pdf

3/23/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.996	85.9	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 85.9
Level Of Service: F
Volume to Capacity (v/c): 0.996

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	146	1015	0	0	181	106	201	0	83	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	30	39	0	0	0	17	0	32	18	41
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-25	28	7	-4	-3	-5	7	-2	6	6	30
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	18	0	0	66	0	0	26	0	0	18
Total Hourly Volume [veh/h]	181	1254	40	46	224	65	248	24	77	38	24	53
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	53	365	12	13	65	19	72	7	22	11	7	15
Total Analysis Volume [veh/h]	210	1458	47	53	260	76	288	28	90	44	28	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal group	5	2	0	1	6	0	7	4	0	3	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	7	15	0	7	15	0	5	7	0	5	7	0
Maximum Green [s]	40	105	0	8	73	0	15	10	0	15	10	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Split [s]	45	111	0	13	79	0	20	16	0	20	16	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	Yes		No	Yes		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	159	159	159	159	159	159	159	159	159	159
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	0.00	4.50	0.00	4.50
g_i, Effective Green Time [s]	38	105	105	6	73	73	30	20	30	10
g / C, Green / Cycle	0.24	0.66	0.66	0.04	0.46	0.46	0.19	0.13	0.19	0.06
(v / s)_i Volume / Saturation Flow Rate	0.12	0.79	0.03	0.03	0.14	0.05	0.18	0.07	0.03	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1591	1648	1404	1667
c, Capacity [veh/h]	420	1226	1051	71	852	730	298	211	243	105
d1, Uniform Delay [s]	46.11	9.43	3.23	75.45	26.98	24.37	71.20	65.09	53.99	73.72
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.50	0.33	0.11	0.18
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.92	93.51	0.08	14.14	0.92	0.29	43.99	6.97	0.35	26.30
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	1.19	0.04	0.74	0.31	0.10	0.97	0.56	0.18	0.86
d, Delay for Lane Group [s/veh]	47.04	102.94	3.31	89.58	27.91	24.65	115.19	72.06	54.35	100.02
Lane Group LOS	D	F	A	F	C	C	F	E	D	F
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh]	6.31	37.95	0.21	2.40	6.35	1.68	14.72	4.84	1.51	4.43
50th-Percentile Queue Length [ft]	157.65	948.76	5.13	59.97	158.77	41.92	367.90	121.08	37.71	110.64
95th-Percentile Queue Length [veh]	10.42	55.10	0.37	4.32	10.48	3.02	21.01	8.45	2.72	7.88
95th-Percentile Queue Length [ft]	260.61	1377.45	9.23	107.95	262.10	75.45	525.19	211.31	67.88	196.89

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Movement, Approach, & Intersection Results

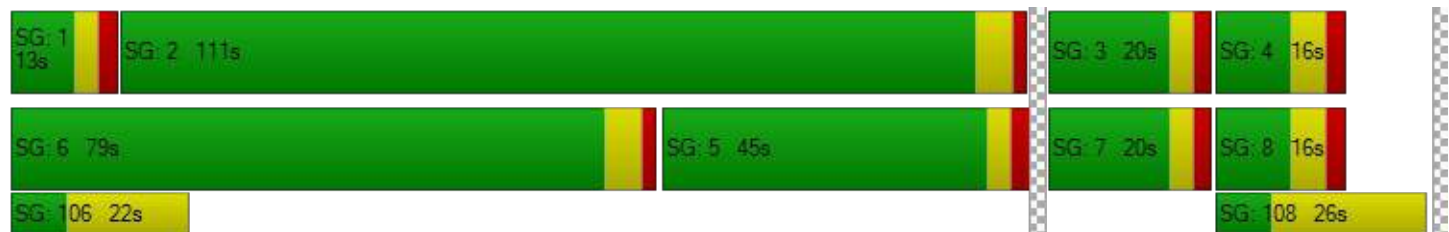
d_M, Delay for Movement [s/veh]	47.04	102.94	3.31	89.58	27.91	24.65	115.19	72.06	72.06	54.35	100.02	100.02
Movement LOS	D	F	A	F	C	C	F	E	E	D	F	F
d_A, Approach Delay [s/veh]	93.36			35.67			102.66			85.02		
Approach LOS	F			D			F			F		
d_I, Intersection Delay [s/veh]	85.88											
Intersection LOS	F											
Intersection V/C	0.996											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			69.38			69.38			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.179			2.400			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1313			913			119			119		
d_b, Bicycle Delay [s]	9.45			23.65			70.78			70.78		
I_b,int, Bicycle LOS Score for Intersection	4.357			1.360			2.164			2.943		
Bicycle LOS	E			A			B			C		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



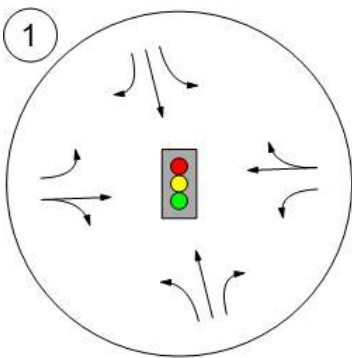
Appendix H - Capacity Analysis Backup

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Lane Configuration and Traffic Control



Appendix H - Capacity Analysis Backup

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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 12 PM 2040 Build - Mitigation

Report File: C:\...\12 - PM 2040 Build - Mitigation, Pm-Pt at
TH 3-CSAH 30.pdf

3/23/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Right	0.800	69.1	E

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 69.1
Level Of Service: E
Volume to Capacity (v/c): 0.800

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	110	328	0	0	806	226	116	0	169	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	37	47	0	0	0	21	0	37	21	48
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-10	13	31	-24	-7	-4	9	-5	29	10	14
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	14	0	0	115	0	0	52	0	0	16
Total Hourly Volume [veh/h]	136	403	36	78	992	163	142	30	156	66	31	46
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	36	106	9	21	261	43	37	8	41	17	8	12
Total Analysis Volume [veh/h]	143	424	38	82	1044	172	149	32	164	69	33	48
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Westgate Development

Scenario 12: 12 PM 2040 Build - Mitigation
Traffic Impact Study

Scenario 12: 12 PM 2040 Build - Mitigation
H102

Westgate Development

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal group	5	2	0	1	6	0	7	4	0	3	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	7	15	0	7	15	0	5	7	0	5	7	0
Maximum Green [s]	27	101	0	8	82	0	15	10	0	15	10	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Split [s]	32	107	0	13	88	0	20	16	0	20	16	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	Yes		No	Yes		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Version 5.00-00



Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	154	154	154	154	154	154	154	154	154	154
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	0.00	4.50	0.00	4.50
g_i, Effective Green Time [s]	27	101	101	8	82	82	28	16	28	9
g / C, Green / Cycle	0.18	0.66	0.66	0.05	0.53	0.53	0.18	0.10	0.18	0.06
(v / s)_i Volume / Saturation Flow Rate	0.08	0.23	0.02	0.05	0.56	0.11	0.09	0.12	0.05	0.05
s, saturation flow rate [veh/h]	1738	1855	1589	1781	1855	1589	1596	1629	1400	1693
c, Capacity [veh/h]	304	1215	1041	92	987	845	294	166	201	99
d1, Uniform Delay [s]	52.92	3.77	3.39	72.63	36.08	18.94	56.83	69.21	54.82	71.72
k, delay calibration	0.11	0.50	0.50	0.22	0.50	0.50	0.49	0.50	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.13	0.79	0.07	38.62	45.31	0.54	6.03	125.72	1.00	15.40
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.47	0.35	0.04	0.89	1.06	0.20	0.51	1.18	0.34	0.81
d, Delay for Lane Group [s/veh]	54.04	4.56	3.46	111.26	81.39	19.48	62.86	194.93	55.83	87.12
Lane Group LOS	D	A	A	F	F	B	E	F	E	F
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	4.60	2.09	0.17	4.17	47.14	3.30	5.63	12.27	2.37	3.61
50th-Percentile Queue Length [ft]	114.94	52.17	4.24	104.36	1178.40	82.60	140.68	306.78	59.28	90.22
95th-Percentile Queue Length [veh]	8.11	3.76	0.31	7.51	61.23	5.95	9.52	19.19	4.27	6.50
95th-Percentile Queue Length [ft]	202.85	93.91	7.64	187.84	1530.80	148.68	237.94	479.67	106.71	162.39

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	54.04	4.56	3.46	111.26	81.39	19.48	62.86	194.93	194.93	55.83	87.12	87.12
Movement LOS	D	A	A	F	F	B	E	F	F	E	F	F
d_A, Approach Delay [s/veh]	16.19			75.08			137.89			72.73		
Approach LOS	B			E			F			E		
d_I, Intersection Delay [s/veh]	69.11											
Intersection LOS	E											
Intersection V/C	0.800											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			64.40			64.40			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.103			2.458			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1347			1093			127			127		
d_b, Bicycle Delay [s]	8.00			15.41			65.80			65.80		
I_b,int, Bicycle LOS Score for Intersection	2.519			2.940			2.107			2.966		
Bicycle LOS	B			C			B			C		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



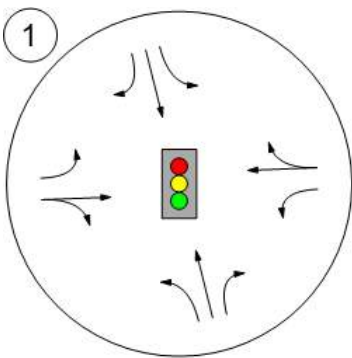
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Lane Configuration and Traffic Control



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 11 AM 2040 Build - Mitigation

Report File: C:\...\AM 2040 Build - Mitigation, Pm-Pt and
added lanes at TH 3-CSAH 30.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Left	0.622	31.9	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 31.9
Level Of Service: C
Volume to Capacity (v/c): 0.622

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	146	1015	0	0	181	106	201	0	83	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	30	39	0	0	0	17	0	32	18	41
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-25	28	7	-4	-3	-5	7	-2	6	6	30
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	18	0	0	66	0	0	26	0	0	18
Total Hourly Volume [veh/h]	181	1254	40	46	224	65	248	24	77	38	24	53
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	53	365	12	13	65	19	72	7	22	11	7	15
Total Analysis Volume [veh/h]	210	1458	47	53	260	76	288	28	90	44	28	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Version 5.00-00



Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal group	5	2	0	1	6	0	7	4	0	3	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	7	15	0	7	15	0	5	7	0	5	7	0
Maximum Green [s]	40	105	0	8	73	0	15	10	0	15	10	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Split [s]	45	111	0	13	79	0	20	16	0	20	16	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	Yes		No	Yes		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	159	159	159	159	159	159	159	159	159	159
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	0.00	4.50	0.00	4.50
g_i, Effective Green Time [s]	38	105	105	6	73	73	30	20	30	10
g / C, Green / Cycle	0.24	0.66	0.66	0.04	0.46	0.46	0.19	0.13	0.19	0.06
(v / s)_i Volume / Saturation Flow Rate	0.12	0.41	0.03	0.03	0.07	0.05	0.18	0.07	0.03	0.05
s, saturation flow rate [veh/h]	1738	3532	1589	1781	3532	1589	1591	1648	1404	1667
c, Capacity [veh/h]	420	2335	1051	71	1623	730	298	211	243	105
d1, Uniform Delay [s]	46.11	4.22	3.23	75.45	25.04	24.37	71.20	65.09	53.99	73.72
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.50	0.33	0.11	0.18
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.92	1.27	0.08	14.14	0.21	0.29	43.99	6.97	0.35	26.30
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.62	0.04	0.74	0.16	0.10	0.97	0.56	0.18	0.86
d, Delay for Lane Group [s/veh]	47.04	5.50	3.31	89.58	25.26	24.65	115.19	72.06	54.35	100.02
Lane Group LOS	D	A	A	F	C	C	F	E	D	F
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh]	6.31	3.67	0.21	2.40	2.89	1.68	14.72	4.84	1.51	4.43
50th-Percentile Queue Length [ft]	157.65	91.82	5.13	59.97	72.34	41.92	367.90	121.08	37.71	110.64
95th-Percentile Queue Length [veh]	10.42	6.61	0.37	4.32	5.21	3.02	21.01	8.45	2.72	7.88
95th-Percentile Queue Length [ft]	260.61	165.28	9.23	107.95	130.20	75.45	525.19	211.31	67.88	196.89

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Movement, Approach, & Intersection Results

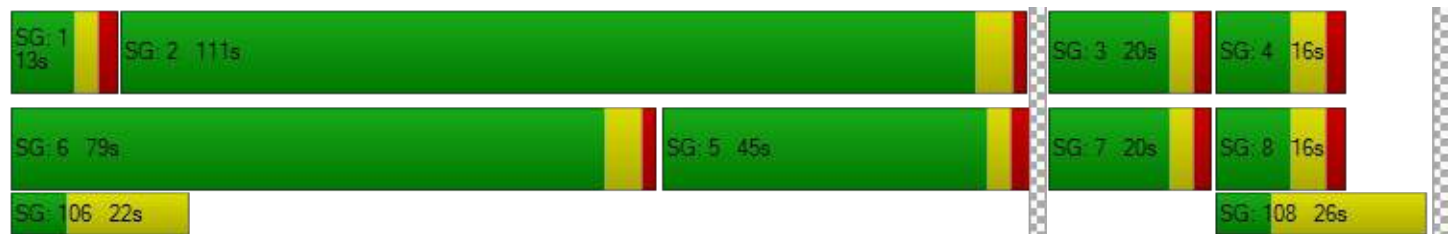
d_M, Delay for Movement [s/veh]	47.04	5.50	3.31	89.58	25.26	24.65	115.19	72.06	72.06	54.35	100.02	100.02
Movement LOS	D	A	A	F	C	C	F	E	E	D	F	F
d_A, Approach Delay [s/veh]	10.52			33.90			102.66			85.02		
Approach LOS	B			C			F			F		
d_I, Intersection Delay [s/veh]	31.89											
Intersection LOS	C											
Intersection V/C	0.622											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			69.38			69.38			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.221			2.400			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1313			913			119			119		
d_b, Bicycle Delay [s]	9.45			23.65			70.78			70.78		
I_b,int, Bicycle LOS Score for Intersection	2.927			0.984			2.164			2.943		
Bicycle LOS	C			A			B			C		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



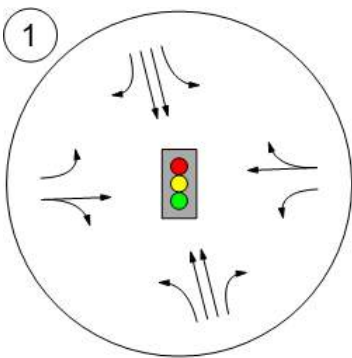
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Lane Configuration and Traffic Control



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 12 PM 2040 Build - Mitigation

Report File: C:\...\PM 2040 Build - Mitigation, Pm-Pt and
added lanes at TH 3-CSAH 30.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Signalized	HCM 6th Edition	EB Right	0.532	44.5	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Signalized
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 44.5
Level Of Service: D
Volume to Capacity (v/c): 0.532

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	1	1	0	0	0	0	0
Pocket Length [ft]	275.00	100.00	275.00	150.00	100.00	150.00	175.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			Yes			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	110	328	0	0	806	226	116	0	169	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	37	47	0	0	0	21	0	37	21	48
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-10	13	31	-24	-7	-4	9	-5	29	10	14
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	14	0	0	115	0	0	52	0	0	16
Total Hourly Volume [veh/h]	136	403	36	78	992	163	142	30	156	66	31	46
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	36	106	9	21	261	43	37	8	41	17	8	12
Total Analysis Volume [veh/h]	143	424	38	82	1044	172	149	32	164	69	33	48
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal group	5	2	0	1	6	0	7	4	0	3	8	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	7	15	0	7	15	0	5	7	0	5	7	0
Maximum Green [s]	27	101	0	8	82	0	15	10	0	15	10	0
Amber [s]	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	2.0	1.5	0.0	2.0	1.5	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Split [s]	32	107	0	13	88	0	20	16	0	20	16	0
Vehicle Extension [s]	3.0	5.0	0.0	3.0	5.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	20	0	0	15	0	0	19	0	0	19	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	3.0	4.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	Yes		No	Yes		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	L	C
C, Cycle Length [s]	154	154	154	154	154	154	154	154	154	154
L, Total Lost Time per Cycle [s]	5.00	6.00	6.00	5.00	6.00	6.00	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	4.00	4.00	3.00	4.00	4.00	0.00	4.50	0.00	4.50
g_i, Effective Green Time [s]	27	101	101	8	82	82	28	16	28	9
g / C, Green / Cycle	0.18	0.66	0.66	0.05	0.53	0.53	0.18	0.10	0.18	0.06
(v / s)_i Volume / Saturation Flow Rate	0.08	0.12	0.02	0.05	0.30	0.11	0.09	0.12	0.05	0.05
s, saturation flow rate [veh/h]	1738	3532	1589	1781	3532	1589	1596	1629	1400	1693
c, Capacity [veh/h]	304	2314	1041	92	1879	845	294	166	201	99
d1, Uniform Delay [s]	52.92	3.54	3.39	72.63	23.98	18.94	56.83	69.21	54.82	71.72
k, delay calibration	0.11	0.50	0.50	0.22	0.50	0.50	0.49	0.50	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.13	0.17	0.07	38.62	1.19	0.54	6.03	125.72	1.00	15.40
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.47	0.18	0.04	0.89	0.56	0.20	0.51	1.18	0.34	0.81
d, Delay for Lane Group [s/veh]	54.04	3.71	3.46	111.26	25.17	19.48	62.86	194.93	55.83	87.12
Lane Group LOS	D	A	A	F	C	B	E	F	E	F
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	4.60	0.93	0.17	4.17	12.52	3.30	5.63	12.27	2.37	3.61
50th-Percentile Queue Length [ft]	114.94	23.20	4.24	104.36	312.90	82.60	140.68	306.78	59.28	90.22
95th-Percentile Queue Length [veh]	8.11	1.67	0.31	7.51	18.32	5.95	9.52	19.19	4.27	6.50
95th-Percentile Queue Length [ft]	202.85	41.77	7.64	187.84	457.95	148.68	237.94	479.67	106.71	162.39

Appendix H - Capacity Analysis Backup

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	54.04	3.71	3.46	111.26	25.17	19.48	62.86	194.93	194.93	55.83	87.12	87.12
Movement LOS	D	A	A	F	C	B	E	F	F	E	F	F
d_A, Approach Delay [s/veh]	15.59			29.85			137.89			72.73		
Approach LOS	B			C			F			E		
d_I, Intersection Delay [s/veh]	44.48											
Intersection LOS	D											
Intersection V/C	0.532											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0			11.0			11.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	0.00			64.40			64.40			0.00		
I_p,int, Pedestrian LOS Score for Intersection	0.000			3.156			2.458			0.000		
Crosswalk LOS	F			C			B			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1347			1093			127			127		
d_b, Bicycle Delay [s]	8.00			15.41			65.80			65.80		
I_b,int, Bicycle LOS Score for Intersection	2.008			1.775			2.107			2.966		
Bicycle LOS	B			A			B			C		

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



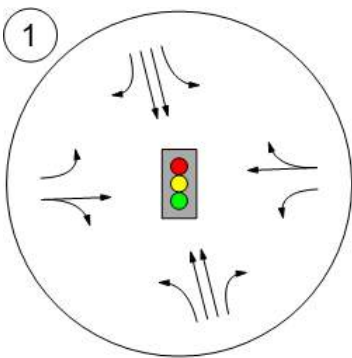
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Lane Configuration and Traffic Control



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 13 AM 2040 Build - Mitigation 2

Report File: C:\...\15 - AM 2040 Build - Mitigation,
Roundabout at TH 3-CSAH 30.pdf

3/23/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Roundabout	HCM 6th Edition	WB Right		23.1	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Roundabout
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 23.1
Level Of Service: C

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	1	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	275.00	100.00	100.00	150.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	146	1015	0	0	181	106	201	0	83	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	30	39	0	0	0	17	0	32	18	41
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-25	28	7	-4	-3	-5	7	-2	6	6	30
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	181	1254	58	46	224	131	248	24	103	38	24	71
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	53	365	17	13	65	38	72	7	30	11	7	21
Total Analysis Volume [veh/h]	210	1458	67	53	260	152	288	28	120	44	28	83
Pedestrian Volume [ped/h]	0			0			0			0		

Appendix H - Capacity Analysis Backup

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Version 5.00-00

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			2			2		
Circulating Flow Rate [veh/h]	376			294			367			2016		
Exiting Flow Rate [veh/h]	83			249			313			1796		
Demand Flow Rate [veh/h]	181	1254	58	46	224	131	248	24	103	38	24	71
Adjusted Demand Flow Rate [veh/h]	210	1458	67	53	260	152	288	28	120	44	28	83

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1420.00	1420.00	1420.00	1420.00
B (coefficient)	0.00091	0.00091	0.00091	0.00091	0.00085	0.00085
HV Adjustment Factor	0.97	0.97	0.97	0.97	0.98	0.98
Entry Flow Rate [veh/h]	842	947	225	253	448	159
Capacity of Entry and Bypass Lanes [veh/h]	1009	1009	1087	1087	1040	256
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	977	980	1057	1059	1014	251
X, volume / capacity	0.84	0.94	0.21	0.23	0.43	0.62

Movement, Approach, & Intersection Results

Lane LOS	C	E	A	A	A	E
95th-Percentile Queue Length [veh]	10.11	15.21	0.78	0.90	2.20	3.70
95th-Percentile Queue Length [ft]	252.81	380.25	19.41	22.55	54.91	92.61
Approach Delay [s/veh]	30.24		5.47		8.35	38.14
Approach LOS	D		A		A	E
Intersection Delay [s/veh]	23.13					
Intersection LOS	C					

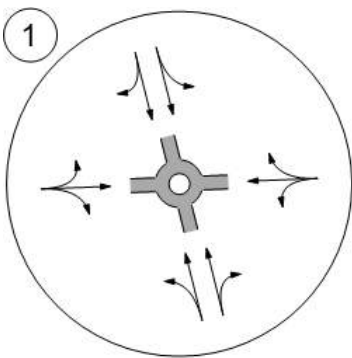
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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 14 PM 2040 Build - Mitigation 2

Report File: C:\...\16 - PM 2040 Build - Mitigation,
Roundabout at TH 3-CSAH 30.pdf

3/23/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	MN 3 & CSAH 30	Roundabout	HCM 6th Edition	EB Right		14.6	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 1: MN 3 & CSAH 30

Control Type: Roundabout
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 14.6
Level Of Service: B

Intersection Setup

Name	MN 3			MN 3			CSAH 30			Site Access		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	1	0	0	1	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	275.00	100.00	100.00	150.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			45.00			45.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	MN 3			MN 3			CSAH 30			Site Access		
Base Volume Input [veh/h]	110	328	0	0	806	226	116	0	169	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	4.00	2.00	2.00	2.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	37	47	0	0	0	21	0	37	21	48
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	-3	-10	13	31	-24	-7	-4	9	-5	29	10	14
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	136	403	50	78	992	278	142	30	208	66	31	62
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	36	106	13	21	261	73	37	8	55	17	8	16
Total Analysis Volume [veh/h]	143	424	53	82	1044	293	149	32	219	69	33	65
Pedestrian Volume [ped/h]	0			0			0			0		

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Intersection Settings

Number of Conflicting Circulating Lanes	1			1			2			2		
Circulating Flow Rate [veh/h]	268			254			1229			739		
Exiting Flow Rate [veh/h]	116			184			1146			589		
Demand Flow Rate [veh/h]	136	403	50	78	992	278	142	30	208	66	31	62
Adjusted Demand Flow Rate [veh/h]	143	424	53	82	1044	293	149	32	219	69	33	65

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1420.00	1420.00	1420.00	1420.00
B (coefficient)	0.00091	0.00091	0.00091	0.00091	0.00085	0.00085
HV Adjustment Factor	0.97	0.97	0.97	0.97	0.97	0.98
Entry Flow Rate [veh/h]	302	339	687	773	413	171
Capacity of Entry and Bypass Lanes [veh/h]	1113	1113	1127	1127	500	758
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1075	1082	1095	1097	485	743
X, volume / capacity	0.27	0.30	0.61	0.69	0.83	0.22

Movement, Approach, & Intersection Results

Lane LOS	A	A	B	B	E	A
95th-Percentile Queue Length [veh]	1.10	1.29	4.33	5.78	8.06	0.86
95th-Percentile Queue Length [ft]	27.59	32.30	108.17	144.46	201.42	21.49
Approach Delay [s/veh]	6.13		12.51		37.90	7.37
Approach LOS	A		B		E	A
Intersection Delay [s/veh]	14.56					
Intersection LOS	B					

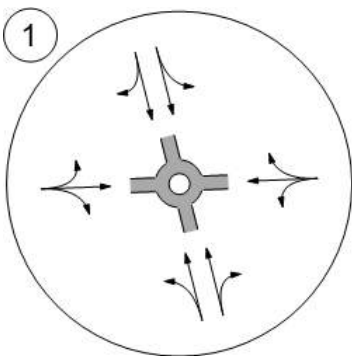
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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 11 AM 2040 Build - Mitigation

Report File: C:\...\AM 2040 Build - Mitigation, Signal at TH 3-TH 149.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
2	MN 3 & MN 149	Signalized	HCM 6th Edition	SB Left	0.629	21.5	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type:	Signalized	Delay (sec / veh):	21.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.629

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	22	23	18	17	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	162	1032	579	231	5
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	46	290	163	65	1
Total Analysis Volume [veh/h]	1	182	1160	651	260	6
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	160
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtectedPermissi	Permissive	Permissive	Permissive
Signal group	4	5	5	2	6	0
Auxiliary Signal Groups		4,5				
Lead / Lag	Lead	-	Lead	-	-	-
Minimum Green [s]	5	15	15	15	7	0
Maximum Green [s]	9	94	94	139	39	0
Amber [s]	4.5	4.5	4.5	4.5	4.5	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	15	100	100	145	45	0
Vehicle Extension [s]	3.0	3.0	3.0	5.0	5.0	0.0
Walk [s]	5	0	0	5	5	0
Pedestrian Clearance [s]	10	0	0	10	10	0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	4.0	4.0	4.0	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	Yes	Yes	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Appendix H - Capacity Analysis Backup

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Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	160	160	160	160	160	160
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	0.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	9	96	139	139	52	52
g / C, Green / Cycle	0.06	0.60	0.87	0.87	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate	0.00	0.12	0.77	0.35	0.14	0.00
s, saturation flow rate [veh/h]	1638	1577	1511	1870	1870	1551
c, Capacity [veh/h]	92	945	1258	1625	608	505
d1, Uniform Delay [s]	71.30	14.50	15.14	2.11	42.29	36.55
k, delay calibration	0.11	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.05	0.45	12.50	0.74	2.19	0.04
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.01	0.19	0.92	0.40	0.43	0.01
d, Delay for Lane Group [s/veh]	71.34	14.95	27.64	2.85	44.48	36.59
Lane Group LOS	E	B	C	A	D	D
Critical Lane Group	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh]	0.04	2.96	12.03	2.60	8.34	0.16
50th-Percentile Queue Length [ft]	0.98	73.95	300.78	64.97	208.51	4.12
95th-Percentile Queue Length [veh]	0.07	5.32	17.72	4.68	13.08	0.30
95th-Percentile Queue Length [ft]	1.76	133.12	443.00	116.94	326.91	7.42

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	71.34	14.95	27.64	2.85	44.48	36.59
Movement LOS	E	B	C	A	D	D
d_A, Approach Delay [s/veh]	15.26		18.73		44.30	
Approach LOS	B		B		D	
d_I, Intersection Delay [s/veh]	21.46					
Intersection LOS	C					
Intersection V/C	0.629					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	80.00	80.00	80.00
I_b,int, Bicycle LOS Score for Intersection	4.132	7.121	4.571
Bicycle LOS	D	F	E

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

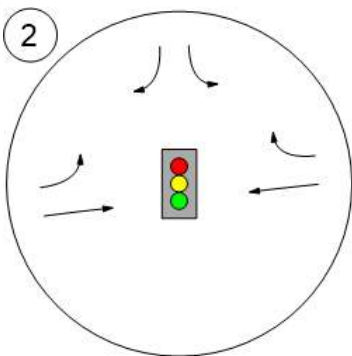


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Lane Configuration and Traffic Control



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Scenario 11 AM 2040 Build - Mitigation

Report File: C:\...\14 - AM 2040 Build - Mitigation,
Roundabout at TH 3-TH 149.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
2	MN 3 & MN 149	Roundabout	HCM 6th Edition	WB Thru		15.5	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Roundabout
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 15.5
Level Of Service: C

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	1	111	801	445	170	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	22	23	18	17	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	162	1032	579	231	5
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	46	290	163	65	1
Total Analysis Volume [veh/h]	1	182	1160	651	260	6
Pedestrian Volume [ped/h]	0		0		0	

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Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	265		1		1195	
Exiting Flow Rate [veh/h]	265		1		1195	
Demand Flow Rate [veh/h]	1	162	1032	579	231	5
Adjusted Demand Flow Rate [veh/h]	1	182	1160	651	260	6

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1420.00	1420.00	1380.00
B (coefficient)	0.00091	0.00091	0.00091	0.00091	0.00102
HV Adjustment Factor	0.89	0.97	0.97	0.98	0.98
Entry Flow Rate [veh/h]	2	188	1195	665	272
Capacity of Entry and Bypass Lanes [veh/h]	1116	1116	1419	1419	408
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	997	1084	1378	1391	400
X, volume / capacity	0.00	0.17	0.84	0.47	0.67

Movement, Approach, & Intersection Results

Lane LOS	A	A	C	A	D
95th-Percentile Queue Length [veh]	0.00	0.60	11.31	2.57	4.67
95th-Percentile Queue Length [ft]	0.08	15.07	282.73	64.22	116.64
Approach Delay [s/veh]	4.83		14.61		28.51
Approach LOS	A		B		D
Intersection Delay [s/veh]	15.45				
Intersection LOS	C				

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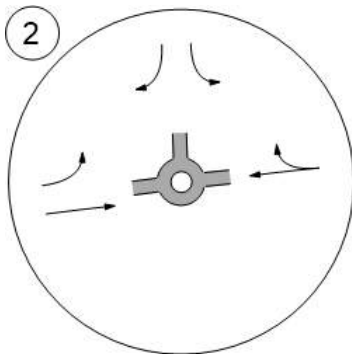
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Scenario 12 PM 2040 Build - Mitigation

Report File: C:\...\PM 2040 Build - Mitigation, Signal at TH 3-TH 149.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
2	MN 3 & MN 149	Signalized	HCM 6th Edition	WB Thru	0.474	55.7	E

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

Appendix H - Capacity Analysis Backup

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type:	Signalized	Delay (sec / veh):	55.7
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.474

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	0	0	1
Pocket Length [ft]	100.00	100.00	150.00	100.00	100.00	200.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	26	27	21	21	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	753	299	307	612	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	188	75	77	153	2
Total Analysis Volume [veh/h]	11	753	299	307	612	8
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtectedPermissi	Permissive	Permissive	Permissive
Signal group	4	5	5	2	6	0
Auxiliary Signal Groups		4,5				
Lead / Lag	Lead	-	Lead	-	-	-
Minimum Green [s]	5	15	15	15	15	0
Maximum Green [s]	44	44	44	94	44	0
Amber [s]	4.5	4.5	4.5	4.5	4.5	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	50	50	50	100	50	0
Vehicle Extension [s]	3.0	3.0	3.0	5.0	5.0	0.0
Walk [s]	5	0	0	5	5	0
Pedestrian Clearance [s]	10	0	0	10	10	0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.0	4.0	4.0	4.0	4.0	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	Yes	Yes	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	0.00	0.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	44	94	94	94	44	44
g / C, Green / Cycle	0.29	0.63	0.63	0.63	0.29	0.29
(v / s)_i Volume / Saturation Flow Rate	0.01	0.48	0.23	0.16	0.33	0.01
s, saturation flow rate [veh/h]	1638	1577	1295	1870	1870	1551
c, Capacity [veh/h]	480	988	645	1172	549	455
d1, Uniform Delay [s]	37.71	20.01	27.87	12.51	53.00	37.65
k, delay calibration	0.11	0.50	0.50	0.50	0.50	0.50
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.02	5.55	2.39	0.54	74.26	0.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.02	0.76	0.46	0.26	1.12	0.02
d, Delay for Lane Group [s/veh]	37.73	25.56	30.26	13.05	127.26	37.72
Lane Group LOS	D	C	C	B	F	D
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	0.28	18.15	4.74	4.58	31.40	0.22
50th-Percentile Queue Length [ft]	7.10	453.71	118.59	114.53	785.07	5.43
95th-Percentile Queue Length [veh]	0.51	25.13	8.32	8.09	43.52	0.39
95th-Percentile Queue Length [ft]	12.78	628.37	207.88	202.29	1087.93	9.77

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.73	25.56	30.26	13.05	127.26	37.72
Movement LOS	D	C	C	B	F	D
d_A, Approach Delay [s/veh]	25.73		21.54		126.10	
Approach LOS	C		C		F	
d_I, Intersection Delay [s/veh]	55.73					
Intersection LOS	E					
Intersection V/C	0.474					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	75.00	75.00	75.00
I_b,int, Bicycle LOS Score for Intersection	4.132	5.132	5.155
Bicycle LOS	D	F	F

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



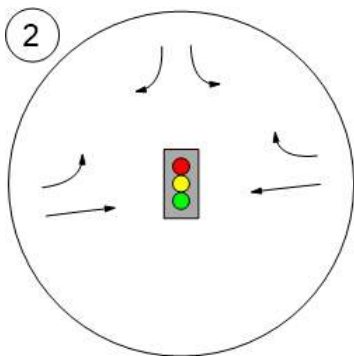
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Lane Configuration and Traffic Control



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Westgate Development

Vistro File: C:\...\Westgate Vistro.vistro

Scenario 12 PM 2040 Build - Mitigation

Report File: C:\...\16 - PM 2040 Build - Mitigation,
Roundabout at TH 3-TH 149.pdf

3/20/2017

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
2	MN 3 & MN 149	Roundabout	HCM 6th Edition	SB Right		23.0	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. for all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report Intersection 2: MN 3 & MN 149

Control Type: Roundabout
Analysis Method: HCM 6th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 23.0
Level Of Service: C

Intersection Setup

Name	MN 149		MN 3		MN 3	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	MN 149		MN 3		MN 3	
Base Volume Input [veh/h]	9	577	216	227	469	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	12.00	3.00	3.00	2.00	2.00	5.00
Growth Rate	1.26	1.26	1.26	1.26	1.26	1.26
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	26	27	21	21	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	753	299	307	612	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	188	75	77	153	2
Total Analysis Volume [veh/h]	11	753	299	307	612	8
Pedestrian Volume [ped/h]	0		0		0	

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Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	624		12		308	
Exiting Flow Rate [veh/h]	624		12		308	
Demand Flow Rate [veh/h]	11	753	299	307	612	8
Adjusted Demand Flow Rate [veh/h]	11	753	299	307	612	8

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1420.00	1420.00	1380.00
B (coefficient)	0.00091	0.00091	0.00091	0.00091	0.00102
HV Adjustment Factor	0.89	0.97	0.97	0.98	0.98
Entry Flow Rate [veh/h]	13	776	308	314	633
Capacity of Entry and Bypass Lanes [veh/h]	805	805	1405	1405	1008
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	719	782	1364	1377	988
X, volume / capacity	0.02	0.96	0.22	0.22	0.63

Movement, Approach, & Intersection Results

Lane LOS	A	E	A	A	B
95th-Percentile Queue Length [veh]	0.05	15.14	0.84	0.86	4.60
95th-Percentile Queue Length [ft]	1.17	378.38	20.94	21.39	114.92
Approach Delay [s/veh]	46.16		4.48		12.71
Approach LOS	E		A		B
Intersection Delay [s/veh]	23.05				
Intersection LOS	C				

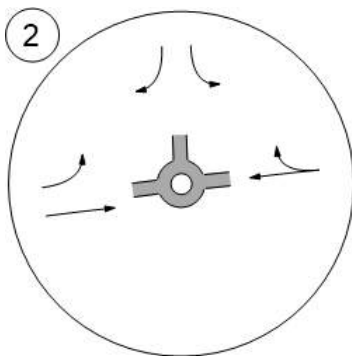
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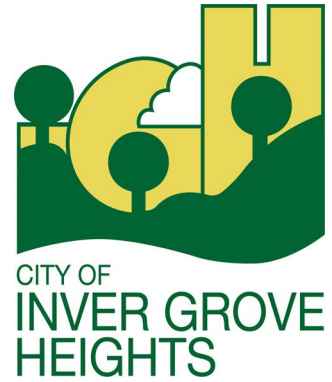
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Lane Configuration and Traffic Control



Memo



TO: Allan Hunting, City Planner
Heather Botten, Associate Planner
FROM: Steve Dodge, Assistant City Engineer *SWD*
Mike Edwards Senior Engineering Technician
Cc:
DATE: October 14, 2022
RE: **Robert Curve Fourth Addition- Preliminary Review**

The Engineering Division provide a preliminary plan/plat review for submittals dated August 22, 2022. Engineering Division finds the submittal in general conformance, with the following comments to be considered prior to final approval.

- See attached Barr Engineering for preliminary hydrologic review and comments
- All storm water facilities that are considered private will need a Storm Water Facilities Maintenance Agreement, operation and maintenance plan and an ownership exhibit provided for final approval. They may not need drainage and utility easements if a private system.
- All storm water facilities that treat public storm water need to be within ROW, outlot or a drainage and utility easement to be depicted on the final plat. Responsible party for maintenance is determined by staff based on portions of private vs public storm water.
- Plat/Plan review comments and Permits will be needed from MNDOT
- Discuss with staff if there is a way to avoid disturbing Diffley Court to the best extent practicable.
- The city does not typically allow inside drop structures. Further coordination with city is necessary for final design approvals of sanitary sewer manhole/stub connections.
- Driveway entrances to be constructed with concrete aprons per detail plate STR-09
- Construct ped ramps (truncated domes) at Diffley Ct and TH3
- Traffic lights at Diffley Ct and TH 3 should be reviewed for pedestrian and vehicular traffic.
- Add catch basins to catch storm water from private drives before reaching public ROW.
- Depict existing sewer and water services on plan.
- Verify water connections making sure to utilize existing lateral stubs where possible.
- Sanitary manhole connection at 1+50 may not be constructable at the proposed angle
- Verify if sewer system be constructed utilizing existing manholes or service stubs.
- The proposed sanitary and water system within the private streets will be public. Provide drainage and utility easements. The lateral utility alignments must remain within private road for city maintenance and access.
- Streets are considered private except for Diffley Court existing ROW.
- Trails and sidewalks outside of right-of-way or trail easement are considered private.
- Public sidewalk along Diffley Court will need to be with ROW or sidewalk easement.
- Provide SWPPP and erosion control plan
- Eagan sewer and water rates apply
- Eagan comments, when requested and received by IGH, will need to be incorporated into the final plat submittal

- Encroachments in gas easement will need owners' approval.
- Access to existing businesses will need to be maintained and addressed in final plans.
- Seek Fire Marshal for comments on fire access, fire protection and adjacent properties.
- Engineering Division will comment in more detail on final plans.

CC: Brian Connolly, Public Works Director
Paul Merchlewicz, City Engineer
Bridget McCauley-Nason, City Attorney
Eric Kramer, Utility Superintendent

Memorandum

To: Steve Dodge, P.E.
From: Greg Fransen
Subject: Roberts Curve 4th Addition Preliminary Stormwater Management Review
Date: October 7, 2022
Project: 23190328.22-PROJ-096 / IGH Escrow Account 702.229.2307703

As requested by the City of Inver Grove Heights (City), Barr Engineering (Barr) reviewed the stormwater management features of the Roberts Curve 4th Addition preliminary engineering plan set and Storm Water Management Plan, prepared by Carlson McCain Engineering with revision date September 23, 2022. As directed by City staff, Barr's reviewed the preliminary submittal for completeness and general conformance with city standards. A detailed review will be performed on a future revised submittal.

The sections below provide project background, Barr's comments, and supporting information.

Background

The proposed Roberts Curve 4th Addition project (Project) would include constructing a 190-unit apartment building and 54 townhomes with associated parking, drive lanes, and utilities on approximately 3.8 acres located north and east of Diffley Court in Inver Grove Heights.

The Project lies within subwatersheds EAG-544, EAG-545, and EAG-575 of the Eagan Drainage Basin of Inver Grove Heights. Currently runoff from the southern part of the site flows overland towards the south and west and enters the road ditch on the east side of South Robert Trail. Water reaching that part of the road ditch is drained by a MnDOT storm sewer system that discharges to the city of Eagan storm sewer system. Runoff from the north part of the site flows overland towards the north and west and also discharges to the road ditch on the east side of South Robert Trail, which then flows towards the north through a series of culverts to stormwater basin RV-F-14, located just southwest of the intersection of Jefferson Trail and South Robert Trail, in the Rich Valley Drainage Basin of Inver Grove Heights. Detailed stormwater modeling of the Project area has not been completed by the city. Previous construction projects along Diffley Court were modeled using HydroCAD software.

Preliminary Review Comments

- HydroCAD model files must be included with the next submittal
- Infiltration basin drawdown calculations must be included with next submittal
- Infiltration basin construction should follow city standards. See city standard plates for the following:
 - Drain tile design

- Infiltration/planting media depth and specifications
- Pretreatment of runoff prior to discharge into infiltration basins is not shown. Pretreatment is required using forebays, sedimentation ponds, or hydrodynamic separators
- The 5-year, 24-hour rainfall event needs to be included in the modeling and peak rate comparison
- Excavation depths to connect infiltration basins to sandy (SP) soils need to be shown (note that the soil boring report indicates the native SM soils are NOT suitable for infiltration)
- Infiltration testing needs to be performed to confirm infiltration rates within basins
- It may be necessary to model the downstream pipe to Eagan to confirm appropriate rate control
- Infiltration basin EOF elevations need to be shown
- Infiltration basin planting palette needs to be included
- A SWPPP needs to be included with a future submittal
- According to city code, water quality modeling is not required if the infiltration requirement is met
- Storm sewer pipe diameters need to be shown
- Storm sewer profiles should be shown
- Storm sewer design calcs should be provided

From: [Tom Murphy](#)
To: [Allan Hunting](#)
Subject: IGH Partners, LLC - Case No.22-40SV - Rezoning of Diffley Court and South Robert Trail
Date: Thursday, October 13, 2022 2:54:19 PM
Attachments: [Proposed Apartments & Town Houses by Caseys on Diffley and South Robert Trail.pdf](#)
[Rezoning Public Hearing Location \(Map\).pdf](#)
[Rezoning Public Hearing Notice.pdf](#)

Hi Allan/Inver Grove Heights Planning Commission,

I hope you are doing well.

My name is Tom Murphy and I live at 4261 South Robert Trail, Eagan, MN, 55123 (directly across the street from this newly proposed 196 apartment and 54 townhome development).

I attended the public hearing to learn more about this new development and during the presentation, the representative from Trident Development, LLC mentioned that the City of Inver Grove Heights had not required a Traffic Impact Study (TIS).

Per section 5.4 TIS Needed/Recommended

(<https://www.dot.state.mn.us/accessmanagement/docs/pdf/manualchapters/chapter5.pdf>), it states "Mn/DOT recommends that a Traffic Impact Study be completed for developments estimated to generate either 250* or more peak-hour vehicle trips...". My neighbors and I have concerns with the density of this project (250 family units with 2 parking spots per unit) and the impact that ~500 vehicles will have on traffic and public safety during peak hours, especially with only 1 entrance/exit into this development.

Please confirm that the City of Inver Grove Heights will require a Traffic Impact Study before agreeing to this rezoning and new development project.

Thank you and have a good day.

Regards,
Tom Murphy

Chapter5 1-02-08

Title: Microsoft Word - Chapter5 1-02-08.DOC Author: Gage1Bri Created Date: 12/27/2007 11:35:06 AM

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organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

From: [anthony bidwell](#)
To: [Allan Hunting](#)
Subject: Proposed apartments and condos
Date: Thursday, October 13, 2022 3:30:01 PM

I am extremely concerned about the rezoning of Diffley and Hwy 3 across from Casey's gas station. There is not sufficient infrastructure to accommodate the increases traffic flow along HWY 3 and Diffley. Not to mention the increases concerns for safety regarding the abundance of school children. The increased noise and pollution is another concern. This proposal primarily only affect Eagan residents, which will be impacted by the negative environmental problems that will occur from this proposal.

I have talked my neighbors in the Country Hollow Development and everyone is vehemently apposed to this plan. Myself and 10 other families are going to find a lawyer if this proposal moves forward.

Sent from my iPhone

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