TRAFFIC IMPACT ANALYSIS

FOR

HACIENDA CAR WASH

IN

ROCKWALL, TEXAS

Prepared for:

HACIENDA CAR WASH

Prepared By:

G.T. (Tom) Walton, P.E. Consulting Traffic Engineer

FEBRUARY 2019

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Executive Summary

Hacienda Car Wash is planning to build a new facility in the City of Rockwall Texas. The project is along the east side of Ridge Rd, FM 740, between the Yellow Jacket Ln intersection and the White Hills Ln. intersection. The development will have one drive.

In order to obtain approval of the plans for the new development by the City of Rockwall, a Traffic Impact Analysis (TIA) must be completed. This TIA investigates the traffic operations on the roadway and intersections near the site.

Traffic counts were conducted on Ridge Rd and at the intersections of Ridge at Yellow Jacket Ln and Ridge at White Hills Ln.. Existing conditions were analyzed to determine the level of congestion on the roadway and the intersections. Due to the fact that the development is expected to take 1 year to develop, the traffic volumes for the year 2020 were calculated.

Trip generation calculations were completed for the proposed development to determine the amount of traffic increase the development will create. The increase in traffic was applied to the roadway, the drive and the intersections and the resulting traffic congestion situation analyzed.

The Traffic Impact Analysis investigations produced the following results:

- Ridge Rd.FM740 and all of the movements at the drive serving the Hacienda Car Wash and the two intersections at buildout of the project were found to operate at "stable flow" LOS C conditions or better.
- Comparison of projected northbound right turning movements at the driveway with the TxDOT thresholds for roadways like Ridge Rd indicates that the expected volumes are well below the threshold levels to indicate the need for separate right turn lanes. Therefore no new separate right turn lane is needed.

INTRODUCTION

Hacienda Car Wash is the owner of the HACIENDA CAR WASH in the City of Rockwall Texas. The entire project is along the east side of Ridge Rd, FM 740 between the Yellow Jacket Ln intersection and the White Hills Dr intersection. FM 740 is a TxDOT roadway. The plan for the development contains 2.008 acres of land and a 4396 sq ft car wash. The City staff has required that a Traffic Impact Analysis (TIA) be completed as part of the submittal of plans for the HACIENDA CAR WASH. G.T. (Tom) Walton, P.E. Consulting Traffic Engineer has been hired to conduct the needed study.

PURPOSE

The following study will evaluate the traffic situation on the existing roadway and the intersection of the car wash driveway and the intersections of Yellow Jacket Ln and White Hills Ln with Ridge Rd. It will impose the traffic created by the proposed development on the existing roadway and intersections to determine the effect the new traffic will have on the operation of the existing roadway and if any roadway improvements are needed to accommodate the traffic additions. Any problems identified will be addressed and mitigation steps recommended.

SCOPE

All access to the new Hacienda Car Wash will be from and to Ridge Rd. One 36 ft wide two way drive will be built to provide access and will be located opposite a median opening for a one way left turn lane for southbound traffic. Development will contain commercial zoning with a 4396 sq ft car wash. The location of the site is shown in FIGURE I.

The analysis will include the study of existing conditions on Ridge Rd adjacent to the development The build out of the entire project will occur in 2020. The traffic volumes on Ridge Rd. FM 740 and at the intersections of Ridge at Yellow Jacket and White Hills at Ridge will be counted. Existing conditions on Ridge Rd and at the intersections will be analyzed. The amount of new traffic to be created by the car wash will be calculated. The traffic volume conditions will be grown to those expected in 2020 and the new trips created by the development will be added to the 2020 traffic and the conditions at completion analyzed. This analysis will include PM Peak conditions. The analysis will be done for the PM peak hour generation rates during the peak traffic hour on the roadway.

METHODOLOGY

The methodology for the study will include the following steps;

- definition of the roadways and intersections under consideration,
- counting of the existing traffic volumes on the subject roadway and intersections,

- the analysis of existing traffic conditions on the subject roadway and intersections,
- the generation of traffic from the proposed development,
- the distribution of site traffic to the roadway
- growth of the roadway and intersection traffic to the 2020 conditions
- the analysis of build out traffic conditions, including site traffic
- comparison of turning traffic at the intersections with the TxDOT turn lane criteria
- the identification of any problems caused by the new development and
- the recommendation of mitigation efforts to deal with identified problems.



FIGURE I

AREA ROADWAYS AND INTERSECTIONS

Ridge Rd.FM740 is a four lane divided concrete north-south roadway with a wide median and a 45 MPH speed limit. A one way left turn lane is provided at the location of the new driveway.

The new driveway will have two 18ft wide lanes, one inbound and one outbound lane.

At the intersection of Ridge Rd and Yellow Jacket Ln there are two thru lanes in each direction on Ridge Rd. There are two separate left turn lanes for south bound to east bound traffic. There is a separate right turn lane for northbound traffic. There are three lanes westbound on Yellow Jacket approaching the intersection, a separate right turn lane, a separate left turn lane and a center lane that is optional either right or left turn.

The intersection of Ridge Rd at White Hills Dr has one left turn lane and one right turn lane westbound. There are two through lanes and one separate left turn lane northbound and two through lanes and a separate left turn lane southbound.

EXISTING TRAFFIC VOLUMES

The existing traffic volumes on Ridge Rd FM 740 were measured by making two directional 24 hour machine counts on Ridge Rd midway between the Yellow Jacket intersection and the White Hills Ln intersection. AM and PM Peak Hour manual counts were done at the Ridge at Yellow Jacket intersection and at the Ridge at White Hills intersection. The details of the traffic counts are given in Appendix A.

EXISTING TRAFFIC CONDITIONS

The quality and safety of the operation of traffic is measured by quantifying the level of congestion that drivers are experiencing. The term that is used to describe traffic conditions is Level of Service (LOS). In Traffic Engineering analysis, LOS on a section of roadway is calculated by comparing the volume of traffic measured on the road to the capacity of the roadway. LOS is described by alphabetic designations. LOS ranges from A to F. The various levels are as follows:

- Volume/Capacity ratio is <= 0.25 is LOS "A" or "B"
- Volume/Capacity ratio is 0.25<x,<=0.40 is LOS "C"
- Volume/Capacity ratio is 0.40<x,<=0.75 is LOS "D"
- Volume/Capacity ratio is 0.75<x,<=1.0 is LOS "E"
- Volume/Capacity Ratio is > 1.0 is LOS "F"

LOS A or B are referred to as "Free" flow conditions, LOS C is "Stable" flow, LOS D is "Forced" flow, LOS E is "Capacity" flow and LOS F is "Failure" conditions.

The existing traffic volume count information was used with the HCS + software which uses the Highway Capacity Manual methodology to analyze the operation of roadway links and intersections. A two way link analysis was conducted on the existing Ridge Rd FM 740 for both the AM and PM Peak Hour conditions. A signalized intersection analysis was also done at each of the intersections.

The results of the analyses of existing conditions are as follows:

• The roadway link analysis

	LOS					
Link	North B	South B				
Ridge Rd south of Yellow Jacket AM	А	A				
Ridge Rd south of Yellow Jacket PM	В	A				

• Signalized intersection analysis

	1	Approach	n LOS	
Intersection	East b	West b	North b	South b
Ridge at White Hills AM		C	В	В
Ridge at White Hills PM		C	В	В
Ridge at Yellow Jacket AM		C	С	В
Ridge at Yellow Jacket PM		C	С	В

The details of the existing conditions analyses are given in Appendix B.

SITE TRAFFIC GENERATION

The amount of traffic that a development will generate can be calculated for an average day or for the peak traffic periods of a day. The number of vehicle trips generated or trip generation will be used to project the effect that the new development will have on the serving roadways. The amount of traffic generated during both the AM and PM Peak Hour will be considered.

Trip generation information is found in <u>Trip Generation</u> published by the Institute of Transportation Engineers. This is a standard reference to determine the trip generation characteristics of particular land use types and densities. Rates are established for specific land use types including residential, office, commercial, industrial and institutional. Trip generation rates are given for a number of development measurement units and at various times of day and days of the week. The percentage of the generated traffic that enters and leaves the site is also indicated. For residential development the dwelling unit (DU) is the measurement unit while 1,000 square feet of gross floor area is used for office, commercial, industrial and retail uses.

As was noted above, Hacienda Car Wash will contain 4396 sq ft of Car Wash space. The Trip Generation category that best describes the development is Automated Car Wash. There is little activity at such a facility therefore no information is available for the AM Peak condition. The PM Peak Hour rate is 14.12 trips per 1000 sq ft with 50% entering and 50 % exiting the site. A copy of the page from <u>Trip Generation</u> is given in Appendix C.

The total traffic to be expected from the development during the PM Peak Hour is as follows:

Site	Peak Hour	Rate	Size	Trips	Enter	Exit	
Hacienda	PM	14.12/K	4396	62	31	31	

TRAFFIC DISTRIBUTION

The distribution of traffic moving to and from a proposed development is based upon the type of development and the distribution of attractors around the site. All of the traffic entering and leaving The Hacienda Car Wash will use Ridge Rd FM 740. This fact will be used to assign the projected traffic for the link analysis and intersection analysis on Ridge Rd.

Based upon information provided by the City of Rockwall staff and the owner of the development, 50% of the site traffic will go to and from the north and 50% to and from the south. Due to the existence of the southbound left turn lane the entering traffic will be 50% from the north and 50% from the south. 100% of the exiting traffic will turn right to go north.

The distribution of the site traffic to the proposed drive and the percentages at the drive is shown in FIGURE II





Applying the distribution percentages in Figures II with the trip generation information for the peak period yields turning movement volumes shown in FIGURE III



FIGURE III

FUTURE BUILDOUT TRAFFIC CONDITIONS

Analysis of future conditions created by the new development will involve the addition of the site generated traffic to the traffic existing on the roadways at the time of build-out of the development. Due to the fact that it is expected to take one year to build out, the existing traffic on the roadways will be grown by an agreed upon growth rate for the area. Discussion with the City's Planning staff produced an expected growth rate of 4% per year. Therefore, the background traffic volumes on Ridge Rd and at the intersections in 2020 at the completion of the development will be 4% higher than at present.

The effect of the development on the operation of Ridge Rd is determined by adding the traffic from the development to the Ridge Rd traffic grown to 2020 conditions and analyzing the result. The results of the analysis are as follows.

	LO	S
Link	North B	South B
Ridge Rd south of Yellow Jacket AM	А	В
Ridge Rd south of Yellow Jacket PM	A	A

The operation of the drive onto Ridge Rd from Hacienda Car Wash was analyzed by using the turning movement volumes given in Figure III and the Ridge Rd volumes grown to 2020 conditions. The results of the analysis are as follows.

Unsignlized intersection analysis;

	Approach LOS							
Intersection	North B	South B	West B					
Hacienda at Ridge Rd PM	В	В	В					

The operation of the two signalized intersections under buildout conditions was analyzed by growing the intersection volumes to 2020 conditions and adding the Hacienda traffic during the PM peak. The results of these analyses are as follows:

	A			
Intersection	East b	West b	North b	South b
Ridge at Yellow Jacket AM		C	С	В
Ridge at Yellow Jacket PM		C	С	В
Ridge at White Hills AM		C	В	В
Ridge at White Hills PM		C	В	C

The details of the link analysis, the driveway analysis and the signalized intersection analysis for buildout conditions are given in Appendix D.

TXDOT ACCESS MANAGEMENT CRITERIA

The Texas Department of Transportation (TxDOT) Access Management Manual provides criteria concerning the need to provide a separate right turn lane when building a driveway or street intersection with a TxDOT roadway. The thresholds for the need for these lanes is given in Table 2-3 of the Access Management Manual. The thresholds depend upon the volume of right turning traffic and the speed of the roadway.

For a roadway with a speed of 45 MPH or more the threshold for the need for a right turn lane is over 50 vehicles per hour during the peak hour.

CONCLUSIONS

The analyses above indicate that the approaches to the new driveway for the Hacienda Car Wash will operate at a Level Of Service "B". Analysis of the link and the two existing signalized intersections on Ridge Rd indicates that all movements will operate at LOS C or better. This includes with the addition of the increase in traffic caused by the proposed Hacienda Car Wash. No congestion problems were indicated on any approach.

The driveway traffic movement volume information projected indicates that the northbound right turn movements into the new drive are a maximum of 16 vehicles per hour which is well below the threshold volume of 50 vehicles per hour used to justify the addition of separate right turn lanes in the TxDOT Access Management Manual. Therefore no separate right turn lane construction is indicated.

RECOMMENDATIONS

No improvements are needed to the geometry of the driveway for Hacienda Car Wash beyond those included in the plan for the development.

APPENDIX A

Traffic Counts

Accurate Counts Traffic Data Services SPEED SUMMARY TUE 01/29/2019

Page: 1

TIME	10	15	20	25	30	35	40	45	50	55	60	65 	70	71+	Total
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Accurate Counts Traffic Data Services SPEED SUMMARY TUE 01/29/2019

Page: 2

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Accurate Counts Traffic Data Collection Services (214) 681-6468

Location:Ridge @ White Hills Weather:Cool Counted By:DS

File Name : Ridge at White Hills Site Code : 00022222 Start Date : 1/31/2019 Page No : 1

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Volume 100 905 0 0 1005 60 1 138 0 199 5 1213 100 0 100 0.0 100 0.0 100 0.0 100 0.0 100 0.0 100 0.0 100 0.0 100 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0						
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Accurate Counts Traffic Data Collection Services (214) 681-6468

Location:Ridge @ Yellow Jacket Weather:Cool Counted By:PI

File Name : Ridge at Yellow Jacket 2019 Site Code : 00000000 Start Date : 1/31/2019 Page No : 1

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17:30	26	20	4	0	õ	245	32	0	39	0	71	0	263	/8		1278	0	0	0	0	0	2737
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High Int. 08:15 Volume 171 220 0 163 100 0.861 0.867 0.822 i Peak Factor Peak Hour From 12:00 to 17:45 - Peak 1 of 1 Intersection 16:45 Volume 100 978 0 0 Percent 9.3 90.7 0.0 0.0 0.0 0.0 0 0 0.0 0.0 0 1098 323 0 0.0 77.3 22.7 0.0
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 170
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 58.6
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Percent 17:30 Volume Peak Factor 26 260 0.964 16:45 0 303 17:15 34 0.925 eak Factor High Int. 17:30 Volume 26 260 0.843 0 52 0.942

Peak Factor

APPENDIX B

Current Traffic Conditions

Phone: E-mail: Fax:

	OPERATION	AL ANALYSIS			
Analyst: Agency/Co: Date: Analysis Period: Highway: From/To: Jurisdiction: Analysis Year: Project ID:	Tom Walton City of Rockwall 2/2/2019 AM Peak HOur Ridge Rd FM740 Yellowjacket to Whi TxDOT 2019 Hacienda Car Wash H	ite Hills Ridge Exist:	ing AM		
	FREE	-FLOW SPEED			
Lane width	Direction	1 12.0	ft	2 12.0	ft
Lateral clearanc Right edge Left edge Total later Access points pe	ce: ral clearance er mile	6.0 6.0 12.0 0	ft ft ft	6.0 6.0 12.0 0	ft ft ft
Median type Free-flow speed FFS or BFF3 Lane width adju Lateral clearan Median type adj Access points a Free-flow speed	: S stment, FLW ce adjustment, FLC ustment, FM djustment, FA	Measured 60.0 0.0 0.0 0.0 0.0 60.0	mph mph mph mph mph mph	Measured 60.0 0.0 0.0 0.0 0.0 0.0 60.0	mph mph mph mph mph mph
		VOLUME			
Volume, V Peak-hour facto	Direction pr, PHF volume, v15	1 752 0.90 209	vph	2 791 0.90 220	vph
Trucks and buse Recreational ve Terrain type Grade	ehicles	0 0 Level 0.00 0.00	% % mi	0 0 Level 0.00 0.00	e 8 mi
Segment ler Number of lanes Driver populati Trucks and buse Recreational ve Heavy vehicle a Flow rate, vp	igen s ion adjustment, fP es PCE, ET ehicles PCE, ER adjustment, fHV	1.00 1.5 1.2 1.000 417	pcphpl	2 1.00 1.5 1.2 1.000 439	pcphpl
		RESULTS			

Direction	1	- h 7	2	ncnhnl
Flow rate, vp Free-flow speed, FFS	41/ 60.0 60.0	mph mph	439 60.0 60.0	mph mph
Level of service, LOS Density, D	A 6.9	pc/mi/ln	A 7.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: E-mail: Fax:

OPERATIONAL ANALYSIS_ Tom Walton Analyst: City of Rockwall Agency/Co: 2/2/2019 Date: Analysis Period: PM Peak HOur Ridge Rd FM740 Highway: Yellowjacket to White Hills From/To: Jurisdiction: TXDOT 2019 Analysis Year: Hacienda Car Wash Ridge Existing PM Project ID: FREE-FLOW SPEED_ 2 1 Direction ft 12.0 ft 12.0 Lane width Lateral clearance: ft 6.0 6.0 ft Right edge ft 6.0 ft 6.0 Left edge ft 12.0 ft Total lateral clearance 12.0 0 Access points per mile 0 Median type Measured Measured Free-flow speed: mph 60.0 mph 60.0 FFS or BFFS 0.0 mph 0.0 mph Lane width adjustment, FLW 0.0 r.ph mph Lateral clearance adjustment, FLC 0.0 mph 0.0 0.0 mph Median type adjustment, FM 0.0 mph mph Access points adjustment, FA Free-flow speed 0.0 60.0 mph 60.0 mph VOLUME 2 Direction 973 vph 1283 vph Volume, V 0.90 0.90 Peak-hour factor, PHF 270 Peak 15-minute volume, v15 356 0 20 0 olo Trucks and buses 90 0 0 00 Recreational vehicles Level Level Terrain type 0.00 8 0.00 2 Grade 0.00 mi mi Segment length 0.00 Number of lanes 1.00 Driver population adjustment, fP 1.00 1.5 1.5 Trucks and buses PCE, ET 1.2 1.2 Recreational vehicles PCE, ER 1.000 1.000 Heavy vehicle adjustment, fHV pcphpl 540 712 pcphpl Flow rate, vp RESULTS

Direction	1		2	ncnhnl
Flow rate, vp Free-flow speed, FFS	/12 60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0 A	mph
Level of service, LOS Density, D	Б 11.9	pc/mi/ln	9.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Signalized Intersections Release 5.3 Inter.: Ridge Rd at Yellow Jacket Ln Analyst: Tom Walton Area Type: All other areas Agency: City of Rockwall Date: 2/2/2019 Jurisd: TxDOT Year : 2019 Period: AM Peak Hour Project ID: Hacienda Car Wash Existing AM N/S St: E/W St: Yellow Jacket Ln _SIGNALIZED INTERSECTION SUMMARY | Southbound | L T R Westbound L T R | Northbound Eastbound | L T R L T R 0 2 1 2 0 2 0 1 1 2 1 2 2 LT R L T 603 309 1435 850 12.0 12.0 12.0 12.0 0 1 0 No. Lanes | L _ LTR R |80 0 99 LGConfig Volume 12.0 12.0 12.0 Lane Width 0 RTOR Vol Area Type: All other areas 0.25 Duration _____Signal Operations 8 5 6 2 3 4 Phase Combination 1 Ρ NB Left EB Left Thru Ρ Thru Р Right Right Peds Peds Ρ Ρ SB Left Ρ WB Left P Ρ Thru Ρ Thru Ρ Right Ρ Ρ Right Peds Peds EB Right NB Right | WB Right SB Right 20.0 35.0 30.0 Green 4.0 4.0 Yellow 4.0 1.0 1.0 1.0 All Red Cycle Length: 100.0 secs Intersection Performance Summary_ Approach Ratios Lane Group Adj Sat Lane Appr/ Flow Rate Group Lane v/c g/C Delay LOS Delay LOS (s) Capacity Grp Eastbound Westbound 26.4 С 542 0.16 0.30 1805 L С 26.9 C 0.30 24.5 1900 0.00 570 LTR С 27.4 0.23 0.30 1615 485 R Northbound 0.35 LT31.6 С 0.35 0.61 1615 565 R Southbound 12.5 В 0.60 3505 0.46 1061 L В 11.8 0.43 0.60 11.5 В 3618 2171 Т (sec/veh) Intersection LOS = Intersection Delay =

HCS+: Signalized Intersections Release 5.3 Inter.: Ridge Rd at Yellow Jacket Ln Analyst: Tom Walton Area Type: All other areas Agency: City of Rockwall Date: 2/2/2019 Jurisd: TxDOT Year : 2019 Period: PM Peak Hour Project ID: Hacienda Car Wash Existing PM N/S St: Ridge Rd E/W⁻St: Yellow Jacket Ln _SIGNALIZED INTERSECTION SUMMARY Northbourd L T R Southbound | Westbound Eastbound LTR L T R IL T R 2 0 1 2 0 2 2 1 1 2 1 LT R L T 1098 323 1100 978 12.0 12.0 12.0 12.0 0 0 0 | 1 1 1 | | L LTR R | |120 0 170 | No. Lanes LGConfig Volume 12.0 12.0 12.0 Lane Width 0 RTOR Vol Area Type: All other areas 0.25 Duration _____Signal Operations_ _____3 4 | 8 5 6 2 Phase Combination 1 Ρ NB Left EB Left Thru Ρ Thru Ρ Right Right Peds Peds Ρ Ρ SB Left Ρ WB Left Ρ Ρ Thru Ρ Thru Ρ Right Ρ Р Right Peds Peds EB Right NB Right WB Right SB Right 20.0 35.0 30.0 Green 4.0 4.0 4.0 Yellow 1.0 1.0 1.0 Cycle Length: 100.0 secs All Red Intersection Performance Summary_ Approach Ratios Lane Group Adj Sat Lane Appr/ Flow Rate Group Lane g/C Delay LOS Delay LOS v/c (s) Capacity Grp Eastbound Westbound 27.5 C 24.5 C 30.1 C 0.30 1805 0.25 L 542 29.0 C 0.00 0.30 1900 570 LTR 30.1 0.30 0.39 485 1615 R Northbound 0.35 LT С 32.5 0.64 0.35 1615 565 R Southbound В 14.9 0.08 0.60 1419 3505 L 12.5 В 0.50 0.60 12.3 В 3618 2171 Τ (sec/veh) Intersection LOS = Intersection Delay =

HCS+: Signalized Intersections Release 5.3 Inter.: Ridge Rd at White Hills Ln Area Type: All other areas Analyst: Agency: City of Rockwall Jurisd: TxDOT Date: 2/2/2019 Year : 2019 Period: AM Peak Hour Project ID: Hacienda Car Wash Existing AM E/W St: White Hills Ln N/ N/S St: Ridge Rd SIGNALIZED INTERSECTION SUMMARY Southbound Northbound | Westbound Eastbound | L T R) L T R R L Т R Т L 2 0 0 1 2 0 1 1 0 0 LT R | L TR 0 96 | 3 780 148 No. Lanes . L T 1 L 1 120 745 LGConfig 124 Volume 112.0 12.0 12.0 12.0 12.0 12.0 Lane Width Ο 0 RTOR VOL Area Type: All other areas 0.25 _____Signal Operations______3 4 1 Duration 8 6 7 5 2 Phase Combination 1 Left Ρ NB EB Left Thru р Thru Ρ Right Right Peds Peds Ρ SB Left Ρ WB Left Thru Ρ Ρ Thru Ρ Right Ρ Right Peds Peds EB Right NB Right WB Right SB Right 55.0 25.0 Green 4.0 4.0 Yellow 1.0 1.0 All Red Cycle Length: 90.0 secs Intersection Performance Summary Approach Lane Group Ratios Adj Sat Appr/ Lane Flow Rate Group Lane Delay LOS g/C Delay LOS (s) v/c Capacity Grp Eastbound Westbound 25.9 С 24.0 C 0.05 0.28 503 1810 LТ Ĉ 26.4 0.28 0.24 1615 449 R Northbound 0.61 6.9 А 574 0.01 351 Ť. 10.4 В 10.4 В 0.48 0.61 3531 2158 TR Southbound 0.61 16.6 В 264 432 0.50 L 10.3 9.3 А B 0.61 0.37 3618 T 2211 Intersection Delay = 11.3 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.3 Inter.: Ridge Rd at White Hills Ln Analyst: Tom Walton Area Type: All other areas Agency: City of Rockwall Date: 2/2/2019 Jurisd: TxDOT Year : 2019 Period: PM Peak Hour Project ID: Hacienda Car Wash Existing PM N/S St: Ridge Rd E/W St: White Hills Ln SIGNALIZED INTERSECTION SUMMARY | Northbound | L T R Southbound | Westbound | L T R Eastbound | L T R R L T R 2 0 1 2 1 0 0 Т TR i L No. Lanes LT R L TR 0 139 |3 1215 180 1100 905 LGConfig 60 Volume 112.0 12.0 12.0 12.0 12.0 12.0 Lane Width 0 0 RTOR Vol Area Type: All other areas 0.25 Duration 7 8 6 4 3 Phase Combination 1 Ρ NB Left EB Left Ρ Thru Thru Ρ Right Right Peds Peds Ρ SB Left Ρ WB Left Ρ Thru Ρ Thru Right Ρ Right Ρ Peds Peds EB Right NB Right WB Right SB Right 55.0 25.0 Green 4.0 4.0 Yellow 1.0 All Red 1.0 Cycle Length: 90.0 secs Intersection Performance Summary_ Approach Lane Group Adj Sat Ratios Appr/ Lane Flow Rate Group Lane Delay LOS Delay LOS g/C v/c (s) Capacity Grp Eastbound Westbound 24.9 C 27.1 C 0.28 0.13 1810 503 LTС 28.0 0.28 0.34 1615 449 R Northbound 6.9 А 0.61 0.01 448 274 T. 14.1 В 14.1 В 0.71 0.61 3548 2168 ΠR Southbound 0.61 108.7 F 178 1.02 109 L В 19.9 B 10.1 0.45 0.61 2211 3618 Т Intersection Delay = 17.3 (sec/veh) Intersection LOS = B

APPENDIX C

Trip Generation Sheets

Land Use: 948 Automated Car Wash

Independent Variables with One Observation

The following trip generation data are for independent variables with only one observation. This information is shown in this table only; there are no related plots for these data.

Users are cautioned to use data with care because of the small sample size.

	Trip	Size of	Number	
	Generation	Independent	of	
Independent Variable	Rate	<u>Variable</u>	<u>Studies</u>	Directional Distribution

1,000 Square Feet Gross Floor Area

Weekday P.M. Peak Hour of Adjacent Street Traffic	14.12	2	1	50% entering, 50% exiting
Saturday Peak Hour of Generator	14.12	2	1	50% entering, 50% exiting

Wash Stalls

Saturday Peak Hour of	41	1	1	46% entering, 54% exiting
Generator				, - , - , - , - , - , - , - , - , - , -

Trip Generation, 9th Edition • Institute of Transportation Engineers 2015

APPENDIX D

Buildout Analysis

Phone: E-mail:

Fax:

OPER#	ATIONAL ANALY	YSIS		
Analyst:Tom WaltonAgency/Co:City of RockwalDate:2/2/2019Analysis Period:AM Peak HOurHighway:Ridge Rd FM740From/To:Yellowjacket toJurisdiction:TxDOTAnalysis Year:2020Project ID:Hacienda Car Wa	l White Hills sh Ridge Bui	ldout AM		
E	REE-FLOW SPE	ED		
Direction	1			
Lane width	12.0	f+	12 0	E.L.
Lateral clearance:	11.0	± C	12.0	IC
Right edge	6.0	ft	6.0	f+
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft.
Access points per mile	0		0	
Median type				
Free-Ilow speed:	Measure	d	Measure	ed
I S OF BEES	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Modian tura adjustment, FL	C 0.0	mph	0.0	mph
Access points adjustment, FM	0.0	mph	0.0	mph
Free-flow speed	0.0	mph	0.0	mph
rice from speed	60.0	mph	60.0	mph
	VOLUME			
Direction	7		0	
Volume, V	782	unh	200	
Peak-hour factor, PHF	0 90	vpn	023	vpn
Peak 15-minute volume, v15	217		220	
Trucks and buses	0	P.	0	0
Recreational vehicles	Ő	olicio di constructivo di cons	0	0 Q
Terrain type	Level	0	Level	0
Grade	0.00	00	0.00	<u>ş</u>
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	111.11
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	1.000		1.000	
Flow rate, vp	434	pcphpl	457	pcphpl
	RESULTS			

Direction Flow rate, vp Free-flow speed, FFS Avg. passenger-car travel speed, S Level of service, LOS Density, D	1 434 60.0 60.0 A	pcphpl mph mph	2 457 60.C 60.0 A	pcphpl mph mph
	1.2	pc/mi/ln	7.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: E-mail:

Fax:

OPERA	FIONAL ANAL	YSIS		
Analyst:Tom WaltonAgency/Co:City of RockwallDate:2/2/2019Analysis Period:PM Peak HOurHighway:Ridge Rd FM740From/To:Yellowjacket toJurisdiction:TxDOTAnalysis Year:2020Project ID:Hacienda Car Was	l White Hill: sh Ridge Bu:	s ildout PM		
FR	EE-FLOW SPE	ED		
Direction Lane width Lateral clearance:	1 12.0	ft	2 12.0	ft
Right edge Left edge Total lateral clearance Access points per mile Median type	6.0 6.0 12.0 0	ft ft ft	6.0 6.0 12.0 0	ft ft ft
Free-flow speed: FFS or BFFS Lane width adjustment, FLW Lateral clearance adjustment, FLC Median type adjustment, FM Access points adjustment, FA Free-flow speed	Measure 60.0 0.0 0.0 0.0 0.0 60.0	d mph mph mph mph mph mph	Measure 60.0 0.0 0.0 0.0 0.0 60.0	d mph mph mph mph mph mph
	VOLUME			
Direction Volume, V Peak-hour factor, PHF Peak 15-minute volume, v15	1 1381 0.90 384	vph	2 1043 0.90 290	vph
Trucks and buses Recreational vehicles Terrain type Grade Segment length Number of lanes Driver population adjustment, fP	0 0 Level 0.00 0.00 2 1.00	% % mi	0 0 Level 0.00 0.00 2 1.00	% % mi
Trucks and buses PCE, ET Recreational vehicles PCE, ER Heavy vehicle adjustment, fHV Flow rate, vp	1.5 1.2 1.000 767 BESULTS	pcphpl	1.5 1.2 1.000 579	pcphpl

Direc Flow rate, vp Free-flow speed, FFS Avg. passenger-car trave Level of service, LOS Density, D	tion 1 speed, S	1 767 60.0 60.0 B	pcphpl mph mph	2 579 60.0 60.0 A	pcphpl mph mph
4.7		12.0	pc/mi/ln	9.6	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY Analyst: Tom Waltom Agency/Co.: City of Rockwall Date Performed: 2/2/2019 Analysis Time Period: PM Peak Hour Intersection: Ridge Rd at Hacienda drive Jurisdiction: TxDOT Units: U. S. Customary Analysis Year: 2021 Project ID: Hacienda Car Wash Buildout PM East/West Street: Hacienda Drive East/West Street: Hacienda Drive North/South Street: Ridge Rd FM 740 Intersection Orientation: NS Study period (hrs): 0.25 Vehicle Volumes and Adjustments_ Majcr Street: Approach Northbound Southbound Movement 1 2 3 4 5 6 L Т R Т | L R Volume 1334 16 15 1012 Peak-Hour Factor, PHF 1.00 1.00 1.00 1.00 Hourly Flow Rate, HFR 1334 16 15 1012 Percent Heavy Vehicles --------0 ----Median Type/Storage Raised curb / 1 RT Channelized? Lanes 2 0 2 1 Configuration Т ΤR Т L Upstream Signal? No No Minor Street: Approach Westbound Eastbound 7 Movement 8 9 10 1 11 12 Т L L R Т R Volume 31 Peak Hour Factor, PHF 1.00 Hourly Flow Rate, HFR 31 Percent Heavy Vehicles 0 Percent Grade (%) 0 0 Flared Approach: Exists?/Storage Lanes 1 Configuration R Delay, Queue Length, and Level of Service Approach NB SB Westbound Eastbound 7 Movement 1 4 8 9 10 12 11 Lane Config L R I. v (vph) 15 31 C(m) (vph) 516 457 v/c 0.03 0.07 95% queue length 0.09 0.22 Control Delay 12.2 13.4 LOS В В Approach Delay 13.4 Approach LOS В

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Analyst: Tom Walton	Inter.: Ridge Rd at Yellow Jacket
Agency: City of Rockwall	Area Type: All other areas
Date: 2/2/2019	Jurisd: TxDOT
Period: AM Peak Hour	Year : 2020
Project ID: Hacienda Car Wash Buildou:	: AM
E/W St: Yellow Jacket In	N/S St: Ridge Rd

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Northbo LT R	ound 1266 565	3618	0.55	0.35	27.9	С	29.4	С		
Northbo LT R Southbo	ound 1266 565	3618 1615	0.55 0.63	0.35 0.35	27.9 32.4	C C	29.4	С		
Northbo LT R Southbo	ound 1266 565 ound	3618 1615 2505	0.55 0.63	0.35 0.35	27.9 32.4	C C	29.4	С		
Northbo LT R Southbo L	ound 1266 565 ound 1071	3618 1615 3505	0.55 0.63 0.47	0.35 0.35 0.60	27.9 32.4 12.8	C C B	29.4	С		
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Northbo LT R Southbo L I	ound 1266 565 ound 1071 2171 Interse	3618 1615 3505 3618 ction Dela	0.55 0.63 0.47 0.45 7 = 19.9	0.35 0.35 0.60 0.60 (sec/veł	27.9 32.4 12.8 11.7	C C B B nterse	29.4 12.1 ection	C B LOS =	= B	

Analyst: Tom Walton Inter.: Ridge Rd at Yellow Jacket Ln Agency: City of Rockwall Date: 2/2/2019 Area Type: All other areas Jurisd: TxDOT Period: PM Peak Hour Year : 2020 Project ID: Hacienda Car Wash Buildout PM E/W St: Yellow Jacket Ln N/S St: Ridge Rd _SIGNALIZED INTERSECTION SUMMARY Eastbound Westbound Northbound Southbound L T R L T R 0 1 1 1 1 0 | L LTR R | |125 0 177 | 0 No. Lanes 0 2 1 LT R 0 2 2 LT R L T 1158 336 |104 1017 LGConfig Volume Lane Width |12.0 12.0 12.0 | 12.0 12.0 |12.0 12.0 RTOR Vol 1 0 0 Duration 0.25 Area Type: All other areas _____Signal Operations Phase Combination 1 2 3 4 5 6 8 EB Left NB Left. Ρ Thra Thru Ρ Right Right Ρ Peds Peds WB Left Ρ SB Left Ρ Ρ Thru Ρ Thru Ρ Ρ Right Ρ Right P Ρ Peds Peds NB Right EB Right SB Right WB Right Green 30.0 15.0 50.0 Yellow 4.0 4.0 4.0 1.0 1.0 All Red 1.0 Cycle Length: 110.0 secs _Intersection Performance Summary_ Appr/ Lane Adj Sat Ratios Lane Group Approach Lane Group Flow Rate (s) v/c g/C Grp Capacity Delay LOS Delay LOS Eastbound Westbound L 492 1805 0.28 0.27 33.0 С LTR 518 1900 0.00 0.27 29.1 С 35.0- C R 440 1615 0.45 0.27 36.4 D Northbound LΤ 1645 3618 0.78 0.45 29.2 С 28.0 C R 734 1615 0.51 0.45 23.8 С Southbound 1056 L T 3505 0.11 0.64 13.9 В 2302 3618 0.49 0.64 11.3 в 11.6 В Intersection Delay = 22.4 (sec/veh) Intersection LOS = C

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Inter.: Ridge Rd at White Hills Ln Agency: City of Rockwall Date: 2/2/2019 Area Type: All other areas Jurisd: TxDOT Period: AM Peak Hour Year : 2020 Project ID: Hacienda Car Wash Buildout AM E/W St: White Hills Ln N/S St: Ridge Rd _SIGNALIZED INTERSECTION SUMMARY Eastbound Westbound | Northbound | L T R Southbound 1 L T R IL TR L T R 0 1 1 1 2 0 LT R L TR 0 100 3 811 154 No. Lanes 0 0 0 0 1 2 LGConfig I L T Volume 125 125 775 Lane Width 12.0 12.0 |12.0 12.0 112.0 12.0 RTOR Vol 0 Ω 1 1 Duration 0.25 Area Type: All other areas _____Signal Operations Phase Combination 1 2 3 4 5 6 7 8 EB Left NB Left Ρ Thru Thru Ρ Right Right Ρ Peds Peds WB Left Ρ SB Left Ρ Thru Ρ Thru P Right Ρ Right P Peds Peds NB Right EB Right SB Right WB Right Green 25.0 55.0 Yellow 4.0 4.0 All Red 1.0 1.0 Cycle Length: 90.0 secs _Intersection Performance Summary_ Appr/ Adj Sat Ratios Lane Group Lane Approach Lane Group Flow Rate (s) Grp Capacity v/c g/C Delay LOS Delay LOS Eastbound Westbound 503 C C LT 1810 0.06 0.28 24.1 26.0 C R 449 1615 0.25 0.28 26.5 Northbound 335 0.01 549 0.61 6.9 А ΤR 2158 3531 0.50 0.61 10.6 В 10.6 В Southbound 249 L 407 0.56 0.61 19.1 B T 2211 3618 0.39 0.61 9.4 А 10.8 В Intersection Delay = 11.6 (sec/veh) Intersection LOS = B

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Analyst:

Applust, m -								
Analyst: Tom U Agency: City o Date: 2/2/20 Period: PM Pea Project ID: Ha E/W St: White	Walton of Rockwall D19 ak Hour acienda Car W	Jash Buil	In Ar Ju Ye ldout PM	ter.: Ridge ea Type: All risd: TxDOT ar : 2020	Rd at l other	White . areas	Hills	Ln
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Peds NB Right SB Right			(EB WB	Peds Right Right				
Peds NB Right SB Right Green Yellow	25.0		i EB WB	Peds Right Right 55.0				
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Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit	25.0 4.0 1.0 Interse Adj Sat Flow Rate Sy (s)	ection Pe Rati v/c	i EB WB erformance los 	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS	le Leng Appr Delay	yth: 90 Toach Y LOS	. 0	secs
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Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit Eastbound Nestbound	25.0 4.0 1.0 Adj Sat Flow Rate y (s)	ection Pe Rati v/c	(EB WB erformance los g/C	Peds Right Right 55.0 4.0 Cycl e Summary Lane Group Delay LOS	le Leng Appr Delay	th: 90 roach LOS	. 0	Secs
Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit Eastbound Nestbound .T 503 449	25.0 4.0 1.0 Adj Sat Flow Rate Ty (s) 1810 1615	0.14 0.36	(EB WB erformance los g/C 0.28 0.28	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS	le Leng Appr Delay 27.3	rth: 90 Toach LOS C	. 0	Secs
Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit Eastbound Jestbound Jestbound Jorthbound	25.0 4.0 1.0 Interse Adj Sat Flow Rate Cy (s) 1810 1615	0.14 0.14	(EB WB erformance los g/C 0.28 0.28 0.28	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS 25.0 C 28.3 C	le Leng Appr Delay 27.3	rth: 90 Toach LOS C	. 0	Secs
Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit Eastbound Vestbound .T 503 1 449 Jorthbound , 252 'R 2168	25.0 4.0 1.0 Maj Sat Flow Rate Cy (s) 1810 1615 413 3548	0.14 0.01 0.75	(EB WB erformance los g/C 0.28 0.28 0.61 0.61	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS 25.0 28.3 C 6.9 A 15 1 P	Le Leng Appr Delay 27.3	rb: 90 Toach LOS C	. 0	Secs
Peds NB Right SB Right Green Yellow All Red Appr/ Lane Lane Group Grp Capacit Eastbound Vestbound .T 503 449 Jorthbound , 252 'R 2168	25.0 4.0 1.0 Adj Sat Flow Rate Cy (s) 1810 1615 413 3548	0.14 0.01 0.75	(EB WB erformance los <u>g/C</u> 0.28 0.28 0.61 0.61	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS 25.0 28.3 C 6.9 A 15.1 B	Le Leng Appr Delay 27.3 15.0	th: 90 Toach LOS C B	. 0	Secs
Peds NB Right SB Right SB Right Green Yellow All Red Appr/ Lane Group Grp Capacit Eastbound Vestbound JT 503 449 Jorthbound , 252 'R 2168 outhbound	25.0 4.0 1.0 Maj Sat Flow Rate Cy (s) 1810 1615 413 3548	0.14 0.14 0.75	(EB WB erformance los g/C 0.28 0.28 0.61 0.61	Peds Right Right 55.0 4.0 1.0 Cycl e Summary Lane Group Delay LOS 25.0 28.3 C 6.9 A 15.1 B	Le Leng Appr Delay 27.3 15.0	th: 90 oach LOS C B	. 0	Secs
Peds NB Right SB Right SB Right Green Yellow All Red Appr/ Lane Group Grp Capacit Eastbound Vestbound JT 503 4 449 Jorthbound , 252 'R 2168 outhbound 91 2211	25.0 4.0 1.0 Maj Sat Flow Rate Cy (s) 1810 1615 413 3548	0.14 0.14 0.75 1.27	(EB WB erformance los g/C 0.28 0.28 0.28 0.61 0.61 0.61	Peds Right Right 55.0 4.0 1.0 Cycl e Summary_ Lane Group Delay LOS 25.0 28.3 C 6.9 A 15.1 B 202.5 F	Le Leng Appr Delay 27.3 15.0	th: 90 oach LOS C B	. 0	Secs
Peds NB Right SB Right Green Yellow All Red Appr/ Lane Group Grp Capacit Eastbound Vestbound JT 503 A 449 Jorthbound , 252 'R 2168 outhbound 91 2211	25.0 4.0 1.0 Interse Adj Sat Flow Rate Cy (s) 1810 1615 413 3548 149 3618	0.14 0.14 0.75 1.27 0.48	(EB WB erformance los g/C 0.28 0.28 0.61 0.61 0.61 0.61	Peds Right Right 55.0 4.0 1.0 Cycl e Summary_ Lane Group Delay LOS 25.0 28.3 C 6.9 15.1 B 202.5 F 10.4 B	Le Leng Appr Delay 27.3 15.0 29.3	rth: 90 roach LOS C B C	. 0	Secs

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