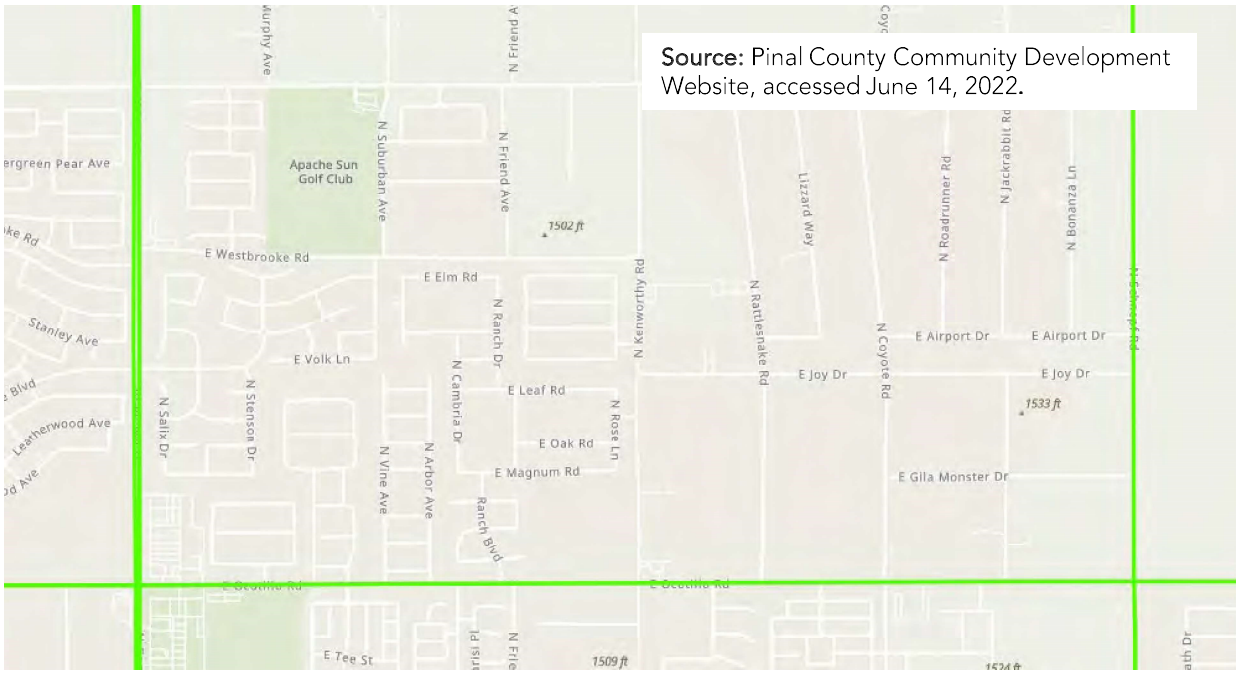
IV. EXISTING ROADWAY CONDITIONS

A. PHYSICAL CHARACTERISTICS

Ocotillo Road is an east-west roadway consisting of one lane in the eastbound and westbound directions separated by a two-way left turn lane within the vicinity of the site. Ocotillo Road is not constructed with curb, gutter, or sidewalk. Within the Pinal County Small Area Transportation Study 2006 and the Regionally Significant Routes Report for Safety and Mobility Update 2017, Ocotillo Road is shown as a route of regional significance and classified as a principal arterial. The posted speed limit on Ocotillo Road is 35 mph. Pinal County controls, operates, and maintains Ocotillo Road within the vicinity of the site.



Source: Pinal County Community Development Website, accessed June 14, 2022.

Kenworthy Road is a north-south roadway consisting of one lane in both the northbound and southbound directions within the vicinity of the site. Kenworthy Road is not constructed with curb, gutter, or sidewalk. The posted speed limit on Kenworthy Road is 25 mph. Pinal County controls, operates, and maintains Kenworthy Road within the vicinity of the site.

The intersection of **Kenworthy Road/Ocotillo Road** operates as an all way stop-controlled intersection. The north- and southbound approaches consist of one shared lane. The westbound approach consists of an exclusive left turn lane and a through right lane. The eastbound approach consists of an exclusive left turn lane, a through lane and a dedicated right turn lane. Pinal County controls and maintains this intersection.

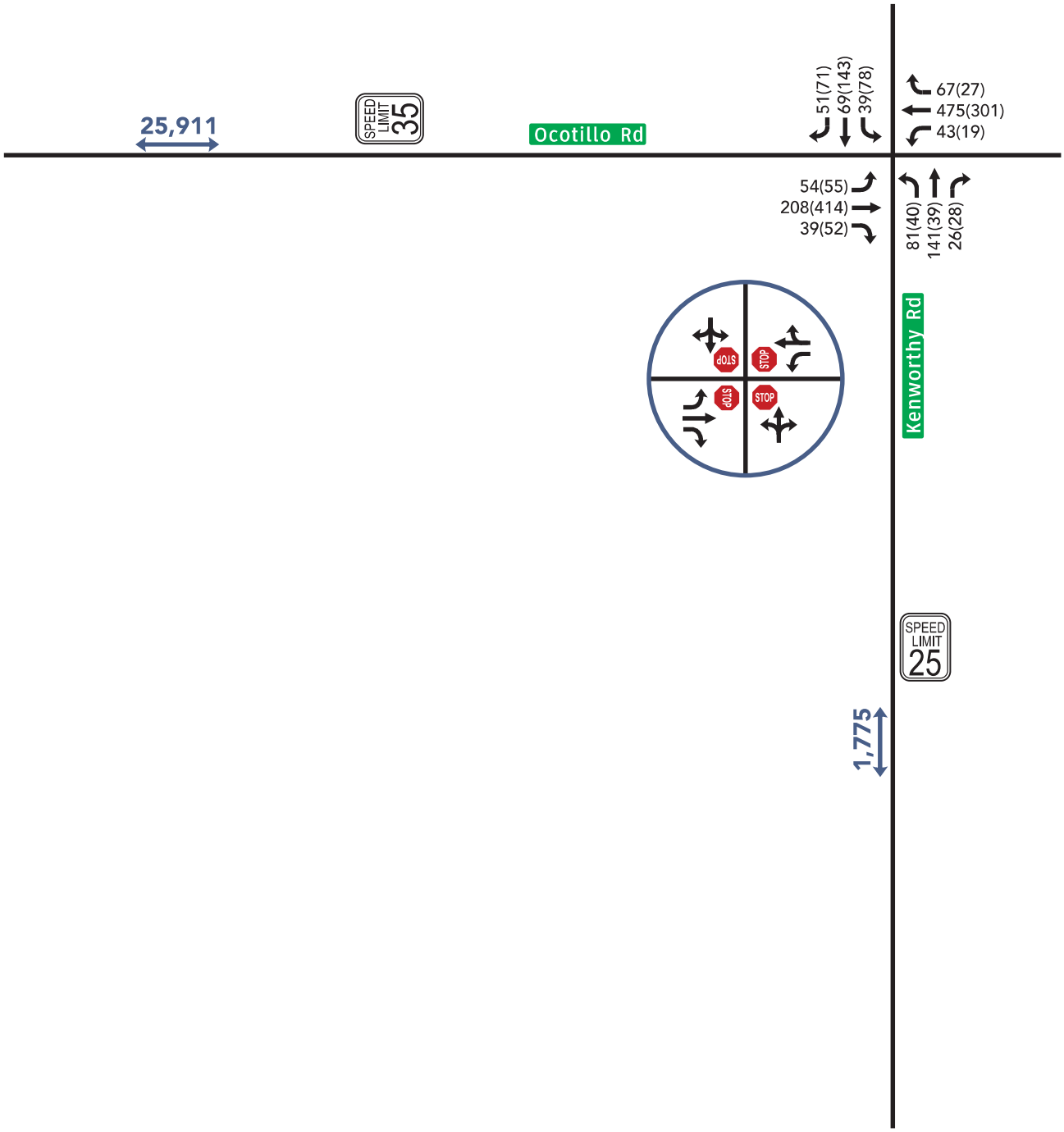
Figure 4 graphically depicts the existing intersection geometry.

B. Existing Traffic Volumes

Existing turning movement counts in 15-minute intervals were collected at the study area intersections on Tuesday August 9, 2022. Data was collected during the morning peak period (7:00AM – 9:00AM) and evening peak period (4:00PM – 6:00PM).

Average daily traffic volumes (ADT) were determined from the Arizona Department of Transportation (ADOT) Transportation Data Management System for Ocotillo Road and Kenworthy Road. The ADT volumes were collected in 2022 and the website was accessed on August 16, 2023.

The resulting morning and evening peak hour traffic volumes along with the ADTs at the study area intersections are presented in **Figure 4.** Complete traffic volume data can be found in **Appendix A.**



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

Average Daily Traffic (ADT)

not to scale

United Civil Group

Figure 4: Existing Conditions

C. Existing Traffic Observations and Issues

Traffic conditions and operations were observed during the study's morning and evening peak periods and no traffic issues were noted.

D. Crash Data

Three years of crash data (January 2019 – December 2021) were obtained from the Arizona Department of Transportation (ADOT) Arizona Crash Information System (ACIS). The data was queried for the intersection of Ocotillo Road/Kenworthy Road. An offset of 200 feet was used on all legs of each intersection. A total of 10 crashes were reported during the 3-year period. The crash data are summarized in **Tables 1 and 2.** The ADOT crash database was accessed on September 28, 2022.

Table 1: Crash Severity Summary – Ocotillo Road/Kenworthy Road

Year	Fatal	Serious Injury	Suspected Minor Injury	Possible Injury	No Injury	*Total*
2019					1	*1*
2020			1	1	3	*5*
2021			2	1	1	*4*
TOTAL	*0*	*0*	*3*	*2*	*5*	*10*

Table 2: Collision Manner Summary

Year	Single Vehicle	Angle	Left Turn	Rear End	Head On	Sideswipe Same Direction	Sideswipe Opposite Direction	Rear to Side	Total
2018			1						1
2019		2		3					5
2021		2	1	1					4
Total	*0*	*4*	*2*	*4*	*0*	*0*	*0*	*0*	*10*

Over the 3-year analysis period, rear end crashes account for 40% of the crashes and angle account for 60% of the crashes at the Ocotillo Road/Kenworthy Road intersection. 50% of the crashes were noted as having no injury.

Based on the data provided, no specific trends or potential safety hazards that can be corrected by intersection geometric modifications were discerned. An examination of individual crash records would be required for this type of analysis.

E. Intersection Level of Service Analyses

E.1 HCM Capacity Analyses and Levels of Service

Intersection capacity analysis is a principal tool used in traffic engineering. Operation is characterized according to the amount of delay at an intersection approach and quantified into a level of service (LOS). The intersection LOS was determined using the methodologies presented in the Transportation Research Board's Highway Capacity Manual (HCM). The LOS grades quantify and categorize a driver's discomfort, frustration, fuel consumption, and travel times experienced as a result of intersection control and the resulting traffic queuing. Per the HCM, the signalized and unsignalized (all-way stop controlled or two-way stop-controlled intersection) delay and associated LOS is presented in **Table 3**.

Pinal County strives to obtain a level of service C or better for both signalized and unsignalized intersection overall operations. Intersections having a LOS D, E, or F may warrant improvements or traffic reductions.

Table 3: Intersection Levels of Service and Delay

Level of Service	Description	Signalized Delay (Sec/Veh)	Unsignalized Delay (Sec/Veh)
A	Minimal control delay, traffic operates at primary free flow conditions, unimpeded movement within traffic stream	≤ 10	≤ 10
B	Minor control delay at signalized intersections, traffic operates at a fairly unimpeded level with slightly restricted movement within traffic stream	> 10 and ≤ 20	> 10 and ≤ 15
C	Moderate control delay, movement within traffic stream more restricted than LOS B, formation of queues contributes to lower average travel speeds	> 20 and ≤ 35	> 15 and ≤ 25
D	Considerable control delay that may be substantially increased by small increases in flow, average travel speeds continue to decrease.	> 35 and ≤ 55	> 25 and ≤ 35
E	High control delay, average travel speed no more than 22 percent of free flow speed	> 55 and ≤ 80	> 35 and ≤ 50
F	Extremely high control	> 80	> 50

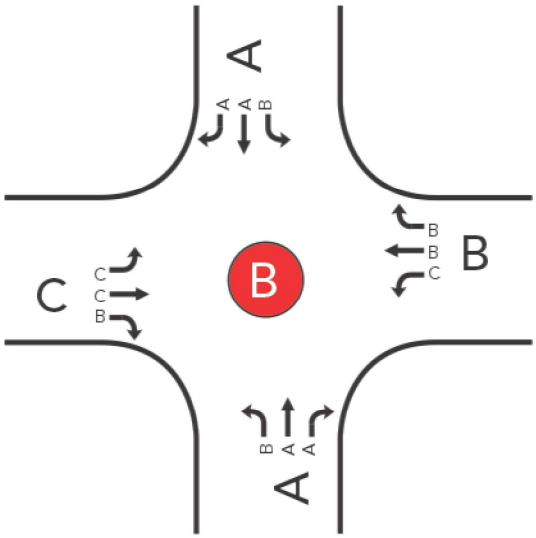
Source: Highway Capacity Manual 2010

For signalized and all-way stop controlled intersections, LOS is calculated for a movement (e.g., left, through, right), for the approach (e.g., northbound, southbound, eastbound, westbound) and for the overall intersection.

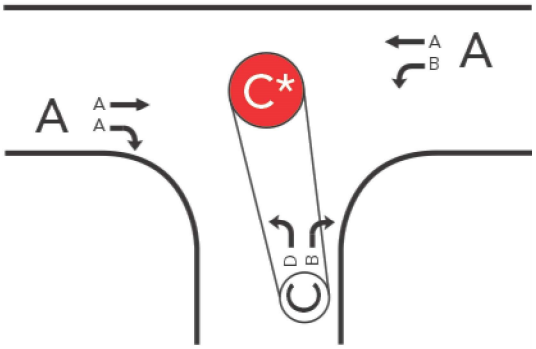
For two-way stop-controlled intersections, LOS is calculated for a movement and for the approach. However, for the overall intersection, LOS is reported as the lowest approach within the intersection. This is because most drivers are on the major roadway and do not experience delay traversing through the intersection. The example below illustrates the various LOS calculations completed for intersections.

EXAMPLE:

Signalized & All-Way Stop Controlled



Two-Way Stop Controlled



*Reported as approach LOS

Source: United Civil Group, 2021

E.2 EXISTING INTERSECTION LEVEL OF SERVICE

The level of service (LOS) and average delay at the existing study area intersections were evaluated using the 2022 intersection volumes, lane geometry, and existing traffic control as presented in Figure 4. PTV Vistro traffic modeling software, employing the methodologies as presented in the Highway Capacity Manual (HCM), was utilized for the capacity analyses to obtain the existing conditions levels of service. Summaries of the Vistro output calculations are included in *Appendix B: Capacity Analyses*.

The results of the existing levels of service analysis are presented in **Table 4**.

TABLE 4: 2022 EXISTING CONDITIONS INTERSECTION LEVELS OF SERVICE

Intersection Location	NB LOS				SB LOS				EB LOS				WB LOS				Overall Intersection
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	AvgDelay/ LOS*
Kenworthy Road/Ocotillo Road – All-Way Stop Controlled																	
AM Peak Hour	C	C	C	C	C	C	C	C	C	C	C	C	F	F	F	F	73.86 F
PM Peak Hour	C	C	C	C	D	D	D	D	E	E	E	E	E	E	E	E	38.66 E

As shown in Table 4 above, the study area intersection of Kenworthy Road/Ocotillo Road currently operates at a level of service, LOS F, in the morning peak hour and a level of service, LOS E, in the evening peak hour. The delay is experienced predominantly in the east- and westbound directions given the number of vehicles traveling through the intersection.

V. PROJECTED TRAFFIC

A. Trip Generation

Estimates of the traffic volumes that will be generated by the development were determined from transportation planning data taken from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition, 2021*. The ITE rates are based on studies that measure trip generation characteristics for various types of land uses. The rates are expressed in terms of trips per unit of land use type.

The ITE land use code utilized for the New Retail Development and Indoor Batting Cages is as follows:

Batting Cages (LUC 433): A batting cage is an area for batting practice that is enclosed by fencing or netting. The facility may consist of one or more individual batting cages. The facility may include limited game rooms or refreshment services. This land use is a stand-alone facility and is not part of a larger multipurpose entertainment or recreational facility.

Strip Retail Plaza (LUC 822): A strip retail plaza is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. Each study site in this land use has less than 40,000 square feet of gross leasable area (GLA). Because a strip retail plaza is open-air, the GLA is the same as the gross floor area of the building.

Table 5 presents the estimated daily and peak hour vehicle trips generated by the New Retail Development and Batting Cages for a typical weekday after full build out.

Table 5: Proposed Development Trip Generation

Land Use	ITE Code	Units	Total Size	Daily	AM Peak			PM Peak		
					Total	In	Out	Total	In	Out
Batting Cages	433	Cages	10	220*	-	-	-	22	12	10
Strip Retail Plaza	822	1,000 sqft	13.4	795	35	21	14	96	48	48
TOTAL				1,015	35	21	14	118	60	58

*ITE trip generation is not available. Therefore, assumed that peak hour is 10 percent of total daily traffic

On a typical weekday, after full build-out, the development is forecasted to generate 1,015 total daily trips, with 35 trips in the morning peak hour and 118 trips in the evening peak hour.

B. Trip Distribution

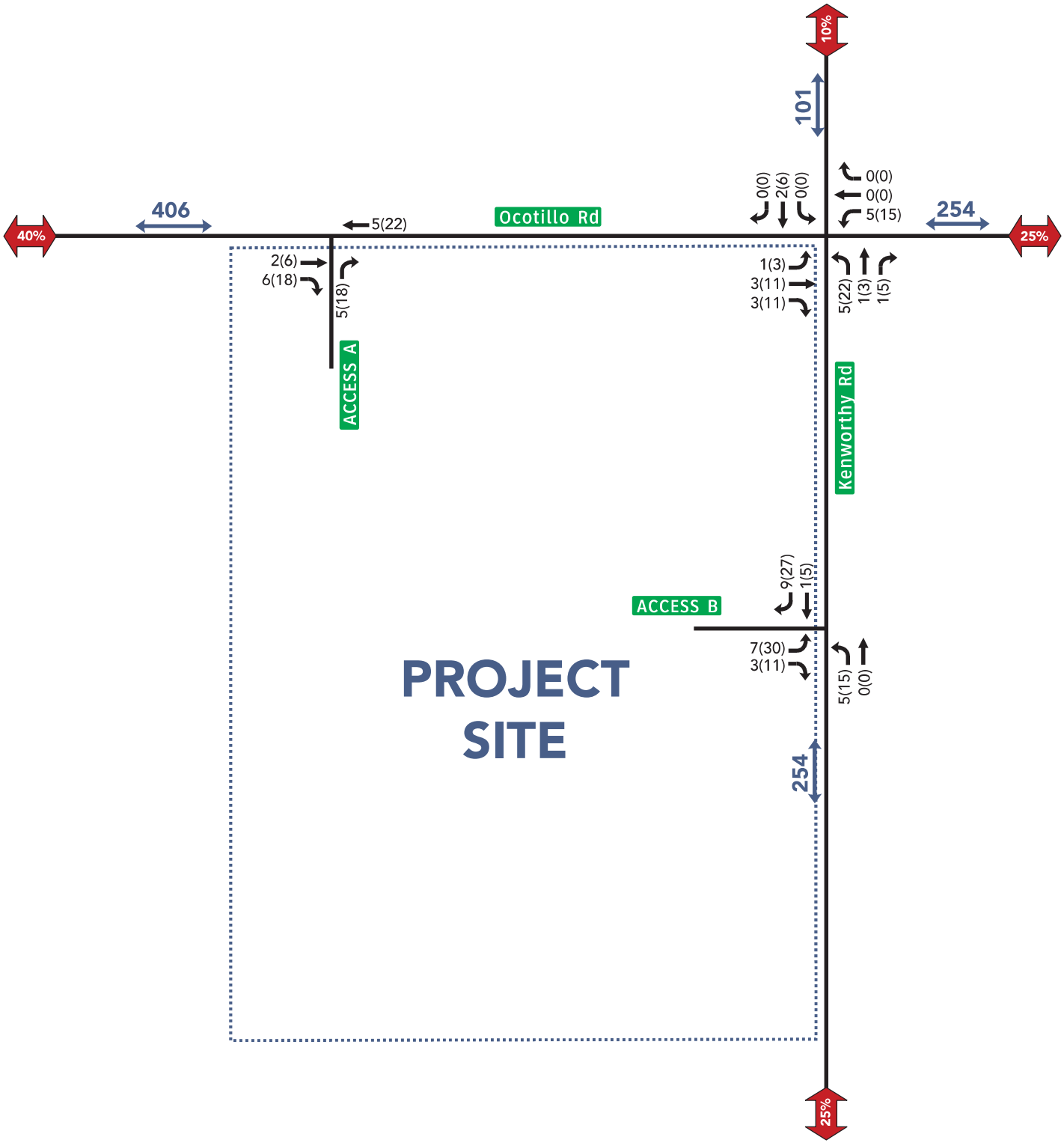
The trip distribution procedure determines the general pattern of travel for vehicles entering and leaving the subject site and the study area. The assumed trip distribution percentages for the development are shown in **Table 6**. For a development of this type, these percentages are mainly based on the type of land uses of the development, the location of the site within Pinal County, and the connectivity of the site to the region.

For the development, distribution of the trips is generally based on the roadway connectivity, residential areas, and employment centers within 15 miles of the development. Pinal County's Small Area Study was utilized to determine future land use surrounding the proposed development. Trips generated by the retail development were routed to and from future residential and employment areas.

Table 6: Trip Distribution Percentages

Direction	Distribution
Ocotillo Road west of the site	40%
Ocotillo Road east of Kenworthy Road	25%
Kenworthy Road north of Ocotillo Road	10%
Kenworthy Road south of site	25%

Figure 5 presents the assigned site generated traffic for full buildout of the proposed development.



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

X% Trip Distribution Percentage Daily

Daily Site Traffic

not to scale

UCG United Civil Group

Figure 5: Site Generated Traffic and Trip Distribution

C. Projected Background Traffic

Non-site or background traffic volumes representing the amount of traffic estimated to be on the area roadway network without the proposed development within the study area were projected for buildout of the development, year 2025. A yearly ambient growth rate for the area of three percent was assumed through each horizon year in addition to the two known future developments within the study area.

Capacity analyses at the existing study area intersections were performed for the forecasted background traffic for the horizon years of the study, as presented in **Figure 6**. **Table 7** below presents the background levels of service at the study area intersection without the proposed development.

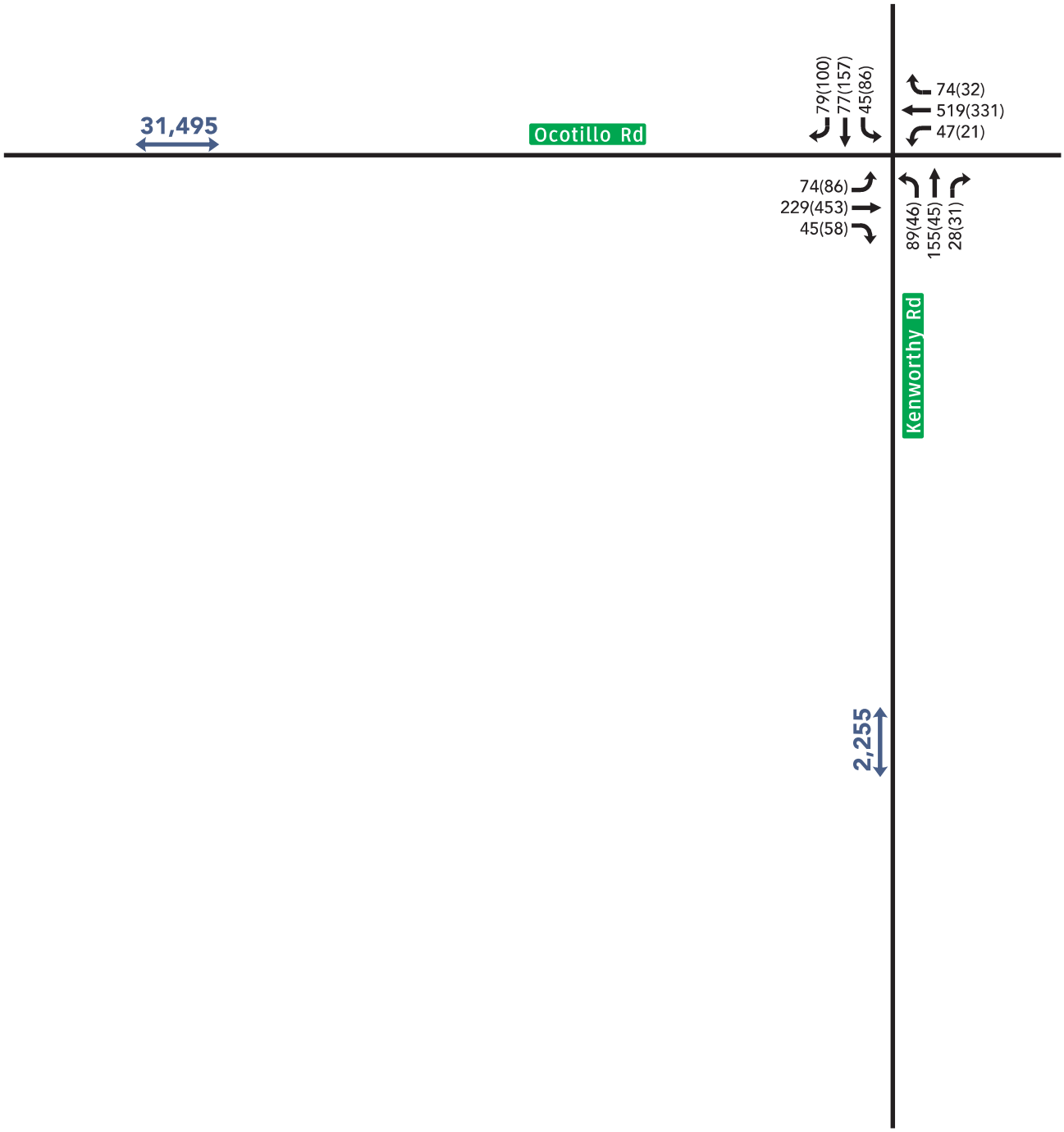
By 2025, it is assumed that the intersection of Kenworthy Road/Ocotillo Road will be signalized because the intersection currently meets signal warrants.

Complete capacity analyses are provided in **Appendix B.**

Table 7: 2025 Background Conditions Intersection Levels of Service

Intersection Location	NB LOS				SB LOS				EB LOS				WB LOS				Overall Intersection
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	AvgDelay/ LOS*
Kenworthy Road/Ocotillo Road – Signalized																	
AM Peak Hour	C	D	D	D	C	D	D	D	A	A	A	A	A	B	B	B	20.92 C
PM Peak Hour	C	C	C	C	C	D	D	D	A	B	A	B	A	B	B	B	20.00 B

As background volumes continue to grow and intersection geometric improvements are made at the intersection of Kenworthy Road/Ocotillo Road, the study area intersection will operate at an acceptable LOS C or better, the morning and evening peak hours through the 2025 background condition year.



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

Average Daily Traffic (ADT)

N

not to scale

UCG
United Civil Group

Figure 6: Background Traffic - Year 2025

VI. TRAFFIC AND IMPROVEMENT ANALYSIS

The purpose of this section is to show the relations between traffic operations and roadway geometrics; identify needs pertaining to progressive traffic flow and safety; and identify alternatives for further consideration, where applicable.

A. Accessibility to Proposed development

Access to the New Retail Development and Indoor Batting Cages is provided by Kenworthy Road and Ocotillo Road:

- **Access A** is located on Ocotillo Road approximately 280 feet west of Kenworthy Road and is planned as a right in/right out only movement driveway.

- **Access B** is located on Kenworthy Road approximately 200 feet south of Ocotillo Road and 215 feet north of Quarter Horse Trail and is planned as a full movement driveway.

All site access points should be designed per Pinal County Subdivision & Infrastructure Design Manual. Per the Pinal County Access Management Manual Final Report dated February 2017, driveway spacing criteria per Table 1 (Access Management Manual) should be followed.

For full access, 360 feet is required on major and minor arterial roadways. Because 360 feet is not provided for driveway spacing or corner clearance, driveway A is limited to right in/right out only to avoid left turning conflicts on Ocotillo Road.

To provide site circulation and reduce U-turn conflicts at the intersection of Ocotillo Road/Kenworthy Road, Access B is proposed as a full movement driveway. For this access a waiver is requested to allow all movements.

Consideration was given to providing access on Quarter Horse Trail from the development. However, because this is a local residential road, approximately 16 feet in width and terminates to the west as a dead end with no cul-de-sac, this option is not viable or recommended.

Figure 8 illustrates the layout of the proposed development in relation to the location of the site access points.

B. Roadway and Intersection Geometric Improvements

The half-street cross section along Kenworthy Road on the site's eastern boundary should be constructed as part of the development. Kenworthy Road is noted as a minor arterial roadway on the mile segment. Therefore, per the Pinal County

Subdivision and Infrastructure Design Manual, Kenworthy Road should provide 55 feet of right-of- way measured centerline to right of way line.

The half-street cross section along Ocotillo Road on the site's northern boundary should be constructed as part of the development. Ocotillo Road is noted as a principal arterial roadway on the mile segment. Therefore, per the Pinal County Subdivision and Infrastructure Design Manual, Ocotillo Road should provide 75 feet of right-of- way measured centerline to right of way line.

With the construction of all new accesses, sight triangles shall be provided and maintained at all site accesses per the most current edition of the American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets and the Pinal County TIA Guidelines.

C. Auxiliary Lane Analyses

C.1. Right Turn Lane Warrants

Per Pinal County Traffic Impact Assessment Guidelines & Procedures dated January 2007, right-turn lanes are warranted based on the right lane warrant chart which incorporates the right turn volume, the design hourly volume of the roadway and the posted speed.

Utilizing 2025 total traffic volumes, exclusive right turn lanes are recommended on eastbound Ocotillo Road at Kenworthy Road, eastbound Ocotillo Road at Access A and on southbound Kenworthy Road at Access B.

C.2. Right Lane Queue and Storage Length Analysis

Per *Section 5.12 Queuing Analysis* of the Pinal County Traffic Impact Assessment Guidelines & Procedures dated January 2007, desirable minimum storage lengths for right turn lanes on arterials were calculated per Pinal County requirements. The queuing analysis was conducted for all turn lanes under stop or signal control using the methodology presented by the County.

Table 8 presents the calculated minimum queue lengths and recommended storage lane lengths for the right turn deceleration lanes at the study intersections and site accesses.

TABLE 8: RIGHT TURN LANE ANALYSIS

Location		Turn Volume 2025	Calculated Storage (feet)	Recommended Storage (feet)	Taper (feet)
On	At				
Ocotillo Road	Kenworthy Road	EB Right (69)	86	250	Continuous Turn Lane
Ocotillo Road	Access A	EB Right (33)	31	100	120
Kenworthy Road	Access B	SB Right (27)	25	50*	80*

*Reduced right turn storage and taper due to location of driveway.

D. TRAFFIC SIGNAL WARRANT ANALYSIS

The 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) was used as the primary tool to determine if a traffic signal is warranted at the intersection of Kenworthy Road/Ocotillo Road.

There are nine specific signal warrants in the MUTCD; however, not all warrants are applicable to this study. The warrants used in this analysis include:

Warrant 1 – Eight-Hour Vehicular Volume
Warrant 2 – Four-Hour Vehicular Volume

Appendix E presents the results of the signal warrant analyses.

Warrant 1 – Eight-Hour Vehicular Volume

The Minimum Vehicular Volume, Condition A, is intended for application where the volume of intersecting traffic from a side street or driveway is the principal reason for considering installation of a traffic signal. In this condition, the warrant would be satisfied when, for each of any eight hours of an average day, the traffic volumes on the major and minor approach are equal to or exceeds specified limits located on *Table 4C-1 Warrant 1 Eight-Hour Vehicular Volume* in the *MUTCD 2009*.

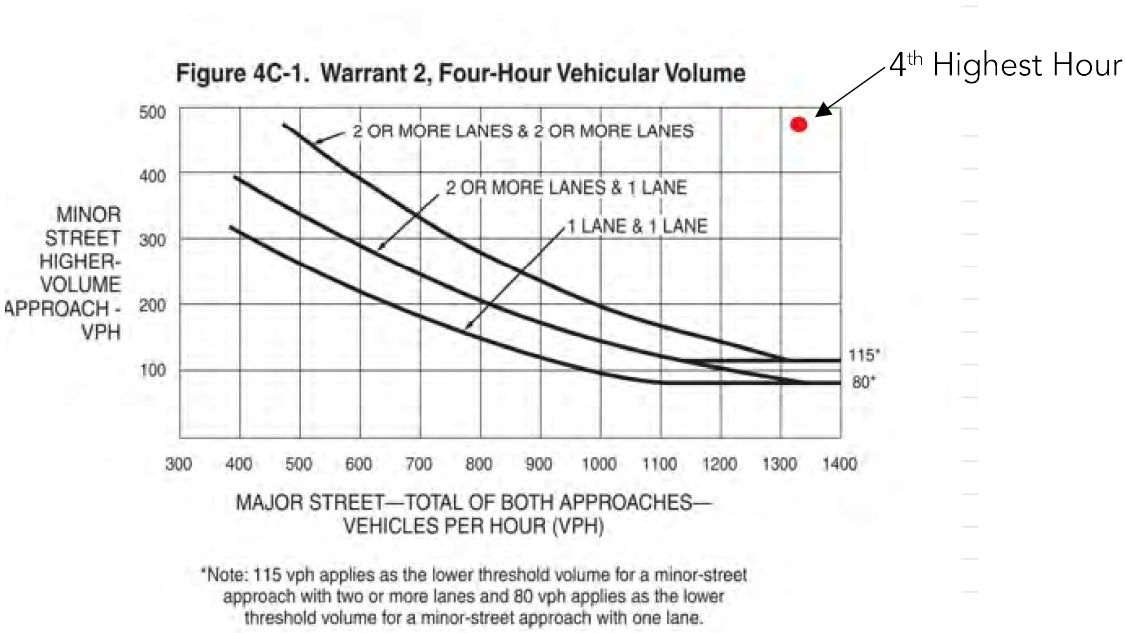
The Interruption of Continuous Traffic, Condition B, is intended for application where the traffic volume on a major street is so heavy that the traffic on a minor intersection street or driveway has excessive delay or hazard in entering or crossing the major street. This warrant is met when, for each of any eight hours of an average day, the traffic volumes on the major and minor approach is equal to or exceeds specified limits located on *Table 4C-1 Warrant 1, Eight-Hour Vehicular Volume* in the *MUTCD 2009*.

Volume projections for the eight highest hours on an average day were determined by applying hourly adjustment factors calculated from the available peak hour turning movement count data.

Warrant 1 Results:
Kenworthy Road/Ocotillo Road – Warrant 1 is **met** for both Condition A and Condition B in the existing condition year of 2021.

Warrant 2 – Four-Hour Vehicular Volume

The four-hour vehicular volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. This warrant is satisfied when, for each of any four hours of an average day, plotted points representing vehicles per hour on the major street (total of both approaches) and the vehicles per hour on the minor street approach (one direction only) all fall above the appropriate curve located on *Figure 4C-2 Warrant 2, Four-Hour Vehicular Volume* in the *MUTCD 2009*.



Warrant 2 Results:
Kenworthy Road/Ocotillo Road – Warrant 2 is **met** in the existing condition year of 2021.

Signal Warrant Summary

Using existing traffic volumes for 2022 a traffic signal is warranted at the intersection of Kenworthy Road/Ocotillo Road.

The traffic signal warrant analyses within this TIA are based on existing traffic volumes and conceptual land plans, site access, and assumed land uses.

The developer is responsible for the completion of the signal design plans for the intersection. Developer is responsible for their proportional share of the signal costs based on the development: Ocotillo Road/Kenworthy Road – 25%

Geometric improvements may be necessary outside the project boundary to complete a signal design and accommodate exclusive left turn lanes on all approaches to the intersection.

E. Intersection Sight Distance

Proper intersection sight distance and sight triangles shall be provided and maintained at all site access driveways of the proposed development to give drivers exiting the site a clear view of oncoming traffic. The landscape and hardscape within the sight triangles must not obstruct the driver's view of the adjacent travel lanes. To ensure adequate sight distances and sight distance triangles are provided at the site access driveways per the most current edition of the American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets and the Pinal County TIA Guidelines.

F. Total Traffic

Total traffic projections for the horizon years were determined by adding the proposed development's site's generated traffic to the forecasted background traffic volumes for the corresponding phase. **Figure 7** presents the total traffic volumes during the morning and evening peak hours.

Capacity analyses at the study area intersections and site access intersections were performed using the recommended geometric infrastructure and forecasted total traffic for each horizon year of the study.

For the intersection of Ocotillo Road/Kenworthy Road a traffic signal is proposed but may not be installed by the study horizon 2025, therefore the unsignalized LOS is presented in **Table 9**. **Table 10** presents the total levels of service utilizing the recommended improvements. Complete capacity analyses are provided in **Appendix B**.

TABLE 9: 2025 TOTAL CONDITIONS INTERSECTION LEVELS OF SERVICE (WITHOUT IMPROVEMENTS)

Intersection Location	NB LOS				SB LOS				EB LOS				WB LOS				Overall Intersection
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	AvgDelay/ LOS*
Kenworthy Road/Ocotillo Road – Unsignalized All Way Stop																	
AM Peak Hour	C	C	C	C	C	C	C	C	C	C	C	C	F	F	F	F	92.20 F
PM Peak Hour	B	B	B	B	C	C	C	C	F	F	F	F	F	F	F	F	65.29 F

*The overall LOS letter grade for one– and two-way stop-controlled intersections is shown as the worst approach.

TABLE 10: 2025 TOTAL CONDITIONS INTERSECTION LEVELS OF SERVICE (WITH IMPROVEMENTS)

Intersection Location	NB LOS				SB LOS				EB LOS				WB LOS				Overall Intersection
	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	L	T	R	Tot	AvgDelay/ LOS*
Kenworthy Road/Ocotillo Road – Signalized																	
AM Peak Hour	C	D	D	D	C	D	D	D	A	A	A	A	A	B	B	B	20.97 C
PM Peak Hour	C	C	C	C	C	D	D	D	A	B	B	B	A	B	B	B	20.61 C
Access A/Ocotillo Road – One-Way Stop Controlled																	
AM Peak Hour	-	-	B	B	-	-	-	-	-	A	A	A	-	A	-	A	10.37 B*
PM Peak Hour	-	-	B	B	-	-	-	-	-	A	A	A	-	A	-	A	13.05 B*
Kenworthy Road/Access B – One-Way Stop Controlled																	
AM Peak Hour	A	A	-	A	-	A	A	A	B	-	A	B	-	-	-	-	11.91 B*
PM Peak Hour		A	-	A	-	A	A	A	-	-	A	A	-	-	-	-	9.89 A*

*The overall LOS letter grade for one– and two-way stop-controlled intersections is shown as the worst approach.

Table 11 provides a comparison of the unsignalized intersection LOS to the signalized LOS and estimated delay for the approaches only at the intersection of Kenworthy Road/Ocotillo Road.

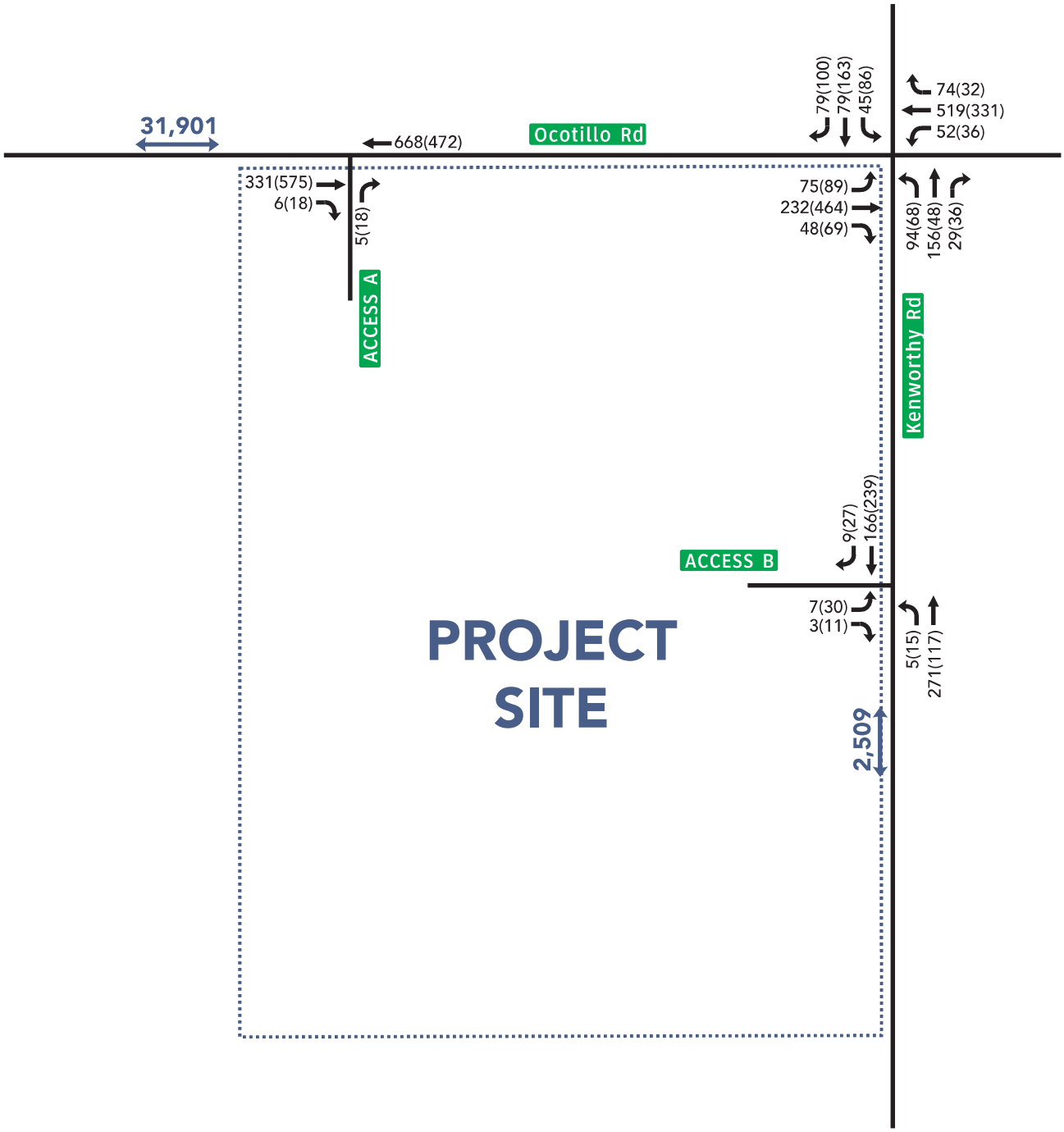
TABLE 11: LOS COMPARISONS FOR KENWORTHY ROAD/OCOTILLO ROAD

Intersection Location	NB Delay/LOS	SB Delay/LOS	EB Delay/LOS	WB Delay/LOS	Overall Intersection
Kenworthy Road/Ocotillo Road – Unsignalized All Way Stop					
AM Peak Hour	16.54 C	15.24 C	18.73 C	189.43 F	92.20 F
PM Peak Hour	14.82 B	24.49 C	108.00 F	53.38 F	65.29 F
Kenworthy Road/Ocotillo Road – Signalized					
AM Peak Hour	36.74 D	41.96 D	8.98 A	14.13 A	20.97 C
PM Peak Hour	**29.73 C**	**38.85 D**	**12.88 B**	**13.26 B**	**20.61 C**

The intersection of Kenworthy Road/Ocotillo Road will continue to operate with unacceptable delay if the traffic control remains as an all way stop as shown in Table 9.

Using the projected total traffic volumes for 2025 along with the recommended roadway improvements, the study area intersections are forecasted to operate at an LOS C or better during the peak periods.

For the intersection of Kenworthy Road/Ocotillo Road, it was assumed that in 2025 the signal would be installed as an interim condition and that interim widening of the intersection will include an exclusive left turn lane with a through right lane on the north-, south- and westbound approaches to the intersection. The eastbound approach to the intersection was modeled as its existing condition with an exclusive left, one through and dedicated right turn lane. When the intersection is constructed to its ultimate geometry the LOS at this intersection will improve when using the forecasted traffic volumes.



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

Average Daily Traffic (ADT)

N

not to scale

UCG United Civil Group

Figure 7: Total Traffic - Year 2025

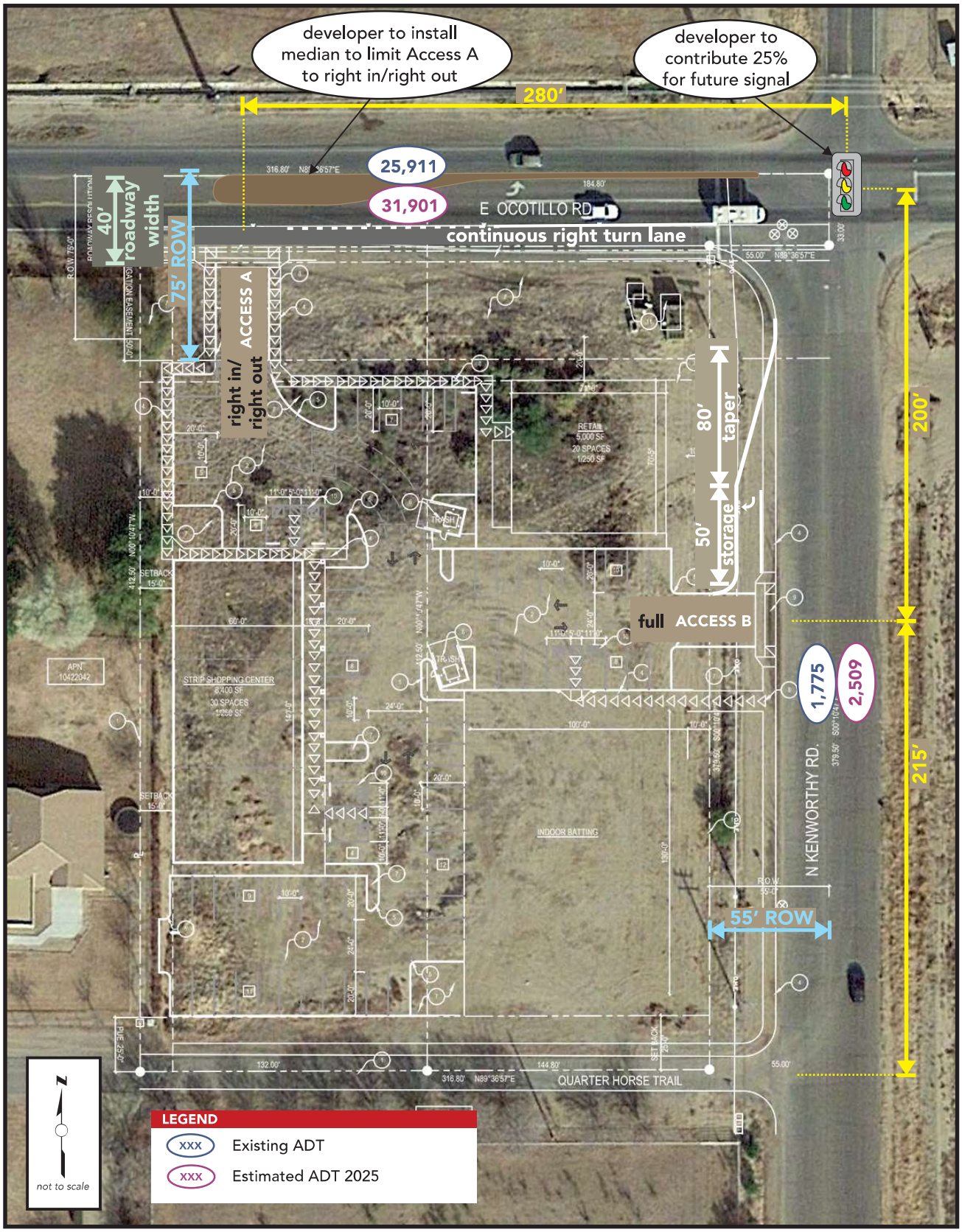


Figure 8: Driveway Spacing

United Civil Group

VII. CONCLUSIONS AND RECOMMENDATIONS

The proposed San Tan 3 (New Retail Development and Indoor Batting Cages) is a planned commercial/retail development located on the southwest corner of Ocotillo Road and Kenworthy Road. The commercial/retail development will include a strip retail plaza, retail outparcel, and indoor batting cages and is planned to be constructed in one phase with full occupancy by 2025.

The proposed San Tan 3 is planned to have two accesses. Access A, a right in/right out driveway, is the primary access into the development and planned to be located on Ocotillo Road approximately 280 feet west of Kenworthy Road, measured center of roadway to center of driveway. Access B will be secondary access and is planned as a full movement driveway. Access B located on Kenworthy Road approximately 200 feet south of Ocotillo Road, measured center of roadway to center of driveway.

After full build-out of the development, per ITE's *Trip Generation Manual 11th Edition,* San Tan 3 is forecasted to 1,015 total daily trips, with 35 trips in the morning peak hour and 118 trips in the evening peak hour.

Kenworthy Road and Ocotillo Road will be the main routes to San Tan 3. Per the Pinal County Community Development website, Kenworthy Road is classified as a minor arterial with 110 feet of right of way. In the future, Kenworthy Road will be developed with two lanes of traffic in each direction separated by a raised median. Therefore, half street improvements are planned along the site's eastern boundary. The half street cross section includes Kenworthy Road as a minor arterial roadway with 55 feet of right of way measured centerline to right of way line. Per the Pinal County Community Development website, Ocotillo Road is classified as a principal arterial with 150 feet of right of way. In the future, Ocotillo Road will be developed with three lanes of traffic in each direction separated by a raised median. Therefore, half street improvements are planned along the site's southern boundary. The half street cross section includes Ocotillo Road as a principal arterial roadway with 75 feet of right of way measured centerline to right of way line.

Using 2022 existing traffic counts, a traffic signal is warranted at the intersection of Kenworthy Road/Ocotillo Road. Therefore, a traffic signal at this intersection was analyzed in the background and total traffic conditions for the year 2025.

Through the 2025 total traffic conditions, all study area intersections operate at an acceptable LOS C or better. For the intersection of Kenworthy Road/Ocotillo Road, it was assumed that the signal will be installed as an interim condition and that ultimate widening of the intersection will not yet have occurred. When the intersection is constructed to its ultimate geometry, the LOS at this intersection will improve.

Proper intersection sight distance and sight triangles shall be provided and maintained at all site access driveways of the proposed development to give drivers exiting the site a clear view of oncoming traffic. The landscape and hardscape (monument signs) within the sight triangles must not obstruct the driver's view of the adjacent travel lanes.

Based on this TIA, the following roadway and intersection improvements are proposed.

BUILDOUT – 2025
By the New Development and Indoor Batting Cages

- Construct half street improvements on Kenworthy Road (minor arterial) along the site's eastern boundary. This improvement should provide 55 feet of right of way, measured from centerline to right of way line.
- Construct half street improvements on Ocotillo Road (principal arterial) along the site's northern boundary. This improvement should provide 75 feet of right of way, measured from centerline to right of way line.
- Construct a raised median on Ocotillo Road along the site's boundary. The raised median will limit Access A to right-in/right-out only.
- Install a continuous right turn deceleration lane on Ocotillo Road from Kenworthy Road west of Access A.
- Install a right turn deceleration lane on Kenworthy Road at Access B. Due to the configuration of the site and the available frontage on Kenworthy Road between Ocotillo Road and Quarter Horse Trail, the turn lane should be reduced to 50 feet of storage with an 80-foot taper.
- Install an interim two way left turn lane on Kenworthy Road within the vicinity of the site to accommodate northbound left turning vehicles at Ocotillo Road.
- Developer to contribute 25% to the cost of the signal at the intersection of Kenworthy Road/Ocotillo Road.

By Others

- Per the approved TIA for Elux Multifamily Development, the developer of the property is to contribute 25% toward the cost of the signal at the intersection of Kenworthy Road/Ocotillo Road. It is anticipated that Pinal County will contribute the remaining 50% of the signal cost because no known development is planned for the northeast or southeast corners of the intersection at this time.

VIII. LIMITATIONS

Our professional services have been performed using the degree of skill ordinarily exercised, under similar circumstances, by reputable transportation engineering firms practicing in this locality. No other warranty, expressed or implied, is made.

The contents of this report are intended for the sole use of the addressee and his/her designees. In completing this report, data was obtained from a variety of sources (i.e., City, County, State and Federal sources); United Civil Group has assumed these sources to be reliable and accurate. Should deviations from this report be noted, this firm shall be contacted for review of the area of concern.

A reasonable attempt was made to acquire recent traffic impact studies, traffic projections and/or data that may be helpful in more accurately projecting traffic volumes. United Civil Group is not responsible for incorporating data made available after this document has been finalized.

This report is issued with the understanding that it is the responsibility of the owner to see that its provisions are carried out or brought to the attention of those concerned. If any changes to the proposed project are planned, the conclusions and recommendations contained in this report shall be reviewed and the report shall be modified or supplemented, as necessary.

IX. SOURCES

Arizona Department of Transportation Traffic Engineering Guidelines and Processes, June 2015.

A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2018.

Highway Capacity Manual, HCM, Transportation Research Board, 2016.

Manual on Uniform Traffic Control Devices, Federal Highway Administration, MUTCD 2009.

Pinal County Access Management Manual, February 24, 2017.

Pinal County Regionally Significant Routes for Safety and Mobility Final Report. December 2008.

Pinal County Small Area Transportation Study Final Report, August 2006.

Pinal County Subdivision & Infrastructure Design Manual.

Pinal County Traffic Assessment Guidelines & Procedures, January 2007.

Trip Generation, 11th Edition, Institute of Transportation Engineers, 2021.

Appendix A

United Civil Group

Turning Movement Count

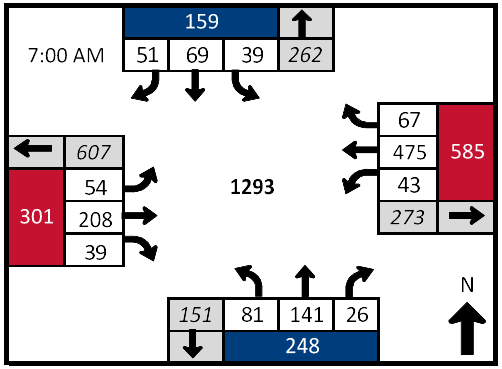
Project No: TR22095

Location: Kenworthy Road and Ocotillo Road

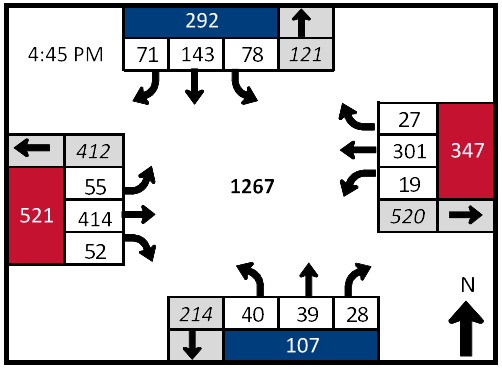
Intersection Configuration: Unsignalized

August 9, 2022 (Tuesday)

	Speed Limit	Lt	Lt\T	T	T/Rt	Rt	Lt/T/Rt	Lt/Rt
Northbound	25						1	
Southbound	25						1	
Eastbound	35	1		1		1		
Westbound	35	1			1			



	Kenworthy Road Northbound				Kenworthy Road Southbound				Ocotillo Road Eastbound				Ocotillo Road Westbound				Total	Peak Hour
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
7:00 AM	21	37	8	0	9	19	14	0	21	48	8	0	17	109	16	0	327	
7:15 AM	27	45	4	0	7	15	10	0	6	43	13	0	7	114	11	0	302	
7:30 AM	15	34	6	0	6	25	13	0	11	51	7	0	12	130	22	0	332	
7:45 AM	18	25	8	0	17	10	14	0	16	66	11	0	7	122	18	0	332	1293
8:00 AM	17	11	4	0	13	13	25	0	13	70	10	0	7	90	5	0	278	1244
8:15 AM	7	7	6	0	4	9	13	0	8	59	6	0	5	73	9	0	206	1148
8:30 AM	20	9	3	0	9	7	6	0	6	65	6	0	10	81	8	0	230	1046
8:45 AM	11	9	4	0	6	4	5	0	5	66	7	0	6	79	5	0	207	921
Peak Hour Total	**81**	**141**	**26**	**0**	**39**	**69**	**51**	**0**	**54**	**208**	**39**	**0**	**43**	**475**	**67**	**0**	**1293**	



	Kenworthy Road Northbound				Kenworthy Road Southbound				Ocotillo Road Eastbound				Ocotillo Road Westbound				Total	Peak Hour
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
4:00 PM	7	11	7	0	27	31	17	0	15	92	16	0	6	76	2	0	307	
4:15 PM	4	15	9	0	19	32	22	0	13	98	14	0	9	60	5	0	300	
4:30 PM	18	16	3	0	20	30	16	0	17	99	14	0	8	64	7	0	312	
4:45 PM	6	7	6	0	22	30	16	0	15	96	10	0	8	66	7	0	289	1208
5:00 PM	17	11	9	0	11	36	16	0	9	104	9	0	4	74	5	0	305	1206
5:15 PM	9	14	3	0	25	39	25	0	17	112	14	0	3	81	7	0	349	1255
5:30 PM	8	7	10	0	20	38	14	0	14	102	19	0	4	80	8	0	324	1267
5:45 PM	10	4	9	0	13	25	13	0	13	83	8	0	5	73	6	0	262	1240
Peak Hour Total	**40**	**39**	**28**	**0**	**78**	**143**	**71**	**0**	**55**	**414**	**52**	**0**	**19**	**301**	**27**	**0**	**1267**	

Appendix B

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	73.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.252

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	23	39	7	11	19	14	15	58	11	12	132	19
Total Analysis Volume [veh/h]	90	157	29	43	77	57	60	231	43	48	528	74
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	473	463	452	482	532	445	602
Degree of Utilization, x	0.58	0.38	0.13	0.48	0.08	0.11	1.25

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	3.67	1.77	0.46	2.55	0.26	0.36	24.38
95th-Percentile Queue Length [ft]	91.72	44.29	11.39	63.85	6.57	9.00	609.55
Approach Delay [s/veh]	20.78	15.53	15.09			142.48	
Approach LOS	C	C	C			F	
Intersection Delay [s/veh]	73.86						
Intersection LOS	F						

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	38.7
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.955

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	11	11	8	22	40	20	15	115	14	5	84	8
Total Analysis Volume [veh/h]	44	43	31	87	159	79	61	460	58	21	334	30
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	412	456	450	482	533	404	432
Degree of Utilization, x	0.29	0.71	0.14	0.96	0.11	0.05	0.84

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	1.17	5.56	0.47	11.85	0.36	0.16	8.19
95th-Percentile Queue Length [ft]	29.18	139.12	11.64	296.35	9.10	4.10	204.65
Approach Delay [s/veh]	15.21	28.22	48.10			40.45	
Approach LOS	C	D	E			E	
Intersection Delay [s/veh]	38.66						
Intersection LOS	E						

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	20.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.527

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	1	0	2	2	23	15	2	2	0	0	1
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	89	155	28	45	77	79	74	229	45	47	519	74
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	43	8	13	21	22	21	64	13	13	144	21
Total Analysis Volume [veh/h]	99	172	31	50	86	88	82	254	50	52	577	82
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	14	25	0	9	20	0	11	47	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	13	21	11	61	54	54	61	53
g / C, Green / Cycle	0.23	0.15	0.23	0.12	0.68	0.60	0.60	0.68	0.59
(v / s)_i Volume / Saturation Flow Rate	0.07	0.11	0.04	0.10	0.09	0.14	0.03	0.05	0.36
s, saturation flow rate [veh/h]	1420	1821	1341	1717	880	1870	1589	1140	1830
c, Capacity [veh/h]	332	267	308	213	529	1113	946	820	1074
d1, Uniform Delay [s]	28.63	36.88	27.88	38.44	7.81	8.54	7.62	4.97	12.01
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.50	4.43	0.24	7.56	0.62	0.48	0.11	0.03	2.62
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.30	0.76	0.16	0.82	0.15	0.23	0.05	0.06	0.61
d, Delay for Lane Group [s/veh]	29.12	41.31	28.12	46.01	8.44	9.02	7.73	5.01	14.63
Lane Group LOS	C	D	C	D	A	A	A	A	B
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.76	4.55	0.87	4.17	0.53	2.27	0.40	0.27	8.20
50th-Percentile Queue Length [ft/ln]	44.00	113.63	21.84	104.35	13.25	56.80	10.03	6.71	205.05
95th-Percentile Queue Length [veh/ln]	3.17	8.04	1.57	7.51	0.95	4.09	0.72	0.48	12.90
95th-Percentile Queue Length [ft/ln]	79.19	201.04	39.32	187.84	23.86	102.24	18.05	12.08	322.47

Movement, Approach, & Intersection Results

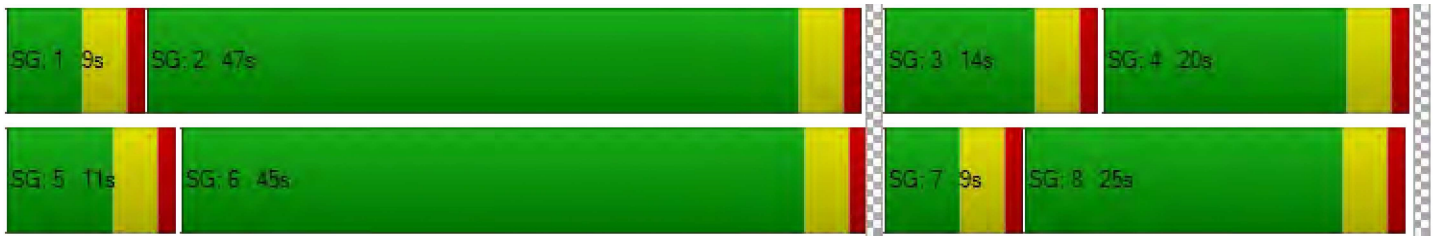
d_M, Delay for Movement [s/veh]	29.12	41.31	41.31	28.12	46.01	46.01	8.44	9.02	7.73	5.01	14.63	14.63
Movement LOS	C	D	D	C	D	D	A	A	A	A	B	B
d_A, Approach Delay [s/veh]	37.31			42.01			8.73			13.93		
Approach LOS	D			D			A			B		
d_I, Intersection Delay [s/veh]	20.92											
Intersection LOS	C											
Intersection V/C	0.527											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	356	956	911
d_b, Bicycle Delay [s]	26.45	30.42	12.27	13.34
I_b,int, Bicycle LOS Score for Intersection	2.058	1.929	2.197	2.733
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	20.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.460

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	46	45	31	86	157	100	86	453	58	21	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	13	9	24	44	28	24	126	16	6	92	9
Total Analysis Volume [veh/h]	51	50	34	96	174	111	96	503	64	23	368	36
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	9	19	0	13	23	0	13	49	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	24	15	24	17	58	52	52	58	49
g / C, Green / Cycle	0.27	0.17	0.27	0.19	0.64	0.57	0.57	0.64	0.55
(v / s)_i Volume / Saturation Flow Rate	0.04	0.05	0.07	0.16	0.09	0.27	0.04	0.03	0.22
s, saturation flow rate [veh/h]	1253	1745	1454	1750	1073	1870	1589	913	1841
c, Capacity [veh/h]	286	291	457	324	676	1070	909	567	1004
d1, Uniform Delay [s]	25.85	32.84	25.44	35.69	7.02	11.28	8.59	7.10	11.91
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.29	0.54	0.23	7.67	0.44	1.49	0.15	0.03	1.20
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.18	0.29	0.21	0.88	0.14	0.47	0.07	0.04	0.40
d, Delay for Lane Group [s/veh]	26.15	33.39	25.66	43.35	7.46	12.76	8.74	7.13	13.11
Lane Group LOS	C	C	C	D	A	B	A	A	B
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.83	1.63	1.61	6.72	0.70	5.81	0.56	0.14	4.60
50th-Percentile Queue Length [ft/ln]	20.76	40.70	40.28	168.01	17.50	145.33	13.96	3.53	114.99
95th-Percentile Queue Length [veh/ln]	1.49	2.93	2.90	10.97	1.26	9.77	1.01	0.25	8.12
95th-Percentile Queue Length [ft/ln]	37.37	73.26	72.51	274.29	31.49	244.18	25.13	6.35	202.93

Movement, Approach, & Intersection Results

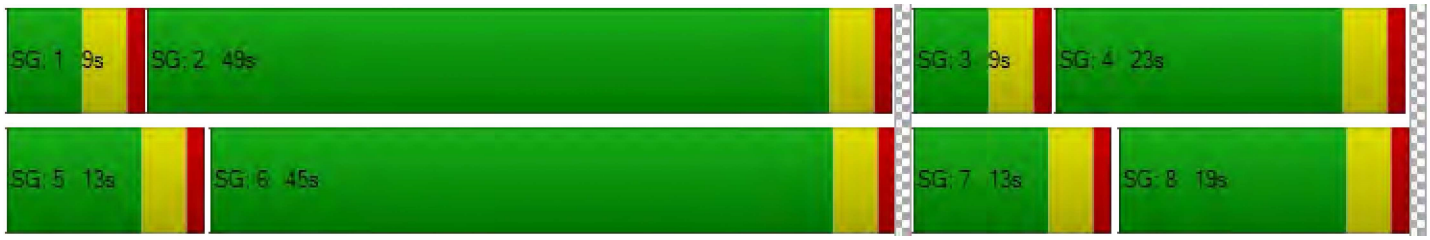
d_M, Delay for Movement [s/veh]	26.15	33.39	33.39	25.66	43.35	43.35	7.46	12.76	8.74	7.13	13.11	13.11
Movement LOS	C	C	C	C	D	D	A	B	A	A	B	B
d_A, Approach Delay [s/veh]	30.65			38.89			11.61			12.79		
Approach LOS	C			D			B			B		
d_I, Intersection Delay [s/veh]	20.00											
Intersection LOS	B											
Intersection V/C	0.460											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	333	422	1000	911
d_b, Bicycle Delay [s]	31.25	28.01	11.25	13.34
I_b,int, Bicycle LOS Score for Intersection	1.782	2.188	2.654	2.264
Bicycle LOS	A	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	92.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.380

Intersection Setup

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	1	1	0	2	0	1	3	3	5	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	1	0	2	2	23	15	2	2	0	0	1
Total Hourly Volume [veh/h]	94	156	29	45	79	79	75	232	48	52	519	74
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	43	8	13	22	22	21	64	13	14	144	21
Total Analysis Volume [veh/h]	104	173	32	50	88	88	83	258	53	58	577	82
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	413	443	406	446	414	439	479	444	659
Degree of Utilization, x	0.25	0.46	0.12	0.39	0.20	0.59	0.11	0.13	1.38

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	0.98	2.40	0.42	1.85	0.74	3.68	0.37	0.45	30.71
95th-Percentile Queue Length [ft]	24.59	59.89	10.43	46.33	18.47	92.03	9.27	11.18	767.76
Approach Delay [s/veh]	16.54		15.24		18.73			189.43	
Approach LOS	C		C		C			F	
Intersection Delay [s/veh]	92.20								
Intersection LOS	F								

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	21.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.531

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	81	141	26	39	69	51	54	208	39	43	475	67
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	1	1	0	2	0	1	3	3	5	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	1	0	2	2	23	15	2	2	0	0	1
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	94	156	29	45	79	79	75	232	48	52	519	74
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	43	8	13	22	22	21	64	13	14	144	21
Total Analysis Volume [veh/h]	104	173	32	50	88	88	83	258	53	58	577	82
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	14	25	0	9	20	0	11	47	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	14	21	11	61	53	53	61	53
g / C, Green / Cycle	0.23	0.15	0.23	0.12	0.68	0.59	0.59	0.68	0.58
(v / s)_i Volume / Saturation Flow Rate	0.07	0.11	0.04	0.10	0.09	0.14	0.03	0.05	0.36
s, saturation flow rate [veh/h]	1422	1820	1337	1718	881	1870	1589	1137	1830
c, Capacity [veh/h]	336	274	311	215	525	1102	936	812	1067
d1, Uniform Delay [s]	28.45	36.60	27.62	38.40	7.98	8.81	7.86	5.12	12.24
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.52	4.09	0.24	7.57	0.64	0.50	0.12	0.04	2.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.31	0.75	0.16	0.82	0.16	0.23	0.06	0.07	0.62
d, Delay for Lane Group [s/veh]	28.97	40.69	27.86	45.96	8.62	9.31	7.97	5.15	14.92
Lane Group LOS	C	D	C	D	A	A	A	A	B
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.84	4.55	0.87	4.22	0.55	2.36	0.43	0.31	8.32
50th-Percentile Queue Length [ft/ln]	46.10	113.82	21.71	105.52	13.65	58.99	10.86	7.66	207.92
95th-Percentile Queue Length [veh/ln]	3.32	8.05	1.56	7.59	0.98	4.25	0.78	0.55	13.05
95th-Percentile Queue Length [ft/ln]	82.97	201.30	39.09	189.75	24.58	106.19	19.54	13.78	326.16

Movement, Approach, & Intersection Results

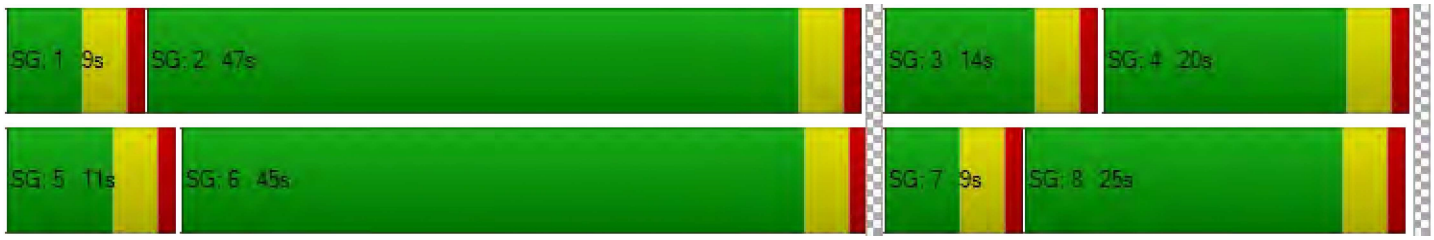
d_M, Delay for Movement [s/veh]	28.97	40.69	40.69	27.86	45.96	45.96	8.62	9.31	7.97	5.15	14.92	14.92
Movement LOS	C	D	D	C	D	D	A	A	A	A	B	B
d_A, Approach Delay [s/veh]	36.74			41.96			8.98			14.13		
Approach LOS	D			D			A			B		
d_I, Intersection Delay [s/veh]	20.97											
Intersection LOS	C											
Intersection V/C	0.531											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	467	356	956	911
d_b, Bicycle Delay [s]	26.45	30.42	12.27	13.34
l_b,int, Bicycle LOS Score for Intersection	2.069	1.933	2.210	2.743
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Access A & Ocotillo Road

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.009

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	0	0	301	0	0	607
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0927	1.0000	1.0000	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	2	6	0	5
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	5	331	6	0	668
Peak Hour Factor	1.0000	0.9000	0.9000	0.9000	1.0000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	92	2	0	186
Total Analysis Volume [veh/h]	0	6	368	7	0	742
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	10.36	0.00	0.00	0.00	0.00
Movement LOS		B	A	A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.03	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.67	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.36		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.06					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 3: Kenworthy Road & Access B

Control Type:	Two-way stop	Delay (sec / veh):	11.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	Kenworthy Road		Kenworthy Road		Access B	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Kenworthy Road		Kenworthy Road		Access B	
Base Volume Input [veh/h]	0	248	151	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0927	1.0927	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	0	1	9	7	3
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	271	166	9	7	3
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	75	46	3	2	1
Total Analysis Volume [veh/h]	6	301	184	10	8	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	7.62	0.00	0.00	0.00	11.91	9.31
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.01	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft/ln]	0.33	0.00	0.00	0.00	1.42	1.42
d_A, Approach Delay [s/veh]	0.15		0.00		11.20	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.33					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	All-way stop	Delay (sec / veh):	65.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.208

Intersection Setup

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road			Ocotillo Road			Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	22	3	5	0	6	0	3	11	11	15	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Total Hourly Volume [veh/h]	68	48	36	86	163	100	89	464	69	36	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	13	10	24	45	28	25	129	19	10	92	9
Total Analysis Volume [veh/h]	76	53	40	96	181	111	99	516	77	40	368	36
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	365	396	392	426	403	516	466	406	432
Degree of Utilization, x	0.21	0.24	0.24	0.69	0.25	1.21	0.17	0.10	0.94

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	0.77	0.90	0.95	5.03	0.95	20.54	0.59	0.33	10.70
95th-Percentile Queue Length [ft]	19.29	22.51	23.72	125.76	23.84	513.38	14.65	8.15	267.57
Approach Delay [s/veh]	14.82		24.49		108.00			53.58	
Approach LOS	B		C		F			F	
Intersection Delay [s/veh]	65.29								
Intersection LOS	F								

Intersection Level Of Service Report
Intersection 1: Kenworthy Road & Ocotillo Road

Control Type:	Signalized	Delay (sec / veh):	20.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.486

Intersection Setup

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			No			No		

Volumes

Name	Kenworthy Road			Kenworthy Road						Ocotillo Road		
Base Volume Input [veh/h]	40	39	28	78	143	71	55	414	52	19	301	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	22	3	5	0	6	0	3	11	11	15	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	2	2	0	1	1	22	26	1	1	0	2	2
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	68	48	36	86	163	100	89	464	69	36	331	32
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	13	10	24	45	28	25	129	19	10	92	9
Total Analysis Volume [veh/h]	76	53	40	96	181	111	99	516	77	40	368	36
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	3	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	5	10	0	5	10	0	5	10	0	5	10	0
Maximum Green [s]	30	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	9	19	0	13	23	0	13	49	0	9	45	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	No	No		No	No		No	No		No	No	
Maximum Recall	No	No		No	No		No	No		No	No	
Pedestrian Recall	No	No		No	No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	R	L	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	25	16	25	17	57	50	50	57	48
g / C, Green / Cycle	0.28	0.18	0.28	0.19	0.63	0.55	0.55	0.63	0.53
(v / s)_i Volume / Saturation Flow Rate	0.06	0.05	0.07	0.17	0.09	0.28	0.05	0.04	0.22
s, saturation flow rate [veh/h]	1260	1738	1442	1752	1076	1870	1589	912	1841
c, Capacity [veh/h]	300	307	462	330	661	1030	875	548	983
d1, Uniform Delay [s]	25.57	32.22	24.74	35.57	7.48	12.55	9.55	7.77	12.52
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.44	0.55	0.22	7.84	0.48	1.74	0.20	0.06	1.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.25	0.30	0.21	0.88	0.15	0.50	0.09	0.07	0.41
d, Delay for Lane Group [s/veh]	26.01	32.77	24.97	43.41	7.96	14.30	9.75	7.82	13.79
Lane Group LOS	C	C	C	D	A	B	A	A	B
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.24	1.78	1.58	6.90	0.75	6.44	0.72	0.26	4.75
50th-Percentile Queue Length [ft/ln]	30.91	44.62	39.62	172.46	18.81	160.99	18.07	6.47	118.87
95th-Percentile Queue Length [veh/ln]	2.23	3.21	2.85	11.21	1.35	10.60	1.30	0.47	8.33
95th-Percentile Queue Length [ft/ln]	55.64	80.32	71.32	280.15	33.87	265.04	32.53	11.64	208.27

Movement, Approach, & Intersection Results

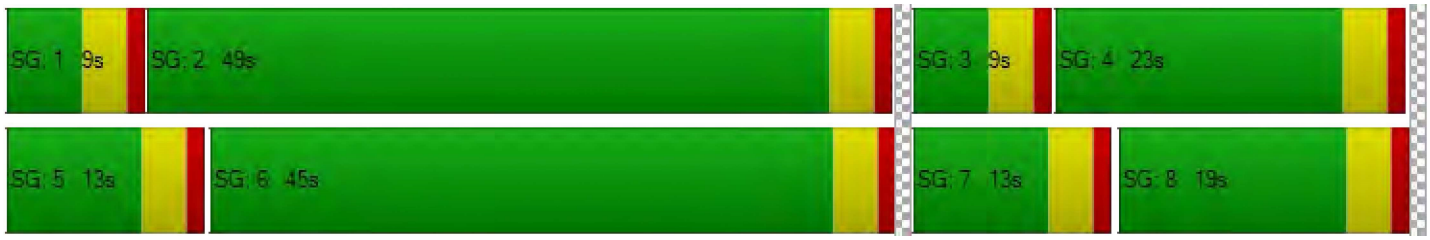
d_M, Delay for Movement [s/veh]	26.01	32.77	32.77	24.97	43.41	43.41	7.96	14.30	9.75	7.82	13.79	13.79
Movement LOS	C	C	C	C	D	D	A	B	A	A	B	B
d_A, Approach Delay [s/veh]	29.73			38.85			12.88			13.26		
Approach LOS	C			D			B			B		
d_I, Intersection Delay [s/veh]	20.61											
Intersection LOS	C											
Intersection V/C	0.486											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	0.000	0.000	0.000
Crosswalk LOS	F	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	333	422	1000	911
d_b, Bicycle Delay [s]	31.25	28.01	11.25	13.34
l_b,int, Bicycle LOS Score for Intersection	1.838	2.200	2.701	2.292
Bicycle LOS	A	B	B	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Access A & Ocotillo Road

Control Type:	Two-way stop	Delay (sec / veh):	12.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.042

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	0	0	521	0	0	412
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0927	1.0000	1.0000	1.0927
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	18	6	18	0	22
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	18	575	18	0	472
Peak Hour Factor	1.0000	0.9000	0.9000	0.9000	1.0000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	5	160	5	0	131
Total Analysis Volume [veh/h]	0	20	639	20	0	524
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.04	0.01	0.00	0.00	0.01
d_M, Delay for Movement [s/veh]	0.00	12.90	0.00	0.00	0.00	0.00
Movement LOS		B	A	A		A
95th-Percentile Queue Length [veh/ln]	0.00	0.13	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	3.28	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	12.90		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.21					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 3: Kenworthy Road & Access B

Control Type:	Two-way stop	Delay (sec / veh):	11.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.057

Intersection Setup

Name	Kenworthy Road		Kenworthy Road		Access B	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Kenworthy Road		Kenworthy Road		Access B	
Base Volume Input [veh/h]	0	107	214	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0927	1.0927	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	15	0	5	27	30	11
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	117	239	27	30	11
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	33	66	8	8	3
Total Analysis Volume [veh/h]	17	130	266	30	33	12
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.06	0.02
d_M, Delay for Movement [s/veh]	7.88	0.00	0.00	0.00	11.73	10.12
Movement LOS	A	A	A	A	B	B
95th-Percentile Queue Length [veh/ln]	0.04	0.00	0.00	0.00	0.24	0.24
95th-Percentile Queue Length [ft/ln]	1.02	0.00	0.00	0.00	5.89	5.89
d_A, Approach Delay [s/veh]	0.91		0.00		11.30	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	1.32					
Intersection LOS	B					

Appendix C

TRAFFIC IMPACT ANALYSIS

Elux at Ocotillo

Northwest Corner of Kenworthy Road & Ocotillo Road
Pinal County, Arizona

June 20, 2022

UCG Project Number: TR22068

PREPARED FOR
Snowdon Residential, LLC
7114 East Stetson Drive, Suite 400
Scottsdale, Arizona 85251

PREPARED BY
United Civil Group
2803 N. 7th Avenue
Phoenix, Arizona 85007
602-265-6155

CONDUCTED BY



Sarah Simpson, PhD, PE
President

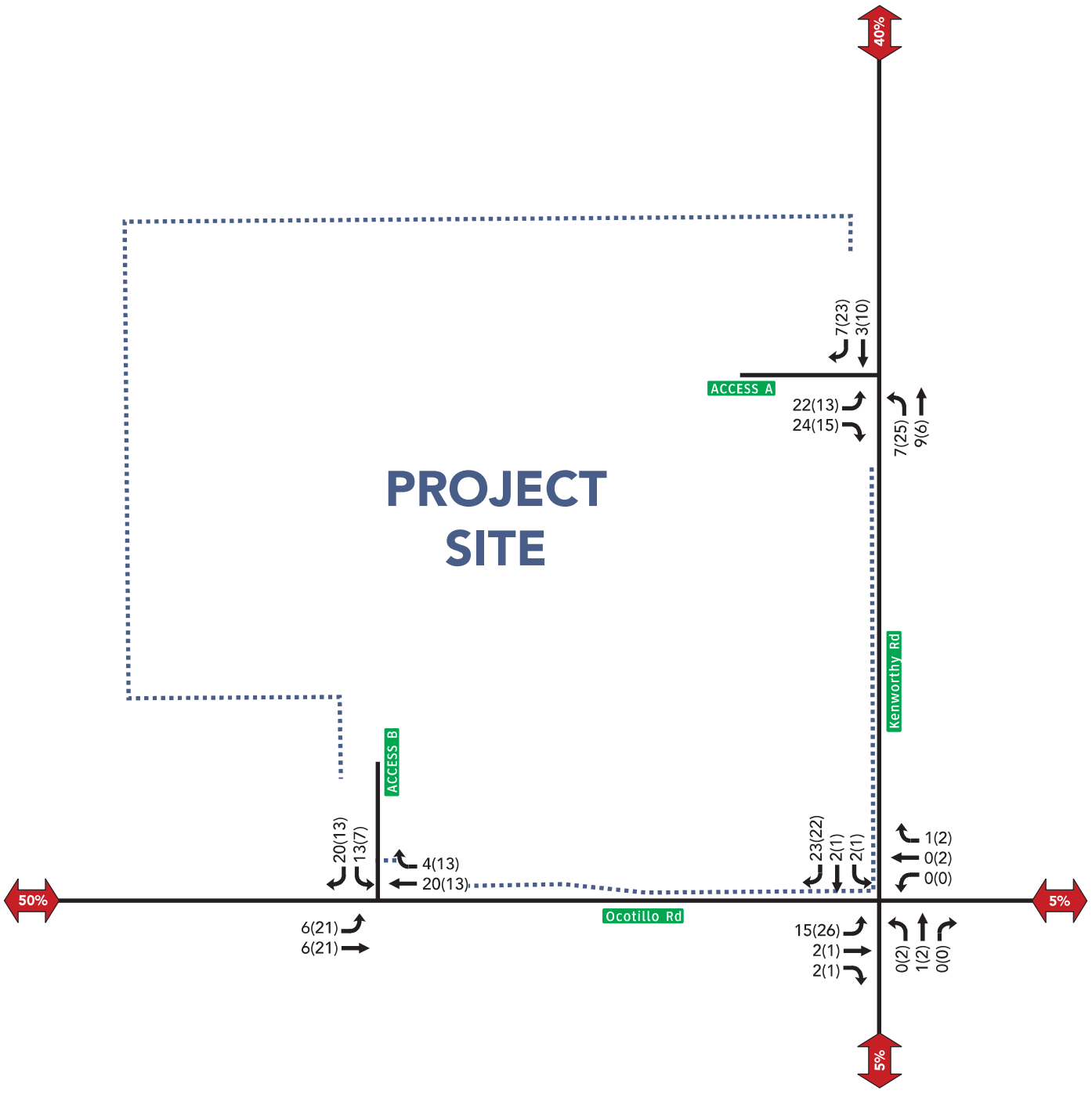


N

not to scale

Figure 3: Site Plan

UCG
United Civil Group



LEGEND

XX(XX) AM(PM) Peak Hour Traffic Volume

X% Trip Distribution Percentage

N

not to scale

UCG United Civil Group

Figure 5: Site Generated Traffic

TRAFFIC IMPACT ANALYSIS
Amendment #1

Wales Ranches
Pinal County, Arizona

March 28, 2022

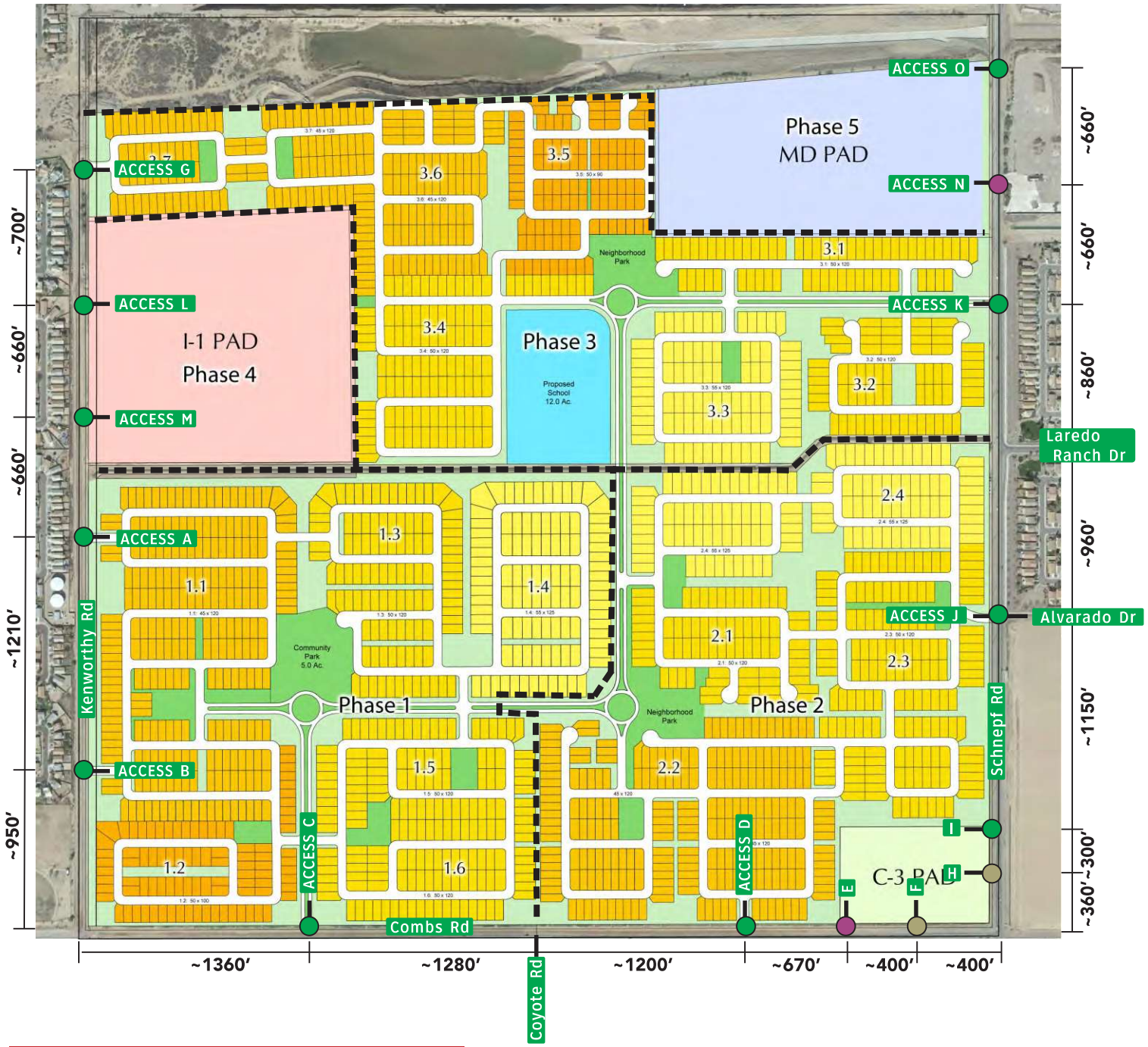
UCG Project Number: TR21135
Original Project Number: TR18089

PREPARED FOR
CVL Consultants
4550 North 12th Street
Phoenix, Arizona 85014

PREPARED BY
United Civil Group
2803 N. 7th Avenue
Phoenix, Arizona 85007
602-265-6155



CONDUCTED BY _____
Sarah Simpson, PhD, PE
President



LEGEND

- Full Access
- Right in/Right out/Left in Access
- Right in/Right out Access

not to scale

Figure 3: Approved Site Plan

United Civil Group

Ocotillo Road is also listed as a RSR Principal Arterial. Ocotillo Road is one mile north of the Wales Ranches northern boundary and provides regional travel throughout the area. Ocotillo Road is constructed as a three-lane section within the study area and includes one lane in each direction separated by a two-way left turn lane within the study area. The posted speed on Ocotillo Road is 35 mph.

Coyote Road is a ½ mile north-south collector roadway located between Kenworthy Road and Schnepf Road. At Combs Road, Coyote Road traverses south only for approximately 550 feet where it terminates as a dead end with barricading. At this location, Coyote Road provides access to a church on the west side of the roadway and a meat processing facility on the east side of the roadway. Coyote Road is developed as a 24-foot ½ street with one lane in each direction and no posted speed limit.

SITE TRAFFIC GENERATION REDUCTION

Estimates of the traffic volumes that will be generated by the proposed single-family development for Phase 3 were determined from transportation planning data taken from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition, 2017*. **Table 1** presents the trip generation for Land Use Code 210-Single Family Detached Housing and the reduction in trips with the reduced lot count. The fitted curve equations were used to calculate the trip ends for each time period.

TABLE 1: TRIP GENERATION

Land Use	Units	Size	Daily	AM Peak			PM Peak		
				total	in	out	total	in	out
210 Single Family	Dwelling Units	633	5,678	454	113	341	597	376	221
210 Single Family	Dwelling Units	268	2,527	188	49	139	252	159	93
Reduction of 365 dwelling units			**-3,151**	**-266**	**-64**	**-202**	**-345**	**-217**	**-128**
Trips forecasted to use Access G				*69*	*17*	*52*	*91*	*57*	*34*
Remaining trips to be eliminated from other accesses in peak periods				*-197*	*-47*	*-150*	*-254*	*-160*	*-94*

The proposed reduction in single family homes is anticipated to decrease the trips in Phase 3 by 3,151 daily trips with 266 less trips occurring in the morning peak hour and 345 less trips occurring in the evening peak hour, per the ITE *Trip Generation Manual*, than originally assumed in the approved TIA.

Appendix D

MUTCD Signal Warrant Analysis

Horizon Year	**2022 Existing Traffic**			
Community Type	Commmunity with greater than 10,000 people			
Street Name	Kenworthy Road		Ocotillo Road	
Posted Speed (mph)	25		35	
Direction	NB	SB	EB	WB
Number of Lanes	1		2 or more	
	Minor Street		Major Street	
Morning Volume	194	189	308	495
Evening Volume	101	269	449	366

8 Highest Hours	Hourly Factors*	Major Street *(both directions)*	Minor Street *(higher one direction)*
1	0.0771	815	254
2	0.0730	772	240
3	0.0688	727	227
4	0.0656	693	216
5	0.0618	653	204
6	0.0612	647	202
7	0.0573	606	189
8	0.0572	605	188

** Source: Pignataro Traffic Engineering Theory and Practice, 1973*

100% Warrant Criteria	Major Street	Minor Street
Condition A	500	200
Condition B	750	100
80% Condition for A and B	600	160

8 Highest Hours	Met? Warrant 1 Condition A	Warrant 1 Condition B	80% Warrant for Conditions A and B**
1	YES	YES	YES
2	YES	YES	YES
3	YES	NO	YES
4	YES	NO	YES
5	YES	NO	YES
6	YES	NO	YES
7	NO	NO	YES
8	NO	NO	YES

***80% Condition for Warrants A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.*

Appendix E

Andrew Smith
Public Works Director

Joe Ortiz
Deputy Director

Christopher Wanamaker
County Engineer

PINAL COUNTY
WIDE OPEN OPPORTUNITY

Leo Lew
County Manager

Public Works Traffic Engineering Review Comment Letter

Project Name:		San Tan 3 aka (New Retail Development and Indoor Batting Cages)			
Engineering Firm:		United Civil Group		**Reviewed by:**	John Kraft Christopher Wanamaker
Engineer:		Sarah Simpson, #32850 Sealed 10/12/2022			
Case #:	PZ-PD-001-23	**Review Status:**	1st Review 2nd Review	**Date:**	06/01/2023

Sheet #	**Comment #**	**RESPOND TO ALL COMMENTS AND REDLINES:**
	1	Ensure that the name used the cover of the report is the same as what is used in other documents related to this project. If multiple names are desired, please include all names on all documents. This will help to alleviate confusion.
Page 6	2	In the section by other, please clarify who the "Others" are. For example, please specify that according to the TIA for Elux, that development will contribute 25% towards the cost of the future Traffic Signal at Kenworthy & Ocotillo. You should also state that it is anticipated that Pinal County would fund the remaining 50% of the signal and install it since no development is planned for the NE or SE corners.
Page 24	3	Page 24 notes that Access B is planned to be a right-in,right-out. While we tend to favor limiting access, this does present a problem with any patron to the development who wishes to leave in the NB or WB directions. To promote good traffic circulation a design alteration should be considered to allow for movements in these directions? Can access be provided onto Quarter Horse? If, for some reason, this is not an option, we may consider a waiver for greater access onto Kenworthy to facilitate good onsite traffic circulations. Please review.
Figure	4	Since the report proposes at limited access (right-in, right-out) condition for both access A and B, how are there 10 AM vehicles and 37 PM vehicles heading NB on Kenworthy and WB on Ocotillo? See also previous comment. Moreover, the 10AM/37PM traffic shown on figure 5 does not appear to be actually entering or existing at access A or B. Is this a valid conclusion?
	5	All TIA's shall provide Average Daily Traffic (ADT) values for all study roadways for both existing and future traffic conditions in addition to the Peak Hour traffic Volumes in the report. Provide this information on the figures that show the AM/PM peak hour traffic volumes
	6	Because the traffic signal will not likely be installed anytime soon, please include a LOS analysis of the intersection for the unsignalized condition with your traffic generated from this site. Next, provide table comparing the unsignalized LOS for background traffic with the unsignalized LOS with the additional traffic from this site.
Part VI.B	7	The half street improvements should include a raised median to ensure that the right-in, right-out condition is met. Please update the report.
	8	Provide an overall traffic circulation map that includes the following items on a single figure: Proposed improvements resulting from this project (turn lanes, half street, signal contribution, etc), all access locations and access types (full, ¾, Right-in-right-out), ADT values (existing and proposed) for adjacent roadways, AND distances between intersections and Access Points. This figure is very important because it will be used at the presentation to the P&Z commission as well as the BOS in the future.
General	9	Review comments made to the Traffic Impact Analysis may require revisions be made to the projects Paving Plan and/or the Signing & Striping Plan. It is the applicant's and engineer's responsibility to ensure that both the plans and report reflect the same design/information.

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General	10	Based on the information being requested, additional comments may be forth coming.
General	11	This report is not approved and a **2nd review** will be required. Please resubmit a revised traffic report, accompanying figures/exhibits and supporting calculations, along with written responses to the comments.

August 16, 2023

Project: San Tan 3 (New Retail Development and Indoor Batting Cages)
UCG Project Number: TR22095
Reviewing Agency: Pinal County
Revision: 1st Review Comments
Date Reviewed: June 1, 2023
Case # PZ-PD-001-23

Sheet #	Comment #	Response
General	1	The name has been changed to **San Tan 3** (New Retail Development and Indoor Batting Cages)
Page 6	2	Rephrased to add: Per the approved TIA for Elux Multifamily Development, the developer of the property is to contribute 25% toward the cost of the signal at the intersection of Kenworthy Road/Ocotillo Road. It is anticipated that Pinal County will contribute the remaining 50% of the signal cost because no known development is planned for the northeast or southeast corners of the intersection, at this time.
Page 24	3	Agreed, Access B on Kenworthy is proposed as a full movement access to allow exiting traffic access to the west and north. This change also allows ingress into the site from the south. Consideration was given to providing access on Quarter Horse Trail from the development. However, because this is a local residential road, is approximately 16 feet in width and terminates to the west as a dead end with no cul-de-sac, this option is not viable or recommended.
Figure 5	4	Vehicles were proposed to be making U-turns on Kenworthy Road and Ocotillo Road. The in and out volumes to and from the site are correct. However, with access changing, the trip distribution has been reallocated because Access B is proposed as a full turning movement access. Therefore, U-turns have been eliminated from the traffic modeling.
General	5	ADTs are added to the figures.
Page 29	6	Added LOS for Kenworth/Ocotillo controlled by all way stop and the comparison table for all way stop and signalized.
	7	Report updated to include the half street improvements and the raised median within the site boundary to limit Access A to right in/right out only

Sheet #	Comment #	Response
General	8	Recommendations figure included in report
General	9	Report provided to engineer for incorporation of recommendations into plans.
General	10	Agreed
General	11	Agreed

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PRELIMINARY DRAINAGE REPORT:

SAN TAN COMMERCIAL 3

SWC of E. Ocotillo Road and N. Kenworthy Road
San Tan Valley, AZ 85140
SECTION 20, T02S, R08E, G&SRM, Pinal County, Arizona

PREPARED FOR
UPFRONT PLANNING & ENTITLEMENTS, LLC
1811 S. Alma School Road #283
Mesa, AZ 85210

UPFRONT
Planning & Entitlements, LLC

PREPARED BY:
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JULY 2023

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Section
1

INTRODUCTION

The parcel/project site examined in this report is referred to as "San Tan Commercial 3", and refers to Parcels 104-22-041A and 205-22-041B. These parcels had previously featured agriculture, and later some minor development activity, but this development has since been removed, leaving a roughly level vacant area. The proposed parcel area of development for San Tan Commercial 3 is approximately 2.65 acres. Currently at the site of San Tan Commercial 3, there is a vacant area in the interior of the site. There are some utilities, including irrigation infrastructure and easements around the north and east perimeters of the site – along E. Ocotillo and N. Kenworthy Roads respectively. The entire site has been previously graded, and is currently earthen. The current intent is to regrade the site, and place multiple commercial buildings on the site along with parking, utilities, landscape, and drainage features. The site will take its access from both E. Ocotillo Road and N. Kenworthy Road. This report will support the Rezone and Planned Area Development for San Tan Commercial 3, and is preliminary in nature – only to establish the feasibility of a viable drainage solution on the site.

1.1 Off-Site Drainage

The overall drainage pattern in the area of San Tan Commercial 3 is characterized by sheet flow over mildly sloping terrain (0.5% +/-) from east to west. As such, storm water run-on to the project site would occur after being conveyed over Kenworthy Road. It is unlikely that any significant volume of storm water would enter the project site from Kenworthy Road. This is because Kenworthy Road itself, as a former agricultural service road, is elevated slightly above the surrounding terrain in this location, thereby serving as a de-facto impediment to overland flow. This is also because there is an earthen berm on the east side of Kenworthy Road which currently holds back storm water generated on the vacant parcel on the southeast corner of Kenworthy/Ocotillo, and only 640 feet to the east of Kenworthy is an existing residential subdivision (Moon Shadow) that features its own drainage system that does not outlet to the vacant parcel or to Kenworthy Road. On the west (San Tan Commercial 3) side of Kenworthy Road are vestiges of a now-abandoned irrigation canal that may further impeded storm water run-on.

Potential run-on from Ocotillo Road and Quarter Horse Trail (the residential street on the south border of San Tan Commercial 3) are unlikely to be significant due to the factors already stated, and because

Ocotillo Road features a crowned cross section. There is a small area of significant vegetation on the project site concentrated along the northern boundary of the parcels. This is likely due to onsite runoff ending up there, and possibly some contribution from the irrigation infrastructure along that alignment. Because of all this, it can reasonably be said that offsite storm water does not enter the project site in any significant quantity, and that San Tan Commercial 3 can be considered to be self-contained with its storm water.

The project site is mapped entirely outside any Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas (SFHAs), and is identified as Zone X, being outside of the 0.2% Annual Chance Flood Hazard, on the Flood Insurance Rate Map Panel 04021C0745E (effective 12/04/2007). Please see Figure 2 – FIRMette. There is also no SFHA near the project site.

Section
2

HYDROLOGIC INFORMATION

A preliminary site grading scheme was developed for the proposed site improvements, and was highly influenced by the existing topography on the site. Basically, the eastern half of the site will drain overland to the proposed underground retention chambers in the western half of the parcel. The preliminary grading plan would maintain the prevailing drainage pattern, whereby the onsite storm water would concentrate at two grate inlets proposed near the northwest and southwest corners of the property, and enter into separate underground storage chamber systems. Flow conveyance is expected to entirely overland flow off of the roof and landscape areas, then over the paved parking and drive aisle areas to one of two concentration points CPNW and CPSW. Channelization is not anticipated, although one or more valley gutters may be necessary.

Peak discharges were determined for the 1% annual chance (100-year) event on the site. To do this, the rational method was utilized per Volume 2, Chapter 2 of the Pinal County Drainage Manual (PCDM), and with the help of the NOAA 14 Atlas information found at https://hdsc.nws.noaa.gov/hdsc/pfds, as there was no intensity-duration information in the PCDM in the vicinity of the project site. It is important to note that the drainage areas considered to be contributing to CPNW and CPSW include the existing utility and irrigation easements outside of the intended development area, and also include the ½ right-of-way (up to the surveyed centerlines) of Ocotillo Road, Kenworthy Road, and Quarter Horse Lane. This is due to the longstanding Pinal County policy compelling inclusion of these areas for the purpose of determining the required storm water volume to retain. Proposed conditions Rational C coefficients were calculated using Equation 2-2 (weighted average) in the Pinal County Drainage Manual (PCDM) with contributing C values chosen from Table 2-1 in the PCDM. The most conservative C values were chosen.

Results of the rational method analyses were that the NW chamber system should receive a 100-year, 1-hour peak discharge of approximately 3.8 cfs in existing conditions, and 12.6 cfs in proposed conditions from 1.78 acres. Similarly, the SW chamber system should receive a 100-year, 1-hour peak discharge of approximately 2.6 cfs in existing conditions, and 8.0 cfs in proposed conditions from 1.22 acres. Please see the hydrology summary in Appendix A.

Section
3

HYDRAULICS INFORMATION

Retention Volume

Contributing areas of 1.78 and 1.22 acres in size were delineated for the two proposed retention chamber systems, which includes the entire project site plus the ½ right-of-way (ROW) areas on Ocotillo Road, Kenworthy Road, and Quarter Horse Lane. The drainage from the ½ right-of-way does not actually enter the chamber systems, as doing so would likely prove infeasible due to the physical layouts of the basin and the right-of-way.

Along with the peak discharges for these areas, the design volumes of the two retention chamber systems were determined per Equation 2-4 in the Pinal County Drainage Manual using the 100-year, 2-hour rainfall depth, the weighted runoff coefficient, and the contributing drainage area. The retention goal (from the 100-year, 2-hour event) is 13,112 cubic feet (cf) for CPNW and 8,981 cf for CPSW. These volumes represent full retention of the entire onsite drainage areas during the 100-year, 2-hour event.

Underground Storage Chamber Sizing

In order to determine the feasibility of placing underground chambers on the project site of San Tan Commercial 3, a sizing exercise was performed using the StormTech underground chamber system. StormTech's online design tool at https://designtool.ads-pipe.com was used to select a chamber product and estimate the number of chambers, as well as the number of rows according to the available space. For both CPNW and CPSW, the MC-4500 product was chosen. It was found that smaller chambers would not provide enough storage within the available space. The number of chambers necessary at each location will depend on whether Pinal County will allow the void spaces within the rock fill to count as storage volume. Normally, StormTech/ADS encourages use of the stone-void volume surrounding the chambers to count as stored volume. Some jurisdictions also allow this volume to count toward the volume goal, and others do not. Pinal County staff has indicated that they normally do not allow this volume to count, but still

have on some occasions. Staff also indicated that when they do allow stone-void volume, they prefer using 30% of the stone-fill volume for the void space volume (StormTech/ADS recommends 40%), and that ideally the void space volume should represent a 'small percentage' of the overall volume. Bowman Consulting has found that the stone-void portion generally represents roughly one-third of the total volume in these underground chamber systems.

Given the uncertainty regarding whether the stone-void volume would count toward the stated volume goals, the aforementioned design tool was used two ways. One way is with the stone-void counting as 30% of the stone-fill, and the other way is with no stone voids counting. Table 1, below, indicates the number of MC-4500 chambers (which are 60-inches tall, and require a minimum 24-inches of cover) required at each location assuming with- and without stone void volume scenarios.

Table 1: Summary of MC-4500 Underground Chambers

Concentration Point	Number of MC-4500 Chambers Required (Integer)	Volume Required In Chambers (100-Year, 2-Hour Event) (ft^3)	Installed System Volume (ft^3)
CPNW			
With 30% Stone-Voids Volume	81	13,112	13,604
Without Stone Voids Volume	120	13,112	13,176
CPSW			
With 30% Stone-Voids Volume	55	8,981	9,461
Without Stone Voids Volume	82	8,981	9,050

There are several other factors to consider when installing underground chambers. One is that these chamber systems will be subject to the 36-hour draindown requirement by Pinal County. As such, there will need to be an infiltration test conducted - preferably at the infiltration depth (7 ft +/-). If draindown cannot be demonstrated within the 36-hour time limit, then a drywell will be necessary at one or both locations. Drywells could be placed within the landscape areas. Another factor is that there will need to be a bearing capacity test conducted either before or during installation, and in the case of a weaker soil, an additional depth of stone on the bottom layer will be required. One more factor is that inspection and maintenance of the underground system may be mandated by a covenant running with the land, which will require maintenance a

minimum of yearly, and likely at least inspection after significant rain events. Details of inspection and maintenance means and methods will be provided during design of the project site.

Section
5

CONCLUSIONS

This drainage report documents the hydrologic and hydraulic analyses performed for the determination of 100-year peak discharges and the full retention of storm water volumes for the planned San Tan Commercial 3 development. The general location is the southeast quarter of Section 20, Township 02 South, Range 08 East of the Gila and Salt River Meridian, within the unincorporated Pinal County, Arizona. More specifically, the project site is located on the west side of N. Kenworthy Road and the south side of E. Ocotillo Road.

To accomplish the tasks identified above, the hydrology procedure described in Volume 2, Chapter 2 of the Pinal County Drainage Manual (a version of the rational method), was used to determine 1% annual chance (100-year) peak discharges for the onsite drainage areas.

It was determined that full retention of the 100-year, 2-hour event will be necessary, and volumes for that were determined according to the conceptual grading plan, which splits the project site into two drainage areas. Underground storage chambers were sized volumetrically with and without counting the stone-void volume toward the volume goals. Accordingly, two chamber systems were determined using the StormTech/ADS MC-4500 chamber product. The underground chamber systems have no outlet. Percolation tests will be performed to determine whether there is a need for a drywell at one or both

locations. Maintenance of the chambers will occur by placing machinery through an access manhole from the ground surface.

The storage and conveyance of storm water through the project site has been shown to be feasible, and will not adversely impact the subject parcel itself, nor the other adjoining properties and right-of-way.

Section 6

REFERENCES

1. Pinal Drainage Organization, *Pinal County Drainage Manual, Volume II: Design Methodology and Procedures, Chapter 2: Hydrology*, August, 2004.

Disclaimer

The analysis presented in this Statement evaluates stormwater runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 1% annual chance (100-year) frequency event. A storm event exceeding the 1% annual chance frequency may cause or create the risk of greater flood impact than is addressed and presented herein. The scope of this assessment does not include evaluation of stormwater runoff resulting from storm events exceeding the 1% annual chance frequency. BOWMAN CONSULTING assumes no responsibility for actual flood damage, increased risks of flood damage, or increased construction or development cost resulting from or related to any such events, nor shall BOWMAN CONSULTING be responsible for any changes in, or additions to, regulatory requirements which may result from, or be related to, any such events or changes in hydrologic or hydraulic conditions within the watershed.

FIGURES



Figure 1 - Location Map

Section 20, Township 02 South, Range 08 East G&SRM

UPFRONT
Planning & Entitlements, LLC

National Flood Hazard Layer FIRMette

FEMA

111°33'6"W 33°15'11"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

111°32'28"W 33°14'41"N

Figure 2 - FIRMette

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/24/2023 at 4:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

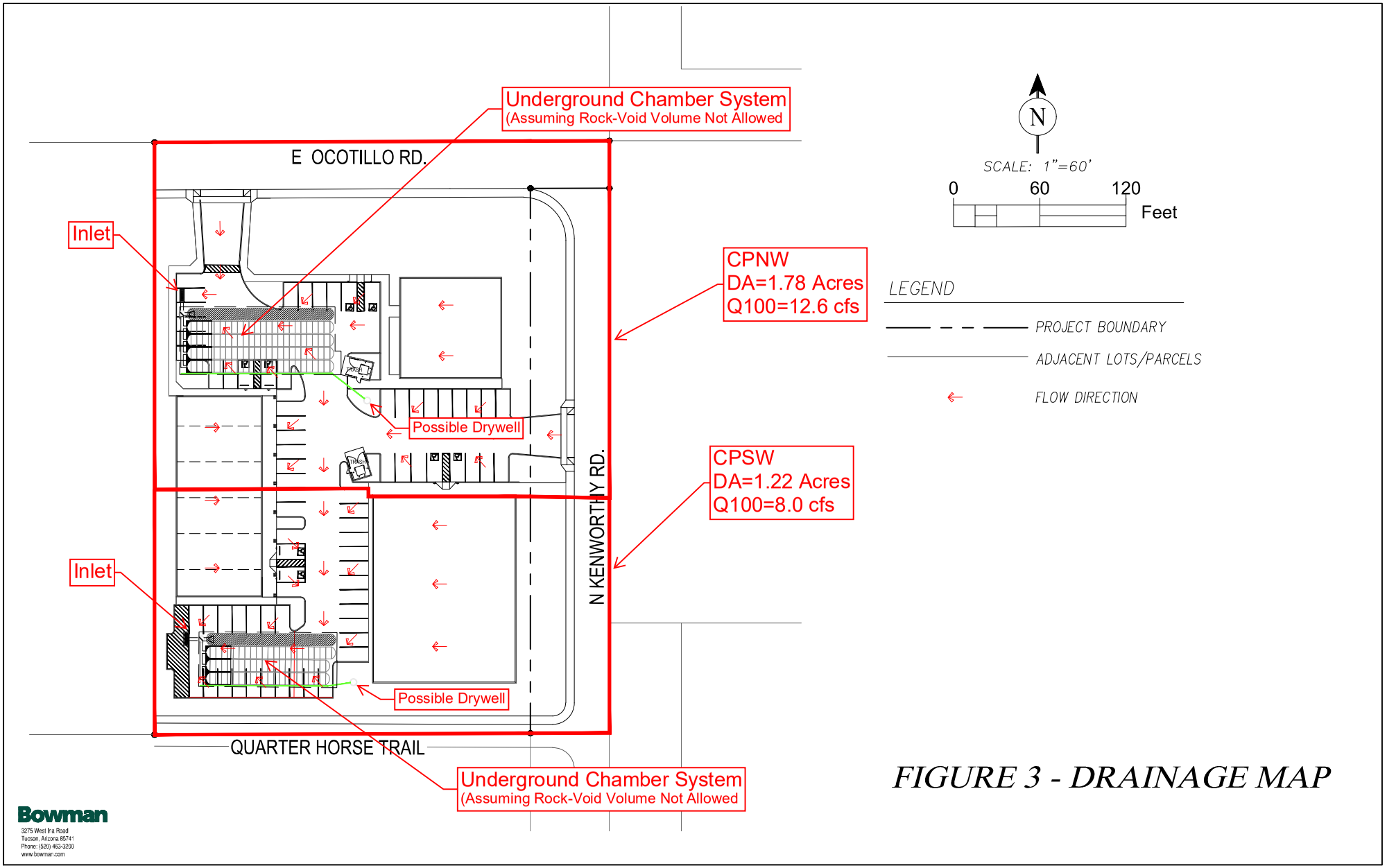


FIGURE 3 - DRAINAGE MAP

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APPENDIX A

HYDROLOGY DOCUMENTATION

For CPNW

Hydrologic Analyses for San Tan Commercial 3

Per Volume 2, Chapter 2 of Pinal County Drainage Manual

A = Drainage Area (acres)
P_1 = 1-Hour Rainfall Depth (From NOAA Atlas 14 - Median Value)
L_c = Length of the Watercourse to the Hydraulically Most Distant Point (mi)
K_b = Watershed Resistance Coefficient (dim), K_b = m log(A) + b
m and b = Empirical Equation Parameters (dim), From Table 2-2 in Pinal County Drainage Manual, Volume 2/Chapter 2
S = Slope of Longest Flow Path, L_c, (ft/mi)
T_c = Time of Concentration (hrs), $T_c = 11.4L_c^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$, Papadakis Equation
i = Average Rainfall Intensity for a Duration of Rainfall Equal to Tc (Minimum Tc is 5 minutes)
Use NOAA 14 Rainfall Intensities to build Intensity-Duration-Frequency Curves
C = Runoff Coefficient (Table 2-1 of Pinal County Drainage Manual
Q_{p100} = 100-Year Peak Discharge (ft^3/s), Q_{p100} = CiA

Onsite Hydrology

Existing Conditions for Contributing Onsite Area

Drainage Area Designation	Return Period (Years)	A (acres)	P_1 (in)	L_c (mi)	m (dim)	b (dim)	K_b	Relief (ft)	S (ft/mi)	i (in/hr)	T_c (hr)	T_c (min)	C	Q_{p100} (ft^3/s)	Notes
CPNW	100	1.78	2.05	0.047	-0.01375	0.08	0.077	1.0	21.1	6.80	0.122	7.3	0.31	3.8	
CPSW	100	1.22	2.05	0.047	-0.01375	0.08	0.079	1.0	21.1	6.80	0.124	7.4	0.31	2.6	

Rational C Per Equation 2-2 of Pinal County Drainage Manual

$C_w = (C_1A_1 + C_2A_2 + \ldots + C_nA_n) / (A_1 + A_2 + \ldots + A_n)$

Where C_i and A_i are the ith Runoff Coefficient (from PCDM Table 2-1) and ith Subarea respectively

Proposed Conditions

C_1= 0.25	For "Agricultural"
C_2= 0.88	For "Gravel Roadways and Shoulders"
A_1= 2.70	
A_2= 0.30	
C_w= 0.31	

For CPSW

Hydrologic Analyses for San Tan Commercial 3

Per Volume 2, Chapter 2 of Pinal County Drainage Manual

A = Drainage Area (acres)
P_1 = 1-Hour Rainfall Depth (From NOAA Atlas 14 - Median Value)
L_c = Length of the Watercourse to the Hydraulically Most Distant Point (mi)
K_b = Watershed Resistance Coefficient (dim), K_b = m log(A) + b
m and b = Empirical Equation Parameters (dim), From Table 2-2 in Pinal County Drainage Manual, Volume 2/Chapter 2
S = Slope of Longest Flow Path, L_c, (ft/mi)
T_c = Time of Concentration (hrs), $T_c = 11.4 L_c^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$, Papadakis Equation
i = Average Rainfall Intensity for a Duration of Rainfall Equal to Tc (Minimum Tc is 5 minutes)
Use NOAA 14 Rainfall Intensities to build Intensity-Duration-Frequency Curves
C = Runoff Coefficient (Table 2-1 of Pinal County Drainage Manual
Q_{p100} = 100-Year Peak Discharge (ft^3/s), Q_{p100} = CiA

Onsite Hydrology

Proposed Conditions for Contributing Onsite Area

Drainage Area Designation	Return Period (Years)	A (acres)	P_1 (in)	L_c (mi)	m (dim)	b (dim)	K_b	Relief (ft)	S (ft/mi)	i (in/hr)	T_c (hr)	T_c (min)	C	Q_{p100} (ft^3/s)	Notes
CPNW	100	1.78	2.05	0.045	-0.00625	0.04	0.038	1.0	22.0	7.84	0.078	5.0	0.91	12.6	Defaults to 5 Minutes
CPSW	100	1.22	2.05	0.063	-0.00625	0.04	0.039	1.0	16.0	7.25	0.106	6.4	0.91	8.0	

Rational C Per Equation 2-2 of Pinal County Drainage Manual

$C_w = (C_1A_1 + C_2A_2 + \ldots + C_nA_n) / (A_1 + A_2 + \ldots + A_n)$

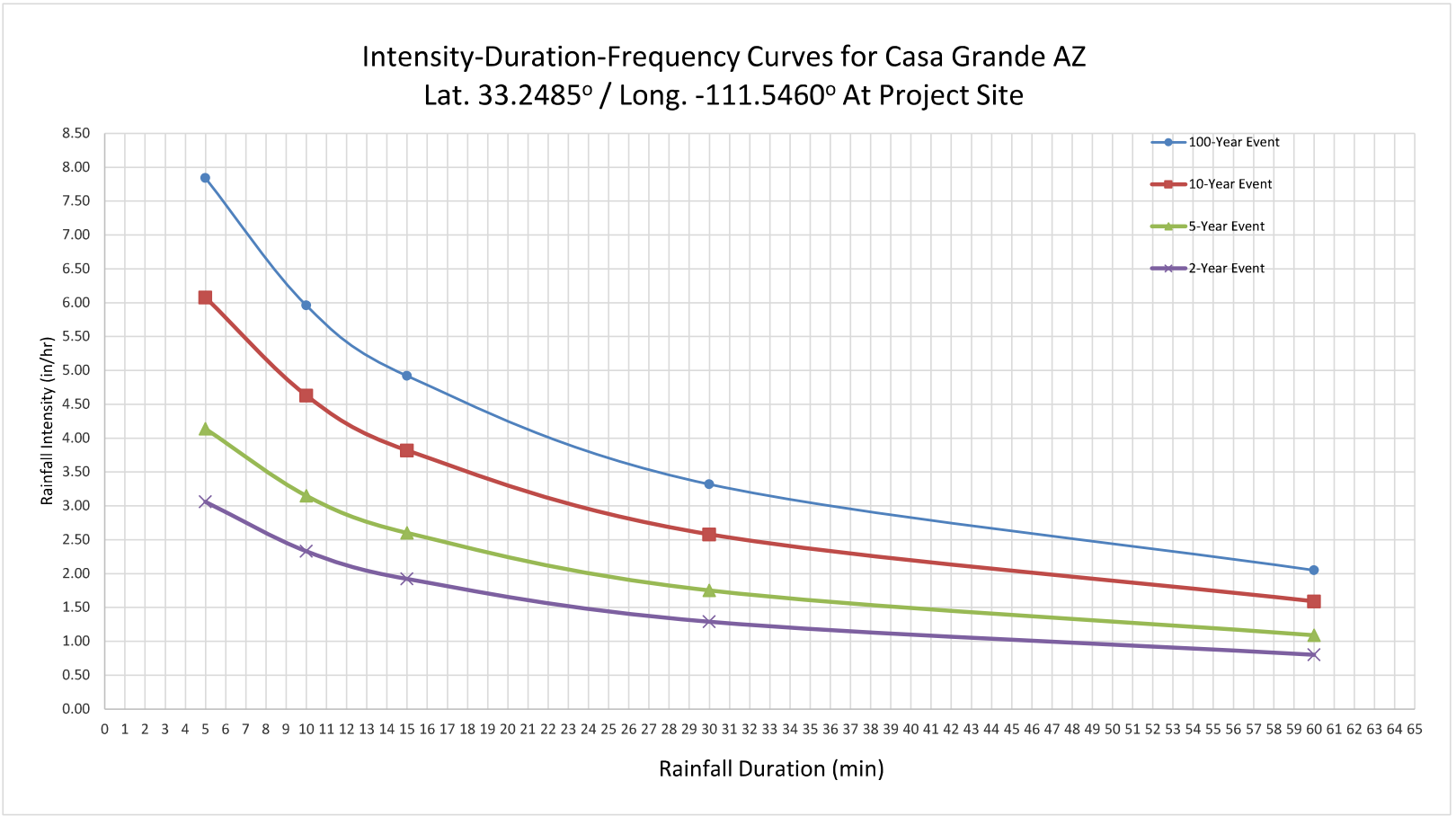
Where C_i and A_i are the ith Runoff Coefficient (from PCDM Table 2-1) and ith Subarea respectively

Proposed Conditions

C_1= 0.95	For "Pavement and Rooftops"
C_2= 0.88	For "Gravel Roadways and Shoulders"
C_3= 0.50	For "Desert Landscaping 2"
A_1= 2.34	
A_2= 0.24	
A_3= 0.24	
C_w= 0.91	

IDF Information for Casa Grande Project Site - Lat 33.2485 / Long -111.5460 - From NOAA Website

Duration (min)	100-Year Intensity (in/hr)	10-Year Intensity (in/hr)	5-Year Intensity (in/hr)	2-Year Intensity (in/hr)
5	7.84	6.08	4.14	3.06
10	5.96	4.63	3.15	2.33
15	4.92	3.82	2.60	1.92
30	3.32	2.58	1.75	1.29
60	2.05	1.59	1.09	0.80



APPENDIX B

HYDRAULICS DOCUMENTATION

Retention Storage Volume Goal and Retention Storage Arriving

Per Equations 2-2, 2-4 and 2-6 of Pinal County Drainage Manual

Retention Storage Volume Goal (100-Year, 2-Hour Event) - Northwest Drainage Area CPNW

$V = C (P_2/12) A$ Equation 2-4 of Pinal County Drainage Manual (Volume 2, Chapter 2)

Where:
C = Rational Coefficient from Equation 2-2
P_2 = 100-Year, 2-hour Median Rainfall Depth per NOAA 14 Atlas (inches)
A = Contributing Drainage Area (Acres)

Proposed Conditions

C=	0.91	Commercial 2 Land Use - See Below
P_2=	2.24	Inches
A=	1.78	Acres
V=	0.30102	Acre-Feet
=	13112	ft^3

Total Retention from Proposed Conditions Area = 13112 Cubic Feet

---

Retention Storage Volume Goal (100-Year, 2-Hour Event) - Southwest Drainage Area CPSW

$V = C (P_2/12) A$ Equation 2-4 of Pinal County Drainage Manual (Volume 2, Chapter 2)

Where:
C = Rational Coefficient from Equation 2-2
P_2 = 100-Year, 2-hour Median Rainfall Depth per NOAA 14 Atlas (inches)
A = Contributing Drainage Area (Acres)

Proposed Conditions

C=	0.91	Commercial 2 Land Use - See Below
P_2=	2.24	Inches
A=	1.22	Acres
V=	0.20617	Acre-Feet
=	8981	ft^3

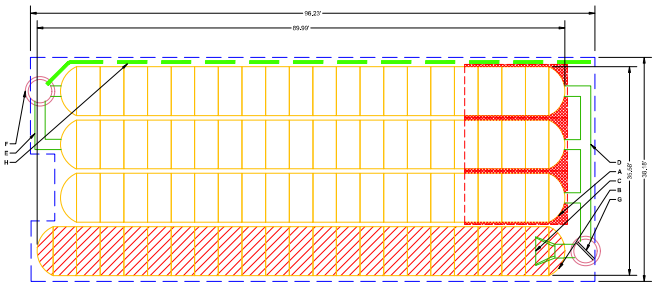
Total Retention from Proposed Conditions Area = 8981 Cubic Feet

Summary of Underground Chamber System for CPNW with Rock Counting

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
83	STORMTECH MC-4500 CHAMBERS	MINIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)	12.75
8	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)	8.25
12	STONE ABOVE (IN)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)	7.75
9	STONE BELOW (IN)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT)	7.25
30	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	7.05
13604	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
	(COVER STONE INCLUDED)	MC ISOLATOR ROW PLUS INVERT:	0.42
	(BASE STONE INCLUDED)	18" x 18" BOTTOM MANIFOLD INVERT:	0.67
2626	SYSTEM AREA (SF)	18" x 18" BOTTOM MANIFOLD2 INVERT:	0.67
2763	SYSTEM PERIMETER (ft)	18" BOTTOM CONNECTION INVERT:	0.67
		BOTTOM OF MC-4500 CHAMBER:	0.42
		UNDERDRAIN INVERT:	0.42
		BOTTOM OF STONE:	0.00

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.37"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500EPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
CLAMP	C	INSTALL CLAMP ON 2" ACCESS PIPE / PART#: MCPLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
MANIFOLD	E	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.37"	
CONCRETE STRUCTURE	F	DCI (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		8.0 CFS OUT
CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		16.5 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		

*INVERT ABOVE BASE OF CHAMBER



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS/PLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

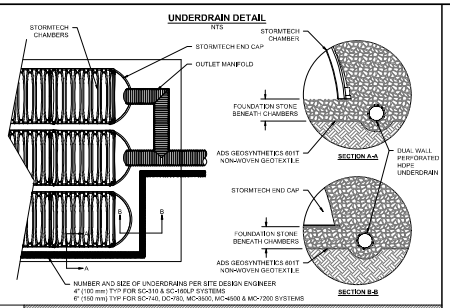
BED LIMITS

NOTES

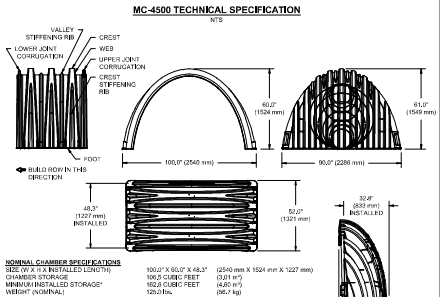
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE 45.22 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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4 UNDERDRAIN DETAIL



2 MC-4500 TECHNICAL SPECIFICATION



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.8 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	129.0 lbs.	(58.7 kg)

NOMINAL END CAP SPECIFICATIONS

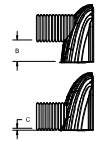
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.6"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS. 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

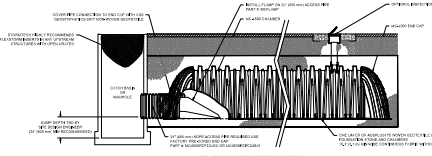
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH A "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500EPP06T	6" (150 mm)	42.54" (1081 mm)	–
MC4500EPP06B		–	0.89" (22 mm)
MC4500EPP08T	8" (200 mm)	40.50" (1029 mm)	–
MC4500EPP08B		–	1.01" (26 mm)
MC4500EPP10T	10" (250 mm)	38.37" (975 mm)	–
MC4500EPP10B		–	1.33" (34 mm)
MC4500EPP12T	12" (300 mm)	35.69" (907 mm)	–
MC4500EPP12B		–	1.59" (39 mm)
MC4500EPP15T	15" (375 mm)	32.72" (831 mm)	–
MC4500EPP15B		–	1.70" (43 mm)
MC4500EPP18T	18" (450 mm)	29.39" (746 mm)	–
MC4500EPP18W			
MC4500EPP18B		–	1.97" (50 mm)
MC4500EPP18BW			
MC4500EPP24T	24" (600 mm)	23.05" (585 mm)	–
MC4500EPP24TW			
MC4500EPP24B		–	2.26" (57 mm)
MC4500EPP24BW			
MC4500EPP30BW	30" (750 mm)	–	2.95" (75 mm)
MC4500EPP36BW	36" (900 mm)	–	3.25" (83 mm)
MC4500EPP42BW	42" (1050 mm)	–	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12x24" (300x600 mm) SIDE ON SIDE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.



MC-4500 ISOLATOR ROW PLUS DETAIL

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON SIDES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2, IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

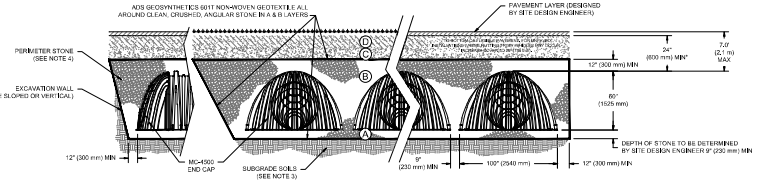
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-4500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS, CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS, PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B) LAYER TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145* A-1, A-2-4, A-3 OR AASHTO M43* 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE: FILL** BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43* 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #1 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 1 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

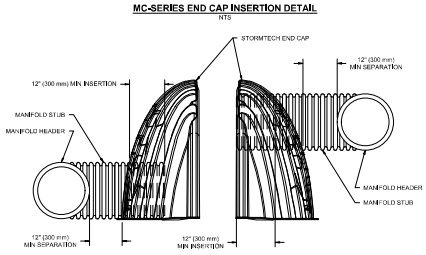


NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/F/IN., THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418, AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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5 MC-SERIES END CAP INSERTION DETAIL



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

1 MC-4500 CROSS SECTION DETAIL

DRAWN: CL | DATE:
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

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SHEET 1 OF 1

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