TRAFFIC IMPACT STUDY

Wildlife Commerce Park
Grand Prairie, Texas

June 24, 2014

Prepared for

Crow Holdings

AVO 30044

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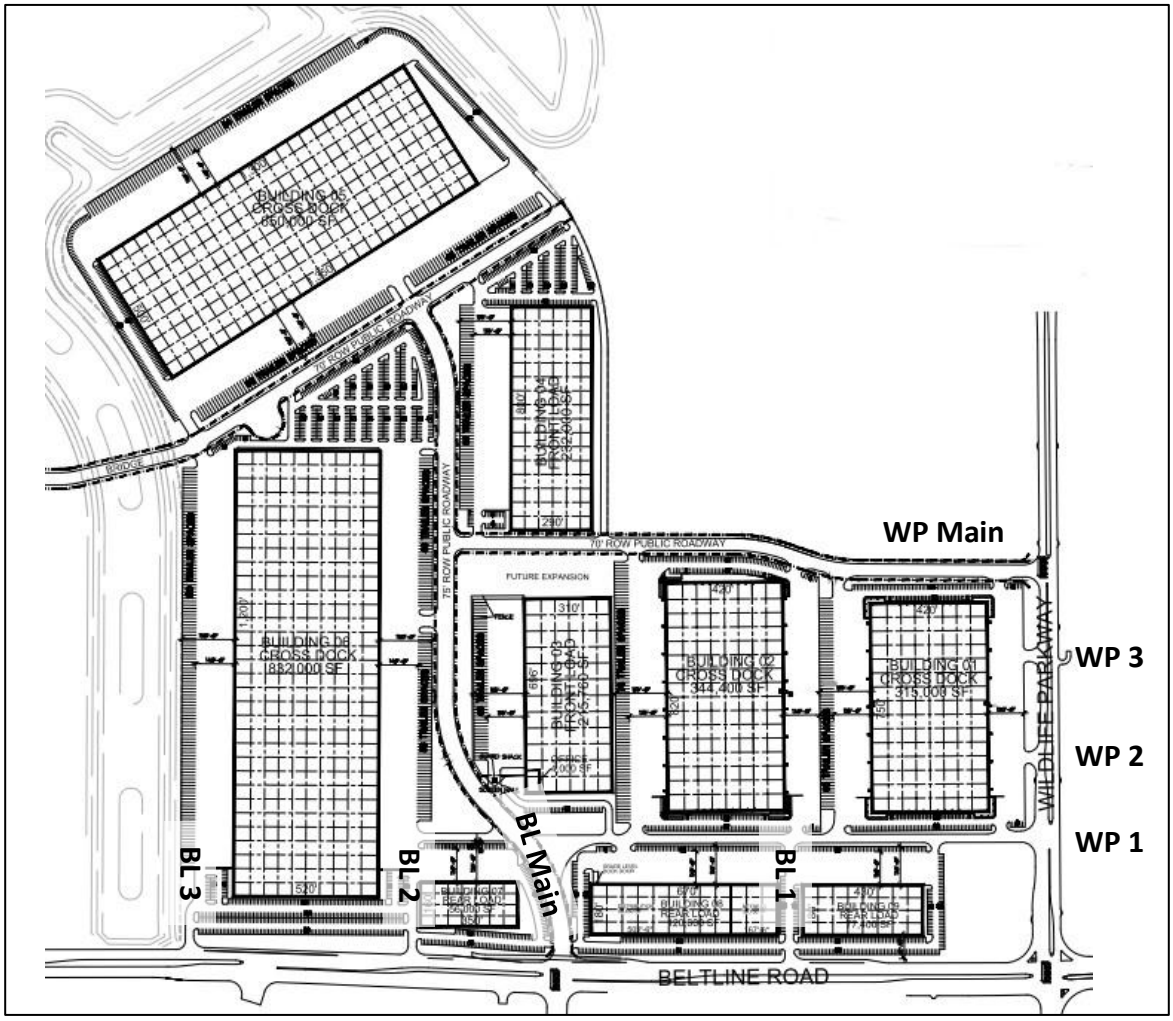
Executive Summary

Halff Associates, Inc. (Halff) conducted a Traffic Impact Analysis (TIA) for Crow Holdings, at the request of the City of Grand Prairie, related to the proposed Phase I of the Wildlife Commerce Park (WCP) located in Grand Prairie, Texas. The proposed development is located in the southwest quadrant of Wildlife Parkway and Belt Line Road. Phase I of the development is anticipated to consist of a mix of warehousing and light industrial uses totaling 2,821,000 SF. Phase II of WCP is a separate 58 acre parcel of land to the south of Phase I. Crow Holdings is currently pursuing retail uses for this tract. It is recommended this TIA be updated when Phase II is developed. A visual depiction of the Phase I site plan is provided below.

The site is bordered on two sides by existing roadways; Wildlife Parkway to the north and Belt Line Road to the east. Proposed access to the site will consist of eight driveways in total with four driveways on Wildlife Parkway and four driveways on Belt Line Road. Please see the site plan for further information.

Note: this site plan represents Crow Holdings' current plan for Phase I of the WCP. The site plan may change as market conditions dictate.



Halff worked with the City of Grand Prairie staff to establish the assumptions for this TIA. The TIA examined the projected impacts of the development on the following intersections:

- Wildlife Parkway/Hunter-Ferrell Road at Belt Line Road
- Lone Star Park Gate 1 at Belt Line Road
- Lone Star Park Gate 2 at Belt Line Road
- Lone Star Parkway at Belt Line

The study is based on three scenarios in response to questions raised by City of Grand Prairie elected officials and staff. Each scenario is run during rush hour, when traffic congestion is most common. The commuter rush hours were based on recent 24-hour traffic count data and were determined to be 7:00 to 8:00 AM and 5:00 to 6:00 PM. For the event scenarios, the critical time period was determined to be between 5:30 and 6:30 PM.
Study scenarios include the following:

1. Existing Conditions during the AM and PM rush hour (to establish control numbers).
2. Existing Conditions plus traffic generated by Phase I of WCP.

3. Scenario 2 with Friday evening events at Lone Star Park, Verizon Theater, and Quick Trip Park. While this scenario represents the highest potential traffic, it is rare and is only scheduled to occur 3 times in 2014.

Trips for the proposed development were generated based on the *ITE Trip Generation Manual - Ninth Edition.* This is the standard text used by the City of Grand Prairie and other municipalities to determine traffic demands of different land uses. The table below contains a summary of the trip generation for Phase I of the development at full build-out.

WCP - New Trip Generation Summary

Land Use (Comparable Use)	Square Footage	Estimated Employees Per Shift	Truck Trips	AM-peak			PM-peak			24-hour Weekday
				In	Out	Total	In	Out	Total	Total
Light Industrial (JMH Printing, Visionaire)	1,017,000	2,300	20%	823	112	935	118	868	986	7,088
Warehouse (Pollock Paper)	994,400	900	30%	235	63	298	80	238	318	3,540
High-Cube Warehouse (Restoration Hardware)	832,000	300	30%	63	29	92	31	69	100	1,398
Totals	**2,843,400**	**3,500**	26%	**1,121**	**204**	**1,325**	**229**	**1,175**	**1,404**	**12,026**

The above trip generation totals include both truck and vehicle trips related to development. At build-out of Phase I the daily truck trips average out to approximately 26 percent of the overall development trips. Also, shown in the table are an estimated number of employees for the proposed uses, and examples of businesses in Grand Prairie which represent each category of use.

All analyses of the study intersections and driveways were conducted according to standard traffic engineering practices and used the Synchro 8 traffic analysis software package, which is the same software used by the City of Grand Prairie and other municipalities. Copies of all analysis reports can be found in Appendix D.

The tables below summarize the traffic impact of the development in all three scenarios (existing conditions, at WCP full build out, and event scenario). The results are based on LOS rankings for the studied intersections. LOS rankings are an industry-standard calculation with A representing no traffic and F representing a traffic jam. The City of Grand Prairie aims for a C level of service on its roadways. Many other municipalities accept a D level of service.

LOS Summary for Typical Weekday at WCP Buildout (Scenario 2)

Intersection	Level of Service Rank			
	Existing Conditions		Phase I Build-Out	
	AM Peak	PM Peak	AM Peak	PM Peak
Belt Line Rd at Wildlife/Hunter-Ferrell Rd	A	B	B	B
Belt Line Road at Gate 1 Entry/BL Main Drive	A	A	A	B
Belt Line Road at Gate 2 Entry	A	A	A	A
Belt Line Road at Lone Star Parkway	A	A	A	A

The next table summarizes the LOS ranking at the study intersections for the PM event peak hour.

LOS Summary for Event Conditions (Scenario 3)

Intersection	Level of Service Rank
	Event Peak Hour
Belt Line Rd at Wildlife/Hunter-Ferrell Rd	C
Belt Line Road at Gate 1 Entry/BL Main Drive	B
Belt Line Road at Gate 2 Entry	A
Belt Line Road at Lone Star Parkway	A

The results above show that traffic from WCP does not significantly impact traffic during an event at all three entertainment venues, which we consider to be our worst case scenario. The main reason is because event traffic will flow in the opposite direction from WCP traffic. Furthermore, entertainment events with the highest attendance figures typically occur on Saturday and Sunday, when traffic from WCP will be significantly lower than on a weekday.

Based on the proposed phasing of the development, it is recommended that the connection to Belt Line Road (opposite Gate 1 at the existing median opening) be constructed when Building 3 is constructed. If trip generation related to Buildings 1 and 2 should be initially higher than anticipated, it is possible that the additional connection to Belt Line could be needed before Building 3 is built.

Based on the analysis summarized above, the WCP development is not anticipated to significantly impact traffic during normal rush hour conditions, or during events in the entertainment district. The full report follows this executive summary.

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I. INTRODUCTION

Halff Associates, Inc. (Halff) conducted a Traffic Impact Analysis (TIA) for Crow Holdings, at the request of the City of Grand Prairie, related to the proposed Wildlife Commerce Park located in Grand Prairie, Texas. Phase I of the development is the focus of the following TIA report. Figure 1 below is a map detailing the site location and a copy of the site plan has been included in Appendix A.

Figure 1 - Area Map

The proposed development is located in the southwest quadrant of Wildlife Parkway and Belt Line Road. Phase I of the development is anticipated to consist of a mix of warehousing and light industrial uses. Development of Phase II will occur at a later time. It is recommended that a separate traffic study for Phase II be completed when that section is developed.

1.1 Existing Roadway Conditions and Site Access

The site is bordered on two sides by existing roadways. To the north is Wildlife Parkway, which is a two-lane asphalt roadway with shoulders and a rural cross-section (no curb). Along the eastern edge of the site is Belt Line Road, which is a 6-lane divided concrete roadway with curb and gutter. There is no formal existing access to the site with the exception of an existing access point across from Gate 1, which serves a former feed store. There is an existing northbound left-turn lane at this median opening on Belt Line Road with an approximately 430 foot car/truck queuing lane.

1.2 Future Roadway Conditions and Site Access

Belt Line Road is currently built to its ultimate condition, so no further improvements are anticipated. Wildlife Parkway is currently under design and will be built as a four lane divided road. Proposed access to the site will consist of eight driveways in total (see Figure 2 below).

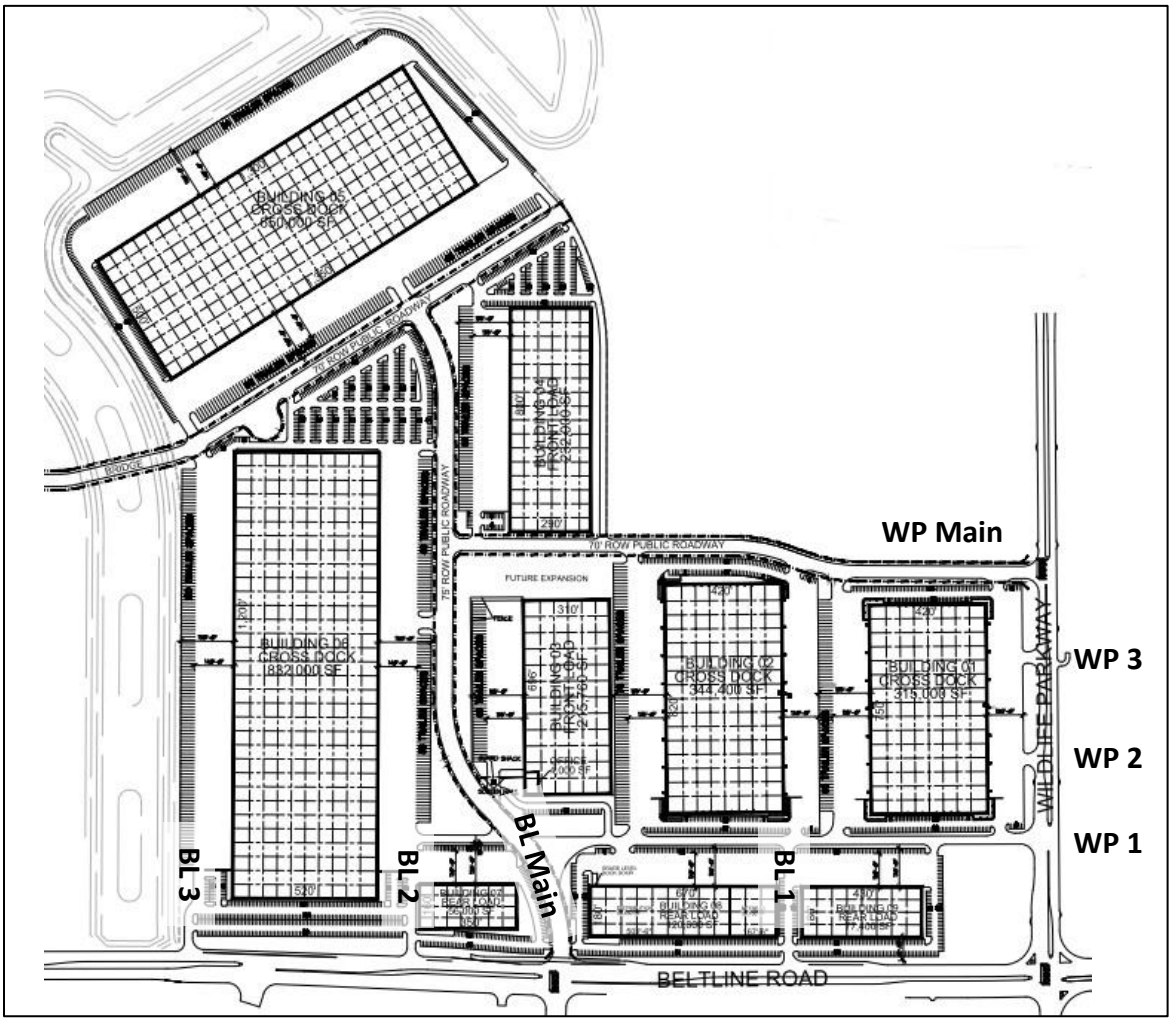

Figure 2 – Proposed Site Layout and Access

Four driveways will be located on Wildlife Parkway, two with full median openings (WP Main and WP 1) and two right-in/right-out driveways (WP 2 and WP 3). The median opening furthest to the west, which is shown as WP Main, is assumed to be the primary truck access point on Wildlife Parkway as it will eventually become a signalized intersection. The median opening furthest to the east (WP 1) will be primarily for employee access.

Of the four driveways on Belt Line Road, three will serve primarily as employee access (BL 1, BL 2, and BL 3) and will allow a right-in and right-out traffic movements only. The proposed main driveway, shown as BL Main, will serve trucks and employees. It is located opposite the Gate 1 entrance to Lone Star Park at an existing signalized median opening.

Note: Figure 2 represents Crow Holdings' current site plan for Phase I of the WCP. The site plan may change as market conditions dictate.

II. ANALYSIS

Halff used standard transportation engineering practices in conducting the TIA for the proposed Wildlife Commerce Park. The TIA examined the projected impacts of the development on the following intersections:

- Wildlife Parkway/Hunter-Ferrell Road at Belt Line Road
- Gate 1/Main Driveway at Belt Line Road
- Gate 2 at Belt Line Road
- Lone Star Parkway at Belt Line

Study scenarios include the following:

- Existing Conditions during the AM and PM commuter peak
- Background plus development during the AM and PM commuter peak
- Event peak hour with events at Lone Star Park, QuikTrip Park, and the Verizon Theater.

The selection of the study intersections and study scenarios was made based on consultation with City of Grand Prairie staff. The commuter peak hours were based on 24-hour count data and were determined to be 7:00 to 8:00 AM and 5:00 to 6:00 PM. For the event, the critical time period was determined to be between 5:30 and 6:30 PM. This event peak hour was determined by event start times and is the peak period when commuter and development traffic on the system are combined with a portion of event traffic on Belt Line Road.

2.1 Traffic Volumes

Directional 24-hour count data was collected at three locations on Belt Line Road as part of the study. The 24-hour data was collected over five days (Wednesday through Sunday) capturing non-event traffic flows (on Wednesday) as well as event traffic volumes. Copies of the traffic count data can be found in Appendix B. Turning movement count data at the study intersections listed above was provided by the City of Grand Prairie.

2.1.1 Existing Conditions

Given that the turning movement data provided by the City was a few years old, Halff was instructed by staff to compare the City provided traffic data to the current 24-hour counts. Based on our review, the turning movement count totals are generally within 5 to 10 percent of the 24-hour data and are therefore reflective of current conditions. Exhibits 2 and 3 in the Appendix C show the turning movement volumes for existing conditions during the AM and PM peak hours, respectively.

2.1.2 Critical PM Peak Hour for Event Scenario Analysis

As discussed above, Halff worked with City staff to determine a critical time period for analysis and review of event related traffic. Based on those conversations, it was determined that a PM peak hour on a Friday would represent a worst case scenario. This scenario assumes that there

are events at all three venues (Lone Star Park, QuikTrip Park, and Verizon Theater). In this scenario, traffic related to the three events was combined with the PM peak hour traffic volumes provided by the City and the traffic related to the proposed development at build-out. Calculation of the event related traffic volume is discussed in section 2.5 below.

2.2 Land Uses and Trip Generation

Trips for the proposed development were generated based on the *ITE Trip Generation Manual - Ninth Edition*. Table 1 below contains a summary of the trip generation for Phase I of the development at build-out.

Table 1 – Development Trip Generation Summary

Land Use (Comparable Use)	Square Footage	Estimated Employees Per Shift	Truck Trips	AM-peak			PM-peak			24-hour Weekday
				In	Out	Total	In	Out	Total	Total
Light Industrial (JMH Printing, Visionaire)	1,017,000	2,300	20%	823	112	935	118	868	986	7,088
Warehouse (Pollock Paper)	994,400	900	30%	235	63	298	80	238	318	3,540
High-Cube Warehouse (Restoration Hardware)	832,000	300	30%	63	29	92	31	69	100	1,398
Totals	**2,843,400**	**3,500**	26%	**1,121**	**204**	**1,325**	**229**	**1,175**	**1,404**	**12,026**

The above trip generation totals include both truck and vehicle trips related to development. The estimated percentage of truck trips for the 24-hour trip totals are shown in the table above for the different uses. At build-out of Phase I the daily truck trips average out to approximately 26 percent of the overall development trips. In the peak hours, the percentage of truck traffic (compared to overall development trips) is lower due to the increased arrival/departure rates of employees. However, given that employees can access all eight driveways and truck traffic is generally limited to the two main driveways, the percentage of trucks during the peak hours at the two main driveways was kept at 26 percent.

It is possible that there will be some limited retail use in Phase I of the development along the section adjacent to Belt Line Road, which would generally consist of retail/restaurant type uses that can support the warehouse/light industrial uses of the development and the surrounding area. If the retail uses are included, the size of the buildings adjacent to Belt Line Road would become smaller (approximately 1/3 in size compared to light industrial/warehousing uses) to be consistent with typical retail building design. Therefore, any inclusion of retail uses would cause the overall square footage of the development to go down and although retail has a higher trip generation rate compared to the other development uses, the net impact to the overall trip generation of the development would be negligible.

2.3 Site-Generated Traffic Distributions/Assignments

Trips related to the development were distributed on the roadway network with the majority of traffic using access points located on Belt Line Road. The proposed distribution of the trips related to the Wildlife Commerce Park was developed with input from City of Grand Prairie staff.

Traffic to and from the north on Belt Line Road represented 25 percent of the total development trips. There was 20 percent to and from the west on Wildlife Parkway and 5 percent to and from the east on Hunter-Ferrell Road. The remaining 50 percent of the development traffic was to and from the south on Belt Line Road. Trips were distributed at the development driveways based upon the location of buildings and parking areas. Exhibits 4 and 5 in Appendix C show the trips related to the development for the AM and PM peak hours, respectively.

2.4 Combined Weekday Traffic Volumes

Combined traffic for the weekday peak hours was generated by adding the distributed development trips with the background traffic volumes from the AM and PM peak hours. Exhibits 6 and 7 in Appendix C show the volumes for these scenarios.

2.5 Event Traffic Volumes

The first step in developing event traffic volumes was to determine the capacity of a particular venue, the average vehicle occupancy for the event, and the percentage of event traffic that will arrive in the analysis hour (in this case 5:30 to 6:30 PM). Table 2 summarizes these variables for the event operations.

Table 2 – Event Trip Generation Summary

Event/Venue	Capacity (Persons)	Vehicle Occupancy (prsn/veh)	Vehicles with sold out event	Event Start Time	Volume During Peak Hour (percent)	Event Volume (during peak)
Lone Star Park	8,000	2.6	3,075	6:35 PM	50%	1,538
QuikTrip Park	5,500	3.2	1,725	7:05 PM	24%	414
Verizon Theater	6,350	2.6	2,450	7:30 PM	25%	613
Event Totals	**19,850**	**n/a**	**7,250**	**n/a**	**n/a**	**2,565**

The table shows that during a Friday PM peak (between 5:30 and 6:30 PM) approximately 2,565 vehicles will arrive at the three events. It should be noted that based on current schedules, an evening with events at all three venues occurs only three times in 2014.

The event traffic was distributed by assuming 30 percent of the traffic is from the north on Belt Line Road and the remaining 70 percent is from the south on Belt Line Road. The volumes were distributed over the three event driveways serving the venues (Lone Star Parkway, Gate 1 entrance, and Gate 2 entrance).

Since the event peak is offset from the normal weekday, the non-event traffic volumes were calculated (based on 24-hour count data) to be 85% of the PM peak hour volumes. Therefore, background/development volumes were reduced by 15 percent in the event peak and then combined with the event trips. Exhibit 8 in Appendix C shows the volumes for the event peak.

III. RESULTS

All analyses of the study intersections and driveways were conducted using the Synchro 8 traffic analysis software package. Copies of the analysis reports can be found in Appendix D. Table 3 below details the LOS rankings for unsignalized intersections based on the information provided in the *Highway Capacity Manual* (HCM). Table 4 summarizes the LOS rankings for signalized intersections.

LOS rankings shown in the results section are based on the combined operation of all approaches of the intersection. At unsignalized intersections, such as driveways, where only one (or two) approaches are controlled by a stop or yield; the LOS ranking shown in the table is for the controlled approach only.

Table 3 – Level-of-Service Criteria for Unsignalized Intersections

LOS	Characteristics	Average Stopped Delay (sec / veh)
A	Completely free-flow conditions	≤ 10.0
B	Indicative of free-flow conditions, although the presence of other vehicles is noticeable	> 10.0 and ≤ 15.0
C	The influence of traffic density on operations becomes marked	> 15.0 and ≤ 25.0
D	The ability to maneuver is severely restricted due to congestion	> 25.0 and ≤ 35.0
E	Operations are at or near capacity and are unstable	> 35.0 and ≤ 50.0
F	Forced flow or breakdown characterized by queues	> 50.0

Table 4 – Level-of-Service Criteria for Signalized Intersections

LOS	Characteristics	Average Stopped Delay (sec/veh)
A	No delays at intersection with smooth progression of traffic. Uncongested operations; all vehicles clear in a single signal cycle.	≤10.0
B		>10.0 and ≤20.0
C	Moderate delays at intersections with satisfactory to good progression of traffic. Light congestion; occasional backups on critical approaches.	>20.0 and ≤35.0
D	40-percent probability of delays of one cycle or more at every intersection. No progression of traffic along the roadway with 90 percent probability of being stopped at every intersection experiencing "D" condition. Significant congestion on critical approaches, but intersections are functional. Vehicles are required to wait through more than one cycle during short peaks. No long standing lines formed.	>35.0 and ≤55.0
E	Heavy traffic flow condition. Delays of two or more cycles are probable. No progression. 100 percent probability of stopping at intersection. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.	>55.0 and ≤80.0
F	Unstable flow. Heavy congestion. Traffic moves in forced flow condition. Three or more cycles to pass through intersection. Total breakdown with stop-and-go operations.	>80.0

It should be noted that an LOS ranking of D during the peak hours is generally considered acceptable to TxDOT, but the City of Grand Prairie strives to maintain at LOS ranking of C.

3.1 Intersection Analysis Results

For the purpose of the study, signalized intersections were assumed to be fully actuated and coordinated with adjacent signalized intersections. The cycle length was set at 120 seconds and analysis software was allowed to optimize the green splits based on the traffic demand at the approaches. Traffic volumes at the two right-in right-out drives on Wildlife Parkway (WP 2 and WP 3) were projected to be very light, therefore, no analysis for the drives was completed.

Table 5 below summarizes the LOS ranking for the signalized study intersections for the AM and PM peak hours for both existing conditions and conditions when Phase I of the development is at build-out.

Table 5 – LOS Summary for Signalized Intersections

Intersection	Level of Service Rank			
	Existing Conditions		Phase I Build-Out	
	AM Peak	PM Peak	AM Peak	PM Peak
Belt Line Rd at Wildlife/Hunter-Ferrell Rd	A	B	B	B
Belt Line Road at Gate 1 Entry/BL Main Drive	A	A	A	B
Belt Line Road at Gate 2 Entry	A	A	A	A
Belt Line Road at Lone Star Parkway	A	A	A	A

The above table shows that the impact of the proposed development on normal weekday peak hour operations is minimal. The only change in LOS ranking occurs at Belt Line Road/Wildlife Parkway intersection, which goes from a LOS ranking of A to a ranking of B. \

Table 6 below summarizes the LOS ranking for the five unsignalized development driveways. The rankings shown are based on build-out of Phase I of the development and are for the stop controlled approaches only, not the overall intersection. The LOS rankings for the movements on Belt Line Road and Wildlife Parkway are an A, since those movements are free flow.

Table 6 – LOS Summary for Development Driveways at Phase I Build-Out

Intersection	Level of Service Rank	
	Phase I Build-Out	
	AM Peak	PM Peak
Wildlife Parkway at WP Main Drive	C	B
Wildlife Parkway at Drive WP1	B	B
Belt Line Road at Drive BL1	A	B
Belt Line Road at Drive BL2	A	B
Belt Line Road at Drive BL3	B	D

Based on the data shown in the previous table, the development driveways are anticipated to operate at an acceptable LOS ranking during the peak hours of operations.

The final table, Table 7, summarizes the LOS ranking at the study intersections and development driveways for the PM event peak hour. The signalized intersections listed in the table are shaded.

Table 7 – LOS Summary for Event Conditions

Intersection	Level of Service Rank
	Event Peak Hour
Belt Line Rd at Wildlife/Hunter-Ferrell Rd	C
Belt Line Road at Gate 1 Entry/BL Main Drive	B
Belt Line Road at Gate 2 Entry	A
Belt Line Road at Lone Star Parkway	A
Wildlife Parkway at WP Main Drive	B
Wildlife Parkway at Drive WP1	B
Belt Line Road at Drive BL1	B
Belt Line Road at Drive BL2	B
Belt Line Road at Drive BL3	C

Again, the presence of the development does not significantly impact operations during an event scenario. One of the main reasons why is because during an evening event, the peak direction of flow from the development is outbound and away from the events on the east side of Belt Line Road. Thus the development compliments the adjacent land use by having peak flows that move in the opposite direction to event traffic.

3.2 Belt Line Road Access

It was requested that the feasibility of eliminating access for trucks to and from Belt Line Road be examined. Under this scenario, the proposed main access to the development opposite Gate 1 Entry to Lone Star Park would be eliminated. All traffic from the south would be required to pass the development, make a left turn at Wildlife Parkway and enter one of the two driveways on Wildlife Parkway. It is also possible that traffic would make a U-turn at Wildlife Parkway and use one of the right-in only driveways. Allowing trucks to use the entrance from Belt Line Road reduces the overall conflict of trucks with vehicular traffic by keeping them out of the busy intersection at Wildlife Parkway.

The result of not allowing Belt Line Road access (for both vehicles and trucks) would be over 600 vehicles at the northbound left-turn at Belt Line Road and Wildlife Parkway in the AM peak and over 140 vehicles in the PM peak (including during events). In either case, the volumes of left-turn traffic results in excessive queue lengths and poor levels of service during the weekday AM peak hour and impacts the southbound through movement during the PM peak and event peak hours. Additionally, by routing all development traffic though the Belt Line Road and

Wildlife Parkway intersection, there is no spare capacity for future northbound left-turn growth that may occur with improvements to Wildlife Parkway and additional development to the west of Belt Line Road.

In summary, not allowing access to the development from Belt Line Road would result in impacts to the traffic flow on Belt Line Road and an increase in traffic congestion. Therefore, it is recommended that the main access point (BL Main) at Belt Line Road and Gate 1 be constructed. This results in a significant improvement to not only the northbound left-turn at Wildlife Parkway and Belt Line Road, but a general improvement to overall intersection operations as well.

Based on the proposed phasing of the development, it is recommended that the connection to Belt Line Road (opposite Gate 1 at the existing median opening) be constructed when Building 3 is constructed. If trip generation related to Buildings 1 and 2 should be initially higher than anticipated, it is possible that the additional connection to Belt Line could be needed before Building 3 is built.

The proposed driveway should connect the main driveway accessing Wildlife Parkway to the existing median opening at Belt Line Road across from Gate 1, forming a main loop around the three warehouse buildings. This would eliminate the long dead end drive from Wildlife Parkway, which is not desirable for large truck operations.

3.3 Turn Lane Evaluations

Deceleration lanes are used to separate traffic that is slowing to turn right (or left) from the through traffic traveling along a roadway. The need for deceleration lanes is based on several factors, such as, volume of turning traffic, volume of through traffic, volume of opposing traffic (i.e. traffic that prevents a permissive left turn), and the vehicle mix (i.e. trucks versus cars).

Right-Turn Deceleration Lanes

For right-turn deceleration lanes, it is generally recommended that a deceleration lane be considered if the number of right-turning vehicles on facilities with a posted speed limit less than or equal to 45 miles per hour exceeds 60 vehicles in any one hour period (TxDOT standard). Based on the proposed distribution of trips related to the development, none of the proposed driveways meet the 60 vehicle threshold in any given hour. Based on the volume threshold, both the main driveway on Wildlife Parkway (WP Main) and the main driveway on Belt Line Road (BL Main) have right-turn traffic volumes warranting consideration of right-turn deceleration lanes. Based on the proposed development layout and roadway system, it is Halff's recommendation that a southbound right-turn deceleration lane at the Main Driveway (BL Main) on Belt Line Road and an eastbound deceleration lane at the Main Driveway (WP Main) on Wildlife Parkway be constructed.

Left-Turn Deceleration Lanes

Left-turn deceleration lanes are already being proposed (or exist) at the major development driveways for truck access therefore, no additional recommendations are necessary. All of the provided left-turn deceleration lanes operate well during the peak hours and do not have significant queuing.

Table 8 below summarizes the left-turn deceleration lane operations during peak ingress (AM Peak). See the Synchro reports in Appendix D for full details.

Table 8 – Queue Length Summary for Left-Turn Lanes at Phase I Build-Out

Location	Length of Left-Turn Lane	LOS	Queue Length (ft)	
			Average	95th Percentile
NB LT - Belt Line Road at BL Main /Gate 1	430'	B	43'	232'
NB LT –Belt Line Road at Wildlife Parkway	415'	B	17'	43'
WB LT – Wildlife Parkway at WP 1 Drive	140'	A	<10'	<10'
WB LT – Wildlife Parkway at WP Main Drive	160'	A	<10'	16'

In the above table the location (and direction) of the each left-turn that carries development traffic is listed under the "Location" column. The next column lists the existing (or proposed) length of the left-turn lane. The column marked "LOS" gives the level of service for the left-turn operations during the peak ingress time, which is the weekday AM Peak.

The last two columns list the projected length of the vehicle queue based on the analyses reports from Synchro. The queue shown in the table is based on the combined car and truck traffic. As discussed above in Section 2.2, truck traffic is anticipated to be approximately 26% of the overall traffic at the main driveways. As a general rule, to determine the number of vehicles in the queue, divide the projected queue by 25 feet per vehicle. Thus a queue of 43 feet would be approximately two cars in length. If the table shows a queue length less than 10 feet, then it is anticipated that vehicles turning left at the given location will not typically be required to stop or wait when making a left turn.

The average queue represents the average length of queue during the peak hour of operation for combined car and truck traffic. The 95th percentile queue (again for combined car and truck traffic) is generally considered the maximum queue length that would be observed in the peak hour, but it will occur less frequently than the average queue. The 95th percentile queue length is generally compared to the available storage to determine if it is adequate. Thus, based on the information contained in the above table, the existing (or proposed) left-turn lane storage is anticipated to be adequate (in many cases double the necessary amount) to serve the projected traffic volumes (combined vehicle and truck) at build-out.

IV. SUMMARY

Based on the analysis discussed above, the proposed development will not significantly impact traffic operations at the study intersections during normal weekday AM and PM peak operations. Furthermore, the analysis shows that the development at build-out does not significantly impact event operations.

Based on the proposed site plan, left-turn deceleration lanes are being provided (either existing or proposed) at all access points where left-turn access is being permitted. All of the left-turn deceleration lanes serving the development operate with a good LOS ranking (C or better) during the peak ingress and do not have queue lengths that exceed the provided vehicle storage.

It is recommended that there be two main access points serving the development, one from Wildlife Parkway (shown as WP Main in Figure 2) and another from Belt Line Road (BL Main as proposed opposite of Gate 1). Is it further recommended that the main access drive from Belt Line Road (opposite Gate 1) be constructed when Building 3 of the development is brought online. If trip generation related to Buildings 1 and 2 is higher than initially anticipated, the main driveway connection from Belt Line Road should be considered before Building 3 is built.

The main driveway from Belt Line Road (BL Main) and main driveway from Wildlife Parkway (WP Main) should connect to each other, forming a main loop around Buildings 1, 2, and as shown on the attached site plan. This would eliminate a long dead end drive, which is not desirable for large truck operations.

It is recommended that a southbound right-turn deceleration lane on Belt Line Road at the main access driveway (BL Main) and an eastbound right-turn deceleration lane on Wildlife Parkway at the main access driveway (WP Main) be constructed to allow trucks to exit the flow of through traffic when turning into the development.

APPENDIX A

Site Plan

APPENDIX B

Traffic Count Data

APPENDIX C

Turning Movement Volume Exhibits

APPENDIX D

Analysis Output/Reports

APPENDIX E

North Central Texas Council of Governments
Capacity Estimates for Roadways

ROADWAY SERVICE VOLUME (CAPACITY) ESTIMATES

THOROUGHFARE CAPACITY SUMMARY

Roadway Type	Level of Service "C"		Level of Service "D"		Level of Service "E"	
	Daily Service Volume Range*	Hourly Service Volume Range per Lane**	Daily Service Volume Range*	Hourly Service Volume Range per Lane**	Daily Service Volume Range*	Hourly Service Volume Range per Lane**
8D-A***	41,000 – 47,000	620 – 700	47,000 – 52,000	700 – 775	52,000 – 58,000	775 – 875
6D-A***	31,000 – 35,000	620 – 700	35,000 – 39,000	700 – 775	39,000 – 44,000	775 – 875
4D-C***	21,000 – 23,000	620 – 700	23,000 – 26,000	700 – 775	26,000 – 39,000	775 – 875
4U-A†	17,000 – 18,000	500 – 550	18,000 – 21,000	550 – 625	21,000 – 23,000	625 – 675
4U-B‡	15,000 – 17,000	440 – 500	17,000 – 18,000	500 – 550	18,000 – 21,000	550 – 625
2U-C	6,000 – 8,000	350 – 400	8,000 – 9,000	400 – 450	9,000 – 10,000	450 – 500

* Level of Service with "K" = 0.10 and "D" = 60/40
** Assumes signal progression; no parking; some access management; and increased intersection capacity
*** Assumes 12-foot lanes and divided roadway
† 4-lane undivided with 12-foot lanes
‡ 4-lane undivided with 11-foot lanes

HOURLY SERVICE VOLUME PER LANE (Divided or One-Way Roads)

Area Type	Functional Class							
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road	HOV Lane
CBD	2,050	575	575	475	475	1,250	575	1,800
Fringe	2,125	625	625	500	500	1,375	625	1,800
Urban Residential	2,150	675	650	525	525	1,425	650	1,800
Suburban Residential	2,225	750	725	575	575	1,600	725	1,800
Rural	2,300	825	775	600	600	1,725	775	1,800

HOURLY SERVICE VOLUME PER LANE (Undivided Roads)

Area Type	Functional Class							
	Freeway	Principal Arterial	Minor Arterial	Collector	Local	Ramp	Frontage Road	HOV Lane
CBD	N/A	525	525	425	425	1,250	525	N/A
Fringe	N/A	575	575	450	450	1,375	575	N/A
Urban Residential	N/A	625	600	475	475	1,425	600	N/A
Suburban Residential	N/A	700	650	525	525	1,600	650	N/A
Rural	N/A	750	700	550	550	1,725	700	N/A

Source: NCTCOG