

# Memorandum



**To:** Spring Creek Apartments, LLC  
 c/o Inter-Mountain Engineering  
 Attn: Jeffery M. Spanel, PE

**From:** Andrew Amend, PE, PTOE

**Date:** December 6, 2016

**Re:** Gypsum Tower Center Development TIS Update

The Tower Center Development Traffic Impact Study (TCDTIS) was completed in May 2006 and has been attached to this update letter. The study evaluated the mixed-use development of a site located at the southeast corner of the intersection of US 6 and Jules Drive in Gypsum, Colorado. The planned development consisted of 140 single family residential units, 190 multi-family residential units, 71,400 square feet of office, a 120 room hotel, and 446,471 square feet of retail space. Six existing intersections along state highways were evaluated in the TCDTIS along with multiple commercial driveways proposed along US 6. US 6 at this location falls within the R-A CDOT access category and is posted at a 55 mph speed limit.

At the time of this update, 44 single family homes and 46 multi-family homes have been built or are partially completed on the site. No development of commercial uses has started. An increase in the density of residential use on the site, resulting in 44 single family units and 425 multi-family units at buildout, is now proposed. The resulting impact on site trip generation was determined using the 9<sup>th</sup> Edition of ITE's *Trip Generation Manual* and is summarized in the following table:

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
<b>2006 TCDTIS</b>						
<b>Residential Trips</b>	26	127	153	104	37	141
<b>Commercial Trips</b>	233	253	486	876	847	1,723
<b>Total Trips</b>	<b>259</b>	<b>380</b>	<b>639</b>	<b>980</b>	<b>884</b>	<b>1,864</b>
<b>2016 Update</b>						
<b>44 Single Family Units</b>	7	15	22	19	10	29
<b>425 Multi-Family Units</b>	32	155	187	148	73	221
<b>Residential Trips</b>	39	170	209	167	83	250
<b>Commercial Trips</b>	233	253	486	876	847	1,723
<b>Total Trips</b>	<b>272</b>	<b>423</b>	<b>695</b>	<b>1,043</b>	<b>930</b>	<b>1,973</b>

In the TCDTIS, all residential traffic accessed US 6 via Jules Drive. At the buildout year of 2025, it was estimated that both background and project traffic would sum to 228 trips at the intersection in the morning peak hour and 276 trips in the afternoon peak hour. The proposed increase in residential density raises this projection of turning traffic at the access by 25% and 39% in the morning and afternoon peak hours, respectively.

Buildout calculations from the TCDTIS predicted Level-Of-Service (LOS) 'D' operations at the Jules Drive/US 6 intersection. The increase in site traffic may worsen operations for the northbound left turn movement beyond acceptable levels if it remains under stop control. However, traffic counts were not collected as part of this update and present-day operations at the intersection cannot be evaluated without that data.

The residential trip distribution shown in Figures 6 and 7 of the TCDTIS are based on traffic counts from December 2005. Traffic patterns at that time suggested that 75% of residential trips were to/from the east on US 6 and only 25% went west toward the I-70 interchange. US 6 has become more congested since the time the TCDTIS was completed and it is likely that a percentage of traffic at Jules Drive much less than 75% is now going to/from the east.

Because updated count data was not available for this update, it was assumed that residential trip distribution matched that of the TCDTIS, resulting in minimal expected change in the impacts at the US 6 intersections with Oak Ridge Road, Valley Road, or I-70 Frontage Road. Only right turn traffic at the I-70 Eastbound Ramp terminal will increase with the increase in site traffic, so no significant impact is anticipated at that location. The TCDTIS did identify the need for signalization at the US 6/I-70 Westbound Ramp intersection at site buildout. The proposed increase in residential density is expected to increase left turn traffic from the ramp by 29 in the PM peak hour, but is unlikely to require additional traffic lanes.

### **Findings and Recommendations**

- Traffic at the US 6/Jules Drive Intersection is expected to increase more than 20% beyond what was forecasted for 2025 in the TCDTIS. This exceeds the threshold for a CDOT Access Permit and a pre-application meeting with CDOT is recommended to determine permit requirements.
- Traffic counts used in the TCDTIS were collected in December 2005. More recent counts are required to update detailed operational analyses at any of the locations originally evaluated.
- With the increase in residential density, the US 6/Jules Drive intersection may not operate within acceptable levels as a stop-controlled intersection under full site development. Updated traffic counts at this location are needed to determine if intersection improvements are needed.
- Consistent with the TCDTIS, only increased through traffic is expected at US 6 intersections between Jules Drive and I-70. The additional traffic at these intersections is not expected to have a significant impact on operations.
- As identified in the TCDTIS, signalization at the I-70 Westbound ramp terminal is likely needed by site buildout to mitigate unacceptable LOS. With only minor increases to intersection traffic, additional lanes are unlikely to be required.

REVISED TRAFFIC IMPACT STUDY

**Tower Center Development**

Gypsum, Colorado

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May 2006

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## 1.0 EXECUTIVE SUMMARY

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Tower Center is to be located along the south side of SH-6, east of Jules Drive in Gypsum, Colorado. The project is anticipated to include a residential development, a commercial development, an office building, and a hotel. For purposes of this traffic study and trip generation calculations, the entire mixed-use development is anticipated to include approximately 140 single family residential units, 190 multi-family residential units, a 71,400 square foot office building, a 120 room hotel, and 446,471 square feet of retail space. This retail space may include a grocery store, a home improvement store, a general merchandise store, a pharmacy, a gasoline station/convenience market, a bank, restaurants, and additional supporting retail development. Per CDOT comments on the original traffic impact study dated February 9, 2006, the retail portion of the project was evaluated as a shopping center use. It is expected that the development will be completed by the end of 2008. Analysis was therefore completed for the 2008 short term horizon, as well as the 2025 long-term horizon.

The purpose of this study is to identify project traffic generation characteristics, to identify potential project traffic related impacts on the local street system, and to develop mitigation measures required for identified impacts. CDOT staff identified six key intersections for evaluation in this study. These include the following existing intersections:

- I-70 Westbound Ramps at Gypsum Interchange & SH-6,
- I-70 Eastbound Ramps at Gypsum Interchange & SH-6,
- I-70 Frontage Road/ & SH-6,
- Valley Road & SH-6,
- Oak Ridge Road & SH-6, and
- Jules Drive & SH-6.

Primary access to the site is expected to be provided by SH-6. There are primarily three separate parcel developments proposed with the project. These parcels are identified as the residential, commercial, and hotel/office areas. The residential portion of the project is located

in the western parcel along Jules Drive. The hotel/office parcel of the project is proposed to be located within the eastern parcel. The commercial area is proposed between the residential and hotel/office parcels. Direct access to and from the residential development will be provided from one full movement access driveway along Jules Drive. In addition, secondary shared access will be provided for the residential development through a shared drive with the commercial development. Direct access to the commercial portion of the development is proposed from two full movement access driveways and one right-in/right-out access driveway along SH-6. Direct access to the hotel and office is proposed from one right-in/right-out access driveway along SH-6. Vehicles desiring to enter the hotel/office site from the east and exit the hotel/office site to the west are anticipated to share the eastern full movement access driveway with the commercial development.

Three access scenarios have been evaluated within this study to determine appropriate access along SH-6 for the commercial, office and hotel portions of the development. Since the commercial, office, and hotel portions of the development only have frontage along SH-6, it was not possible to evaluate a "No Highway Access Scenario." While efficient, reasonable access to and from this regional commercial development requires multiple points of ingress and egress to serve customers and delivery vehicles, the site was first evaluated with a single full movement access to and from the commercial development and a right-in/right-out for the hotel/office (Scenario 1). An additional full movement access was added and studied for the commercial portion of the development (Scenario 2). And, a needed additional right-in/right-out access driveway for the commercial development was also studied (Scenario 3).

The entire development is expected to generate approximately 19,424 daily weekday trips. Of these, 639 trips are expected to occur during the weekday morning peak hour, while 1,864 trips are expected during the weekday afternoon peak hour. Since this project contains commercial development, a certain percentage of trips are expected to be pass-by trips. Pass-by trips are those vehicles already on the street network, passing by that will be attracted to the site. Pass-by trips were not taken into account in this study due to the relatively low traffic volume along SH-6 in the project vicinity and in order to provide a conservative analysis of the off-site intersections.

Additionally, it is important to note that due to the nature of this development, some trips will be shared between uses. These trips will occur between the commercial uses, as well as between the commercial, residences, office and hotel on the site without using the off-site road system. The shopping center use already contains internal capture within the trip generation calculations. Therefore, in order to determine the appropriate internal capture rates for the mixed use components of the project, the *ITE Trip Generation Handbook*, June 2004 was used. The ITE procedure was directly applied to the trip generation for the four primary uses proposed on the site, which include retail, residential, office, and hotel.

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns along SH-6 for both residential and commercial project traffic, anticipated surrounding development areas, and the proposed access system for the project. These distributions were then provided to CDOT, Eagle County, and the Town of Gypsum for their review and concurrence. The distributions were finalized based upon the comments received. Assignment of the project traffic was based upon the net external trip generation described previously and the distributions developed.

The proposed Tower Center project development and expected traffic volumes resulted in the following recommendations:

- The intersection of SH-6 with the westbound I-70 ramp of the Gypsum interchange is recommended to be signalized due to the increase in traffic expected on the westbound and northbound left turns. It is anticipated that this intersection will require signalization upon construction of approximately 50 percent of the project.
- Scenario 3 was found to be the appropriate access scenario, which includes two full movement signalized access driveways and two right-in/right-out access driveways along SH-6, along with one full movement access driveway to serve the residential development along Jules Drive. Therefore, it is recommended that CDOT approve this access scenario. This proposed access to and from the development via SH-6 will optimize the internal site

circulation. Vehicles entering and exiting the commercial portion of the site will be spread over several access points, rather than concentrating all vehicles to one access.

- It is recommended that both proposed full movement commercial accesses along SH-6 be signalized.
- At the intersection of Jules Drive with SH-6, an eastbound to southbound right turn deceleration lane is required for residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this deceleration lane is recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.
- To serve residential traffic, a westbound to southbound left turn deceleration lane is required at the intersection of Jules Drive with SH-6 according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this left turn deceleration lane is recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. The storage requirement for this left turn lane is 125 feet. Therefore, this left turn deceleration lane should be constructed providing a full lane width for 500 feet with an additional 225 foot taper.
- For residential traffic, an acceleration lane is recommended for the receiving lane of the northbound to westbound left turns at the SH-6 and Jules Drive intersection. This acceleration lane should be constructed with a length of 960 feet, which includes the 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.

- At the Jules Drive and SH-6 intersection, a northbound to eastbound right turn acceleration lane is required to serve residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this right turn acceleration lane is recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.
- At all proposed commercial access locations along SH-6, eastbound to southbound right turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these deceleration lanes are recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.
- At the proposed two full movement commercial accesses along SH-6, westbound to southbound left turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these left turn deceleration lanes are recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. With two full movement accesses serving the site, the western driveway (Access B) requires 100 feet for vehicle storage, while the eastern driveway (Access D) requires 175 feet for vehicle storage. Therefore, the left turn deceleration lane for the western full movement driveway (Access B) should be constructed providing a full lane width (assumed 12 feet) for 475 feet with an additional 225 foot taper. The left turn deceleration lane for the eastern full movement driveway (Access D) should be constructed providing a full lane width for 550 feet with an additional 225 foot taper.
- At all commercial accesses along SH-6, northbound to eastbound right turn acceleration lanes are required according to the State Highway Access Code for category RA roadways.

According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these right turn acceleration lanes are recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.

- As development occurs, it is recommended that CDOT monitor SH-6 to determine if a reduction in the speed limit or a change in classification is needed.
- Summation of the acceleration lane and deceleration lane lengths along eastbound SH-6 between the project access points would require 1110 feet (735 feet for acceleration and 375 feet for deceleration). With the proposed driveway configurations, there is approximately 1200 feet between Jules Drive and Access B, 750 feet between Access B and Access C, 775 feet between Access C and Access D, and 975 feet between Access D and Access E. Therefore, the acceleration and deceleration lanes are recommended to be constructed as a continuous auxiliary lane along project frontage between Jules Drive and Access E.
- All on-site and off-site signing and striping improvements should be incorporated into the Civil Drawings, and conform to CDOT and Town of Gypsum standards, as well as the Manual on Uniform Traffic Control Devices - 2003 Edition (MUTCD).

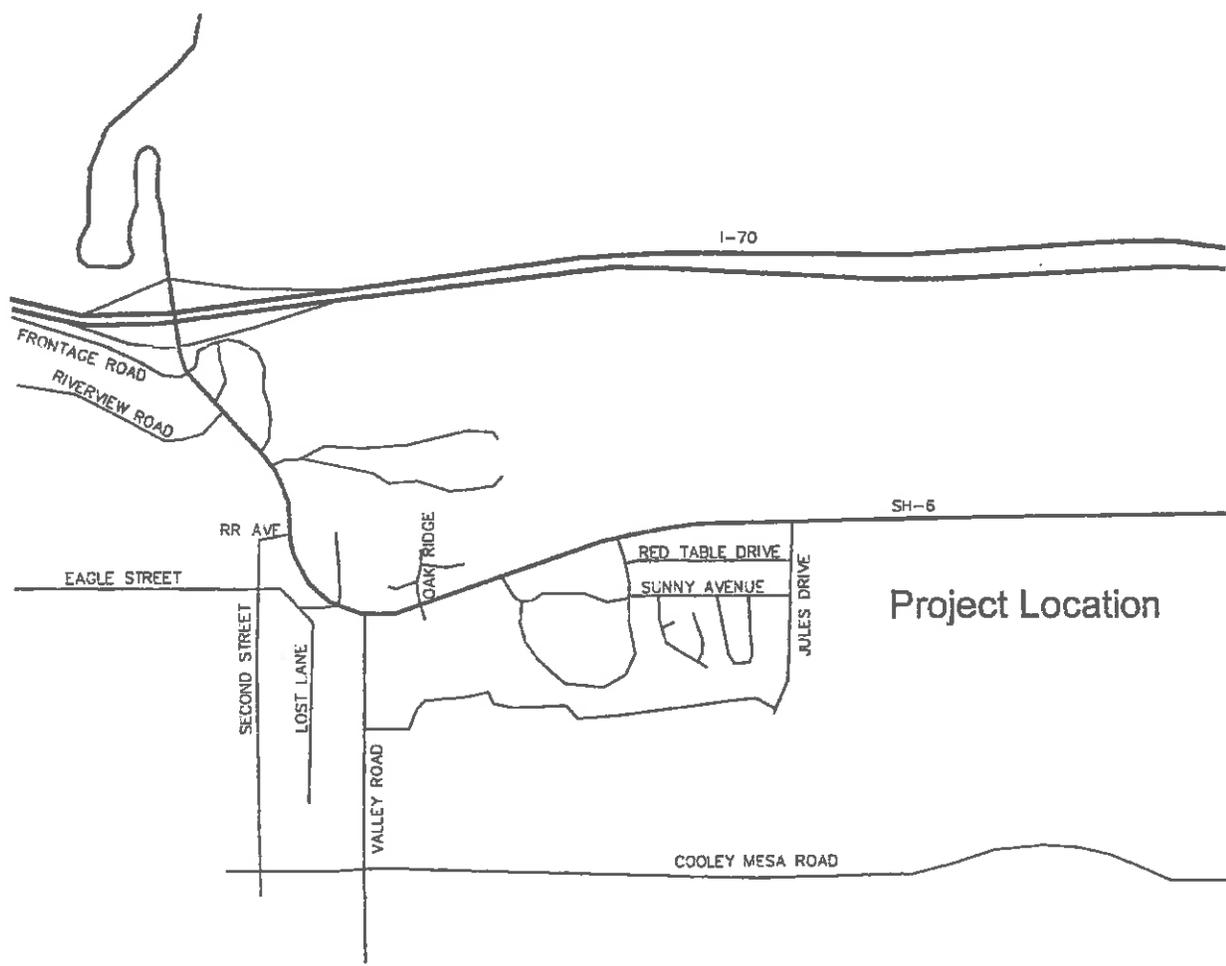
## 2.0 INTRODUCTION

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Kimley-Horn and Associates, Inc. (Kimley-Horn) has prepared this report to document the results of a Traffic Impact Study of future traffic conditions associated with the proposed Tower Center Development to be located along the south side of SH-6, east of Jules Drive in Gypsum, Colorado. The vicinity map illustrating the project site location is shown in Figure 1.

Tower Center is anticipated to include a residential development, a commercial development, an office building and a hotel. For purposes of this traffic study and trip generation calculations, the entire mixed-use development is anticipated to include approximately 140 single family residential units, 190 multi-family residential units, a 71,400 square foot office building, a 120 room hotel, and 446,471 square feet of retail space. This retail space may include a grocery store, a home improvement store, a general merchandise store, a pharmacy, a gasoline station/convenience market, a bank, restaurants, and additional supporting retail development. Per CDOT comments on the original traffic impact study dated February 9, 2006, the retail portion of the project was evaluated as a shopping center use. It is expected that the development will be completed by the end of 2008. Analysis was therefore completed for the 2008 short term horizon, as well as the 2025 long-term horizon. The current site plan illustrating the development and access locations is shown in Appendix A.

The purpose of this study is to identify project traffic generation characteristics, identify potential project traffic related impacts on the local street system, and to develop mitigation measures required for identified impacts. CDOT identified six key intersections for evaluation in this study. These include SH-6 with the I-70 Gypsum interchange Westbound Ramps, the I-70 Gypsum interchange Eastbound Ramps, the I-70 Frontage Road, Valley Road, Oak Ridge Road, and Jules Drive.



TOWER CENTER, GYPSUM, CO  
SITE LOCATION

FIGURE 1



Primary access to the site is expected to be provided by SH-6. There are primarily three separate parcel developments proposed with the project. These parcels are identified as the residential, commercial, and hotel/office areas. The residential portion of the project is located in the western parcel along Jules Drive. The hotel/office parcel of the project is proposed to be located within the eastern parcel. The commercial area is proposed between the residential and hotel/office parcels. Direct access to and from the residential development will be provided from one full movement access driveway along Jules Drive. In addition, secondary access will be provided for the residential development through a shared drive with the commercial development. Direct access to the commercial portion of the development is proposed from two full movement access driveways and one right-in/right-out access driveway along SH-6. Direct access to the hotel/office is proposed from one right-in/right-out access driveway along SH-6. Vehicles desiring to enter the hotel/office site from the east and exit the hotel site to the west are anticipated to share the eastern full movement access driveway with the commercial development.

Three access scenarios have been evaluated within this study to determine appropriate access along SH-6 for the commercial and hotel/office portions of the development. Since the commercial, office, and hotel portions of the development only have frontage along SH-6, it was not possible to evaluate a "No Highway Access Scenario." While efficient, reasonable access to and from this regional commercial development requires multiple points of ingress and egress to serve customers and delivery vehicles, the site was first evaluated with a single full movement access to and from the commercial development and a right-in/right-out for the hotel (Scenario 1). An additional full movement access was added and studied for the commercial portion of the development (Scenario 2). And, a needed additional right-in/right-out access driveway for the commercial development was also studied (Scenario 3).

## 3.0 EXISTING AND FUTURE CONDITIONS

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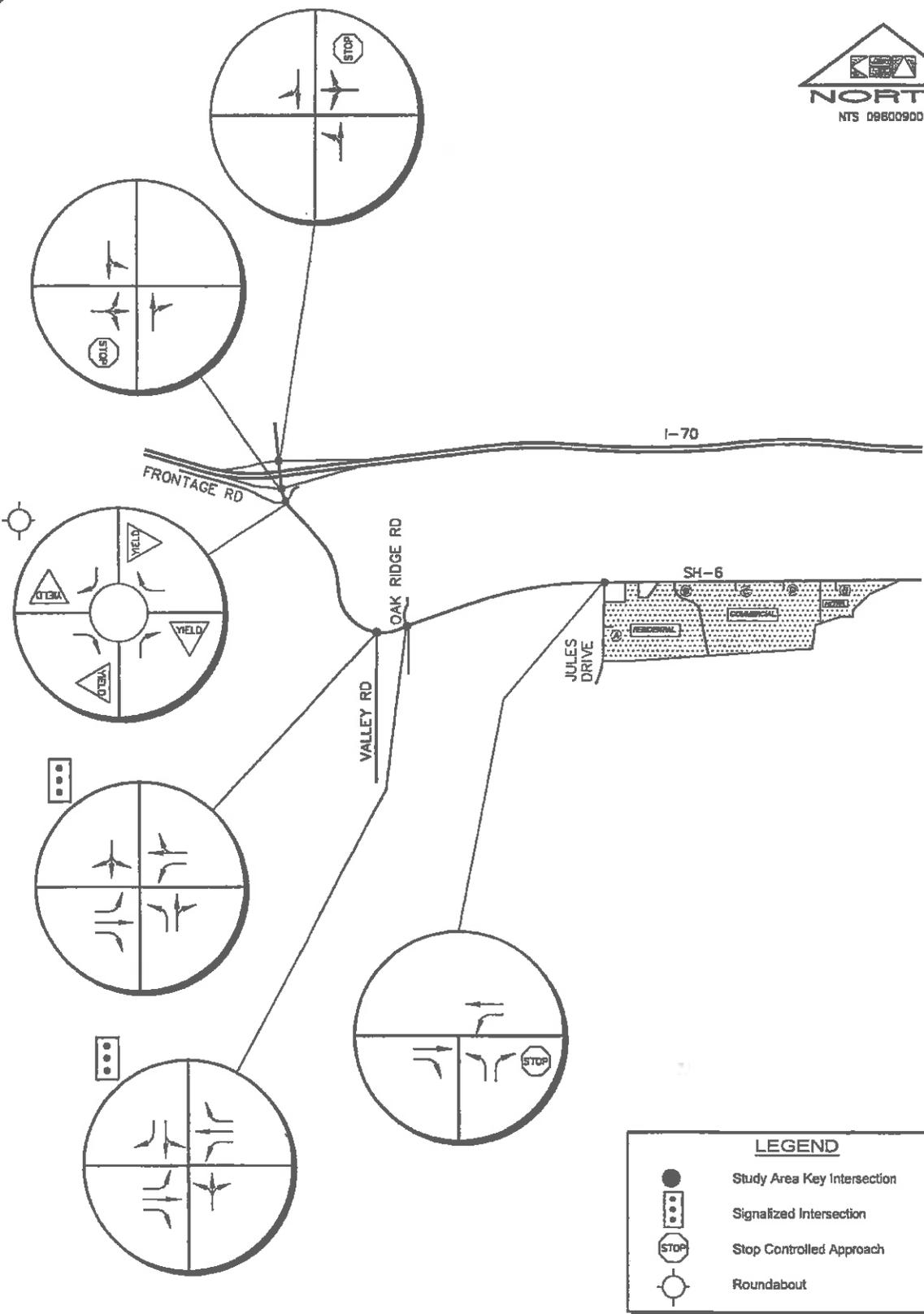
### 3.1 Existing Roadway Network

The proposed Tower Center Development in Gypsum, Colorado is to be located along the south side of SH-6, just east of Jules Drive. Primary access to the site is expected to be provided by SH-6. According to the State Highway Access Category Assignment Schedule, SH-6 is categorized RA adjacent to the site. SH-6 has a posted speed limit of 55 miles per hour and primarily carries a single through lane in each direction.

The intersections of SH-6 with both I-70 Eastbound and Westbound Ramps operate with two-way stop control along the ramps. All approaches at these two intersections are single lane approaches. The intersection of the I-70 Frontage Road with SH-6 is a single lane roundabout. The I-70 Frontage Road west of SH-6 becomes Trail Gulch Road to the east of SH-6. This roadway provides a single through lane in each direction. The intersection of Valley Road with SH-6 is signalized. Valley Road provides a single through lane in each direction with a 30 mile per hour posted speed limit. The intersection of Oak Ridge Road with SH-6 is also signalized. Oak Ridge Road is a two lane road. The intersection of Jules Drive with SH-6 operates with stop control along Jules Drive. Jules Drive provides a single through lane in each direction. The intersection lane configurations and control for the study area are shown in attached Figure 2.

### 3.2 Existing Study Area

The existing site, known as the Lehman Parcels, is primarily comprised of vacant land. Directly to the southeast of the site is the Eagle County Airport.



**LEGEND**

-  Study Area Key Intersection
-  Signalized Intersection
-  Stop Controlled Approach
-  Roundabout

**TOWER CENTER, GYPSUM, CO  
EXISTING LANEAGE AND CONTROL**

**FIGURE 2**

### **3.3 Future Development and Access Considerations**

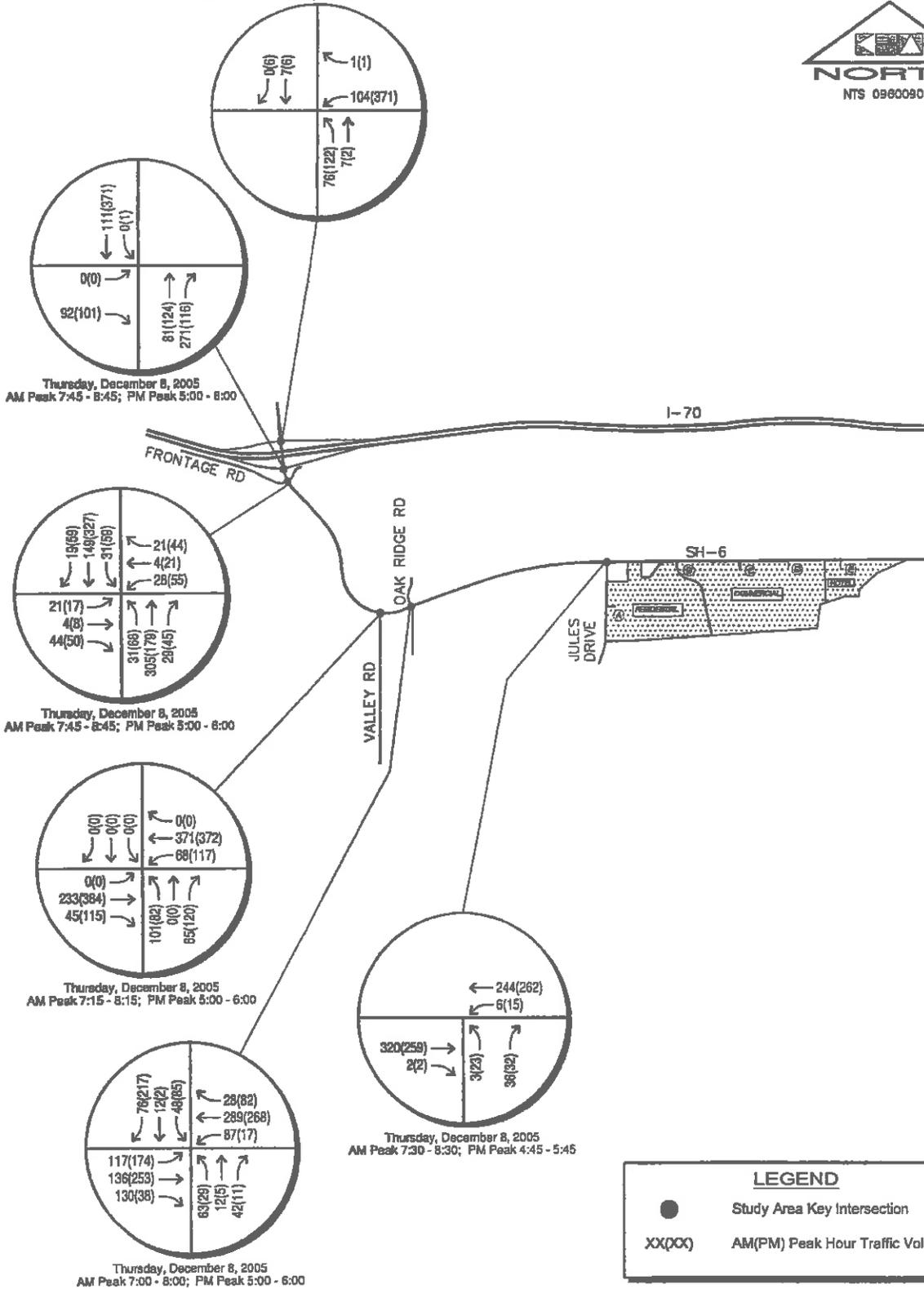
There are currently two parcels of land along the north side of SH-6 that are being used for gravel mining. Once these resources are expended, it is anticipated that these two parcels will develop similar to the proposed project. Therefore, access to these two parcels of land north of SH-6 may be shared with the future full movement access driveways for the Tower Center Development. Therefore, the two full movement access driveways proposed with the project are anticipated to satisfy the goal of the Colorado State Highway Access Code "to serve as many properties and interests as possible to reduce the need for additional direct access to the State Highway."

In addition, it is understood that a new interchange with Interstate 70 has been discussed to serve the area between Gypsum and Eagle. Given the uncertainty of this improvement, it has specifically not been included in the analysis to be conservative.

### **3.4 Existing Traffic Volumes**

Existing peak hour turning movement counts were conducted at the existing study intersections on Thursday, December 8, 2005. The counts were conducted during the AM and PM peak hours of adjacent street traffic in 15-minute intervals from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on this Thursday. These turning movement counts are shown in Figure 3 with count sheets provided in Appendix B. It is important to recognize that a common peak hour was obtained for the three SH-6 intersections in close proximity to each other. These include the intersections of the I-70 westbound ramp, I-70 eastbound ramp, and the frontage road roundabout. The other intersections were evaluated for their actual peak hour to evaluate these on a maximum volume worst case analysis.

Thursday, December 8, 2005  
 AM Peak 7:45 - 8:45; PM Peak 5:00 - 6:00



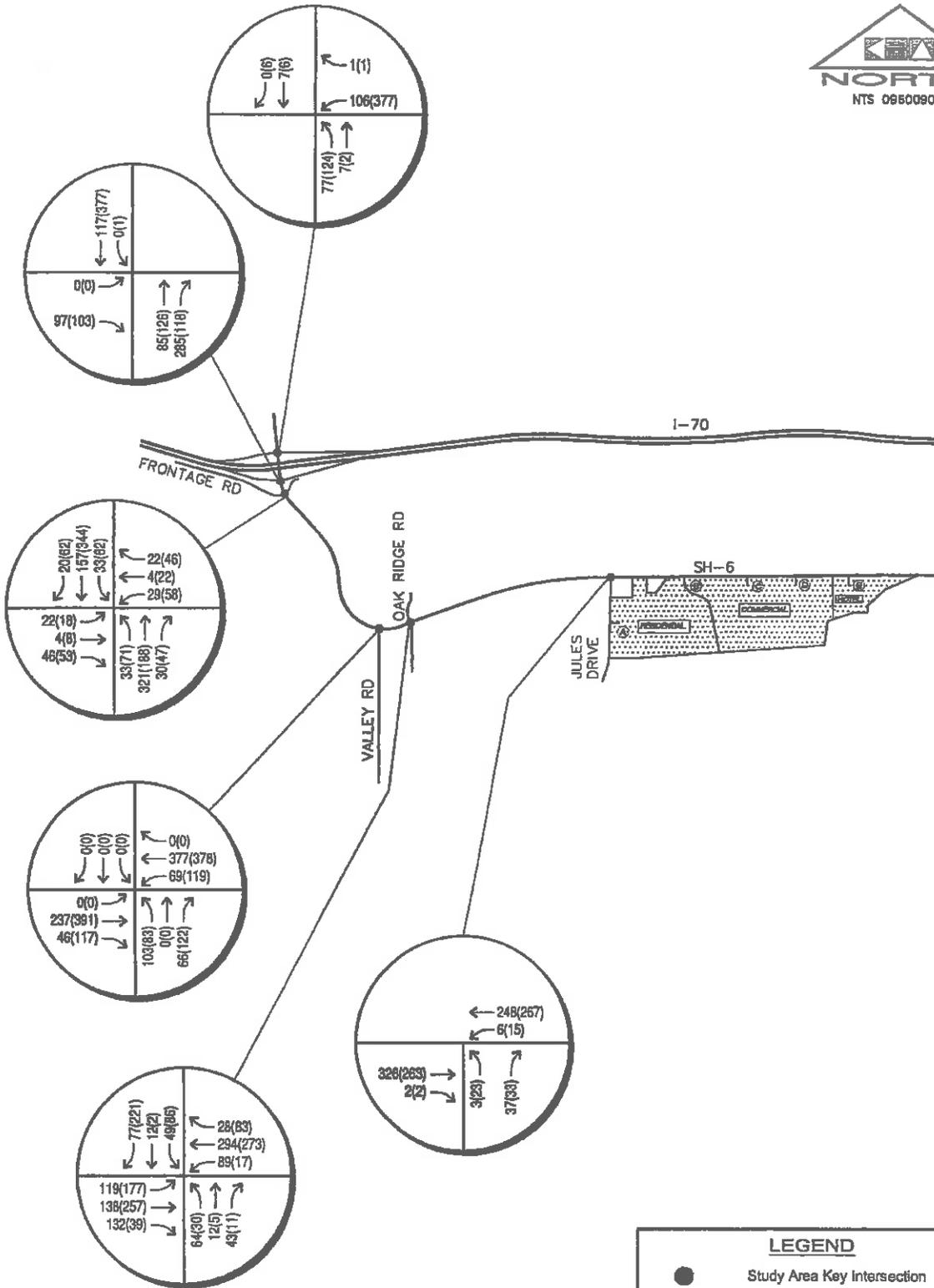
TOWER CENTER, GYPSUM, CO  
 EXISTING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3



### **3.5 Unspecified Development Traffic Growth**

In order to obtain an estimate of traffic growth in the area, traffic count information from the Colorado Department of Transportation website was obtained along SH-6 east of the I-70 interchange. The 20-year growth factor along SH-6 in this vicinity is 1.41, which equates to an annual growth rate of approximately 1.73 percent. SH-6 traffic growth information is provided in Appendix C. Existing traffic was grown at this 1.73 percent annual growth rate to obtain future background volumes. Weekday background traffic volumes for 2008 and 2025 are shown in Figures 4 and 5, respectively.

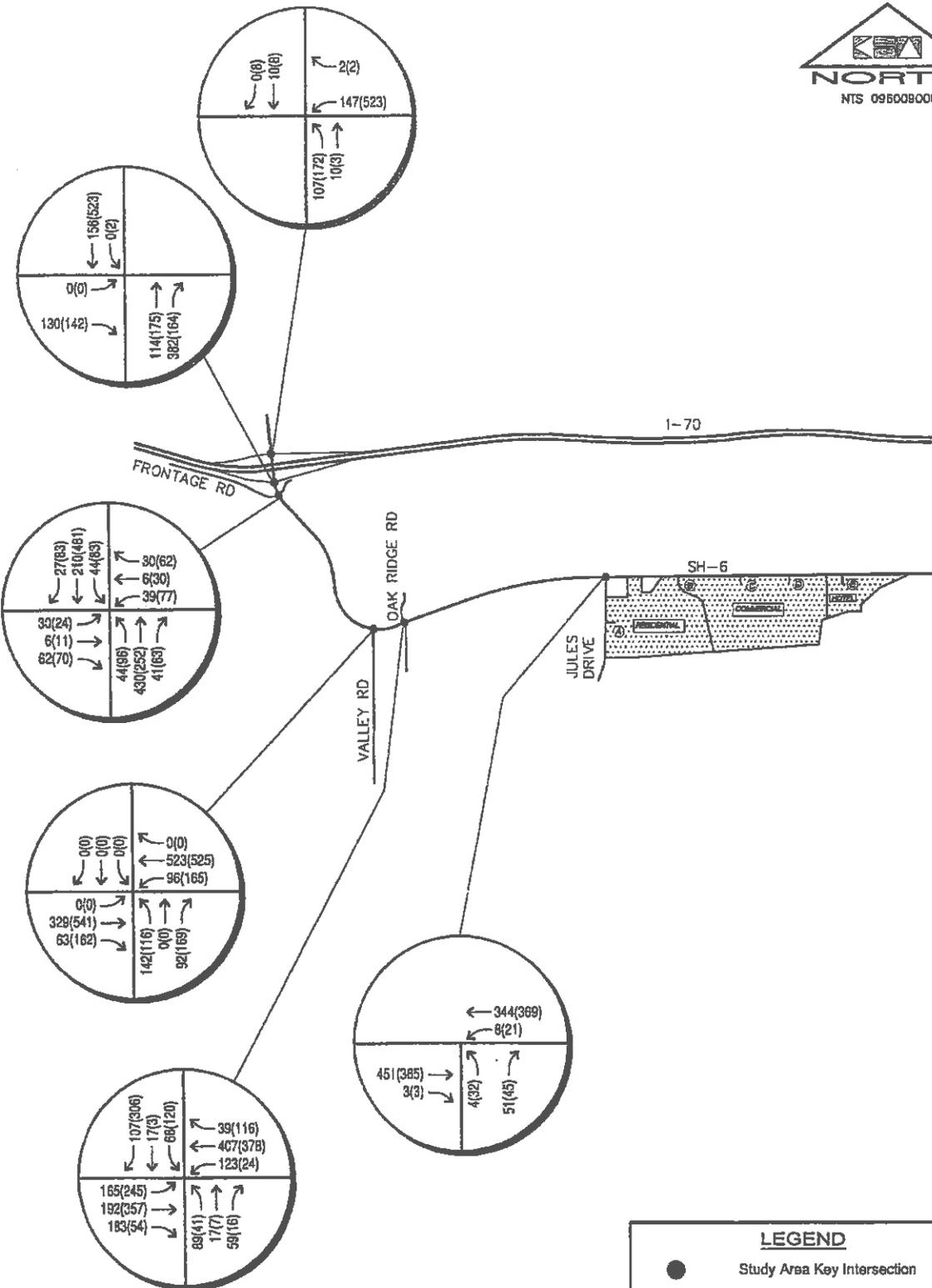


TOWER CENTER, GYPSUM, CO  
2008 BACKGROUND PEAK HOUR  
TRAFFIC VOLUMES

**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

FIGURE 4

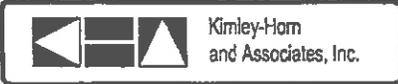


TOWER CENTER, GYPSUM, CO  
2025 BACKGROUND PEAK HOUR  
TRAFFIC VOLUMES

**LEGEND**

- Study Area Key Intersection
- XX(X) AM(PM) Peak Hour Traffic Volumes

FIGURE 5



## 4.0 PROJECT TRAFFIC CHARACTERISTICS

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### 4.1 Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Report*<sup>1</sup> published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. For this revised study, Kimley-Horn used the ITE Trip Generation Report average trip rates and regression equations that apply to Single-Family Detached Housing (ITE Land Use Code 210), Residential Condominium/Townhouse (230), Hotel (310), General Office Building (710), and Shopping Center (820) for traffic associated with the development. The Shopping Center use was applied to all commercial components of the project based upon CDOT comments.

The entire development is expected to generate approximately 19,424 daily weekday trips. Of these, 639 trips are expected to occur during the weekday morning peak hour, while 1,864 trips are expected during the weekday afternoon peak hour. Since this project contains commercial development, a certain percentage of trips are expected to be pass-by trips. Pass-by trips are those vehicles already on the street network, passing by that will be attracted to the site. Pass-by trips were not taken into account in this study due to the relatively low traffic volume along SH-6 in the project vicinity and in order to provide a conservative analysis of the off-site intersections.

Additionally, it is important to note that due to the nature of this development, some trips will be shared between uses. These trips will occur between the commercial uses, as well as between the commercial, residences, office and hotel on the site without using the off-site road system. The shopping center use already contains internal capture within the trip generation calculations. Therefore, in order to determine the appropriate internal capture rates for the

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<sup>1</sup> Institute of Transportation Engineers, *Trip Generation: An Information Report*, Seventh Edition, Washington DC, 2003.

mixed use components of the project, the *ITE Trip Generation Handbook*, June 2004 was used. The ITE procedure was directly applied to the trip generation for the four primary uses proposed on the site, which include retail, residential, office, and hotel.

Table 1 summarizes the estimated traffic generation for the entire proposed development. The trip generation worksheets are included in Appendix D. These calculations illustrate the equations used, directional distribution of trips, and number of daily trips.

**Table 1 - Tower Center Development External Project Traffic Generation**

Land Use	Daily	Vehicles Trips					
		Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Residential Housing (140 SF & 190 MF d.u.)	1,548	26	127	153	104	37	141
Hotel (120 rooms)	401	18	11	29	26	21	47
Shopping Center (446,471 sf)	16,670	203	122	325	738	808	1,546
Office (71,400 sf)	805	12	120	132	112	18	130
<b>Total</b>	<b>19,424</b>	<b>259</b>	<b>380</b>	<b>639</b>	<b>980</b>	<b>884</b>	<b>1,864</b>

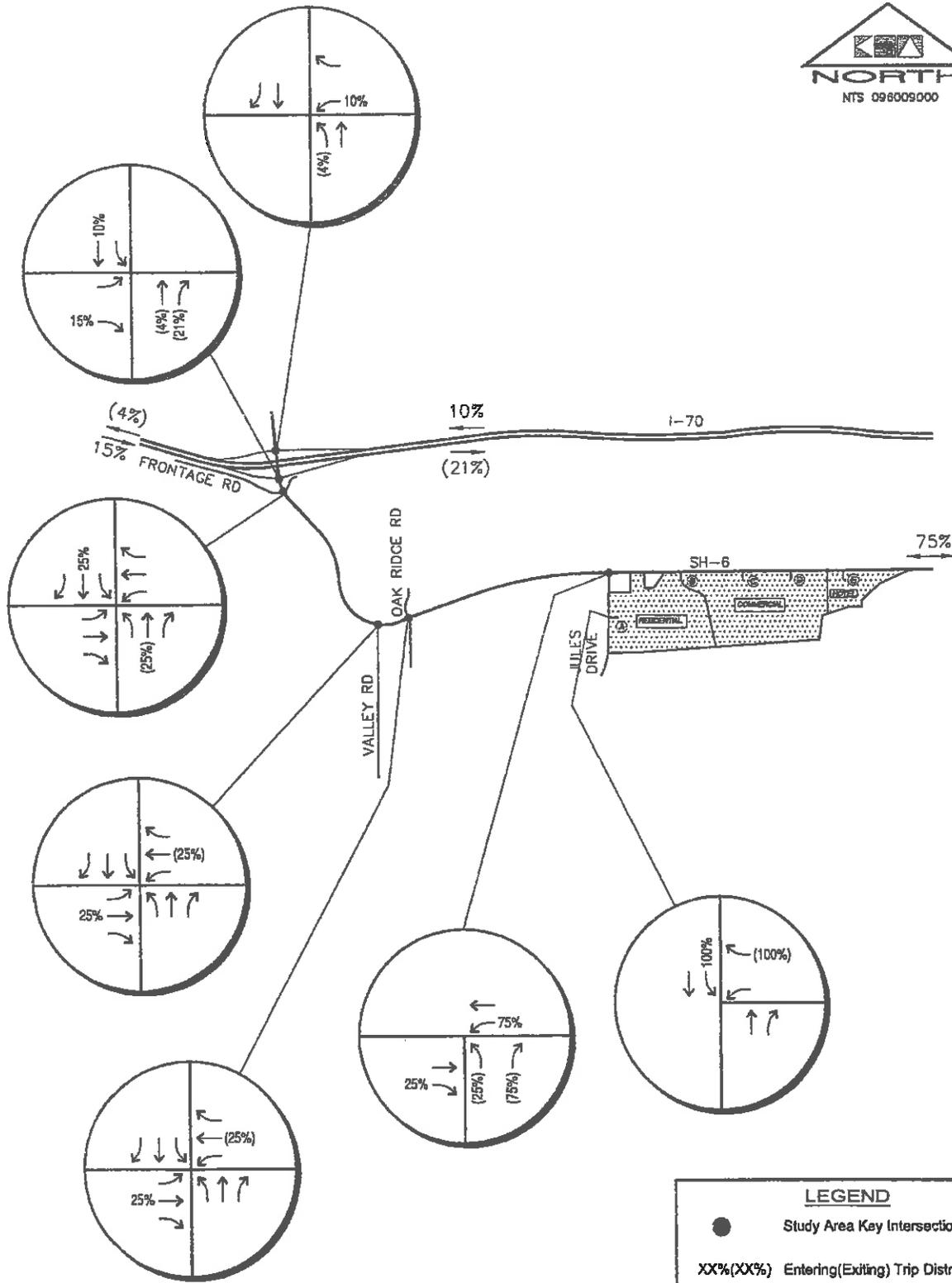
#### 4.2 Trip Distribution

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns, and the proposed access system for the project. The directional distribution of traffic is a means to quantify the percentage of site-generated traffic that approaches the site from a given direction and departs the site back to initial arrival direction. In order to determine the distribution of commercial traffic eastbound and westbound along SH-6, the existing traffic distribution at Oak Ridge Drive was applied to the commercial access driveways since Oak Ridge Drive serves existing commercial development. For purposed of this study, the commercial distribution includes also the office/hotel portion of the development. In order to determine the distribution of residential traffic eastbound and westbound along SH-6, the existing traffic distribution at Jules Drive was applied to the

residential access driveways since Jules Drive serves existing residential development. The existing traffic distribution to and from the I-70 Eastbound and Westbound Ramps during the AM and PM peak hours was also used to determine project distribution for the proposed development. Distributions were prepared separately for the AM and PM peak hours due to the anticipated directional traffic patterns through the study area intersections. These distributions were then provided to CDOT, Eagle County, and the Town of Gypsum for their review and concurrence. The distributions were finalized based upon the comments received.

Figures 6 and 7 illustrate the expected residential trip distribution for the site for the AM and PM peak hours, respectively. Figures 8 and 9 illustrate the expected commercial trip distribution for the site at the key intersections for the AM and PM peak hours, respectively.

As mentioned previously, in order to determine reasonable access to and from the commercial and office/hotel portions of the development, several access scenarios to and from SH-6 have been evaluated. Since the commercial and hotel/office portions of the development only have frontage along SH-6, it was not possible to evaluate a "No Highway Access Scenario." While efficient, reasonable access to and from this regional commercial development requires multiple points of ingress and egress to serve customers and delivery vehicles, the site was first evaluated with a single full movement access to and from the commercial development and a right-in/right-out for the hotel (Scenario 1). An additional full movement access was added and studied for the commercial portion of the development (Scenario 2). And, a needed additional right-in/right-out access driveway for the commercial development was also studied (Scenario 3).



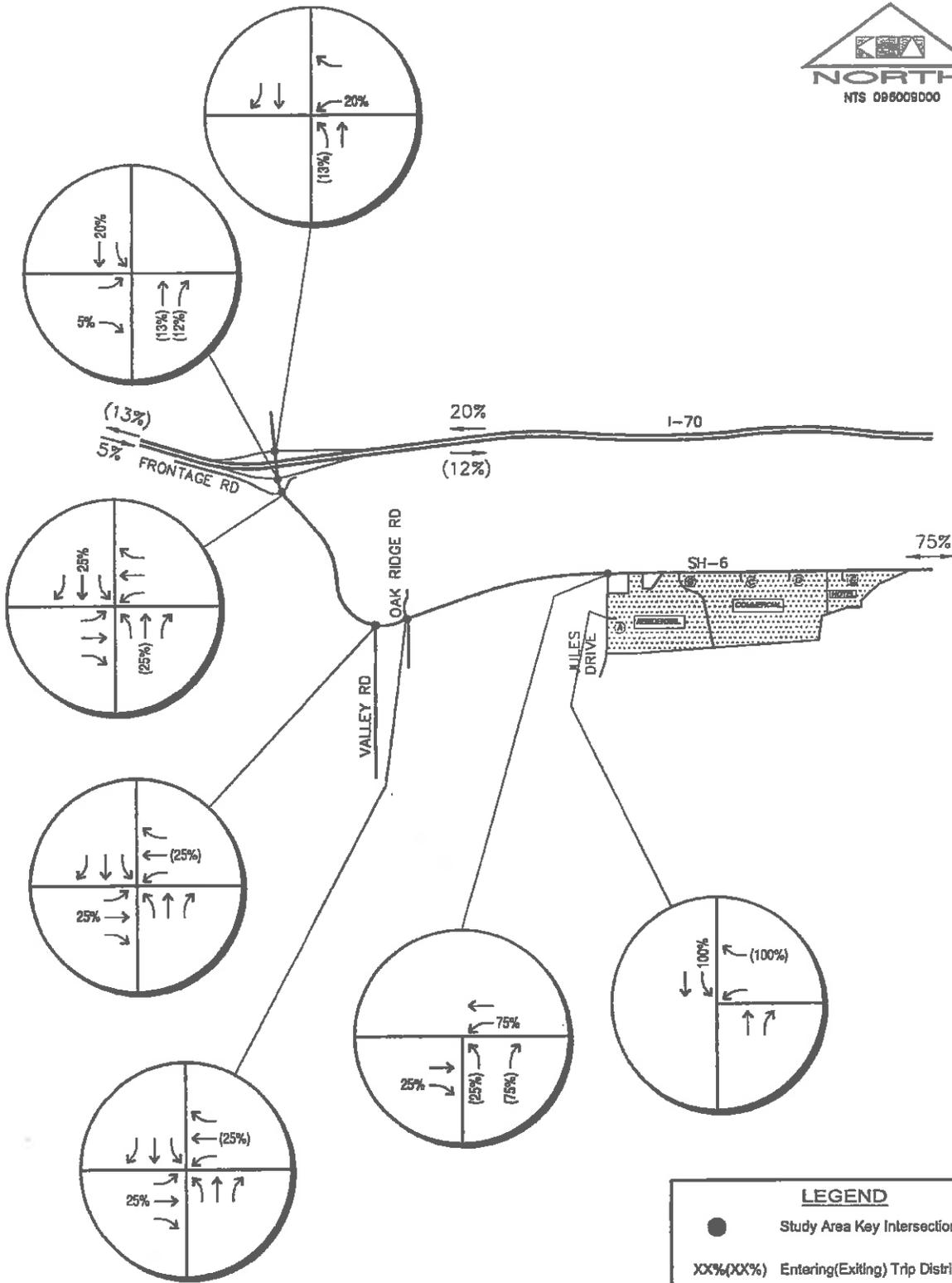
**LEGEND**

- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

\*Trip distribution shown only for movements impacted by project traffic

**TOWER CENTER, GYPSUM, CO  
AM RESIDENTIAL PEAK HOUR PROJECT  
TRIP DISTRIBUTION**

**FIGURE 6**

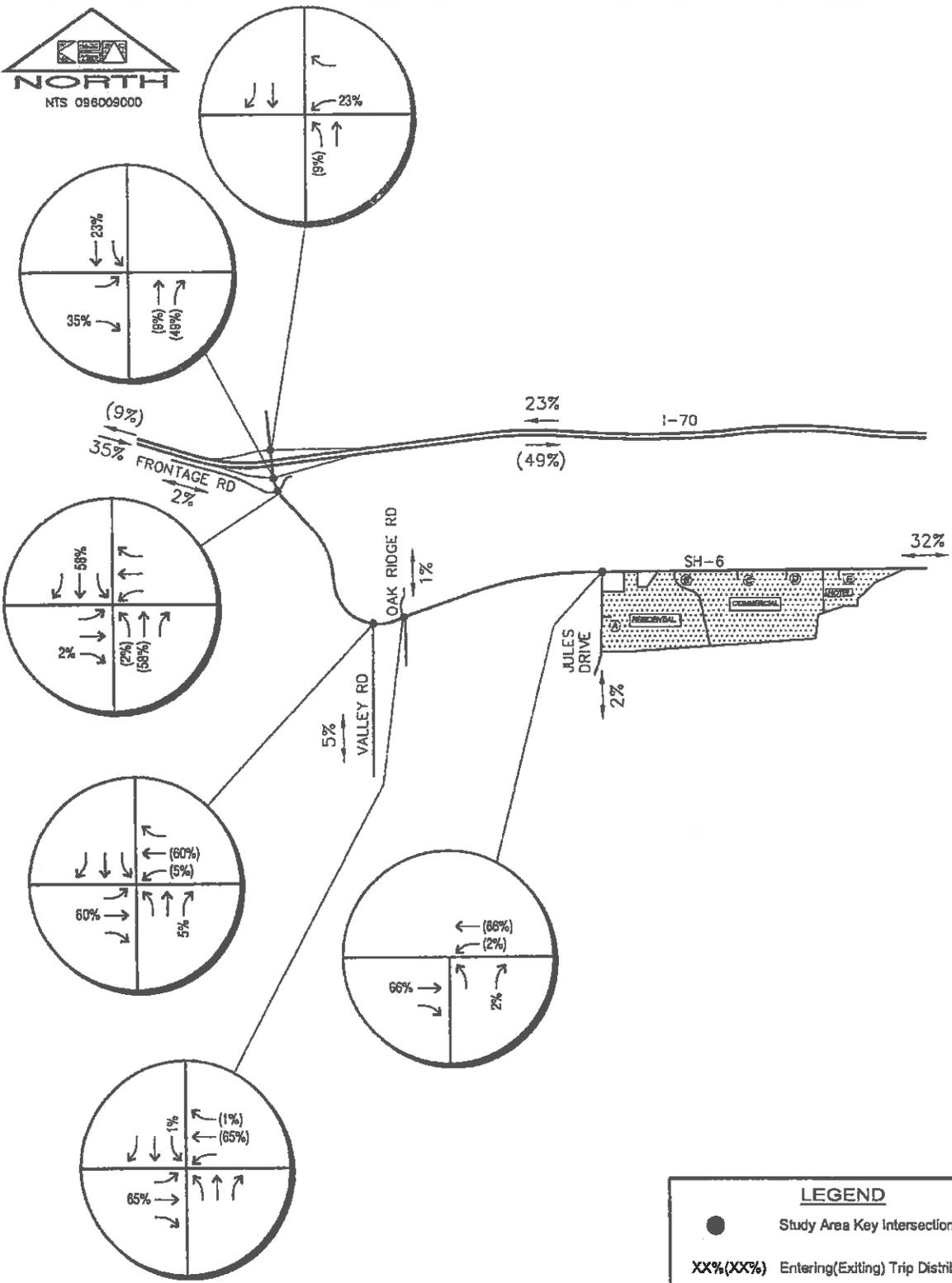


**LEGEND**  
 ● Study Area Key Intersection  
 XX%(XX%) Entering(Exiting) Trip Distribution

\*Trip distribution shown only for movements impacted by project traffic

**TOWER CENTER, GYPSUM, CO  
 PM RESIDENTIAL PEAK HOUR PROJECT  
 TRIP DISTRIBUTION**

**FIGURE 7**



**LEGEND**

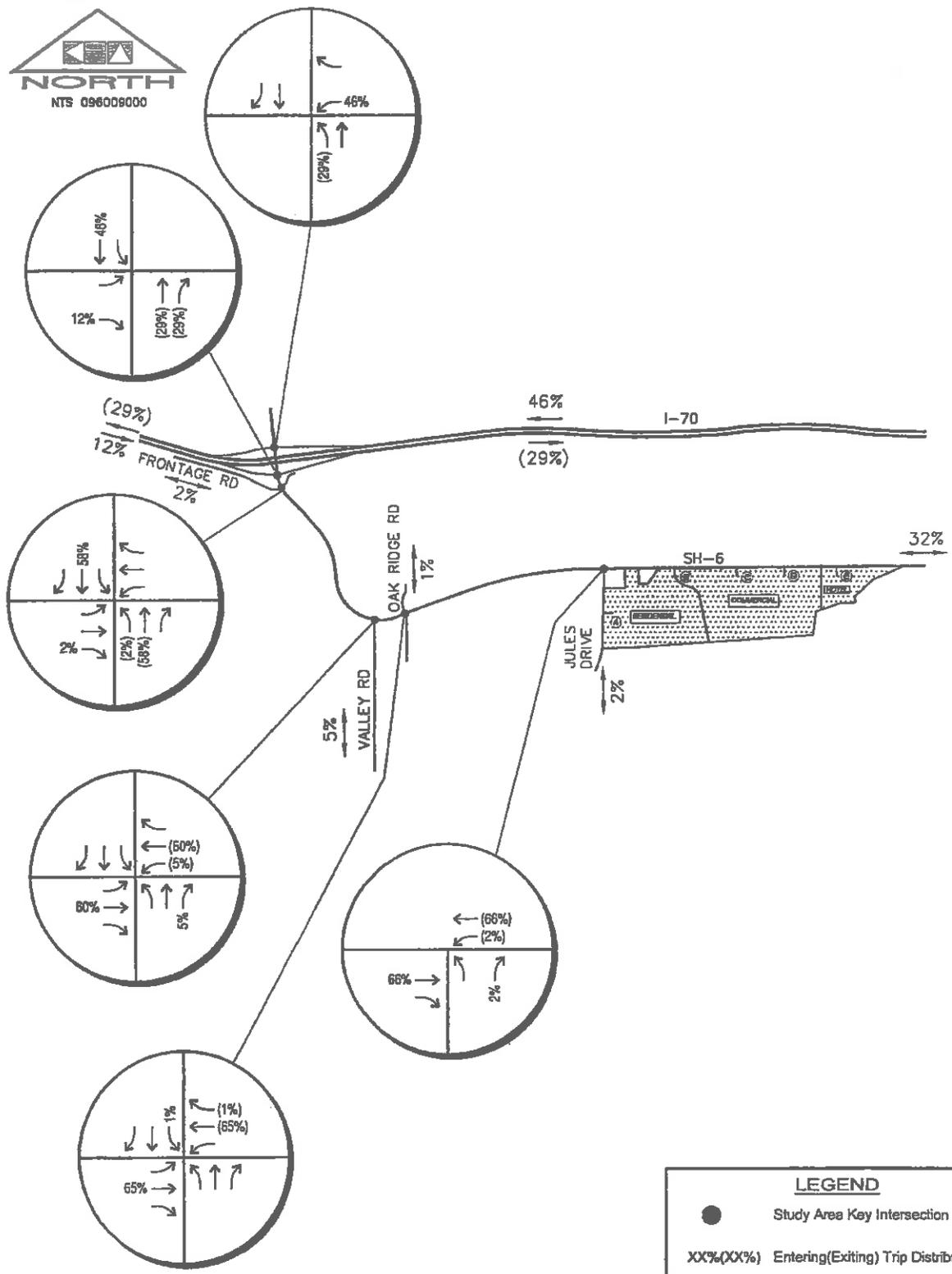
- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

\*Trip distribution shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
 AM COMMERCIAL PROJECT PEAK HOUR TRIP  
 DISTRIBUTION AT KEY INTERSECTIONS

FIGURE 8





**LEGEND**

- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

\*Trip distribution shown only for movements impacted by project traffic

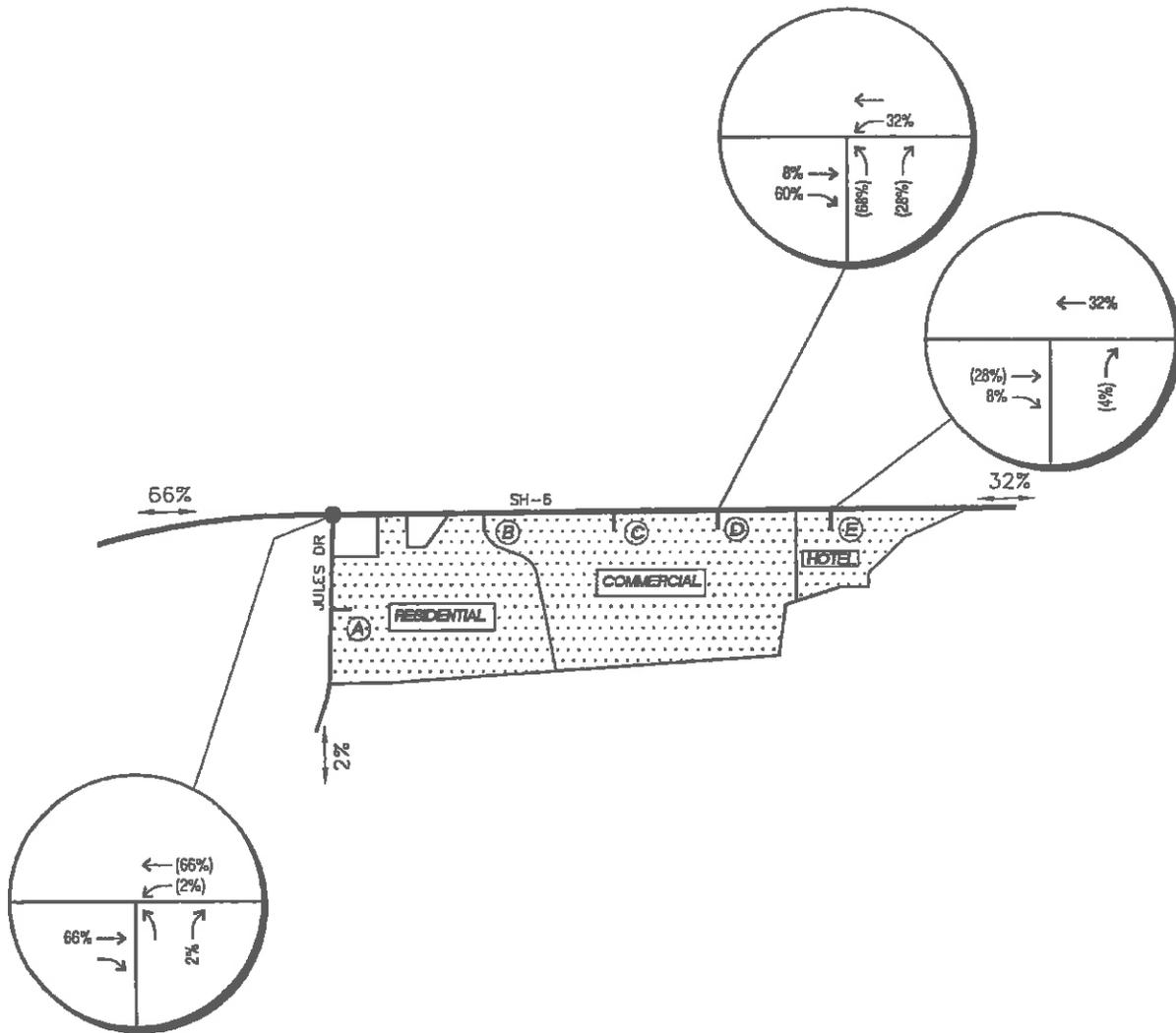
**TOWER CENTER, GYPSUM, CO  
PM COMMERCIAL PROJECT PEAK HOUR TRIP  
DISTRIBUTION AT KEY INTERSECTIONS**

**FIGURE 9**



Kimley-Horn  
and Associates, Inc.

Figure 10 illustrates the expected commercial trip distribution for the site at the proposed access locations (including Jules Drive) with a single full movement access along SH-6 to be shared by the commercial development and the hotel, as well as a single right-in/right-out access for the hotel (Scenario 1). Figure 11 illustrates the expected commercial trip distribution for the site at the proposed access locations (including Jules Drive) with an additional full movement access for the commercial portion of the development (Scenario 2). Figure 12 illustrates the expected commercial trip distribution for the site at the proposed access locations (including Jules Drive) with the proposed access described in Scenario 2, as well as an additional right-in/right-out access driveway to serve the commercial development (Scenario 3).



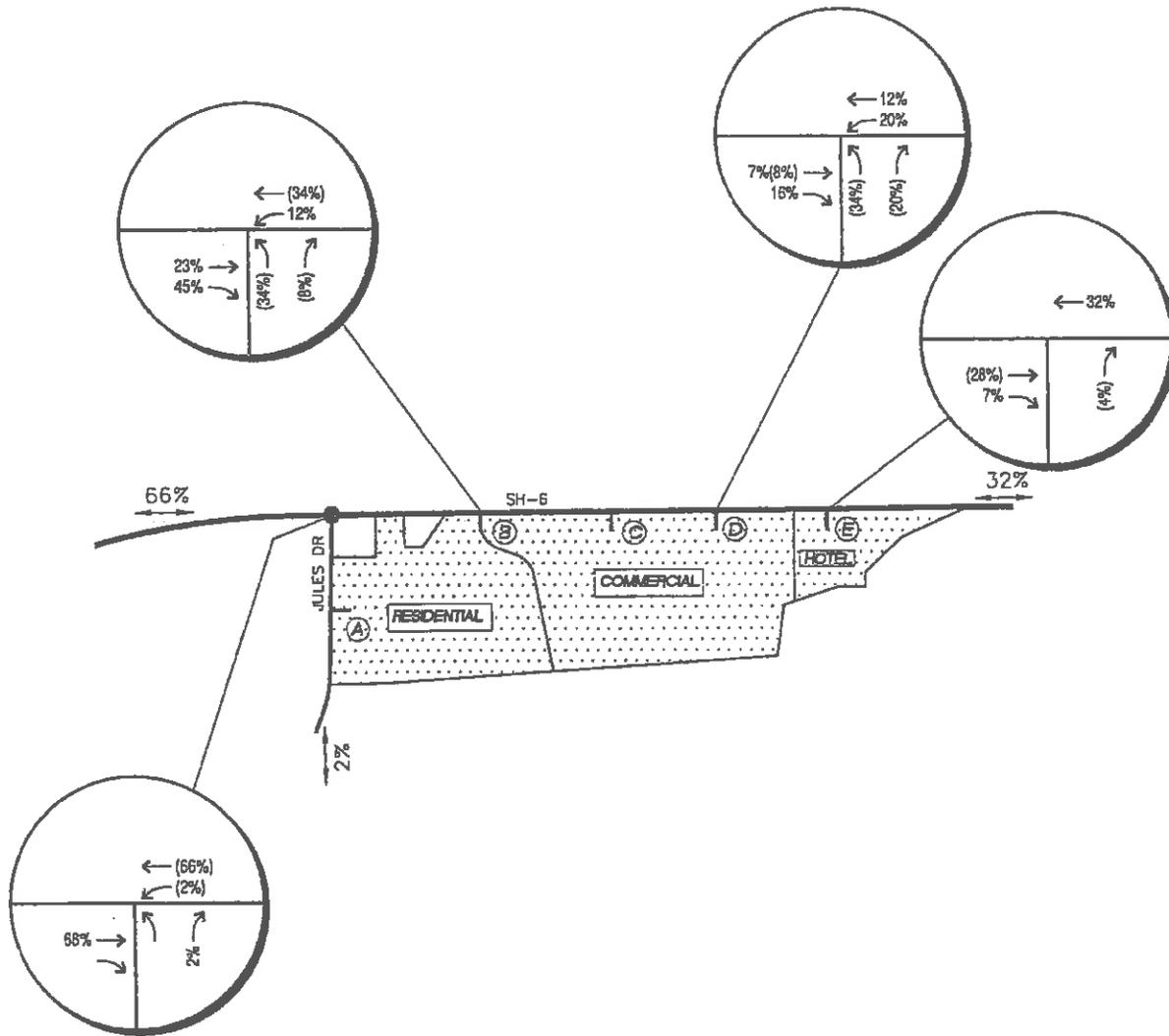
**LEGEND**

- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

*\*Trip distribution shown only for movements impacted by project traffic*

**TOWER CENTER, GYPSUM, CO  
 SCENARIO 1 COMMERCIAL PROJECT  
 PEAK HOUR TRIP DISTRIBUTION  
 AT ACCESS DRIVEWAYS**

**FIGURE 10**



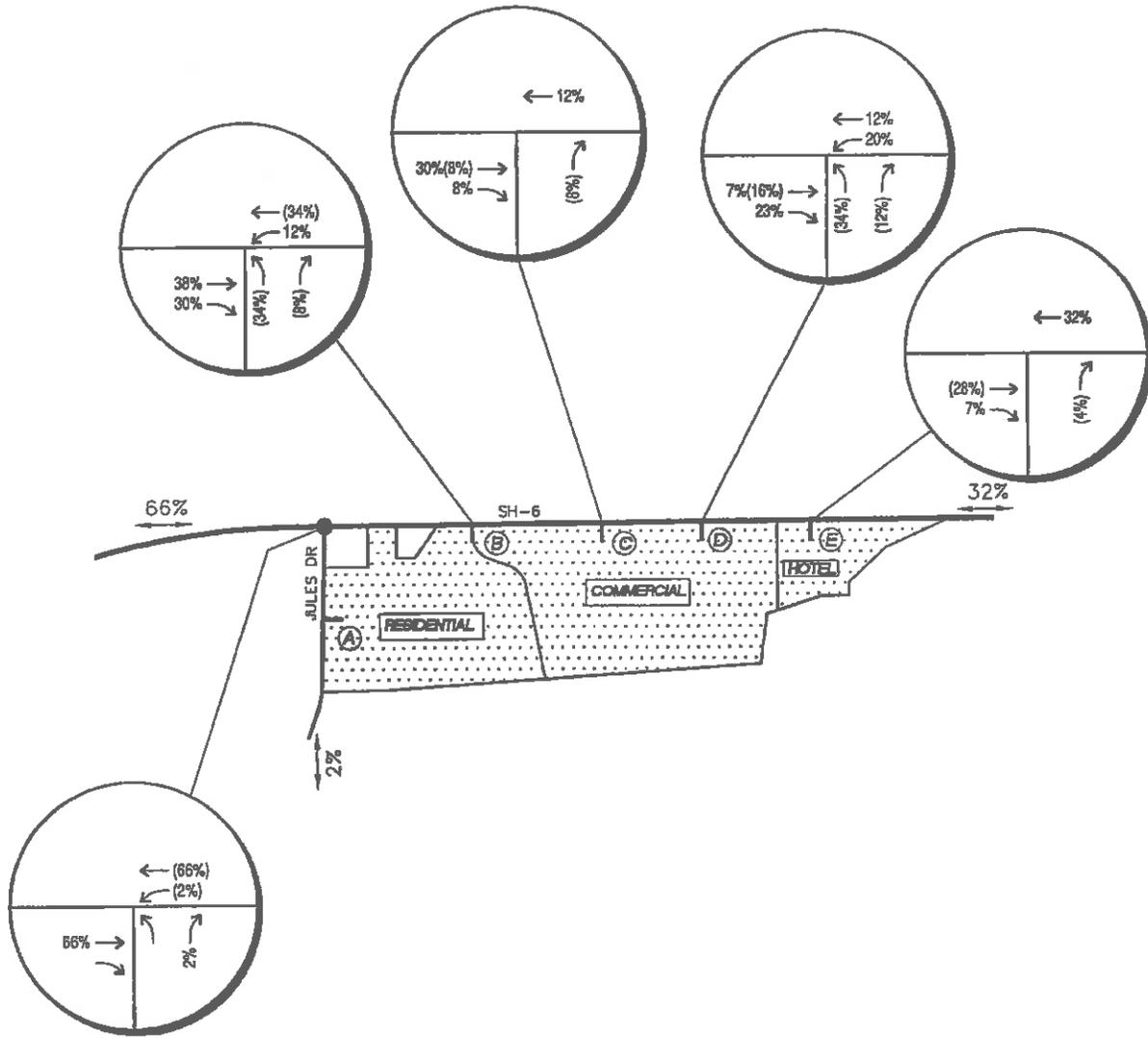
**LEGEND**

- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

\*Trip distribution shown only for movements impacted by project traffic

**TOWER CENTER, GYPSUM, CO  
 SCENARIO 2 COMMERCIAL PROJECT  
 PEAK HOUR TRIP DISTRIBUTION  
 AT ACCESS DRIVEWAYS**

**FIGURE 11**



**LEGEND**

- Study Area Key Intersection
- XX%(XX%) Entering(Exiting) Trip Distribution

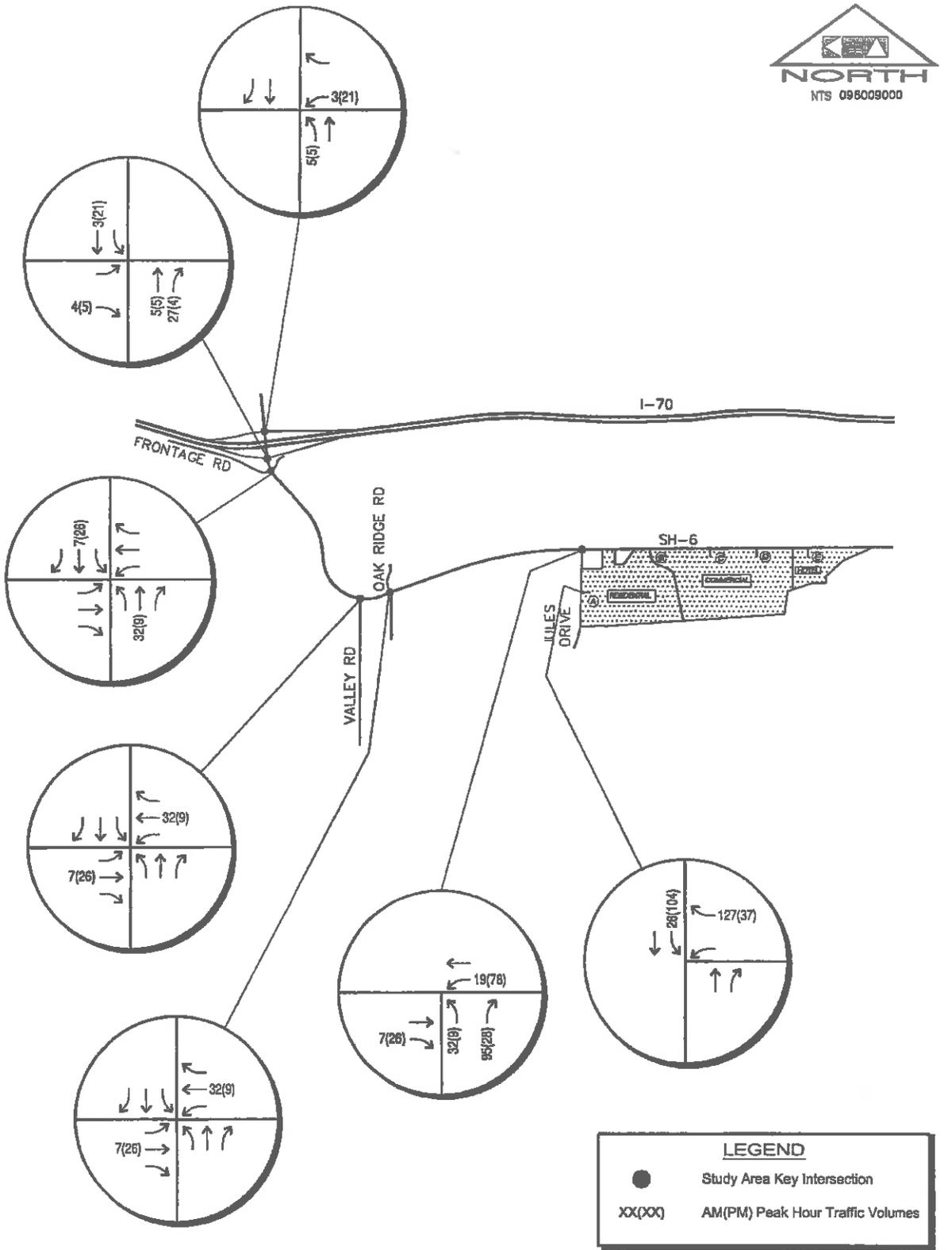
\*Trip distribution shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
SCENARIO 3 COMMERCIAL PROJECT  
PEAK HOUR TRIP DISTRIBUTION  
AT ACCESS DRIVEWAYS

FIGURE 12

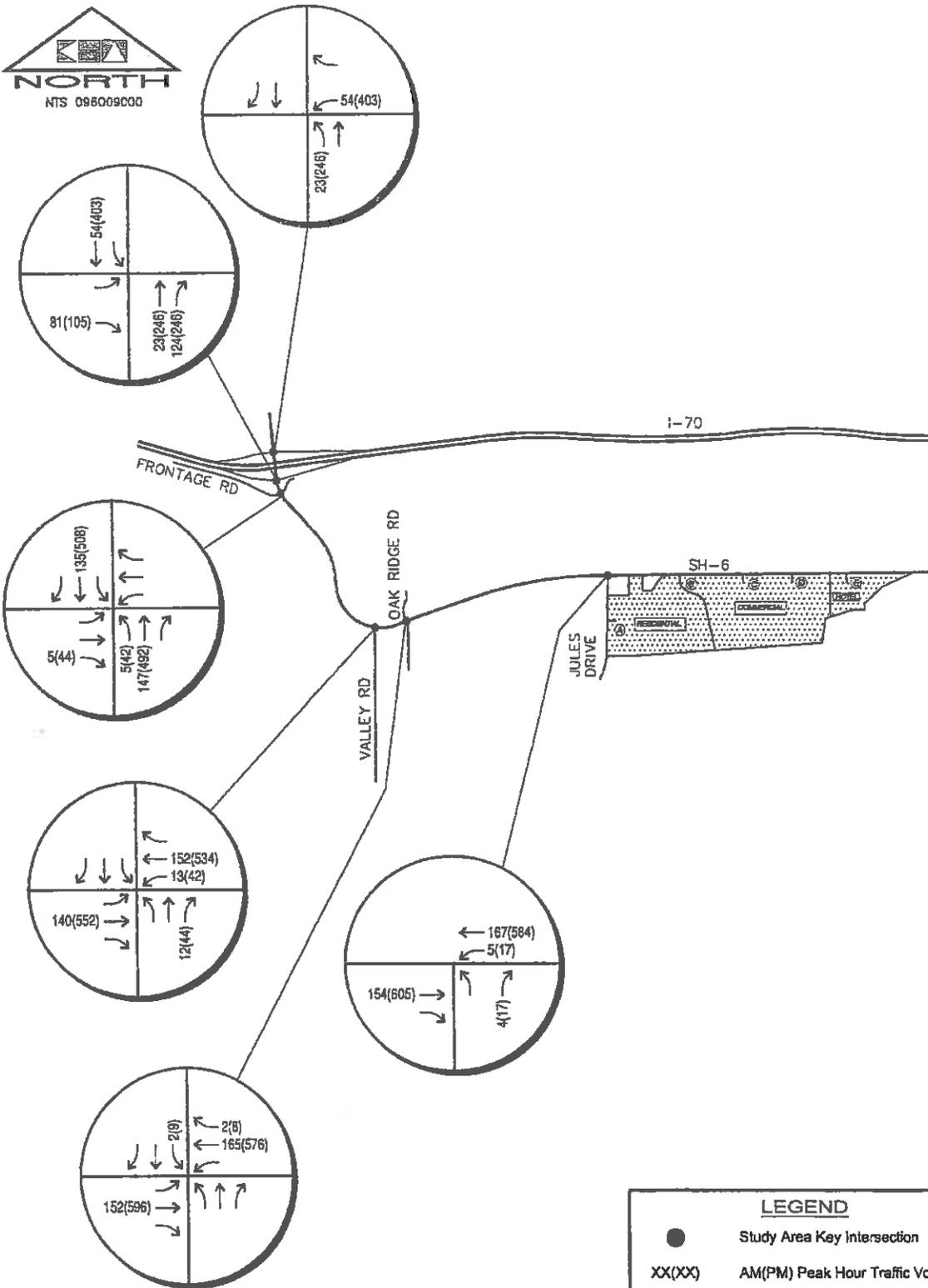
### **4.3 Total (Background Plus Project) Traffic Volumes**

Peak hour traffic assignment was obtained by applying the distributions to the estimated net external traffic generation of the development shown in Table 2. Site traffic volumes were added to the background volumes to represent estimated traffic conditions for the short term 2008 horizon and long term 2025 horizon. The peak hour residential traffic assignment for the key intersections is shown in Figure 13 and the peak hour commercial traffic assignment for the key intersections is shown in Figure 14. These volumes were added to the background traffic volumes for the 2008 and 2025 horizon years to obtain total (background plus project) traffic volumes. These 2008 and 2025 total peak hour traffic volumes for the key intersections are illustrated in Figures 15 and 16.



TOWER CENTER, GYPSUM, CO  
RESIDENTIAL PROJECT PEAK HOUR TRAFFIC  
ASSIGNMENT AT KEY INTERSECTIONS

FIGURE 13



**LEGEND**

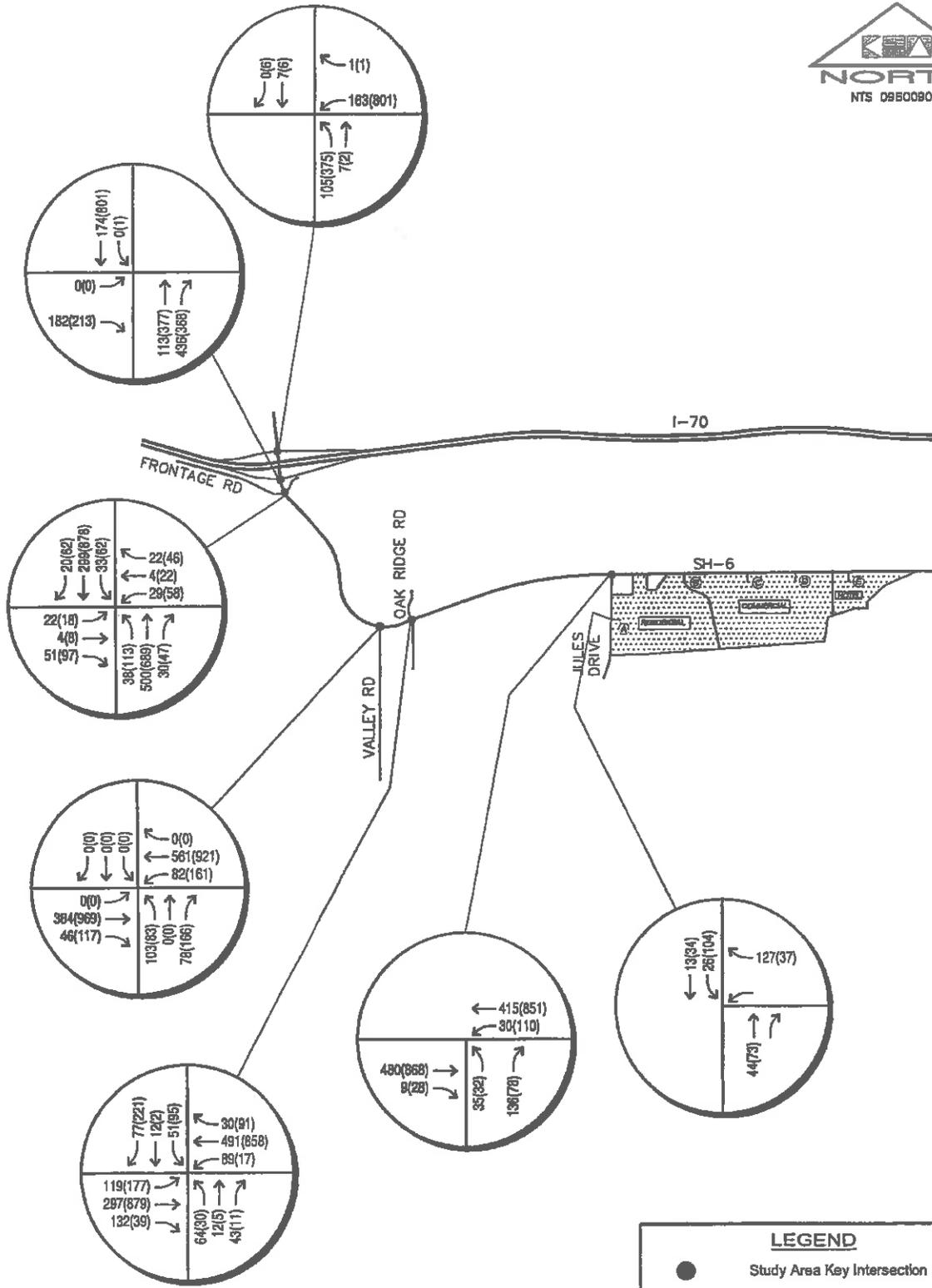
- Study Area Key Intersection
- XX(X) AM(PM) Peak Hour Traffic Volumes

\*Traffic assignment shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
 COMMERCIAL PROJECT PEAK HOUR TRAFFIC  
 ASSIGNMENT AT KEY INTERSECTIONS

FIGURE 14





TOWER CENTER, GYPSUM, CO  
2008 TOTAL PEAK HOUR TRAFFIC VOLUMES  
AT KEY INTERSECTIONS

**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

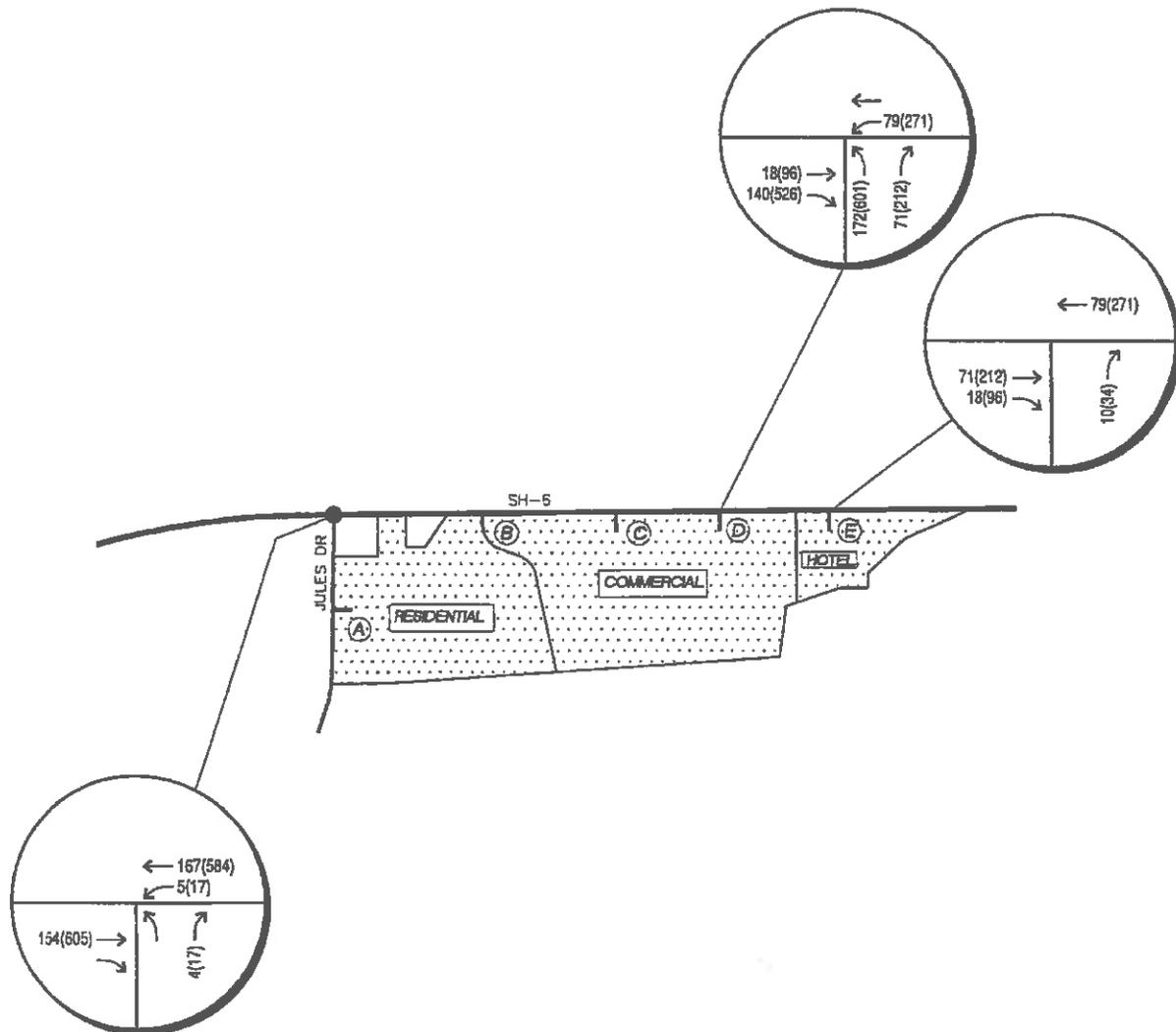
FIGURE 15



The following subsections describe the total traffic conditions for each scenario studied.

#### **4.3.1 Scenario 1: One full movement access and one right-in/right-out access**

The commercial project traffic assignment for Scenario 1 (one proposed full movement and right-in/right-out access driveway) is shown in Figure 17. This was combined with the residential traffic assignment (as shown in Figure 13), and then added to the background traffic volumes for the 2008 and 2025 horizon years to obtain total (Background plus project) traffic volumes. These 2008 and 2025 total peak hour traffic volumes at the access driveways along SH-6 with this access scenario are illustrated in Figures 18 and 19, respectively.



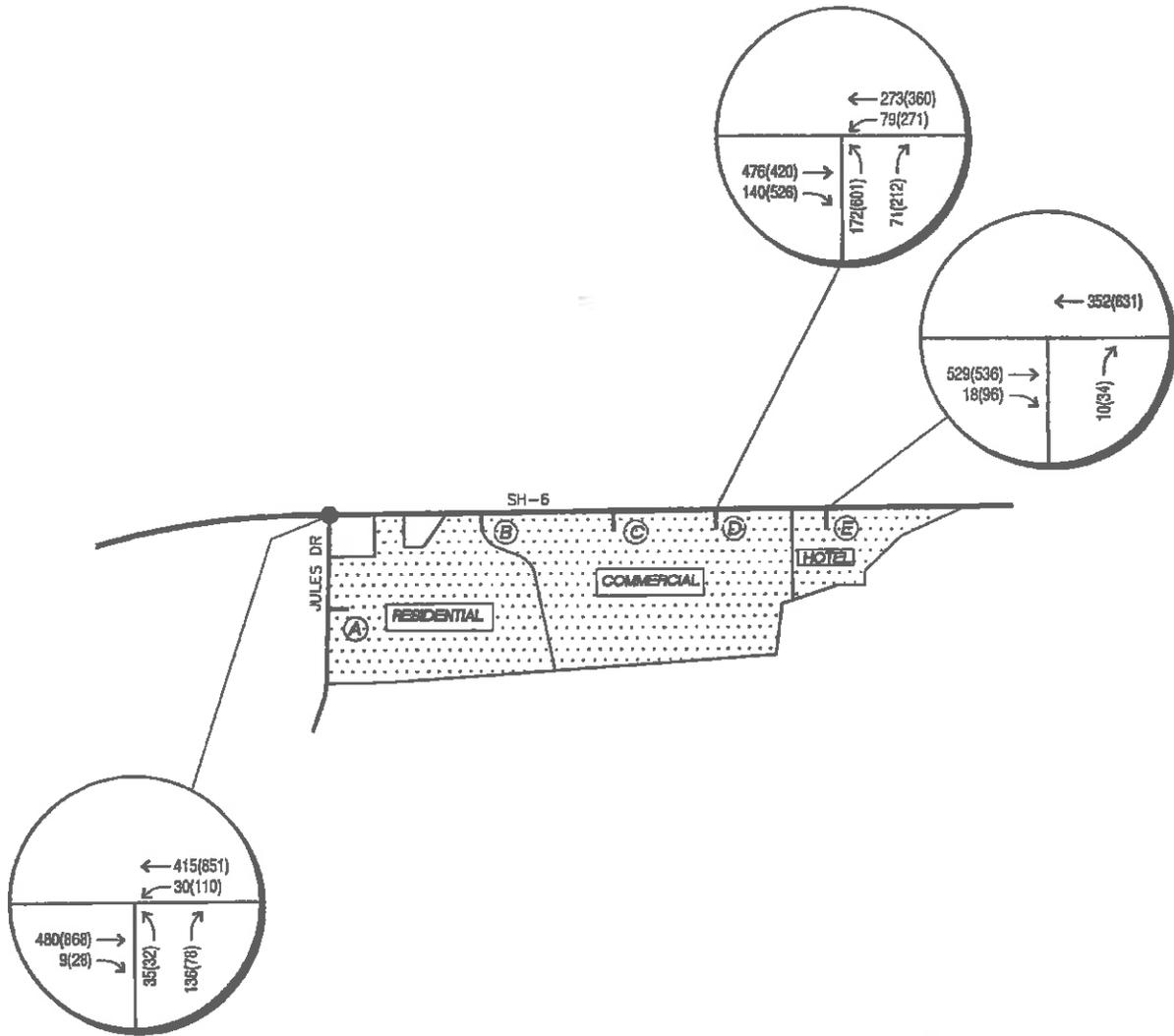
**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

\*Traffic assignment shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
COMMERCIAL PROJECT PEAK HOUR TRAFFIC  
ASSIGNMENT AT ACCESS DRIVEWAYS  
SCENARIO 1

FIGURE 17



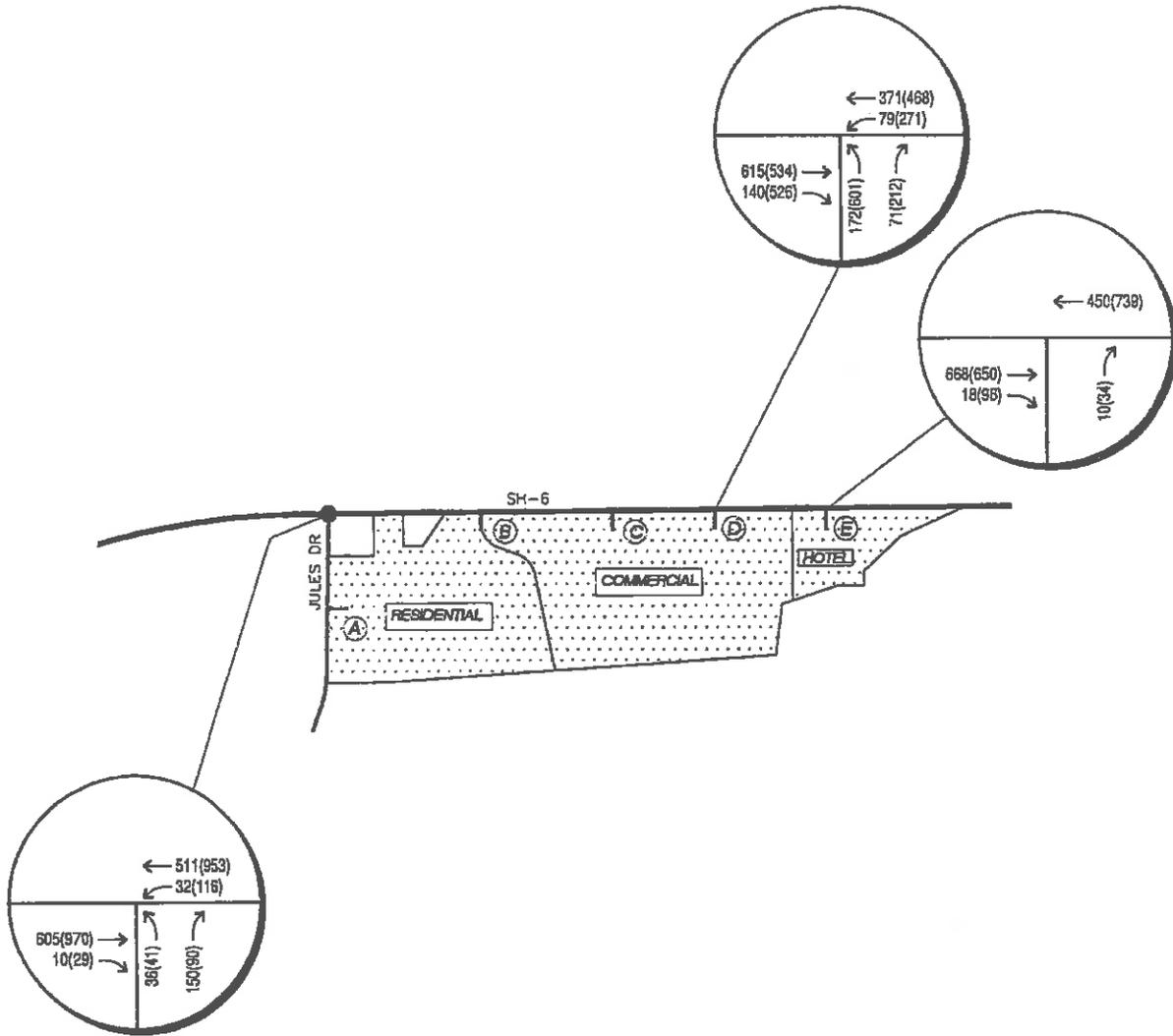
**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
 2008 TOTAL PEAK HOUR TRAFFIC VOLUMES  
 AT ACCESS DRIVEWAYS: SCENARIO 1

FIGURE 18





**LEGEND**

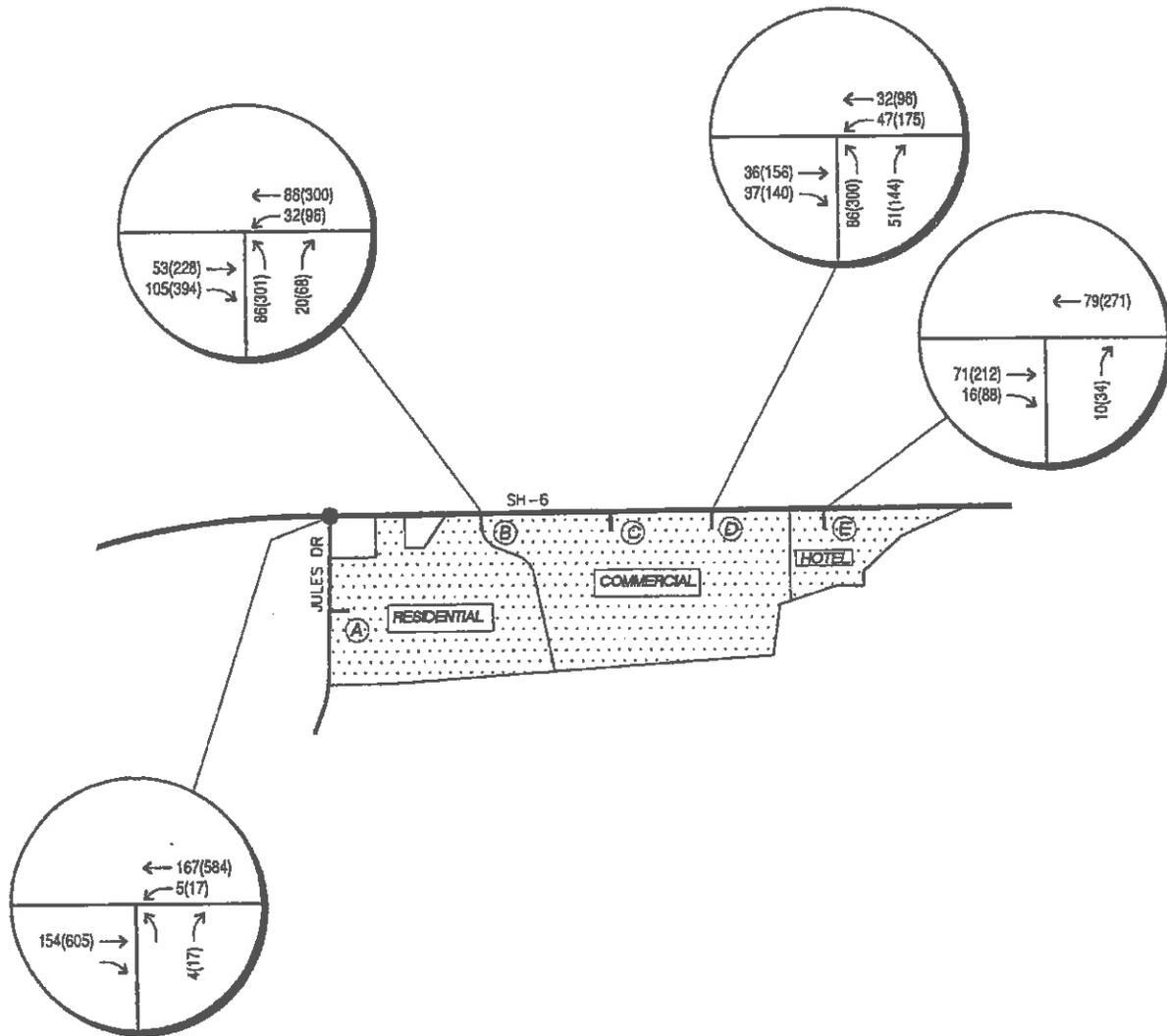
- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
2025 TOTAL PEAK HOUR TRAFFIC VOLUMES  
AT ACCESS DRIVEWAYS: SCENARIO 1

FIGURE 19

#### **4.3.2 Scenario 2: Two full movement accesses and one right-in/right-out access**

The commercial project traffic assignment for Scenario 2 (two proposed full movement driveways and one right-in/right-out access driveway) is shown in Figure 20. This was combined with the residential traffic assignment (as shown in Figure 13), and then added to the background traffic volumes for the 2008 and 2025 horizon years to obtain total (Background plus project) traffic volumes. These 2008 and 2025 total peak hour traffic volumes at the access driveways along SH-6 with this access scenario are illustrated in Figures 21 and 22, respectively.



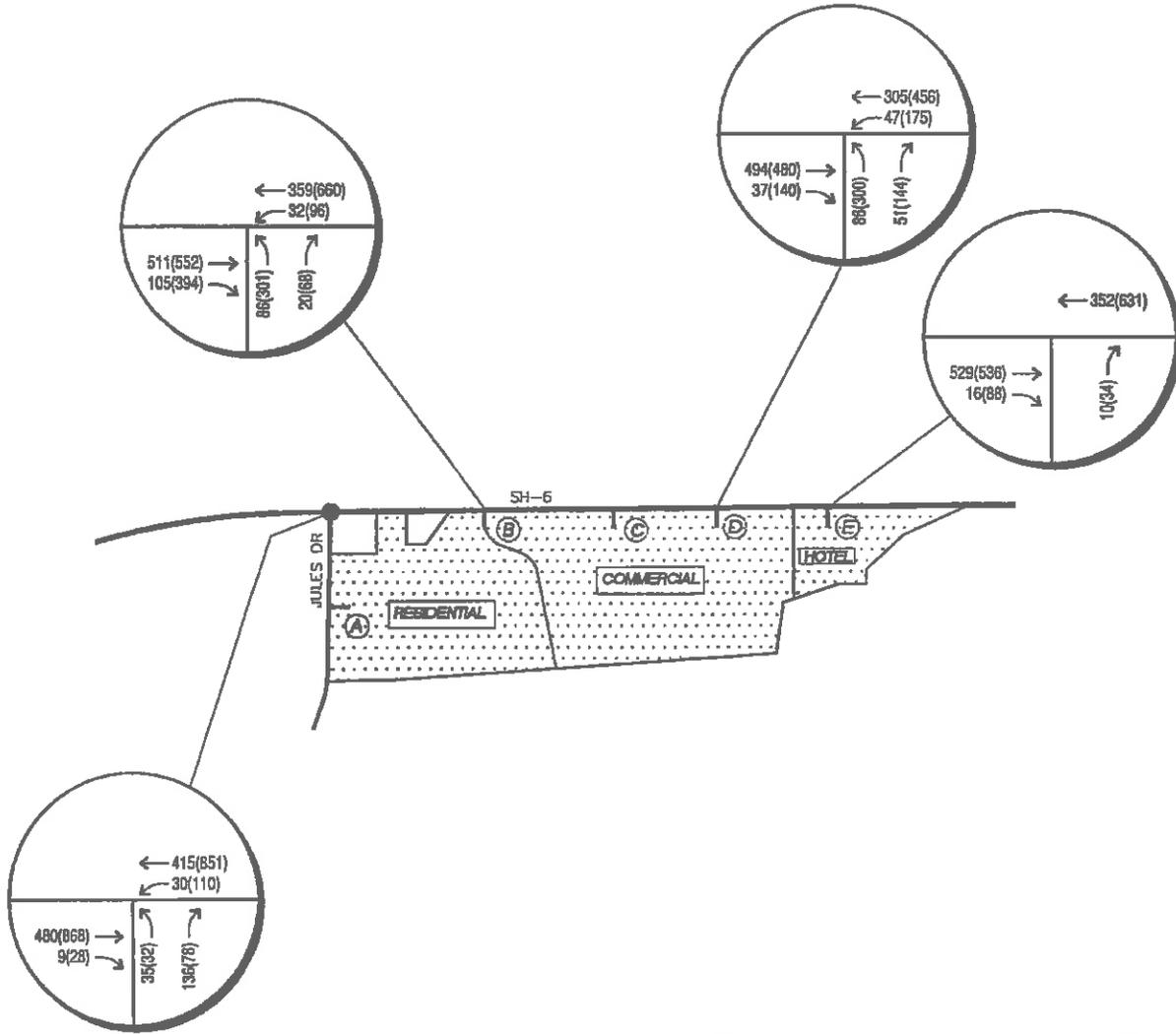
**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

\*Traffic assignment shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
COMMERCIAL PROJECT PEAK HOUR TRAFFIC  
ASSIGNMENT AT ACCESS DRIVEWAYS  
SCENARIO 2

FIGURE 20



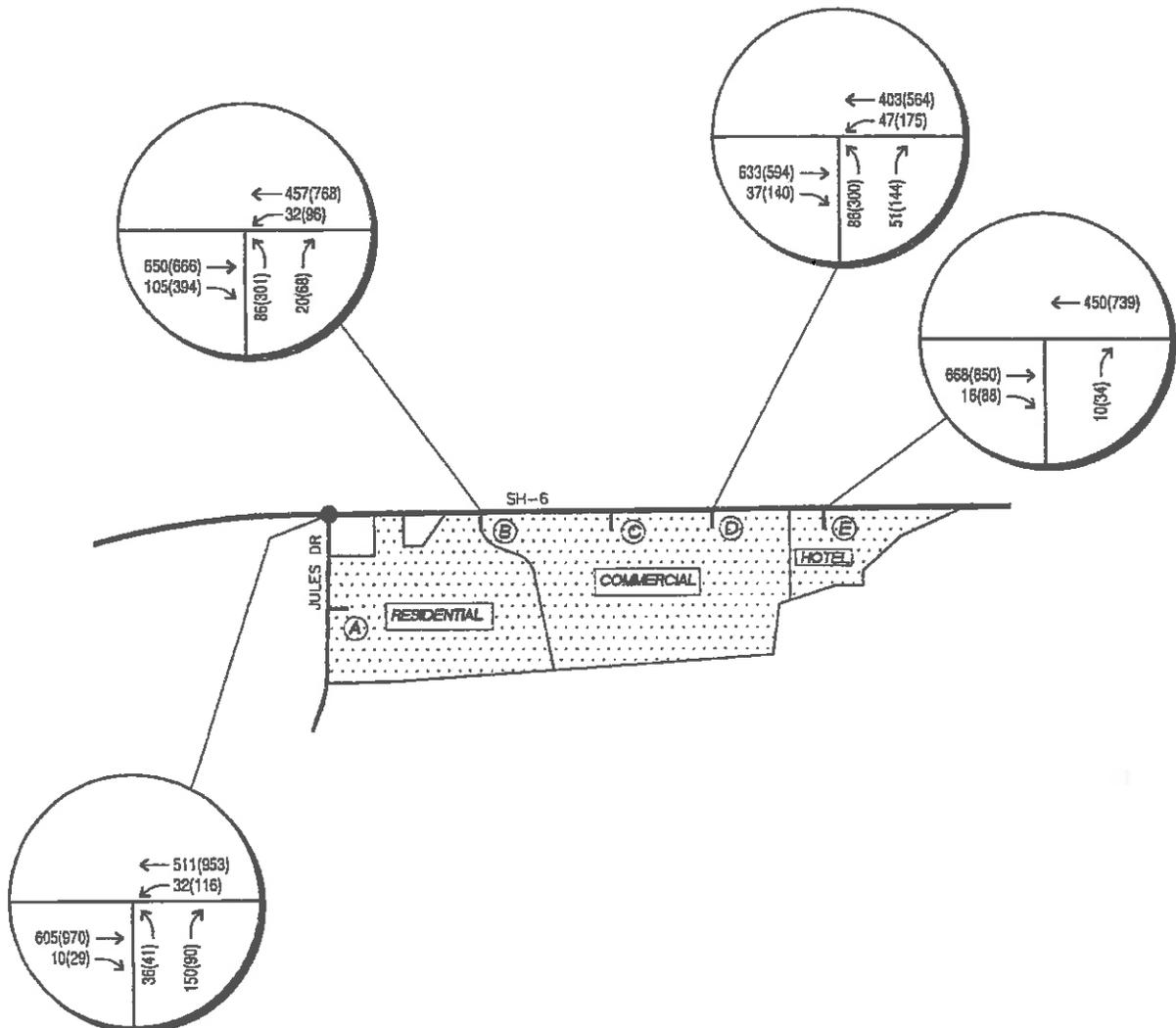
**LEGEND**

- Study Area Key Intersection
- XX(PM) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
 2008 TOTAL PEAK HOUR TRAFFIC VOLUMES  
 AT ACCESS DRIVEWAYS: SCENARIO 2

FIGURE 21





**LEGEND**

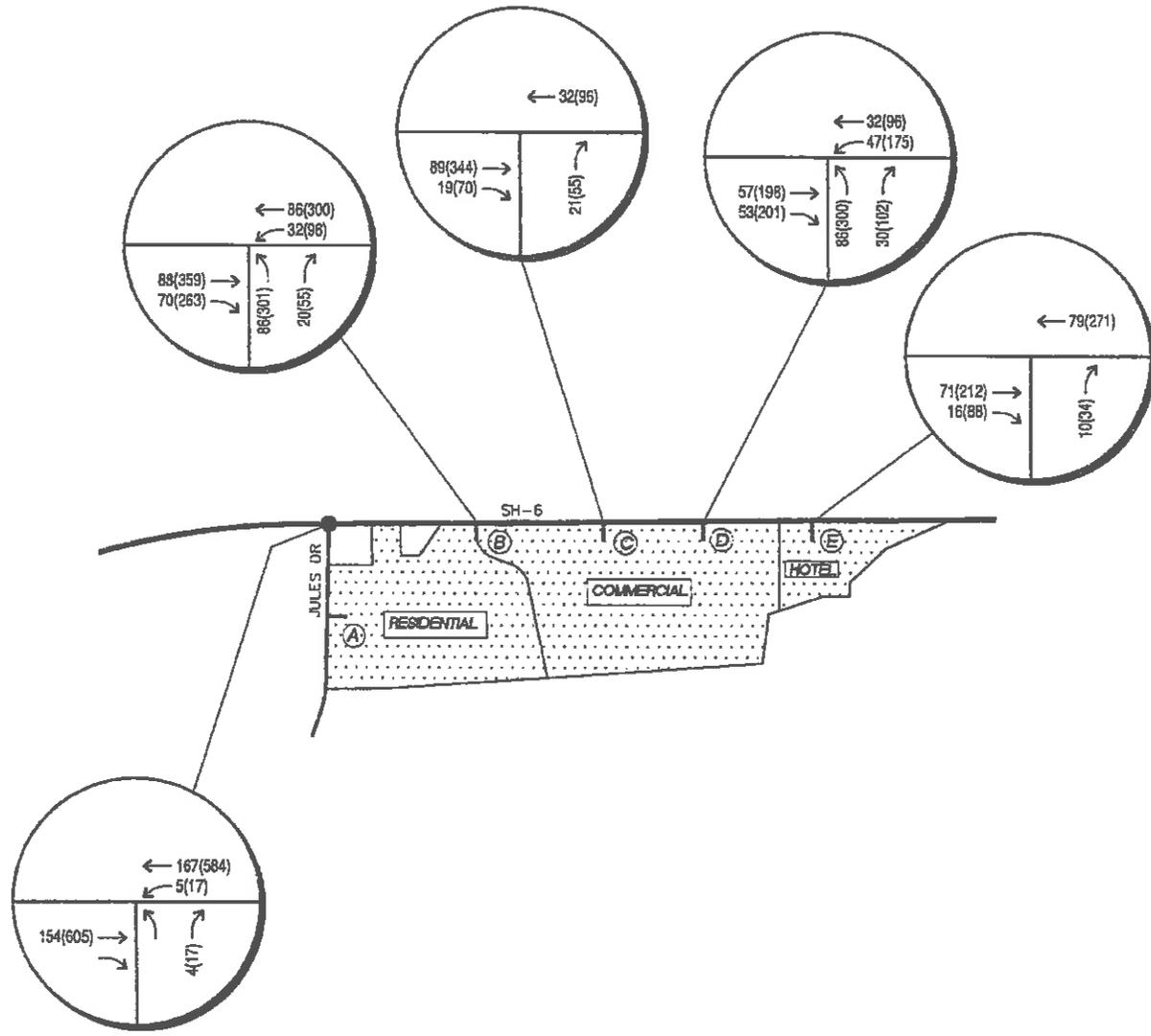
- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
 2025 TOTAL PEAK HOUR TRAFFIC VOLUMES  
 AT ACCESS DRIVEWAYS: SCENARIO 2

FIGURE 22

#### 4.3.3 Scenario 3: Two full movement accesses and two right-in/right-out accesses

The commercial project traffic assignment for Scenario 3 (two proposed full movement driveways and two right-in/right-out access driveways) is shown in Figure 23. This was combined with the residential traffic assignment (as shown in Figure 13), and then added to the background traffic volumes for the 2008 and 2025 horizon years to obtain total (Background plus project) traffic volumes. These 2008 and 2025 total peak hour traffic volumes at the access driveways along SH-6 with this access scenario are illustrated in Figures 24 and 25, respectively.



**LEGEND**

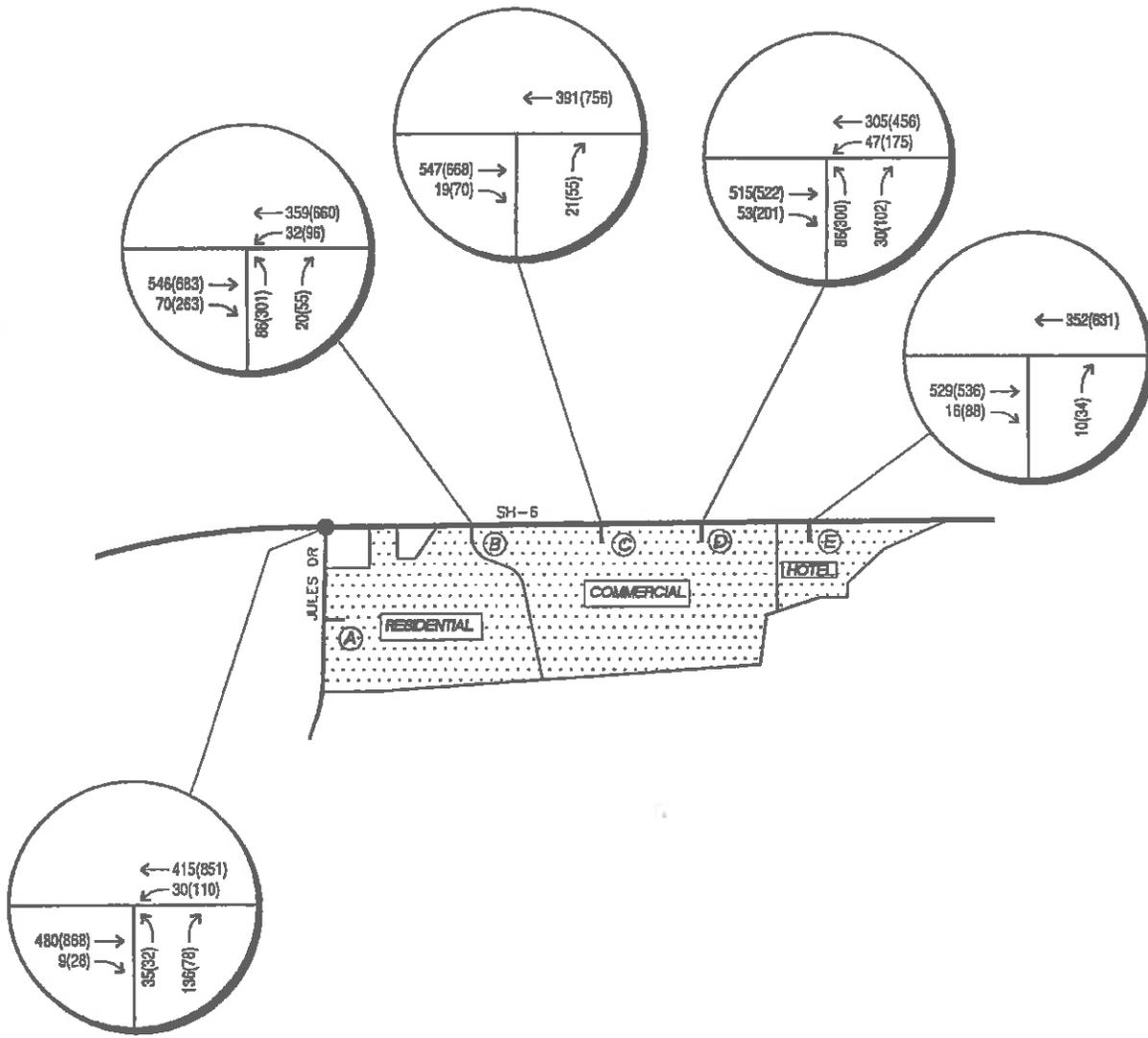
- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

\*Traffic assignment shown only for movements impacted by project traffic

TOWER CENTER, GYPSUM, CO  
 COMMERCIAL PROJECT PEAK HOUR TRAFFIC  
 ASSIGNMENT AT ACCESS DRIVEWAYS  
 SCENARIO 3

FIGURE 23



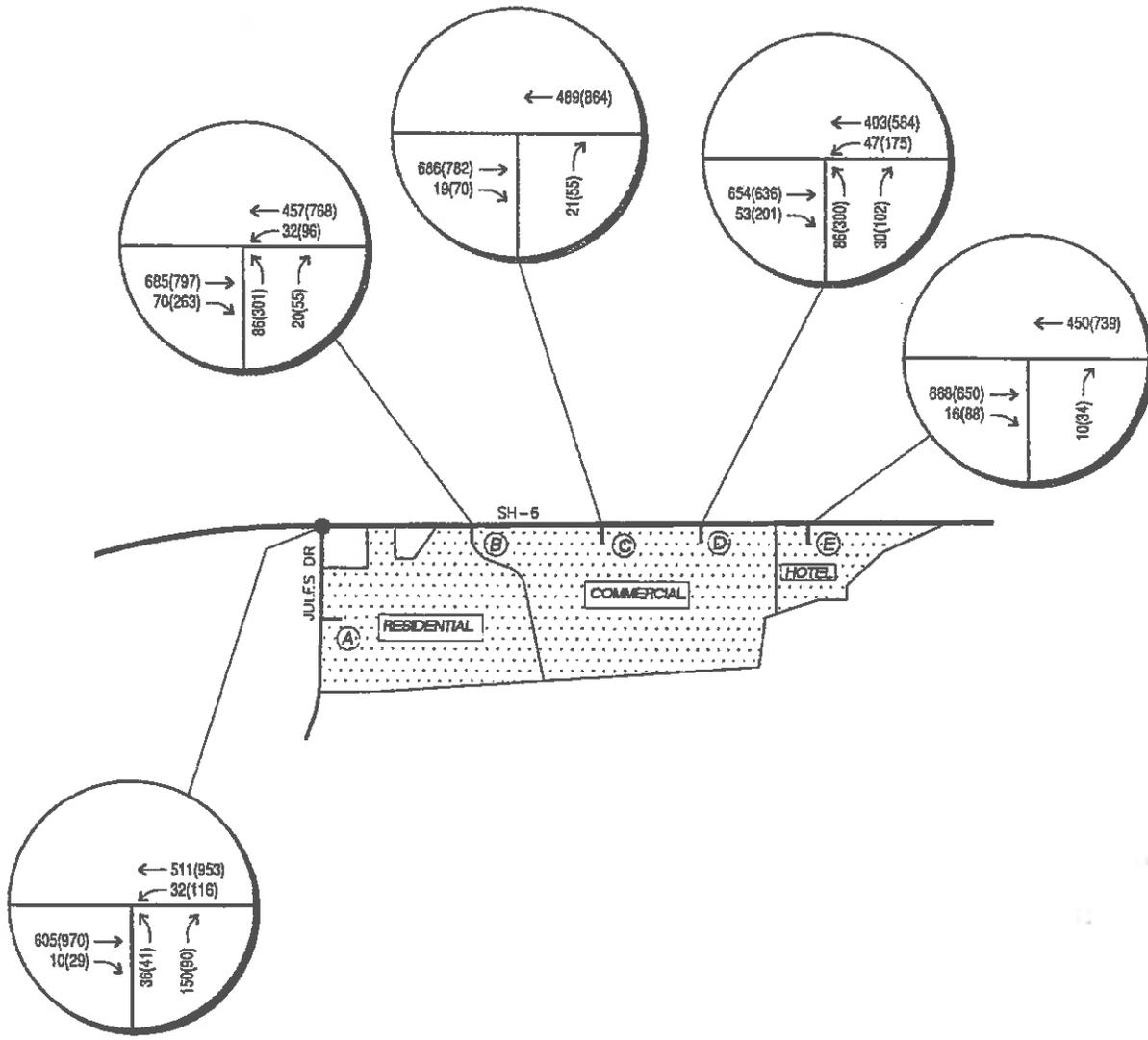


**LEGEND**

- Study Area Key Intersection
- XX(XX) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
 2008 TOTAL PEAK HOUR TRAFFIC VOLUMES  
 AT ACCESS DRIVEWAYS: SCENARIO 3

FIGURE 24



**LEGEND**

- Study Area Key Intersection
- XX(X) AM(PM) Peak Hour Traffic Volumes

TOWER CENTER, GYPSUM, CO  
 2025 TOTAL PEAK HOUR TRAFFIC VOLUMES  
 AT ACCESS DRIVEWAYS: SCENARIO 3

FIGURE 25

## 5.0 TRAFFIC OPERATIONS ANALYSIS

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies in the 2008 and 2025 development horizons at the identified key intersections. The acknowledged source for determining overall capacity is the current edition of the *Highway Capacity Manual*<sup>2</sup>.

### 5.1 Analysis Methodology

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this study area, CDOT and Kimley-Horn recommends intersection LOS D as the minimum threshold for acceptable operations. Table 2 shows the definition of level of service for signalized and unsignalized intersections.

**Table 2 - Level of Service Definitions**

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤10	≤10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Definitions provided from the *Highway Capacity Manual*, Special Report 209, Transportation Research Board, 2000.

Study area intersections were analyzed based on average total delay analysis for signalized and unsignalized intersections. Under the unsignalized analysis, the level of service (LOS) for a two-way stop controlled intersection is determined by the computed or measured control delay

<sup>2</sup> Transportation Research Board, *Highway Capacity Manual*, Special Report 209, Washington DC, 2000.

and is defined for each minor movement. Level of service for a two-way stop-controlled intersection is not defined for the intersection as a whole. Level of service for a signalized and four-way stop controlled intersection is defined for each approach and for the intersection.

## **5.2 Key Intersection Operational Analysis**

Calculations for the level of service at the key intersections identified for study are provided in Appendix E. The analyses are based on the lane geometry and intersection control shown in Figure 2. All future signalized intersection analyses utilize existing phasing, as well as optimized timing/cycle length of the intersections, where applicable. LOS for signalized intersections and unsignalized intersections was calculated using HCS analysis software. The roundabout intersection was evaluated using the internationally recognized aaSidra software. In addition, it is important to note that the possible new interchange with Interstate 70 has not been included in the analysis to be conservative. Therefore, if this interchange were constructed, the effects of the addition of project traffic through the Town of Gypsum would likely be significantly less in the long term horizon.

### **SH-6 & I-70 Westbound Ramps**

All movements at the existing intersection of SH-6 with the I-70 Westbound Ramps operate acceptably during the AM and PM peak hours. All movements are anticipated to continue to operate acceptably during both peak hours throughout the 2008 near term horizon prior to the addition of project traffic. However, with the current intersection configuration and addition of project traffic in 2008, the westbound approach to the intersection is anticipated to operate with excessive delays. It is believed that improvements needed to maintain acceptable level of service at this intersection are to include signalization. Signalization is anticipated to be required when approximately 50 percent of the project is constructed. With signalization, the intersection is anticipated to operate acceptably with the addition of project traffic in both the 2008 and 2025 horizons without any additional improvements. Table 3 provides the results of the level of service at this intersection.

**Table 3 - SH-6 & I-70 Westbound Ramps LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2005 Existing TWO-WAY STOP CONTROL				
Northbound Approach	7.3	A	7.4	A
Westbound Approach	10.6	B	17.6	C
2008 Background TWO-WAY STOP CONTROL				
Northbound Approach	7.3	A	7.4	A
Westbound Approach	10.6	B	18.1	C
2008 Background Plus Project SIGNALIZED	12.7	B	26.3	C
2025 Background TWO-WAY STOP CONTROL				
Northbound Approach	7.4	A	7.5	A
Westbound Approach	12.1	B	61.7	F
2025 Background Plus Project SIGNALIZED	12.7	B	47.6	D

**SH-6 & I-70 Eastbound Ramps**

The intersection of SH-6 with the I-70 Eastbound Ramps currently operates with stop control along the ramp. As such, all movements operate acceptably during both AM and PM peak hours. In the 2008 near term horizon year, all movements at this unsignalized intersection are anticipated to continue to operate acceptably with or without the addition of project traffic. In the 2025 long term horizon year, all movements at this unsignalized intersection are anticipated to continue to operate acceptably prior to the addition of project traffic. With the addition of project traffic in 2025, the eastbound approach may experience longer than average delays (approximately 40.1 seconds) and LOS E. However, these are right turning vehicles so signalization is not believed to be warranted or needed. Rather, it is anticipated that right turning movements would occur during the northbound left turn movement phase at the signalized SH-6 & I-70 Westbound Ramp intersection. It is believed that HCS overestimated the delay on this right turn movement without accurately accounting for the gap created by the signal at the other ramp intersection. If desired, to improve operations of this right turn movement in 2025, a larger right turn radius and acceleration lane could be constructed. Table 4 provides the results of the level of service at this intersection.

**Table 4 - SH-6 & I-70 Eastbound Ramps LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2005 Existing				
Southbound Approach	8.1	A	7.7	A
Eastbound Approach	9.4	A	11.4	B
2008 Background				
Southbound Approach	8.1	A	7.7	A
Eastbound Approach	9.4	A	11.4	B
2008 Background Plus Project				
Southbound Approach	8.7	A	9.2	A
Eastbound Approach	10.6	B	22.0	C
2025 Background				
Southbound Approach	8.6	A	8.0	A
Eastbound Approach	10.0	A	14.0	B
2025 Background Plus Project				
Southbound Approach	9.2	A	9.6	A
Eastbound Approach	11.7	B	40.1	E

**SH-6 & I-70 Frontage Road**

The intersection of SH-6 with the I-70 Frontage Road is a roundabout. As such, all approaches currently operate acceptably. In the horizon years of 2008 and 2025, this intersection is anticipated to continue to operate acceptably with its current configuration, with or without the addition of project traffic. Table 5 provides the results of the level of service at this intersection.

**Table 5 – SH-6 & I-70 Frontage Road LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2005 Existing				
South Approach	4.5	A	5.7	A
East Approach	9.1	A	8.2	A
North Approach	5.0	A	5.3	A
West Approach	7.1	A	7.7	A
2008 Background				
South Approach	4.5	A	5.7	A
East Approach	9.2	A	8.3	A
North Approach	5.0	A	5.4	A
West Approach	7.2	A	7.9	A
2008 Background Plus Project				
South Approach	4.4	A	5.1	A
East Approach	10.2	B	12.0	B
North Approach	4.6	A	6.1	A
West Approach	7.7	A	12.8	B
2025 Background				
South Approach	4.6	A	5.9	A
East Approach	9.8	A	8.7	A
North Approach	5.1	A	5.9	A
West Approach	7.5	A	8.9	A
2025 Background Plus Project				
South Approach	4.6	A	5.6	A
East Approach	11.1	B	13.4	B
North Approach	4.8	A	12.2	B
West Approach	8.2	A	19.2	B

**SH-6 & Valley Road**

This signalized intersection was found to operate at acceptable level of service B for the existing AM and PM peak hours. In both 2008 and 2025 horizon years, this intersection is expected to continue to operate at LOS B during both AM and PM peak hours, prior to the addition of project traffic. With the addition of project traffic in 2008, this intersection is anticipated to continue to operate acceptably during both AM and PM peak hours (LOS B and C). In 2025, this intersection is expected to continue to operate acceptably with the addition of project traffic during both AM and PM peak hours (LOS B and D). Table 6 provides the results of the level of service at this intersection.

**Table 6 - SH-6 & Valley Road LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2005 Existing	10.9	B	11.4	B
2008 Background	11.0	B	11.4	B
2008 Background Plus Project	10.6	B	23.0	C
2025 Background	12.7	B	13.7	B
2025 Background Plus Project	13.0	B	42.2	D

**SH-6 & Oak Ridge Road**

The intersection of SH-6 with Oak Ridge Road is signalized and currently operates at LOS B during both AM and PM peak hours. Prior to the addition of project traffic in both near term 2008 and long term 2025 horizon years, the intersection is anticipated to continue to operate at LOS B during both AM and PM peak hours. With the addition of project traffic in 2008, it is anticipated that the intersection will continue to operate acceptably during both AM and PM peak hours at LOS B. With the addition of project traffic in 2025, this intersection is anticipated to operate acceptably at LOS C during the AM and PM peak hours without modification. Table 7 provides the results of the level of service at this intersection.

**Table 7 - SH-6 & Oak Ridge Road LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2005 Existing	13.1	B	12.1	B
2008 Background	13.2	B	12.2	B
2008 Background Plus Project	16.8	B	16.2	B
2025 Background	18.3	B	13.7	B
2025 Background Plus Project	31.1	C	25.0	C

### SH-6 & Jules Drive

The T-intersection of SH-6 with Jules Drive operates with stop control along Jules Drive. As such, all movements currently operate with acceptable level of service during both AM and PM peak hours. In the background horizons of 2008 and 2025, all movements are anticipated to operate with acceptable level of service. With the addition of project traffic in 2008 and 2025, all movements are anticipated to continue to operate with acceptable level of service. It is recommended that an acceleration lane be constructed for the northbound to westbound left turning vehicles. Table 8 provides the results of the level of service at this intersection.

**Table 8 - SH-6 & Jules Drive LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>2005 Existing</b>				
Westbound Left	7.9	A	7.8	A
Northbound Left	12.8	B	13.0	B
Northbound Right	10.3	B	9.9	A
<b>2008 Background</b>				
Westbound Left	8.0	A	7.8	A
Northbound Left	10.7	B	13.1	B
Northbound Right	10.4	B	9.9	A
<b>2008 Background Plus Project</b>				
Westbound Left	8.5	A	10.8	B
Northbound Left	11.8	B	20.8	C
Northbound Right	13.4	B	19.3	C
<b>2025 Background</b>				
Westbound Left	8.3	A	8.1	A
Northbound Left	16.0	C	16.8	C
Northbound Right	11.6	B	10.8	B
<b>2025 Background Plus Project</b>				
Westbound Left	8.9	A	11.6	B
Northbound Left	12.9	B	25.2	D
Northbound Right	16.1	C	23.3	C

### **5.3 Project Access Issues**

Three access scenarios have been evaluated within this study to determine appropriate access along SH-6 for the commercial and hotel portions of the development. It is important to recognize that the project extends for approximately one-mile along the south side of SH-6, east of Jules Drive. Since the commercial and office/hotel portions of the development only have frontage along SH-6, it was not possible to evaluate a "No Highway Access Scenario." While efficient, reasonable access to and from this regional commercial development requires multiple points of ingress and egress to serve customers and delivery vehicles, the site was first evaluated with a single full movement access to and from the commercial development and a right-in/right-out for the hotel (Scenario 1). An additional full movement access was added and studied for the commercial portion of the development (Scenario 2). And, a needed additional right-in/right-out access driveway for the commercial development was also studied (Scenario 3). It was found that both of the proposed full movement driveway intersections with SH-6 would warrant and require signalization (MUTCD Peak Hour Warrant Figures provided in Appendix G).

The results of the operational analysis for the project site driveways for each scenario are shown in Table 9 with calculations provided in Appendix F. The operational analysis was conducted using Synchro software. It is important to note that since right turn deceleration and acceleration lanes will be provided at all proposed access locations along SH-6, the right-in/right-out access driveways will experience no delay. Therefore, analysis results are not applicable for these locations.

**Table 9 - Access Driveway LOS Results**

Scenario Access Location Movement	2008 Background Plus Project Traffic				2025 Background Plus Project Traffic			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>Scenario 1</b>								
Access A/Jules Dr WB Approach	9.2	A	9.4	A	9.3	A	9.6	A
SB Approach	5.0	A	5.9	A	4.6	A	5.6	A
Access D/SH-6 Signalized	17.4	B	61.7	E	19.5	B	71.2	E
<b>Scenario 2</b>								
Access A/Jules Dr WB Approach	9.2	A	9.4	A	9.3	A	9.6	A
SB Approach	5.0	A	5.9	A	4.6	A	5.6	A
Access B/SH-6 Signalized	14.9	B	18.4	B	17.8	B	21.7	C
Access D/SH-6 Signalized	8.0	A	15.4	B	8.9	A	18.0	B
<b>Scenario 3</b>								
Access A/Jules Dr WB Approach	9.2	A	9.4	A	9.3	A	9.6	A
SB Approach	5.0	A	5.9	A	4.6	A	5.6	A
Access B/SH-6 Signalized	12.2	B	17.0	B	13.4	B	18.5	B
Access D/SH-6 Signalized	8.6	A	14.6	C	9.8	A	14.7	C

Based upon results from the analysis, it was determined that either Scenario 2 or Scenario 3 provides acceptable traffic operations. Scenario 3 was found to be the appropriate access scenario, which includes two full movement signalized access driveways and two right-in/right-out access driveways along SH-6, along with one full movement access driveway to serve the residential development along Jules Drive. This proposed access to and from the development via SH-6 is anticipated to optimize the internal site circulation. Vehicles entering and exiting the commercial portion of the site will be spread over several access points, rather than concentrating all vehicles to one access.

#### **5.4 Auxiliary Lane Recommendations along SH-6**

It is recommended that all auxiliary lanes along project frontage be constructed in accordance with the current CDOT State Highway Access Code. The State Highway Access Category Schedule categorizes the segment of SH-6 adjacent to the site as RA. In the site vicinity, SH-6 provides primarily a single lane of travel in each direction with a 55 mile per hour posted speed limit. As such, turn lane requirements at the intersections of SH-6 with the proposed access driveways are as follows:

- At the intersection of Jules Drive with SH-6, an eastbound to southbound right turn deceleration lane is required for residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this deceleration lane is recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.
- To serve residential traffic, a westbound to southbound left turn deceleration lane is required at the intersection of Jules Drive with SH-6 according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this left turn deceleration lane is recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. The storage requirement for this left turn lane is 125 feet. Therefore, this left turn deceleration lane should be constructed providing a full lane width for 500 feet with an additional 225 foot taper.
- For residential traffic, an acceleration lane is recommended for the receiving lane of the northbound to westbound left turns at the SH-6 and Jules Drive intersection. This acceleration lane should be constructed with a length of 960 feet, which includes the 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.

- At the Jules Drive and SH-6 intersection, a northbound to eastbound right turn acceleration lane is required to serve residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this right turn acceleration lane is recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.
- At all proposed commercial access locations along SH-6, eastbound to southbound right turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these deceleration lanes are recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.
- At the proposed two full movement commercial accesses along SH-6, westbound to southbound left turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these left turn deceleration lanes are recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. With two full movement accesses serving the site, the western driveway (Access B) requires 100 feet for vehicle storage, while the eastern driveway (Access D) requires 175 feet for vehicle storage. Therefore, the left turn deceleration lane for the western full movement driveway (Access B) should be constructed providing a full lane width (assumed 12 feet) for 475 feet with an additional 225 foot taper. The left turn deceleration lane for the eastern full movement driveway (Access D) should be constructed providing a full lane width for 550 feet with an additional 225 foot taper.
- At all commercial accesses along SH-6, northbound to eastbound right turn acceleration lanes are required according to the State Highway Access Code for category RA roadways.

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According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these right turn acceleration lanes are recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

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Based on the analysis presented in this report, Kimley-Horn believes the proposed Tower Center Development and associated out parcels will be successfully incorporated into the future roadway network. The proposed project development and expected traffic volumes resulted in the following recommendations:

- The intersection of SH-6 with the westbound I-70 ramp of the Gypsum interchange is recommended to be signalized due to the increase in traffic expected on the westbound and northbound left turns. It is anticipated that this intersection will require signalization upon construction of approximately 50 percent of the project.
- Scenario 3 was found to be the appropriate access scenario, which includes two full movement signalized access driveways and two right-in/right-out access driveways along SH-6, along with one full movement access driveway to serve the residential development along Jules Drive. Therefore, it is recommended that CDOT approve this access scenario. This proposed access to and from the development via SH-6 will optimize the internal site circulation. Vehicles entering and exiting the commercial portion of the site will be spread over several access points, rather than concentrating all vehicles to one access.
- It is recommended that both proposed full movement commercial accesses along SH-6 be signalized.
- At the intersection of Jules Drive with SH-6, an eastbound to southbound right turn deceleration lane is required for residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this deceleration lane is recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.

- To serve residential traffic, a westbound to southbound left turn deceleration lane is required at the intersection of Jules Drive with SH-6 according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this left turn deceleration lane is recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. The storage requirement for this left turn lane is 125 feet. Therefore, this left turn deceleration lane should be constructed providing a full lane width for 500 feet with an additional 225 foot taper.
- For residential traffic, an acceleration lane is recommended for the receiving lane of the northbound to westbound left turns at the SH-6 and Jules Drive intersection. This acceleration lane should be constructed with a length of 960 feet, which includes the 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.
- At the Jules Drive and SH-6 intersection, a northbound to eastbound right turn acceleration lane is required to serve residential traffic according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, this right turn acceleration lane is recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, this lane should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.
- At all proposed commercial access locations along SH-6, eastbound to southbound right turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these deceleration lanes are recommended to be designed to provide 600 feet for deceleration, which includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 375 feet with an additional 225 foot taper.

- At the proposed two full movement commercial accesses along SH-6, westbound to southbound left turn deceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these left turn deceleration lanes are recommended to be designed to provide 600 feet for deceleration plus storage. The 600 feet for deceleration includes an 18.5 to 1 taper. With two full movement accesses serving the site, the western driveway (Access B) requires 100 feet for vehicle storage, while the eastern driveway (Access D) requires 175 feet for vehicle storage. Therefore, the left turn deceleration lane for the western full movement driveway (Access B) should be constructed providing a full lane width (assumed 12 feet) for 475 feet with an additional 225 foot taper. The left turn deceleration lane for the eastern full movement driveway (Access D) should be constructed providing a full lane width for 550 feet with an additional 225 foot taper.
- At all commercial accesses along SH-6, northbound to eastbound right turn acceleration lanes are required according to the State Highway Access Code for category RA roadways. According to the Access Code for category RA roadways with a 55 mile per hour speed limit, these right turn acceleration lanes are recommended to be designed to provide 960 feet for acceleration. This includes an 18.5 to 1 taper. Therefore, these lanes should be constructed for a full lane width (assumed 12 feet) for 735 feet with an additional 225 foot taper.
- As development occurs, it is recommended that CDOT monitor SH-6 to determine if a reduction in the speed limit or a change in classification is needed.
- Summation of the acceleration lane and deceleration lane lengths along eastbound SH-6 between the project access points would require 1110 feet (735 feet for acceleration and 375 feet for deceleration). With the proposed driveway configurations, there is approximately 1200 feet between Jules Drive and Access B, 750 feet between Access B and Access C, 775 feet between Access C and Access D, and 975 feet between Access D and Access E.

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Therefore, the acceleration and deceleration lanes are recommended to be constructed as a continuous auxiliary lane along project frontage between Jules Drive and Access E.

- All on-site and off-site signing and striping improvements should be incorporated into the Civil Drawings, and conform to CDOT and Town of Gypsum standards, as well as the Manual on Uniform Traffic Control Devices – 2003 Edition (MUTCD).