TRAFFIC IMPACT STUDY

Helendale Route 66 Gas Station

SAN BERNARDINO COUNTY, CALIFORNIA

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DRAFT REPORT
August 23, 2016

August 23, 2016 Job No. HELN0000-0001

Mr. Moussa Waw
Helendale Route 66 Gas Station
26428 National Trails Highway
Helendale, CA 92342

RE: Draft Traffic Impact Study – Helendale Route 66 Gas Station
San Bernardino County, California

Dear Mr. Waw:

David Evans and Associates, Inc. is pleased to submit this Draft Traffic Impact Study (TIS) Report for the proposed Helendale Route 66 Gas Station. The Helendale Route 66 Gas Station is proposed to be located at the southwest corner of National Trails Highway and Vista Road in Helendale, California. The proposed project consists of a gas station with convenience store and 12 fueling pumps, and fast-food restaurant within the gas station building.

The report examines the traffic impacts with and without the addition of the proposed project and presents recommended traffic improvements. The report also addresses the impacts of overall growth within the area to assure that cumulative traffic mitigations can be addressed.

We are pleased to have been of assistance to you in processing and obtaining approval for the project. If you have any questions or comments, please feel free to contact me at 760-524-9115.

Respectfully submitted,

David Evans and Associates, Inc.

Robert A. Kilpatrick, P.E., T.E.
Senior Project Manager / Senior Associate

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1 INTRODUCTION

This report identifies the traffic impacts and presents recommendations for access and traffic mitigation for the proposed Helendale Route 66 Gas Station. The Gas Station is proposed to be located at the southwest corner of National Trails Highway and Vista Road in Helendale, California. The proposed site consists of a gas station with a convenience store with 12 fueling positions and a fast food restaurant within the gas station building. *Figure 1* illustrates the vicinity map and project location and *Figure 2* illustrates the proposed project site plan. The proposed project is bounded to the north by Vista Road, to the east by National Trails Highway, and is surrounded by undeveloped land to the south and west.

The intent of this TIA is to address the impacts and mitigations required for the proposed development. This report identifies six (6) scenarios, as outlined in the County approved Traffic Scope, necessary to address project specific mitigations. The scenarios include an Existing Condition, Existing Plus Project Condition, Background Condition, Project Conditions, Future Conditions Year 2040, and Future Conditions Year 2040 with Project.

The Existing Condition analysis is based on existing traffic counts collected in June 2016 and reflects the current conditions of the project area.

The Existing Plus Project Condition addresses anticipated impacts if the project were completed today. The values generate a base comparison of project impacts without ambient growth. The Existing Plus Project Condition considers a trip distribution utilizing existing intersections included in the study area.

The Background Condition addresses impacts due to ambient growth up to the Project Buildout Year of 2017 within the study area. The ambient growth is estimated as an annual 2% growth rate. The Background Condition considers a trip distribution utilizing existing intersections included in the study area.

The Project Conditions analysis is the examination of potential development correlating with the development of the project up to the Project Year of 2017. The values generate a base comparison of project impacts with ambient growth. The Project Conditions considers a trip distribution utilizing existing intersections included in the study area.

The Future Conditions Year 2040 addresses impacts due to ambient growth of the surrounding regional area up to the Future Year 2040. The ambient growth up to the Future Year 2040 was developed from the San Bernardino Transportation Analysis Model (SBTAM). The Future Conditions Year 2040 considers a trip distribution utilizing existing intersections included in the study area.

The Future Conditions Year 2040 plus Project addresses impacts due to the proposed project and ambient growth up to the Future Year 2040 within the study area. The Future Conditions Year 2040 plus Project considers a trip distribution utilizing existing intersections included in the study area.

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FIGURE 1: VICINITY MAP
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

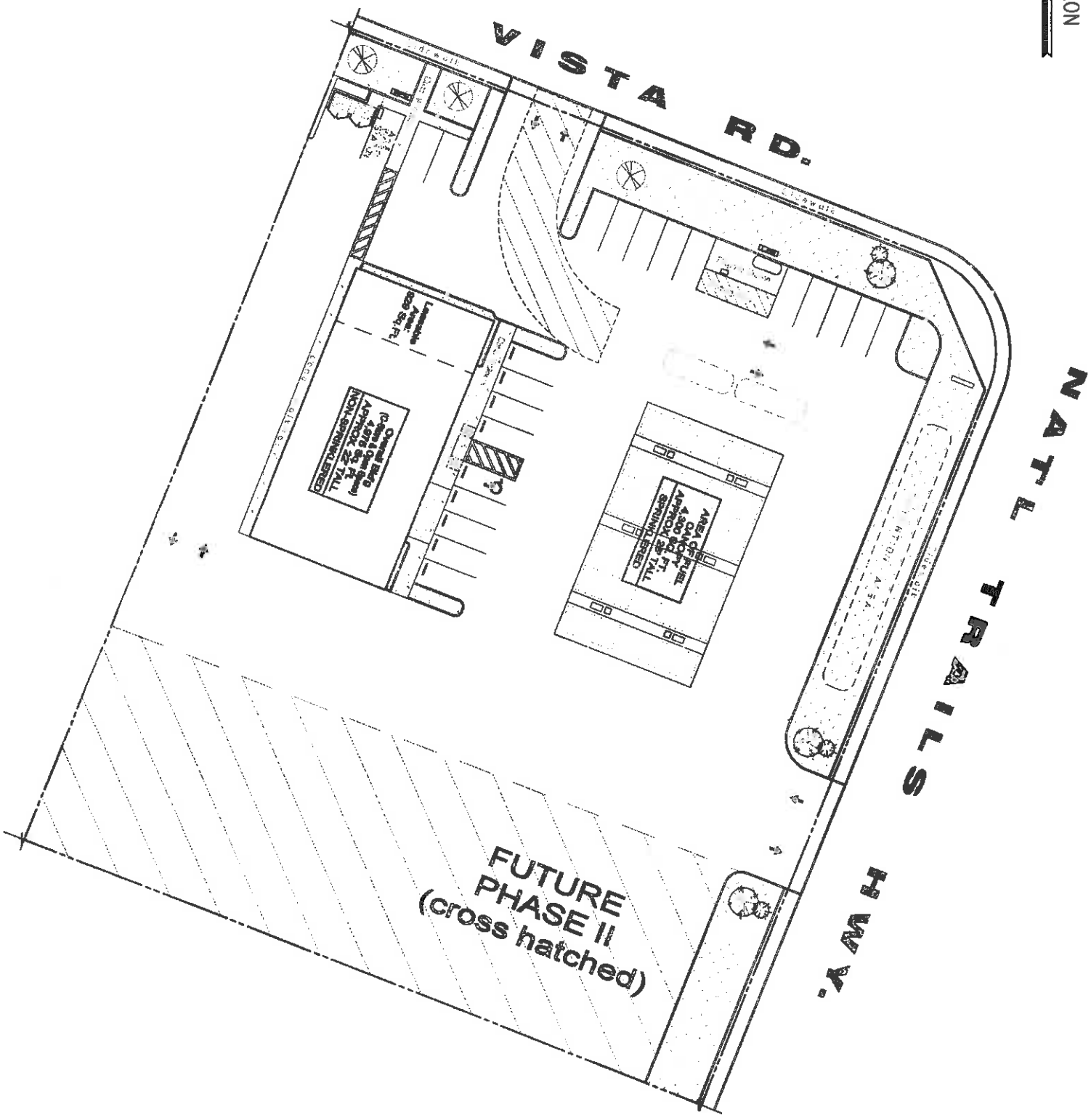

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FIGURE 2: SITE PLAN
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

2 EXISTING CONDITIONS

Existing Street System

The following roadways provide access to the study area;

National Trails Highway is a primarily north-south route that provides regional access between the Victorville and Barstow areas and serves as the primary access road to Helendale. This roadway is primarily a two-lane highway (one lane in each direction and with a lane for left and right turn pockets).

Vista Road is the primary access road to the Helendale community. It is a two-lane roadway (one lane in each direction) and provides direct access to residential and commercial driveways.

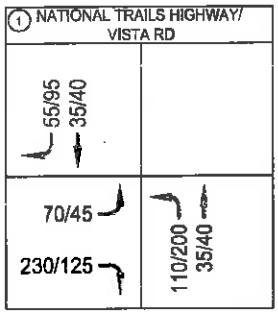
The proposed project is located at the southwest corner of National Trails Highway and Vista Road in the unincorporated community of Helendale, San Bernardino County, California. It is bounded to the north by Vista Road, to the east by National Trails Highway, and undeveloped land to the west and south. Based on potential traffic impacts to the area roadways, one (1) existing intersection and two (2) future intersections in the study area have been identified for analysis;

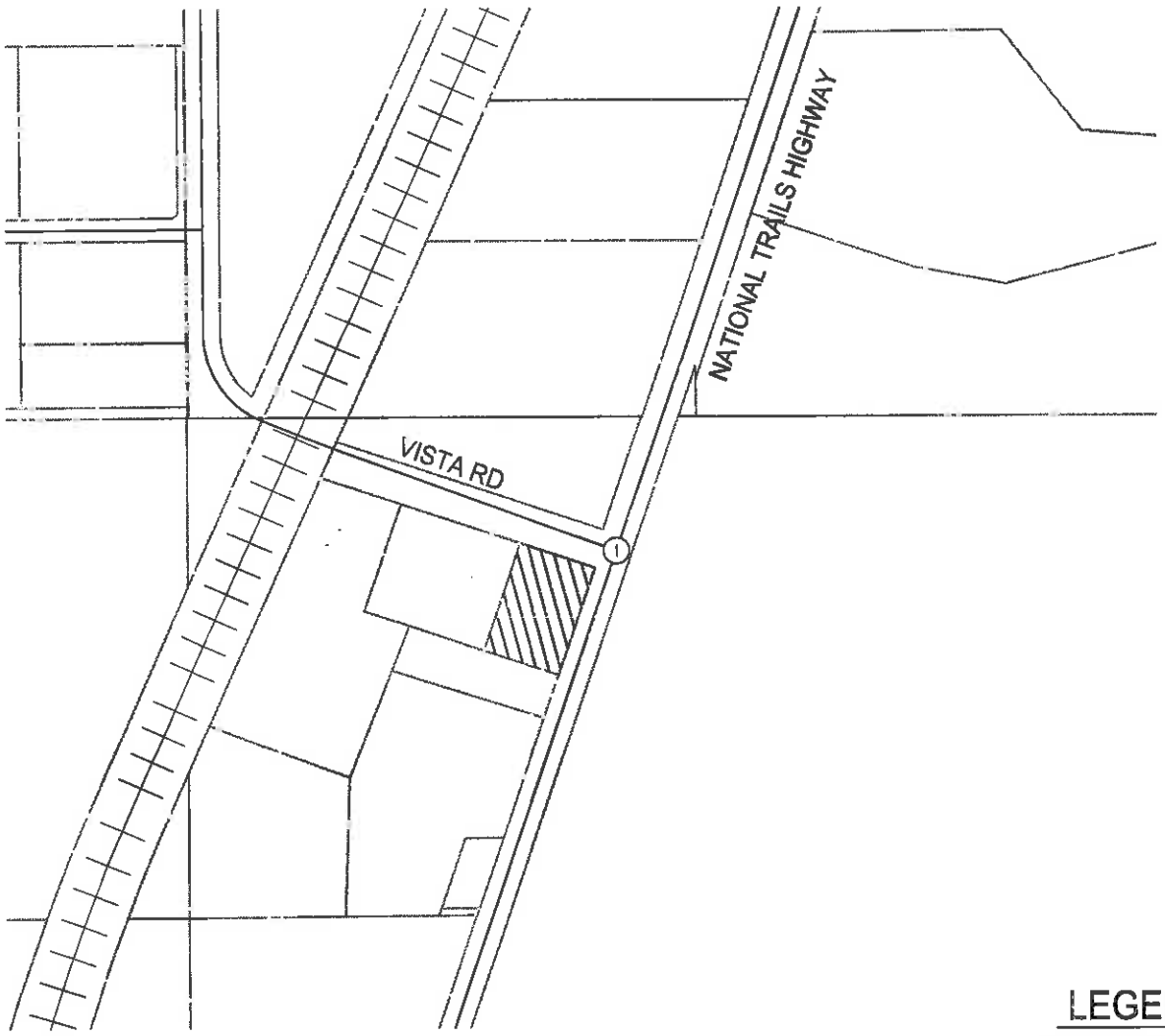
1. Vista Road and National Trails Highway (existing intersection)
2. Project Driveway A and Vista Road (proposed future intersection)
3. National Trails Highway and Project Driveway B (proposed future intersection)

The intersection of National Trails Highway and Vista Road is currently stop controlled along Vista Road.

Existing Traffic Volumes

Figure 3 illustrates the existing peak hour traffic volumes in the study area. Turn movement counts were obtained from Newport Traffic Studies, an independent traffic data collection company. Turn movement counts were collected during the am (7:00am – 9:00am) and pm (4:00pm – 6:00pm) peak hour at the above-mentioned existing intersection. These counts were conducted in June 2016. The resulting turning movement volumes are presented in *APPENDIX C* of this report.





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XX/XX - AM/PM PEAK HOUR VOLUMES

① - STUDY INTERSECTIONS

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FIGURE 3: EXISTING TRAFFIC VOLUME
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

Intersection Capacity Analysis Methodology

Based on the existing intersection geometrics and traffic volumes during the AM and PM Peak Hour, the intersection capacity analyses were conducted for the un-signalized intersection using the Synchro Software. Synchro is released by Trafficware Ltd, version 8.

For un-signalized intersections the HCM measures the LOS based on the computed or measured control delay for Two Way Stop Controlled intersections (TWSC) and control delay for All Way Stop Controlled (AWSC) intersections. For a TWSC the LOS is computed for each movement and the most critical LOS is the one that describes the effectiveness of that intersection, which is typically the stop controlled left turn movement from the minor street. For an AWSC intersection the LOS defines the whole intersection. *Table 1* provides the LOS thresholds for TWSC and AWSC intersections per the HCM 2010 methodology.

Table 1: HCM 2010 - LOS Criteria for TWSC and AWSC

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10 and ≤15
C	> 15 and ≤25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Source: **HCM 2010**

2.1 Existing Traffic Analysis

Intersection capacity analysis were conducted for the study intersection to determine an existing intersection level-of-service (LOS), based on the existing intersection geometrics and the AM and PM peak hour traffic volumes. The results of the analysis are shown in *Table 2* and provided in *APPENDIX C. Figure 4* illustrates the existing intersection geometrics utilized in the capacity analysis.

Table 2: Intersection Capacity Analysis - Existing Condition
Traffic Study – Helendale Route 66 Gas Station

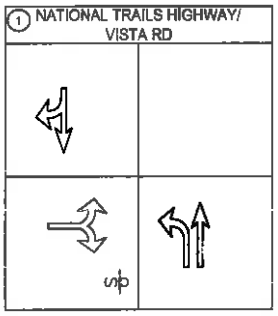
Intersection	AM		PM	
	Delay (1)	LOS(2)	Delay (1)	LOS(2)
1 National Trails Hwy and Vista Road (3)	12.2	B	12.1	B

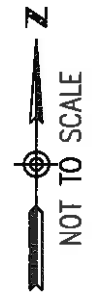
(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection

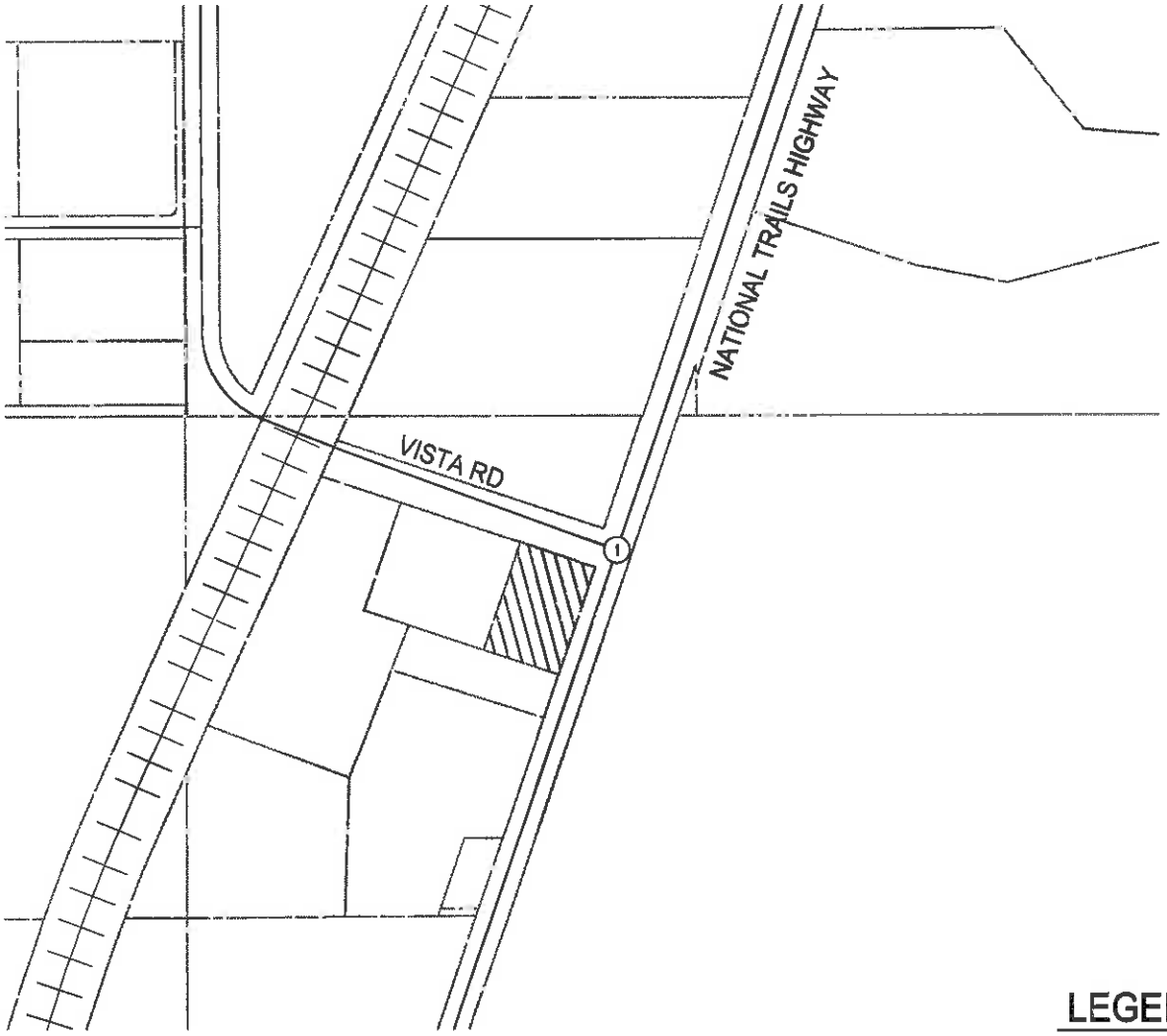
Source: **David Evans and Associates, Inc.**

As shown in *Table 2* under Existing Conditions, the study intersection is operating at an acceptable LOS during the am and pm peak periods.

Traffic signal warrant analysis was completed with the existing condition volume for the un-signalized intersection of National Trails Hwy and Vista Road, resulting in the intersection not complying with any of the warrants.







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- $\frac{b}{s}$ - UNSIGNALIZED INTERSECTION
- (1) - STUDY INTERSECTIONS
- ⟸ - EXISTING GEOMETRICS

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FIGURE 4: EXISTING CONDITION INTERSECTION GEOMETRICS

HELENDALE ROUTE 66 GAS STATION

HELENDALE , CALIFORNIA

3 EXISTING PLUS PROJECT CONDITIONS

The proposed project consists of a gas station with convenience store and 12 fueling pumps, as well as a fast-food restaurant within the gas station building. The Existing Plus Project Conditions address the impacts due to project traffic.

Project Trip Generation

To identify potential traffic impacts, trip generation factors were applied to the land use to generate project trip estimates. The trip generation factors for a Gas Station with Convenience Store and for a Fast-Food Restaurant without Drive-Through Window were obtained from the 9th Edition of the Institute of Transportation Engineers trip generation report.

Table 3 summarizes the estimated trip generation for the project site during the weekday AM peak (7-9 AM) and PM peak (4-6 PM) periods.

Table 3: Project Trip Generation
Traffic Scope – Helendale Route 66 Gas Station

	Use		AM Peak Hour			PM Peak Hour		
		Daily	In	Out	Total	In	Out	Total
1	**Gas Station with Convenience Store**							
	(ITE 945) Vehicle Fueling Positions	162.78	5.08	5.08	10.16	6.76	6.76	13.51
	12 Gasoline Fueling Positions	1,953	61	61	122	81	81	162
	Internal Total Trips (10% Reduction)	195	6	6	12	8	8	16
	Adjusted Total Trips	1,758	55	55	110	73	73	146
	Pass-By Trips (62%/56%)	-	34	34	68	41	41	82
	Primary Trips (38%/44%)	-	21	21	42	32	32	64
2	**Fast-Food Restaurant without Drive-Through Window**							
	(ITE 933) Per 1,000 Sq. Feet Gross Floor Area	716.00	26.32	17.55	43.87	13.34	12.81	26.15
	929 Sq. Feet Gross Floor Area	665	24	16	40	12	12	24
	Internal Total Trips (10% Reduction)	67	2	2	4	1	1	2
	Adjusted Total Trips	599	22	14	36	11	11	22
	Pass-By Trips (25%)	-	6	4	10	3	3	6
	Primary Trips (75%)	-	16	10	26	8	8	16
	Sub Total Trips	2,619	85	77	162	93	93	186
	Internal Total Trips (10% Reduction)	262	8	8	16	9	9	19
	Adjusted Total Trips	2,357	77	69	146	84	84	168
	Pass-By Trips	-	40	38	78	44	44	88
	Primary Trips	-	37	31	**68**	40	40	**80**

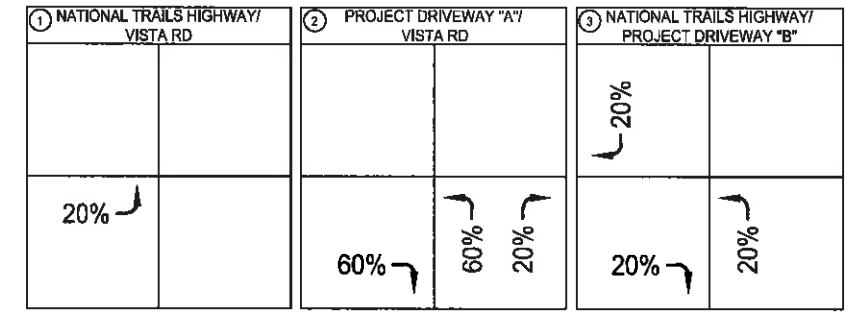
Source: "Trip Generation Manual, Institute of Transportation Engineers", 9th Edition

As presented in *Table 3,* it is estimated that the proposed project will generate 68 primary trips during the am peak hour and 168 primary trips during the pm peak hour.

Project Trip Distribution

To address the impacts of the estimated project traffic, the trips were distributed and assigned to the surrounding streets and study intersections. The project traffic was distributed based on the anticipated project utilization. Once the distribution pattern was established, project trips were assigned to the area streets that serve the project.

Figure 5 illustrates the estimated distribution pattern for the primary and pass-by project trips. *Figure 6* illustrates the AM and PM peak hour pass-by trips that occur at the study area intersections. The project traffic was added to the existing traffic volume to assess the impacts generated. The Total Primary Project Trips are illustrated in *Figure 7*. The Total Project Trips are illustrated in *Figure 7*.



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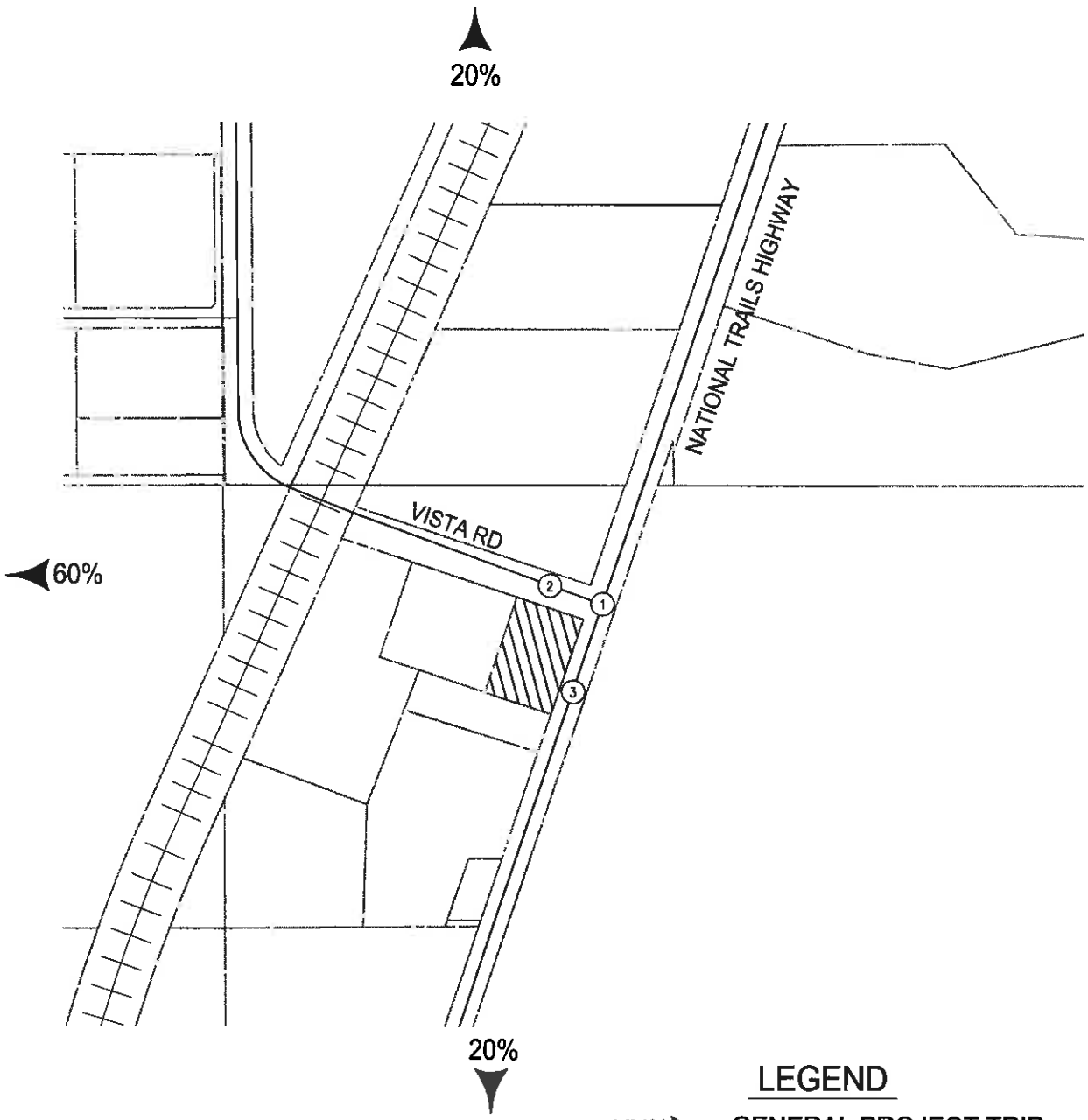

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XX% - GENERAL PROJECT TRIP DISTRIBUTION

XX% - SPECIFIC PROJECT TRIP

(#) - STUDY INTERSECTIONS

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FIGURE 5: PRIMARY TRIP DISTRIBUTION
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

① NATIONAL TRAILS HIGHWAY/ VISTA RD	
5/5 -15/-20	-15/-20 -5/-5

② PROJECT DRIVEWAY "A"/ VISTA RD	
-15/-20 15/20	15/20 5/5

③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
5/5 -5/-5	
20/25	20/25 -20/-25

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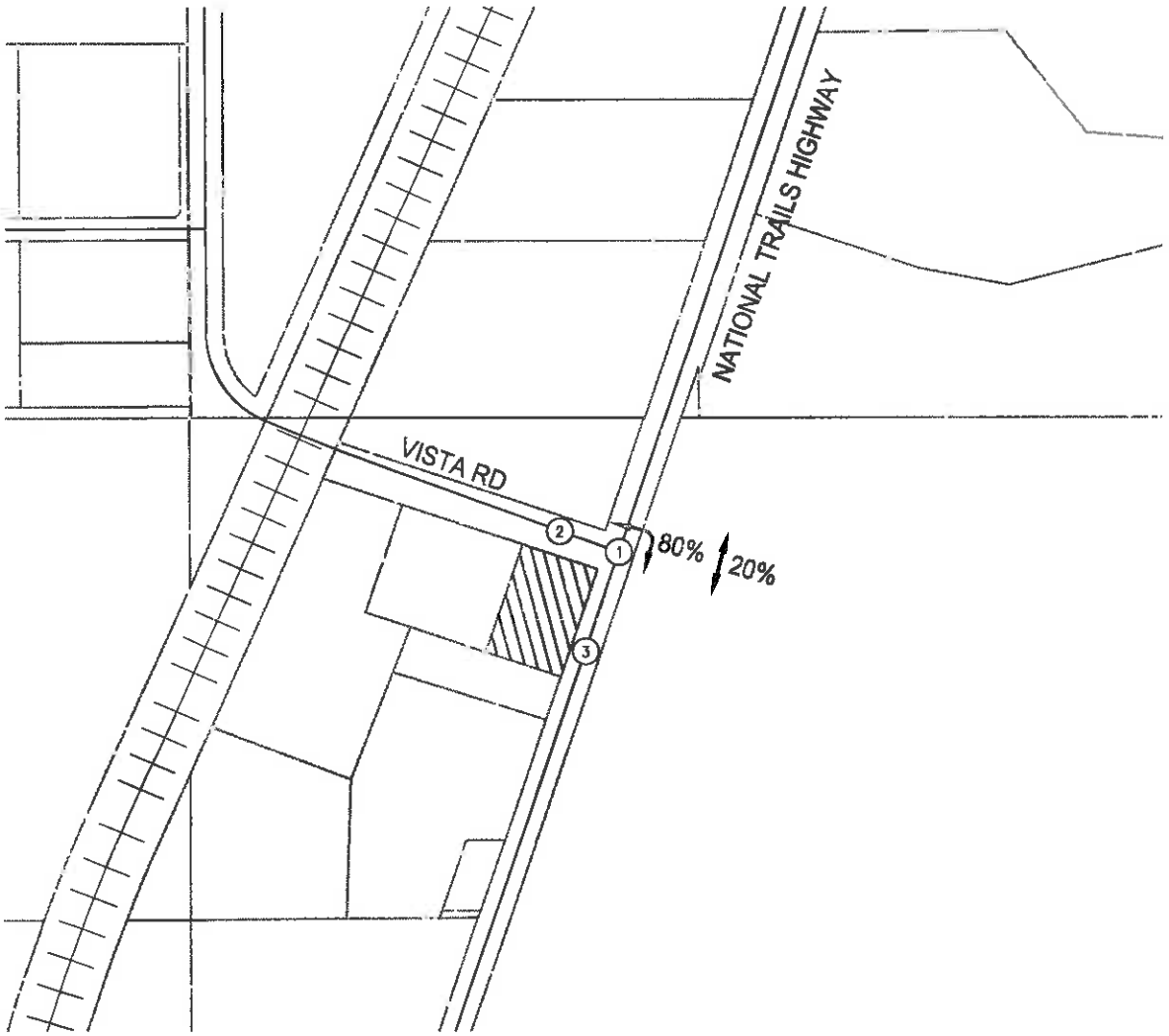

PROJECT TRIPS

AM PEAK PERIOD - 40 IN / 38 OUT
PM PEAK PERIOD - 44 IN / 44 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP
① - STUDY INTERSECTIONS

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FIGURE 6: PASS-BY PROJECT TRIPS
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

① NATIONAL TRAILS HIGHWAY/ VISTA RD		② PROJECT DRIVEWAY "A"/ VISTA RD		③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
				10/10	
10/10		25/25	20/25 10/10	5/10	10/10

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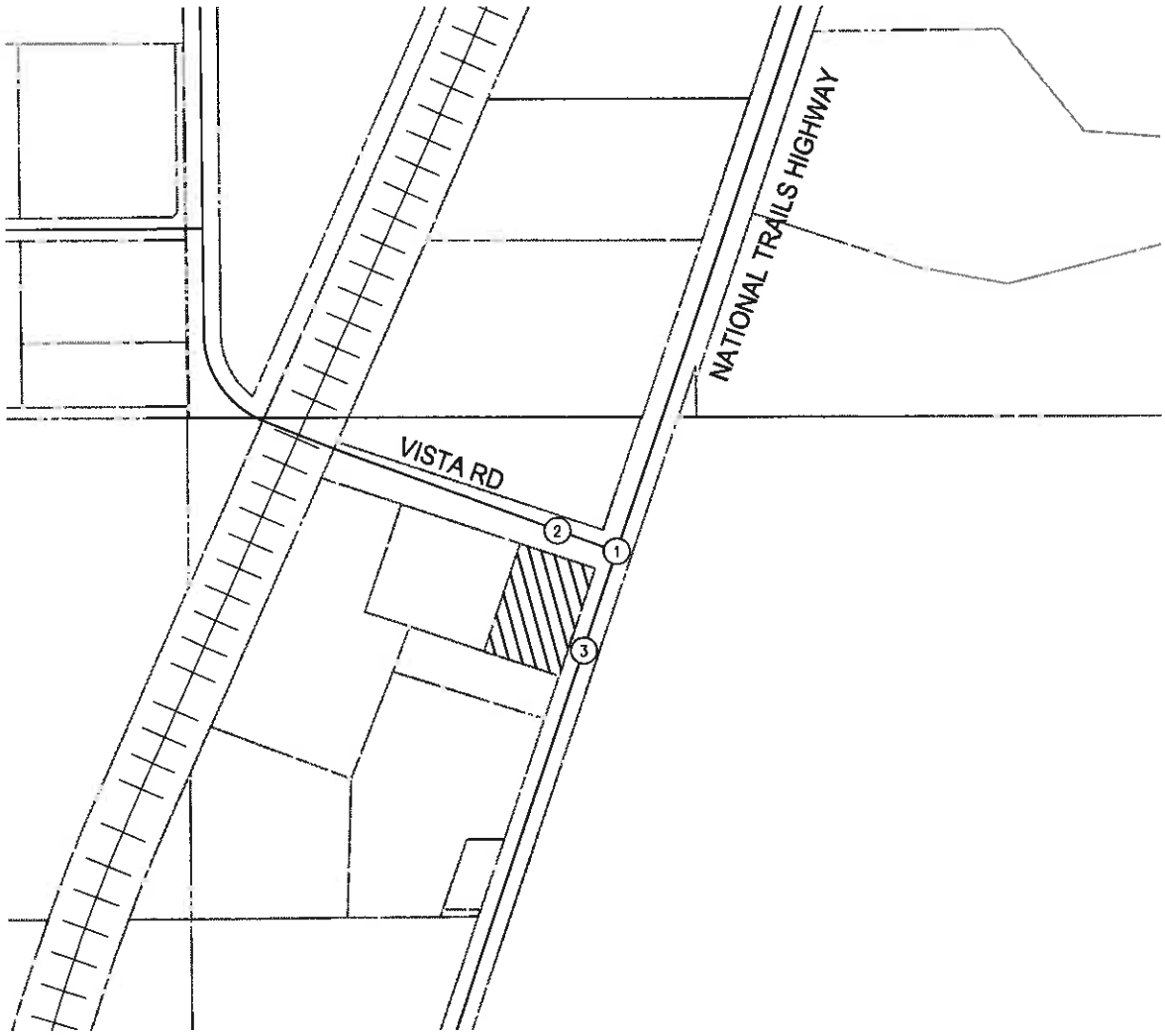

PROJECT TRIPS

AM PEAK PERIOD - 37 IN / 31 OUT
PM PEAK PERIOD - 40 IN / 40 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP
① - STUDY INTERSECTIONS

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FIGURE 7: PRIMARY PROJECT TRIPS
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

① NATIONAL TRAILS HIGHWAY/ VISTA RD		② PROJECT DRIVEWAY "A"/ VISTA RD		③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
				15/15 -5/-5	
15/15 -15/-20	-15/-20 -5/-5	-15/-20 40/45	35/45 15/15	25/35	30/35 -20/-25

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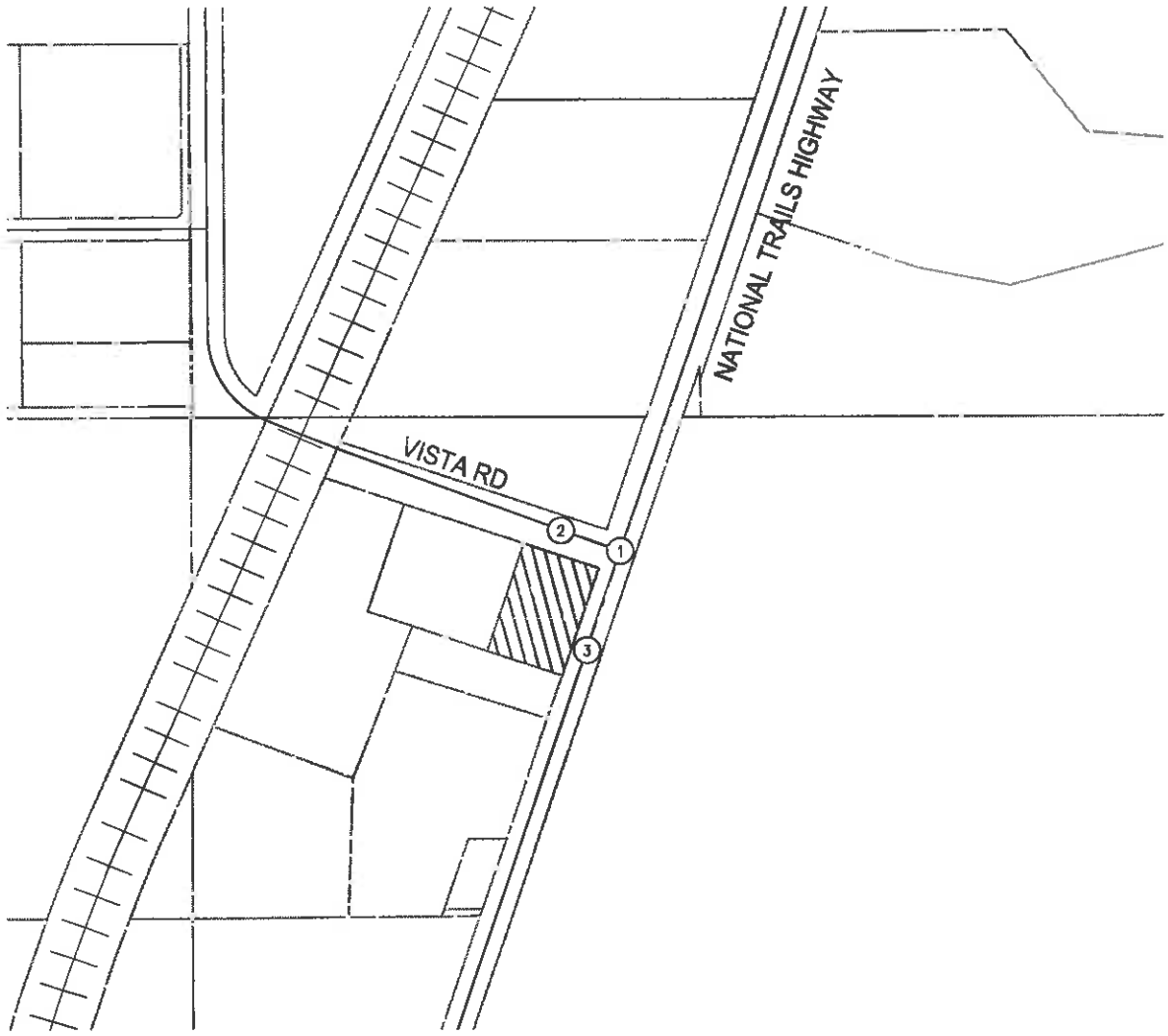

PROJECT TRIPS

AM PEAK PERIOD - 77 IN / 69 OUT
PM PEAK PERIOD - 84 IN / 84 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP
① - STUDY INTERSECTIONS

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FIGURE 8: TOTAL PROJECT TRIPS
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

3.1 Existing Plus Project Traffic Analysis

Based on the proposed project trip generation, traffic distribution and assignment patterns intersection capacity analyses were conducted to assess the estimated project impacts.

The project trips were added to the Existing Condition to develop the Existing Plus Project Traffic Volumes, illustrated in *Figure 9.* Intersection capacity analysis for the Existing Plus Project was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 4* and provided in *APPENDIX C.*

Table 4: Intersection Capacity Analysis – Existing plus Project Conditions
Traffic Study – Helendale Route 66 Gas Station +

	Intersection	AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	National Trails Hwy and Vista Road	12.2	B	12.1	B
	Mitigation: Intersection Improvements	10.5	B	11.0	B
2	Project Driveway A and Vista Road	12.1	B	12.1	B
3	National Trails Hwy and Project Driveway B	10.0	B	9.4	A

(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As shown in *Table 4* under the Existing Plus Project Condition, all of the study intersections are anticipated to continue to operate at an acceptable LOS during the am and pm peak periods, utilizing the existing and proposed project intersection geometrics.

Traffic signal warrant analysis was completed with the existing condition volume for the un-signalized intersection of National Trails Hwy and Vista Road, resulting in the intersection not complying with any of the warrants.

The proposed project improvements include restriping the eastbound approach of National Trails Hwy and Vista Road to provide a left turn lane and a right turn lane. Additional improvements include providing a southbound right turn deceleration lane and extending the northbound Two-Way-Left-Turn-Lane (TWLTL) at the intersection of National Trails Hwy and Project Driveway B.

The Project Conditions Intersection Geometrics are illustrated in *Figure 10.*

① NATIONAL TRAILS HIGHWAY/ VISTA RD		② PROJECT DRIVEWAY "A"/ VISTA RD		③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
55/95 ↓ 35/40 ↰			← 170/300	15/15 ↰ 265/165 ←	
70/45 ↰ 230/125 ↰	110/200 ↑ 35/40 ↑	290/160 ← 40/45 ↰	35/45 ↰ 15/15 ↰	25/35 ↰	30/35 ↰ 130/220 ←

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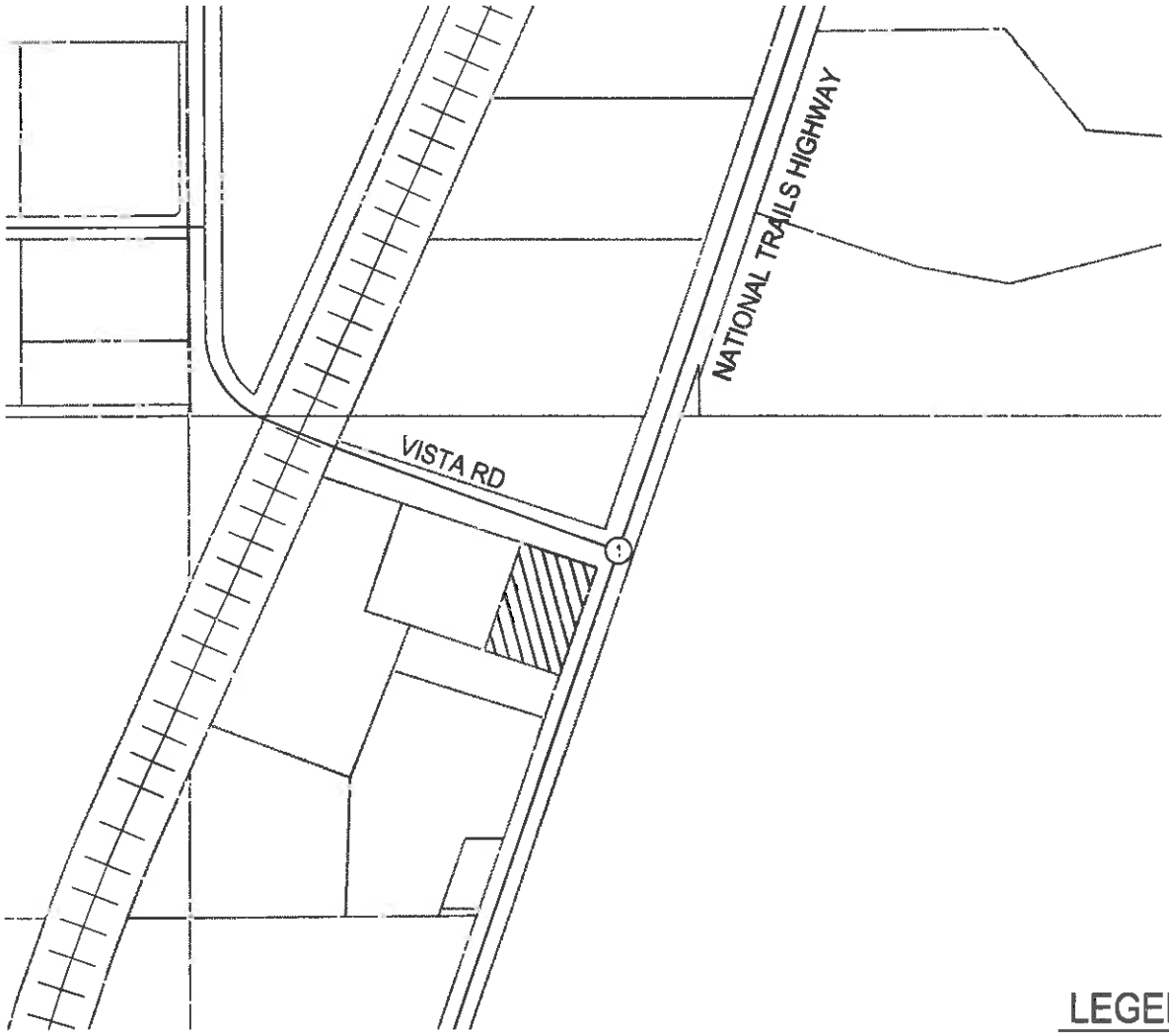

LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

① - STUDY INTERSECTIONS

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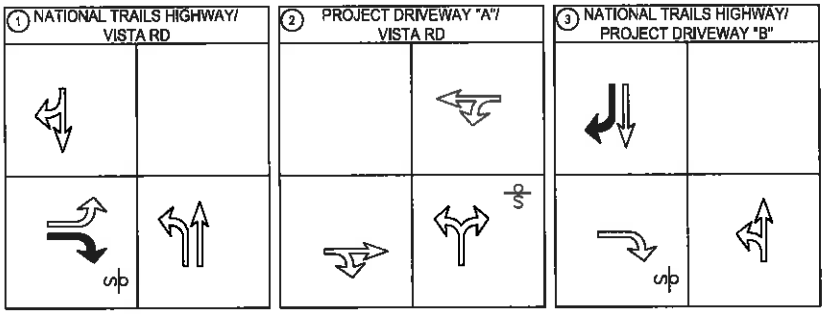
FIGURE 9: EXISTING + PROJECT TRAFFIC VOLUME
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA



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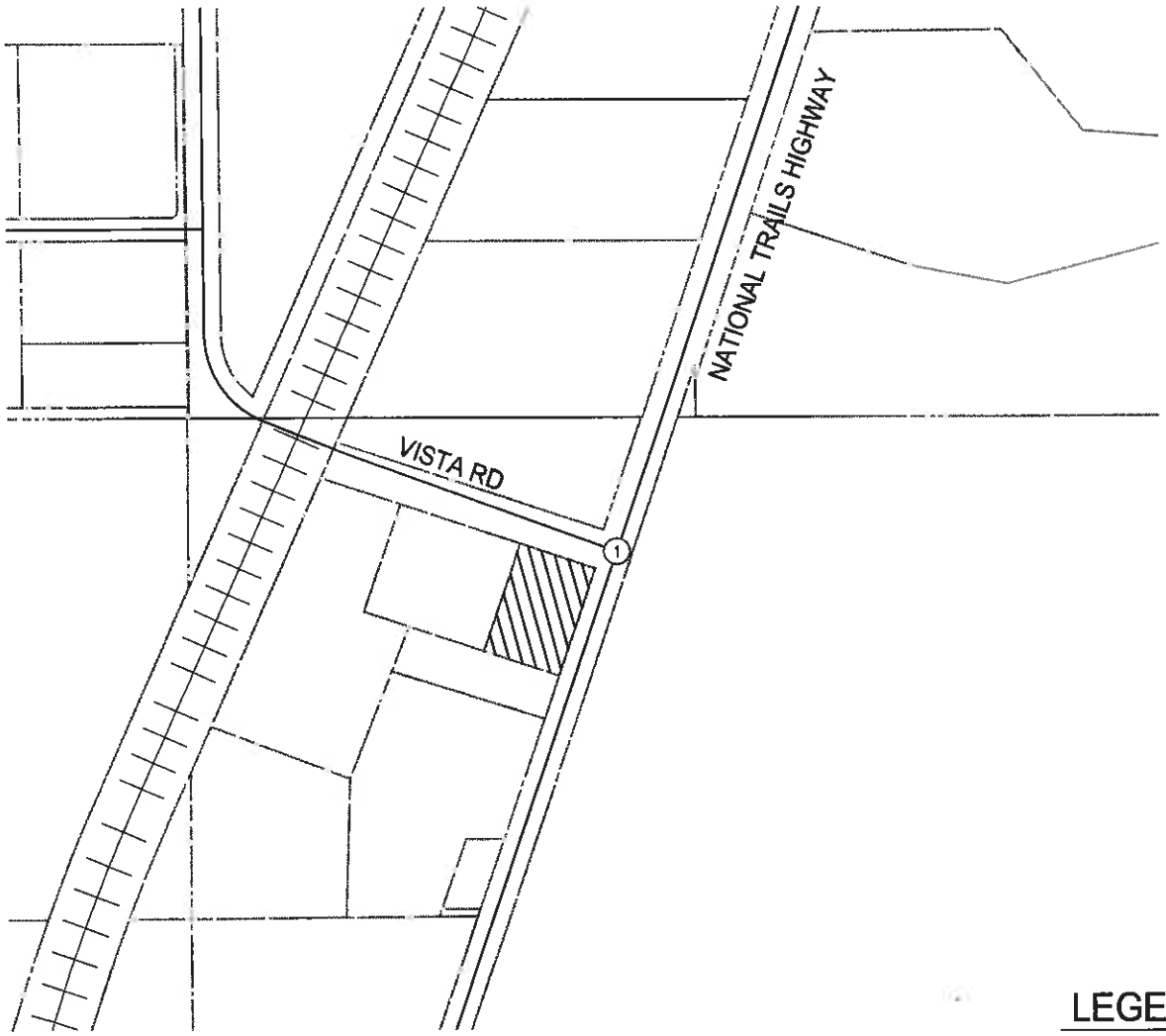

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- p/s - UNSIGNALIZED INTERSECTION
- (1) - STUDY INTERSECTIONS
- ⇦ - EXISTING GEOMETRICS
- ⇦ - PROPOSED GEOMETRICS

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FIGURE 10: EXISTING + PROJECT CONDITION INTERSECTION GEOMETRICS
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

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3.2 Queuing Analysis

Table 5: Queue Length - Existing Condition
Traffic Study – Helendale Route 66 Gas Station

Intersection/Movement			Storage Length (ft)	Existing Plus Project Condition		Existing Plus Project Condition Mitigated	
				AM	PM	AM	PM
1	National Trails and Vista Rd	EBLR/EBL		**79**	59	51	45
		EBR	75	-	-	**65**	50
		NBL	100	31	**54**	32	**55**
		NBT					
		SBTR		3	**6**	0	**10**
2	Project Driveway "A" and Vista Rd	EBTR		0	0	0	0
		WBLT		0	0	0	**0**
		NBLR		52	**58**	53	**58**
3	National Trails and Project Driveway "B"	EBR		45	**47**	32	**35**
		NBLT		24	**24**	**26**	23
		SBTR/SBT		4	0	0	0
		SBR	75	-	-	4	0

(-) Movement not available in Condition
Queue – In Feet
Critical Queue Length is denoted in **Bold** font
95% - 95 Percentile Queue Length
Source: **David Evans and Associates, Inc.**

Table 5 provides the 95% queue length by lane for the study intersection. Denoted in bold are the critical queue lengths used in determining the length needed for the storage pocket of the turn lanes.

4 BACKGROUND CONDITIONS

Area Growth

To analyze the project impacts, the inclusion of ambient traffic within the study area is necessary. Typically, regional and local growth is expected over the years at rates ranging from 1% to 2% compounded annually. The regional and local growth is based on the existing traffic volumes, an annual 2% increase up to Project Year in 2017. This growth is known as background traffic. The analysis of background traffic allows a comparison of traffic impacts with and without the project applying the growth to the existing turn movement volumes. *Figure 11* illustrates Background Condition traffic volumes.

4.1 Background Traffic Analysis

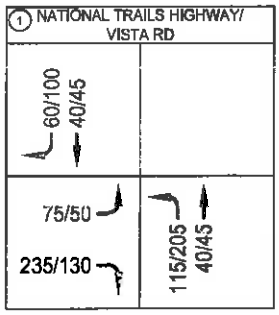
To determine the impacts of the project to the study intersection, anticipated regional growth was added to existing condition volumes to produce the Background Condition volumes. The analysis was conducted with the existing intersection geometrics. Intersection capacity analysis for the Background Condition was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 6* and provided in *Appendix C* of this report.

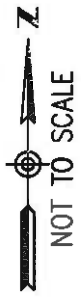
Table 6: Intersection Capacity Analysis - Background Condition
Traffic Study – Helendale Route 66 Gas Station

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	National Trails Hwy and Vista Road (3)	12.7	B	12.7	B

(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As provided in *Table 6* under Background Condition, the study intersection is anticipated to continue operate at an acceptable LOS during the am and pm peak hours, utilizing the existing intersection geometrics.





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

① - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

FIGURE 11: BACKGROUND TRAFFIC VOLUME
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

5 PROJECT CONDITIONS

The proposed project is anticipated to open in the Year 2017. To analyze the project impacts, the inclusion of traffic generated by regional ambient growth within the study area is necessary. Typically, ambient growth is expected over the years at rates ranging from 1% to 2% annually, a 2% annual increase was utilized to establish the background traffic.

Based on the proposed traffic distribution, assignment patterns and project trip generation, intersection capacity analyses were conducted to assess the estimated project impacts. To determine the project impacts at the study intersection and driveways, project trips were added to the Background Condition volumes to produce the Project Condition volumes.

5.1 Project Traffic Analysis

Figure 12 illustrates the calculated Project Completion traffic volumes. Intersection capacity analysis for the Project Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 7* and provided in *Appendix C* of this report.

Table 7: Intersection Capacity Analysis - Project Traffic
Traffic Study – Helendale Route 66 Gas Station

	Intersection	AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	National Trails Hwy and Vista Road	12.8	B	13.1	B
	Mitigation: Intersection Improvements	10.7	B	11.7	B
2	Project Driveway A and Vista Road	12.1	B	12.1	B
3	National Trails Hwy and Project Driveway B	10.0	B	9.4	A

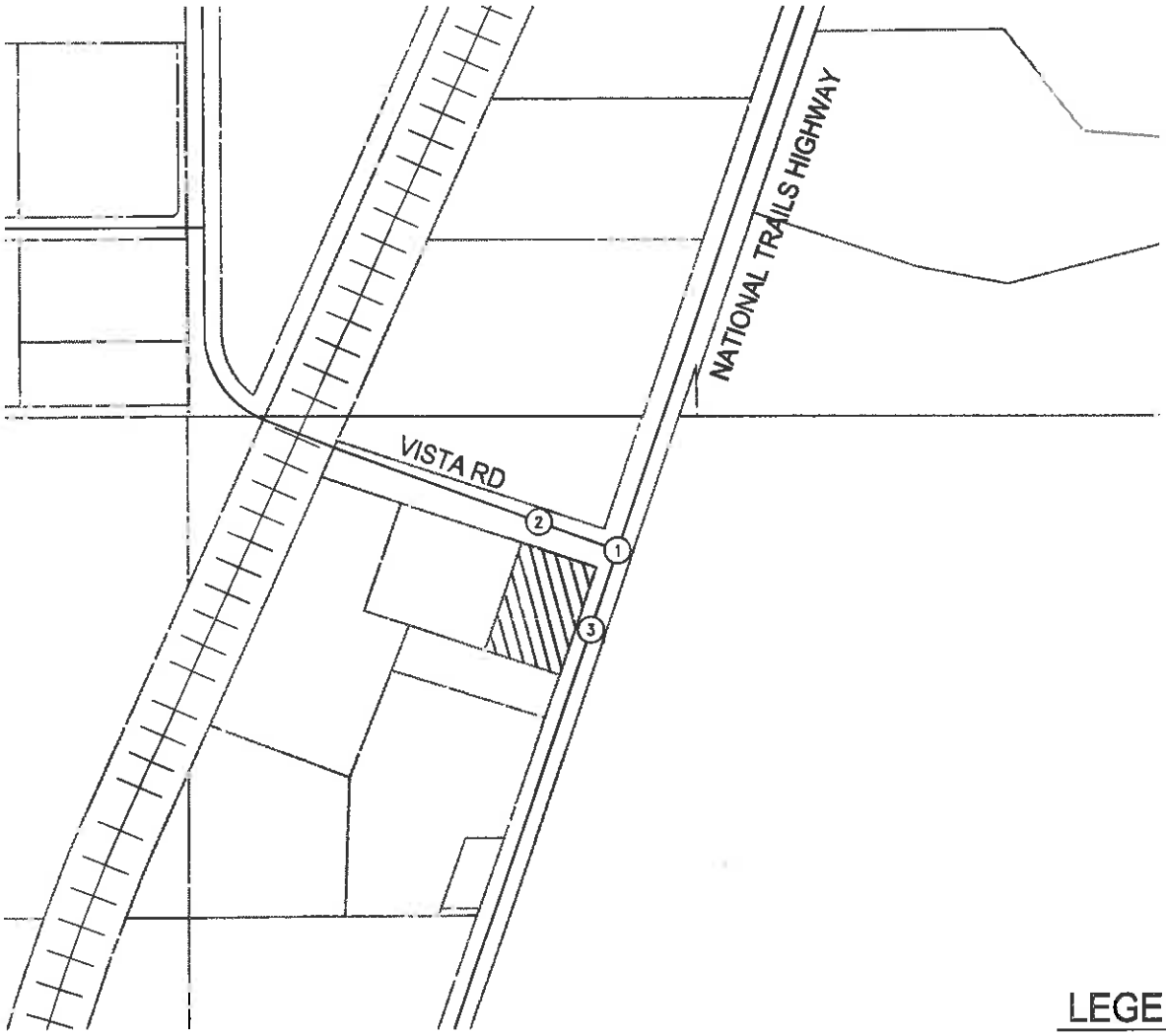
(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table 7* under Project Completion, the study intersections are anticipated to continue operate at an acceptable LOS during the am and pm peak periods, utilizing the existing and proposed intersection geometrics.

① NATIONAL TRAILS HIGHWAY/ VISTA RD		② PROJECT DRIVEWAY "A"/ VISTA RD		③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
60/100 ↓ 40/45 ↓			← 170/300	15/15 ↓ 265/165 ↑	
90/65 ↓ 220/110 ↓	100/185 ↑ 35/40 ↑	290/160 ← 40/45 ↓	35/45 ↓ 15/15 ↓	25/35 ↓	30/35 ↓ 130/220 ↑

N

NOT TO SCALE



LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

Ⓘ - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

FIGURE 12: PROJECT TRAFFIC VOLUME
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

5.2 Queuing Analysis

Table 8: Queue Length - Project Condition
Traffic Study – Helendale Route 66 Gas Station

	Intersection/Movement		Storage Length (ft)	Project Traffic Condition		Project Traffic Condition Mitigated	
				AM	PM	AM	PM
1	National Trails and Vista Rd	EBLR/EBL		**86**	68	59	48
		EBR	75	-	-	**71**	49
		NBL	100	32	**49**	34	**49**
		NBT		0	10	0	6
		SBTR		0	**3**	0	**5**
2	Project Driveway "A" and Vista Rd	EBTR		0	0	0	0
		WBLT		0	0	0	0
		NBLR		54	**55**	54	**57**
3	National Trails and Project Driveway "B"	EBR		**47**	**47**	**35**	34
		NBLT		22	**24**	**23**	20
		SBTR/SBT		3	**4**	0	4
		SBR	75	-		**6**	0

(-) Movement not available in Condition
Queue – In Feet
Critical Queue Length is denoted in **Bold** font
95% - 95 Percentile Queue Length
Source: **David Evans and Associates, Inc.**

Table 9 provides the 95% queue length by lane for the study intersection. Denoted in bold are the critical queue lengths used in determining the length needed for the storage pocket of the turn lanes.

6 FUTURE YEAR 2040 CONDITION

The Future Year 2040 Condition addresses impacts due to ambient growth for the year within the study area. The Future Year 2040 Volumes were developed from the San Bernardino Transportation Analysis Model (SBTAM) Traffic Model. The Future Year 240 intersection turn movements were determined using existing counts and the model plot approach volumes. These values were then used in a 'Future Directional Link Volume (NCHRP 255)' calculator to determine Future Year 2035 Turn Movement Volumes.

Area Growth

The analysis of ambient traffic allows a comparison of traffic impacts with and without the project. The results of the year 2040 ambient traffic forecast calculations are illustrated in *Figures 13,* and presented in *Appendix D* to this report.

6.1 Future Year 2040 Traffic Analysis

The intersection of National Trails Highway and Vista Road was analyzed using the capacity analysis methodology described in *Chapter 2.* The analysis was conducted with the anticipated Future Year 2040 traffic volumes and the existing intersection geometrics. The results of the analysis are shown in *Table 9* and provided in *APPENDIX C.*

Table 9: Intersection Capacity Analysis - Future Year 2040 Condition
Traffic Study – Helendale Route 66 Gas Station

Intersection		AM		PM	
		Delay (1)	LOS (2)	Delay (1)	LOS (2)
1	National Trails Hwy and Vista Road (3)	24.1	C	20.4	C

(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table 9* under the Future Year 2040 Condition, the intersection of National Trails Highway and Vista Road will continue to operate at an acceptable LOS during the am and pm peak periods, utilizing the existing intersection geometrics.

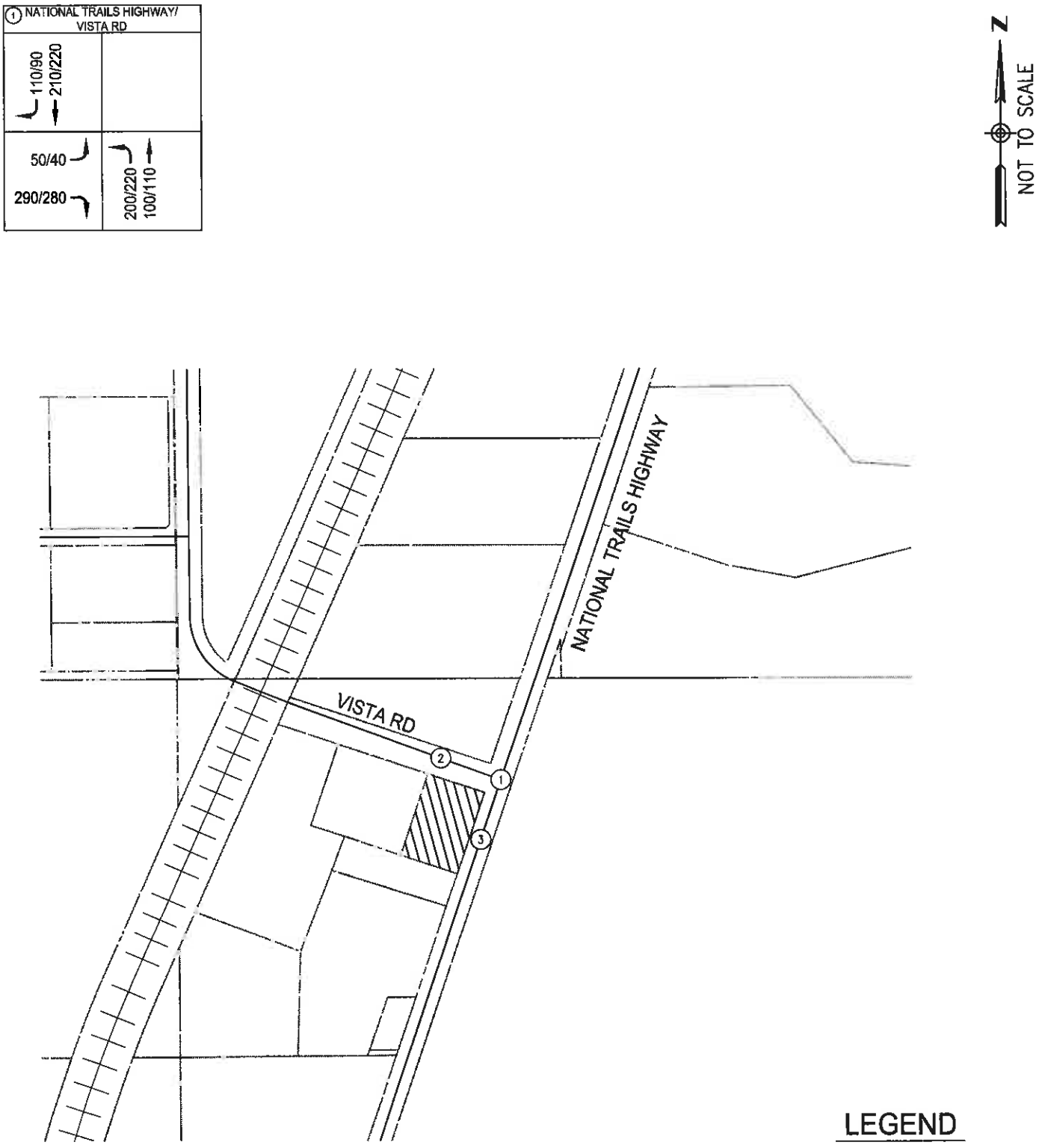


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FIGURE 13: FUTURE YEAR 2040 TRAFFIC VOLUME HELENDALE ROUTE 66 GAS STATION HELENDALE , CALIFORNIA

7 FUTURE YEAR 2040 PLUS PROJECT CONDITION

The Future Year 2040 plus Project Condition addresses impacts for the Future Year 2040 within the study area. The Future Year 2040 Volumes were developed from the San Bernardino Transportation Analysis Model (SBTAM) Traffic Model. The traffic from the proposed project was added to the projected Future Year 2040 Volumes to develop the Future Year 2040 Plus Project Volumes.

7.1 Future Year 2040 Plus Project Traffic Analysis

The results of the Future Conditions Year 2040 plus Project forecasted volumes are illustrated in *Figure 14,* and presented in the Turn Movement summary worksheets provided in *APPENDIX C* of this report.

Intersection capacity analysis for Future Conditions Year 2040 plus Project Condition was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 10* and provided in *APPENDIX C.*

Table 10: Intersection Capacity Analysis – Future Year 2040 Plus Project Condition
Traffic Study – Helendale Route 66 Gas Station

	Intersection	AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	National Trails Hwy and Vista Road	26.2	D	21.7	C
	Mitigation: Intersection Improvements	15.5	C	14.6	B
2	Project Driveway A and Vista Road	14.0	B	14.2	B
3	National Trails Hwy and Project Driveway B	12.0	B	12.1	B

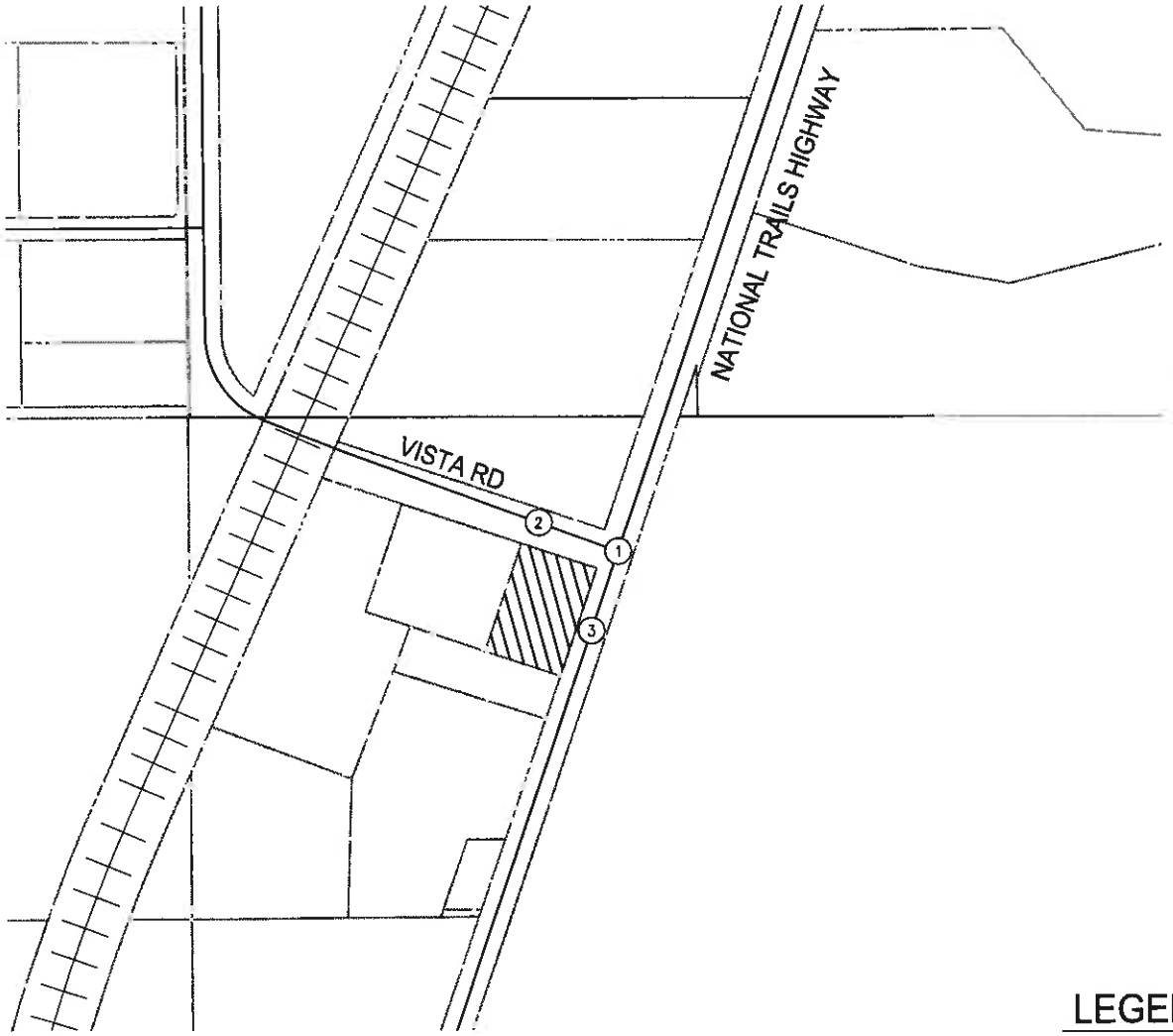
(1) Delay –In Seconds (HCM Methodology)
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table 10* under the Future Year 2040 Plus Project Condition, the study intersections are anticipated to continue to operate at an acceptable LOS during the am and pm peak periods, utilizing the existing and proposed intersection geometrics.

① NATIONAL TRAILS HIGHWAY/ VISTA RD		② PROJECT DRIVEWAY "A"/ VISTA RD		③ NATIONAL TRAILS HIGHWAY/ PROJECT DRIVEWAY "B"	
110/90 ← 210/220			← 310/310	15/15 ← 495/495	
65/55 ↰ 275/260 ↰	185/200 ↑ 95/105 ↑	325/305 → 40/45 ↰	35/45 ↰ 15/15 ↰	25/35 ↰	30/35 ↑ 280/305 ↑

N

NOT TO SCALE



LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

① - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

FIGURE 14: FUTURE YEAR 2040 + PROJECT TRAFFIC VOLUME
HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

7.2 Queuing Analysis

Table 11: Queue Length - Project Condition
Traffic Study – Helendale Route 66 Gas Station

Intersection/Movement			Storage Length (ft)	Future Year 2040 Plus Project Traffic Condition		Future Year 2040 Plus Project Traffic Condition Mitigated	
				AM	PM	AM	PM
1	National Trails and Vista Rd	EBLR/EBL		**119**	105	60	54
		EBR	75	-	-	**83**	79
		NBL	100	**67**	**67**	**68**	**68**
		NBT		0	0	8	18
		SBTR		**12**	11	**16**	12
2	Project Driveway "A" and Vista Rd	EBTR		**26**	0	0	0
		WBLT		**4**	0	0	0
		NBLR		**56**	53	**56**	52
3	National Trails and Project Driveway "B"	EBR		41	**48**	29	**36**
		NBLT		**42**	41	40	**46**
		SBTR/SBT		3	**6**	4	**6**
		SBR	75	-	-	0	3

(-) Movement not available in Condition
Queue – In Feet
Critical Queue Length is denoted in **Bold** font
95% - 95 Percentile Queue Length
Source: **David Evans and Associates, Inc.**

Table 9 provides the 95% queue length by lane for the study intersection. Denoted in bold are the critical queue lengths used in determining the length needed for the storage pocket of the turn lanes.

8 PROJECT MITIGATION AND SUMMARY

In summary, the project as presented will not cause significant impacts to the intersections.

8.1 Project Specific Mitigations

To accommodate project traffic, specific traffic mitigations have been identified. The project specific mitigation consists of the proposed improvements to the project frontage along Vista Road and National Trails Highway. The recommended project mitigations include;

1. Construct driveway approaches along Vista Road and National Trails Highway.

2. Construct curb and gutter along project frontage.

3. Project Driveway A and Vista Road: Full access will be provided at the driveway.

4. National Trails Highway and Project Driveway B: A left turn out restriction will be placed on the driveway. Provide a southbound right turn deceleration lane and extending the northbound Two-Way-Left-Turn-Lane (TWLTL). The eastbound direction will provided a right turn lane. The northbound direction will provide a shared left-through lane, with a two way left turn lane. The southbound direction will provide a through land and a right turn lane.

5. Vista Road and National Trails Highway: Restripe the eastbound approach (Vista Road) to provide a left turn lane and a right turn lane. The eastbound direction will provided a left and a right turn lane. The northbound direction will provide a left turn lane and a through lane. The southbound direction will provide a shared through-right turn lane.

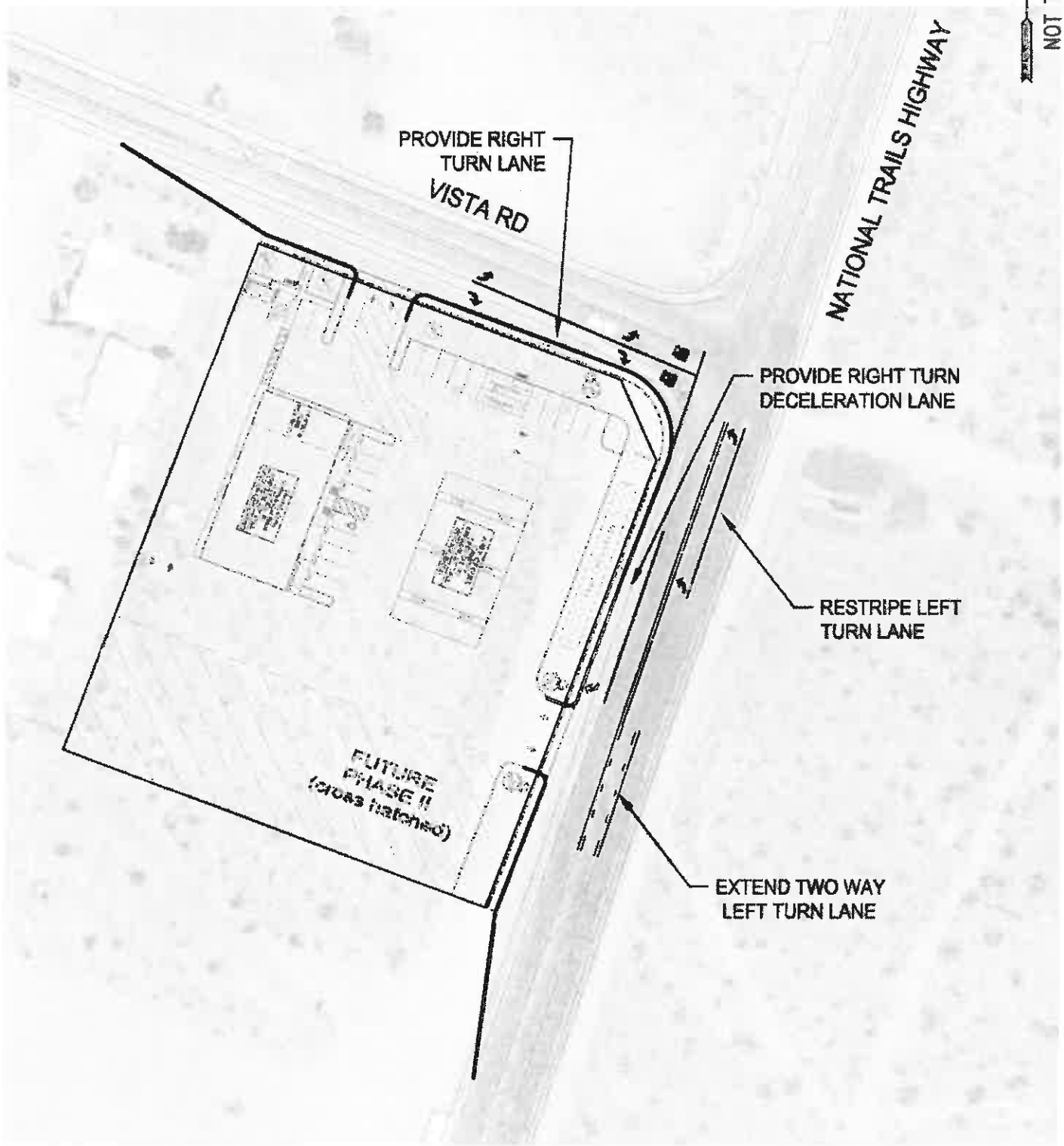


FIGURE 15: PROPOSED PROJECT IMPROVEMENTS

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HELENDALE ROUTE 66 GAS STATION
HELENDALE , CALIFORNIA

9 APPENDICES

APPENDIX A: SCOPE MEMO/MEMORANDUM OF UNDERSTANDING
APPENDIX B: MODEL PLOTS
APPENDIX C: INTERSECTION CAPACITY ANALYSIS CALCULATIONS
APPENDIX D: TRAFFIC SIGNAL WARRANT WORKSHEET
APPENDIX E: QUEUING ANALYSIS