U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **Traffic Signal Warrant Study**
NV FLAP US50(1)
Round Hill Pines Access

Date: 6/27/19

From: Ryan Mathis
Lead Design Engineer
Lakewood, CO

To: Nevada Department of Transportation

A Signal Warrant Study was conducted for the proposed intersection of US-50 and the proposed Round Hill Pines Access Road in Douglas County. The subject project involves relocating the intersection of Round Hill Pines Access Road and US-50 north of the existing intersection. The existing access road is located within a horizontal curve and near the top of the hill, resulting in very poor sight distance for all traffic movements at this intersection. By relocating the intersection to the north, thus moving the access road onto a tangent section of US-50 and further away from the roadway crest, the sight distance is greatly improved.

Traffic Characteristics:
This proposed intersection signal warrant analysis is based on readily available traffic information; a separate traffic study was not conducted specific to this project.

Nevada Department of Transportation (NDOT) Traffic Records Information Access (TRINA) was utilized for US-50 traffic data. The nearest station with traffic data is located approximately 0.7 miles south of the proposed intersection, at the intersection of US-50 and Elks Point Road. Due to the close proximity and nature of the US-50 corridor and adjacent roadways, US-50 at the proposed intersection will have very similar traffic patterns and volumes. Using the data from this station is sufficient for this study. The station provides 24-hour approach volumes that are representative of average weekday conditions.

Traffic counts for the existing Round Hill Pines Access Road were provided with the FLAP application, with an estimated average daily traffic (ADT) of 1,000. Based on proposed parking availability (the Forest Service will be adding additional parking in the future) and accounting for a reasonable number of visitor drop offs, an estimated ADT of 1,200 (with an ADT of 600 for one direction) was established for project design and for this study. There is no hourly traffic information available for the access road and engineering judgement in conjunction with anecdotal information was utilized to conduct the warrant analysis.

For the purposes of this analysis, US-50 is considered the Major Street and the proposed Round Hill Pines Access Road is considered the Minor Street.

Intersection Characteristics:
The proposed intersection is a 3-way T-intersection with the Round Hill Pines Access Road stopping for US-50. The proposed Round Hill Pines Access Road provides access to the Round Hill Pines Beach Resort.

Roadway Characteristics:
Both the northbound and southbound approaches on US-50 have two through lanes. A northbound left turn lane would be added with the installation of a traffic signal. The proposed Round Hill Pines Access Road has one lane in each direction. The posted speed limit is 45 MPH on US-50 and 15 MPH on the proposed Round Hill Pines Access Road.

See the attached summary and supporting data for further information. If you have any questions or need additional information, please contact Ryan Mathis at 720-963-3728.

SUMMARY OF SIGNAL WARRANT ANALYSIS
6/27/19
US-50 @ Round Hill Pines Beach Resort

A Traffic Signal Warrant Study was conducted at the proposed intersection of US-50 and the Round Hill Pines Access Road in Douglas County. The data provided is indicative of an average weekday traffic pattern. The Major Street has a speed limit greater than 40 MPH; therefore, the volume warrants are 70% of the stated minimum vehicular volume requirements. The 2009 Manual on Uniform Traffic Control Devices details the traffic signal warrant analysis. Evaluation of data at this proposed intersection provided the following results.

WARRANT 1 – A

Description: This warrant is met when for each of any 8 hours of an average day, the total approach vehicle traffic for the Major Street exceeds 420 vehicles per hour (VPH), and the Minor Street approach vehicle traffic exceeds 105 VPH.

Analysis: The Major Street approach vehicle volume requirement was satisfied for 8 hours of the specified 8-hour period. However, the Minor Street approach vehicle volume requirement is not satisfied for 8 hours of the specified 8-hour period. The Minor Street average daily traffic was estimated at 600 vehicles per day in one direction. Even if all of the Minor Street traffic occurred in the specified 8-hour period, which is unlikely based on anecdotal information from the Forest Service, the average VPH is only 75 VPH, which is well below the necessary 105 VPH specified in Warrant 1-A. Based on the estimated Minor Street ADT of 600, on an average day there cannot be 8 hours where 105 VPH is exceeded. **Warrant 1-A is not met.**

-- OR –

WARRANT 1 – B

Description: This warrant is met when for each of any 8 hours of an average day, the total approach vehicle traffic for the Major Street exceeds 630 VPH and the Minor Street approach vehicle traffic exceeds 53 VPH.

Analysis: The Major Street approach vehicle volume requirement was satisfied for 8 hours of the specified 8-hour period. However, the Minor Street approach vehicle volume requirement is likely not satisfied for 8 hours of the specified 8-hour period. Hourly traffic data has not been completed for the existing Minor Street. The Minor Street average daily traffic was estimated at 600 vehicles per day in one direction. The Forest Service indicated that the majority of the traffic on the Minor Street occurs in the morning through the early afternoon. The majority of the traffic would occur in a 4 – 6 hour period and it is likely, based on the estimate one-way ADT of 600, that the 53 VPH would only be exceeded in some of these hours, and not for the necessary 8-hours. **Warrant 1-B is likely not met.**

WARRANT 1 IS LIKELY NOT MET

WARRANT 2

Description: This warrant is met when for each of any 4 hours of an average day, the Minor Street approach vehicle volume is above the appropriate curve on MUTCD Figure 4C-2.

Analysis: The Minor Street approach vehicle volumes are likely above the curve for any 4 hours of an average day. Based on anecdotal information from the Forest Service, most of the traffic on the Minor Street occurs in the morning through the early afternoon. In general, US-50 traffic volumes are between 850 – 1200 VPH during this time period, which, per MUTCD Figure 4C-2, would require a VPH of between 60 – 80 to be above the appropriate line. With an estimated ADT of 600 in one direction and knowing that the Minor Street traffic occurs mostly in a 4 – 6 hour time period, the Minor Street approach vehicle volume is likely above the appropriate curve on MUTCD Figure 4C-2 for 4 hours of an average day.

WARRANT 2 IS LIKELY MET

WARRANT 3

Description: The warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the Minor Street traffic suffers undue delay when entering or crossing the major street. The signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Analysis: Based on anecdotal information from the Forest Service, on an average day there are no undue delays exceeding the minimum of 1 hour. Additionally, the resort the Minor Street provides access to does not attract and discharge large numbers of vehicles over a short time.

WARRANT 3 DOES NOT APPLY

WARRANT 4

Description: This warrant is met when the pedestrian volume crossing the Major Street at an intersection or mid-block during an average weekday is 75 or more for each hour any 4 hours or 93 or more during any 1 hour.

Analysis: While a formal study was not completed, zero pedestrians crossing the Major Street were observed during the 30% site visit and the Forest Service indicated that pedestrians do not cross the Major Street at this location. With a posted speed limit of 45 MPH and a lack of any facilities or businesses on the east side of the Major Street, it is not expected that any pedestrians would need to cross.

WARRANT 4 IS NOT MET

WARRANT 5

Description: This warrant is met when at an established school crossing across the Major Street, the number of adequate gaps in the vehicle traffic stream during the period when schoolchildren are using the crossing is less than the number of minutes in the same period and there is a minimum of 20 schoolchildren during the highest crossing hour.

Analysis: There are no established school crossings within the project limits.

WARRANT 5 DOES NOT APPLY

WARRANT 6

Description: This warrant is met when progressive movement control is needed on a two-way street where adjacent traffic signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Analysis: There are no traffic signals that would be adjacent to the proposed signal discussed in this analysis. The nearest traffic signals are over a half mile in either direction on US-50.

WARRANT 6 DOES NOT APPLY

WARRANT 7

Description: This warrant is satisfied when five or more reported crashes, of types susceptible to correction by traffic control signal, have occurred in a consecutive 12-month period.

Analysis: NDOT's website has an application with crash data from 2015-2017. From this data, there are no consecutive 12-month periods with five or more reported crashes within the project limits.

WARRANT 7 IS NOT MET

WARRANT 8

Description: This warrant is met when the common intersection of two or more major routes (1) have a total existing or projected entering volume of at least 1,000 vehicles during the peak hour of a typical weekday; or (2) has a total existing or projected entering volume of at least 1,000 vehicles for each of any 5 hours of a Saturday and/or Sunday.

Analysis: The proposed location is not an intersection of two major routes.

WARRANT 8 DOES NOT APPLY

WARRANT 9

Description: This warrant is met when the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Analysis: There is no grade crossing within the project limits.

WARRANT 9 DOES NOT APPLY

CONCLUSION

This signal warrant analysis indicates that a traffic signal installation may not be justified at the proposed intersection based on only likely meeting 1 warrant (Warrant 2). A traffic study may be required to prove that this warrant is met. Per the MUTCD, the satisfaction of a traffic signal warrant or warrants shall not itself require the installation of a traffic control signal.

Google Earth Pro

miles 1

km 3

Nevada Department of Transportation

Daily Volume from 05/14/2018 through 05/17/2018

Site Names: 0050038, , , US50
County: Douglas
Funct. Class: Rural Principal Arterial - Other
Location: .72 mi E of SR760 (Elk Point Rd)

Seasonal Factor Group: 02
Daily Factor Group: 02
Axle Factor Group: 03
Growth Factor Group: 03

	Sun 05/13/2018			Mon 05/14/2018			Tue 05/15/2018			Wed 05/16/2018			Thu 05/17/2018			Fri 05/18/2018			Sat 05/19/2018		
	ROAD	W	E	ROAD	W	E	ROAD	W	E	ROAD	W	E	ROAD	W	E	ROAD	W	E	ROAD	W	E
00:00							66	31	35	65	34	31	66	38	28						
01:00							48	26	22	46	23	23	60	32	28						
02:00							30	12	18	35	12	23	35	12	23						
03:00							42	15	27	29	8	21	30	12	18						
04:00							60	36	24	63	19	44	64	26	38						
05:00							215	128	87	194	103	91	205	111	94						
06:00							529	284	245	553	302	251	540	290	250						
07:00							863	456	407	869	433	436	899	441	458						
08:00							859	432	427	834	399	435	939	462	477						
09:00							884	400	484	882	379	503	955	434	521						
10:00				965	447	518	955	409	546	853	332	521	1,005	443	562						
11:00				967	456	511	965	442	523	981	448	533	1,066	484	582						
12:00				1,021	483	538	1,020	500	520	1,005	473	532	1,172	598	574						
13:00				981	514	467	999	512	487	981	493	488	1,098	593	505						
14:00				1,087	582	505	1,123	552	571	970	517	453	1,211	638	573						
15:00				1,327	698	629	1,294	665	629	1,074	518	556	1,288	704	584						
16:00				1,153	574	579	1,264	622	642	1,048	520	528	1,293	635	658						
17:00				1,016	524	492	1,100	473	627	933	502	431									
18:00				768	398	370	704	382	322	672	366	306									
19:00				477	260	217	528	275	253	483	263	220									
20:00				414	238	176	407	244	163	329	199	130									
21:00				249	147	102	316	215	101	302	178	124									
22:00				179	102	77	205	125	80	171	89	82									
23:00				87	43	44	110	60	50	110	59	51									
Volume				10,691	5,466	5,225	14,586	7,296	7,290	13,482	6,669	6,813	11,926	5,953	5,973						
AM Peak Vol							1,007	458	570	989	448	550	1,089	494	617						
AM Peak Fct							0.93	0.92	0.89	0.95	0.97	0.96	0.86	0.90	0.89						
AM Peak Hr							10:30	7:15	10:30	10:45	11:00	10:15	10:45	8:30	10:45						
PM Peak Vol				1,339	709	630	1,299	668	668	1,123	569	566									
PM Peak Fct				0.95	0.93	0.98	0.97	0.93	0.93	0.93	0.88	0.93									
PM Peak Hr				15:15	15:15	15:15	15:15	15:15	16:30	15:30	15:15	15:30									
Seasonal Fct				0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974						
Daily Fct				1.028	1.028	1.028	0.918	0.918	0.918	0.908	0.908	0.908	0.886	0.886	0.886						
Axle Fct				0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500						
Pulse Fct				2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000						

Collected by: NDOT
Created 05/15/2019 9:18:36AM

ROAD AADT 13,033 **W AADT 6,550** **E AADT 6,482**