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2023

Northern Lights Traffic Impact Study v1-2

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3/6/2023

Civilize, PLLC

Management and Engineering

Traffic Impact Study Disclaimer

All recommendations and/or advice presented in this document regarding probably project conditions are the opinions of Civilize, PLLC. Project conditions are based on information and data sources that are readily available from the public sector, provided by the project owner, previously published studies by other competent professionals, and other reliable sources including state agencies and local municipal government entities, all of which are relied upon as accurate. Our recommendations and/or advice are made on the basis of our experience and represent our judgment and opinions. We have no control over new and/or non-public information, changed conditions, cost of land, cost of labor, materials, equipment, and/or other construction costs, or over competitive bidding or market conditions. Therefore, we do not guarantee that actual conditions or actual costs will not vary from those presented in this report.

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TRAFFIC IMPACT ANALYSIS

Northern Lights

I. Executive Summary

A. Site Location and Study Area

Northern Lights is a proposed 17-lot subdivision, that will house a main and accessory dwelling unit, that is located in Teton County northeast of the City of Tetonia positioned on two (2) parcels; the two (2) parcels make up a total of 80 acres. Figure 1 shows the location of the proposed development.

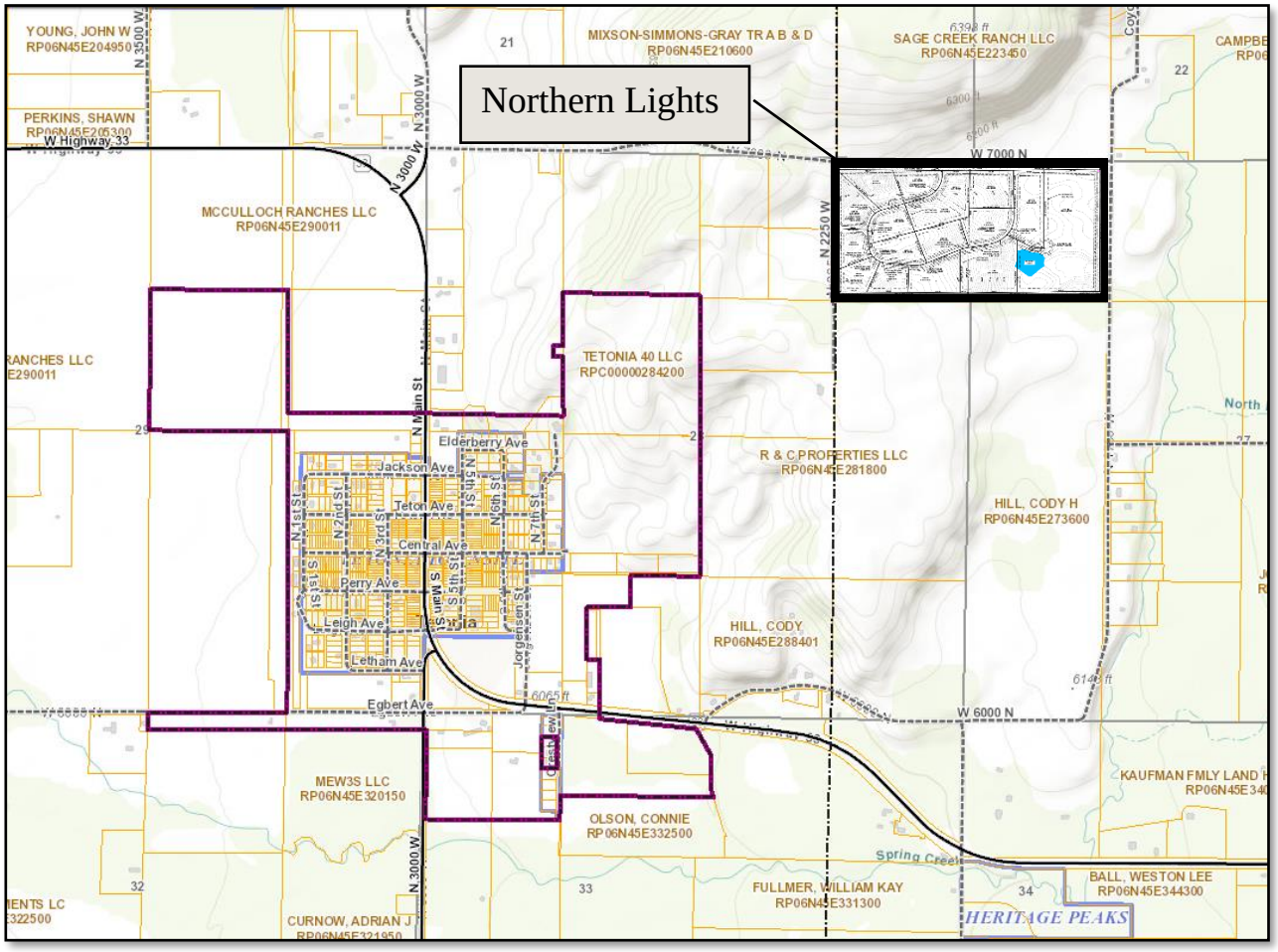


Figure 1 - Location Map

1. Development Description and Phasing

The projected land use for the build-out year of the proposed development is comprised of 17 main dwelling units and 17 accessory dwelling units (34 units total).

This traffic impact study evaluates the existing transportation conditions, the buildout condition, and a horizon year 20 years beyond the buildout year. The following analyses were performed:

- 2022 existing background traffic
- 2027 buildout year background traffic
- 2027 buildout year background plus site traffic
- 2047 horizon year background traffic
- 2047 buildout year background plus site traffic

B. Conclusions and Recommendations

After evaluating the proposed development within the context of zoning; projected land use; existing transportation system; background traffic counts for the principal roadways within the study impact area; projected traffic for horizon years corresponding with project opening, project buildout, and a 20-year horizon year; the findings of the Traffic Impact Study are summarized below. In order to simplify the forecasted traffic conditions as they have progressed through this study, the following three (3) tables were produced. The first table shows the forecasted progression of the roadway segments, the second table shows the intersections, and the third shows the left or right turn.

Table 1 - Segment Traffic Conditions Progression Each Horizon Year

Segment 1: 3000W	Northeast V/C Ratio	LOS	Southwest V/C Ratio	LOS
2022 Existing Traffic	0.014	A	0.008	A
2027 Background plus Site Traffic	0.016	A	0.010	A
2047 Background plus Site Traffic	0.027	A	0.016	A

Segment 2: 2000W	Northbound V/C Ratio	LOS	Southbound V/C Ratio	LOS
2022 Existing Traffic	0.011	A	0.012	A
2027 Background plus Site Traffic	0.022	A	0.018	A
2047 Background plus Site Traffic	0.030	A	0.026	A

Table 2 - Intersection Traffic Conditions Progression Each Horizon *Year*

Int 1: Hwy 33/3000W	Northeast Max LOS	Southeast Max LOS	Northwest Max LOS	Southwest Max LOS
2022 Existing Traffic	n/a	A	A	B
2027 Background Traffic	n/a	A	A	B
2027 Background plus Site Traffic	n/a	A	A	B
2047 Background Traffic	n/a	A	A	C
2047 Background plus Site Traffic	n/a	A	A	D

Int 2: Hwy 33/2000W	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	A	A	B	C
2027 Background Traffic	A	A	C	C
2027 Background plus Site Traffic	A	A	C	C
2047 Background Traffic	A	A	E	F
2047 Background plus Site Traffic	A	A	E	F

Int 3: 7000N/1750W	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	A	n/a	A	A
2027 Background Traffic	A	n/a	A	A
2027 Background plus Site Traffic	A	n/a	A	A
2047 Background Traffic	A	n/a	A	A
2047 Background plus Site Traffic	A	n/a	A	A

Int 4: 7000N/Solstice East (New)	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	n/a	n/a	n/a	n/a
2027 Background Traffic	n/a	n/a	n/a	n/a
2027 Background plus Site Traffic	A	A	A	n/a
2047 Background Traffic	n/a	n/a	n/a	n/a
2047 Background plus Site Traffic	A	A	A	n/a

Int 5: 7000N/Solstice West (New)	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	n/a	n/a	n/a	n/a
2027 Background Traffic	n/a	n/a	n/a	n/a
2027 Background plus Site Traffic	A	A	A	n/a
2047 Background Traffic	n/a	n/a	n/a	n/a
2047 Background plus Site Traffic	A	A	A	n/a

Table 3 - Left and Right Turn Lane Progression Each Horizon Year

Int 1: Hwy 33/3000W	Left Turn Lane		Right Turn Lane	
	Southeast	Northwest	Southeast	Northwest
2022 Existing Traffic	Warranted	n/a	n/a	Not Warranted
2027 Background Traffic	Warranted	n/a	n/a	Not Warranted
2027 Background plus Site Traffic	Warranted	n/a	n/a	Not Warranted
2047 Background Traffic	Warranted	n/a	n/a	Warranted
2047 Background plus Site Traffic	Warranted	n/a	n/a	Warranted

Int 2: Hwy 33/2000W	Left Turn Lane		Right Turn Lane	
	Eastbound	Westbound	Eastbound	Westbound
2022 Existing Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2027 Background Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2027 Background plus Site Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2047 Background Traffic	Warranted	Warranted	Not Warranted	Warranted
2047 Background plus Site Traffic	Warranted	Warranted	Not Warranted	Warranted

C. Existing Traffic Conditions (2022)

The existing traffic conditions were analyzed with the existing intersection control and lane configurations, all the road segments and intersections are operating within minimum operational thresholds except:

- Int. 1 Hwy 33/3000W: Southeast bound, left turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Eastbound, left turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Westbound, left turning traffic, exceeds the minimum levels

(1) Mitigating Measures

It is recommended that a left turn lane be constructed on Hwy 33 for the southeast bound traffic at Int. 1 and that left turn lanes be constructed for both the eastbound and westbound traffic on Hwy 33 at Int. 2.

D. Projected Traffic

The build-out conditions are expected to generate approximately 325 trips for the MADT and 26 trips during PM peak hour by year 2027.

E. 2027 Buildout Year Traffic Conditions Results

All segment capacity and intersection delay times/LOS are projected to operate within the minimum allowable operational thresholds. It was determined that for the 2022 existing conditions, left turn lanes are warranted at Intersection 1 and Intersection 2. For the 2027 buildout conditions, no new left turn lanes are warranted with or without the proposed development.

(1) Mitigating Measures

For the 2027 buildout scenario no deficiencies were forecasted, therefore no mitigation measures are recommended.

F. 2047 Horizon Year Traffic Conditions Results

The forecasted 2047 traffic conditions were analyzed with the existing intersection control and lane configurations, all the road segments and intersections are within minimum operational thresholds except:

- Int 1 Hwy 33/3000W: Northwest bound, right turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Northbound traffic left, thru, and right turning movement's LOS is E, without or with the development
- Int. 2 Hwy 33/2000W: Southbound traffic left, thru, and right turning movement's LOS is F, without or with the development
- Int 2 Hwy 33/2000W: Westbound, right turning traffic, exceeds the minimum levels

(1) Mitigating Measures

Analysis shows that the addition of left turn lanes for both the eastbound and westbound traffic (warranted for the 2022 Existing Conditions), a westbound right turn lane (warranted for the 2047 Horizon Year), a northbound right and left turn lane (warranted for the 2047 Horizon Year), a southbound right and left turn lane (warranted for the 2047 Horizon Year) will create a road network that will operate within the minimum allowable thresholds.

G. Overall Study Summary

As can be seen from the tables shown previously, the development is forecasted to have minimal impact to the traffic network within the study area. All segments and intersections are forecasted to operate below the allowable operation thresholds throughout the study time period. As can be seen in the tables presented in this chapter, the LOS at each intersection for each turning movement without or with the development are the same except for the southwest traffic in the 2047 Horizon Year (reference the red highlighted cell in Table ES-2). Even though the southwest traffic without and with the development is difference, they are still forecasted to operate at an acceptable level through the 2047 Horizon Year.

This study also determined that all the intersections, each direction, within the study area on Hwy 33 warrant a left turn lane for the current/existing conditions. Additionally, right turn lanes are warranted within the next 25 years for the northwest bound traffic at Int. 1 Hwy 33/3000W and for the westbound traffic at Int. 2 Hwy 33/2000W without or with the development.

II. Introduction and Summary

Northern Lights is a proposed 17-lot subdivision located in Teton County but within the impact area of the City of Tetonia. Each lot will consist of a main and an accessory dwelling unit; 34 total units. The Teton County Planning & Zoning Commission approved the Concept Plan for the subdivision and the Tetonia Planning & Zoning Commission, and the Tetonia City Council approved the Preliminary Plat submittal. The application for Preliminary Plat submittal is currently begin presented to the Teton County Planning & Zoning Commission for consideration. The application for Preliminary Plat Submittal has several stipulations that apply to a proposed subdivision including the requirement for a Public Service / Fiscal Analysis to ascertain the financial impact the proposed development may have on public services.

Civilize, PLLC has been retained to prepare a Traffic Impact Study for the Northern Lights project in accordance with the requirements of Teton County.

A. Project Identification

The following table lists important project identification information and contact information for the project.

Table 4 - Project Information Table

Project Name	**Victor Hotel and Workforce Housing**
Owner	Tony & Anne Campbell
Owner Address	718 Meadow Hills Drive Richland, WA 99352
Owner Telephone Number	(509) 948-4441
Owner Email	anne@campbelltrainingsolutions.com
Engineer	Civilize, PLLC
Engineer Contact Person	Brent E. “Husk” Crowther, P.E.
Engineer Address	3853 W. Mountain View Dr. Rexburg, ID 83440
Engineer Project Number	01-21-0011
Engineer Telephone Number	208-351-2824
Engineer Email	bcrowther@civilize.design

B. Location

Northern Lights is a proposed 17-lot subdivision, that will house a main and accessory dwelling unit, that is located in Teton County northeast of the City of Tetonia positioned on two (2) parcels; the two (2) parcels make up a total of 80 acres. Figure 1 shows the location of the proposed development.

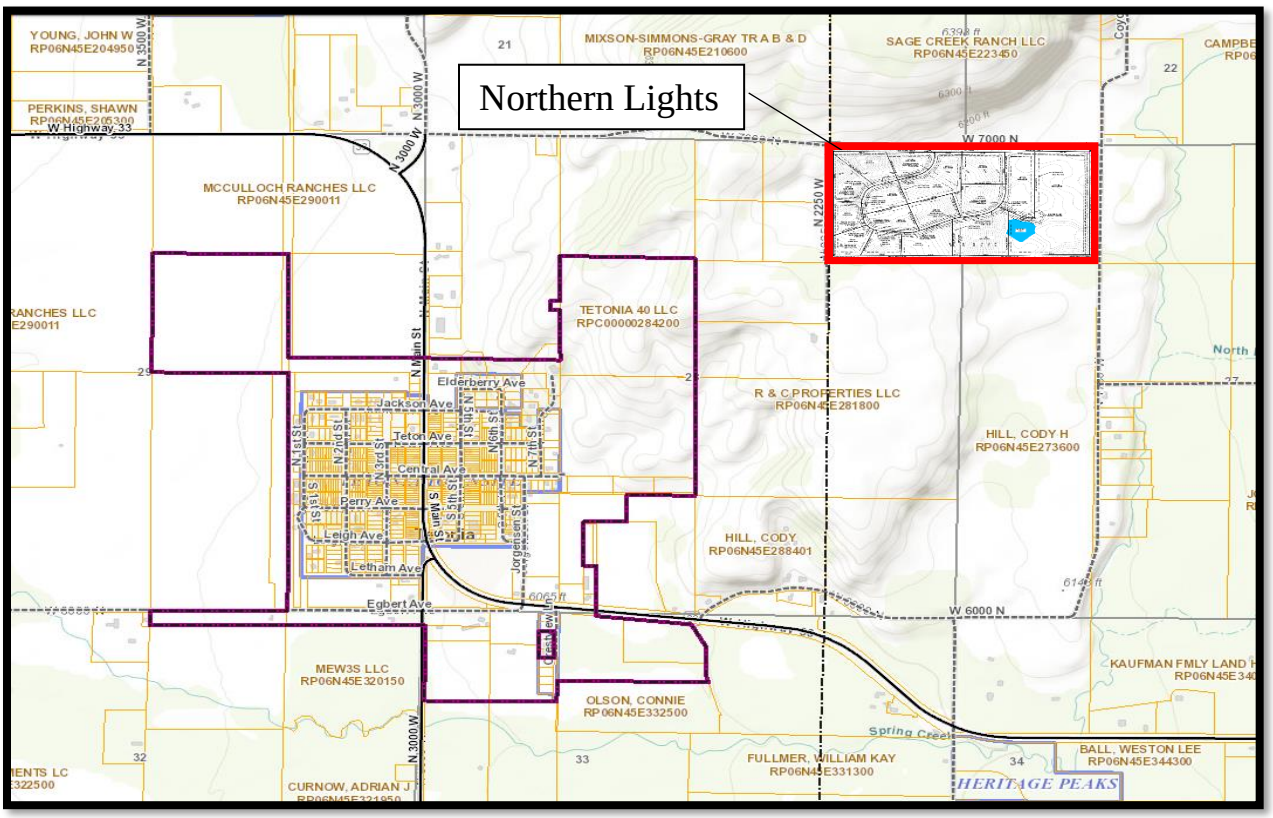


Figure 2 - Location Map

C. Applicable Regulations

The Teton County Code, Title 9 Subdivision Regulations, Chapter 3 Procedure for Approval, Section 2 Subdivision or Planned Unit Development, Paragraph C Preliminary Plat Phase, Paragraph 3 Regulations That May Apply, Item d Traffic Impact Study states:

Due to the impact that a subdivision or PUD may have on traffic levels, congestion levels, and levels of service on roads, the applicant for a proposed subdivision containing more than ten (10) lots or a proposed PUD containing more than ten (10) lots or dwelling units shall traffic impact study prepared by a professional engineer. A TIS may also be required if the Planning Administrator, the Commission, or the Board think that the condition of one or more of the roads that would provide access between the proposed development and the nearest State Highway is so poor that traffic from ten (10) or fewer lots or dwelling units could create public safety risks or interfere with the efficient flow of traffic. Each required traffic impact study shall meet the following standards: (amd. 11-14-08)

D. Purpose of Report and Study Objectives

The purpose of the Traffic Impact Study (TIS) is to evaluate the traffic impacts resulting from the proposed development and to make recommendations for mitigation to the impacts if such prove necessary. This study discusses:

- The proposed development
- The study approach
- The area conditions
- Existing 2022 traffic volumes and conditions
- Projected traffic from the development
- Buildout 2027 traffic volumes and conditions without and with the development
- 20-Year Horizon Year traffic volumes and conditions without and with the development
- Conclusions, recommendations, and possible mitigation measures

III. Proposed Development

A. Description of On-Site Development

1. Description

The development plans call for 17 single family residences and 17 accessory dwelling units. The Traffic Impact Study (TIS) will be based on the that type of development.

2. Location

As presented previously, the proposed development is located northeast of Tetonia and is comprised of two (2) parcels totaling 80 acres. The parcel numbers and legal descriptions are:

- RP06N45E280010, NE4 NE4 SEC 28 T6N R4 5E
- RP06N45E273000, NW4 NW4 SEC 27 T6N R4 5E

3. Zoning

Currently, Teton County lists the west parcel as FH-10 Foothills and the east parcel as RA-35 Rural Agriculture. The following map, from the Teton County GIS page, shows the zoning of the area

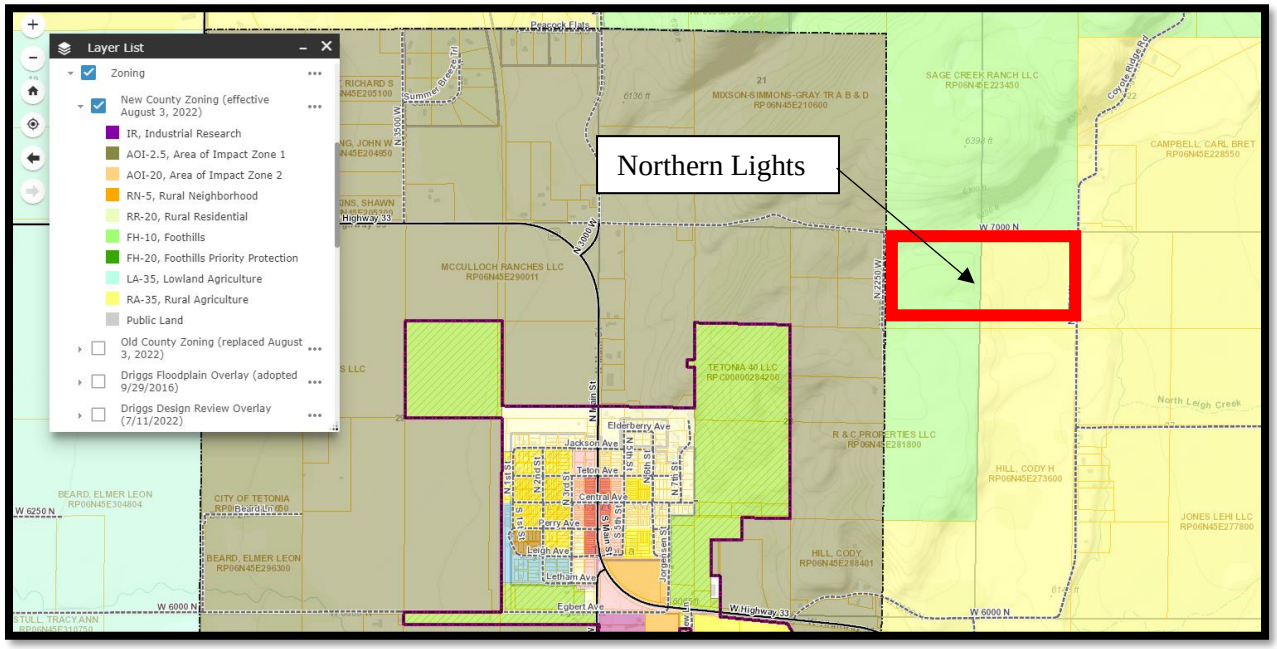


Figure 3 - Zoning Map

4. Site Plan

The Concept Master Plan has been prepared and presented to Teton County who approved the plan at the concept plan hearing. That plan is presented in the following figure and a larger version presented in Exhibit A – Proposed Site Plan. Although the site configuration may change slightly in the future, the Site Master Plan represents the best information regarding anticipated future development for land use and will be the basis of traffic projections generated by the proposed development.

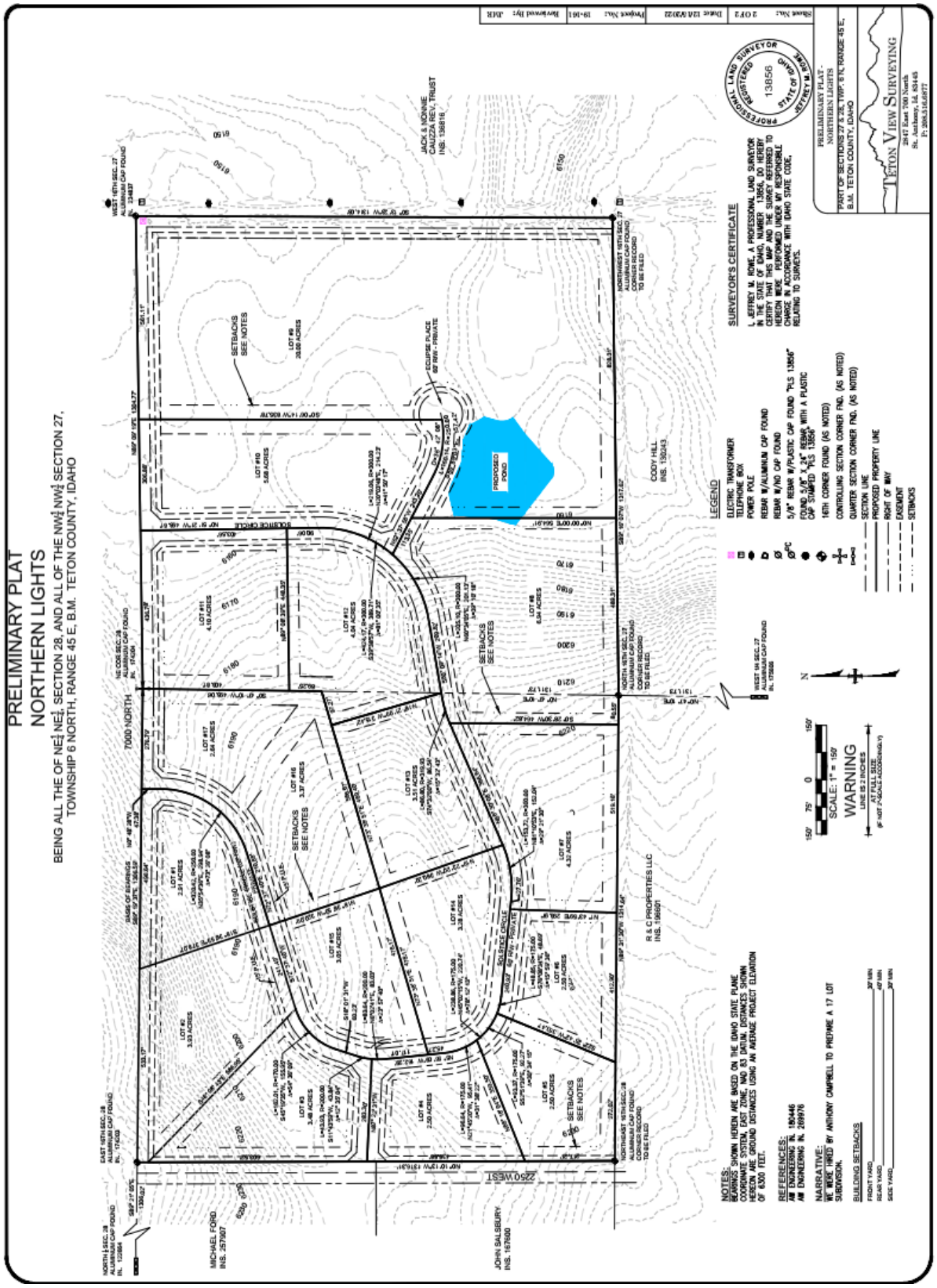


Figure 4 - Site Plan

5. Land Use and Intensity

The development as proposed consists of 17 single family residences lots. As stated earlier, the 17 lots will consist of a main and accessory dwelling unit for a total of 34 dwellings. While future development may occur in the area of the proposed project, that development is not currently defined and will not be considered in the traffic modeling, rather that responsibility will be relegated to future developers.

6. Phasing and Timing

a. Existing Conditions

The traffic counts were obtained in November of 2022. The existing condition year will be considered 2022.

b. Buildout Conditions

It is estimated that buildout will occur in five (5) years. The buildout conditions will be considered for 2027

c. 20-Year Horizon Year

The 20-year longer term traffic conditions occur 20 years after buildout. Therefore, the 20-year horizon year will be projected to year 2047. As mentioned earlier, this TIS will not consider additional traffic that may be generated from unknown developments within the study area.

IV. Study Approach

A. Full TIS or Minor TIS

The scope of this TIS is based on ITD's *Requirements for Transportation Impact Studies* (Supplement to Board Policy B-12-06) as well as the guidance document titled *Transportation Impact Analyses for Site Development*.published by the Institute of Transportation Engineers (ITE). These requirements outline a full or minor TIS as:

- A full TIS shall be required for developments that will generate more than 100 vph or 1000 vpd.
- A minor TIS is required for developments that will generate up to 99 vph or 999 vpd.

This development is forecasted to generate less than 99 vph, and less than 999 vpd, thus a minor TIS will be performed. Since this is determined to be a minor TIS, only the pm peak hour will be analyzed as recommended by the Requirements for Transportation Impact Studies by ITD

B. Study Period

The following study periods were identified for analysis:

1. 2022 (Existing)
2. 2027 (Project Buildout)
3. 2047 (Horizon year)

The following time intervals were identified for analysis:

1. Weekend PM peak hour

C. Segments and Intersections to be Studied

For roadway segments or links, the requirements state that if a segment experiences a directional increase of 250 vpd, and/or 25vph vehicles in the peak hour should be included in the study. In total, it is forecasted that the development at buildout will generate 325 vpd and 26 vph.

It is assumed that 10% of the generated traffic will use 7000N to access Hwy 33 to the west. The traffic will travel from the development on 7000N to and from 3000W then to and from Hwy 33 on 3000W. The segment, on this path to Hwy 33, that currently has the highest hourly volume is 3000W. Even though this segment does not experience the minimum requirement for analysis, this 550 ft segment of 3000W north of Hwy 33 will be analyzed in this study.

It is assumed that 90% of the generated traffic will use 7000N to access Hwy 33 to the south. The traffic will travel from the development on 7000N to and from 1750W, then to and from 1750W to and from 6000N, then to and from 6000N to 2000W, then to and from Hwy 33 on 2000W. The segment, on this path to Hwy 33, that currently has the highest hourly volume is 2000W. Even though this segment does not experience the minimum requirement for analysis, this 1200 ft segment of 3000W north of Hwy 33 will be analyzed in this study.

The traffic from the development will use two (2) intersections on Hwy 33. This study will analyze these two (2) intersections on Hwy 33 along with the intersection of 7000N/1750W and the two (2) new intersections created by the development for a total of five (5) intersections.

D. Study Methodology, Limitations and Assumptions

1. Traffic Model

The data gathered will be entered into the Synchro Traffic Modeling Software Version 11. The traffic volumes (in vehicles per hour) during the pm peak hour will be entered into the traffic model. The following steps will be followed in this TIS:

1. PM peak traffic turning off and on 3000W at the intersection of Hwy 33/3000N will be visually counted
2. PM peak traffic turning off and on 2000W at the intersection of Hwy 33/2000W will be visually counted
3. PM peak traffic counts for all turning movements at the intersection of 7000N/1750W will be visually counted
4. Hwy 33 data will be obtained from ITD
5. Since the data was visually collected out of peak season, the visual data will be seasonally adjusted to the peak month to match the data from ITD
6. The adjusted volumes will be entered into a model for the 2022 existing conditions to establish a baseline
7. The proposed development will be analyzed to determine the projected generated traffic
8. A growth factor will be multiplied to the 2022 existing volumes to determine the forecasted 2027 traffic volumes and conditions **without** the development
9. The projected generated traffic from the development will be added to the 2027 forecasted traffic volumes to determine the forecasted 2027 traffic volumes and conditions **with** the development
10. The growth factor will be multiplied to the 2022 existing volumes to determine the forecasted 2047 (20-years after anticipated buildout) traffic volumes and conditions **without** the development
11. The projected generated traffic from the development will be added to the 2047 forecasted traffic volumes to determine the forecasted 2047 traffic volumes and conditions **with** the development
12. If a poor Level of Service (LOS) is determined, mitigation measure will be discussed to improve the LOS

Along with entering in the traffic volumes into the model, a peak hour factor, as recommended by the Highway Capacity Manual HCM for rural roadways, of 0.88 and a 5% heavy vehicle factor will be used.

2. Anticipated Annual Growth

The growth will be based on the historical increase in traffic that the ITD has collected. This data show that in 2002 the ADT was 1951 vpd and the in 2022 the ADT was 3252 vpd. Using the population growth formula of $P=P*(\exp(e^{rt}))$, we get an annual average increase of 2.55%. This increase will be used throughout this study.

3. Level of Service (LOS)

The traffic modeling software is used to determine the LOS. The LOS helps to determine when improvements are needed. The following sections discuss the difference between the segment and intersection LOS.

a. Segment LOS

At the time of this study, the free flow speed (FFS) was not available for the specific road segment being analyzed to determine the LOS. Therefore, in order to determine the LOS for the road segment through this area, the volume to capacity ratio (v/c ratio) will be used. In order to determine the v/c ratio, we divide the volume of the roadway by the capacity. According to the Highway Capacity Manual, the capacity of a two-lane highway is 1,700 vehicles per hour for each direction of travel. By dividing the peak hour by the peak hour capacity, we get a v/c ratio. The following table shows the correlation between the v/c ratio and the LOS. For this study, the mountainous terrain with 0% no passing will be used.

Table 5 - LOS Criteria for General Two-Lane Highway Segments

Level of Service Criteria for General Two-Lane Highway Segments

		V/C Ratio[a]																		
		Level Terrain							Rolling Terrain							Mountainous Terrain						
			% No-Passing Zone							% No-Passing Zone							% No-Passing Zone					
LOS	% Time Delay	Avg.[b] Speed	0	20	40	60	80	100	Avg.[b] Speed	0	20	40	60	80	100	Avg.[b] Speed	0	20	40	60	80	100
A	≤ 30	≥ 58	0.15	0.12	0.09	0.07	0.05	0.04	≥ 57	0.15	0.10	0.07	0.05	0.04	0.03	≥ 56	0.14	0.09	0.07	0.04	0.02	0.01
B	≤ 45	≥ 55	0.27	0.24	0.21	0.19	0.17	0.16	≥ 54	0.26	0.23	0.19	0.17	0.15	0.13	≥ 54	0.25	0.20	0.16	0.13	0.12	0.10
C	≤ 60	≥ 52	0.43	0.39	0.36	0.34	0.33	0.32	≥ 51	0.42	0.39	0.35	0.32	0.30	0.28	≥ 49	0.39	0.33	0.28	0.23	0.20	0.16
D	≤ 75	≥ 50	0.64	0.62	0.60	0.59	0.58	0.57	≥ 49	0.62	0.57	0.52	0.48	0.46	0.43	≥ 45	0.58	0.50	0.45	0.40	0.37	0.33
E	> 75	≥ 45	1.00	1.00	1.00	1.00	1.00	1.00	≥ 40	0.97	0.94	0.92	0.91	0.90	0.90	≥ 35	0.91	0.87	0.84	0.82	0.80	0.78
F	100	< 45	--	--	--	--	--	--	< 40	--	--	--	--	--	--	< 35	--	--	--	--	--	--

The following figure helps define each of the six (6) segment LOS levels. When a LOS decreases to a LOS of E, mitigation measures/improvements are recommended.

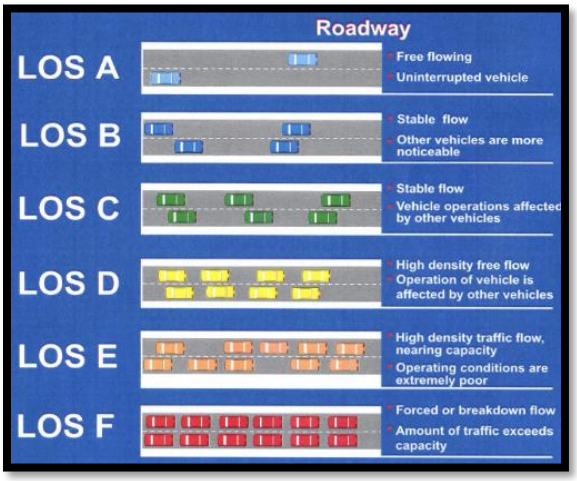


Figure 5 – Segment LOS

b. Intersection LOS

The LOS for an intersection is determined by the control delay per vehicle. The LOS is broken down into six (6) categories A through F; A being the best, F being the worst and E being the start of failure. In other words, when a LOS decreases from a D to an E, improvements are recommended. The following bulleted items and table breakdown the six (6) categories and show the correlation between the delay time and a LOS.

- LOS A: The intersection has no congestion, has less than a 10 second control delay per vehicle, and is operating below 55% capacity.
- LOS B: The intersection has very little congestion, has a control delay per vehicle between 10 and 15 seconds, and is operating between 55% and 64% capacity.
- LOS C: The intersection has no major congestion, has a control delay per vehicle between 15 and 25 seconds, and is operating between 64% and 73% capacity.
- LOS D: The intersection normally has no congestion, has a control delay per vehicle between 25 and 35 seconds, and is operating between 73% and 82% capacity.
- LOS E: The intersection is right on the verge of congested conditions, has a control delay per vehicle between 35 and 50 seconds, and is operating between 82% and 91% capacity.
- LOS F: The intersection is over capacity and experiences congestion, has a control delay per vehicle between 50 seconds or more, and is operating between 91% and 100% capacity.

Table 6 - Control Delay per Vehicle to LOS Correlation Table

Control Delay Per Vehicle (s)	LOS
≤10	A
10 to 15	B
15 to 25	C
25 to 35	D
35 to 50	E
>50	F

4. Left Turn and Right Turn Lane Warrant Analysis

The right-hand turn and left-hand turn lane warrants are analyzed following the guidance found in ITD's *Traffic Manual: Idaho's Supplementary Guide to the MUTCD*, which references *NCHRP Report 745 – Left-Turn Accommodations at Unsignalized Intersections.* In addition, the *NCHRP 457 – Evaluating Intersection Improvements: An Engineering Study Guide* was utilized for right-turn movements. The following figures show the left-turn and right-turn warrant charts for intersections on a two-lane rural highway.

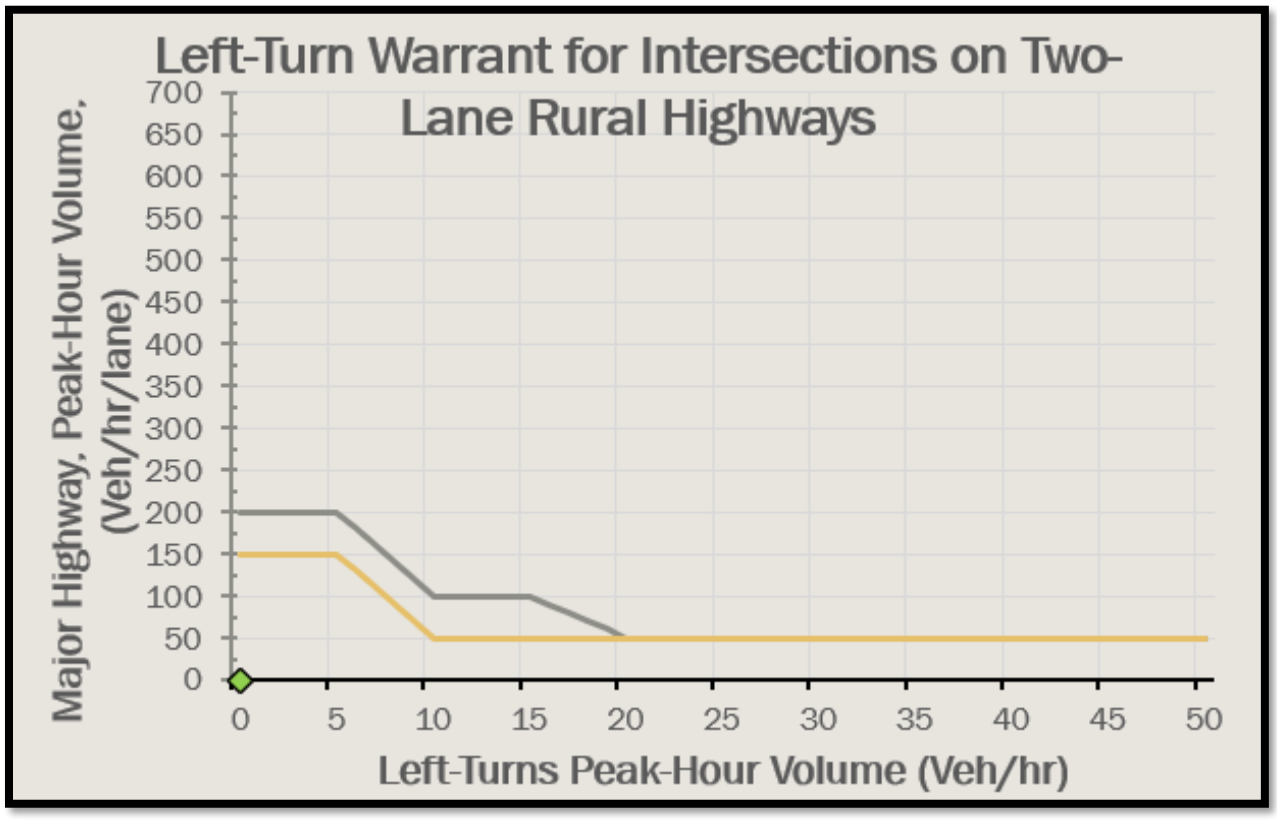


Figure 6 – Left-Turn Warrant Chart

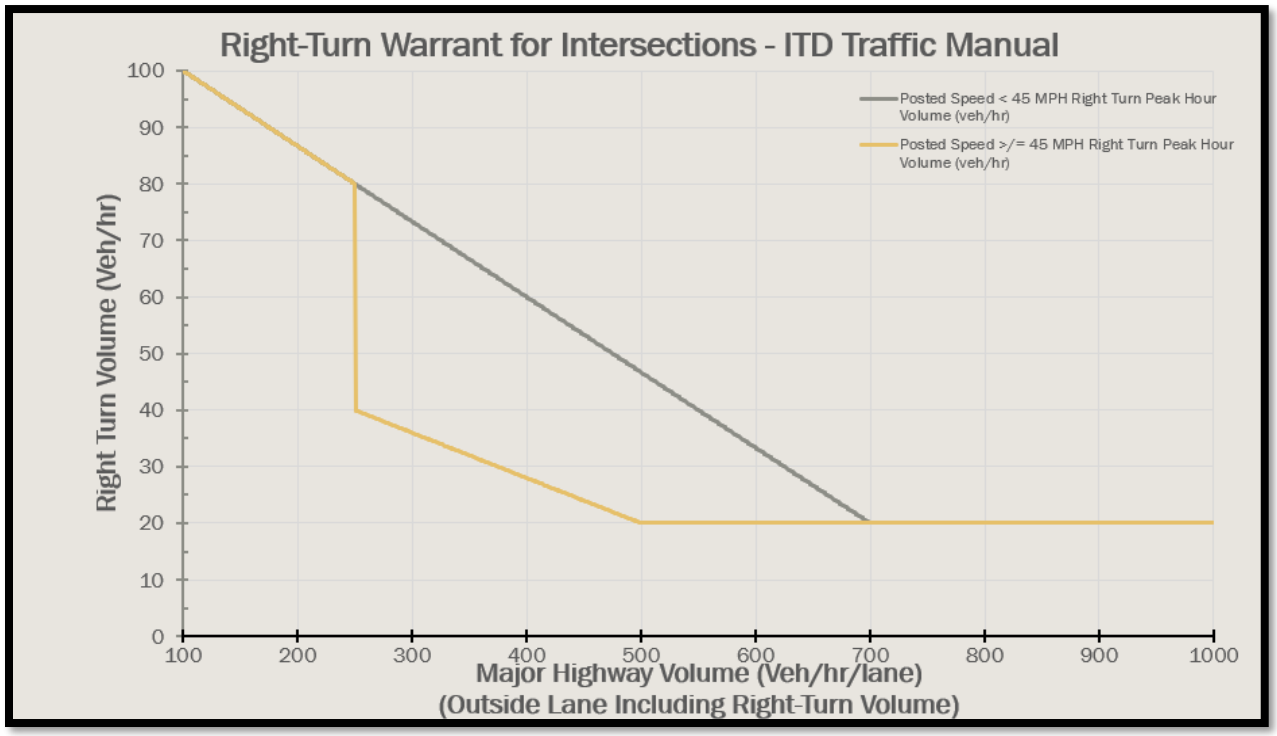


Figure 7 – Right-Turn Warrant Chart

V. Area Conditions

A. Study Area

1. Area of Influence and Significant Traffic Impact

The area of influence for this analysis includes the following roadway segments and intersections.

1. Segment #1 – 3000W
2. Segment #2 – 2000W
3. Intersection #1 – Hwy 33/3000W
4. Intersection #2 – Hwy 33/2000W
5. Intersection #3 – 7000N/1750W
6. Intersection #4 – 7000N/Solstice Circle East (new intersection)
7. Intersection #5 – 7000N/Solstice Circle West (new intersection)

The area of influence is presented in the following figure.

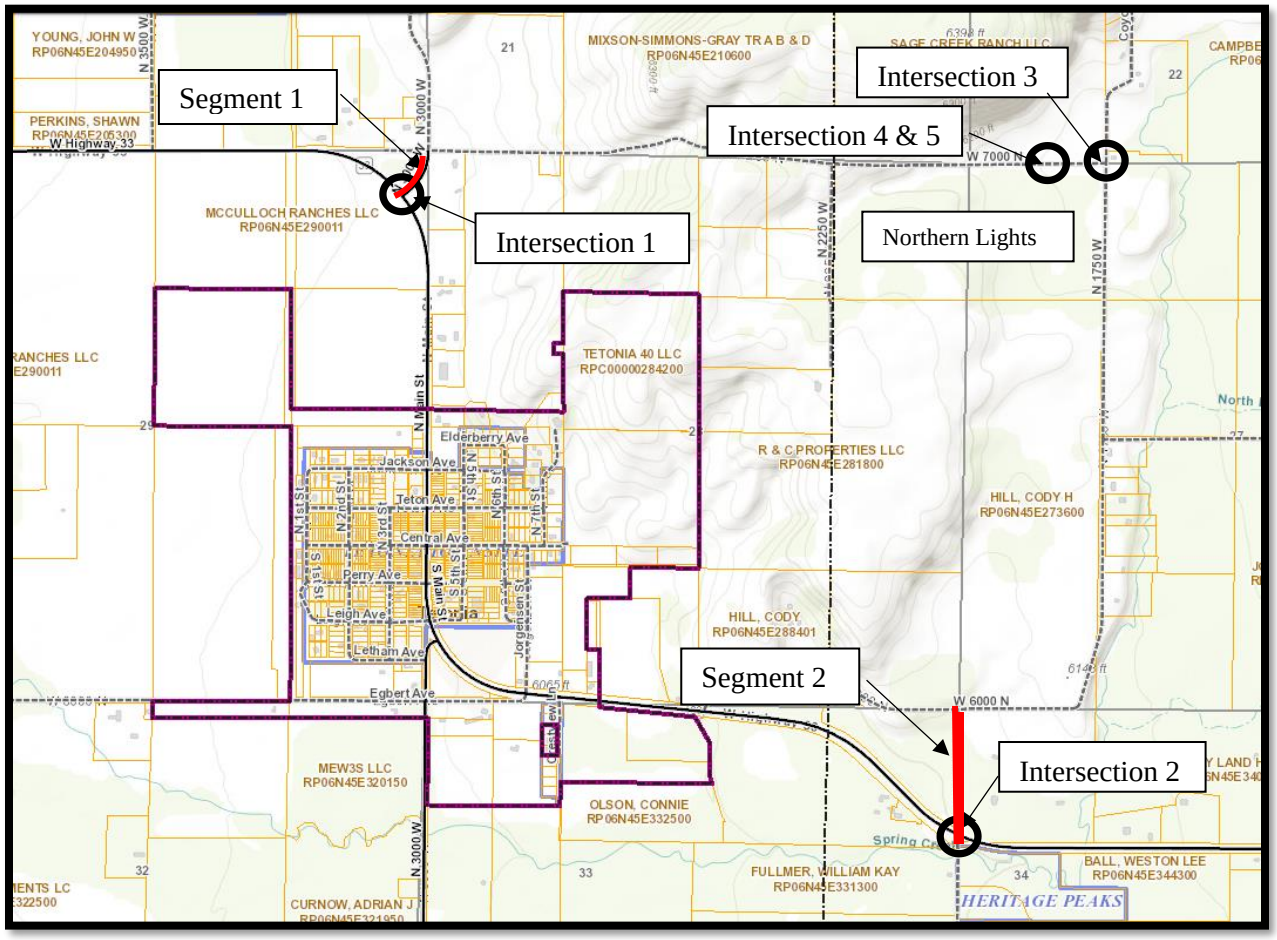


Figure 8 – Area of Influence and Significant Traffic Impact

B. Study Area Land Use

1. Existing Land Uses

The current land use is agricultural interspersed with scattered residential use. The City of Tetonia is a small rural community located just southwest of the development. The use can be observed in the various figures presented and in viewing the parcels using various commercial mapping platforms available to the public such as Google Earth, Bing Maps, and the Teton County GIS parcel viewer.

2. Existing Zoning

Currently, Teton County lists the west parcel as FH-10 Foothills and the east parcel as RA-35 Rural Agriculture. The use of the land reflects that zone.

3. Anticipated Future Development

The only known future development in the area is the proposed project which consists of 17 single family residences lots. As stated earlier, the County requires the study to assume that all 17 lots will consist of a main home and an accessory dwelling unit for a total of 34 dwellings.

C. Site Accessibility

Access to the site will be by 2000W, 6000N, and 1750W to and from Hwy 33 and 7000N, 3000W to and from Hwy 33. The main access to the development will be off of 7000N.

a. Road Network Functional Classification.

For access guidelines, the Road Classification Map published by Teton County shows that 2000W, 6000N, 1750W, 7000N, and 3000W are considered minor neighborhood while Highway 33 is considered a minor arterial; see the following figure for the Teton County Road Classification Map.

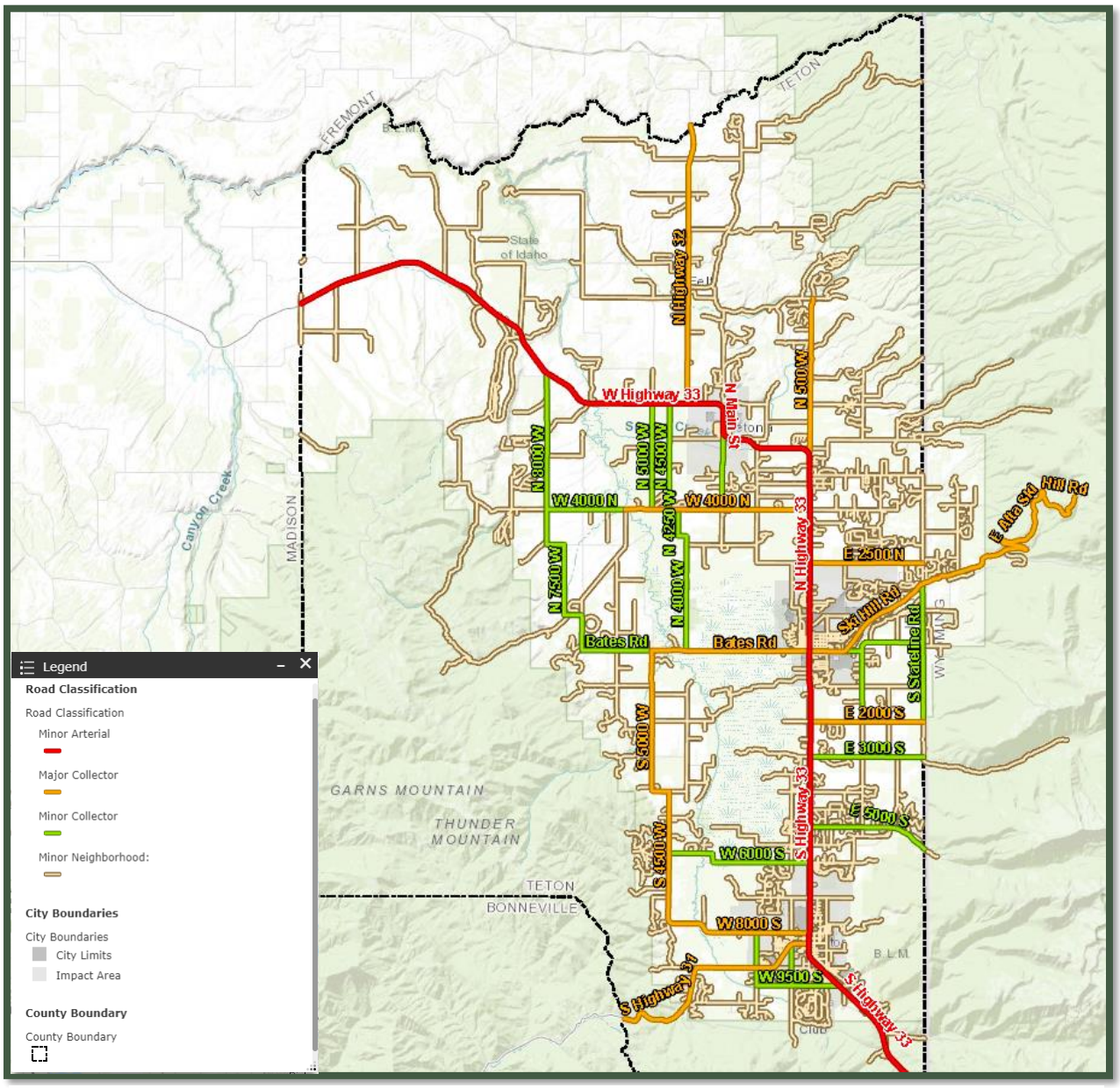


Figure 9 - Teton County Road Classification Map

1. Access Management

Access management within a city is intended to facilitate safe and convenient access and circulation for vehicular traffic, pedestrians, and bicycles within a jurisdiction. Access management for the state highway system intended to provide safe transit for reginal and interstate traffic. As such, the objectives of access management within a city can sometimes be different than those for a state highway system.

a. Teton County

Access management for Teton County is governed by the publication Highway & Street Guidelines for Design and Construction in Teton County, Idaho as amended April 11, 2013. A review of that publication does not reveal any specific requirements for access management.

2. Area Transportation Elements and Roadway System

a. Existing Roadway Network

The existing roadway network consists of rural two-lane roadways.

b. Transit Service

TRPTA operates public transit services in the area but not on roadways within the study area of this Traffic Impact Study.

c. Bicycle and Pedestrian Facilities

There are no bicycle or pedestrian facilities on the roads in the vicinity of the development.

d. Future

Other than the roads for the proposed development, there are no known future road improvements in the vicinity.

3. Accident History

a. ITD Crash Data

Figure 10 - LHTAC Crash Data

According to the Idaho Local Road Crash Data that was obtained from the Local Highway Technical Assistance Council (LHTAC) there has been six (6) crashes within the influence area of this study; four (4) at the intersection of Hwy 33/3000N and two (2) at the intersection of Hwy 33/2000W as depicted in the above Figure. Of these six (6) accidents, no fatalilites have been recorded and are below the base rate for a similar intersection types in Idaho.

VI. Existing 2022 Traffic Volumes and Conditions

A. Traffic Forecasting

There are diverse ways to forecast future traffic flow and patterns. A common forecasting method is to take the historic population and forecast the traffic from those values. However, in this situation, recreation and tourism is a major factor, therefore using traffic data trends from ITD traffic counts will provide more satisfactory results from which to draw conclusions and make recommendations for mitigation. This study will use traffic data obtained from the ITD to determine traffic conditions for the 2022 (existing), 2027 (Project buildout), and the 2047 (20-year after buildout) horizon years.

B. Roadway Network

Within the area of influence there will be two (2) roadway segments, three (3) existing intersections, and two (2) future intersection studied. The segments and the intersections that will analyzed are:

1. Segment #1 – 3000W
2. Segment #2 – 2000W
3. Intersection #1 – Hwy 33/3000W
4. Intersection #2 – Hwy 33/2000W
5. Intersection #3 – 7000N/1750W
6. Intersection #4 – 7000N/Solstice Circle East (new intersection)
7. Intersection #5 – 7000N/Solstice Circle West (new intersection)

C. Seasonal Adjustment

As a recreational destination, the traffic volumes fluctuate throughout the year with the summer months exhibiting the highest ADT. It has been determined that the peak month in 2022 was July with an ADT of 4,219 vpd. The visual counts were performed in November of 2022. The ITD data for November of 2022 shows that there was an ADT of 2,869 vpd. This indicated that the seasonal difference between when the visual counts were performed (November) and the peak month (July) is a difference of 47.1%. Throughout this study, all visual counts in November will be increased by 47.1% to help represent the traffic in July.

D. Existing 2022 Segment PM Peak Traffic Volumes

This section discusses the ADT, the peak hour flows, and the trip distribution for the existing traffic. As stated previously, the segments of 3000W and 2000W will be analyzed. Traffic counts in the study area were visually collected on November 4, 2022 during the pm peak hour.

1. Seg. 1 - 3000W Existing 2022 PM Peak Hr Flow

The results of this visual count show that there were 12 vph headed northeast and seven (7) vph headed southwest during pm peak hour. Increasing counts these by the 47.1% seasonal adjustment it is calculated that there are 23 vph headed northeast and 13 vph headed southwest.

2. Seg. 2 - 2000W Existing 2022 PM Peak Hr Flow

The results of this visual count show that there were 10 vph headed northbound and 20 vph headed southbound during pm peak hour. Increasing these counts by the 47.1% seasonal adjustment it is calculated that there are 18 vph headed northbound and 20 vph headed southbound.

E. Existing 2022 PM Peak Intersection Traffic Volumes

1. Highway 33 Peak Hr Flow

The traffic volumes at the three (3) existing intersections were visually counted on November 4, 2022. However, for the two (2) intersections that include Hwy 33, only the turning movements off of Hwy 33 were counted. This is due to the fact that the ITD has counters on Hwy 33 that collect a number of different data items that provides a larger window of data. The data obtained from the ITD for Hwy 33 will be adjusted to the study area and added to the seasonally adjusted visual counts. The ITD website for Road Data features an interactive map that allows a query by road milepost for Average Annual Daily Traffic (AADT), which is the total volume of traffic on a road for a year divided by the number of days (365) in a year. However, these values are annual averages rather than peak days that reflect summertime travel. ITD also maintains Automatic Traffic Recorders (ATRs) throughout the state including District 6, two (2) of these ATRs are located on Hwy 33; ATR 59 east of Newdale and ATR 239 south of Driggs. The ATR most relevant to this project is ATR #59 near Newdale which records the traffic on Hwy 33. The monthly AADT for ATR #59 in 2022 ranged from a low in January of 2,357 vpd to a high in July of 4,219 vpd. This study will focus on the July MADT or peak season and not the ADT. The following figure shows the locations of the ATRs in the area.

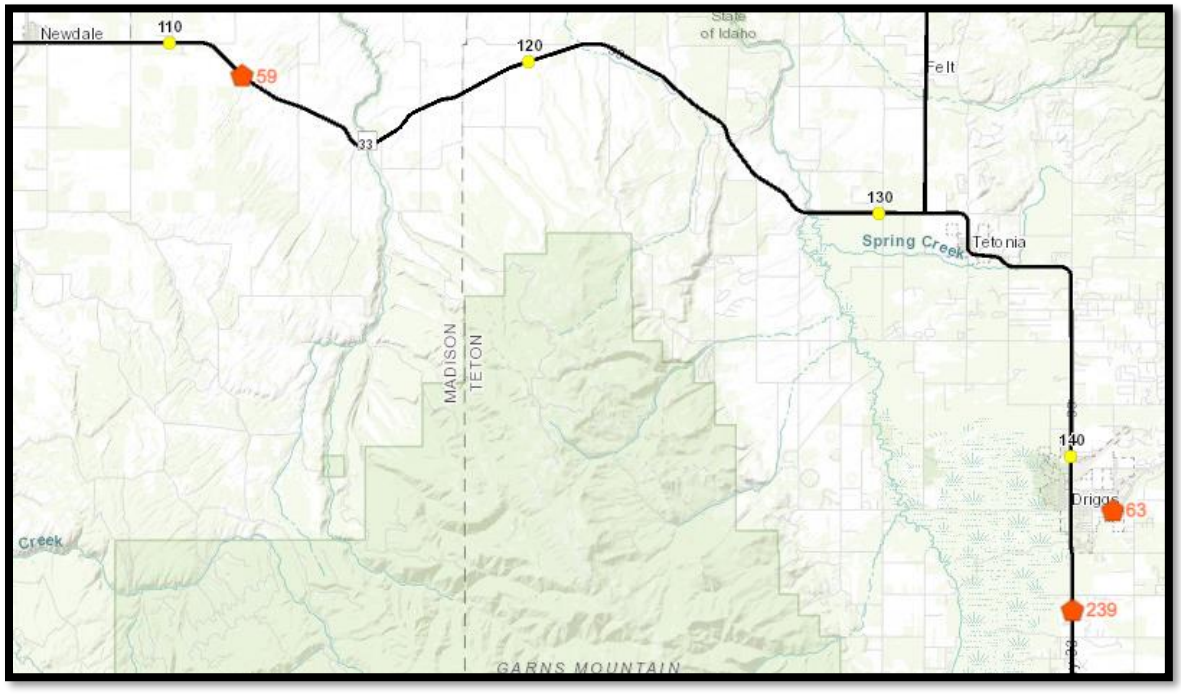


Figure 11: Hwy 33 ATR Locations

Furthermore, an adjustment needs to be made due to the fact that ATR 59 is 24 miles away from the study area. The ITD does have a database that has the ADT for each milepost along Hwy 33. In order to make these adjustments, the ADT difference between ATR 59 (Milepost 113) and the study area (Milepost 132 and Milepost 134) will be used. The following figure shows the mileposts along Hwy 33.

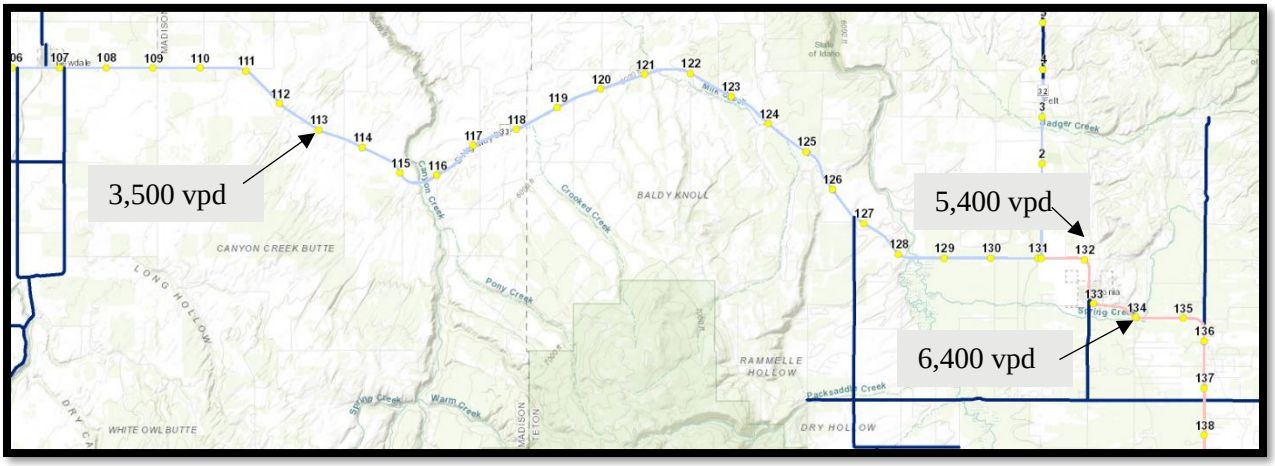


Figure 12: Hwy 33 Mileposts and ADT

The ITD website shows that the ADT at Milepost 113 to Milepost 130 is 3,500 vpd, at Milepost 132 is 5,400 vpd, and at Milepost 134 is 6,400 vpd. It is calculated that there is an increase in traffic of 54.3% between Milepost 113 and Milepost 132 and an increase of 18.5% between mileposts 132 and 134.

Data retrieved at ATR 59 shows that the in July, the highest traffic day is Friday. Furthermore, the highest pm peak hour traffic occurs between 5:00 pm and 6:00 pm on Fridays with a monthly average pm peak of 407 vph with 192 vph traveling east and 214 vph traveling west.

The last step is to take the pm peak hour traffic and adjust them proportionately to the by the calculated increase; an increase of 54.3% from Milepost 113 to Milepost 132 and an increase of 18.5% from Milepost 132 to Milepost 134. The following table shows the calculated PM peak hour volumes that will be used in this study. These volumes will be used in analyzing the intersections.

Table 7 Existing Segment ADT, Peak Hour, and Trip Distribution Volumes

Milepost	Year	ADT	July PM Peak	PM Peak Eastbound	PM Peak Westbound
113	2022	3500	407	192	214
132	2022	5400	626	296	330
134	2022	6400	742	351	391

2. Int. 1 – Hwy 33/3000W Peak Hr Volume

The turning movements that were visually counted on November 4, 2022 were seasonally adjusted to July and were added to the collected July traffic counts provided by the ITD. The results are shown in the following figure.

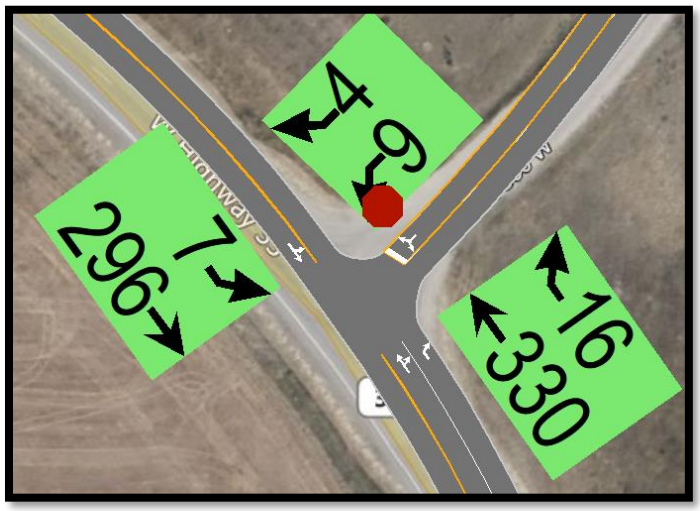


Figure 13: Existing 2022 Conditions Hwy 33/3000W PM Peak Hr Volume

3. Int. 2 – Hwy 33/2000W Peak Hr Volume

The turning movements that were visually counted on November 4, 2022 were seasonally adjusted to July and were added to the collected July traffic counts provided by the ITD. The results are shown in the following figure.

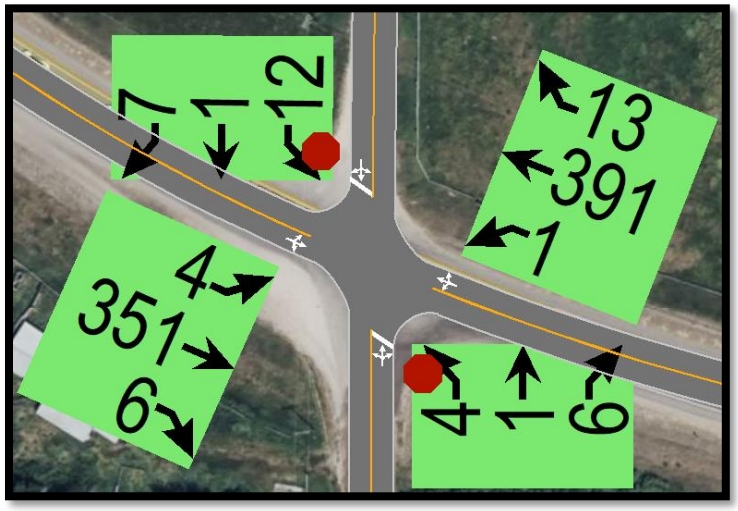


Figure 14: Existing 2022 Conditions Hwy 33/2000W PM Peak Hr Volume

4. Int. 3 – 7000N/1750W Peak Hr Volume

The traffic volumes that were collected on November 4, 2022 were seasonally adjusted to help emulate the peak month of July. The results are shown in the following figure.

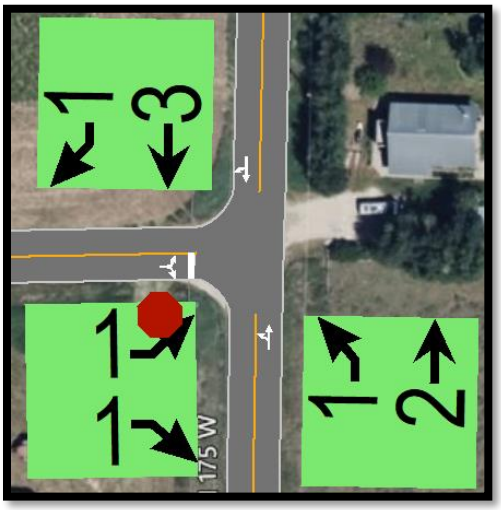


Figure 15: Existing 2022 Conditions 7000N/1750W PM Peak Hr Volume

5. Int. 4 – 7000N/Solstice Circle East Peak Hr Volume (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no traffic counts were counted. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

6. Int. 5 – 7000N/Solstice Circle West Peak Hr Volume (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no traffic counts were counted. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

F. Existing 2022 Segment PM Peak Traffic Conditions

At the time of this study, the free flow speed (FFS) was not available for the specific road segment being analyzed. Therefore, in order to determine the LOS for the road segment through this area, the volume to capacity ratio (v/c ratio) will be used. In order to determine the v/c ratio, we divide the volume of the roadway by the capacity. According to the Highway Capacity Manual, the capacity of a two-lane highway is 1,700 vehicles per hour for each direction of travel. By dividing the peak hour by the peak hour capacity, we get a v/c ratio. The following table shows the correlation between the v/c ratio and the LOS.

Table 8 Level of Service Criteria for General Two-Lane Highway Segments

Level of Service Criteria for General Two-Lane Highway Segments

		V/C Ratio[a]																		
		Level Terrain							Rolling Terrain							Mountainous Terrain						
			% No-Passing Zone							% No-Passing Zone							% No-Passing Zone					
LOS	% Time Delay	Avg.[b] Speed	0	20	40	60	80	100	Avg.[b] Speed	0	20	40	60	80	100	Avg.[b] Speed	0	20	40	60	80	100
A	≤ 30	≥ 58	0.15	0.12	0.09	0.07	0.05	0.04	≥ 57	0.15	0.10	0.07	0.05	0.04	0.03	≥ 56	0.14	0.09	0.07	0.04	0.02	0.01
B	≤ 45	≥ 55	0.27	0.24	0.21	0.19	0.17	0.16	≥ 54	0.26	0.23	0.19	0.17	0.15	0.13	≥ 54	0.25	0.20	0.16	0.13	0.12	0.10
C	≤ 60	≥ 52	0.43	0.39	0.36	0.34	0.33	0.32	≥ 51	0.42	0.39	0.35	0.32	0.30	0.28	≥ 49	0.39	0.33	0.28	0.23	0.20	0.16
D	≤ 75	≥ 50	0.64	0.62	0.60	0.59	0.58	0.57	≥ 49	0.62	0.57	0.52	0.48	0.46	0.43	≥ 45	0.58	0.50	0.45	0.40	0.37	0.33
E	> 75	≥ 45	1.00	1.00	1.00	1.00	1.00	1.00	≥ 40	0.97	0.94	0.92	0.91	0.90	0.90	≥ 35	0.91	0.87	0.84	0.82	0.80	0.78
F	100	< 45	--	--	--	--	--	--	< 40	--	--	--	--	--	--	< 35	--	--	--	--	--	--

1. Seg. 1 – 3000W Existing 2022 PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there were 23 vph heading northeast and 13 vph heading southwest during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.014 for northeast bound traffic and 0.008 for southwest bound traffic. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

a. Seg. 1: 3000W Existing 2022 Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

2. Seg. 2: 2000W Existing 2022 PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there are 18 vph heading northbound and 20 vph heading southbound during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.011 for northbound and 0.012 for southbound. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

a. Seg. 2: 2000W Existing 2022 Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

G. Existing 2022 Intersection PM Peak Hr Traffic Conditions

In order to determine how well an intersection is functioning, the intersection's Measures of Effectiveness (MOEs) for the peak hour is analyzed. The MOEs include:

1. Level of Service (LOS)
2. Control Delay
3. Volume/Capacity Ratio (V/C Ratio)
4. 95th Percentile Queue

Using the traffic volumes and turning movements shown previously, the 2022 existing MOEs for the intersections can be determined.

1. Int. 1 – Hwy 33/3000W Existing 2022 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 1 are shown in the following figure.

Table 9 –Int. 1 – Existing (2022) Peak Hr MOEs

HCM 2000 SIGNING SETTINGS	WBL	WBR	NBT	NBR	SBL	SBT
Lanes and Sharing (#RL)						
Traffic Volume (vph)	9	4	330	16	7	296
Future Volume (vph)	9	4	330	16	7	296
Sign Control	Stop	—	Free	—	—	Free
Median Width (ft)	12	—	0	—	—	0
TWLTL Median	☐	—	☐	—	—	☐
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	—	—	4.1	—
Follow Up Time, tF (s)	3.5	3.3	—	—	2.2	—
Volume to Capacity Ratio	0.03	0.03	0.22	0.22	0.01	0.01
Control Delay (s)	13.2	13.2	0.0	0.0	0.1	0.3
Level of Service	B	B	A	A	A	A
Queue Length 95th (ft)	2	2	0	0	1	1
Approach Delay (s)	13.2	—	0.0	—	—	0.3

2. Int. 2 – Hwy 33/2000W Existing 2022 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 2 are shown in the following figure.

Table 10 –Int. 2 - Existing (2022) Peak Hr MOEs

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	4	351	6	1	391	13	4	1	6	12	1	7
Future Volume (vph)	4	351	6	1	391	13	4	1	6	12	1	7
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	0	—	—	0	—	—	0	—	—	0	—
TWLTL Median	—	☐	—	—	☐	—	—	☐	—	—	☐	—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.06	0.06	0.06
Control Delay (s)	0.0	0.1	0.1	0.0	0.0	0.0	13.7	13.7	13.7	15.8	15.8	15.8
Level of Service	A	A	A	A	A	A	B	B	B	C	C	C
Queue Length 95th (ft)	0	0	0	0	0	0	2	2	2	5	5	5
Approach Delay (s)	—	0.1	—	—	0.0	—	—	13.7	—	—	15.8	—

3. Int. 3 – 7000N/1750W Existing 2022 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 3 are shown in the following figure.

Table 11 –Int. 3 - Existing (2022) Peak Hr MOEs

HCM 2000 SIGNING SETTINGS	EBL	EBR	NBL	NBT	SBT	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	1	1	1	2	3	1
Future Volume (vph)	1	1	1	2	3	1
Sign Control	Stop	—	—	Free	Free	—
Median Width (ft)	12	—	—	0	0	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	4.1	—	—	—
Follow Up Time, tF (s)	3.5	3.3	2.2	—	—	—
Volume to Capacity Ratio	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay (s)	8.5	8.5	0.0	2.4	0.0	0.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	8.5	—	—	2.4	0.0	—

4. Int. 4 – 7000N/Solstice Circle East Existing 2022 PM Peak Hr Traffic Conditions (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no delays are recorded. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

5. Int. 5 – 7000N/Solstice Circle West Existing 2022 PM Peak Hr Traffic Conditions (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no delays are recorded. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

H. Turn Lane Warrants Based on Safety Analysis of Intersections

1. Existing Conditions Left Turn Lane Analysis

Intersection #1 and #2 were evaluated for safety using ITD guidelines which recommend using the *National Cooperative Highway Research Report 745 –Left-Turn Accommodations at Unsignalized Intersections* (*NCHRP 745) to evaluate left-hand turns and* National Cooperative Highway Research Report 457: Evaluating Intersection Improvements: An Engineering Study Guide (NCHRP 457) *to evaluate right-turn movements to determine if turning movements are consistent with national standards for safety based on traffic volumes.* These guidelines show that if a three-leg intersection has traffic higher than 200 vph per lane on the major roadway and more than 150 vph per lane on a four-leg intersection, a left turn is warranted (see left-turn lane warrant chart in Chapter 4). Based on the ITD guidelines, a left turn lane is warranted for the southwest bound traffic at Intersection 1 and are warranted for both eastbound and westbound traffic at Intersection 2 (see Appendix F for the left-turn worksheet).

2. Existing Conditions Right Turn Lane Analysis

The Right-hand turn warrant analysis follows the guidance found in ITD's *Traffic Manual: Idaho's Supplementary Guide to the MUTCD* (reference the right-turn lane warrant chart in Chapter 4). Based on these guidelines, no right turning lanes are warranted for existing conditions (see Appendix G for the right-turn worksheet).

I. Analysis of Existing 2022 PM Peak Hr Traffic Conditions Summary

This chapter has identified the following:

1. Segments

b. Seg. 1: 3000W

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

c. Seg. 2: 2000W

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

d. Segment Summary

The following table is a summary of each segment's v/c ratio and LOS for each direction.

Table 12 –Existing 2022 Segments Traffic Condition Summary

3000W	2022	
Direction	v/c	LOS
Northeast	0.014	A
Southwest	0.008	A

2000 W	2022	
Direction	v/c	LOS
Northbound	0.011	A
Southbound	0.012	A

2. Intersections

a. Int. 1: Hwy 33/3000W

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of B during the PM peak hour of the day.

b. Int. 2: Hwy 33/2000W

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of C during the PM peak hour of the day.

c. Int. 3: 7000N/1750W

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

d. Int. 4 - 7000N/Solstice Circle East (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no delays are recorded. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

e. Int. 5 – 7000N/Solstice Circle West (New Intersection)

Due to the fact that this intersection does not exist for the existing conditions, no delays are recorded. This intersection will be analyzed in the buildout and 20-year after buildout horizon years.

f. Intersection Summary

The following table is a summary of each intersection's LOS and delay time for each turning movement.

Table 13 –Existing 2022 Intersections Traffic Condition Summary

Int 1 - Hwy 33/3000W - Build LOS and Delay Times												
	Northeastbound			Southeastbound			Northwestbound			Southwestbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2022 Traffic	n/a	n/a	n/a	7	296	n/a	n/a	330	16	9	n/a	4
LOS	n/a	n/a	n/a	A	A	n/a	n/a	A	A	B	n/a	B
Delay	n/a	n/a	n/a	0.1	0.3	n/a	n/a	0	0	13.2	n/a	13.2

Int 2 - Hwy 33/2000W - Build LOS and Delay Times												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2022 Traffic	4	351	6	1	391	13	4	1	6	12	1	7
LOS	A	A	A	A	A	A	B	B	B	C	C	C
Delay	0	0.2	0.2	0	0.1	0.1	13.7	13.7	13.7	15.8	15.8	15.8

Int 3 - 7000N/1750W - Build LOS and Delay Times												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2022 Traffic	1	n/a	1	n/a	n/a	n/a	1	3	n/a	n/a	4	1
LOS	A	n/a	A	n/a	n/a	n/a	A	A	n/a	n/a	A	A
Delay	8.5	n/a	8.5	n/a	n/a	n/a	0	2.4	n/a	n/a	0	0

3. Turn Lane Analysis

a. Left Turn Lane Analysis

Left turns lanes are warranted for the southwest bound traffic at Intersection 1 and are warranted for both eastbound and westbound traffic at Intersection 2.

b. Right Turn Lane Analysis

Right turns lanes are not warranted for either intersection on Hwy 33 for the existing conditions.

4. Overall Summary for 2022

In summary, the following is determined to be operating at an unacceptable level for the existing conditions:

1. Int. 1 Hwy 33/3000W: Southeast bound, left turning traffic, exceeds the minimum levels
2. Int. 2 Hwy 33/2000W: Eastbound, left turning traffic, exceeds the minimum levels
3. Int. 2 Hwy 33/2000W: Westbound, left turning traffic, exceeds the minimum levels

5. Mitigation Measures for the 2022 Existing Conditions

It is recommended that a left turn lane be constructed on Hwy 33 for the southeast bound traffic at Int. 1 and that left turn lanes be constructed for both the eastbound and westbound traffic on Hwy 33 at Int. 2.

VII. Projected Traffic

A. Site Traffic

It is anticipated that buildout of the development will be complete by 2027.

1. Trip Generation

In order to determine the trips generated by the proposed development, the ITE Trip Generation 10th Edition Manual was used. This study will use traffic data obtained from the ITD to determine traffic conditions for the 2022 (existing), 2027 (Project buildout), and the 2047 (Future) horizon years.

a. Buildout (2027)

The following two (2) tables show the land use and trip generation for the ADT and the peak hour.

Table 14- Land Use and Trip Generation (ADT) for Buildout (2027)

Land Use Category	ITE Code	Size	Units	Trip Generation per unit	Total Trips	Internal Capture Trips		Pass-by Trips		Primary Trips Total
Weekday Trips										
Single-Family Detached Housing (Main)	210	17	Dwelling Untis	9.57	163	0%	0	-	-	163
Single-Family Detached Housing (Accessory)	210	17	Dwelling Untis	9.57	163	0%	0	-	-	163
Total					**325**		**0**		**0**	**325**

Table 15- Land Use and Trip Generation (Peak Hour) for Buildout (2027)

Land Use Category	ITE Code	Size	Units	Trip Generation per unit	Total Trips	Internal Capture Trips		Pass-by Trips		Primary Trips Total
Weekday Peak Hour										
Single-Family Detached Housing (Main)	210	17	Dwelling Untis	0.76	13	0%	0	-	-	13
Single-Family Detached Housing (Accessory)	210	17	Dwelling Untis	0.76	13	0%	0	-	-	13
Total					**26**		**0**		**0**	**26**

2. Trip Distribution

Trip distribution is a percentage indicating what percentage of traffic is entering or exiting the study area. The ITE Trip Generation Handbook outlines the trip distribution for each land use. The following two (2) tables show the land use, trip generation, and trip distribution for the ADT and the peak hour.

Table 16- Trip Distribution (ADT) for Buildout (2027)

Land Use Category	ITE Code	Size	Units	Trip Generation per unit	Total Trips	Internal Capture Trips		Pass-by Trips		Primary Trips Total	Primary Trips Entering		Primary Trips Exiting	
Weekday Trips														
Single-Family Detached Housing (Main)	210	17	Dwelling Untis	9.57	163	0%	0	-	-	163	50%	81	50%	81
Single-Family Detached Housing (Accessory)	210	17	Dwelling Untis	9.57	163	0%	0	-	-	163	50%	81	50%	81
Total					**325**		**0**		**0**	**325**		**163**		**163**

Table 17- Trip Distribution (Peak Hour) for Buildout (2027)

Land Use Category	ITE Code	Size	Units	Trip Generation per unit	Total Trips	Internal Capture Trips		Pass-by Trips		Primary Trips Total	Primary Trips Entering		Primary Trips Exiting	
Weekday Peak Hour														
Single-Family Detached Housing (Main)	210	17	Dwelling Untis	0.76	13	0%	0	-	-	13	64%	8	36%	5
Single-Family Detached Housing (Accessory)	210	17	Dwelling Untis	0.76	13	0%	0	-	-	13	64%	8	36%	5
Total					**26**		**0**		**0**	**26**		**17**		**9**

3. Modal Split

Modal split is the determination of different travel modes (automobile, heavy vehicles, walk, etc.) from an origin to a given destination. Analyzing the pedestrian traffic is outside the scope of this study and it is assumed that no heavy vehicles will be generated from the development. A standard 5% heavy vehicle percentage will be applied to this study.

4. Trip Assignment

It is assumed that 10% of the generated traffic will travel to and from Intersection 1 and 90% will travel to and from Intersection 2 and 3.

a. Intersection 1: Hwy 33/3000W

When the 10% of the generated traffic reaches this intersection, it is assumed that the traffic will follow the existing traffic percentages presented in Chapter 6; 67% using Hwy 33 to and from Tetonia and 33% using Hwy 33 to and from the Hwy 33/Hwy 32 intersection.

b. Intersection 2: Hwy 33/2000W

When traffic enters/exits the development, it is assumed that 90% will use 7000N to and from Intersection 3. From there, it is assumed that 95% of the traffic will use 1750W south of the intersection to and from 6000N, to and from 2000W, and then to and from Intersection 2 on Hwy 33; the remaining 5% will use 1750W north of the intersection. When the traffic reaches Intersection 2, it is assumed that the traffic will follow the existing traffic percentages presented in Chapter 6; 57% turning left, 9% thru, and 35% turning right.

c. Intersection 3: 7000N/1750W

It is assumed that when the 90% of traffic generated from the development will travel to and from Intersection 1. When the traffic reaches this intersection, 95% will use the south leg, heading to and from Hwy 33, and the remaining 5% will use the north leg of the intersection

d. Intersection 4: 7000N/Solstice Circle East

From the site plan, it is assumed that nine (9) lots (lots 6–14) will access 7000N via the east access.

e. Intersection 5: 7000N/Solstice Circle West

From the site plan, it is assumed that eight (8) lots (lots 1–5 and lots 15-17) will access 7000N via the west access.

B. Through Traffic (Non-Site Traffic)

1. Non-Site Traffic for anticipated Development in Study Area

a. Method of Projections

Pass-by trips are made as intermediate stops on the way from an origin to a destination without a route diversion. In other words, a pass-by trip is when the traffic on an adjacent roadway is attracted to a certain land use in a development as non-site traffic. The trip generally goes from origin to generator and then returns to the origin. The proposed development does not have any land uses that would be considered pass-by trips.

b. Trip Distribution

This section is not applicable due to the fact that single-family detached housing is not considered a non-site traffic generator.

c. Modal Split

This section is not applicable due to the fact that single-family detached housing is not considered a non-site traffic generator.

d. Trip Assignment

This section is not applicable due to the fact that single-family detached housing is not considered a non-site traffic generator.

C. Total Traffic

The total trips generated by the development and the impact to each intersection for the 2027 Buildout are shown in the following figures.

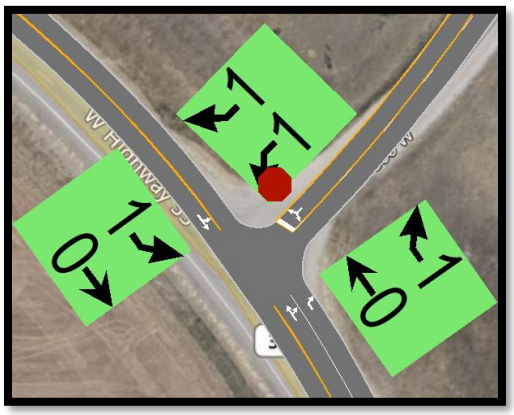


Figure 16- Intersection 1 Hwy 33/3000W PM Peak Generated Traffic

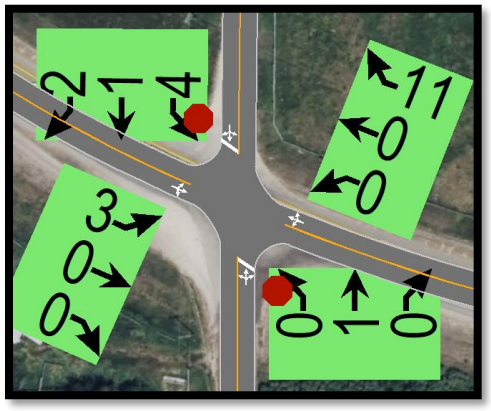


Figure 17- Intersection 2 Hwy 33/2000W PM Peak Generated Traffic

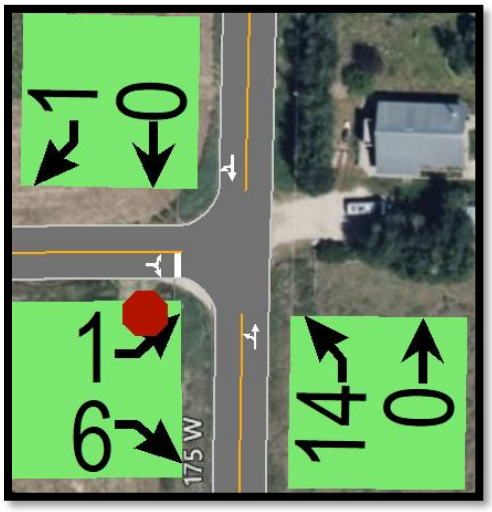


Figure 18- Intersection 3 7000N/1750W PM Peak Generated Traffic

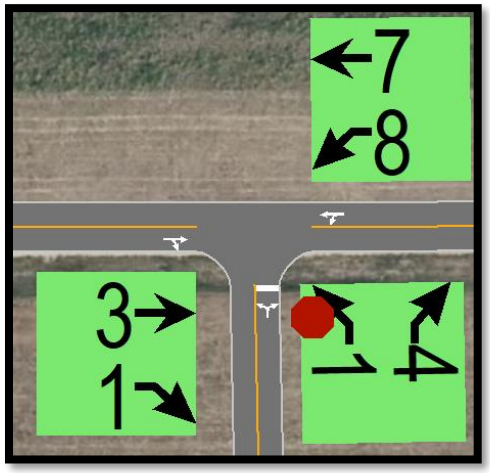


Figure 19- Intersection 4 Solstice Circle East PM Peak Generated Traffic

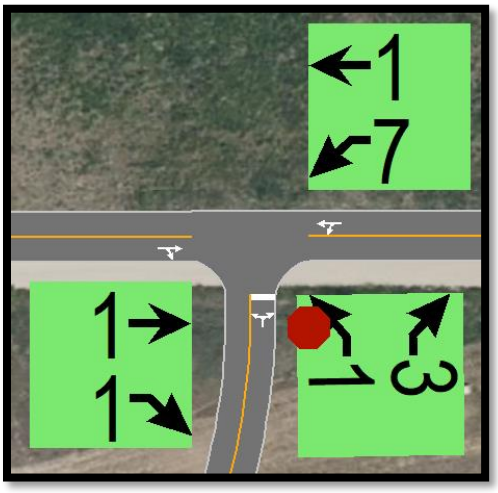


Figure 20- Intersection 4 Solstice Circle West PM Peak Generated Traffic

VIII. 2027 Horizon Year Traffic Analysis (Buildout)

A. On-Site Development

Buildout is assumed to be complete by the year 2027.

B. Traffic Forecasting

The traffic counts from Chapter 6 were increased by the annual growth rate percentages to establish the background traffic. This chapter will analyze two (2) scenarios for each segment and intersection; 2027 background traffic (without the development) and 2027 background plus site traffic (with the development).

C. Roadway Network

Within the area of influence there will be two (2) roadway segments, three (3) existing intersections, and two (2) future intersection studied. The segments and the intersections that will analyzed are:

1. Segment #1 – 3000W
2. Segment #2 – 2000W
3. Intersection #1 – Hwy 33/3000W
4. Intersection #2 – Hwy 33/2000W
5. Intersection #3 – 7000N/1750W
6. Intersection #4 – 7000N/Solstice Circle East (new intersection)
7. Intersection #5 – 7000N/Solstice Circle West (new intersection)

D. 2027 PM Peak Segment Traffic Volumes

1. Seg. 1 – 3000W 2027 PM Peak Segment Traffic Volumes

a. 2027 Background 3000W PM Peak Hour Flow

The traffic volumes for the 2022 Existing Conditions were increased by the annual growth rate to forecast the 2027 Background Traffic. The results of this forecast 26 vph headed northeast and 15 vph headed southwest during pm peak hour.

b. 2027 Background plus Site Traffic 3000W PM Peak Hour Flow

The traffic generated by the development was added to the 2027 Background Traffic. The results of this forecast 28 vph headed northeast and 17 vph headed southwest during pm peak hour after buildout.

2. Seg. 2 – 2000W 2027 PM Peak Segment Traffic Volumes

a. 2027 Background 2000W PM Peak Hour Flow

The traffic volumes for the 2022 Existing Conditions were increased by the annual growth rate to forecast the 2027 Background Traffic. The results of this forecast 20 vph headed northbound and 23 vph headed southbound during pm peak hour.

b. 2027 Background plus Site Traffic 2000W PM Peak Hour Flow

The traffic generated by the development was added to the 2027 Background Traffic. The results of this forecast 37 vph headed northbound and 30 vph headed southbound during pm peak hour after buildout.

E. 2027 PM Peak Intersection Traffic Volumes

The traffic volumes for the 2022 Existing Conditions were increased by the annual growth rate to forecast the 2027 Background Traffic for each intersection. The following sections show the forecasted intersection traffic volumes without and with the proposed development.

1. Int. 1 – Hwy 33/3000W 2027 PM Peak Segment Traffic Volumes

Figure 21: Hwy 33/3000W 2027 Traffic Volumes without and with the Development

2. Int. 2 – Hwy 33/2000W 2027 PM Peak Segment Traffic Volumes

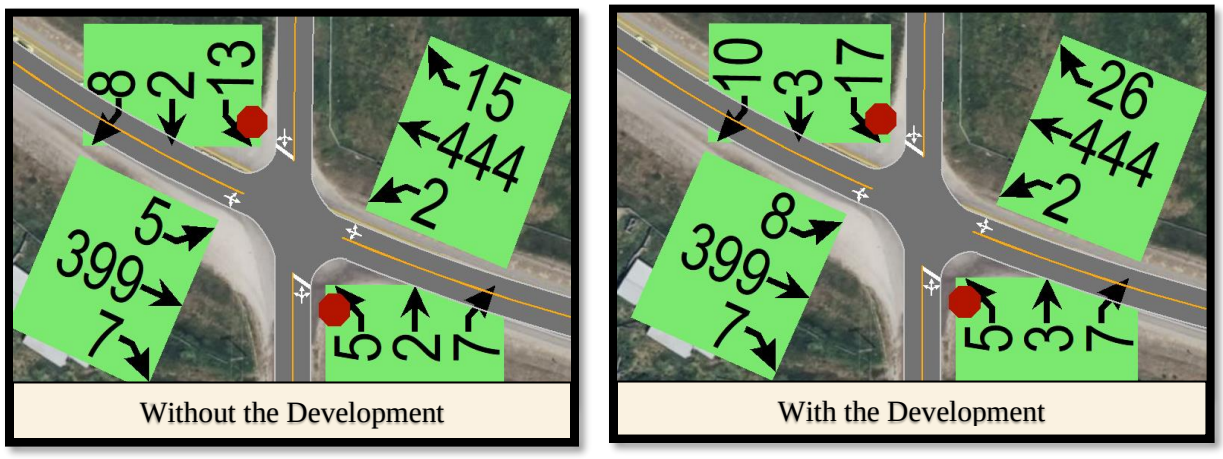


Figure 22: Hwy 33/2000W 2027 Traffic Volumes without and with the Development

3. Int. 3 – 7000N/1750W 2027 PM Peak Segment Traffic Volumes

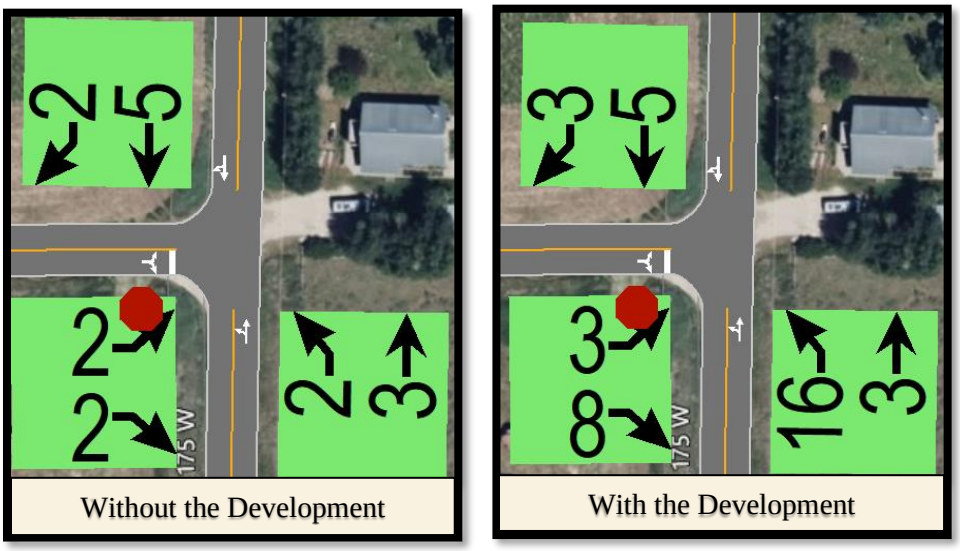


Figure 23: 7000N/1750W 2027 Traffic Volumes without and with the Development

4. Int. 4 – 7000N/Solstice East 2027 PM Peak Segment Traffic Volumes

Since this intersection only exists with the development, only traffic volumes with the development are included.

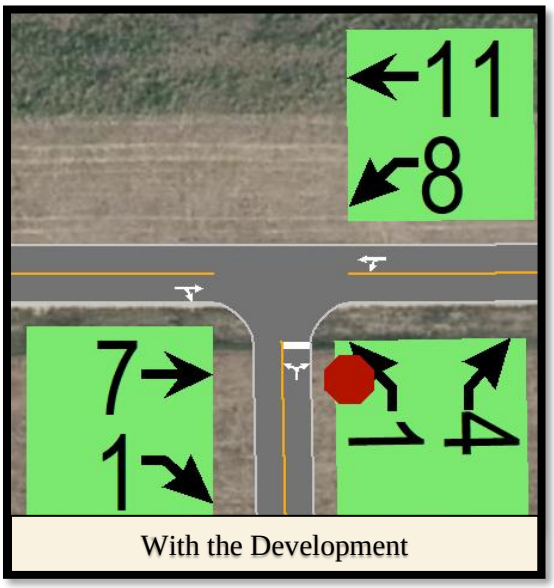


Figure 24: 7000N/Solstice Circle East 2027 Traffic Volumes with the Development

5. Int. 5 – 7000N/Solstice West 2027 PM Peak Segment Traffic Volumes

Since this intersection only exists with the development, only traffic volumes with the development are included.

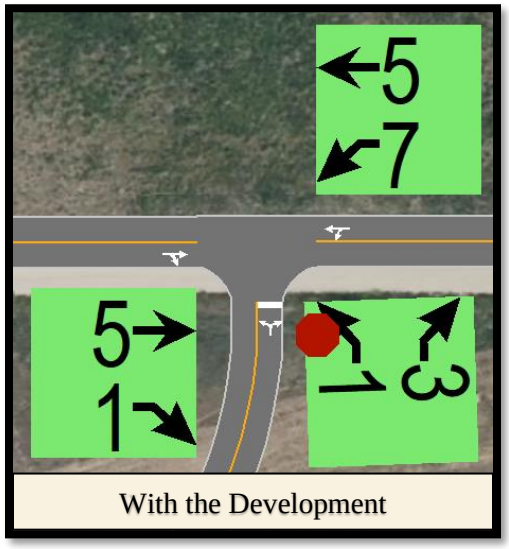


Figure 25: 7000N/Solstice Circle West 2027 Traffic Volumes with the Development

F. 2027 Segment PM Peak Hr Traffic Conditions

The traffic counts shown previously in the chapter were used to determine the forecasted conditions without and with the proposed development. The following sections identify the projected LOS for each segment for both scenarios.

1. Seg. 1 – 3000W 2027 PM Peak Hr Segment Traffic Conditions

a. Seg.1 - 2027 Background 3000W PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there were 26 vph heading northeast and 15 vph heading southwest during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.015 for northeast bound traffic and 0.009 for southwest bound traffic. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

b. Seg.1 - 2027 Background plus Site Traffic 3000W PM Peak Hr Traffic Conditions

The traffic generated by the development was added to the 2027 Background Traffic. The results show that there are 28 vph heading northeast and 17 vph heading southwest during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.016 for northeast bound traffic and 0.010 for southwest bound traffic. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

c. Seg.1-2027 Background plus Site Traffic 3000W PM Peak Hr Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

2. Seg. 2 – 2000W 2027 PM Peak Hr Segment Traffic Conditions

a. Seg.2 - 2027 Background 2000W PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there are 20 vph heading northbound and 23 vph heading southbound during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.012 for northbound and 0.013 for southbound. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

b. Seg.2 - 2027 Background plus Site Traffic 2000W PM Peak Hr Traffic Conditions

The traffic generated by the development was added to the 2027 Background Traffic. The results show that there are 37 vph heading northbound and 30 vph heading southbound during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.022 for northbound and 0.018 for southbound. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

c. Seg.2-2027 Background plus Site Traffic 2000W PM Peak Hr Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

G. 2027 Intersection PM Peak Hr Traffic Conditions

In order to determine how well an intersection is functioning, the intersection's Measures of Effectiveness (MOEs) for the peak hour is analyzed. The MOEs include:

1. Level of Service (LOS)
2. Control Delay
3. Volume/Capacity Ratio (V/C Ratio)
4. 95th Percentile Queue

Using the traffic volumes and turning movements shown previously, the 2027 MOEs for the intersections, without and with the development, can be determined.

1. Int. 1 – Hwy 33/3000W 2027 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 1, without and with the development, are shown in the following figures.

Table 18 –Int. 1 – 2027 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	WBL	WBR	NBT	NBR	SBL	SBT
Lanes and Sharing (#RL)						
Traffic Volume (vph)	10	5	375	18	8	336
Future Volume (vph)	10	5	375	18	8	336
Sign Control	Stop	—	Free	—	—	Free
Median Width (ft)	12	—	0	—	—	0
TWLTL Median	☐	—	☐	—	—	☐
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	—	—	4.1	—
Follow Up Time, tF (s)	3.5	3.3	—	—	2.2	—
Volume to Capacity Ratio	0.04	0.04	0.25	0.25	0.01	0.01
Control Delay (s)	14.2	14.2	0.0	0.0	0.1	0.3
Level of Service	B	B	A	A	A	A
Queue Length 95th (ft)	3	3	0	0	1	1
Approach Delay (s)	14.2	—	0.0	—	—	0.3

Table 19 –Int. 1 – 2027 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	WBL	WBR	NBT	NBR	SBL	SBT
Lanes and Sharing (#RL)						
Traffic Volume (vph)	11	6	375	19	9	336
Future Volume (vph)	11	6	375	19	9	336
Sign Control	Stop	—	Free	—	—	Free
Median Width (ft)	12	—	0	—	—	0
TWLTL Median	☐	—	☐	—	—	☐
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	—	—	4.1	—
Follow Up Time, tF (s)	3.5	3.3	—	—	2.2	—
Volume to Capacity Ratio	0.05	0.05	0.25	0.25	0.01	0.01
Control Delay (s)	14.0	14.0	0.0	0.0	0.1	0.3
Level of Service	B	B	A	A	A	A
Queue Length 95th (ft)	4	4	0	0	1	1
Approach Delay (s)	14.0	—	0.0	—	—	0.3

2. Int. 2 – Hwy 33/2000W 2027 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 2, without and with the development, are shown in the following figures.

Table 20 –Int. 2 – 2027 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	5	399	7	2	444	15	5	2	7	13	2	8
Future Volume (vph)	5	399	7	2	444	15	5	2	7	13	2	8
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	0	—	—	0	—	—	0	—	—	0	—
TWLTL Median	—		—	—		—	—		—	—		—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.08	0.08	0.08
Control Delay (s)	0.1	0.1	0.1	0.0	0.1	0.1	15.6	15.6	15.6	18.1	18.1	18.1
Level of Service	A	A	A	A	A	A	C	C	C	C	C	C
Queue Length 95th (ft)	0	0	0	0	0	0	3	3	3	7	7	7
Approach Delay (s)	—	0.1	—	—	0.1	—	—	15.6	—	—	18.1	—

Table 21 –Int. 2 – 2027 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	8	399	7	2	444	26	5	3	7	17	3	10
Future Volume (vph)	8	399	7	2	444	26	5	3	7	17	3	10
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	0	—	—	0	—	—	0	—	—	0	—
TWLTL Median	—		—	—		—	—		—	—		—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.01	0.01	0.01	0.00	0.00	0.00	0.05	0.05	0.05	0.11	0.11	0.11
Control Delay (s)	0.1	0.3	0.3	0.0	0.1	0.1	16.1	16.1	16.1	18.9	18.9	18.9
Level of Service	A	A	A	A	A	A	C	C	C	C	C	C
Queue Length 95th (ft)	1	1	1	0	0	0	4	4	4	9	9	9
Approach Delay (s)	—	0.3	—	—	0.1	—	—	16.1	—	—	18.9	—

3. Int. 3 – 7000N/1750W 2027 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 3, without and with the development, are shown in the following figures.

Table 22 –Int. 3 – 2027 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	EBL	EBR	NBL	NBT	SBT	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	2	2	2	3	5	2
Future Volume (vph)	2	2	2	3	5	2
Sign Control	Stop	—	—	Free	Free	—
Median Width (ft)	12	—	—	0	0	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	4.1	—	—	—
Follow Up Time, tF (s)	3.5	3.3	2.2	—	—	—
Volume to Capacity Ratio	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay (s)	8.5	8.5	0.0	2.9	0.0	0.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	8.5	—	—	2.9	0.0	—

Table 23 –Int. 3 – 2027 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBL	EBR	NBL	NBT	SBT	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	3	8	16	3	5	3
Future Volume (vph)	3	8	16	3	5	3
Sign Control	Stop	—	—	Free	Free	—
Median Width (ft)	12	—	—	0	0	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	4.1	—	—	—
Follow Up Time, tF (s)	3.5	3.3	2.2	—	—	—
Volume to Capacity Ratio	0.01	0.01	0.01	0.01	0.00	0.00
Control Delay (s)	8.5	8.5	0.1	6.2	0.0	0.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	1	1	0	0
Approach Delay (s)	8.5	—	—	6.2	0.0	—

4. Int. 4 – 7000N/Solstice Circle East 2027 PM Peak Hr Traffic Conditions (New Intersection)

Since this intersection only exists with the development, only traffic volumes with the development are included.

Table 24 –Int. 4 – 2027 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	7	1	8	11	1	4
Future Volume (vph)	7	1	8	11	1	4
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	1	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.1	—	6.4	6.2
Follow Up Time, tF (s)	—	—	2.2	—	3.5	3.3
Volume to Capacity Ratio	0.01	0.01	0.01	0.01	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	3.1	8.4	8.4
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	3.1	8.4	—

5. Int. 5 – 7000N/Solstice Circle West 2027 PM Peak Hr Traffic Conditions (New Intersection)

Since this intersection only exists with the development, only traffic volumes with the development are included.

Table 25 –Int. 5 – 2027 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	5	1	7	5	1	3
Future Volume (vph)	5	1	7	5	1	3
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	1	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.1	—	6.4	6.2
Follow Up Time, tF (s)	—	—	2.2	—	3.5	3.3
Volume to Capacity Ratio	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	4.5	8.4	8.4
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	4.5	8.4	—

H. Turn Lane Warrants Based on Safety Analysis of Intersections

1. 2027 Left Turn Lane Analysis

Intersection #1 and #2 were evaluated for safety using ITD guidelines which recommend using the *National Cooperative Highway Research Report 745 –Left-Turn Accommodations at Unsignalized Intersections* (*NCHRP 745) to evaluate left-hand turns and* National Cooperative Highway Research Report 457: Evaluating Intersection Improvements: An Engineering Study Guide (NCHRP 457) *to evaluate right-turn movements to determine if turning movements are consistent with national standards for safety based on traffic volumes.* These guidelines show that if a three-leg intersection has traffic higher than 200 vph per lane on the major roadway and more than 150 vph per lane on a four-leg intersection, a left turn is warranted (see left-turn lane warrant chart in Chapter 4). Based on the ITD guidelines, no new turn-lanes are warranted from the increase (including the projected traffic generated by the proposed development) in traffic from 2022 to 2027 (see Appendix K for the left-turn worksheet).

2. 2027 Right Turn Lane Analysis

The Right-hand turn warrant analysis follows the guidance found in ITD's *Traffic Manual: Idaho's Supplementary Guide to the MUTCD* (reference the right-turn lane warrant chart in Chapter 4). Based on these guidelines, no right turning lanes are warranted for existing conditions (see Appendix K for the right-turn worksheet).

I. 2027 PM Peak Hr Traffic Conditions Summary without and with the Development

This chapter has identified the following:

1. Segments

d. Seg. 1: 3000W without the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

e. Seg. 1: 3000W with the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

f. Seg. 2: 2000W without the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

g. Seg. 2: 2000W with the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

h. Segment Summary

The following tables are a summary of each segment's v/c ratio and LOS for each direction without and with the development.

Table 26 –Seg. 1 3000W 2027 Segments Traffic Condition Summary

3000W	2022		2027	
Direction	v/c	LOS	v/c	LOS
Northeast	0.014	A	0.015	A
Southwest	0.008	A	0.009	A
Without the Development				

3000W	2022		2027	
Direction	v/c	LOS	v/c	LOS
Northeast	0.014	A	0.016	A
Southwest	0.008	A	0.010	A
With the Development				

Table 27 –Seg. 2 2000W 2027 Segments Traffic Condition Summary

2000 W	2022		2027	
Direction	v/c	LOS	v/c	LOS
Northbound	0.011	A	0.012	A
Southbound	0.012	A	0.013	A
Without the Development				

2000 W	2022		2027	
Direction	v/c	LOS	v/c	LOS
Northbound	0.011	A	0.022	A
Southbound	0.012	A	0.018	A
With the Development				

2. Intersections

a. Int. 1: Hwy 33/3000W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of B during the PM peak hour of the day.

b. Int. 1: Hwy 33/3000W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of B during the PM peak hour of the day.

c. Int. 2: Hwy 33/2000W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of C during the PM peak hour of the day.

d. Int. 2: Hwy 33/2000W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of C during the PM peak hour of the day.

e. Int. 3: 7000N/1750W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

f. Int. 3: 7000N/1750W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

g. Int. 4 – 7000N/Solstice Circle East (New Intersection) with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

h. Int. 5 – 7000N/Solstice Circle West (New Intersection) with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

i. Intersection Summary

The following tables are a summary of each intersection's LOS and delay time for each turning movement. It should be noted that by adding the trips generated by the development, none of the LOS's degraded.

Table 28 –Int. 1 2027 Traffic Condition Summary without and with the Development

Int 1 - Hwy 33/3000W - Build LOS and Delay Times without the Development												
	Northeastbound			Southeastbound			Northwestbound			Southwestbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	n/a	n/a	n/a	8	336	n/a	n/a	375	18	10	n/a	5
LOS	n/a	n/a	n/a	A	A	n/a	n/a	A	A	B	n/a	B
Delay	n/a	n/a	n/a	0.1	0.3	n/a	n/a	0	0	14.2	n/a	14.2

Int 1 - Hwy 33/3000W - Build LOS and Delay Times with the Development												
	Northeastbound			Southeastbound			Northwestbound			Southwestbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	n/a	n/a	n/a	9	336	n/a	n/a	375	19	11	n/a	6
LOS	n/a	n/a	n/a	A	A	n/a	n/a	A	A	B	n/a	B
Delay	n/a	n/a	n/a	0.1	0.3	n/a	n/a	0	0	14	n/a	14

Table 29 –Int. 2 2027 Traffic Condition Summary without and with the Development

Int 2 - Hwy 33/2000W - Build LOS and Delay Times without the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	5	399	7	2	444	15	5	2	7	13	2	8
LOS	A	A	A	A	A	A	C	C	C	C	C	C
Delay	0.1	0.1	0.1	0	0.1	0.1	15.6	15.6	15.6	18.1	18.1	18.1

Int 2 - Hwy 33/2000W - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	8	399	7	2	444	26	5	3	7	17	3	10
LOS	A	A	A	A	A	A	C	C	C	C	C	C
Delay	0.1	0.3	0.3	0	0.1	0.1	16.1	16.1	16.1	18.9	18.9	18.9

Table 30 –Int. 3 2027 Traffic Condition Summary without and with the Development

Int 3 - 7000N/1750W - Build LOS and Delay Times without the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	2	n/a	2	n/a	n/a	n/a	2	3	n/a	n/a	5	2
LOS	A	n/a	A	n/a	n/a	n/a	A	A	n/a	n/a	A	A
Delay	8.5	n/a	8.5	n/a	n/a	n/a	0	2.9	n/a	n/a	0	0

Int 3 - 7000N/1750W - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	3	n/a	8	n/a	n/a	n/a	16	3	n/a	n/a	5	3
LOS	A	n/a	A	n/a	n/a	n/a	A	A	n/a	n/a	A	A
Delay	8.5	n/a	8.5	n/a	n/a	n/a	0.1	6.2	n/a	n/a	0	0

Table 31 –Int. 4 2027 Traffic Condition Summary with the Development

Int 4 - 7000N/Solstice Cir East - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	n/a	7	1	8	11	n/a	1	n/a	4	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	3.1	n/a	8.4	n/a	8.4	n/a	n/a	n/a

Table 32 –Int. 5 2027 Traffic Condition Summary with the Development

Int 5 - 7000N/Solstice Cir West - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2027 Traffic	n/a	5	1	7	5	n/a	1	n/a	3	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	4.5	n/a	8.4	n/a	8.4	n/a	n/a	n/a

3. Turn Lane Analysis

a. Left Turn Lane Analysis

Based on the ITD guidelines, no new turn-lanes are warranted from the increase (including the projected traffic generated by the proposed development) in traffic from 2022 to 2027

b. Right Turn Lane Analysis

Right turns lanes are not warranted for either intersection on Hwy 33 for the 2027 buildout.

4. Overall Summary for 2027

a. 2022 Existing Conditions Review

In summary, the following was determined to be operating at an unacceptable level for the 2022 existing conditions:

1. Int. 1 Hwy 33/3000W: Southeast bound, left turning traffic, exceeds the minimum levels
2. Int. 2 Hwy 33/2000W: Eastbound, left turning traffic, exceeds the minimum levels

3. Int. 2 Hwy 33/2000W: Westbound, left turning traffic, exceeds the minimum levels

(1) 2022 Mitigation Measures

It is recommended that a left turn lane be constructed on Hwy 33 for the southeast bound traffic at Int. 1 and that left turn lanes be constructed for both the eastbound and westbound traffic on Hwy 33 at Int. 2.

b. 2027 Buildout Conditions

Besides those areas noted for the 2022 existing conditions, no new LOS has been identified as operating at an unacceptable level for the 2027 buildout year.

5. Mitigation Measures

Since no new areas are identified to be operating at an unacceptable level, no new mitigation measures are warranted for the 2027 buildout year.

IX. 2047 Horizon Year Traffic Analysis

A. On-Site Development

Buildout is assumed to be complete by the year 2027. This chapter will analyze the forecasted conditions for the 20-years after buildout.

B. Traffic Forecasting

The traffic counts from Chapter 6 were increased by the annual growth rate percentages to establish the background traffic. This chapter will analyze two (2) scenarios for each segment and intersection; 2047 background traffic (without the development) and 2047 background plus site traffic (with the development).

C. Roadway Network

Within the area of influence there will be two (2) roadway segments, three (3) existing intersections, and two (2) future intersection studied. The segments and the intersections that will analyzed are:

1. Segment #1 – 3000W
2. Segment #2 – 2000W
3. Intersection #1 – Hwy 33/3000W
4. Intersection #2 – Hwy 33/2000W
5. Intersection #3 – 7000N/1750W
6. Intersection #4 – 7000N/Solstice Circle East (new intersection)
7. Intersection #5 – 7000N/Solstice Circle West (new intersection)

D. 2047 PM Peak Segment Traffic Volumes

1. Seg. 1 – 3000W 2047 PM Peak Segment Traffic Volumes

a. 2047 Background 3000W PM Peak Hour Flow

The traffic volumes for the 2027 Horizon Year were increased by the annual growth rate to forecast the 2047 Background Traffic. The results of this forecast 44 vph headed northeast and 25 vph headed southwest during pm peak hour.

b. 2047 Background plus Site Traffic 3000W PM Peak Hour Flow

The traffic generated by the development was added to the 2047 Background Traffic. The results of this forecast 46 vph headed northeast and 27 vph headed southwest during pm peak hour after buildout.

2. Seg. 2 – 2000W 2047 PM Peak Segment Traffic Volumes

c. 2047 Background 2000W PM Peak Hour Flow

The traffic volumes for the 2027 Horizon Year were increased by the annual growth rate to forecast the 2047 Background Traffic. The results of this forecast 34 vph headed northbound and 38 vph headed southbound during pm peak hour.

d. 2047 Background plus Site Traffic 2000W PM Peak Hour Flow

The traffic generated by the development was added to the 2047 Background Traffic. The results of this forecast 51 vph headed northbound and 45 vph headed southbound during pm peak hour after buildout.

E. 2047 PM Peak Intersection Traffic Volumes

The traffic volumes for the 2027 Horizon Year were increased by the annual growth rate to forecast the 2047 Background Traffic for each intersection. The following sections show the forecasted intersection traffic volumes without and with the proposed development.

1. Int. 1 – Hwy 33/3000W 2047 PM Peak Segment Traffic Volumes

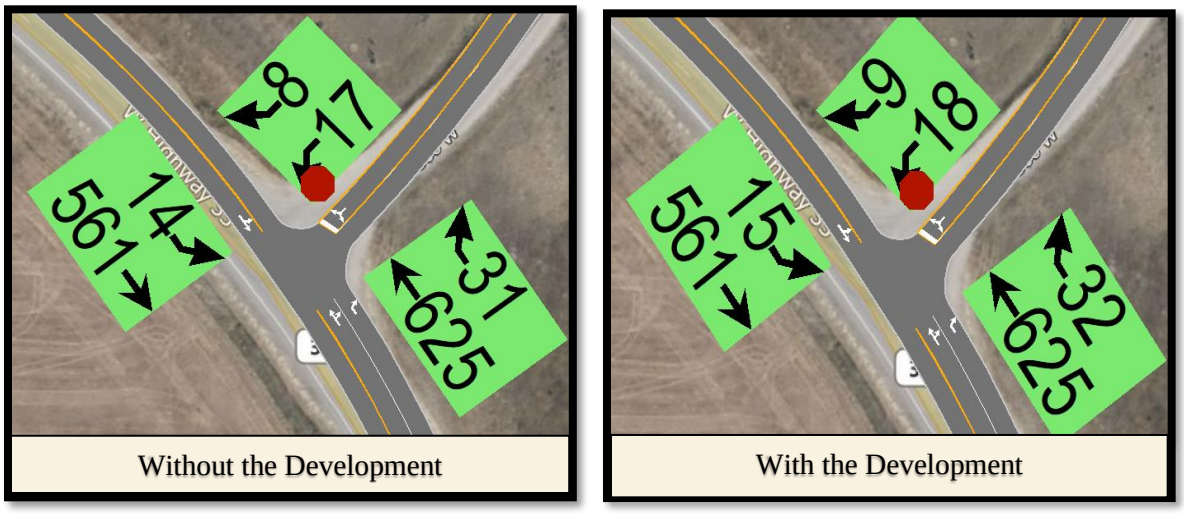


Figure 26: Hwy 33/3000W 2047 Traffic Volumes without and with the Development

2. Int. 2 – Hwy 33/2000W 2047 PM Peak Segment Traffic Volumes

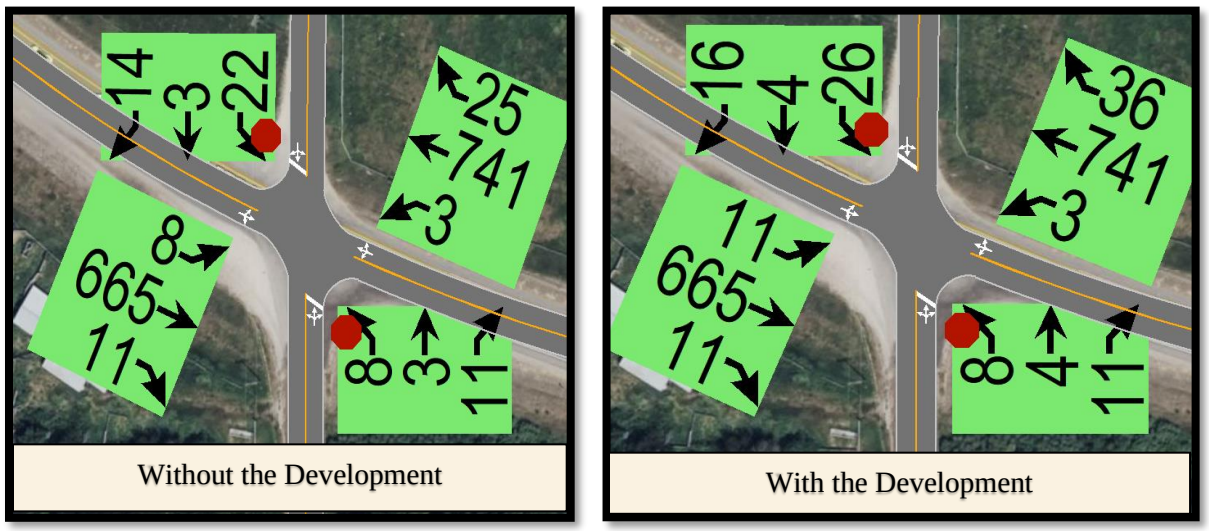


Figure 27: Hwy 33/2000W 2047 Traffic Volumes without and with the Development

3. Int. 3 – 7000N/1750W 2047 PM Peak Segment Traffic Volumes

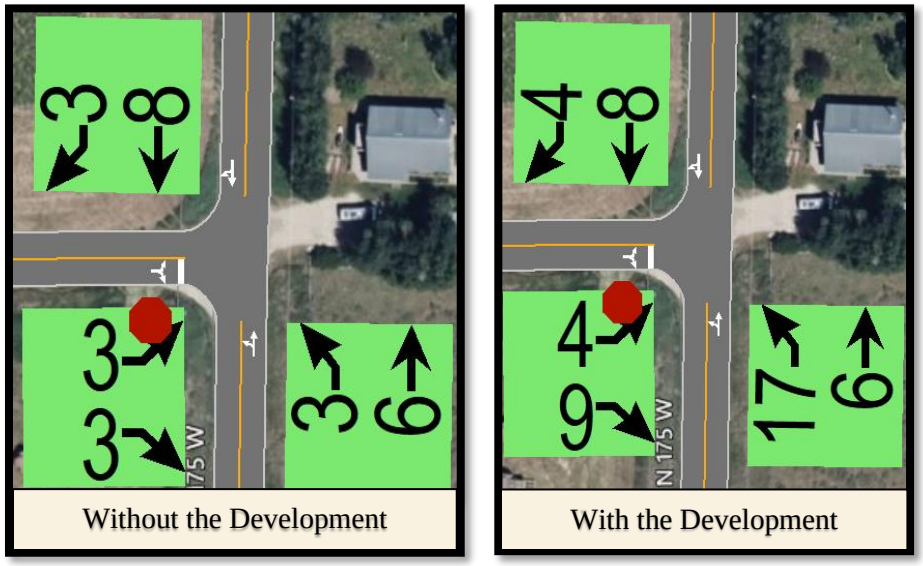


Figure 28: 7000N/1750W 2047 Traffic Volumes without and with the Development

4. Int. 4 – 7000N/Solstice East 2047 PM Peak Segment Traffic Volumes

Since this intersection only exists with the development, only traffic volumes with the development are included.

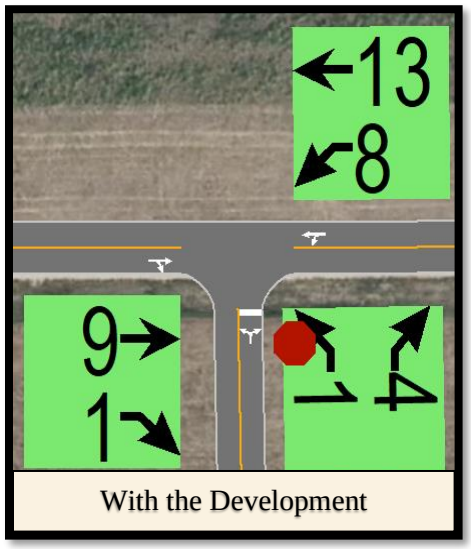


Figure 29: 7000N/Solstice Circle East 2047 Traffic Volumes with the Development

5. Int. 5 – 7000N/Solstice West 2047 PM Peak Segment Traffic Volumes

Since this intersection only exists with the development, only traffic volumes with the development are included.

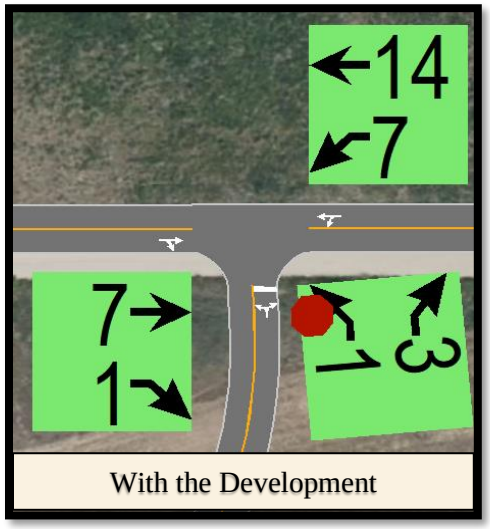


Figure 30: 7000N/Solstice Circle West 2047 Traffic Volumes with the Development

F. 2047 Segment PM Peak Hr Traffic Conditions

The traffic counts shown previously in the chapter were used to determine the forecasted conditions without and with the proposed development. The following sections identify the projected LOS for each segment for both scenarios.

1. Seg. 1 – 3000W 2047 PM Peak Hr Segment Traffic Conditions

a. Seg. 1 - 2047 Background 3000W PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there were 44 vph heading northeast and 25 vph heading southwest during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.026 for northeast bound traffic and 0.014 for southwest bound traffic. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

b. Seg. 1 - 2047 Background plus Site Traffic 3000W PM Peak Hr Traffic Conditions

The traffic generated by the development was added to the 2047 Background Traffic. The results show that there are 46 vph heading northeast and 27 vph heading southwest during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.027 for northeast bound traffic and 0.016 for southwest bound traffic. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

c. Seg. 1-2047 Background plus Site Traffic 3000W PM Peak Hr Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

2. Seg. 2 – 2000W 2047 PM Peak Hr Segment Traffic Conditions

a. Seg.2 - 2047 Background 2000W PM Peak Hr Traffic Conditions

The visual counts that were seasonally adjusted show that there are 34 vph heading northbound and 38 vph heading southbound during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.020 for northbound and 0.022 for southbound. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

b. Seg.2 - 2047 Background plus Site Traffic 2000W PM Peak Hr Traffic Conditions

The traffic generated by the development was added to the 2047 Background Traffic. The results show that there are 51 vph heading northbound and 45 vph heading southbound during the pm peak hour. Dividing these volumes by 1700 vph, the v/c ratio is 0.030 for northbound and 0.026 for southbound. The terrain within the study area is considered level and a 0% no passing zone will be used. This results in a LOS of A for both directions.

c. Seg.2-2047 Background plus Site Traffic 2000W PM Peak Hr Mitigation Measures

Since the worst LOS is an A, no improvements are warranted for the existing segment conditions.

G. 2047 Intersection PM Peak Hr Traffic Conditions

In order to determine how well an intersection is functioning, the intersection's Measures of Effectiveness (MOEs) for the peak hour is analyzed. The MOEs include:

1. Level of Service (LOS)
2. Control Delay
3. Volume/Capacity Ratio (V/C Ratio)
4. 95th Percentile Queue

Using the traffic volumes and turning movements shown previously, the 2047 MOEs for the intersections, without and with the development, can be determined.

1. Int. 1 – Hwy 33/3000W 2047 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 1, without and with the development, are shown in the following figures.

Table 33 –Int. 1 – 2047 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	WBL	WBR	NBT	NBR	SBL	SBT
Lanes and Sharing (#RL)						
Traffic Volume (vph)	17	8	625	31	14	561
Future Volume (vph)	17	8	625	31	14	561
Sign Control	Stop	—	Free	—	—	Free
Median Width (ft)	12	—	0	—	—	0
TWLTL Median	☐	—	☐	—	—	☐
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	—	—	4.1	—
Follow Up Time, tF (s)	3.5	3.3	—	—	2.2	—
Volume to Capacity Ratio	0.13	0.13	0.42	0.42	0.02	0.02
Control Delay (s)	24.7	24.7	0.0	0.0	0.2	0.5
Level of Service	C	C	A	A	A	A
Queue Length 95th (ft)	11	11	0	0	1	1
Approach Delay (s)	24.7	—	0.0	—	—	0.5

Table 34 –Int. 1 – 2047 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	WBL	WBR	NBT	NBR	SBL	SBT
Lanes and Sharing (#RL)						
Traffic Volume (vph)	18	9	625	32	15	561
Future Volume (vph)	18	9	625	32	15	561
Sign Control	Stop	—	Free	—	—	Free
Median Width (ft)	12	—	0	—	—	0
TWLTL Median	☐	—	☐	—	—	☐
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	—	—	4.1	—
Follow Up Time, tF (s)	3.5	3.3	—	—	2.2	—
Volume to Capacity Ratio	0.14	0.14	0.42	0.42	0.02	0.02
Control Delay (s)	25.1	25.1	0.0	0.0	0.3	0.5
Level of Service	D	D	A	A	A	A
Queue Length 95th (ft)	12	12	0	0	1	1
Approach Delay (s)	25.1	—	0.0	—	—	0.5

2. Int. 2 – Hwy 33/2000W 2047 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 2, without and with the development, are shown in the following figures.

Table 35 –Int. 2 – 2047 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	8	665	11	3	741	25	8	3	11	22	3	14
Future Volume (vph)	8	665	11	3	741	25	8	3	11	22	3	14
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	0	—	—	0	—	—	0	—	—	0	—
TWLTL Median	—		—	—		—	—		—	—		—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.01	0.01	0.01	0.00	0.00	0.00	0.17	0.17	0.17	0.36	0.36	0.36
Control Delay (s)	0.2	0.3	0.3	0.1	0.1	0.1	35.1	35.1	35.1	52.1	52.1	52.1
Level of Service	A	A	A	A	A	A	E	E	E	F	F	F
Queue Length 95th (ft)	1	1	1	0	0	0	15	15	15	36	36	36
Approach Delay (s)	—	0.3	—	—	0.1	—	—	35.1	—	—	52.1	—

Table 36 –Int. 2 – 2047 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	11	665	11	3	741	36	8	4	11	26	4	16
Future Volume (vph)	11	665	11	3	741	36	8	4	11	26	4	16
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	0	—	—	0	—	—	0	—	—	0	—
TWLTL Median	—		—	—		—	—		—	—		—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.02	0.02	0.02	0.00	0.00	0.00	0.18	0.18	0.18	0.43	0.43	0.43
Control Delay (s)	0.3	0.4	0.4	0.1	0.1	0.1	37.1	37.1	37.1	59.4	59.4	59.4
Level of Service	A	A	A	A	A	A	E	E	E	F	F	F
Queue Length 95th (ft)	1	1	1	0	0	0	16	16	16	47	47	47
Approach Delay (s)	—	0.4	—	—	0.1	—	—	37.1	—	—	59.4	—

3. Int. 3 – 7000N/1750W 2047 PM Peak Hr Traffic Conditions

The traffic volumes, identified at the beginning of this chapter, were entered into the computer modeling software Synchro. The results from the model for Intersection 3, without and with the development, are shown in the following figures.

Table 37 –Int. 3 – 2047 Peak Hr MOEs without the Development

HCM 2000 SIGNING SETTINGS	EBL	EBR	NBL	NBT	SBT	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	3	3	3	6	8	3
Future Volume (vph)	3	3	3	6	8	3
Sign Control	Stop	—	—	Free	Free	—
Median Width (ft)	12	—	—	0	0	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	4.1	—	—	—
Follow Up Time, tF (s)	3.5	3.3	2.2	—	—	—
Volume to Capacity Ratio	0.01	0.01	0.00	0.00	0.01	0.01
Control Delay (s)	8.5	8.5	0.0	2.2	0.0	0.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	8.5	—	—	2.2	0.0	—

Table 38 –Int. 3 – 2047 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBL	EBR	NBL	NBT	SBT	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	4	9	17	6	8	4
Future Volume (vph)	4	9	17	6	8	4
Sign Control	Stop	—	—	Free	Free	—
Median Width (ft)	12	—	—	0	0	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	6.4	6.2	4.1	—	—	—
Follow Up Time, tF (s)	3.5	3.3	2.2	—	—	—
Volume to Capacity Ratio	0.01	0.01	0.01	0.01	0.01	0.01
Control Delay (s)	8.5	8.5	0.1	5.3	0.0	0.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	1	1	0	0
Approach Delay (s)	8.5	—	—	5.3	0.0	—

4. Int. 4 – 7000N/Solstice Circle East 2047 PM Peak Hr Traffic Conditions (New Intersection)

Since this intersection only exists with the development, only traffic volumes with the development are included.

Table 39 –Int. 4 – 2047 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	9	1	8	13	1	4
Future Volume (vph)	9	1	8	13	1	4
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.1	—	6.4	6.2
Follow Up Time, tF (s)	—	—	2.2	—	3.5	3.3
Volume to Capacity Ratio	0.01	0.01	0.01	0.01	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	2.9	8.5	8.5
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	2.9	8.5	—

5. Int. 5 – 7000N/Solstice Circle West 2047 PM Peak Hr Traffic Conditions (New Intersection)

Since this intersection only exists with the development, only traffic volumes with the development are included.

Table 40 –Int. 5 – 2047 Peak Hr MOEs with the Development

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	7	1	7	14	1	3
Future Volume (vph)	7	1	7	14	1	3
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.1	—	6.4	6.2
Follow Up Time, tF (s)	—	—	2.2	—	3.5	3.3
Volume to Capacity Ratio	0.01	0.01	0.00	0.00	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	2.5	8.5	8.5
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	2.5	8.5	—

H. Turn Lane Warrants Based on Safety Analysis of Intersections

1. 2047 Left Turn Lane Analysis

Intersection #1 and #2 were evaluated for safety using ITD guidelines which recommend using the *National Cooperative Highway Research Report 745 –Left-Turn Accommodations at Unsignalized Intersections* (*NCHRP 745) to evaluate left-hand turns and* National Cooperative Highway Research Report 457: Evaluating Intersection Improvements: An Engineering Study Guide (NCHRP 457) *to evaluate right-turn movements to determine if turning movements are consistent with national standards for safety based on traffic volumes.* These guidelines show that if a three-leg intersection has traffic higher than 200 vph per lane on the major roadway and more than 150 vph per lane on a four-leg intersection, a left turn is warranted (see left-turn lane warrant chart in Chapter 4).

It was found in the 2022 Existing Conditions Chapter that left turn lanes are warranted at Intersection 1 for eastbound traffic and at Intersection 2 for both eastbound and westbound traffic. Based on the ITD guidelines, no new turn-lanes are warranted from the increase (including the projected traffic generated by the proposed development) in traffic from 2027 to 2047 (see Appendix K for the left-turn worksheet).

2. 2047 Right Turn Lane Analysis

The Right-hand turn warrant analysis follows the guidance found in ITD's *Traffic Manual: Idaho's Supplementary Guide to the MUTCD* (reference the right-turn lane warrant chart in Chapter 4).

Based on these guidelines, it has been determined that the forecasted traffic for 2047 warrant right turn lanes for the westbound traffic at Intersection 1 and for the westbound traffic at Intersection 2. (see Appendix K for the right-turn worksheet).

I. 2047 PM Peak Hr Traffic Conditions Summary without and with the Development

This chapter has identified the following:

1. Segments

a. Seg. 1: 3000W without the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

b. Seg. 1: 3000W with the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

c. Seg. 2: 2000W without the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

d. Seg. 2: 2000W with the Development

The segment/link v/c ratio results in a LOS of A. Therefore, in accordance with ITD guidelines, no improvements are warranted for the existing conditions.

e. Segment Summary

The following tables are a summary of each segment's v/c ratio and LOS for each direction without and with the development.

Table 41 –Seg. 1 3000W 2047 Segments Traffic Condition Summary

3000W	2022		2027		2047	
Direction	v/c	LOS	v/c	LOS	v/c	LOS
Northeast	0.014	A	0.015	A	0.026	A
Southwest	0.008	A	0.009	A	0.014	A
Without the Development						

3000W	2022		2027		2047	
Direction	v/c	LOS	v/c	LOS	v/c	LOS
Northeast	0.014	A	0.016	A	0.027	A
Southwest	0.008	A	0.010	A	0.016	A
With the Development						

Table 42 –Seg. 2 2000W 2047 Segments Traffic Condition Summary

2000 W	2022		2027		2047	
Direction	v/c	LOS	v/c	LOS	v/c	LOS
Northbound	0.011	A	0.012	A	0.020	A
Southbound	0.012	A	0.013	A	0.022	A
Without the Development						

2000 W	2022		2027		2047	
Direction	v/c	LOS	v/c	LOS	v/c	LOS
Northbound	0.011	A	0.022	A	0.030	A
Southbound	0.012	A	0.018	A	0.026	A
With the Development						

2. Intersections

a. Int. 1: Hwy 33/3000W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of C during the PM peak hour of the day.

b. Int. 1: Hwy 33/3000W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of D during the PM peak hour of the day.

c. Int. 2: Hwy 33/2000W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of F during the PM peak hour of the day.

d. Int. 2: Hwy 33/2000W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of F during the PM peak hour of the day.

e. Int. 3: 7000N/1750W without the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

f. Int. 3: 7000N/1750W with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

g. Int. 4 - 7000N/Solstice Circle East (New Intersection) with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

h. Int. 5 - 7000N/Solstice Circle West (New Intersection) with the Development

The delay times, v/c ratio, and LOS indicate that the intersection's worst turning movement is operating at a LOS of A during the PM peak hour of the day.

i. Intersection Summary

Intersection 1 is forecasted to operate in an acceptable range but is near unacceptable with a max LOS of D. Intersection 2 is forecasted to operate in an unacceptable range in the 2047 horizon year with a max LOS of F. The remaining intersections are forecasted to operate within an acceptable range for the 2047 horizon year. The following tables are a summary of each intersection's LOS and delay time for each turning movement.

Table 43 –Int. 1 2047 Traffic Condition Summary without and with the Development

Int 1 - Hwy 33/3000W - Build LOS and Delay Times without the Development												
	Northeastbound			Southeastbound			Northwestbound			Southwestbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	n/a	n/a	n/a	14	561	n/a	n/a	625	31	17	n/a	8
LOS	n/a	n/a	n/a	A	A	n/a	n/a	A	A	C	n/a	C
Delay	n/a	n/a	n/a	0.2	0.5	n/a	n/a	0	0	24.7	n/a	24.7

Int 1 - Hwy 33/3000W - Build LOS and Delay Times with the Development												
	Northeastbound			Southeastbound			Northwestbound			Southwestbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	n/a	n/a	n/a	15	561	n/a	n/a	625	32	18	n/a	9
LOS	n/a	n/a	n/a	A	A	n/a	n/a	A	A	D	n/a	D
Delay	n/a	n/a	n/a	0.3	0.5	n/a	n/a	0	0	25.1	n/a	25.1

Table 44 –Int. 2 2047 Traffic Condition Summary without and with the Development

Int 2 - Hwy 33/2000W - Build LOS and Delay Times without the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	8	665	11	3	741	25	8	3	11	22	3	14
LOS	A	A	A	A	A	A	E	E	E	F	F	F
Delay	0.2	0.3	0.3	0.1	0.1	0.1	35.1	35.1	35.1	52.1	52.1	52.1

Int 2 - Hwy 33/2000W - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	11	665	11	3	741	36	8	4	11	26	4	16
LOS	A	A	A	A	A	A	E	E	E	F	F	F
Delay	0.3	0.4	0.4	0.1	0.1	0.1	37.1	37.1	37.1	59.4	59.4	59.4

Table 45 –Int. 3 2047 Traffic Condition Summary without and with the Development

Int 3 - 7000N/1750W - Build LOS and Delay Times without the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	3	n/a	3	n/a	n/a	n/a	3	6	n/a	n/a	8	3
LOS	A	n/a	A	n/a	n/a	n/a	A	A	n/a	n/a	A	A
Delay	8.5	n/a	8.5	n/a	n/a	n/a	0	2.2	n/a	n/a	0	0

Int 3 - 7000N/1750W - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	4	n/a	9	n/a	n/a	n/a	17	6	n/a	n/a	8	4
LOS	A	n/a	A	n/a	n/a	n/a	A	A	n/a	n/a	A	A
Delay	8.5	n/a	8.5	n/a	n/a	n/a	0.1	5.3	n/a	n/a	0	0

Table 46 –Int. 4 2047 Traffic Condition Summary with the Development

Int 4 - 7000N/Solstice Cir East - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	n/a	9	1	8	13	n/a	1	n/a	4	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	2.9	n/a	8.5	n/a	8.5	n/a	n/a	n/a

Table 47 –Int. 5 2047 Traffic Condition Summary with the Development

Int 5 - 7000N/Solstice Cir West - Build LOS and Delay Times with the Development												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2047 Traffic	n/a	7	1	7	14	n/a	1	n/a	3	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0.01	0.01	0	2.5	n/a	8.5	n/a	8.5	n/a	n/a	n/a

3. Turn Lane Analysis

a. Left Turn Lane Analysis

Based on the ITD guidelines, no new turn-lanes are warranted from the increase (including the projected traffic generated by the proposed development) in traffic from 2022 to 2027

b. Right Turn Lane Analysis

Right turns lanes are not warranted for either intersection on Hwy 33 for the 2027 buildout.

4. Overall Summary for 2047

a. 2022 Existing Conditions Review

In summary, the following was determined to be operating at an unacceptable level for the 2022 existing conditions:

1. Int. 1 Hwy 33/3000W: Southeast bound, left turning traffic, exceeds the minimum levels

2. Int. 2 Hwy 33/2000W: Eastbound, left turning traffic, exceeds the minimum levels
3. Int. 2 Hwy 33/2000W: Westbound, left turning traffic, exceeds the minimum levels

(1) 2022 Mitigation Measures

It is recommended that a left turn lane be constructed on Hwy 33 for the southeast bound traffic at Int. 1 and that left turn lanes be constructed for both the eastbound and westbound traffic on Hwy 33 at Int. 2.

b. 2027 Buildout Conditions Review

Besides those areas noted for the 2022 existing conditions, no new LOS has been identified as operating at an unacceptable level for the 2027 buildout year.

(1) 2022 Mitigation Measures

Since no new areas are identified to be operating at an unacceptable level, no new mitigation measures are warranted for the 2027 buildout year.

c. 2047 Horizon Conditions Review

In summary, the following was determined to be operating at an unacceptable level for the 2047 conditions:

1. Int 1 Hwy 33/3000W: Northwest bound, right turning traffic, exceeds the minimum levels
2. Int. 2 Hwy 33/2000W: Northbound traffic left, thru, and right turning movement's LOS is E, without or with the development
3. Int. 2 Hwy 33/2000W: Southbound traffic left, thru, and right turning movement's LOS is F, without or with the development
4. Int 2 Hwy 33/2000W: Westbound, right turning traffic, exceeds the minimum levels

5. Mitigation Measures for the 2047 Horizon Year Traffic

a. Int. 1: Hwy 33/3000W

It has been determined that the northwest bound traffic at Int. 1 Hwy 33/3000W warrants a right turn lane. It is recommended that a right turn lane be constructed before the 2047 Horizon Year to meet the minimum recommended guidelines.

b. Int. 2: Hwy 33/2000W

It has been determined that in 2047 the projected westbound traffic will require a right turn lane. It is recommended that a right turn lane be constructed to meet this minimum recommended guideline. Also, the northbound and southbound traffic is forecasted to be failed. It is recommended that right and left turn lanes be added to the north and south leg of the intersection.

(1) 2047 Mitigation Measures Traffic Analysis

The following figure shows the projected layout and traffic volumes for the 2047 mitigation measures; this includes the addition of left turn lanes for both the eastbound and westbound traffic (warranted for the 2022 Existing Conditions), a westbound right turn lane (warranted for the 2047 Horizon Year), a northbound right and left turn lane (warranted for the 2047 Horizon Year), a southbound right and left turn lane (warranted for the 2047 Horizon Year).

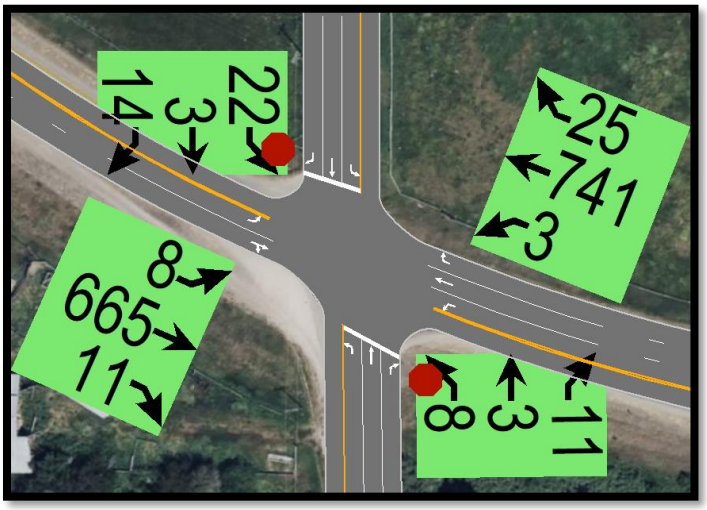


Figure 31: 2047 Horizon Year Mitigation Measures Improvements Layout and Volumes

The following shows the results of the mitigated measures traffic model.

Table 48 –Int. 2 – 2047 Peak Hr MOEs with the Development Mitigation Measures

HCM 2000 SIGNING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	8	665	11	3	741	25	8	3	11	22	3	14
Future Volume (vph)	8	665	11	3	741	25	8	3	11	22	3	14
Sign Control	—	Free	—	—	Free	—	—	Stop	—	—	Stop	—
Median Width (ft)	—	12	—	—	12	—	—	12	—	—	12	—
TWLTL Median	—	☑	—	—	☑	—	—	☐	—	—	☐	—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Critical Gap, tC (s)	4.1	—	—	4.1	—	—	7.1	6.5	6.2	7.1	6.5	6.2
Follow Up Time, tF (s)	2.2	—	—	2.2	—	—	3.5	4.0	3.3	3.5	4.0	3.3
Volume to Capacity Ratio	0.01	0.43	0.43	0.00	0.47	0.02	0.03	0.01	0.03	0.09	0.01	0.04
Control Delay (s)	9.5	0.0	0.0	9.2	0.0	0.0	19.1	17.6	13.8	19.5	17.3	14.8
Level of Service	A	A	A	A	A	A	C	C	B	C	C	B
Queue Length 95th (ft)	1	0	0	0	0	0	3	1	2	7	1	3
Approach Delay (s)	—	0.1	—	—	0.0	—	—	16.2	—	—	17.7	—

It can be seen from this table that by improving the intersection as outline, the projected traffic is forecasted to operate at an acceptable level in the 2047 Horizon Year.

X. Conclusions.

After evaluating the proposed development within the context of zoning; projected land use; existing transportation system; background traffic counts for the principal roadways within the study impact area; projected traffic for horizon years corresponding with project opening, project buildout, and a 20-year horizon year; the findings of the Traffic Impact Study are summarized below. In order to simplify the forecasted traffic conditions as they have progressed through this study, the following three (3) tables were produced. The first table shows the forecasted progression of the roadway segments, the second table shows the intersections, and the third shows the left or right turn.

Table 49- Segment Traffic Conditions Progression Each Horizon Year

Segment 1: 3000W	Northeast V/C Ratio	LOS	Southwest V/C Ratio	LOS
2022 Existing Traffic	0.014	A	0.008	A
2027 Background plus Site Traffic	0.016	A	0.010	A
2047 Background plus Site Traffic	0.027	A	0.016	A

Segment 2: 2000W	Northbound V/C Ratio	LOS	Southbound V/C Ratio	LOS
2022 Existing Traffic	0.011	A	0.012	A
2027 Background plus Site Traffic	0.022	A	0.018	A
2047 Background plus Site Traffic	0.030	A	0.026	A

Table 50- Intersection Traffic Conditions Progression Each Horizon Year

Int 1: Hwy 33/3000W	Northeast Max LOS	Southeast Max LOS	Northwest Max LOS	Southwest Max LOS
2022 Existing Traffic	n/a	A	A	B
2027 Background Traffic	n/a	A	A	B
2027 Background plus Site Traffic	n/a	A	A	B
2047 Background Traffic	n/a	A	A	C
2047 Background plus Site Traffic	n/a	A	A	D

Int 2: Hwy 33/2000W	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	A	A	B	C
2027 Background Traffic	A	A	C	C
2027 Background plus Site Traffic	A	A	C	C
2047 Background Traffic	A	A	E	F
2047 Background plus Site Traffic	A	A	E	F

Int 3: 7000N/1750W	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	A	n/a	A	A
2027 Background Traffic	A	n/a	A	A
2027 Background plus Site Traffic	A	n/a	A	A
2047 Background Traffic	A	n/a	A	A
2047 Background plus Site Traffic	A	n/a	A	A

Int 4: 7000N/Solstice East (New)	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	n/a	n/a	n/a	n/a
2027 Background Traffic	n/a	n/a	n/a	n/a
2027 Background plus Site Traffic	A	A	A	n/a
2047 Background Traffic	n/a	n/a	n/a	n/a
2047 Background plus Site Traffic	A	A	A	n/a

Int 5: 7000N/Solstice West (New)	Eastbound Max LOS	Westbound Max LOS	Northbound Max LOS	Southbound Max LOS
2022 Existing Traffic	n/a	n/a	n/a	n/a
2027 Background Traffic	n/a	n/a	n/a	n/a
2027 Background plus Site Traffic	A	A	A	n/a
2047 Background Traffic	n/a	n/a	n/a	n/a
2047 Background plus Site Traffic	A	A	A	n/a

Table 51- Left and Right Turn Lane Progression Each Horizon Year

Int 1: Hwy 33/3000W	Left Turn Lane		Right Turn Lane	
	Southeast	Northwest	Southeast	Northwest
2022 Existing Traffic	Warranted	n/a	n/a	Not Warranted
2027 Background Traffic	Warranted	n/a	n/a	Not Warranted
2027 Background plus Site Traffic	Warranted	n/a	n/a	Not Warranted
2047 Background Traffic	Warranted	n/a	n/a	Warranted
2047 Background plus Site Traffic	Warranted	n/a	n/a	Warranted

Int 2: Hwy 33/2000W	Left Turn Lane		Right Turn Lane	
	Eastbound	Westbound	Eastbound	Westbound
2022 Existing Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2027 Background Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2027 Background plus Site Traffic	Warranted	Warranted	Not Warranted	Not Warranted
2047 Background Traffic	Warranted	Warranted	Not Warranted	Warranted
2047 Background plus Site Traffic	Warranted	Warranted	Not Warranted	Warranted

A. Existing Traffic Conditions (2022)

The existing traffic conditions were analyzed with the existing intersection control and lane configurations, all the road segments and intersections are operating within minimum operational thresholds except:

- Int. 1 Hwy 33/3000W: Southeast bound, left turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Eastbound, left turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Westbound, left turning traffic, exceeds the minimum levels

1. Mitigating Measures

It is recommended that a left turn lane be constructed on Hwy 33 for the southeast bound traffic at Int. 1 and that left turn lanes be constructed for both the eastbound and westbound traffic on Hwy 33 at Int. 2.

B. Projected Traffic

The projected land use for the build-out year of the proposed development is comprised of 17 main dwelling units and 17 accessory dwelling units (34 units total). All other uses remain the same as the existing conditions. The build-out conditions are expected to generate approximately 325 trips for the MADT and 26 trips during PM peak hour by year 2027.

C. 2027 Buildout Year Traffic Conditions Results

All segment capacity and intersection delay times/LOS are projected to operate within the minimum allowable operational thresholds. It was determined that for the 2022 existing conditions, left turn lanes are warranted at Intersection 1 and Intersection 2. For the 2027 buildout conditions, no new left turn lanes are warranted with or without the proposed development.

1. Mitigating Measures

For the 2027 buildout scenario no deficiencies were forecasted, therefore no mitigation measures are recommended.

D. 2047 Horizon Year Traffic Conditions Results

The forecasted 2047 traffic conditions were analyzed with the existing intersection control and lane configurations, all the road segments and intersections are within minimum operational thresholds except:

- Int 1 Hwy 33/3000W: Northwest bound, right turning traffic, exceeds the minimum levels
- Int. 2 Hwy 33/2000W: Northbound traffic left, thru, and right turning movement's LOS is E, without or with the development
- Int. 2 Hwy 33/2000W: Southbound traffic left, thru, and right turning movement's LOS is F, without or with the development
- Int 2 Hwy 33/2000W: Westbound, right turning traffic, exceeds the minimum levels

1. Mitigating Measures

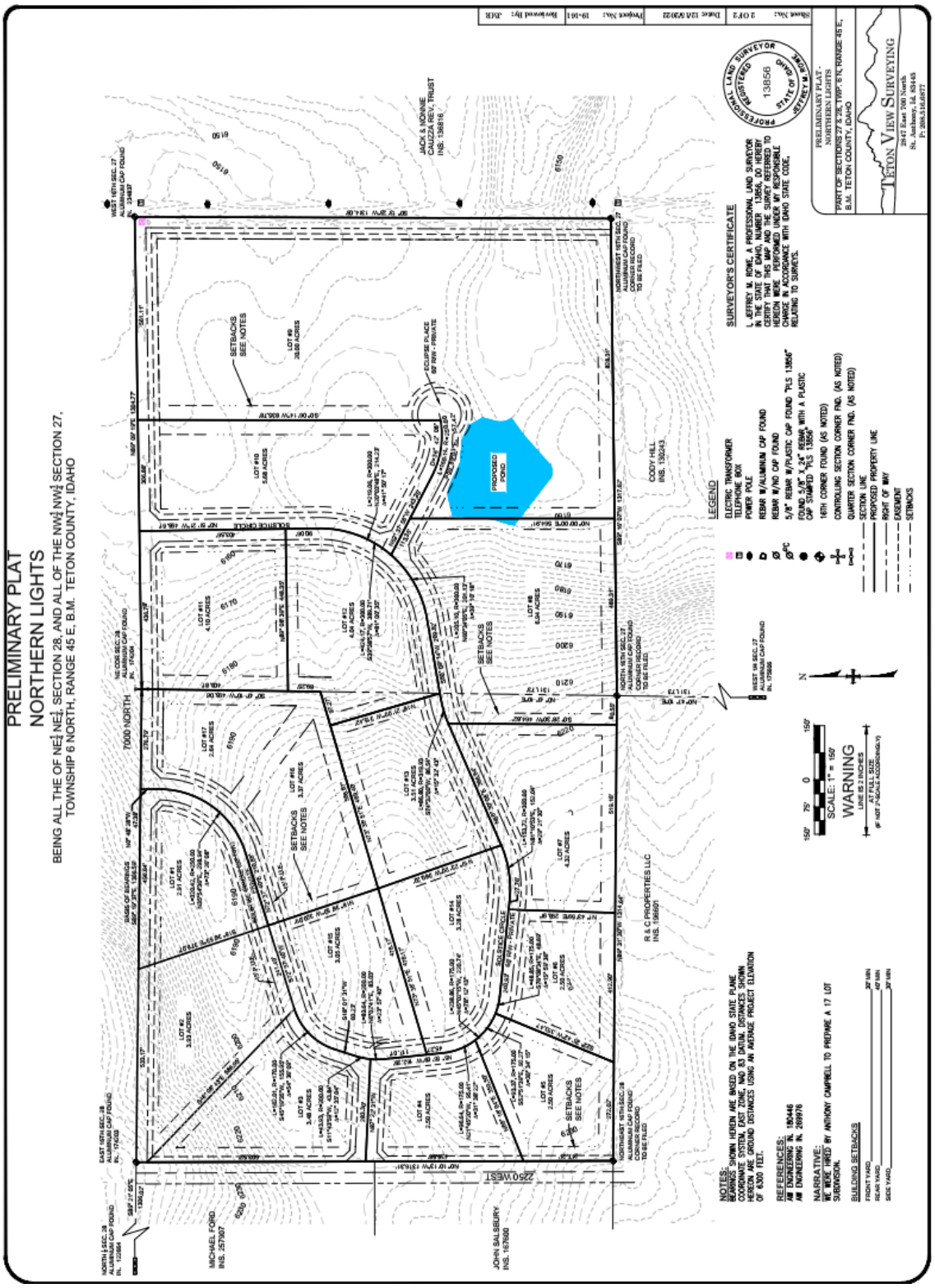
Analysis shows that the addition of left turn lanes for both the eastbound and westbound traffic (warranted for the 2022 Existing Conditions), a westbound right turn lane (warranted for the 2047 Horizon Year), a northbound right and left turn lane (warranted for the 2047 Horizon Year), a southbound right and left turn lane (warranted for the 2047 Horizon Year) will create a road network that will operate within the minimum allowable thresholds.

E. Overall Study Summary

As can be seen from the tables in this chapter, the development is forecasted to have minimal impact to the traffic network within the study area. All segments and intersections are forecasted to operate below the allowable operation thresholds throughout the study time period. As can be seen in the tables presented in this chapter, the LOS at each intersection for each turning movement without or with the development are the same except for the southwest traffic in the 2047 Horizon Year (reference the red highlighted cell in Table 47). Even though the southwest traffic without and with the development is difference, they are still forecasted to operate at an acceptable level through the 2047 Horizon Year.

This study also determined that all the intersections, each direction, within the study area on Hwy 33 warrant a left turn lane for the current/existing conditions. Additionally, right turn lanes are warranted within the next 25 years for the northwest bound traffic at Int. 1 Hwy 33/3000W and for the westbound traffic at Int. 2 Hwy 33/2000W without or with the development.

XI. Appendix A: Site Master Plan



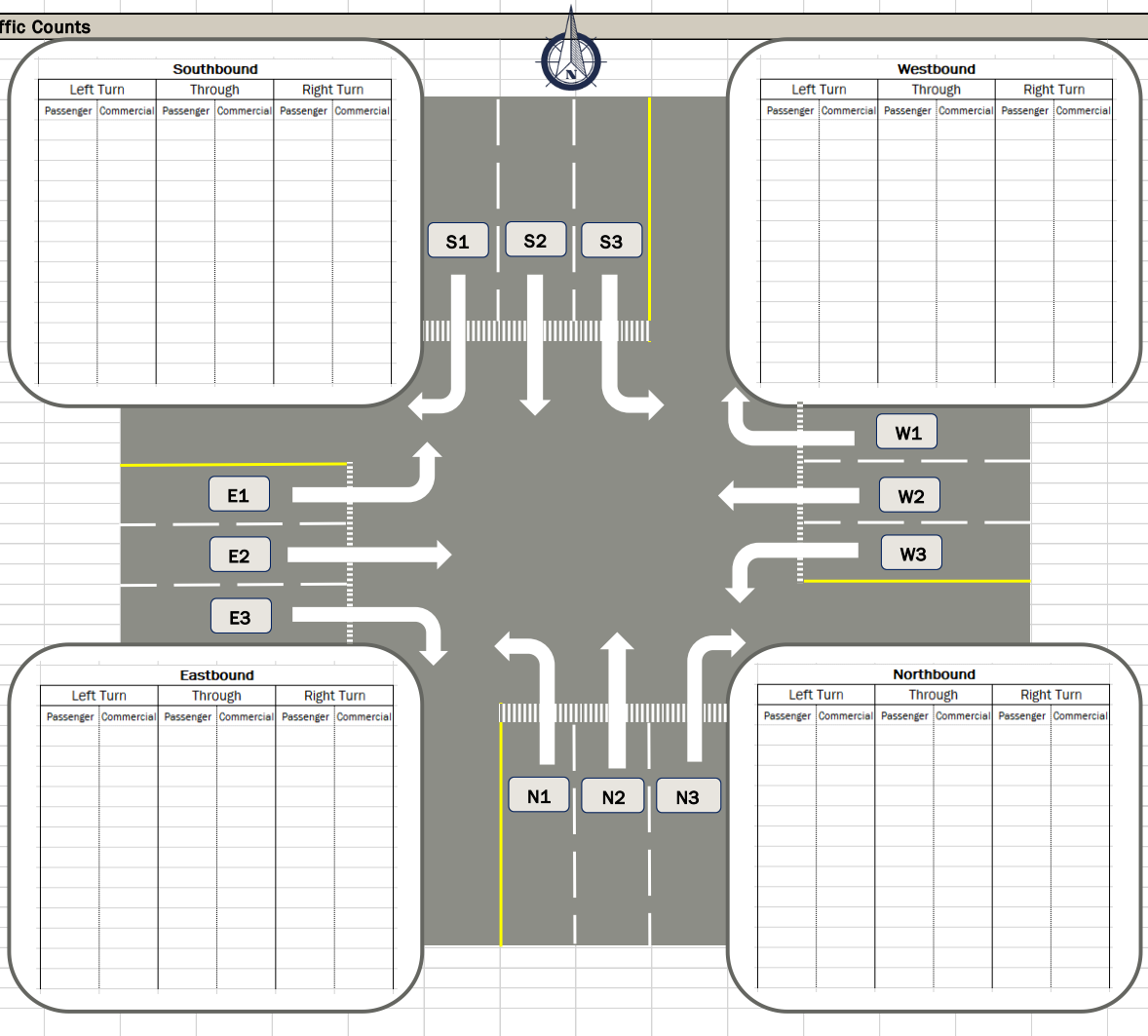
XII. Appendix B: Traffic Counts

Client:		DESIGNED	BLH
Project:	**Northern Lights**	CHECKED	BLH
Project No.:		DATE:	########

Project Information

					TOTAL COUNTS	
				ID	Passenger	**Total**
1	State:	Idaho		N1		0
2	County:	Teton		N2		0
3	North-South Roadway	3000W		N3	16	16
4	East-West Roadway	Hwy 33		S1		0
5	Type of Intersection:	Four-Way		S2		0
6	Date Data Collected:	4-Nov-23		S3	7	7
7	Time Period Analyzed:	5:00	P.M.	E1		0
8	until	6:00	P.M.	E2		0
9				E3		0
10				W1	4	4
11				W2		0
12				W3	9	9
13				Total		36
14						

Traffic Counts

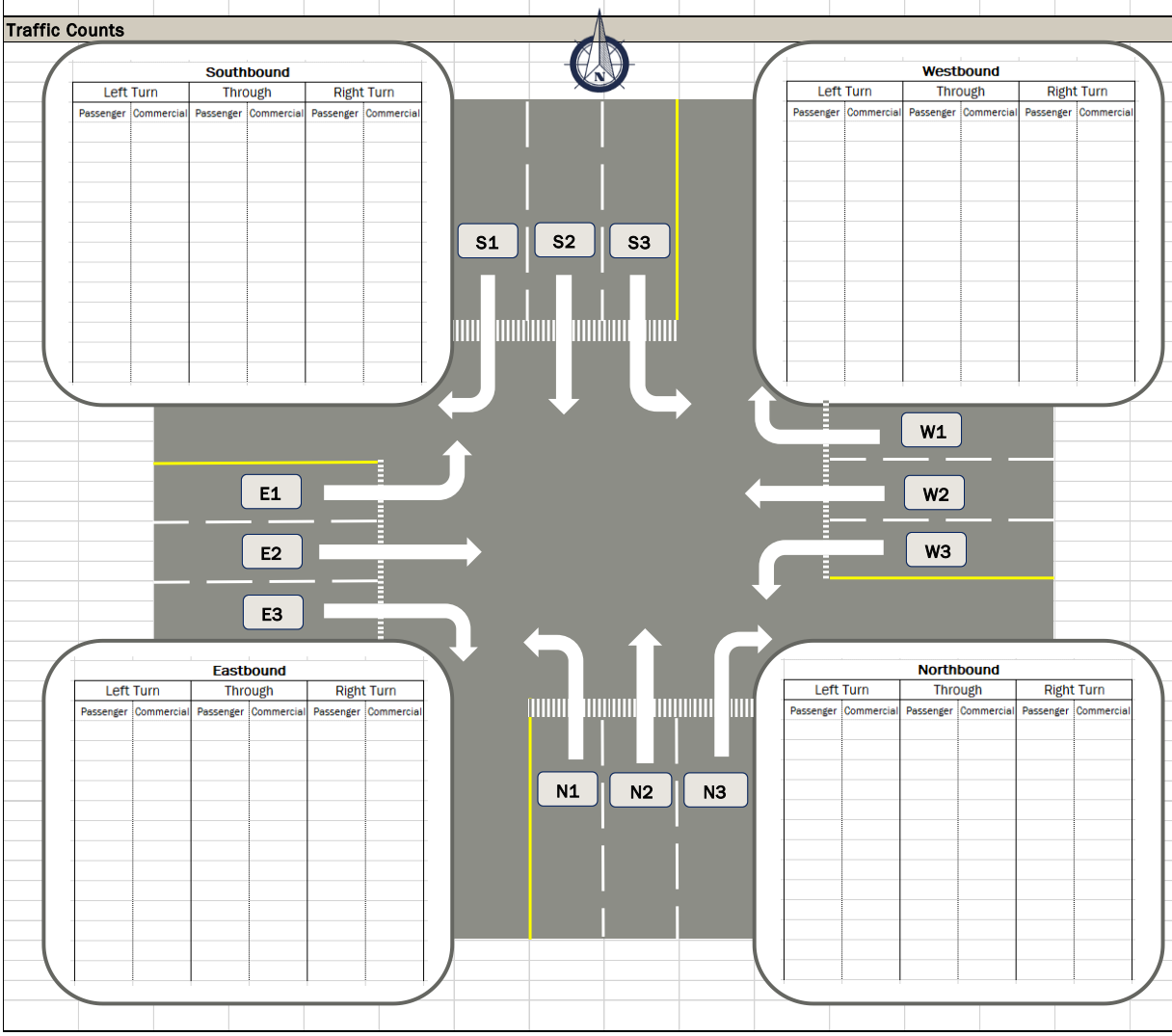


Client:		DESIGNED	BLH
Project:	**Northern Lights**	CHECKED	BLH
Project No.:		DATE:	########

Project Information

1	State:		Idaho			TOTAL COUNTS		
2	County:		Teton		ID	Passenger		**Total**
3	North-South Roadway		2000W		N1	4		4
4	East-West Roadway		Hwy 33		N2	1		1
5	Type of Intersection:		Four-Way		N3	6		6
6	Date Data Collected:		4-Nov-22		S1	7		7
7	Time Period Analyzed:		5:00	P.M.	S2	1		1
8		until	6:00	P.M.	S3	12		12
9					E1	4		4
10					E2			0
11					E3	6		6
12					W1	13		13
13					W2			0
14					W3	1		1
					Total			55

Traffic Counts

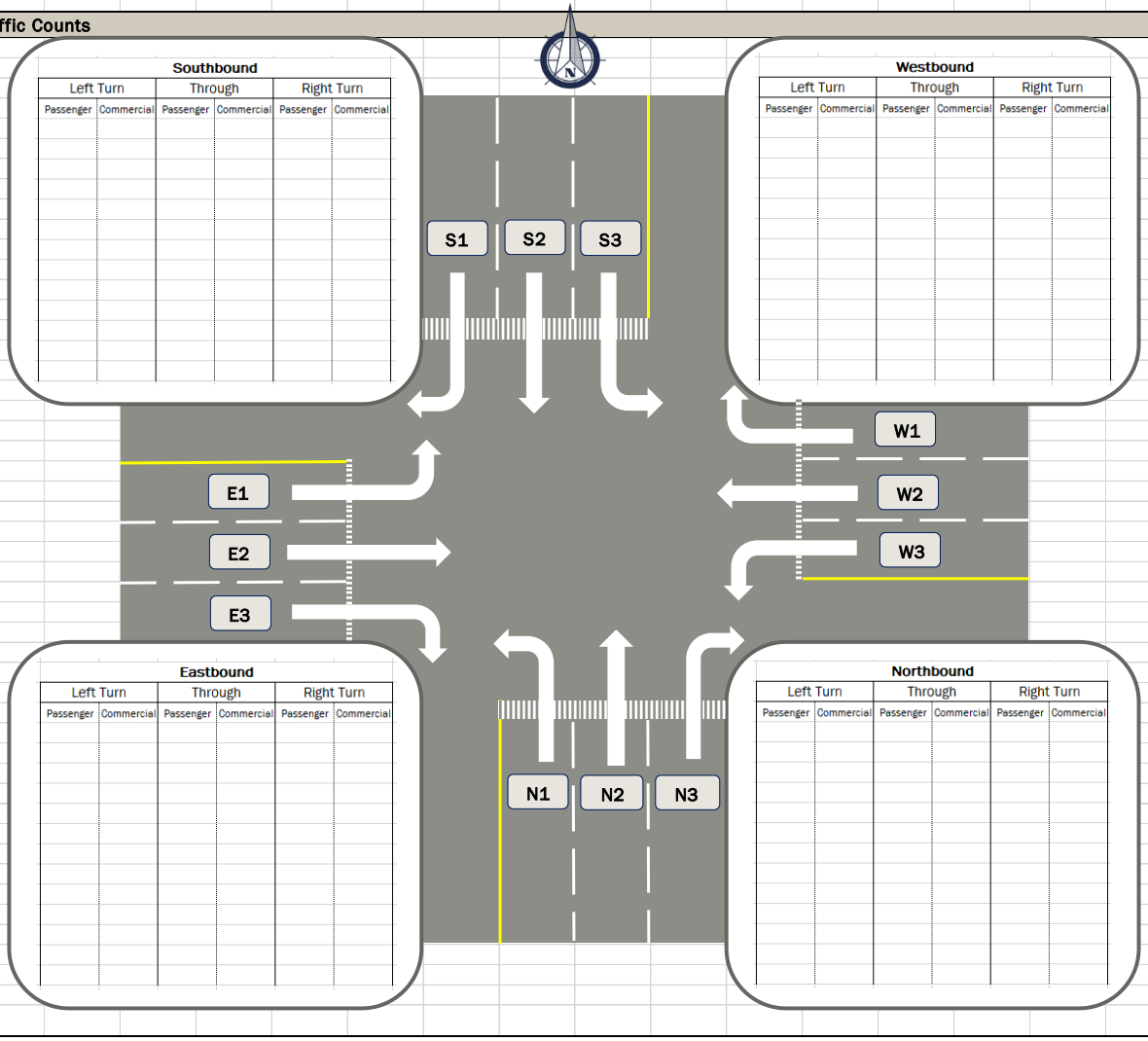


Client:		DESIGNED	BLH
Project:	**Northern Lights**	CHECKED	BLH
Project No.:		DATE:	########

Project Information

1	State:		Idaho			TOTAL COUNTS	
2	County:		Teton		ID	Passenger	**Total**
3	North-South Roadway		1750 W		N1	1	1
4	East-West Roadway		7000N		N2	2	2
5	Type of Intersection:		Three-Way		N3		0
6	Date Data Collected:		4-Nov-22		S1	1	1
7	Time Period Analyzed:		5:00	P.M.	S2	3	3
8		until	6:00	P.M.	S3		0
9					E1	1	1
10					E2		0
11					E3	1	1
12					W1		0
13					W2		0
14					W3		0
					Total		9

Traffic Counts



#059 - Newdale - ATR | Average Daily Traffic | Published Reports

Automatic Counter Volumes

Report Types

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	24-Hour	Annual Avg.
1990	835	895	1230	1375	1428	1505	1876	1777	1389	1396	1091	1047	1324	
1991	859	1021	1069	1327	1461	1616	1820	1799	1521	1580	1066	1061	1352	
1992	1029	1131	1242	1557	1635	1761	2079	1877	1696	1348	1149	905	1455	
1993	835	915	1208	1463	1669	1706	2053	1838	1724	1550	1168	1159	1444	
1994	1145	1138	1415	1729	1674	1842	2147	2032	1762	1579	1234	1172	1575	
1995	1211	1245	1660	1919	2157	1883	2208	2143	1922	1788	1407	1409	1746	
1996	1025	1282	1528	1739	1765	1886	2188	2071	1814	1653	1273	1049	1606	
1997	1072	1230	1329	1639	1893	1997	2297	2194	1936	1704	1427	1399	1676	
1998	1141	1280	1479	1678	1860	1901	2201	2176	1935	1786	1466	1353	1688	
1999	1331	1302	1604	1764	1896	2084	2479	2392	2124	1651	1473	1433	1794	
2000	1120	1310	1578	1763	1824	2038	2352	2349	1983	1825	1506	1484	1761	
2001	1451	1516	1695	1906	1999	2122	2379	2336	2155	1893	1662	1571	1890	
2002	1305	1480	1786	1819	2048	2152	2574	2451	2258	2065	1752	1723	1951	
2003	1635	1637	1737	1899	2103	2202	2438	2393	2121	1955	1642	1627	1949	
2004	1371	1596	1785	1949	2031	2170	2614	2380	2227	1955	1813	1816	1976	
2005	1584	1746	1846	1992	2190	2363	2600	2395	2108	2085	1762	1822	2041	
2006	1611	1734	1870	2011	2294	2507	2706	2766	2500	2370	1978	2079	2202	
2007	1967	2179	2321	2417	2666	2980	3089	3314	2977	2726	2351	2173	2597	
2008	1806	1703	2170	2158	2306	2533	2714	2538	2341	2222	1846	1632	2164	
2009	1660	1721	1768	1911	2180	2483	2625	2411	2414	2062	1704	1700	2053	
2010	1659	1712	1793	1814	2036	2360	2668	2321	2263	2024	1585	1518	1979	
2011	1519	1505	1667	1679	1887	2097	2482	2234	2180	1909	1505	1535	1850	
2012	1461	1566	1615	1802	1844	2155	2352	2212	2044	1747	1518	1567	1824	
2013	1416	1530	1604	1741	1894	2306	2410	2107	1976	1874	1622	1612	1841	
2014	1562	1556	1805	1907	1995	2440	2480	2293	2217	2018	1701	1730	1975	
2015	1732	1833	1920	2084	2089	2508	2879	2688	2522	2255	1957	1861	2194	
2016	1826	2000	2147	2219	2367	2744	3115	2954	2655	2293	2011	1838	2347	
2017	1804	1918	2154	2322	2529	2991	3293	3402	2880	2633	2264	2251	2537	
2018	2191	2152	2246	2444	2733	3146	3470	3164	3126	2853	2296	2169	2666	
2019	2139	1706		2604	2764	3189	3526	3434	3084	2666	2395	2318	2697	
2020	2157	2257	1971	1920	2651	3078	3430	3565	3461	3015	2454	2460	2701	
2021	2519	2129	2702	2809	3276	3948	4073	3529	3045	2528	2349	2287	2933	
2022	2357	2547	2730	2777	3242	3791	4219	4145	4135	3685	2869	2533		

Idaho Transportation Department

Monthly Hourly Day of Week Summary for July 2022

Site names: 00059
County: Madison
Funct Class: R Minor Arterial - Other
Location: SH-33 5.3 Mi. E of Main St

Seasonal Factor Grp: 4
Daily Factor Grp: 3
Axle Factor Grp: 3
Growth Factor Grp: 7

	SUN			MON			TUE			WED			THU			FRI			SAT		
	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W
00:00	40	23	17	18	10	8	26	17	9	15	9	6	21	9	12	24	10	13	37	18	19
01:00	18	8	10	9	3	5	10	6	3	9	4	5	8	3	5	9	5	4	15	6	8
02:00	11	6	5	5	2	3	6	1	4	7	4	2	9	3	5	8	3	4	11	7	4
03:00	11	7	3	8	5	3	8	5	3	8	4	4	9	6	3	6	4	1	9	6	3
04:00	12	8	4	24	20	4	21	16	4	22	16	6	20	18	2	20	17	3	23	16	7
05:00	31	20	11	113	101	12	115	101	14	122	113	9	118	106	12	98	85	13	57	43	14
06:00	41	27	14	181	161	20	215	193	22	220	194	25	216	193	23	187	163	24	100	76	24
07:00	70	35	35	217	153	63	251	185	65	257	194	63	256	191	65	252	185	66	158	100	58
08:00	117	51	66	247	149	97	267	173	94	265	175	89	280	193	87	256	163	93	228	131	97
09:00	168	66	102	276	147	128	281	156	124	268	161	106	314	188	126	285	155	130	274	139	135
10:00	204	80	124	248	119	129	272	138	133	267	132	134	288	150	138	286	146	139	304	141	163
11:00	230	91	138	246	110	136	267	115	152	256	115	141	270	133	137	286	128	157	306	137	168
12:00	219	87	131	237	101	136	248	104	143	247	111	135	274	123	150	307	136	171	283	137	146
13:00	222	97	125	226	102	124	252	123	129	249	129	120	257	126	131	304	141	163	283	144	138
14:00	215	108	106	258	124	134	257	122	134	253	112	141	261	124	137	325	146	179	277	132	145
15:00	231	118	113	249	113	136	283	131	152	278	127	151	318	151	167	344	163	181	294	143	151
16:00	236	125	111	273	108	165	325	125	200	312	124	187	344	150	193	397	188	209	294	136	158
17:00	209	112	96	316	112	204	356	124	232	357	123	233	368	140	228	407	192	214	278	117	160
18:00	197	98	99	305	111	193	335	106	228	324	107	216	328	112	216	345	161	184	248	106	142
19:00	169	88	80	184	63	120	209	70	138	217	81	136	228	89	139	270	133	137	204	85	118
20:00	141	74	66	125	54	71	138	61	76	133	57	76	150	60	90	210	91	118	158	67	91
21:00	116	59	56	96	46	50	104	46	58	121	53	68	121	55	66	152	70	82	147	64	83
22:00	76	38	38	70	29	40	67	32	34	86	43	43	91	38	53	143	57	86	105	48	56
23:00	41	24	17	59	28	31	34	15	18	38	18	20	47	19	27	97	33	63	67	33	34
MADW	3,033	1,458	1,574	3,999	1,980	2,019	4,354	2,174	2,179	4,339	2,213	2,125	4,607	2,387	2,219	5,027	2,584	2,442	4,170	2,040	2,129
N Days	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5

Idaho Transportation Department

Monthly Hourly Day of Week Summary for November 2022

Site names: 00059
County: Madison
Funct Class: R Minor Arterial - Other
Location: SH-33 5.3 Mi. E of Main St

Seasonal Factor Grp: 4
Daily Factor Grp: 3
Axle Factor Grp: 3
Growth Factor Grp: 7

	SUN			MON			TUE			WED			THU			FRI			SAT		
	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W	Road	E	W
00:00	17	12	5	8	6	2	7	4	3	11	5	5	9	5	4	9	5	3	17	10	7
01:00	5	3	2	4	3	1	2	1	1	6	3	2	4	2	1	3	2	1	6	3	3
02:00	5	3	1	3	2	0	3	2	0	6	4	1	4	3	1	5	3	1	7	4	2
03:00	7	4	3	7	4	2	5	3	2	4	2	2	4	2	1	3	1	1	6	4	2
04:00	7	4	3	13	9	3	12	9	2	14	11	3	12	8	4	10	7	3	11	6	5
05:00	15	5	10	77	69	8	86	77	9	80	74	5	66	57	8	56	44	11	24	14	9
06:00	32	18	14	158	143	15	160	142	18	163	143	19	128	112	15	114	97	16	49	35	14
07:00	61	40	20	203	147	55	216	161	54	211	155	56	187	138	48	190	140	49	113	76	36
08:00	89	41	48	215	143	72	222	157	65	225	154	71	184	122	61	211	134	77	146	87	58
09:00	117	45	72	212	127	84	222	127	94	207	126	81	187	105	81	228	117	111	163	85	77
10:00	144	47	96	172	96	76	184	98	86	183	96	86	173	95	78	223	110	113	178	66	112
11:00	140	51	89	168	80	88	178	85	93	171	77	93	159	80	79	204	87	116	209	79	130
12:00	142	57	85	173	75	98	178	77	100	165	73	92	173	79	94	216	92	124	212	85	127
13:00	143	60	83	178	74	104	182	78	103	165	72	93	163	80	83	221	97	124	200	91	109
14:00	160	71	88	181	79	101	200	86	113	195	80	115	164	73	91	242	106	136	191	88	103
15:00	170	85	85	198	77	120	223	95	128	219	93	126	188	78	110	244	107	136	219	100	119
16:00	173	90	83	246	87	159	275	96	179	248	83	165	224	71	152	288	113	174	230	96	134
17:00	142	78	64	292	80	211	313	89	224	279	83	196	264	79	185	301	123	178	213	97	115
18:00	110	67	43	210	65	145	235	68	167	225	71	154	214	69	145	213	93	119	151	79	71
19:00	63	36	27	93	39	54	115	44	70	125	51	74	134	51	83	144	72	72	118	67	51
20:00	55	37	18	58	30	28	67	34	33	70	33	36	82	43	39	97	45	51	90	51	38
21:00	34	24	10	57	36	21	55	32	23	52	32	19	61	41	19	72	35	36	78	46	32
22:00	26	18	8	27	16	11	28	18	10	30	20	10	32	19	12	54	31	23	55	37	17
23:00	12	8	3	13	7	5	18	10	7	15	9	6	20	12	7	33	19	13	29	17	11
MADW	1,877	910	966	2,974	1,504	1,470	3,198	1,602	1,595	3,077	1,559	1,518	2,844	1,433	1,410	3,389	1,691	1,698	2,722	1,333	1,389
N Days	3	3	3	4	4	4	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4

XIII. Appendix C: 2022 Existing Conditions Traffic Model Results

Northern Lights - 2022 Existing Conditions - Intersection 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	4	330	16	7	296
Future Volume (Veh/h)	9	4	330	16	7	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	4	359	17	8	322
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	706	368			376	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	706	368			376	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	400	678			1182	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	14	376	330
Volume Left	10	0	8
Volume Right	4	17	0
cSH	453	1700	1182
Volume to Capacity	0.03	0.22	0.01
Queue Length 95th (ft)	2	0	1
Control Delay (s)	13.2	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	13.2	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		31.2%	ICU Level of Service A
Analysis Period (min)		15	

Northern Lights - 2022 Existing Conditions - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	351	6	1	391	13	4	1	6	12	1	7
Future Volume (Veh/h)	4	351	6	1	391	13	4	1	6	12	1	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	382	7	1	425	14	4	1	7	13	1	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	439			389			836	834	386	835	831	432
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	439			389			836	834	386	835	831	432
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	99	95	100	99
cM capacity (veh/h)	1121			1170			281	302	662	282	304	624

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	393	440	12	22
Volume Left	4	1	4	13
Volume Right	7	14	7	8
cSH	1121	1170	427	354
Volume to Capacity	0.00	0.00	0.03	0.06
Queue Length 95th (ft)	0	0	2	5
Control Delay (s)	0.1	0.0	13.7	15.8
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	0.0	13.7	15.8
Approach LOS			B	C

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	32.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Northern Lights - 2022 Existing Conditions - Intersection 3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	1	1	2	3	1
Future Volume (Veh/h)	1	1	1	2	3	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1	1	2	3	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	8	4	4			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	8	4	4			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1013	1080	1618			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	2	3	4
Volume Left	1	1	0
Volume Right	1	0	1
cSH	1045	1618	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.5	2.4	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	2.4	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

XIV. Appendix D: 2027 Buildout Traffic Model Results

Without the Development

Northern Lights Without the Development - 2027 Buildout - Intersection 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	10	5	375	18	8	336
Future Volume (Veh/h)	10	5	375	18	8	336
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	408	20	9	365
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	801	418			428	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	801	418			428	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	351	635			1131	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	428	374
Volume Left	11	0	9
Volume Right	5	20	0
cSH	408	1700	1131
Volume to Capacity	0.04	0.25	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	14.2	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	14.2	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		34.1%	ICU Level of Service A
Analysis Period (min)		15	

With the Development

Northern Lights With the Development - 2027 Buildout - Intersection 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	11	6	375	19	9	336
Future Volume (Veh/h)	11	6	375	19	9	336
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	7	408	21	10	365
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	804	418			429	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	804	418			429	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	349	635			1130	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	19	429	375
Volume Left	12	0	10
Volume Right	7	21	0
cSH	419	1700	1130
Volume to Capacity	0.05	0.25	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	14.0	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	14.0	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		34.9%	ICU Level of Service A
Analysis Period (min)		15	

Without the Development

Northern Lights Without the Development - 2027 Buildout - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	399	7	2	444	15	5	2	7	13	2	8
Future Volume (Veh/h)	5	399	7	2	444	15	5	2	7	13	2	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	434	8	2	483	16	5	2	8	14	2	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	499			442			953	951	438	952	947	491
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	499			442			953	951	438	952	947	491
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	99	99	94	99	98
cM capacity (veh/h)	1065			1118			233	258	619	234	259	578

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	447	501	15	25
Volume Left	5	2	5	14
Volume Right	8	16	8	9
cSH	1065	1118	356	300
Volume to Capacity	0.00	0.00	0.04	0.08
Queue Length 95th (ft)	0	0	3	7
Control Delay (s)	0.1	0.1	15.6	18.1
Lane LOS	A	A	C	C
Approach Delay (s)	0.1	0.1	15.6	18.1
Approach LOS			C	C

Intersection Summary				
Average Delay			0.8	
Intersection Capacity Utilization			35.4%	ICU Level of Service
Analysis Period (min)			15	

With the Development

Northern Lights With the Development - 2027 Buildout - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	399	7	2	444	26	5	3	7	17	3	10
Future Volume (Veh/h)	8	399	7	2	444	26	5	3	7	17	3	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	434	8	2	483	28	5	3	8	18	3	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	511			442			970	971	438	966	961	497
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	511			442			970	971	438	966	961	497
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			98	99	99	92	99	98
cM capacity (veh/h)	1054			1118			224	250	619	227	254	573

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	451	513	16	32
Volume Left	9	2	5	18
Volume Right	8	28	8	11
cSH	1054	1118	339	290
Volume to Capacity	0.01	0.00	0.05	0.11
Queue Length 95th (ft)	1	0	4	9
Control Delay (s)	0.3	0.1	16.1	18.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.1	16.1	18.9
Approach LOS			C	C

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			37.1%	ICU Level of Service
Analysis Period (min)			15	

Without the Development

Northern Lights Without the Development - 2027 Buildout - Intersection 3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	2	2	3	5	2
Future Volume (Veh/h)	2	2	2	3	5	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	2	2	3	5	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	13	6	7			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	13	6	7			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1005	1077	1614			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	4	5	7
Volume Left	2	2	0
Volume Right	2	0	2
cSH	1040	1614	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.5	2.9	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	2.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		3.0	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

With the Development

Northern Lights With the Development - 2027 Buildout - Intersection 3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	8	16	3	5	3
Future Volume (Veh/h)	3	8	16	3	5	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	9	17	3	5	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	44	6	8			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	44	6	8			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	957	1076	1612			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	12	20	8
Volume Left	3	17	0
Volume Right	9	0	3
cSH	1044	1612	1700
Volume to Capacity	0.01	0.01	0.00
Queue Length 95th (ft)	1	1	0
Control Delay (s)	8.5	6.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	6.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		5.6	
Intersection Capacity Utilization		17.7%	ICU Level of Service A
Analysis Period (min)		15	

With the Development

Northern Lights With the Development - 2027 Buildout - Intersection 4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	7	1	8	11	1	4
Future Volume (Veh/h)	7	1	8	11	1	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	9	12	1	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			9		38	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			9		38	8
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1611		968	1073

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	9	21	5
Volume Left	0	9	1
Volume Right	1	0	4
cSH	1700	1611	1051
Volume to Capacity	0.01	0.01	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	3.1	8.4
Lane LOS		A	A
Approach Delay (s)	0.0	3.1	8.4
Approach LOS			A

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

With the Development

Northern Lights With the Development - 2027 Buildout - Intersection 5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	5	1	7	5	1	3
Future Volume (Veh/h)	5	1	7	5	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1	8	5	1	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			6		26	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			6		26	6
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1615		984	1077

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	6	13	4
Volume Left	0	8	1
Volume Right	1	0	3
cSH	1700	1615	1052
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	4.5	8.4
Lane LOS		A	A
Approach Delay (s)	0.0	4.5	8.4
Approach LOS			A

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	16.5%	ICU Level of Service	A
Analysis Period (min)	15		

XV. Appendix E: 2047 Horizon Year Traffic Analysis

Without the Development

Northern Lights without the Development - 2047 Horizon Year - Intersection 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	8	625	31	14	561
Future Volume (Veh/h)	17	8	625	31	14	561
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	9	679	34	15	610
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1336	696			713	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1336	696			713	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	98			98	
cM capacity (veh/h)	166	442			887	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	713	625
Volume Left	18	0	15
Volume Right	9	34	0
cSH	210	1700	887
Volume to Capacity	0.13	0.42	0.02
Queue Length 95th (ft)	11	0	1
Control Delay (s)	24.7	0.0	0.5
Lane LOS	C		A
Approach Delay (s)	24.7	0.0	0.5
Approach LOS	C		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

With the Development

Northern Lights with the Development - 2047 Horizon Year - Intersection 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	9	625	32	15	561
Future Volume (Veh/h)	18	9	625	32	15	561
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	10	679	35	16	610
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1338	696			714	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1338	696			714	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	98			98	
cM capacity (veh/h)	166	441			886	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	30	714	626
Volume Left	20	0	16
Volume Right	10	35	0
cSH	209	1700	886
Volume to Capacity	0.14	0.42	0.02
Queue Length 95th (ft)	12	0	1
Control Delay (s)	25.1	0.0	0.5
Lane LOS	D		A
Approach Delay (s)	25.1	0.0	0.5
Approach LOS	D		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Without the Development

Northern Lights without the Development - 2047 Horizon Year - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	665	11	3	741	25	8	3	11	22	3	14
Future Volume (Veh/h)	8	665	11	3	741	25	8	3	11	22	3	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	723	12	3	805	27	9	3	12	24	3	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	832			735			1588	1585	729	1585	1578	818
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	832			735			1588	1585	729	1585	1578	818
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			89	97	97	71	97	96
cM capacity (veh/h)	801			870			81	107	423	82	108	376

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	744	835	24	42
Volume Left	9	3	9	24
Volume Right	12	27	12	15
cSH	801	870	143	117
Volume to Capacity	0.01	0.00	0.17	0.36
Queue Length 95th (ft)	1	0	15	36
Control Delay (s)	0.3	0.1	35.1	52.1
Lane LOS	A	A	E	F
Approach Delay (s)	0.3	0.1	35.1	52.1
Approach LOS			E	F

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	52.5%	ICU Level of Service	A	
Analysis Period (min)	15			

With the Development

Northern Lights with the Development - 2047 Horizon Year - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	665	11	3	741	36	8	4	11	26	4	16
Future Volume (Veh/h)	11	665	11	3	741	36	8	4	11	26	4	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	723	12	3	805	39	9	4	12	28	4	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	844			735			1602	1603	729	1598	1590	824
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	844			735			1602	1603	729	1598	1590	824
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			88	96	97	65	96	95
cM capacity (veh/h)	792			870			78	104	423	80	106	373

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	747	847	25	49
Volume Left	12	3	9	28
Volume Right	12	39	12	17
cSH	792	870	137	113
Volume to Capacity	0.02	0.00	0.18	0.43
Queue Length 95th (ft)	1	0	16	47
Control Delay (s)	0.4	0.1	37.1	59.4
Lane LOS	A	A	E	F
Approach Delay (s)	0.4	0.1	37.1	59.4
Approach LOS			E	F

Intersection Summary				
Average Delay			2.5	
Intersection Capacity Utilization			54.6%	ICU Level of Service
Analysis Period (min)			15	

Without the Development

Northern Lights without the Development - 2047 Horizon Year - Intersection 3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	3	3	6	8	3
Future Volume (Veh/h)	3	3	3	6	8	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	3	3	7	9	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	24	10	12			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	24	10	12			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	991	1071	1607			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	10	12
Volume Left	3	3	0
Volume Right	3	0	3
cSH	1029	1607	1700
Volume to Capacity	0.01	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.5	2.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	2.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

With the Development

Northern Lights with the Development - 2047 Horizon Year - Intersection 3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	9	17	6	8	4
Future Volume (Veh/h)	4	9	17	6	8	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	10	18	7	9	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	54	11	13			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	54	11	13			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	943	1070	1606			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	25	13
Volume Left	4	18	0
Volume Right	10	0	4
cSH	1030	1606	1700
Volume to Capacity	0.01	0.01	0.01
Queue Length 95th (ft)	1	1	0
Control Delay (s)	8.5	5.3	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	5.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

With the Development

Northern Lights with the Development - 2047 Horizon Year - Intersection 4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	9	1	8	13	1	4
Future Volume (Veh/h)	9	1	8	13	1	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	1	9	14	1	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			11		42	10
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			11		42	10
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1608		963	1071

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	11	23	5
Volume Left	0	9	1
Volume Right	1	0	4
cSH	1700	1608	1047
Volume to Capacity	0.01	0.01	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	2.9	8.5
Lane LOS		A	A
Approach Delay (s)	0.0	2.9	8.5
Approach LOS			A

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		17.8%	ICU Level of Service A
Analysis Period (min)		15	

With the Development

Northern Lights with the Development - 2047 Horizon Year - Intersection 5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	7	1	7	14	1	3
Future Volume (Veh/h)	7	1	7	14	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	8	15	1	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			9		40	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			9		40	8
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1611		967	1073

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	9	23	4
Volume Left	0	8	1
Volume Right	1	0	3
cSH	1700	1611	1045
Volume to Capacity	0.01	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	2.5	8.5
Lane LOS		A	A
Approach Delay (s)	0.0	2.5	8.5
Approach LOS			A

Intersection Summary			
Average Delay		2.6	
Intersection Capacity Utilization		16.9%	ICU Level of Service A
Analysis Period (min)		15	

Intersection 2 - 2047 Mitigation Measures

Northern Lights - 2047 Mitigation Measures - Intersection 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	665	11	3	741	25	8	3	11	22	3	14
Future Volume (Veh/h)	8	665	11	3	741	25	8	3	11	22	3	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	723	12	3	805	27	9	3	12	24	3	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	832			735			1574	1585	729	1566	1564	805
vC1, stage 1 conf vol							747	747		811	811	
vC2, stage 2 conf vol							828	838		754	753	
vCu, unblocked vol	832			735			1574	1585	729	1566	1564	805
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			97	99	97	91	99	96
cM capacity (veh/h)	801			870			265	289	423	273	296	382

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	9	735	3	805	27	9	3	12	24	3	15
Volume Left	9	0	3	0	0	9	0	0	24	0	0
Volume Right	0	12	0	0	27	0	0	12	0	0	15
cSH	801	1700	870	1700	1700	265	289	423	273	296	382
Volume to Capacity	0.01	0.43	0.00	0.47	0.02	0.03	0.01	0.03	0.09	0.01	0.04
Queue Length 95th (ft)	1	0	0	0	0	3	1	2	7	1	3
Control Delay (s)	9.5	0.0	9.2	0.0	0.0	19.1	17.6	13.8	19.5	17.3	14.8
Lane LOS	A		A			C	C	B	C	C	B
Approach Delay (s)	0.1		0.0			16.2			17.7		
Approach LOS						C			C		

Intersection Summary					
Average Delay	0.8				
Intersection Capacity Utilization	55.7%	ICU Level of Service		B	
Analysis Period (min)	15				

XVI. Appendix F: Left Turn Lane Warrant Analyses

Based on ITD Traffic Manual / NCHRP Report 745

Client:		DESIGNED	BLH
Project:	**Northern Lights**	CHECKED	BLH
Project No.:		DATE:	1/12/2023

Description: Eastbound Traffic at Intersection 1 — **Horizon Years:** 2022, 2027, 2047

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
Warrants for left-turn lanes on uncontrolled highways can be found in "NCHRP Report 745 – Left-Turn Accommodations at Unsignalized Intersections."

NCHRP Report 745 - Left-Turn Accommodations at Unsignalized Intersections
Before installing a left-turn lane (or any other roadway improvement), it is necessary to consider the characteristics of the location where it would be installed. These characteristics guide the practitioner's decisions about whether to install the lane and what specific design criteria need to be emphasized to optimize the operation of the lane at that location.

The basic geometry of the intersection needed for use with the warrants is the number of lanes on the major roadway and the number of approaches to the intersection. The number of approaches and the development type (rural or urban/ suburban) are included in the warrants because the crash prediction methodology used to develop the warrants varied by these features. Rural crash prediction equations vary by number of lanes on the major roadway, so the warrants for rural highways also vary by number of lanes.

Technical warrants are an important element of the decision-making process; however, other factors should also be considered when deciding whether to install a left-turn lane, including:
- Sight distance relative to the position of the driver and
- Design consistency within the corridor.

These factors should be considered in conjunction with the numerical warrants.

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of Legs	Three	Three	Three	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	8	10	16	(vehicles per hour)
6	Posted Speed Limit (MPH)	45	Major Roadway Peak-hr vc	296	336	561	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Eastbound Traffic at Intersection 1 — **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

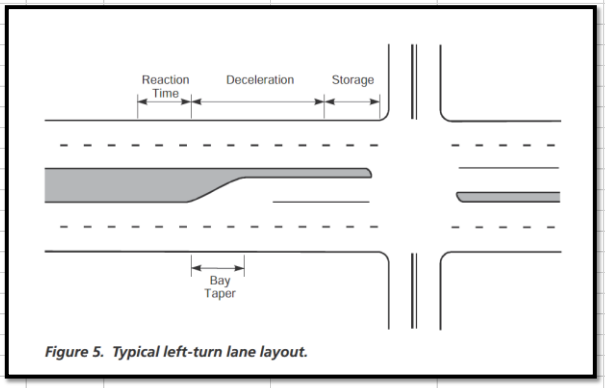
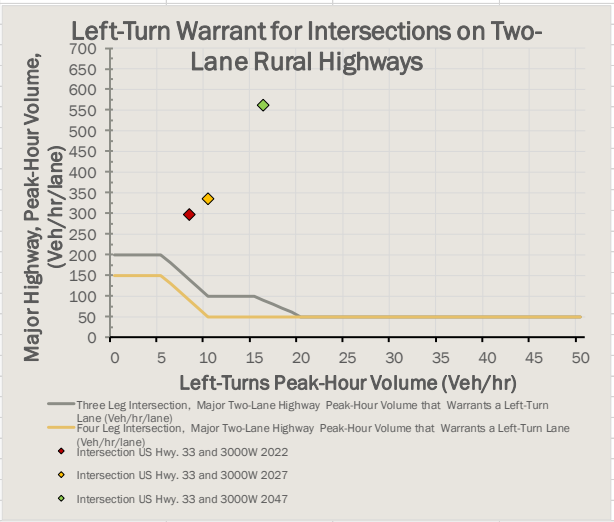


Figure 5. Typical left-turn lane layout.



Based on ITD Traffic Manual / NCHRP Report 745

Client:
Project: **Northern Lights**
Project No.:

DESIGNED BLH
CHECKED BLH
DATE: 1/12/2023

Description: Eastbound Traffic at Intersection 2

Horizon Years: 2022, 2027, 2047

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
Warrants for left-turn lanes on uncontrolled highways can be found in "NCHRP Report 745 – Left-Turn Accommodations at Unsignalized Intersections."

NCHRP Report 745 - Left-Turn Accommodations at Unsignalized Intersections
Before installing a left-turn lane (or any other roadway improvement), it is necessary to consider the characteristics of the location where it would be installed. These characteristics guide the practitioner's decisions about whether to install the lane and what specific design criteria need to be emphasized to optimize the operation of the lane at that location.

The basic geometry of the intersection needed for use with the warrants is the number of lanes on the major roadway and the number of approaches to the intersection. The number of approaches and the development type (rural or urban/ suburban) are included in the warrants because the crash prediction methodology used to develop the warrants varied by these features. Rural crash prediction equations vary by number of lanes on the major roadway, so the warrants for rural highways also vary by number of lanes.

Technical warrants are an important element of the decision-making process; however, other factors should also be considered when deciding whether to install a left-turn lane, including:
- Sight distance relative to the position of the driver and
- Design consistency within the corridor.

These factors should be considered in conjunction with the numerical warrants.

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of Legs	Four	Four	Four	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	5	6	10	(vehicles per hour)
6	Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	351	399	665	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Eastbound Traffic at Intersection 2 **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

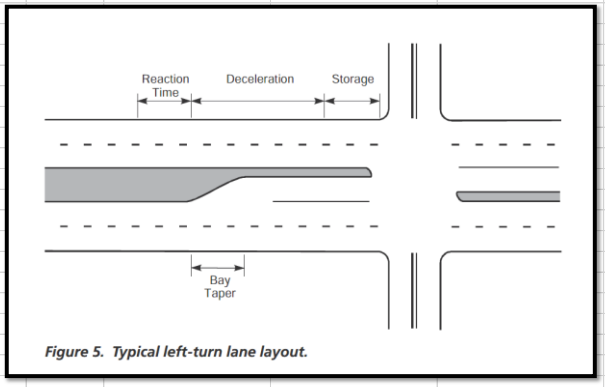
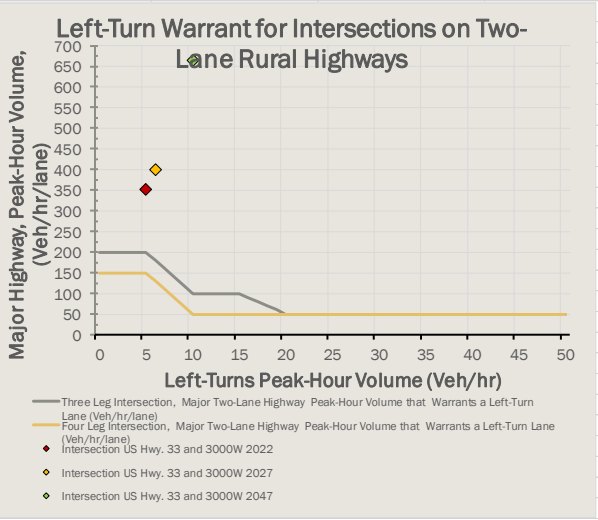


Figure 5. Typical left-turn lane layout.



Based on ITD Traffic Manual / NCHRP Report 745

Client:
Project: **Northern Lights**
Project No.:

DESIGNED BLH
CHECKED BLH
DATE: 1/12/2023

Description: Westbound Traffic at Intersection 2

Horizon Years: 2022, 2027, 2047

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
Warrants for left-turn lanes on uncontrolled highways can be found in "NCHRP Report 745 – Left-Turn Accommodations at Unsignalized Intersections."

NCHRP Report 745 - Left-Turn Accommodations at Unsignalized Intersections
Before installing a left-turn lane (or any other roadway improvement), it is necessary to consider the characteristics of the location where it would be installed. These characteristics guide the practitioner's decisions about whether to install the lane and what specific design criteria need to be emphasized to optimize the operation of the lane at that location.

The basic geometry of the intersection needed for use with the warrants is the number of lanes on the major roadway and the number of approaches to the intersection. The number of approaches and the development type (rural or urban/ suburban) are included in the warrants because the crash prediction methodology used to develop the warrants varied by these features. Rural crash prediction equations vary by number of lanes on the major roadway, so the warrants for rural highways also vary by number of lanes.

Technical warrants are an important element of the decision-making process; however, other factors should also be considered when deciding whether to install a left-turn lane, including:
- Sight distance relative to the position of the driver and
- Design consistency within the corridor.

These factors should be considered in conjunction with the numerical warrants.

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of Legs	Four	Four	Four	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	2	2	3	(vehicles per hour)
6	Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	391	444	741	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Westbound Traffic at Intersection 2 **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

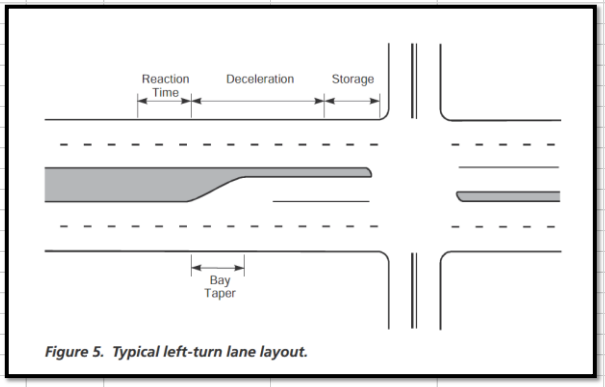
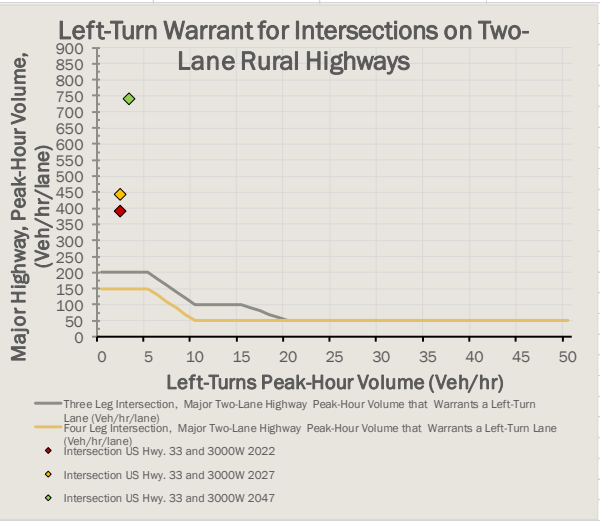


Figure 5. Typical left-turn lane layout.



XVII. Appendix G: Right Turn Lane Warrant Analyses

Based on ITD Traffic Manual

Client:
Project: **Northern Lights**
Project No.:
DESIGNED BLH
CHECKED BLH
DATE: 1/12/2023

Description: Westbound on Highway 33 at Intersection 1 **Horizon Years: 2022, 2027, 2047**

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
A right-turn lane warrant is shown in Figure 3B-1 that can be used for uncontrolled highways intersecting with public roads or approaches. Right-turn lanes can be further analyzed using the economic analysis procedure for right-turn deceleration lanes described in the article "Operational and Safety Effects of Right-Turn Deceleration Lanes on Urban and Suburban Arterials" that was published in the "Transportation Research Record, Volume 2023." The methodology can be used for rural highways in addition to urban and suburban arterials

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

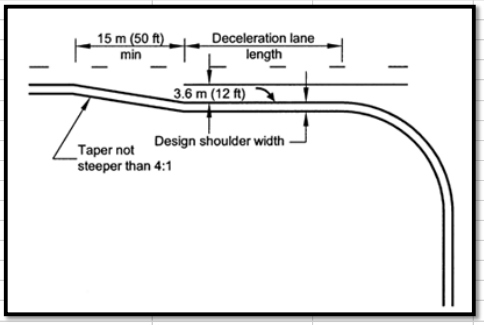
1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	330	375	625	(veh/hour/lane).
6	Posted Speed Limit (MPH)	45	Right-Turn, Peak Hour Vol	18	21	35	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

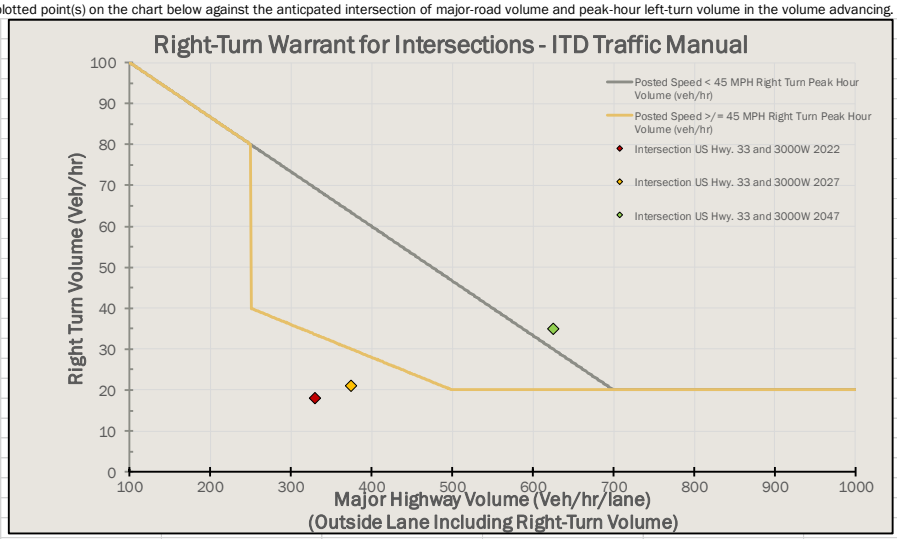
Intersection Westbound on Highway 33 at Intersection 1 **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



Based on ITD Traffic Manual

Client:
Project: **Northern Lights**
Project No.:

DESIGNED BLH
CHECKED BLH
DATE: 1/12/2023

Description: Eastbound on Highway 33 at Intersection 2

Horizon Years: 2022, 2027, 2047

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
A right-turn lane warrant is shown in Figure 3B-1 that can be used for uncontrolled highways intersecting with public roads or approaches. Right-turn lanes can be further analyzed using the economic analysis procedure for right-turn deceleration lanes described in the article "Operational and Safety Effects of Right-Turn Deceleration Lanes on Urban and Suburban Arterials" that was published in the "Transportation Research Record, Volume 2023." The methodology can be used for rural highways in addition to urban and suburban arterials

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

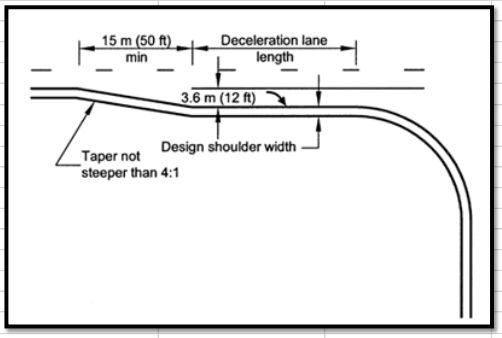
1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	351	399	665	(veh/hour/lane).
6	Posted Speed Limit (MPH)	45	Right-Turn, Peak Hour Vol	7	8	13	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

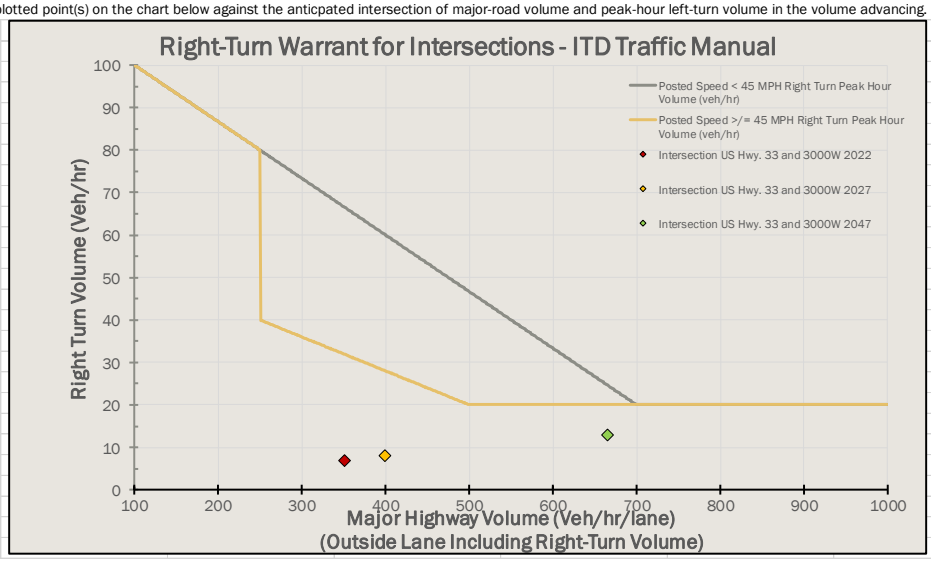
Intersection Eastbound on Highway 33 at Intersection 2 **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



Based on ITD Traffic Manual

Client:
Project: **Northern Lights**
Project No.:

DESIGNED BLH
CHECKED BLH
DATE: 1/12/2023

Description: Westbound on Highway 33 at Intersection 2

Horizon Years: 2022, 2027, 2047

ITD Traffic Manual, Section 3B.04 White Lane Line Pavement Markings and Warrants
A right-turn lane warrant is shown in Figure 3B-1 that can be used for uncontrolled highways intersecting with public roads or approaches. Right-turn lanes can be further analyzed using the economic analysis procedure for right-turn deceleration lanes described in the article "Operational and Safety Effects of Right-Turn Deceleration Lanes on Urban and Suburban Arterials" that was published in the "Transportation Research Record, Volume 2023." The methodology can be used for rural highways in addition to urban and suburban arterials

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

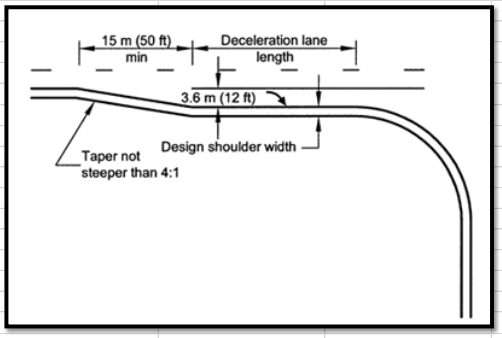
1	Jurisdiction	ITD	Horizon or Planning Year	2022	2027	2047	
2	Subdivision or Development Name	Northern Lights	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	US Hwy. 33	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	3000W	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	391	444	741	(veh/hour/lane).
6	Posted Speed Limit (MPH)	45	Right-Turn, Peak Hour Vol	15	17	29	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Westbound on Highway 33 at Intersection 2 **Horizon Years** 2022, 2027, 2047

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.