Kimley»Horn

Traffic Engineer's Statement

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

Curtis D. Rowe, P.E., PTOE, PE #36355 — May 1, 2020
Date

Developer's Statement

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

Mr. Kyle Katos — May 1, 2020
Date

KESS Properties, LLC
4955 Austin Bluffs Parkway
Colorado Springs, CO 80918

May 1, 2020

Mr. Mark Phelan
KESS Properties, LLC
4955 Austin Bluffs Parkway
Colorado Springs, CO 80918

Re: The Shire at Old Ranch
Traffic Study Deviation Letter
El Paso County, Colorado

Dear Mr. Phelan:

This traffic study letter has been prepared for The Shire at Old Ranch proposed nursery to be located on the northeast corner of the Old Ranch Road and Howells Road intersection in El Paso County, Colorado. A vicinity map illustrating the location of the proposed development is attached as **Figure 1**.

Specifically, this letter has been prepared to provide a deviation request to allow access to the project along Howells Road as directed by El Paso County staff per the El Paso County Engineering Criteria Manual (El Paso ECM), 2016. A deviation is believed to be needed due to County standards identifying that access can only be granted from a lesser category street. Ridgeway Lane to the north is a local roadway whereas Howells Road to the west is a collector roadway. It is understood that a deviation is a critical aspect of the review process and needs to be documented to ensure that the deviations granted are applied to a specific development application in conformance with the criteria for approval. It is our hope that this study provides the County the needed information to grant this deviation request.

The project is bound by single family residences in all directions with rural ranch style homes located to the north and the east while typical urban style single family communities are located to the south and the west. Pine Creek High School is located in the extended area further to the west. The site area is shown within an aerial of attached **Figure 2**. A conceptual site plan for the proposed development is also attached.

This traffic study identifies the amount of project traffic associated with this proposed development and the resultant trip distribution and traffic assignment on the adjacent streets and public roadway intersections. An operational analysis was performed for the intersections of Ridgeway Lane/Howells Road and Old Ranch Road/Howells Road. In addition, the proposed full movement project access proposed to be located along Howells Road was included for evaluation. Analysis was performed for the 2020 short term development horizon as well as the 2040 long-term twenty-year horizon.

Existing Roadway Network and Traffic Counts
Regional access will be provided by State Highway 21 (SH-21) while primary access will be provided by Old Ranch Road. Direct access to the project is proposed from one full movement access along Howells Road.

Old Ranch Road is a collector street providing one through lane in each direction, eastbound and westbound, with a 45 mile per hour speed limit east of Howells Road and a 35 mile per speed limit west of Howells Road. Howells Road is an unpaved collector street while Ridgeway Lane is an unpaved local street.

The existing T-intersection of Ridgeway Lane and Howells Road is stop controlled in the westbound Ridgeway Lane approach direction. Lane configurations are not defined at this intersection due to both roadways being unpaved. However, this intersection was analyzed with single shared movements lanes on all three approaches.

The T-intersection of Old Ranch Road and Howells Roads is unsignalized with stop control along the southbound Howells Road approach. The eastbound approach of this intersection provides a left turn lane within an existing two-way left turn lane and one through lane. The westbound approach provides one through lane and a right turn lane currently not built to County standards. The southbound approach has a paved section for approximately 50 feet before transitioning to an unpaved roadway. This southbound approach provides a single shared lane to serve all movements. An existing intersection lane configuration and control figure is attached as **Figure 3**.

Existing weekday afternoon peak hour and Saturday midday peak hour of the generator turning movement counts were conducted at the study key intersections, Ridgeway Lane/Howells Road and Old Ranch Road/Howells Road, on Thursday, March 21, 2019 and on Saturday, March 30, 2019. The weekday counts were conducted in 15-minute intervals during the afternoon peak hours of adjacent street traffic from 4:00 PM to 6:00 PM. Likewise, the Saturday counts were conducted in 15-minute intervals during the peak hour of the generator traffic from 12:00 PM to 2:00 PM. Existing turning movement counts are shown in attached **Figure 4** with count sheets attached as well.

Unspecified Development Traffic Growth
In order to obtain traffic volumes for the future build out and twenty-year study horizons, future traffic volume projections were obtained from surrounding area traffic information, including from traffic projections from the El Paso County Major Transportation Corridor Plan (El Paso MTCP) and from Colorado Department of Transportation (CDOT) traffic information. According to information provided on the CDOT Online Transportation Information System (OTIS) website, the 20-year growth factor along Powers Boulevard (SH-21), south of Old Ranch Boulevard in the vicinity of the project, is 1.56, which equates to an annual growth rate of approximately 2.25 percent.

Additional information provided by the El Paso MTCP was used to determine annual traffic volume growth rates along Burgess Road, Shoup Road, and Black Forest Road. The annual growth rate for Burgess Road, east of Milam Road, was determined to be 1.81 percent while the annual growth rate for Shoup Road, west of Milam Road, was found to be 3.56 percent. Further, the annual growth rate for Black Forest Road, north of Burgess Road, was found to

be 3.88 percent. An overview of both the El Paso MTCP and CDOT traffic growth information for the study area are attached with this letter.

Both El Paso MTCP and CDOT traffic projection estimates were used to calculate an overall average annual growth rate of 2.87 percent. Based on this, an annual growth projection of three percent (3%) was used to calculate future traffic volumes within the project study area. It should be noted that Milam Road will extend south of South of Old Ranch Road and will connect with Union Boulevard/Grand Cordera Parkway to the south. This extension of Milam Road is expected to be constructed and open soon. The extension of Milam Road will likely reduce the traffic volumes along Old Ranch Road; however, traffic volumes were not reduced along Old Ranch Road to provide a conservative analysis. The 3 percent annual growth rate was used to estimate near term 2020 and long term 2040 traffic volume projections at the key intersections. Background traffic volumes for 2020 and 2040 are shown in attached **Figures 5** and **6**, respectively.

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 is the *Trip Generation Manual*[1] published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses.

Project generated traffic volumes are identified on a weekday daily as well as on an afternoon peak hour of the adjacent street and Saturday peak hour of the generator basis. The afternoon peak hour is the highest one-hour time period of adjacent street traffic during four consecutive 15-minute intervals between the hours of 4:00 pm and 6:00 pm. The Saturday peak hour is the highest one-hour time period of site traffic during four consecutive 15-minute intervals between the hours of 12:00 pm and 2:00 pm.

For this study, ITE Trip Generation average rate equations that apply to Hotel (ITE Code 310), Campground (ITE 416), Office (ITE 710), Nursery Garden Center (ITE 817), Nursery Wholesale (ITE 818), Arts and Craft (ITE 879), and Sit-Down Restaurant (ITE 932) were used for traffic associated with the proposed development. The restaurant use is expected to capture trips within the site and was accounted for in calculations for total external trips for the project. The following **Table 1** summarizes the anticipated trip generation for the proposed project with the trip generation calculations worksheet attached.

The site is expected to contain six (6) guest housing yurt sites and four (4) campsites which categorized as hotel and campground. A metal shop, wood shop, and ceramics shop are proposed which were categorized as arts and crafts. These three shops are conduct classes. A café is also proposed on the property which was evaluated under sit-down restaurant. The proposed equipment barn and animal barn will not be for the public and is not expected to generate traffic. It is possible for the facility to host special events, but these will not occur frequently and are not expected to be planned during the peak hours of travel.

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1 Institute of Transportation Engineers, *Trip Generation Manual*, Tenth Edition, Washington DC, 2017.

Table 1 – The Shire at Old Ranch Project Traffic Generation

Land Use	Quantity	Units	Vehicle Trips						
			Weekday Daily	Weekday PM Peak Hour			Saturday Peak Hour of Generator		
				In	Out	Total	In	Out	Total
Total Site Generated Trips									
Hotel (ITE 310)	6	Rooms	50	2	2	4	2	2	4
Campground (ITE 416)	4	Campsites	20	1	0	1	*1	*0	*1
Office (ITE 710)	5,300	Square Feet	52	1	5	6	2	1	3
Nursery - Garden Center (ITE 817)	25,300	Square Feet	1,724	88	88	176	254	254	508
Nursery - Wholesale (ITE 818)	4,500	Square Feet	176	12	11	23	11	14	25
Arts and Craft Store (ITE 879)	3,000	Square Feet	170	9	10	19	*9	*10	*19
Sit-Down Restaurant (ITE 932)	2,500	Square Feet	282	15	9	24	14	14	28
Total Site Generated Trips			2,474	128	125	253	283	285	568
Internal Capture Trips									
Sit-Down Restaurant (ITE 932)	2,500	Square Feet	141	8	5	12	7	7	14
Total External Trips after Internal Capture			**2,333**	**121**	**121**	**241**	**276**	**278**	**554**

* = Includes Weekday PM Peak Hour due to Saturday Peak Hour of Generator Data not provided by ITE

As summarized in the table above, The Shire at Old Ranch project is anticipated to generate approximately 2,333 daily external weekday trips with 241 of these trips occurring during the afternoon peak hour. Further, 554 external project trips are expected to be generated during the peak hour on a Saturday.

Distribution, Assignment, and Total Traffic

Distribution of site traffic was based on the area street system characteristics, existing traffic patterns and volumes, and the proposed access system for the project. The 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 the original source. Project traffic originating from either direction can access the site. Two separate trip distributions were developed for the project due to the deviation request for allowing a full movement access along Howells Road. Project trip distribution Scenario 1 includes providing access along Howells Road while Scenario 2 includes access only along Ridgeway Lane to meet current County standards. Attached **Figure 7** illustrates the expected trip distribution under Scenario 1 for the proposed project, while **Figure 8** provides the trip distribution for Scenario 2.

Traffic assignment was obtained by applying the project trip distribution to the estimated project traffic generation of the development shown in the trip generation table. The traffic assignment for project traffic Scenario 1 is shown in **Figure 9** while project traffic for Scenario 2 is shown in **Figure 10**. Site traffic volumes were added to the 2020 and 2040 background volumes to represent estimated build-out year and long-term traffic conditions. These total traffic volumes for 2020 are illustrated in **Figure 11** for Scenario 1 and **Figure 12** for Scenario 2. Likewise, the 2040 total traffic volumes are shown in **Figure 13** for Scenario 1 and **Figure 14** for Scenario 2.

Traffic Operations Analysis

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies at the project key intersections for the 2020 buildout and 2040 long term horizons. The acknowledged source for determining overall capacity is the *Highway Capacity Manual.*

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, typical traffic study practice identifies overall intersection LOS D and movements or approaches LOS E as the minimum thresholds for acceptable operations. The following **Table 2** shows the definition of level of service for signalized and unsignalized intersections. Intersection level of service capacity analysis outputs are attached.

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, Sixth Edition, Transportation Research Board, 2016.

Ridgeway Lane and Howells Road

The existing T-intersection of Ridgeway Lane and Howells Road operates with stop control on the westbound Ridgeway Lane approach. All movements at this intersection currently operate acceptably with LOS A during the morning and afternoon peak hours. With addition of project traffic and accesses allowed along Howells Road (Scenario 1), all movements at this intersection are expected to continue to operate acceptably with LOS A during the peak hours throughout the 2040 horizon. With an access only located along Ridgeway Lane (Scenario 2), all movements at this intersection are expected to operate acceptably during the peak hours in 2020 and 2040, however the westbound approach degrades to a LOS C. **Table 3** provides the results of the level of service analysis for this intersection.

Table 3 – Ridgeway Lane and Howells Road LOS Results

Scenario	PM Peak Hour		Saturday Peak	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2019 Existing				
Westbound Approach	8.8	A	8.8	A
Southbound Left	-	A	-	A
2020 Background				
Westbound Approach	8.8	A	8.8	A
Southbound Left	-	A	-	A
2020 Total Traffic (Scenario 1)				
Westbound Approach	8.9	A	9.0	A
Southbound Left	-	A	-	A
2020 Total Traffic (Scenario 2)				
Westbound Approach	10.6	B	15.6	C
Southbound Left	7.7	A	8.1	A
2040 Background				
Eastbound Left	9.1	A	9.0	A
Southbound Approach	-	A	-	A
2040 Total Traffic (Scenario 1)				
Westbound Approach	9.2	A	9.2	A
Southbound Left	-	A	-	A
2040 Total Traffic (Scenario 2)				
Westbound Approach	11.1	B	15.9	C
Southbound Left	7.7	A	8.1	A

Scenario 1: Includes full movement access along Howells Road
Scenario 2: Includes one access along Ridgeway Lane only

Old Ranch Road and Howells Road

The existing T-intersection of Old Ranch Road and Howells Road operates with stop control on the southbound Howells Road approach. All movements at this intersection currently operate acceptably with LOS B or better during the morning and afternoon peak hours. With addition of project traffic, all movements at this intersection are expected to continue to operate acceptably with LOS C or better during the peak hours in 2022. In 2040 with the addition of project traffic and separate southbound left turn and right turn lanes, the southbound left turn may operate with a LOS E if future traffic projections are realized. However, 35 seconds is the threshold from going from D to E, so the southbound left turn is just 0.2 seconds of delay per vehicle during the morning peak hour and 0.1 seconds of delay per vehicle during the afternoon peak hour from operating at LOS D. The southbound approach is anticipated to operate at LOS B during the morning peak hour and LOS C during the afternoon peak hour. Of note, whether access is provided along Howells Road or Ridgeway Lane for this project, the traffic volumes will be the same through this intersection for both access scenarios. **Table 4** provides the results of the level of service analysis for this intersection.

Table 4 – Old Ranch Road and Howells Road LOS Results

	PM Peak Hour		Saturday Peak	
Scenario	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
2019 Existing				
Eastbound Left	7.8	A	7.6	A
Southbound Approach	10.1	B	9.4	A
2020 Background				
Eastbound Left	7.8	A	7.6	A
Southbound Approach	10.2	B	9.5	A
2020 Total Traffic (Scenario 1 & 2)				
Eastbound Left	8.3	A	8.3	A
Southbound Approach	11.6	B	12.8	C
Southbound Left Turn	21.7	C	22.8	C
Southbound Right Turn	10.6	B	11.7	B
2040 Background				
Eastbound Left	8.4	A	8.0	A
Southbound Approach	13.4	B	10.9	B
2040 Total Traffic (Scenario 1 & 2)				
Eastbound Left	8.5	A	8.9	A
Southbound Approach	13.8	B	16.0	C
Southbound Left Turn	35.1	E	35.0	E
Southbound Right Turn	11.8	B	13.9	B

Scenario 1: Includes full movement access along Howells Road
Scenario 2: Includes one access along Ridgeway Lane only

Project Access Operational Analysis
With completion of The Shire at Old Ranch development, the site proposes one access location, a full movement access along the east side of Howells Road. This access should be stop controlled with the installation of a R1-1 "STOP" sign on the exiting access approaches and a 115-foot northbound right turn lane constructed. The lane configuration and control recommendations are shown in **Figure 15**. With the Scenario 1 recommended lane configurations, all movements at the access along Howells Road are expected to operate acceptably with LOS B or better during the peak hours throughout the 2040 horizon.

A scenario with one full movement access along the south side of Ridgeway Lane was also evaluated due to El Paso County guidelines of not allowing access along major collectors. An access analysis is discussed and evaluated later in this study to allow access along Howells Road per a deviation request. With access only allowed along Ridgeway Lane, all movements at the Ridgeway Lane access are expected to operate with LOS B or better during the peak hours in 2020 and 2040.

The operational analysis at the proposed project driveways is summarized in **Table 5** for the short-term 2020 horizon and for the long-term 2040 horizon. Detailed results of the operational analysis are also attached.

Table 5 – Project Access LOS Results

	2020 Total Traffic				2040 Total Traffic			
	PM Peak Hour		Saturday Peak		PM Peak Hour		Saturday Peak	
Access and Movement	**Delay (sec/ veh)**	**LOS**	**Delay (sec/ veh)**	**LOS**	**Delay (sec/ veh)**	**LOS**	**Delay (sec/ veh)**	**LOS**
Scenario 1: Access along Howells Road Only								
Howells Road Access (Scenario 1)								
Westbound Approach	9.5	A	10.7	B	9.9	A	11.1	B
Southbound Left	7.5	A	7.9	A	7.6	A	7.9	A
Scenario 2: One Access along Ridgeway Lane Only								
Ridgeway Lane Access (Scenario 2)								
Northbound Approach	9.1	A	10.1	B	9.1	A	10.3	B

Deviation Request Access Analysis
A deviation to allow access along Howells Road as directed by El Paso County staff is evaluated in this section per the El Paso ECM. A deviation is a critical aspect of the review process and needs to be documented to ensure that the deviations granted are applied to a specific development application in conformance with the criteria for approval.

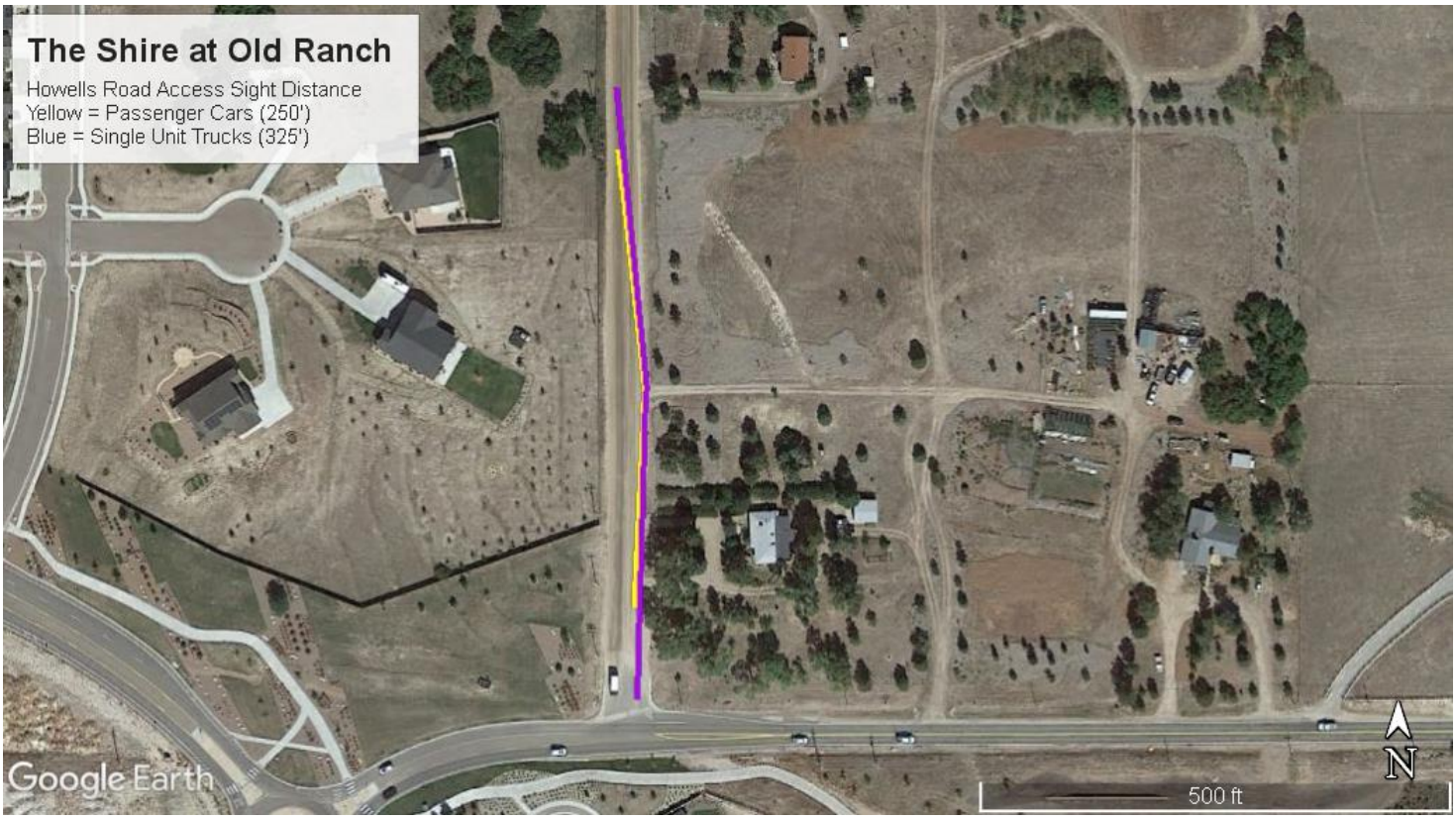
Table 2-5 from the El Paso ECM indicates that access along major collectors is not permitted if access from a lower category street is available. According to the El Paso ECM, accesses may be permitted as a deviation if they meet the criteria for sight distances and grades, turn lane requirements, and do not negatively impact traffic operations or safety.

The addition of such accesses also shall minimize impacts to queuing or blocking of lane entries or access points and minimize impacts to progression.

Sight Distances

It is recommended that sight triangles be provided at all site access points to give drivers exiting the site a clear view of oncoming traffic. Landscaping and objects within sight triangles must not obstruct drivers' views of the adjacent travel lanes. ECM design intersection sight distances for left turn from stop and right turn from stop were evaluated at the Howells Road access.

According to Table 2-36 from ECM and with a speed limit of 25 miles per hour along Howells Road, the intersection entering sight distance for a passenger car is 250 feet. The project site is expected to have minimal truck trips; however, sight distances were evaluated for both passenger cars and single unit trucks. Table 2-36: Entering Sight Distance (Access Design) from ECM was used for entering vehicles. With a speed limit of 25 miles per hour and a two-lane roadway along Howells Road, the entering sight distance is 325 feet for single unit trucks. All obstructions for left turn vehicles from stop at the Howells Road access should be clear to the left and right within a triangle created from the vertex point 10 feet from the traveled way edge and a line of sight distance of 325 feet located in the middle of the approaching through lane along Howells Road. The passenger car distance (yellow) and single unit truck (blue) distances are shown in following aerial.



As shown, the 325-foot sight distance requirement from the proposed Howells Road access will be to the north edge of the Old Ranch Road intersection to the south and to the existing residence access to the north. These distances were evaluated. The proposed access is located on the crest of a vertical curve along Howells Road. This provides an optimal location of the access intersection with acceptable sight distance to the north and south. Further, Howells Road is straight through this section without any horizontal curvature. A graphic is attached that provides photographs of the access and the associated sight distance available. Through this analysis, it is believed that adequate sight distance will be available for the Howells Road access intersection. This will be considered when the Howell Road improvements are designed.

Auxiliary Turn Lane Warrants and Length Criteria

A left turn lane is required with a projected peak hour ingress turning volume of 25 vehicles per hour (vph) or greater for any access along a minor arterial or lower classification roadway per the El Paso ECM. A right turn lane is required with a projected peak hour ingress turning volume of 50 vph or greater for any access along a minor arterial or lower classification roadway. An acceleration lane is generally not required. These thresholds were applied to the Old Ranch Road/Howells Road and Howells Road Access as follows:

Old Ranch Road/Howells Road

An eastbound left turn lane is warranted and exists today. This left turn lane is currently designated with two-way left turn lane striping for approximately 230 feet to the roundabout splitter island on the east leg. Based on a 30-mph design speed on this uncontrolled approach, the left turn lane length would include 50 feet for storage, 115 feet for deceleration, and a 120-foot taper. Therefore, it is recommended that this distance be striped with a left turn lane for 165 feet plus a 90-foot taper back to the splitter island crosswalk location. This is the maximum length available for this left turn lane.

Likewise, a southbound right turn lane is warranted at this intersection. This southbound right turn lane will be constructed as part of the paving improvements of Howells Road proposed as part of this project. Per El Paso County standards, the southbound right turn lane should include storage, plus deceleration of 115 feet and taper of 120 feet with a design speed of 30 mph. This is a stop-controlled approach, so the storage length is defined by the traffic volume instead of by actual queue length calculations. The southbound right turn volume is anticipated to be 255 vehicles per hour with project development, which indicates that this southbound right turn lane needs to provide a length of 250 feet plus 115 feet for deceleration plus a 120-foot taper. Therefore, this southbound right turn lane needs to provide a length of 365 feet plus a 120-foot taper to meet standards.

Howells Road Access

A northbound right turn lane will be required at the project access along Howells Road based on a projected 262 vph right turn movements during the Saturday peak hour with a threshold of 50 vph. The northbound right turn lane at the access along Howells Road should provide a right turn lane to include storage length plus 115 feet for deceleration plus a 120-foot taper per Table 2-25 of the El Paso ECM with a roadway that has a 30-mph design speed. This is an uncontrolled approach that shows a storage length of less than 1 vehicle. Therefore, 50 feet of storage is applied, which identifies that the northbound right turn lane should be constructed with a length of 165 feet plus 120-foot taper.

Intersection Operations, Vehicle Queuing and Progression

As indicated in the Traffic Operations Analysis section, the intersection of Old Ranch Road/Howells Road is expected to operate with the same LOS when access is proposed along Howells Road compared to only allowing access along Ridgeway Lane. However, movements at the intersection of Ridgeway Lane/Howells Road are expected to operate with better LOS and lower vehicle delays with the Howells Road access scenario (Scenario 1). Additionally, all movements at the project access along Howells Road are expected to operate acceptably with LOS B or better during the peak hours throughout the 2040 horizon.

A vehicle queuing analysis was performed for the study area intersections in 2020 and 2040 under both Scenario 1 and Scenario 2 access options. Vehicle queuing calculations are attached within the level of service operational sheets. Results of the queuing analysis and recommendations at the study area intersections are provided in **Table 6**.

Table 6 – Vehicle Queuing Analysis Results

Intersection Turn Lane	Scenario 1 2020 Calculated Queue Length (vehicles)	Scenario 2 2020 Calculated Queue Length (vehicles)	Scenario 1 2040 Calculated Queue Length (vehicles)	Scenario 2 2040 Calculated Queue Length (vehicles)
Ridgeway Ln & Howells Rd				
Westbound Approach	1	4	1	4
Southbound Left	1	1	1	1
Old Ranch Rd & Howells Rd				
Eastbound Left	1	1	1	1
Southbound Left	1	1	1	1
Southbound Right	2	2	3	3

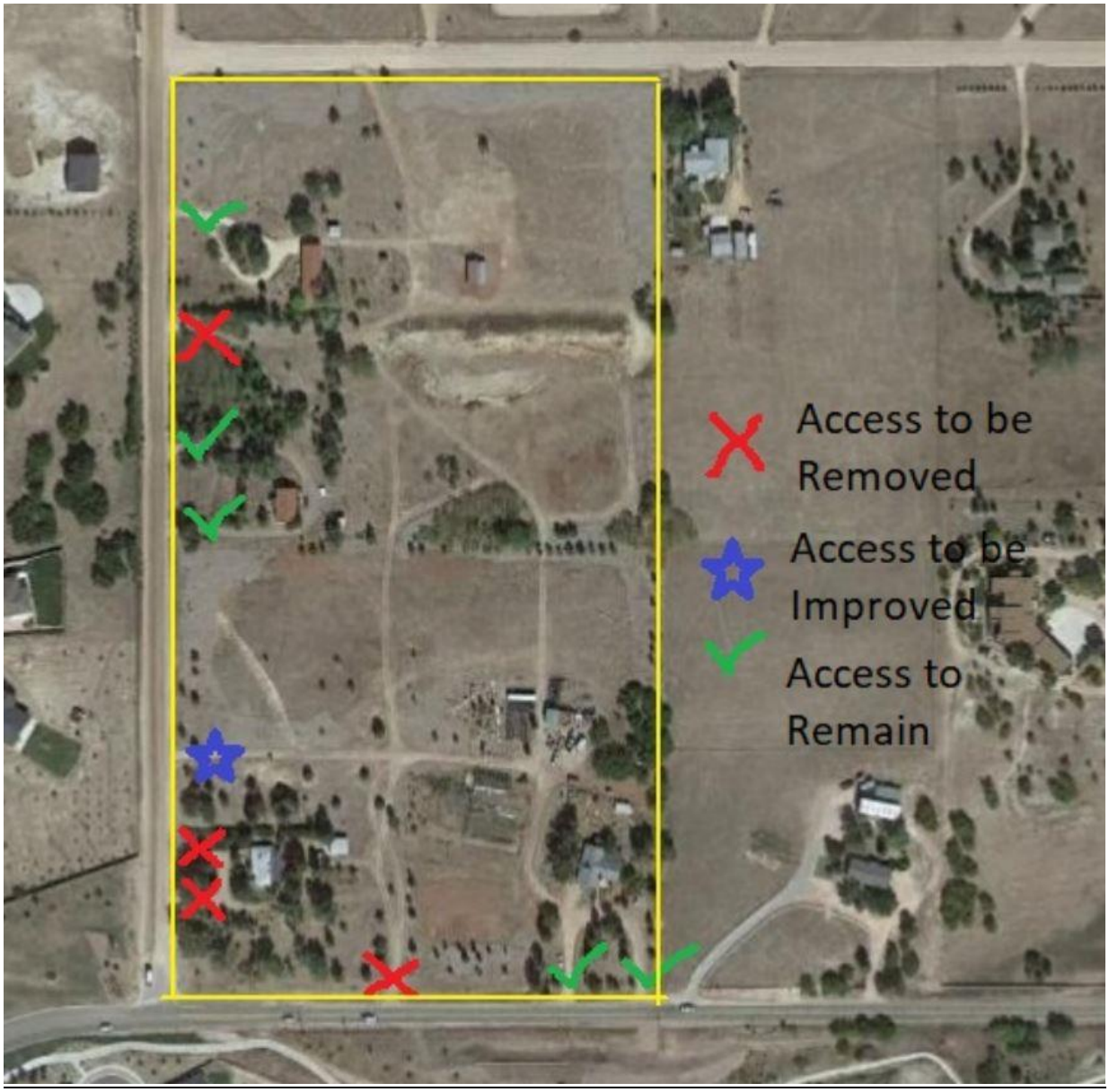
As documented in the LOS outputs (attached) and vehicle queuing table for the Ridgeway Lane and Howells Road intersection, all vehicle queues are expected to be one (1) vehicle for Scenario 1 with the Howells Road access. If access isn't provided along Howells Road and only access is allowed along Ridgeway Lane, then the westbound approach may be four (4) vehicles.

Progression of traffic will not be impacted at the proposed access location along Howells Road because this access intersection will not warrant or require signalization.

Existing Residential Access Removals

The existing site consists of four (4) residences. The residence located in the southeast portion of the site, located at 3890 Old Ranch Road will remain as a residence with its access to remain unmodified along Old Ranch Road. The residence located in the southwest portion of the site, directly on the northeast corner of the Old Ranch Road and Howells Road intersection at 3820 Old Ranch Road will be converted to office space and the accesses to this property from both Old Ranch Road and Howells Road will be removed. The proposed access for The Shire at Old Ranch development will be located at the existing access just to the north of this existing residence being converted to office. The two

residences located along Howells Road at 10655 Howells Road and 10755 Howells Road will remain as residences with their accesses to remain unmodified. However, there is an access between these two residences that will be removed. The following aerial shows the accesses to be removed (red X), the access to be improved as the proposed project access, and the residential accesses to remain (green check-mark). For the exhibit, the property is outlined in yellow. Ridgeway Lane is located along the north side of the property, Howells Road along the west side of the property, and Old Ranch Road along the south side of the property (north is up).



Additional Deviation Request Factors

Access granted only along Ridgeway Lane will change the character of the local street. Ridgeway Lane is classified as a local street and local streets can typically support approximately 750 vehicles per day while maintaining the local character with residential driveways. Based on this project with access only provided along Ridgeway Lane (Scenario 2), weekday and weekend daily project traffic volumes are expected be approximately 2,400 and 3,400 vehicles per day, respectively. These vehicles would all have to be directed to Ridgeway Lane if access was only permitted on Ridgeway Lane. These volumes alone would exceed the 750 vehicles per day typical threshold along a local street. Traffic volumes are currently very low along Ridgeway Lane and homeowners along this local street will not desire all traffic from this project routed onto their street. Additionally, access only along Ridgeway Lane would increase vehicle miles traveled (VMT), travel time, vehicle emissions, and reduce air quality.

It is respectfully being requested that a full movement access along Howells Road be allowed. If granted, it is recommended that the access along Howells Road be located a minimum of 330 feet (measured center to center) north of Old Ranch Road based on the deviation request analysis. This spacing distance has been based on evaluation of minimum spacing, turn lane requirements, and sight distances.

Recommendations and Conclusions

It is respectfully requested that access be allowed along Howells Road to serve The Shire at Old Ranch project. If granted, the following provides recommendations and conclusions based on this requested access condition:

- It is recommended that the access along Howells Road be located a minimum of 330 feet (measured center to center) north of Old Ranch Road based on the deviation request analysis.
- A northbound right turn lane should be provided at the access along Howells Road and be constructed with a lane length of 165 feet plus a 120-foot taper. Of note, since clear zone is calculated from the edge of the through lane, adding a right turn lane at this access intersection isn't anticipated to impact the clear zone. Based on fence lines along Howells Road, it appears that the roadway right-of-way is 60 feet, which is sufficient for the three lane section proposed.
- The proposed project access along Howells Road should be stop controlled with the installation of R1-1 "STOP" sign on the exiting access approach.
- Howells Road should be paved from Old Ranch Road to the proposed Howells Road Access per ECM Section 2.2.7.B.2: Existing Roads.
- The southbound approach of Howells Road to Old Ranch Road is recommended to include a 365-foot right turn lane with a 120-foot taper.
- The existing 235-foot long two-way left turn lane striping between the roundabout splitter island and Howells Road intersection along Old Ranch Road is recommended to be reconstructed and restriped to include a 165-foot left turn lane with 90-foot taper as available between the crosswalk on the east leg of the roundabout and Howells Road.

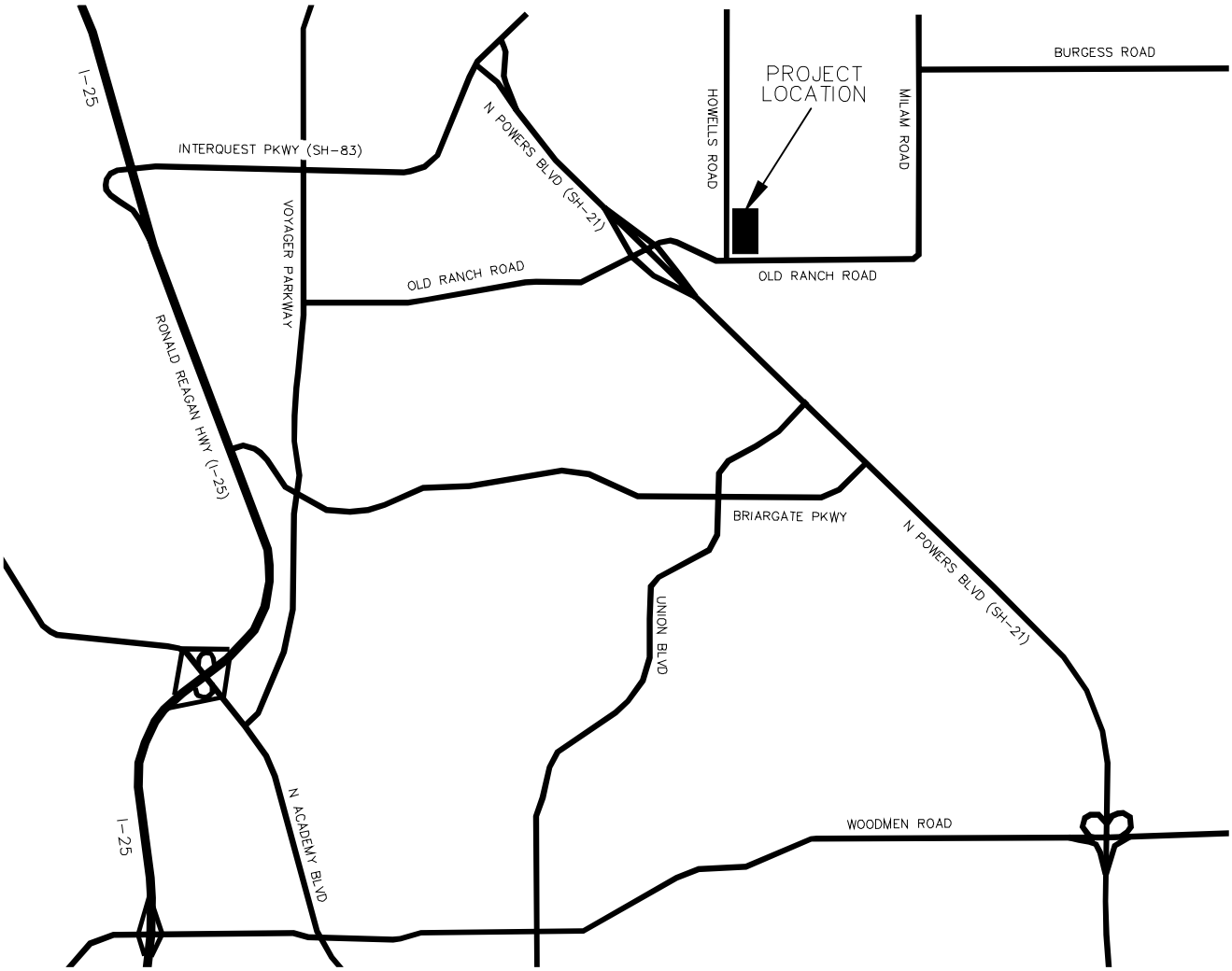
The recommended intersection lane configurations and control for the project intersections and access is illustrated in attached **Figure 15**.

In summary, this traffic study letter provides a deviation request to allow a full movement access along Howells Road. Kimley-Horn believes The Shire at Old Ranch project will be successfully incorporated into the existing and future roadway network. We respectfully request that El Paso County consider approval of this deviation request to allow access along Howells Road. If you have any questions or require anything further, please feel free to call me at (303) 228-2304.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Curtis D. Rowe, P.E., PTOE
Vice President

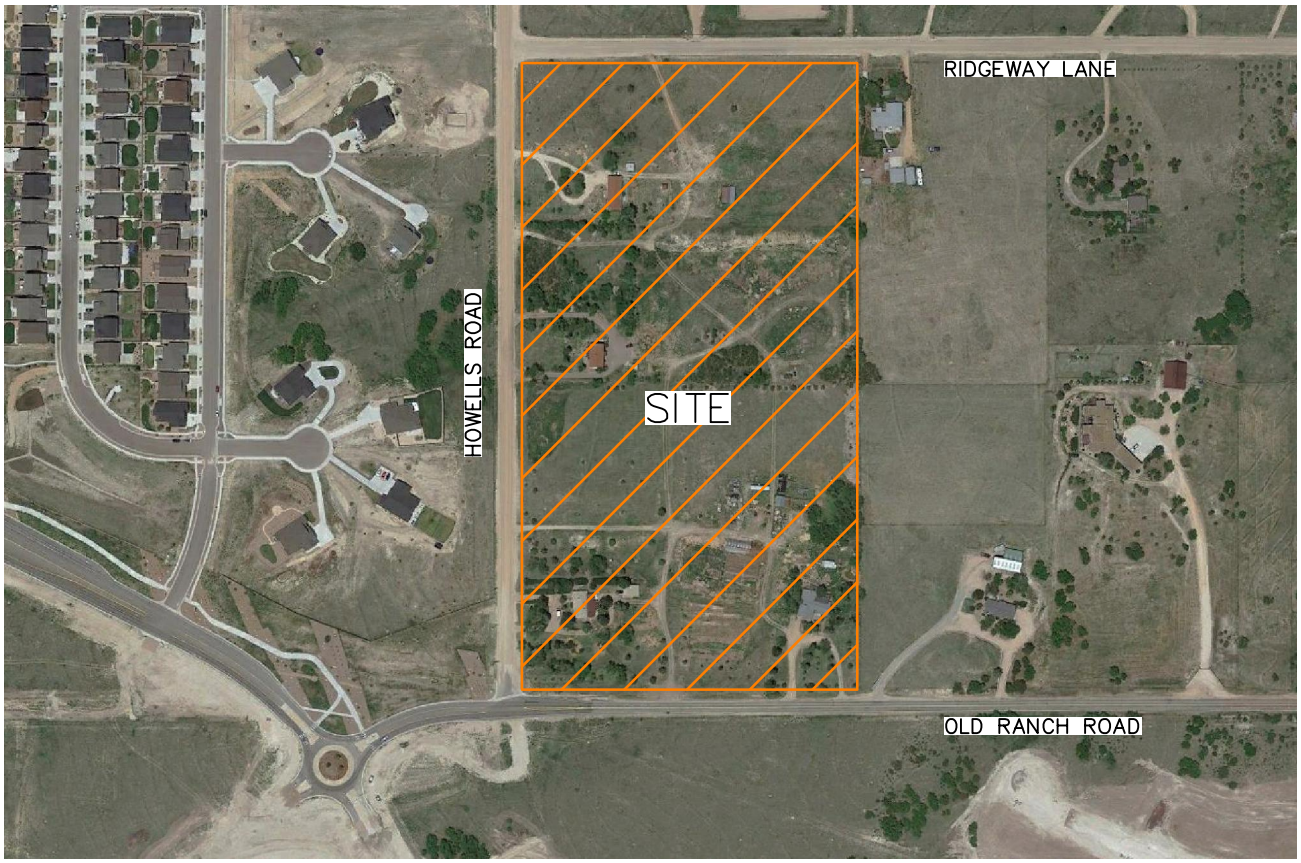


THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
VICINITY MAP

FIGURE 1

Kimley»Horn

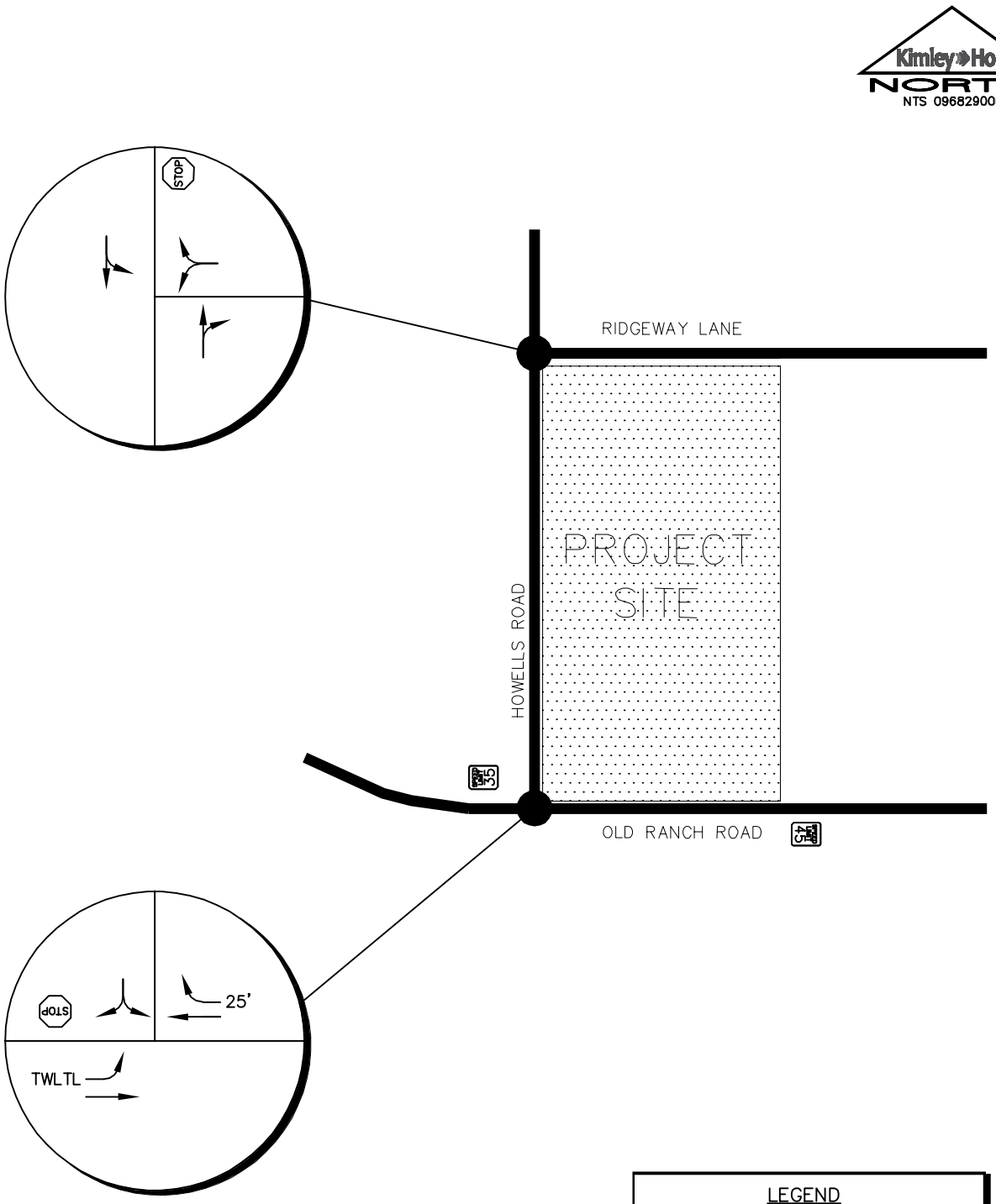
NORTH
NTS 096829000



THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
SITE AREA

FIGURE 2

Kimley»Horn



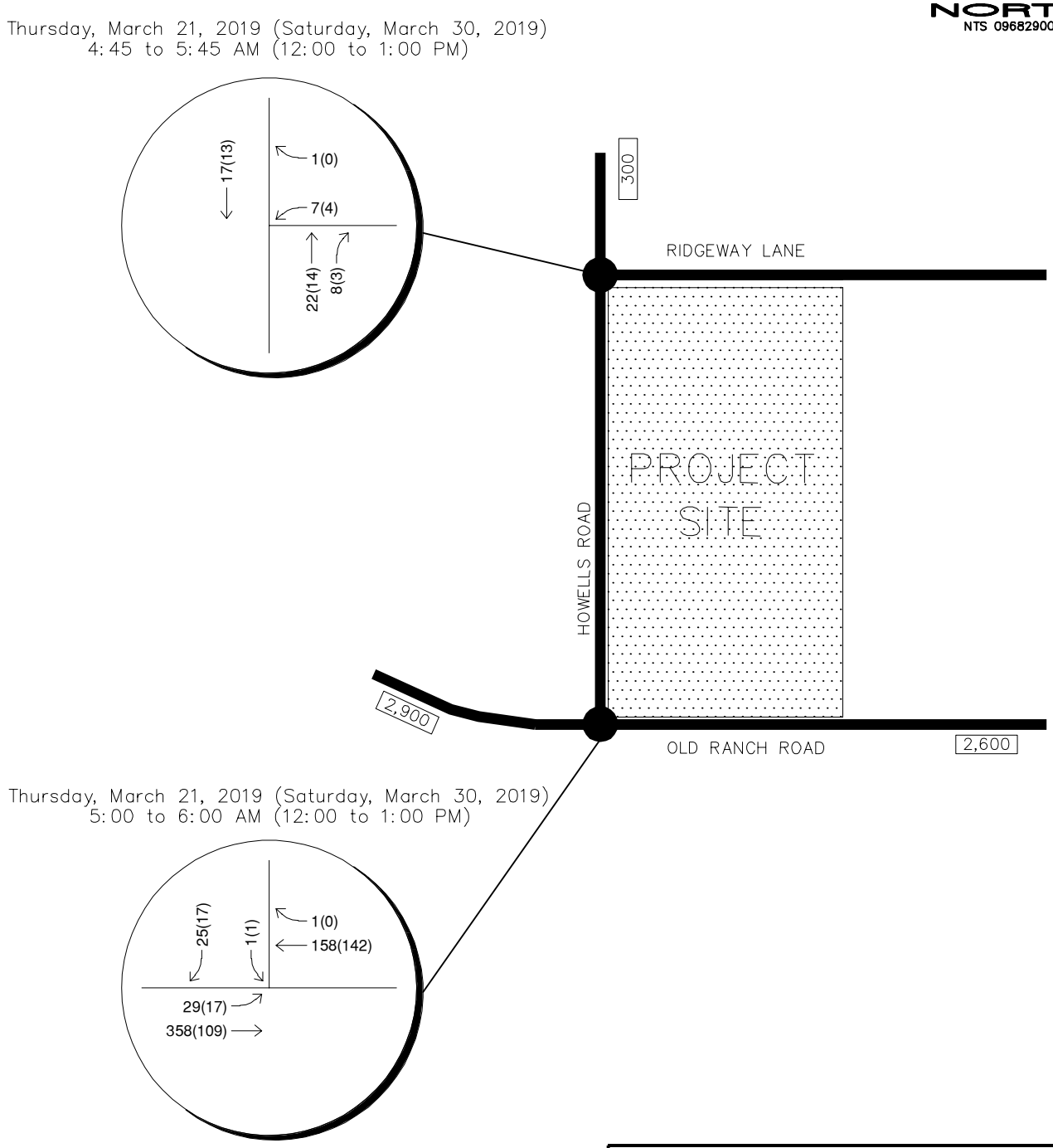
LEGEND

- Study Area Key Intersection
- STOP — Stop Controlled Approach
- Roadway Speed Limit
- 100' — Turn Lane Length (feet)
- TWLTL — Two-Way Left Turn Lane

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
EXISTING LANE CONFIGURATIONS

FIGURE 3

Kimley»Horn



LEGEND

● Study Area Key Intersection

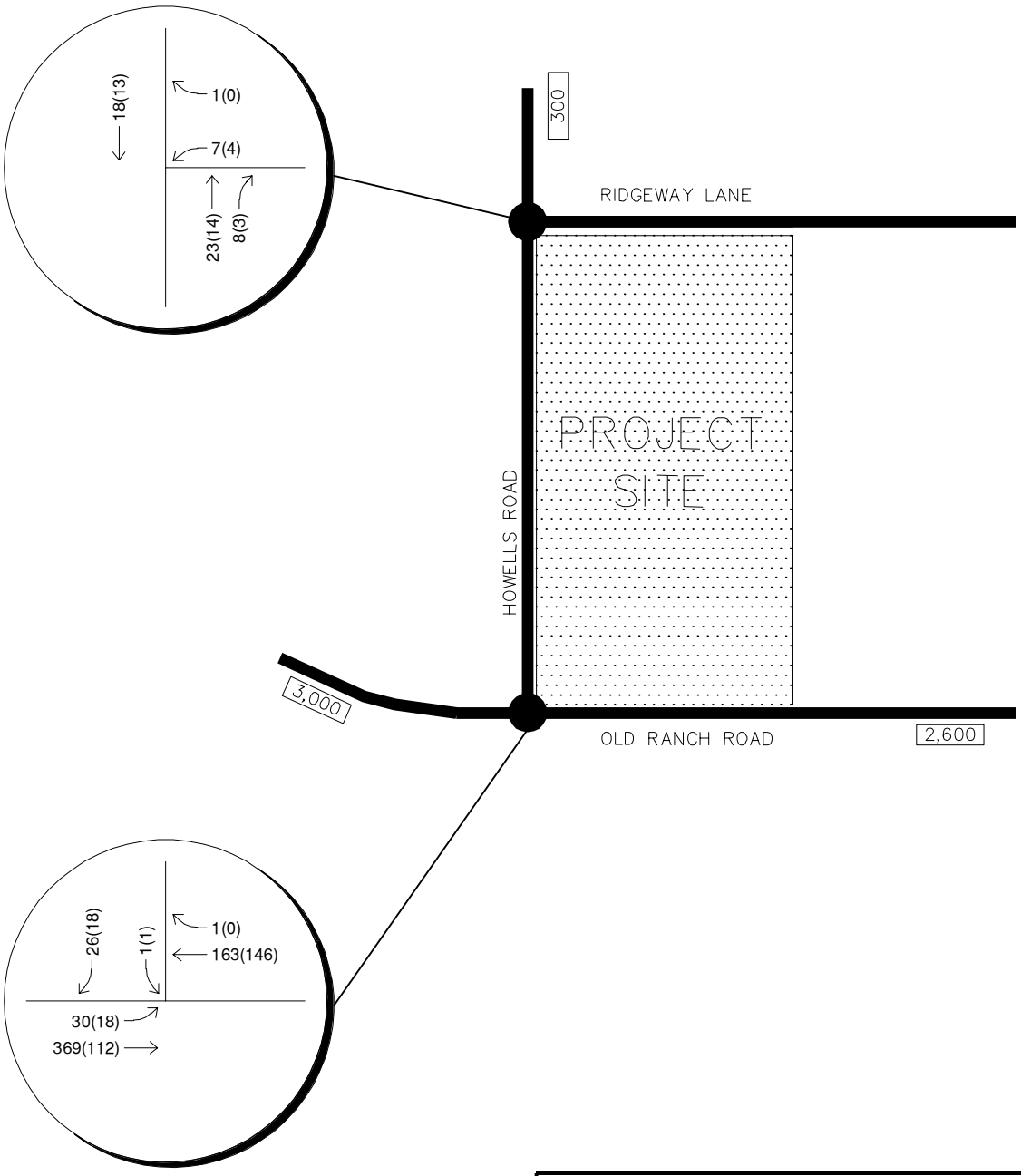
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
EXISTING TRAFFIC VOLUMES

FIGURE 4

Kimley»Horn



LEGEND

● Study Area Key Intersection

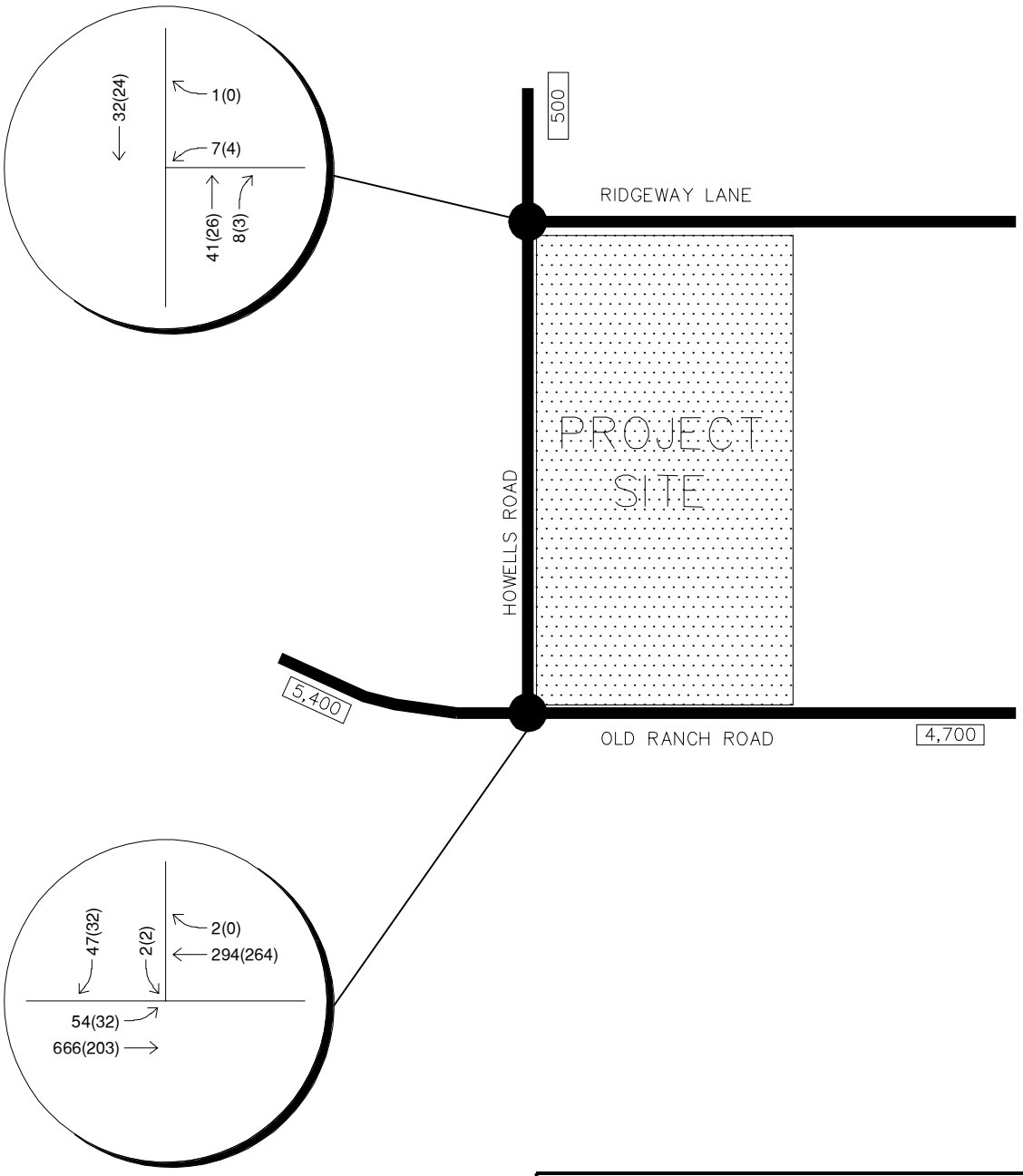
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2020 BACKGROUND TRAFFIC VOLUMES

FIGURE 5

Kimley»Horn



LEGEND

● Study Area Key Intersection

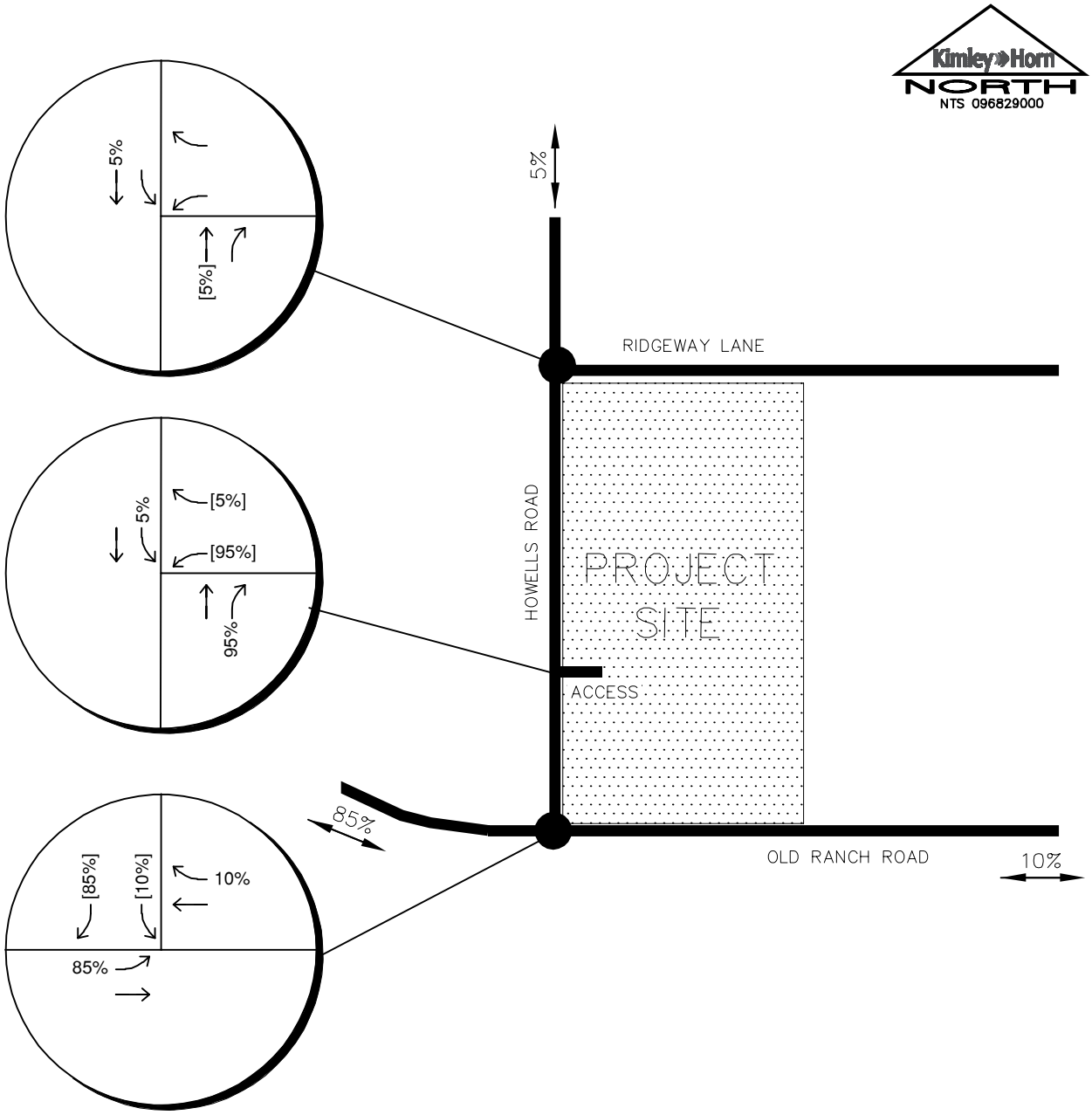
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2040 BACKGROUND TRAFFIC VOLUMES

FIGURE 6

Kimley»Horn



LEGEND

● Study Area Key Intersection

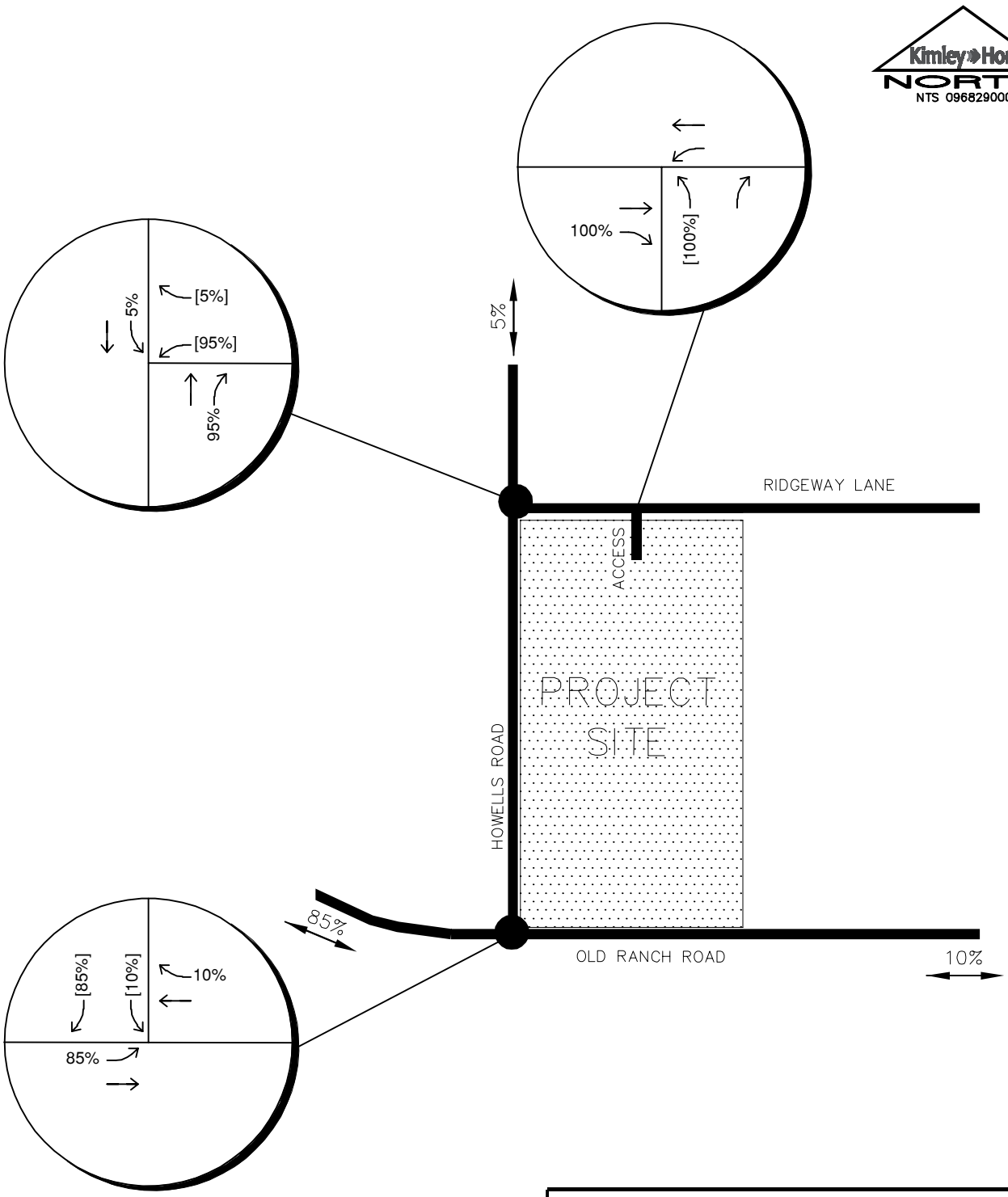
XX% External Trip Distribution Percentage

XX%[XX%] Entering[Exiting] Trip Distribution Percentage

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
PROJECT TRIP DISTRIBUTION
SCENARIO 1

FIGURE 7

Kimley»Horn



LEGEND

● Study Area Key Intersection

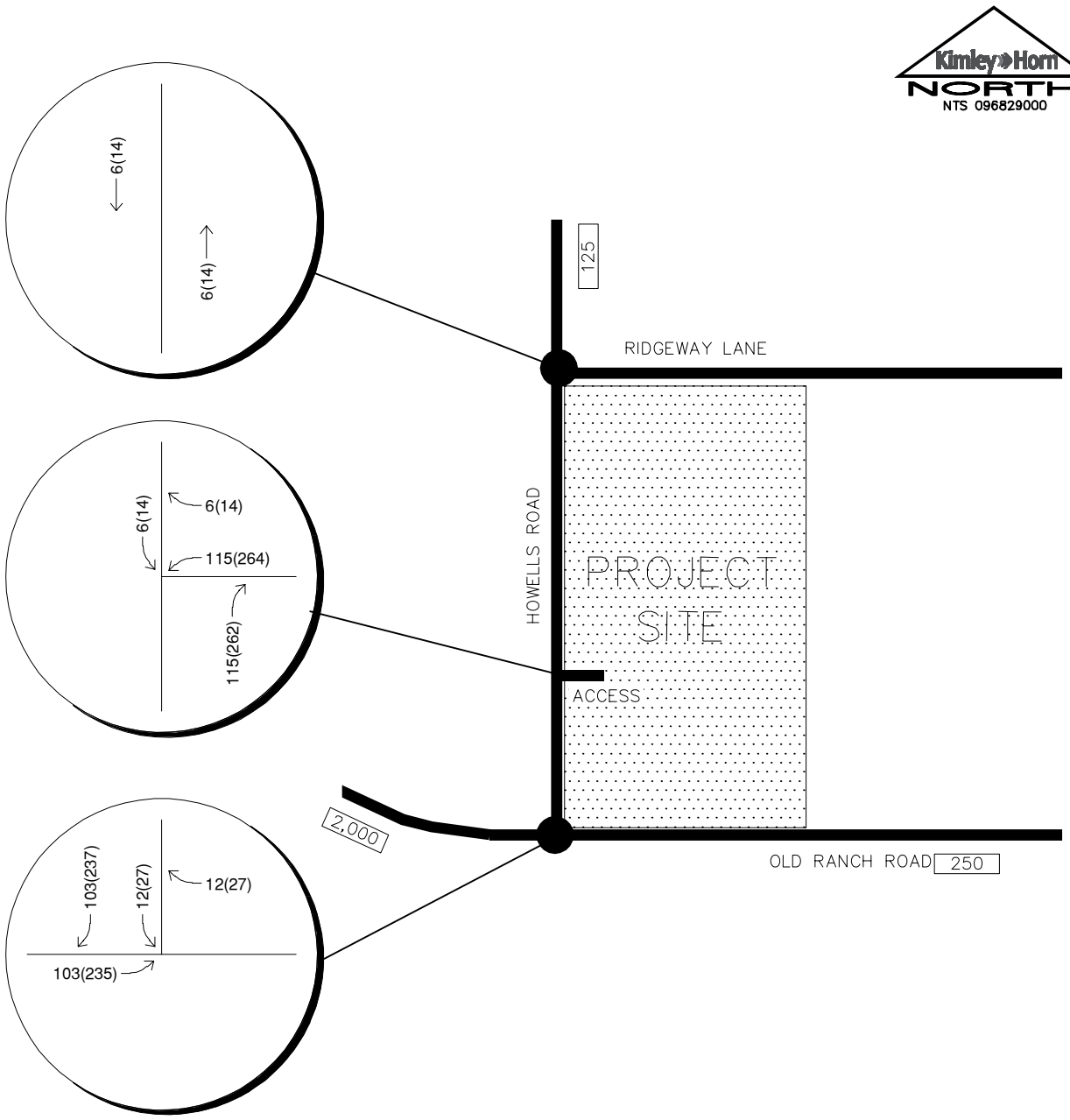
XX% External Trip Distribution Percentage

XX%[XX%] Entering[Exiting] Trip Distribution Percentage

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
PROJECT TRIP DISTRIBUTION
SCENARIO 2

FIGURE 8

Kimley»Horn



LEGEND

● Study Area Key Intersection

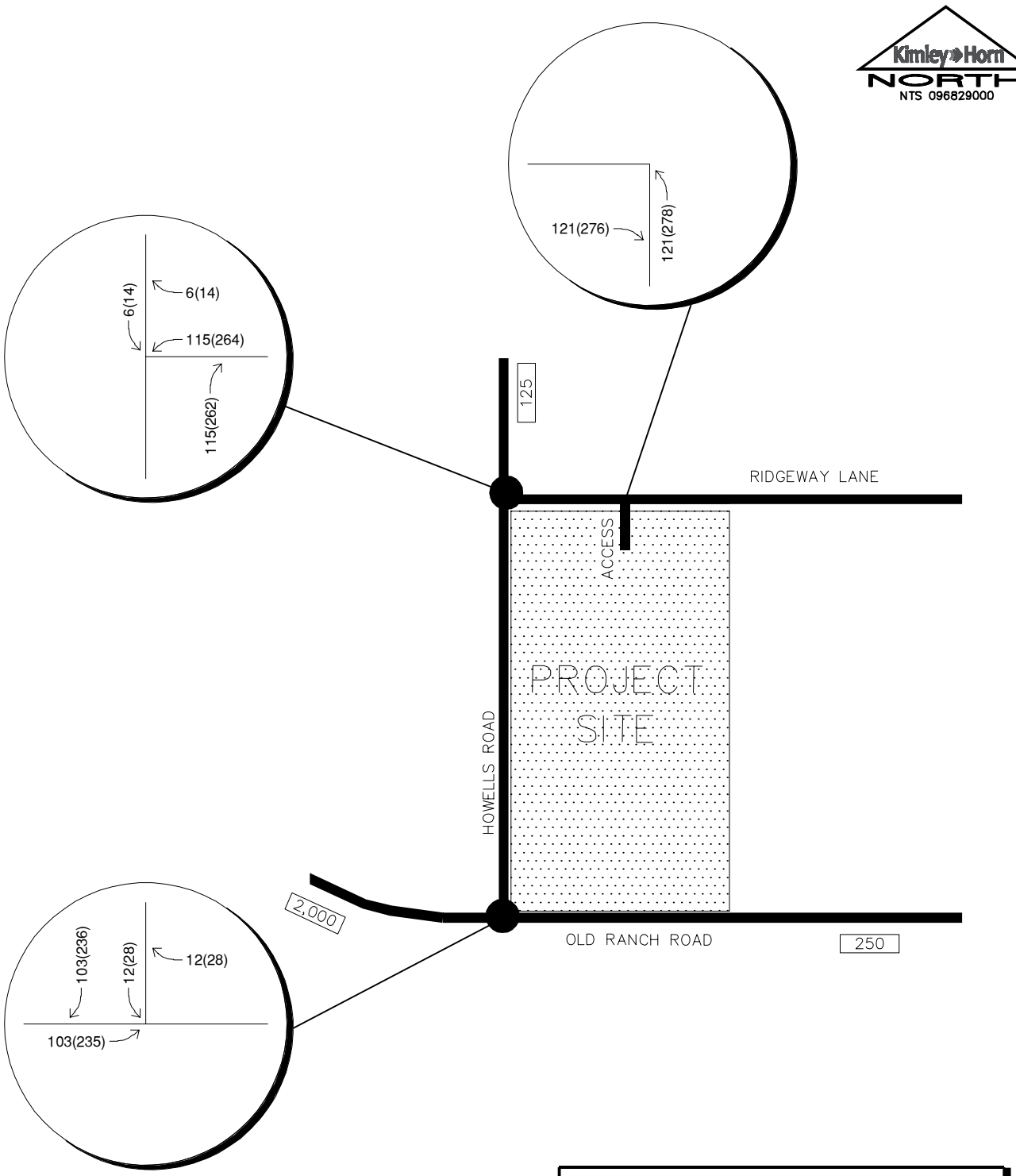
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
PROJECT TRAFFIC ASSIGNMENT
SCENARIO 1

FIGURE 9

Kimley»Horn



LEGEND

● Study Area Key Intersection

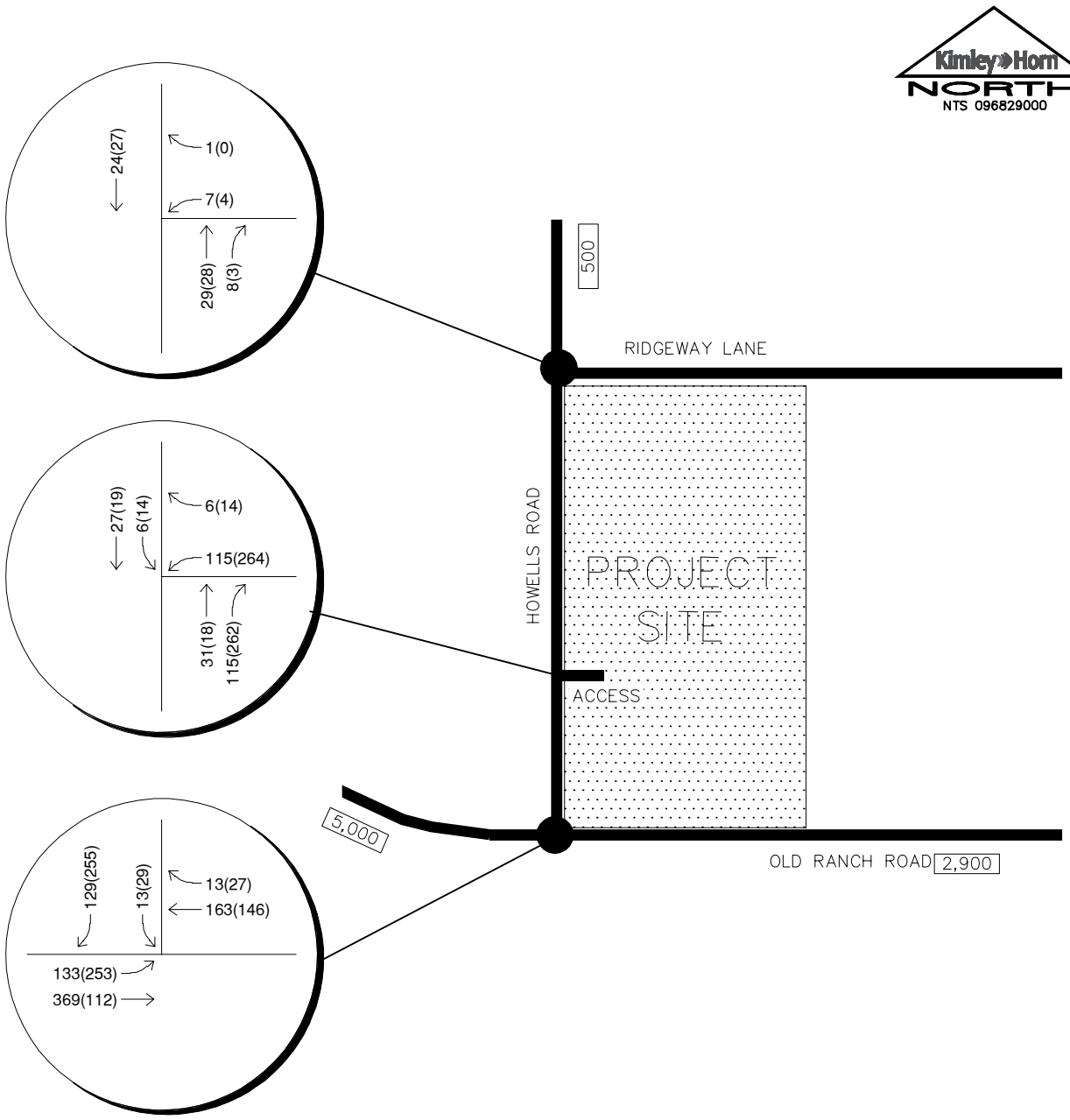
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
PROJECT TRAFFIC ASSIGNMENT
SCENARIO 2

FIGURE 10

Kimley»Horn



LEGEND

● Study Area Key Intersection

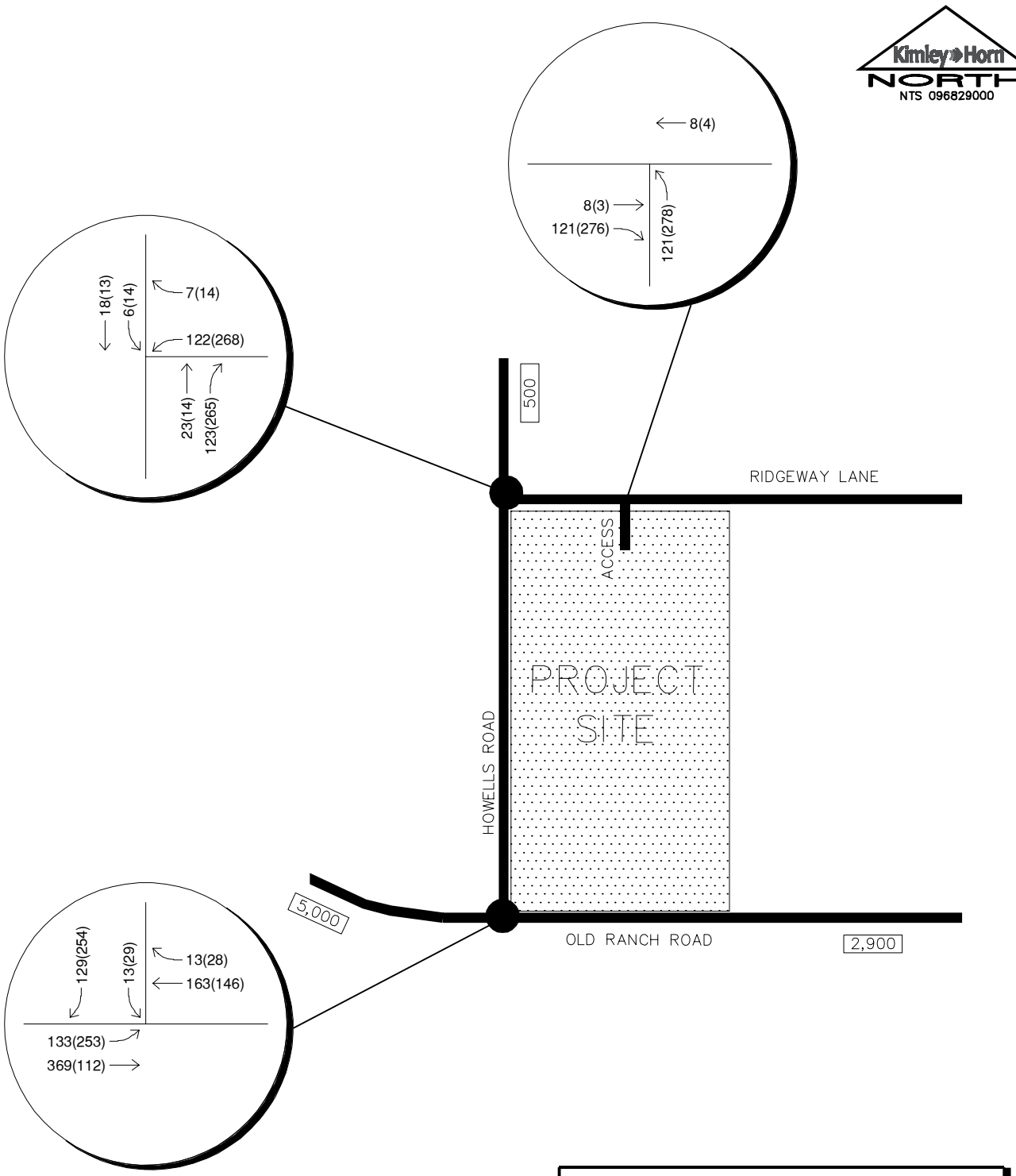
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2020 BACKGROUND PLUS
PROJECT TRAFFIC VOLUMES
SCENARIO 1

FIGURE 11

Kimley»Horn



LEGEND

● Study Area Key Intersection

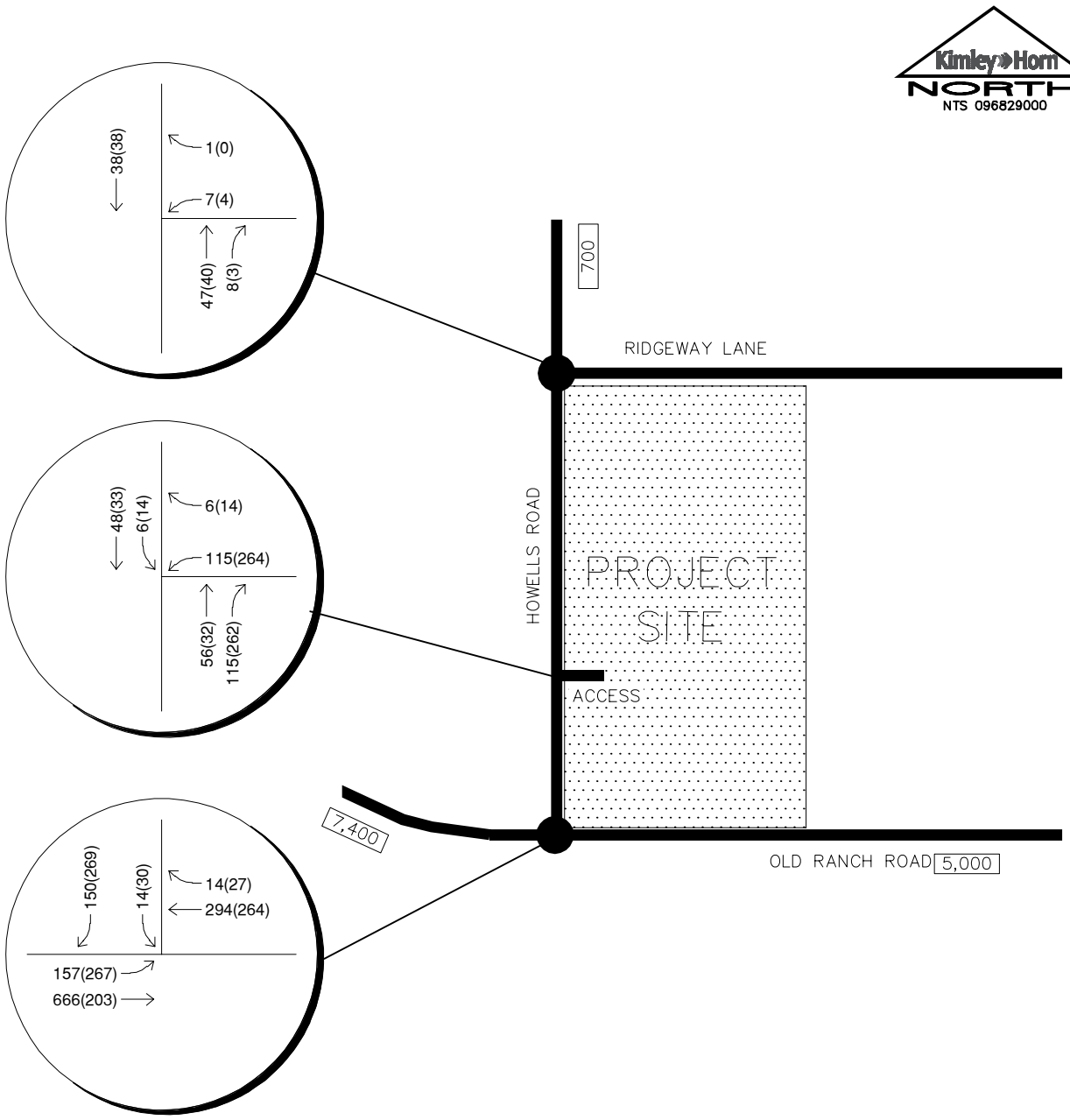
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2020 BACKGROUND PLUS
PROJECT TRAFFIC VOLUMES
SCENARIO 2

FIGURE 12

Kimley»Horn



LEGEND

● Study Area Key Intersection

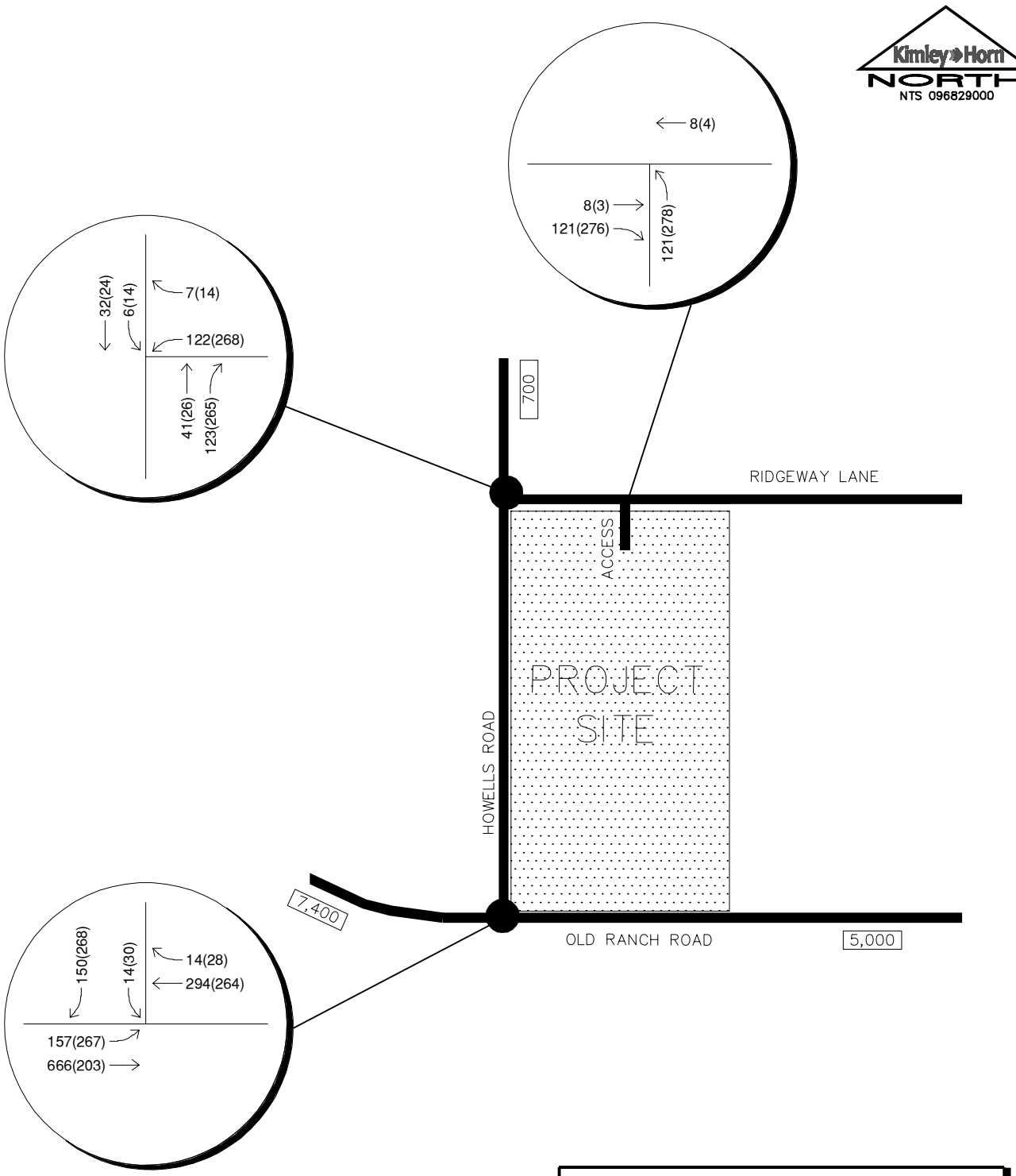
XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2040 BACKGROUND PLUS
PROJECT TRAFFIC VOLUMES
SCENARIO 1

FIGURE 13

Kimley»Horn



LEGEND

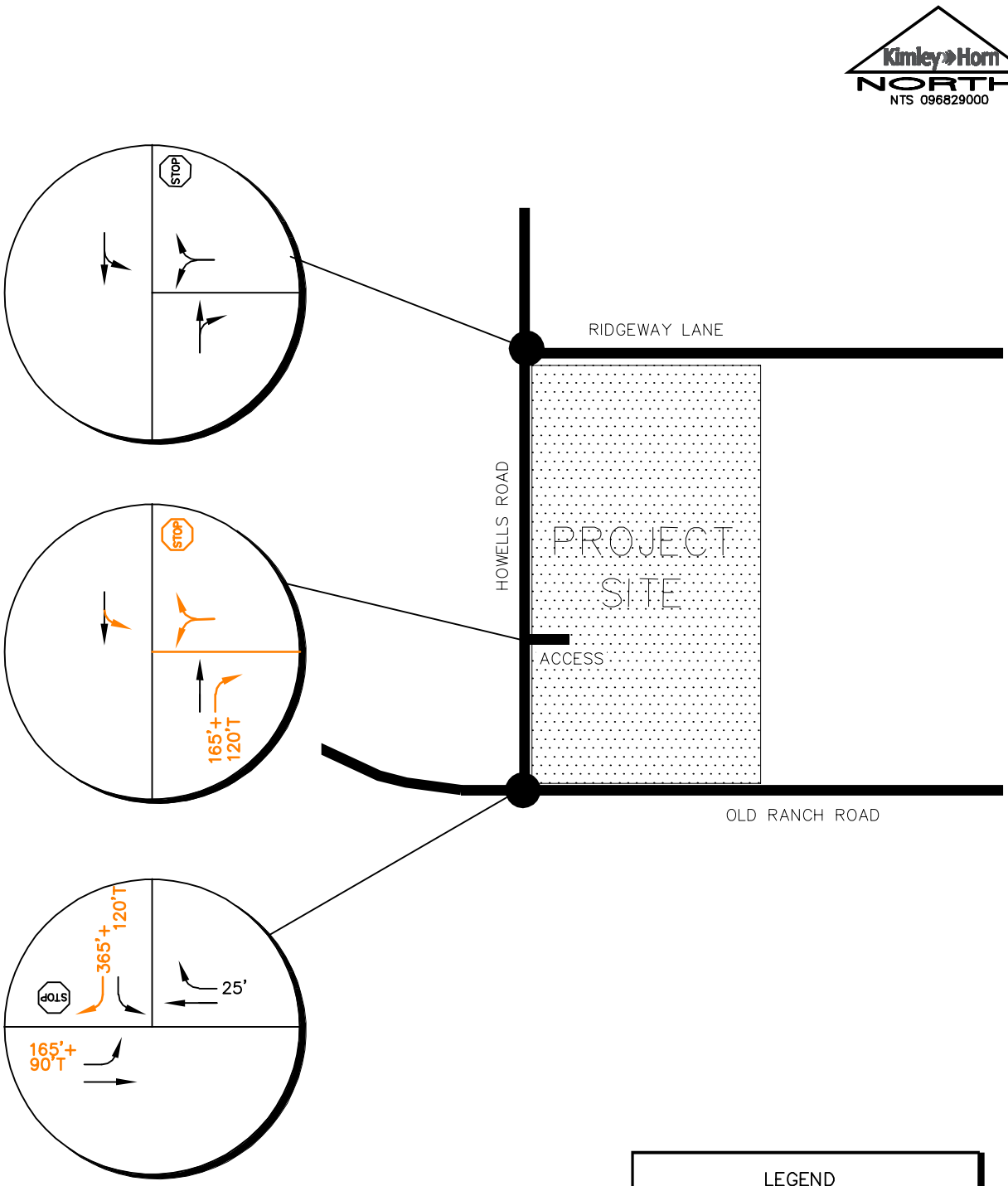
● Study Area Key Intersection

XXX(XXX) Weekday PM(Saturday Midday) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
2040 BACKGROUND PLUS
PROJECT TRAFFIC VOLUMES
SCENARIO 2

FIGURE 14



LEGEND

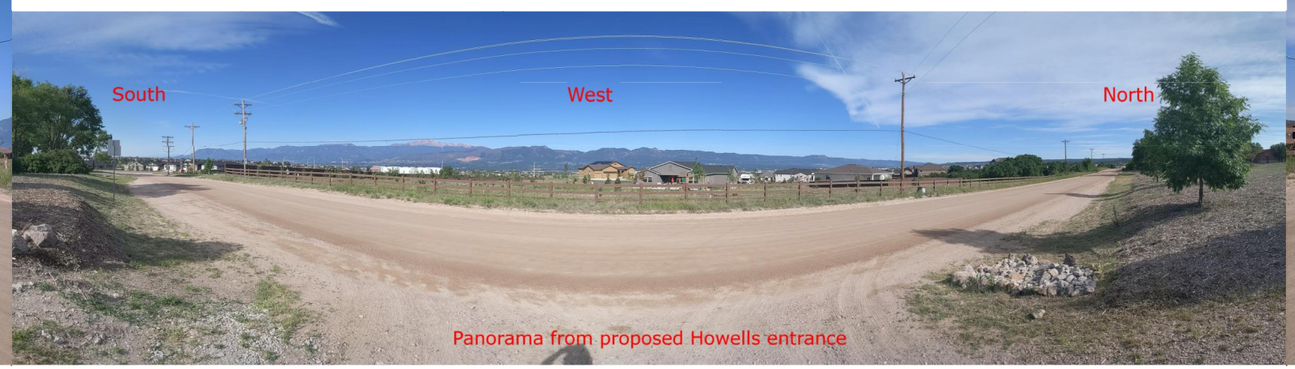
- Study Area Key Intersection
- STOP Stop Controlled Approach
- 100' Turn Lane Length (feet)
- TWLTL Two-Way Left Turn Lane
- Improvement

THE SHIRE AT OLD RANCH
EL PASO COUNTY, CO
RECOMMENDED
LANE CONFIGURATIONS AND CONTROL
SCENARIO 1

FIGURE 15

Kimley»Horn

Howells Rd. entrance to The Shire at Old Ranch



Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 1

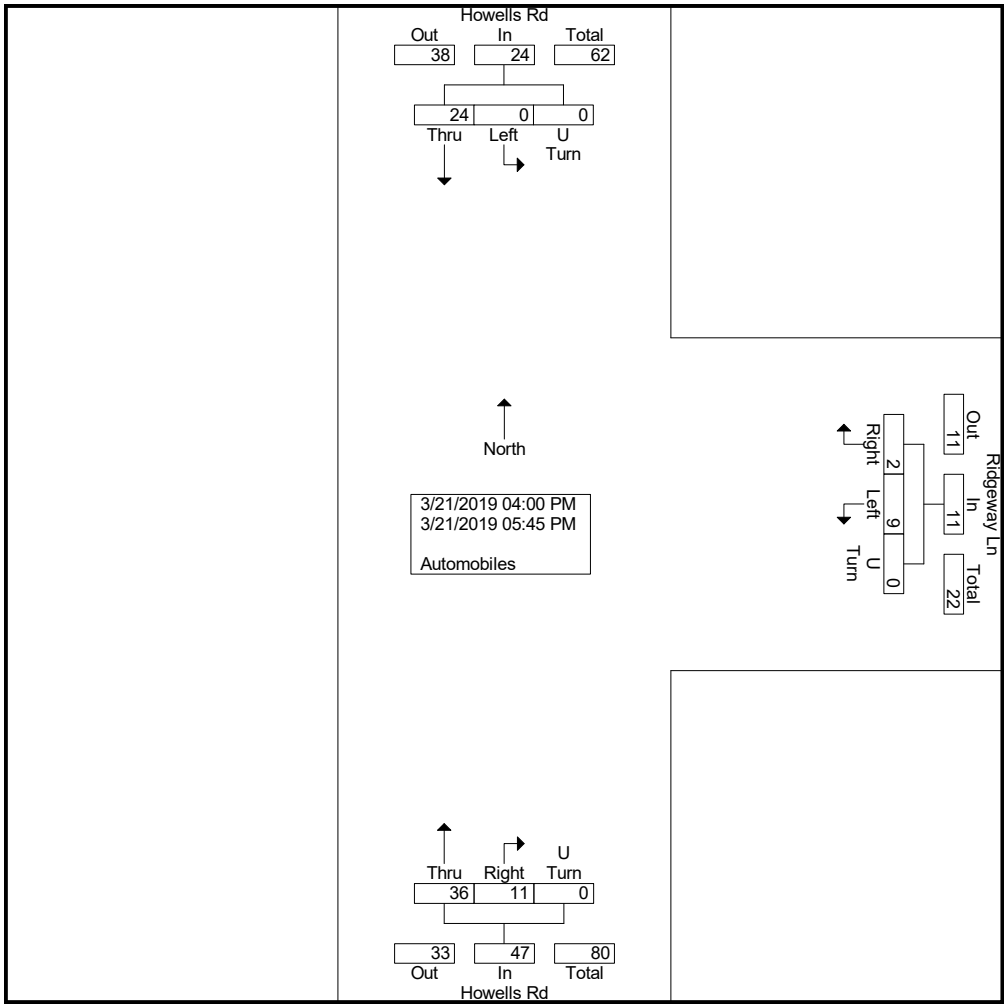
Groups Printed- Automobiles

	Ridgeway Ln Westbound				Howells Rd Northbound				Howells Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	Int. Total
04:00 PM	0	0	0	0	7	2	0	9	0	2	0	2	11
04:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
04:30 PM	1	0	0	1	2	1	0	3	0	1	0	1	5
04:45 PM	3	1	0	4	4	2	0	6	0	3	0	3	13
Total	4	1	0	5	14	5	0	19	0	7	0	7	31
05:00 PM	1	0	0	1	9	1	0	10	0	6	0	6	17
05:15 PM	1	0	0	1	6	4	0	10	0	3	0	3	14
05:30 PM	2	0	0	2	3	1	0	4	0	5	0	5	11
05:45 PM	1	1	0	2	4	0	0	4	0	3	0	3	9
Total	5	1	0	6	22	6	0	28	0	17	0	17	51
Grand Total	9	2	0	11	36	11	0	47	0	24	0	24	82
Apprch %	81.8	18.2	0		76.6	23.4	0		0	100	0		
Total %	11	2.4	0	13.4	43.9	13.4	0	57.3	0	29.3	0	29.3	

Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 2

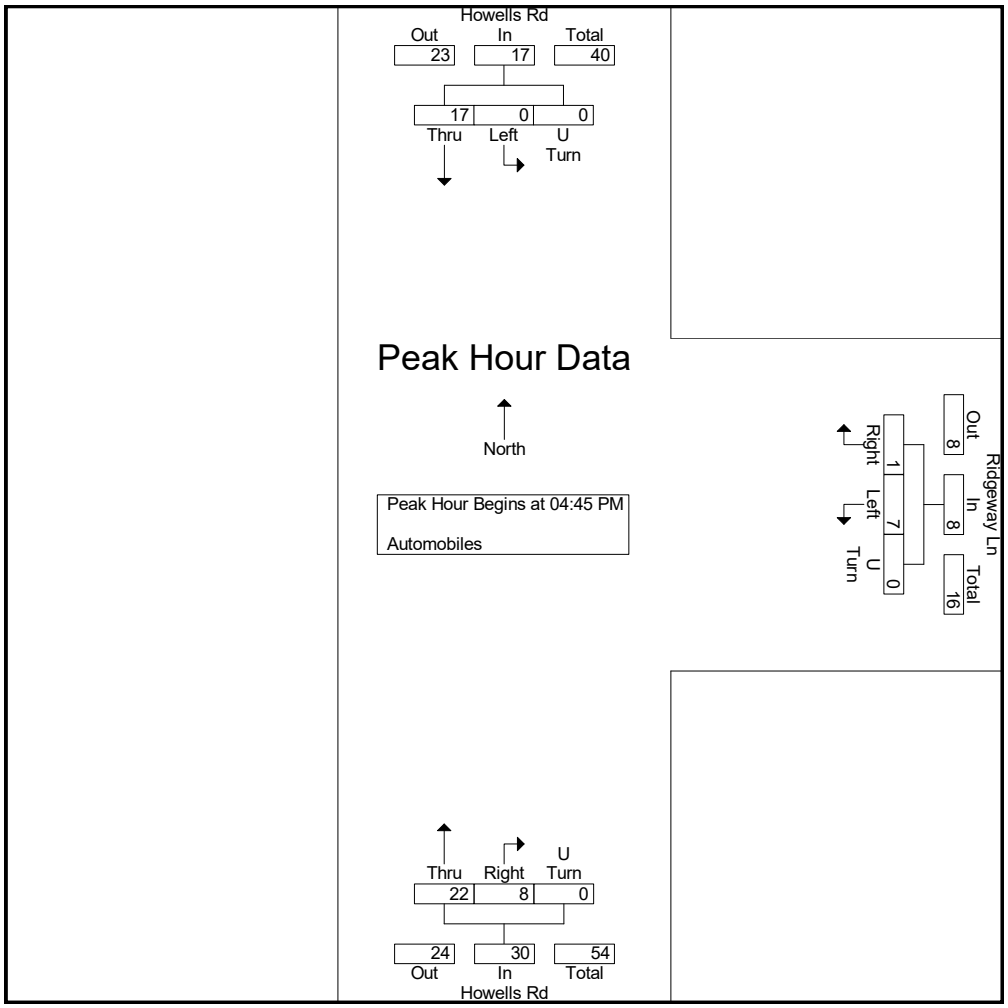


Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 3

	Ridgeway Ln Westbound				Howells Rd Northbound				Howells Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	**3**	**1**	0	**4**	4	2	0	6	0	3	0	3	13
05:00 PM	1	0	0	1	**9**	1	0	**10**	0	**6**	0	**6**	**17**
05:15 PM	1	0	0	1	6	**4**	0	10	0	3	0	3	14
05:30 PM	2	0	0	2	3	1	0	4	0	5	0	5	11
Total Volume	7	1	0	8	22	8	0	30	0	17	0	17	55
% App. Total	87.5	12.5	0		73.3	26.7	0		0	100	0		
PHF	.583	.250	.000	.500	.611	.500	.000	.750	.000	.708	.000	.708	.809



Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 1

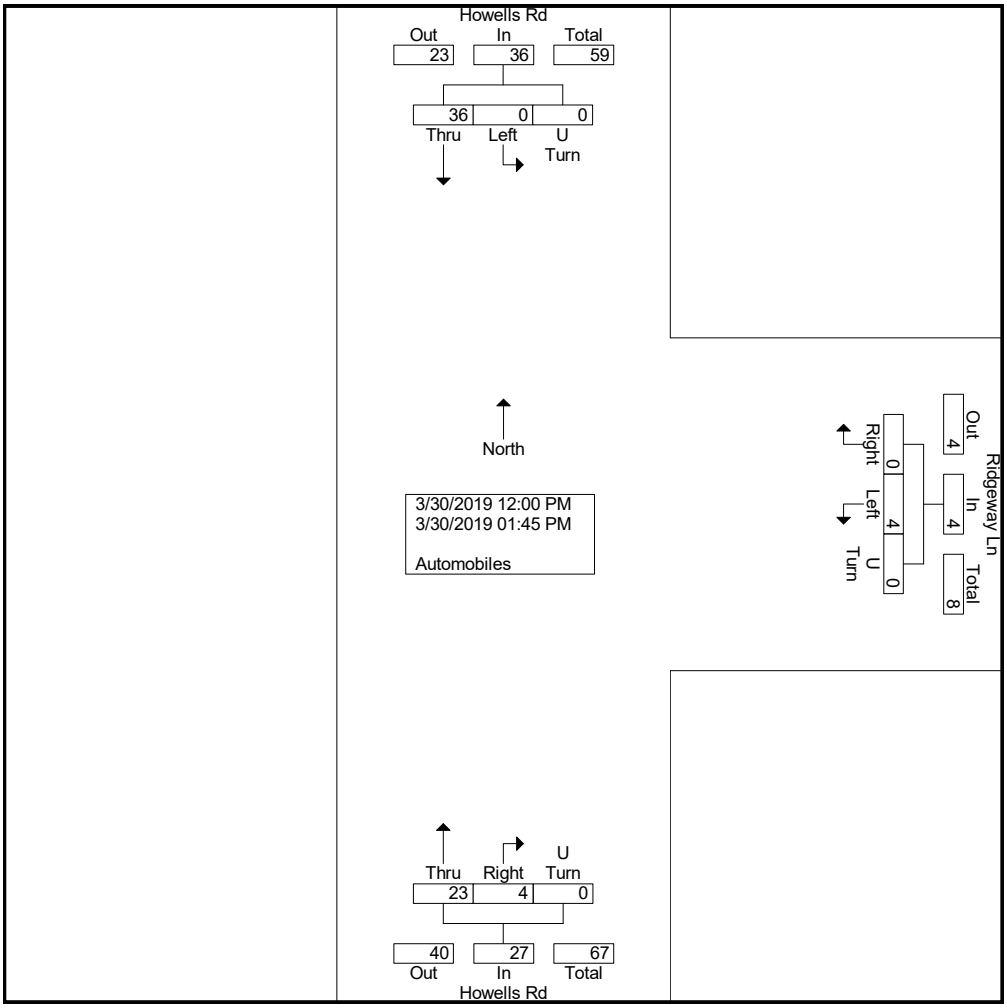
Groups Printed- Automobiles

	Ridgeway Ln Westbound				Howells Rd Northbound				Howells Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	Int. Total
12:00 PM	0	0	0	0	4	1	0	5	0	5	0	5	10
12:15 PM	1	0	0	1	2	1	0	3	0	4	0	4	8
12:30 PM	3	0	0	3	6	1	0	7	0	2	0	2	12
12:45 PM	0	0	0	0	2	0	0	2	0	2	0	2	4
Total	4	0	0	4	14	3	0	17	0	13	0	13	34
01:00 PM	0	0	0	0	2	0	0	2	0	5	0	5	7
01:15 PM	0	0	0	0	4	0	0	4	0	6	0	6	10
01:30 PM	0	0	0	0	1	1	0	2	0	6	0	6	8
01:45 PM	0	0	0	0	2	0	0	2	0	6	0	6	8
Total	0	0	0	0	9	1	0	10	0	23	0	23	33
Grand Total	4	0	0	4	23	4	0	27	0	36	0	36	67
Apprch %	100	0	0		85.2	14.8	0		0	100	0		
Total %	6	0	0	6	34.3	6	0	40.3	0	53.7	0	53.7	

Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 2

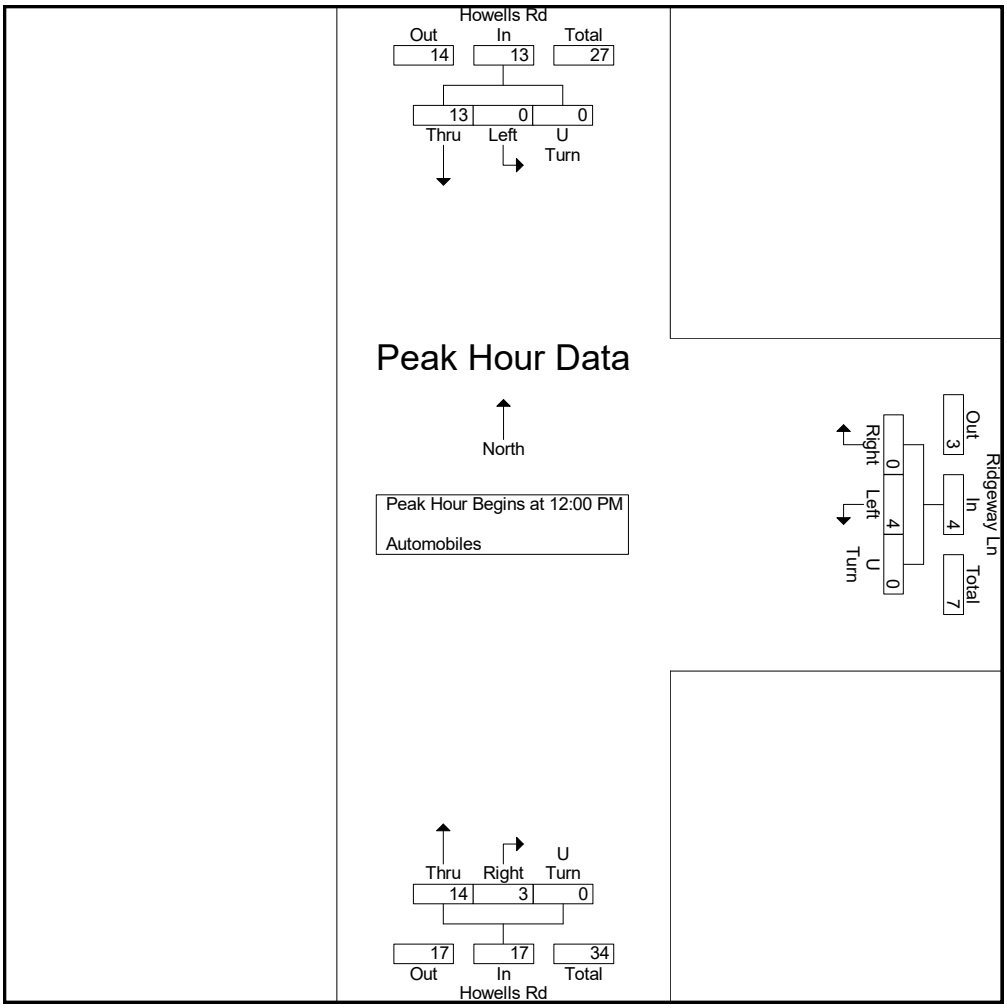


Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Ridgeway Ln and Howells Rd

File Name : Ridgeway and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 3

	Ridgeway Ln Westbound				Howells Rd Northbound				Howells Rd Southbound				
Start Time	Left	Right	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Thru	U Turn	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	0	0	0	0	4	**1**	0	5	0	**5**	0	**5**	10
12:15 PM	1	0	0	1	2	1	0	3	0	4	0	4	8
12:30 PM	**3**	0	0	**3**	**6**	1	0	**7**	0	2	0	2	**12**
12:45 PM	0	0	0	0	2	0	0	2	0	2	0	2	4
Total Volume	4	0	0	4	14	3	0	17	0	13	0	13	34
% App. Total	100	0	0		82.4	17.6	0		0	100	0		
PHF	.333	.000	.000	.333	.583	.750	.000	.607	.000	.650	.000	.650	.708



Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 1

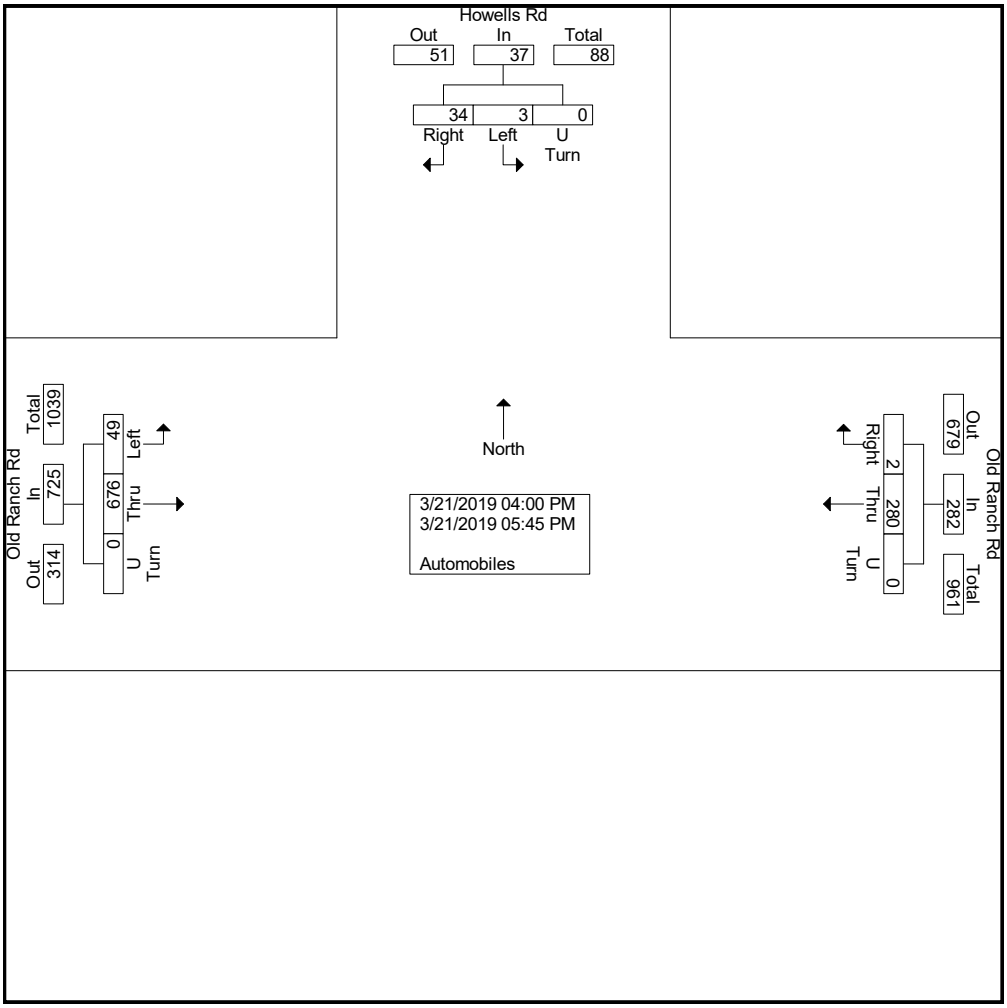
Groups Printed- Automobiles

	Old Ranch Rd Eastbound				Old Ranch Rd Westbound				Howells Rd Southbound				
Start Time	Left	Thru	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Right	U Turn	App. Total	Int. Total
04:00 PM	8	75	0	83	40	1	0	41	1	3	0	4	128
04:15 PM	2	85	0	87	29	0	0	29	0	1	0	1	117
04:30 PM	4	68	0	72	28	0	0	28	1	1	0	2	102
04:45 PM	6	90	0	96	25	0	0	25	0	4	0	4	125
Total	20	318	0	338	122	1	0	123	2	9	0	11	472
05:00 PM	11	94	0	105	54	1	0	55	0	9	0	9	169
05:15 PM	9	92	0	101	40	0	0	40	0	4	0	4	145
05:30 PM	5	91	0	96	30	0	0	30	1	5	0	6	132
05:45 PM	4	81	0	85	34	0	0	34	0	7	0	7	126
Total	29	358	0	387	158	1	0	159	1	25	0	26	572
Grand Total	49	676	0	725	280	2	0	282	3	34	0	37	1044
Apprch %	6.8	93.2	0		99.3	0.7	0		8.1	91.9	0		
Total %	4.7	64.8	0	69.4	26.8	0.2	0	27	0.3	3.3	0	3.5	

Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 2

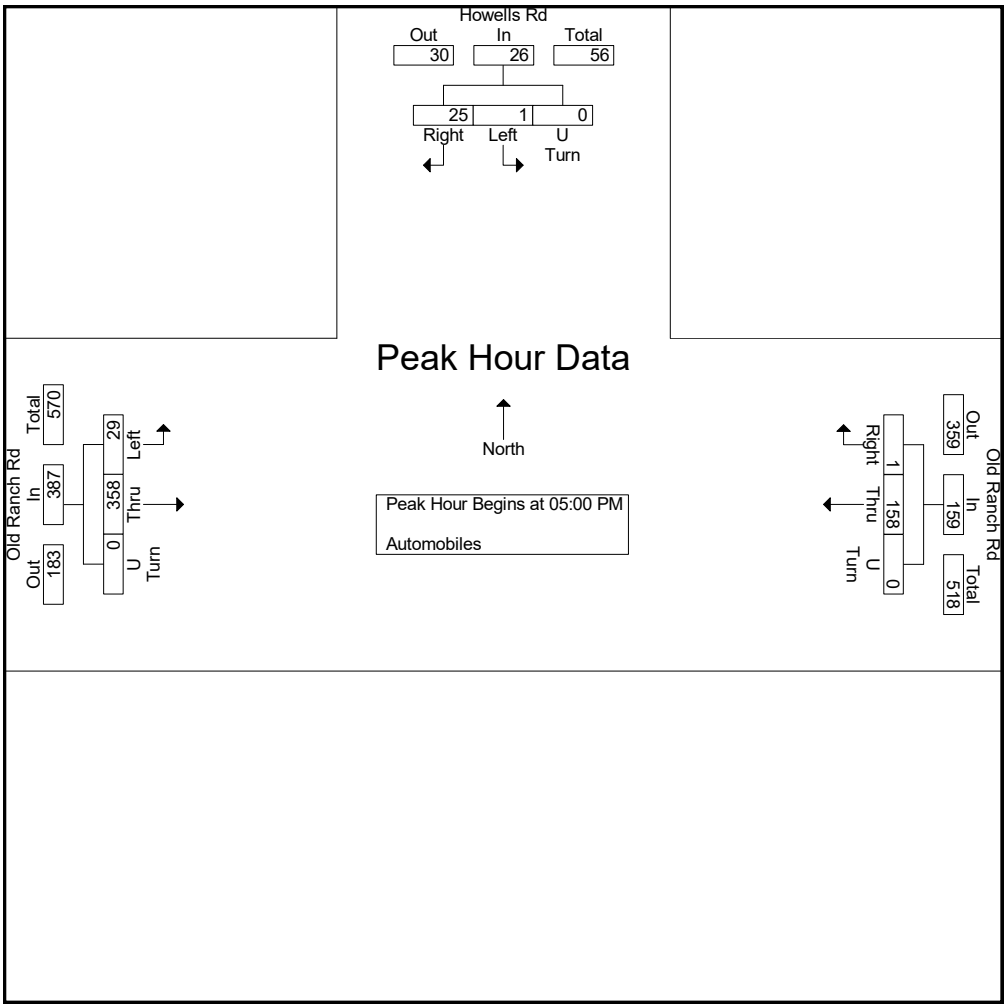


Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
PM Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells PM
Site Code : IPO 422
Start Date : 3/21/2019
Page No : 3

	Old Ranch Rd Eastbound				Old Ranch Rd Westbound				Howells Rd Southbound				
Start Time	Left	Thru	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Right	U Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	**11**	**94**	0	**105**	**54**	**1**	0	**55**	0	**9**	0	**9**	**169**
05:15 PM	9	92	0	101	40	0	0	40	0	4	0	4	145
05:30 PM	5	91	0	96	30	0	0	30	**1**	5	0	6	132
05:45 PM	4	81	0	85	34	0	0	34	0	7	0	7	126
Total Volume	29	358	0	387	158	1	0	159	1	25	0	26	572
% App. Total	7.5	92.5	0		99.4	0.6	0		3.8	96.2	0		
PHF	.659	.952	.000	.921	.731	.250	.000	.723	.250	.694	.000	.722	.846



Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 1

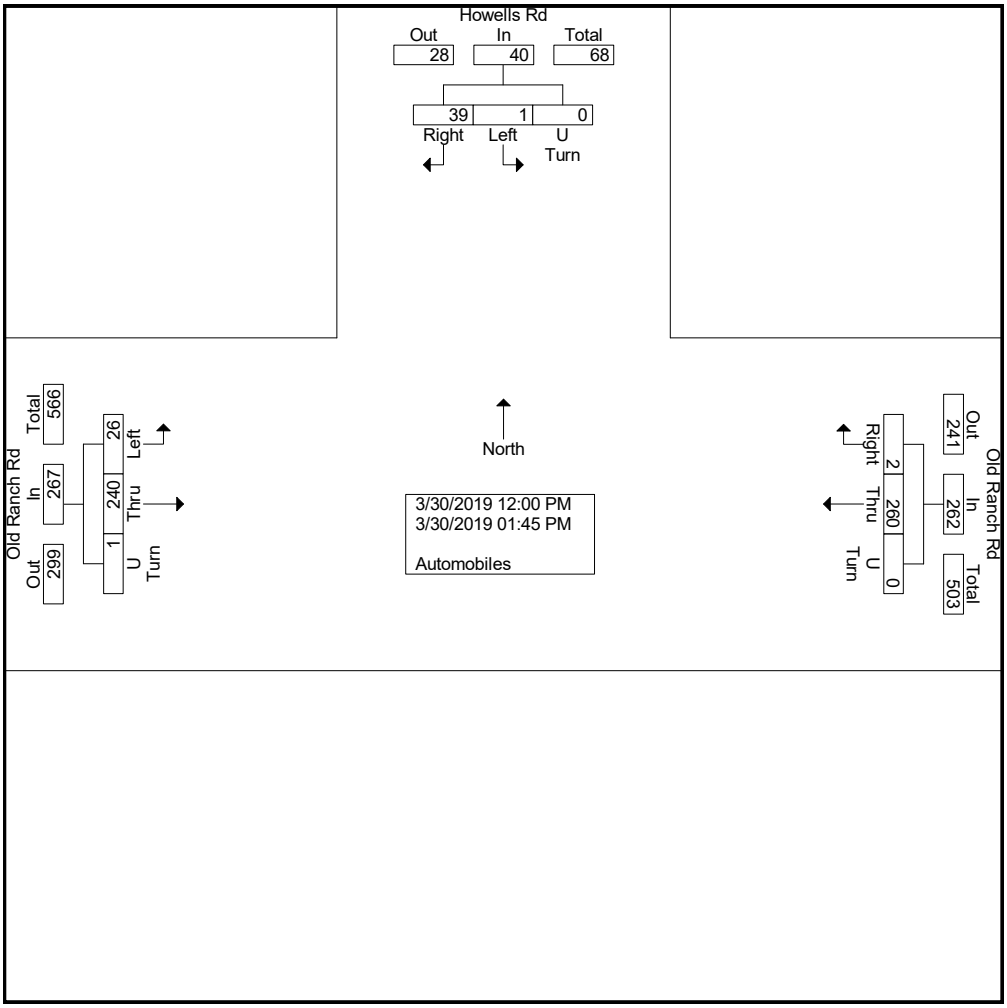
Groups Printed- Automobiles

	Old Ranch Rd Eastbound				Old Ranch Rd Westbound				Howells Rd Southbound				
Start Time	Left	Thru	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Right	U Turn	App. Total	Int. Total
12:00 PM	5	33	0	38	32	0	0	32	0	2	0	2	72
12:15 PM	3	29	0	32	38	0	0	38	0	7	0	7	77
12:30 PM	5	19	0	24	41	0	0	41	1	6	0	7	72
12:45 PM	4	28	0	32	31	0	0	31	0	2	0	2	65
Total	17	109	0	126	142	0	0	142	1	17	0	18	286
01:00 PM	1	29	0	30	32	0	0	32	0	4	0	4	66
01:15 PM	5	26	1	32	24	0	0	24	0	6	0	6	62
01:30 PM	1	43	0	44	31	2	0	33	0	8	0	8	85
01:45 PM	2	33	0	35	31	0	0	31	0	4	0	4	70
Total	9	131	1	141	118	2	0	120	0	22	0	22	283
Grand Total	26	240	1	267	260	2	0	262	1	39	0	40	569
Apprch %	9.7	89.9	0.4		99.2	0.8	0		2.5	97.5	0		
Total %	4.6	42.2	0.2	46.9	45.7	0.4	0	46	0.2	6.9	0	7	

Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 2

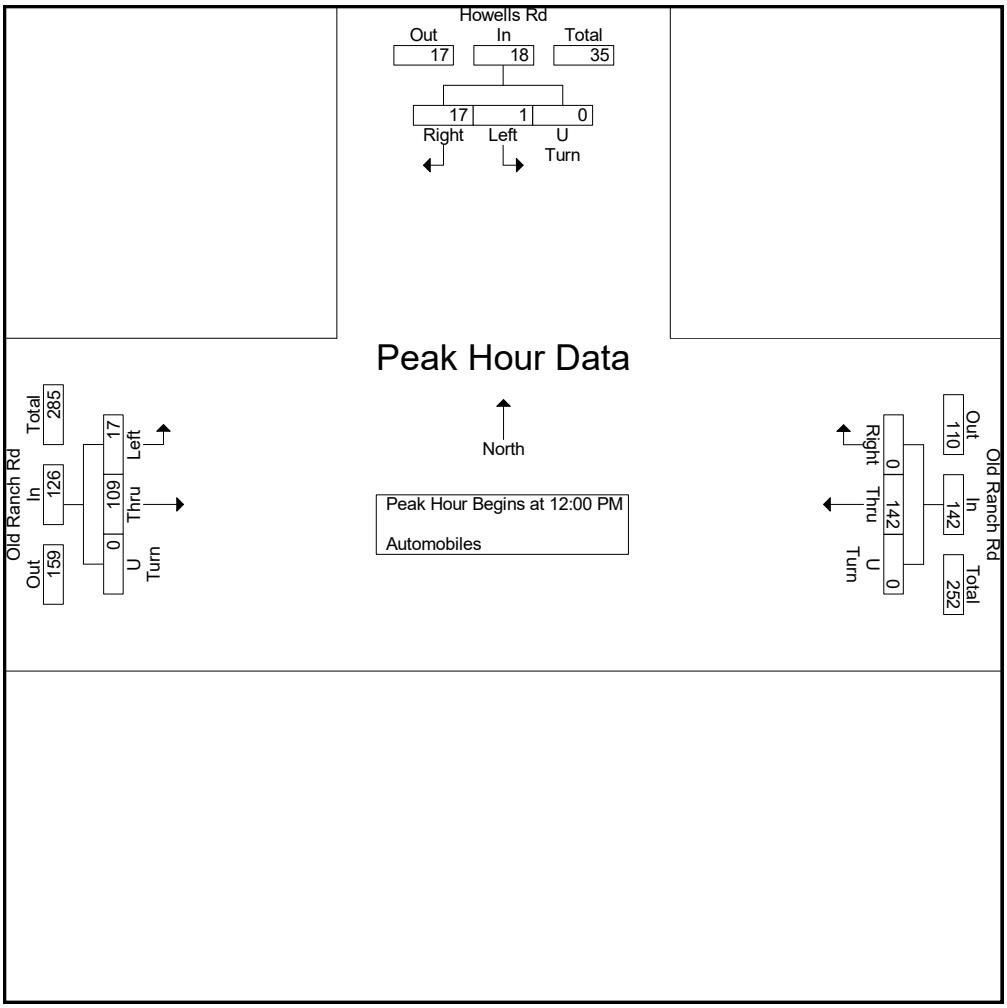


Ridgeview Data Collection

El Paso County, CO
The Shire at Old Ranch
Saturday Noon Peak
Old Ranch Rd and Howells Rd

File Name : Old Ranch and Howells Sat Noon
Site Code : IPO 422
Start Date : 3/30/2019
Page No : 3

	Old Ranch Rd Eastbound				Old Ranch Rd Westbound				Howells Rd Southbound				
Start Time	Left	Thru	U Turn	App. Total	Thru	Right	U Turn	App. Total	Left	Right	U Turn	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:00 PM													
12:00 PM	**5**	**33**	0	**38**	32	0	0	32	0	2	0	2	72
12:15 PM	3	29	0	32	38	0	0	38	0	**7**	0	**7**	**77**
12:30 PM	5	19	0	24	**41**	0	0	**41**	**1**	6	0	7	72
12:45 PM	4	28	0	32	31	0	0	31	0	2	0	2	65
Total Volume	17	109	0	126	142	0	0	142	1	17	0	18	286
% App. Total	13.5	86.5	0		100	0	0		5.6	94.4	0		
PHF	.850	.826	.000	.829	.866	.000	.000	.866	.250	.607	.000	.643	.929



The Shire at Old Ranch Project Traffic Projections

Roadway	Source	2013 Volume	2040 Projection	Growth Factor	Annual Growth
Burgess Rd E/O Milan Rd	El Paso County	3,200	5,200	1.63	1.81%
Shoup Rd W/O Milan Rd	El Paso County	4,200	10,800	2.57	3.56%
Black Forest Rd N/O Burgess Rd	El Paso County	4,800	13,400	2.79	3.88%
Powers Blvd (SH-21) S/O Old Ranch Rd	CDOT (20 yr)	-	-	1.56	2.25%
Average					2.87%

The Shire at Old Ranch Trip Generation Summary

Land Use	Quantity	Units	Vehicle Trips						
			Weekday Daily	Weekday PM Peak Hour			Saturday Peak Hour of Generator		
				In	Out	Total	In	Out	Total
Total Site Generated Trips									
Hotel (ITE 310)	6	Rooms	50	2	2	4	2	2	4
Campground (ITE 416)	4	Campsites	20	1	0	1	*1	*0	*1
Office (ITE 710)	5,300	Square Feet	52	1	5	6	2	1	3
Nursery - Garden Center (ITE 817)	25,300	Square Feet	1,724	88	88	176	254	254	508
Nursery - Wholesale (ITE 818)	4,500	Square Feet	176	12	11	23	11	14	25
Arts and Craft Store (ITE 879)	3,000	Square Feet	170	9	10	19	*9	*10	*19
Sit-Down Restaurant (ITE 932)	2,500	Square Feet	282	15	9	24	14	14	28
Total Site Generated Trips			2,474	128	125	253	283	285	568
Internal Capture Trips									
Sit-Down Restaurant (ITE 932)	2,500	Square Feet	141	8	5	12	7	7	14
Total External Trips after Internal Capture			**2,333**	**121**	**121**	**241**	**276**	**278**	**554**

* = Includes Weekday PM Peak Hour due to Saturday Peak Hour of Generator not Provided in ITE

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for Hotel				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by				*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code -Hotel (310)

Independant Variable - Rooms (X)

X = 6
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (Series 300 Page 3)

Directional Distribution: 59% ent. 41% exit.
(T) = 0.47 (X) T = 2 Average Vehicle Trip Ends
(T) = 0.47 * (6.0) 1 entering 1 exiting

1 + 1 = 2

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (Series 300 Page 4)

Directional Distribution: 51% ent. 49% exit.
T = 0.60 X T = 4 Average Vehicle Trip Ends
T = 0.60 * 6 2 entering 2 exiting

2 + 2 = 4

Weekday (Series 300 Page 2)

Average Weekday Directional Distribution: 50% entering, 50% exiting
(T) = 8.36 (X) T = 50 Average Vehicle Trip Ends
(T) = 8.36 * (6.0) 25 entering 25 exiting

25 + 25 = 50

Saturday (300 Series Page 7)

Directional Distribution: 50% ent. 50% exit.
T = 8.19 X T = 50 Average Vehicle Trip Ends
T = 8.19 * 6 25 entering 25 exiting

25 + 25 = 50

Saturday Peak Hour of Generator (300 Series Page 8)

Average Weekday Directional Distribution: 56% entering, 44% exiting
(T) = 0.72 (X) T = 4 Average Vehicle Trip Ends
(T) = 0.72 * (6.0) 2 entering 2 exiting

2 + 2 = 4

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation - Campground/Recreational Vehicle Park				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 of 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations
Land Use Code - Campground/Recreational Vehicle Park (416)
Independant Variable - Occupied Campsites (X)

Campsites 4
X = 4
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (400 Series Page 29)

Directional Distribution: 36% ent. 64% exit.
(T) = 0.21 (X) T = 1 Average Vehicle Trip Ends
(T) = 0.21 * (4.0) 0 entering 1 exiting
0 + 1 = 1

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (400 Series Page 30)

Directional Distribution: 65% ent. 35% exit.
(T) = 0.27 (X) T = 1 Average Vehicle Trip Ends
(T) = 0.27 * (4.0) 1 entering 0 exiting
1 + 0 = 1

AM Peak Hour of Generator (400 Series Page 31)

Directional Distribution: 36% ent. 64% exit.
(T) = 0.25 (X) T = 1 Average Vehicle Trip Ends
(T) = 0.25 * (4.0) 0 entering 1 exiting
0 + 1 = 1

PM Peak Hour of Generator (400 Series Page 32)

Directional Distribution: 62% ent. 38% exit.
(T) = 0.41 (X) T = 2 Average Vehicle Trip Ends
(T) = 0.41 * (4.0) 1 entering 1 exiting
1 + 1 = 2

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for Office Building				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates

Land Use Code - General Office Building (710)

Independant Variable - 1000 Square Feet (X)
SF = 5,300
X = 5.300
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (700 Series Page 4)

Directional Distribution: 86% ent. 14% exit.
(T) = 1.16 (X) T = 6 Average Vehicle Trip Ends
(T) = 1.16 * (5.3) 5 entering 1 exiting

5 + 1 = 6

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (700 Series Page 5)

Directional Distribution: 16% ent. 84% exit.
(T) = 1.15 (X) T = 6 Average Vehicle Trip Ends
(T) = 1.15 * (5.3) 1 entering 5 exiting

1 + 5 = 6

Weekday (700 Series Page 3)

Average Weekday Directional Distribution: 50% ent. 50% exit.
(T) = 9.74 (X) T = 52 Average Vehicle Trip Ends
(T) = 9.74 * (5.3) 26 entering 26 exiting

26 + 26 = 52

Saturday, Peak Hour of Generator (700 Series Page 9)

Daily Weekday Directional Distribution: 54% ent. 46% exit.
(T) = 0.53 (X) T = 3 Average Vehicle Trip Ends
(T) = 0.53 * (5.3) 2 entering 1 exiting

2 + 1 = 3

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for Nursery (Garden Center)				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates
Land Use Code - Nursery (Garden Center) (817)
Independant Variable - 1,000 Square Feet (X)
Square Feet = 25,300
SF = 25.300
T = Average Vehicle Trip Ends

Weekday (800 Series Page 82)

Average Weekday — Directional Distribution: 50% ent. 50% exit.
T = 68.10 (X) — T = 1724 Average Vehicle Trip Ends
T = 68.10 * (25.3) — 862 entering 862 exiting

862 + 862 = 1724

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 83)

Directional Distribution: 50% ent. 50% exit.
T = 2.43 (X) — T = 61 Average Vehicle Trip Ends
T = 2.43 * (25.3) — 31 entering 31 exiting

31 + 30 = 61

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 84)

Directional Distribution: 50% ent. 50% exit.
T = 6.94 (X) — T = 176 Average Vehicle Trip Ends
T = 6.94 * (25.3) — 88 entering 88 exiting

88 + 88 = 176

Saturday (800 Series Page 87)

Average Saturday — Directional Distribution: 50% ent. 50% exit.
T = 133.31 (X) — T = 3374 Average Vehicle Trip Ends
T = 133.31 * (25.3) — 1687 entering 1687 exiting

1687 + 1687 = 3374

Saturday Peak Hour of Generator (800 Series Page 88)

Directional Distribution: 50% ent. 50% exit.
T = 20.06 (X) — T = 508 Average Vehicle Trip Ends
T = 20.06 * (25.3) — 254 entering 254 exiting

254 + 254 = 508

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for Nursery (Wholesale)				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates
Land Use Code - Nursery (Wholesale) (818)
Independant Variable - 1,000 Square Feet (X)
Square Feet = 4,500
SF = 4.500
T = Average Vehicle Trip Ends

Weekday (800 Series Page 110)

Average Weekday — Directional Distribution: 50% ent. 50% exit.
T = 39.00 (X) — T = 176 Average Vehicle Trip Ends
T = 39.0 * (4.5) — 88 entering 88 exiting

88 + 88 = 176

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 111)

Directional Distribution: 50% ent. 50% exit.
T = 2.40 (X) — T = 11 Average Vehicle Trip Ends
T = 2.40 * (4.5) — 4 entering 6 exiting

4 + 7 = 11

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 112)

Directional Distribution: 50% ent. 50% exit.
T = 5.18 (X) — T = 23 Average Vehicle Trip Ends
T = 5.18 * (4.5) — 12 entering 12 exiting

12 + 11 = 23

Saturday (800 Series Page 115)

Average Saturday — Directional Distribution: 50% ent. 50% exit.
T = 29.94 (X) — T = 136 Average Vehicle Trip Ends
T = 29.94 * (4.5) — 68 entering 68 exiting

68 + 68 = 136

Saturday Peak Hour of Generator (800 Series Page 116)

Directional Distribution: 50% ent. 50% exit.
T = 5.53 (X) — T = 25 Average Vehicle Trip Ends
T = 5.53 * (4.5) — 11 entering 13 exiting

11 + 14 = 25

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for Arts and Crafts Store				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates

Land Use Code - Arts and Crafts Store (879)

Independant Variable - 1000 Square Feet (X)
SF = 3,000
X = 3.000
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (700 Series Page 4)

Directional Distribution: 0% ent. 0% exit.
(T) = 0(X) T = 0 Average Vehicle Trip Ends
(T) = 0 * (3.0) 0 entering 0 exiting

0 + 0 = 0

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (700 Series Page 5)

Directional Distribution: 46% ent. 54% exit.
(T) = 6.21 (X) T = 19 Average Vehicle Trip Ends
(T) = 6.21 * (3.0) 9 entering 10 exiting

9 + 10 = 19

Weekday (700 Series Page 3)

Average Weekday Directional Distribution: 50% ent. 50% exit.
(T) = 56.55 (X) T = 170 Average Vehicle Trip Ends
(T) = 56.55 * (3.0) 85 entering 85 exiting

85 + 85 = 170

Saturday, Peak Hour of Generator (700 Series Page 9)

Daily Weekday Directional Distribution: 53% ent. 47% exit.
(T) = 0 (X) T = 0 Average Vehicle Trip Ends
(T) = 0 * (3.0) 0 entering 0 exiting

0 + 0 = 0

Kimley»Horn

Project	The Shire at Old Ranch				
Subject	Trip Generation for High-Turnover (Sit-Down) Restaurant				
Designed by	JRP	*Date*	September 27, 2019	*Job No.*	096829000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations
Land Use Code - High Turnover Sit-Down Restaurant (932)
Independant Variable - 1000 Square Feet Gross Floor Area (X)

Gross Floor Area = 2,500 Square Feet
X = 2.500
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 97)

Average Weekday — Directional Distribution: 55% ent. 45% exit.
T = 9.94 (X) — T = 25 Average Vehicle Trip Ends
T = 9.94 * 2.500 — 14 entering 11 exiting

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 98)

Average Weekday — Directional Distribution: 62% ent. 38% exit.
T = 9.77 (X) — T = 24 Average Vehicle Trip Ends
T = 9.77 * 2.500 — 15 entering 9 exiting

Weekday (900 Series Page 96)

Average Weekday — Directional Distribution: 50% entering, 50% exiting
T = 112.18 (X) — T = 282 Average Vehicle Trip Ends
T = 112.18 * 2.500 — 141 entering 141 exiting

P.M. Peak Hour of Generator (900 Series Page 100)

Average Weekday — Directional Distribution: 52% ent. 48% exit.
T = 17.41 (X) — T = 44 Average Vehicle Trip Ends
T = 17.41 * 2.500 — 23 entering 21 exiting

Saturday Peak Hour of Generator (900 Series Page 105

Average Saturday — Directional Distribution: 51% ent. 49% exit.
T = 11.19 (X) — T = 28 Average Vehicle Trip Ends
T = 11.19 * 2.500 — 14 entering 14 exiting

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017-Page 207)

AM Peak Hour = 57% Non-Pass By PM Peak Hour = 57% Non-Pass By

	IN	Out	Total
AM Peak	8	6	14
PM Peak	9	5	14
Daily	80	80	160

PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017 -Page 207)

AM Peak Hour = 43% Pass By PM Peak Hour = 43% Pass By

	IN	Out	Total
AM Peak	6	5	11
PM Peak	7	4	11
Daily	61	61	122

PM Peak Hour Rate Applied to Daily

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	22	8	0	17
Future Vol, veh/h	7	1	22	8	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	25	61	50	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	4	36	16	0	24

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	68	44	0	0	52	0
Stage 1	44	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	937	1026	-	-	1554	-
Stage 1	978	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	937	1026	-	-	1554	-
Mov Cap-2 Maneuver	937	-	-	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	958	1554	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	0	14	3	0	13
Future Vol, veh/h	4	0	14	3	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	0	24	4	0	20

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	46	26	0	0	28	0
Stage 1	26	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	964	1050	-	-	1585	-
Stage 1	997	-	-	-	-	-
Stage 2	1003	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	964	1050	-	-	1585	-
Mov Cap-2 Maneuver	964	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	964	1585	-
HCM Lane V/C Ratio	-	-	0.013	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	23	8	0	18
Future Vol, veh/h	7	1	23	8	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	25	61	50	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	4	38	16	0	25

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	71	46	0	0	54	0
Stage 1	46	-	-	-	-	-
Stage 2	25	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	933	1023	-	-	1551	-
Stage 1	976	-	-	-	-	-
Stage 2	998	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	933	1023	-	-	1551	-
Mov Cap-2 Maneuver	933	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	998	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	954	1551	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	0	14	3	0	13
Future Vol, veh/h	4	0	14	3	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	0	24	4	0	20

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	46	26	0	0	28	0
Stage 1	26	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	964	1050	-	-	1585	-
Stage 1	997	-	-	-	-	-
Stage 2	1003	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	964	1050	-	-	1585	-
Mov Cap-2 Maneuver	964	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	1003	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	964	1585	-
HCM Lane V/C Ratio	-	-	0.013	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	29	8	0	24
Future Vol, veh/h	7	1	29	8	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	25	61	50	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	4	48	16	0	34

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	90	56	0	0	64	0
Stage 1	56	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	910	1011	-	-	1538	-
Stage 1	967	-	-	-	-	-
Stage 2	988	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	910	1011	-	-	1538	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	967	-	-	-	-	-
Stage 2	988	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	933	1538	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	8.9	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	0	28	3	0	27
Future Vol, veh/h	4	0	28	3	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	0	48	4	0	42

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	92	50	0	0	52	0
Stage 1	50	-	-	-	-	-
Stage 2	42	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	908	1018	-	-	1554	-
Stage 1	972	-	-	-	-	-
Stage 2	980	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	908	1018	-	-	1554	-
Mov Cap-2 Maneuver	908	-	-	-	-	-
Stage 1	972	-	-	-	-	-
Stage 2	980	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	908	1554	-
HCM Lane V/C Ratio	-	-	0.013	-	-
HCM Control Delay (s)	-	-	9	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	122	7	23	123	6	18
Future Vol, veh/h	122	7	23	123	6	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	70	50	61	70	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	14	38	176	7	25

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	165	126	0	0	214	0
Stage 1	126	-	-	-	-	-
Stage 2	39	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	826	924	-	-	1356	-
Stage 1	900	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	822	924	-	-	1356	-
Mov Cap-2 Maneuver	822	-	-	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	983	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	1.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	829	1356	-
HCM Lane V/C Ratio	-	-	0.227	0.005	-
HCM Control Delay (s)	-	-	10.6	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Intersection	
Int Delay, s/veh	7.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	268	14	14	265	14	13
Future Vol, veh/h	268	14	14	265	14	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	70	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	383	15	24	353	15	20

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	251	201	0	0	377	0
Stage 1	201	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	738	840	-	-	1181	-
Stage 1	833	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	728	840	-	-	1181	-
Mov Cap-2 Maneuver	728	-	-	-	-	-
Stage 1	822	-	-	-	-	-
Stage 2	972	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.6	0	3.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	732	1181	-
HCM Lane V/C Ratio	-	-	0.544	0.013	-
HCM Control Delay (s)	-	-	15.6	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	3.3	0	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	41	8	0	32
Future Vol, veh/h	7	1	41	8	0	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	25	61	50	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	4	67	16	0	45

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	120	75	0	0	83	0
Stage 1	75	-	-	-	-	-
Stage 2	45	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	876	986	-	-	1514	-
Stage 1	948	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	876	986	-	-	1514	-
Mov Cap-2 Maneuver	876	-	-	-	-	-
Stage 1	948	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	901	1514	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	-	-	9.1	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	0	26	3	0	24
Future Vol, veh/h	4	0	26	3	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	0	45	4	0	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	84	47	0	0	49	0
Stage 1	47	-	-	-	-	-
Stage 2	37	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	918	1022	-	-	1558	-
Stage 1	975	-	-	-	-	-
Stage 2	985	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	918	1022	-	-	1558	-
Mov Cap-2 Maneuver	918	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	985	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	918	1558	-
HCM Lane V/C Ratio	-	-	0.013	-	-
HCM Control Delay (s)	-	-	9	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	1	47	8	0	38
Future Vol, veh/h	7	1	47	8	0	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	25	61	50	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	4	77	16	0	54

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	139	85	0	0	93	0
Stage 1	85	-	-	-	-	-
Stage 2	54	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	854	974	-	-	1501	-
Stage 1	938	-	-	-	-	-
Stage 2	969	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	854	974	-	-	1501	-
Mov Cap-2 Maneuver	854	-	-	-	-	-
Stage 1	938	-	-	-	-	-
Stage 2	969	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	881	1501	-
HCM Lane V/C Ratio	-	-	0.018	-	-
HCM Control Delay (s)	-	-	9.2	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	0	40	3	0	38
Future Vol, veh/h	4	0	40	3	0	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	0	69	4	0	58

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	129	71	0	0	73	0
Stage 1	71	-	-	-	-	-
Stage 2	58	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	865	991	-	-	1527	-
Stage 1	952	-	-	-	-	-
Stage 2	965	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	865	991	-	-	1527	-
Mov Cap-2 Maneuver	865	-	-	-	-	-
Stage 1	952	-	-	-	-	-
Stage 2	965	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	865	1527	-
HCM Lane V/C Ratio	-	-	0.014	-	-
HCM Control Delay (s)	-	-	9.2	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	4.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	122	7	41	123	6	32
Future Vol, veh/h	122	7	41	123	6	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	70	50	61	70	92	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	14	67	176	7	45

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	214	155	0	0	243	0
Stage 1	155	-	-	-	-	-
Stage 2	59	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	774	891	-	-	1323	-
Stage 1	873	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	770	891	-	-	1323	-
Mov Cap-2 Maneuver	770	-	-	-	-	-
Stage 1	869	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	778	1323	-
HCM Lane V/C Ratio	-	-	0.242	0.005	-
HCM Control Delay (s)	-	-	11.1	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Intersection	
Int Delay, s/veh	7.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	268	14	26	265	14	24
Future Vol, veh/h	268	14	26	265	14	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	92	58	75	92	65
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	357	15	45	353	15	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	289	222	0	0	398	0
Stage 1	222	-	-	-	-	-
Stage 2	67	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	702	818	-	-	1161	-
Stage 1	815	-	-	-	-	-
Stage 2	956	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	693	818	-	-	1161	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	804	-	-	-	-	-
Stage 2	956	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.9	0	2.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	697	1161	-
HCM Lane V/C Ratio	-	-	0.535	0.013	-
HCM Control Delay (s)	-	-	15.9	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	3.2	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	358	158	1	1	25
Future Vol, veh/h	29	358	158	1	1	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	66	95	73	25	25	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	377	216	4	4	36

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	220	0	-	0	681	216
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	465	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1349	-	-	-	416	824
Stage 1	-	-	-	-	820	-
Stage 2	-	-	-	-	632	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1349	-	-	-	402	824
Mov Cap-2 Maneuver	-	-	-	-	402	-
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	632	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1349	-	-	-	746
HCM Lane V/C Ratio	0.033	-	-	-	0.054
HCM Control Delay (s)	7.8	-	-	-	10.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	109	142	0	1	17
Future Vol, veh/h	17	109	142	0	1	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	83	87	92	25	61
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	131	163	0	4	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	163	0	-	0	334	163
Stage 1	-	-	-	-	163	-
Stage 2	-	-	-	-	171	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1416	-	-	-	661	882
Stage 1	-	-	-	-	866	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1416	-	-	-	652	882
Mov Cap-2 Maneuver	-	-	-	-	652	-
Stage 1	-	-	-	-	854	-
Stage 2	-	-	-	-	859	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1416	-	-	-	845
HCM Lane V/C Ratio	0.014	-	-	-	0.038
HCM Control Delay (s)	7.6	-	-	-	9.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	369	163	1	1	26
Future Vol, veh/h	30	369	163	1	1	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	66	95	73	25	25	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	388	223	4	4	38

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	227	0	-	0	701	223
Stage 1	-	-	-	-	223	-
Stage 2	-	-	-	-	478	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1341	-	-	-	405	817
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	624	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1341	-	-	-	391	817
Mov Cap-2 Maneuver	-	-	-	-	391	-
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	624	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1341	-	-	-	740
HCM Lane V/C Ratio	0.034	-	-	-	0.056
HCM Control Delay (s)	7.8	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	112	146	0	1	18
Future Vol, veh/h	18	112	146	0	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	83	87	92	25	61
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	135	168	0	4	30

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	168	0	-	0	345	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	177	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1410	-	-	-	652	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	854	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1410	-	-	-	642	876
Mov Cap-2 Maneuver	-	-	-	-	642	-
Stage 1	-	-	-	-	849	-
Stage 2	-	-	-	-	854	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1410	-	-	-	839
HCM Lane V/C Ratio	0.015	-	-	-	0.04
HCM Control Delay (s)	7.6	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	133	369	163	13	13	129
Future Vol, veh/h	133	369	163	13	13	129
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	95	73	25	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	190	388	223	52	17	172

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	275	0	-	0	991	223
Stage 1	-	-	-	-	223	-
Stage 2	-	-	-	-	768	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1288	-	-	-	273	817
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	458	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1288	-	-	-	233	817
Mov Cap-2 Maneuver	-	-	-	-	233	-
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	458	-

Approach	EB	WB	SB
HCM Control Delay, s	2.7	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1288	-	-	-	233	817
HCM Lane V/C Ratio	0.148	-	-	-	0.074	0.211
HCM Control Delay (s)	8.3	-	-	-	21.7	10.6
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.5	-	-	-	0.2	0.8

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	253	112	149	27	29	255
Future Vol, veh/h	253	112	149	27	29	255
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	83	87	92	75	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	298	135	171	29	39	340

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	200	0	-	0	902	171
Stage 1	-	-	-	-	171	-
Stage 2	-	-	-	-	731	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1372	-	-	-	308	873
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1372	-	-	-	241	873
Mov Cap-2 Maneuver	-	-	-	-	241	-
Stage 1	-	-	-	-	673	-
Stage 2	-	-	-	-	476	-

Approach	EB	WB	SB
HCM Control Delay, s	5.7	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1372	-	-	-	241	873
HCM Lane V/C Ratio	0.217	-	-	-	0.16	0.389
HCM Control Delay (s)	8.3	-	-	-	22.8	11.7
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.8	-	-	-	0.6	1.9

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	54	666	294	2	2	47
Future Vol, veh/h	54	666	294	2	2	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	66	95	73	25	25	69
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	701	403	8	8	68

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	411	0	-	0	1268	403
Stage 1	-	-	-	-	403	-
Stage 2	-	-	-	-	865	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1148	-	-	-	186	647
Stage 1	-	-	-	-	675	-
Stage 2	-	-	-	-	412	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1148	-	-	-	173	647
Mov Cap-2 Maneuver	-	-	-	-	173	-
Stage 1	-	-	-	-	627	-
Stage 2	-	-	-	-	412	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1148	-	-	-	502
HCM Lane V/C Ratio	0.071	-	-	-	0.152
HCM Control Delay (s)	8.4	-	-	-	13.4
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.5

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	32	203	264	0	2	32
Future Vol, veh/h	32	203	264	0	2	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	83	87	92	25	61
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	245	303	0	8	52

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	303	0	-	0	624	303
Stage 1	-	-	-	-	303	-
Stage 2	-	-	-	-	321	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1258	-	-	-	449	737
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1258	-	-	-	436	737
Mov Cap-2 Maneuver	-	-	-	-	436	-
Stage 1	-	-	-	-	727	-
Stage 2	-	-	-	-	735	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1258	-	-	-	675
HCM Lane V/C Ratio	0.03	-	-	-	0.09
HCM Control Delay (s)	8	-	-	-	10.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	157	666	294	14	14	150
Future Vol, veh/h	157	666	294	14	14	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	95	90	50	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	701	327	28	18	188

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	355	0	-	0	1376	327
Stage 1	-	-	-	-	327	-
Stage 2	-	-	-	-	1049	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1204	-	-	-	160	714
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	337	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1204	-	-	-	137	714
Mov Cap-2 Maneuver	-	-	-	-	137	-
Stage 1	-	-	-	-	625	-
Stage 2	-	-	-	-	337	-

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1204	-	-	-	137	714
HCM Lane V/C Ratio	0.145	-	-	-	0.128	0.263
HCM Control Delay (s)	8.5	-	-	-	35.1	11.8
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.5	-	-	-	0.4	1.1

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	267	203	264	27	30	269
Future Vol, veh/h	267	203	264	27	30	269
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	50	0	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	83	87	92	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	314	245	303	29	38	336

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	332	0	-	0	1176	303
Stage 1	-	-	-	-	303	-
Stage 2	-	-	-	-	873	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1227	-	-	-	211	737
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	409	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	157	737
Mov Cap-2 Maneuver	-	-	-	-	157	-
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	409	-

Approach	EB	WB	SB
HCM Control Delay, s	5	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1227	-	-	-	157	737
HCM Lane V/C Ratio	0.256	-	-	-	0.239	0.456
HCM Control Delay (s)	8.9	-	-	-	35	13.9
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	1	-	-	-	0.9	2.4

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	6	31	115	6	27
Future Vol, veh/h	115	6	31	115	6	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	125	7	34	125	7	29

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	77	34	0	0	159	0
Stage 1	34	-	-	-	-	-
Stage 2	43	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	926	1039	-	-	1420	-
Stage 1	988	-	-	-	-	-
Stage 2	979	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	921	1039	-	-	1420	-
Mov Cap-2 Maneuver	921	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	974	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	1.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	926	1420	-
HCM Lane V/C Ratio	-	-	0.142	0.005	-
HCM Control Delay (s)	-	-	9.5	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	5.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	264	14	18	262	14	19
Future Vol, veh/h	264	14	18	262	14	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	287	15	20	285	15	21

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	71	20	0	0	305	0
Stage 1	20	-	-	-	-	-
Stage 2	51	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	933	1058	-	-	1256	-
Stage 1	1003	-	-	-	-	-
Stage 2	971	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	922	1058	-	-	1256	-
Mov Cap-2 Maneuver	922	-	-	-	-	-
Stage 1	1003	-	-	-	-	-
Stage 2	959	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.7	0	3.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	928	1256	-
HCM Lane V/C Ratio	-	-	0.326	0.012	-
HCM Control Delay (s)	-	-	10.7	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	6	56	115	6	48
Future Vol, veh/h	115	6	56	115	6	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	125	7	61	125	7	52

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	127	61	0	0	186	0
Stage 1	61	-	-	-	-	-
Stage 2	66	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	868	1004	-	-	1388	-
Stage 1	962	-	-	-	-	-
Stage 2	957	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	864	1004	-	-	1388	-
Mov Cap-2 Maneuver	864	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	952	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	870	1388	-
HCM Lane V/C Ratio	-	-	0.151	0.005	-
HCM Control Delay (s)	-	-	9.9	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	5.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	264	14	32	262	14	33
Future Vol, veh/h	264	14	32	262	14	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	287	15	35	285	15	36

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	101	35	0	0	320	0
Stage 1	35	-	-	-	-	-
Stage 2	66	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	898	1038	-	-	1240	-
Stage 1	987	-	-	-	-	-
Stage 2	957	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	887	1038	-	-	1240	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	987	-	-	-	-	-
Stage 2	946	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	2.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	894	1240	-
HCM Lane V/C Ratio	-	-	0.338	0.012	-
HCM Control Delay (s)	-	-	11.1	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	8	121	0	8	121	0
Future Vol, veh/h	8	121	0	8	121	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	132	0	9	132	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	141	0	18	9
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	9	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1442	-	1000	1073
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1014	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1442	-	1000	1073
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1014	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1000	-	-	1442	-
HCM Lane V/C Ratio	0.132	-	-	-	-
HCM Control Delay (s)	9.1	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Intersection	
Int Delay, s/veh	5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3	276	0	4	278	0
Future Vol, veh/h	3	276	0	4	278	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	300	0	4	302	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	303	0	7	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	4	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1258	-	1014	1081
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	1019	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1258	-	1014	1081
Mov Cap-2 Maneuver	-	-	-	-	1014	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	1019	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1014	-	-	1258	-
HCM Lane V/C Ratio	0.298	-	-	-	-
HCM Control Delay (s)	10.1	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.3	-	-	0	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	8	121	0	8	121	0
Future Vol, veh/h	8	121	0	8	121	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	132	0	9	132	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	141	0	18	9
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	9	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1442	-	1000	1073
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1014	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1442	-	1000	1073
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1014	-
Stage 2	-	-	-	-	1014	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1000	-	-	1442	-
HCM Lane V/C Ratio	0.132	-	-	-	-
HCM Control Delay (s)	9.1	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Intersection	
Int Delay, s/veh	5

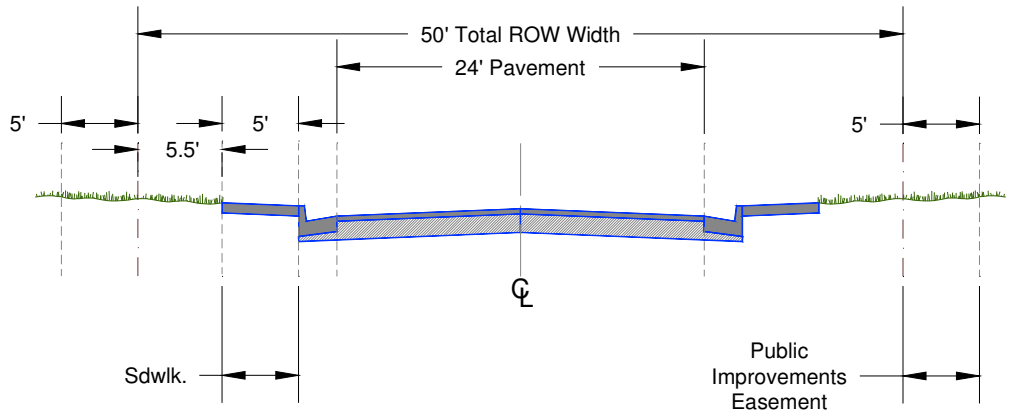
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3	276	0	4	278	0
Future Vol, veh/h	3	276	0	4	278	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	300	0	4	302	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	303	0	7	3
Stage 1	-	-	-	-	3	-
Stage 2	-	-	-	-	4	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1258	-	1014	1081
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	1019	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1258	-	1014	1081
Mov Cap-2 Maneuver	-	-	-	-	1014	-
Stage 1	-	-	-	-	1020	-
Stage 2	-	-	-	-	1019	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1014	-	-	1258	-
HCM Lane V/C Ratio	0.298	-	-	-	-
HCM Control Delay (s)	10.1	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.3	-	-	0	-

Figure 2-17. Typical Urban Local (low volume) Cross Section



2.2.5 Roadway Access Criteria

All new or modified accesses to the County roadways shall meet the requirements of the ECM. Standards and technical criteria not specifically addressed in the ECM shall follow the provisions of the AASHTO, A Policy on Geometric Design of Highways and Roadways ("Green Book") and the Colorado State Highway Access Code. In addition, should any access request fall within the preview of the Major Thoroughfare Task Force (MTTF), per their adopted bylaws, then the request shall be brought before the MTTF for a recommendation.

A. Rural and Urban Expressway Access Criteria

1. Intersection Spacing and General Access Standards

Full movement intersections and major access spacing shall meet the requirements of this section. Right-in/right-out and three quarter movement accesses may be permitted as a deviation only if they meet the criteria presented in this section for sight distances, turn lane requirements, grades and do not negatively impact traffic operations or safety.

2. No Alternative Access to Road System

Where reasonable access can be obtained from the local roadway system, a temporary direct lot or partial turn movement access may be permitted provided the access meets these Standards or as otherwise required by the ECM Administrator.

3. Access and Lot Division

No additional access right shall accrue and no additional access shall be provided when splitting or dividing of existing lots of land. When an alternative is reasonably available in the opinion of the ECM Administrator, all access to the newly created properties shall be

provided internally from the existing access or new access to a roadway of lower functional classification.

4. Relocation of Access when Alternative is Available

All access to an expressway not meeting the minimum one-mile spacing requirement shall be closed in favor of an alternative access when an alternative is reasonably available in the opinion of the ECM Administrator.

B. Rural and Urban Principal Arterial and Rural Minor Arterial Access Criteria

1. Spacing

Spacing of roads accessing a principal arterial or rural minor arterial that will result in a full movement intersection shall be planned at one-half mile (one-quarter mile for rural minor arterials). Should the one-half mile spacing not be “viable or practical” for providing access to the adjacent land, a deviation may be considered and approved by the ECM Administrator. If a deviation is granted, only one additional full movement intersection will be permitted by the ECM Administrator. The Applicant shall have the burden of proof that no other “viable or practical” access is available. A deviation request should be supported by a traffic study or memorandum that provides information to assist the ECM Administrator in determining the proposed deviation minimizes negative safety and other operational impacts. If the development is at the intersection of two major corridors, the full movement access should be located on the lower functional classification roadway. The intersection shall only be approved if the intersection and roadway are shown to operate safely and efficiently with buildout design hour/peak hour projected traffic volumes. The intersection must also show a public benefit. An arterial progression through bandwidth percentage of 35 percent or greater must be achieved or the inclusion of a signal at the access must not degrade the existing signal progression. The intersection must not create any queuing or blocking of lane entries or access points. The intersection must be in a location such that any necessary turn, acceleration and deceleration lanes can be accommodated to maintain safe operations and capacity. The analysis should consider all potential future additional requirements for left turn or other exclusive phasing at a signal for which the need is created by traffic generated by land uses on both sides of the roadway.

2. Topographic and Other Limitations

Where topography or other existing conditions make the required spacing inappropriate or unfeasible, location of the access shall be determined with consideration given to topography, established property ownerships, unique physical limitations, pre-existing historical land use patterns, and physical design constraints, with every attempt to achieve an access spacing of one-half mile. The final location shall serve as

many properties as possible to reduce the need for additional direct access to the principal arterial or rural minor arterial. In selecting locations for full movement intersections, preference shall be given to roads that meet, or may be reasonably expected to meet, signal warrants in the future.

3. Access and Lot Division

No additional access right shall accrue and no additional access shall be provided when splitting or dividing existing lots of land. When an alternative is reasonably available in the opinion of the ECM Administrator, all access to the newly created properties shall be provided internally from the existing access or new access to a roadway of lower functional classification.

C. Urban Minor Arterial Access Criteria

Spacing of roads accessing an urban minor arterial that will result in a full movement intersection shall be planned at one-quarter mile. However, one parcel access shall be granted to each existing lot, if it does not create safety or operational problems. The parcel access will provide for right turns only. The access may allow for left turns in (three-quarters movement) if the addition of left turns will improve the operation at an adjacent full movement intersection and meet appropriate design standards.

D. Collector Access Standards

Collector roadways shall intersect another roadway (centerline to centerline) in accordance with the standards in Section 2.3.7. On minor collector roadways, the closest local roadway intersection to an arterial roadway shall be 330 feet (right-of-way line of arterial to centerline of local roadway). On major collector roadways, the closest local roadway intersection to an arterial roadway shall be 660 feet (right-of-way line of arterial to centerline of local roadway). Single-family residence access to major collector roadways is not permitted (even though existing conditions show otherwise).

E. Rural and Urban Local Roadways

Roads shall not intersect urban local roadways closer than 200 feet from each other (centerline to centerline) and shall not intersect a rural local roadway closer than 330 feet from each other. On an urban local roadway, the closest intersection to a collector roadway shall be at least 200 feet (centerline to centerline). To an arterial roadway, the closest intersection shall be 330 feet (arterial right-of-way line to local roadway centerline).

2.2.7 Pavement Design

A. General

Pavement design is a critical component of roadway design. Proper pavement design helps to ensure roadway performance and reduce the lifecycle costs associated with maintaining the roadway system.

B. Road Paving Policy

Paved roads meet the paving requirements established by Roadway Functional Classifications in Section 2.2.4.

1. New Roads

New roadways shall be paved if it connects to an existing roadway that is paved at the time of final approval of the development or it connects to a roadway internal to the development that is required to be paved.

New roadways are not required to be paved where:

- The new roadway has a projected ADT of less the 200 ADT within the proposed 20-year design life and the new road connects to an existing gravel road or
- The new road is located in an area of gravel roads and, to reduce the cost of maintenance, the ECM Administrator has determined that a gravel road is the most appropriate application.

2. Existing Roads

Existing roadways shall be paved where:

- Any development causes an existing gravel road to exceed a projected ADT of 200 (Note: the extent of paving will be determined by the ECM Administrator based on the Transportation Impact Study [Section 2.2.3]).
- In accordance with the terms and conditions of BOCC Resolution 99-55, 100% of the residents agree to participate in a Resident Participation Program to pave a road in their neighborhood at their own expense.

3. New Gravel Roads

New gravel roads may be permitted in accordance with the allowances in Section 2.2.7B.1 except where:

- The gravel road is projected to have an ADT of 200 or more. All roads with a projected ADT of 200 or more shall be paved to facilitate compliance with Colorado Air Quality Control Commission Regulation No. 1, Emission Control Regulations for Particulates, Smokes, and Sulfur Oxides for the State of Colorado.

Table 2-3. Roadway Design Criteria Continued

Criteria	Concern	Guideline
Minimize Space Devoted to Road Use	It is desirable to minimize local road mileage, thereby reducing construction and maintenance costs, as well as permitting the most efficient use of land. Roads should also have an appearance commensurate with their function.	Roads should be designed to complement local character.
Relate Road to Topography	Local roads are more attractive and economical if constructed to closely adhere to topography (minimize cut and fill).	The important role that roads play in the overall storm drainage system can be enhanced by closely following existing topography.
Layout Road to Achieve Optimum Subdivision of Land	The arrangement of roads should allow for economical and practical patterns, shapes, and sizes of adjacent lots. Roads as a function of land use must not unduly hinder the development of land.	Distances between roads, number of roads, and related elements all have a bearing on efficient subdivision of an area. Access to adjoining properties should also be encouraged.

2.3.2 Design Standards by Functional Classification

Section 2.2.4 of these standards identifies the Roadway Functional Classifications recognized and used by the County. Table 2-4 through Table 2-7 summarize many of the minimum roadway design standards by category and functional classification. Detailed road Standard Drawings are provided in Appendix F.

Table 2-4. Roadway Design Standards for Rural Expressways and Arterials

	Expressways		Arterials		
Criteria	**6 Lane**	**4 Lane**	**6 Lane Principal**	**4 Lane Principal**	**Minor**
Design Speed / Posted Speed (MPH)	70 / 65	70 / 65	70 / 65	70 / 65	60 / 55
Clear Zone	34’	34’	34’	34’	30’
Minimum Centerline Curve Radius	2,510’[1]	2,510’[1]	2,510’[1]	2,510’[1]	1,505’[1]
Number of Through Lanes	6	4	6	4	2
Lane Width	12’	12’	12’	12’	12’
Right-of-Way	210’	180’	210’	180’	100’
Paved Width	56’[2]	38’[2]	56’[2]	38’[2]	40’
Median Width	24’	24’	24’	24’	n/a
Outside Shoulder Width (paved/gravel)	12’(10’/2’)	12’(10’/2’)	12’(10’/2’)	12’(10’/2’)	10’(8’/2’)
Inside Shoulder Width (paved/gravel)	12’(10’/2’)	6’(4’/2’)	12’(10’/2’)	6’(4’/2’)	n/a
Design ADT		48,000		40,000	10,000
Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67
Access Permitted	No	No	No	No	No
Access Spacing	n/a	n/a	n/a	n/a	n/a
Intersection Spacing	1 mile	1 mile	½ mile	½ mile	¼ mile
Parking Permitted	No	No	No	No	No
Minimum Flowline Grade	1%	1%	1%	1%	1%
Centerline Grade (Min.-Max.)	1-5%	1-5%	1-5%	1-5%	1-6%
Intersection Grades (Min.-Max.)	1-2%	1-2%	1-3%	1-3%	1-4%

[1] Assumes 4% superelevation, 6% for 70 MPH design speeds
[2] Pavement width in each direction for divided roadways

Table 2-5. Roadway Design Standards for Rural Collectors and Locals

	Collectors		Local	
Criteria	**Major**	**Minor**	**Local**	**Gravel**
Design Speed / Posted Speed (MPH)	50 / 45	40 / 35	30 / 30	50/45
Clear Zone	20’	14’	7’	12'
Minimum Centerline Curve Radius	930’[2]	565’	300’	As Approved
Number of Through Lanes	2	2	2	2
Lane Width	12’	12’	12’	12'
Right of Way	90’	80’	70’[3]	70'[3]
Paved Width	32’	32’	28’	n/a
Median Width	n/a	n/a	n/a	n/a
Outside Shoulder Width (paved/gravel)	8’(4’/4’)	6’(4’/2’)	4’(2’/2’)	5'(0'/5')
Inside Shoulder Width (paved/gravel)	n/a	n/a	n/a	n/a
Design ADT	3,000	1,500	750	200
Design Vehicle	WB-67	WB-67	WB-50	WB-50
Access Permitted	No	Yes	Yes	Yes
Access Spacing	n/a	Frontage	Frontage	Frontage
Intersection Spacing	¼ mile	660’	330’	330'
Parking Permitted	No	Yes	Yes	No
Minimum Flowline Grade	1%	1%	1%	n/a
Centerline Grade (Min.-Max.)	1-8%[1]	1-8%[1]	1-8%[1]	1-6%
Intersection Grades (Min.-Max.)	1-4%	1-4%	1-4%	1-4%

[1] 10% maximum grade permitted at the discretion of the ECM Administrator
[2] Assumes 4% superelevation, 6% for 70 MPH design speeds
[3] 60-foot right-of-way plus two 5-foot Public Improvements Easements granted to El Paso County

Table 2-6. Roadway Design Standards for Urban Expressways and Arterials

	Expressways		Arterials		
Criteria	**6 Lane**	**4 Lane**	**6 Lane Principal**	**4 Lane Principal**	**Minor**
Design Speed / Posted Speed (MPH)	60 / 55	60 / 55	50 / 45	50 / 45	40 / 35
Clear Zone	30’	30’	20’	20’	14’
Minimum Centerline Curve Radius	1,505’[1]	1,505’[1]	930’[1]	930’[1]	565’
Number of Through Lanes	6	4	6	4	4
Lane Width	12’	12’	12’	12’	12’
Right-of-Way	160’	140’	160’	130’	100’
Paved Width (Excluding Gutter Pan)	48’[2]	36’[2]	48’[2]	36’[2]	62’
Median Width (Including Curb & Gutter)	31’	23’	31’	19’	14’
Shoulder Width (Ext., Excluding Gutter)	8’	8’	8’	8’	n/a
Shoulder Width (Int., Excluding Gutter)	4’	4’	4’	4’	n/a
Required Curb/ Gutter Type (Vertical)	6”	6”	6”	6”	6”
Sidewalk Width (@ FL)	6’ detached	6’ detached	6’ detached	6’ detached	6’ detached
Design ADT		48,000		40,000	20,000
Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67
Bike Lanes Permitted	No	No	Yes	Yes	No
Access Permitted	No	No	No	No	No[3]
Access Spacing	n/a	n/a	n/a	n/a	See Table 2-36
Intersection Spacing	1 mile	1 mile	½ mile	½ mile	¼ mile
Parking	No	No	No	No	No
Minimum Flowline Grade of Curb	.50%	.50%	.50%	.50%	.50%
Centerline Grade (Min.-Max.)	0.5-5%	0.5-5%	0.5-6%	0.5-6%	0.5-6%
Intersection Grades (Min.-Max.)	0.5-2%	0.5-2%	0.5-3%	0.5-3%	0.5-4%

[1] Assumes 4% superelevation, 6% for 70 MPH design speeds
[2] Pavement width in each direction for divided roadways
[3] Where no local public or private roadway can provide access, temporary or partial turn movement parcel access may be permitted

Table 2-7. Roadway Design Standards for Urban Collectors and Locals

Criteria	Collectors		Local	
	Non-Residential	Residential	Local	Local[4] (low volume)
Design Speed / Posted Speed (MPH)	40 / 35	40 / 35	25 / 25	20 / 20
Clear Zone	14’	14’	12’	7’
Minimum Centerline Curve Radius	565’	565’	200’	100’
Number of Through Lanes	2	2	2	2
Lane Width	12’	12’	12’	12’
Right-of-Way	80’	60’	60’[3]	60’[3]
Paved Width (Excluding Gutter Pan)	48’	36’	30’	24’
Median Width (Including Curb & Gutter)	12’	n/a	n/a	n/a
Shoulder Width (Ext., Excluding Gutter)	n/a	n/a	n/a	n/a
Shoulder Width (Int., Excluding Gutter)	n/a	n/a	n/a	n/a
Required Curb/ Gutter Type (Vertical)	6”	6”	6” (or ramp)	6” (or ramp)
Sidewalk Width (@ FL)	5’ detached	5’ detached	5’ attached	5’ attached
Design ADT	20,000	10,000	3,000	300
Design Vehicle	WB-50	WB-50	WB-50	SU-30
Bike Lanes Permitted	No	Yes	No	No
Access Permitted	No[5]	No[5]	Yes	Yes
Access Spacing	See Table 2-36	See Table 2-36	Frontage	Frontage
Intersection Spacing	660’[2]	660’[2]	175’	150’
Parking Permitted	No	No	Yes	Yes
Minimum Flowline Grade of Curb	.50%	.50%	.50%	.50%
Centerline Grade (Min.-Max,)	0.5-6%[1]	0.5-8%[1]	0.5-8%[1]	0.5-8%[1]
Intersection Grades (Min.-Max.)	0.5-4%	0.5-4%	0.5-4%	0.5-4%

[1] 10% maximum grade permitted at the discretion of the ECM Administrator
[2] 330 feet when intersecting local roadways
[3] 50-foot right-of-way plus two 5-foot Public Improvements Easements granted to El Paso County
[4] Section can be used for cul-de-sacs, or roads with two ways out having a maximum of 300 ADT and a maximum length of 1,200 feet
[5] Where no local public or private roadway can provide access, temporary or partial turn movement parcel access may be permitted

2.3.3 Horizontal Alignment

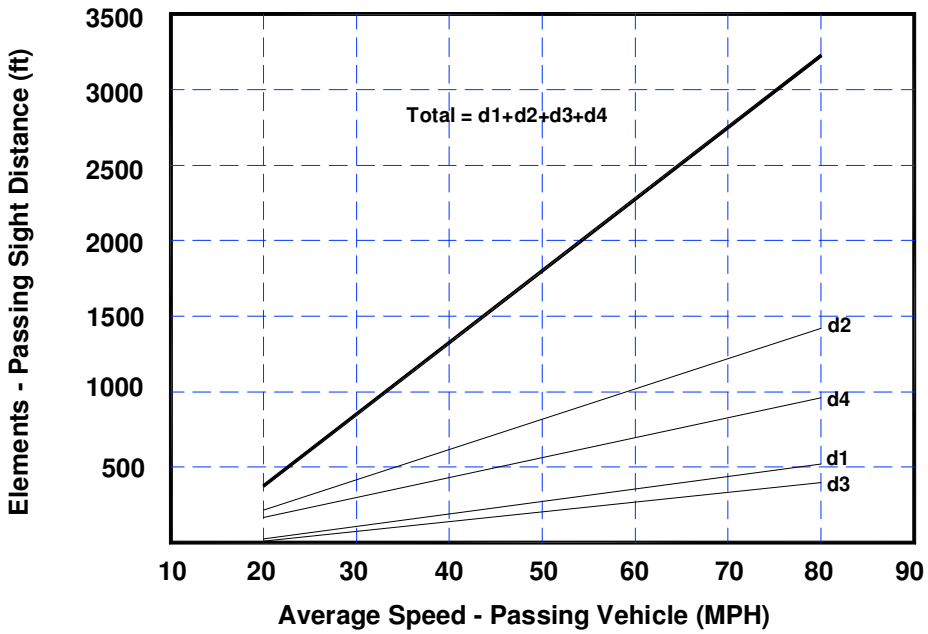
A. General Criteria

Proper roadway alignment provides for safe and continuous operation at a uniform design speed. Proposed road layouts shall have a logical relationship to existing or platted roads and fit within the overall transportation plan.

Table 2-21. Minimum Passing Sight Distance for Two-Lane Roads

Design Speed (MPH)	Assumed Speeds		Passing Sight Distance (feet)	
	Passed Vehicle (MPH)	Passing Vehicle (MPH)	Figure 2-23	Design
25	22	32	897	900
30	26	36	1,088	1,090
40	34	44	1,470	1,470
50	41	51	1,832	1,835
60	47	57	2,133	2,135
70	54	64	2,479	2,480

Figure 2-23. Total Passing Sight Distance for Two-Lane Roads



d1 - distance traversed during perception an dreaction time and during initial acceleration to the point of encroachment on the left lane
d2 - distance traveled while the passing vehicle occupies the left lane
d3 - distance between the passing vehicle at the end of its maneuver and the opposing vehicle
d4 - distance traversed by an opposing vehicle for two-thirds of the time the passing vehicle occupies the left lane, or 2/3 of d2

G. Intersection sight distance

The intersection sight distance provides for vehicles to enter traffic and accelerate to the average running speed. Intersection sight distances shall be measured as shown on Figure 2-24. The intersection sight distance shall be as shown in Table 2-22.

Figure 2-24. Sight Distance Triangle (Stop Controlled)

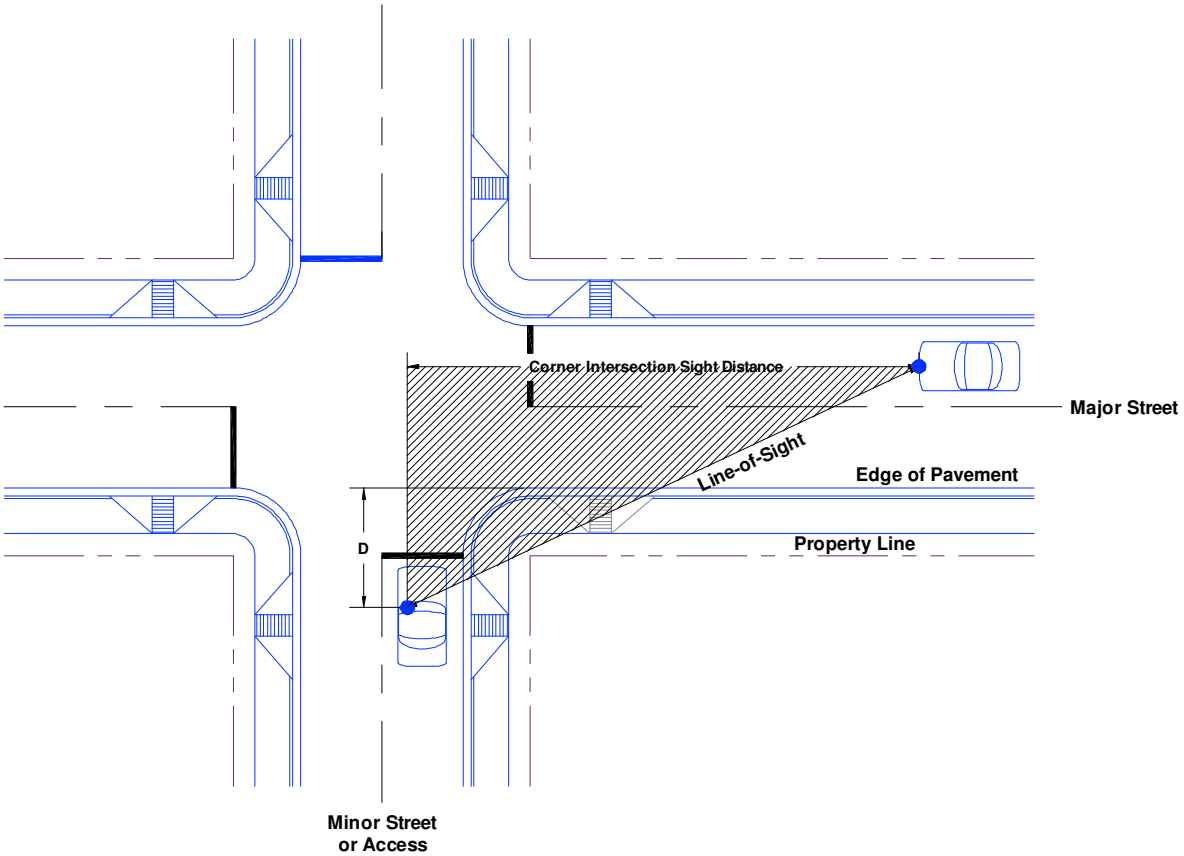


Table 2-22. Intersection sight distance

Higher Functional Classification Roadway Design Speed (MPH)	Intersection site distance (feet)[1, 3]
50	555
40	445
30	335[2]
25	280[2]

[1] Intersection site distance measured from a point on the minor road at 13 feet back from the edge of the major road pavement ("D") and measured from a height of eye at 3.5 feet on the minor road to a height of object at 3.5 feet on the major road.
[2] At local/local road intersections only, "D" shall be 10 feet and the sight distance shall be measured to the centerline of the road.
[3] These values only apply to two-lane roads with stop control, all other situations require special design considerations.

1. Sight Distance Triangles within Easements

There shall be an unobstructed sight distance along both approaches and both sides at an intersection (within the right-of-way) for distances sufficient to allow the operators of vehicles, approaching simultaneously, to see each other in time to prevent collisions at the intersection.

All sight distance triangles must be within the public right-of-way or a sight distance easement (See Figure 2-24). If the line of sight crosses onto private property, a "Sight Distance Easement" shall be dedicated to provide the required sight distance. The easement or right-of-way shall be dedicated to the County. Maintenance of a sight distance easement shall be the responsibility of the property owner or the homeowners' association unless otherwise approved by the County.

2. Encroachment into Sight distance Triangles or Easements

Any object within the sight distance triangle or easement more than 30 inches above the flowline elevation of the adjacent roadway shall constitute a sight obstruction, and shall be removed or lowered. The objects may include but are not limited to berms, buildings, parked vehicles on private property, cut slopes, hedges, trees, bushes, utility cabinets or tall crops. Trees may be permitted at the discretion of the ECM Administrator if pruned to at least 8 feet above the flowline elevation of the adjacent roadway.

3. On-Roadway Parking within Sight Distance Triangles

The ECM Administrator may limit on-street parking to protect visibility and enhance roadway capacity.

2.3.7 Intersections

A. Intersection Design Guidelines

Intersections shall be designed to provide safe movement for all those using roadways within the County (motorists, pedestrians, and bicyclists). By their nature, intersections are conflict locations. Vehicles, pedestrians, and bicycles all cross paths. Each crossing is a conflict point. The basic design of intersections includes the following objectives:

- Minimize points of conflict
- Simplify areas of conflict
- Limit conflict frequency
- Limit conflict severity

B. Intersection Spacing and General Access Standards

Full movement intersections and major accesses spacing shall meet the requirements in Section 2.2.5. While access to a major roadway should be avoided, right-in/right-out and three quarter movement accesses may be permitted as a deviation if they meet the criteria for sight distances, turn lane

requirements, grades and do not negatively impact traffic operations or safety. The applicant shall have the burden of proof that no other "viable or practical" property access is available. A deviation request should be supported by a traffic study or memorandum that provides information to assist the ECM Administrator in determining the proposed deviation minimizes negative safety and other operational impacts along upstream and downstream roadway segments. The addition of such an access shall minimize impacts to queuing or blocking of lane entries or access points and minimize impacts to progression. The access must be in a location such that any necessary turn lanes and acceleration/deceleration lanes can be accommodated to maintain safe operations and capacity. The analysis should consider all potential future additional requirements for to accommodate traffic generated by adjacent land uses. Buildout design hour/peak hour projected traffic volumes should be used.

C. Intersection Alignment

1. Offset

All lanes traversing an intersection shall be in alignment. A maximum 2-foot lane offset may be approved by the ECM Administrator if no other alternative exists.

2. Angle

Crossing roadways shall intersect at 90 degrees whenever possible. In no case shall roadways be permitted to intersect at less than 80 degrees or more than 100 degrees.

3. Horizontal Alignment

The horizontal alignment of roadways through an intersection shall be designed in conformance with this chapter depending on the classification of the roadways intersecting. Intersections may be placed on horizontal curves, provided the minimum tangent lengths shown in Table 2-11 are provided on the lower functional classification roadway and the required sight distance is met.

4. Vertical Alignment

The roadway profile grade shall not exceed the value presented in Table 2-23 on the approach to the intersection, as measured along the centerline of the roadway for a minimum distance equal to the grade lengths presented in Table 2-24 for each of the roadway functional classifications.

The grade of the roadway with the higher functional classification shall prevail at intersections. Grading of lower functional classifications, adjacent property, private access shall adapt to the higher functional classification roadway grade.

In cases where the natural grade for which a roadway is to be constructed is steeper than 4 percent (hillside areas). A deviation from the presented standards may be requested for to accommodate these conditions up to a maximum of 8 percent.

Table 2-23. Intersection Grades by Roadway Functional Classification

Functional Classification	Maximum Intersection Grade (%)	Minimum Intersection Grade (%)
Expressway (Urban/Rural)	2/2	0.5/1
Arterial (Urban/Rural)	3/3 (4 for minor)	0.5/1
Collector (Urban/Rural)	4/4	0.5/1
Local (Urban/Rural)	4/4	0.5/1

Table 2-24. Intersection Profile Grade Lengths[1]

Higher Classification Roadway (below)	Lower Classification Roadway			
	Local	**Collector**	**Arterial**	**Expressway**
Expressway	n/a	n/a	200	250[1]
Arterial	n/a	120	200[1]	n/a
Collector	100	120[1]	n/a	n/a
Local	100[1]	n/a	n/a	n/a

[1] In the case of where each intersecting roadway is of the same classification, the ECM Administrator will designate which roadway takes precedence and the distance required.

D. Turn Lanes Required

1. Exclusive Left Turn Lane Required

Exclusive left turn lanes shall be provided wherever left turn lanes are specified as being needed by an approved TIS, identified in the MTCP, required by the ECM, or determined to be warranted by the ECM Administrator. Information in the TIS shall be used to determine whether an exclusive left turn lane is warranted. Warrant determinations shall also be based on this chapter, which include:

- Expressways Left Turn Lane (State Highway Access Code Designation - EX): A left turn lane is required for any access that allows left turn ingress movement, except for field approaches. A left turn acceleration lane may be required if the design would be a benefit to safety and operation of the roadway.
- Principal Arterials Left Turn Lane (State Highway Access Code Designation - RA for Rural and NR-A for Urban): A left turn lane is required for an access with a projected peak hour left ingress turning volume of 10 VPH or greater. A left turn acceleration lane

may be required if it would be a benefit to the safety and operation of the roadway.

- Minor Arterials (State Highway Access Code Designation - RB for Rural and NR-B for Urban) and Lower Classifications Left Turn Lane: A left turn lane is required for any access with a projected peak hour ingress turning volume of 25 VPH or greater.

2. Exclusive Right Turn Lanes Required

Exclusive right turn lanes shall be provided wherever right turn lanes are specified as being needed by an approved TIS, identified in the MTCP, required by the ECM or determined to be warranted by the ECM Administrator. Information in the TIS shall be used to determine whether an exclusive right turn lane is warranted. Warrant determinations shall also be based on this chapter, which include:

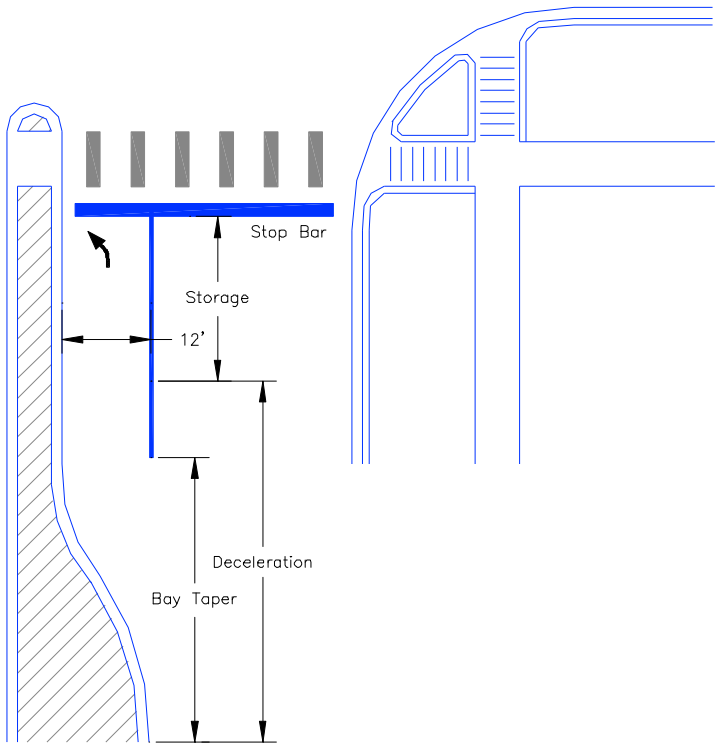
- Expressway Right Turn Lane (State Highway Access Code Designation - EX): A right turn lane is required for any access with a projected peak hour right turn ingress turning volume of 10 VPH or greater. A right turn acceleration lane is required for any access with a projected peak hour right turn egress turning volume of 10 VPH or greater.
- Principal Arterials Right Turn Lane (State Highway Access Code Designation - RA for Rural and NR-A for Urban): A right turn lane is required for any access with a projected peak hour right ingress turning volume of 25 VPH or greater. A right turn acceleration lane is required for any access with a projected peak hour right turning volume of 50 VPH or greater when the posted speed on the roadway is greater than 40 MPH. A right turn acceleration lane may also be required at a signalized intersection if a free right-turn is needed to maintain an appropriate level of service in the intersection.
- Minor Arterials (State Highway Access Code Designation - RB for Rural and NR-B for Urban) and Lower Classifications Right Turn Lane: A right turn lane is required for any access with a projected peak hour right turning volume of 50 VPH or greater. An acceleration lane is generally not required.

3. Acceleration Lanes Required

Acceleration lanes shall be provided wherever acceleration lanes are specified as being needed by an approved TIS, identified in the MTCP, required by the ECM or determined to be warranted by the ECM Administrator. Information in the TIS shall be used to determine whether an acceleration lane is warranted. Warrant determinations shall be based on this chapter.

26. The specific designs for these lanes shall be in accordance with this chapter. For each high volume access and major intersection, both acceleration and deceleration lanes shall be considered in designing an exclusive left turn lane.

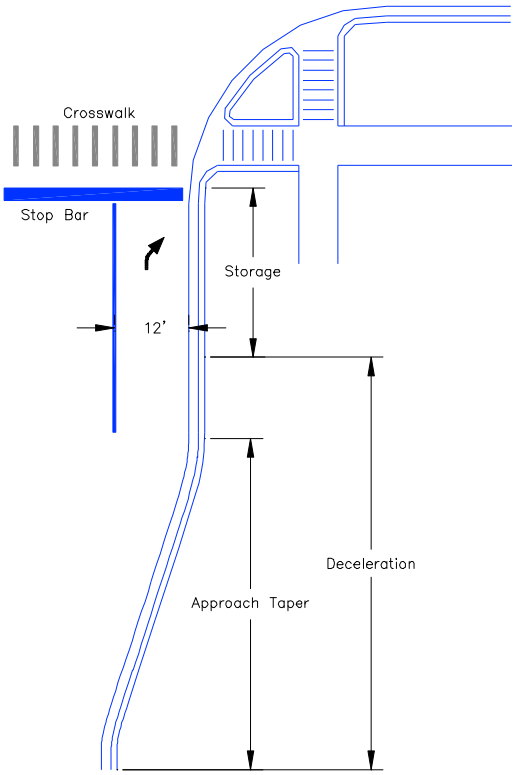
Figure 2-26. Design Elements for Left Turn Lanes



- Right Turn Lane. The design elements for a right turn and deceleration lanes are the approach taper, lane length, storage length, which in combination makes up the right turn lane. The elements are as shown in Figure 2-27. For each high volume access and major intersection, both acceleration and deceleration lanes shall be considered in designing an exclusive right turn lane. The specific designs for these lanes shall be in accordance with this chapter. Specific lane shift and lane drop design criteria can be found in Section 2.3.8J.3.
- Acceleration Lane. The design elements for an acceleration lane are the transition taper and acceleration length. For each high volume access and major intersection, both acceleration and deceleration lanes shall be considered in designing an exclusive right or left turn lane. The specific designs for these lanes shall be in accordance with this chapter.

- Shift or Drop Lane. The design elements for a transition or drop land are the redirect taper, full width auxiliary lane, and storage length. The use and design of these elements varies based on the roadway classification and site-specific conditions.

Figure 2-27. Design Elements for Right Turn Lanes



2. Tapers

- Approach Tapers. The basis for designing a deceleration lane and taper is to provide sufficient length for a vehicle to decelerate and brake primarily outside the through traffic lanes. Table 2-25 provides the required deceleration lane and taper design lengths by design speed. Deceleration lane lengths shall be adjusted for a grade of 3% or more using the factors in Table 2-26. The required length allows a motorist to decelerate in gear for at least 3 seconds followed by safe braking to a complete stop.

Table 2-25. Required Deceleration Lane and Taper Lengths

Design Speed (MPH)	Lane Length (feet)	Approach Taper (feet)	Total Length (feet)
25	115	120	235
30	115	120	235
40	155	160	315
50	235	200	435
60	290	240	530
70	Special Design	Special Design	Special Design

Table 2-26. Deceleration Lane Grade Adjustment Factors

Roadway Grade	Factors
Upgrade	
3% to 4.9%	0.90
5% to 7.5%	0.80
Downgrade	
3% to 4.9%	1.20
5% to 7.5%	1.35

- Bay Tapers. Table 2-27 provides the required bay taper length by lane width. A bay taper is designed to direct left-turning vehicles into the turn lane. A minimum taper ratio of 8:1 may be used for tangent bay tapers in constrained locations. Bay tapers should be used (asymmetrical reverse curves) for deceleration transition tapers. Straight transition tapers should be avoided at design speeds above 40, and where a vertical crest or horizontal curve is present. Under these conditions, an immediate bay taper and lane striping should be substituted for a straight transition taper to reduce drifting of the through vehicles into the deceleration lane. Where horizontal or crest vertical curves exist, the ECM Administrator may require the deceleration transition taper to begin with an immediate asymmetrical reverse curve bay taper of 1/3L then 2/3L with the remaining required transition taper length at full lane width. Partial tangent transition tapers, symmetrical reverse curve tapers or asymmetrical reverse curve tapers may be used for transition taper design provided a radius of at least 150 feet is used in curve calculations.

Table 2-27. Required Bay Taper Lengths

Design Speed (MPH)	Lane Length (feet)	Bay Taper (feet)	Total Length (feet)
25	115	80	195
30	115	120	235
40	155	160	315
50	235	200	435
60	290	Special Design	Special Design
70	Special Design	Special Design	Special Design
Taper = WV/3 where: W = lane width, feet, V = design speed, MPH			

- Transition Tapers. The basis for designing an acceleration lane and transition taper is to provide sufficient length for a vehicle to accelerate to the appropriate speed and merge into the through traffic lanes without disrupting traffic flow. Table 2-28 provides the required acceleration lane and transition taper design lengths by design speed. Acceleration lane lengths in Table 2-28 shall be adjusted for a grade of 3% or more using the factors in Table 2-29. The total length of the acceleration lane includes the values of both the lane and transition taper. The length of a transition taper is calculated by multiplying the width of the lane by a standard ratio. The beginning and ending point of all tapers shall be rounded.

Table 2-28. Design Criteria for Acceleration Lanes

Design Speed (MPH)	Lane Length (feet)	Transition Taper (feet)	Total Length (feet)
40	270	120	390
50	550	162	712
60	960	222	1182
70	1380	300	1680

Table 2-29. Grade Adjustment Factors for Acceleration Lanes

	Design Speed (MPH)		
	40 to 50	60	70
Upgrade			
3 to 4.9%	1.3	1.5	1.7
5 to 7.5%	1.5	2.0	2.5
Downgrade			
3 to 4.9%	0.7	0.65	0.6
5 to 7.5%	0.6	0.55	0.5

- Redirect Tapers. Redirect tapers shall be used where an exclusive turn lane, median or other redirection of vehicles is necessary and where redirection of the flow of traffic is necessary to accommodate the exclusive turn lane or median due to constraints. Redirect tapers required for redirecting

2.4 ROADWAY ACCESS DESIGN

2.4.1 Access Design Criteria

A. Access Design Guidelines

Access points shall be designed to provide safe movement for both those entering and traveling on roadways within the County. Like intersections, access points are conflict locations. The basic design of access points includes the following objectives:

- Adequate spacing
- Proper alignments
- Clear sight distances
- Coordinated widths with its intended use
- Clearances from intersections

B. Access Spacing

Accesses shall be separated by a distance equal to the entering sight distance values in Table 2-36. When turn lanes are present or will be needed in the future, the accesses shall be separated by a sufficient distance so that exclusive turn lanes including tapers will not overlap. Access shall not be permitted within a turn lane. Warrant criteria, design, and construction of turn lanes shall be governed by the requirements contained in Section 2.3.7D.

C. Access Alignment

1. Horizontal Alignment

Access points shall be aligned at 90 degrees to the adjacent road centerline or along a radial line in a cul-de-sac.

2. Vertical Alignment

Maximum access grades are 7% for commercial and industrial properties with a required 30-foot landing width and 15% for residential properties with a required 15-foot landing width. Access point approach grades and configuration shall be designed and constructed to accommodate the ultimate road standard of the intersecting roadway to prevent major access point reconstruction. Where an access approach will cross an existing sidewalk, the access shall be designed and constructed to match the elevation of the sidewalk where the two intersect. Reverse slope private accesses may be allowed as long as sight distance requirements are met.

D. Access Sight Distances

Accesses and specific turn movements shall not be permitted where the sight distance is not adequate to allow the safe movement of a motorist using or passing the access. Any potentially obstructing objects, such as but not limited to advertising signs, structures, trees, and bushes, shall be designed, placed, and

maintained at a height not to interfere with the sight distance needed by any vehicle using the access. Reconstruction of the horizontal and vertical curvature along the roadway or side slopes adjacent to the roadway may be necessary to increase sight distances.

1. Sight Distance Along Roadways

Horizontal and vertical sight distances shall conform to Table 2-33 for the vehicle traveling on the roadway toward the access. The lengths shown in Table 2-34 shall be adjusted for any grade of 3% or greater using the figures set forth in Table 2-35.

Table 2-34. Minimum Sight Distance Along Roadway (Horizontal and Vertical)

Posted Speed (MPH)	25	30	35	40	45	50	55	60	65	70
Design Sight distance (feet)	150	200	250	325	400	475	550	650	725	850
Minimum Sight distance (feet)[1, 2]	150	200	225	275	325	400	450	525	550	625

[1] To calculate sight distance at the proposed access location, a height of 3.5 feet shall be used for the driver's eyes of a vehicle on the highway approaching the access location. The driver's eyes shall be assumed to be at the centerline of the inside lane (inside with respect to the curve) for measurement purposes. A height of 3.5 feet shall be used for a vehicle assumed to be on the centerline of the access 5 feet back from the edge of the roadway.
[2] If an auxiliary lane is present, the entering posted speed for the deceleration lane and the posted speed at the end of the acceleration lane shall be used.

Table 2-35. Sight distance Adjustment Factors for Roadway Grade

Roadway Grade	Factors
Upgrade	
3% to 4.9%	0.90
5% to 7.5%	0.80
Downgrade	
3% to 4.9%	1.20
5% to 7.5%	1.35

2. Entering Sight Distance

The entering sight distance necessary for the entering vehicle shall conform to Table 2-36. These lengths shall be adjusted for any grade of 3% or greater using Table 2-35. The design vehicle used to determine the entering sight distance shall be selected from Table 2-37.

If the median provides at least 20 feet of storage for a crossing or turning vehicle and can safely store the design vehicle, then the sight distance may be calculated assuming a two-stop condition.

Table 2-36. Entering Sight Distance (Access Design)

Design Vehicle[3]	Posted Speed of Roadway (MPH)				
	25	35	45	55	65
Two Lane Roadway [1,2]					
Passenger Cars, Pickup Trucks	250	350	450	550	n/a
Single Unit Trucks	325	455	585	715	n/a
Multi-Unit Trucks	425	595	765	935	n/a
Four Lane Roadway [1,2]					
Passenger Cars, Pickup Trucks	n/a	420	540	660	780
Single Unit Trucks	n/a	525	675	825	975
Multi-Unit Trucks	n/a	700	900	1,100	1,300
Six Lane Roadway [1,2]					
Passenger Cars, Pickup Trucks	n/a	n/a	585	715	845
Single Unit Trucks	n/a	n/a	765	935	1,105
Multi-Unit Trucks	n/a	n/a	945	1,155	1,365

[1] For calculating sight distance, a height of 3.5 feet shall be used for the driver's eyes at the access location and a height of 3.5 feet for the oncoming vehicle. The entering driver's eyes shall be 10 feet behind the edge of the roadway.
[2] If an auxiliary lane is present, the entering posted speed for the deceleration lane and the posted speed at the end of the acceleration lane shall be used.
[3] From Table 2-37.

Table 2-37. Design Vehicle Selection

Land Use(s) Served by Access	Design Vehicle
Residential, Non-School Bus Route	Passenger Cars, Pickup Trucks
Residential, School Bus Route	Single Unit Trucks
Office	Single Unit Trucks
Recreational	Single Unit Trucks
Commercial/Retail	Multi-Unit Trucks[1]
Industrial	Multi-Unit Trucks[1]
Agricultural Field Approaches (< 1 VPD)	Single Unit Trucks

[1] If less than 2 multi-unit truck trips per day (average), use single-unit truck

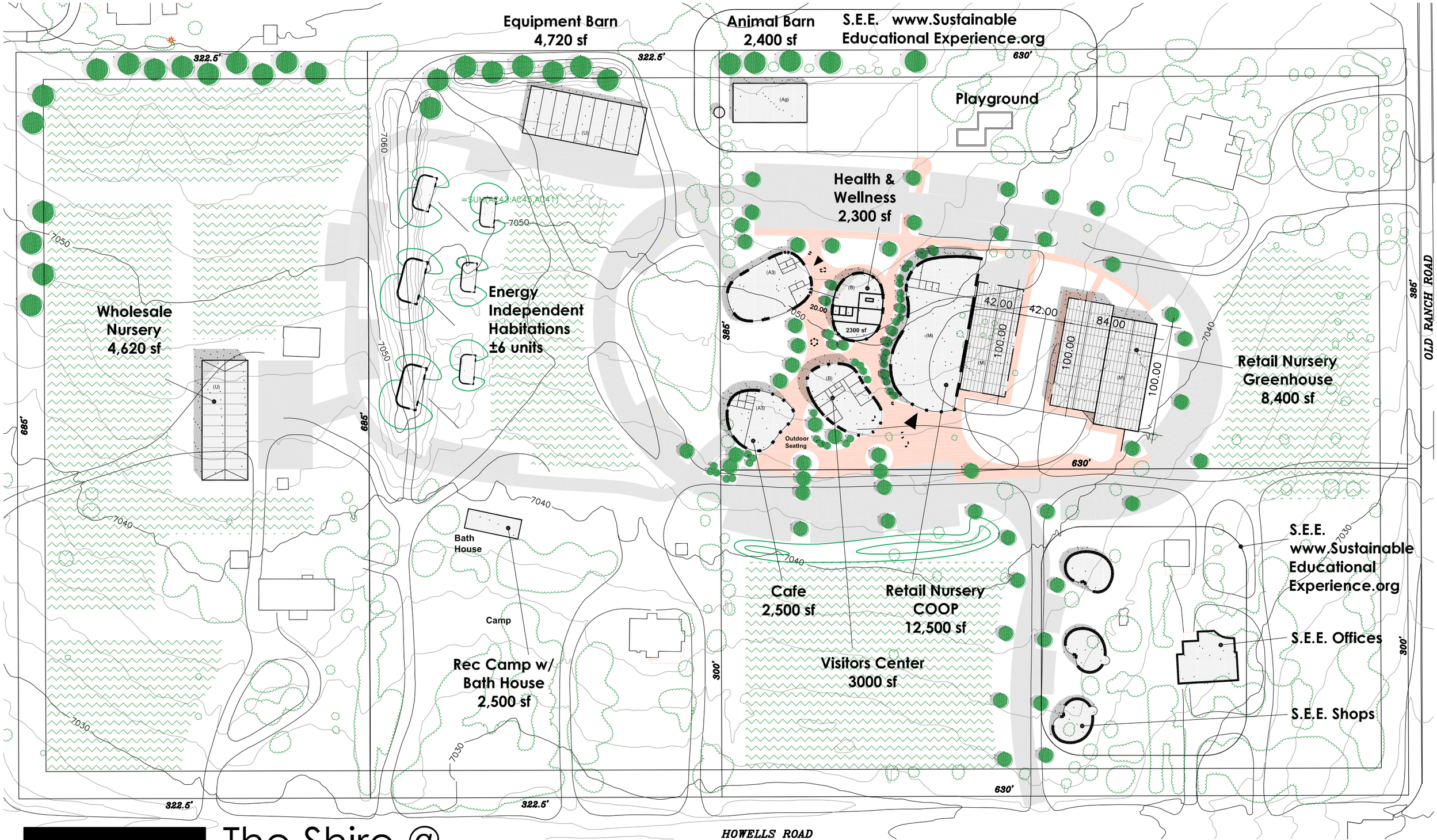
E. Access Width

1. Residential Access Points

Two-way residential access points shall have a 10-foot minimum and a 24-foot maximum width.

2. One-Way Commercial or Industrial Access Points

One-way commercial or industrial access points shall have a minimum 15-foot and a maximum 30-foot inbound access, and a minimum 20-foot and maximum 35-foot outbound access width.



fisher architecture

The Shire @ Old Ranch

Site Plan

March 5,2020

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