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Traffic Memorandum

Prepared for:

El Paso County, CO

Prepared by:



2435 Research Parkway, Suite 300
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 Contact: Scott Barnhart, PE, PTOE
 719.575.0100

On Behalf of:

View Homes, Inc
 555 Middle Creek Parkway, Suite 500
 Colorado Springs, CO 80921

Traffic Engineer's Statement

The attached traffic report and supporting information were prepared under my responsible charge and they comply with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.



Scott D. Barnhart, PE #37447

July 12, 2023

_____ Date


Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.



Tim Buschar, Director of Entitlement
 View Homes, Inc
 555 Middle Creek Parkway, Suite 500
 Colorado Springs, CO 80921

8/15/23
 _____ Date

<p>Accepted for File By: Gilbert LaForce, P.E. Engineering Manager Date: 08/30/2023 1:51:40 PM El Paso County Department of Public Works</p> 

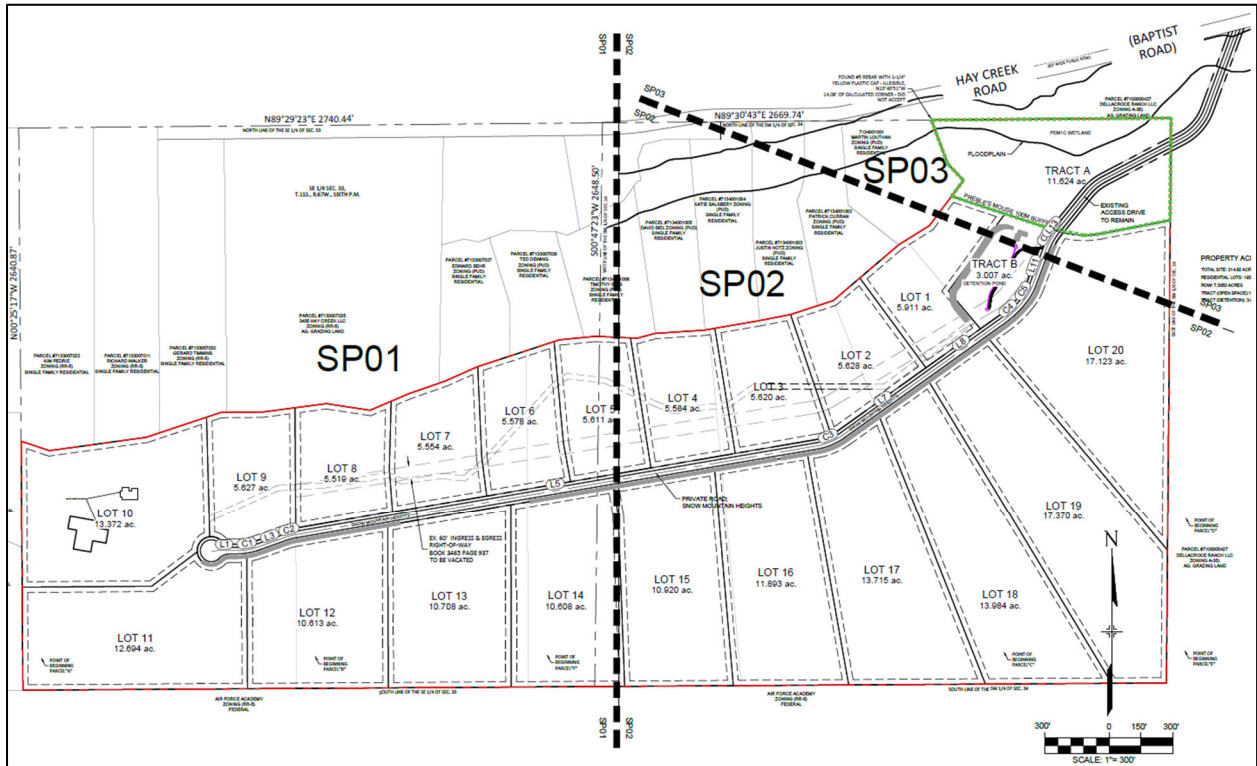
PCD File No SP231

View Homes, Inc is proposing to build a residential subdivision within El Paso County, northwest of Colorado Springs, Colorado. This memorandum documents the potential traffic impact of the development by evaluating the proposed subdivision in accordance with the El Paso County Engineering Criteria Manual (ECM), Appendix B – Transportation Impact Study Guidelines. Per the ECM and the specific development characteristics, this document follows the criteria for an individual site study at the Traffic Memorandum level.

Project Description

The proposed residential subdivision, Hay Creek Valley, is located at 2855 Hay Creek Road in El Paso County, Colorado. The project includes 6 lots consisting of between 31.9 to 37.7 acres, totaling 213.41 acres. The six lots are planned to be subdivided into 20 single-family residential lots. The development is planned as single-family, detached residences with basements and attached one- or two-car garages. Each proposed lot will consist of between 5.52 and 17.37 acres of land and will be occupied by one residence. There is currently one single-family residence existing in the project location, resulting in 19 additional residences being added to this subdivision. There is no proposed phasing for this development; it can be assumed that construction will occur in one phase. Figure 1 shows the proposed site plan, including the single access to the development, a currently unnamed dirt road with the proposed name White Bear Point. As this area is rural in nature and the proposed White Bear Point is classified as a private road and will be privately maintained, there are no provisions for pedestrian or bicycle traffic. There is, however, a 4-foot shoulder on either side of the roadway, with the inside 2 feet of each shoulder being paved and the outer 2 feet consisting of aggregate base.

Figure 1: Proposed Preliminary Site Plan



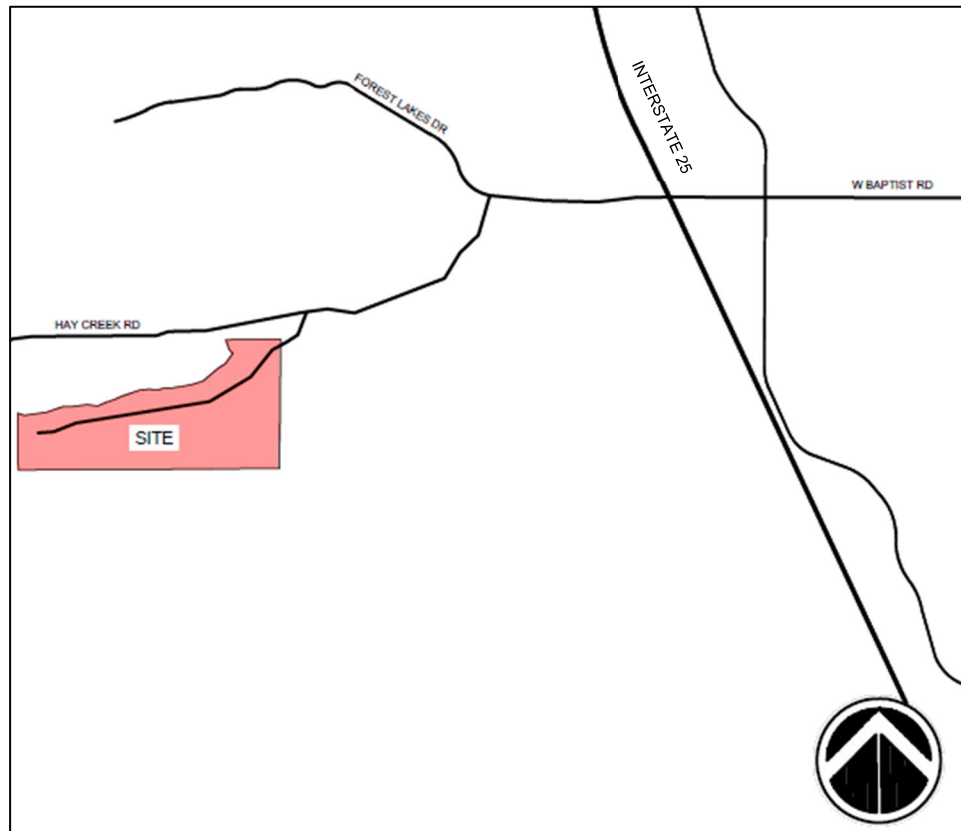
Analysis Horizon

The location of the proposed development is well built out and therefore traffic volumes are not anticipated to increase over time as most of the growth has already occurred. The project was evaluated for the existing conditions as well as the existing conditions plus the project-generated traffic.

Study Area

This traffic memorandum analyzed the intersection of White Bear Point and Hay Creek Road. White Bear Point is the sole access to the proposed development and serves as the main drive. There are no existing or proposed pedestrian or bicycle facilities along White Bear Point, nor are there along Hay Creek Road. The development access is located approximately 0.9 miles from Forest Lakes Drive. There are no public transportation services existing or proposed in the immediate area of the development. Figure 2 shows the relationship of the proposed site to the surrounding roadway network.

Figure 2: Vicinity Map/Study Area



Existing Traffic

Traffic Counts

Existing traffic counts were obtained on April 11, 2023, by All Traffic Data Services. A 24-hour tube count was performed on Hay Creek Road west of White Bear Point. Counts began at midnight on the 11th and were gathered in 15-minute intervals. The AM split was 59% eastbound and 41% westbound; the PM split was about 56% westbound and 44% eastbound; the daily split was even at about 51% eastbound and 49% westbound.

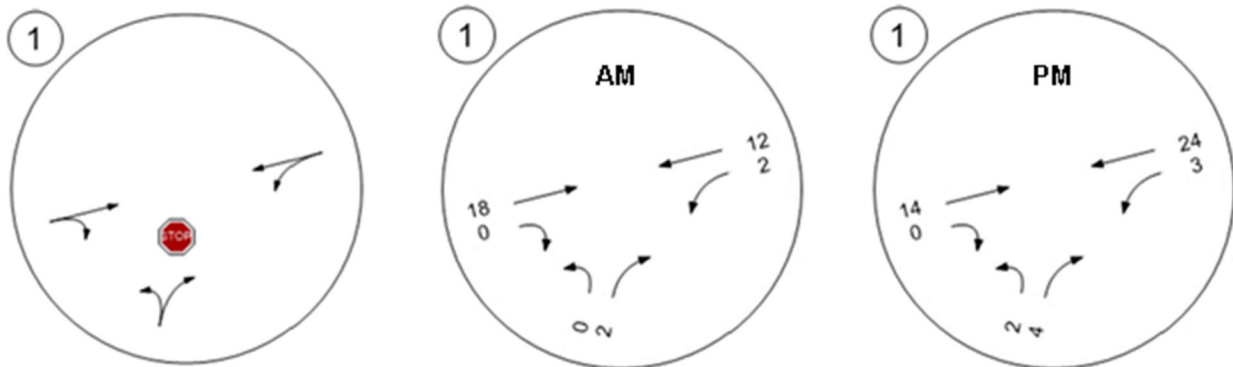
Turning movement counts were observed at the intersection of Hay Creek Road and White Bear Point on the same day, with the AM period collected from 7:00 AM until 9:00 AM and the PM period collected from 4:00 PM until 6:00 PM. The AM peak hour was from 8:00 AM until 9:00 AM, with the peak 15-minute period from 8:15 AM to 8:30 AM. The PM peak hour was from 4:45 PM to 5:45 PM, with the peak 15-minute period from 4:45 PM to 5:00 PM.

Intersection LOS

The Hay Creek Road/White Bear Point intersection was evaluated using *Highway Capacity Manual, 7th Edition* (HCM7) methodologies using PTV Vistro software. Figure 3 shows the configuration of the intersection, with one caveat: although the intersection is currently

uncontrolled, in order to perform an analysis using HCM methodologies, the intersection had to be modeled as a two-way stop-controlled intersection with the minor street being stop controlled. The figure also shows AM and PM peak hour volumes, in that order.

Figure 3: Hay Creek Road/White Bear Point Intersection Configuration and Volumes



The control delay for a two-way stop-controlled intersection is the movement with the worst (highest) delay, measured in seconds per vehicle. For both AM and PM peak hours, the approach with the highest delay was the northbound approach. The worst movement in the AM was the northbound right and for the PM it was the northbound left. The results of the analysis are shown below.

Table 1: Existing AM Movement, Approach, and Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.73	8.43	0.00	0.00	7.27	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.01	0.01	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.21	0.21	0.00	0.00	0.08	0.08
d_A, Approach Delay [s/veh]	8.43		0.00		0.91	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.91					
Intersection LOS	A					

Table 2: Existing PM Movement, Approach, and Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.83	8.44	0.00	0.00	7.26	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.04	0.04	0.00	0.00	0.01	0.01
95th-Percentile Queue Length [ft/ln]	0.89	0.89	0.00	0.00	0.17	0.17
d_A, Approach Delay [s/veh]	8.57		0.00		0.88	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.06					
Intersection LOS	A					

Because the volumes at this intersection are relatively low, this intersection operates at LOS A for all legs and all movements.

Safety – Crash Experience

Serious injury and fatal crashes within the vicinity of the project site were evaluated to determine if any safety concerns exist that should be mitigated. Maps of crashes were taken from the El Paso County Unincorporated Area Safety Performance Dashboard. Figure 4 shows the serious injury crashes and Figure 5 shows the fatal crashes. The size of the symbol represents the number of crashes in a particular location.

There was only one serious injury crash within one mile of the project site and this crash was caused by driver negligence. The next three crashes within approximately two miles of the site were alcohol-related crashes.

There were no fatal crashes within two miles of the project site. Furthermore, all fatal crashes were on or around freeways or freeway interchanges.

The proposed project and its associated single access will not affect the crash types representative of the crash experience in this area. Therefore, there are no mitigative efforts necessary for the proposed project.

Figure 4: Serious Injury Crashes

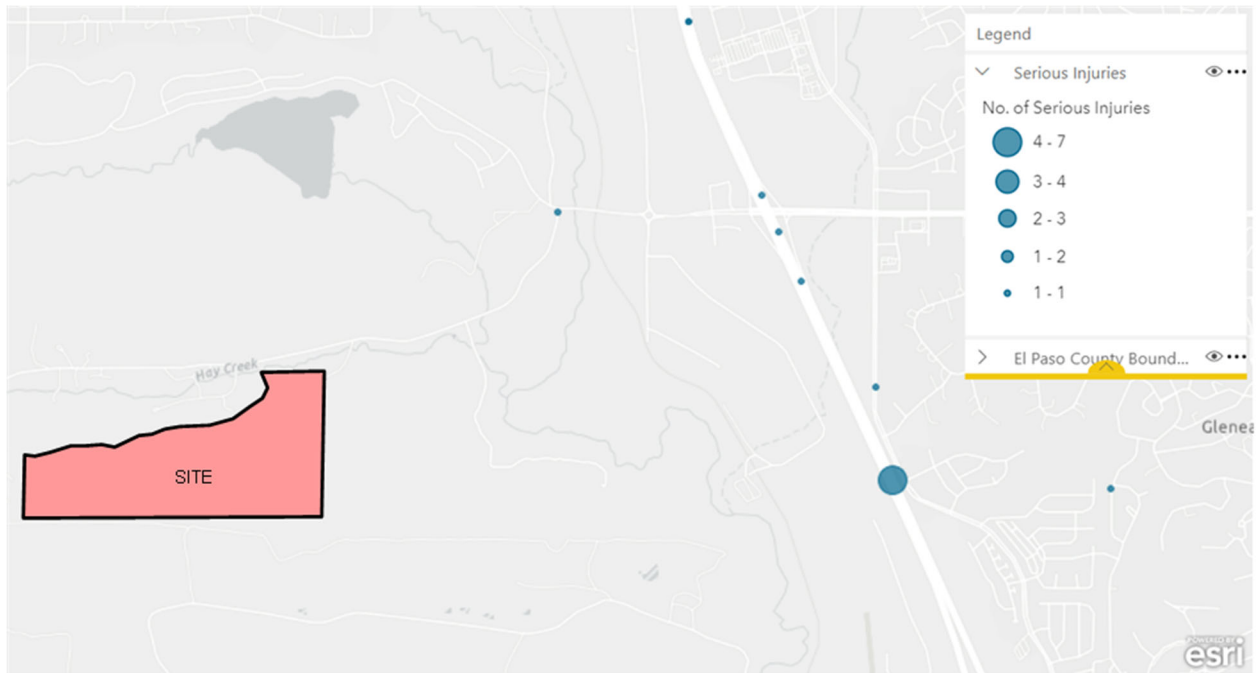
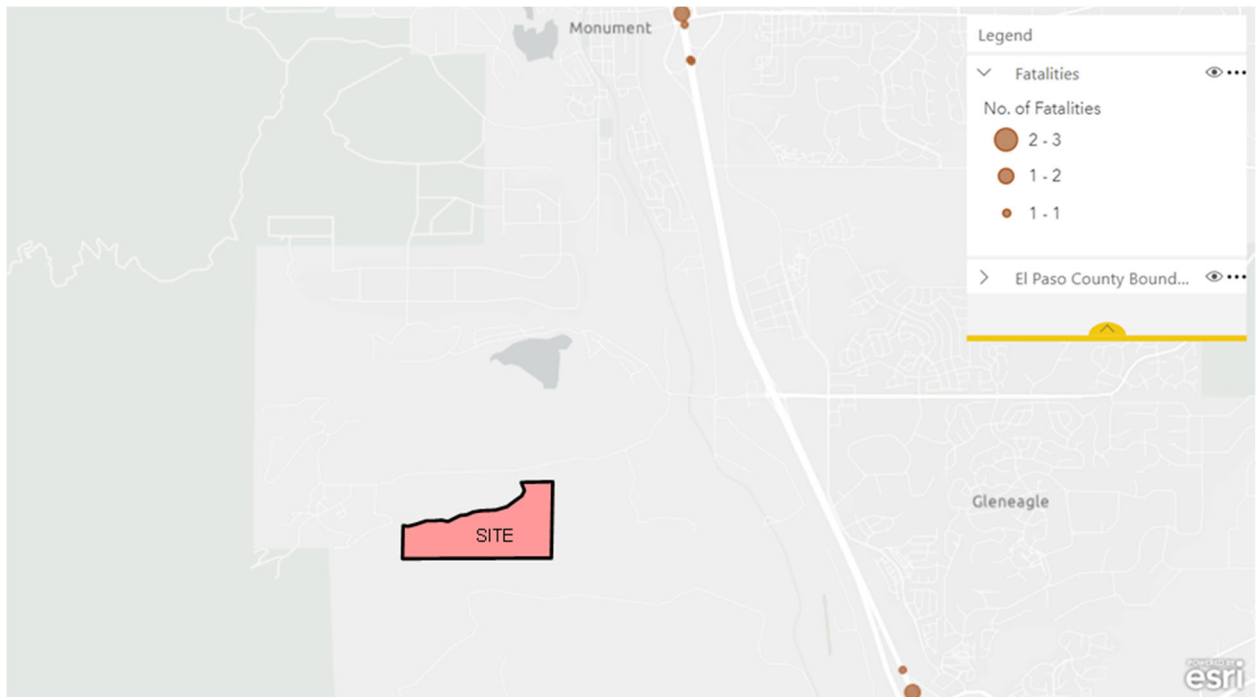


Figure 5: Fatal Crashes



Project Traffic

Trip Generation

A trip generation analysis was performed for the proposed site based on the methods and average rates published in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition*. The ITE Trip Generation Manual is a compilation of traffic data from existing developments throughout the United States. The ITE land use code that most closely matches the proposed project is 210 – Single-Family Detached Housing. Using the independent variable of Dwelling Units (DU), the Daily, AM Peak Hour, and PM Peak Hour entering, exiting, and total trips were calculated. The proposed development consists of 20 lots of free-standing homes, of which, one existing lot already has a home present. Therefore, a size of 19 DU was used to calculate the number of new trips generated by the development. A fitted curve regression equation was available and applicable for the size of the independent variable being analyzed, so that method was used to determine the number of trips for each scenario. The results of the analysis are shown in Table 3.

Table 3: Site-Generated Trips

ITE Land Use Code	Description	Independent Variable	Size	Daily Trips			AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total	In	Out	Total
210	Single-Family Detached Housing	Dwelling Units	19	109	109	218	4	12	16	13	8	21

Adjustments to Trip Generation

No adjustments to the trip generation were justified or performed as the development is a single land use in an isolated, rural area.

Trip Distribution

Although the daily volume gathered along Hay Creek Road west of White Bear Point indicated an almost 50/50 split between eastbound and westbound traffic, turning movement counts at the intersection indicated that almost all of the traffic from White Bear Point was headed eastbound. A Split of 90% eastbound/10% westbound was chosen to reflect that most trips will be heading to the developments east of the proposed site and especially towards I-25.

Trip Assignment

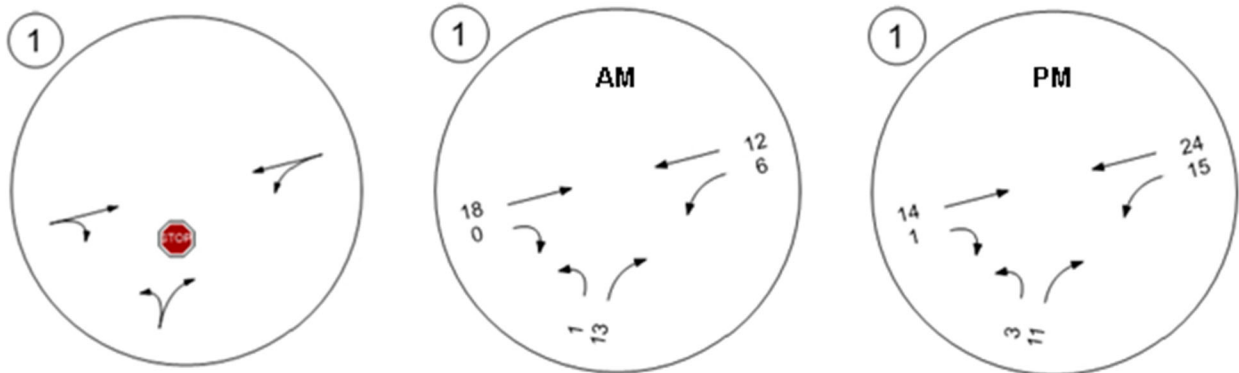
The trips generated in Table 1 were assigned to the roadway network per the splits described above. Due to the low number of anticipated trips from the west and the percentage of trips assumed in the trip distribution, there were no eastbound right turns generated during the AM peak hour.

Total Traffic

The total traffic is the existing or background traffic plus the site-generated trips calculated in the trip generation and assigned through the roadway network by the trip distribution percentages.

The configuration of the study intersection is proposed to remain the same, but White Bear Point will be paved. Figure 6 reiterates that the configuration is unchanged and shows the AM and PM peak hour turning movement volumes.

Figure 6: Hay Creek Road/White Bear Point Intersection Configuration and Total Volumes



Intersection LOS

The HCM7 and Vistro were again used to analyze the study intersection to determine at what level of service it operates. The results of the analysis are shown below.

Table 4: Existing+Project AM Movement, Approach, and Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.86	8.50	0.00	0.00	7.27	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.00	0.00	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.69	1.69	0.00	0.00	0.29	0.29
d_A, Approach Delay [s/veh]	8.53		0.00		2.42	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.58					
Intersection LOS	A					

Table 5: Existing+Project PM Movement, Approach, and Intersection Results

V/C, Movement V/C Ratio	0.01	0.02	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	9.07	8.50	0.00	0.00	7.28	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.08	0.08	0.00	0.00	0.03	0.03
95th-Percentile Queue Length [ft/ln]	2.11	2.11	0.00	0.00	0.76	0.76
d_A, Approach Delay [s/veh]	8.62		0.00		2.79	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.92					
Intersection LOS	A					

As expected, the northbound approach remains the approach with the highest delay. Due to the site generating trips making a northbound left turn, both the AM and PM worst movement is the northbound left. Despite the addition of the site trips, this intersection still operates at LOS A and the overall delay of the worst movement has increased by less than half a second.

Project Impact Assessment

This project is anticipated to have a negligible impact on the adjacent roadway network. There are no additional accesses nor are there proposed traffic signals. It is assumed that the intersection will be side-street stop-controlled simply due to the nature of a tee intersection. The nearest pedestrian/bicycle facilities are approximately 0.9 miles away, along the north side of Baptist Road/Forest Lakes Drive.

Mitigation Measures

As the results of the LOS analysis indicated that the intersection of Hay Creek Road and White Bear Point will operate at LOS A for all three legs even through the buildout volumes, there are no mitigation measures to be considered. Although there are no traffic concerns for this intersection, the existing unnamed private road is a dirt road that is skewed at approximately 30-degrees from perpendicular and has adjacent stone-column/metal fencing, and several pine trees of approximately six-inch or greater diameter trunks.

Although the site layout may undergo refinement throughout the development process, currently White Bear Point centerline is aligned at a 10-degree skew from perpendicular. This will be

addressed in a design deviation request. Additionally, a sight distance analysis was performed to determine if there is sufficient visibility. Hay Creek Road has a design speed of 40 MPH, resulting in a sight distance requirement of 445 feet. This results in sight lines that will require the removal or relocation of trees. See Appendix A for the sight distance exhibit.

Deviation Requests

There are three deviation requests associated with this development, which include cul-de-sac length, minimum number of access points, and skew of the proposed intersection.

Per ECM 2.3.8.A, the maximum length of a cul-de-sac located in rural conditions is 1,600 feet from the edge of the adjacent right-of-way to the bulb of the cul-de-sac. The length of White Bear Point is approximately 5,770 feet.

Per the El Paso County Land Development Code (LDC) Section 6.3.3(C)(2)(c), access to a planned building area shall be provided by a minimum of two separate routes if the cul-de-sac exceeds the length allowed by the ECM. This section applies to all roads whether or not they are dedicated as public roads.

Per ECM 2.3.3.B, all new roadways must intersect at or nearly at right angles. The existing unnamed dirt road is currently skewed approximately 30-degrees from perpendicular with Hay Creek Road and White Bear Point has a proposed centerline skew at the intersection with Hay Creek Road of approximately 10-degrees.

Report Conclusions and Recommendations

The proposed development will not have an appreciable effect on traffic on the adjacent roadway network. The effect on the existing traffic conditions is an increase in delay of 0.4 and 0.3 seconds per vehicle in the AM and PM peak hours, respectively. In both cases, the LOS remains at LOS A. Based on the results of the sight distance analysis, obstructions such as fences and pine trees that fall within the sight triangles of the intersection should be removed or relocated.

Appendices

Appendix A: Sight Distance Exhibit

Appendix B: Traffic Counts

Appendix C: Existing Conditions Analysis

Appendix D: Project Trip Generation

Appendix E: Existing + Project Trips Analysis

Appendix A: Sight Distance Exhibit

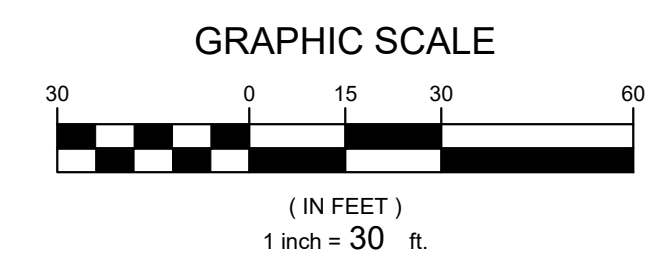


POSTED SPEED ON HAY CREEK ROAD IS 30 MPH.
 HAY CREEK ROAD IS CLASSIFIED AS A COLLECTOR; WHITE BEAR POINT IS CLASSIFIED AS PRIVATE.
 HAY CREEK ROAD IS THE HIGHER FUNCTIONAL CLASSIFICATION ROADWAY.
 DESIGN SPEED FOR A RURAL COLLECTOR ROADWAY IS 40 MPH.

FROM EL PASO COUNTY ENGINEERING CRITERIA MANUAL, TABLE 2-21, THE INTERSECTION SIGHT DISTANCE FOR THE HIGHER FUNCTIONAL CLASSIFICATION ROADWAY WITH A DESIGN SPEED OF 40 MPH IS **445 FEET**.

SCREENSHOT TAKEN FROM GOOGLE STREET VIEW ON 06/20/2023 AT 4:27PM MST.

LEGEND:
 SIGHT DISTANCE TRIANGLE



HAY CREEK DEVELOPMENT

Matrix
 Excellence by Design

2435 Research Parkway, Suite 300
 Colorado Springs, CO 80920
 Contact: Jason Alwine
 Phone (719) 575-0100 | Fax (719) 575-0208

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SIGHT DISTANCE EXHIBIT

JULY 2023

Appendix B: Traffic Counts



All Traffic Data Services

SITE 1_W - HAY CREEK RD WEST OF SNOW MTN HEIGHTS

Time	EB	WB	Total
4/11/2023	0	0	0
4/11/2023 12:15:00 AM	0	0	0
4/11/2023 12:30:00 AM	0	0	0
4/11/2023 12:45:00 AM	0	0	0
4/11/2023 1:00:00 AM	0	0	0
4/11/2023 1:15:00 AM	0	0	0
4/11/2023 1:30:00 AM	1	0	1
4/11/2023 1:45:00 AM	0	0	0
4/11/2023 2:00:00 AM	0	0	0
4/11/2023 2:15:00 AM	0	0	0
4/11/2023 2:30:00 AM	0	0	0
4/11/2023 2:45:00 AM	0	0	0
4/11/2023 3:00:00 AM	0	0	0
4/11/2023 3:15:00 AM	0	0	0
4/11/2023 3:30:00 AM	0	0	0
4/11/2023 3:45:00 AM	0	0	0
4/11/2023 4:00:00 AM	0	1	1
4/11/2023 4:15:00 AM	0	0	0
4/11/2023 4:30:00 AM	1	0	1
4/11/2023 4:45:00 AM	0	0	0
4/11/2023 5:00:00 AM	1	0	1
4/11/2023 5:15:00 AM	0	0	0
4/11/2023 5:30:00 AM	3	1	4
4/11/2023 5:45:00 AM	0	0	0
4/11/2023 6:00:00 AM	1	0	1
4/11/2023 6:15:00 AM	3	1	4
4/11/2023 6:30:00 AM	4	1	5
4/11/2023 6:45:00 AM	4	0	4
4/11/2023 7:00:00 AM	5	0	5
4/11/2023 7:15:00 AM	2	0	2
4/11/2023 7:30:00 AM	5	1	6
4/11/2023 7:45:00 AM	3	2	5
4/11/2023 8:00:00 AM	5	3	8
4/11/2023 8:15:00 AM	7	3	10
4/11/2023 8:30:00 AM	4	3	7
4/11/2023 8:45:00 AM	2	3	5
4/11/2023 9:00:00 AM	1	4	5
4/11/2023 9:15:00 AM	7	2	9
4/11/2023 9:30:00 AM	3	6	9
4/11/2023 9:45:00 AM	3	7	10
4/11/2023 10:00:00 AM	5	2	7
4/11/2023 10:15:00 AM	2	3	5
4/11/2023 10:30:00 AM	3	5	8
4/11/2023 10:45:00 AM	5	8	13
4/11/2023 11:00:00 AM	5	4	9
4/11/2023 11:15:00 AM	6	2	8
4/11/2023 11:30:00 AM	1	3	4
4/11/2023 11:45:00 AM	3	1	4
Total	95	66	161
Percentage	59.0%	41.0%	
Peak Hour	7:30 AM	10:15 AM	10:30 AM
Volume	20	20	38
PHF	0.714	0.625	0.731



All Traffic Data Services

SITE 1_W - HAY CREEK RD WEST OF SNOW MTN HEIGHTS

Time	EB	WB	Total
4/11/2023 12:00:00 PM	5	4	9
4/11/2023 12:15:00 PM	2	3	5
4/11/2023 12:30:00 PM	2	1	3
4/11/2023 12:45:00 PM	5	1	6
4/11/2023 1:00:00 PM	4	4	8
4/11/2023 1:15:00 PM	2	5	7
4/11/2023 1:30:00 PM	7	4	11
4/11/2023 1:45:00 PM	1	5	6
4/11/2023 2:00:00 PM	2	4	6
4/11/2023 2:15:00 PM	1	2	3
4/11/2023 2:30:00 PM	3	2	5
4/11/2023 2:45:00 PM	4	2	6
4/11/2023 3:00:00 PM	5	0	5
4/11/2023 3:15:00 PM	3	3	6
4/11/2023 3:30:00 PM	3	3	6
4/11/2023 3:45:00 PM	3	4	7
4/11/2023 4:00:00 PM	1	5	6
4/11/2023 4:15:00 PM	3	4	7
4/11/2023 4:30:00 PM	4	4	8
4/11/2023 4:45:00 PM	3	7	10
4/11/2023 5:00:00 PM	5	6	11
4/11/2023 5:15:00 PM	3	4	7
4/11/2023 5:30:00 PM	3	8	11
4/11/2023 5:45:00 PM	3	4	7
4/11/2023 6:00:00 PM	4	5	9
4/11/2023 6:15:00 PM	1	6	7
4/11/2023 6:30:00 PM	0	1	1
4/11/2023 6:45:00 PM	3	1	4
4/11/2023 7:00:00 PM	2	3	5
4/11/2023 7:15:00 PM	3	1	4
4/11/2023 7:30:00 PM	0	3	3
4/11/2023 7:45:00 PM	0	0	0
4/11/2023 8:00:00 PM	1	0	1
4/11/2023 8:15:00 PM	0	2	2
4/11/2023 8:30:00 PM	0	1	1
4/11/2023 8:45:00 PM	0	2	2
4/11/2023 9:00:00 PM	0	0	0
4/11/2023 9:15:00 PM	0	0	0
4/11/2023 9:30:00 PM	0	1	1
4/11/2023 9:45:00 PM	0	0	0
4/11/2023 10:00:00 PM	0	0	0
4/11/2023 10:15:00 PM	0	0	0
4/11/2023 10:30:00 PM	0	0	0
4/11/2023 10:45:00 PM	0	0	0
4/11/2023 11:00:00 PM	0	0	0
4/11/2023 11:15:00 PM	0	0	0
4/11/2023 11:30:00 PM	0	0	0
4/11/2023 11:45:00 PM	0	0	0
Total	91	115	206
Percentage	44.2%	55.8%	
Peak Hour	12:45 PM	4:45 PM	4:45 PM
Volume	18	25	39
PHF	0.643	0.781	0.886
Grand Total	186	181	367
Percentage	50.7%	49.3%	

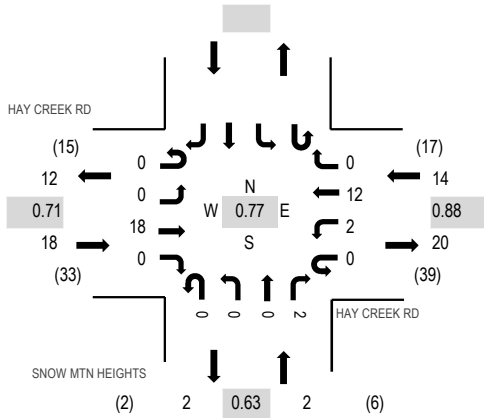
Location: 1 SNOW MTN HEIGHTS & HAY CREEK RD AM

Date: Tuesday, April 11, 2023

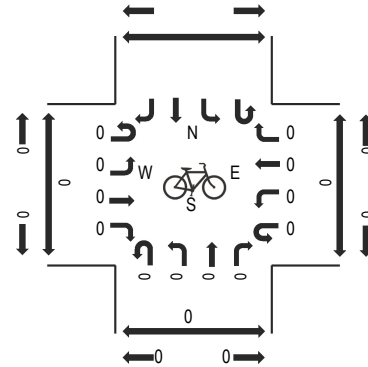
Peak Hour: 08:00 AM - 09:00 AM

Peak 15-Minutes: 08:15 AM - 08:30 AM

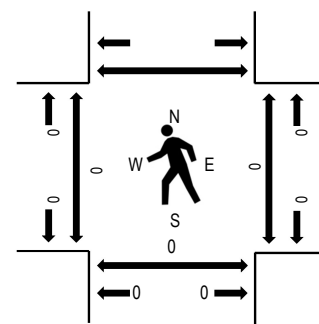
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	HAY CREEK RD Eastbound				HAY CREEK RD Westbound				SNOW MTN HEIGHTS Northbound				Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	22	0	0	0	
7:15 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	4	26	0	0	0	
7:30 AM	0	0	5	0	0	0	1	0	0	0	0	0	0	0	0	2	8	33	0	0	0	
7:45 AM	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	5	33	0	0	0	
8:00 AM	0	0	5	0	0	0	3	0	0	0	0	1	0	0	0	1	9	34	0	0	0	
8:15 AM	0	0	7	0	0	1	3	0	0	0	0	0	0	0	0	0	11	0	0	0	0	
8:30 AM	0	0	4	0	0	1	3	0	0	0	0	0	0	0	0	0	8	0	0	0	0	
8:45 AM	0	0	2	0	0	0	3	0	0	0	0	1	0	0	0	1	6	0	0	0	0	
Count Total	0	0	33	0	0	2	15	0	0	0	0	6	0	0	0	6	56	0	0	0	0	
Peak Hour	0	0	18	0	0	2	12	0	0	0	0	2	0	0	0	2	34	0	0	0	0	

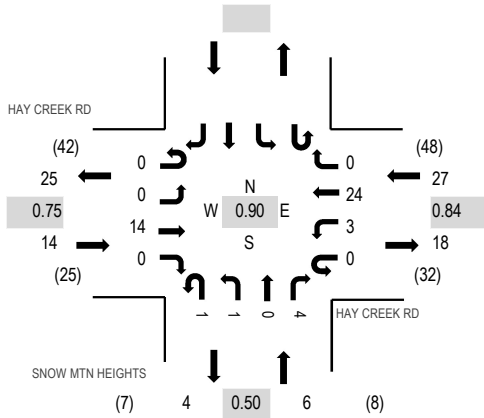
Location: 1 SNOW MTN HEIGHTS & HAY CREEK RD PM

Date: Tuesday, April 11, 2023

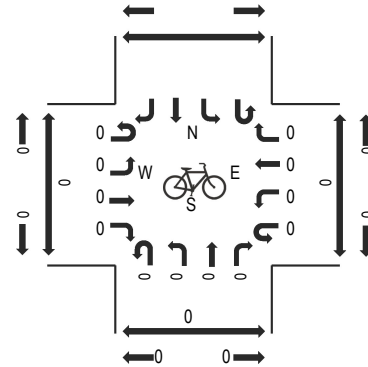
Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

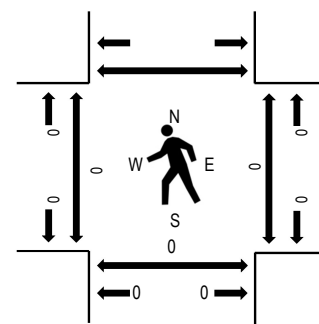
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	HAY CREEK RD Eastbound				HAY CREEK RD Westbound				SNOW MTN HEIGHTS Northbound				Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	1	0	1	1	5	0	0	0	0	0	0	0	0	0	8	39	0	0	0	
4:15 PM	0	0	3	0	0	1	4	0	0	0	0	0	0	0	0	0	8	44	0	0	0	
4:30 PM	0	0	4	0	0	1	4	0	0	0	0	1	0	0	0	0	10	45	0	0	0	
4:45 PM	0	0	3	0	0	1	6	0	1	1	0	1	0	0	0	0	13	47	0	0	0	
5:00 PM	0	0	5	0	0	1	6	0	0	0	0	1	0	0	0	0	13	42	0	0	0	
5:15 PM	0	0	3	0	0	1	4	0	0	0	0	1	0	0	0	0	9		0	0	0	
5:30 PM	0	0	3	0	0	0	8	0	0	0	0	1	0	0	0	0	12		0	0	0	
5:45 PM	0	0	3	0	0	0	4	0	0	0	0	1	0	0	0	0	8		0	0	0	
Count Total	0	0	25	0	1	6	41	0	1	1	0	6	0	0	0	0	81		0	0	0	
Peak Hour	0	0	14	0	0	3	24	0	1	1	0	4	0	0	0	0	47		0	0	0	

Appendix C: Existing Conditions Analysis

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Hay Creek Valley TIS

Vistro File: \\...\HayCreekTIS_2023-07-10.vistro

Scenario 1 Existing AM

Report File: \\...\01_Existing AM.pdf

7/10/2023

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hay Creek/White Bear Point	Two-way stop	HCM 7th Edition	NB Right	0.003	8.4	A

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

Intersection Level Of Service Report
Intersection 1: Hay Creek/White Bear Point

Control Type:	Two-way stop	Delay (sec / veh):	8.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.003

Intersection Setup

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↔		↗		↖	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Base Volume Input [veh/h]	0	2	18	0	2	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	2	18	0	2	12
Peak Hour Factor	0.6300	0.6300	0.7100	0.7100	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	6	0	1	3
Total Analysis Volume [veh/h]	0	3	25	0	2	14
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.73	8.43	0.00	0.00	7.27	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.01	0.01	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.21	0.21	0.00	0.00	0.08	0.08
d_A, Approach Delay [s/veh]	8.43		0.00		0.91	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.91					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: Hay Creek/White Bear Point

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	Yes
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	14	18	2
2	14	17	2
3	13	17	2
4	12	16	2
5	11	14	2
6	11	14	2
7	11	14	2
8	10	13	1
9	10	12	1
10	10	12	1
11	8	11	1
12	8	10	1
13	8	10	1
14	6	7	1
15	6	7	1
16	4	5	1
17	2	3	0
18	2	3	0
19	1	2	0
20	1	1	0
21	0	1	0
22	0	0	0
23	0	0	0
24	0	0	0

Warrant Analysis by Hour

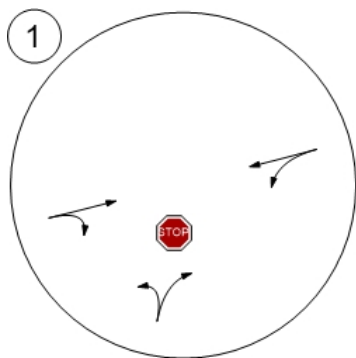
Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3 Condition B
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		
1	1	32	1	2	No	No	No	No	No	No	No	No	No	No
2	1	31	1	2	No	No	No	No	No	No	No	No	No	No
3	1	30	1	2	No	No	No	No	No	No	No	No	No	No
4	1	28	1	2	No	No	No	No	No	No	No	No	No	No
5	1	25	1	2	No	No	No	No	No	No	No	No	No	No
6	1	25	1	2	No	No	No	No	No	No	No	No	No	No
7	1	25	1	2	No	No	No	No	No	No	No	No	No	No
8	1	23	1	1	No	No	No	No	No	No	No	No	No	No
9	1	22	1	1	No	No	No	No	No	No	No	No	No	No
10	1	22	1	1	No	No	No	No	No	No	No	No	No	No
11	1	19	1	1	No	No	No	No	No	No	No	No	No	No
12	1	18	1	1	No	No	No	No	No	No	No	No	No	No
13	1	18	1	1	No	No	No	No	No	No	No	No	No	No
14	1	13	1	1	No	No	No	No	No	No	No	No	No	No
15	1	13	1	1	No	No	No	No	No	No	No	No	No	No
16	1	9	1	1	No	No	No	No	No	No	No	No	No	No
17	1	5	1	0	No	No	No	No	No	No	No	No	No	No
18	1	5	1	0	No	No	No	No	No	No	No	No	No	No
19	1	3	1	0	No	No	No	No	No	No	No	No	No	No
20	1	2	1	0	No	No	No	No	No	No	No	No	No	No
21	1	1	1	0	No	No	No	No	No	No	No	No	No	No
22	1	0	1	0	No	No	No	No	No	No	No	No	No	No
23	1	0	1	0	No	No	No	No	No	No	No	No	No	No
24	1	0	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

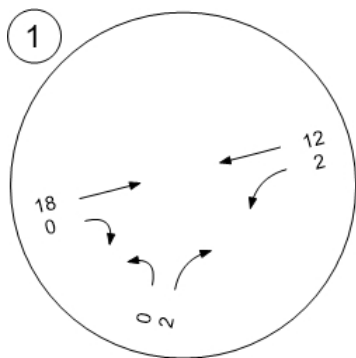
Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.4
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach (h:mm)	0:00
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	2
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	34
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	No



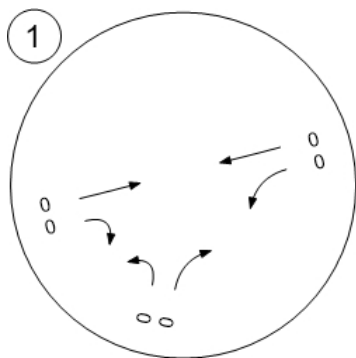
Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume

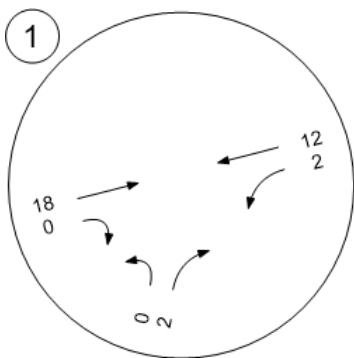


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Traffic Volume - Net New Site Trips	10
Traffic Volume - Future Total Volume	11

Hay Creek Valley TIS

Vistro File: \\...\HayCreekTIS_2023-07-10.vistro

Scenario 2 Existing PM

Report File: \\...\02_Existing PM.pdf

7/10/2023

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hay Creek/White Bear Point	Two-way stop	HCM 7th Edition	NB Left	0.004	8.8	A

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

Intersection Level Of Service Report
Intersection 1: Hay Creek/White Bear Point

Control Type:	Two-way stop	Delay (sec / veh):	8.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.004

Intersection Setup

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Base Volume Input [veh/h]	2	4	14	0	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	4	14	0	3	24
Peak Hour Factor	0.5000	0.5000	0.7500	0.7500	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	2	5	0	1	7
Total Analysis Volume [veh/h]	4	8	19	0	4	29
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.83	8.44	0.00	0.00	7.26	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.04	0.04	0.00	0.00	0.01	0.01
95th-Percentile Queue Length [ft/ln]	0.89	0.89	0.00	0.00	0.17	0.17
d_A, Approach Delay [s/veh]	8.57		0.00		0.88	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.06					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: Hay Creek/White Bear Point

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	Yes
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	27	14	6
2	26	14	6
3	26	13	6
4	24	12	5
5	21	11	5
6	21	11	5
7	21	11	5
8	19	10	4
9	19	10	4
10	18	10	4
11	16	8	4
12	15	8	3
13	15	8	3
14	11	6	2
15	11	6	2
16	8	4	2
17	4	2	1
18	4	2	1
19	2	1	1
20	1	1	0
21	1	0	0
22	0	0	0
23	0	0	0
24	0	0	0

Warrant Analysis by Hour

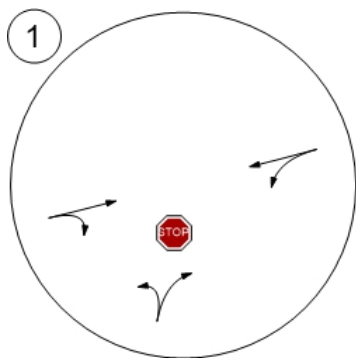
Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3 Condition B
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		
1	1	41	1	6	No	No	No	No	No	No	No	No	No	No
2	1	40	1	6	No	No	No	No	No	No	No	No	No	No
3	1	39	1	6	No	No	No	No	No	No	No	No	No	No
4	1	36	1	5	No	No	No	No	No	No	No	No	No	No
5	1	32	1	5	No	No	No	No	No	No	No	No	No	No
6	1	32	1	5	No	No	No	No	No	No	No	No	No	No
7	1	32	1	5	No	No	No	No	No	No	No	No	No	No
8	1	29	1	4	No	No	No	No	No	No	No	No	No	No
9	1	29	1	4	No	No	No	No	No	No	No	No	No	No
10	1	28	1	4	No	No	No	No	No	No	No	No	No	No
11	1	24	1	4	No	No	No	No	No	No	No	No	No	No
12	1	23	1	3	No	No	No	No	No	No	No	No	No	No
13	1	23	1	3	No	No	No	No	No	No	No	No	No	No
14	1	17	1	2	No	No	No	No	No	No	No	No	No	No
15	1	17	1	2	No	No	No	No	No	No	No	No	No	No
16	1	12	1	2	No	No	No	No	No	No	No	No	No	No
17	1	6	1	1	No	No	No	No	No	No	No	No	No	No
18	1	6	1	1	No	No	No	No	No	No	No	No	No	No
19	1	3	1	1	No	No	No	No	No	No	No	No	No	No
20	1	2	1	0	No	No	No	No	No	No	No	No	No	No
21	1	1	1	0	No	No	No	No	No	No	No	No	No	No
22	1	0	1	0	No	No	No	No	No	No	No	No	No	No
23	1	0	1	0	No	No	No	No	No	No	No	No	No	No
24	1	0	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

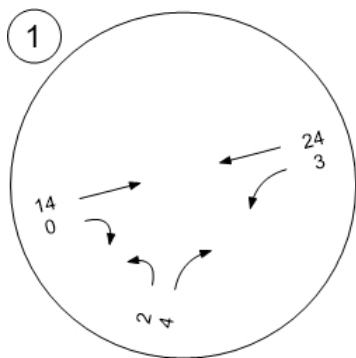
Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.6
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach (h:mm)	0:00
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	6
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	47
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	No



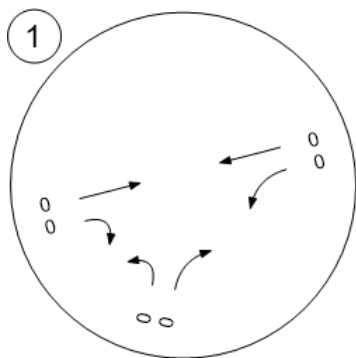
Lane Configuration and Traffic Control



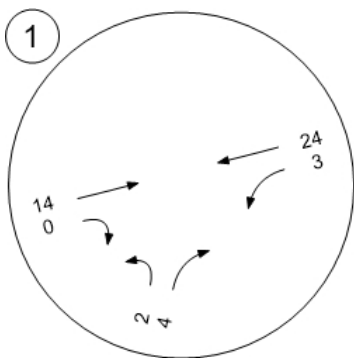
Traffic Volume - Base Volume



Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume



Appendix D: Project Trip Generation

PROJECT DETAILS

Project Name:	Hay Creek Memo	Type of Project:	
Project No:		City:	
Country:		Built-up Area(Sq.ft):	
Analyst Name:	Scott Barnhart	Clients Name:	
Date:	4/19/2023	ZIP/Postal Code:	
State/Province:		No. of Scenarios:	3
Analysis Region:			

SCENARIO SUMMARY

Scenarios	Name	No. of Land Uses	Phases of Development	No. of Years to Project Traffic	User Group	Estimated New Vehicle Trips		
						Entry	Exit	Total
Scenario - 1	AM Peak Hour	1	1	0		4	12	16
Scenario - 2	PM Peak Hour	1	1	0		13	8	21
Scenario - 3	Weekday Trips	1	1	0		109	109	218

Scenario - 1

Scenario Name: AM Peak Hour

User Group:

Dev. phase: 1

No. of Years to Project 0

Traffic :

Analyst Note:

Warning:

VEHICLE TRIPS BEFORE REDUCTION

Land Use & Data Source	Location	IV	Size	Time Period	Method	Entry	Exit	Total
					Rate/Equation	Split%	Split%	
210 - Single-Family Detached Housing	General Urban/Suburban	Dwelling Units	19	Weekday, Peak Hour of Adjacent Street Traffic,	Best Fit (LOG)	4	12	16
Data Source: Trip Generation Manual, 11th Ed					$\ln(T) = 0.91\ln(X) + 0.12$	25%	75%	

VEHICLE TO PERSON TRIP CONVERSION

BASELINE SITE VEHICLE CHARACTERISTICS:

Land Use	Baseline Site Vehicle Mode Share		Baseline Site Vehicle Occupancy		Baseline Site Vehicle Directional Split	
	Entry (%)	Exit (%)	Entry	Exit	Entry (%)	Exit (%)
210 - Single-Family Detached Housing	100	100	1	1	25	75

ESTIMATED BASELINE SITE PERSON TRIPS:

Land Use	Person Trips by Vehicle		Person Trips by Other Modes		Total Baseline Site Person Trips	
	Entry	Exit	Entry	Exit	Entry	Exit
210 - Single-Family Detached Housing	4	12	0	0	4	12
	16		0		16	

NEW VEHICLE TRIPS

Land Use	New Vehicle Trips		
	Entry	Exit	Total
210 - Single-Family Detached Housing	4	12	16

RESULTS

Site Totals	Entry	Exit	Total
Vehicle Trips Before Reduction	4	12	16
External Vehicle Trips	4	12	16
New Vehicle Trips	4	12	16

Scenario - 2

Scenario Name: PM Peak Hour

User Group:

Dev. phase: 1

No. of Years to Project 0

Traffic :

Analyst Note:

Warning:

VEHICLE TRIPS BEFORE REDUCTION

Land Use & Data Source	Location	IV	Size	Time Period	Method	Entry	Exit	Total
					Rate/Equation	Split%	Split%	
210 - Single-Family Detached Housing	General Urban/Suburban	Dwelling Units	19	Weekday, Peak Hour of Adjacent Street Traffic,	Best Fit (LOG)	13	8	21
Data Source: Trip Generation Manual, 11th Ed					$\ln(T) = 0.94\ln(X) + 0.27$	63%	37%	

VEHICLE TO PERSON TRIP CONVERSION

BASELINE SITE VEHICLE CHARACTERISTICS:

Land Use	Baseline Site Vehicle Mode Share		Baseline Site Vehicle Occupancy		Baseline Site Vehicle Directional Split	
	Entry (%)	Exit (%)	Entry	Exit	Entry (%)	Exit (%)
210 - Single-Family Detached Housing	100	100	1	1	63	37

ESTIMATED BASELINE SITE PERSON TRIPS:

Land Use	Person Trips by Vehicle		Person Trips by Other Modes		Total Baseline Site Person Trips	
	Entry	Exit	Entry	Exit	Entry	Exit
210 - Single-Family Detached Housing	13	8	0	0	13	8
	21		0		21	

NEW VEHICLE TRIPS

Land Use	New Vehicle Trips		
	Entry	Exit	Total
210 - Single-Family Detached Housing	13	8	21

RESULTS

Site Totals	Entry	Exit	Total
Vehicle Trips Before Reduction	13	8	21
External Vehicle Trips	13	8	21
New Vehicle Trips	13	8	21

Scenario - 3

Scenario Name: Weekday Trips

User Group:

Dev. phase: 1

No. of Years to Project 0

Traffic :

Analyst Note:

Warning:

VEHICLE TRIPS BEFORE REDUCTION

Land Use & Data Source	Location	IV	Size	Time Period	Method	Entry	Exit	Total
					Rate/Equation	Split%	Split%	
210 - Single-Family Detached Housing	General Urban/Suburban	Dwelling Units	19	Weekday	Best Fit (LOG)	109	109	218
Data Source: Trip Generation Manual, 11th Ed					$\ln(T) = 0.92\ln(X) + 2.68$	50%	50%	

VEHICLE TO PERSON TRIP CONVERSION

BASELINE SITE VEHICLE CHARACTERISTICS:

Land Use	Baseline Site Vehicle Mode Share		Baseline Site Vehicle Occupancy		Baseline Site Vehicle Directional Split	
	Entry (%)	Exit (%)	Entry	Exit	Entry (%)	Exit (%)
210 - Single-Family Detached Housing	100	100	1	1	50	50

ESTIMATED BASELINE SITE PERSON TRIPS:

Land Use	Person Trips by Vehicle		Person Trips by Other Modes		Total Baseline Site Person Trips	
	Entry	Exit	Entry	Exit	Entry	Exit
210 - Single-Family Detached Housing	109	109	0	0	109	109
	218		0		218	

NEW VEHICLE TRIPS

Land Use	New Vehicle Trips		
	Entry	Exit	Total
210 - Single-Family Detached Housing	109	109	218

RESULTS

Site Totals	Entry	Exit	Total
Vehicle Trips Before Reduction	109	109	218
External Vehicle Trips	109	109	218
New Vehicle Trips	109	109	218

Appendix E: Existing + Project Trips Analysis

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Hay Creek Valley TIS

Vistro File: \\...\HayCreekTIS_2023-07-10.vistro

Scenario 5 Buildout Total AM

Report File: \\...\05 Buildout Total AM.pdf

7/10/2023

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hay Creek/White Bear Point	Two-way stop	HCM 7th Edition	NB Left	0.001	8.9	A

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

Intersection Level Of Service Report
Intersection 1: Hay Creek/White Bear Point

Control Type:	Two-way stop	Delay (sec / veh):	8.9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↔		↗		↖	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Base Volume Input [veh/h]	0	2	18	0	2	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.4000	1.4000	1.4000	1.4000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	1	11	0	0	4	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	13	25	0	7	17
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	7	0	2	4
Total Analysis Volume [veh/h]	1	14	26	0	7	18
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.86	8.48	0.00	0.00	7.27	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.04	0.04	0.00	0.00	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.09	1.09	0.00	0.00	0.29	0.29
d_A, Approach Delay [s/veh]	8.51		0.00		2.04	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.70					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: Hay Creek/White Bear Point

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	Yes
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	24	25	14
2	23	24	14
3	23	24	13
4	21	22	12
5	19	20	11
6	19	20	11
7	18	19	11
8	17	18	10
9	17	17	10
10	16	17	10
11	14	15	8
12	13	14	8
13	13	14	8
14	10	10	6
15	10	10	6
16	7	7	4
17	4	4	2
18	4	4	2
19	2	2	1
20	1	1	1
21	1	1	0
22	0	0	0
23	0	0	0
24	0	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3 Condition B
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		
1	1	49	1	14	No	No	No	No	No	No	No	No	No	No
2	1	47	1	14	No	No	No	No	No	No	No	No	No	No
3	1	47	1	13	No	No	No	No	No	No	No	No	No	No
4	1	43	1	12	No	No	No	No	No	No	No	No	No	No
5	1	39	1	11	No	No	No	No	No	No	No	No	No	No
6	1	39	1	11	No	No	No	No	No	No	No	No	No	No
7	1	37	1	11	No	No	No	No	No	No	No	No	No	No
8	1	35	1	10	No	No	No	No	No	No	No	No	No	No
9	1	34	1	10	No	No	No	No	No	No	No	No	No	No
10	1	33	1	10	No	No	No	No	No	No	No	No	No	No
11	1	29	1	8	No	No	No	No	No	No	No	No	No	No
12	1	27	1	8	No	No	No	No	No	No	No	No	No	No
13	1	27	1	8	No	No	No	No	No	No	No	No	No	No
14	1	20	1	6	No	No	No	No	No	No	No	No	No	No
15	1	20	1	6	No	No	No	No	No	No	No	No	No	No
16	1	14	1	4	No	No	No	No	No	No	No	No	No	No
17	1	8	1	2	No	No	No	No	No	No	No	No	No	No
18	1	8	1	2	No	No	No	No	No	No	No	No	No	No
19	1	4	1	1	No	No	No	No	No	No	No	No	No	No
20	1	2	1	1	No	No	No	No	No	No	No	No	No	No
21	1	2	1	0	No	No	No	No	No	No	No	No	No	No
22	1	0	1	0	No	No	No	No	No	No	No	No	No	No
23	1	0	1	0	No	No	No	No	No	No	No	No	No	No
24	1	0	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

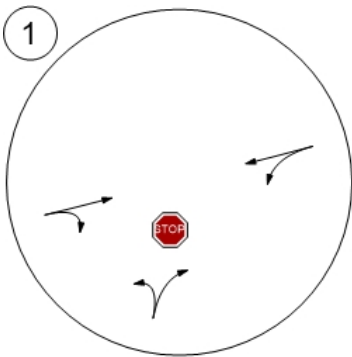
Warrant 3 Condition A

Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.5
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach (h:mm)	0:01
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	14
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	63
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	No

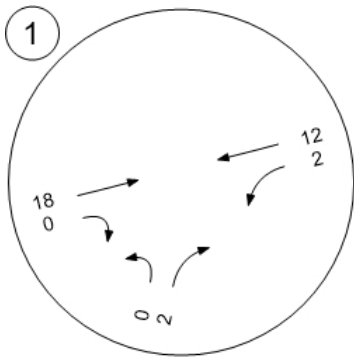
Study Intersections



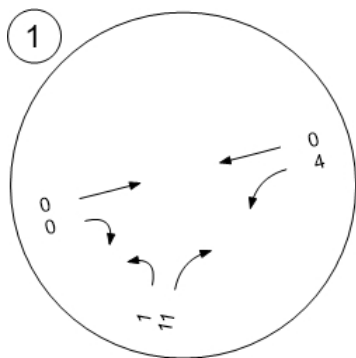
Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume

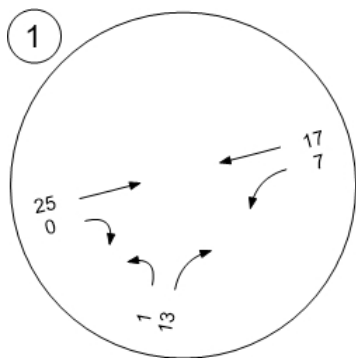


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Hay Creek Valley TIS

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Scenario 6 Buildout Total PM

Report File: \\...\06_Buildout Total PM.pdf

7/10/2023

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Hay Creek/White Bear Point	Two-way stop	HCM 7th Edition	NB Left	0.003	9.1	A

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

Intersection Level Of Service Report
Intersection 1: Hay Creek/White Bear Point

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.003

Intersection Setup

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Snow Mountain Heights		Hay Creek Road		Hay Creek Road	
Base Volume Input [veh/h]	2	4	14	0	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.4000	1.4000	1.4000	1.4000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	1	7	0	1	12	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	11	20	1	16	34
Peak Hour Factor	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	3	5	0	4	9
Total Analysis Volume [veh/h]	3	12	21	1	17	36
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	9.06	8.46	0.00	0.00	7.28	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.04	0.04	0.00	0.00	0.03	0.03
95th-Percentile Queue Length [ft/ln]	1.12	1.12	0.00	0.00	0.71	0.71
d_A, Approach Delay [s/veh]	8.58		0.00		2.33	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.81					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: Hay Creek/White Bear Point

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	Yes
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	50	21	14
2	49	20	14
3	48	20	13
4	45	19	12
5	40	17	11
6	39	16	11
7	39	16	11
8	35	15	10
9	35	14	10
10	34	14	10
11	30	12	8
12	28	12	8
13	27	11	8
14	20	8	6
15	20	8	6
16	14	6	4
17	8	3	2
18	8	3	2
19	5	2	1
20	3	1	1
21	2	1	0
22	1	0	0
23	1	0	0
24	1	0	0

Warrant Analysis by Hour

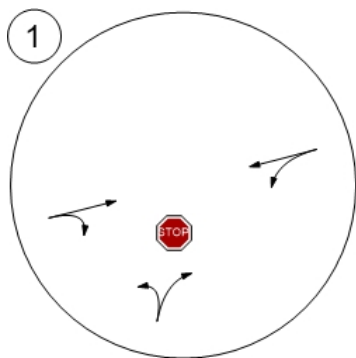
Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3 Condition B
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		
1	1	71	1	14	No	No	No	No	No	No	No	No	No	No
2	1	69	1	14	No	No	No	No	No	No	No	No	No	No
3	1	68	1	13	No	No	No	No	No	No	No	No	No	No
4	1	64	1	12	No	No	No	No	No	No	No	No	No	No
5	1	57	1	11	No	No	No	No	No	No	No	No	No	No
6	1	55	1	11	No	No	No	No	No	No	No	No	No	No
7	1	55	1	11	No	No	No	No	No	No	No	No	No	No
8	1	50	1	10	No	No	No	No	No	No	No	No	No	No
9	1	49	1	10	No	No	No	No	No	No	No	No	No	No
10	1	48	1	10	No	No	No	No	No	No	No	No	No	No
11	1	42	1	8	No	No	No	No	No	No	No	No	No	No
12	1	40	1	8	No	No	No	No	No	No	No	No	No	No
13	1	38	1	8	No	No	No	No	No	No	No	No	No	No
14	1	28	1	6	No	No	No	No	No	No	No	No	No	No
15	1	28	1	6	No	No	No	No	No	No	No	No	No	No
16	1	20	1	4	No	No	No	No	No	No	No	No	No	No
17	1	11	1	2	No	No	No	No	No	No	No	No	No	No
18	1	11	1	2	No	No	No	No	No	No	No	No	No	No
19	1	7	1	1	No	No	No	No	No	No	No	No	No	No
20	1	4	1	1	No	No	No	No	No	No	No	No	No	No
21	1	3	1	0	No	No	No	No	No	No	No	No	No	No
22	1	1	1	0	No	No	No	No	No	No	No	No	No	No
23	1	1	1	0	No	No	No	No	No	No	No	No	No	No
24	1	1	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

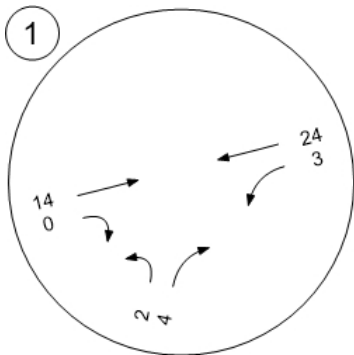
Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.6
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach (h:mm)	0:02
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	14
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	85
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	No



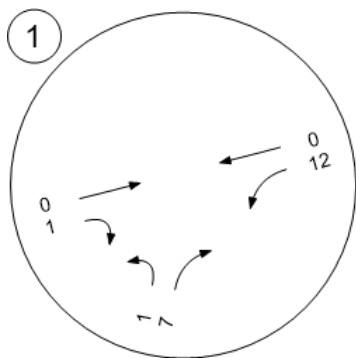
Lane Configuration and Traffic Control



Traffic Volume - Base Volume



Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume

