July 20, 2026 CITY COUNCIL WORKSHOP AND MEETING AGENDA

THE STATE OF TEXAS §
COUNTY OF BRAZORIA §
CITY OF MANVEL §

KEITH BONNER, COUNCIL PLACE 1
DAVID LANDS, COUNCIL PLACE 2
HARRY OPLIGER, COUNCIL PLACE 3
CARMYN ROBEY-ROBINSON, COUNCIL PLACE 4
JASON ALBERT, COUNCIL PLACE 5
GARRETT ROSSI KNOX, COUNCIL PLACE 6

DAN DAVIS, MAYOR
DAN JOHNSON, CITY MANAGER
TAMMY BELL, CITY SECRETARY

NOTICE OF A CITY COUNCIL MEETING OF THE CITY OF MANVEL
July 20, 2026

NOTICE IS HEREBY GIVEN
5:00 P.M. WORKSHOP – 6:00 P.M. REGULAR SESSION

Taxpayer Impact Statement
This statement shows the estimated annual property tax bill for a **median-valued homestead in Manvel** ($359,719), comparing the **previous FY tax rate**, the **no-new-revenue rate**, and the **adopted tax rate for FY 2025-2026**.

Tax Rate Scenario	Tax Rate per $100 Valuation	Estimated Annual Tax Bill	Difference from Previous FY
FY 2024-25	$0.560000	**$2,014.43**	—
No-New-Revenue Rate	$0.539339	**$1,940.10**	-$74.33
Adopted Rate FY 2025-26 – $0.56	$0.560000	**$2,014.43**	No change

Adopted Budget
A physical copy is available at City Hall and online at https://cityofmanvel.news/AdoptedBudgetFY25-26

QR to Budget

Pursuant to Chapter 551, Title 5 of the Texas Government Code, the Texas Open Meetings Act, notice is hereby given that the Manvel City Council will convene a regular meeting at the Manvel City Hall, located at **20031 Hwy 6, Manvel Tx 77578** for the purpose of discussing and if appropriate, take action with respect to the following items:

NOTE: The City Council of the City of Manvel reserves the right to discuss any items in Closed Session whenever authorized under the Texas Open Meetings Act, Chapter 551, of the Texas Government Code. The City Council may discuss the items on this agenda in any order.

This facility is wheelchair accessible, and accessible parking spaces are available. Requests for accommodation or interpreter services must be made 48 hours prior to the meeting. Please contact the City Secretary at 281-489-0630 x6 for further information.

CITY OF MANVEL MISSION STATEMENT

The City of Manvel is a safe and responsible community, embracing the values of our past, present, and future citizens.

Workshop Session

Update by Brazoria County Mosquito Control District on mosquito activity.

Budget Presentation — Personnel, Finance, and City Manager/Administration.

Discussion on any topic as listed on the current agenda.

Regular Session

Call To Order

Invocation

Inspirational Reading - Councilmember Rossi-Knox

Pledge

Pledge of Allegiance and Texas Pledge: "Honor the Texas flag; I pledge allegiance to thee Texas, one state under God, one and indivisible.

Presentations

Jonathan Garcia - 5 Year Work Anniversary.

Staff Presentation on Public Hearing Item(s)

Public Hearing

TO HEAR INPUT FROM THE PUBLIC REGARDING AN ORDINANCE OF THE CITY OF MANVEL, TEXAS, AMENDING THE ZONING CLASSIFICATION OF AN APPROXIMATE 1.683-ACRE TRACT OF LAND BEING RESERVE "B" OF BLUEWATER RETAIL CENTER MINOR PLAT, AS RECORDED IN BRAZORIA COUNTY CLERK'S FILE (B.C.C.F.) NUMBER 2025010899 (PID: 710337); CURRENTLY, DEVELOPED AS A RETAIL CENTER WITH ASSOCIATED PARKING (SHOPS AT BLUEWATER), LOCATED AT 18909 MORRIS AVENUE/HIGHWAY 6, MANVEL, TEXAS, FROM LIGHT COMMERCIAL DISTRICT / STATE HIGHWAY 6 OVERLAY DISTRICT (LC/SH6) TO LIGHT COMMERCIAL DISTRICT/ STATE HIGHWAY 6 OVERLAY DISTRICT WITH SPECIFIC USE PERMIT (LC/SH6-SUP); PROVIDING FOR THE GRANTING OF A SPECIFIC USE PERMIT WITH CONDITIONS TO AUTHORIZE THE USE OF PROPERTY FOR NAICS USE 812113 "NAIL SALONS" WITHIN THE LEASE SPACE "SUITE 300;" PROVIDING FOR THE AMENDMENT OF THE CITY'S OFFICIAL ZONING MAP; PROVIDING FOR SEVERABILITY; AND PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000 FOR EACH DAY OF VIOLATION OF ANY PROVISION HEREOF.

Public Comments: "Comment Card" Required

o Members of the public with business before the board, NOT scheduled on the agenda as a public hearing (that have submitted a public comment card) may have three (3) minutes to address the board. o The board may not participate in any discussion and cannot vote on the subject you present unless it is listed on the agenda as an action item.

City Manager Update

Update on current events and city issues.

Consent Agenda

1. Acceptance of the meeting minutes to date.

2. Consideration and possible action to approve Resolution 2026-R-39;
   RESOLUTION OF THE CITY OF MANVEL, TEXAS, GIVING CONSENT TO THE SALE AND ISSUANCE OF BONDS BY BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57 OF BRAZORIA COUNTY.

3. Consideration and possible action to approve the second and final reading of Ordinance 2026-O-20;
   AN ORDINANCE AMENDING THE CODE OF ORDINANCES OF THE CITY OF MANVEL, TEXAS, CHAPTER 41. "TRAFFIC AND MOTOR VEHICLES," BY ADOPTING A NEW *ARTICLE III. ELECTRIC BICYCLES, MOPEDS, AND SCOOTERS,* ADOPTING REGULATIONS PERTAINING TO ELECTRIC BICYCLES, MOPEDS, AND SCOOTERS; PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000.00 FOR ANY VIOLATION OF ANY PROVISION OF THIS ORDINANCE; REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HEREWITH; AND PROVIDING FOR SEVERABILITY. (First reading passed 7/0 on 7/6/2026).

Items Removed from Consent Agenda

Regular Agenda

1. Consideration and possible action to provide direction to staff regarding the Presidio project and its request to allow the use of pumped detention.

2. Consideration and possible action to approve the second and final reading of Ordinance 2026-O-16;
   AN ORDINANCE AMENDING THE ZONING ORDINANCE (2007-O-26) OF THE CITY, BY CHANGING THE ZONING CLASSIFICATION OF A CERTAIN TRACT OF LAND CONSTITUTING APPROXIMATELY 394.232 ACRES FROM OPEN PLANNED USE DEVELOPMENT (O-PUD) DISTRICT TO PLANNED USE DEVELOPMENT (PUD) DISTRICT, SUCH TRACT IMMEDIATELY LOCATED ON THE EAST OF S.H. 288, EXTENDS ACROSS BOTH NORTH AND SOUTH SIDES OF S.H. 6, SOUTH OF DEL BELLO LAKES DEVELOPMENT, WEST OF IOWA LANE AND VALENCIA DEVELOPMENT, AND GENERALLY WITHIN THE BOUNDARIES OF BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 30. (First reading passed 5/0 on 6/15/26).

3. Consideration and possible action to approve the first of two readings of Ordinance 2026-O-17;
   AN ORDINANCE AMENDING THE ZONING CLASSIFICATION OF AN APPROXIMATE 1.683-ACRE TRACT OF LAND BEING RESERVE "B" OF BLUEWATER RETAIL CENTER MINOR PLAT, AS RECORDED IN BRAZORIA COUNTY CLERK'S FILE (B.C.C.F.) NUMBER 2025010899 (PID: 710337); CURRENTLY, DEVELOPED AS A RETAIL CENTER WITH ASSOCIATED PARKING (SHOPS AT BLUEWATER), LOCATED AT 18909 MORRIS AVENUE/HIGHWAY 6, MANVEL, TEXAS, FROM LIGHT COMMERCIAL DISTRICT / STATE HIGHWAY 6 OVERLAY DISTRICT (LC/SH6) TO LIGHT COMMERCIAL DISTRICT/ STATE HIGHWAY 6 OVERLAY DISTRICT WITH SPECIFIC USE PERMIT (LC/SH6-SUP); PROVIDING FOR THE GRANTING OF A SPECIFIC USE PERMIT WITH CONDITIONS TO AUTHORIZE THE USE OF PROPERTY FOR NAICS USE 812113 "NAIL SALONS" WITHIN THE LEASE SPACE SUITE 300.

4. Consideration and possible action to award Project No. FY 2026-03, Traffic Signal at Croix Road and Rodeo Drive, to Traffic Systems Construction, Inc. in the amount of $295,295.00, and authorize the City Manager to execute the agreement.

5. Consideration and possible action on nominations to the Texas Municipal League Intergovernmental Risk Pool Board of Trustees, Place 1, Place 2, Place 3, and Place 4. (Postponed on 7/6/2026).

6. Consideration and possible action to direct staff on amending the Tree Preservation Ordinance.

Mayor and Council Comments

Update on current events and city issues.
Additionally, pursuant to Texas Government Code § 551.0415, City Council Members and city staff may make a report about items of community interest during a meeting of the governing body without having given notice of the report.
Items of community interest include:

- Expressions of thanks, congratulations, or condolence;
- Information regarding holiday schedules;
- An honorary or salutary recognition of a public official, public employee, or other citizen, except that a discussion regarding a change in the status of a person's public office or public employment is not an honorary or salutary recognition for purposes of this subdivision;
- A reminder about an upcoming event organized or sponsored by the governing body;
- Information regarding a social, ceremonial, or community event organized or sponsored by an entity other than the governing body that was attended or is scheduled to be attended by a member of the governing body or an official or employee of the municipality; and
- Announcements involving an imminent threat to the public health and safety of people in the municipality that has arisen after the posting of the agenda.

Adjourn

CERTIFICATION

I, Tammy Bell, City Secretary for the City of Manvel, do hereby certify that the foregoing Agenda of the Manvel City Council is true and correct and that I posted such notice on the bulletin board at the Manvel City Hall; a place convenient and readily accessible to the public on July 14, 2026 in accordance with the Texas Open Meetings Act (Tex. Gov't. Code §551.001 et.seq). Said notice remained posted for at least 3 business days preceding the scheduled day of the meeting.

TAMMY BELL, CITY SECRETARY
CITY OF MANVEL, TEXAS

BRAZORIA COUNTY

MOSQUITO CONTROL

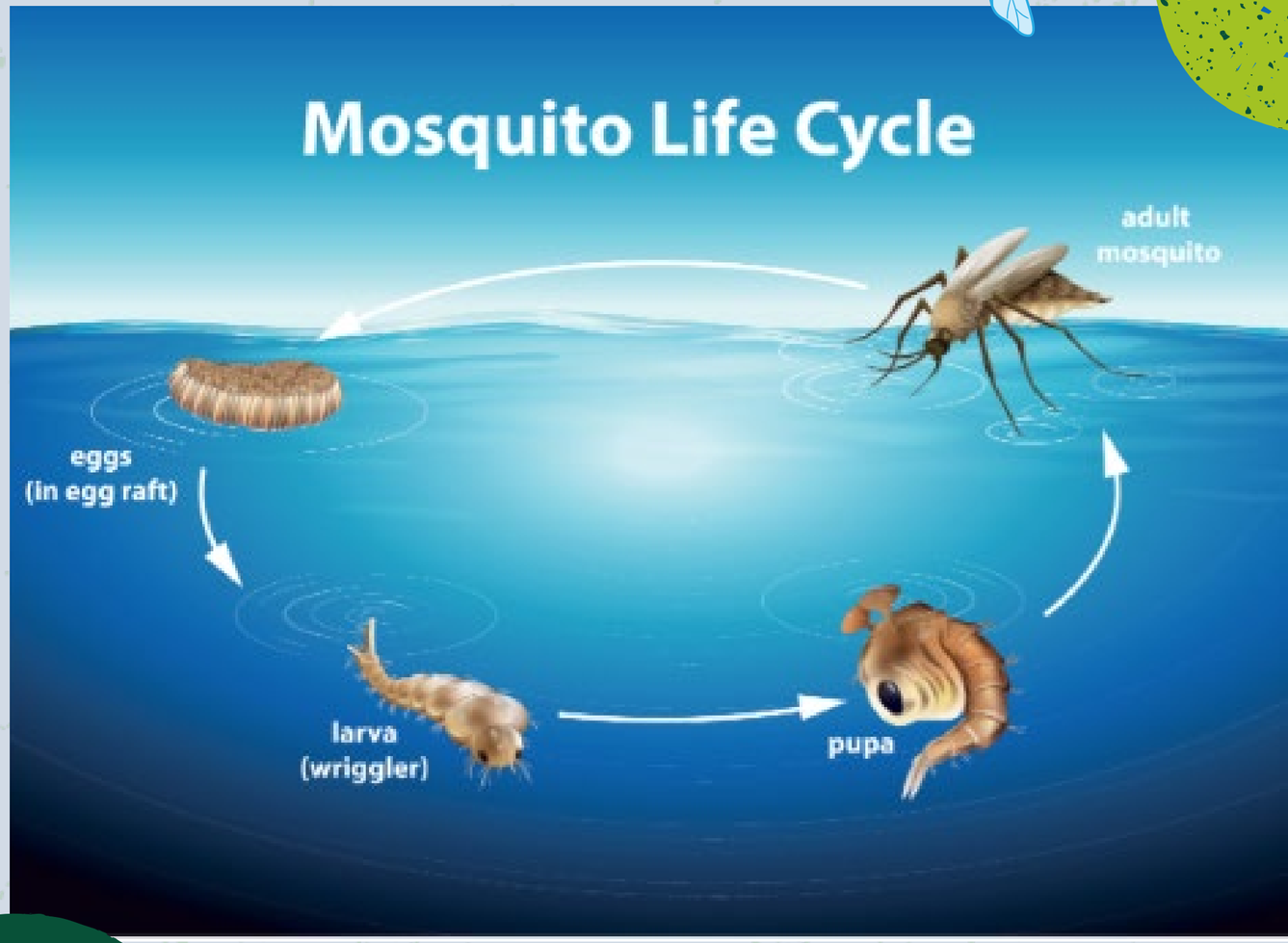
DISTRICT



Mosquito Facts



- More than 3,500 species worldwide, 175 species in the United States, 88 species in Texas and 46 in Brazoria County
- Mosquitoes are the deadliest animal, mosquito borne illnesses affect over 700M people a year and cause 1M deaths
- Only female mosquitoes bite, not all species bite
- Typical lifespan of a mosquito is about 2 weeks, depending on the species, temperature and environment. Females lay eggs every 3 days during their adult lifespan.















BRAZORIA COUNTY MOSQUITO CONTROL DISTRICT'S HISTORY

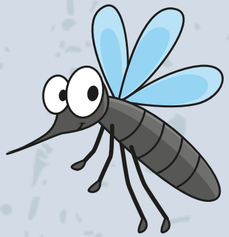
- Established in 1955 by Commissioner's Court
- Began ground applications by truck
- Operated an aircraft from 1958 - 2016

Mission Statement:

The Brazoria County Mosquito Control District protects the health and well -being of county residents through surveillance, education, and with control measures to prevent and control both pest mosquitoes and mosquito -borne diseases.

BCMCD TODAY

Staff of 18



1- Director
1- Operations Manager
1- Mechanic
1- Supervisor
1- Admin Assistant
3 - Surveyors
9 - Pesticide Applicators
1- Part Time Applicator





- Licensed through Texas Department of Agriculture, with required yearly CEU's
- Active members of Texas Mosquito Control Association

- 16 tucks with spray units and monitors
- 3 marsh trucks
- 2 trucks with dual driver set up
- Contract aerial spraying with local business



Brazoria County Mosquito Control District
Chemical Berm

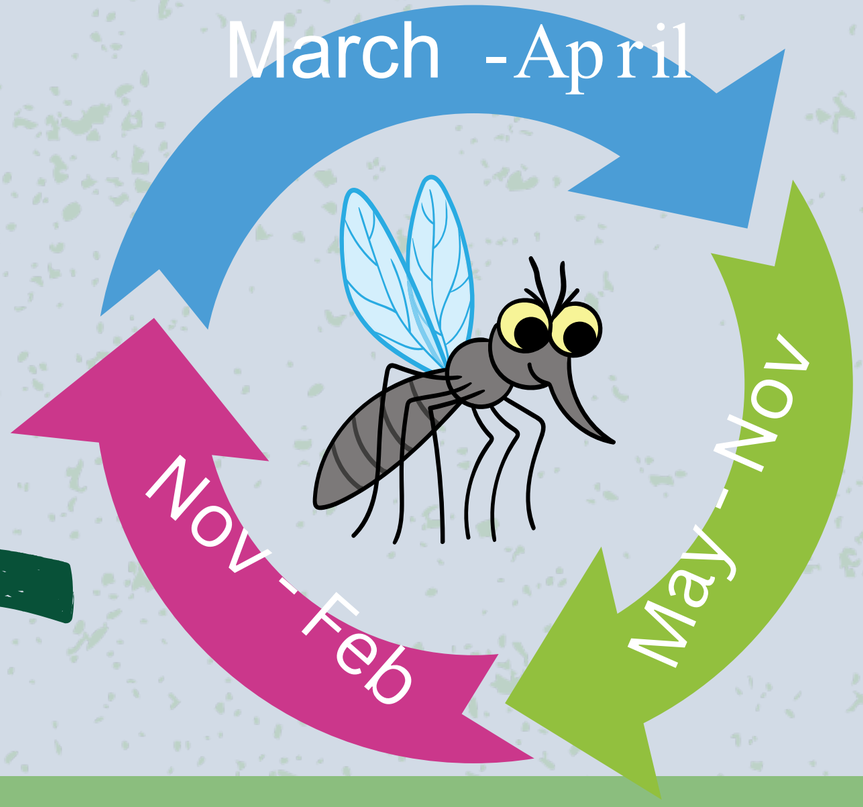


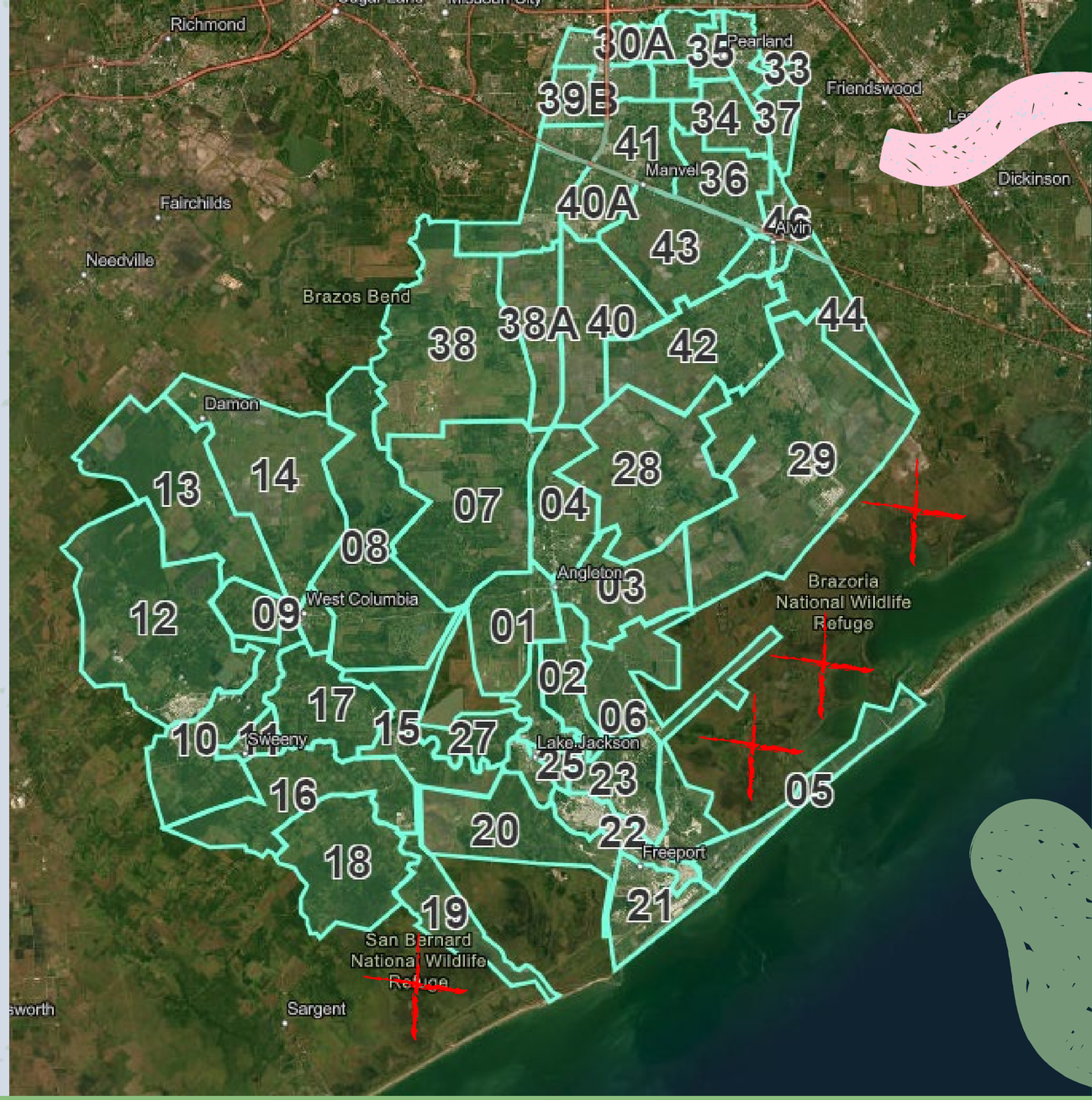
OPERATIONS

Surveillance, Traps & Testing for Arbovirus Disease

Larviciding, Adulticiding & Spray Request

Winter Maintenance





Winter Maintenance







- Build and maintain our ULV spray units in house
- Maintenance & body work of our fleet
- Grounds Upkeep
- Inventory
- Plan for next season

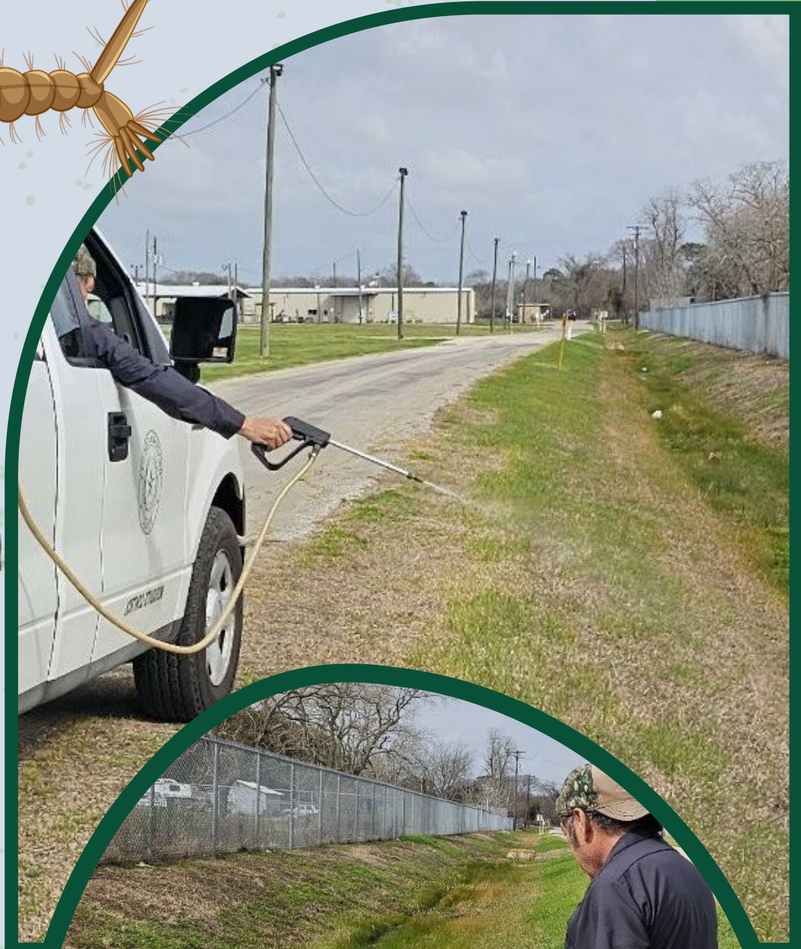
Our facility includes:

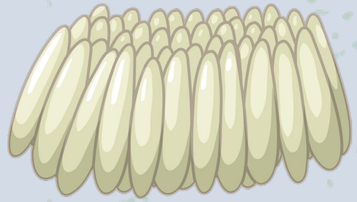
- Auto shop
- Small engine shop
- Welding shop
- Paint booths
- Chemical buildings
- Chemical berm
- Truck sheds
- Office
- UST fuel tank/station

LARAVCIDING

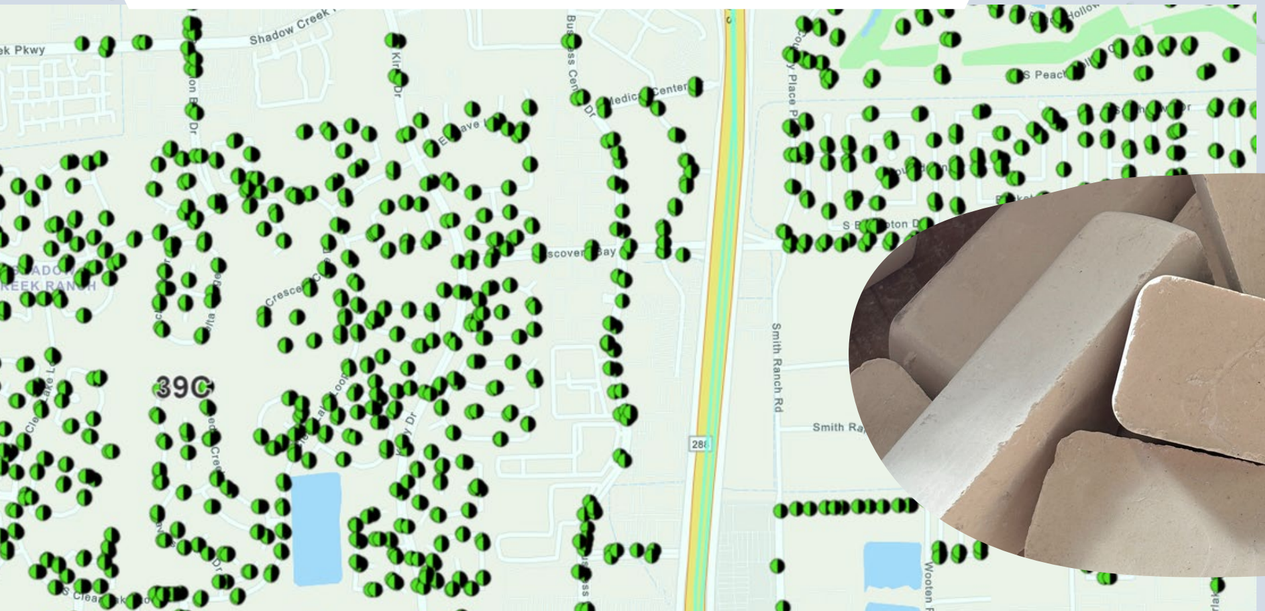














SURVEILLANCE

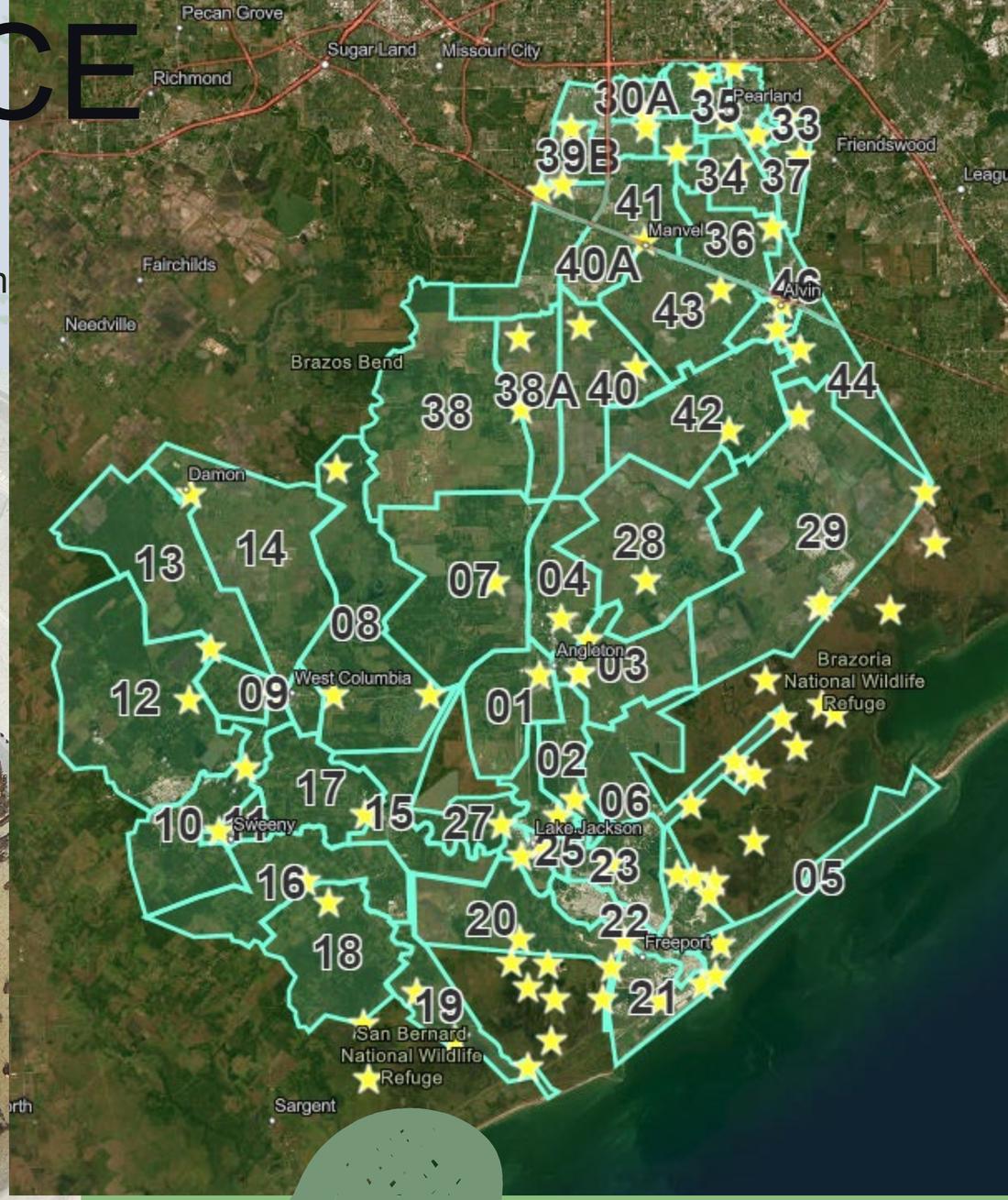
83 SURVEY LOCATONS

We survey 83 locations county wide twice a week generally from March- Nov







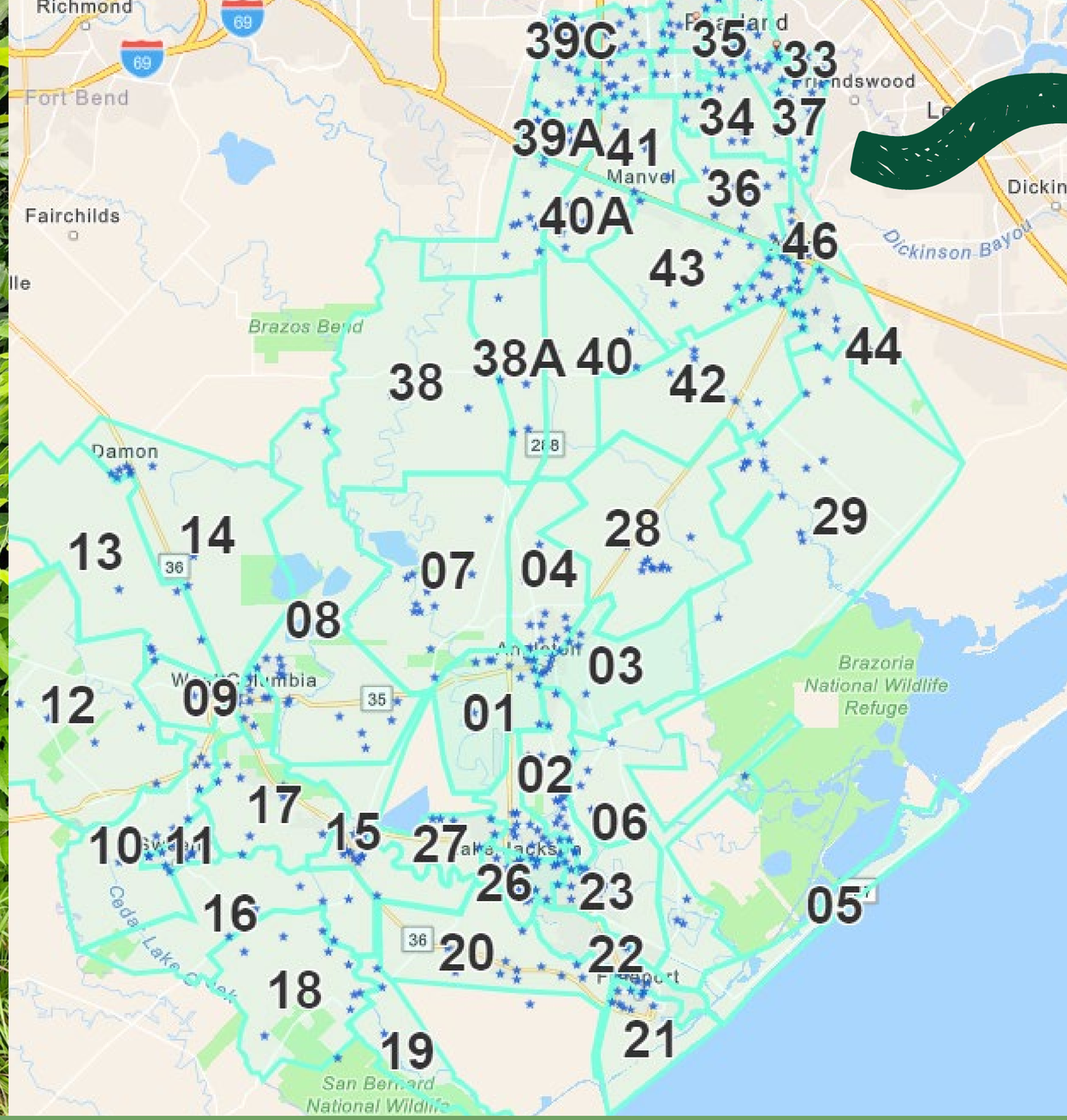


MOSQUITO TRAPS

30 GRAVID TRAPS
30 EVS LIGHT TRAPS

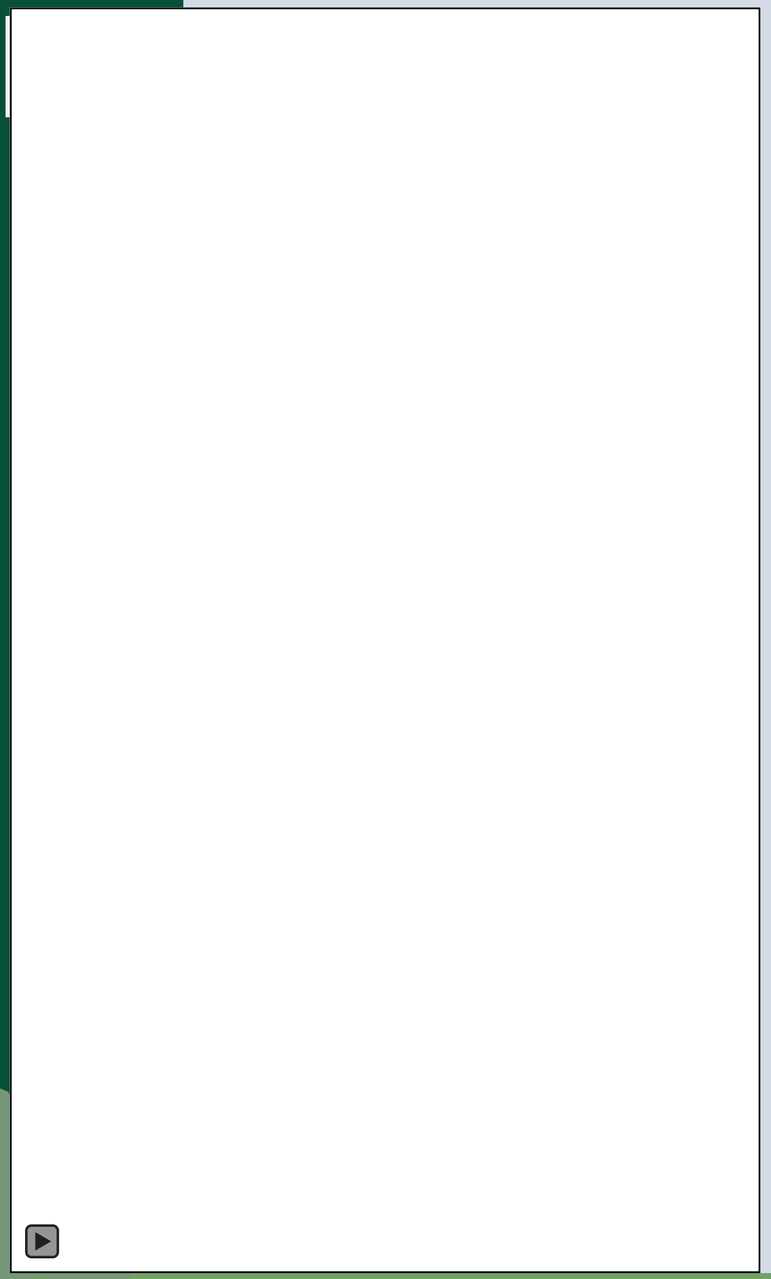
We trap 27 weeks a year

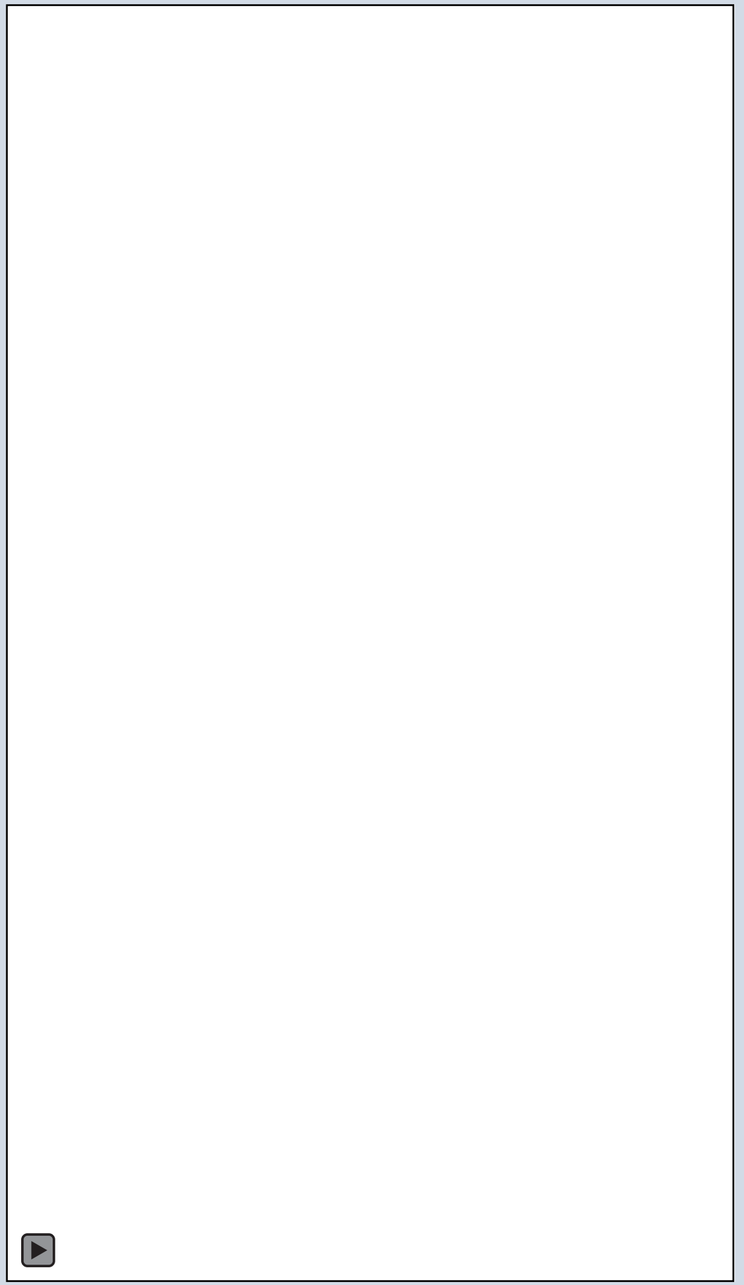




2026 Trap Locations

MOSQUI
TRAPS IN ACTION





Testing for Arbovirus







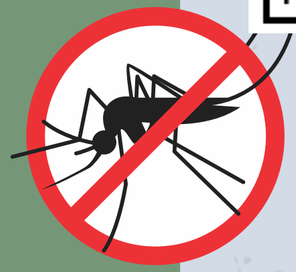


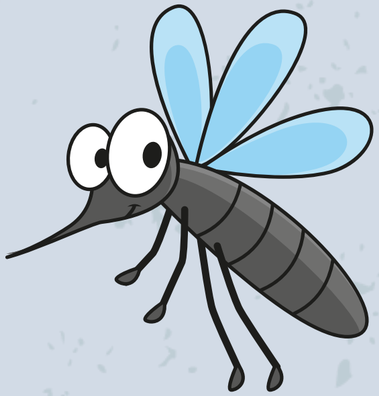
Texas 2026 Arbovirus Acti

Brazoria County West Nile Activity

2026*	12
2025	2
2024	7
2023	5
2022	1
2021	10
2020	1

*as of 7/1/26

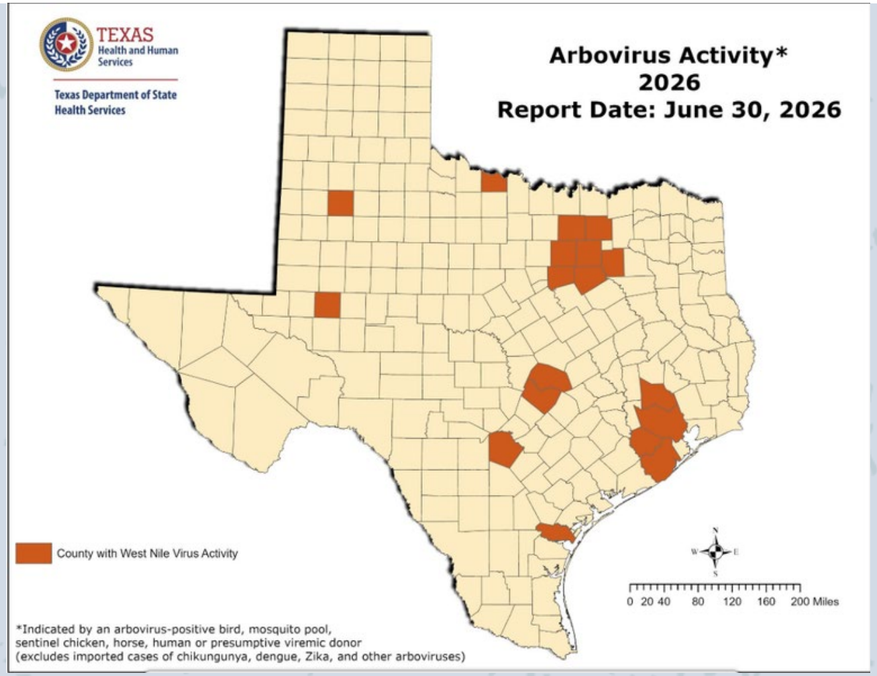


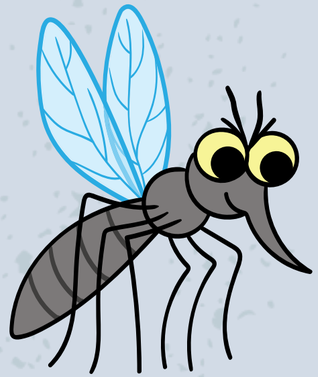


2026 DSHS Arbovirus Activity Report
Week #25 (ending Jun 27, 2026)
Report Date: June 30, 2026

Table 1. 2026 Arbovirus Activity Summary, Texas, Week 25

Arbovirus	Mosquito Pools	Avian	Veterinary	Sentinel Chicken	Human					
					Febrile Illness	Neurologic Illness	Severe Dengue	TOTAL (HUMAN)	Deaths	PVD[2]
California Serogroup[1]								0		
Chikungunya					1			1		
Dengue					4			4		
Eastern Equine Encephalitis								0		
St. Louis Encephalitis								0		
West Nile	339	3			2	2		4		2
Zika								0		
TOTAL REPORTS	339	3	0	0	7	2	0	9	0	2

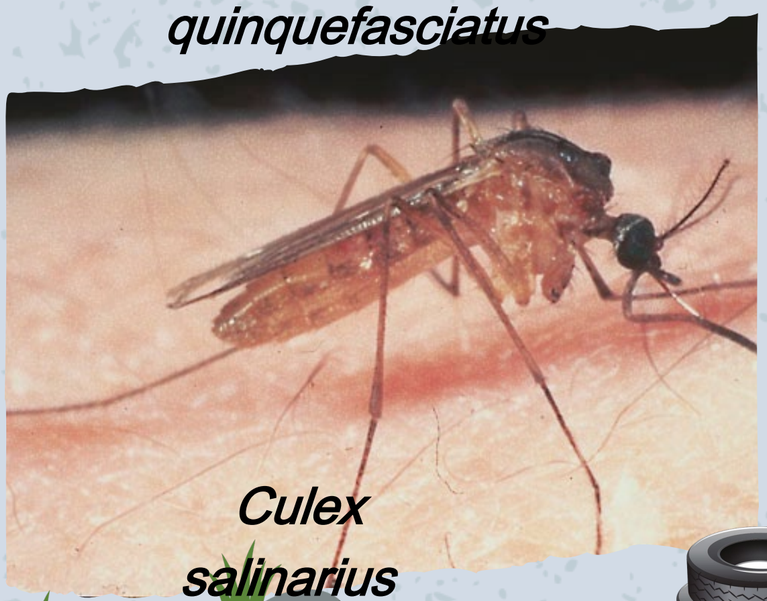




Mosquito Identification



Culex quinquefasciatus



Culex salinarius



Psorophora ciliata





Aedes sollicitans



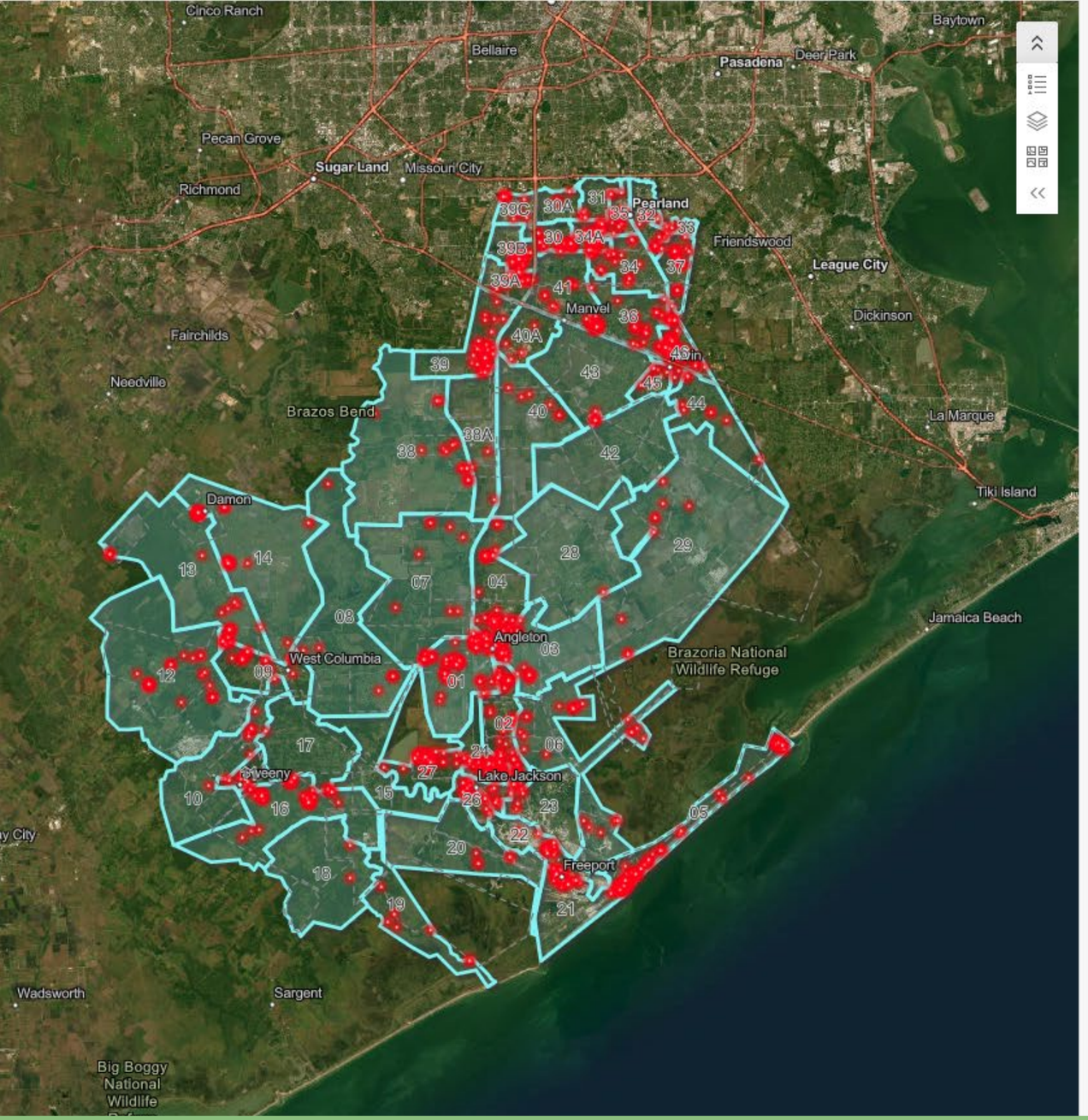
Aedes taeniorhynchu

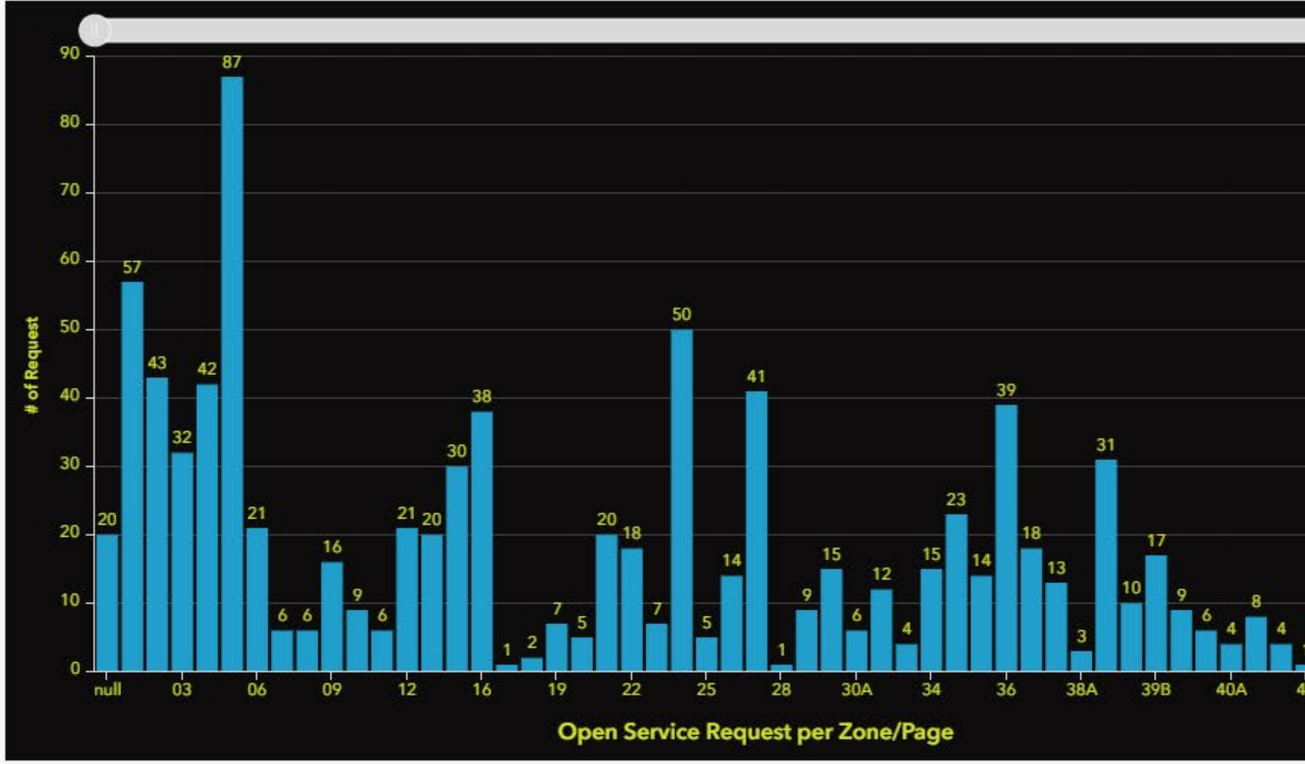
What happens after a spray request is submitted?











Today's Service Request

63

This week's

1.9k

Service Request

Total Open

951

Total Service Request

25.8k

Spray Request

Today's Highest

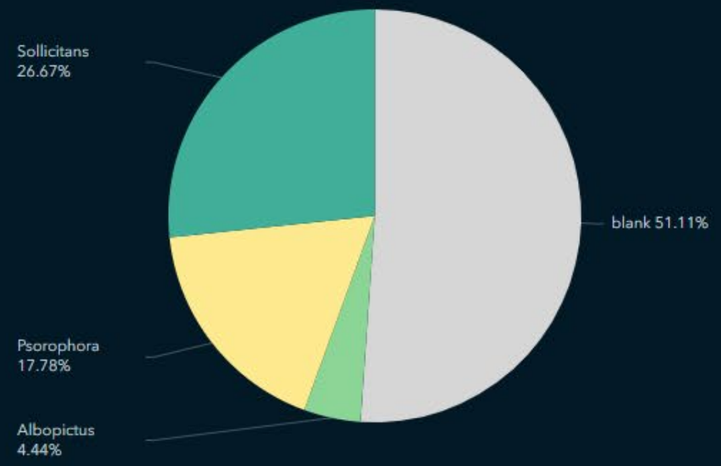
100

Landing Count

Today's Highest

100

Larvae Count



Today's Inspection Details

Location Name	Zone	Field Tech	Total Larvae	# Dips	Landing Rate	Conditions	Field Species	Comments
S-14 FM 1495 Boatramp	21	Jose Marquez	8	5	0			Pupi and pupi skins found, Adult males in grasses
E-17 New Chocolate Bayou	29	Burton (BJ) Girouard	100	15	100	Low| Light Breeze	Sollicitans	Pupae present, grass is full of adults mostly male, all dips had heavy counts of larvae and pupae, breezy
E-16 CR 227	N/A	Burton (BJ) Girouard	0	8	0	Low| Light Breeze		Water in ditches is flowing with minnows and other aquatic life present, breezy
S-13 New River Cut Off	N/A	Jose Marquez	0	3	0	Low| Light Breeze		Vert little water in ditch no aquatic life
E-15 Gator Lake MG	06	Burton (BJ) Girouard	0	0	3	Dry| Light Breeze	Sollicitans	Area is dry, breezy
S-12 New River Bridge	20	Jose Marquez	0	0	0	Dry| Light Breeze		
W-14 Cedar St	14	Benton (Wade) Ohlen	0	0	5		Psorophora	Area is damp and light breeze
E-13 Bomb Range Gate	N/A	Burton (BJ) Girouard	0	10	0	Low| Light Breeze		Water along fence line, light breeze
S-11 Gun Wildlife HQ	N/A	Jose Marquez	0	0	0	Dry		
E-14 Bombing Range	N/A	Burton (BJ) Girouard	1	25	0	Low| Light Breeze		Area has shallow water throughout water bugs present, light breeze

- No set spray schedule
- Treatment locations are decided on
  after data review.
- Night spray routes are posted daily on our website by 4pm.

Current Mosquito Activity Alert: Recent rainfall has created favorable breeding conditions for mosquitoes across Brazoria County. Our teams are actively conducting countywide control operations by truck and aircraft. Treatment locations are based on surveillance data and service requests rather than a fixed spray schedule.

Spray trucks operate from 8pm - 4:30am

Tuesday, July 7, 2026

Truck Spraying -

Laurel Heights, Stewart Heights, Lakes of Savannah, Rodeo Palms

Pomona, South Fork, Southern Trails, South Lake

Shadow Creek Ranch

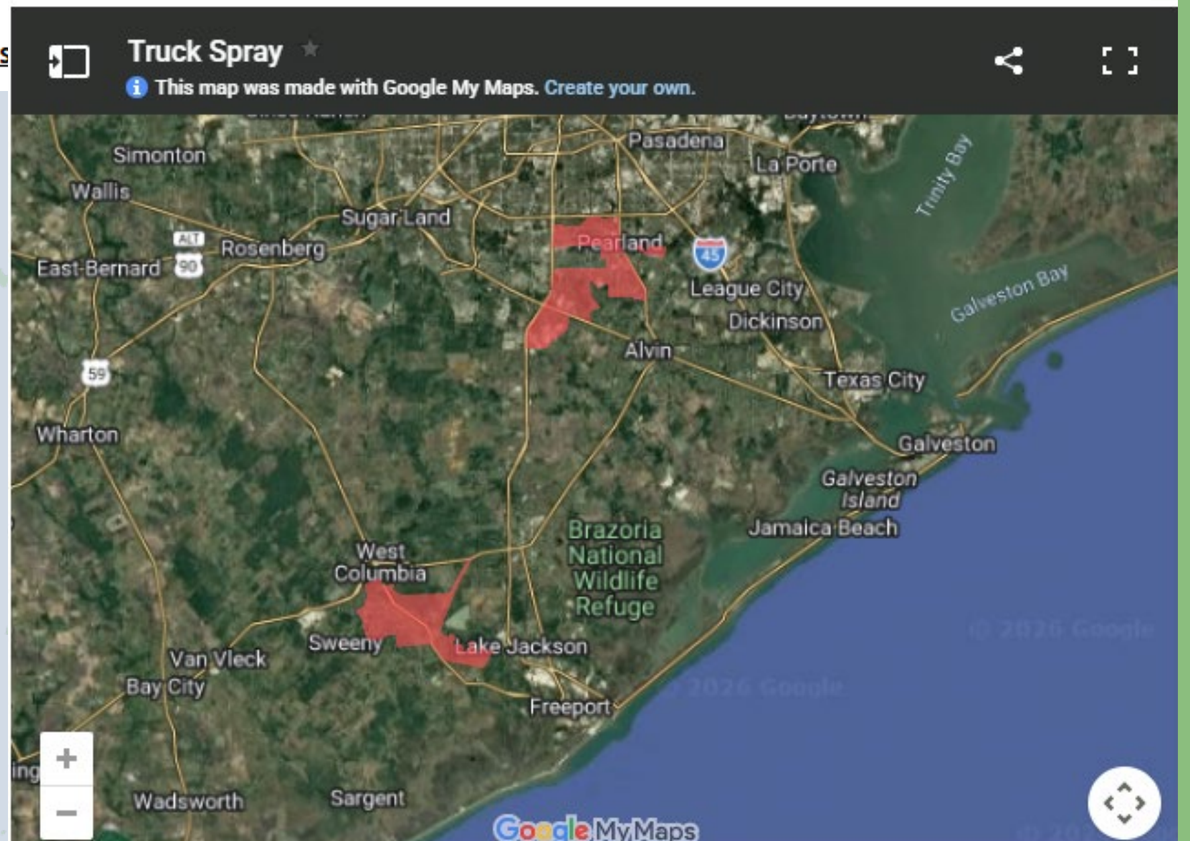
Columbia Lakes, Bar X, East Columbia, Pecan Bend

Clute

Sweeny

Old Ocean, Danciger

Aerial S



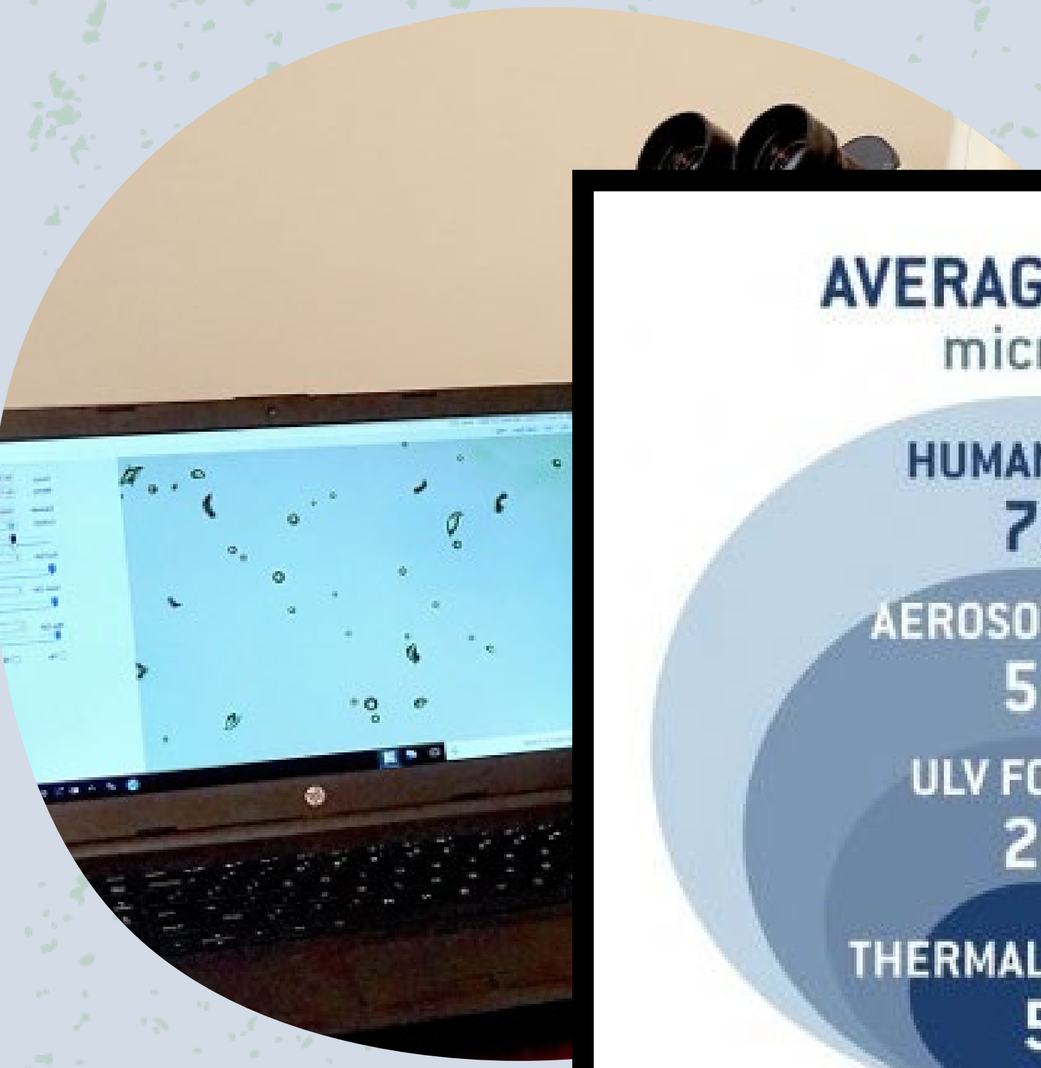
Adulticiding ULV Spray Trucks

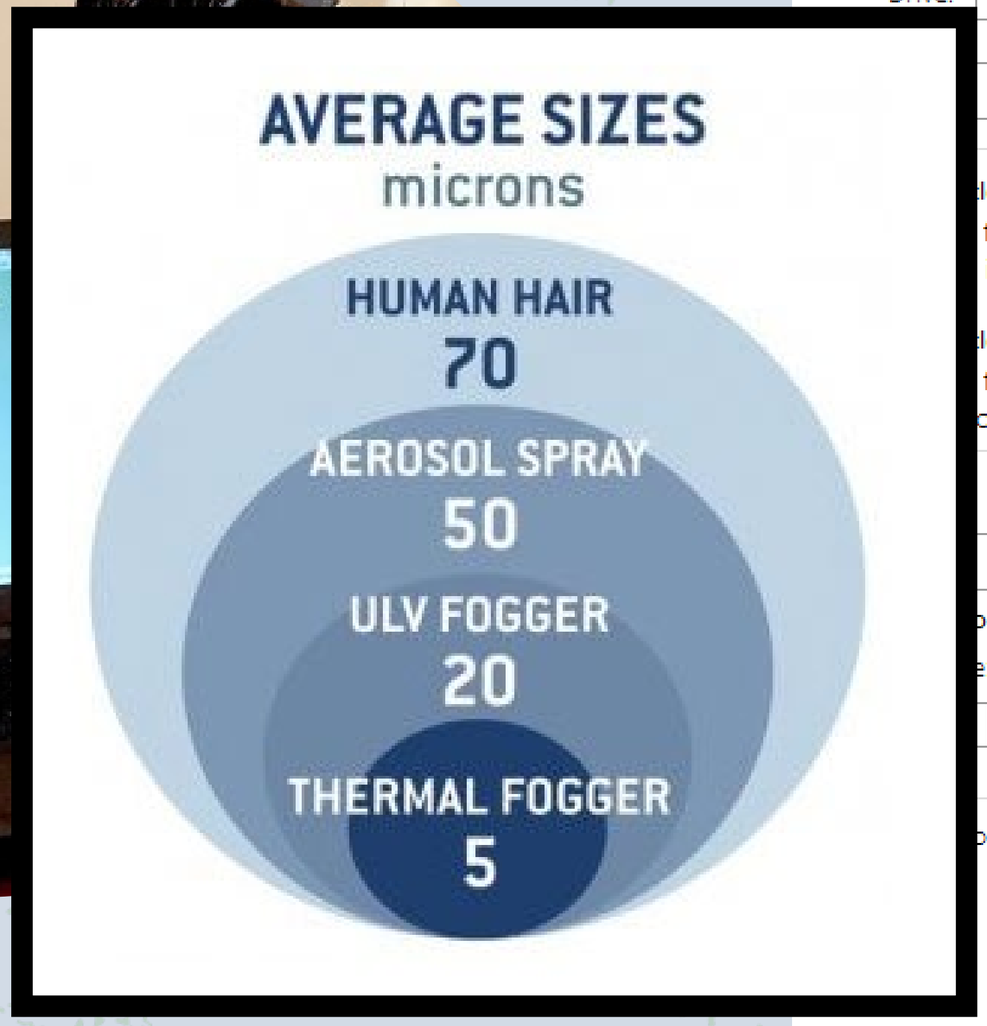












Azelis Monitor Mission Configuration

Drive: E:\ Rescan Read

Monitor 4S Technician: Calibration

le Up
for most sprayers or when
is no throttle solenoid.

le Down
for Guardian 190 G4s and
on Fog 18-20s.

Manual flow enabled
Calibration enabled
PIN: 1532

Pump Type
FMI
MFC

Fyfanon Vehicle: 25

on Rate
e: 0.5494
Oz / Minute @ 10 MPH

Speed Triggers
Spray between: 5 and 20 MPH
Low alarm: 0
Hi alarm: 19

ow Rate (Oz / Minute): 5

AccuFlow Time Zone Setting:
(UTC-6:00) Central Time

Export Mission Exit

Calibration & Droplet Testing



Log

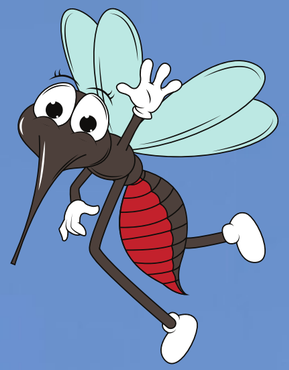
/10/2025 9:47:22 PM
mph
62°
.8 floz/min
: On
/ 15
anon
0.0 mph
on: 0
: 0.0 °F
y: 0.0%
e: 0.0 bars
es: Mosquito
d App.:



Aerial Spraying

Contract with Garrett Flying in Danbury, TX









Yearly Compare

*as of June 30, 2026

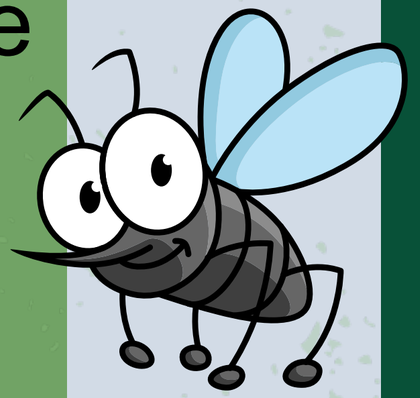
YEAR	2020		2021		2022		2023		2024		2025		2026*	
	QTY	ACRES	QTY	ACRES	QTY	ACRES	QTY	ACRES	QTY	ACRES	QTY	ACRES	QTY	ACRES
DIBROM	2,160.00	1,243,729.13	990.00	576,280.46	1,440.00	771,507.42	1,710.00	942,791.10	4,140.00	2,175,256.06	2,160.00	687,801.96	1,260.00	663,967.50
FYFANON	2,691.25	651,503.93	2,701.28	617,041.08	4,003.03	913,892.19	2,536.42	569,002.98	3,801.30	854,523.29	2,788.73	626,309.96	2,848.69	635,586.75
KONTROL 30-30	4,476.11	1,037,343.60	5,207.06	1,201,733.80	1,518.31	337,676.93	2,749.08	622,326.51	7,804.15	1,068,286.73	8,507.22	967,093.28	795.87	176,829.44
BRIQUETS	11,916.00	45.73	22,495.00	51.67	25,905.00	59.51	25,968.00	59.39	25,073.00	57.55	27,347.00	62.78	27,250.00	62.56
BTI MIX	228.85	7.17	2,187.18	227.42	131.00	14.00	458.88	57.37	315.00	31.50	441.00	41.34	521.20	48.89
COCOBEAR (oz)	198.30	2.44	10.99	23.80	1,298.38	13.72	204.00	3.02	487.70	7.32	104.50	9.53	705.00	1.64
IN2CARE	220.00	22.00	240.00	22.00	30.00	3.00								
MetaLarv													1725.58	354.62
SERVICE REQUEST	13,279		15,165		15,632		13,952		52,469		14,127			26,243
SPECIALS	52		109		85		124		177		124			90
TIRES COLLECTED	110		197		226		177		99		12			0
Total Acres		**2,932,654.01**		**2,395,380.23**		**2,023,166.77**		**2,134,240.37**		**4,098,162.45**		**2,314,838.51**		**1,476,851.40**

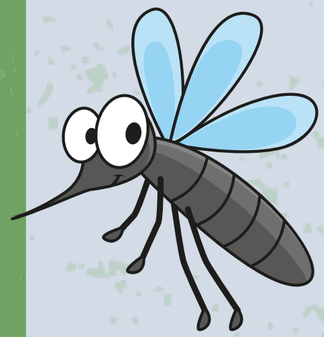
- Brazoria County - 1,609 square miles
- Federal Wildlife Refuge Area - 90 K acres = Salt marsh Mosquitoes
- access to spray 970 acres but allowed to survey in marshes

Challenges We Face

- Weather Impacts
- Insecticide Resistance
- Public Misconceptions
- Public Education







Most Common Questions & Complaints





THANK YOU

Scan for our

Website



Tiffany Walker
Operations Manager
twalker@brazoriacountytx.gov
979-864-1533

Jose Marquez
Senior Pesticide Applicator
jmarquez@brazoriacountytx.gov
979-864-1532

FINANCE DEPARTMENT PRESENTATION



OVERVIEW

Finance Department safeguards and accounts for the City's financial assets.



DIVISIONS

- ❑ General Ledger
- ❑ Accounts Payable
- ❑ Audit
- ❑ Budget
- ❑ Fixed Assets
- ❑ Payroll
- ❑ Utility Billing
- ❑ Utility Collections
- ❑ Development Agreement Management
- ❑ Grant Management
- ❑ TIRZ
- ❑ MEDC

ACCOMPLISHMENTS

- ❑ GFOA Budget Award - 2025 - 2026
- ❑ Completed 2024 - 2025 Fiscal Audit
- ❑ Completed 1st Impact Fee Audit
- ❑ Attended GFOA Conference
- ❑ PFIA Investment Certification Renewed
- ❑ Received CGFOA Certification



PROCESSED:

	2022-2023	2023-2024	2024-2025	2025-2026 YTD
Payments	2,261	2,042	2,327	1,732
Invoices	3,369	4,329	5,459	4,612
Employees	88	100	116	133
Utility Accts	1,568	1,882	2,073	2,197
Audit Requests FY24-25:				
	1,089	Documents		



CHALLENGES

Small Staff

- More separation of duties required per our Auditors
- If one employee is out it places a large strain on the rest of the department
- Growing population requires more customer service



BUDGET REQUESTS

In the upcoming Fiscal Year 2026-2027 budget, the Finance department is requesting the following positions.

PERSONNEL

Accounts Payable Clerk	$50 - 60,000*
Utility Billing Clerk	$50-60,000*

*PLUS BENEFITS

THANK YOU



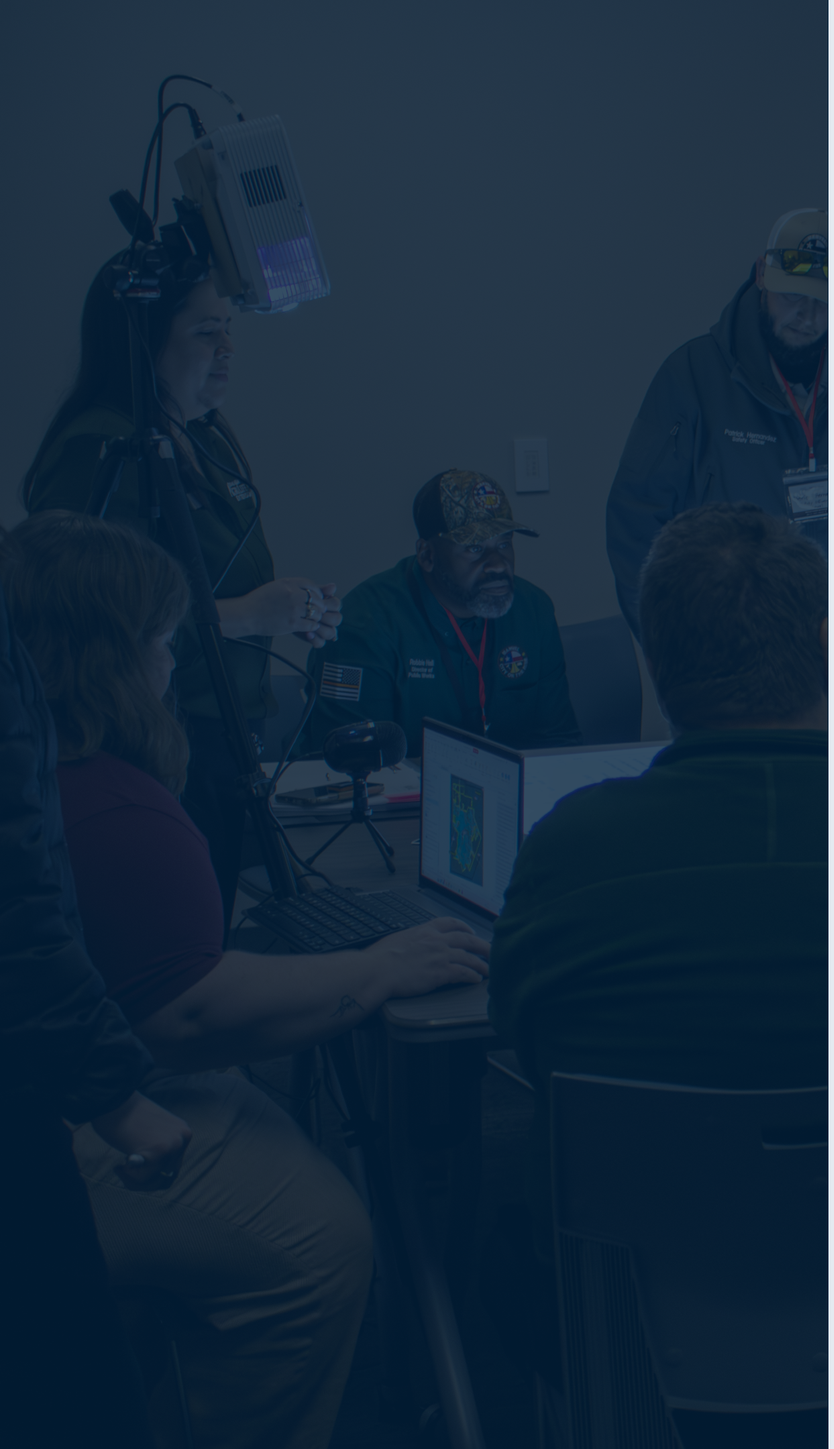
CITY OF MANVEL EFFICIENCY STUDY

65TH NORTH GROUP

Introduction and Overview

The City of Manvel engaged 65th North Group to conduct an operational, staffing, organizational, and efficiency study of City departments and major service functions.

The purpose of this study is to evaluate current operations, assess staffing structures and future staffing needs, identify opportunities for organizational and process improvements, and provide practical recommendations to help the City manage growth in a more efficient, sustainable, and service-oriented manner.



Study Scope and Methodologies

Comprehensive Review

The study examined the City’s core functions, including administration, internal services, infrastructure, and public safety to identify opportunities for operational improvement.

Focus Areas

The evaluation focused on organizational structure, staffing levels, operational efficiency, business processes and technology use.

Multi-Method Approach

Recommendations were made through combined staff interviews, observations, document reviews, data analysis, and anonymous surveys.

Growth & Capacity Planning

Recommendations reflect projected population growth and are designed to strengthen organizational capacity long-term.

“The opportunity isn’t to change who we are, it’s to improve how we serve.”



Key Themes

Lean Staffing Challenges

Many departments operate with minimal staff and limited backup, risking disruption from absences or turnover.

Underutilized Technology

Several functions rely on manual or paper-based processes, reducing efficiency and increasing errors.

Service Delivery Efficiency

Improving internal coordination and streamlining processes will enable the City to respond more effectively to resident needs.

Department Findings & Recommendations

Legal Department



Growing Service Demands

City growth increases complexity in development, employment, procurement, and public records legal workflows.



Future Staffing Needs

Adding an Assistant City Attorney by 2034 and a second Legal Assistant by 2036 will improve workload distribution.



Prosecutor Role Consideration

The City may transition the outsourced municipal prosecutor in-house based on cost-benefit analysis in the future.

City Secretary

Improvement Opportunities

Key improvements include better records systems, workflow automation, online services expansion, and cross-training staff.

Future Staffing Needs

Add one Records Coordinator by 2030 to support increasing records management responsibilities.

*This position may be needed sooner as the new City Hall West Wing is set to open 2027.

Organizational Restructure

Recommend separating Municipal Court and PIO division from CSO.

Municipal Court

Recommendation

Establish the Municipal Court as a separate function rather than continuing to have it report through the City Secretary, with the Court Administrator reporting to an Assistant City Manager.

Continue using part-time judges and outsourced prosecutorial services for now, but periodically evaluate workload, service demands, and actual prosecution costs to determine whether a full-time judge or full-time prosecutor model becomes more appropriate in the future.

Future Staffing Needs

Add an additional Deputy Court Clerk by 2030; with the new courthouse, this may be needed sooner.

"As communities grow, court operations must evolve to remain efficient, responsive, and impartial."



Human Resources



Personnel Manual Review

Maintain regular updates to the Personnel Policy to strengthen policy consistency, improve usability, and support effective administration.



Future Staffing Needs

Add one additional HR position once City reaches ~150 FTEs.



Training Opportunities

Formalize training and safety programs and improve use of HR systems.

Information Technology

Improvement Opportunities

Key improvements include better records systems, workflow automation, online services expansion, and cross-training staff.

Future Staffing Needs

- Maintain four positions but restructure titles into broader, more flexible roles.
- Add Network Administrator/Engineer (by 2036).

Organizational Restructure

Separate Human Resources and Information Technology as independent departments, with both reporting directly to the Assistant City Manager, while keeping existing job titles unchanged.

Finance and Utility Billing

Internal Control Risks

Lean staffing and limited segregation of duties cause internal control risks in Finance and Utility Billing.

Recommendations for Improvement

Recommended actions include adding staff, enforcing deadlines, improving controls, cross-training, and upgrading billing technology.

Future Staffing Needs

Add a Finance Manager and Utility Billing Clerk by 2028.

"Strong financial stewardship begins with strong internal controls."



Development Services



Improvement Opportunities

Optimizing MyGov workflow, updating website guidance, and enhancing completeness checks before zoning review.



Future Staffing Needs

Add a Building Official by 2030 due to workload and project complexity growth.



Engineering Alignment

Engineering should be integrated within Development Services for consistency and improved coordination.









Public Works

Maintenance and Asset Management

Emphasizes preventive maintenance, service-level standards, equipment training, and robust asset management for operational efficiency.

Parks Maintenance Strategy

The City should also consider whether parks-related functions should remain within Public Works permanently or whether a separate Parks and Recreation Department may eventually be necessary.

Future Staffing Needs

Plans to expand field operations staff, add maintenance workers, heavy equipment operators, utility staff, and project managers by 2032.









Public Safety

Patrol Staffing Analysis

Analysis using the Rule of 60 shows patrol is not overwhelmed by reactive calls, allowing for measured staffing increases.

Technology and Performance Improvements

Suggested improvements include evidence barcoding, advanced code enforcement technology, and development of performance metrics.

Future Staffing Needs

Recommendations include hiring a Communications Supervisor, increasing Communications Officers for 24-hour coverage, and evaluating detention staffing.

Administration



City Manager's Workload

The City Manager handles excessive operational duties, limiting focus on strategic leadership and planning.



Assistant City Manager Role

Hiring an Assistant City Manager is recommended to balance operational tasks and enhance organizational efficiency.



Dedicated City Engineer Position

Establishing a City Engineer in Development Services will relieve technical responsibilities from the City Manager.

Phased Implementation Plan

Priority Levels

Priority 1

Priority 1 includes immediate actions like filling key city roles and strengthening internal controls for stability.

Priority 2

Priority 2 focuses on medium-term improvements such as customer service upgrades and staffing aligned with growth

Priority 3

Priority 3 outlines long-term plans including legal staffing enhancements and departmental evaluations.

Implementation Cost

Low

Can likely be implemented at low cost, with limited disruption and modest staff time. These are often policy, workflow, training, or process changes.

Medium

Can likely be implemented at low cost, with limited disruption and modest staff time. These are often policy, workflow, training, or process changes.

High

Will likely require substantial coordination, ongoing budget commitment, structural change, major technology work, or addition of multiple positions or significant new resources.

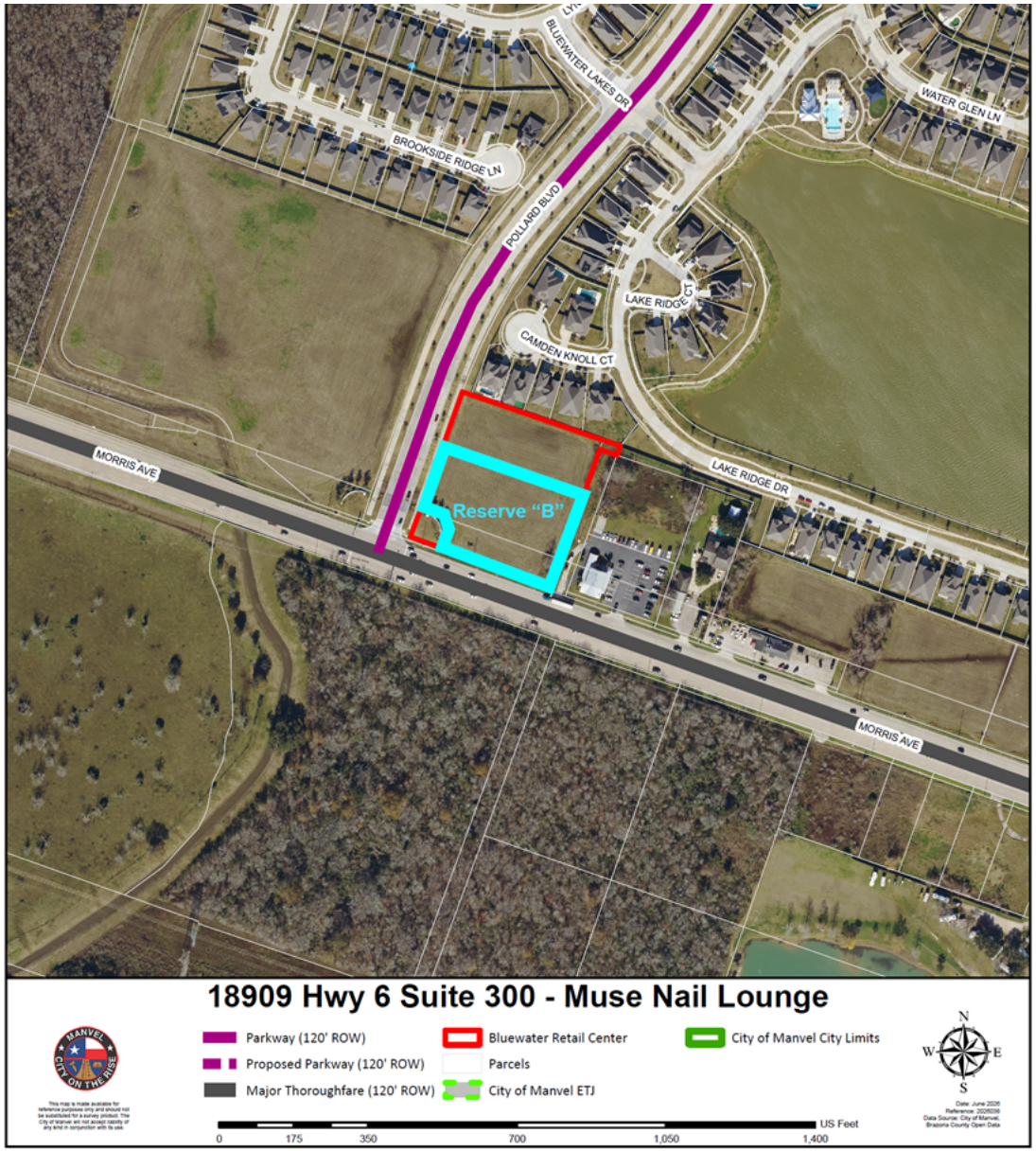
Current Initiatives

1. City Engineer hired (June 2026)
2. Dispatch Supervisor Recruitment (July 2026)
3. Public Works Organizational Title Restructuring (July 2026)
4. On-going HR Technology Modernization using NEOGOV
5. The Assistant City Manager will begin in August 2026.

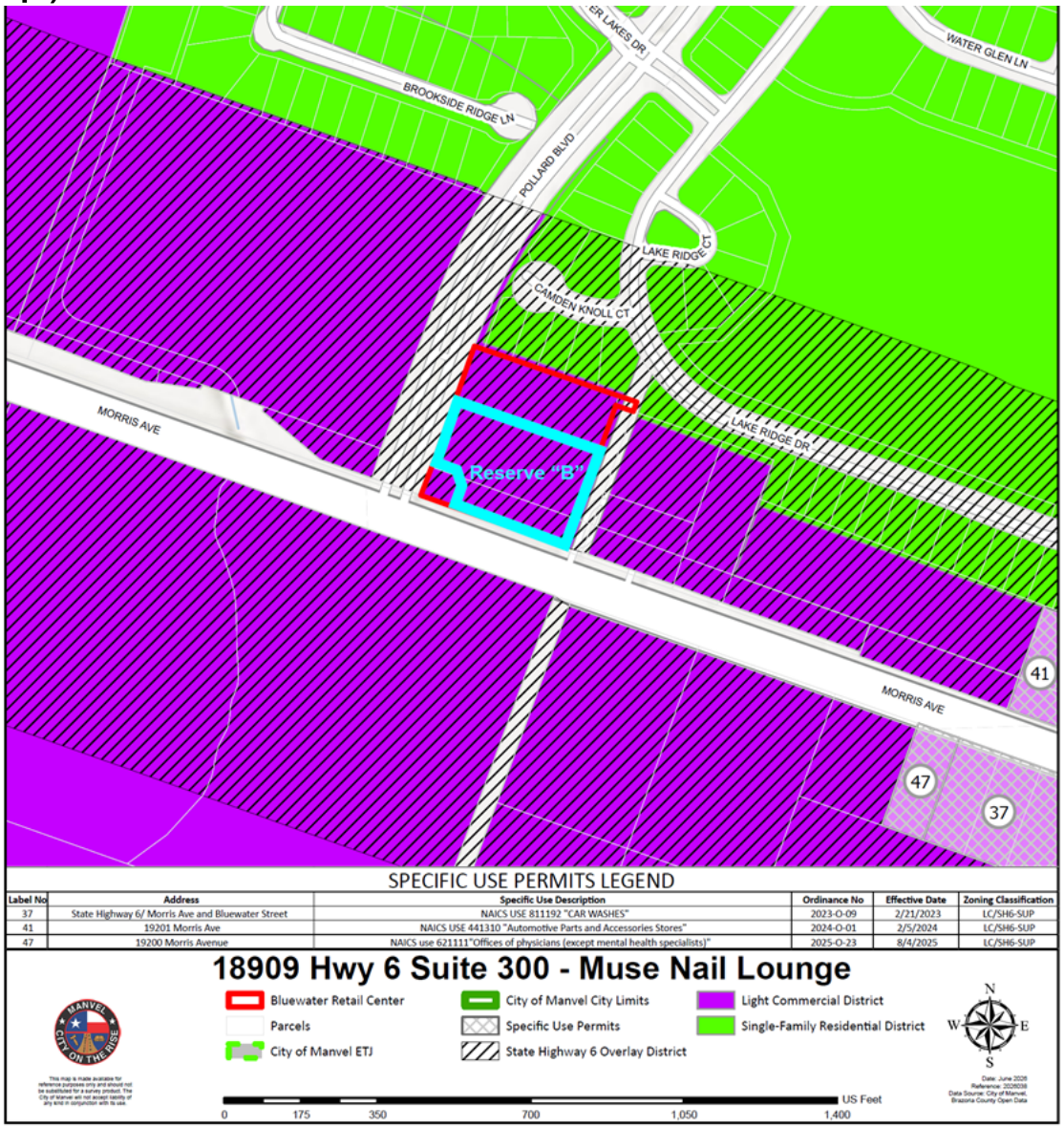
City Council Meeting

Monday, July 20, 2026

SUP –
18909 Hwy 6 Suite 300 - Muse Nail Lounge (NAICS 812113) (Arial & MTP Map)



SUP –
18909 Hwy 6 Suite 300 - Muse Nail Lounge (NAICS 812113)
(Zoning Map)



Label No	Address	Specific Use Description	Ordinance No	Effective Date	Zoning Classification
37	State Highway 6/ Morris Ave and Bluewater Street	NAICS USE 811192 "CAR WASHES"	2023-O-09	2/21/2023	LC/SH6-SUP
41	19201 Morris Ave	NAICS USE 441310 "Automotive Parts and Accessories Stores"	2024-O-01	2/5/2024	LC/SH6-SUP
47	19200 Morris Avenue	NAICS use 621111"Offices of physicians (except mental health specialists)"	2025-O-23	8/4/2025	LC/SH6-SUP

SUP –

18909 Hwy 6 - Shops at Bluewater retail center

View of the subject site from Highway 6



RESOLUTION NO. 2026-R-39

RESOLUTION OF THE CITY OF MANVEL, TEXAS GIVING CONSENT TO THE SALE AND ISSUANCE OF BONDS BY BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57 OF BRAZORIA COUNTY

WHEREAS, Utility District No. 57 of Brazoria County (the "District") was heretofore duly created by Order of the Texas Commission on Environmental Quality ("TCEQ"); and

WHEREAS, The District is located within the corporate boundaries of the City of Manvel, Texas (the "City"); and

WHEREAS, pursuant to V.T.C.A. Local Government Code, Section 42.042 and by Resolution No. 2007-R-03, dated January 8, 2007 (the "Consent Resolution"), the City consented to the creation of the District; and

WHEREAS, as condition of the Consent Resolution, the City must consent to the sale and issuance of bonds by the District; and

WHEREAS, the City has received and reviewed a draft Preliminary Official Statement, a draft Notice of Sale, and a draft debt service schedule; and

WHEREAS, the City Council of the City desires to adopt Resolution No. 2026-R-39 (the "Resolution"), as set forth herein, for the purpose of acknowledging its receipt and review of the draft Preliminary Official Statement, a draft Notice of Sale, and a draft debt service schedule and consenting to the sale and issuance of road bonds by the District pursuant thereto.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF MANVEL, TEXAS:

Section 1. The facts and recitals set forth in the preamble of this Resolution are hereby found to be true and correct.

Section 2. Pursuant to Section 4.05 of Exhibit "B" and Exhibit "C" to the Consent Resolution, the City Council of Manvel, Texas hereby specifically (1) acknowledges its receipt and review of a draft Preliminary Official Statement, a draft Notice of Sale, and a draft debt service schedule; (2) declares that, based upon representation made by the District, the District is in compliance with the Consent Resolution, as well as all exhibits thereto; and (3) consents to the sale and issuance of road bonds by the District.

[REMAINDER OF PAGE INTENTIONALLY BLANK]

PASSED AND APPROVED this _____ day of _____, 2026.

_____
Mayor

ATTEST:

_____
City Secretary

[SEAL]

ABHR

HOUSTON
3200 Southwest Freeway,
Suite 2600
Houston, TX 77027
(713) 860-6400

Direct Line: (713) 860-6493
Direct Fax: (713) 860-6667

hbradley@abhr.com

Hannah Bradley
Senior Attorney

June 29, 2026

VIA E-MAIL AND REGULAR MAIL

Mr. Daniel S. Johnson
City Manager
City of Manvel
P.O. Box 187
Manvel, TX 77578

Re: Brazoria County Municipal Utility District No. 57

Dear Mr. Johnson:

The Board of Directors of the referenced District plans to sell $13,395,000 Unlimited Tax Bonds in July 2026, to fund the following month. The City consent conditions provide for "level debt service" on the bonds. Because we never know exactly what the debt service will be until we open the bids, the consent conditions allow for prior approval based on the predicted debt service on the bonds.

Please find attached (i) the Preliminary Official Statement for the bonds (note that the summary of costs for the bond issue begins on page 22), (ii) the Notice of Sale for the bonds, (iii) a cash flow analysis by the District's financial advisor, and (iv) the current consent conditions from the City's consent resolution relating to the District. The District respectfully requests that, based on the attached, the City concurs that the level debt service requirement is substantially met as required by the consent conditions. An affirmation from you or the appropriate City official will be sufficient. I've attached a simple affirmation for execution for your convenience. The District will be authorized to sell and close on the bonds without the concurrence but might have to incur expense in rejecting and re-bidding the bonds if the actual interest rates do not meet technical level debt service requirements.

4900-8742-5964 v.1

If you have any questions or comments, please let me know. Thanks very much.

Sincerely,

Hannah Bradley

Hannah Bradley
Attorney for the District

Enclosures
cc: Bobby Gervais, City Attorney (via e-mail)
Katie Sherborne, Attorney for the District (via-email)

The City of Manvel, Texas has received the proposed debt service schedule for the $13,395,000 Brazoria County Municipal Utility District No. 57 Unlimited Tax Bonds, Series 2026, and acknowledges compliance with the applicable level debt service consent conditions relating to issuance.

_____

City Manager, City of Manvel, Texas

4900-8742-5964 v.1

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57

(BRAZORIA COUNTY, TEXAS)

PRELIMINARY OFFICIAL STATEMENT

DATED: MAY 14, 2026

$13,395,000
UNLIMITED TAX BONDS
SERIES 2026

BIDS TO BE SUBMITTED BY: 9:30 A.M., CENTRAL TIME
THURSDAY, JULY 9, 2026

BIDS TO BE AWARDED: 10:30 A.M., CENTRAL TIME
THURSDAY, JULY 9, 2026

CEDAR CREEK
MUNICIPAL ADVISORS

Financial Advisor

This Preliminary Official Statement and the information contained herein are subject to completion or amendment. These securities may not be sold nor may offers to buy be accepted prior to the time the Official Statement is delivered in final form. Under no circumstances shall this Preliminary Official Statement constitute an offer to sell or the solicitation of an offer to buy nor shall there be any of these securities in any jurisdiction in which such offer, solicitation or sale would be unlawful prior to registration or qualification under the securities laws of any such jurisdiction.

PRELIMINARY OFFICIAL STATEMENT DATED MAY 14, 2026

This Preliminary Official Statement is subject to completion and amendment and is intended for the solicitation of initial bids to purchase the Bonds (herein defined). Upon the sale of the Bonds, the Official Statement will be completed and delivered to the Initial Purchaser (herein defined).

IN THE OPINION OF BOND COUNSEL (HEREIN DEFINED), UNDER EXISTING LAW, INTEREST ON THE BONDS (I) IS EXCLUDABLE FROM GROSS INCOME FOR FEDERAL INCOME TAX PURPOSES UNDER SECTION 103 OF THE INTERNAL REVENUE CODE OF 1986, AS AMENDED, AND (II) IS NOT AN ITEM OF TAX PREFERENCE FOR PURPOSES OF THE ALTERNATIVE MINIMUM TAX ON INDIVIDUALS. SEE "TAX MATTERS" HEREIN, INCLUDING INFORMATION REGARDING POTENTIAL ALTERNATIVE MINIMUM TAX CONSEQUENCES FOR CORPORATIONS.

The Bonds will not be designated "qualified tax-exempt obligations" for financial institutions.

NEW ISSUE – Book-Entry-Only **NON-RATED**

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57
(A Political Subdivision of the State of Texas, located within Brazoria County)
$13,395,000
Unlimited Tax Bonds
Series 2026

Dated: August 1, 2026
Interest Accrues from: Date of Delivery **Due: September 1, as shown on inside cover**

The $13,395,000 Unlimited Tax Bonds, Series 2026 (the "Bonds") are obligations of Brazoria County Municipal Utility District No. 57 (the "District") and are not obligations of the State of Texas; Brazoria County, Texas; the City of Iowa Colony, Texas; the City of Manvel, Texas; or any political subdivision or entity other than the District. Neither the full faith and credit nor the taxing power of the State of Texas; Brazoria County, Texas; the City of Iowa Colony, Texas; the City of Manvel, Texas; nor any entity other than the District is pledged to the payment of the principal of or the interest on the Bonds.

Principal of the Bonds is payable upon presentation at the principal payment office of the paying agent/ registrar, initially, BOKF, NA, Dallas, Texas (the "Paying Agent/Registrar"). The Bonds will be dated August 1, 2026, and interest on the Bonds accrues from the date of delivery which is expected to be on or about August 13, 2026 (the "Date of Delivery"), with interest payable on March 1, 2027, and on each September 1 and March 1 thereafter (each an "Interest Payment Date") until the earlier of maturity or prior redemption. Interest on the Bonds will be payable by check dated as of the Interest Payment Date and mailed by the Paying Agent/Registrar to registered owners as shown on the records of the Paying Agent/Registrar at the close of business on the 15th calendar day of the month next preceding each Interest Payment Date. The Bonds are fully registered bonds in principal denominations of $5,000 or any integral multiple thereof.

The Bonds will be registered in the name of Cede & Co., as nominee for The Depository Trust Company ("DTC"), which will act as securities depository for the Bonds. Beneficial owners of the Bonds will not receive physical certificates representing the Bonds but will receive a credit balance on the books of the nominees of such beneficial owners. So long as Cede & Co. is the registered owner of the Bonds, the principal of and interest on the Bonds will be paid by the Paying Agent/Registrar directly to DTC, which will, in turn, remit such principal and interest to its participants for subsequent disbursement to the beneficial owners of the Bonds as described herein. See "THE BONDS – Book-Entry-Only System."

See "PRINCIPAL AMOUNTS, MATURITIES, INTEREST RATES AND INITIAL REOFFERING YIELDS AND CUSIPS" on inside cover page.

The Bonds constitute the second series of unlimited tax bonds issued by the District, from the $483,900,000 principal amount of unlimited tax bonds authorized by the District's voters at an election held on November 8, 2022, for the purpose of purchasing, constructing, operating and maintaining water, wastewater, and drainage facilities to serve the District (the "Utility System") and $483,900,000 for the further purpose of refunding such bonds. The District's voters also authorized $344,700,000 principal amount of unlimited tax bonds for the purpose of constructing or acquiring a road system to serve the District (the "Road System") and $344,700,000 for the further purpose of refunding such bonds and $163,790,000 principal amount of unlimited tax bonds for the purpose of constructing parks and recreational facilities to serve the District (the "Park System") and $163,790,000 for the further purpose of refunding such bonds.

Following the issuance of the Bonds, $456,190,000 principal amount of unlimited tax bonds for the Utility System; $339,100,000 principal amount of unlimited tax bonds for the Road System; and $163,790,000 principal amount of unlimited tax bonds for the Park System will remain authorized and unissued. All refunding bonds remain authorized but unissued.

The Bonds, when issued, will constitute valid and binding obligations of the District and will be payable from the proceeds of a continuing direct annual ad valorem tax, without legal limitation as to rate or amount, levied upon all taxable property within the District, as further described herein. See "THE BONDS – Source of Payment." Investment in the Bonds is subject to special investment considerations as described herein. See "RISK FACTORS."

The Bonds are offered when, as and if issued by the District and accepted by the winning bidders for the Bonds (the "Initial Purchaser"), and subject to the approval of the Attorney General of Texas and of Allen Boone Humphries Robinson LLP ("Bond Counsel"). Certain legal matters will be passed on for the District by Orrick, Herrington & Sutcliffe LLP, Houston, Texas ("Disclosure Counsel"). Delivery of the Bonds is expected on or about August 13, 2026.

PRINCIPAL AMOUNTS, MATURITIES, INTEREST RATES AND INITIAL REOFFERING YIELDS AND CUSIPS

$13,395,000 Unlimited Tax Bonds, Series 2026

Maturity September 1	Principal Amount	Interest Rate	Initial Reoffering Yield (a)	CUSIP No. _____ (b)	Maturity September 1	Principal Amount	Interest Rate	Initial Reoffering Yield (a)	CUSIP No. _____ (b)
2027	$ 295,000	____%	____%	___	2039 (c)	$ 545,000	____%	____%	___
2028	335,000	____%	____%	___	2040 (c)	570,000	____%	____%	___
2029	350,000	____%	____%	___	2041 (c)	595,000	____%	____%	___
2030	365,000	____%	____%	___	2042 (c)	625,000	____%	____%	___
2031	385,000	____%	____%	___	2043 (c)	650,000	____%	____%	___
2032 (c)	400,000	____%	____%	___	2044 (c)	680,000	____%	____%	___
2033 (c)	420,000	____%	____%	___	2045 (c)	710,000	____%	____%	___
2034 (c)	440,000	____%	____%	___	2046 (c)	745,000	____%	____%	___
2035 (c)	460,000	____%	____%	___	2047 (c)	775,000	____%	____%	___
2036 (c)	480,000	____%	____%	___	2048 (c)	810,000	____%	____%	___
2037 (c)	500,000	____%	____%	___	2049 (c)	850,000	____%	____%	___
2038 (c)	525,000	____%	____%	___	2050 (c)	885,000	____%	____%	___

(a) Information with respect to the initial reoffering yields of the Bonds is the responsibility of the Initial Purchaser. Initial reoffering yields represent the initial offering price, which may be changed for subsequent purchasers. The initial yield indicated above represents the lower of the yields resulting when priced to maturity or to the first call date.

(b) CUSIP numbers will be assigned to the Bonds by CUSIP Global Services, managed by FactSet Research Systems Inc. on behalf of the American Bankers Association and are included solely for the convenience of the owners of the Bonds.

(c) Bonds maturing on September 1, 2032, and thereafter, shall be subject to redemption and payment at the option of the District, in whole, or from time to time in part, on September 1, 2031, or on any date thereafter, at the par value thereof plus accrued interest to the date fixed for redemption. In addition, the Initial Purchaser may designate one or more maturities as term bonds.

USE OF INFORMATION IN OFFICIAL STATEMENT

For purposes of compliance with Rule 15c2-12 of the United States Securities Exchange Commission ("Rule 15c2-12"), as amended, and in effect on the date of this Preliminary Official Statement, this document constitutes an "official statement" of the District with respect to the Bonds that has been deemed "final" by the District as of its date except for the omission of no more than information permitted by Rule 15c2-12.

This document, when further supplemented by adding additional information specifying the interest rates and certain other information relating to the Bonds, shall constitute a "final official statement" of the District with respect to the Bonds, as such term is defined in Rule 15c2-12.

No dealer, broker, salesman or other person has been authorized to give any information, or to make any representations, other than those contained in this Preliminary Official Statement, and, if given or made, such other information or representations must not be relied upon as having been authorized by the District or the Initial Purchaser.

All of the summaries of the statutes, resolutions, orders, contracts, audits, engineering and other related reports set forth in this Preliminary Official Statement are made subject to all of the provisions of such documents. These summaries do not purport to be complete statements of such provisions and reference is made to such documents, copies of which are available from Bond Counsel, for further information.

This Preliminary Official Statement is not to be used in connection with an offer to sell or the solicitation of an offer to buy in any state in which such offer or solicitation is not authorized or in which the person making such offer or solicitation is not qualified to do so or to any person to whom it is unlawful to make such offer or solicitation.

This Preliminary Official Statement contains, in part, estimates, assumptions and matters of opinion which are not intended as statements of fact, and no representation is made as to the correctness of such estimates, assumptions or matters of opinion, or as to the likelihood that they will be realized. Any information and expressions of opinion herein contained are subject to change without notice, and neither the delivery of this Preliminary Official Statement nor any sale made hereunder shall, under any circumstances, create any implication that there has been no change in the affairs of the District or other matters described herein since the date hereof. The District has agreed to keep this Preliminary Official Statement current by amendment or sticker to reflect material changes in the affairs of the District and to the extent such information actually comes to its attention, the other matters described in this Preliminary Official Statement, until delivery of the Bonds to the Initial Purchaser and thereafter only as specified in "OFFICIAL STATEMENT – Updating of Official Statement" and "CONTINUING DISCLOSURE OF INFORMATION."

References to web site addresses presented herein are for informational purposes only and may be in the form of a hyperlink solely for the reader's convenience. Unless specified otherwise, such web sites and the information or links contained therein are not incorporated into, and are not part of, this final official statement for any purpose.

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APPENDIX A - FINANCIAL STATEMENTS OF THE DISTRICT

SALE AND DISTRIBUTION OF THE BONDS

Award of the Bonds

After requesting competitive bids for the Bonds, the District has accepted the bid of _____ (the "Initial Purchaser") to purchase the Bonds at the interest rates shown on the inside cover page of this Preliminary Official Statement at a price of _____% of par, resulting in a net effective interest rate to the District of _____%, as calculated pursuant to Chapter 1204, Texas Government Code, as amended. No assurance can be given that any trading market will be developed for the Bonds after their sale by the District to the Initial Purchaser. The District has no control over the price at which the Bonds are subsequently sold, and the initial yields at which the Bonds are priced and reoffered are established by and are the sole responsibility of the Initial Purchaser.

Prices and Marketability

Subject to certain hold-the-offering-price requirements described in the Official Notice of Sale, the District has no control over the reoffering yields or prices of the Bonds or over trading of the Bonds in the secondary market. Moreover, there is no assurance that a secondary market will be made in the Bonds. If there is a secondary market, the difference between the bid and asked prices of the Bonds may be greater than the difference between the bid and asked prices of bonds of comparable maturity and quality issued by more traditional municipal entities, as bonds of such entities are more generally bought, sold or traded in the secondary market.

Subject to certain hold-the-offering-price requirements described in the Official Notices of Sale, the prices and other terms with respect to the offering and sale of the Bonds may be changed from time to time by the Initial Purchaser after the Bonds are released for sale, and the Bonds may be offered and sold at prices other than the initial offering prices, including sales to dealers who may sell the Bonds into investment accounts.

IN CONNECTION WITH THIS OFFERING, THE INITIAL PURCHASER MAY OVER-ALLOT OR EFFECT TRANSACTIONS WHICH STABILIZE OR MAINTAIN THE MARKET PRICE OF THE BONDS AT A LEVEL ABOVE THAT WHICH MIGHT OTHERWISE PREVAIL IN THE OPEN MARKET. SUCH STABILIZING, IF COMMENCED, MAY BE DISCONTINUED AT ANY TIME.

Securities Laws

No registration statement relating to the Bonds has been filed with the United States Securities and Exchange Commission (the "SEC") under the Securities Act of 1933, as amended, in reliance upon exemptions provided thereunder. The Bonds have not been registered or qualified under the Securities Act of Texas in reliance upon various exemptions contained therein; nor have the Bonds been registered or qualified under the securities acts of any other jurisdictions. The District assumes no responsibility for registration or qualification of the Bonds under the securities laws of any jurisdiction in which the Bonds may be offered, sold, or otherwise transferred. This disclaimer of responsibility for registration or qualification for sale or other disposition of the Bonds should not be construed as an interpretation of any kind with regard to the availability of any exemption from securities registration or qualification provisions.

MUNICIPAL BOND INSURANCE

The District has made applications to Build America Mutual Assurance Company and Assured Guaranty Inc. for a commitment for municipal bond guaranty insurance on the Bonds. **THE PURCHASE OF SUCH INSURANCE IS MANDATORY**, and the payment of all associated costs, including the premium charged by the insurance company and fees charged by rating companies, will be at the expense of the Initial Purchaser.

RATINGS

The District has not made an application for a rating on the Bonds. Furthermore, it is not expected that the District would have been successful in receiving an investment grade rating on the Bonds.

OFFICIAL STATEMENT SUMMARY

The following material is a summary of certain information contained herein and is qualified in its entirety by the more detailed information and financial statements appearing elsewhere in this Preliminary Official Statement. The summary should not be detached and should be used in conjunction with the more complete information contained herein. A full review should be made of this entire Official Statement and of the documents summarized or described herein.

THE BONDS

The District	Brazoria County Municipal Utility District No. 57 (the "District"), a political subdivision of the State of Texas, is located in Brazoria County, Texas. See "THE DISTRICT."
The Bonds	The $13,395,000 Unlimited Tax Bonds, Series 2026 (the "Bonds") are dated August 1, 2026, and accrue interest from the date of delivery which is expected to be on or about August 13, 2026 (the "Date of Delivery"), with interest payable on March 1, 2027, and on each September 1 and March 1 thereafter (each an "Interest Payment Date") until the earlier of maturity or prior redemption. The Bonds mature serially on September 1 in the years and in the principal amounts set forth on the inside cover page. See "THE BONDS."
Redemption of the Bonds	The Bonds that mature on or after September 1, 2032, are subject to redemption, in whole or from time to time in part, on September 1, 2031, or on any date thereafter, at the par value thereof plus accrued interest to the date fixed for redemption. See "THE BONDS – Redemption of the Bonds."
Book-Entry-Only System	The Bonds will be initially registered and delivered only to Cede & Co., the nominee of The Depository Trust Company ("DTC"), pursuant to the Book-Entry-Only System described herein. Beneficial ownership of the Bonds may be acquired in principal denominations of $5,000 or integral multiples thereof. No physical delivery of the Bonds will be made to the Beneficial Owners (herein defined) thereof. Principal of and interest on the Bonds will be payable by BOKF, NA, Dallas, Texas (the "Paying Agent/Registrar"), to Cede & Co., which will make distribution of the amounts so paid to the participating members of DTC for subsequent payment to the Beneficial Owners of the Bonds. See "THE BONDS – Book-Entry-Only System."
Authority for Issuance	The Bonds constitute the second series of unlimited tax bonds issued by the District, from the $483,900,000 principal amount of unlimited tax bonds authorized by the District's voters at an election held on November 8, 2022, for the purpose of purchasing, constructing, operating and maintaining water, wastewater, and drainage facilities to serve the District (the "Utility System") and $483,900,000 for the further purpose of refunding such bonds. The District's voters also authorized $344,700,000 principal amount of unlimited tax bonds at an election held on November 8, 2022 for the purpose of constructing or acquiring a road system to serve the District (the "Road System") and $344,700,000 for the further purpose of refunding such bonds and $163,790,000 principal amount of unlimited tax bonds for the purpose of constructing parks and recreational facilities to serve the District (the "Park System") and $163,790,000 for the further purpose of refunding such bonds. Following the issuance of the Bonds, $456,190,000 principal amount of unlimited tax bonds for the Utility System; $339,100,000 principal amount of unlimited tax bonds for the Road System; and $163,790,000 principal amount of unlimited tax bonds for the Park System will remain authorized and unissued. All refunding bonds remain authorized but unissued. See "THE BONDS – Authority for Issuance." The Bonds are issued pursuant to: (i) an order of the Texas Commission on Environmental Quality (the "TCEQ"); (ii) the general laws of the State of Texas, including Chapters 49 and 54 of the Texas Water Code, as amended, applicable to municipal utility districts created under Section 59, Article XVI, Texas Constitution; (iii) a resolution authorizing the issuance of the Bonds

	adopted by the Board of Directors of the District (the "Board") on the date of sale of the Bonds (the "Bond Resolution"); and (iv) an election held within the District on November 8, 2022.
Source of Payment	The District is authorized to levy separate taxes to pay debt service on bonds issued for the Utility System, and the Park System, and the Road System, and such taxes are unlimited as to rate or amount. The Bonds are payable from a continuing direct annual ad valorem tax, unlimited as to rate or amount, levied against all taxable property within the District. The Bonds are obligations of the District and are not obligations of the State of Texas; Brazoria County, Texas; the City of Iowa Colony ("Iowa Colony"), Texas; City of Manvel ("Manvel"), Texas, or any entity other than the District. See "THE BONDS – Source of Payment."
Outstanding Bonds	The District has previously issued two (2) series of unlimited tax bonds, as follows: $14,315,000 Unlimited Tax Bonds, Series 2025; and $5,600,000 Unlimited Tax Road Bonds, Series 2025. As of the Date of Delivery, $19,915,000 principal amount of such previously issued bonds will remain outstanding (the "Outstanding Bonds"). See "THE BONDS – Outstanding Bonds."
Payment Record	The Bonds are the third issuance of bonded indebtedness by the District. The District has never defaulted on the timely payment of debt service on its bonded indebtedness.
Short-Term Debt	The District issued its $5,347,000 Bond Anticipation Note, Series 2025 (the "BAN"), dated December 18, 2025. The BAN matures on December 17, 2026, and accrues interest at a rate of 4.850% per annum, calculated on the basis of a 365-day year. The District will use a portion of the proceeds from the sale of the Bonds to redeem the BAN prior to its maturity. Proceeds from the BAN were used to reimburse the Developer (herein defined) for a portion of the improvements and related costs shown under "THE BONDS – Use and Distribution of Proceeds of the Bonds."
Use of Proceeds of the Bonds	Proceeds from the sale of the Bonds will be used by the District to redeem the BAN, the proceeds of which were used to reimburse the Developer for a portion of the improvements and related costs shown under "THE BONDS – Use and Distribution of Proceeds of the Bonds." Additionally, proceeds from the sale of the Bonds will also be used to reimburse the Developer for the improvements and related costs that were not reimbursed by the BAN and to pay: twelve (12) months of capitalized interest, BAN interest, developer interest, and other certain costs associated with the issuance of the Bonds. See "THE BONDS – Use and Distribution of Proceeds of the Bonds."
NOT Qualified Tax-Exempt Obligations	The Bonds will not be designated as "qualified tax-exempt obligations" for financial institutions.
Municipal Bond Insurance	The District has made applications to Build America Mutual Assurance Company and Assured Guaranty Inc. for a commitment for municipal bond guaranty insurance on the Bonds. **THE PURCHASE OF SUCH INSURANCE IS MANDATORY**, and the payment of all associated costs, including the premium charged by the insurance company and fees charged by rating companies, will be at the expense of the Initial Purchaser.
Ratings	The District has not made an application for a rating on the Bonds. Furthermore, it is not expected that the District would have been successful in receiving an investment grade rating on the Bonds. See "RATINGS."
Bond Counsel	Allen Boone Humphries Robinson LLP, Houston, Texas.
Disclosure Counsel	Orrick, Herrington & Sutcliffe LLP, Houston, Texas.
Financial Advisor	Cedar Creek Municipal Advisors, LLC, Houston, Texas.

THE DISTRICT

Description — The District is a political subdivision of the State of Texas, located approximately 21 miles south of the central business district of the City of Houston, Texas. At the time of creation, the District encompassed approximately 447.471 acres. Currently, the District consists of 1,606.9093 acres. The District boundaries lie entirely within the corporate limits of Manvel and Iowa Colony. The District is a municipal utility district created by an order of the TCEQ effective August 16, 2007, and by a confirmation election held within the District on November 6, 2007. The District operates in accordance with Article XVI, Section 59 and Article III, Section 52 of the Constitution of the State of Texas, and Chapters 49 and 54 of the Texas Water Code, as amended, and other statutes of Texas applicable to municipal utility districts. See "THE DISTRICT."

Development within the District — The District is one of three municipal utility districts that make up the approximately 3,000-acre master-planned community known as Meridiana. In addition to Meridiana, the District includes planned developments known as Ellwood and Rally East.

To date, approximately 279.21 acres (1,077 lots) within the District have been developed as the residential subdivisions of Meridiana, Sections 4A East, 4B, 5 East, 6 East, 7, 10A, 13A, 13B, 14A, 14B, 24A, 24B, 25A, 26A, 26B, and 82, and approximately 26.27 acres (92 lots) within the District have been developed as the residential subdivisions of Ellwood, Sections 1A and 1B. As of May 14, 2026, the District was composed of 406 completed homes, 154 homes under construction not including the 32 model homes under construction in the Ellwood subdivision and approximately 37 vacant developed lots. Of the 560 homes completed and under construction as of May 14, 2026 (which excludes the 32 model homes under construction in the Ellwood subdivision), 448 homes were sold to homeowners within the District.

In addition, approximately 13.00 acres have been developed as Alvin ISD Elementary School Site No. 2 and approximately 170.62 acres for other Alvin ISD Schools. The remaining land within the District consists of approximately 1,011.24 undeveloped but developable acres and approximately 139.38 undevelopable acres consisting of easements, rights of way and greenbelts. See "DEVELOPERS," "DEVELOPMENT OF THE DISTRICT," and "THE DISTRICT."

Developers — Land within the District is being developed by Rise Communities, LLC ("Rise Communities") and Beazer Homes Texas, L.P., a Delaware limited partnership ("Beazer Homes"). Rise Communities and Beazer Homes are collectively referred to herein as the "Developers." See "DEVELOPERS" and "DEVELOPMENT OF THE DISTRICT."

Homebuilders Within the District — Homebuilders who are active in Meridiana include David Weekley Homes, Drees Custom Homes, Highland Homes, Perry Homes, NewMark Homes, Shea Homes, Chesmar Homes, and Westin Homes. Prices of new homes being constructed in the District range from the $280,000s –$1,000,000+. See "DEVELOPERS – Homebuilders within the District."

RISK FACTORS

THE DISTRICT'S TAX IS LEVIED ONLY ON THE PROPERTY LOCATED WITHIN THE DISTRICT. THEREFORE, THE INVESTMENT SECURITY AND QUALITY OF THE BONDS IS DEPENDENT UPON THE SUCCESSFUL DEVELOPMENT OF PROPERTY LOCATED WITHIN THE DISTRICT AND THE PAYMENT AND COLLECTION OF TAXES LEVIED THEREON.

THE BONDS ARE SUBJECT TO CERTAIN INVESTMENT RISKS. PROSPECTIVE PURCHASERS SHOULD REVIEW THIS ENTIRE OFFICIAL STATEMENT, PARTICULARLY THE SECTION OF THIS OFFICIAL STATEMENT ENTITLED "RISK FACTORS," BEFORE MAKING AN INVESTMENT DECISION.

SELECTED FINANCIAL INFORMATION

(UNAUDITED)

2025 Certified Taxable Assessed Valuation	$ 67,565,323	(a)
2026 Preliminary Taxable Assessed Valuation	$ 248,060,950	(b)
Estimated Taxable Valuation as of May 1, 2026	$ 303,751,121	(c)
Direct Debt:		
The Outstanding Bonds	$ 19,915,000	
The Bonds	13,395,000	
Total	$ 33,310,000	
Estimated Overlapping Debt	$ 11,156,383	(d)
Total Direct and Estimated Overlapping Debt	$ 44,466,383	(d)
Direct Debt Ratios:		
As a percentage of the 2025 Certified Taxable Assessed Valuation	49.30 %	
As a percentage of the 2026 Preliminary Taxable Assessed Valuation	13.43 %	
As a percentage of the Estimated Taxable Valuation as of May 1, 2026	10.97 %	
Direct and Estimated Overlapping Debt Ratios:		
As a percentage of the 2025 Certified Taxable Assessed Valuation	65.81 %	
As a percentage of the 2026 Preliminary Taxable Assessed Valuation	17.93 %	
As a percentage of the Estimated Taxable Valuation as of May 1, 2026	14.64 %	
Road System Debt Service Fund Balance (as of May 14, 2026)	$ 341,647	(e)
Utility System Debt Service Fund Balance (as of May 14, 2026)	$ 771,251	(f)
Road System Capital Projects Fund Balance (as of May 14, 2026)	$ 21,734	
Utility System Capital Projects Fund (as of May 14, 2026)	$ 209,156	
General Fund Balance (as of May 14, 2026)	$ 286,923	

(a) Represents the taxable amount of assessed valuation of taxable properties in the District as of January 1, 2025, as provided by the Brazoria County Appraisal District (the "Appraisal District"). See "TAX DATA" and "TAXING PROCEDURES."

(b) Provided by the Appraisal District as the preliminary value as of January 1, 2026. This value represents the preliminary determination of the taxable value in the District as of January 1, 2026, provided by the Appraisal District. No taxes will be levied on this preliminary value, which is subject to review and downward adjustment. See "TAXING PROCEDURES."

(c) As of May 1, 2026, provided by the Appraisal District for information purposes only. Represents new construction within the District as of May 1, 2026. This estimate is based upon the same unit value used in the assessed taxable valuation. No taxes will be levied on this estimate. See "TAXING PROCEDURES."

(d) See "DISTRICT DEBT – Estimated Direct and Overlapping Debt Statement."

(e) Neither Texas law nor the Bond Resolution (herein defined) requires that the District maintain any particular sum in the Road System Debt Service Fund (herein defined). Funds in the Road System Debt Service Fund are not available to pay debt service on bonds issued for the Utility System (herein defined), such as the Outstanding Bonds (herein defined) issued for the Utility System and the Bonds.

(f) In addition to this amount, twelve (12) months of capitalized interest on the Bonds will be deposited into the Utility System Debt Service Fund (herein defined) upon closing of the Bonds. Neither Texas law nor the Bond Resolution requires that the District maintain any particular sum in the Utility System Debt Service Fund. Monies in the Utility System Debt Service Fund cannot be used to pay debt service on bonds issued for the Road System (herein defined), such as the Outstanding Bonds issued for the Road System.

SELECTED FINANCIAL INFORMATION

(UNAUDITED)

2025 Tax Rate per $100 of Assessed Taxable Valuation			
Utility System Debt Service	$	0.000	(a)
Road System Debt Service		0.000	(a)
Maintenance and Operations		0.900	
Total	$	0.900	
Combined Estimated Average Annual Debt Service Requirement (2026–2050)	$	2,238,572	(b)
Combined Estimated Maximum Annual Debt Service Requirement (2049)	$	2,411,544	(b)
Debt Service Tax Rate per $100 of Assessed Taxable Valuation Required to Pay the Combined Estimated Average Annual Debt Service Requirement on the Outstanding Bonds and the Bonds (2026–2050) at 95% Tax Collections:			
Based on the 2025 Certified Taxable Assessed Valuation	$	3.49	
Based on the 2026 Preliminary Taxable Assessed Valuation	$	0.95	
Based on the Estimated Taxable Valuation as of May 1, 2026	$	0.78	
Debt Service Tax Rate per $100 of Assessed Taxable Valuation Required to Pay the Combined Estimated Maximum Annual Debt Service Requirement on the Outstanding Bonds and the Bonds (2049) at 95% Tax Collections:			
Based on the 2025 Certified Taxable Assessed Valuation	$	3.76	
Based on the 2026 Preliminary Taxable Assessed Valuation	$	1.03	
Based on the Estimated Taxable Valuation as of May 1, 2026	$	0.84	
Single-Family Homes (including 154 under construction) as of May 1, 2026		560	(c)

(a) The District is authorized to levy two separate taxes to pay the debt service on bonds issued for the Utility System, such as the Outstanding Bonds and the Bonds, and bonds issued for the Road System. Such taxes are unlimited as to rate or amount. The District has not levied a debt service tax to date, but anticipates levying its first debt service tax rate for the Utility System debt service and the Road System debt service tax rate in 2026.

(b) Requirement of debt service on the Outstanding Bonds and the Bonds. Debt service on the Bonds is a requirement estimate based on the Bonds being sold at an average annual interest rate of 4.50%. See "DISTRICT DEBT – Pro-Forma Debt Service Requirement Schedule."

(c) Of the 560 homes completed and under construction as of May 14, 2026, 448 homes were sold to homeowners within the District (which excludes the 32 model homes under construction in the Ellwood subdivision).

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57

(A Political Subdivision of the State of Texas, located within Brazoria County)

$13,395,000
Unlimited Tax Bonds
Series 2026

INTRODUCTION

This Preliminary Official Statement provides certain information in connection with the issuance by Brazoria County Municipal Utility District No. 57 (the "District") of its $13,395,000 Unlimited Tax Bonds, Series 2026 (the "Bonds").

The Bonds are issued pursuant to: (i) an order of the Texas Commission on Environmental Quality (the "TCEQ"); (ii) the general laws of the State of Texas, including Chapters 49 and 54 of the Texas Water Code, as amended, applicable to municipal utility districts created under Section 59, Article XVI, Texas Constitution; (iii) a resolution authorizing the issuance of the Bonds adopted by the Board of Directors of the District (the "Board") on the date of sale of the Bonds (the "Bond Resolution"); and (iv) an election held within the District on November 8, 2022.

Certain capitalized terms used in this Official Statement have the same meanings assigned to such terms in the Bond Resolution, except as otherwise indicated herein.

There follow in this Preliminary Official Statement descriptions of the Bonds, the Developers (herein defined), the Bond Resolution and certain information about the District and its finances. All descriptions of documents contained herein are only summaries and are qualified in their entirety by reference to each such document. Copies of such documents may be obtained from Allen Boone Humphries Robinson LLP, 3200 Southwest Freeway, Suite 2600, Houston, Texas 77027, upon payment of the costs of duplication, therefor.

RISK FACTORS

General

The Bonds, which are obligations of the District and not of the State of Texas, Brazoria County, Texas (the "County"); the City of Iowa Colony ("Iowa Colony"), Texas, City of Manvel ("Manvel"), Texas, or any political subdivision other than the District, will be secured by a continuing direct annual ad valorem tax, without legal limitation as to rate or amount, levied against all taxable property located within the District. Therefore, the ultimate security for payment of the principal of and interest on the Bonds depends upon the ability of the District to collect from the property owners within the District taxes levied against all taxable property located within the District, or, in the event taxes are not collected and foreclosure proceedings are instituted by the District, upon the value of the taxable property with respect to taxes levied by the District and by other taxing authorities. The District makes no representations that over the life of the Bonds the property within the District will maintain a value sufficient to justify continued payment of taxes by the property owners. The potential increase in taxable valuation of District property is directly related to the economics of the residential housing industry, not only due to general economic conditions, but also due to the particular factors discussed below. See "DEVELOPMENT OF THE DISTRICT," "TAX DATA" and "TAXING PROCEDURES."

Effects of Hurricane Harvey

The greater City of Houston, Texas, area sustained widespread damage as a result of Hurricane Harvey's landfall along the Texas Gulf Coast on August 25, 2017, and historic levels of rainfall during the succeeding four days. The District is located in the County, which is located on the Texas Gulf Coast.

The District cannot predict the effect that additional extreme weather events may have upon the District and the Gulf Coast. Additional extreme weather events have the potential to cause damage within the District and along the Gulf Coast generally that could have a negative effect on taxable assessed valuations in the District and the economy of the District and the region.

Certain qualified taxpayers, including owners of residential homesteads, located within a disaster area and whose property has been damaged as a direct result of the disaster, are entitled to enter into a tax payment installment agreement with a taxing jurisdiction such as the District if the taxpayer pays at least one-fourth of the tax bill imposed on the property by the delinquency date. The remaining taxes may be paid without penalty or interest in three equal installments within six months of the delinquency date.

Potential Effects of Oil Price Declines on the Houston Area

The economy of the Houston area has, in the past, been particularly affected by adverse conditions in the oil and gas industry, and such conditions and their spillover effects into other industries could result in declines in the demand for residential and commercial property in the Houston area and could reduce or negatively affect property values within the

District. The District cannot predict the impact that negative conditions in the oil industry could have on property values in the District.

Factors Affecting Taxable Values and Tax Payments

Economic Factors: The rate of development of the District is directly related to the vitality of the residential housing industry. New residential housing construction can be significantly affected by factors such as interest rates, construction costs, and consumer demand. Decreased levels of home construction activity would restrict the growth of property values in the District. The District cannot predict the pace or magnitude of any future development or home construction in the District.

Developers: There is no commitment by or legal requirement of the principal landowners/developers or any other landowner to the District to proceed at any particular rate or according to any specified plan with the development of land in the District, or of any homebuilder to proceed at any particular pace with the construction of homes in the District. Moreover, there is no restriction on any landowner's right to sell its land. Therefore, the District can make no representation about the probability of future development, if any, or the rate of future home construction activity in the District. Failure to construct taxable improvements on developed lots would restrict the rate of growth of taxable values in the District and result in higher tax rates. See "DEVELOPMENT OF THE DISTRICT," "DEVELOPERS" and "TAX DATA – Principal Taxpayers."

Dependence on Principal Taxpayers: The ability of any principal landowner to make full and timely payments of taxes levied against its property by the District and similar taxing authorities will directly affect the District's ability to meet its debt service obligations. As illustrated in this Preliminary Official Statement under the caption "TAX DATA – Principal Taxpayers," the District's principal taxpayers in 2025 own approximately 28.21% of the District's total 2025 Certified Taxable Assessed Valuation of property located within the District. GR-M1 LTD, an entity associated with Rise Communities, LLC, one of the Developers in the District, owns approximately 6.95% or $4,698,923 of the District's total 2025 Certified Taxable Assessed Valuation of property located within the District. In the event that a Developer, any other taxpayer, or any combination of taxpayers, should default in the payment of taxes in an amount which exceeds the surpluses in the District's debt service funds, the ability of the District to make timely payment of debt service on the Bonds will be dependent on its ability to enforce and liquidate its tax liens, which is a time-consuming process. Failure to recover or borrow funds in a timely fashion could result in an excessive District tax rate. The District is not required by law or the Bond Resolution to maintain any specified amount of surplus in its interest and sinking fund. See "TAX DATA – Principal Taxpayers" and "TAXING PROCEDURES – Levy and Collection of Taxes."

Maximum Impact on District Tax Rates: Assuming no further development or home construction, the value of the land and improvements currently within the District will be the major determinant of the ability or willingness of property owners to pay their taxes. The 2025 Certified Taxable Assessed Value of property located within the District is $67,565,323, the 2026 Preliminary Taxable Assessed Valuation is $248,060,950, and the Estimated Taxable Valuation as of May 1, 2026, is $303,751,121. After issuance of the Bonds, the combined estimated maximum annual debt service requirement on the Outstanding Bonds and the Bonds will be $2,411,544 (2049) and the combined estimated average annual debt service requirement on the Outstanding Bonds (herein defined) and the Bonds will be $2,238,572 (2026–2050). Assuming no increase to nor decrease from the 2025 Certified Taxable Assessed Valuation, tax rates of $3.76 and $3.49 per $100 of Certified Taxable Assessed Value at a 95% tax collection rate would be necessary to pay the combined estimated maximum annual debt service requirement and the combined estimated average annual debt service requirement, respectively. Assuming no increase to nor decrease from 2026 Preliminary Taxable Assessed Valuation, tax rates of $1.03 and $0.95 per $100 of 2026 Preliminary Taxable Assessed Valuation at a 95% tax collection rate would be necessary to pay the combined estimated maximum annual debt service requirement and the combined estimated average annual debt service requirement, respectively. Assuming no increase to nor decrease from the Estimated Taxable Valuation as of May 1, 2026, tax rates of $0.84 and $0.78 per $100 of assessed taxable valuation at 95% tax collection rate would be necessary to pay the combined estimated maximum annual debt service requirement and the combined estimated average annual debt service requirement, respectively.

The District can make no representation that the taxable property values in the District will increase in the future or will maintain a value sufficient to support the proposed District tax rate or to justify continued payment of taxes by property owners. The District has levied a total tax rate of $0.90 per $100 of assessed valuation for the 2025 tax year. Such rate is composed entirely of a maintenance and operations tax rate of $0.90 per $100 of assessed valuation.

Competitive Nature of Residential Housing Market

The housing industry in the City of Houston, Texas, area is very competitive, but the District can give no assurance that the building programs which are planned by any home builder(s) will be continued or completed. The respective competitive position of the homebuilders listed herein and any other developer or homebuilder(s) which might attempt future home building or development projects in the District, the sale of developed lots or in the construction and sale of single-family residential units, are affected by most of the factors discussed in this section, and such competitive positions are directly related to tax revenues received by the District and the growth and maintenance of taxable values in the District.

The demand for and construction of taxable improvements in the District could be affected by competition from other developments near the District. In addition to competition for new single-family home sales from other developments, there are numerous previously-owned single-family homes in more established commercial centers and neighborhoods closer to the City of Houston, Texas that are for sale. Such existing developments could represent additional competition for new development proposed to be constructed within the District. The competitive position of a Developers or the principal landowners in the sale of land, and the sale or leasing of residences is affected by most of the factors discussed in this section. Such a competitive position is directly related to the growth and maintenance of taxable values in the District and tax revenues to be received by the District. The District can give no assurance that building and marketing programs in the District by the Developers will be implemented or, if implemented, will be successful.

The District is located approximately 22 miles south of the central business district of the City of Houston, Texas. Many of the single-family developments with which the District competes are in a more developed state and have lower taxes. As a result, particularly during times of increased competition, Developers within the District may be at a competitive disadvantage to the developers in other single-family projects located closer to major urban centers or in a more developed state. See "THE DISTRICT" and "DEVELOPMENT OF THE DISTRICT – Status of Development within the District."

Increase in Costs of Building Materials

As a result of supply issues, shipping constraints, and ongoing trade disputes (including tariffs), there have been recent substantial increases in the cost of lumber and other building materials, causing many homebuilders and general contractors to experience budget overruns. Further, the unpredictable nature of current trade policy (including the threatened imposition of tariffs) may impact the ability of the Developer or homebuilders in the District to estimate costs. Additionally, immigration policies may affect the State's workforce, and any labor shortages that could occur may impact the rate of construction within the District. Uncertainty surrounding availability and cost of materials may result in decreased levels of construction activity, and may restrict the growth of property values in the District. The District makes no representations regarding the probability of development or homebuilding continuing in a timely manner or the effects that current or future economic or governmental circumstances may have on any plans of the Developer or homebuilders.

Tax Collection Limitations

The District's ability to make debt service payments may be adversely affected by its inability to collect ad valorem taxes. Under Texas law, the levy of ad valorem taxes by the District constitutes a lien in favor of the District on a parity with the liens of all other state and local taxing authorities on the property against which taxes are levied, and such lien may be enforced by foreclosure. The District's ability to collect ad valorem taxes through such foreclosure may be impaired by (a) cumbersome, time-consuming and expensive collection procedures, (b) a bankruptcy court's stay of tax collection procedures against a taxpayer, (c) market conditions limiting the proceeds from a foreclosure sale of taxable property, or (d) the taxpayer's right to redeem the property within two years of foreclosure for residential homestead and agricultural use property and within six (6) months of foreclosure for other property. While the District has a lien on taxable property within the District for taxes levied against such property, such lien can be foreclosed only in a judicial proceeding. Moreover, the value of property to be sold for delinquent taxes and thereby the potential sales proceeds available to pay debt service on the Bonds, may be limited by among other factors, the existence of other tax liens on the property, by the current aggregate tax rate being levied against the property, or by the taxpayers' right to redeem residential or agricultural use property within two (2) years of foreclosure and all other property within six (6) months of foreclosure. Finally, a bankruptcy court with jurisdiction over bankruptcy proceedings initiated by or against a taxpayer within the District pursuant to Federal Bankruptcy Code could stay any attempt by the District to collect delinquent ad valorem taxes assessed against such taxpayer. See "TAXING PROCEDURES."

Registered Owners' Remedies and Bankruptcy

In the event of default in the payment of principal of or interest on the Bonds, the registered owners of the Bonds (the "Registered Owners") have a right to seek a writ of mandamus requiring the District to levy sufficient taxes each year to make such payments. Except for mandamus, the Bond Resolution does not specifically provide for remedies to protect and enforce the interests of the Registered Owners. There is no acceleration of maturity of the Bonds in the event of default and, consequently, the remedy of mandamus may have to be relied upon from year to year. Although the Registered Owners could obtain a judgment against the District, such a judgment could not be enforced by a direct levy and execution against the District's property. Further, the Registered Owners cannot themselves foreclose on property within the District or sell property within the District in order to pay the principal of and interest on the Bonds. Since there is no trust indenture or trustee, the Registered Owners would have to initiate and finance the legal process to enforce their remedies. The enforceability of the rights and remedies of the Registered Owners may be limited further by laws relating to bankruptcy, reorganization or other similar laws of general application affecting the rights of creditors of political subdivisions such as the District. In this regard, should the District file a petition for protection from creditors under federal bankruptcy laws, the remedy of mandamus or the right of the District to seek judicial foreclosure of its tax lien would be automatically stayed and could not be pursued unless authorized by a federal bankruptcy judge.

Marketability

The District has no understanding (other than the initial reoffering yields) with the winning bidder of the Bonds (the "Initial Purchaser") regarding the reoffering yields or prices of the Bonds and has no control over the trading of the Bonds in the secondary market. Moreover, there is no assurance that a secondary market will be made for the Bonds. If there is a secondary market, the difference between the bid and asked price of the Bonds may be greater than the bid and asked spread of other bonds generally bought, sold, or traded in the secondary market. See "SALE AND DISTRIBUTION OF THE BONDS."

Future Debt

The District reserves in the Bond Resolution the right to issue the remaining $456,190,000 principal amount of unlimited tax bonds for the purpose of acquiring or constructing, operating and maintaining water, wastewater, and drainage facilities to serve the District (the "Utility System") and $483,900,000 for the refunding of such bonds; $339,100,000 principal amount of unlimited tax bonds for the purpose of constructing or acquiring a road system to serve the District (the "Road System") and $344,700,000 for the refunding of such bonds; and $163,790,000 principal amount of unlimited tax bonds for the purpose of constructing parks and recreational facilities to serve the District (the "Park System") and $163,790,000 for the refunding of such bonds, and such additional bonds as may hereafter be approved by the voters of the District. See "THE BONDS – Issuance of Additional Debt." The District has also reserved the right to issue certain other additional bonds, special project bonds, and other obligations described in the Bond Resolution authorized by the voters of the District, which may be issued by the District from time to time as needed. Issuance of the remaining $456,190,000 of unlimited tax bonds for the purpose of acquiring or constructing the Utility System and $483,900,000 for the refunding of such bonds, as well as the $163,790,000 of unlimited tax bonds for the purpose of acquiring or constructing the Park System to serve the District and $163,790,000 for the refunding of such bonds, is subject to approval by the TCEQ.

Following the issuance of the Bonds, $456,190,000 principal amount of unlimited tax bonds for the Utility System; $339,100,000 principal amount of unlimited tax bonds for the Road System; and $163,790,000 principal amount of unlimited tax bonds for the Park System will remain authorized and unissued. All refunding bonds remain authorized but unissued. See "THE BONDS – Authority for Issuance."

As of May 14, 2026, the District owes the Developers approximately $18,937,504 for expenditures relating to the acquisition or construction of the Utility System, the Road System, and the Park System serving the District. Additionally, the District owes the Developers approximately $14,971,233 for projects under construction for expenditures relating to the acquisition or construction of the Utility System, the Road System, and the Park System serving the District. If additional bonds are issued in the future and property values have not increased proportionately, such issuance may increase gross debt-property valuation ratios and thereby adversely affect the investment quality or security of the Bonds. See "THE BONDS – Issuance of Additional Debt" and See "APPENDIX A."

Additionally, the District intends to issue unlimited tax bonds for the Road System in August 2026, with a scheduled closing date of September 10, 2026, in an aggregate principal amount of $3,120,000. If the District does issue park bonds, the outstanding principal amount of such bonds may not exceed an amount equal to one percent of the value of the taxable property in the District at the time of issuance, unless the District meets certain financial feasibility requirements under the TCEQ rules, in which case the outstanding principal amount of such bonds issued by the District may exceed an amount equal to one percent but not greater than three percent of the value of the taxable property in the District.

Continuing Compliance with Certain Covenants

The Bond Resolution contains covenants by the District intended to preserve the exclusion from gross income of interest on the Bonds. Failure of the District to comply with such covenants on a continuous basis prior to maturity of the Bonds could result in interest on the Bonds becoming taxable retroactively to the date of original issuance. See "TAX MATTERS."

Environmental Regulations

Wastewater treatment, water supply, storm sewer facilities and construction activities within the District are subject to complex environmental laws and regulations at the federal, state and local levels that may require or prohibit certain activities that affect the environment, such as:

- Requiring permits for construction and operation of water wells, wastewater treatment and other facilities;
- Restricting the manner in which wastes are treated and released into the air, water and soils;
- Restricting or regulating the use of wetlands or other properties; or
- Requiring remedial action to prevent or mitigate pollution.

Sanctions against a municipal utility district or other type of special purpose district for failure to comply with environmental laws and regulations may include a variety of civil and criminal enforcement measures, including assessment of monetary penalties, imposition of remedial requirements and issuance of injunctions to ensure future compliance. Environmental laws and compliance with environmental laws and regulations can increase the cost of planning, designing, constructing and operating water production and wastewater treatment facilities. Environmental laws can also inhibit growth and development within the District. Further, changes in regulations occur frequently, and any changes that result in more stringent and costly requirements could materially impact the District.

Air Quality Issues. Air quality control measures required by the United States Environmental Protection Agency (the "EPA") and the TCEQ may impact new industrial, commercial and residential development in the Houston area. Under the Clean Air Act ("CAA") Amendments of 1990, the eight-county Houston-Galveston-Brazoria area ("HGB Area")—Harris, Galveston, Brazoria, Chambers, Fort Bend, Waller, Montgomery and Liberty Counties—has been designated a nonattainment area under two separate federal ozone standards: the eight-hour ozone standard of 75 ppb promulgated by the EPA in 2008 (the "2008 Ozone Standard"), and the EPA's most-recent promulgation of an even lower, 70 ppb eight-hour ozone standard in 2015 (the "2015 Ozone Standard"). While the State of Texas has been able to demonstrate steady progress and improvements in air quality in the HGB Area, the HGB Area remains subject to CAA nonattainment requirements.

The HGB Area is currently designated as a "severe" nonattainment area under the 2008 Ozone Standard, with an attainment deadline of July 20, 2027. If the EPA ultimately determines that the HGB Area has failed to meet the attainment deadline based on the relevant data, the area is subject to reclassification to a nonattainment classification that provides for more stringent controls on emissions from the industrial sector. In addition, the EPA may impose a moratorium on the awarding of federal highway construction grants and other federal grants for certain public works construction projects if it finds that an area fails to demonstrate progress in reducing ozone levels.

The HGB Area is currently designated as a "serious" nonattainment area under the 2015 Ozone Standard, with an attainment deadline of August 3, 2027. For purposes of the 2015 Ozone Standard, the HGB Area consists of only six counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, and Montgomery Counties.

In order to demonstrate progress toward attainment of the EPA's ozone standards, the TCEQ has established a state implementation plan ("SIP") for the HGB Area setting emission control requirements, some of which regulate the inspection and use of automobiles. These types of measures could impact how people travel, what distances people are willing to travel, where people choose to live and work, and what jobs are available in the HGB Area. These SIP requirements can negatively impact business due to the additional permitting/regulatory constraints that accompany this designation and because of the community stigma associated with a nonattainment designation. It is possible that additional controls will be necessary to allow the HGB Area to reach attainment with the ozone standards by the EPA's attainment deadlines. These additional controls could have a negative impact on the HGB Area's economic growth and development.

Water Supply & Discharge Issues. Water supply and discharge regulations that municipal utility districts, including the District, may be required to comply with involve: (1) groundwater well permitting and surface water appropriation; (2) public water supply systems; (3) wastewater discharges from treatment facilities; (4) storm water discharges; and (5) wetlands dredge and fill activities. Each of these is addressed below:

Certain governmental entities regulate groundwater usage in the HGB Area. A municipal utility district or other type of special purpose district that (i) is located within the boundaries of such an entity that regulates groundwater usage, and (ii) relies on local groundwater as a source of water supply, may be subject to requirements and restrictions on the drilling of water wells and/or the production of groundwater that could affect both the engineering and economic feasibility of district water supply projects.

Pursuant to the federal Safe Drinking Water Act ("SDWA") and the EPA's National Primary Drinking Water Regulations ("NPDWRs"), which are implemented by the TCEQ's Water Supply Division, a municipal utility district's provision of water for human consumption is subject to extensive regulation as a public water system. Municipal utility districts must generally provide treated water that meets the primary and secondary drinking water quality standards adopted by the TCEQ, the applicable disinfectant residual and inactivation standards, and the other regulatory action levels established under the agency's rules. The EPA has established NPDWRs for more than ninety (90) contaminants and has identified and listed other contaminants which may require national drinking water regulation in the future. Further, the EPA has established a NPDWR for six (6) Per- and Polyflouroalkyl Substances ("PFAS"), which requires public water systems to perform certain monitoring and remediation measures. Public water systems may be subject to additional PFAS regulation in the future, which could increase the cost of constructing, operating, and maintaining water production and distribution facilities.

Texas Pollutant Discharge Elimination System ("TPDES") permits set limits on the type and quantity of discharge, in accordance with state and federal laws and regulations. The TCEQ reissued the TPDES Construction General Permit (TXR150000) ("CGP"), with an effective date of March 5, 2023, which is a general permit authorizing the discharge of stormwater runoff associated with small and large construction sites and certain non-stormwater discharges into surface

water in the state. The CGP has a 5-year permit term, and is then subject to renewal. Moreover, the Clean Water Act ("CWA") and Texas Water Code require municipal wastewater treatment plants to meet secondary treatment effluent limitations and more stringent water quality-based limitations and requirements to comply with the Texas water quality standards. Any water quality-based limitations and requirements with which a municipal utility district must comply may have an impact on the municipal utility district's ability to obtain and maintain compliance with TPDES permits.

The TCEQ issued the General Permit for Phase II (Small) Municipal Separate Storm Sewer Systems (the "MS4 Permit") on August 15, 2024. The MS4 Permit authorizes the discharge of stormwater to surface water in the state from small municipal separate storm sewer systems. While the District is currently not subject to the MS4 Permit, if the District's inclusion were required at a future date, the District could incur substantial costs to develop, implement, and maintain the necessary plans as well as to install or implement best management practices to minimize or eliminate unauthorized pollutants that may otherwise be found in stormwater runoff in order to comply with the MS4 Permit.

Operations of utility districts, including the District, are also potentially subject to requirements and restrictions under the CWA regarding the use and alteration of wetland areas that are within the "waters of the United States." The District must obtain a permit from the United States Army Corps of Engineers ("USACE") if operations of the District require that wetlands be filled, dredged, or otherwise altered.

On May 25, 2023, the Supreme Court of the United States issued its decision in *Sackett v. EPA*, which clarified the definition of "waters of the United States" and significantly restricted the reach of federal jurisdiction under the CWA. Under the *Sackett* decision, "waters of the United States" includes only geographical features that are described in ordinary parlance as "streams, oceans, rivers, and lakes" and to adjacent wetlands that are indistinguishable from such bodies of water due to a continuous surface connection. Subsequently, the EPA and USACE issued a final rule amending the definition of "waters of the United States" under the CWA to conform with the Supreme Court's decision.

While the *Sackett* decision and subsequent legislation removed a great deal of uncertainty regarding the ultimate scope of "waters of the United States" and the extent of EPA and USACE jurisdiction, operations of municipal utility districts, including the District, could potentially be subject to additional restrictions and requirements, including additional permitting requirements, in the future.

Extreme Weather Events

The Texas Gulf Coast area is subject to occasional severe tropical weather events, including tropical storms and hurricanes. If the District were to sustain damage to its facilities requiring substantial repair or replacement or if substantial damage were to occur to taxable property within the District as a result of such a weather event, the investment security of the Bonds could be adversely affected.

The greater Houston area has experienced multiple storms exceeding a 0.2% probability (i.e. "500-year flood" events) since 2015, including Hurricane Harvey ("Harvey"), which made landfall along the Texas Gulf Coast on August 26, 2017, and brought historic levels of rainfall during the successive four days.

If a future weather event significantly damaged all or part of the improvements within the District, the assessed value of property within the District could be substantially reduced, which could result in a decrease in tax revenues and/or necessitate an increase the District's tax rate. Further, there can be no assurance that a casualty loss to taxable property within the District will be covered by insurance (or that property owners will even carry flood or other casualty insurance), that any insurance company will fulfill its obligation to provide insurance proceeds, or that insurance proceeds will be used to rebuild or repair any damaged improvements within the District. Even if insurance proceeds are available and improvements are rebuilt, there could be a lengthy period in which assessed values within the District could be adversely affected. See "RISK FACTORS – Factors Affecting Taxable Values and Tax Payments – Maximum Impact on District Tax Rates."

Potential Impact of Natural Disaster

The District is located near the Texas Gulf Coast and, as it has in the past, could be impacted by wide-spread fires, earthquakes, or weather events such as hurricanes, tornadoes, tropical storms, or other severe weather events that could produce high winds, heavy rains, hail, and flooding. In the event that a natural disaster should damage or destroy improvements and personal property in the District, the assessed value of such taxable properties could be substantially reduced, resulting in a decrease in the taxable assessed value of the District or an increase in the District's tax rates.

There can be no assurance that a casualty will be covered by insurance (certain casualties, including flood, are usually excepted unless specific insurance is purchased), that any insurance company will fulfill its obligation to provide insurance proceeds, or that insurance proceeds will be used to rebuild, repair, or replace any taxable properties in the District that were damaged. Even if insurance proceeds are available and damaged properties are rebuilt, there could a lengthy period in which assessed values in the District would be adversely affected. There can be no assurance the District will not sustain damage from such natural disasters.

Specific Flood Type Risks

The District may be subject to the following flood risks:

Ponding (or Pluvial) Flood. Ponding, or pluvial, flooding occurs when heavy rainfall creates a flood event independent of an overflowing water body, typically in relatively flat areas. Intense rainfall can exceed the drainage capacity of a drainage system, which may result in water within the drainage system becoming trapped and diverted onto streets and nearby property until it is able to reach a natural outlet. Ponding can also occur in a flood pool upstream or behind a dam, levee or reservoir.

Riverine (or Fluvial) Flood. Riverine, or fluvial, flooding occurs when water levels rise over the top of river, bayou or channel banks due to excessive rain from tropical systems making landfall and/or persistent thunderstorms over the same area for extended periods of time. The damage from a riverine flood can be widespread. The overflow can affect smaller rivers and streams downstream, or may sheet-flow over land. Flash flooding is a type of riverine flood that is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash flooding can also occur even if no rain has fallen, for instance, after a levee, dam or reservoir has failed or experienced an uncontrolled release, or after a sudden release of water by a debris or ice jam. In addition, planned or unplanned controlled releases from a dam, levee or reservoir also may result in flooding in areas adjacent to rivers, bayous or drainage systems downstream.

National Weather Service Atlas 14 Rainfall Study

The National Weather Service recently completed a rainfall study known as NOAA Atlas 14, Volume 11 Precipitation-Frequency Atlas of the United States ("Atlas 14"). Floodplain boundaries within the District may be redrawn based on the Atlas 14 study based on a higher statistical rainfall amount, resulting in interim floodplain regulations applying to a larger number of properties and consequently leaving less developable property within the District. Such regulations could additionally result in higher insurance rates, increased development fees, and stricter building codes for any property located within the expanded boundaries of the floodplain.

Approval of the Bonds

The Attorney General of Texas must approve the legality of the Bonds prior to their delivery. The Attorney General of Texas, however, does not pass upon or guarantee the safety of the Bonds as an investment or the adequacy or accuracy of the information contained in this Official Statement.

Bond Insurance Risk Factors

The District has applied for a bond insurance policy to guarantee the scheduled payment of principal and interest on each series of Bonds. THE PURCHASE OF SUCH INSURANCE IS MANDATORY. If an insurance policy is purchased, the following are risk factors relating to bond insurance.

In the event of default of the payment of principal or interest with respect to the Bonds when all or some becomes due, any owner of the Bonds shall have a claim under the applicable bond insurance policy on the Bonds, (the "Policy") for such payments. However, in the event of any acceleration of the due date of such principal by reason of mandatory or optional redemption or acceleration resulting from default or otherwise, other than any advancement of maturity pursuant to a mandatory sinking fund payment, the payments are to be made in such amounts and at such times as such payments would have been due had there not been any such acceleration. The Policy does not insure against redemption premium, if any. The payment of principal and interest in connection with mandatory or optional prepayment of the Bonds by the District which is recovered by the District from the bond owner as a voidable preference under applicable bankruptcy law is covered by the insurance policy; however, such payments will be made by the bond insurer at such time and in such amounts as would have been due absent such prepayment by the District unless the bond insurer chooses to pay such amounts at an earlier date.

Under most circumstances, default of payment of principal and interest does not obligate acceleration of the obligations of the bond insurer without appropriate consent. The bond insurer may direct and must consent to any remedies and the bond insurer's consent may be required in connection with amendments to any applicable bond documents.

In the event the bond insurer is unable to make payment of principal and interest as such payments become due under the Policy, the Bonds are payable solely from the moneys received pursuant to the applicable bond documents. In the event the bond insurer becomes obligated to make payments with respect to the Bonds, no assurance is given that such event will not adversely affect the market price of the Bonds or the marketability (liquidity) for the Bonds.

The long-term ratings on the Bonds are dependent in part on the financial strength of the bond insurer and its claim paying ability. The bond insurer's financial strength and claims paying ability are predicated upon a number of factors which could change over time. No assurance is given that the long-term ratings of the bond insurer and of the ratings on the Bonds insured by the bond insurer will not be subject to downgrade and such event could adversely affect the market price of the Bonds or the marketability (liquidity) for the Bonds. See "MUNICIPAL BOND INSURANCE" and "RATINGS."

The obligations of the bond insurer are contractual obligations and in an event of default by the bond insurer, the remedies available may be limited by applicable bankruptcy law or state law related to insolvency of insurance companies.

Neither the District or Initial Purchaser has made independent investigation into the claims paying ability of the bond insurer and no assurance or representation regarding the financial strength or projected financial strength of the bond insurer is given. Thus, when making an investment decision, potential investors should carefully consider the ability of the District to pay principal and interest on the Bonds and the claims paying ability of the bond insurer, particularly over the life of the investment. See "MUNICIPAL BOND INSURANCE" herein for further information provided by the bond insurer and the Policy, which includes further instructions for obtaining current financial information concerning the bond insurer.

THE BONDS

General

The following is a description of some of the terms and conditions of the Bonds, which description is qualified in its entirety by reference to the Bond Resolution. A copy of the Bond Resolution may be obtained from the District upon written request made to the District's Bond Counsel, Allen Boone Humphries Robinson LLP, Phoenix Tower, 3200 Southwest Freeway, Suite 2600, Houston, Texas 77027.

The Bonds are dated August 1, 2026, and accrue interest from the date of delivery which is expected to be on or about August 13, 2026 (the "Date of Delivery"), with interest payable on March 1, 2027, and on each September 1 and March 1 thereafter (each an "Interest Payment Date") until the earlier of maturity or prior redemption. The Bonds are fully registered bonds maturing on September 1 of the years shown under "PRINCIPAL AMOUNTS, MATURITIES, INTEREST RATES AND INITIAL REOFFERING YIELDS AND CUSIPS" on the inside cover page of this Official Statement. Principal of the Bonds will be payable to the Registered Owners at maturity or redemption upon presentation at the principal payment office of the paying agent/registrar, initially, BOKF, NA, Dallas, Texas (the "Paying Agent/Registrar"). Interest on the Bonds will be payable by check, dated as of the Interest Payment Date, and mailed by the Paying Agent/Registrar to Registered Owners as shown on the records of the Paying Agent/Registrar at the close of business on the 15th calendar day of the month next preceding the Interest Payment Date (the "Record Date") or by such other customary banking arrangements as may be agreed upon by the Paying Agent/Registrar and a Registered Owner at the risk and expense of such Registered Owner.

Book-Entry-Only System

This section describes how ownership of the Bonds is to be transferred and how the principal of and interest on the Bonds are to be paid to and credited by The Depository Trust Company ("DTC"), while the Bonds are registered in its nominee's name. The information in this section concerning DTC and the Book-Entry-Only System has been provided by DTC for use in disclosure documents such as this Official Statement. The District believes the source of such information to be reliable, but takes no responsibility for the accuracy or completeness thereof.

The District cannot and does not give any assurance that (1) DTC will distribute payments of debt service on the Bonds, or redemption or other notices, to DTC Participant, (2) DTC Participants or others will distribute debt service payments paid to DTC or its nominee (as the registered owner of the Bonds), or redemption or other notices, to the Beneficial Owners, or that they will do so on a timely basis, or (3) DTC will serve and act in the manner described in this Official Statement. The current rules applicable to DTC are on file with the Securities and Exchange Commission, and the current procedures of DTC to be followed in dealing with DTC Participants are on file with DTC.

DTC will act as securities depository for the Bonds. The Bonds will be issued as fully-registered securities registered in the name of Cede & Co. (DTC's partnership nominee) or such other name as may be required by an authorized representative of DTC. One fully-registered Bond certificate will be issued for each of the Bonds, each in the aggregate principal amount of such issue, and will be deposited with DTC.

DTC, the world's largest securities depository, is a limited-purpose trust company organized under the New York Banking Law, a "banking organization" within the meaning of the New York Banking Law, a member of the Federal Reserve System, a "clearing corporation" within the meaning of the New York Uniform Commercial Code, and a "clearing agency" registered pursuant to the provisions of Section 17A of the Securities Exchange Act of 1934. DTC holds and provides asset servicing for over 3.5 million issues of U.S. and non-U.S. equity issues, corporate and municipal debt issues, and money market instruments (from over 100 countries) that DTC's participants ("Direct Participants") deposit with DTC. DTC also facilitates the post-trade settlement among Direct Participants of sales and other securities transactions in deposited securities, through electronic computerized Book-Entry-Only transfers and pledges between Direct Participants' accounts. This eliminates the need for physical movement of securities certificates. Direct Participants include both U.S. and non-U.S. securities brokers and dealers, banks, trust companies, clearing corporations, and certain other organizations. DTC is a wholly-owned subsidiary of The Depository Trust & Clearing Corporation ("DTCC"). DTCC is the holding company for DTC, National Securities Clearing Corporation and Fixed Income Clearing Corporation, all of which are registered clearing agencies. DTCC is owned by the users of its regulated subsidiaries. Access to the DTC system is also available to others such

as both U.S. and non-U.S. securities brokers and dealers, banks, trust companies, and clearing corporations that clear through or maintain a custodial relationship with a Direct Participant, either directly or indirectly ("Indirect Participants"). DTC has a Standard & Poor's rating of AA+. The DTC Rules applicable to its Participants are on file with the Securities and Exchange Commission. More information about DTC can be found at www.dtcc.com.

Purchases of Bonds under the DTC system must be made by or through Direct Participants, which will receive a credit for the Bonds on DTC's records. The ownership interest of each actual purchase of each Bond ("Beneficial Owner") is in turn to be recorded on the Direct and Indirect Participants' records. Beneficial Owners will not receive written confirmation from DTC of their purchase. Beneficial Owners are, however, expected to receive written confirmations providing details of the transaction, as well as periodic statements of their holdings, from the Direct or Indirect Participant through which the Beneficial Owner entered into the transaction. Transfers of ownership interests in the Bonds are to be accomplished by entries made on the books of Direct and Indirect Participants acting on behalf of Beneficial Owners. Beneficial Owners will not receive certificates representing their ownership interests in Securities, except in the event that use of the Book-Entry-Only System for the Bonds is discontinued.

To facilitate subsequent transfers, all Bonds deposited by Direct Participants with DTC are registered in the name of DTC's partnership nominee, Cede & Co., or such other name as may be requested by an authorized representative of DTC. The deposit of Bonds with DTC and their registration in the name of Cede & Co. or such other DTC nominee do not effect any change in beneficial ownership. DTC has no knowledge of the actual Beneficial Owners of the Bonds; DTC's records reflect only the identity of the Direct Participants to whose accounts such Bonds are credited, which may or may not be the Beneficial Owners. The Direct and Indirect Participants will remain responsible for keeping account of their holdings on behalf of their customers.

Conveyance of notices and other communications by DTC to Direct Participants, by Direct Participants to Indirect Participants, and by Direct Participants and Indirect Participants to Beneficial Owners will be governed by arrangements among them, subject to any statutory or regulatory requirements as may be in effect from time to time.

Redemption notices shall be sent to DTC. If less than all of the Bonds within an issue are being redeemed, DTC's practice is to determine by lot the amount of the interest of each Direct Participant in such issue to be redeemed.

Neither DTC nor Cede & Co. (nor any other DTC nominee) will consent or vote with respect to Securities unless authorized by a Direct Participant in accordance with DTC's MMI Procedures. Under its usual procedures, DTC mails an Omnibus Proxy to Issue as soon as possible after the record date. The Omnibus Proxy assigns Cede & Co.'s consenting or voting rights to those Direct Participants to whose accounts Securities are credited on the record date (identified in a listing attached to the Omnibus Proxy).

Redemption proceeds, principal and interest payments on the Bonds will be made to Cede & Co., or such other nominee as may be requested by an authorized representative of DTC. DTC's practice is to credit Direct Participants' accounts upon DTC's receipt of funds and corresponding detail information from the District or Paying Agent/Registrar, on payable date in accordance with their respective holdings shown on DTC's records. Payments by Participants to Beneficial Owners will be governed by standing instructions and customary practices, as is the case with securities held for the accounts of customers in bearer form or registered in "street name," and will be the responsibility of such Participant and not of DTC, Paying Agent/Registrar or the District, subject to any statutory or regulatory requirements as may be in effect from time to time. Payment of redemption proceeds, principal and interest payments to Cede & Co. (or such other nominee as may be requested by an authorized representative of DTC) is the responsibility of the District or Paying Agent/Registrar, disbursement of such payments to Direct Participants will be the responsibility of DTC, and disbursement of such payments to the Beneficial Owners will be the responsibility of Direct and Indirect Participants.

DTC may discontinue providing its services as depository with respect to the Bonds at any time by giving reasonable notice to the District or the Paying Agent/Registrar. Under such circumstances, in the event that a successor depository is not obtained, Bond certificates are required to be printed and delivered.

The District may decide to discontinue use of the system of Book-Entry-Only transfers through DTC (or a successor securities depository). In that event, Bond certificates will be printed and delivered to DTC.

The information in the section concerning DTC and DTC's Book-Entry-Only system has been obtained from sources that the District believes to be reliable, but Issuer takes no responsibility for the accuracy thereof.

Use of Certain Terms in Other Sections of this Official Statement

In reading this Preliminary Official Statement, it should be understood that while the Bonds are in the Book-Entry-Only form, references in other sections of this Preliminary Official Statement to registered owners should be read to include the person for which the Participant acquires an interest in the Bonds, but (i) all rights of ownership must be exercised through DTC and the Book-Entry-Only system, and (ii) except as described above, notices that are to be given to registered owners under the Bond Resolution will be given only to DTC.

Successor Paying Agent/Registrar

Provisions are made in the Bond Resolution for replacing the Paying Agent/Registrar. If the District replaces the Paying Agent/Registrar, such Paying Agent/Registrar shall, promptly upon the appointment of a successor, deliver the Paying Agent/Registrar's records to the successor Paying Agent/Registrar, and the successor Paying Agent/Registrar shall act in the same capacity as the previous Paying Agent/Registrar. Any successor Paying Agent/Registrar selected by the District shall be a commercial bank; a trust company organized under the laws of the State of Texas; or other entity duly qualified and legally authorized to serve and perform the duties of the Paying Agent/Registrar for the Bonds.

Registration, Transfer and Exchange

In the event the Book-Entry-Only System is discontinued, the Bonds are transferable only on the bond register kept by the Paying Agent/Registrar upon surrender at the corporate trust office of the Paying Agent/Registrar in Dallas, Texas. A Bond may be assigned by the execution of an assignment form on the Bonds or by other instrument of transfer and assignment acceptable to the Paying Agent/Registrar. At any time after the date of initial delivery, any Bond may be transferred upon its presentation and surrender at the designated offices of the Paying Agent/Registrar, duly endorsed for transfer or accompanied by an assignment duly executed by the Initial Purchaser.

The Bonds are exchangeable upon presentation at the designated office(s) of the Paying Agent/Registrar, for an equal principal amount of Bonds of the same maturity in authorized denominations. To the extent possible, new Bonds issued in exchange or transfer of Bonds will be delivered to the Registered Owner or assignee of the Registered Owner within not more than three (3) business days after the receipt by the Paying Agent/Registrar of the request in proper form to transfer or exchange the Bonds. New Bonds registered and delivered in an exchange or transfer shall be in the denomination of $5,000 in principal amount for a Bond, or any integral multiple thereof for any one maturity and shall bear interest at the same rate and be for a like aggregate principal or maturity amount as the Bond or Bonds surrendered for exchange or transfer. Neither the Paying Agent/Registrar nor the District is required to issue, transfer, or exchange any Bond during a period beginning at the opening of business on a Record Date and ending at the close of business on the next succeeding Interest Payment Date or to transfer or exchange any Bond selected for redemption, in whole or in part, beginning fifteen (15) calendar days prior to, and ending on the date of the mailing of notice of redemption, or where such redemption is scheduled to occur within thirty (30) calendar days. No service charge will be made for any transfer or exchange, but the District or Paying Agent/Registrar may require payment of a sum sufficient to cover any tax or governmental charge payable in connection therewith.

Outstanding Bonds

The District has previously issued two (2) series of unlimited tax bonds, as follows: $14,315,000 Unlimited Tax Bonds, Series 2025; and $5,600,000 Unlimited Tax Road Bonds, Series 2025. As of the Date of Delivery, $19,915,000 principal amount of such previously issued bonds will remain outstanding (the "Outstanding Bonds").

Redemption of the Bonds

Bonds maturing on September 1, 2032, and thereafter shall be subject to redemption and payment at the option of the District, in whole or from time to time in part, on September 1, 2031, or on any date thereafter, at the par value thereof plus accrued interest to the date fixed for redemption. Notice of the exercise of the reserved right of redemption will be given at least thirty (30) days prior to the redemption date by sending such notice by first class mail to the Registered Owner of each Bond to be redeemed in whole or in part at the address shown on the bond register. If less than all of the Bonds are redeemed at any time, the maturities of the Bonds to be redeemed shall be selected by the District. If less than all of the Bonds of a certain maturity are to be redeemed, the particular Bonds or portions thereof to be redeemed will be selected by the Paying Agent/Registrar prior to the redemption date by such random method as the Paying Agent/Registrar deems fair and appropriate in integral multiples of $5,000 within any one maturity.

Mutilated, Lost, Stolen or Destroyed Bonds

In the event the Book-Entry-Only System is discontinued, the District has agreed to replace mutilated, destroyed, lost or stolen Bonds upon surrender of the mutilated Bonds to the Paying Agent/Registrar, or receipt of satisfactory evidence of such destruction, loss or theft, and receipt by the District and Paying Agent/Registrar of security or indemnity as may be required by either of them to hold them harmless. The District may require payment of taxes, governmental charges and other expenses in connection with any such replacement.

Authority for Issuance

The Bonds constitute the second series of unlimited tax bonds issued by the District, from the $483,900,000 principal amount of unlimited tax bonds authorized by District's voters at an election held on November 8, 2022, for the purpose of constructing or acquiring the Utility System and $483,900,000 for the further purpose of refunding such bonds. The District's voters also authorized $344,700,000 principal amount of unlimited tax bonds for the purpose of constructing or acquiring the Road System and $344,700,000 for the further purpose of refunding such bonds and $163,790,000 principal

amount of unlimited tax bonds for the purpose of constructing the Park System and $163,790,000 for the further purpose of refunding such bonds.

Following the issuance of the Bonds, $456,190,000 principal amount of unlimited tax bonds for the Utility System; $339,100,000 principal amount of unlimited tax bonds for the Road System; and $163,790,000 principal amount of unlimited tax bonds for the Park System will remain authorized and unissued. All refunding bonds remain authorized but unissued. See "THE BONDS – Authority for Issuance."

The Bonds are issued pursuant to: an order of the TCEQ; the general laws of the State of Texas, including Chapters 49 and 54 of the Texas Water Code, as amended, applicable to municipal utility districts created under Section 59, Article XVI, Texas Constitution; the Bond Resolution; and an election held within the boundaries of the District on November 8, 2022.

Short-Term Debt

The District issued its $5,347,000 Bond Anticipation Note, Series 2025 (the "BAN"), dated December 18, 2025. The BAN matures on December 17, 2026, and accrues interest at a rate of 4.850% per annum, calculated on the basis of a 365-day year. The District will use a portion of the proceeds from the sale of the Bonds to redeem the BAN prior to its maturity. Proceeds from the BAN were used to reimburse the Developer (herein defined) for a portion of the improvements and related costs shown under "THE BONDS – Use and Distribution of Proceeds of the Bonds."

Issuance of Additional Debt

The District may issue additional bonds for the Utility System and the Park System, subject to the approval of the TCEQ, and for the Road System, necessary to provide improvements and facilities consistent with the purposes for which the District was created and subject to additional bonding authorization approved by voters in the District. The District's voters have authorized the issuance of $483,900,000 of unlimited tax bonds for the purpose of acquiring or constructing the Utility System and $483,900,000 for the refunding of such bonds; $344,700,000 of unlimited tax bonds for the purpose of acquiring or constructing the Road System and $344,700,000 for the refunding of such bonds; and $163,790,000 principal amount of unlimited tax bonds for the purpose of acquiring or constructing the Park System and $163,790,000 for the refunding of such bonds. The District could authorize additional amounts of each. The Bonds are the second series of bonds issued by the District for the purpose of acquiring or constructing the Utility System.

Following the issuance of the Bonds, $456,190,000 principal amount of unlimited tax bonds for the purpose of acquiring or constructing the Utility System; $339,100,000 principal amount of unlimited tax bonds for the purpose of acquiring or constructing the Road System; and $163,790,000 principal amount of unlimited tax bonds for the purpose of acquiring or constructing the Park System will remain authorized but unissued. All refunding bonds remain authorized but unissued. The Bond Resolution imposes no limitation on the amount of additional parity bonds which may be issued by the District (if authorized by the District's voters and approved by the TCEQ, as needed).

As of May 14, 2026, the District owes the Developers approximately $18,937,504 for expenditures relating to the acquisition or construction of the Utility System, the Road System, and the Park System serving the District. Additionally, the District owes the Developers approximately $14,971,233 for projects under construction for expenditures relating to the acquisition or construction of the Utility System, the Road System, and the Park System serving the District. If additional bonds are issued in the future and property values have not increased proportionately, such issuance may increase gross debt-property valuation ratios and thereby adversely affect the investment quality or security of the Bonds. See "APPENDIX A."

Additionally, the District intends to issue unlimited tax bonds for the Road System in August 2026, with a scheduled closing date of September 10, 2026, in an aggregate principal amount of $3,120,000. If the District does issue park bonds, the outstanding principal amount of such bonds may not exceed an amount equal to one percent of the value of the taxable property in the District at the time of issuance, unless the District meets certain financial feasibility requirements under the TCEQ rules, in which case the outstanding principal amount of such bonds issued by the District may exceed an amount equal to one percent but not greater than three percent of the value of the taxable property in the District.

Source of Payment

The Bonds are payable from the proceeds of a continuing, direct annual ad valorem tax, without legal limitation as to rate or amount, levied against all taxable property located within the District. Bonds issued for the Utility System and for the Road System are each supported by a separate unlimited tax levied by the District.

In the Bond Resolution, the District covenants to levy a sufficient tax to pay principal of and interest on the Bonds, with full allowance being made for delinquencies, costs of collections, Paying Agent/Registrar fees, and fees of the Brazoria County Appraisal District (the "Appraisal District"). Tax proceeds, after deduction for collection costs, will be placed in the Utility System Debt Service Fund (defined on the following page) and used solely to pay principal of and interest on the Bonds, any additional bonds payable from taxes which may be issued for the Utility System, and fees of the Paying Agent/Registrar.

Amounts on deposit in the Utility System Debt Service Fund and may not be used to pay debt service on bonds issued by the District for the Road System.

The Bonds are obligations solely of the District and are not the obligations of the State of Texas; the County; Iowa Colony; Manvel, or any entity other than the District.

Funds

The Bond Resolution confirms the District's fund for debt service on the Bonds, and any additional unlimited tax bonds issued by the District for the Utility System (the "Utility System Debt Service Fund"), including the Bonds. Twelve (12) months of capitalized interest on the Bonds will be deposited from the proceeds from the sale of the Bonds into the Utility System Debt Service Fund upon closing of the Bonds. The Utility System Debt Service Fund, which constitutes a trust fund for the benefit of the owners of the Outstanding Bonds for the Utility System and any additional unlimited tax bonds issued by the District for the Utility System, is to be kept separate from all other funds of the District, and is to be used for payment of debt service on the Outstanding Bonds issued for the Utility System and on any of the District's other duly authorized bonds issued for the Utility System payable in whole or in part from taxes. Amounts deposited in the Utility System Debt Service Fund may also be used to pay the fees and expenses of the Paying Agent/Registrar, to defray the expenses of assessing and collecting taxes levied for payment of interest on and principal of any additional bonds issued for the Utility System payable in whole or in part from taxes, and to pay any tax anticipation notes issued, together with interest thereon, as such tax anticipation notes become due. Amounts on deposit in the Utility System Debt Service Fund may not be used to pay debt service on bonds issued for the Road System.

In connection with the Outstanding Bonds for the Road System, the District has established a fund for payment of debt service on the Outstanding Bonds issued by the District for the Road System (the "Road System Debt Service Fund"). The Road System Debt Service Fund, which constitutes a trust fund for the benefit of the owners of the Outstanding Bonds for the Road System and any additional unlimited tax bonds issued by the District for the Road System, is to be kept separate from all other funds of the District, and is to be used for payment of debt service on the Outstanding Bonds issued for the Road System and on any of the District's other duly authorized bonds issued for the Road System payable in whole or in part from taxes. Amounts deposited in the Road System Debt Service Fund may also be used to pay the fees and expenses of the Paying Agent/Registrar, to defray the expenses of assessing and collecting taxes levied for payment of interest on and principal of any additional bonds issued for the Road System payable in whole or in part from taxes, and to pay any tax anticipation notes issued, together with interest thereon, as such tax anticipation notes become due. Amounts on deposit in the Road System Debt Service Fund may not be used to pay debt service on bonds issued for the Utility System, such as the Bonds.

No Arbitrage

The District will certify, on the Date of Delivery of the Bonds, that based upon all facts and estimates now known or reasonably expected to be in existence on the date the Bonds are delivered and paid for, the District reasonably expects that the proceeds of the Bonds will not be used in a manner that would cause the Bonds, or any portion of the Bonds, to be "arbitrage bonds" under the Internal Revenue Code of 1986, as amended (the "Code"), and the regulations prescribed thereunder. Furthermore, all officers, employees and agents of the District have been authorized and directed to provide certifications of facts and estimates that are material to the reasonable expectations of the District as of the date the Bonds are delivered and paid for. In particular, all or any officers of the District are authorized to certify to the facts and circumstances and reasonable expectations of the District on the date the Bonds are delivered and paid for regarding the amount and use of the proceeds of the Bonds. Moreover, the District covenants that it shall make such use of the proceeds of the Bonds, regulate investment of proceeds of the Bonds and take such other and further actions and follow such procedures, including, without limitation, calculating the yield on the Bonds, as may be required so that the Bonds shall not become "arbitrage bonds" under the Code and the regulations prescribed from time to time thereunder.

Defeasance

The Bond Resolution provides that the District may discharge its obligations to the Registered Owners of any or all of the Bonds to pay principal, interest and redemption price thereon in any manner permitted by law. Under current Texas law, such discharge may be accomplished either (i) by depositing with the Comptroller of Public Accounts of the State of Texas a sum of money equal to the principal of, premium, if any, and all interest to accrue on the Bonds to maturity or redemption or (ii) by depositing with any place of payment (Paying Agent) of the Bonds or other obligations of the District payable from revenues or from ad valorem taxes or both, amounts sufficient to provide for the payment and/or redemption of the Bonds; provided that such deposits may be invested and reinvested only in (a) direct noncallable obligations of the United States of America, (b) noncallable obligations of an agency or instrumentality of the United States, including obligations that are unconditionally guaranteed or insured by the agency or instrumentality and that, on the date the governing body of the District adopts or approves the proceedings authorizing the issuance of refunding bonds, are rated as to investment quality by a nationally recognized investment rating firm not less than AAA or its equivalent, and (c) noncallable obligations of a state or an agency or a county, municipality, or other political subdivision of a state that have been refunded and that, on

the date the governing body of the District adopts or approves the proceedings authorizing the issuance of refunding bonds, are rated as to investment quality by a nationally recognized investment rating firm not less than AAA or its equivalent, and which mature and/or bear interest payable at such times and in such amounts as will be sufficient to provide for the scheduled payment and/or redemption of the Bonds.

Upon such deposit as described above, such Bonds shall no longer be regarded as outstanding or unpaid. After firm banking and financial arrangements for the discharge and final payment or redemption of the Bonds have been made as described above, all rights of the District to initiate proceedings to call the Bonds for redemption or take any other action amending the terms of the Bonds are extinguished; provided, however, that the right to call the Bonds for redemption is not extinguished if the District: (i) in the proceedings providing for the firm banking and financial arrangements, expressly reserves the right to call the Bonds for redemption; (ii) gives notice of the reservation of that right to the owners of the Bonds immediately following the making of the firm banking and financial arrangements; and (iii) directs that notice of the reservation be included in any redemption notices that it authorizes.

There is no assurance that the current law will not be changed in the future in a manner which would permit investments other than those described above to be made with amounts deposited to defease the Bonds.

Legal Investment and Eligibility to Secure Public Funds in Texas

The following is quoted from Section 49.186 of the Texas Water Code, and is applicable to the District:

> (a) All bonds, notes, and other obligations issued by a district shall be legal and authorized investments for all banks, trust companies, building and loan associations, savings and loan associations, insurance companies of all kinds and types, fiduciaries, and trustees, and for all interest and sinking funds and other public funds of the state, and all agencies, subdivisions, and instrumentalities of the state, including all counties, cities, towns, villages, school districts, and all other kinds and types of districts, public agencies, and bodies politic.
>
> (b) A district's bonds, notes, and other obligations are eligible and lawful security for all deposits of public funds of the state, and all agencies, subdivisions, and instrumentalities of the state, including all counties, cities, towns, villages, school districts, and all other kinds and types of districts, public agencies, and bodies politic, to the extent of the market value of the bonds, notes, and other obligations when accompanied by any unmatured interest coupons attached to them.

The Public Funds Collateral Act (Chapter 2257, Texas Government Code) also provides that bonds of the District (including the Bonds) are eligible as collateral for public funds.

No representation is made that the Bonds will be suitable for or acceptable to financial or public entities for investment or collateral purposes. No representation is made concerning other laws, rules, regulations, or investment criteria which apply to or which might be utilized by any of such persons or entities to limit the acceptability or suitability of the Bonds for any of the foregoing purposes. Prospective purchasers are urged to carefully evaluate the investment quality of the Bonds as to the suitability or acceptability of the Bonds for investment or collateral purposes.

Registered Owners' Remedies

Pursuant to Texas law, the Bond Resolution provides that, in the event the District defaults in the payment of the principal of or interest on any of the Bonds when due, fails to make payments required by the Bond Resolution into the debt service fund, or defaults in the observance or performance of any of the other covenants, conditions or obligations set forth in the Bond Resolution, any Registered Owner shall be entitled to seek a writ of mandamus from a court of competent jurisdiction compelling and requiring the District to make such payments or to observe and perform such covenants, obligations or conditions. Such right is in addition to other rights the Registered Owners may be provided by the laws of the State of Texas.

In the event of default in the payment of principal of or interest on the Bonds, the Registered Owners may seek a writ of mandamus requiring the District to levy adequate taxes to make such payments. Except for the remedy of mandamus, the Bond Resolution does not specifically provide for remedies to a Registered Owner in the event of a District default, nor does it provide for the appointment of a trustee to protect and enforce the interests of the Registered Owners. There is no acceleration of maturity of the Bonds in the event of default and, consequently, the remedy of mandamus may have to be relied upon from year to year. Although the Registered Owners could obtain a judgment against the District, such a judgment could not be enforced by direct levy and execution against the District's property. Further, the Registered Owners cannot themselves foreclose on the property of the District or sell property within the District in order to pay the principal of or interest on the Bonds. The enforceability of the rights and remedies of the Registered Owners may be further limited by laws relating to bankruptcy, reorganization or other similar laws of general application affecting the rights of creditors of political subdivisions such as the District. For example, a Chapter 9 bankruptcy proceeding by the District could delay or eliminate payment of principal or interest to the Registered Owners.

Use and Distribution of Proceeds of the Bonds

Proceeds from the sale of the Bonds will be used by the District to redeem the BAN, the proceeds of which were used to reimburse the Developer for a portion of the improvements and related costs shown below. Additionally, proceeds from the sale of the Bonds will also be used to reimburse the Developer for the improvements and related costs that were not reimbursed by the BAN and to pay: twelve (12) months of capitalized interest, BAN interest, developer interest, and other certain costs associated with the issuance of the Bonds. Totals may not sum due to rounding.

Non-construction costs are based upon either contract amounts or estimates of various costs by the Engineer (herein defined) and the Financial Advisor (herein defined). The actual amounts to be reimbursed by the District and the non-construction costs will be finalized after the sale of the Bonds and completion of agreed-upon procedures by the District's auditor.

Construction Costs	District's Share
A. Developer Contribution Items	
1. Meridiana, Section 24A	$ 519,581
2. Meridiana, Section 4A East	1,271,051
3. Meridiana, Section 5 East	611,062
4. Meridiana, Section 14A	1,089,461
5. Meridiana, Section 14B	823,671
6. Meridiana, Section 13A	1,050,049
7. Meridiana, Section 10	1,553,266
8. City of Manvel Plan Approval (Meridiana, Section 5E)	1,525
9. Section 13A – Raise Sanitary Sewer Manhole to Natural Ground	1,800
10. Engineering and Geotechnical (19.13% of Item Nos. 2–7)	1,139,947
11. Storm Water Compliance	108,428
Total Developer Contribution Items	$ 8,169,841
B. District Contribution Items	
1. Land Acquisition	$ 1,808,099
Total District Contribution Items	$ 1,808,099
Total Construction Costs	$ 9,977,941
Less: Surplus Funds	(62,836)
Net Construction Costs (74.02% of BIR)	$ 9,915,104
Non-Construction Costs	
A. Legal Fees	$ 307,900
B. Fiscal Agent Fees	267,900
C. Interest	
1. Capitalized Interest (12 months at an estimated 5.25%)	703,238
3. Developer Interest (5.25%)	824,346
2. Bond Anticipation Note Interest (1 Year at 4.850%)	280,718
D. Bond Discount (3.00%)	401,850
E. Bond Issuance Expenses	60,283
F. BAN Issuance Expenses	126,397
G. Operating Costs	401,783
H. Bond Application Report	62,494
I. Attorney General Fee (0.10%)	9,500
J. TCEQ Bond Issuance Fee (0.25%)	33,488
Total Non-Construction Costs (25.98% of BIR)	$ 3,479,896
TOTAL BOND ISSUE REQUIREMENT	**$ 13,395,000**

In the instance that approved estimated amounts exceed the actual costs, the difference comprises a surplus which may be expended for approved uses in accordance with the rules of the TCEQ. However, the District cannot and does not guarantee the sufficiency of such funds for such purposes.

THE DISTRICT

Authority

The District was created by order of the TCEQ, dated August 16, 2007, and by a confirmation election held within the District on November 6, 2007, and operates pursuant to Article XVI, Section 59 and Article III, Section 52 of the Constitution of the State of Texas, and Chapters 49 and 54, Texas Water Code, as amended.

The District is empowered, among other things, to purchase, construct, operate, and maintain all works, improvements, facilities, and plants necessary for the supply of water; the collection, transportation, and treatment of wastewater; and the control and diversion of storm water.

The District also is authorized to acquire, construct, develop and maintain park and recreational facilities using operating revenues or by issuing bonds payable from taxes, and to construct roads. In addition, the District is authorized, upon TCEQ and voter approval, to establish, operate and maintain a fire department, independently or with one or more other conservation and reclamation districts, and provide such facilities and services to the customers of the District.

Description

The District is a political subdivision of the State of Texas, located approximately 21 miles south of the central business district of the City of Houston, Texas. At the time of creation, the District encompassed approximately 447.471 acres. The District has since annexed 1,159.4383 acres, and thus the total acreage of the District is now 1,606.9093 acres. The District's boundaries lie entirely within the corporate limits of Manvel and Iowa Colony.

Location

A portion of the District (1,008.5993 acres) in Manvel is located in Brazoria County, in the corporate limits of Manvel and approximately one and a half (1.5) miles southeast of the intersection of SH 288 and TX-6. The District is bounded on the south by Masters Rd, the east by the Manvel City Limits and C12 Ditch, the west by Chocolate Bayou, and the north by Clark Road and SH 6. The District is accessed via SH 6; exit Meridiana Parkway.

A portion of the District (598.31 acres) in Iowa Colony is located in Brazoria County, in the corporate limits of Iowa Colony and directly south of the intersection of SH 288 and CR 64 (Davenport Parkway). The District is located on the east and west side of SH 288. The south is bounded by the CR 63 (Airline Road 2 and Airline Road No 2 East). The far east and west side of the District is bounded by various private properties. The District is accessed via CR 64 (Davenport Parkway).

Management of the District

The District is governed by its Board, consisting of five directors who have control over and management supervision of all affairs of the District. All of the directors own property in the District. The directors serve staggered, four-year terms. Elections are held in even-numbered years in May. The current members and officers of the Board are listed below:

Name	Title	Term Expires May
Lance Taylor	President	2028
David Rivera	Vice President	2030
Tim Austin	Secretary	2028
Tushunya Peacock	Assistant Secretary	2030
Heather Ping	Assistant Vice President	2028

Investment Policy

The District has adopted an Investment Policy (the "Policy") as required by the Public Funds Investment Act, Chapter 2256, Texas Government Code (the "Act"). The District's goal is to preserve principal and maintain liquidity in a diversified portfolio while securing a competitive yield on its portfolio. Funds of the District are to be invested only in accordance with the Policy. The Policy states that the funds of the District may be invested in short term obligations of the U.S. or its agencies or instrumentalities, in certificates of deposits insured by the Federal Deposit Insurance Corporation ("FDIC") and secured by collateral authorized by the Act, and in TexPool and TexStar, which are public funds investment pools rated in the highest rating category by a nationally recognized rating service. The District does not currently own, nor does it anticipate, the inclusion of long term securities or derivative products in the portfolio.

Consultants

Although the District does not have a general manager or any other full-time employees, it has contracted for utility system operating, bookkeeping, tax assessing and collecting, auditing, engineering, and legal services as follows:

Tax Assessor/Collector: The tax assessor/collector for the District is Assessments of the Southwest, Inc.

Bookkeeper: The District's bookkeeper is Myrtle Cruz, Inc.

Utility System Operator: The District's water and sewer system is operated by Si Environmental, LLC.

Auditor: The District engaged McGrath & Co., PLLC to audit its financial statements for the fiscal year ended March 31, 2025. See "APPENDIX A" for financial statements for the fiscal year ended March 31, 2025, related to the District.

Engineer: The District's engineer is Edminster, Hinshaw, Russ and Associates, Inc. (the "Engineer"). Such firm acts as engineer for many residential and commercial developments in Texas.

Bond & General Counsel: The District has engaged Allen Boone Humphries Robinson LLP, Houston, Texas, as general counsel to the District and as bond counsel ("Bond Counsel") in connection with the issuance of the Bonds. The fees to be paid Bond Counsel in connection with the issuance of the Bonds are contingent upon the sale and delivery of the Bonds. See "LEGAL MATTERS."

Disclosure Counsel: The District has engaged Orrick, Herrington & Sutcliffe LLP, Houston, Texas, as disclosure counsel ("Disclosure Counsel") to the District in connection with the issuance of the Bonds. The fees to be paid Disclosure Counsel in connection with the issuance of the Bonds are contingent upon the sale and delivery of the Bonds.

Financial Advisor: Cedar Creek Municipal Advisors, LLC, serves as financial advisor ("Financial Advisor") to the District in connection with the issuance of the Bonds. The Financial Advisor's fee for services rendered with respect to the sale of the Bonds is contingent upon the issuance and delivery of the Bonds. The Financial Advisor is not obligated to undertake, and has not undertaken to make, an independent verification or to assume responsibility for the accuracy, completeness, or fairness of the information in this Official Statement.

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DEVELOPMENT OF THE DISTRICT

The District is one of three municipal utility districts that make up the approximately 3,000-acre master-planned community known as Meridiana. In addition to Meridiana, the District includes planned developments known as Ellwood and Rally East.

To date, approximately 279.21 acres (1,077 lots) within the District have been developed as the residential subdivisions of Meridiana, Sections 4A East, 4B, 5 East, 6 East, 7, 10A, 13A, 13B, 14A, 14B, 24A, 24B, 25A, 26A, 26B, and 82, and approximately 26.27 acres (92 lots) within the District have been developed as the residential subdivisions of Ellwood, Sections 1A and 1B. As of May 14, 2026, the District was composed of 406 completed homes, 154 homes under construction not including the 32 model homes under construction in the Ellwood subdivision and approximately 37 vacant developed lots. Of the 560 homes completed and under construction as of May 14, 2026 (which excludes the 32 model homes under construction in the Ellwood subdivision), 448 homes were sold to homeowners within the District.

In addition, approximately 13.00 acres have been developed as Alvin ISD Elementary School Site No. 2 and approximately 186.62 acres for Alvin ISD Schools. The remaining land within the District consists of approximately 825.11 undeveloped but developable acres and approximately 139.38 undevelopable acres consisting of easements, rights of way and greenbelts.

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Status of Development within the District

The following is a status of construction of single-family housing within the District as of May 14, 2026:

Meridiana, Phase 1	Section Acreage	Platted Lots	Completed Homes	Homes Under Construction	Developed Vacant Lots
Section 4A East	16.01	47	39	7	1
Section 4B	12.00	45	7	9	29
Section 5 East	10.36	37	36	1	0
Section 6 East	23.70	88	9	12	67
Section 7	20.60	72	2	9	61
Section 10A	31.28	72	0	17	55
Section 13A	15.29	57	57	0	0
Section 13B	12.97	50	1	16	33
Section 14A	14.26	68	61	4	3
Section 14B	11.86	66	46	11	9
Section 24A	17.82	78	76	1	1
Section 24B	13.25	58	58	0	0
Section 25A	19.65	79	0	2	77
Section 26A	12.92	47	0	26	21
Section 26B	18.55	75	9	19	47
Section 82	28.69	138	5	20	113
Subtotal	**279.21**	**1,077**	**406**	**154**	**517**
Ellwood Subdivision					
Ellwood Section 1A	3.45	10	6	0	4
Ellwood Section 1B	22.82	82	17	32	33
Subtotal	**26.27**	**92**	**23**	**32**	**37**
Total	**305.48**	**1,169**	**429**	**186**	**554**

Single-Family Developed:	305.48
Commercial:	9.27
School Acreage:	186.62
Under Construction (a):	141.05
Undevelopable Acres:	139.38
Remaining Developable Acres (b):	825.11
Service Area Total:	**1,606.91**

(a) Meridiana Sections 4B, 6 East, 7 East, 8A, 9, 13B, 15A, 16, and 25A are currently under construction.

(b) Approximately 233.17 acres are currently being developed as Ellwood Development and 132.15 acres are currently being developed as Rally East Development.

DEVELOPERS

Role of the Developer

In general, the activities of a developer in a municipal utility district such as the District include purchasing the land within the District, designing the subdivision, designing the utilities and streets to be constructed in the subdivision, designing any community facilities to be built, defining a marketing program and building schedule, securing necessary governmental approvals and permits for development, arranging for the construction of roads and the installation of utilities (including, in some cases, water, wastewater, and drainage facilities pursuant to the rules of the TCEQ, as well as gas, telephone, and electric service) and selling improved lots and commercial reserves to builders, developers, or other third parties. In most instances, the developer will be required to pay up to thirty percent of the cost of constructing certain of the water, wastewater and drainage facilities in a utility district pursuant to the rules of the TCEQ. The relative success or failure of a developer to perform such activities in development of the property within a utility district may have a profound effect on the security of the unlimited tax bonds issued by a district. A developer is generally under no obligation to a district to develop the property which it owns in a district. Furthermore, there is no restriction on a developer's right to sell any or all of the land which it owns within a district. In addition, a developer is ordinarily a major taxpayer within a municipal utility district during the development phase of the property.

Prospective purchasers of the Bonds should note that the prior real estate experience of a developer should not be construed as an indication that further development within the District will occur, or construction of taxable improvements upon property within the District will occur, or that marketing or leasing of taxable improvements constructed upon property within the District will be successful. Circumstances surrounding development within the District may differ from circumstances surrounding development of other land in several respects, including the existence of different economic conditions, financial arrangements, homebuilders, geographic location, market conditions, and regulatory climate.

Neither the Developers, nor any affiliate entity, is obligated to pay principal of or interest on the Bonds. Furthermore, none of the Developers or affiliate entities have a binding commitment to the District to carry out any plan of development, and the furnishing of information relating to the proposed development by the Developers or affiliate entities should not be interpreted as such a commitment. Prospective purchasers are encouraged to inspect the District in order to acquaint themselves with the nature of development that has occurred or is occurring within the District's boundaries.

Developers

GR-M1 LTD, an entity associated with Rise Communities LLC, one of the Developers (herein defined), was formed for the purpose of acquiring and holding for investment and sale tracts of land, including the land in the District. The Developer has determined the overall development plan for such land in the District and arranged for the construction of water, sanitary sewer and road facilities within the District. GR-M1 LTD plans to use equity contributions to fund the development of Meridiana.

Rise Communities LLC is a developer and manager of master-planned, large-scale communities. In addition to developing Meridiana, Rise Communities LLC is also developing Cane Island, an 1,100-acre master-planned community located in the City of Katy, Texas.

Beazer Homes Texas, L.P., a Delaware limited partnership ("Beazer Homes"), is developing Ellwood Development. Beazer Homes is a subsidiary of Beazer Homes USA, Inc., a Delaware corporation, the stock of which is publicly traded on the New York Stock Exchange under the ticker symbol "BZH." For more information, visit www.beazer.com.

Rise Communities and Beazer Homes are collectively referred to herein as the "Developers."

Homebuilders within the District

Homebuilders who are active in Meridiana include David Weekley Homes, Drees Custom Homes, Highland Homes, Perry Homes, NewMark Homes, Shea Homes, Chesmar Homes, and Westin Homes. Prices of new homes being constructed in the District range from the $280,000s –$1,000,000+.

JOINT FACILITIES AND INTERCONNECT AGREEMENT

On March 14, 2024, the District ("MUD 57") entered into a Joint Facilities and Interconnect Agreement (the "Joint Agreement") with Brazoria County Municipal Utility District No. 55 ("MUD 55") for the purpose of obtaining a connection for supply of potable water.

MUD 55 has constructed a water plant with available capacity to serve MUD 55 and MUD 57 until MUD 57' s water plant is complete, which is expected to be on or before December 31, 2026.

MUD 55 is constructing a wastewater treatment plant ("MUD 55 WWTP") with available capacity to serve MUD 55 and a portion of MUD 57, which is located in the City of Iowa Colony.

MUD 57 will share in their portion of the operation and maintenance expenses related to MUD 55's wastewater treatment plant based on the amount of capacity purchased in the MUD 55 WWTP.

MUD 55 provides wastewater capacity to serve 1,037 ESFCs and water capacity to serve 955 ESFCs for the 259.43 acres of the District which are being developed as "Ellwood Development" and 132.15 acres which are being developed as "Rally East Development" all of which are located in Iowa Colony. Currently, there are no active connections being served.

INTERCONNECT AGREEEMENT

On October 10, 2024, MUD 57 entered into an Interconnect Agreement (the "Agreement") with Brazoria County Municipal Utility District No. 56 ("MUD 56"), as amended by the first amendment there to, dated November 13, 2025, for the purpose of obtaining a connection for supply of potable water.

MUD 56 has constructed a water plant with available capacity to serve MUD 56 and MUD 57 until MUD 57' s water plant is complete, which is expected to be on or before December 31, 2026. MUD 56 provides up to 802 ESFCs.

Utility Functions Agreement with the City of Iowa Colony

The District and Iowa Colony have entered into a Utility Functions Agreement under which Iowa Colony will provide water supply and wastewater treatment services to the portion of the District within the corporate limits of Iowa Colony (the "Utility Functions Agreement"). The Utility Functions Agreement states that as Facilities are constructed, such Facilities will be immediately conveyed to Iowa Colony for ownership, operation, and maintenance.

THE UTILITY SYSTEM

Regulation

According to the Engineer, the water distribution and wastewater collection lines constructed by the District have been designed in accordance with accepted engineering practices and the requirements of all governmental agencies having regulatory or supervisory jurisdiction over the construction and operation of such facilities including, among others, the TCEQ, Iowa Colony, Manvel and the County. According to the District's Engineer, the design of all such completed facilities has been approved by all required governmental agencies.

Operation of the District's waterworks and sewer treatment facilities is subject to regulation by, among others, the Environmental Protection Agency and the TCEQ. In many cases, regulations promulgated by these agencies have become effective only recently and are subject to further development and revisions.

Water, Sanitary Sewer and Drainage System

Water Supply: The District's water capacity is provided by a 16-inch waterline interconnect agreement between the District and BCMUD 56 per the "Interconnect Agreement." Per the stated Interconnect Agreement, MUD 56 agrees to provide MUD 57 with up to 802 ESFCs of water capacity, during the time period required for the construction of the MUD 57 water plant.

The MUD 56 water plant is owned, managed and operated by MUD 56. The water plant has a 1,500 gpm water well, which will adequately serve 2,500 equivalent single-family connections (ESFCs).

MUD 56's water well is permitted and monitored by the Brazoria County Groundwater Conservation District under Permit No. 3243 with a total annual withdraw limit, not to exceed 135,000,000 gallons.

The District has a Joint Facilities and Interconnect Agreement with MUD 55 to provide interim water supply up to 955 ESFCs during the interim term until the District's water plant is complete, for the 259.43 acres of the District which are being developed as "Ellwood Development" located within the Iowa Colony.

Wastewater Treatment: The District's wastewater treatment is provided to the District by a 12-inch force main between the District and MUD 55 per the Joint Facilities Agreement. Per the Joint Facilities Agreement, MUD 55 agrees to provide MUD 57 wastewater capacity up to 1,037 ESFCs. The MUD 55 wastewater treatment plant is a 0.48 MGD facility leased and operated by MUD 55 and wastewater capacity can serve 1,330 ESFCs based on the City of Iowa Colony criteria of 300 gpd/ESFC for design purposes.

MUD 55 is currently expanding the plant to a 980,000 gpd wastewater treatment facility with one permanent wastewater treatment plant with a capacity of 0.50 mgd. According to the Engineer, the ultimate phase of the facility will be adequate to serve 4,300 ESFCs, based on the re-rate to 240 gpd/ESFCs.

Storm Water Drainage Facilities: The District is located within the Westfork of Chocolate Bayou and Unit 101-05-00 watersheds. Prior to development, surface drainage was accomplished by overland flow and natural drainage ditches or swales that outfall into Westfork of Chocolate Bayou and Unit 101-05-00. Westfork of Chocolate Bayou and Unit 101-05-00 are Drainage District ("BCDD5") maintained channels.

The District contains storm water detention basins that are designed in accordance with BCDD5 and Manvel and Iowa Colony standards. The basin system has an outfall location into Westfork of Chocolate Bayou. Storm sewer pipe includes 24-Inch to 60-Inch Cl III R/G, RCP Storm Sewer, 60-Inch HDPE, and 6-Foot by 6-foot to 7-Foot by 6-foot RCB.

Neither BCDD5 nor Manvel or Iowa Colony has any requirements for storm water quality facilities.

100-Year Flood Plain

The portion of the District within Manvel lies partially within the published FEMA/FIRM 100- year Floodplain Map No. 48039C0110K, dated December 30, 2020 and Map No. 48039C0130K, Panel 130 of 925, dated December 30, 2020.

All floodplain within the portion of the District in Manvel will be contained within the limits of Chocolate Bayou and detention facilities. Any floodplain currently located within future developable acreage will be removed with a Letter of Map Revision based on Fill (LOMR-F).

The portion of the District within Iowa Colony lies partially within the published FEMA/FIRM 100-year Floodplain Map No. 48039C0120K, Panel 120 of 925, dated December 30, 2020.

All floodplain within the portion of the District in Iowa Colony will be contained within the limits of North Hayes Creek and detention facilities. Any floodplain currently located within future developable acreage will be removed with a Letter of Map Revision based on Fill (LOMR-F).

THE ROAD SYSTEM

The Road System serves residents of the District by providing access to the major thoroughfares and collectors within the Meridiana development and surrounding area. The major thoroughfares and collectors serving the District include Meridiana Parkway, Discovery Drive and Iowa Colony Boulevard. Discovery Drive and Iowa Colony Boulevard act as collectors by conveying residents of the District to the major thoroughfare of Meridiana Parkway which connects to the State Highway 288 to the west. The District will finance, design and construct the Road System in phases as development progresses. The Road System will ultimately be owned, operated and maintained by Iowa Colony and Manvel as the phases are constructed and accepted by Iowa Colony and Manvel. The District does not intend to maintain or operate the roads once they are accepted by Iowa Colony and Manvel.

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General Fund Operating Statement

The following statement sets forth in condensed form the historical results of operations of the District. Such summary has been prepared by the Financial Advisor for inclusion herein, based upon information obtained from the District's March 31, 2023, March 31, 2024, and March 31, 2025, audited financial statements. Reference is made to such statement for further and more complete information. See "APPENDIX A."

	FISCAL YEAR END MARCH 31				
	2026 (a)	2025	2024	2023	2022 (a)
REVENUES					
Water Service	$ 299,106	$ 35,402	$ 3,926	$ 535	$ -
Sewer Service	130,207	29,644	1,068	-	-
Property Taxes	490,000	62,276	51,226	-	-
Penalties and interest	8,047	2,317	-	-	-
Groundwater pumpage fees	-	155	29	4	-
Tap Connection and Inspection	657,163	503,294	47,878	1,865	-
Miscellaneous	27,669	19,751	6,500	965	-
Investment Earnings	4,289	21,812	17,370	714	1
TOTAL REVENUES	$ 1,616,481	$ 674,651	$ 127,997	$ 4,083	$ 1
EXPENDITURES					
Professional Fees	$ 286,711	$ 367,441	$ 213,196	$ 192,857	$ 141,194
Contracted Services	561,416	82,339	62,073	11,362	17,188
Repairs and Maintenance	536,323	148,246	7,595	3,379	-
Utilities	1,994	1,435	-	-	
Administrative	86,742	57,561	27,262	25,892	21,877
Other	5,024	78,040	5,609	4,866	-
Capital Outlay	-	359,222	-	-	-
TOTAL EXPENDITURES	$ 1,478,209	$ 1,094,284	$ 315,735	$ 238,356	$ 180,260
Excess Revenues (Expenditures)	$ 138,271	$ (419,633)	$ (187,738)	$ (234,273)	$ (180,259)
Other Financing Sources (Uses):					
Developer Advances	$ -	$ -	$ -	$ 189,000	$ 174,000
Capital Recovery Fees	-	-	-	872,666	
Net Change in Fund Balance	$ -	$ (419,633)	$ (187,738)	$ 827,393	$ (6,259)
Balance, Beg of Year	$ 215,055	$ 634,688	$ 822,426	$ (4,967)	$ 1,291
Balance, End of Year	$ 353,326	$ 215,055	$ 634,688	$ 822,426	$ (4,967)

(a) Unaudited. Provided by the bookkeeper.

AERIAL PHOTOGRAPH OF THE DISTRICT

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PHOTOGRAPHS TAKEN WITHIN THE DISTRICT

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DISTRICT DEBT

Pro-Forma Debt Service Requirement Schedule

The following schedule sets forth the debt service requirements on the Outstanding Bonds and the principal and estimated interest requirement on the Bonds, assuming an interest rate of 4.50%. Totals may not sum due to rounding.

Calendar Year	Outstanding Debt Service	The Bonds: Principal	The Bonds: Interest	The Bonds: Debt Service	Total Debt Service
2026	$ 478,075	$ -	$ -	$ -	$ 478,075
2027	1,416,150	295,000	632,914	927,914	2,344,064
2028	1,411,250	335,000	589,500	924,500	2,335,750
2029	1,404,725	350,000	574,425	924,425	2,329,150
2030	1,396,575	365,000	558,675	923,675	2,320,250
2031	1,391,800	385,000	542,250	927,250	2,319,050
2032	1,385,075	400,000	524,925	924,925	2,310,000
2033	1,378,031	420,000	506,925	926,925	2,304,956
2034	1,381,331	440,000	488,025	928,025	2,309,356
2035	1,388,381	460,000	468,225	928,225	2,316,606
2036	1,395,781	480,000	447,525	927,525	2,323,306
2037	1,406,781	500,000	425,925	925,925	2,332,706
2038	1,416,181	525,000	403,425	928,425	2,344,606
2039	1,422,238	545,000	379,800	924,800	2,347,038
2040	1,425,056	570,000	355,275	925,275	2,350,331
2041	1,435,006	595,000	329,625	924,625	2,359,631
2042	1,436,844	625,000	302,850	927,850	2,364,694
2043	1,446,269	650,000	274,725	924,725	2,370,994
2044	1,453,138	680,000	245,475	925,475	2,378,613
2046	1,458,450	710,000	214,875	924,875	2,383,325
2046	1,466,256	745,000	182,925	927,925	2,394,181
2047	1,471,325	775,000	149,400	924,400	2,395,725
2048	1,476,331	810,000	114,525	924,525	2,400,856
2049	1,483,244	850,000	78,075	928,075	2,411,319
2050	401,844	885,000	39,825	924,825	1,326,669
Total	$ 33,626,138	$ 13,395,000	$ 8,830,114	$ 22,225,114	$ 55,851,251

Combined Estimated Average Annual Debt Service Requirement on the Outstanding Bonds and the Bonds (2026–2050) ..... $ 2,238,572

Combined Estimated Maximum Annual Debt Service Requirement on the Outstanding Bonds and the Bonds (2049) ..... $ 2,411,544

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Bonded Indebtedness

2025 Certified Taxable Assessed Valuation	$ 67,565,323	(a)
2026 Preliminary Taxable Assessed Valuation	$ 248,060,950	(b)
Estimated Taxable Valuation as of May 1, 2026	$ 303,751,121	(c)
Direct Debt:		
The Outstanding Bonds	$ 19,915,000	
The Bonds	13,395,000	
Total	$ 33,310,000	
Estimated Overlapping Debt	$ 11,156,383	(d)
Total Direct and Estimated Overlapping Debt	$ 44,466,383	(d)
Direct Debt Ratios:		
As a percentage of the 2025 Certified Taxable Assessed Valuation	49.30 %	
As a percentage of the 2026 Preliminary Taxable Assessed Valuation	13.43 %	
As a percentage of the Estimated Taxable Valuation as of May 1, 2026	10.97 %	
Direct and Estimated Overlapping Debt Ratios:		
As a percentage of the 2025 Certified Taxable Assessed Valuation	65.81 %	
As a percentage of the 2026 Preliminary Taxable Assessed Valuation	17.93 %	
As a percentage of the Estimated Taxable Valuation as of May 1, 2026	14.64 %	
Road System Debt Service Fund Balance (as of May 14, 2026)	$ 341,647	(e)
Utility System Debt Service Fund Balance (as of May 14, 2026)	$ 771,251	(f)
Road System Capital Projects Fund (as of May 14, 2026)	$ 21,734	
Utility System Capital Projects Fund (as of May 14, 2026)	$ 209,156	
General Fund Balance (as of May 14, 2026)	$ 286,923	

(a) Represents the taxable amount of assessed valuation of taxable properties in the District as of January 1, 2025, as provided by the Brazoria County Appraisal District (the "Appraisal District"). See "TAX DATA" and "TAXING PROCEDURES."

(b) Provided by the Appraisal District as the preliminary value as of January 1, 2026. This value represents the preliminary determination of the taxable value in the District as of January 1, 2026, provided by the Appraisal District. No taxes will be levied on this preliminary value, which is subject to review and downward adjustment. See "TAXING PROCEDURES."

(c) As of May 1, 2026, provided by the Appraisal District for information purposes only. Represents new construction within the District as of May 1, 2026. This estimate is based upon the same unit value used in the assessed taxable valuation. No taxes will be levied on this estimate. See "TAXING PROCEDURES."

(d) See "DISTRICT DEBT – Estimated Direct and Overlapping Debt Statement."

(e) Neither Texas law nor the Bond Resolution requires that the District maintain any particular sum in the Road System Debt Service Fund. Funds in the Road System Debt Service Fund are not available to pay debt service on bonds issued for the Utility System (herein defined), such as the Outstanding Bonds issued for the Utility System and the Bonds.

(f) In addition to this amount, twelve (12) months of capitalized interest on the Bonds will be deposited into the Utility System Debt Service Fund upon closing of the Bonds. Neither Texas law nor the Bond Resolution requires that the District maintain any particular sum in the Utility System Debt Service Fund. Monies in the Utility System Debt Service Fund cannot be used to pay debt service on bonds issued for the Road System, such as the Outstanding Bonds issued for the Road System.

Estimated Direct and Overlapping Debt Statement

Other governmental entities whose boundaries overlap the District have outstanding bonds payable from ad valorem taxes. The following statement of direct and estimated overlapping ad valorem tax debt was developed from information contained in *Texas Municipal Reports* published by the Municipal Advisory Council of Texas, or other available information. Except for the amount relating to the District, the District has not independently verified the accuracy or completeness of such information, and no person is entitled to rely upon such information as being accurate or complete. Furthermore, certain of the entities listed below may have issued additional bonds since the dates stated in this table, and such entities may have programs requiring the issuance of substantial amounts of additional bonds, the amount of which cannot presently be determined. Political subdivisions overlapping the District are authorized by Texas law to levy and collect ad valorem taxes for operation, maintenance or general revenue purposes in addition to taxes for payment of their debt, and some are presently levying and collecting such taxes.

Taxing Jurisdiction	Outstanding Debt as of April 30, 2026	Estimated Overlapping Percent	Estimated Overlapping Amount
Brazoria County, Texas	$ 209,453,313	0.11%	$ 233,673
Alvin Independent School District	1,002,700,000	0.44%	4,441,792
Alvin Community College District	46,170,000	0.30%	140,555
City of Manvel, Texas	94,510,000	2.87%	2,713,094
City of Iowa Colony, Texas	39,885,000	9.09%	3,627,269
Total Estimated Overlapping Debt			$ 11,156,383
The District			$ 33,310,000 (a)
Total Direct & Estimated Overlapping Debt			$ 44,466,383 (b)

(a) The Bonds and the Outstanding Bonds.

(b) Includes the Bonds and the Outstanding Bonds.

Debt Ratios

	Percentage of 2025 Certified Taxable Assessed Valuation	Percentage of Preliminary Taxable Assessed Valuation	Percentage of Estimate of Value May 1, 2026
Direct Debt (a)	49.30%	13.43%	10.97%
Total Direct and Estimated Overlapping Debt (a)	65.81%	17.93%	14.64%

(a) The Bonds.

TAXING PROCEDURES

Authority to Levy Taxes

The Board is authorized to levy an annual ad valorem tax, without legal limitation as to rate or amount, on all taxable property within the District in sufficient amount to pay the principal of and interest on the Bonds, the Outstanding Bonds, and any additional Utility System bonds payable from taxes which the District may hereafter issue (see "RISK FACTORS – Future Debt"), and to pay the expenses of assessing and collecting such taxes. The Board is also authorized to levy an annual ad valorem tax, without legal limitation as to rate or amount, on all taxable property within the District in sufficient amount to pay the principal of and interest on any Road System bonds payable from taxes which the District may hereafter issue, and to pay the expenses of assessing and collecting such taxes. The District agrees in the Bond Resolution to levy such a tax from year to year as described more fully above under "THE BONDS – Source of Payment." Under Texas law, the Board may also levy and collect annual ad valorem taxes for the operation and maintenance of the District and the Utility System and for the payment of certain contractual obligations. See "TAX DATA – Maintenance Tax."

Property Tax Code and County-Wide Appraisal District

Title I of the Texas Tax Code (the "Property Tax Code") specifies the taxing procedures of all political subdivisions of the State of Texas, including the District. Provisions of the Property Tax Code are complex and are not fully summarized herein. The Property Tax Code requires, among other matters, county-wide appraisal and equalization of taxable property values and establishes in each county of the State of Texas an appraisal district with the responsibility for recording and appraising property for all taxing units within a county and an appraisal review board with responsibility for reviewing and equalizing the values established by the Appraisal District. The Appraisal District has the responsibility of appraising property for all taxing units within the County, including the District. Such appraisal values will be subject to review and change by the Brazoria County Appraisal Review Board (the "Appraisal Review Board"). The appraisal roll, as approved by the Appraisal Review Board, will be used by the District in establishing its tax rolls and tax rate.

Property Subject to Taxation by the District

Except for certain exemptions provided by Texas law, all real property, tangible personal property held or used for the production of income, mobile homes and certain categories of intangible personal property with a tax situs in the District are subject to taxation by the District. Principal categories of exempt property include, but are not limited to: property owned by the State of Texas or its political subdivisions, if the property is used for public purposes; property exempt from ad valorem taxation by federal law; certain household goods, family supplies and personal effects; certain goods, wares, and merchandise in transit; certain farm products owned by the producer; certain property of charitable organizations, youth development associations, religious organizations, and qualified schools; designated historical sites; and most individually-owned automobiles. In addition, the District may by its own action exempt residential homesteads of persons 65 years or older and certain disabled persons, to the extent deemed advisable by the Board. The District may be required to offer such exemptions if a majority of voters approve same at an election. The District would be required to call an election upon petition by twenty percent (20%) of the number of qualified voters who voted in the preceding election. The District is authorized by statute to disregard exemptions for the disabled and elderly if granting the exemption would impair the District's obligation to pay tax supported debt incurred prior to adoption of the exemption by the District. Furthermore, the District must grant exemptions to disabled veterans or the surviving spouse or children of a deceased veteran who died while on active duty in the armed forces, if requested, but only to the maximum extent of between $5,000 and $12,000 depending upon the disability rating of the veteran claiming the exemption. A veteran who receives a disability rating of 100% is entitled to an exemption for the full value of the veteran's residence homestead. Furthermore, qualifying surviving spouses of persons 65 years of age and older are entitled to receive a resident homestead exemption equal to the exemption received by the deceased spouse. Additionally, subject to certain conditions, the surviving spouse of a disabled veteran who is entitled to an exemption for the full value of the veteran's residence homestead is also entitled to an exemption from taxation of the total appraised value of the same property to which the disabled veteran's exemption applied.

A partially disabled veteran or certain surviving spouses of partially disabled veterans are entitled to an exemption from taxation of a percentage of the appraised value of their residence homestead in an amount equal to the partially disabled veteran's disability rating if the residence homestead was donated by a charitable organization. This exemption will also apply to a residence homestead that was donated by a charitable organization at some cost to such veterans. Also, the surviving spouse of a member of the armed forces who was killed in action is entitled to an exemption of the total appraised value of the surviving spouse's residence homestead if the surviving spouse has not remarried since the service member's death and said property was the service member's residence homestead at the time of death. Such exemption may be transferred to a subsequent residence homestead of the surviving spouse, if the surviving spouse has not remarried, in an amount equal to the exemption received on the prior residence in the last year in which such exemption was received.

The surviving spouse of a first responder who is killed or fatally injured in the line of duty is entitled to an exemption of the total appraised value of the surviving spouse's residence homestead if the surviving spouse has not remarried since the first responder's death, and said property was the first responder's residence homestead at the time of death. Such exemption would be transferred to a subsequent residence homestead of the surviving spouse, if the surviving spouse has not remarried, in an amount equal to the exemption received on the prior residence in the last year in which such exemption was received.

Residential Homestead Exemptions: The Property Tax Code authorizes the governing body of each political subdivision in the State to exempt up to twenty percent (20%) of the appraised market value of residential homesteads from ad valorem taxation. Where ad valorem taxes have previously been pledged for the payment of debt, the governing body of a political subdivision may continue to levy and collect taxes against the exempt value of the homesteads until the debt is discharged, if the cessation of the levy would impair the obligations of the contract by which the debt was created. The adoption of a homestead exemption may be considered each year, but must be adopted by before July 1. The District has never adopted a homestead exemption. See "TAX DATA."

Freeport Goods and Goods-in-Transit Exemption: A "Freeport Exemption" applies to goods, wares, ores, and merchandise other than oil, gas, and petroleum products (defined as liquid and gaseous materials immediately derived from refining petroleum or natural gas), and to aircraft or repair parts used by a certified air carrier acquired in or imported into Texas

which are destined to be forwarded outside of Texas and which are detained in Texas for assembling, storing, manufacturing, processing or fabricating for less than 175 days. Although certain taxing units may take official action to tax such property in transit and negate such exemption, the District does not have such an option. A "Goods-in-Transit" Exemption is applicable to the same categories of tangible personal property which are covered by the Freeport Exemption, if, for tax year 2013 and prior applicable years, such property is acquired in or imported into Texas for assembling, storing, manufacturing, processing, or fabricating purposes and is subsequently forwarded to another location inside or outside of Texas not later than 175 days after acquisition or importation, and the location where said property is detained during that period is not directly or indirectly owned or under the control of the property owner. For tax year 2012 and subsequent years, such Goods-in-Transit Exemption includes tangible personal property acquired in or imported into Texas for storage purposes only if such property is stored under a contract of bailment by a public warehouse operator at one or more public warehouse facilities in Texas that are not in any way owned or controlled by the owner of such property for the account of the person who acquired or imported such property. A property owner who receives the Goods-in-Transit Exemption is not eligible to receive the Freeport Exemption for the same property. Local taxing units such as the District may, by official action and after public hearing, tax goods-in-transit property. A taxing unit must exercise its option to tax goods-in-transit property before January 1 of the first tax year in which it proposes to tax the property at the time and in the manner prescribed by applicable law. The District has taken official action to allow taxation of all such goods-in-transit personal property for all prior and subsequent years.

Tax Abatement

The County may designate all or part of the area within the District as a reinvestment zone. Thereafter, the County, the City of Manvel, Iowa Colony and the District, at the option and discretion of each entity, may enter into tax abatement agreements with owners of property within the zone. Prior to entering into a tax abatement agreement, each entity must adopt guidelines and criteria for establishing tax abatement which each entity will follow in granting tax abatement to owners of property. The tax abatement agreements may exempt from ad valorem taxation by each of the applicable taxing jurisdictions, including the District, for a period of up to ten (10) years, all or any part of any increase in the assessed valuation of property covered by the agreement over its assessed valuation in the year in which the agreement is executed on the condition that the property owner make specified improvements or repairs to the property in conformity with the terms of the tax abatement. Each taxing jurisdiction has discretion to determine terms for its tax abatement agreements without regard to the terms approved by the other taxing jurisdictions. At this time, the County has not designated any of the area within the District as a reinvestment zone.

Valuation of Property for Taxation

Generally, property in the District must be appraised by the Appraisal District at market value as of January 1 of each year. Once an appraisal roll is prepared and finally approved by the Appraisal Review Board, it is used by the District in establishing its tax rolls and tax rate. Assessments under the Property Tax Code are to be based on one hundred percent (100%) of market value, as such is defined in the Property Tax Code. Nevertheless, certain land may be appraised at less than market value, as such is defined in the Property Tax Code. The Texas Constitution limits increases in the appraised value of residence homesteads to 10 percent annually regardless of the market value of the property.

The Property Tax Code permits land designated for agricultural use, open space or timberland to be appraised at its value based on the land's capacity to produce agricultural or timber products rather than at its fair market value. The Property Tax Code permits under certain circumstances that residential real property inventory held by a person in the trade or business be valued at the price all of such property would bring if sold as a unit to a purchaser who would continue the business. Provisions of the Property Tax Code are complex and are not fully summarized here. Landowners wishing to avail themselves of the agricultural use, open space or timberland designation or residential real property inventory designation must apply for the designation and the appraiser is required by the Property Tax Code to act on each claimant's right to the designation individually. A claimant may waive the special valuation as to taxation by one political subdivision while claiming it for another. If a claimant receives the agricultural use designation and later loses it by changing the use of the property or selling it to an unqualified owner, the District can collect taxes based on the new use, including taxes for the previous three years for agricultural use, open space land, and timberland.

The Property Tax Code requires the Appraisal District to implement a plan for periodic reappraisal of property to update appraisal values. The plan must provide for appraisal of all property in the Appraisal District at least once every three years. It is not known what frequency of reappraisals will be utilized by the Appraisal District or whether reappraisals will be conducted on a zone or county-wide basis. The District, however, at its expense, has the right to obtain from the Appraisal District a current estimate of appraised values within the District or an estimate of any new property or improvements within the District. While such current estimate of appraised values may serve to indicate the rate and extent of growth of taxable values within the District, it cannot be used for establishing a tax rate within the District until such time as the Appraisal District chooses to formally include such values on its appraisal roll.

The Property Tax Code provides for a temporary exemption from ad valorem taxation of a portion of the appraised value of certain property that is at least 15% physically damaged by a disaster and located within an area declared to be a disaster

area by the Governor of the State of Texas. This temporary exemption is automatic if the disaster is declared prior to a taxing unit, such as the District, adopting its tax rate for the tax year. A taxing unit, such as the District, may authorize the exemption at its discretion if the disaster is declared after the taxing unit has adopted its tax rate for the tax year. The amount of the exemption is based on the percentage of damage and is prorated based on the date of the disaster. Upon receipt of an application submitted within the eligible timeframe by a person who qualifies for a temporary exemption under the Property Tax Code, the Appraisal District is required to complete a damage assessment and assign a damage assessment rating to determine the amount of the exemption. The temporary exemption amounts established in the Property Tax Code range from 15% for property less than 30% damaged to 100% for property that is a total loss. Any such temporary exemption granted for disaster-damaged property expires on January 1 of the first year in which the property is reappraised.

During the 2nd Special Session, convened on June 27, 2023, the Texas Legislature passed Senate Bill 2 ("SB 2"), which, among other things, includes provisions that prohibit an appraisal district from increasing the appraised value of real property during the 2024 tax year on non-homestead properties (the "Subjected Property") whose appraised values are not more than $5,000,000 (the "Maximum Property Value") to an amount not to exceed the lesser of: (1) the market value of the Subjected Property for the most recent tax year that the market value was determined by the appraisal office or (2) the sum of: (a) 20 percent of the appraised value of the Subjected Property for the preceding tax year; (b) the appraised value of the Subjected Property for the preceding tax year; and (c) the market value of all new improvements to the Subjected Property. After the 2024 tax year, through December 31, 2026, the Maximum Property Value may be increased or decreased by the product of the preceding state fiscal year's increase or decrease in consumer price index, as applicable, to the Maximum Property Value. SB 2 was signed into law by the Governor of Texas (the "Governor") on July 22, 2023. The provisions described hereinabove took effect January 1, 2024, after the constitutional amendment proposed by H.J.R. 2, 88th Legislature, 2nd Called Session, 2023, was approved by voters at an election held on November 7, 2023.

District and Taxpayer Remedies

Under certain circumstances, taxpayers and taxing units, including the District, may appeal orders of the Appraisal Review Board by filing a timely petition for review in district court. In such event, the property value in question may be determined by the court, or by a jury, if requested by any party. Additionally, taxing units may bring suit against the Appraisal District to compel compliance with the Property Tax Code.

The Property Tax Code sets forth notice and hearing procedures for certain tax rate increases by the District and provides for taxpayer referenda which could result in the repeal of certain tax increases. The Property Tax Code also establishes a procedure for notice to property owners of reappraisals reflecting increased property values, appraisals that are higher than renditions and appraisals of property not previously on an appraisal roll.

Levy and Collection of Taxes

The District is responsible for the levy and collection of its taxes unless it elects to transfer such functions to another governmental entity. The rate of taxation is set by the Board, after the legally required notice has been given to owners of property within the District, based upon: a) the valuation of property within the District as of the preceding January 1, and b) the amount required to be raised for debt service, maintenance purposes, and authorized contractual obligations. Taxes are due October 1, or when billed, whichever comes later, and become delinquent if not paid before February 1 of the year following the year in which imposed. A delinquent tax incurs a penalty of six percent (6%) of the amount of the tax for the first calendar month it is delinquent, plus one percent (1%) for each additional month or portion of a month the tax remains unpaid prior to July 1 of the year in which it becomes delinquent. If the tax is not paid by July 1 of the year in which it becomes delinquent, the tax incurs a total penalty of twelve percent (12%) regardless of the number of months the tax has been delinquent and incurs an additional penalty for collection costs of an amount established by the District and a delinquent tax attorney. A delinquent tax on personal property incurs an additional penalty, in an amount established by the District and a delinquent tax attorney, 60 days after the date the taxes become delinquent. The delinquent tax accrues interest at a rate of one percent (1%) for each month or portion of a month it remains unpaid. The Property Tax Code makes provisions for the split payment of taxes, discounts for early payment and the postponement of the delinquency date of taxes under certain circumstances which, at the option of the District, which may be rejected by taxing units. The District's tax collector is required to enter into an installment payment agreement with any person who is delinquent on the payment of tax on a residence homestead for payment of tax, penalties and interest, if the person requests an installment agreement and has not entered into an installment agreement with the collector in the preceding 24 months. The installment agreement must provide for payments to be made in monthly installments and must extend for a period of at least 12 months and no more than 36 months. Additionally, the owner of a residential homestead property who is (i) sixty-five (65) years of age or older, (ii) disabled, or (iii) a disabled veteran, is entitled by law to pay current taxes on a residential homestead in installments without penalty or to defer the payment of taxes during the time of ownership. In the instance of tax deferral, a tax lien remains on the property and interest continues to accrue during the period of deferral.

Tax Payment Installments After Disaster

Certain qualified taxpayers, including owners of residential homesteads, located within a designated disaster area or emergency area and whose property has been damaged as a direct result of the disaster or emergency, are entitled to enter into a tax payment installment agreement with a taxing jurisdiction, such as the District, if the taxpayer pays at least one-fourth of the tax bill imposed on the property by the delinquency date. The remaining taxes may be paid without penalty or interest in three equal installments within six months of the delinquency date.

Additionally, the Property Tax Code authorizes a taxing jurisdiction such as the District, solely at the jurisdiction's discretion to adopt a similar installment payment option for taxes imposed on property that is located within a designated disaster area or emergency area and is owned or leased by certain qualified business entities, regardless of whether the property has been damaged as a direct result of the disaster or emergency.

Rollback of Operation and Maintenance Tax Rate

Chapter 49 of the Texas Water Code, as amended, classifies districts differently based on the current operation and maintenance tax rate or on the percentage of projected build-out that a district has completed. Districts that have adopted an operation and maintenance tax rate for the current year that is 2.5 cents or less per $100 of taxable value are classified herein as "Special Taxing Units." Districts that have financed, completed, and issued bonds to pay for all land, improvements and facilities necessary to serve at least 95% of the projected build-out of the district are classified as "Developed Districts." Districts that do not meet either of the classifications previously discussed can be classified herein as "Developing Districts." The impact each classification has on the ability of a district to increase its maintenance and operations tax rate is described for each classification below. Debt service cannot be reduced by a rollback election held within any of the districts described below.

Special Taxing Units

Special Taxing Units that adopt a total tax rate that would impose more than 1.08 times the amount of the total tax imposed by such district in the preceding tax year on a residence homestead appraised at the average appraised value of a residence homestead in the district, subject to certain homestead exemptions, may be required to hold an election within the district to determine whether to approve the adopted total tax rate. If the adopted total tax rate is not approved at the election, the total tax rate for a Special Taxing Unit is the current year's debt service and contract tax rate plus the operation and maintenance tax rate that would impose 1.08 times the amount of operation and maintenance tax imposed by the District in the preceding tax year on a residence homestead appraised at the average appraised value of a resident homestead in the District in that year, subject to certain homestead exemptions.

Developed Districts

Developed Districts that adopt a total tax rate that would impose more than 1.035 times the amount of the total tax imposed by the district in the preceding tax year on a residence homestead appraised at the average appraised value of a residence homestead in the district, subject to certain homestead exemptions, plus any unused increment rates, as calculated and described in Section 26.013 of the Property Tax Code, may be required to hold an election within the district to determine whether to approve the adopted total tax rate. If the adopted total tax rate is not approved at the election, the total tax rate for a Developed District is the current year's debt service and contract tax rate plus the operation and maintenance tax rate that would impose 1.035 times the amount of operation and maintenance tax imposed by the district in the preceding year on a residence homestead appraised at the average appraised value of a residence homestead in the district in that year, subject to certain homestead exemptions, plus any unused increment rates. In addition, if any part of a Developed District lies within an area declared for disaster by the Governor of Texas or President of the United States, alternative procedures and rate limitations may apply for a temporary period. If a district qualifies as both a Special Taxing Unit and a Developed District, the district will be subject to the operation and maintenance tax threshold applicable to Special Taxing Units.

Developing Districts

Districts that do not meet the classification of a Special Taxing Unit or a Developed District can be classified as Developing Districts. The qualified voters of these districts, upon the Developing District's adoption of a total tax rate that would impose more than 1.08 times the amount of the total tax imposed by such district in the preceding tax year on a residence homestead appraised at the average appraised value of a residence homestead in the district, subject to certain homestead exemptions, are authorized to petition for an election to reduce the operation and maintenance tax rate. If an election is called and passes, the total tax rate for Developing Districts is the current year's debt service and contract tax rate the operation and maintenance tax rate that would impose 1.08 times the amount of operation and maintenance tax imposed by the District in the preceding tax year on a residence homestead appraised at the average appraised value of a resident homestead in the District in that year, subject to certain homestead exemptions.

The District

For the 2025 tax year, the District made the determination of its status as a Developing District. A determination as to the District's status as a Special Taxing Unit, Developed District or Developing District will be made by the Board of Directors on an annual basis, in September or October of each year. The District cannot give any assurances as to what its classification will be at any point in time or whether the District's future tax rates will result in a total tax rate that will reclassify the District into a new classification and new election calculation.

District's Rights in the Event of Tax Delinquencies

Taxes levied by the District are a personal obligation of the owner of the property as of January 1 of the year in which the tax is imposed. On January 1 of each year, a tax lien attaches to property to secure the payment of all taxes, penalties and interest ultimately imposed for the year on the property. The lien exists in favor of the State and each taxing unit, including the District, having the power to tax the property. The District's tax lien is on a parity with the tax liens of other such taxing units. A tax lien on real property takes priority over the claims of most creditors and other holders of liens on the property encumbered by the tax lien, whether or not the debt or lien existed before the attachment of the tax lien; however, whether a lien of the United States is on a parity with or takes priority over a tax lien of the District is determined by federal law. Personal property, under certain circumstances, is subject to seizure and sale for the payment of delinquent taxes, penalty and interest.

At any time after taxes on property become delinquent, the District may file suit to foreclose the lien securing payment of the tax, to enforce personal liability for the tax, or both. In filing a suit to foreclose a tax lien on real property, the District must join other taxing units that have claims for delinquent taxes against all or part of the same property. Collection of delinquent taxes may be adversely affected by the amount of taxes owed to other taxing units, by the effects of market conditions on the foreclosure sale price, by taxpayer redemption rights or by bankruptcy proceedings which restrict the collection of taxpayer debts. A taxpayer may redeem property within two years for residential and agricultural property and six months for commercial property and all other types of property after the purchaser's deed at the foreclosure sale is filed in the county records.

TAX DATA

General

All taxable property within the District is subject to the assessment, levy and collection by the District of a continuing, direct annual ad valorem tax without legal limitation as to rate or amount, sufficient to pay principal of and interest on the Bonds (see "TAXING PROCEDURES"). The Board has in its Bond Resolution covenanted to assess and levy for each year that all or any part of the Bonds remain outstanding and unpaid a tax ample and sufficient to produce funds to pay the principal of and interest on the Bonds (see "THE BONDS" and "RISK FACTORS"). The District has levied a total tax rate of $0.90 per $100 of assessed valuation for the 2025 tax year. Such rate is composed entirely of a maintenance and operations tax rate of $0.90 per $100 of assessed valuation.

Tax Rate Limitation

Debt Service:	Unlimited (no legal limit as to rate or amount).
Maintenance:	$1.50 per $100 assessed taxable valuation.
Maintenance Tax Roads:	$0.25 per $100 assessed taxable valuation.

Maintenance Tax

The Board has the statutory authority to levy and collect an annual ad valorem tax for maintenance of the District's improvements if such maintenance tax is authorized by vote of the District's electors. The Board is authorized by the District's voters to levy such maintenance tax in an amount not to exceed $1.50 per $100 of assessed valuation. Such tax, when levied, is in addition to taxes which the District is authorized to levy for paying principal of and interest on the Bonds and any parity bonds which may be issued in the future. See "Tax Rate Distribution" below.

Additional Penalties

The District has contracted with a delinquent tax attorney to collect certain delinquent taxes. In connection with that contract, the District can establish an additional penalty of twenty percent (20%) of the tax to defray the costs of collection. This 20% penalty applies to taxes that either: (1) become delinquent on or after February 1 of a year, but not later than June 1 of that year, and that remain delinquent on April 1 (for personal property) and July 1 (for real property) of the year in which they become delinquent or (2) become delinquent on or after June 1, pursuant to the Property Tax Code.

Tax Rate Calculations

The tax rate calculations set forth below are presented to indicate the tax rates per $100 of assessed taxable valuation which would be required to meet certain debt service requirements of the Bonds if no growth in the District's tax base occurs beyond the 2025 Certified Taxable Assessed Valuation ($67,565,323), the 2026 Preliminary Taxable Assessed Valuation ($248,060,950), or the Estimated Taxable Assessed Valuation as of May 1, 2026 ($303,751,121). The calculations assume collection of 95% of taxes levied, the sale of the Bonds but not the sale of any additional bonds by the District.

Estimated Average Annual Debt Service Requirement (2026–2050)	$ 2,238,572
Debt Service Tax Rate of $3.49 on the 2025 Certified Taxable Assessed Valuation	$ 2,240,128
Debt Service Tax Rate of $0.95 on the 2026 Preliminary Taxable Assessed Valuation	$ 2,238,750
Debt Service Tax Rate of $0.78 on the Estimated Taxable Valuation as of May 1, 2026	$ 2,250,796
Estimated Maximum Annual Debt Service Requirement (2049)	$ 2,411,544
Debt Service Tax Rate of $3.76 on the 2025 Certified Taxable Assessed Valuation	$ 2,413,433
Debt Service Tax Rate of $1.03 on the 2026 Preliminary Taxable Assessed Valuation	$ 2,427,276
Debt Service Tax Rate of $0.84 on the Estimated Taxable Valuation as of May 1, 2026	$ 2,423,934

Estimated Overlapping Taxes

Property within the District is subject to taxation by several taxing authorities in addition to the District. Under Texas law, if ad valorem taxes levied by a taxing authority become delinquent, a lien is created upon the property which has been taxed. A tax lien on property in favor of the District is on a parity with tax liens of other taxing jurisdictions. In addition to ad valorem taxes required to make debt service payments on bonded debt of the District and of such other jurisdictions (see "DISTRICT DEBT – Estimated Direct and Overlapping Debt Statement"), certain taxing jurisdictions are authorized by Texas law to assess, levy and collect ad valorem taxes for operation, maintenance, administrative and/or general revenue purposes.

Set forth below is an estimation of all taxes per $100 of assessed valuation levied by such jurisdictions. No recognition is given to local assessments for civic association dues, emergency medical service contributions, fire department contributions or any other charges made by entities other than political subdivisions. The following chart includes the 2025 taxes per $100 of assessed valuation levied by all such taxing jurisdictions. No prediction can be made of the tax rates that will be levied in future years by the respective taxing jurisdictions.

Taxing Jurisdictions	2025 Tax Rate Per $100 of A.V.
The District	$ 0.900000
City of Iowa Colony, Texas	0.519209 (a)
City of Manvel, Texas	0.560000
Brazoria County Drainage District No. 5	0.108452
Brazoria County Emergency Services District No. 3	0.079229
Brazoria County, Texas	0.262837
Alvin Community College	0.156543
Alvin Independent School District	1.150000
Road and Bridge Fund	0.041921
Total	$ 3.258982 (b)

(a) Not included in the total tax rate calculation.
(b) This illustrates the highest tax rate possible for a property owner in the District. A property owner will either be taxed by the City of Manvel or the City of Iowa Colony. For illustrative purposes, the total tax rate includes the City of Manvel's 2025 levied tax rate.

Historical Tax Collections

Tax Year	Assessed Valuation	Tax Rate Per $100 (a)	Adjusted Levy	% of Collections Current Year	For the Current Year Ended September 30	% of Collections as of 05/31/2026
2023	$ 5,691,671	$0.9000	$ 51,225	100.00%	2024	100.00%
2024	6,922,504	0.9000	62,303	100.00%	2025	100.00%
2025	67,565,323	0.9000	608,088	97.99% (b)	2026	97.99% (b)

(a) Tax rate per $100 of taxable value. See "Tax Rate Distribution" below.
(b) In process of collections.

Tax Rate Distribution

	2025	2024	2023
Utility System Debt Service (a)	$ 0.000	$ 0.000	$ 0.000
Road System Debt Service (a)	0.000	0.000	0.000
Maintenance	0.900	0.900	0.900
Total	$ 0.900	$ 0.900	$ 0.900

(a) The District expects to levy a debt service tax in 2026.

Assessed Taxable Valuation Summary

The following represents the types of property comprising the District's assessed taxable value for each of the 2023–2025 tax years.

Type of Property	2025 Assessed Valuation	2024 Assessed Valuation	2023 Assessed Valuation
Land	$ 35,929,941	$ 7,469,989	$ 7,304,512
Improvements	55,091,621	19,660,880	3,100
Personal Property	308,090	-	-
Exemptions	(22,736,203)	(20,208,365)	(1,615,941)
Total	$ 67,565,323	$ 6,922,504	$ 5,691,671

Principal Taxpayers

The following are the principal taxpayers in the District as shown on the District's certified appraisal rolls for the 2025 tax year.

Taxpayer	Type of Property	Assessed Taxable Valuation 2025 Tax Roll
GR-M1 LTD (a)	Land & Improvements	$ 4,698,923
Perry Homes LLC	Land & Improvements	2,907,450
Terra Prima LTD	Land & Improvements	2,520,000
Westin Homes and Properties LP	Land & Improvements	2,189,240
Highland Homes - Houston LLC	Land & Improvements	2,022,940
Weekley Homes LLC	Land & Improvements	1,935,365
Chesmar Homes LLC	Land & Improvements	840,950
Homeowner	Land & Improvements	675,200
Homeowner	Land & Improvements	636,560
Homeowner	Land & Improvements	631,850
Total		$ 19,058,478
Percent of Respective Tax Roll		28.21%

(a) See "DEVELOPERS."

LEGAL MATTERS

Legal Opinions

Delivery of the Bonds will be accompanied by the approving legal opinion of the Attorney General of Texas to the effect that the Bonds are valid and legally binding obligations of the District under the Constitution and laws of the State of Texas, payable from the proceeds of an annual ad valorem tax levied, without legal limitation as to rate or amount, upon all taxable property within the District, and, based upon their examination of a transcript of certified proceedings relating to the issuance and sale of the Bonds, the approving legal opinion of Bond Counsel to a like effect and to the effect that, under existing law, interest on the Bonds (i) is excludable from gross income for federal income tax purposes under section 103 of the Code (as defined herein), and (ii) is not an item of tax preference for purposes of the alternative minimum tax on individuals.

Bond Counsel has reviewed the information appearing in this Official Statement under "THE BONDS (except for information under the subheadings "Book-Entry-Only System," "Use and Distribution of Proceeds of the Bonds," "THE DISTRICT – Authority," "TAXING PROCEDURES," "LEGAL MATTERS," "TAX MATTERS" and "CONTINUING DISCLOSURE OF INFORMATION" solely to determine whether such information, insofar as it relates to matters of law, is true and correct and whether such information fairly summarizes matters of law and the provisions of the documents referred to therein. Bond Counsel has not, however, independently verified any of the factual information contained in this Official Statement nor has it conducted an investigation of the affairs of the District for the purpose of passing upon the accuracy or completeness of this Official Statement. No person is entitled to rely upon Bond Counsel's limited participation as an assumption of responsibility for or an expression of opinion of any kind with regard to the accuracy or completeness of any information contained herein.

Allen Boone Humphries Robinson LLP, also serves as general counsel to the District on matters other than the issuance of bonds. The legal fees paid to Bond Counsel for services rendered in connection with the issuance of the Bonds are based on a percentage of the bonds actually issued, sold and delivered and, therefore, such fees are contingent upon the sale and delivery of the Bonds.

The various legal opinions to be delivered concurrently with the delivery of the Bonds express the professional judgment of the attorneys rendering the opinions as to the legal issues explicitly addressed therein. In rendering a legal opinion, the attorney does not become an insurer or guarantor of the expression of professional judgment, of the transaction opined upon, or of the future performance of the parties to the transaction, nor does the rendering of an opinion guarantee the outcome of any legal dispute that may arise out of the transaction.

No-Litigation Certificate

The District will furnish the Initial Purchaser a certificate, executed by the President and Secretary of the Board, and dated as of the Date of Delivery of the Bonds, that to their knowledge, no litigation is pending or threatened affecting the validity of the Bonds, or the levy and/or collection of taxes for the payment thereof, or the organization or boundaries of the District, or the title of the officers thereof to their respective offices.

No Material Adverse Change

The obligations of the Purchasers to take and pay for the Bonds, and of the District to deliver the Bonds, are subject to the condition that, up to the time of delivery of and receipt of payment for the Bonds, there shall have been no material adverse change in the condition (financial or otherwise) of the District subsequent to the date of sale from that set forth or contemplated in the Preliminary Official Statement, as it may have been supplemented or amended through the date of sale.

TAX MATTERS

The following discussion of certain federal income tax considerations is for general information only and is not tax advice. Each prospective purchaser of the Bonds should consult its own tax advisor as to the tax consequences of the acquisition, ownership and disposition of the Bonds.

Tax Exemption

In the opinion of Allen Boone Humphries Robinson LLP, Bond Counsel, under existing law, interest on the Bonds (i) is excludable from gross income for federal income tax purposes under section 103 of the Internal Revenue Code of 1986, as amended (the "Code"), and (ii) is not an item of tax preference for purposes of the alternative minimum tax on individuals.

The Code imposes a number of requirements that must be satisfied for interest on state or local obligations, such as the Bonds, to be excludable from gross income for federal income tax purposes. These requirements include limitations on the use of bond proceeds and the source of repayment of bonds, limitations on the investment of bond proceeds prior to expenditure, a requirement that excess arbitrage earned on the investment of bond proceeds be paid periodically to the

United States and a requirement that the issuer file an information report with the Internal Revenue Service (the "Service"). The District has covenanted in the Bond Resolution that it will comply with these requirements.

Bond Counsel's opinion will assume continuing compliance with the covenants of the Bond Resolution pertaining to those sections of the Code that affect the excludability of interest on the Bonds from gross income for federal income tax purposes and, in addition, will rely on representations by the District and other parties involved with the issuance of the Bonds with respect to matters solely within the knowledge of the District and such parties, which Bond Counsel has not independently verified. If the District fails to comply with the covenants in the Bond Resolution or if the foregoing representations are determined to be inaccurate or incomplete, interest on the Bonds could become includable in gross income from the Date of date of delivery of the Bonds, regardless of the date on which the event causing such inclusion occurs.

Bond Counsel will express no opinion as to the amount or timing of interest on the Bonds or, except as stated above, any federal, state or local tax consequences resulting from the receipt or accrual of interest on, or acquisition, ownership or disposition of, the Bonds. Certain actions may be taken or omitted subject to the terms and conditions set forth in the Bond Resolution upon the advice or with the approving opinion of Bond Counsel. Bond Counsel will express no opinion with respect to Bond Counsel's ability to render an opinion that such actions, if taken or omitted, will not adversely affect the excludability of interest of the Bonds from gross income for federal income tax purposes.

Bond Counsel's opinions are based on existing law, which is subject to change. Such opinions are further based on Bond Counsel's knowledge of facts as of the date thereof. Bond Counsel assumes no duty to update or supplement its opinions to reflect any facts or circumstances that may thereafter come to Bond Counsel's attention or to reflect any changes in any law that may thereafter occur or become effective. Moreover, Bond Counsel's opinions are not a guarantee of result and are not binding on the Service; rather, such opinions represent Bond Counsel's legal judgment based upon its review of existing law and in reliance upon the representations and covenants referenced above that it deems relevant to such opinions. The Service has an ongoing audit program to determine compliance with rules that relate to whether interest on state or local obligations is includable in gross income for federal income tax purposes. No assurance can be given as to whether the Service will commence an audit of the Bonds. If an audit is commenced, in accordance with its current published procedures the Service is likely to treat the District as the taxpayer, and the Owners of the Bonds may not have a right to participate in such audit. Public awareness of any future audit of the Bonds could adversely affect the value and liquidity of the Bonds, regardless of the ultimate outcome of the audit.

Not Qualified Tax-Exempt Obligations

The Bonds will not be designated "qualified tax-exempt obligations" for financial institutions.

Additional Federal Income Tax Considerations

Collateral Tax Consequences

Prospective purchasers of the Bonds should be aware that the ownership of tax-exempt obligations may result in collateral federal income tax consequences, including but not limited those noted below. Therefore, prospective purchasers of the Bonds should consult their own tax advisors as to the tax consequences of the acquisition, ownership and disposition of the Bonds.

An "applicable corporation" (as defined in section 59(k) of the Code) may be subject to a 15 percent alternative minimum tax imposed under section 55 of the Code on its "adjusted financial statement income" (as defined in section 56A of the Code) for such taxable year. Because interest on tax-exempt obligations, such as the Bonds, is included in a corporation's "adjusted financial statement income," ownership of the Bonds could subject certain corporations to alternative minimum tax consequences.

Ownership of tax-exempt obligations also may result in collateral federal income tax consequences to financial institutions, life insurance and property and casualty insurance companies, certain S corporations with Subchapter C earnings and profits, individual recipients of Social Security or Railroad Retirement benefits, taxpayers who may be deemed to have incurred or continued indebtedness to purchase or carry tax-exempt obligations, low and middle income taxpayers otherwise qualifying for the health insurance premium assistance credit and individuals otherwise qualifying for the earned income tax credit. In addition, certain foreign corporations doing business in the United States may be subject to the "branch profits tax" on their effectively connected earnings and profits, including tax-exempt interest such as interest on the Bonds.

Prospective purchasers of the Bonds should also be aware that, under the Code, taxpayers are required to report on their returns the amount of tax-exempt interest, such as interest on the Bonds, received or accrued during the year.

Tax Accounting Treatment of Original Issue Premium

If the issue price of any maturity of the Bonds exceeds the stated redemption price payable at maturity of such Bonds, such Bonds (the "Premium Bonds") are considered for federal income tax purposes to have "bond premium" equal to the amount of such excess. The basis of a Premium Bond in the hands of an initial owner is reduced by the amount of such excess that is amortized during the period such initial owner holds such Premium Bond in determining gain or loss for federal income tax purposes. This reduction in basis will increase the amount of any gain or decrease the amount of any loss recognized for federal income tax purposes on the sale or other taxable disposition of a Premium Bond by the initial owner. No corresponding deduction is allowed for federal income tax purposes for the reduction in basis resulting from amortizable bond premium. The amount of bond premium on a Premium Bond that is amortizable each year (or shorter period in the event of a sale or disposition of a Premium Bond) is determined using the yield to maturity on the Premium Bond based on the initial offering price of such Premium Bond.

The federal income tax consequences of the purchase, ownership and redemption, sale or other disposition of Premium Bonds that are not purchased in the initial offering at the initial offering price may be determined according to rules that differ from those described above. All owners of Premium Bonds should consult their own tax advisors with respect to the determination for federal, state, and local income tax purposes of amortized bond premium upon the redemption, sale or other disposition of a Premium Bond and with respect to the federal, state, local, and foreign tax consequences of the purchase, ownership, and sale, redemption or other disposition of such Premium Bonds.

Tax Accounting Treatment of Original Issue Discount

If the issue price of any maturity of the Bonds is less than the stated redemption price payable at maturity of such Bonds (the "OID Bonds"), the difference between (i) the amount payable at the maturity of each OID Bond, and (ii) the initial offering price to the public of such OID Bond constitutes original issue discount with respect to such OID Bond in the hands of any owner who has purchased such OID Bond in the initial public offering of the Bonds. Generally, such initial owner is entitled to exclude from gross income (as defined in section 61 of the Code) an amount of income with respect to such OID Bond equal to that portion of the amount of such original issue discount allocable to the period that such OID Bond continues to be owned by such owner. Because original issue discount is treated as interest for federal income tax purposes, the discussions regarding interest on the Bonds under the captions "TAX MATTERS – Tax Exemption" and "TAX MATTERS – Additional Federal Income Tax Considerations – Collateral Tax Consequences" and "—Tax Legislative Changes" generally apply and should be considered in connection with the discussion in this portion of the Official Statement.

In the event of the redemption, sale or other taxable disposition of such OID Bond prior to stated maturity, however, the amount realized by such owner in excess of the basis of such OID Bond in the hands of such owner (adjusted upward by the portion of the original issue discount allocable to the period for which such OID Bond was held by such initial owner) is includable in gross income.

The foregoing discussion assumes that (i) the Underwriter has purchased the Bonds for contemporaneous sale to the public and (ii) all of the OID Bonds have been initially offered, and a substantial amount of each maturity thereof has been sold, to the general public in arm's-length transactions for a price (and with no other consideration being included) not more than the initial offering prices thereof stated on the inside cover page of this Official Statement. Neither the District nor Bond Counsel has made any investigation or offers any assurance that the OID Bonds will be offered and sold in accordance with such assumptions.

Under existing law, the original issue discount on each OID Bond accrues daily to the stated maturity thereof (in amounts calculated as described below for each six-month period ending on the date before the semiannual anniversary dates of the date of the Bonds and ratably within each such six-month period) and the accrued amount is added to an initial owner's basis for such OID Bond for purposes of determining the amount of gain or loss recognized by such owner upon the redemption, sale or other disposition thereof. The amount to be added to basis for each accrual period is equal to (i) the sum of the issue price and the amount of original issue discount accrued in prior periods multiplied by the yield to stated maturity (determined on the basis of compounding at the close of each accrual period and properly adjusted for the length of the accrual period) less (ii) the amounts payable as current interest during such accrual period on such Bond.

The federal income tax consequences of the purchase, ownership, and redemption, sale or other disposition of OID Bonds that are not purchased in the initial offering at the initial offering price may be determined according to rules that differ from those described above. All owners of OID Bonds should consult their own tax advisors with respect to the determination for federal, state, and local income tax purposes of interest accrued upon redemption, sale or other disposition of such OID Bonds and with respect to the federal, state, local and foreign tax consequences of the purchase, ownership, redemption, sale or other disposition of such OID Bonds.

Tax Legislative Changes

Current law may change so as to directly or indirectly reduce or eliminate the benefit of the excludability of interest on the Bonds from gross income for federal income tax purposes.

Any proposed legislation, whether or not enacted, could also affect the value and liquidity of the Bonds. Prospective purchasers of the Bonds should consult with their own tax advisors with respect to any recently enacted, proposed, pending or future legislation.

CONTINUING DISCLOSURE OF INFORMATION

In the Bond Resolution, the District has made the following agreement for the benefit of the holders and beneficial owners of the Bonds. The District is required to observe these agreements so long as it remains obligated to advance funds to pay the Bonds. Under the agreement, the District will be obligated to provide certain updated financial information and operating data annually, as well as timely notice of specified events, to the Municipal Securities Rulemaking Board or any successor to its function as a repository (the "MSRB"), through its Electronic Municipal Market Access ("EMMA") system.

Annual Reports

The District will provide certain updated financial information and operating data to the MSRB. The information to be updated with respect to the District includes all quantitative financial information and operating data with respect to the District of the general type included in this Official Statement included under the headings "DISTRICT DEBT" (except for the subheading "—Estimated Direct and Overlapping Debt Statement"), "TAX DATA," and in "APPENDIX A." The District will update and provide this information within six months after the end of each of its fiscal years ending in or after 2026. The District will provide the updated information to the MSRB.

Any information so provided shall be prepared in accordance with generally accepted accounting principles or other such principles as the District may be required to employ from time to time pursuant to state law or regulation, and audited if the audit report is completed within the period during which it must be provided. If the audit report is not complete within such period, then the District shall provide unaudited financial statements for the applicable fiscal year to the MSRB within such six-month period, and audited financial statements when and if the audit report becomes available. The District's current fiscal year end is March 31. Accordingly, it must provide updated information by the last day in September in each year, unless the District changes its fiscal year. If the District changes its fiscal year, it will notify the MSRB of the change.

Event Notices

The District will provide timely notices of certain events to the MSRB, but in no event will such notices be provided to the MSRB in excess of ten business days after the occurrence of an event. The District will provide notice of any of the following events with respect to the Bonds: (1) principal and interest payment delinquencies; (2) non-payment related defaults, if material; (3) unscheduled draws on debt service reserves reflecting financial difficulties; (4) unscheduled draws on credit enhancements reflecting financial difficulties; (5) substitution of credit or liquidity providers, or their failure to perform; (6) adverse tax opinions, the issuance by the Internal Revenue Service of proposed or final determinations of taxability, Notices of Proposed Issue (IRS Form 5701-TEB) or other material notices or determinations with respect to the tax-exempt status of the Bonds, or other material events affecting the tax-exempt status of the Bonds; (7) modifications to rights of beneficial owners of the Bonds, if material; (8) bond calls, if material, and tender offers; (9) defeasances; (10) release, substitution, or sale of property securing repayment of the Bonds, if material; (11) rating changes; (12) bankruptcy, insolvency, receivership or similar event of the District or other obligated person within the meaning of the Rule; (13) consummation of a merger, consolidation, or acquisition involving the District or other obligated person within the meaning of the Rule, or the sale of all or substantially all of the assets of the District or other obligated person, within the meaning of the Rule, other than in the ordinary course of business, the entry into a definitive agreement to undertake such an action or the termination of a definitive agreement relating to any such actions, other than pursuant to its terms, if material; (14) appointment of a successor or additional trustee or the change of name of a trustee, if material; (15) incurrence of a financial obligation of the District or obligated person, if material, or agreement to covenants, events of default, remedies, priority rights, or other similar terms of a financial obligation of the District or obligated person, any of which affect security holders, if material; and (16) default, event of acceleration, termination event, modification of terms, or other similar events under the terms of the financial obligation of the District or obligated person, any of which reflect financial difficulties. The terms "obligated person" and "financial obligation" when used in this paragraph shall have the meanings ascribed to them under SEC Rule 15c2-12 (the "Rule"). The term "material" when used in this paragraph shall have the meaning ascribed to it under federal securities laws. Neither the Bonds nor the Bond Resolution makes any provision for debt service reserves or liquidity enhancement. In addition, the District will provide timely notice of any failure by the District to provide information, data, or financial statements in accordance with its agreement described above under "Annual Reports."

Availability of Information from EMMA

The District has agreed to provide the information only to the MSRB. The MSRB has prescribed that such information must be filed via EMMA. The MSRB makes the information available to the public without charge and investors will be able to access continuing disclosure information filed with the MSRB at www.emma.msrb.org.

Limitations and Amendments

The District has agreed to update information and to provide notices of material events only as described above. The District has not agreed to provide other information that may be relevant or material to a complete presentation of its financial results of operations, condition, or prospects or agreed to update any information that is provided, except as described above. The District makes no representation or warranty concerning such information or concerning its usefulness to a decision to invest in or sell bonds at any future date. The District disclaims any contractual or tort liability for damages resulting in whole or in part from any breach of its continuing disclosure agreement, or from any statement made pursuant to its agreement, although holders and beneficial owners of Bonds may seek a writ of mandamus to compel the District to comply with its agreement.

The District may amend its continuing disclosure agreement to adapt to changed circumstances that arise from a change in legal requirements, a change in law, or a change in the identity, nature, status, or operations of the District but only if the agreement, as amended, would have permitted an underwriter to purchase or sell Bonds in the offering described herein in compliance with the Rule, taking into account any amendments and interpretations of the Rule to the date of such amendment, as well as changed circumstances, and either the holders of a majority in aggregate principal amount of the outstanding Bonds consent or any person unaffiliated with the District (such as nationally recognized bond counsel) determines that the amendment will not materially impair the interests of the beneficial owners of the Bonds. The District may also amend or repeal the agreement if the SEC amends or repeals the applicable provisions of such rule or a court of final jurisdiction determines that such provisions are invalid, but in either case only to the extent that its right to do so would not prevent the Initial Purchaser from lawfully purchasing the Bonds in the offering described herein. If the District so amends the agreement, it has agreed to include with any financial information or operating data next provided in accordance with its agreement described above under "Annual Reports" an explanation, in narrative form, of the reasons for the amendment and of the impact of any change in the type of financial information and operating data so provided.

Compliance with Prior Undertakings

The District has complied in all material respects with its previous continuing disclosure agreements made in accordance with SEC Rule 15c2-12, except as described below:

The District filed an Annual Report on October 20, 2025, for the fiscal year ended March 31, 2025, with the MSRB through the EMMA internet portal. Due to an administrative oversight, the Annual Report was filed late and due on September 30, 2025.

OFFICIAL STATEMENT

General

The information contained in this Official Statement has been obtained primarily from the Developer, the District's records, the Engineer, the Tax Assessor/Collector and other sources believed to be reliable; however, no representation is made as to the accuracy or completeness of the information contained herein, except as described below. The summaries of the statutes, resolutions and engineering and other related reports set forth herein are included subject to all of the provisions of such documents. These summaries do not purport to be complete statements of such provisions and reference is made to such documents for further information.

Experts

The information contained in the Official Statement relating to engineering and to the description of the Utility System, and, in particular, that engineering information included in the sections entitled "THE DISTRICT – Description" and "THE UTILITY SYSTEM," and "THE ROAD SYSTEM" has been provided by Edminster, Hinshaw, Russ and Associates, Inc. and has been included herein in reliance upon the authority of said firm as experts in the field of civil engineering.

The information contained in the Official Statement relating to assessed valuations of property generally and, in particular, that information concerning collection rates and valuations contained in the sections captioned "TAX DATA" and "DISTRICT DEBT" was provided by Assessments of the Southwest, Inc. and the Appraisal District. Such information has been included herein in reliance upon Assessments of the Southwest, Inc.'s authority as an expert in the field of tax collection and the Appraisal District's authority as an expert in the field of tax assessing.

Certification as to Official Statement

The District, acting by and through its Board in its official capacity and in reliance upon the experts listed above, hereby certifies, as of the date hereof, that to the best of its knowledge and belief, the information, statements and descriptions pertaining to the District and its affairs herein contain no untrue statements of a material fact and do not omit to state any material fact necessary to make the statements herein, in light of the circumstances under which they were made, not misleading. The information, descriptions and statements concerning entities other than the District, including particularly other governmental entities, have been obtained from sources believed to be reliable, but the District has made no

independent investigation or verification of such matters and makes no representation as to the accuracy or completeness thereof.

Updating of Official Statement

If, subsequent to the date of the Official Statement, the District learns, through the ordinary course of business and without undertaking any investigation or examination for such purposes, or is notified by the Initial Purchaser, of any adverse event which causes the Official Statement to be materially misleading, and unless the Initial Purchaser elects to terminate its obligation to purchase the Bonds, the District will promptly prepare and supply to the Initial Purchaser an appropriate amendment or supplement to the Official Statement satisfactory to the Initial Purchaser; provided, however, that the obligation of the District to so amend or supplement the Official Statement will terminate when the District delivers the Bonds to the Initial Purchaser, unless the Initial Purchaser notifies the District in writing on or before such date that less than all of the Bonds have been sold to ultimate customers, in which case the District's obligations hereunder will extend for an additional period of time (but not more than 90 days after the date the District delivers the Bonds) until all of the Bonds have been sold to ultimate customers.

CONCLUDING STATEMENT

The information set forth herein has been obtained from the District's records, audited financial statements and other sources which are considered to be reliable. There is no guarantee that any of the assumptions or estimates contained herein will ever be realized. All of the summaries of the statutes, documents and resolutions contained in this Official Statement are made subject to all of the provisions of such statutes, documents and resolutions. These summaries do not purport to be complete statements of such provisions and reference is made to such summarized documents for further information. Reference is made to official documents in all respects.

This Official Statement was approved by the Board of Directors of Brazoria County Municipal Utility District No. 57 as of the date shown on the cover page.

/s/ _____
Lance Taylor
President, Board of Directors
Brazoria County Municipal Utility District No. 57

ATTEST:

/s/ _____
Tim Austin
Secretary, Board of Directors
Brazoria County Municipal Utility District No. 57

APPENDIX A

FINANCIAL STATEMENTS OF THE DISTRICT

OFFICIAL NOTICE OF SALE

$13,395,000

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57
(A political subdivision of the State of Texas located in Brazoria County)

UNLIMITED TAX BONDS
SERIES 2026

BIDS TO BE SUBMITTED BY:
9:30 A.M., THURSDAY, JULY 9, 2026
CENTRAL TIME

BONDS TO BE AWARDED:
10:30 A.M., THURSDAY, JULY 9, 2026
CENTRAL TIME

This Official Notice of Sale does not alone constitute an invitation for bids, but is merely notice of sale of the bonds described herein. The invitation for such bids is being made by means of this Official Notice of Sale, the Official Bid Form and the Preliminary Official Statement. Information contained in this Official Notice of Sale is qualified in its entirety by the detailed information contained in the Preliminary Official Statement.

OFFICIAL NOTICE OF SALE

$13,395,000

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57

(A political subdivision of the State of Texas located within Brazoria County, Texas)

UNLIMITED TAX BONDS
SERIES 2026

THE BONDS WILL NOT BE DESIGNATED AS "QUALIFIED TAX-EXEMPT OBLIGATIONS" FOR FINANCIAL INSTITUTIONS.

BONDS OFFERED FOR SALE AT COMPETITIVE BID: The Board of Directors (the "Board") of Brazoria County Municipal Utility District No. 57 (the "District"), is offering for sale at competitive bid the District's $13,395,000 Unlimited Tax Bonds, Series 2026 (the "Bonds").

METHODS FOR SUBMISSION OF BIDS AND BID FORMS: Bidders may submit bids for the Bonds by any of the following methods:

1. Submit bids in writing as described below in "WRITTEN BIDDING PROCEDURE;"
2. Submit bids electronically as described below in "ELECTRONIC BIDDING PROCEDURE;" or
3. Submit bids by telephone as described below in "TELEPHONIC BIDDING PROCEDURE."

The District will not accept bids submitted by facsimile.

All bids must be submitted by 9:30 A.M., Central Time, on Thursday, July 9, 2026. Any prospective bidder must also submit, by 9:30 A.M., Central Time, on Thursday, July 9, 2026, signed Official Bid Form(s) to the District's financial advisor, Cedar Creek Municipal Advisors, LLC (the "Financial Advisor"), as more fully described below. Any bid or bid form submitted after such scheduled time for bid receipt will not be accepted and will be returned unopened. See "CONDITIONS OF SALE – REQUIRED DISCLOSURE OF INTERESTED PARTIES" for additional requirements concerning submission of bids by certain entities.

WRITTEN BIDDING PROCEDURE: A prospective bidder that intends to submit its bid in writing must do so in accordance with this paragraph. Two (2) sealed bids, which must be submitted on the Official Bid Form and plainly marked "Bid for Bonds," are to be addressed to "President and Board of Directors, Brazoria County Municipal Utility District No. 57." The two (2) sealed bids must be submitted on signed Official Bid Forms and delivered, by, to the office of the District's Financial Advisor, Cedar Creek Municipal Advisors, LLC, Attn: David Smalling, 4801 Woodway Drive, Suite 118-E, Houston, Texas 77056, by 9:30 A.M., Central Time, on, Thursday, July 9, 2026. Any bid or bid form submitted after such scheduled time for bid receipt will not be accepted and will be returned unopened. For purposes of the written bidding procedure, the time as maintained by PARITY (described below) shall constitute the official time.

ELECTRONIC BIDDING PROCEDURE: Any prospective bidder that intends to submit an electronic bid must submit its electronic bid through the facilities of PARITY. Bidders must submit, prior to 9:30 A.M., Central Time, Thursday, July 9, 2026, one (1) signed copy of the Official Bid Form that is signed but otherwise incomplete to the Financial Advisor by e-mail to the following address: dsmalling@cedarcreekma.com. Subscription to the i-Deal's BIDCOMP Competitive Bidding System is required in order to submit an electronic bid. The District will neither confirm any subscription nor be responsible for the failure of any prospective bidder to subscribe. Electronic bids must be received via PARITY in the manner described below, until 9:30 A.M., Central Time, on Thursday, July 9, 2026.

Electronic bids must be submitted via PARITY in accordance with this Official Notice of Sale, until 9:30 A.M., Central Time, but no bid will be received after the time for receiving bids specified above. An electronic bid made through the facilities of PARITY shall be deemed an irrevocable offer to purchase the Bonds on the terms provided in the Official Notice of Sale, and shall be binding upon the bidder as if made by a signed, sealed bid delivered to the District. The District shall not be responsible for any malfunction or mistake made by, or as a result of the use of the facilities of, PARITY, the use of such facilities being the sole risk of the prospective bidder.

If any provisions of the Official Notice of Sale shall conflict with information provided by PARITY as the approved provider of electronic bidding services, this Official Notice of Sale shall control. Further information about PARITY, including any fee charged, may be obtained from i-Deal, 1359 Broadway, 2nd Floor, New York, NY 10018, (212) 849-5000.

For purposes of the electronic bidding process, the time as maintained by PARITY shall constitute the official time. For information purposes only, bidders are requested to state in their electronic bids the net effective interest rate to the District, as described under "CONDITIONS OF THE SALE – BASIS OF AWARD" below. All electronic bids shall be deemed to incorporate the provisions of this Official Notice of Sale and the Official Bid Form. See "CONDITIONS OF SALE – REQUIRED DISCLOSURE OF INTERESTED PARTIES" for additional requirements concerning submission of bids.

TELEPHONIC BIDDING PROCEDURE: Any prospective bidder that intends to submit its bid by telephone must submit its bid in accordance with this section. Prior to 9:30 A.M., Central Time, on Thursday, July 9, 2026, bidders must submit two (2) signed Official Bid Forms, executed by an authorized representative of the bidder, to Cedar Creek Municipal Advisors, LLC, Attn: David Smalling, 4801 Woodway Drive, Suite 118-E, Houston, Texas 77056. Bidders who have provided signed bid forms may thereafter submit bids by telephone on the date of sale by 9:30 A.M., Central Time. Inquiries with respect to this procedure may be directed to David Smalling of Cedar Creek Municipal Advisors, LLC at (713) 230-6125.

David Smalling of Cedar Creek Municipal Advisors, LLC will call telephone bidders who have submitted SIGNED Official Bid Forms prior to the date of the sale. Contact David Smalling of Cedar Creek Municipal Advisors, LLC on the day of the sale to obtain the phone number.

LATE BIDS AND IRREGULARITIES: Cedar Creek Municipal Advisors, LLC is not authorized and will not be responsible for the submission of any bids made after the time prescribed, nor does the District or Cedar Creek Municipal Advisors, LLC assume any responsibility or liability with respect to any irregularities associated with the submission, delivery, or electronic transmission of any bid. The District and the Board reserve the right to reject any and all bids and to waive any irregularities, except time of filing.

AWARD AND SALE OF THE BONDS: The District will take action to adopt a resolution (the "Bond Resolution") authorizing the issuance and awarding sale of the Bonds or will reject all bids promptly after receiving the bids at 10:30 A.M. Central Time on Thursday, July 9, 2026 at the offices of Allen Boone Humphries Robinson LLP, 3200 Southwest Freeway, Suite 2600, Houston, Texas 77027. Sale of the Bonds will be made subject to the terms, conditions, and provisions of the Bond Resolution, to which Bond Resolution reference is hereby made for all purposes, and subject to compliance with Section 2252.908 of the Texas Government Code as more fully described below. The Board reserves the right to reject any or all bids and to waive any irregularities, except time of filing. All bids must comply with the requirements in "CONDITIONS OF SALE – REQUIRED DISCLOSURE OF INTERESTED PARTIES."

THE BONDS

DESCRIPTION OF CERTAIN TERMS OF THE BONDS: The Bonds will be dated August 1, 2026, with interest accruing from the initial date of delivery (expected to be August 13, 2026) (the "Date of Delivery") and payable on March 1, 2027, and each September 1 and March 1 thereafter (each an "Interest Payment Date") until the earlier of maturity or prior redemption. The Bonds will be issued only in fully registered form. Principal is payable to the registered owner(s) of the Bonds (the "Registered Owner(s)") upon presentation and surrender at the principal payment office of the paying agent/registrar, initially, BOKF, NA, Dallas, Texas, (the "Paying Agent/Registrar"). Interest on the Bonds will be payable as of the Interest Payment Date, and paid by the Paying Agent/Registrar to the Registered Owner, as shown on the records of the Registrar at the close of business on the 15th day of the calendar month next preceding each Interest Payment Date (the "Record Date"). The Bonds will be registered in the name of Cede & Co., as nominee for The Depository Trust Company ("DTC"), which will act as securities depository for the Bonds. Beneficial owners of the Bonds will not receive physical certificates representing the Bonds, but will receive a credit balance on the books of the nominees of such beneficial owners. So long as Cede & Co. is the Registered Owner of the Bonds, the principal of and interest on the Bonds will be paid by the Paying Agent/Registrar directly to DTC, which will, in turn, remit such principal and interest to its participants for subsequent disbursement to the beneficial owners of the Bonds as described herein. See "THE BONDS – Book-Entry-Only System" in the Preliminary Official Statement.

The Bonds will mature serially on September 1 in each of the following years and principal amounts:

Maturity (September 1)	Principal Amount	Maturity (September 1)	Principal Amount
2027	$295,000	2039	$545,000
2028	335,000	2040	570,000
2029	350,000	2041	595,000
2030	365,000	2042	625,000
2031	385,000	2043	650,000
2032	400,000	2044	680,000
2033	420,000	2045	710,000
2034	440,000	2046	745,000
2035	460,000	2047	775,000
2036	480,000	2048	810,000
2037	500,000	2049	850,000
2038	525,000	2050	885,000

SERIAL BONDS AND TERM BONDS: Bidders may provide that all the Bonds be issued as serial bonds or may provide that any two or more consecutive annual principal amounts may be combined into one or more term bonds.

REDEMPTION OF THE BONDS: The Bonds maturing on and after September 1, 2032, are subject to redemption and payment, at the option of the District, in whole or, from time to time, in part, on September 1, 2031, or on any date thereafter, at a price equal to the principal amount thereof, plus accrued interest thereon to the date fixed for redemption. If less than all the Bonds are redeemed at any time, the District shall determine the maturity or maturities and the amounts thereof to be redeemed, in integral multiples of $5,000 in principal amount, and if less than all of the Bonds within a maturity are to be redeemed, the Paying Agent/Registrar shall select by lot or other customary method of random selection the Bonds within such maturity to be redeemed (or by DTC in accordance with its procedures while the Bonds are in Book-Entry-Only form). The Registered Owner holder of any Bond, all or a portion of which has been called for redemption, will be required to present such Bond to the Paying Agent/Registrar for payment of the redemption price on the portion of such Bond called for redemption and for the issuance of an exchange Bond in a principal amount equal to the portion of the Bond not so redeemed.

SECURITY FOR PAYMENT: The Bonds, when issued, will constitute valid and binding obligations of the District, payable as to principal and interest from the proceeds of an annual ad valorem tax, without legal limitation as to rate or amount, levied against all taxable property within the District. The Bonds are obligations of the District and are not obligations of the State of Texas; Brazoria County, Texas; the City of Iowa Colony, Texas; the City of Manvel, Texas; or any entity other than the District.

OTHER TERMS AND COVENANTS: Other terms of the Bonds and the various covenants of the District contained in the Bond Resolution are described in the Preliminary Official Statement, to which reference is made for all purposes.

USE OF PROCEEDS: Proceeds from the sale of the Bonds will be used by the District to redeem the BAN (as defined in the Preliminary Official Statement), the proceeds of which were used to reimburse the Developers (as defined in the Preliminary Official Statement) for a portion of the improvements and related costs shown below. Additionally, proceeds from the sale of the Bonds will also be used to reimburse the Developers for the improvements and related costs that were not reimbursed by the BAN and to pay: twelve (12) months of capitalized interest, BAN interest, developer interest, and other certain costs associated with the issuance of the Bonds. See "THE BONDS – Use and Distribution of Proceeds of the Bonds" in the Preliminary Official Statement.

MUNICIPAL BOND RATING AND INSURANCE: The District has made applications to Build America Mutual Assurance Company and Assured Guaranty Inc. for a commitment for municipal bond guaranty insurance on the Bonds. **THE PURCHASE OF SUCH INSURANCE IS MANDATORY**, and the payment of all associated costs, including the premium charged by the insurance company and fees charged by rating companies, will be at the expense of the Initial Purchaser. The District has not made an application for a rating on the Bonds.

Furthermore, it is not expected that the District would have been successful in receiving an investment grade rating on the Bonds.

CONDITIONS OF SALE

TYPES OF BIDS AND INTEREST RATES: The Bonds will be sold in one block on an "all or none" basis at a price of not less than 97% of the par value thereof. Bidders are to name the rates of interest to be borne by the Bonds, provided that each interest rate bid must be a multiple of 1/8th or 1/20th of 1%. All Bonds maturing within a single year must bear the same rate of interest. The net effective interest rate on the Bonds may not exceed _____%, as calculated pursuant to Chapter 1204 of the Texas Government Code. No limitation will be imposed upon bidders as to the number of rates which may be used, but the highest rate bid may not exceed the lowest rate bid by more than 2-1/2% in interest rate. No bids involving supplemental interest payments will be considered. No bid that generates a cash premium greater than $5,000 will be considered. Each bid shall indicate the total and net interest costs in dollars and the net effective interest rate determined therefrom, which shall be considered informative only and not as a part of the bid.

BASIS OF AWARD: For the purpose of awarding sale of the Bonds, the total interest cost of each bid will be computed by determining, at the rates specified therein, the total dollar value of all interest on the Bonds from the date thereof to their respective maturities, and adding thereto the dollar amount of the discount bid, if any, or deducting therefrom the premium bid, if any. Subject to the District's right to reject any or all bids, sale of the Bonds will be awarded to the bidder (the "Initial Purchaser") whose bid, under the above computation, produces the lowest net effective interest rate to the District subject to compliance with Texas Government Code §2252.908. The Board reserves the right to reject any or all bids. In the event of mathematical discrepancies between the interest rate(s) bid and the interest cost determined therefrom, as both appear on the Official Bid Form; the bid will be governed solely by the interest rate(s) bid.

GOOD FAITH DEPOSIT: Each bid must be accompanied by a bank cashier's check payable to the order of "Brazoria County Municipal Utility District No. 57" in the amount of $267,900, which represents two percent (2%) of the principal amount of the Bonds. The check will be considered as a Good Faith Deposit, and the check of the successful bidder (the "Initial Purchaser") will be retained uncashed by the District until the Bonds are delivered. In the event the Initial Purchaser should fail or refuse to accept delivery of and pay for the Bonds in accordance with its bid, then the Good Faith Deposit shall be cashed and the proceeds accepted by the District as full and complete liquidated damages against the Initial Purchaser. The Good Faith Deposit may accompany the Official Bid Form or it may be submitted separately. If submitted separately, it shall be made available to the District prior to the opening of the bids and shall be accompanied by instructions from the bank on which it is drawn to authorize its use as a Good Faith Deposit by the bidder, who shall be named in such instructions. The Good Faith Deposit will be returned immediately after full payment has been made by the Initial Purchaser to the District in federal or immediately available funds in the amount of the purchase price plus accrued interest thereon. No interest will be paid on the Good Faith Deposit. The checks accompanying bids other than the winning bid will be returned immediately after the bids are opened and an award of the Bonds has been made.

REQUIRED DISCLOSURE OF INTERESTED PARTIES: Bidders, including any syndicate member listed on the Official Bid Form, who are not publicly traded business entities, or wholly-owned subsidiaries of a publicly traded business entity, must submit to the District (c/o Cedar Creek Municipal Advisors, LLC, 4801 Woodway Drive, Suite 118-E, Houston Texas 77056, Attn: David Smalling, dsmalling@cedarcreekma.com) a completed and signed Texas Ethics Commission Form 1295 ("TEC Form 1295") which has been assigned a certificate number by the TEC in accordance with Texas Government Code Section § 2252.908. According to the rules prescribed by the TEC, the TEC Form 1295 must be completed online through the TEC's website, assigned a certificate number, printed, signed and provided to the District. If required, the TEC Form 1295 may accompany the Official Bid Form or may be submitted separately, but must be provided to the District prior to the time prescribed for the award of the Bonds. If required, the TEC Form 1295 may be provided to the District via facsimile or electronically; however, the original signed TEC Form 1295, including certificate number, must be physically delivered to the District (c/o Allen Boone Humphries Robinson LLP, 3200 Southwest Freeway, Suite 2600, Houston, Texas 77027) within two business days of the award. The District reserves the right to reject any bid that does not comply with the requirements prescribed herein, if applicable, or to waive any such requirements. For purposes of completing the TEC Form 1295, box two is "Brazoria County Municipal Utility District No. 57" and box 3 is "BCMUD57 – S2026UD – B." Neither the District nor its consultants have the ability to verify the information included in a TEC Form 1295, and neither have an obligation nor undertake responsibility for advising any bidder with respect to the proper completion of the TEC Form 1295.

Consequently, any entity who is not a publicly traded business entity, or a wholly-owned subsidiary of a publicly traded business entity, should consult its own advisors to the extent it deems necessary and be prepared to submit the completed form promptly upon notification from the District that its bid is the apparent winning bid.

COMPLIANCE WITH LAWS PROHIBITING CONTRACTS WITH CERTAIN COMPANIES: The District will not award the Bonds to a bidder unless the bidder verifies on behalf of itself and each syndicate member listed on the Official Bid Form that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on the Official Bid Form is a Company that boycotts or will boycott Israel. The terms "boycotts Israel" and "boycott Israel" as used in this paragraph have the meaning assigned to the term "boycott Israel" in Section 808.001 of the Texas Government Code, as amended.

Additionally, the District will not award the Bonds to a bidder unless the bidder certifies that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on the Official Bid Form is a Company[2] (i) that engages in business with Iran, Sudan, or any foreign terrorist organization as described in Chapter 2270 of the Texas Government Code, or Subchapter F of Chapter 2252 of the Texas Government Code, or (ii) listed by the Texas Comptroller of Public Accounts under Section 2270.0201 or 2252.153 of the Texas Government Code. The term "foreign terrorist organization" as used in this paragraph has the meaning assigned to such term in Section 2252.151 of the Texas Government Code.

Additionally, the District will not award the Bonds to a bidder unless the bidder verifies on behalf of itself and each syndicate member listed on the Official Bid Form that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on the Official Bid Form is a Company[1] that boycotts or will boycott energy companies. The terms "boycotts energy companies" and "boycott energy companies" shall have the meaning assigned to the term "boycott energy company" in Section 809.001 of the Texas Government Code, as amended.

Additionally, the District will not award the Bonds to a bidder unless the bidder verifies on behalf of itself and each syndicate member listed on the Official Bid Form that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on the Official Bid Form is a Company[1] that has a practice, policy, guidance or directive that discriminates against a firearm entity or firearm trade association or will discriminate against a firearm entity or firearm trade association. The term "discriminates against a firearm entity or firearm trade association" as used in this paragraph has the meaning assigned to the term "discriminate against a firearm entity or firearm trade association" in Section 2274.001(3) of the Texas Government Code.

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[1] "Company" means a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly-owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit, but does not mean a sole proprietorship.

[2] "Company" means a sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, limited liability company, or other entity or business association whose securities are publicly traded, including a wholly-owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations, that exists to make a profit.

Notwithstanding anything contained herein in the Bond Resolution, or the Official Bid Form to the contrary, any prospective bidder agrees that liability for breach of verification of the statutory representations and covenants provided above as required by Chapters 2252, 2271, 2274, and 2276 of the Texas Government Code shall survive until barred by the applicable statute of limitations and shall not be liquidated or otherwise limited by any provision of the contract the Bond Resolution, this Official Notice of Sale, and the Official Bid Form.

By submitting a bid, a bidder makes and certifies to the representations necessary and convenient for the compliance with the aforementioned laws and, at the request of the District, agrees to execute further written certifications as may be necessary or convenient for the District to establish compliance with the aforementioned laws.

CONTRACTING INFORMATION: The District will not award the Bonds to a bidder unless the bidder verifies on behalf of itself and each syndicate member listed on the Official Bid Form that the bidder and each syndicate member listed on the Official Bid Form will (i) preserve all contracting information related to the bid as provided by the records retention requirements applicable to the District through the delivery date of the Bonds, (ii) promptly provide to the District any contracting information related to the bid that is in the custody

or possession of the bidder or any syndicate member on request of the District, and (iii) upon delivery of the Bonds to the bidder, either (a) provide at no cost to the District all contracting information related to the bid that is in the custody or possession of the bidder or any syndicate member or (b) preserve the contracting information related to the bid as provided by the records retention requirements applicable to the District. The term "contracting information" as used in this paragraph has the meaning assigned to such term in Section 552.003 of the Texas Government Code.

STANDING LETTER REQUIREMENT: Each prospective bidder must have a standing letter on file with the Municipal Advisory Council of Texas and the Texas Attorney General's Office as required by, and compliant in all respects with, the All Bond Counsel Letter of the Texas Attorney General dated November 1, 2023, as supplemented on November 16, 2023, and December 29, 2023, and any All Bond Counsel Letter issued hereafter (collectively, the "All Bond Counsel Letter"). In submitting a bid, a bidder represents to the District that it and each syndicate member listed on the Official Bid Form, if any, (i) has filed a standing letter that conforms to the requirements set forth in the All Bond Counsel Letter; (ii) has no reason to believe that the District may not be entitled to rely on the standing letter on file with the Municipal Advisory Council of Texas and the Texas Attorney General's Office; and (iii) neither bidder, any syndicate member listed on the Official Bid Form, nor any parent company, subsidiaries, or affiliates of the same, have received a letter from the Texas Comptroller of Public Accounts related to its inclusion on any list of financial companies boycotting energy companies. Bidder agrees that it will not rescind its standing letter at any time during the period of time required by the All Bond Counsel Letter and at least not before the delivery of the Bonds unless same is immediately replaced with a standing letter meeting the requirements of the All Bond Counsel Letter. The District reserves the right, in its sole discretion, to reject any bid from a bidder that does not have such standing letter on file as of the deadline for bids for the Bonds. By submitting a bid, each bidder agrees, should it be the winning bidder, to cooperate with the District and take any action necessary to further verify and confirm compliance with state law by the bidder and each syndicate member listed on the Official Bid Form.

The District reserves the right, in its sole discretion, to reject any bid from a bidder that does not have such standing letter on file as of the deadline for bids for the Bonds. In the event that a bidder does not have such standing letter on file at the time of submission of a bid, the bidder agrees to file such standing letter with the Municipal Advisory Council of Texas and the Texas Attorney General's Office by the earlier of: (a) two (2) hours after submitting its bid, and (b) the deadline for bids for the Bonds. If requested by the District, the Initial Purchaser agrees to provide such further representations, certifications or assurances regarding the matters described under the heading "Compliance with Laws Prohibiting Contracts with Companies," as applicable, as of the Date of Delivery of the Bonds or such other date requested by the District.

A bidder who is currently under review by the Texas Attorney General for being a potential discriminator or boycotter under (i) Section 2271.002 of the Texas Government Code, (ii) Section 2252.151 of the Texas Government Code, (iii) Section 2276.002 of the Texas Government Code, or (iv) Section 2274.002 of the Texas Government Code, agrees to provide, prior to the Date of Delivery of the Bonds, a bring-down certification that the Texas Attorney General can continue to rely on the bidder's standing letter and the statutory representations and covenants, in accordance with the requirements set forth in the All Bond Counsel Letters.

Notwithstanding anything contained herein, the representations and covenants contained in "Compliance with Laws Prohibiting Contracts with Certain Companies," and "Standing Letter Requirement" shall survive termination of the agreement until the statute of limitations has run, and liability for breach of any verification in such sections during such period shall not be liquidated or otherwise limited by any provision herein, notwithstanding anything in herein to the contrary.

OFFICIAL STATEMENT

To assist the Initial Purchaser in complying with Rule 15c2-12 of the United States Securities and Exchange Commission ("SEC"), the District and the Initial Purchaser contract and agree, by the submission and acceptance of the winning bid, as follows.

FINAL OFFICIAL STATEMENT: The District has approved and authorized distribution of the accompanying Preliminary Official Statement for dissemination to potential purchasers of the Bonds, but does not presently intend to prepare any other document or version thereof for such purpose, except as described below. Accordingly, the District intends the Preliminary Official Statement to be final as of its date, within the meaning of SEC Rule 15c2-12(b)(1), except for information relating to the offering prices, interest rates, final debt service schedule, selling compensation, identity of the Initial Purchaser and other similar information, terms

and provisions to be specified in the competitive bidding process. The Initial Purchaser shall be responsible for promptly informing the District of the initial offering yields of the Bonds. Thereafter, the District will complete and authorize distribution of the Official Statement identifying the Initial Purchaser and containing such omitted information. The District does not intend to amend or supplement the Official Statement otherwise, except to take into account certain subsequent events, if any, as described below. By delivering the final Official Statement or any amendment or supplement thereto in the requested quantity to the Initial Purchaser on or after the sale date, the District intends the same to be final as of such date, within the meaning of the Rule. Notwithstanding the foregoing, the only representations concerning the absence of material misstatements or omissions from the Official Statement which are being or which will be made by the District are those described and contained in the Official Statement under the caption "OFFICIAL STATEMENT – Certification as to Official Statement."

CHANGES TO OFFICIAL STATEMENT: If, subsequent to the date of the Official Statement, the District learns, through the ordinary course of business and without undertaking any investigation or examination for such purposes, or is notified by the Initial Purchaser of any adverse event which causes the Official Statement to be materially misleading, and unless the Initial Purchaser elects to terminate its obligation to purchase the Bonds, as described below under "DELIVERY OF THE BONDS AND ACCOMPANYING DOCUMENTS – CONDITIONS TO DELIVERY," the District will promptly prepare and supply to the Initial Purchaser an appropriate amendment or supplement to the Official Statement satisfactory to the Initial Purchaser; provided, however, that the obligation of the District to do so will terminate when the District delivers the Bonds to the Initial Purchaser, unless the Initial Purchaser notifies the District on or before such date that less than all of the Bonds have been sold to ultimate customers, in which case the District's obligations hereunder will extend for an additional period of time (but not more than 90 days after the date the District delivers the Bonds) until all of the Bonds have been sold to ultimate customers.

DELIVERY OF OFFICIAL STATEMENTS: The District shall furnish to the Initial Purchaser (and to each participating underwriter of the Bonds, within the meaning of the Rule, designated by the Initial Purchaser), within seven (7) business days after the sale date, the aggregate number of Official Statements specified in the winning bid. The District also shall furnish to the Initial Purchaser a like number of any supplements or amendments approved and authorized for distribution by the District for dissemination to potential purchasers of the Bonds, as well as such additional copies of the Official Statement or any such supplements or amendments as the Initial Purchaser may request prior to the 90th day after the end of the underwriting period described in SEC Rule 15c2-12(e)(2). The District shall pay the expense of preparing the number of copies of the Official Statement specified in the winning bid and an equal number of any supplements or amendments issued on or before the delivery date, but the Initial Purchaser shall pay for all other copies of the Official Statement or any supplement or amendment thereto.

DELIVERY OF THE BONDS AND ACCOMPANYING DOCUMENTS

DELIVERY OF INITIAL BONDS: Initial delivery of the Bonds ("Initial Delivery") will be as set forth below. Unless otherwise agreed with the Initial Purchaser, delivery will be at the corporate trust office of the Paying Agent/Registrar in Dallas, Texas. Payment for the Bonds must be made in immediately available funds for unconditional credit to the District, or as otherwise directed by the District. If, at the time of closing, the Initial Purchaser has provided the Paying Agent/Registrar five (5) business days' written notice of its registration instructions, the Initial Purchaser shall not be required to pay for the initial Bonds until the Paying Agent/Registrar is able to deliver to the Initial Purchaser definitive, registered Bonds conforming to such registration instructions. The Initial Purchaser will be given six (6) business days' notice of the time fixed for delivery of the Bonds.

It is anticipated that initial delivery can be made on or about August 13, 2026, and subject to the aforesaid notice, it is understood and agreed that the Initial Purchaser will accept delivery and make payment for the initial Bonds by 9:00 A.M., Central Time, on August 13, 2026, or thereafter on the date the initial Bonds are tendered for delivery, up to and including September 15, 2026. If for any reason the District is unable to make delivery on or before September 15, 2026, then the District immediately shall contact the Initial Purchaser and offer to allow the Initial Purchaser to extend its offer for an additional thirty (30) days. If the Initial Purchaser does not elect to extend its offer within five (5) days thereafter, then the Good Faith Deposit will be returned, and both the District and the Initial Purchaser shall be relieved of any further obligation.

EXCHANGE ON DELIVERY DATE: Upon written request of the Initial Purchaser, delivered to the Paying Agent/Registrar not less than five (5) business days prior to the date fixed for delivery, the Paying Agent/Registrar will, on the delivery date, exchange the Bonds to be delivered by the District for Bonds registered in accordance with instructions contained in such request, in integral multiples of $5,000, maturing as set out in this Official Notice of Sale and bearing interest in accordance with the terms of the Initial Purchaser's bid.

CUSIP NUMBERS: It is anticipated that CUSIP identification numbers will be printed on the Bonds, but neither the failure to print such number on any Bond nor any error with respect thereto shall constitute cause for a failure or refusal by the Initial Purchaser to accept delivery of and pay for the Bonds in accordance with the terms of this Official Notice of Sale. All expenses relating to the printing of CUSIP numbers on the Bonds shall be paid for by the District; however, payment of the CUSIP Global Services charge for the assignment of the numbers shall be the responsibility of the Initial Purchaser.

CONDITIONS TO DELIVERY: The obligation to take up and pay for the Bonds is subject to the following conditions: the issuance of an approving opinion of the Attorney General of Texas, the Initial Purchaser's receipt of the Bonds, the Initial Purchaser's receipt of the legal opinion of Bond Counsel and the no-litigation certificate, and the non-occurrence of the events described below under the caption "NO MATERIAL ADVERSE CHANGE," all as described below. Further, the Initial Purchaser is not obligated to take up and pay for the Bonds at initial delivery if at any time after the award of the Bonds and at or prior to initial delivery, the Congress of the United States shall have declared war or a national emergency. In addition, if the District fails to comply with its obligations described under "OFFICIAL STATEMENT" above, the Initial Purchaser may terminate its contract to purchase the Bonds by delivering written notice to the District within five (5) days thereafter.

INITIAL PURCHASER'S CERTIFICATION OF ISSUE PRICE: In order to provide the District with information required to enable it to comply with certain conditions of the Internal Revenue Code of 1986, as amended (the "Code"), relating to the exclusion of interest on the Bonds from gross income for federal income tax purposes, and subject to the section entitled "CONDITIONS OF SALE – COMPETITIVE BIDDING AND CERTIFICATE OF INITIAL PURCHASER" herein, the Initial Purchaser will be required to complete, execute and deliver to the District (on or before the Date of Delivery of the Bonds) a certification regarding the "issue price" of the Bonds in one of the forms accompanying this Official Notice of Sale. Each bidder, by submitting its bid, agrees to complete, execute, and deliver such a certificate by the Date of Delivery of the Bonds, if its bid is accepted by the District. It will be the responsibility of the Initial Purchaser to institute such syndicate reporting requirements, to make such investigation, or otherwise to ascertain the facts necessary to enable it to make such certification with reasonable certainty. Any questions concerning such certification should be directed to Bond Counsel.

LEGAL OPINIONS: The District will furnish to the Initial Purchaser a transcript of certain certified proceedings incident to the issuance and authorization of the Bonds, including a certified copy of the approving legal opinion of the Attorney General of Texas, as recorded in the Bond Register of the Comptroller of Public Accounts of the State of Texas, to the effect that the Attorney General has examined a transcript of proceedings authorizing the issuance of the Bonds, and that based upon such examination, the Bonds are valid and binding obligations of the District payable from the proceeds of an annual ad valorem tax, levied without legal limitation as to rate or amount upon all taxable property in the District. The District will also furnish the approving legal opinion of Allen Boone Humphries Robinson LLP, Bond Counsel, Houston, Texas, to the effect that, based upon an examination of such transcript, the Bonds are valid and binding obligations of the District under the Constitution and laws of the State of Texas, except to the extent that enforcement of the rights and remedies of the Registered Owners may be limited by laws relating to bankruptcy, reorganization, or other similar laws of general application affecting the rights of creditors of political subdivisions such as the District. The legal opinion of Bond Counsel will further state that the Bonds are payable, both as to principal and interest, from the levy of ad valorem taxes without legal limitation as to rate or amount, upon all taxable property within the District, and that, under existing law, interest on the Bonds is excludable from gross income for federal income tax purposes and interest on the Bonds is not subject to the alternative minimum tax on individuals; however, such interest is taken into account in determining the annual adjusted financial statement income of applicable corporations for the purpose of determining the alternative minimum tax imposed on corporations. See "LEGAL MATTERS" and "TAX MATTERS" in the Preliminary Official Statement. Such opinions express no opinion with respect to the sufficiency of the security for or marketability of the Bonds.

DTC DEFINITIVE BONDS: After delivery, the Bonds will be issued in Book-Entry-Only form. Cede & Co. is the nominee for DTC. All references herein to the Registered Owners of the Bonds shall mean Cede & Co. and not the Beneficial Owners of the Bonds. Purchase of beneficial interests in the Bonds will be made in Book-Entry-Only form (without registered Bonds) in principal denominations of $5,000 or any integral multiple thereof. Under certain limited circumstances described herein, the District may determine to forego immobilization of the Bonds at DTC, or another securities depository, in which case, such beneficial interests would become exchangeable for one or more fully registered Bonds of like principal amount for the Bonds. See "THE BONDS – Book-Entry-Only System" in the Preliminary Official Statement.

NOT QUALIFIED TAX-EXEMPT OBLIGATIONS: The Bonds will **not** be designated as "qualified tax-exempt obligations" for financial institutions.

NO-LITIGATION CERTIFICATE: On the Date of Delivery of the Bonds to the Initial Purchaser, the District will execute and deliver to the Initial Purchaser, a certificate to the effect that no litigation of any nature has been filed or is pending, as of that date, of which the District has notice, to restrain or enjoin the issuance or delivery of the Bonds, or which would affect the provisions made for their payment or security, or in any manner question the validity of the Bonds.

NO MATERIAL ADVERSE CHANGE: The obligation of the Initial Purchaser to take up and pay for the initial Bonds, and of the District to deliver the initial Bonds, is subject to the condition that, up to the time of delivery of and receipt of payment for the initial Bonds, there shall have been no material adverse change in the financial condition of the District subsequent to the date of sale from that set forth in the Preliminary Official Statement, as it may have been finalized, supplemented or amended through the Date of Delivery.

GENERAL CONSIDERATIONS

REGISTRATION: The Bonds are transferable on the bond register kept by the Paying Agent/Registrar upon surrender and reissuance. The Bonds are exchangeable for an equal principal amount of Bonds of the same maturity in any authorized denomination upon surrender of the Bonds to be exchanged, but the District may require payment of a sum sufficient to cover any tax or governmental charge payable in connection therewith.

RISK FACTORS: THE BONDS INVOLVE CERTAIN INVESTMENT RISKS AS SET FORTH IN THE PRELIMINARY OFFICIAL STATEMENT. PROSPECTIVE PURCHASERS SHOULD CAREFULLY REVIEW THE ENTIRE PRELIMINARY OFFICIAL STATEMENT BEFORE MAKING THEIR INVESTMENT DECISION. PARTICULAR ATTENTION SHOULD BE GIVEN TO THE INFORMATION SET FORTH THEREIN UNDER THE CAPTION "RISK FACTORS."

RESERVATION OF RIGHTS: The District reserves the right to reject all bids or any bid not conforming with the terms hereof and the right to waive any and all irregularities, except time of filing.

NOT AN OFFER TO SELL: This Official Notice of Sale does not alone constitute an offer to sell the Bonds but is merely notice of sale of the Bonds. The invitation for bids on the Bonds is being made by means of this Official Notice of Sale, the Preliminary Official Statement and the Official Bid Form.

SECURITIES REGISTRATION AND QUALIFICATION: No registration statement relating to the Bonds has been filed with the SEC under the Securities Act of 1933, as amended, in reliance upon exemptions provided thereunder. The Bonds have not been registered or qualified under the Securities Act of Texas in reliance upon various exemptions contained therein; nor have the Bonds been registered or qualified under the securities laws or regulations of any other jurisdiction. The District assumes no responsibility for registration or qualification of the Bonds under the securities laws or regulations of any other jurisdiction in which the Bonds may be offered, sold or otherwise transferred. This disclaimer of responsibility for registration or qualification for sale or other disposition of the Bonds shall not be construed as an interpretation of any kind with regard to the availability of any exemption from securities registration or qualification provisions in such other jurisdictions.

By submission of a bid, the Initial Purchaser represents that the sale of the Bonds in states other than Texas will be made only pursuant to exemptions from registration or qualification or, where necessary, the Initial Purchaser will register or qualify the Bonds in accordance with the securities laws or regulations of any jurisdiction which so requires. The District agrees to cooperate, at the Initial Purchaser's written request and expense, in registering or qualifying the Bonds, or in obtaining an exemption from registration or qualification,

in any jurisdiction where such action is necessary, provided that the District shall not be required to file a general consent to service of process in any jurisdiction.

CONTINUING DISCLOSURE OF INFORMATION: The District will agree in the Bond Resolution to provide certain periodic information and notices of material events in accordance with SEC Rule 15c2-12, as described in the Preliminary Official Statement under "CONTINUING DISCLOSURE OF INFORMATION." The Initial Purchaser's obligation to accept and pay for the Bonds is conditioned upon delivery to the Initial Purchasers or their agent of a certified copy of the Bond Resolution containing the provisions described under such heading.

ADDITIONAL COPIES: Additional copies of the Official Notice of Sale, the Official Bid Form and the Preliminary Official Statement may be obtained from Cedar Creek Municipal Advisors, LLC, 4801 Woodway Drive, Suite 118-E, Houston, Texas 77056.

/s/ Lance Taylor
President, Board of Directors
Brazoria County Municipal Utility District No. 57

CERTIFICATE OF INITIAL PURCHASER—FEDERAL TAX COMPETITIVE BIDDING REQUIREMENTS MET

The undersigned hereby certifies as follows with respect to the $13,395,000 Brazoria County Municipal Utility District No. 57 Unlimited Tax Bonds, Series 2026 (the "Bonds"):

1. The undersigned is the underwriter or the manager of the syndicate of underwriters ("Initial Purchaser") that has purchased the Bonds from the District at competitive sale.

2. The Initial Purchaser was not given the opportunity to review other bids prior to submitting its bid, and the bid submitted by the Initial Purchaser constituted a firm bid to purchase the Bonds.

3. As of the Sale Date (defined below), the reasonably expected initial offering prices of the Bonds to the public by the Initial Purchaser (expressed as a percentage of principal amount and exclusive of accrued interest) is as set forth below.

Maturity (September 1)	Principal Amount	Price/Yield	Maturity (September 1)	Principal Amount	Price/Yield
2027	$295,000	_____%	2039	$ 545,000	_____%
2028	335,000	_____%	2040	570,000	_____%
2029	350,000	_____%	2041	595,000	_____%
2030	365,000	_____%	2042	625,000	_____%
2031	385,000	_____%	2043	650,000	_____%
2032	400,000	_____%	2044	680,000	_____%
2033	420,000	_____%	2045	710,000	_____%
2034	440,000	_____%	2046	745,000	_____%
2035	460,000	_____%	2047	775,000	_____%
2036	480,000	_____%	2048	810,000	_____%
2037	500,000	_____%	2049	850,000	_____%
2038	525,000	_____%	2050	885,000	_____%

4. The Initial Purchaser has purchased bond insurance for the Bonds. The bond insurance has been purchased from _____ (the "Insurer") for a fee of $_____ (net of any nonguarantee cost, e.g., rating agency fees). The amount of such fee is set forth in the Insurer's commitment and does not include any payment for any direct or indirect services other than the transfer of credit risk, unless the compensation for those other services is separately stated, reasonable, and excluded from such fee. Such fee does not exceed a reasonable, arms-length charge for the transfer of credit risk. The present value of the debt service savings expected to be realized as a result of such insurance exceeds the amount of the fee set forth above. For this purpose, present value is computed using the yield on the Bonds, determined by taking into account the amount of the fee set forth above, as the discount rate. No portion of the fee payable to the Insurer is refundable upon redemption of any of the Bonds in an amount which would exceed the portion of such fee that had not been earned.

5. The term "public" means any person (including an individual, trust, estate, partnership, association, company, or corporation) other than an underwriter or a related party to an underwriter. A related party generally means two or more persons with greater than 50 percent common ownership, directly or indirectly.

6. The term "Sale Date" means the first date on which there is a binding contract in writing for the sale of the Bonds. The Sale Date of the Bonds is Thursday, July 9, 2026.

The undersigned understands that the statements made herein will be relied upon by the District and Allen Boone Humphries Robinson LLP in complying with the conditions imposed by the Internal Revenue Code of 1986, as amended, on the exclusion of interest on the Bonds from the gross income of their owners for federal income tax purposes.

EXECUTED AND DELIVERED this _____ day of _____ 2026.

_____
(Name of Initial Purchaser or Manager)

By _____

Title _____

CERTIFICATE OF INITIAL PURCHASER—FEDERAL TAX COMPETITIVE SALE REQUIREMENTS NOT MET

The undersigned hereby certifies as follows with respect to the $13,395,000 Brazoria County Municipal Utility District No. 57 Unlimited Tax Bonds, Series 2026 (the "Bonds"):

1. The undersigned is the underwriter or the manager of the syndicate of underwriters ("Initial Purchaser") that has purchased the Bonds from the District at competitive sale.

2. As of the date of this Certificate, for each of the following maturities (the "Sold Maturities"), the first price at which a substantial amount (at least ten percent) of such maturity was sold to the public (expressed as a percentage of principal amount and exclusive of accrued interest) is set forth below:

Maturity (September 1)	Principal Amount	Price/Yield	Maturity (September 1)	Principal Amount	Price/Yield
2027	$ 295,000	_____%	2039	$ 545,000	_____%
2028	335,000	_____%	2040	570,000	_____%
2029	350,000	_____%	2041	595,000	_____%
2030	365,000	_____%	2042	625,000	_____%
2031	385,000	_____%	2043	650,000	_____%
2032	400,000	_____%	2044	680,000	_____%
2033	420,000	_____%	2045	710,000	_____%
2034	440,000	_____%	2046	745,000	_____%
2035	460,000	_____%	2047	775,000	_____%
2036	480,000	_____%	2048	810,000	_____%
2037	500,000	_____%	2049	850,000	_____%
2038	525,000	_____%	2050	885,000	_____%

3. As of the Sale Date (defined below), each of the following maturities (the "Unsold Maturities") was offered to the public for purchase at the price (expressed as a percentage of principal amount and exclusive of accrued interest) set forth below:

Maturity (September 1)	Principal Amount	Price/Yield	Maturity (September 1)	Principal Amount	Price/Yield
2027	$ 295,000	_____%	2039	$ 545,000	_____%
2028	335,000	_____%	2040	570,000	_____%
2029	350,000	_____%	2041	595,000	_____%
2030	365,000	_____%	2042	625,000	_____%
2031	385,000	_____%	2043	650,000	_____%
2032	400,000	_____%	2044	680,000	_____%
2033	420,000	_____%	2045	710,000	_____%
2034	440,000	_____%	2046	745,000	_____%
2035	460,000	_____%	2047	775,000	_____%
2036	480,000	_____%	2048	810,000	_____%
2037	500,000	_____%	2049	850,000	_____%
2038	525,000	_____%	2050	885,000	_____%

4. As set forth in the Official Notice of Sale, the Initial Purchaser has agreed in writing that, for each of the Unsold Maturities, the Initial Purchaser would neither offer nor sell any of the Bonds of such maturity to any person at a price that is higher than the initial offering price for each maturity, as set forth in the pricing wire or equivalent communication for the Bonds attached to this Certificate, during the Offering Period for such maturity, nor would the Initial Purchaser permit a related party to do so. Pursuant to such agreement, the Initial Purchaser has neither offered nor sold any of the Unsold Maturities at a price higher than the respective initial offering price for that maturity of the Bonds during the Offering Period.

5. The Initial Purchaser has purchased bond insurance for the Bonds. The bond insurance has been purchased from _____ (the "Insurer") for a fee of $_____ (net of any nonguarantee cost, e.g., rating agency fees). The amount of such fee is set forth in the Insurer's commitment and does not include any payment for any direct or indirect services other than the transfer of credit risk, unless the

compensation for those other services is separately stated, reasonable, and excluded from such fee. Such fee does not exceed a reasonable, arms-length charge for the transfer of credit risk. The present value of the debt service savings expected to be realized as a result of such insurance exceeds the amount of the fee set forth above. For this purpose, present value is computed using the yield on the Bonds, determined by taking into account the amount of the fee set forth above, as the discount rate. No portion of the fee payable to the Insurer is refundable upon redemption of any of the Bonds in an amount which would exceed the portion of such fee that had not been earned.

6. The term "public" means any person (including an individual, trust, estate, partnership, association, company, or corporation) other than an underwriter or a related party to an underwriter. A related party generally means two or more persons with greater than 50 percent common ownership, directly or indirectly.

7. The term "Sale Date" means the first date on which there is a binding contract in writing for the sale of the Bonds. The Sale Date of the Bonds is Thursday, July 9, 2026.

8. The term "Offering Period" means, with respect to an Unsold Maturity, the period beginning on the Sale Date and ending on the earlier of (a) the close of the fifth business day after the Sale Date or (b) the date on which the Initial Purchaser has sold at least 10 percent of such Unsold Maturity to the public at a price that is no higher than the initial offering price for such Unsold Maturity.

The undersigned understands that the statements made herein will be relied upon by the District and Allen Boone Humphries Robinson LLP in complying with the conditions imposed by the Internal Revenue Code of 1986, as amended, on the exclusion of interest on the Bonds from the gross income of their owners for federal income tax purposes.

EXECUTED AND DELIVERED this _____ day of _____ 2026.

_____
(Name of Initial Purchaser or Manager)

By _____

Title _____

OFFICIAL BID FORM

July 9, 2026

President and Board of Directors
Brazoria County Municipal Utility District No. 57
c/o Cedar Creek Municipal Advisors, LLC
Attn: David Smalling
4801 Woodway Dr., Suite 188-E
Houston, Texas 77056

Board Members:

We have read in detail the Official Notice of Sale and Preliminary Official Statement, which are hereby made a part hereof, of Brazoria County Municipal Utility District No. 57 (the "District") relating to its $13,395,000 Unlimited Tax Bonds, Series 2026 (the "Bonds"). We realize that the Bonds involve certain investment risks and that the ability of the District to service the Bonds depends, in part, on the risk factors set forth in the Preliminary Official Statement dated May 14, 2026. We have made such inspections and investigations as we deem necessary relating to the investment quality of the Bonds. Accordingly, we offer to purchase the Bonds for a cash price of $_____ (which represents _____% of the principal amount thereof) provided such Bonds bear interest at the following rates:

Maturity (September 1)	Principal Amount	Interest Rate	Maturity (September 1)	Principal Amount	Interest Rate
2027	$295,000	_____%	2039 (a)	$545,000	_____%
2028	335,000	_____%	2040 (a)	570,000	_____%
2029	350,000	_____%	2041 (a)	595,000	_____%
2030	365,000	_____%	2042 (a)	625,000	_____%
2031	385,000	_____%	2043 (a)	650,000	_____%
2032 (a)	400,000	_____%	2044 (a)	680,000	_____%
2033 (a)	420,000	_____%	2045 (a)	710,000	_____%
2034 (a)	440,000	_____%	2046 (a)	745,000	_____%
2035 (a)	460,000	_____%	2047 (a)	775,000	_____%
2036 (a)	480,000	_____%	2048 (a)	810,000	_____%
2037 (a)	500,000	_____%	2049 (a)	850,000	_____%
2038 (a)	525,000	_____%	2050 (a)	885,000	

(a) The Bonds maturing on or after September 1, 2032, are subject to redemption and payment, at the option of the District, in whole or, from time to time, in part, on September 1, 2031, or on any date thereafter, at a price equal to the principal amount thereof, plus accrued interest thereon to the date fixed for redemption.

At the option of the Initial Purchaser, any or all of such serial maturities may be designated as term bonds ("Term Bonds") subject to mandatory sinking fund redemption provided that the mandatory sinking fund redemption amount in each year shall equal the amounts shown above as maturing in such year.

We hereby designate the following as term bonds ("Term Bonds") with mandatory sinking redemptions.

Term Bond Maturity Date (September 1)	Year of First Mandatory Redemption	Principal Amount of Term Bonds	Interest Rate
_____	_____	$_____	____%
_____	_____	_____	____%
_____	_____	_____	____%
_____	_____	_____	____%
_____	_____	_____	____%

Our calculation (which is not a part of this bid) of the interest cost from the above is:

Total Interest Cost from the Date of Delivery	$_____
Plus: Dollar Amount of Discount (or Less: Dollar Amount of Premium)	$_____
NET INTEREST COST	$_____
NET EFFECTIVE INTEREST RATE	_____%

The initial Bonds shall be registered in the name of Cede & Co. as nominee for The Depository Trust Company. We will require __ copies of the final Official Statement for dissemination to potential purchasers of the Bonds (not to exceed 250 copies). By our submission of this bid, we agree to provide such copies of the final Official Statement and of any amendments or supplements thereto in accordance with the Official Notice of Sale, and to undertake the obligations of the Initial Purchaser described therein, as contemplated by Rule 15c2-12 of the United States Securities and Exchange Commission.

Cashier's Check ("Official Checks" are not acceptable) No. _____, issued by _____, and payable to your order in the amount of $267,900 (has been made available to you prior to the opening of this bid) as a Good Faith Deposit for disposition in accordance with the terms and conditions set forth in the Official Notice of Sale. Should we fail or refuse to make payment for the Bonds in accordance with the terms and conditions stated in the Official Notice of Sale, this check shall be cashed and the proceeds retained as complete liquidated damages against us. The Good Faith Deposit will be returned to the Initial Purchaser uncashed on the Date of Delivery of the Bonds.

Unless the bidder is exempt from such requirements pursuant to Texas Government Code § 2252.908(c)(4), the District may not accept this bid until it has received from the bidder a completed and signed TEC Form 1295 and Certification of Filing pursuant to Texas Government Code § 2252.908 and the rules promulgated thereunder by the Texas Ethics Commission. The undersigned understands that failure to provide said form and Certification of Filing, when required, will result in a non-conforming bid and will prohibit the District from considering this bid for acceptance.

By executing this Official Bid Form, the bidder represents and verifies that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on this Official Bid Form is a Company[1] that boycotts or will boycott Israel. The terms "boycotts Israel" and "boycott Israel" as used in this paragraph have the meaning assigned to the term "boycott Israel" in Section 808.001 of the Texas Government Code, as amended.

[1] "Company" means a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly-owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit, but does not mean a sole proprietorship.

Additionally, by executing this Official Bid Form, the bidder also represents and certifies that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on this Official Bid Form is a Company[2] (i) that engages in business with Iran, Sudan, or any foreign terrorist organization as described in Chapter 2270 of the Texas Government Code, or Subchapter F of Chapter 2252 of the Texas Government Code, or (ii) listed by the Texas Comptroller of Public Accounts under Section 2270.0201 or 2252.153 of the Texas Government Code. The term "foreign terrorist organization" as used in this paragraph has the meaning assigned to such term in Section 2252.151 of the Texas Government Code. The undersigned agrees to execute, at the request of the District, further written certifications as may be necessary or convenient for the District to establish compliance with these laws.

Additionally, by executing this Official Bid Form, the bidder also represents and verifies that, on behalf of itself and each syndicate member listed on this Official Bid Form that, through the end of the underwriting period, neither the bidder nor a syndicate member listed on this Official Bid Form is a Company[1] that boycotts or will boycott energy companies. The terms "boycotts energy companies" and "boycott energy companies" as used in this paragraph have the meaning assigned to the term "boycott energy company" in Section 809.001 of the Texas Government Code, as amended.

Additionally, by executing this Official Bid Form, the bidder also represents and verifies that through the end of the underwriting period, neither the bidder nor a syndicate member listed on this Official Bid Form is a Company[1] that has a practice, policy, guidance or directive that discriminates against a firearm entity or firearm trade association or will discriminate against a firearm entity or firearm trade association. The term "discriminates against a firearm entity or firearm trade association" as used in this paragraph has the meaning assigned to the term "discriminate against a firearm entity or firearm trade association" in Section 2274.001(3) of the Texas Government Code.

Notwithstanding anything contained herein, the bidder agrees that liability for breach of verification of the statutory representations and covenants provided above as required by Chapters 2252, 2271, 2274 and 2276 of the Texas Government Code during the term of the contract shall survive until barred by the applicable statute of limitations and shall not be liquidated or otherwise limited by any provision of the contract.

By submitting a bid, the bidder makes and certifies to the representations necessary and convenient for the compliance with the aforementioned laws and, at the request of the District, agrees to execute further written certifications as may be necessary or convenient for the District to establish compliance with the aforementioned laws.

Additionally, by executing this Official Bid Form, the bidder also represents and certifies that, the bidder and each syndicate member listed on the Official Bid Form will (i) preserve all contracting information related to the bid as provided by the records retention requirements applicable to the District through the delivery date of the Bonds, (ii) promptly provide to the District any contracting information related to the bid that is in the custody or possession of the bidder or any syndicate member on request of the District, and (iii) upon delivery of the Bonds to the bidder, either (a) provide at no cost to the District all contracting information related to the bid that is in the custody or possession of the bidder or any syndicate member or (b) preserve the contracting information related to the bid as provided by the records retention requirements applicable to the District. The term "contracting information" as used in this paragraph has the meaning assigned to such term in Section 552.003 of the Texas Government Code.

Additionally, by submitting this Official Bid Form, the bidder represents to the District that it and each syndicate member listed on the Official Bid Form, if any, (i) has filed a standing letter with the Attorney General and the Municipal Advisory Counsel of Texas that conforms to the requirements set forth in the All Bond Counsel Letters of the Texas Attorney General dated November 1, 2023, and supplemented November 16, 2023, and December 29, 2023, and any All Bond Counsel Letters subsequently issued, (collectively, the "All Bond Counsel Letters") (ii) has no reason to believe that the District may not be entitled to rely on such standing letters, and (iii) neither bidder, any syndicate member listed on the Official Bid Form, nor any parent company, any wholly- or majority-owned subsidiaries, or affiliates of the same, have received a letter from the Texas Comptroller of Public Accounts or the Attorney General related to its inclusion on any list of financial companies boycotting energy companies or companies that have been found to have a practice, policy, guidance or direction that discriminates against a firearm entity or firearm trade association. Bidder agrees that it will not rescind its standing letter at any time before the delivery of the Bonds unless same is immediately replaced with a standing letter that meets the requirements of the Attorney General.

We will require ___ copies of the final Official Statement for dissemination to potential purchasers of the Bonds (not to exceed 250 copies). By our submission of this bid, we agree to provide such copies of the final Official Statement and of any amendments or supplements thereto in accordance with the Official Notice of Sale, and to undertake the obligations of the Initial Purchaser described therein, as contemplated by Rule 15c2-12 of the United States Securities and Exchange Commission.

The undersigned agrees to complete, execute, and deliver to the District, by the date of delivery of the Bonds, a certificate relating to the "issue price" of the Bonds in the form accompanying the Official Notice of Sale.

We hereby represent that sale of the Bonds in jurisdictions other than Texas will be made only pursuant to exemptions from registration or qualification and that, where necessary, we will register or qualify the Bonds in accordance with the securities laws and regulations of the jurisdictions in which the Bonds are offered or sold.

We agree to accept delivery of and make payment for the initial Bonds in immediately available funds at the corporate trust office of BOKF, NA, Dallas, Texas, not later than 10:00 A.M., Central Time, on August 13, 2026, or thereafter on the date the Bonds are tendered for delivery pursuant to the terms set forth in the Official Notice of Sale.

Respectfully submitted,

_____

_____

By: _____

Authorized Representative

ACCEPTANCE CLAUSE

The above and foregoing bid is hereby in all things accepted by Brazoria County Municipal Utility District No. 57 this 9th day of July 2026.

ATTEST:

_____ _____

Secretary, Board of Directors President, Board of Directors

Return of $267,900 Good Faith Deposit is hereby acknowledged:

Firm:_____
By:_____
Date:_____

(For your information you will find attached a list of the group of underwriters associated with us in this proposal.)

$13,395,000

BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 57

UNLIMITED TAX BONDS
SERIES 2026

BOND YEARS

Dated Date: August 1, 2026
Interest accrues from: Date of Delivery

Due: September 1

Year	Amount	Bond Years	Accumulated Bond Years
2027	$ 295,000	309.7500	309.7500
2028	335,000	686.7500	996.5000
2029	350,000	1,067.5000	2,064.0000
2030	365,000	1,478.2500	3,542.2500
2031	385,000	1,944.2500	5,486.5000
2032	400,000	2,420.0000	7,906.5000
2033	420,000	2,961.0000	10,867.5000
2034	440,000	3,542.0000	14,409.5000
2035	460,000	4,163.0000	18,572.5000
2036	480,000	4,824.0000	23,396.5000
2037	500,000	5,525.0000	28,921.5000
2038	525,000	6,326.2500	35,247.7500
2039	545,000	7,112.2500	42,360.0000
2040	570,000	8,008.5000	50,368.5000
2041	595,000	8,954.7500	59,323.2500
2042	625,000	10,031.2500	69,354.5000
2043	650,000	11,082.5000	80,437.0000
2044	680,000	12,274.0000	92,711.0000
2045	710,000	13,525.5000	106,236.5000
2046	745,000	14,937.2500	121,173.7500
2047	775,000	16,313.7500	137,487.5000
2048	810,000	17,860.5000	155,348.0000
2049	850,000	19,592.5000	174,940.5000
2050	885,000	21,284.2500	196,224.7500

Total Bond Years: 196,224.7500

Average Maturity: 14.6491 years

Brazoria County Municipal Utility District No. 57

Utility Debt Service Tax Rate Analysis - No Growth Scenario

Proposed $13,395,000 Series 2026 Bond Issue at 4.750% Interest Rate

2026	766,352	12,304	636,263	67,565,323			-	1,414,919	347,363	-	347,363	1,067,556	53.645%
2027	1,067,556	21,351	-	239,525,220	254.509%	0.670000	1,572,723	2,661,630	1,029,725	960,328	1,990,053	671,577	33.809%
2028	671,577	-	-	303,751,121	26.814%	0.670000	1,994,430	2,666,007	1,027,950	958,425	1,986,375	679,632	34.366%
2029	679,632	-	-	303,751,121		0.670000	1,994,430	2,674,062	1,019,875	957,750	1,977,625	696,437	35.313%
2030	696,437	-	-	303,751,121		0.670000	1,994,430	2,690,867	1,015,825	956,363	1,972,188	718,679	36.486%
2031	718,679	-	-	303,751,121		0.670000	1,994,430	2,713,109	1,010,475	959,263	1,969,738	743,372	37.830%
2032	743,372	-	-	303,751,121		0.670000	1,994,430	2,737,801	1,008,825	956,213	1,965,038	772,764	39.434%
2033	772,764	-	-	303,751,121		0.670000	1,994,430	2,767,194	1,002,181	957,450	1,959,631	807,562	41.061%
2034	807,562	-	-	303,751,121		0.670000	1,994,430	2,801,992	1,008,981	957,738	1,966,719	835,274	42.360%
2035	835,274	-	-	303,751,121		0.670000	1,994,430	2,829,703	1,014,781	957,075	1,971,856	857,847	43.325%
2036	857,847	-	-	303,751,121		0.670000	1,994,430	2,852,277	1,019,581	960,463	1,980,044	872,233	43.918%
2037	872,233	-	-	303,751,121		0.670000	1,994,430	2,866,663	1,028,381	957,663	1,986,044	880,619	44.144%
2038	880,619	-	-	303,751,121		0.670000	1,994,430	2,875,049	1,035,981	958,913	1,994,894	880,156	44.010%
2039	880,156	-	-	303,751,121		0.670000	1,994,430	2,874,585	1,040,906	958,975	1,999,881	874,704	43.716%
2040	874,704	-	-	303,751,121		0.670000	1,994,430	2,869,134	1,043,006	957,850	2,000,856	868,278	43.338%
2041	868,278	-	-	303,751,121		0.670000	1,994,430	2,862,708	1,047,944	955,538	2,003,481	859,226	42.802%
2042	859,226	-	-	303,751,121		0.670000	1,994,430	2,853,656	1,050,406	957,038	2,007,444	846,212	42.031%
2043	846,212	-	-	303,751,121		0.670000	1,994,430	2,840,642	1,056,206	957,113	2,013,319	827,324	41.041%
2044	827,324	-	-	303,751,121		0.670000	1,994,430	2,821,753	1,060,106	955,763	2,015,869	805,885	39.874%
2045	805,885	-	-	303,751,121		0.670000	1,994,430	2,800,315	1,063,106	957,988	2,021,094	779,221	38.427%
2046	779,221	-	-	303,751,121		0.670000	1,994,430	2,773,651	1,069,256	958,550	2,027,806	745,844	36.727%
2047	745,844	-	-	303,751,121		0.670000	1,994,430	2,740,274	1,073,325	957,450	2,030,775	709,499	34.819%
2048	709,499	-	-	303,751,121		0.670000	1,994,430	2,703,929	1,077,988	959,688	2,037,675	666,254	32.656%
2049	666,254	-	-	303,751,121		0.670000	1,994,430	2,660,684	1,080,213	960,025	2,040,238	620,446	64.734%
2050	620,446	-	-	303,751,121		0.670000	1,994,430	2,614,876		958,463	958,463	1,656,414	
Totals		33,655	636,263				49,439,039		24,232,388	22,992,078	47,224,466		
					Average Tax Rate:	0.670000							

CEDAR CREEK

Exhibit B
Consent Conditions

(a) The District may issue bonds, including refunding bonds, only for the purpose of purchasing, refinancing, designing and constructing, or otherwise acquiring waterworks systems, sanitary sewer systems, storm sewer systems, drainage facilities, and fire, parks and recreational facilities, and streets and thoroughfares, or parts of such systems or facilities, and to make any and all necessary purchases, constructions, improvements, extensions, additions, and repairs thereto, and to purchase or acquire all necessary land, right-of-way, easements, sites, equipment, buildings, plants, structures, and facilities therefor, and to operate and maintain same, and to sell water, sanitary sewer, and other services within or without the boundaries of the District. No bonds will be issued with a final maturity date more than 25 years from the date of issuance, and the first principal maturity must occur within three years of the date of issuance. The Bonds shall have level debt service requirements. Level debt service shall mean that during the period beginning with the calendar year of the first principal payment on a bond issue and ending in the calendar year of the final scheduled maturity of said issue, the spread from the greatest debt service in a calendar year during said period to the least debt service in a calendar year during said period shall not be more than $15,000. The intent may be demonstrated by submitting a proposed Notice of Sale and estimated bid using the proposed maturity pattern that shows coupons, interest and total debt service requirements that meets the required standard above to the City for prior approval. Having shown intent to comply by getting approval of the structure by the City in advance of advertising for sale will be sufficient in the event the actual results of a competitive sale return debt service payments that otherwise would not meet the standard of $15,000 difference between maximum and minimum annual debt service payments. Such bonds must provide that the District reserves the right to redeem said bonds on any date subsequent to the 10th anniversary of the date of issuance (or any earlier date at the discretion of the District) without premium, and none of such bonds, other than refunding bonds, will be sold for less than 97 percent of par; provided that the net effective interest rate on bonds so sold, taking into account any discount or premium as well as the interest rate borne by such bonds, will not exceed two percent above the highest average interest rate reported by the Daily Bond Buyer in its weekly "20 Bond Index" during the one-month period next preceding the date of the sale of such bonds. No bonds of the District may be issued without specific City consent if the City has given notice to the District that it intends to dissolve the District in accordance with applicable law within 120 or fewer days after such notice.

(b) Any refunding bonds of the District must provide for level debt service savings (annual savings must be approximately equal for each year with no more than $7,500 between the maximum and minimum savings per year), a minimum of three percent present value savings, and no maturity beyond the latest maturity of the refunded bonds, unless approved by the City in writing prior to the sale thereof.

CITY COUNCIL DATA SHEET

MEETING DATE: July 6, 2026

Agenda: **Regular** ☑ **Consent** ☐

TOPIC:

Ordinance to regulate Electric Bicycles and Electric Scooters

BACKGROUND:

This ordinance is intended to proactively address the growing use of electric bicycles and scooters in our community. It balances the rights of riders with the safety of pedestrians and motorists, provides officers with clear enforcement authority, aligns with Texas law, and establishes reasonable safety standards that will help protect everyone using our streets, sidewalks, parks, and shared-use paths.

RECOMMENDATION:

For discussion and possible action to approve

ATTACHMENTS:

Ordinance No-2026-0-20 Electric Bicycles, Mopeds, and Electric Scooters

FUNDING ISSUES

☑ Not applicable
☐ Not budgeted
☐ Full amount already budgeted
☐ Funds to be transferred from Acct.#

SUBMITTING STAFF MEMBER	FINANCE DIRECTOR APPROVAL ☐
Keith Traylor	CITY MANAGER APPROVAL: ☐

ORDINANCE NO. 2026-O-20

AN ORDINANCE AMENDING THE CODE OF ORDINANCES OF THE CITY OF MANVEL, TEXAS, CHAPTER 41. "TRAFFIC AND MOTOR VEHICLES," BY ADOPTING A NEW *ARTICLE III. ELECTRIC BICYCLES, MOPEDS, AND MOTOR ASSISTED SCOOTERS,* ADOPTING REGULATIONS PERTAINING TO ELECTRIC BICYCLES, MOPEDS, AND *ELECTRIC* SCOOTERS; PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000.00 FOR ANY VIOLATION OF ANY PROVISION OF THIS ORDINANCE; REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HEREWITH; AND PROVIDING FOR SEVERABILITY.

* * * * * *

WHEREAS, the City Council hereby further finds and determines that it is in the best interest of the City of Manvel to expressly regulate electric bicycles, mopeds, and electric scooters; **NOW THEREFORE**,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MANVEL, TEXAS:

Section 1. The Code of Ordinances of the City of Manvel, Texas is hereby amended by amending Chapter 41. "Traffic and Motor Vehicles" to add a new Article III, to read and provide as follows:

"**Chapter 41 - TRAFFIC AND MOTOR VEHICLES**

. . .

ARTICLE III. - ***ELECTRIC BICYCLES, MOPEDS, AND MOTOR ASSISTED SCOOTERS***

Sec. 41.51. - Definitions

Bicycle is defined as a device propelled by human power, capable of being ridden with two tandem wheels, with at least one wheel over 14 inches in diameter. Under Texas Transportation Code §551.101, bicycles are considered vehicles, granting riders the same rights and duties as motorists. The definition includes a human-powered device with two tandem wheels, including electric bicycles (under 750 watts, < 28 mph).

Electric bicycle or e-bike means a bicycle equipped with fully operable pedals and an electric motor of not more than 750 watts (1 h.p.), which is classified as follows:

(1) Class I: Provides assistance only when the rider is pedaling and ceases to provide assistance when the bicycle reaches 20 miles per hour.

(2) Class II: May be propelled exclusively by the motor (throttle) and ceases to provide assistance when the bicycle reaches 20 miles per hour.

(3) Class III: Provides assistance only when the rider is pedaling and ceases to provide assistance when the bicycle reaches 28 miles per hour; equipped with a speedometer.

Electric Mobility Device means a two non-tandem wheeled device designed for transporting one person that is:

(1) self-balancing; and
(2) propelled by an electric propulsion system with an average power of 750 watts or one horsepower.

Moped is defined as a motor vehicle equipped with a seat or saddle, no more than three wheels, and a top speed of 30 mph or less. It must have a motor that produces 5 brake horsepower or less and, if it has an internal combustion engine, a piston displacement of 50 cubic centimeters or less.

Motor Assisted Scooter means a self-propelled device that:

1) Has at least two wheels in contact with the ground during operation;
2) Has a braking system capable of stopping the device under normal operating conditions;
3) Has a gas or electric motor;
4) Has a deck designed to allow a person to stand or sit while operating it; and
5) Can be propelled by human power alone. It does not include a pocket bike or mini-motorbike.

Operator means any person in control of an electric bicycle.
Shared-use path means a paved or unpaved way physically separated from motor vehicle traffic, intended for use by pedestrians, bicyclists, and other non-motorized users.

Sidewalk means the portion of a street or highway between the curb or lateral line of the roadway and the adjacent property line, intended for pedestrian use.

Tampering means altering or modifying performance characteristics or speed limiter settings so that an electric bicycle no longer conforms to its original class designation.

Sec. 41.52. - Rights and Duties (Texas Transportation Code § 551.101)

(a) A person operating a bicycle has the rights and duties applicable to a driver operating a vehicle under this subtitle, unless:

(1) a provision of this chapter alters a right or duty; or
(2) a right or duty applicable to a driver operating a vehicle cannot by its nature apply to a person operating a bicycle.

(b) A parent of a child or a guardian of a ward may not knowingly permit the child or ward to violate this subtitle.

Sec. 41.53. - General Operation (Texas Transportation Code § 551.102)

(a) A person operating a bicycle shall ride only on or astride a permanent and regular seat attached to the bicycle.

(b) A person may not use a bicycle to carry more persons than the bicycle is designed or equipped to carry.

(c) A person operating a bicycle may not use the bicycle to carry an object that prevents the person from operating the bicycle with at least one hand on the handlebars of the bicycle.

(d) A person operating a bicycle, coaster, sled, or toy vehicle or using roller skates may not attach either the person or the bicycle, coaster, sled, toy vehicle, or roller skates to a streetcar or vehicle on a roadway.

Sec. 41.54. – Operation on roadway. (Texas Transportation Code § 551.103)

(a) Except as provided by Subsection (b), a person operating a bicycle on a roadway who is moving slower than the other traffic on the roadway shall ride as near as practicable to the right curb or edge of the roadway, unless:

(1) the person is passing another vehicle moving in the same direction;

(2) the person is preparing to turn left at an intersection or onto a private road or driveway;

(3) a condition on or of the roadway, including a fixed or moving object, parked or moving vehicle, pedestrian, animal, or surface hazard prevents the person from safely riding next to the right curb or edge of the roadway; or

(4) the person is operating a bicycle in an outside lane that is:

(A) less than 14 feet in width and does not have a designated bicycle lane adjacent to that lane; or

(B) too narrow for a bicycle and a motor vehicle to safely travel side by side.

(b) A person operating a bicycle on a one-way roadway with two or more marked traffic lanes may ride as near as practicable to the left curb or edge of the roadway.

(c) Persons operating bicycles on a roadway may ride two abreast. Persons riding two abreast on a laned roadway shall ride in a single lane. Persons riding two abreast may not impede the normal and reasonable flow of traffic on the roadway. Persons may not ride more than two abreast unless they are riding on a part of a roadway set aside for the exclusive operation of bicycles.

Sec. 41.55. – Safety Equipment. (Texas Transportation Code § 551.104)

(a) A person may not operate a bicycle unless the bicycle is equipped with a brake capable of making a braked wheel skid on dry, level, clean pavement.

(b) A person may not operate a bicycle at nighttime unless the bicycle is equipped with:

(1) a lamp on the front of the bicycle that emits a white light visible from a distance of at least 500 feet in front of the bicycle; and

(2) on the rear of the bicycle:

(A) a red reflector that is:

(i) of a type approved by the department; and

(ii) visible when directly in front of lawful upper beams of motor vehicle headlamps from all distances from 50 to 300 feet to the rear of the bicycle; or

(B) a lamp that emits a red light visible from a distance of 500 feet to the rear of the bicycle.

Sec. 41.56. – Regulation of bicycles by department or local authority. (Texas Transportation Code § 551.106)

(a) The department or a local authority may not prohibit the operation of an electric bicycle:

(1) on a highway that is used primarily by motor vehicles; or

(2) in an area in which the operation of a nonelectric bicycle is permitted, unless the area is a path that:

(A) is not open to motor vehicles; and

(B) has a natural surface tread made by clearing and grading the native soil without adding surfacing materials.

(b) The department or a local authority may:

(1) prohibit the operation of a bicycle on a sidewalk; and

(2) establish speed limits for bicycles on paths set aside for the exclusive operation of bicycles and other paths on which bicycles may be operated.

Sec. 41.57. – Applicability; Conflicts.

(a) This ordinance applies to all operators of electric bicycles on streets, alleys, sidewalks, shared-use paths, parks, and public property within the City of Manvel.

(b) In the event of conflict with state law, state law controls, and provisions of this ordinance shall be construed to be consistent therewith.

Sec. 41.58. – Class labeling; Compliance.

(a) Retailers shall not sell an electric bicycle without a permanently affixed label stating the classification (I, II, or III), top assisted speed, and motor wattage.

(b) It is unlawful to remove, obscure, or falsify the class label.

(c) Operators shall not tamper with an electric bicycle so as to change its performance beyond its labeled class. An electric bicycle that is tampered with is deemed an unclassified motor-driven device and prohibited from sidewalks and shared-use paths under this ordinance.

Sec. 41.59. – General rules of electric bicycle operation.

(a) Electric bicycles shall be operated in accordance with all laws applicable to bicycles, including obedience to traffic control devices, yielding to pedestrians in crosswalks, and use of appropriate hand signals.

(b) Speed. Operators shall ride at a safe speed no greater than:

(1) The class-limited assist speed; and

(2) The posted speed limit or, where none is posted, a speed reasonable and prudent for conditions, not to exceed 15 mph on shared-use paths and 8 mph on sidewalks.

(c) Lane Positioning. On roadways, operators shall ride as near as practicable to the right-hand curb or edge of the roadway except where overtaking, preparing for a left turn, avoiding hazards, or when a lane is too narrow for a bicycle and a motor vehicle to travel safely side by side.

(d) Passing. On shared-use paths and sidewalks, operators shall slow, announce ("on your left"), and give audible warning before overtaking pedestrians or other path users, and maintain a minimum safe passing distance of three (3) feet.

(e) A person may not operate an electric bicycle unless the motor disengages or ceases to function either:

(1) when the operator stops peddling: or

(2)_when the brakes are applied.

Sec. 41.60. - Sidewalks.

(a) Prohibition—Downtown/Designated Areas. It shall be unlawful to operate Class III electric bicycles on sidewalks at any time. The City Manager or designee may designate additional areas where sidewalk riding is prohibited for any class and shall cause signage to be posted.

(b) Limited Sidewalk Use—Class I/II. Class I and Class II electric bicycles may operate on sidewalks unless posted otherwise, provided the operator:

(1) Yields to pedestrians at all times;

(2) Does not exceed eight (8) miles per hour;

(3) Does not engage in reckless or careless operation; and

(4) Dismounts when crowd density or conditions make riding unsafe.

(c) Driveways and Crosswalks. Operators entering a roadway from a sidewalk shall stop or yield as required and not enter the roadway unless safe.

Sec. 41.61. – Shared-use paths; Parks; Trails.

(a) Class I and Class II electric bicycles may be operated on shared-use paths unless prohibited by posted sign or specific facility rules.

(b) Class III on Paths. [Two Options] Class III electric bicycles are permitted on shared-use paths, subject to a 15 mph maximum and all path rules. [Option B—Restrict] Class III electric bicycles are prohibited on shared-use paths except where a path is specifically signed to allow Class III operation.

(c) Unpaved or Natural Trails. The City may prohibit electric bicycles on certain unpaved or natural trails to preserve trail conditions, safety, or environmental resources, as indicated by posted signage or facility rules.

(d) Parks Director Authority. The Parks Director is authorized to adopt facility-specific rules consistent with this ordinance and post signage accordingly.

Sec. 41.62. - Electric Personal Assistive Mobility Device. (Transportation Code § 551.202.)

(a) A person may operate an electric personal assistive mobility device on a residential street, roadway, or public highway with a speed limit of 30 miles per hour or less only:

(1) while making a direct crossing of a highway in a marked or unmarked crosswalk;

(2) where no sidewalk is available; or

(3) when so directed by a traffic control device or by a law enforcement officer.

(b) A person may operate an electric personal assistive mobility device on a path set aside for the exclusive operation of bicycles.

(c) Any person operating an electric personal assistive mobility device on a residential street, roadway, or public highway shall ride as close as practicable to the right-hand edge.

(d) Except as otherwise provided by this section, provisions of this title applicable to the operation of bicycles apply to the operation of electric personal assistive mobility devices.

Sec.41.63. Motor Assisted Scooters (Transportation Code § 551.352)

(a) A motor-assisted scooter may be operated only on a street or highway for which the posted speed limit is 35 miles per hour or less. The motor-assisted scooter may cross a road or

street at an intersection where the road or street has a posted speed limit of more than 35 miles per hour.

(c) A person may operate a motor-assisted scooter on a path set aside for the exclusive operation of bicycles or on a sidewalk. Except as otherwise provided by this chapter, a provision of this chapter applicable to the operation of a bicycle applies to the operation of a motor-assisted scooter.

(d) A provision of state law applicable to a motor vehicle does not apply to a motor-assisted scooter.

Sec. 41.64. Age restrictions; Helmets.

(a) Class III Operation. No person under sixteen (15) years of age may operate a Class III electric bicycle.

(b) Helmets. Operators and passengers under sixteen (15) years of age shall wear a properly fitted and fastened bicycle helmet that meets CPSC (Consumer Product Safety Commission) standards. The City recommends helmet use for all riders of any age.

(c) Passenger Seats. No person may ride as a passenger unless the electric bicycle is equipped with a manufacturer-installed seat or child carrier designed for that purpose.

(d) Operators of motor assisted scooters and electric personnel mobility devices shall follow all applicable safety regulations and rules of the road.

(e) Operators of motor assisted scooters and electric personnel mobility devices under the age of 15 shall wear the approved CPSC helmet.

Sec. 41.65.- Electric bicycle equipment requirements.

(a) Brakes. Electric bicycles shall be equipped with a brake system enabling the operator to make the braked wheels skid on dry, level, clean pavement.

(b) Lights and Reflectors. From sunset to sunrise or when visibility is less than 500 feet, operators shall use:

(1) A white front light visible from at least 500 feet; and

(2) A red rear light or reflector visible from at least 500 feet.

(c) Bell or Audible Device. An audible device capable of signaling approach shall be installed and used when necessary to warn.

(d) Speedometer. Class III electric bicycles shall be equipped with a functioning speedometer.

(e) Condition. Electric bicycles shall be maintained in good working order; unsafe equipment is prohibited.

Sec. 41.66.- Prohibited conduct.

(a) Reckless Operation. No person shall operate an electric bicycle in a manner that endangers the safety of any person or property.

(b) Racing. Street or path racing, speed trials, or exhibitions of speed are prohibited unless part of a permitted event.

(c) Distracted Operation. Operators shall not use handheld devices in a manner that distracts from safe operation.

(d) Towing; Trailers. Towing with an electric bicycle is prohibited except for small bicycle trailers designed for that purpose and not exceeding manufacturer limits.

Sec. 41.67.- Commercial operations; Fleets.

(a) Permit Required. Any person or entity operating shared or rental electric bicycle fleets within the City must obtain a permit issued by the City Manager or designee and comply with fleet rules, including:

(1) Proof of insurance meeting City requirements;

(2) Geo-fencing of slow zones and no-ride areas when technically feasible;

(3) Distribution and parking standards to avoid sidewalk obstruction;

(4) Maintenance and safety checks; and

(5) Data-sharing (aggregate, privacy-protected) for compliance auditing.

(b) Parking. Electric bicycles shall not be parked in a manner that blocks pedestrian access, ADA curb ramps, doorways, fire lanes, or transit stops.

Sec. 41.68.- Enforcement; Penalties.

(a) Enforcement. The Manvel Police Department and authorized City personnel are empowered to enforce this ordinance.

(b) Penalties. Violation of this ordinance is a civil offense punishable by:

(1) First offense: up to $50.00;

(2) Second offense within 12 months: up to $100.00;

(3) Subsequent offenses within 12 months: up to $200.00.

(c) Diversion. The Municipal Court may offer a safety education course in lieu of fine for first offenses.

(d) Temporary Impoundment. An electric bicycle operated in a reckless manner that presents an immediate hazard may be temporarily impounded when necessary to abate the hazard, with release procedures provided by MPD policy.

(e) Juveniles. Enforcement actions involving persons under 17 may include parental notification and may be referred to juvenile diversion programs where appropriate.

Sec. 41.69.- Exemptions.

(a) Public Safety. This ordinance does not apply to electric bicycles operated by public safety personnel (police, fire, EMS) while in the performance of official duties.

(b) ADA Devices. Devices designed and used to assist persons with disabilities are exempt.

(c) Utility and City Maintenance. City utility and maintenance operations may use electric bicycles or similar devices as needed for official duties.

Sec. 41.70.- Education; Signage.

(a) The City Manager or designee shall develop and implement public education materials on safe electric bicycle operation and the rules established by this ordinance.

(b) The City shall post signage where sidewalk or path restrictions apply, including speed limits and no-ride areas. ”

Section 2. **Penalty**. Any person who shall intentionally, knowingly, recklessly, or with criminal negligence violate any provision of this chapter shall be deemed guilty of a misdemeanor and, upon conviction, shall be fined in an amount not to exceed $2,000.00. Each day of violation shall constitute a separate offense.

Section 3. **Repealer**. All ordinances or parts of ordinances inconsistent or in conflict herewith, are, to the extent of such inconsistency or conflict, hereby repealed.

Section 4. **Severability**. In the event any clause, phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstance shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Manvel, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

PASSED AND APPROVED on first reading this _____ day of _____, 2026.

PASSED, APPROVED, AND ADOPTED on second and final reading this _____ day of _____, 2026.

_____
Dan Davis, Mayor

Attest:

_____
Tammy Bell, City Secretary

APPROVED AS TO FORM:

_____

Robert Gervais, City Attorney

MANVEL
CITY COUNCIL
DATA SHEET

MEETING DATE: June 15, 2026

TOPIC: Public Hearing followed by consideration of a request to change the zoning classification of an approximate 394.232 tract of land, generally located east of S.H. 288, extends across both north and south sides of S.H. 6, south of Del Bello Lakes Development, west of Iowa Lane and Valencia Development, from Open Planned Use Development (O-PUD) District to Planned Use Development (PUD) District. (Proposed Ordinance No. 2026-O-16)

BACKGROUND:

The subject site is generally bounded by S.H. 6 to the south, Del Bello Lakes Development to the north, Iowa Lane and Valencia Development to the west. The property, approximately 394.232 acres, is currently undeveloped and located within the City of Manvel. The applicant, LJA Engineering, on behalf of developers, Houston 118 LLC, Milestone, Scottsdale LLC, and Tharaldson Ethanol Plant I LLC, is requesting to change the zoning classification from Open Planned Use Development (O-PUD) District to Planned Use Development (PUD) District.

The proposed PUD, titled “Presidio PUD,” is proposed as a master-planned, mixed-use commercial development, including single family residential, medical, retail, services, office uses. The project is intended to incorporate coordinated architecture, a comprehensive land use table, landscaping requirements, pedestrian-friendly amenities, and internal circulation, including multiple access points from Highway 6, State Highway 288, Manvel Parkway, Charlotte Street, and Iowa Lane. Surrounding properties are a mix of underdeveloped acreage and commercial development to the south, State Highway 288 with commercial development on the other side of it to the west, and single-family residential developments to the north and east including Del Bello Lakes and Valencia Development. The applicant has provided a PUD document that will govern the land use allowances and development standard for the development. The proposed PUD document includes certain provisions that deviate from the current City standards but are necessary for the development according to the applicant.

The Notice of Public Hearing was published in the newspaper of general circulation and all property owners within 200 feet of the property were notified. At the time of writing this report, staff has received informational inquiries and is not aware of opposition.

- Additional details and staff analysis are included in the attached PD&Z Final Report.

STAFF RECOMMENDATION: City staff recommends approval of the requested Rezoning upon addressing the comments and concerns listed in the Final Report from PD&Z Commission.

PD&Z PUBLIC HEARING AND DISCUSSION (May 26, 2026): One of the residents asked for clarification on why an entity named Tharaldson Ethanol Plant LLC is involved in a commercial project. This concern was addressed by the applicant who explained how different entities got involved in land banking for this project and clarified that this project will have no industrial element to it. Commissioners generally discussed the proposed project.

PD&Z RECOMMENDATION: The PD&Z Commission recommends approval of the requested Rezoning upon addressing the comments and concerns listed in the Final Report from PD&Z Commission with a vote of five (5) “Yeas” to zero (0) “Nays” at their May 26, 2026, meeting.

ATTACHMENTS: PD&Z Final Report, and Proposed Ordinance No. 2026-O-16

FUNDING ISSUES

_X_ Not applicable
___ Not budgeted
___ Full amount already budgeted
___ Funds to be transferred from Acct.#

SUBMITTING STAFF MEMBER Jesica Portie, Assistant Planner	**FINANCE DIRECTOR APPROVAL** __NA___ **CITY MANAGER APPROVAL** ___YES___

FINAL REPORT TO CITY COUNCIL

Rezoning

Agenda of:	June 15, 2026	**Initiated By:**	Jose Abraham Director, Development Services
Subject:	Rezoning, O-PUD/SH6 to PUD/SH6	**Presented By:**	Jesica Portie Associate Planner
Recommended Action:	A Public Hearing followed by Consideration and Possible Action to Approve Ordinance No. 2026-O-16		

SUMMARY

This is a rezoning request pertaining to Presidio, a development previously approved as Open-Planned Unit Development (O-PUD). Presidio is approximately 394.232 acres in size, currently undeveloped and generally located along the east side of SH 288 with majority of the acreage on the north side of SH 6 and about 45.5 acres on the south side. Brazoria County Municipal Utility District (BCMUD) No. 30 was established to serve this proposed development. Even though this development was approved in 2007, the developer did not get Council approval to proceed with the development as required by the O-PUD ordinance. The applicant, LJA Engineering, on behalf of the developers, Houston 118 LLC, Milestone, Scottsdale LLC, and Tharaldson Ethanol Plant I LLC, is requesting to change the zoning classification from Open Planned Use Development District with State Highway 6 Overlay (O-PUD/SH6) to Planned Use Development District with State Highway 6 Overlay (PUD/SH6). Proposed PUD includes allowance for light commercial uses and single family residential. The proposed PUD document generally aligns with the city Ordinances with certain provisions that deviate from the current City standards but are necessary for the development according to the applicant. Several provisions also are similar to Manvel Town Center and Manvel Crossing PUD. Staff have provided input and comments on the PUD document for the applicant to consider prior to the meeting. The Notice of Public Hearing was published in the newspaper of general circulation and all property owners within 200 feet of the property were notified. At the time of writing this report, staff has received two informational inquiry and is not aware of any opposition to the request. Please note that the applicant has updated the PUD document to address the list of comments and staff is reviewing the submittal to ensure everything has been address. The updated PUD document is included in the packet.

Staff Recommendation: Approval with conditions
PD&Z Recommendation: Approval with conditions

EXHIBITS

Zoning Vicinity Map, Major Thoroughfare Plan Map, Application Form, Development Summary Letter, Public Hearing Notice, 2007 O-PUD, Proposed PUD, Proposed PUD Exhibits, Presidio OPUD to PUD Changes, Deviations and Variances Table, DIA, and TIA.

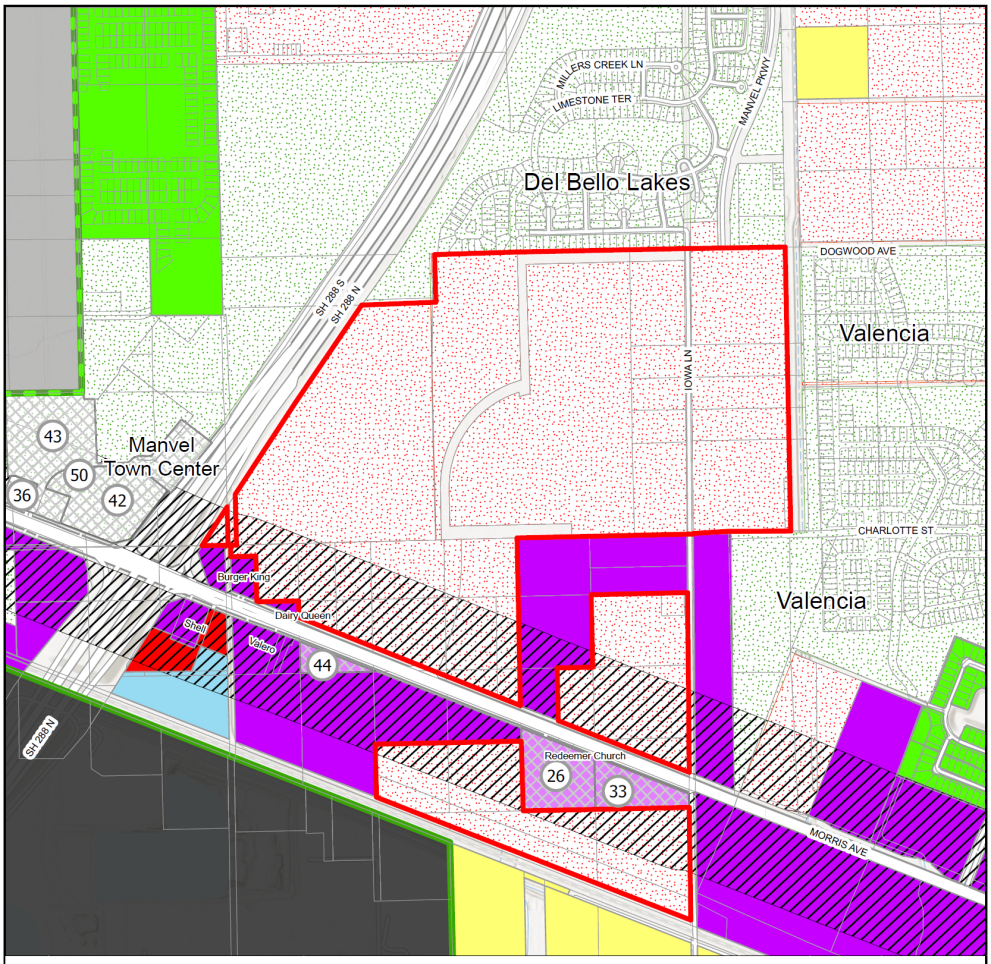
GENERAL SITE INFORMATION

The following is a summary of general site information.

Surrounding Property Zoning	**North:** Planned Unit Development (PUD) **South:** Light Commercial District (LC) / State Highway 6 Overlay District (SH6) **East:** PUD / LC / SH6 **West:** S.H 288/ PUD/ SH6

Surrounding Land Use	**North:** Del Bello Development **South:** Quick-service restaurants (Jack in the Box, Subway, Taco Bell, and Sonic Drive-In), Shell plc gas station, storage facility, future ambulatory health care services, church, and undeveloped land. **East:** Valencia Development **West:** Manvel Town Center
Major Thoroughfare	Subject site is located along both side of State Highway 6/Morris Avenue, Manvel Parkway, Charlotte Street, and Iowa lane. Subject site is located along east side of SH 288 and south side of Dogwood Avenue.

ZONING VICINITY MAP



SPECIFIC USE PERMITS LEGEND

Label No	Address	Specific Use Description	Ordinance No	Effective Date	Zoning Classification
26	18218 MORRIS AVE	NAICS Use 6111 RELIGIOUS ORGANIZATIONS AND NAICS USE 6111 ELEMENTARY AND SECONDARY SCHOOLS	2019-O-09	4/1/2019	LC/SH6
33	SOUTHWEST CORNER OF STATE HIGWAY 6 AND IOWA LANE	NAICS USE 721 ACCOMMODATIONS	EXPIRED		LC/SH6-SUP
36	17205 Highway 6/ Morris Ave	NACIS USE OFFICE OF DENTISTS	2023-O-15	3/20/2023	PUD/SH6-SUP
42	21708 Highway 288	NAICS USE 621493 "Ambulatory Health Care Services"	2024-O-17	5/6/2024	PUD/SH6-SUP
43	17221 State Highway 6, Suite 103	NAICS USE 812113 "Nail Salon"	2024-O-25	7/1/2024	PUD/SH6-SUP
44	17518 Morris Avenue	NAICS use 621493 "Ambulatory health Care Services"	2024-O-26	10/21/2024	LC/SH6-SUP

Presidio PUD

Presidio
Parcels
City of Manvel ETJ
City of Manvel City Limits
Specific Use Permits
State Highway 6 Overlay District
Heavy Commercial District
Light Commercial District
Multi-Family District
Planned Unit Development
Open Single-Family Residential District
Single-Family Residential District
Open - Planned Unit Development

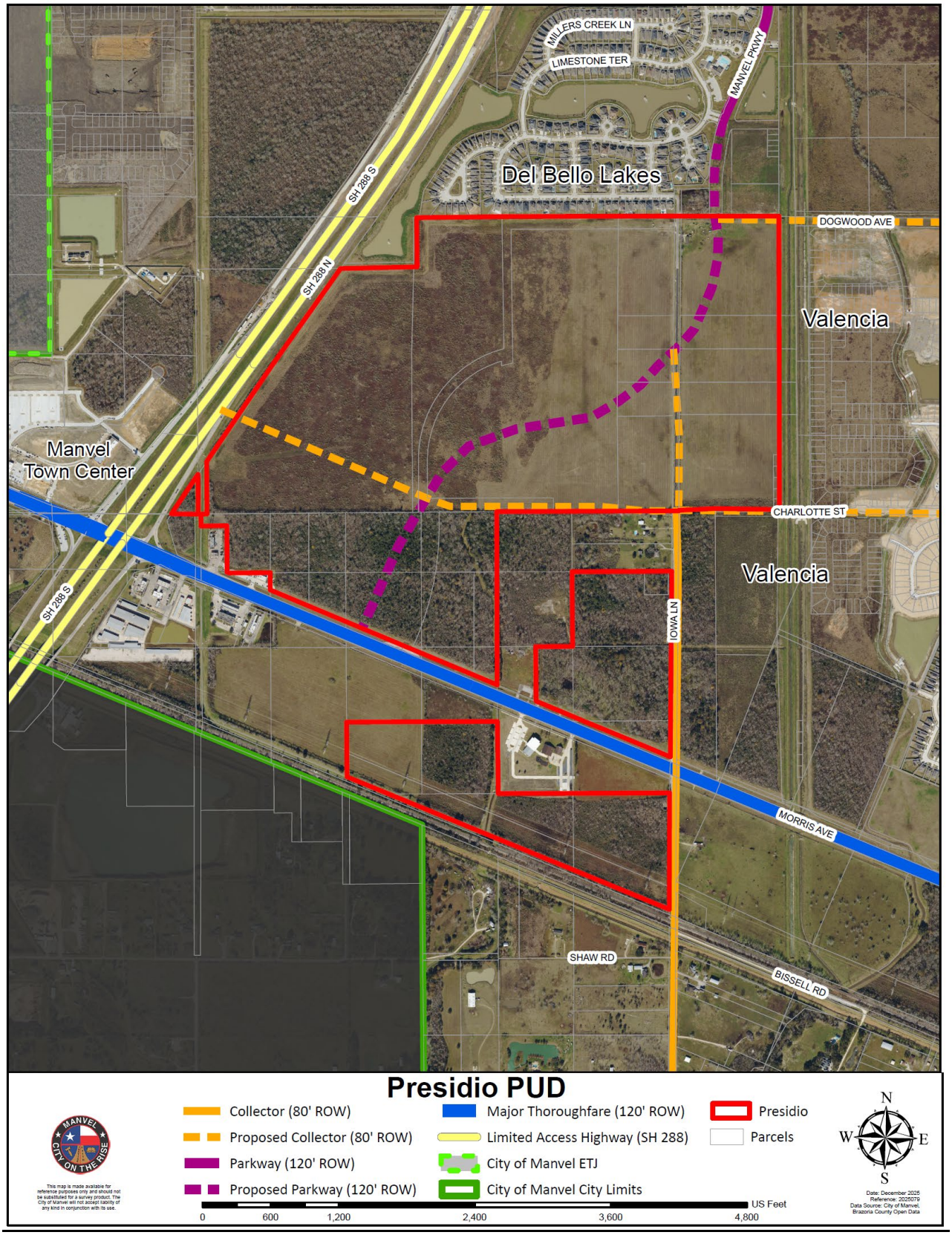
0 0.13 0.25 0.5 0.75 1 Miles

N W E S

This map is made available for reference purposes only and should not be substituted for a survey product. The City of Manvel will not accept liability of any kind in conjunction with its use.

Date: December 2025
Reference: 20250276
Data Source: City of Manvel, Brazoria County Open Data

MAJOR THOROUGHFARE PLAN MAP



PURPOSE AND INTENT OF THE PROPOSED ZONING DISTRICT

According to the section 77-29, *Planned Unit Development (PUD) district*, of the Zoning Ordinance purpose of PUD "*is to promote diversity and creativity in site design. The PUD process is provided as an option to encourage unique developments which may combine a mixture of residential and non-residential land uses and building functions. The PUD allows flexibility in the application of development standards by permitting departures from the conventional siting, setback, and density requirements of a particular zoning district in the interest of achieving site development not otherwise possible.*"

PROJECT DETAILS

The Presidio PUD is a mixed-use project that previously received O-PUD approval in 2007; and it intends to replace the previous of O-PUD based on provision of Section 77-29. The intent of the proposed PUD is to re-establish the original development framework while updating standards to reflect current market conditions, best practices, and the City's current ordinances. The previously approved O-PUD included approximately 394.232 acres. However, approximately 1.03 acres is being removed from the original tract after being sold to the Gulf Coast Water Authority (GCWA) in July 2020. As a result, the total acreage has been reduced to approximately 392.9 acres.

The subject site is located immediately east of S.H. 288 and extends across both the north and south sides of S.H. 6, south of the Del Bello Lakes development, west of Iowa Lane and the Valencia development, and generally within the boundaries of Brazoria County Municipal Utility District (BCMUD) No. 30. Approximately 45 acres located south of S.H. 6 are reserved for detention. Pursuant to the City's zoning ordinance, the project qualifies as a Large PUD Development based on its acreage and is proposed as a master-planned, mixed-use development consisting of commercial and traditional single-family residential uses.

The commercial component is intended to create an active corridor along S.H. 6 and will include a variety of retail, service, medical, and office uses that complement surrounding developments, including Manvel Town Center. A commercial tract located on the northwest boundary of the proposed PUD, consisting of approximately 50.3 acres, is identified for medical use (permitted use) and may be developed for general commercial uses without being subject to the 10 percent land use acreage adjustment limitation.

The residential component will consist of multiple neighborhoods connected by an internal street network with access provided from Manvel Parkway, Charlotte Street, S.H. 6, S.H. 288, and Iowa Lane. Residential lot widths are anticipated to be distributed on an approximate 50/50 basis between 50-foot and 60-foot lots with a minimum lot depth of 120 feet in response to market conditions and housing demand.

The development proposes an integrated circulation system with pedestrian connections, trails, landscaped public areas, and open space throughout the site. Approximately 21.96 percent of the gross acreage is dedicated to open space areas, including parks, landscape reserves, trails, natural open space areas, a Manvel Civic Center, lakes/detention areas, and drainage facilities.

The PUD establishes detailed architectural and site design standards to ensure high-quality development, including signage criteria and landscape buffering. All architectural standards and design guidelines for the residential and commercial portions of the development will be submitted separately for City review and approval.

The following table provides a comparison between the previously approved O-PUD and the proposed Presidio PUD:

Category	Previous O-PUD (2007)	Current PUD (2026)
Total Acreage	Approximately 394.232 acres	Approximately 392.9 acres
Acreage Difference	Included GCWA tract	Reduced by approximately 1.03 acres after sale to GCWA in July 2020
Development Type	Mixed-use O-PUD	Master-planned mixed-use PUD
Non-Residential Land Use	Included Pad, Office, Hotel, Water Plant and Wastewater Treatment Plant, Civic Center, detention, ROW	Includes traditional Commercial and Medical uses, Water Plant, Civic Center, detention, ROW, NAICS tables
Commercial Acreage	Approximately 165.2 acres	Approximately 200.2 acres
Commercial Uses	General commercial uses	Retail, service, medical, and office uses
Medical Use Tract	Not specified	Approximately 50.3-acre tract identified for medical use on northwest boundary of PUD
Residential Land Use	Traditional Single-Family Residential with minimum 60-foot lots and Urban Density Residential	Traditional Single-Family Residential ranging from approximately 50% 50-foot lots and 50% 60-foot lots; Urban Density Residential removed
Residential Acreage	Approximately 95.9 acres total	Approximately 57.5 acres total
Residential Types	77.5 acres Single-Family Detached Residential and 18.4 acres Urban Density Residential	Traditional Single-Family Residential only
Residential Lot Depth and Acreage	Depth not specified; Minimum 6,300 square feet	Minimum 120-foot depth; acreage not specified
Parks & Open Space	6-foot trails along Manvel Parkway and Iowa Lane; no dedicated park space	Variety of trail widths ranging from 6 feet to 12 feet along Manvel Parkway, Iowa Lane, Charlotte Street, and Street X; dedicated park space based on current City Park requirements
Open Space Percentage	Approximately 20.7%	Approximately 21.96%
Manvel Civic Site	Approximately 5.3 acres	Approximately 5 acres
Signage Standards	Unified signage program to be submitted separately and approved by City Council	Signage standards included within the PUD
Landscaping & Buffering	No specific screening or buffering requirements	Clear landscaping, buffering, and screening requirements provided
SH 6 Overlay District Compliance	Not addressed	Incorporates S.H. 6 Overlay District requirements
Definitions	Limited or not included	Comprehensive definitions section included

Portions of the development located within the S.H. 6 Overlay District will be required to comply with Section 77-36 of the City of Manvel Code of Ordinances. Stormwater management will be provided through on-site detention facilities designed to meet City and Brazoria County Drainage District No. 4 requirements. Utilities, drainage, and roadway infrastructure will be provided through the City of Manvel and BCMUD No. 30 and will be constructed in accordance with applicable City, County, and TCEQ standards.

Overall, the Presidio PUD is intended to provide expanded commercial amenities, residential opportunities, employment growth, and increased public amenities while maintaining the "town and country" character of Manvel through coordinated design and landscaping standards. The previously approved O-PUD did not include a NAICS Code table or detailed regulations pertaining to permitted land uses and building uses. The proposed PUD includes comprehensive land use tables identifying permitted uses, office-only uses, Special Use Permit (SUP) uses, and prohibited uses. Please note that gas station is allowed upon approval of an SUP. The proposed PUD includes the following permitted land uses:

1. Single Family
2. Retail Bakeries
3. Furniture and Home Furnishing Stores
4. Electronics and Appliance Stores
5. Building Material, Garden Equipment and Supplies Dealers
6. Food and Beverage Stores
7. Health and Personal Care Stores
8. 1 Gasoline Station in association with a Grocer
9. Clothing and Clothing Accessories Stores
10. Sporting Goods, Hobby, Book, and Music Stores
11. General Merchandise Stores
12. Misc. Store Retailers
13. Postal Service
14. Finance and Insurance
15. Real Estate
16. Lessors of Nonresidential Buildings (Except Mini \Warehouses)
17. Consumer Goods Rental
18. Professional, Scientific, and Technical Services
19. Accounting. Tax Preparation. Bookkeeping and Payroll
20. Veterinary Services
21. Management of Companies and Enterprises
22. Administrative and Support Services
23. Educational Support Services
24. Social Assistance
25. Child Care Services
26. Arts. Entertainment. and Recreation
27. Fitness and Recreational Sports Centers
28. Food Services
29. Electronic and Precision Equipment Repair and Maintenance
30. Automotive Glass Replacement Shop

31. Personal and Laundry Services
32. Specialty Trade Contractors
33. Printing and Related Support
34. Wholesale
35. Medical/ Hospital Uses (Tract H Only)
36. Convenience Retailers
37. Automotive Repairs and Replacement Shops

The proposed PUD also establishes separation and operational requirements for certain uses, including automotive uses, restaurants and retail uses, drinking places, hotel uses, freestanding ambulatory surgical and emergency centers, and personal care services.

The following sections provide staff's analysis of the requested rezoning and some key points to consider.

1. *The proposal is unique in design to warrant the use of a PUD and the development is not possible using the existing zoning regulation of the property:*

   The proposed PUD represents a master-planned, mixed-use development integrating traditional single-family residential neighborhoods with retail, office, medical, and service commercial uses within a unified development framework. The proposed development includes coordinated architecture, internal circulation systems, open space amenities, pedestrian connectivity, and comprehensive landscaping standards that cannot be effectively achieved through conventional zoning districts. The PUD is necessary to:

   - Integrate a mixture of residential and commercial uses within a cohesive master-planned development.
   - Allow flexibility in lot sizes, setbacks, circulation design, landscaping, and open space configuration.
   - Provide coordinated development standards and infrastructure planning across approximately 392.9 acres.
   - Accommodate phased development and interconnected roadway systems throughout the project area.

2. *The project depicts creative land development, providing a variety in the development patterns of the city which conform to the intended purpose of the city's comprehensive plan and vision statement*:

   The PUD introduces a Master-Planned Development pattern that provides more choice in housing and commercial development locations and types for the community. Overall, it supports the 2045 Plan and aligns with the recently adopted Future Land Use and Character Map.

   - Internal roadway connectivity between residential neighborhoods and commercial areas.
   - Coordinated architectural, landscaping, and design standards throughout the development.
   - Pedestrian trails, landscaped public spaces, and open space amenities that promote walkability and community interaction.

- A development pattern intended to complement surrounding developments, including Manvel Town Center.

3. *Mixed uses and building functions if proposed shall be complementary, and pose minimal impact to adjacent uses or function*:

   The proposed residential and commercial land uses are designed to function cohesively while minimizing impacts on adjacent properties through buffering, landscaping, roadway planning, and transitional development patterns. The commercial areas along State Highway 6 are intended to serve surrounding residential neighborhoods and nearby developments.
   - Please note that an approximate 50.3-acre tract identified for medical use on northwest boundary of proposed PUD abut Del Bello Development that may be developed for general commercial uses, previously identified as an Urban Density Residential in the approved O-PUD.
   - NOTE: Per Texas Occupations Code section 455.005(b-1) and (c), the City may not adopt a zoning regulation that is more restrictive for massage therapists than for "other health care professionals" and "other health care establishments." So if an SUP is required for a state licensed massage therapist, we also require SUP for other healthcare professionals and establishments.
   - NOTE: The PUD document includes some reference to High Density Urban residential in error, which needs to be revised.
   - Additionally, please note that some of the sign regulation included in the PUD document deviate from the recently approved PUDs. (comparison table attached)

4. *Development within the PUD encourages the use of alternative transportation circulation between structures and open spaces, including pedestrian and bicyclist*:

   The PUD includes a comprehensive internal circulation network intended to provide connectivity throughout the development and to surrounding areas supported by an approved Traffic Impact analysis. The development proposes pedestrian connections, trails, landscaped pathways, and open space areas designed to encourage walkability and recreational activity. Additionally:
   - Multiple access points are proposed from State Highway 6, State Highway 288, Manvel Parkway, Charlotte Street, and Iowa Lane.
   - Internal sidewalks and trail systems are intended to connect residential neighborhoods, commercial areas, parks, and open spaces. The proposed PUD includes details and exhibits pertaining to trails.
   - Landscaped pedestrian corridors and public spaces are incorporated throughout the development to enhance connectivity and mobility.
   - Note: The PUD document may need minor revision to ensure that street and sidewalk design will comply with the requirements of the City's Major Thoroughfare plan and Subdivision Ordinance.

5. *Landscaping areas shall visually enhance the structures within the development and conform to the city's comprehensive plan and vision statement*:

The PUD includes proposed landscaping and open space standards intended to create a cohesive development character and enhance the visual appearance of the project. Approximately 21.96 percent of the gross acreage is dedicated to parks and open space areas, including trails, landscape reserves, detention features, and natural open space areas. Landscaping elements include:

- Street trees and enhanced landscape areas throughout the development.
- Landscaped buffers between residential and commercial uses.
- Open space amenities, trails, and pedestrian-oriented public spaces.
- Coordinated landscaping standards intended to preserve the "town and country" character of the City of Manvel.
- PUD indicates traditional, constant-level detention lakes.
- NOTE: The bufferyard requirement in the PUD document does not include specific planting requirements similar to the City's Ordinance.

6. *The proposed project is in compliance with the minimum development requirements described in the PUD Manual:*

   In general, the PUD demonstrates conformance with the City's PUD Manual and zoning ordinance requirements for a large-scale mixed-use development. The PUD includes proposed development standards, land use planning, circulation systems, open space provisions, and infrastructure coordination.

STAFF RECOMMENDATION

Staff supports the proposed rezoning from Open Planned Use Development (O-PUD) District to Planned Use Development (PUD) District. The proposed project generally aligns with the goals of the Comprehensive Plan, however, some of the details included in the PUD document need reconsideration prior to City Council action. Staff recommends forwarding a recommendation of approval with a condition that the PUD document shall be revised to address certain issues and/or that clarification on certain issues will be provided for items listed below. (Proposed Ordinance No. 2026-O-16).

1. Introduction Section: Revise the introduction section in the O-PUD where it mentions that the O-PUD approval has since expired pursuant to Sec. 77-29 of the Manvel Code of Ordinances to state that this is zoning change from O-PUD to PUD based on provision of Section 77-29.
2. Sidewalk: Revise Section III.4 (page 7) to add: "Except as expressly stated in the PUD, compliance with the City of Manvel's sidewalk requirements will be maintained……"
3. Trails: It appears that the document uses the terms trails and sidewalks interchangeably. Revise for consistency or include specific definitions for clarity.
4. Vesting: Revise section VI in the proposed PUD to add "Applicable International Code Council Codes adopted by the City of Manvel shall apply as amended from time to time."
5. Planting within Buffer yard: Revise Section VI. 5 to include the minimum requirements of Section 77-44(C)(6) of the City's Ordinance (Transitional buffer yard between residential and non-residential uses).
6. Street and Circulation System Section: Revise to reference Major Thoroughfare Plan compliance on Page 14. Additionally, there is a section called Streets on Page 16 which could be made part of Section VI.2. on page 14.

7. Utility Agreement: Provide clarification on why Section VI.4. includes a reference to the Utility Agreement. Also, include a definition for the Utility Agreement.
8. Miscellaneous Regulations: Revise the setback requirement regarding proximity to pipelines from 30 feet to 50 feet.
9. Trees within median: Include specific requirements pertaining to root barriers, maintenance requirements, etc., for tree planting allowance within medians.
10. Urban Corridor: Remove reference to Urban corridor and High-density urban corridor on page 26.
11. Phasing: Revise Phasing schedule section to indicate phasing of detention ponds. Additionally, revise to reference Exhibit H instead of I.
12. Commercial standards: A development standard comparison table was provided which includes standards for Light Commercial uses. However, these standards are not included in the PUD document.
13. Signage: Size restriction for off-premise signs is not provided. Sign area allowance for multi-tenant monument signs is significantly larger than city ordinance allowance. Multi-Tenant Highway Pylon sign doesn't include any spacing of number limit. Provide clarification to illustrate how this aligns with the overall spirit of the city's sign ordinance or other similar districts within Manvel.

PUBLIC HEARING

The Notice of Public Hearing was published in the newspaper of general circulation and a sign was posted on the subject site. All property owners within 200 feet of the property were notified. At the time of writing this report, staff has received two informational inquiry and is not aware of any opposition to the request.

PUBLIC HEARING NOTICE PUBLISHED ON SUNDAY 05/10/2026

A PUBLIC HEARING WILL BE HELD AT MANVEL CITY HALL, 20031 HWY 6, MANVEL, TX 77578 AT 6:00 P.M. ON TUESDAY, MAY 26, 2026 BEFORE THE MANVEL PLANNING, DEVELOPMENT, AND ZONING COMMISSION AND AT 6:00 P.M., ON MONDAY, JUNE 15, 2026 BEFORE THE MANVEL CITY COUNCIL TO HEAR INPUT FROM THE PUBLIC REGARDING AN ORDINANCE (2026-O-16) OF THE CITY OF MANVEL, TEXAS, AMENDING THE ZONING ORDINANCE (2007-O-26) OF THE CITY, BY CHANGING THE ZONING CLASSIFICATION OF A CERTAIN TRACT OF LAND CONSTITUTING APPROXIMATELY 394.232 ACRES FROM OPEN PLANNED USE DEVELOPMENT (O-PUD) DISTRICT TO PLANNED USE DEVELOPMENT (PUD) DISTRICT, SUCH TRACT IMMEDIATELY LOCATED ON THE EAST OF S.H. 288, EXTENDS ACROSS BOTH NORTH AND SOUTH SIDES OF S.H. 6, SOUTH OF DEL BELLO LAKES DEVELOPMENT, WEST OF IOWA LANE AND VALENCIA DEVELOPMENT, AND GENERALLY WITHIN THE BOUNDARIES OF BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 30; PROVIDING FOR THE AMENDMENT OF THE CITY'S OFFICIAL ZONING MAP; PROVIDING FOR SEVERABILITY; AND PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000 FOR EACH DAY OF VIOLATION OF ANY PROVISION HEREOF.. /S/ TAMMY BELL, CITY SECRETARY.

PLANNING, DEVELOPMENT AND ZONING COMMISSION DISCUSSION AND RECOMMENDATION

At the May 26, 2026, Planning, Development, and Zoning (PD&Z) Commission meeting, a public hearing was held to receive input on this request. The applicant made a presentation explaining the

proposed project. One of the residents asked for clarification on why an entity named Tharaldson Ethanol Plant LLC is involved in a commercial project. This concern was addressed by the applicant who explained how different entities got involved in land banking for this project and clarified that this project will have no industrial element to it. Commissioners generally discussed the proposed project.

The PD&Z Commission is recommending approval of this request with conditions provided by staff. The motion to approve passed with a vote of five (5) "Yeas" to zero (0) "Nays." Therefore, the Planning, Development, and Zoning Commission is recommending approval of proposed Ordinance No. 2026-O-16

Please note that the applicant has provided a revised PUD document addressing the conditions provided at the PD&Z Commission meeting. Staff is reviewing the revisions and will provide an update at the meeting.

APPLICATION FORM

Staff Use Only:
Date Received: _____
Received by: _____
Date Complete: _____
Completeness Review by:
_____

Planned Unit Development (PUD) Application

Incomplete Applications will not be accepted. Please review application submittal requirements contained in the City of Manvel PUD Manual.

(Please Type or Print Clearly with Dark Ink)

[X] Master Plan PUD [ ] Small PUD [ ] Site Plan Only

General Information
PUD Name: Presidio PUD
Number of Units Proposed: 242 Current Zoning Designation: Open Planned Unit Development
Zoning District under Which PUD Will Be Designed: PUD-Single Family Residential and PUD- Light Commercial
Address/Location: North of State Highway 6 and East of State Highway 288
Brazoria County Parcel Number (s): Please see attached list. Acres: 392.9
Legal Description: Please see attached list.
_____

Applicant Information
Name: LJA Engineering, Inc. Daytime Phone: _____
Mailing Address: _____
City/State/Zip: _____
Contact Person: Katy Harris
Email Address: _____

Property Owner Information (If different from applicant; attach additional signature page or appropriate letter of consent/agreement if more than one property owner)
Name: Please see attached list. Daytime Phone: _____
Mailing Address: _____
City/State/Zip: _____
Email Address: _____

APPLICATION FORM

CITY OF MANVEL PLANNED UNIT DEVELOPMENT APPLICATION, PAGE 2

(Attach additional sheets if necessary to fully answer the following.)

1. Contiguous Land Ownership- Please specify if the owner(s) own any property that is directly adjacent to the proposed PUD and describe any future projects in adjacent property: Owners do not own property that is directly adjacent to the proposed PUD.

2. Concept Statement- Brief description of the project including proposed the use or uses: The project will consist of residential and commercial development. A variety of housing options (50s, 60s) are being offered in addition to pedestrian trails, open space, and amenitized ponds.

The proposed activities and uses shall be shown on an attached PUD plan based on the exhibit requirements for master plan and site plan review. Please refer to the City of Manvel PUD Manual for the master plan and site plan requirements.

3. Statement of Justification- Brief description outlining how the proposed PUD is consistent with the purpose of the Zoning Ordinance and all departures from the provisions of the underlying zoning district that are necessary to provide superior site development: The project is currently zoned to Open Planned Unit Development. The proposed PUD will consist of commercial development, and residential homes including some higher density that the adjacent major thoroughfares can accommodate.

4. Statement of Compliance with the Comprehensive Plan- Description of how the PUD meets or exceeds the City vision as described in the Comprehensive Plan: The proposed PUD complies with the comprehensive plan by proposing well-planned development with open space for safe recreation that protects the natural environment and offering a variety of housing for different needs.

5. Statement of Compatibility- Describe how the proposed project is compatible with the surrounding uses and will not have significant adverse impacts on the properties: The proposed PUD will consist of commercial development taking access from adjacent highways and a proposed major thoroughfare. This commercial development aligns with commercial uses existing along the adjacent highways west of the PUD. The PUD is also proposing traditional single-family residential lots that compatible with existing residential communities to the north and to the east of the PUD.

12/11/25
Date

Katy Harris
Applicant's Signature

12/11/25
Date

Manager
Owner's Signature (If different from Applicant)

The above signed property owners, certify that the above information is true and correct to the best of our knowledge and state that we are the legal owners of the property included in this application and/or designate the applicant to act as our agent with respect to this application. If there are more than one property owner(s), attach additional signature sheets or letter of consent to application.

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CITY OF MANVEL PLANNED UNIT DEVELOPMENT APPLICATION, PAGE 2

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DEVELOPMENT SUMMARY LETTER

LJA PLANNING & LANDSCAPE ARCHITECTURE

713.953.5200
TBPELS 10194382
www.LJA.com
3600 West Sam Houston Parkway S, Suite 600, Houston, Texas 77042

May 13, 2025

City of Manvel
Planning Department
20025 Highway 6
Manvel, Texas 77578

Re: Presidio PUD – Development Summary Letter

To Whom It May Concern:

This letter provides an overview of the proposed Presidio Planned Unit Development (PUD) and summarizes anticipated build-out characteristics, land use allocation, and the planned approach to public and private service provision, as requested.

Project Overview

The Presidio PUD consists of approximately 392.9 acres located east of State Highway 288, north of State Highway 6, and west of Pollard Boulevard. The PUD establishes a balanced mix of residential, commercial, roadway, drainage, and open space uses consistent with the City's development objectives and the Comprehensive Plan.

Residential Development

The PUD includes one residential product:

- Traditional Single-Family Residential: Approximately 57.5 acres, developed with a range of lot sizes (50'–60' lots) to respond to market demand.

Commercial Development

The PUD includes 200.2 acres of commercial land distributed throughout the site with access from State Highway 288, State Highway 6, Manvel Parkway, Charlotte Street, and Iowa Lane. These areas are intended to accommodate a broad mix of retail, service, medical, and office uses.

At this stage of planning, specific building programs, tenant mix, and gross floor area projections for the commercial tracts have not yet been determined. These elements will be refined as market conditions evolve and as individual end users are identified. Final site development details, including building square footage, parking, and site circulation, will be provided through subsequent site plan and platting submittals in accordance with City requirements.

DEVELOPMENT SUMMARY LETTER

Land to Be Developed, Preserved, or Dedicated

Acreage allocation within the PUD includes the following:

- Residential: 57.5 acres
- Commercial: 200.2 acres
- Mobility Corridors: 32.4 acres
- Drainage & Detention: 78.3 acres
- Parks & Open Space: 86.3 acres

Parks and open space, representing approximately 21.96% of the gross acreage, will be developed and dedicated in accordance with the City's parkland dedication requirements, including trail connectivity and the potential use of detention amenities.

Provision of Public and Private Services

Utilities, drainage, roadway improvements, and related infrastructure will be provided through a combination of public and private systems in coordination with the City of Manvel and Brazoria County MUD 30. A full water, wastewater, and storm drainage system will be designed and constructed in accordance with applicable City, County, and TCEQ standards. All dry utilities will be provided by private utility companies serving the region.

Maintenance responsibilities for parks, open space, trails, and landscaping will be performed by the Homeowners Association, MUD, and/or the Commercial Property Owners Association, depending on location and use.

Phasing

The development is anticipated to occur in two phases over a 5–15 year period, beginning with major roadway construction and entry features. Residential and commercial phases will be constructed based on market conditions and infrastructure availability.

Please let us know if any additional detail or clarification is needed. We appreciate the City's review and look forward to continuing to coordinate throughout the entitlement process.

Sincerely,

Katy Harris, AICP
Principal, Planning
LJA Engineering

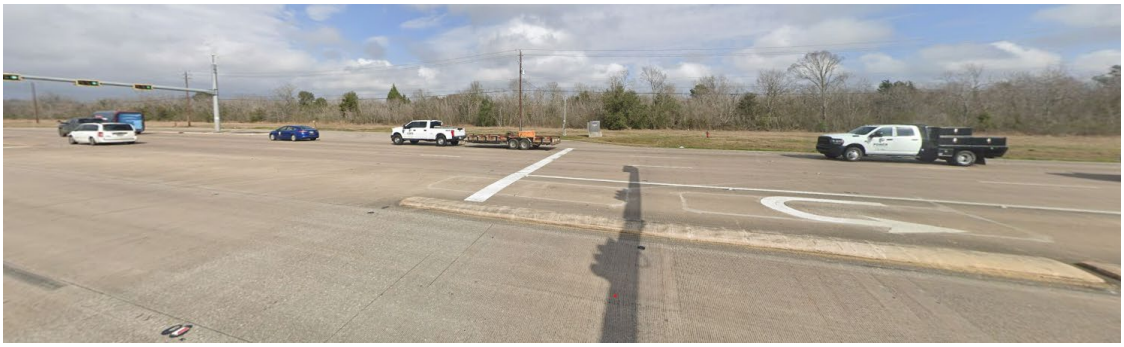
SITE PICTURES



View of the property to the south from Morris Avenue/SH6 (Sonic and Valero Gas Station)



View of the subject site from Morris Avenue/SH6 (Dairy Queen), looking north.



View of the subject site from Morris Avenue/SH6 (Trafic light), looking north.

SITE PICTURES



View of the subject site from southern Iowa Ln (after Highway 6), looking west.



View of the subject site from northern Iowa Ln, looking west.



View of the subject site from S.H 288, looking east.

SITE PICTURES



View of the subject site from southern Iowa Lane (before Highway 6), looking north



View of the subject site from north Iowa Lane (north of Highway 6 within the Del Bello development), looking south.

Presidio
Planned Unit Development

Prepared for:

Diversified Real Estate Group

Prepared by:

LJA

PLANNING &
LANDSCAPE
ARCHITECTURE

June 2026

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I. INTRODUCTION

This application was prepared on behalf of Diversified Real Estate Group pursuant to the City of Manvel's zoning ordinance Sec. 77-29 Planned Unit Development (PUD) district. The purpose of a PUD District is to provide a high level of amenities, encourage a pedestrian friendly environment, and provide flexibility in the development of land subject to the development standards coordinated with the necessary public services and facilities.

This property previously received OPUD approval in 2007; however, this is a zoning change from O-PUD to PUD based on provision Sec. 77-29 of the Manvel Code of Ordinances. The intent of this PUD is to re-establish the original development framework while updating the standards to reflect current market conditions, best practices, and the City's expectations today. Although the technical standards have been modernized, the overall vision and development intent remain consistent with what was previously approved.

The Presidio PUD is primarily a commercial project that consists of approximately 392.9 acres of land and is located immediately east of State Highway 288, north of Highway 6, generally south of Del Bello Boulevard, and generally west of Pollard Boulevard, with roughly forty-five acres south of Highway 6 reserved for detention. The project is immediately south of the Del Bello Development and west of the Valencia development. The Area Location Map (Exhibit A) located in the Exhibits section of this document illustrates the location of the property.

The property is generally flat with elevations ranging from 60 feet to 80 feet above mean sea level (MSL) and is largely comprised of prairie land and agricultural fields. The property is encumbered by several pipeline easements and an existing access easement.

Generally, the surrounding land use is a mix of underdeveloped acreage and commercial development to the south, State Highway 288 with commercial development on the other side of it to the west, and single-family residential developments to the north and east including Del Bello Lakes and Valencia. Surrounding commercial developments include an HEB, several restaurants, retail, dental and medical offices, and gas stations.

The surrounding area can be seen on the Area Location Map and the Project Aerial map (Exhibit A and B).

II. DEFINITIONS

Abandoned signage – Any sign which does not display any advertisement, copy or message or any sign which identifies or advertises a business, lessor, service, owner, product, or activity, which is no longer available at the indicated location or no longer available on the premises for which no legal owner can be found.

Anchor Tenant – A large retail establishment (up to three tenants) within a multi-tenant development that occupies the greatest amount of floor area.

Building – A structure used for or supporting any use or occupancy that requires a building permit.

Canopy Signage – Any sign attached to a freestanding canopy or onto an entrance canopy.

Collector Street – A public street designated as a "minor corridor" on the City's Major

Thoroughfare Plan.

Concrete – A composite material made of cement, water, sand, and aggregates.

Directional/Informational Signage – An attached or freestanding on-premise sign giving directions, instructions, or facility information, i.e., entrance or exit signs, one-way location of parking, etc. which may contain the name or logo of an establishment but no other advertising.

Electronic Changeable Message Sign – An electronic sign or portion of a sign that uses light emitting diode (LED) technology to form a sign message or messages in text form, with or without fixed images, wherein the sequence of messages and the rate of change is electronically programmed and can be modified by electronic processes.

Flashing Sign – A directly or indirectly illuminated sign which contains an intermittent flashing light source. This does not include electronic changeable message or time/temperature signs.

Frontage – Frontage shall mean that portion of any lot or tract that abuts a street or approved common area. A single family residential lot abutting more than one (1) street shall have frontage on only one (1) street which shall be deemed to be the side having the shortest dimension unless otherwise indicated on the subdivision plat.

Fuel Station Signage – A changeable sign advertising gasoline prices.

Gross Floor Area – Gross floor area (GFA) shall be defined as the sum in square feet of all floors of the building measured from the exterior face of the exterior walls. The gross floor area shall include all enclosed habitable space, including elevators, hallways, and stairwells on stories containing habitable space.

Illuminated Sign – A sign that has characters, letters, fixtures, designs, or outlines illuminated externally by electric lights or internally by luminous tubes or other internal illumination device.

Landscaping – Planting and related improvements for the purpose of beautifying and enhancing a portion of land and for the control of erosion and the reduction of glare, dust and noise. Rocks and/or gravel, by itself shall not constitute landscaping.

LED Signage – Any sign that uses light-emitting diodes (LEDs) as its illumination source. LED signage is energy efficient, durable, and low maintenance.

Lot – An undivided tract of land having frontage on a public or private street which is designated as a separate and distinct tract and identified by numerical identification on a duly and properly recorded subdivision plat.

Major Thoroughfare Plan – A long-range planning document that maps out the primary roadways and transportation corridors in a city or region.

Monument Sign – A low-profile, ground-mounted sign or sign supported by one or more columns, uprights, or braces anchored in the ground, but not elevated above the ground by any device that holds the sign off the ground and not attached to any building, including reader panels, often with a solid base made of masonry, stone, or concrete.

Multi-Tenant Sign – A free-standing sign that lists multiple businesses located within the same property or shopping center, often placed at entrances to plazas or office complexes.

NAICS – North American Industry Classification System (NAICS), which is a number code assigned by the NAICS Association to simplify the process of identifying what category a specific land use falls under.

Off-Premise Signage – Any sign advertising a business, person, activity, goods, products, or services not usually located on the premises where the sign is installed and maintained, or which directs persons to any location not on the premises.

Parapet – A low protective wall or barrier that extends above the edge of a roof, balcony, terrace, or bridge.

Parkway – A right-of-way with a total width of 120 feet, designed for higher traffic transportation.

Private Park – A park which is privately maintained (such as by the HOA or the MUD) instead of maintained by the City.

Pylon Sign – A tall, freestanding sign supported by one or more poles where the support structure is enclosed, widened or architecturally treated. A Pylon Sign shall not be a Pole Sign or any sign supported by only one column, pole, or brace anchored in the ground and not attached to any building.

Residential Use – A premise used for 1 or more dwellings for ordinary domestic use, and does not include any commercial, industrial, or institutional uses except as specifically permitted under the land use regulations.

Retail – Retail sales of any article, substance, or commodity within a building or structure.

Setback – The required distance a structure or improvement must be placed from another specified structure, improvement, or location.

Sexually Oriented Businesses – Establishments that provide adult entertainment or sell adult products, such as strip clubs, adult bookstores, or adult video stores.

Shade Tree – A shade tree is a tree planted or valued primarily for the shade it provides, rather than for fruit, beauty, or other purposes.

Shrub – A woody plant smaller than a tree, usually with multiple stems growing from the base.

Sign Area – The entire advertising area of a sign, excluding any framing, trim or molding and the supporting structure, with wording in either permanent or removable letter form. This definition also includes the LED portion of an electronic changeable message sign.

Sign Structure – A structure, device, or system, which supports or is capable of supporting a sign.

Single-Tenant Monument – A freestanding, ground-mounted sign advertising a single use.

Single-Tenant Sign – A sign identifying one business or tenant on a property.

Small or Ornamental Tree – A tree that is grown for its aesthetic appeal, such as attractive flowers, fall foliage, or unique bark, rather than for practical purposes like fruit or wood

Stone – Natural rock material used in construction for walls, facades, and landscaping.

Street – Any public or private thoroughfare, other than an alley, designed to be used by motor vehicles.

Structure – A building or constructed improvement permanently affixed to the ground and intended for human occupancy or use, including any improvement that provides enclosed or occupiable space.

Subdivision – The division of a lot, tract, or parcel of land into two or more lots, plats, sites or other divisions of land for the purpose of industrial, office, and business development or other uses

Temporary Signage - Any sign, banner, pennant, or other advertising display constructed of cloth, canvas, light fabric, cardboard, or other light materials, with or without frames, with or without words, intended to be displayed for a limited period of time on the property of the business.

Utility Agreement – The formal agreement between a developer and governmental entity that outlines the responsibilities, terms, and conditions for the design, construction, funding, ownership, operation, and maintenance of utility infrastructure needed to serve a development.

Wall-Mounted Sign – A sign attached or anchored directly to the exterior wall of a building.

Window/Door Signage – A temporary business sign placed on, affixed to, painted on or located within the frame of a transparent opening in the wall or door of a building.

Yard – The open space of a lot at grade that lies between the lot lines and the required building setback.

III. PROJECT DESCRIPTION

1. Compliance with Comprehensive Plan

In Manvel's 2045 Comprehensive Plan, drafted in 2026, the proposed Future Land Use and Character Plan classifies the land within the Presidio Development area as "Master-Planned Development" with a small part classified as "commercial". The Presidio PUD complies with the Manvel Comprehensive Plan by adhering to the development principles outlined in the plan. This is accomplished by encouraging well-planned quality residential and non-residential development, while providing open space for recreation and protecting the natural environment. The Development is primarily commercial and residential and will serve as a regional commercial center for the community and surrounding region. The Presidio PUD has a well-defined network of both vehicular and pedestrian circulation systems that provide connectivity.

2. Justification

The intent of the PUD District is to encourage high quality development in the City by providing additional flexibility to take advantage of special site characteristics, location, and land uses. This document establishes certain development standards that exceed the minimum Manvel zoning regulation requirements for properties specifically located within the boundaries of the Presidio PUD.

The PUD will meet or exceed the minimum requirements of Manvel's zoning regulations through

specific architectural design and engineering standards such as:

- Creating a PUD district which will respond to market conditions and maintain the flexibility necessary to address changes in the future;
- Incorporating diverse single-family products that will provide a variety of housing stock to ensure residents of all ages and lifestyles can fulfill their housing needs;
- Establishing areas for retail, office, and other commercial uses that will offer goods, services, and employment opportunities, thereby supporting the daily needs of residents and contributing to the City's economic vitality;
- Providing parks, amenitized detention areas, and a well-defined trail system;
- Providing a 5-acre civic center site for the City of Manvel to use for the community.

3. Residential

The traditional single-family residential component that will be found in the Presidio PUD will be a collection of individual neighborhoods that take access from Manvel Parkway, Charlotte Street, and/or an internal local street system that provides connections within the neighborhood and to the surrounding areas. The traditional single-family residential neighborhoods will be developed with lot widths that may range from 50 feet to 60 feet to respond to market conditions. All residential development standards can be found on page thirteen, section three.

4. Amenities, Parks, and Open Space

Parks and open space account for approximately 21.96% of the gross acreage within the Presidio PUD. The open space calculation includes parks, landscape reserves, trails, natural open space areas, a Manvel Civic Center, lakes/detention areas, and drainage facilities. The Presidio PUD Conceptual Amenities and Open Space Plan (Exhibit H) show lake/detention areas and open space areas all connected via a pedestrian trail system. The various parks and trails will be developed as the adjacent residential sections are developed.

A pedestrian sidewalk system is intended to connect the open spaces and residential tracts to the commercial district. The pedestrian sidewalk system will be comprised of a hierarchy of sidewalk widths ranging from 12 feet in width to 6 feet in width; all sidewalks located in front of homes will be 5 feet in width. This pedestrian pathway is a single "serpentine" pathway along the collector street system where necessary but may follow traditional back of curb style sidewalk. Sidewalks will be on both sides of Manvel Parkway, Iowa Lane, Charlotte Street up to Street Y and Street X up to Street Y. Except as expressly stated in the PUD, compliance with the City of Manvel's sidewalk requirements will be maintained throughout the overall pedestrian network.

The lakes within the Presidio PUD will maintain a constant water level while also serving as detention facilities for the project and provide a significant amount of open space. The lake/detention areas will not only enhance the aesthetic quality of the development but will provide numerous opportunities for the enjoyment of the residents. Detention facilities will be comprised of both wet and dry facilities.

City of Manvel requires one acre of land to be dedicated for parks and open space for every 100 proposed dwelling units. Compliance with the Parks and Open Space Requirements for land dedication will be achieved by the provision of a minimum of 2.4 acres of common open space, ultimately dependent on the total number of housing units, including the possibility of amenities within detention ponds. The Homeowners Association (HOA), MUD, and/or Commercial

Property Owners Association (CPOA) shall be responsible for the maintenance of all landscape and open space areas utilized by the development.

5. Other Land Uses

The Presidio PUD has fifteen proposed commercial sites located throughout the development. The commercial sites will take access from Manvel Parkway, Charlotte Street, Iowa Lane, Highway 6, and State Highway 288. It is anticipated that the commercial developments will largely be commercial or medical facilities, typically found near Highway interchanges.

IV. Land Use Classification

1. Proposed Land Use Classification

a. To implement the conceptual master plan as currently proposed, each of the proposed land uses has been assigned a zoning district consistent with the current City of Manvel zoning regulations as shown on the Composition of Land Use Table below. The various land uses will follow the development requirements for their assigned zoning district as described in the Zoning Ordinance, in effect when this PUD is approved, unless otherwise noted in this PUD. Notwithstanding the foregoing, no amendment shall impact the project's vested rights. When there is a conflict between the requirements in the regulations listed below and this PUD Document, this PUD Document will govern. Applicable International Code Council Codes adopted by the City of Manvel shall apply as amended from time to time.

Land use shall be regulated on a total acreage basis. Each Land Use may be increased or decreased by up to 10% of the land use acreage in Section IV.2. The percentage land use area change is required to ensure the success of the Presidio PUD by maintaining the flexibility to modify land use sizes in response to changes in economic and market conditions. This will allow Presidio PUD to remain competitive in the real estate market over the life of the project and the ability to adjust as necessary to accommodate specific end users in a timely manner.

The land uses may be relocated within the boundaries of the PUD, as necessary to address economic and market conditions or future modification of roadway and drainage alignments. The Land Use Comparison table below provides a detailed tabulation of each land use within the development as shown on the Conceptual Land Use Exhibit, Exhibit E. All acreages shown below are subject to change as development occurs within the boundaries of the PUD and as allowed by this document.

Following approval of the Presidio PUD, land uses may be adjusted or relocated within the boundaries of the PUD in accordance with the allowable percentage modifications established herein without requiring a formal PUD amendment. Compliance with the permitted land use acreage adjustments shall be demonstrated at the time of preliminary plat submittal through an updated Master Plan and accompanying land use acreage table identifying the acreage established by the PUD, the proposed revised acreage, and the percentage increase or decrease associated with each land use category. The purpose of this process is to document compliance with the allowable land use flexibility provisions of the PUD while allowing the development to respond to changing market conditions, roadway alignments, drainage requirements, and end-user needs over the life of the project.

Notwithstanding the provisions above, Tract H, which is currently identified for medical use, may be developed for general commercial uses without being subject to the 10% land use acreage adjustment limitation. This allowance is intended to provide flexibility to respond to market conditions and end-user demand. Any such change shall be consistent with the overall intent of the PUD and shall not require a formal amendment to the PUD, provided all other applicable development standards are met.

2. Acreage per Land Use Summary

Land Use	Land Use Designation	Approximate Acreage	% Gross Acreage
Constraints			
Major Thoroughfare & Collector Roadways	PUD-SFR	32.4	
Drainage & Detention	PUD-SFR	78.3	
Lift Station/Water Plant/Utility Easement	PUD-SFR	16.5	
Subtotal		**127.2**	**32.4%**
Community Elements			
Parks	PUD-SFR	2.4	
Landscape/Open Space	PUD-SFR	0.6	
Manvel Civic Site	PUD-LC	5.0	
Subtotal		**8.0**	**2.0%**
Non Residential			
Commercial	PUD-LC	149.9	
Medical	PUD-LC	50.3	
Subtotal		**200.2**	**51.0%**
Residential			
Traditional Single-Family Residential	PUD-SFR	57.5	
Subtotal		**57.5**	**14.6%**
Totals		**392.9**	**100%**

A. Single-Family Residential Lot Distribution Table

Lot Size	Allowable Percentage of Total Lots	Approximate Acreage	Estimated Lot Count
50' X 120' (Typical)	50%	28.8	134
60' X 120' (Typical)	50%	28.7	108
Gross Residential Total	**100%**	**57.5**	**242**

Please refer to the Conceptual Land Use Exhibit, Exhibit E, for the general location of residential areas. Specific lot types are not assigned to individual locations or pods and may be distributed throughout the residential areas of the PUD as needed to respond to market conditions, provided the overall percentage limitations established herein are maintained. Refer to Section IV.VI.3 of this document for a listing of lot sizes and applicable standards for the various single-family residential products. The percentage of 60-

foot lots may be increased by up to 10% as provided in this document.

3. Permitted, Special Use Permit, and Prohibited Land Uses

The proposed fourteen (14) commercial tracts are intended to provide neighborhood-scaled commercial development with retail, service, and office uses. In addition to the commercial tracts, one (1) medical tract and three (3) single-family tracts are proposed. Below is a list of allowed uses within these tracts. Anything not specifically listed here is prohibited.

a. Permitted Uses:

Permitted	
NAICS Code	**Classification**
	Single Family
311811	Retail Bakeries
4491	Furniture And Home Furnishing Stores
44921	Electronics And Appliance Stores
444	Building Material, Garden Equipment And Supplies Dealers
445	Food And Beverage Stores
4561	Health And Personal Care Stores
4571	1 Gasoline Station in association with a Grocer
458110	Clothing And Clothing Accessories Stores
459	Sporting Goods, Hobby, Book, And Music Stores
455	General Merchandise Stores
4599	Misc. Store Retailers
491110	Postal Service
52	Finance And Insurance
531	Real Estate
531120	Lessors Of Nonresidential Buildings (Except Mini Warehouses)
5322	Consumer Goods Rental
541	Professional, Scientific, And Technical Services
54121	Accounting, Tax Preparation, Bookkeeping And Payroll
54194	Veterinary Services
55	Management Of Companies And Enterprises
561	Administrative And Support Services
611710	Educational Support Services
624	Social Assistance
624410	Child Care Services
71	Arts, Entertainment, And Recreation
713940	Fitness And Recreational Sports Centers
722	Food Services
8112	Electronic And Precision Equipment Repair And Maintenance
811122	Automotive Glass Replacement Shop
812	Personal And Laundry Services
238	Specialty Trade Contractors
3231	Printing And Related Support
42	Wholesale
622110	Medical / Hospital Uses (Tract H Only)
445131	Convenience Retailers
811111	Automotive Repairs And Replacement Shops
92	Public Adminstration

b. Office functions only:

Office Functions Only	
NAICS Code	**Classification**
31-33	Any Manufacturing Or Industrial Related Uses
115	Support Activities For Agriculture And Forestry
236	Construction Of Buildings
48-49	Transportation And Warehousing
5324	Commercial And Industrial Machinery And Equipment Rental

c. Special Use Permit required:

Special Use Permit Required	
NAICS Code	**Classification**
7224	Drinking Places (Alcoholic Beverages)
3121	Beverage Manufacturing
51	Information
53	Automotive And Equipment Rental
713	Amusement, Gambling, Recreation Industries
532284	Recreational Goods Rental
811192	Colleges, Universities, Professional, And Business Schools
623	Nursing And Residential Care Facilities
6239	Other Residential Care Facilities
622110	Medical / Hospital Uses (All Other Tracts Besides Tract H)
621493	Ambulatory Health Care Services
3363	Motor And Vehicle Parts Manufacturing
4571	Gasoline Stations (except for 1 in association with a grocer)
721191	Bed And Breakfast Inns
7139	All Other Amusement And Recreational Industries
722330	Mobile Food Services
8114	Personal And Household Goods Repair And Maintenance
812199	Other Personal Care Services
813110	Religious Organizations
813410	Civic And Social Organizations
454	Non-Store Retailers
61151	Technical And Trade Schools
6116	Other Schools And Instruction
721	Accommodations
6116	Adult Entertainment Business
713290	Other Gambling Industries
22	Utilities
23713	Power And Communication Line And Related Structures Construction

d. Prohibited:

Prohibited	
NAICS Code	**Classification**
493190	Other Warehousing And Storage
238990	All Other Specialty Trade Contractors
812220	Cemeteries And Crematories
512132	Drive-In Motion Picture Theaters
424910	Farm Supplies Merchant Wholesalers
812910	Pet Care (Except Veterinary) Services
531130	Lessors Of Mini Warehouses And Self-Storage Units
522299	International, Secondary Market, And All Other Nondepository Credit
	Sexually Oriented Businesses
459510	Flea Markets, Used Merchandise, Permanent
811192	Car Washes
812199	Tattoo Parlors
115210-17	Support Activities For Animal Production
811121	Automotive Upholstery Shops
459991	Vape Shops
455219	All Other Dollar Store Retailers

e. Separation Requirements

a. **Automotive Uses** – Only one (1) nationally or regionally recognized automotive-oriented use shall be permitted for each of the following categories:

- **811111 General Automotive Repair:**
  Includes, but is not limited to: Take 5, Valvoline, Firestone, Jiffy Lube, or other similar nationally recognized vehicle maintenance or repair concepts.

- **441340 Automotive Tire Dealers:**
  Includes, but is not limited to: Discount Tire, Mavis, NTB, or other similar nationally recognized tire retail concepts primarily engaged in the sale of tires and related accessories.

- **441330 Automotive Parts and Accessories Retailers:**
  Includes, but is not limited to: Advance Auto Parts, AutoZone, O'Reilly Auto Parts, NAPA Auto Parts, or other similar nationally recognized retail concepts primarily engaged in the sale of automotive parts and accessories.

  All approved automotive-related uses shall be restricted to locations within the westernmost eight hundred (800) feet of Highway 6 frontage.

b. **Restaurant and Retail Uses** – Specific restaurant and retail concepts/franchises shall not locate or operate a site within The Presidio development if they own, lease, or control another site within a two-mile radius of the Project.

c. **Drinking Places (Alcoholic Beverages)** – Following TABC regulations, all drinking places shall not be located within 300 feet of religious institutions, day care centers designated as Alcohol-Free Zones, public hospitals, or schools.

d. **Hotel Use** – Nationally or regionally recognized hotel flags shall be permitted within the PUD, and such hotel use shall be restricted to the Manvel Parkway Frontage. Hotel uses may include, but are not limited to, the following nationally or regionally recognized brands or similar concepts:

- **Full-Service and Select-Service Hotels:**
  Marriott, Hilton, Hyatt, Sheraton, Westin, Embassy Suites, DoubleTree, Renaissance, or other comparable full-service or select-service hotel brands.

- **Limited-Service Hotels:**
  Hampton Inn, Holiday Inn Express, Fairfield Inn & Suites, Courtyard by Marriott, Hilton Garden Inn, Best Western Plus, La Quinta, Comfort Suites, or other comparable limited-service hotel brands.

  All approved hotel uses shall be subject to City Ordinances regarding Hotel Licensing, Operations, and Hotel human trafficking training and other provisions found in Section 77-50.(g)1.a. of the City of Manvel Code of Ordinances.

e. **Freestanding Ambulatory Surgical and Emergency Centers** – Freestanding Ambulatory Surgical and Emergency Centers as defined by NAICS No. 621493, Permitted Uses, shall include the following conditions:

i. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;

ii. All waiting and/or lobby areas shall maintain an unobstructed view from the outside; and

iii. All doors shall remain unlocked and accessible during normal business hours.

iv. Only one (1) major hospital and only one (1) freestanding ambulatory surgical and emergency center shall be permitted within the PUD.

f. **Other Personal Care Services** – Other Personal Care Services as defined by NAICS No. 812199 shall be subject to the conditions of Section 77.50.(g)(10) of the City of Manvel Code of Ordinances.

V. PARKS

To meet the parks dedication requirement, there shall be a minimum of one acre of parkland dedicated for every 100 proposed single-family residential lots. Based upon the estimated number of 242 single-family residential lots, the Presidio PUD will be required to provide approximately ±2.4 acres of parkland. In the event that the number of single-family residential lots exceeds the acreage listed above, the requirement of a minimum of one acre of parkland dedicated for every 100 proposed single-family residential lots shall apply.

Parkland Dedication will be credited based on the following criteria:

a. Parks maintained by the HOA, CPOA, or MUD: Up to 100% of the required parkland dedication acreage may be comprised of private parkland.

b. Trails: No more than 50% of the required parkland dedication acreage may be comprised of trails. To qualify for credit as trails, the following requirements must be met:

   i. All-weather hike/bike paths, landscaping and sodding installed according to the construction standards of the city for trails;

   ii. Have connections to surrounding private parks, public parks, open space, recreation areas, school and/or other trails/sidewalks;

   iii. Reserves dedicated as parkland acreage for trails shall have an average minimum width of 25 feet.

The acreages and locations of the various parks shown on the above table may be adjusted and/or moved within the boundaries of the PUD as allowed by this document. A well-defined trail system will be constructed throughout the development as depicted on the Conceptual Amenities and Open Space Plan (Exhibit H). The Homeowners Association (HOA), MUD, and/or Commercial Property Owners Association (CPOA) shall be responsible for the maintenance of all landscape and open space areas utilized by the development.

VI. DEVELOPMENT REGULATIONS

Unless otherwise outlined in this document, all City of Manvel regulations, as amended from time to time, shall apply to this PUD. If any provision of a future amended zoning or subdivision regulation imposes a higher standard than that provided for in this PUD document, then the provisions of this PUD document shall control. If any provision of any city regulation not contained in this PUD document imposes a higher standard, that regulation shall control. Notwithstanding the foregoing, no amendment shall impact the project's vested rights. When there is a conflict between the requirements in the development regulations listed below and this PUD Document, this PUD document will govern.

1. Architectural Standards

Architectural standards and guidelines for single-family residential and commercial uses will be prepared separately from this document for the development. The criteria will be submitted to the City for review and approval to ensure compliance with the zoning ordinance at the time of final plat approval for the residential commercial developments. Copies of deed restrictions and covenants shall be submitted as part of the final plat submittal and will be provided to the City for review at least 30 days prior to filing.

The State Highway 6 (SH-6) Overlay District extends along both sides of State Highway 6 at a depth of 700 feet from the right-of-way. For parts of the Presidio Development located within the Overlay District, development will comply to the requirements specified in Sec. 77-36. – State Highway 6 overlay (SH-6) district of the City of Manvel Code of Ordinances.

2. Street and Circulation System

The street and circulation system for the Presidio development will comply with the City of Manvel Major Throughfare Plan, in addition to the standards below:

a. The Presidio PUD will have sufficient mobility through the construction of several proposed roadways:

- Iowa Lane, a 80-foot local road ROW running north-south through the property;
- Manvel Parkway, a 120-foot thoroughfare ROW running north-south.
- Street X, an 80-foot R.O.W. collector road that runs east-west providing access from state Highway 288 to Manvel Parkway.
- Street Y, a 60-foot local road ROW that runs east/west and north/south providing access to the commercial tracts.
- Street Z, a 60-foot local road ROW that runs north/south to provide additional access from Highway 6 to the commercial development.
- Charlotte Street, an 80-foot-wide collector road ROW that runs east–west through the property and connects to State Highway 288. Charlotte will maintain an 80-foot width west of Manvel Parkway and transition to a 60-foot width east of Manvel Parkway to align with the existing section within the Valencia development.
- Dogwood Avenue, an 80-foot-wide collector road ROW that runs east-west in the northeast corner of the development and ends at Manvel Parkway.

b. Setback Requirements

- Major Thoroughfare — 25’ feet from edge of ROW (inclusive of landscaping)
- Collector — 15’ from edge of ROW (inclusive of landscaping)
- Local road — 10’ from edge of ROW (inclusive of landscaping)

c. The thoroughfare and circulation plan for Presidio PUD and the surrounding vicinity is illustrated on the Conceptual Roadway Exhibit (Exhibit G). Refer to the Utility agreement and any amended agreements thereafter for applicable regulations and details regarding paving width, sidewalk width, and phasing of these roadways.

i. In the event that there is a conflict between the Presidio PUD and the Utility Agreement and any amended agreements thereafter, the Utility Agreement shall control. The development will provide points of access as required by Streets, Section 62-104(5). Multiple access points with the following modifications:

1. Two points of access. There shall be a minimum two points of access from a collector street into a subdivision or subdivision phase, up to a maximum of 75 platted lots.

2. Three points of access. There shall be a minimum of three points of access from a collector street in a subdivision or subdivision phase for 76 to 175 platted lots.

3. Four points of access. There shall be a minimum of four points of access from a collector street in a subdivision or subdivision phase for 176 platted lots or greater.

4. Boulevard entries. A boulevard entry may only be considered as two points of access when a third or fourth point of access is triggered under subsections 5.b. and 5.c. above.

3. Traditional Single-Family

Lot Sizes and Standards:

a. 50’ lots:
   ii. Minimum lot size area – 6,000 square feet
   iii. Minimum width – 50 feet (measured at the front yard setback)
   iv. Front yard setback – 20 feet along cul-de-sacs/knuckles; 25 feet otherwise
   v. Side yard setback – 5 feet minimum
   vi. Corner side yard setback – 10 feet minimum
   vii. Garage Front yard setback – 25 feet minimum
   viii. Rear yard setback – 15 feet minimum
   ix. Building height – 40 feet maximum
   x. Accessory building front setback – 20 feet minimum
   xi. Accessory building corner setback – 10 feet minimum
   xii. Accessory building rear setback – equivalent to utility easement width or 5 feet (greater of the two)

b. 60’ lots:
   i. Minimum lot size area – 6,300 square feet
   ii. Minimum width – 60 feet (measured at the front building line)
   iii. Front yard setback – 20 feet along cul-de-sacs/knuckles; 25 feet otherwise
   iv. Side yard setback – 5 feet minimum
   v. Corner side yard setback – 10 feet minimum
   vi. Garage Front yard setback – 25 feet minimum
   vii. Rear yard setback – 15 feet minimum
   viii. Building height – 40 feet maximum
   ix. Accessory building front setback – 20 feet minimum
   x. Accessory building corner setback – 10 feet minimum
   xi. Accessory building rear setback – equivalent to utility easement width or 5 feet (greater of the two)

If the rear property line of a corner parcel abuts the side property line of a neighboring parcel, the street side setback of the corner parcel must be a minimum of 15 feet

A minimum ten (10) foot wide landscaping buffer will be provided between commercial and traditional single-family residential zoning districts. Landscaping and screening requirements can be found on page eighteen, Section 5.

4. Commercial

Lot Sizes and Standards:

a. Minimum lot width – 60 feet (measured at the front yard setback)
b. Minimum lot depth – 100 feet
c. Front yard setback– 10 feet minimum
d. Rear yard setback – 10 feet minimum (Zero feet adjacent to commercial/retail)
e. Corner side yard setback – 10 feet minimum
f. Building height:
   i. Pad Site – No building may exceed thirty-five (35) feet in height.
   ii. Commercial Anchor Tenant – No building may exceed sixty (60) feet in height.

A minimum ten (10) foot wide landscaping buffer will be provided between commercial and

traditional single-family residential zoning districts. Landscaping and screening requirements can be found in the following section (section 5).

5. Landscaping, Buffering, and Screening

Landscaping and fencing for the commercial area of the Presidio development will adhere to Sec. 77-44. - Tree preservation, landscaping, fencing, and screening of the City of Manvel Code of Ordinances, in addition to the standards below:

a. Minimum 10% of site (excluding building footprint) must be landscaped. Minimum 5% of the site must be distributed as street, building, and parking lot landscaping. Specific tree and shrub spacing and screening requirements apply.

b. Presidio shall design, construct, and install a detention and drainage system that incorporates landscaping and pedestrian trails with continuous connectivity to internal sidewalks and surrounding developments. These enhancements shall be integrated into the detention areas to improve connectivity, promote aesthetic quality, and create a welcoming and enjoyable environment for the community. The berms and areas with aesthetic improvements in these areas shall count toward the 10% landscaping requirement.

c. Landscaping and/or decorative fences shall screen outside storage areas, loading docks, garbage collection bins and delivery entrances from adjacent property and public street right of way.

d. A minimum ten (10) foot wide landscaping buffer will be provided between non-residential uses and traditional single-family residential zoning districts. This buffer shall include a continuous screening element, such as an opaque fence or wall, with a minimum height of six (6) feet. Supplemental landscaping, including trees, and shrubs, shall be provided within the buffer to enhance visual screening and compatibility between uses. The buffer yard shall include one (1) tree per 30 linear feet. Loading docks, service areas, and outdoor storage areas sharing a property line with residential uses shall be oriented away from residential properties where feasible and shall be screened from view.

e. The traditional single-family residential zoning districts shall provide a ten (10) foot wide landscape buffer yard when abutting undeveloped properties zoned for non-residential uses. The buffer yard shall be maintained by the homeowner's association and shall include one (1) tree per thirty (30) linear feet. A screening fence in accordance with Sec. 77-43 of the City of Manvel Code of Ordinances is required when a fence is not already present on the abutting property zoned for non-residential uses.

f. No landscaping shall be required within twenty (20) feet of a commercial structure's entrance.

g. General Tree Standards

    i. Trees may be planted within right-of-way medians to enhance the overall landscape plan for the development. Trees shall be planted at a minimum spacing of 30 feet and located within the center of the right-of-way median. They may be located within other areas of the right-of-way in a limited manner to address physical or other constraints that exist in various areas throughout the development. Trees shall not be planted closer than 5 feet from any pavement or utility line.

ii. Trees planted within medians shall be maintained in a safe and orderly manner so as not to obstruct vehicular sight distance, traffic control devices, street lighting, pedestrian circulation, or routine roadway maintenance operations. At a minimum, lower branches shall be pruned as necessary to maintain a clear height of fourteen (14) feet above the adjacent street surface and eight (8) feet above any adjacent sidewalk, trail, or pedestrian path, as applicable. In addition, dead, broken, diseased, or otherwise hazardous limbs shall be removed promptly, and all pruning shall be performed in accordance with recognized arboricultural standards to preserve the natural form and long-term health of the tree.

iii. Root barriers shall be required adjacent to paving or utilities whenever a tree is planted closer than ten (10) feet to any utility or paved surface, including but not limited to aggregate paths, concrete sidewalks, curbs, driveways, trails, and similar paving improvements. The required root barrier shall extend continuously for a length equal to the maximum mature drip line of the tree species being planted, as measured parallel to the adjacent paving, unless a modified installation is approved by the City due to site constraints, utilities, or other physical conditions. Root barriers shall consist of a rigid HDPE or polypropylene root barrier system, or approved equal, with integral vertical root-deflecting ribs, and shall be installed to a minimum depth of twenty-four (24) inches. Where the adjacent pavement section and base course exceed 24 inches in total depth, the root barrier shall extend to a depth at least equal to the full pavement profile.

h. Street Trees

i. A minimum of one (1) street tree is required for every thirty (30) feet of street frontage.
ii. No street tree shall be less than two and a half (2.5) inch caliper

i. Parking lot landscaping

ii. In addition to the Street Trees noted above, a tree of minimum one and a half (1.5) inch caliper shall be provided within or adjacent to the parking area at tree islands that:

1. Are at least nine (9) feet wide (back of curb to back of curb).

2. Each have a square footage of minimum one-hundred eighty (180).

3. Are located so that no parking space is further than one hundred feet (100) feet from a tree island.

iii. Shrub planting shall be placed along the perimeter of a parking lot in order to screen the parking lot. The shrubs shall be maintained at a maximum height of thirty-six (36) inches.

iv. At entrance and exits, shrubs shall be no higher than twelve (12) inches in height.

j. Trees Along Highway 6

i. Trees along Highway 6 will be staggered, with small and ornamental trees closest to Highway 6, and shade trees set back per distances listed below for a more natural look, as well as a precaution from unnecessary trimming near the power

line.

1. Small and Ornamental Trees: May be planted up to ten (10) feet from any power lines and may constitute up to 60% of the trees planted on site.

    a. Of small or ornamental trees, crape myrtles may constitute up to 30% of the trees planted.

2. Shade trees: May be planted up to twenty (20) feet from the powerline.

    a. Evergreen trees shall constitute a minimum of 40% of trees planted.

6. Signage

All Signage within the development shall comply with the City of Manvel Ordinance except for the items below. When there is a conflict between the requirements in the sign ordinance and this PUD Document, this PUD document will govern.

The following regulations shall apply:

a. General Signage Requirements

i. All signage must be composed of materials and colors compatible with the associated use and the overall development. LED front, side, or backlit signage is recommended within the development for all business types.

ii. All signage shall be located at a minimum of ten (10') feet from the property line, except for along Highway 288 and Highway 6. No setbacks shall be required along those property lines.

iii. All signage must be perpendicular to the right of way.

iv. A commercial tract with a multi-tenant monument sign is also allowed one (1) single tenant monument sign per tenant, not to be located within seventy-five feet (75') of any other single tenant monument sign or thirty feet (30') of any multi-tenant monument sign.

v. Off-premise signage, when located within the Presidio Development, is permitted for uses located within Tracts A, F, G, and H, I, L, M, N, and Q.

vi. Directional/informational signs within the Presidio project indicating the location of a business, street or facility within the project are permitted up to six (6) signs, six (6) feet in height and eighteen (18) square feet in area per side.

vii. Temporary Signage: Temporary signage shall be subject to the regulations listed in Section 53-10 of the City of Manvel Code of Ordinances in effect January 16, 2024, as amended.

viii. Prohibited Signage: Unless specifically permitted in the above regulations, all signage listed in 53-11 of the City of Manvel Code of Ordinances in effect January 16, 2024, is prohibited.

b. Window and Door Signage – Window and Door signage is defined as a temporary business sign placed on, affixed to, painted on or located within the frame of a transparent opening in the wall or door of a building.

i. *Size.* Window and Door Signs shall not exceed 25% of the total window and door area of the building elevation identified for placement of the sign.

ii. *Location.* Window and Door Signs are limited to the ground floor of a building. Window and Door Signs must be affixed to the interior face of the window surface. Signs affixed to the exterior face of a window or door are Wall Signs.

iii. *Materials.* Window and Door Signs include any material painted, etched, or affixed to the interior side of a window or door. Window and Door Signs include Electronic and Illuminated Signs hanging within the interior space and viewable from the public Street through the window or door.

iv. *Permits.* A Sign permit is not required for the placement or use of Window and Door Signs.

v. Within 60 days of the date a Window and/or Door Sign becomes an Abandoned Sign, the sign must be removed.

ii. Multi-Tenant Highway Pylon Signs - A multi-tenant highway pylon sign is defined as a freestanding sign supported by one or more poles where the structural poles or pylons are concealed using architectural design features.

i. State Highway 288 Frontage

1. *Maximum Height*. Fifty feet (50').

2. *Maximum Width.* Twenty-five feet (25').

3. *Minimum Clearance.* The bottom of the sign structure shall be no less than ten feet (10') above finished grade.

4. *Location*. Signs shall be located at primary entrances to the development along State Highway 288.

5. *Number of Signs*. One (1) sign permitted at each primary entrance from State Highway 288.

ii. State Highway 6 Frontage

1. *Maximum Height*. Forty feet (40').

2. *Maximum Width*. Twenty-five feet (25').

3. *Minimum Clearance.* The bottom of the sign structure shall be no less than ten feet (10') above finished grade.

4. *Location.* Signs shall be located at major entrances to the development

along State Highway 6.

5. *Number of Signs.* Up to three (3) signs may be permitted along State Highway 6 frontage where access points warrant.

iii. Tract H Highway 288 Frontage

1. *Maximum Height.* Fifty feet (50').

2. *Maximum Width.* Twenty-five feet (25').

3. *Minimum Clearance.* The bottom of the sign structure shall be no less than ten feet (10') above finished grade.

4. *Number of Signs.* One (1) sign permitted at each primary entrance to the development.

c. Multi-tenant Monument Signs – A multi-tenant monument sign is defined as a low-profile, free-standing sign that is not elevated above the ground and lists multiple businesses located within the same property or shopping center, often placed at entrances to plazas or office complexes.

i. *Maximum Height*. Twelve feet (12').

ii. *Maximum Width*. Thirteen feet (13').

iii. *Maximum Sign Area (exclusive of development name)*. Ninety (90) square feet.

iv. *Location*. Signs shall be located adjacent to the public street right-of-way.

v. *Setbacks*. Minimum ten feet (10') from property line.

vi. *Spacing.* Minimum one hundred feet (100') between monument signs.

vii. *Number of Signs*. One (1) monument sign per commercial tract, unless on a corner tract. Corner tracts may have one sign per street frontage.

d. Single-Tenant Monument Signs – A single-tenant monument sign is defined as a freestanding, ground mounted sign advertising a single use.

i. Maximum Height. Eight feet (8').

ii. Maximum Width. Eleven feet (11').

iii. Maximum Sign Area: Fifty (50) square feet.

iv. Location. Signs shall be located adjacent to the public street right-of-way.

v. Setbacks. Minimum ten feet (10') from property line.

vi. Spacing. Minimum seventy-five feet (75') between signs.

vii. Number of Signs. One (1) monument sign per commercial tract

e. Fuel Station Signs

i. Electronic fuel price signs are permitted.

ii. Face of electronic fuel price signs shall not exceed one hundred (100) square feet.

iii. Display information shall be limited to fuel price and grade information.

iv. Electronic displays shall remain static and shall not flash or rapidly change.

v. Canopy Signage

1. Signage may be placed on all sides of the canopy.

2. Sign area shall not exceed fifty percent (50%) of the canopy face

3. Letter Heights:

a. Twenty-four inches (24”) maximum for one line of text.

b. Eighteen inches (18”) maximum for two lines of text.

f. Wall Signs (Building Mounted) – A wall sign is defined as a sign anchored to a wall elevation of a business.

i. Buildings thirty Feet (30’) or Less in Height (Per Elevation)

1. Maximum Letter Height:

a. Thirty-six inches (36”) for one line of text.

b. Eighteen inches (18”) for two lines of text.

2. Maximum Sign Height:

a. Thirty-six inches (36”) for one line.

b. Forty-two inches (42”) for two lines.

3. Maximum Sign Face: Eighty percent (80%) of storefront width.

4. Wall Signs shall not exceed fifteen percent (15%) of the building elevation with a maximum sign area of two hundred (200) square feet.

ii. Buildings Greater Than 30 Feet in Height (Per Elevation)

1. Letter height may increase twelve inches (12”) for every six feet (6’) of building height above thirty feet.

2. Maximum Sign Height: Seventy-two inches (72”).

3. Sign face shall not exceed eighty percent (80%) of storefront width.

4. Wall signs shall not exceed twenty-five percent (25%) of the building elevation with a maximum sign area of four hundred (400) square feet.

iii. Anchor Tenant Signage

1. Anchor Tenants Greater Than 80,000 Square Feet

a. Wall Signage may have letter heights up to one hundred twenty inches (120”).

2. Anchor Tenants Greater Than 120,000 Square Feet

a. Wall signage may have an overall height up to one hundred thirty inches (130”).

b. Wall-mounted logos or branding elements may be permitted up to one hundred ninety-eight inches (198”) in height.

g. Illumination

vi. Electronic reader boards/led screens are not permitted along public ROW except when used at fuel stations. When used in other areas of The Development, then:

3. No internal or external illumination of LED screens permitted between 10 PM and 6 AM.

4. Max illumination will be the difference between ambient light and full wattage cannot be more than .2 foot-candles at 75 ft.

5. Max wattage will be 6500.

6. Electrical components such as ballasts, transformers, and conduits shall be fully concealed.

a. Residential Entry Signage

iv. Primary Entry Monument: The overall primary entry monument shall consist of a primary monument sign, an attached sign blade wall, and an optional attached covered structure. The primary monument sign shall not exceed a sign area of 200 square feet. The sign blade wall shall attach the primary monument sign and the attached covered structure. The attached covered structure shall be open on three sides and shall contain roof signage that shall not exceed 200 square feet. The combined sign area of the primary monument sign and structure roof sign shall not exceed 400 square feet. The overall building envelope including the primary monument sign, attached sign structure, and attached covered structure shall be no greater than twenty feet (20’) in height, sixty feet (60’) in length, and twenty feet (20’) in depth. These signs will be placed at the major entry point to the project.

v. Secondary Entry Monument: The secondary entry monument building envelope shall be no greater than twenty-five feet (25’) in height, forty feet (40’) in length, and fifteen feet (15’) in depth. A water cistern twenty-five feet

(25') in height by fifteen (15') in length shall contain signage on two walls of the water cistern. An ornamental/decorative fence may be provided as part of the overall design of the secondary entry monument and shall not be measured as part of the building envelope. The combined sign area of the tower and secondary monument sign shall not exceed 400 square feet. These signs will be placed at the secondary entry points to the project.

vi. Village/Park Entry Monument: Six feet (6') tall with a six-foot by six-foot (6'x6') tower footprint and an attached or isolated sign blade wall with a maximum size of six feet tall by twenty feet in length (6'x20'). The sign area shall not be greater than 64 square feet. These signs will be placed at the entry points to residential subdivisions within the project.

vii. Model Home Monument: Used to identify different builder model homes to potential home buyers. The monuments shall be a maximum of 60 square feet in size and shall not exceed five feet (5') in height. These monuments may be installed at model homes at various locations within the development. All model home monuments must be removed when the model home is purchased and used as a private home.

viii. Temporary Construction Signs/For Sale Signs: To be used during construction of the development. These signs recognize builders, architects, engineers, leasing representatives, lenders, and other associated with the project. There shall be one sign per parcel of land and the sign shall have a maximum of 64 square feet in size and not to exceed eight feet (8') in height and eight feet (8') in width per parcel of land. All temporary signs must be removed when the principle building on the applicable building site is occupied.

7. Trails

The pedestrian pathway system, which is illustrated on the Conceptual Amenities and Open Space Plan (Exhibit H), will use a combination of 12 foot wide and 6 foot wide primary trails, and additional trails of not less than five feet in width to serve the residents of the project and provide multiple pedestrian connections. The trails system will provide easy and safe pedestrian access to public parks, private parks, open space, commercial tracts, and single-family residential areas located within the project.

8. Utilities

The Presidio PUD will be wholly included within the boundaries of Brazoria County Municipal Utility District 30.

a. Proposed Improvements

i. A complete utility system is planned to include a water distribution system, a wastewater collection system, and a storm drainage system including proposed detention and outfall channel improvements. Design and construction of these facilities will be in conformance with criteria published by the City of Manvel and the Texas Commission of Environmental Quality (TCEQ).

ii. The District is planned to serve a total of approximately 392.9 acres. The construction of the water distribution system, wastewater collection, and storm drainage for the District will be achieved by phasing construction of the improvement to coincide with the overall rate of development. The District will construct its internal water distribution system, wastewater collection system, and storm drainage. All utilities will be designed in accordance with the criteria established by the City of Manvel, Brazoria County, Brazoria Drainage District No. 4, TCEQ and the Texas Department of Health.

b. Existing Utilities and Easements

i. There is a 22' H.L.&P. easement and a 250' H.L.&P. easement running northwest to southeast through the south region of the District between State Highway 6 and the Topeka and Santa Fe Railroad. The Brazos River Authority Canal property runs north to south along the eastern boundary of the District.

c. Water Supply and Distribution System

i. This section describes the water supply and distribution system necessary to serve the District at full development. At full development, the District will 1,900 equivalent single-family connections (ESFC).

ii.

i. Design Criteria:

1. All water distribution facilities will be designed to meet or exceed the City of Manvel and 30 TAC 290.45 (b) (1) (D) requirements.

ii. Proposed Water Supply and Distribution Facilities:

1. The water distribution facilities required by the design criteria listed above and as described in 30 TAC 290.45(b) (1) (D) will be constructed in phases to coincide with the rate of development. The water distribution system for the District will be looped where feasible to provide alternate service routes during emergencies and maintenance periods, and to equalize pressure in the system.

2. The District intends to connect to the City facilities along SH 6 and Iowa Lane. A new water treatment plant site is to be provided in Tract O along Iowa Lane.

d. Wastewater Collection System

i. General:

i. The wastewater generated by the development within the District will flow by gravity through internal sanitary sewer lines. It will be conveyed to the City's trunk facilities located along State Highway 6 by a combination of gravity trunk lines and force mains where necessary.

ii. At full development, the ultimate ESFC's of the District will be 1,900. The wastewater generated by this development is estimated as 665,000 gpd (average dry weather flow) and 2,660,000 gpd (maximum wet weather flow).

iii. The district intends to connect to the City trunk sewer line along State Highway 6. No new wastewater treatment plant is proposed.

iv. Proposed Wastewater Collection System:

i. The wastewater collection system for full development of the District will consist of gravity sewer lines ranging in diameter size. Refer to Exhibit 10 – Wastewater Collection System.

v. Wastewater Treatment:

i. The District intends to connect to the City trunk sewer line along State Highway 6. No new wastewater treatment plants are proposed.

e. Storm Drainage System

i. General:

i. The storm water runoff within the District will be routed through a curb and gutter street system to collector lines that will outfall into detention lakes throughout the District and ultimately into Chocolate Bayou. The District will construct all stormwater trunk lines and detention facilities for stormwater collection.

ii. Design Criteria:

i. All storm drainage improvements will be designed in accordance with criteria established by the City of Manvel and Brazoria County Drainage District No. 4.

ii. The U.S Army Corps of Engineers HEC-HMS computer models were used to generate storm runoff hydrographs while the XP-SWMM computer model was used to analyze the proposed drainage and detention system. The proposed internal detention lake system was sized to contain the difference between the developed and undeveloped run-off resulting from a 24-hour 100-year frequency rainfall event while maintaining a minimum freeboard of one foot.

iii. Proposed Storm Sewer System:

i. The District's internal storm sewer system will consist of a concrete curb and gutter street system with inlets and reinforced concrete pipe and box culverts. Reinforced concrete storm sewer pipe will range in size from 24'' RCP to sizes necessary to convey the applicable runoff. The storm sewers will discharge directly into the detention lake within the development.
ii. The District will provide concrete storm sewer trunk lines ranging in size form 24 inches in diameter reinforced concrete pipe to various reinforced concrete boxes. In addition, it also has approximately 76 acres of lakes for amenity and detention purposed. Box culverts and pipes are designed to connect all the lakes together.

f. Other Utilities

i. Dry utilities are available from the local public utility companies that serve the area. A list of the utility companies and the services to be provided are as follows:

   i. Telephone service – AT&T Telephone
   ii. Electrical service – Centerpoint Energy
   iii. Gas Service – Centerpoint Energy
   iv. Cable Service – Texas Mid Gulf Cable Vision

9. Miscellaneous Regulations

i. Fencing - Fences in any traditional single-family residential district may not exceed seven (7') feet in height.

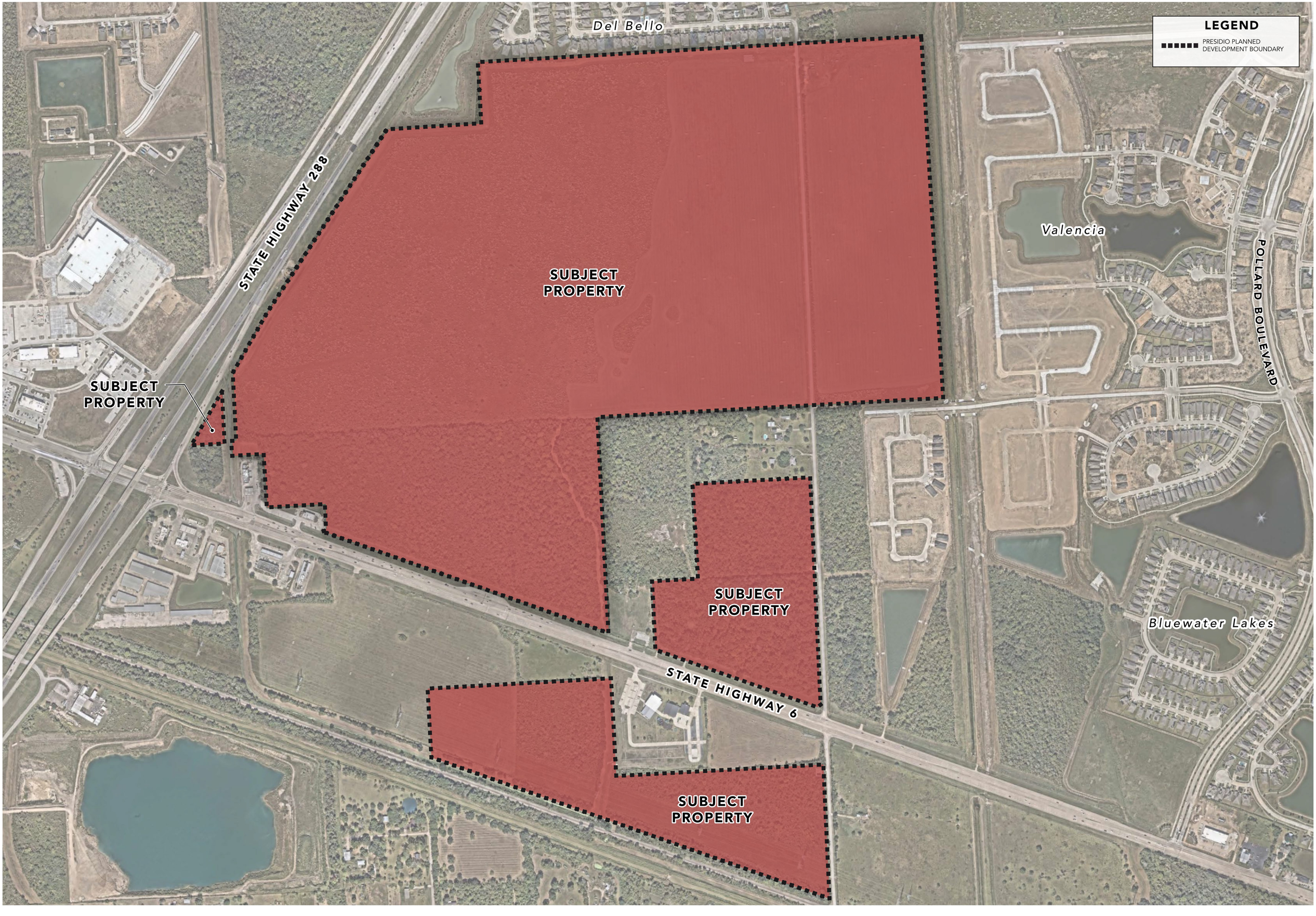
ii. Proximity of structures to pipelines - No structure shall be erected or moved to a location closer than 30 feet to any existing pipeline, except as may be allowed for low pressure distribution system pipeline as defined in section 62-2 of the Manvel Code of Ordinances.

iii. On-street parking areas – Along Charlotte Street, abutting tracts F, G, and A, on-street diagonal parking spaces may be provided for the use of adjacent commercial establishments & apply toward minimum parking requirements.

iv. Within Charlotte Street's public right-of-way, abutting tracts F, G, and A, 60-degree diagonal on-street parking may be provided to serve adjacent or nearby commercial tenants.

VII. PHASING / DEVELOPMENT SCHEDULE

It is anticipated that the Presidio PUD will be developed in two phases over a 5 to 15 year period. The construction of the initial phases of the project is estimated to begin approximately 24 months from PUD approval date. The initial phases of the project will include portions of Manvel Parkway, Charlotte Street, Street Y, Street X, project entry statements and monumentation, as well as landscaping. The majority of the detention system will be developed in the first phase as adjacent pods are developed. The roughly sixteen (16) acre detention pond at the southeastern intersection of Manvel Parkway and Iowa Lane will be completed in the second phase as tract J is developed. The implementation of infrastructure to the residential development will be tied to the residential development schedule as shown on the Phasing Exhibit (Exhibit H). The location and timing of future phases will be dependent upon market conditions and is subject to change. Commercial development will be driven by market conditions.



LJA

± 392.9 Ac. PRESIDIO - AREA LOCATION EXHIBIT

EXHIBIT A

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

P:\01 Planning\1140-09004\02-City and Zoning\PUD Exhibits\1140-09004_Presidio PUD Exhibits_12.09.25.indd

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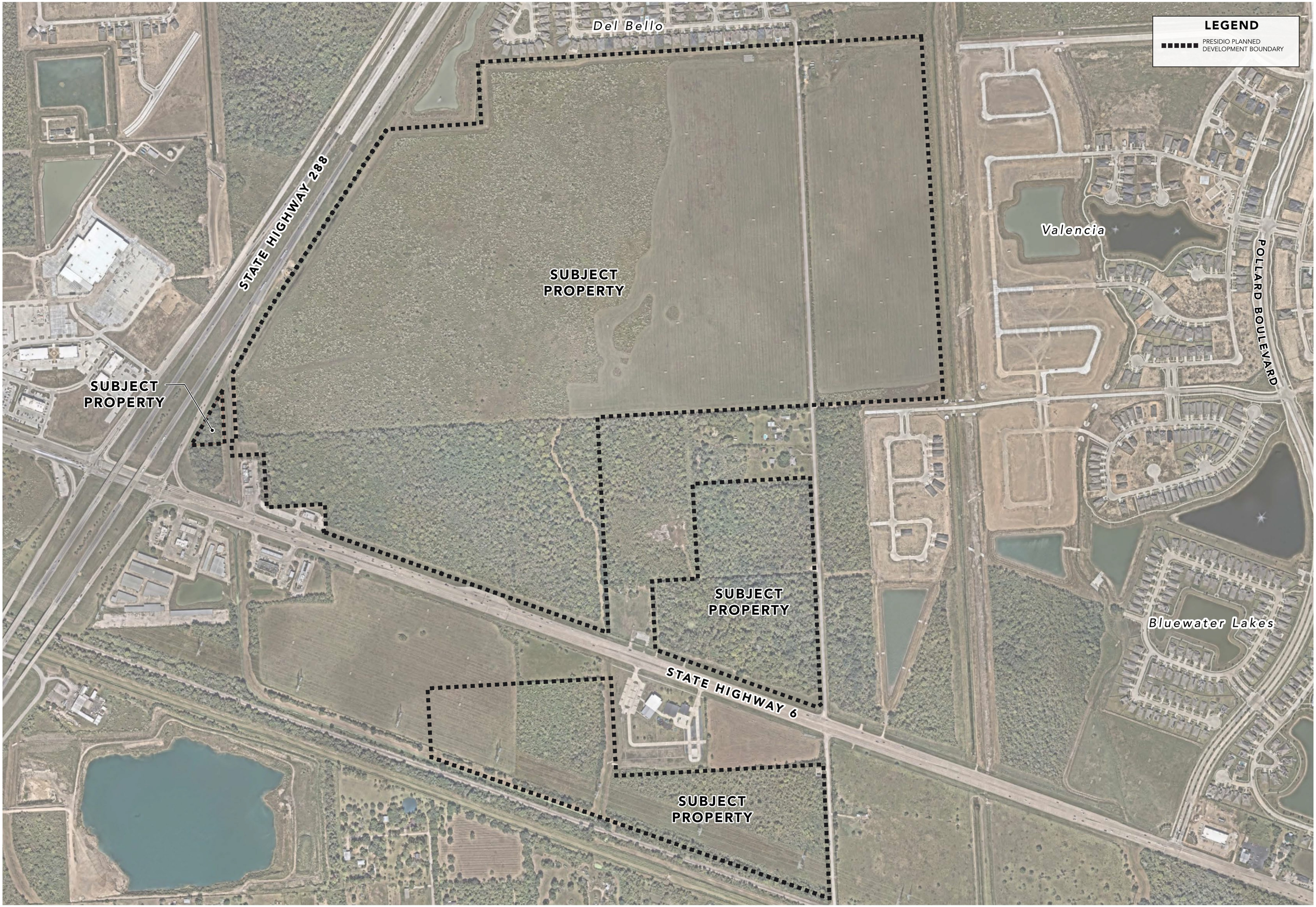

LJA

± 392.9 Ac. PRESIDIO - PROJECT AERIAL EXHIBIT

EXHIBIT B

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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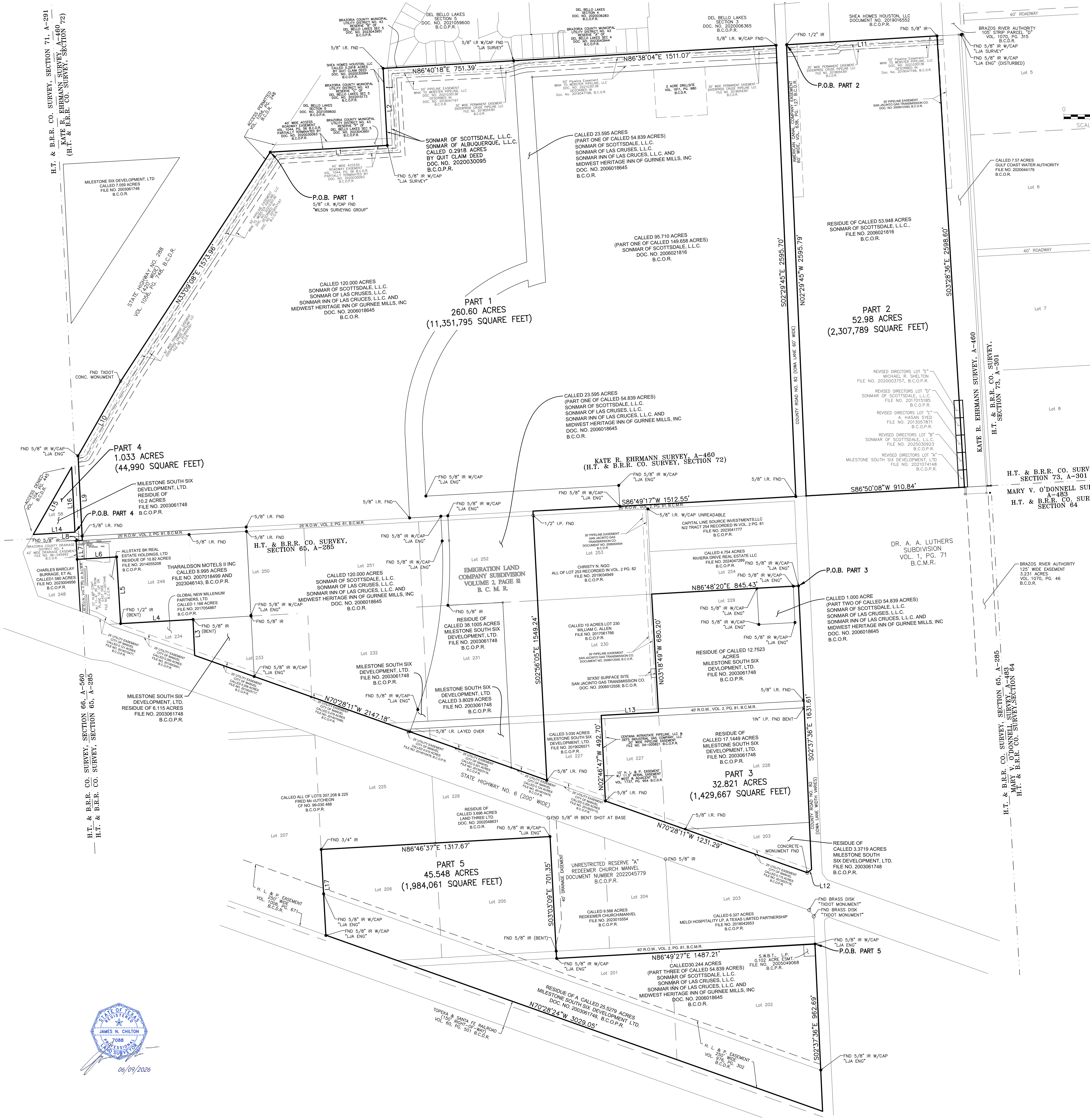
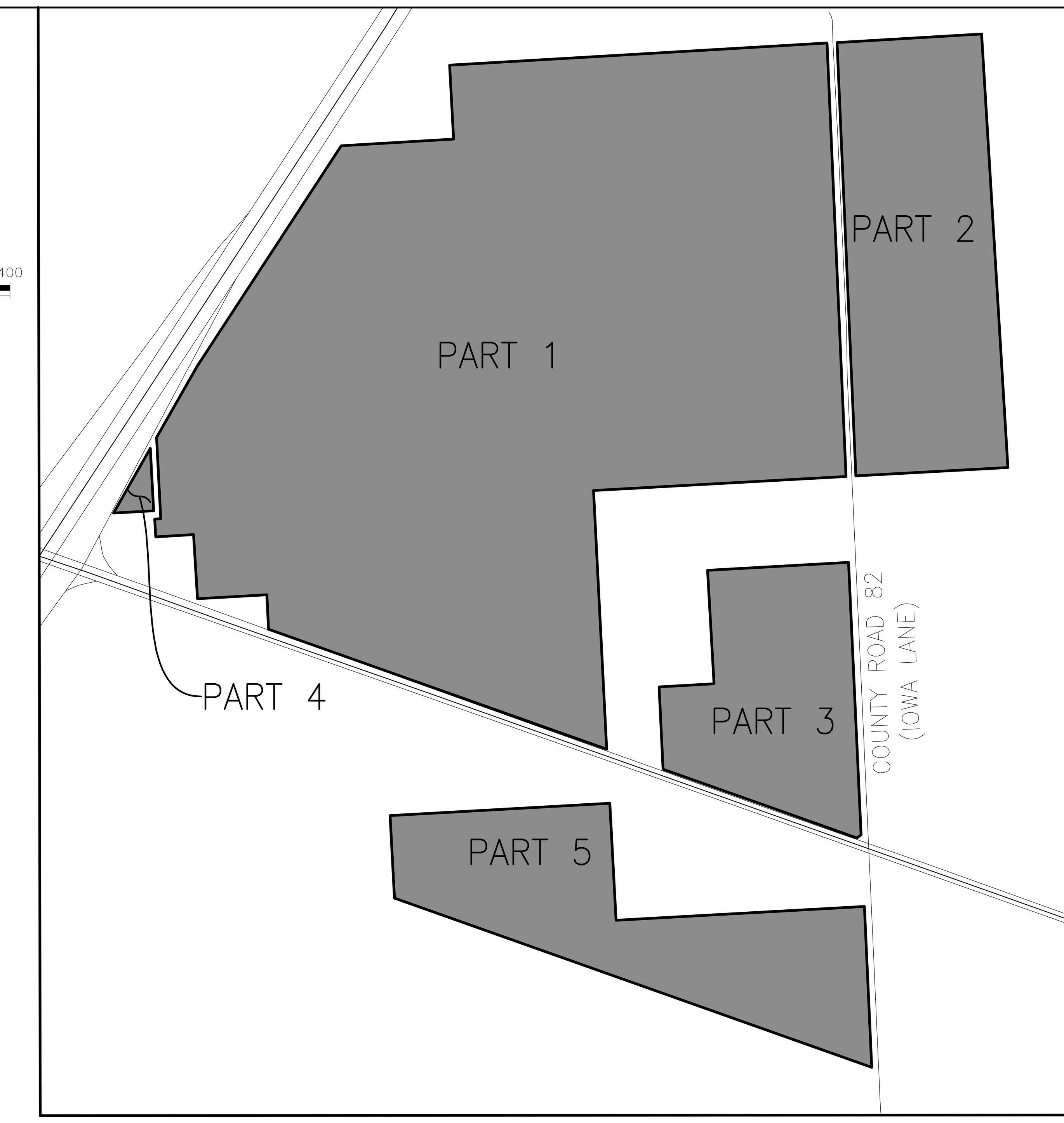




VICINITY MAP 1" = 500'

Line Table		
Line #	Direction	Length
L1	N86° 40' 38"E	673.33'
L2	N03° 05' 49"W	443.26'
L3	N02° 37' 58"W	206.42'
L4	S86° 42' 16"W	416.54'
L5	N03° 28' 32"W	384.02'
L6	S86° 32' 02"W	226.68'
L7	N03° 22' 47"W	107.16'
L8	N86° 50' 19"E	36.02'
L9	N02° 56' 34"W	486.40'
L10	N29° 41' 19"E	492.89'
L11	N86° 38' 25"E	866.39'
L12	S53° 19' 57"W	30.42'
L13	N86° 50' 47"E	329.67'
L14	S86° 49' 17"W	240.35'
L15	N29° 41' 19"E	445.72'
L16	S02° 56' 34"E	374.37'
L17	N03° 08' 59"W	493.86'

LEGEND:

B.C.D.R.	DEED RECORDS OF BRAZORIA COUNTY, TEXAS
B.C.M.R.	MAP RECORDS OF BRAZORIA COUNTY, TEXAS
B.C.P.R.	PLAT RECORDS PF BRAZORIA COUNTY, TEXAS
B.C.O.P.R.	OFFICIAL PUBLIC RECORDS OF BRAZORIA COUNTY, TEXAS
B.C.O.R.	OFFICIAL RECORDS OF BRAZORIA COUNTY, TEXAS
NO.	NUMBER
R.O.W.	RIGHT OF WAY

EXHIBIT OF 392.98 ACRES IN 5 PARTS IN THE H.T. & B.R.R. COMPANY SURVEY SECTION 72, A.K.A. THE KATE EHRMANN SURVEY, A-460 AND THE H.T. & B.R.R. COMPANY SURVEY SECTION 65, A-291 BRAZORIA COUNTY, TEXAS

MAY 2026 JOB NO. 1140-2501

LJA SURVEYING, INC.
3600 W Sam Houston Parkway S
Suite 175
Houston, Texas 77042
Phone 713.953.5200
Fax 713.953.5026
TBPELS Firm No. 10194382

NOTES:

1. ALL BEARINGS FOR PARTS 1, 2, 3, 4, AND 5 ARE BASED ON RECORD BEARINGS.
2. THIS MAP WAS PREPARED UNDER 22 TAC § 138.95, DOES NOT REFLECT THE RESULTS OF AN ON THE GROUND SURVEY, AND IS NOT TO BE USED TO CONVEY OR ESTABLISH INTERESTS IN REAL PROPERTY EXCEPT THOSE RIGHTS AND INTEREST IMPLIED OR ESTABLISHED BY THE CREATION OR RECONFIGURATION OF THE BOUNDARY OF THE POLITICAL SUBDIVISION FOR WHICH IT WAS PREPARED. DATED THIS 9TH DAY OF JUNE, 2026.
3. REVISED: ADDED 30 FOOT WIDE PERMANENT EASEMENT, ENTERPRISE CRUDE PIPELINE, LLC, FILE NUMBER 2018054391, OFFICIAL PUBLIC RECORDS OF BRAZORIA COUNTY, TEXAS.

\\ljaeng.com\shares\Sectors\Survey\Basemaps\1140 – Presidio\Presidio Base Map PUD Exhibit Discrepancy.dwg 6/9/2026

DESCRIPTION OF
392.98 ACRES

Being 392.98 acres (17,118,302 square feet) of land located in the H.T. & B.R.R. Company Survey, Section 72, also known as Kate R. Ehrmann Survey, Abstract Number 460, the H.T. & B.R.R. Company Survey, Section 71, Abstract Number 291 and the H.T. & B.R.R. Company Survey, Section 65, Abstract Number 285 Brazoria County, Texas, a portion of which being out of and a part of Emigration Land Company Subdivision, a subdivision of record under Volume 2, Page 81 of the Map Records of Brazoria County, Texas (B.C.M.R.) and being all of that certain called 120.000 acre tract (exhibit "A"), all of that certain called certain called 23.595 acre tract (exhibit "B", part one), all of that certain called 1.000 acre tract (exhibit “B”, part two), and all of that certain called 30.244 acre tract (exhibit "B", part three), conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Las Cruses LLC, Sonmar Inn of Las Cruces L.L.C., and Midwest Heritage Inn of Gurnee Mills Inc. by an instrument of record under Document Number 2006018645 of the Official Records of Brazoria County, Texas (B.C.O.R.), all of that certain called 95.710 acre tract described as part one of a called 149.658 acre tract and all of the residue of that certain called 53.948 acre tract conveyed to Sonmar of Scottsdale, L.L.C., by an instrument of record under Document Number 2006021816, B.C.O.R., all of that certain called 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque L.L.C., by and instrument of record under Document Number 2020030095 of the Official Public Records of Brazoria County, Texas (B.C.O.P.R.), all of the residue of that certain called 3.8029 acre tract, all of the residue of that certain called 38.1005 acre tract, all of the residue of that certain called 6.115 acre tract, all of the residue of that certain called 10.2 acre tract, all of the residue of that certain called 17.1449 acre tract, all of the residue of that certain called 12.7523 acre tract, all of that certain called 3.3719 acre tract and all of the residue of that certain called 25.5279 acre tract conveyed to Milestone South Six Development, LTD. by an instrument of record under Document Number 2003061748, B.C.O.P.R., all of that certain called 8.995 acre tract conveyed to Tharaldson Motels II Inc by an instrument of record under Document Numbers 2007018499 and 2023046143, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “A” conveyed to Milestone South Six Development, LTD by an instrument of record under Document Number 2021074148, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “B” conveyed to Sonmar of Scottsdale, L.L.C. by an instrument of record under Document Number 2025030923, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “C” conveyed to A. Hasan Syed by an instrument of record under Document Number 2013057871, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “D” conveyed to Sonmar of Scottsdale, L.L.C. by an instrument of record under Document Number 2017015185, B.C.O.P.R. and all of that certain 0.115 acre tract, Directors Lot “E” conveyed to Sonmar of Scottsdale,

L.L.C. by an instrument of record under Document Number 2020003757, B.C.O.P.R., said 392.98 acre tract being more particularly described by metes and bounds, in five (5) parts, as follows (all bearings referenced to the Texas Coordinate System, South Central Zone, NAD 83):

PART 1

BEGINNING at a 5/8-inch iron rod with cap stamped "WILSON SURVEYING GROUP", found, for the southwest corner of Reserve "F" of Del Bello Lakes Section 5, a subdivision of record under Document Number 2021059600, B.C.O.P.R., said Reserve "F" conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043951, B.C.O.P.R., same being the northwest corner of said called 120.000 acre tract and lying on the east right of way line of State Highway 288, called 420 feet wide, conveyed to the State of Texas by an instrument of record under Volume 1056, Page 748 of the Deed Records of Brazoria County, Texas (B.C.D.R.);

Thence, North 86° 40' 38" East, departing said east right-of-way line of State Highway 288, with a south line of said Reserve "F", same being the north line of said called 120.000 acre tract, 673.33 feet to a 5/8 inch iron rod with cap stamped "LJA SURVEY", found, for the southwest corner of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque L.L.C., same being the southeast corner of that certain called 0.2918 acre tract conveyed to Shea Homes Houston, L.L.C. by an instrument of record under Document Number 2020030094, B.C.O.P.R;

Thence, North 03° 05' 49" West, with the east line of said 0.2918 acre tract conveyed to Shea Homes Houston, L.L.C., same being the west line of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque, L.L.C., 443.26 feet to a 5/8 inch iron rod found for the common north corner of said 0.2918 acre tracts, same being the most northerly northwest corner of the herein described tract and lying in an easterly interior line of Reserve "C" of said Del Bello Lakes Section 5, said Reserve "C" conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2022015173, B.C.O.P.R.;

Thence, North 86° 40' 18" East, with an easterly interior line of said Reserve "C", a portion of the south line of Reserve "B" of said Del Bello Lakes Section 5 conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043951, B.C.O.P.R., same being the north lines of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque, L.L.C. and said 120.000 acre tract, at 29.27 feet pass the common north corner of said

0.2918 acre tract and said 120.000 acre tract, continuing with the north line of said 120.000 acre tract and the south line of said Reserve "B", in all a total distance of 751.39 feet to a 5/8 inch iron rod with cap stamped "LJA SURVEY", found, for the northeast corner of said 120.000 acre tract, same being the northwest corner of the aforementioned 23.595 acre tract;

Thence, North 86° 38' 04" East, continuing with the south line of said Reserve "B", the south line of Reserve “A” of Del Bello Lakes Section 4, subdivision of record under Document Number 2020036283, B.C.O.P.R., said Reserve “A” conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043944, B.C.O.P.R. and the south line of Reserve “B” of Del Bello Lakes Section 3, A subdivision of record under Document Number 2020006365, B.C.O.P.R., same being the north line of said called 23.595 acre tract, and the herein described tract, 1,511.07 feet to a 5/8 inch iron rod with cap stamped “KALKOMEY”, found, for the northeast corner of said called 95.710 acre tract and the herein described tract, said point lying in the west right of way line of County Road 82, also known as Iowa Lane, called 60 feet wide;

Thence, South 02° 29' 45" East, with the west right of way line of said County Road 82, same being the east line of said called 95.710 acre tract, 2,595.70 feet to a 5/8 inch iron rod, found, for the southeast corner of said called 95.710 acre tract, and the herein described tract, said point lying in the north line of a 25 foot wide road right of way easement per plat of said Emigration Land Company Subdivision;

Thence, South 86° 49' 17" West, with the north line of said road right of way easement, same being a southeast interior line of the herein described tract and in part a southeast interior line of said called 23.595 acre tract, 1,512.55 feet to a point for corner;

Thence, South 02° 56' 05" East, with a southeast interior line of said called 23.595 acre tract and the herein described tract, same being the west lines of that certain called tract of land conveyed to Christy N. Ngo by an instrument of record under Document Number 2019034949, B.C.O.P.R., that certain called 10 acre tract conveyed to William C. Allen by an instrument of record under Document Number 2017061766, B.C.O.P.R. and that certain called 3.030 acre tract conveyed to Milestone South Six Development, LTD by an instrument of record under Document Number 2019026571, B.C.O.P.R., 1,549.24 feet to a 5/8 inch iron rod, found for the southwest corner of said called 3.030 acre tract, same being the southeast corner of said called 23.595 acre tract, said point lying on the north right of way line of State Highway 6, called 200 feet wide;

Thence, North 70° 28' 11" West, with the north right of way line of said State Highway 6, same being the south lines of said called 23.595 acre tract, the aforementioned 3.8029 acre tract, the aforementioned 120.000 acre tract, the aforementioned residue of a called 6.115 acre tract and the herein described tract, 2,147.18 feet to a point for corner for the southwest corner of said residue tract, same being the southeast corner of that certain called 1.166 acre tract conveyed to Global New Millenium Partners, LTD by an instrument of record under Document Number 2017054867, B.C.O.P.R.;

Thence, North 02° 37' 58" West, with the east line of said called 1.166 acre tract, same being the west line of said residue tract and a southwest interior line of the herein described tract, 206.42 feet to a point for corner for the north common corner of said called 1.166 acre tract and said residue tract, said point lying in the south line of the aforementioned 8.995 acre tract;

Thence, South 86° 42' 16" West, with the north line of said called 1.166 acre tract, same being the south line of said called 8.995 acre tract and a southwest interior line of the herein described tract, 416.54 feet to a point for corner for the northwest corner of said called 1.166 acre tract, same being the southwest corner of said called 8.995 acre tract;

Thence, North 03° 28' 32" West, with a west line of said called 8.995 acre tract, 384.02 feet to a point for corner;

Thence, South 86° 32' 02" West, with a northwesterly interior line of said called 8.995 acre tract, 226.68 feet to a point for corner said point lying in the east line of that certain called 1.580 acre tract conveyed to Charles Barclay Burrage, et al by an instrument of record under Document Number 2023004956, B.C.O.P.R.;

Thence, North 03° 22' 47" West, with the east line of said called 1.580 acre tract, same being the northwest line of said called 8.995 acre tract, 107.16 feet to a point for corner said point lying in the south line of a 50 foot road right of way easement per said plat of Emigration Land Company Subdivision;

Thence, North 86° 50' 19" East, with the south line of said roadway easement, same being the north line of said called 8.995 acre tract, 36.02 feet to a point for corner;

Thence, North 02° 56' 34" West, over and across said road right of way easement, with the west line of the aforementioned 120.000 acre tract, 486.40 feet to a 5/8 inch iron rod with cap stamped 'LJA SURVEY', found lying in the east right of way line of aforementioned State Highway 288;

Thence, North 29° 41' 19" East, with the east right of way line of said State Highway 288, same being the west line of said called 120.000 acre tract, 492.89 feet to a point for corner;

Thence, North 33° 09' 08" East, continuing with the east right of way line of said State Highway 288, same being the west line of said called 120.000 acre tract, 1,573.96 feet to the POINT OF BEGINNING and containing 260.60 acres (11,351,795 square feet) of land.

Part 2

BEGINNING at a 1/2-inch iron rod found on the east right-of-way line of County Road No. 82, Iowa Lane, 60.0 feet wide, and being the northwest corner of said 53.948 acre tract, same being the southwest corner of that certain called 1.367 acre tract conveyed to Joan Banneyer, by an instrument of record under Document Number 2005003981, B.C.O.R.;

Thence North 86° 38' 25" East, along the north line of said 53.948 acre tract and the south line of said 1.367 acre tract and the south line of Manvel Parkway (120 feet wide) as shown on Del Bello Boulevard and Manvel Parkway Street Dedication, a subdivision of record under Document Number 2019062193, and along the south line of the remainder of that certain called 56.104 acre tract conveyed to Shea Homes Houston, LLC by an instrument of record under Document Number 2018049942, B.C.O.R., 866.40 feet to the northwest corner of that certain called 7.57 acre tract conveyed to Gulf Coast Water Authority by an instrument of record under 2020044179, B.C.O.R.;

Thence South 03° 20' 50" East, departing the north line of said 53.948 acre tract and the south line of said 56.104 acre tract, and along the west line of said 7.57 acre tract, 2,598.60 feet to a point for corner on the south line of said 53.948 acre tract, said point being on the common line between the aforesaid Kate R. Ehrmann Survey, A-460 and the H.T.&B.R.R. Company Survey, Section 65, A-285;

Thence South 86° 50' 08" West, along the south line of said 53.948 acre tract and said common survey line, 910.84 feet to a 5/8-inch iron rod found for the southwest corner of said 53.948 acre tract and on the east right-of-way line of County Road No. 82, Iowa Lane;

Thence North 02° 29' 45" West, departing said common survey lines, and along the east right-of-way line of said County Road No. 82, Iowa Lane and with the west line of said 53.948 acre tract, 2,595.79 feet to the POINT OF BEGINNING and containing 52.98 acres (2,307,789 square feet) of land.

Part 3

"COMMENCING for reference at an old one (1) inch axle found marking the northeast corner of Lot No. 254 of said Emigration Land Company Subdivision, same being on the west right-of-way line of County Road No. 82 (Iowa Lane), varying width, and the northeast corner of that certain tract called 9.51 acres conveyed to B.J. Reynolds, et al, Trustee, by an instrument of record in File No. 97-004363 of the B.C.P.R.;

Thence South 02° 37' 36" East, 489.15 feet with the east line of Lot No. 254, the west right-of-way line of said County Road No. 82 and the east line of said 9.51 acre tract to the POINT OF BEGINNING of the herein described tract, same being the southeast corner of said 9.51 acre tract, the southeast corner of said Lot No. 254, the northeast corner of the aforesaid 12.7523 acre tract and the northeast corner of Lot No. 229 of said subdivision;

Thence South 02° 37' 36" East, with the west right-of-way line of said County Road No. 82, with the east line of said Lot No. 229 and the east line of said 12.7523 acre tract, at 660.82 feet pass the southeast corner of said Lot No. 229, the southeast corner of said 12.7523 acre tract and the north line of the aforesaid 40.0 foot wide Platted Roadway (not open), at 700.83 feet pass the northeast corner of Lot No. 228 of said subdivision, the northeast corner of said 17.1449 acre tract and the south line of said 40.0 foot wide Platted Roadway (not open) and continue with said west right-of-way line, the east line of Lot No. 228 and Lot No. 203, with the east line of said 17.1449 acre tract and with the east line of the aforesaid 3.3719 acre tract in all a total of 1631.61 feet to a point for corner from which a TxDOT brass disk in concrete bears South 40° 25' 35" East, 1.22 feet;

Thence South 53° 19' 57" West, 30.42 feet departing said east and west lines to a point for corner on the northerly right-of-way line of State Highway No. 6, 200.0 feet wide;

Thence North 70° 28' 11" West, 1231.29 feet with said northerly right-of-way line to a point for corner on a west line of the aforesaid 17.1449 acre tract and on the east line of that certain tract called 3.030 acres conveyed to Todd Properties, Ltd., by an instrument of record in File No. 98-036507 of the B.C.P.R.;

Thence North 02° 46' 47" West, with the common line between said 17.1449 acre and 3.030 acre tracts, at 472.70 feet pass the common north corner of said 17.1449 acre and 3.030 acre tracts, same being on the south line of the aforesaid 40.0 foot wide Platted Roadway (not open), and continue in all a total of 492.70 feet to a point for corner on the centerline of said 40.0 foot wide Platted Roadway (not open);

Thence North 86° 50' 47" East, 329.67 feet with the centerline of said 40.0 foot wide Platted Roadway (not open) to a point for corner;

Thence North 03° 18' 49" West, departing said centerline, at 20.00 feet pass the common south corner of Lot No. 229 and Lot No. 230 of said subdivision, the southwest corner of the aforesaid 12.7523 acre tract, the southeast corner of that certain tract called 10.0 acres conveyed to Jayne Meadows Cotter Allen, Trustee, by an instrument of record in File No. 03-043040 of the B.C.P.R. and continue with the common line between Lot No. 229 and Lot No. 230 and with the common line between said 12.7523 acre and 10.0 acre tracts in all a total of 680.20 feet to a point for corner, the common north corner of Lot No. 229 and Lot No. 230, the common north corner of said 12.7523 acre and 10.0 acre tracts, the common south corner of Lot No. 253 and Lot No. 254, the common south corner of the aforesaid 9.51 acre tract and that certain tract called 7.41 acres conveyed to Fredrick Lee Huffman, et al, by an instrument of record in File No. 01-052769 of the B.C.P.R.

Thence North 86° 48' 20" East, with the common line between said Lot No. 229 and Lot No. 254 and with the common line between said 12.7523 acre and 9.51 acre tracts, at 605.67 feet pass the northwest corner of the aforesaid 1.000 acre tract, at 815.43 feet pass the northeast corner of said 1.000 acre tract and continue with the common line between said Lot No. 229 and Lot No. 254 and with the common line between said 12.7523 acre and 9.51 acre tracts in all a total of 845.43 feet to the POINT OF BEGINNING and containing 32.821 acres of land."

Part 4

"BEGINNING at the southeast corner of Lot 58 of said Emigration Land Company Subdivision, same being the southeast corner of aforementioned residue of a called 10.2 acre tract and the herein

described tract, from which a 5/8 inch iron rod, found for the southerly west corner of aforementioned 120.000 acre tract bears South 61° 06’ 30” East, 47.08 feet;

Thence, South 86° 49’ 17” West with the south line of said residue tract and the herein described tract, 240.35 feet to the southwest corner of the said residue tract and the herein described tract, said point lying in the east right of way line of State Highway 288, called 420 feet wide and recorded under Volume 1056, Page 748, B.C.D.R.;

Thence, North 29° 41’ 19” West, with the east right of way line of said State Highway 288, same being the west line of said residue tract and the herein described tract, 445.72 feet to the north corner of said residue tract and the herein described tract, said point lying in the east line of said Lot 58;

Thence, South 02° 56’ 34” East, with the east line of said Lot 58, the east line of said residue tract and the herein described tract, 374.38 feet to the POINT OF BEGINNING and containing 1.033 acres (44,990 square feet) of land.”

Part 5

“COMMENCING for reference at an old one (I) inch axle found marking the northeast corner of Lot No. 254 of said Emigration Land Company Subdivision and on the west right-of-way line of County Road No. 82 (Iowa Lane), varying width;

Thence South 02° 37' 36" East, with said west right-of-way line and with the east line of said subdivision, at 1189.97 feet pass the south line of a 40.0 foot wide platted road (not open) and the northeast corner of Lot No. 228 of said subdivision, at 2509.88 feet pass the southeast corner of Lot No. 203 of said subdivision, the southeast corner of that certain tract called 6.327 acres conveyed to William G. Neumann, Jr., by an instrument of record in File No. 97- 014478 of the B.C.P.R. and on the north line of a 40.0 foot wide platted roadway (not open) and continue in all a total of 2549.88 feet to the POINT OF BEGINNING of the herein described tract, same being on the south line of said 40.0 foot wide platted roadway (not open), the northeast corner of Lot 202 of said subdivision, the northeast corner of the aforesaid 25.5279 acre tract and the northeast corner of the 30.244 acre tract;

Thence South 02° 37' 36" East, 962.69 feet continuing with said west right-of-way line, with the east line of said subdivision, with the east line of said Lot No. 202 and with the east of said 25.5279 acre tract, to a point for corner, the southeast corner of said Lot 202, the southeast corner of said 25.5279

acre tract and on the northerly right-of-way line of the Topeka & Santa Fe Railroad Company's 150.00 foot wide right-of-way line;

Thence North 70° 28' 24" West, departing said east and west lines, with the south line of said Lot No. 202 and Lot No. 201 of said subdivision, with the south line of said 25.5279 acre tract and with said northerly right-of-way line, at 2494.26 feet pass the west corner of said Lot No. 201, the west corner of said 25.5279 acre tract and on the south line of a 40.0 foot wide platted roadway (not open), at 2597.90 feet pass the north right-of-way line of said 40.0 foot wide platted road (not open), the westerly southeast corner of Lot No. 206 of said subdivision, a westerly southeast corner of the aforesaid 19.1938 acre tract and continue with said northerly right-of-way line and with a south line of said 19.1938 acre tract in all a total of 3029.05 feet to a point for corner, the southwest corner of Lot No. 206 and the southwest corner of said 19.1938 acre tract, same being the southeast corner of Lot No. 207 and that certain tract called "All of Lot No. 207, Lot No. 208 and Lot No. 225" conveyed to Fred McCutcheon by an instrument of record in File No. 99-030488 of the B.C.P.R.;

Thence North 03° 08' 59" West, 493.86 feet with the common line between said 19.1938 acre tract and said McCutcheon tract and with the common line between said Lot No. 206 and Lot No. 207 to a point for corner on the east line of said Lot No. 207, same being the northwest corner of said Lot No. 206, the northwest corner of said 30.244 acre tract and the southwest corner of said Lot No. 225;

Thence North 86° 46' 37" East, with the north line of said 30.244 acre tract, the south line of said McCutcheon tract, the south line of that certain tract called 3.696 acres conveyed to Douglas B. Wilson, Trustee, by an instrument of record in File No. 02-048631 of the B.C.P.R., with the common line between Lot No. 206 and Lot No. 225 and Lot No. 205 and Lot No. 226, at 1314.41 feet pass a found one (1) inch iron pipe and continue in all a total of 1317.67 feet to a point for corner, the northeast corner of said 30.244 acre tract and the common corner of Lot No. 204, Lot No. 205, Lot No. 226 and Lot No. 227 of said subdivision and on a west line of that certain tract called 5.021 acres conveyed to Grace United Methodist Church of Manvel and Iowa Colony, Texas by an instrument of record in File No. 2004-039311of the B.C.P.R.;

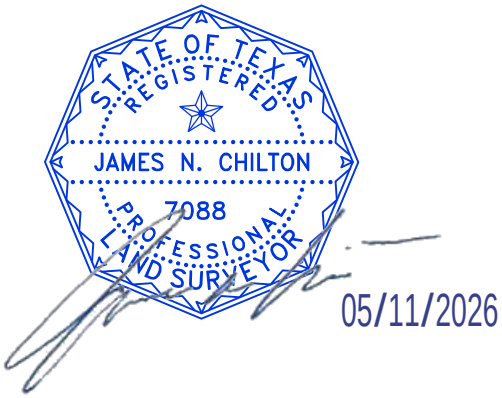
Thence South 03° 03' 09" East, with the east line of said 30.244 acre tract, with the west line of said 5.021 acre tract and with the common line between said Lot No. 205 and Lot No. 204, at 661.35 feet pass the common south corner of the aforesaid 19.1938 acre and 5.021 acre tracts and the common south corner of said Lot No. 205 and Lot No. 204 and continue in all a total of 701.35 feet to a point for

corner on the south line of the aforesaid 40.0 foot wide platted road (not open) and on the north line of said 30.244 acre tract;

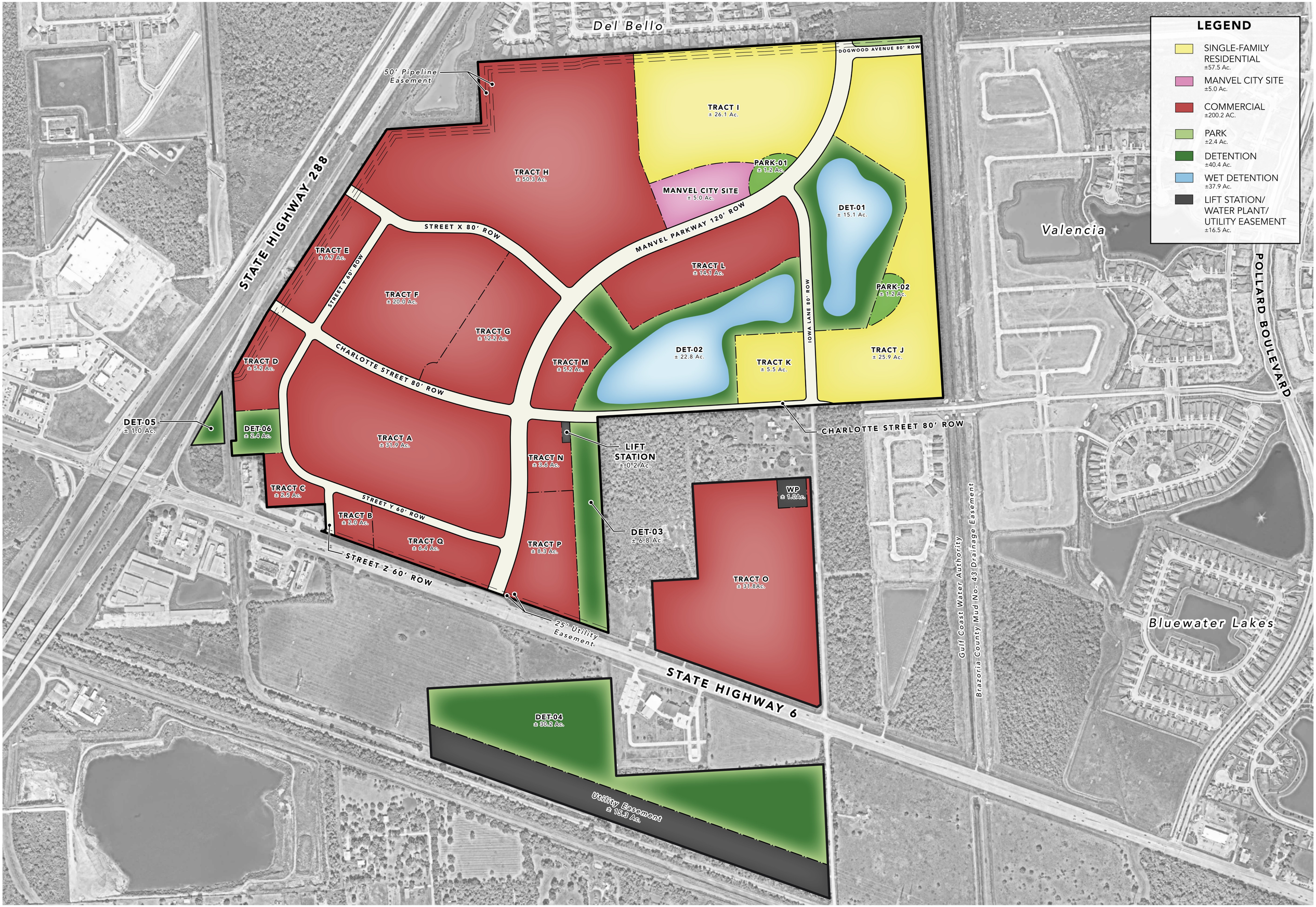
Thence North 86° 49' 27" East, 1487.21 feet with the south line of said 40.0 foot wide platted roadway (not open) and the north line of said 30.244 acre tract to the POINT OF BEGINNING and containing 45.548 acres of land."

Said Parts 1, 2, 3, 4, and 5 containing a total of 392.98 acres of land.

This document was prepared under 22 Texas Administrative Code § 138.95, does not reflect the results of an on the ground survey, and is not to be used to convey or establish interests in real property except those rights and interests implied or established by the creation or reconfiguration of the boundary of the political subdivision for which it was prepared.



LJA Surveying, Inc.



± 392.9 Ac. PRESIDIO - CONCEPTUAL LAND USE EXHIBIT

EXHIBIT E

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

P:\01 Planning\1140-09004\02-City and Zoning\PUD Exhibits\1140-09004_Presidio Conceptual Land Use Plan_12.09.25.indd

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This exhibit is an illustrative representation for presentation purposes only and should not be used for construction purposes. Boundaries, dimensions, and areas are approximate and subject to change. Final configuration and dimensions, plat components and relationships are subject to change without notice. All property boundaries, easements, road alignments, acreages, floodplains, environmental issues and other information shown is approximate and based on preliminary data. Actual conditions may vary. Final plans, engineering, and actual design, sourcing, location, and character of the facilities shown on this exhibit are intended.

LEGEND

- PROPOSED LOCAL ROAD
- PROPOSED COLLECTOR ROAD
- EXISTING COLLECTOR ROAD
- PROPOSED MAJOR THOROUGHFARE
- EXISTING HIGHWAY

Del Bello

Valencia

Bluewater Lakes

STATE HIGHWAY 288

STATE HIGHWAY 6

POLLARD BOULEVARD

50' Pipeline Easement

DOGWOOD AVENUE 80' ROW

TRACT I
± 26.1 Ac.

TRACT H
± 50.3 Ac.

PARK-01
± 1.2 Ac.

MANVEL CITY SITE
± 5.0 Ac.

DET-01
± 15.1 Ac.

MANVEL PARKWAY 120' ROW

STREET X 80' ROW

TRACT E
± 6.7 Ac.

STREET Y 60' ROW

TRACT L
± 14.1 Ac.

PARK-02
± 1.2 Ac.

TRACT F
± 20.0 Ac.

IOWA LANE 80' ROW

TRACT G
± 12.2 Ac.

DET-02
± 22.8 Ac.

TRACT J
± 25.9 Ac.

TRACT D
± 5.2 Ac.

CHARLOTTE STREET 80' ROW

TRACT M
± 5.2 Ac.

TRACT K
± 5.5 Ac.

DET-05
± 1.0 Ac.

DET-06
± 2.4 Ac.

TRACT A
± 31.9 Ac.

TRACT N
± 3.6 Ac.

LIFT STATION
± 0.2 Ac.

CHARLOTTE STREET 80' ROW

TRACT C
± 2.5 Ac.

STREET Y 60' ROW

TRACT B
± 2.0 Ac.

TRACT Q
± 6.4 Ac.

TRACT P
± 8.3 Ac.

DET-03
± 6.8 Ac.

WP
± 1.0Ac.

STREET Z 60' ROW

25' Utility Easement

TRACT O
± 31.8Ac.

Gulf Coast Water Authority
Brazoria County Mud No. 43 Drainage Easement

DET-04
± 30.2 Ac.

Utility Easement
± 15.3 Ac.

± 392.9 Ac. PRESIDIO - CONCEPTUAL ROADWAY EXHIBIT

EXHIBIT F

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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± 392.9 Ac. PRESIDIO - CONCEPTUAL AMENITIES AND OPEN SPACE EXHIBIT

EXHIBIT G

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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LEGEND

- PHASE 1
- PHASE 2

Del Bello

50' Pipeline Easement

DOGWOOD AVENUE 80' ROW

TRACT I
± 26.1 Ac.

PARK-01
± 1.2 Ac.

TRACT H
± 50.3 Ac.

MANVEL CITY SITE
± 5.0 Ac.

DET-01
± 15.1 Ac.

STATE HIGHWAY 288

STREET X 80' ROW

MANVEL PARKWAY 120' ROW

TRACT E
± 6.7 Ac.

STREET Y 60' ROW

TRACT L
± 14.1 Ac.

IOWA LANE 80' ROW

PARK-02
± 1.2 Ac.

TRACT F
± 20.0 Ac.

TRACT G
± 12.2 Ac.

TRACT M
± 5.2 Ac.

DET-02
± 22.8 Ac.

TRACT K
± 5.5 Ac.

TRACT J
± 25.9 Ac.

TRACT D
± 5.2 Ac.

CHARLOTTE STREET 80' ROW

DET-05
± 1.0 Ac.

DET-06
± 2.4 Ac.

TRACT A
± 31.9 Ac.

TRACT N
± 3.6 Ac.

LIFT STATION
± 0.2 Ac.

CHARLOTTE STREET 80' ROW

TRACT C
± 2.5 Ac.

STREET Y 60' ROW

WP
± 1.0Ac.

TRACT B
± 2.0 Ac.

DET-03
± 6.8 Ac.

TRACT Q
± 6.4 Ac.

TRACT P
± 8.3 Ac.

STREET Z 60' ROW

TRACT O
± 31.8Ac.

25' Utility Easement

STATE HIGHWAY 6

DET-04
± 30.2 Ac.

Utility Easement
± 15.3 Ac.

Valencia

POLLARD BOULEVARD

Gulf Coast Water Authority

Brazoria County Mud No. 43 Drainage Easement

Bluewater Lakes

± 392.9 Ac. PRESIDIO - PHASING EXHIBIT

EXHIBIT H

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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LEGEND

- RESIDENTIAL ENTRY SIGNAGE
- MULTI-TENENT HIGHWAY PYLON SIGN

*POSSIBLE SIGNAGE LOCATIONS. SUBJECT TO CHANGE

Del Bello

Valencia

Bluewater Lakes

STATE HIGHWAY 288

POLLARD BOULEVARD

DOGWOOD AVENUE 80' ROW

50' Pipeline Easement

TRACT I
± 26.1 Ac.

TRACT H
± 50.3 Ac.

PARK-01
± 1.2 Ac.

MANVEL CITY SITE
± 5.0 Ac.

DET-01
± 15.1 Ac.

MANVEL PARKWAY 120' ROW

STREET X 80' ROW

TRACT E
± 6.7 Ac.

STREET Y 60' ROW

TRACT F
± 20.0 Ac.

TRACT L
± 14.1 Ac.

PARK-02
± 1.2 Ac.

IOWA LANE 80' ROW

TRACT G
± 12.2 Ac.

TRACT D
± 5.2 Ac.

CHARLOTTE STREET 80' ROW

TRACT M
± 5.2 Ac.

DET-02
± 22.8 Ac.

TRACT K
± 5.5 Ac.

TRACT J
± 25.9 Ac.

DET-05
± 1.0 Ac.

DET-06
± 2.4 Ac.

TRACT A
± 31.9 Ac.

TRACT N
± 3.6 Ac.

LIFT STATION
± 0.2 Ac.

CHARLOTTE STREET 80' ROW

TRACT C
± 2.5 Ac.

STREET Y 60' ROW

TRACT B
± 2.0 Ac.

TRACT Q
± 6.4 Ac.

TRACT P
± 8.3 Ac.

DET-03
± 6.8 Ac.

WP
± 1.0Ac.

STREET Z 60' ROW

TRACT O
± 31.8Ac.

25' Utility Easement

STATE HIGHWAY 6

DET-04
± 30.2 Ac.

Utility Easement
± 15.3 Ac.

Gulf Coast Water Authority
Brazoria County Mud No. 43 Drainage Easement

± 392.9 Ac. PRESIDIO - CONCEPTUAL PROJECT SIGNAGE EXHIBIT

EXHIBIT I

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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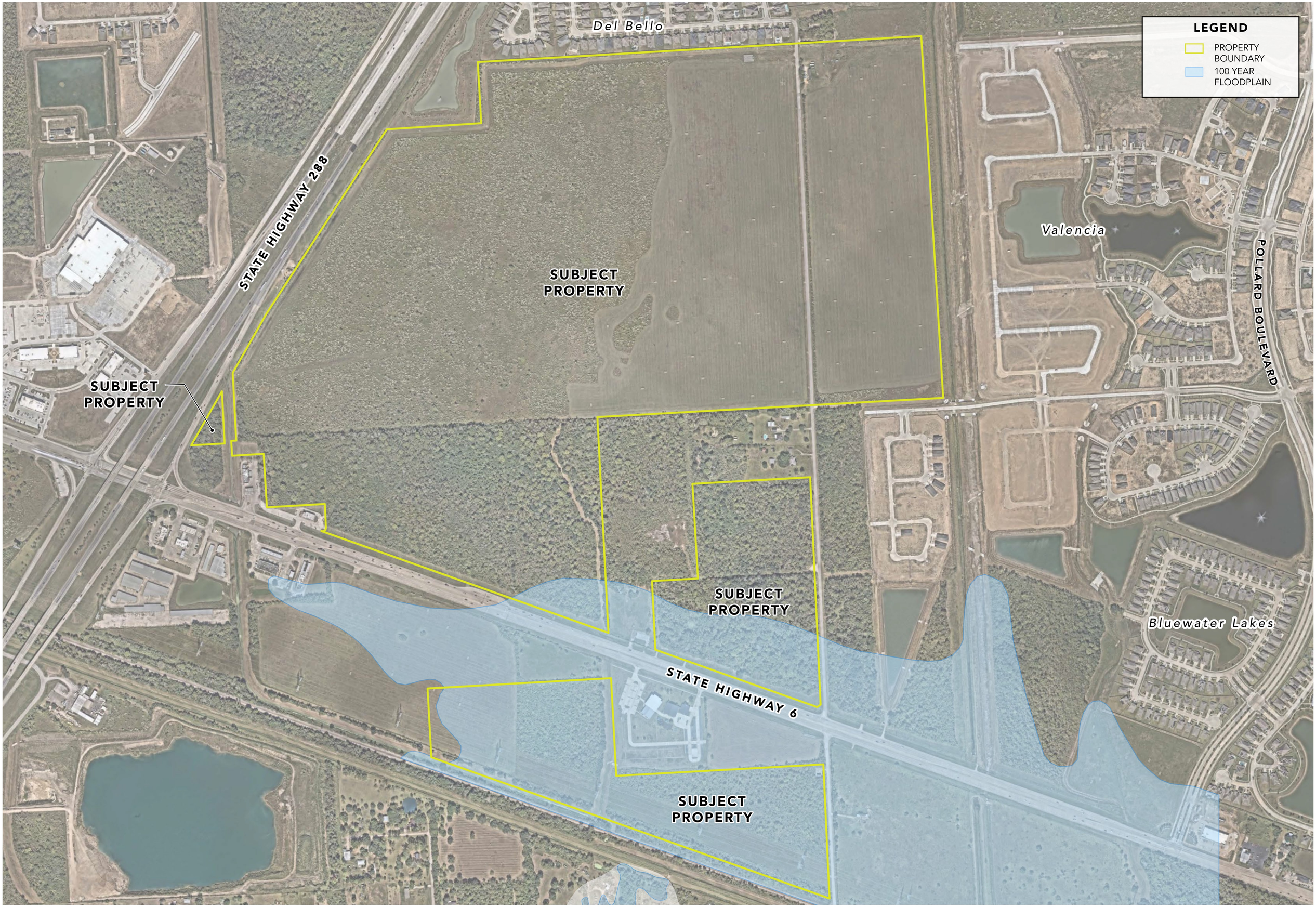

LJA

± 392.9 Ac. PRESIDIO - 100 YEAR FLOODPLAIN EXHIBIT

EXHIBIT J

0 100 200 400

LOCATION: Manvel, Texas CLIENT: Diversified Real Estate Group DATE: June 10, 2026

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As requested, the following provides a high-level summary of the major differences between the previously approved O-PUD (2007) and the current Presidio PUD. The intent of the updated PUD is to maintain the original development vision while modernizing standards, improving flexibility, and aligning with current City regulations and market conditions.

Category	Previous O-PUD (2007)	Current PUD (2026)
Non-Residential Land Use	Included Pad, Office, and Hotel; Included Water Plan and Wastewater Treatment Plan; Included a Civic Center; Included Detention; included ROW	Includes traditional Commercial and Medical; Included Water Plan; included a Civic Center; Included Detention; Included ROW; NAICS tables included
Residential Land Use	Traditional Single Family with a minimum lot size of 60' and Urban Density Residential	Traditional Single Family ranging from 50' – 60' and removed Urban Density Residential
Parks & Open Space	6' trails along Manvel Parkway and Iowa Lane; No dedicated park space	A variety of trail sizes ranging from 6' to 12' along Manvel Parkway, Iowa Lane, Charlotte Street, and Street X; dedicated park space based on Manvel's current parks requirements
Signage Standards	Unified Signage program to be submitted separately and approved by City Council	Signage standards listed within the PUD
Landscaping & Buffering	No specific screening or buffering requirements	Clear landscaping, buffering, and screening requirements provided
SH6 Overlay District Compliance	Not addressed	Incorporates SH 6 Overlay requirements
Definitions	Limited or not included	Comprehensive definitions section added

Overall, the proposed Presidio PUD maintains the foundational vision of the original O-PUD while updating development standards to reflect current regulatory requirements, infrastructure planning, and market conditions.

Presidio PUD – Signage Ordinance Comparison

Sign Type / Requirement	Current City of Manvel Requirement	Proposed Presidio PUD Standard
Multi-Tenant Highway Pylon Signs	Not specifically addressed in current ordinance	SH 288: 50’ maximum height; SH 6: 40’ maximum height; 25’ maximum width
Multi-Tenant Highway Pylon Sign Quantity	Not specifically addressed in current ordinance	One sign permitted at each primary entrance along SH 288; up to three signs permitted along SH 6 frontage
Sign Setbacks Along SH 288 / SH 6	Standard ordinance setbacks apply	No setback required along SH 288 and SH 6 frontage
Off-Premise Signage	Prohibited	Permitted within Presidio for uses located in Tracts A, F, G, and H
Multi-Tenant Monument Sign Area	Maximum 50 square feet	Maximum 90 square feet (exclusive of development name)
Single-Tenant Monument Sign Area	Maximum 50 square feet	Maximum 50 square feet
Additional Single-Tenant Monument Signs	Standard ordinance quantity limitations apply	Commercial tracts with multi-tenant monument signs may also provide one single-tenant monument sign per tenant
Directional / Informational Signs	Directional or informational signs shall be no more than four feet in height with a maximum area per side of six square feet;	Up to six signs permitted; maximum 6’ in height and 18 SF per side
Wall Signs – Principal Entrance Elevation	Maximum 15% of business frontage or 200 SF	Maximum 15% of building elevation and 200 SF for buildings 30’ or less
Wall Signs – Public Street Frontage	Maximum 10% of business frontage or 150 SF	Buildings over 30’ may have wall signage up to 25% of building elevation and 400 SF
Wall Signs – Canopies	Maximum 10% per canopy side	Canopy signage permitted up to 50% of canopy face
Electronic Reader Boards / LED Screens	Subject to ordinance limitations	Prohibited along public ROW except at fuel stations; custom illumination standards added
Residential Entry Monumentation	Standard subdivision signage regulations apply	Custom primary, secondary, and village entry monument standards permitted

PRESIDIO PLANNED UNIT DEVELOPMENT DEVELOPMENT STANDARDS COMPARISON TABLE				
Subject	**City of Manvel Code of Ordinances Section**	**Code of Ordinances Regulation**	**Proposed**	**Variance**
Land Use Change	**N/A**	**N/A**	**Each land use category may be increased or decreased in acreage by up to ten (10) percent of the total gross acreage of that land use category.**	**No**
Zoning – Single Family Residential (SFR) District	**Sec. 77-28. - Single-family residential (SFR) district.**	**(b) Minimum lot size.** **(1) Minimum lot area is 6,300 square feet.** **(2) The minimum front lot width is 60 feet measured at the front setback line.** **(3) Minimum lot width for a cul-de-sac lot is 20 feet measured at the street edge and 60 feet measured at the setback line.** **(c) Setbacks, minimum.** **(1) Front yard: The minimum front yard setback shall be 25 feet.** **(2) Side yard: The minimum side yard setback shall be five feet.** **(3) Corner side yard: The minimum corner side yard setback shall be ten feet.** **(4) Rear yard: The minimum rear yard setback shall be 15 feet for the principal structure.** **(5) Accessory structure. The minimum side and rear yard setback shall**	**Lot Sizes and Standards:** **a. 50' lots:** **i. Minimum lot size area: 6,000 square feet** **ii. Minimum width – 50 feet (measured at the front yard setback)** **iii. Front yard setback – 20 feet minimum** **iv. Side yard setback – 5 feet minimum** **v. Corner side yard setback – 10 feet minimum** **vi. Garage Front yard setback – 25 feet minimum** **vii. Rear yard setback – 15 feet minimum** **viii. Building height – 40 feet maximum** **ix. Accessory building front setback – 20 feet minimum** **x. Accessory building corner setback – 10 feet minimum** **xi. Accessory building rear setback – equivalent to utility easement width or 5 feet (greater of the two)** **b. 60' lots:** **i. Minimum lot size area: 6,300 square feet** **ii. Minimum width – 60 feet (measured at the front building line)** **iii. Front yard setback – 20 feet minimum** **iv. Side yard setback – 5 feet minimum** **v. Corner side yard setback – 10 feet minimum** **vi. Garage Front yard setback – 25 feet minimum** **vii. Rear yard setback – 15 feet minimum** **viii. Building height – 40 feet maximum** **ix. Accessory building front setback – 20 feet minimum** **x. Accessory building corner setback – 10 feet minimum** **xi. Accessory building rear setback – equivalent to utility easement width or 5 feet (greater of the two)** **If the rear property line of a corner parcel abuts the side property line of a neighboring parcel, the street side setback of the corner parcel must be a minimum of 15 feet**	**Yes**

		be five feet and corner side setback shall be ten feet. Accessory structures shall not extend past the front line of the principal structure. (d) Parking. A minimum of one off-street parking space in an enclosed garage is required per dwelling unit. (e) Maximum building height. The maximum height of any building in the open-single-family residential district shall not exceed 40 feet measured from the finished grade to the highest point of the roof, not including ancillary structures such as chimneys. (f)Accessory dwelling unit (ADU). One accessory dwelling unit is allowed if all the requirements of section 77-37 are satisfied.		
Zoning – Light Commercial	Sec. 77-31. - Light-commercial (LC) district.	(b) *Minimum lot size.* (1) The minimum lot width is 60 feet measured at the setback line. (2) The minimum lot depth is 100 feet measured at the setback line. (c) Setbacks. (1) Minimum front yard setback is 25 feet.	a. Minimum lot width – 60 feet (measured at the front yard setback) b. Minimum lot depth – 100 feet c. Front yard setback – 10 feet minimum d. Rear yard setback – 10 feet minimum (Zero feet is adjacent to commercial/retail) e. Side yard setback – 10 feet minimum (Zero feet is adjacent to commercial/retail) f. Corner side yard setback – 10 feet minimum g. Building Height: i. Pad Site - No building may exceed thirty five feet in height. ii. Commercial Anchor Tenant- No building may exceed sixty feet in height	Yes

		(2) Minimum rear yard setback is ten feet. (3) Minimum side yard and corner side yard is five feet. (4) Accessory structure. A minimum side and rear yard setback of five feet and corner side setback of ten feet. Accessory structures shall not extend past the front line of the principal structure. (d) *Maximum building height.* The maximum height of any building in the light commercial district may not exceed 60 feet measured from the finished grade to the highest point of the roof, not including ancillary structures such as chimneys. (e) Open storage and display of new or used cars for sale shall only be permitted where in compliance with section 77-52.	

Permitted Land Uses	**Chapter 77-26 – Permitted Land Uses**	**See table in column adjacent**	
Signage	**Chapter 53 – Signs**	**See separate document for full details**	

Permitted		Permitted Status in Manvel Code under LC or SFR
NAICS Code	Classification	
	Single Family	P
311811	Retail Bakeries	P
4491	Furniture And Home Furnishing Stores	P
4492	Electronics And Appliance Stores	P
444	Building Material, Garden Equipment And Supplies Dealers	P
445	Food And Beverage Stores	P
4561	Health And Personal Care Stores	P
4571	1 Gasoline Station in association with a Grocer	S
458110	Clothing And Clothing Accessories Stores	P
459	Sporting Goods, Hobby, Book, And Music Stores	P
455	General Merchandise Stores	P
4599	Misc. Store Retailers	P
491110	Postal Service	P
52	Finance And Insurance	P
531	Real Estate	P
531120	Lessors Of Nonresidential Buildings (Except Mini Warehouses)	P
5322	Consumer Goods Rental	P
541	Professional, Scientific, And Technical Services	P
54121	Accounting, Tax Preparation, Bookkeeping And Payroll	P
54194	Veterinary Services	P
55	Management Of Companies And Enterprises	P
561	Administrative And Support Services	P
611710	Educational Support Services	P/S
624	Social Assistance	P
624410	Child Care Services	P
71	Arts, Entertainment, And Recreation	P
713940	Fitness And Recreational Sports Centers	P
722	Food Services	P
8112	Electronic And Precision Equipment Repair And Maintenance	P
811122	Automotive Glass Replacement Shop	P
812	Personal And Laundry Services	P
238	Specialty Trade Contractors	O
3231	Printing And Related Support	P
42	Wholesale	O
622110	Medical / Hospital Uses (Tract H Only)	S
445131	Convenience Retailers	S
811111	Automotive Repairs And Replacement Shops	S

713.953.5200
TBPELS F-1386
TBPELS 10110501
www.LJA.com
3600 W Sam Houston Pkwy S, Suite 600 Houston, Texas 77042

PRESIDIO
TRAFFIC IMPACT ANALYSIS

LJA Project No. 2013 - 2515

Bahareh Bakhtiari, PE, PTOE
LJA Engineering, Inc.

3600 West Sam Houston Parkway South, Suite 600
Houston, Texas 77042-3703
Phone: 713.953.5200
Fax: 713.953.5183
www.lja.com
FRN-F-1386

March 2026

PRESIDIO
TRAFFIC IMPACT ANALYSIS



March 31, 2026

LJA Project No. 2013 - 2515

LJA TRANSPORTATION

3600 West Sam Houston Parkway South, Suite 600
Houston, Texas 77042-3703
Phone: 713.953.5200
Fax: 713.953.5183
www.lja.com
FRN-F-1386

March 2026

Executive Summary

This report presents the summary of findings for the Traffic Impact Analysis (TIA) prepared by LJA Engineering, Inc. (LJA) for the proposed Presidio development in Manvel, Texas. This development consists of a shopping center, multifamily housing, medical hospital, and single-family housing. The site for this development is located approximately 0.65 miles south of Del Bello Blvd and directly east of the intersection of SH 288 northbound entrance ramp and SH 6. The analyzed development is expected to be completed by 2030, therefore, the study horizon for this TIA is 2035. The objective of this study is to analyze the impacts of the traffic generated by the proposed development on the performance of the surrounding street network and to determine the required mitigation measures to address any resulting deficiencies.

Access to this development will be provided via two (2) proposed driveways along a new frontage road to be constructed parallel to the SH 288 northbound entrance ramp and three (3) along SH 6, the proposed Manvel Pkwy connection to SH 6, and existing Iowa Ln. Internal intersections within the development will also be analyzed in this study. An assumed speed of 45 mph was used along the proposed frontage road, based on conditions observed at the intersection of SH 288 frontage road and Broadway St located approximately five (5) miles north of the proposed development. This TIA also analyzes existing major intersections along SH 288, Del Bello Blvd and SH 6. In total, twenty (20) intersections were analyzed, existing and proposed.

Only the weekday AM and PM peak hour periods were analyzed in this TIA. The overall proposed development is expected to externally generate 52,027 daily vehicle trips with 2,274 vehicle trips during the AM peak hour period and 4,691 vehicle trips during the PM peak hour period.

An average annualized growth rate of five (5) percent was calculated by comparing the 2020 traffic volumes to the projected 2045 traffic volumes in the Houston-Galveston Area Council (H-GAC) Travel Demand Models. This growth rate was applied to the 2025 traffic volumes in order to determine the future traffic volumes without the proposed development generated traffic (Future No Build conditions). The No Build conditions will also include the background volume data from the Valencia Development and the City Center for Manvel project. The traffic that would be generated by this proposed development was then added to the No Build conditions to establish the future 2030 Build conditions.

Intersection Capacity Analyses were completed for major intersections within the study area. Mitigation measures for this TIA require that when the LOS without development is LOS A, B, C or D, the minimum acceptable projected LOS shall be LOS D, and when the LOS without development is LOS E or F, the minimum acceptable projected LOS shall be equal to the LOS without development.

Right and left turn lane analyses were completed along Del Bello Blvd, SH 6, and Manvel Pkwy at the proposed driveways, using the Texas Department of Transportation (TxDOT) Access Management Manual and National Cooperative Highway Research Program (NCHRP) 457 requirements for right and left turn deceleration lanes. Based on the analysis, various right and left turn lanes warrant along the driveways of SH 288 northbound frontage road, Del Bello Blvd, Manvel Pkwy, and SH 6.

A Traffic Signal Warrant Analysis (TSWA) was completed for the intersections of SH 6 at Iowa Lane and Manvel Pkwy at Charlotte St under Future Build conditions. Under Future Build conditions, the 8-hour and 4-hour warrant are met at all intersections. A TSWA was also completed for the intersections of Del Bello Blvd at Manvel Pkwy and SH 288 ramps at Rodeo Palms/Del Bello Blvd for the No Build conditions. Under No Build conditions the 8-hour and 4-hour warrant are met at all intersections.

Recommendations

The improvements that will be required to successfully accommodate the traffic that will be generated by the proposed **Presidio development** are listed below:

Please Be Advised: The City Center Development was included in this TIA as background traffic data at the city's request. Based on the analysis, three intersections are expected to operate at failing conditions under No-Build conditions due to background data. It is our understanding that, since the city requested this information to be included as background, the City Center Development is expected to occur prior to the proposed development. Since these issues are expected to occur before the Presidio development, the Presidio developer is not responsible for constructing these signals at these locations, however they are included in the analysis. Based on the traffic analysis these are the three intersections:

- SH 288 SB exit ramp and Rodeo Palms Pkwy
- SH 288 NB exit ramp and Del Bello Blvd
- Del Bello Blvd and Manvel Pkwy

Please Note: When the second lane of Manvel Pkwy is constructed by the Del Bello MUD, the left and right turn lanes need to be reanalyzed by the City Center Development as part of the City Center analysis at Del Bello Blvd and Manvel Pkwy.

The developer is responsible for the improvements shown below:

- **SH 6 and Pollard Blvd:**
  - Update signal timings (Done by TxDOT)
- **SH 6 and Iowa Ln:**

  The following three (3) mitigation measures for this intersection are required due to traffic generated by Tracts K and L, which create the need for a signal; these improvements should be implemented once Tracts K and L are fully constructed by the year 2030.

  - Construct a signal at this intersection.
  - Construct a southbound left turn lane along Iowa Ln that consists of 335' of storage length and a 100-foot taper.
  - Construct a westbound right turn lane along SH 6 that consists of 250' of storage length, 340' of deceleration length and a 100-foot taper.

  Freeway segments were evaluated using density parameters, and conditions are expected to remain acceptable. However, it is recommended that the posted speed limit along this section of SH 6 be reevaluated due to the addition of multiple new driveways, which increase turning movements and potential conflict points. To improve corridor safety, we recommend based on a review of similar density and corridor conditions within the vicinity of SH 6 and I-69/US 59, where the speed limit is reduced to 45 mph due to increased access points and higher potential for conflicts. Therefore, a lower speed limit would better reflect future conditions and help improve safety for all users.

- **SH 6 and Manvel Pkwy:**
    - Update signal modification due to the connection of Manvel Pkwy, e.g. new signal design, optimization of new signal turn types, addition of signal heads for the southbound approach, removal and reconstruction of the existing median and shoulder along the westbound approach.
    - Restripe the existing eastbound only U-turn lane to left turn lane.
    - Construct 2 dual southbound left turn lanes.
    - Construct a westbound right turn lane along SH 6 that consists of 430' of storage length, 340' of deceleration length and a 100-foot taper.

      Freeway segments were evaluated using density parameters, and conditions are expected to remain acceptable. However, it is recommended that the posted speed limit along this section of SH 6 be reevaluated due to the addition of multiple new driveways, which increase turning movements and potential conflict points. To improve corridor safety, we recommend based on a review of similar density and corridor conditions within the vicinity of SH 6 and I-69/US 59, where the speed limit is reduced to 45 mph due to increased access points and higher potential for conflicts. Therefore, a lower speed limit would better reflect future conditions and help improve safety for all users.

- **Manvel Pkwy and Driveway 1:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 110' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound right turn lane along Manvel Pkwy that consists of 190' of storage length (95th Queue), and a 100-foot taper.
    - Construct an eastbound right turn lane along Driveway 1 that consists of 265' of storage length (95th Queue), and a 100-foot taper.

- **Manvel Pkwy and Charlotte St:**
    - Construct a signal at this intersection.
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a northbound right turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct an eastbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a westbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper.

- **Manvel Pkwy and Driveway 2:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

      Please Note: Driveway 2 will be a 3-lane roadway with one lane in each direction and a center two-way left turn lane (TWLTL).

- **Driveway 2 and Driveway 3:**
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct a westbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

      Please Note: Driveway 2 will be a 3-lane roadway with one lane in each direction and a center two-way left turn lane (TWLTL).

- **Driveways 1 & 3 and Charlotte St**
    - Construct a northbound left turn lane along Driveway 1 that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct a southbound left turn lane along Driveway 3 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

- **SH 288 NB Frontage Road and Charlotte St:**
    - Construct a northbound right turn lane along SH 288 northbound frontage road that consists of 120' storage length (95th Queue), 340' of deceleration length and a 100-foot taper.

- **SH 288 NB Frontage Road and Driveway 2:**
    - Construct a northbound right turn lane along SH 288 northbound frontage road that consists of 230' storage length (95th Queue), 340' of deceleration length and a 100-foot taper.

- **SH 288 NB Frontage Road and SH 6:**
    - Update signal timings (Done by TxDOT).

- **SH 288 SB Exit Ramp and SH 6:**
    - Update signal timings (Done by TxDOT).

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Introduction

This report presents the summary of findings for the Traffic Impact Analysis (TIA) prepared by LJA Engineering, Inc. (LJA) for the proposed Presidio development in Manvel, Texas. This development consists of a shopping center, multifamily housing, medical hospital, and single-family housing. The site for this development is located approximately 0.65 miles south of Del Bello Blvd and directly east of the intersection of SH 288 NB Entrance Ramp and SH 6. The analyzed development is expected to be completed by 2030. The objective of this study is to analyze the impacts of the traffic generated by the proposed development on the performance of the surrounding street network and to determine the required mitigation measures to address any resulting deficiencies. **Figure 1** shows the vicinity map and the existing street network within the study area. **Appendix A** provides a preliminary site plan of the proposed development.

Existing Area Conditions

The study area for this TIA includes the street network located within one mile from the proposed development's access points. Existing lane configurations are presented in **Figure 2.**

Table 1: Roadway Conditions

Street Name	Functional Class	Existing Roadway Cross Section	Posted Speed (MPH)
SH 6	Arterial	6-lane divided	60
Iowa Ln	Collector	2-lane undivided	30
Pollard Blvd	Collector	4-lane divided	30
Del Bello Blvd	Collector	4-lane divided	35
Rodeo Palms Pkwy	Collector	4-lane divided	35
SH 288	Arterial	4-lane divided	55

13-hour traffic volume data was collected on August 26, 2025. 13-hour volumes were used to determine the AM and PM peak periods of traffic. Pedestrian volumes were determined to be low and were not considered in this study. **Figure 3** shows the existing traffic volumes which were collected within the study area. Collected traffic volumes are presented in **Appendix B**.

Proposed Area Conditions

Access to this development will be provided via two proposed driveways along a new frontage road to be constructed parallel to the SH 288 northbound entrance ramp and three along SH 6, the proposed Manvel Pkwy connection to SH 6, and existing Iowa Ln. Internal intersections within the development will also be analyzed in this study. An assumed speed of 45 mph was used along the proposed frontage road, based on conditions observed at the intersection of SH 288 frontage road and Broadway St located approximately 5 miles north of the proposed development. This TIA also analyzes existing major intersections along SH 288, Del Bello Blvd and SH 6. In total, twenty (20) intersections were analyzed, existing and proposed.

Table 2: Intersection Distance			
Intersection	**Reference Point**	**Distance (ft)**	**Direction / Note**
Driveway 1	Build Exhibit (Bubble #4)	500 ft	North of SH 6 & Manvel Pkwy
Driveway 2	Build Exhibit (Bubble #5)	560 ft	North of Driveway 1
Driveway 3	Build Exhibit (Bubble #6)	700 ft	North of Charlotte St
Driveway 4	Build Exhibit (Bubble #9)	1250 ft	West of Driveway 2 and Manvel Pkwy
Driveway 5	Build Exhibit (Bubble #10)	1300 ft	West of the intersection of Charlotte St and Manvel Pkwy
Driveway 6	Build Exhibit (Bubble #11)	1820 ft	West of the intersection of Charlotte St and Manvel Pkwy
Driveway 7	Build Exhibit (Bubble #12)	1600 ft	West of the intersection of Driveway 2 and Manvel Pkwy
Driveway 8	Build Exhibit (Bubble #17)	1000 ft	West of Intersection of SH 6 and Manvel Pkwy
Driveway 9	Build Exhibit (Bubble #18)	1060 ft	West of Intersection of Driveway 1 and Manvel Pkwy
Driveway 10	Build Exhibit (Bubble #19)	1310 ft	East of SH 6 and Manvel Pkwy
Driveway 11	Build Exhibit (Bubble #20)	2050 ft	East of SH 6 and Manvel Pkwy

Within the area two (2) projects were considered for background traffic, the Valencia Development and the proposed City Center for Manvel project. The Valencia Development report created by LJA engineering is currently under construction and consists of residential development which will connect to Del Bello Blvd. Therefore, the trip generated volumes for the Valencia Development were included in the No Build and Build conditions. The proposed City Center for Manvel project report was created by Voigt Associates, however the site plan analyzed has changed. With the new site plan that was provided by the City of Manvel, an updated trip generation was established and distributed based on the same distribution on the report. The newly generated trips that were calculated were then used as background traffic volumes and included in the No Build and Build conditions. Furthermore, it is our understanding that, since the city requested this information to be included as background, the City Center Development is expected to occur prior to the proposed development. Since the City Center Development is expected to occur before the proposed Presidio development, the developer is not responsible for constructing these signals at the locations of SH 288 southbound exit ramp at Rodeo Palms Pkwy, SH 288 northbound exit ramp at Del Bello Blvd, and Del Bello Blvd at Manvel Pkwy. Additionally, the recommendations for each project were incorporated into this study for both the No Build and Build Conditions. The combined trips from the Valencia Development and City Center for Manvel project are shown in **Figure 4.**

VICINITY MAP
MANVEL, TEXAS

CROIX ROAD

PROJECT LOCATION

DEL BELLO BLVD

SH 288

SH 6

RODEO PALMS PKWY

STOP

DEL BELLO BLVD

MANVEL PKWY

DOGWOOD AVE

PROPOSED DEVELOPMENT

SH 288 NB

SH 6

CHARLOTTE STREET

SH 288 SB

SH 6

POLLARD BLVD

N

NOT TO SCALE

LEGEND

PROPOSED DEVELOPMENT

STOP CONTROLLED INTERSECTION

SIGNALIZED INTERSECTION

$$$$$$SYSTIME$$$$$$ $DATE$
$$$$$$DONOTSPECIFICATION$$$$$$

PRESIDIO TIA

FIGURE 1

STUDY AREA CONDITIONS

LJA Engineering, Inc.
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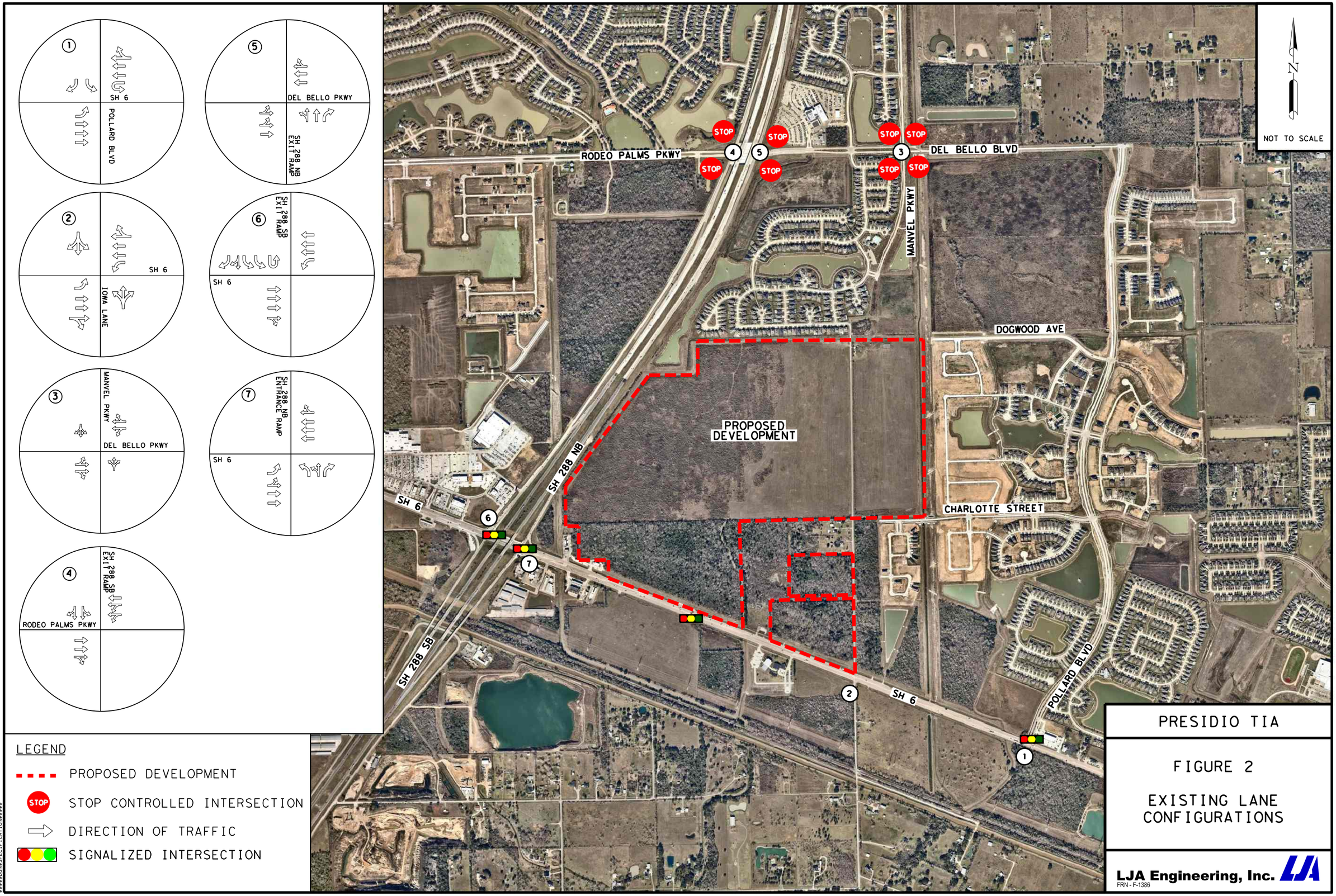


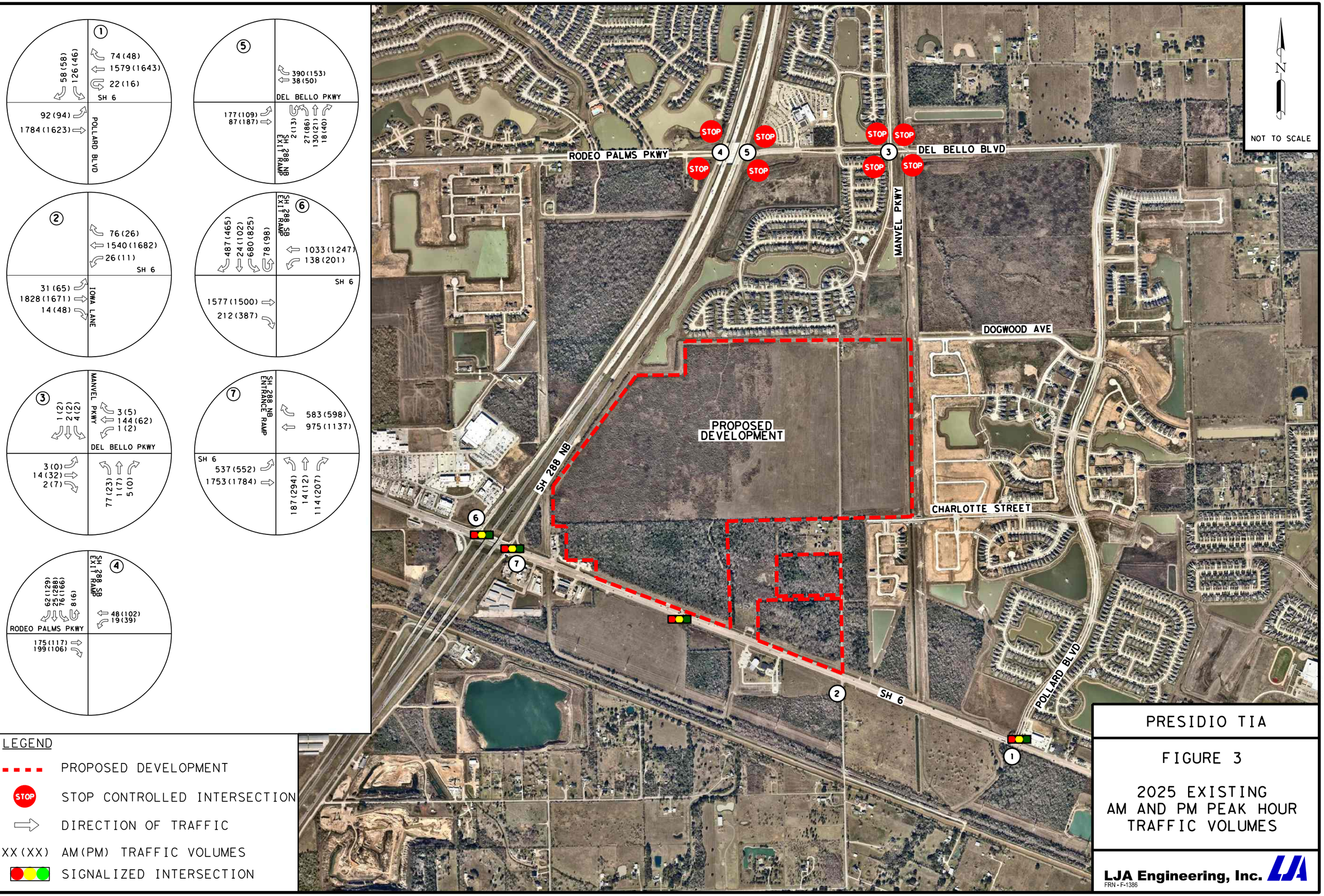
PRESIDIO TIA

FIGURE 2

EXISTING LANE CONFIGURATIONS

LJA Engineering, Inc.
FRN - F-1386

$$$$$$SYSTIME$$$$$$ $DATE$
$$$$$$DONOTSPECIFICATION$$$$$$



LEGEND

- PROPOSED DEVELOPMENT
- STOP — STOP CONTROLLED INTERSECTION
- DIRECTION OF TRAFFIC
- XX (XX) — AM (PM) TRAFFIC VOLUMES
- SIGNALIZED INTERSECTION

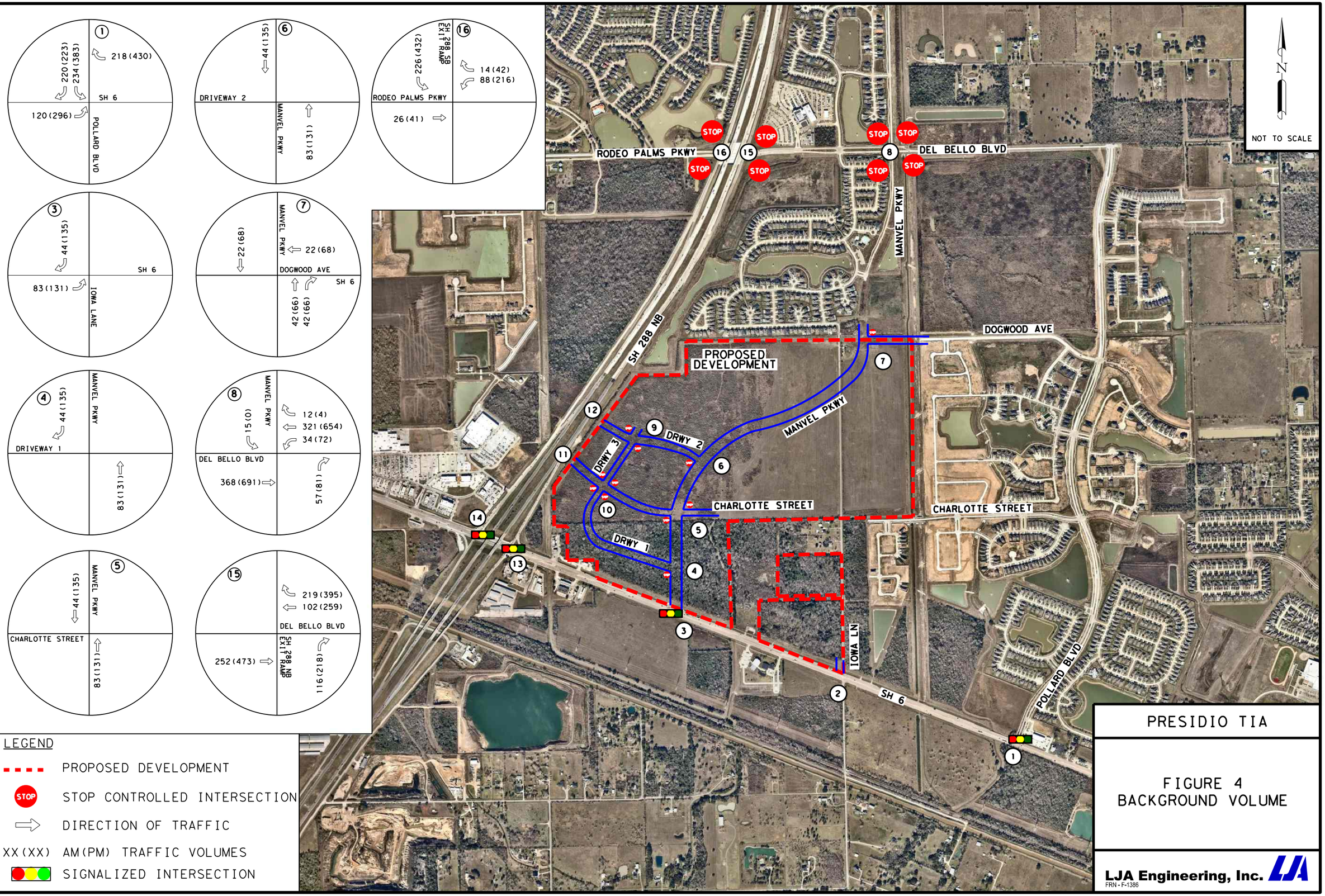
PRESIDIO TIA

FIGURE 3

2025 EXISTING
AM AND PM PEAK HOUR
TRAFFIC VOLUMES

LJA Engineering, Inc.
FRN - F-1386

$$$$$$SYSTIME$$$$$ $DATE$
$$$$$$DONOTSPECIFICATION$$$$$$



LEGEND

- PROPOSED DEVELOPMENT
- STOP CONTROLLED INTERSECTION
- DIRECTION OF TRAFFIC
- XX (XX) AM (PM) TRAFFIC VOLUMES
- SIGNALIZED INTERSECTION

PRESIDIO TIA

FIGURE 4
BACKGROUND VOLUME

LJA Engineering, Inc.
FRN - F-1386

$$$$$$SYSTIME$$$$$ $DATE$
$$$$$DON$SPECIFICATION$$$$$

Methodology

In order to evaluate the traffic impacts of the proposed development on the surrounding street network, future traffic conditions were analyzed without (No Build) and with (Build) the development's generated traffic. After the future Build conditions were analyzed, mitigation measures were established in order to address any resulting deficiencies in the performance of the surrounding street network. The AM and PM peak hours were analyzed at the proposed intersections for each of the Existing, No Build, Build and Mitigation conditions. A total of ten (10) conditions were analyzed for this study:

- 2025 Existing AM Conditions
- 2025 Existing PM Conditions
- 2030 No Build AM Conditions
- 2030 No Build PM Conditions
- 2030 Build AM Conditions
- 2030 Build PM Conditions
- 2030 Mitigation AM Conditions
- 2030 Mitigation PM Conditions
- 2030 Horizon AM Conditions
- 2030 Horizon PM Conditions

Trip Growth

An average annualized growth rate of five (5) percent was calculated from the Houston-Galveston Area Council (H-GAC) traffic projection modules. The growth rate was applied to the 2025 traffic volumes in order to determine the future traffic volumes without the proposed development generated traffic (2030 No Build conditions). Background traffic was then added to the 2030 No Build conditions. The traffic that would be generated by this proposed development was then added to the 2030 No Build conditions to establish the future 2030 Build conditions. **Figure 5** shows the future No Build traffic volumes for the year 2030.

Trip Generation

The amount of traffic a proposed development will generate depends on a number of factors including the nature, size, and location of the proposed development. The Trip Generation Manual, 12th Edition which is published by the Institute of Transportation Engineers (ITE) is a compilation of trip generation studies that have been performed at various sites throughout the United States. Standard engineering practice dictates the use of this manual to determine the amount of entering and exiting traffic a proposed development will generate during the peak hours of traffic by using rates or equations provided in the manual for various types of developments. **Table 3** shows the amount of traffic which will be generated by this proposed development. Trip generation calculations are presented in **Appendix C**.

Table 3: Vehicle Trips Generated by the Proposed Development

Land Use	ITE	Daily Trips (vpd)			AM Peak Trips (vph)			PM Peak Trips (vph)		
	Code	In	Out	Total	In	Out	Total	In	Out	Total
Shopping Center (>150K)	820	15939	15939	31878	478	293	771	1399	1457	2856
Multi-Family Housing (Low Rise)	220	1056	1055	2111	33	106	139	110	67	177
Hospital + Bed Tower	610	2942	2942	5885	295	140	434	161	312	473
Surgery	610	535	535	1070	54	25	79	29	57	86
HAL	630	3760	3760	7520	446	104	550	213	521	734
Single Family Detached Housing	210	1782	1781	3563	74	200	274	226	139	365
Total		**26,014**	**26,012**	**52,027**	**1,380**	**868**	**2,247**	**2,138**	**2,553**	**4,691**

The overall proposed development is expected to generate 52,027 daily vehicle trips with 2,247 vehicle trips during the AM peak hour period and 4,691 vehicle trips during the PM peak hour period.

Trip Distribution and Assignment

Peak hour trips generated by the proposed development were distributed to the entrances and exits of the surrounding roadway network based on the expected traffic patterns within the study area. Generated traffic volumes were assigned to the study street network according to the routes that provide the shortest travel distance to their corresponding origins/destinations. Trip distribution and assignment percentages are shown in **Figure 6**. Generated vehicle trips are presented in **Figure 7**. Generated vehicle trips were then added to the No-Build traffic to determine the Build traffic volumes. **Figure 8** shows the total traffic volumes which are projected within the study area following the completion of this development (Build conditions).

Internal Capture

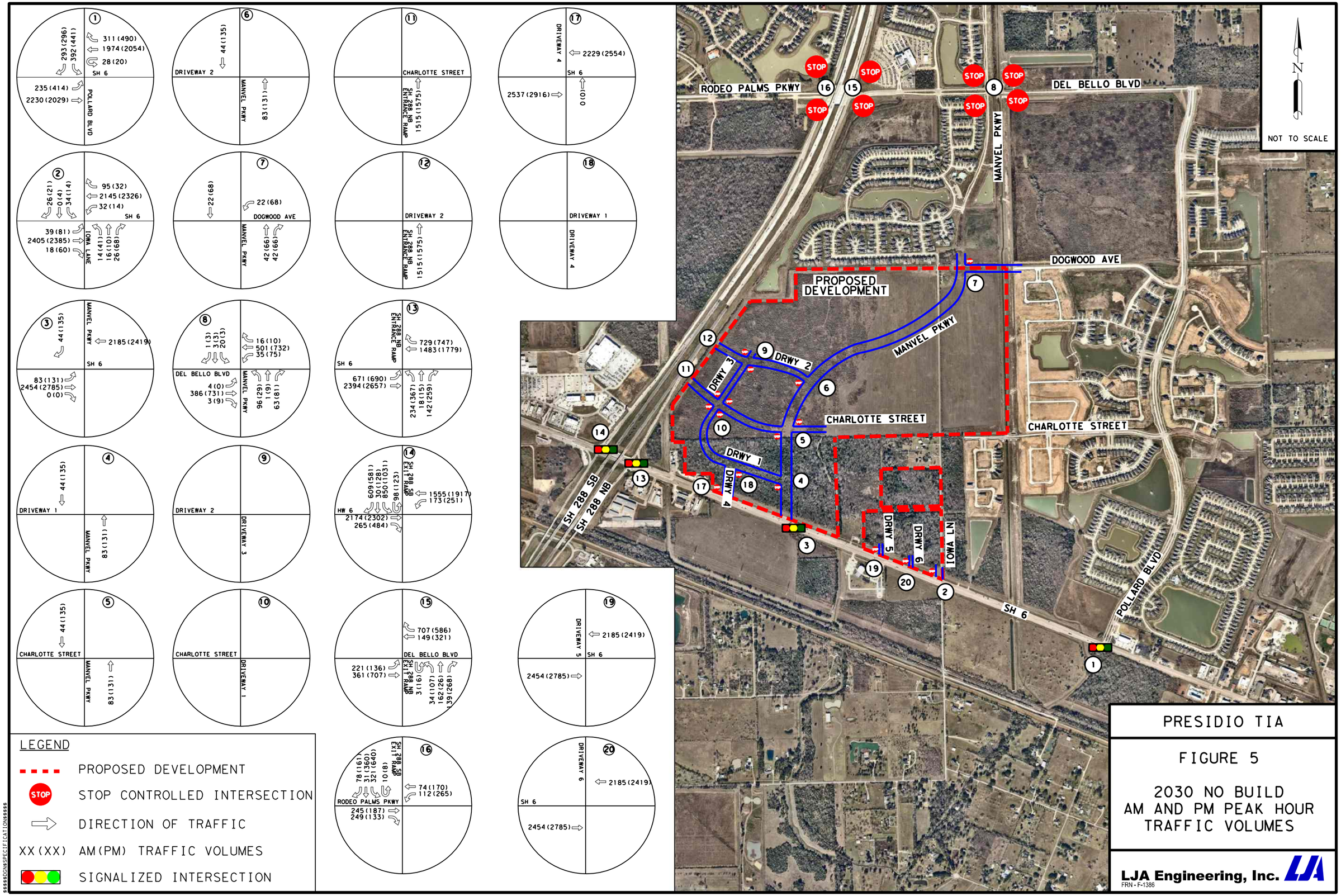
Internal Capture only applies to certain types of developments. These types of developments are presented in the Trip Generation Manual 12th Edition, which is published by the Institute of Transportation Engineers (ITE). Internal capture was not applied to the proposed development.

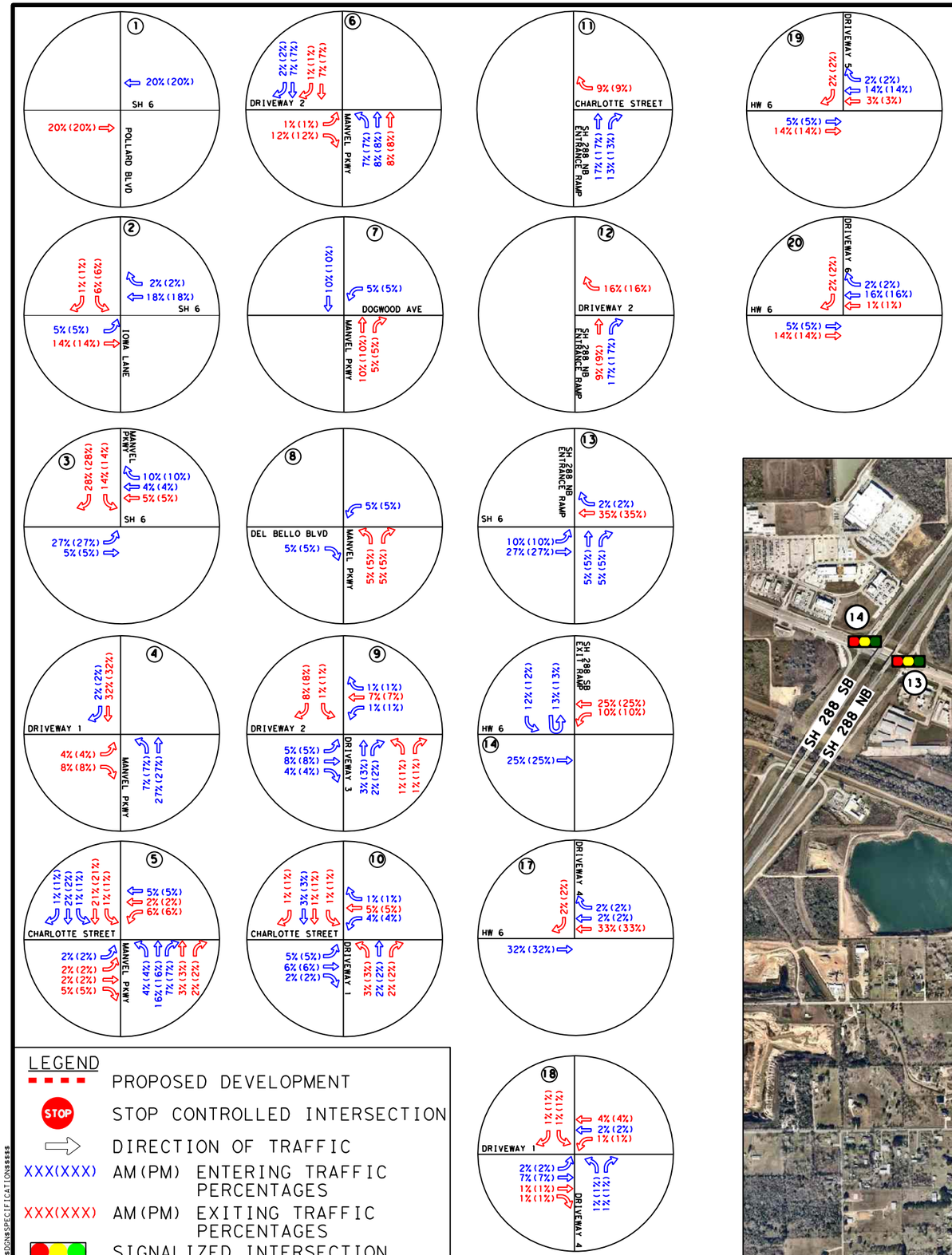
Pass-by Reduction

The total external trips of the generated traffic may be reduced by a Pass-by Reduction factor to account for the projected traffic that is already traveling along the roadways adjacent to the proposed development. Pass-by Reduction methodologies are established by the Institute of Transportation Engineers (ITE) and only apply to certain types of development. Pass-by reduction does not apply to this type of development and was not considered in this analysis.

Modal Split

This study assumed that all existing private vehicular trips would continue to be made as private vehicular trips. In order to be conservative in the determination of the development impacts on the adjacent street network, no credit was taken for mass transit and carpooling.


1
311 (490)
1974 (2054)
28 (20)
SH 6
293 (296)
392 (441)
235 (414)
2230 (2029)
POLLARD BLVD
2
95 (32)
2145 (2326)
32 (14)
SH 6
26 (21)
0 (4)
34 (14)
39 (81)
2405 (2385)
18 (60)
IOWA LANE
14 (41)
16 (10)
26 (68)
3
44 (135)
2185 (2419)
MANVEL PKWY
SH 6
83 (131)
2454 (2785)
0 (0)
4
44 (135)
DRIVEWAY 1
MANVEL PKWY
83 (131)
5
44 (135)
CHARLOTTE STREET
MANVEL PKWY
83 (131)
6
44 (135)
DRIVEWAY 2
MANVEL PKWY
83 (131)
7
22 (68)
DOGWOOD AVE
22 (68)
MANVEL PKWY
42 (66)
42 (66)
8
1 (3)
3 (3)
20 (13)
DEL BELLO BLVD
16 (10)
501 (732)
35 (75)
MANVEL PKWY
4 (0)
386 (731)
3 (9)
96 (29)
1 (9)
63 (81)
9
DRIVEWAY 2
DRIVEWAY 3
10
CHARLOTTE STREET
DRIVEWAY 1
11
CHARLOTTE STREET
SH 288 NB EXIT RAMP
1515 (1575)
12
DRIVEWAY 2
SH 288 NB ENTRANCE RAMP
1515 (1575)
13
SH 288 NB ENTRANCE RAMP
729 (747)
1483 (1779)
SH 6
671 (690)
2394 (2657)
234 (367)
18 (15)
142 (259)
14
SH 288 SB EXIT RAMP
1555 (1917)
173 (251)
609 (581)
351 (283)
850 (1031)
98 (123)
HW 6
2174 (2302)
265 (484)
15
707 (586)
149 (321)
DEL BELLO BLVD
SH 288 NB EXIT RAMP
221 (136)
361 (707)
3 (16)
34 (107)
162 (26)
139 (268)
16
SH 288 SB EXIT RAMP
78 (161)
31 (360)
321 (640)
10 (8)
74 (170)
112 (265)
RODEO PALMS PKWY
245 (187)
249 (133)
17
DRIVEWAY 4
2229 (2554)
SH 6
2537 (2916)
0 (0)
18
DRIVEWAY 1
DRIVEWAY 4
19
DRIVEWAY 5
2185 (2419)
SH 6
2454 (2785)
20
DRIVEWAY 6
2185 (2419)
SH 6
2454 (2785)
LEGEND
PROPOSED DEVELOPMENT
STOP CONTROLLED INTERSECTION
DIRECTION OF TRAFFIC
XX (XX) AM (PM) TRAFFIC VOLUMES
SIGNALIZED INTERSECTION
STOP
RODEO PALMS PKWY
DEL BELLO BLVD
MANVEL PKWY
DOGWOOD AVE
PROPOSED DEVELOPMENT
CHARLOTTE STREET
CHARLOTTE STREET
DRWY 1
DRWY 2
DRWY 3
DRWY 4
DRWY 5
DRWY 6
IOWA LN
SH 288 SB
SH 288 NB
SH 6
POLLARD BLVD
NOT TO SCALE
PRESIDIO TIA
FIGURE 5
2030 NO BUILD
AM AND PM PEAK HOUR
TRAFFIC VOLUMES
LJA Engineering, Inc.
FRN - F-1386
$$$$$$SYSTIME$$$$$$ $DATE$
$$$$$$DGNSPECIFICATION$$$$$$



PRESIDIO TIA

FIGURE 6

2030 GENERATED AM AND PM TRAFFIC PERCENTAGES

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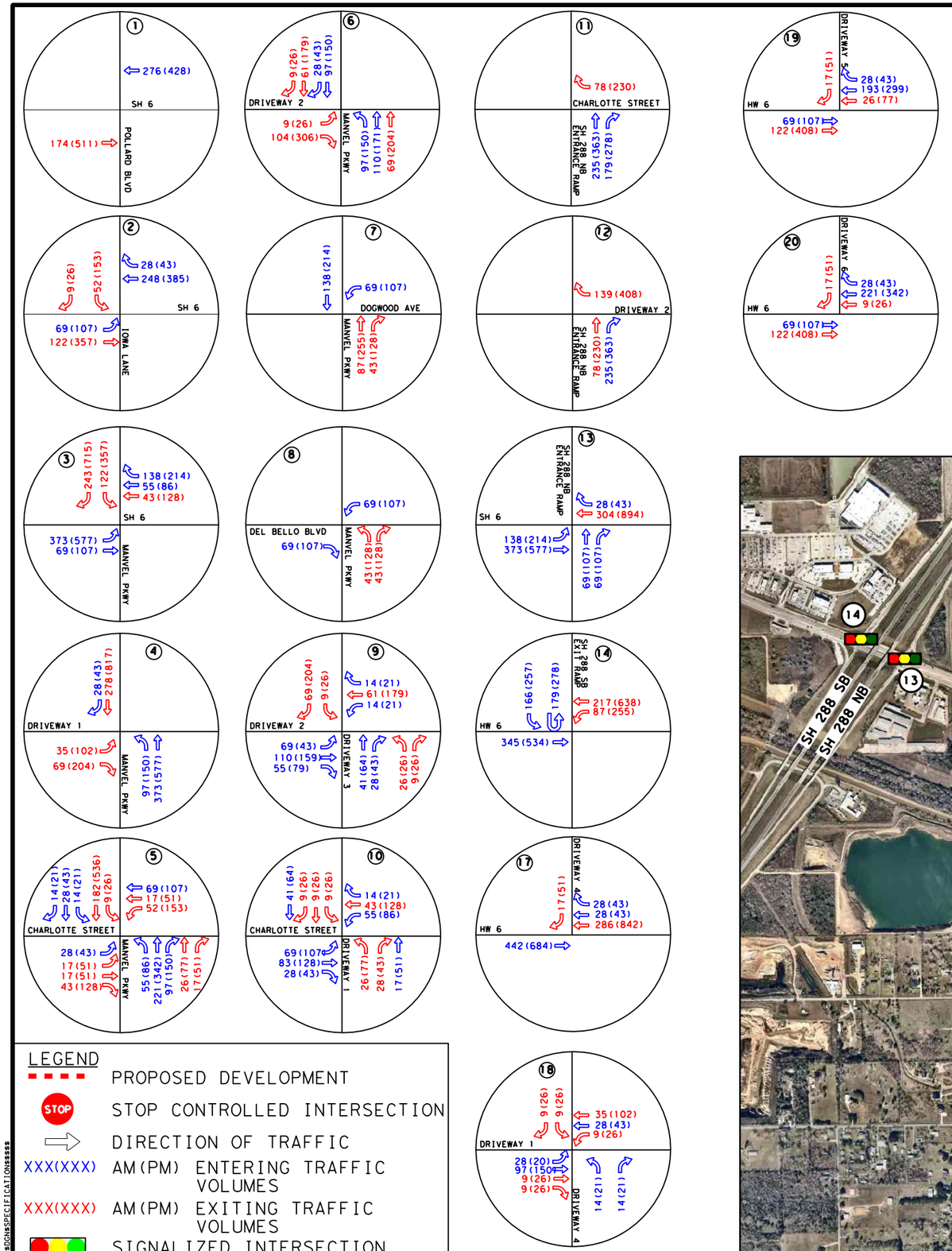

$$$$$SYSTIME$$$$$ $DATE$
$$$$$DGNSPECIFICATIONS$$$$$

PRESIDIO TIA

FIGURE 7

2030 GENERATED AM AND PM TRAFFIC VOLUMES

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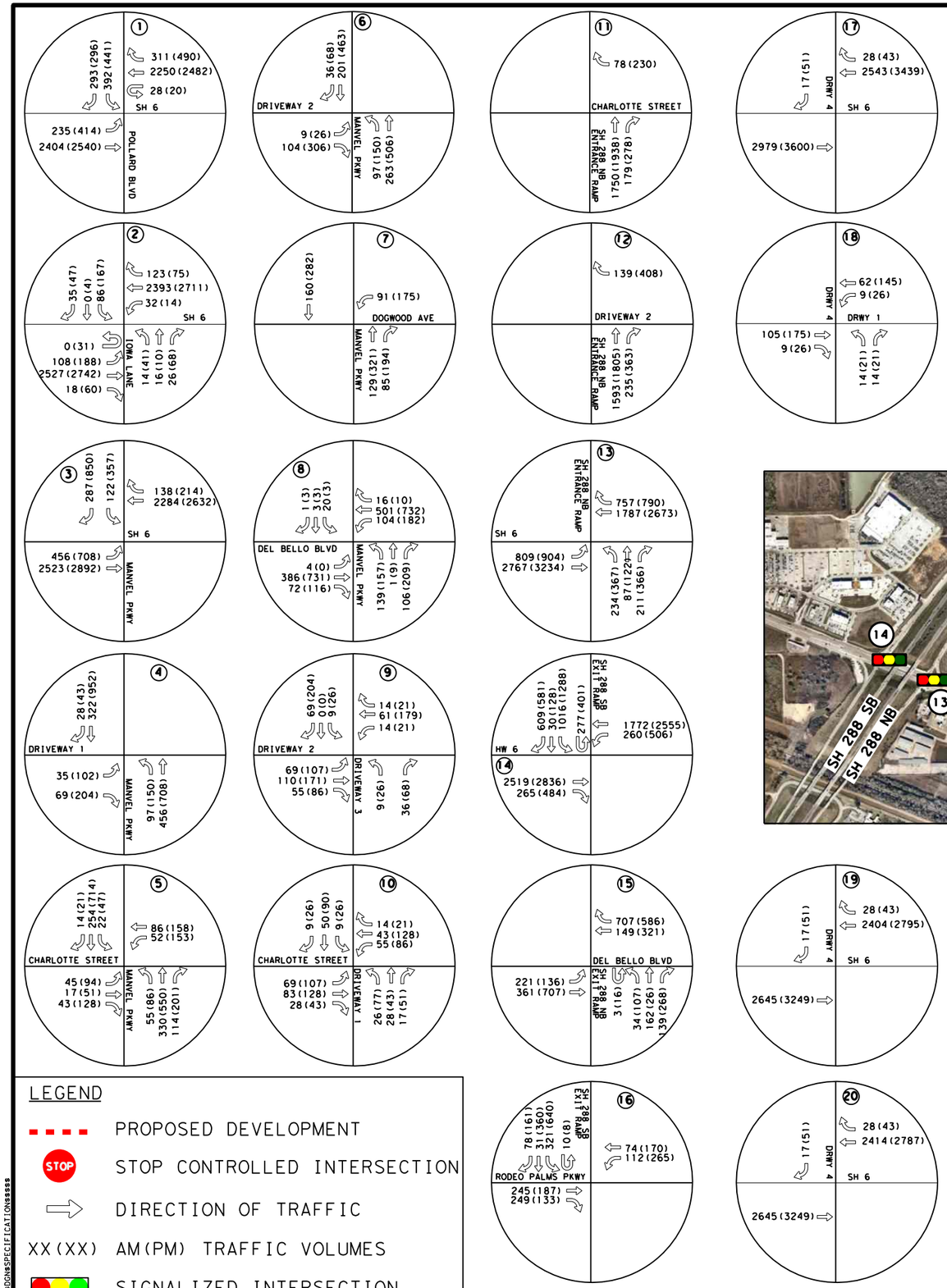

$$$$$$SYSTIME$$$$$$ $$DATE$$
$$$$$$DGNSPECIFICATION$$$$$$

PRESIDIO TIA

FIGURE 8

2030 BUILD
AM AND PM
TRAFFIC VOLUMES

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Intersection Capacity Analysis

The Highway Capacity Manual, 7th Edition (HCM) provides procedures which are used to evaluate the operations of all types of transportation facilities, including both signalized and unsignalized intersections. For intersections that cannot be evaluated with HCM 7th edition methodologies, HCM 2000 was utilized. These procedures require the input of the intersection geometrics, operational characteristics, as well as the traffic volumes in order to determine the maximum capacity the intersection can handle and to calculate the amount of average delay a driver will experience as they travel through the intersection. Following these procedures, a Level of Service (LOS) is given to each of the controlled movements at an intersection which is based on the average amount of control delay drivers experience traveling through the intersection. Control delay is the delay experienced by drivers due to the presence of a traffic control device (e.g. a stop sign, a yield sign, or a traffic signal) and includes the time associated with drivers slowing down as they approach the intersection, the delay associated in traveling through the intersection in the desired direction, as well as the time it takes drivers to accelerate back to their desired speed. There are six Levels of Service which can be assigned to a controlled movement at an intersection (A through F). Generally, a LOS C or better is considered acceptable. LOS E represents a condition where the demand volume is approaching the maximum capacity for a particular movement or the intersection in general, and a LOS F represents a condition where the demand volume exceeds the capacity.

For signalized intersections and all-way stop controlled intersections, a LOS is calculated for each of the lane groups at the intersection and an overall LOS is also calculated by aggregating the delays at the intersection weighted by the traffic volumes. For one-way and two-way stop-controlled intersections, an overall LOS is not defined, and a LOS is only calculated for the movements which are controlled with a stop sign, a yield sign, or left turning traffic which must yield to the opposing conflicting traffic at the intersection. **Table 4** shows the criteria for each of the levels of service as listed in the HCM for both signalized and unsignalized intersections.

Table 4: Level of Service Criteria for Intersections and Intersection Lane Groups

Level of Service	Average Amount of Control Delay (sec/veh)	
	Unsignalized Intersections	Signalized Intersections
A	0 – 10	0 – 10
B	>10 – 15	>10 – 20
C	>15 – 25	>20 – 35
D	>25 – 35	>35 – 55
E	>35 – 50	>55 – 80
F	> 50	> 80

Synchro 12 software was utilized to complete the analysis. Signalized intersections use optimized signal timings values under the assumption that the intersection is already at its optimized capacity prior to the construction of the proposed development.

Capacity Analysis results are presented in the following sub-sections of the report. Complete Capacity Analyses output files are presented in **Appendix D.**

The intersection capacity analysis for the existing roadway network indicates that the Existing conditions generally operates at acceptable levels of service, with most intersections functioning efficiently except for SH 6 & Iowa Ln, which currently experience high delays and LOS F during the peak hour. Under the No-

Build condition (2030), the overall network is projected to operate at LOS F, primarily due to increased background traffic volumes associated with regional growth and no roadway improvements. Several intersections, particularly SH 6 & Iowa Ln, Pollard Blvd & SH 6, and SH 288 northbound frontage roads & SH 6 are expected to continue operating at failing levels of service, reflecting the growth in the area. Under the Build condition (2030), the analysis shows substantial increases in delay and worsening levels of service (LOS E/F) across multiple intersections along SH 6, SH 288 ramps, and the proposed driveways. However, with the implementation of mitigation measures, the overall intersections at the proposed driveways are expected to operate at acceptable levels of service. The only exceptions remain at SH 6 & Iowa Ln and SH 6 & Manvel Pkwy, which are projected to continue experiencing high delays and failing levels of service even after implementation of mitigation measures shown in **Table 5 and 6.**

After applying the 5-year horizon from the build/mitigation year, the analysis indicates that all proposed site driveways are expected to continue operating at acceptable levels of service. However, some intersections are projected to experience increased delay during the 5-year horizon period, including the intersections of SH 6 & Pollard Blvd, SH 6 & Iowa Lane, SH 6 & Manvel Pkwy, SH 288 northbound frontage road & SH 6, and SH 288 southbound exit ramp & SH 6. To maintain acceptable operations, updating signal timing may be required at these locations as traffic volumes increase over time.

Table 5 : Intersection Capacity Analysis Summary (AM)

Intersection	Northbound		Southbound		Eastbound		Westbound		Overall	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Existing Conditions (2025)										
Pollard Blvd & SH 6	-	-	17.2	B	18	B	20.7	C	19.5	B
SH 6 & Iowa Ln	>500	F	>500	F	0.5	A	0.7	A	-	-
SH 6 & Manvel Pkwy	0	A	0	A	0	A	0	A	0	A
Del Bello Blvd & Manvel Pkwy	8.1	A	7.5	A	7.7	A	8	A	8	A
SH 288 NB Entrance Ramp & SH 6	37.9	D	0	A	17.7	B	39.6	D	27.4	C
SH 288 SB Exit Ramp & SH 6	0	A	22.3	C	32	C	5	A	21.6	C
SH 288 NB Exit Ramp & Del Bello Blvd	9.6	A	-	-	9.8/	A	8.3	A	9	A
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	-	-	9	A	7.2	A	7.9	A	7.8	A
No Build Year (2030)										
Pollard Blvd & SH 6	-	-	29.5	C	73.3	E	108.7	F	82.8	F
SH 6 & Iowa Ln	>500	F	>500	F	1.6	A	1.8	A	-	-
SH 6 & Manvel Pkwy	0	A	0	A	0.1	A	0.1	A	0.1	A
Del Bello Blvd & Manvel Pkwy	11.7	B	10.2	B	11.9	B	13.7	B	12.7	B
SH 288 NB Entrance Ramp & SH 6	38.4	D	0	A	21.1	C	182.4	F	85.3	F
SH 288 SB Exit Ramp & SH 6	0	A	25.1	C	116.6	F	4.8	A	58.3	E
SH 288 NB Exit Ramp & Del Bello Blvd	12.9	B	-	-	14.9	B	76.5	F	44.3	E
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	-	-	21.5	C	10.6	B	11.1	B	14.9	B
Build Out Year (2030)										
Pollard Blvd & SH 6	-	-	29.5	C	97.5	F	171.8	F	122.2	F
SH 6 & Iowa Ln	>500	F	>500	F	30.1	D	2.2	A	-	-
SH 6 & Manvel Pkwy	0	A	28	C	40.2	D	192.8	F	102.9	F
Manvel Pkwy & Driveway 1	2	A	0	A	14.4	B	-	-	-	-
Charlotte St & Manvel Pkwy	1.1	A	0.8	A	23	C	36.8	E	-	-
Manvel Pkwy & Driveway 2	2.5	A	0	A	10.2	B	-	-	-	-
Manvel Pkwy & Dogwood Ave	0	A	0	A	-	-	11.1	B	-	-
Del Bello Blvd & Manvel Pkwy	13.3	B	11.8	B	14.8	B	19.6	C	16.7	C
Driveway 2 & Driveway 3	12	B	9.6	A	2.2	A	1.2	A	-	-
Driveway 1/Driveway 3 & Charlotte St	13.4	B	13.6	B	2.9	A	3.7	A	-	-
SH 288 NB Frontage Road & Charlotte St	0	A	-	-	-	-	30.5	D	-	-
SH 288 NB Frontage Road & Driveway 2	0	A	-	-	-	-	41.1	E	-	-
SH 288 NB Entrance Ramp & SH 6	40.7	D	0	A	72.5	E	275	F	147.4	F
SH 288 SB Exit Ramp & SH 6	0	A	29	C	190.5	F	22.7	C	96.5	F
SH 288 NB Exit Ramp & Del Bello Blvd	12.9	B	0	A	14.9	B	76.5	F	44.3	E
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	-	-	21.5	C	10.6	B	11.1	B	14.9	B
SH 6 & Driveway 4	-	-	43.4	E	0	A	0	A	-	-
Driveway 1 & Driveway 4	9.4	A	-	-	0	A	0.9	A	-	-
SH 6 & Driveway 5	-	-	38.4	E	0	A	0	A	-	-
SH 6 & Driveway 6	-	-	38.8	E	0	A	0	A	-	-
Mitigation (2030)										
Pollard Blvd & SH 6	-	-	80.2	F	37.2	D	54.7	D	49.9	D
SH 6 & Iowa Ln	45.5	D	60.1	E	23.7	C	28	C	26.7	C
SH 6 & Manvel Pkwy	0	A	40.3	D	38.6	D	39.8	D	39.2	D
Manvel Pkwy & Driveway 1	1.5	A	0	A	12.9	B	-	-	-	-
Charlotte St & Manvel Pkwy	7.9	A	9.7	A	20	B	19.7	B	11.2	A
Manvel Pkwy & Driveway 2	2.2	A	0	A	10	A	-	-	-	-
Driveway 2 & Driveway 3	11.9	B	9.6	A	2.2	A	1.2	A	-	-
Driveway 1/Driveway 3 & Charlotte St	12.7	B	13.2	B	2.9	A	3.7	A	-	-
SH 288 NB Frontage Road & Charlotte St	0	A	-	-	-	-	25.4	D	-	-
SH 288 NB Frontage Road & Driveway 2	0	A	-	-	-	-	29.1	D	-	-
SH 288 NB Entrance Ramp & SH 6	100.4	F	0	A	41.8	D	178.3	F	98.7	F
SH 288 SB Exit Ramp & SH 6	0	A	63.2	E	103.7	F	8.6	A	63.5	E

Table 6 : Intersection Capacity Analysis Summary (PM)

Intersection	Northbound		Southbound		Eastbound		Westbound		Overall	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Existing Conditions (2025)										
Pollard Blvd & SH 6	-	-	15.5	B	18.3	B	21.7	C	19.9	B
SH 6 & Iowa Ln	>500	F	>500	F	2.6	A	0.2	A	-	-
SH 6 & Manvel Pkwy	0	A	0	A	0	A	0	A	0	A
Del Bello Blvd & Manvel Pkwy	7.5	A	7.1	A	7.4	A	7.5	A	7.5	A
SH 288 NB Entrance Ramp & SH 6	40.5	D	0	A	18.7	B	50.4	D	33.1	C
SH 288 SB Exit Ramp & SH 6	0	A	30.6	C	32	C	4.5	A	23.2	C
SH 288 NB Exit Ramp & Del Bello Blvd	9.3	A	-	-	8.3	A	6.9	A	8.1	A
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	-	-	14	B	8.9	A	9.5	A	12.1	B
No Build Year (2030)										
Pollard Blvd & SH 6	-	-	36.4	D	182.2	F	169.9	F	158	F
SH 6 & Iowa Ln	>500	F	>500	F	19.4	B	0.5	A	-	-
SH 6 & Manvel Pkwy	0	A	0	A	14.6	B	0.1	A	8	A
Del Bello Blvd & Manvel Pkwy	11.8	B	10.6	B	33.6	D	26.8	D	28.6	D
SH 288 NB Entrance Ramp & SH 6	45.7	D	0	A	50.6	D	246.7	F	126.2	F
SH 288 SB Exit Ramp & SH 6	0	A	52.3	D	170.9	F	5.7	A	86.6	F
SH 288 NB Exit Ramp & Del Bello Blvd	20	C	-	-	35.9	E	90.8	F	56.1	F
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	0	A	303	F	13.9	B	17.2	C	189.8	F
Build Out Year (2030)										
Pollard Blvd & SH 6	-	-	36.4	D	207	F	271.9	F	217.3	F
SH 6 & Iowa Ln	>500	F	>500	F	191.8	F	0.8	A	-	-
SH 6 & Manvel Pkwy	0	A	180.2	F	115.7	F	300.3	F	194.5	F
Manvel Pkwy & Driveway 1	4.5	A	0	A	>500	F	-	-	-	-
Charlotte St & Manvel Pkwy	1.8	A	1.2	A	>500	F	>500	F	-	-
Manvel Pkwy & Driveway 2	3	A	0	A	22.8	C	-	-	-	-
Manvel Pkwy & Dogwood Ave	0	A	0	A	-	-	20	C	-	-
Del Bello Blvd & Manvel Pkwy	19.8	C	13	B	73.7	F	112.8	F	80.8	F
Driveway 2 & Driveway 3	21.4	C	14.3	B	2.3	A	0.8	A	-	-
Driveway 1/Driveway 3 & Charlotte St	43.9	E	27.8	D	3	A	2.9	A	-	-
SH 288 NB Frontage Road & Charlotte St	0	A	-	-	-	-	267.8	F	-	-
SH 288 NB Frontage Road & Driveway 2	0	A	-	-	-	-	>500	F	-	-
SH 288 NB Entrance Ramp & SH 6	72	E	0	A	208	F	495.7	F	312	F
SH 288 SB Exit Ramp & SH 6	0	A	119.3	F	282.9	F	76.3	E	168.4	F
SH 288 NB Exit Ramp & Del Bello Blvd	20	C	0	A	35.9	E	90.8	F	56.1	F
SH 288 SB Exit Ramp & Rodeo Palms Pkwy	-	-	303	F	13.9	B	17.2	C	189.8	F
SH 6 & Driveway 4	-	-	283.7	F	0	A	0	A	-	-
Driveway 1 & Driveway 4	10.7	B	-	-	0	A	1.2	A	-	-
SH 6 & Driveway 5	-	-	96.8	F	0	A	0	A	-	-
SH 6 & Driveway 6	-	-	95.6	F	0	A	0	A	-	-
Mitigation (2030)										
Pollard Blvd & SH 6	-	-	114.7	F	54.3	D	176	F	151.4	F
SH 6 & Iowa Ln	81.6	F	86.1	F	48.7	D	41.2	D	47.2	D
SH 6 & Manvel Pkwy	0	A	127.3	F	60.1	E	130.8	F	96.9	F
Manvel Pkwy & Driveway 1	2.2	A	0	A	207.3	F	-	-	-	-
Charlotte St & Manvel Pkwy	15.9	B	21.3	C	22.6	C	19.5	B	19.1	B
Manvel Pkwy & Driveway 2	2.1	A	0	A	15.9	C	-	-	-	-
Driveway 2 & Driveway 3	21	C	14.1	B	2.3	A	0.8	A	-	-
Driveway 1/Driveway 3 & Charlotte St	27.1	D	22.3	C	3	A	2.9	A	-	-
SH 288 NB Frontage Road & Charlotte St	0	A	-	-	-	-	143.6	F	-	-
SH 288 NB Frontage Road & Driveway 2	0	A	-	-	-	-	402.4	F	-	-
SH 288 NB Entrance Ramp & SH 6	191	F	0	A	152.6	F	318.9	F	224.6	F
SH 288 SB Exit Ramp & SH 6	0	A	115.6	F	270.8	F	62.2	E	157.6	F

Right and Left Turn Lane Analysis

Right and left turn lane analyses were completed along Del Bello Blvd, SH 6, and Manvel Pkwy at the proposed driveways, the Texas Department of Transportation (TxDOT) Access Management Manual and the National Cooperative highway Research Program (NCHRP) 457 requirements for right and left turn deceleration lanes. Based on the analyses, various right and left turn lanes warrant along the driveways of SH 288 northbound frontage road, Del Bello Blvd and Manvel Pkwy. **Appendix E** provides the criteria for a right turn lane. **Appendix F** provides the left turn criteria. The following lanes are recommended.

The improvements that will be required to successfully accommodate the traffic that will be generated by the proposed **Presidio development** are listed below:

- **SH 6 and Iowa Ln:**
    - Construct a signal at this intersection.
    - Construct a southbound left turn lane along Iowa lane that consists of 335' of storage length and a 100-foot taper.
    - Construct a westbound right turn lane along SH 6 that consists of 250' of storage length, 340' of deceleration length and a 100-foot taper.

- **SH 6 and Manvel Pkwy:**
    - Update signal modification due to the connection of Manvel Pkwy, e.g. a new signal design, optimization of new signal turn types, addition of signal heads for the southbound approach, removal and reconstruction of the existing median and shoulder along the westbound approach.
    - Restripe the existing eastbound only U-turn Lane to left turn lane.
    - Construct 2 dual southbound left turn lanes.
    - Construct a westbound right turn lane along SH 6 that consists of 430' of storage length, 340' of deceleration length and a 100-foot taper.

- **Manvel Pkwy and Driveway 1:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 110' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound right turn lane along Manvel Pkwy that consists of 190' of storage length (95th Queue), and a 100-foot taper.
    - Construct an eastbound right turn lane along Driveway 1 that consists of 265' of storage length (95th Queue), and a 100-foot taper.

- **Manvel Pkwy and Charlotte St:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a northbound right turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper
    - Construct an eastbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper
    - Construct a westbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper

- **Manvel Pkwy and Driveway 2:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100’ of storage length (95th Queue) and a 100-foot taper.
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100’ of storage length (95th Queue) and a 100-foot taper.

- **Driveway 2 and Driveway 3:**
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100’ of storage length (95th Queue) and a 100-foot taper.
    - Construct a westbound left turn lane along Driveway 2 that consists of 100’ of storage length (95th Queue) and a 100-foot taper.

- **Driveways 1 & 3 and Charlotte St**
    - Construct a northbound left turn lane along Driveway 1 that consists of 100’ of storage length (95th Queue) and a 100-foot taper.
    - Construct a southbound left turn lane along Driveway 3 that consists of 100’ of storage length (95th Queue) and a 100-foot taper.

- **SH 288 NB Frontage Road and Charlotte St:**
    - Construct a northbound right turn lane along SH 288 NB Frontage Road that consists of 120’ storage length (95th Queue), 340’ of deceleration length and a 100-foot taper.

- **SH 288 NB Frontage Road and Driveway 2:**
    - Construct a northbound right turn lane along SH 288 NB Frontage Road that consists of 230’ storage length (95th Queue), 340’ of deceleration length and a 100-foot taper.

Table 7: Calculated Storage lengths							
Intersesections	**95th QUE Storage (Feet)**	**Signalized Equation Storage [L = (V/N)(2)(S)]**	**Unsignalized Equation Storage [L = (V/30)(2)(S)]**	**Recommended Storage (Feet)**	**Deceleration Length (Feet)**	**Taper Length (Feet)**	**Total Length (Feet)**
SH 6 & Iowa Lane (WBR)	260	246'	-	**250**	**600/340**	**100**	**690**
SH 6 & Iowa Lane (SBL)	170	335'	-	**335**	**-**	**100**	**435**
SH 6 & Manvel Pkwy (WBR)	275	428'	-	**430**	**600/340**	**100**	**870**
Manvel Pkwy & Driveway 1 (NBL)	110	-	250'	**110**	**-**	**100**	**210**
Manvel Pkwy & Driveway 1 (SBR)	190	-	72'	**190**	**-**	**100**	**290**
Manvel Pkwy & Driveway 1 (EBR)	265	-	340'	**265**	**-**	**100**	**365**
Manvel Pkwy & Charlotte St (NBL)	65	172'	-	**100**	**-**	**100**	**200**
Manvel Pkwy & Charlotte St (NBR)	50	402'	-	**100**	**-**	**100**	**200**
Manvel Pkwy & Charlotte St (SBL)	36	94'	-	**100**	**-**	**100**	**200**
Manvel Pkwy & Charlotte St (WBL)	92	300'	-	**100**	**-**	**100**	**200**
Manvel Pkwy & Charlotte St (EBL)	82	188'	-	**100**	**-**	**100**	**200**
Driveway 2 & Manvel Pkwy (EBL)	86	-	510'	**100**	**-**	**100**	**200**
Driveway 2 & Manvel Pkwy (NBL)	57	-	250'	**100**	**-**	**100**	**200**
Driveway 3 & Driveway 2 (EBL)	25	-	166'	**100**	**-**	**100**	**200**
Driveway 3 & Driveway 2 (WBL)	100			**100**		**100**	**200**
Driveway 1/3 & Charlotte St (NBL)	25	-	166'	**100**	**-**	**100**	**200**
Driveway 1/3 & Charlotte St (SBL)	100			**100**		**100**	**200**
SH 288 NB (Frontage Rd) & Charlotte St (NBR)	120	-	463'	**120**	**340**	**100**	**560**
SH 288 NB (Frontage Rd) & Driveway 2 (NBR)	230	-	605'	**230**	**340**	**100**	**670**

Traffic Signal Warrant Analysis

A Traffic Signal Warrant Analysis (TSWA) was completed for the following intersections:

- SH 6 and Iowa Ln (Build)
- Manvel Pkwy and Charlotte St (Build)
- SH 288 Ramps and Rodeo Palms/Del Bello Blvd (No Build)
- Del Bello Blvd and Manvel Pkwy (No Build)

The procedures listed in the Texas Manual on Uniform Traffic Control Devices (TMUTCD) were used to determine the appropriateness of a traffic signal at this intersection. The manual lists nine traffic signal warrants, which should be evaluated at an intersection to determine if a traffic signal should be installed. The following is a list of these warrants:

- Eight Hour Vehicular Volume Warrant
- Four Hour Vehicular Volume Warrant
- Peak Hour Warrant
- Pedestrian Volume Warrant
- School Crossing Warrant
- Coordinated Signal System Warrant
- Crash Experience Warrant
- Roadway Network Warrant
- Intersection Near a Rail Crossing

Should one of these warrants be satisfied, the installation of a traffic signal should be considered. However, the satisfaction of one of these warrants should not by itself require the installation of the traffic signal; the final determination should be based upon sound engineering judgment. The warrants which are applicable to this intersection include the Eight Hour Vehicular Volume Warrant and the Four-Hour Vehicular Volume Warrant. Each of the traffic signal warrants which were evaluated is explained in further detail in the following sub-sections. Traffic Signal Warrant Analysis worksheets are provided in **Appendix E**.

Eight Hour Vehicular Volume Warrant

There are two separate conditions for the Eight Hour Vehicular Volume Warrant; Condition A is intended for application where a large volume of intersecting traffic is the principal reason to consider the installation of a traffic signal, while Condition B is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. For both of these warrants, the TMUTCD lists minimum threshold volumes for both the main street (sum of both approaches) and the higher volume minor street approach which must be met for a minimum of 8 hours of an average day in order for the warrant to be met.

Under the Build Conditions, the Eight Hour Vehicular Volume Warrant will be met at all intersections.

Four Hour Vehicular Volume Warrant

The Four-Hour Vehicular Volume warrant is intended to be applied where the volume of the intersecting traffic is the principal reason to consider installing a traffic control signal. In order for this warrant to be satisfied, the average traffic volumes at the intersection must fall above the threshold curves provided in the TMUTCD for a minimum of four hours of an average day. These curves are shown in the warrant analysis reports included in **Appendix E**.

Under the Build Conditions, the Four-Hour Vehicular Volume Warrant is met at all intersections

Peak Hour Warrant

The Peak Hour Signal Warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. The Peak Hour Signal Warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. At this time no intersections meet the Peak Hour Warrant criteria.

Crash Experience

The Crash Experience Warrant is intended to be applied where the number of reported crashes is the principal reason to consider installing a traffic control signal. In order for this warrant to be satisfied, there must have been 5 or more reported crashes susceptible to correction by a traffic signal in the last 12 months. Crash data for the intersection has been collected and evaluated, however, a traffic signal is not warranted based on crash experience.

The intersections of SH 6 and Iowa Ln, Manvel Pkwy and Driveway 1, Manvel Pkwy and Charlotte St, and Charlotte St and Driveways 1 & 3 are recommended to be signalized based on the results of the four-hour and eight-hour traffic signal warrants analyses Adding traffic signals at these intersections will improve overall traffic operations, enhance safety, and provide better control for turning and through movements during busy hours.

Conclusion

This report presents the summary of findings for the Traffic Impact Analysis (TIA) prepared by LJA Engineering, Inc. (LJA) for the proposed Presidio development in Manvel, Texas. This development consists of a shopping center, multifamily housing, medical hospital, and single-family housing. The site for this development is located approximately 0.65 miles south of Del Bello Blvd and directly east of the intersection of SH 288 northbound entrance ramp and SH 6. The analyzed development is expected to be completed by 2030, therefore, the study horizon for this TIA is 2035. The objective of this study is to analyze the impacts of the traffic generated by the proposed development on the performance of the surrounding street network and to determine the required mitigation measures to address any resulting deficiencies.

Access to this development will be provided via two (2) proposed driveways along a new frontage road to be constructed parallel to the SH 288 northbound entrance ramp and three (3) along SH 6, the proposed Manvel Pkwy connection to SH 6, and existing Iowa Ln. Internal intersections within the development will also be analyzed in this study. An assumed speed of 45 mph was used along the proposed frontage road, based on conditions observed at the intersection of SH 288 frontage road and Broadway St located approximately five (5) miles north of the proposed development. This TIA also analyzes existing major intersections along SH 288, Del Bello Blvd and SH 6. In total, twenty (20) intersections were analyzed, existing and proposed.

Only the weekday AM and PM peak hour periods were analyzed in this TIA. The overall proposed development is expected to externally generate 52,027 daily vehicle trips with 2,274 vehicle trips during the AM peak hour period and 4,691 vehicle trips during the PM peak hour period.

An average annualized growth rate of five (5) percent was calculated by comparing the 2020 traffic volumes to the projected 2045 traffic volumes in the Houston-Galveston Area Council (H-GAC) Travel Demand Models. This growth rate was applied to the 2025 traffic volumes in order to determine the future traffic volumes without the proposed development generated traffic (Future No Build conditions). The No Build conditions will also include the background volume data from the Valencia Development and the City Center for Manvel project. The traffic that would be generated by this proposed development was then added to the No Build conditions to establish the future 2030 Build conditions.

Intersection Capacity Analyses were completed for major intersections within the study area. Mitigation measures for this TIA require that when the LOS without development is LOS A, B, C or D, the minimum acceptable projected LOS shall be LOS D, and when the LOS without development is LOS E or F, the minimum acceptable projected LOS shall be equal to the LOS without development.

Right and left turn lane analyses were completed along Del Bello Blvd, SH 6, and Manvel Pkwy at the proposed driveways, using the Texas Department of Transportation (TxDOT) Access Management Manual and National Cooperative Highway Research Program (NCHRP) 457 requirements for right and left turn deceleration lanes. Based on the analysis, various right and left turn lanes warrant along the driveways of SH 288 northbound frontage road, Del Bello Blvd, Manvel Pkwy, and SH 6.

A Traffic Signal Warrant Analysis (TSWA) was completed for the intersections of SH 6 at Iowa Lane and Manvel Pkwy at Charlotte St under Future Build conditions. Under Future Build conditions, the 8-hour and 4-hour warrant are met at all intersections. A TSWA was also completed for the intersections of Del Bello Blvd at Manvel Pkwy and SH 288 ramps at Rodeo Palms/Del Bello Blvd for the No Build conditions. Under No Build conditions the 8-hour and 4-hour warrant are met at all intersections.

Recommendations

The improvements that will be required to successfully accommodate the traffic that will be generated by the proposed **Presidio development** are listed below:

Please Be Advised: The City Center Development was included in this TIA as background traffic data at the city's request. Based on the analysis, three intersections are expected to operate at failing conditions under No-Build conditions due to background data. It is our understanding that, since the city requested this information to be included as background, the City Center Development is expected to occur prior to the proposed development. Since these issues are expected to occur before the Presidio development, the Presidio developer is not responsible for constructing these signals at these locations, however they are included in the analysis. Based on the traffic analysis these are the three intersections:

- SH 288 SB exit ramp and Rodeo Palms Pkwy
- SH 288 NB exit ramp and Del Bello Blvd
- Del Bello Blvd and Manvel Pkwy

Please Note: When the second lane of Manvel Pkwy is constructed by the Del Bello MUD, the left and right turn lanes need to be reanalyzed by the City Center Development as part of the City Center analysis at Del Bello Blvd and Manvel Pkwy.

The developer is responsible for the improvements shown below:

- **SH 6 and Pollard Blvd:**
  - Update signal timings (Done by TxDOT)
- **SH 6 and Iowa Ln:**

  The following three (3) mitigation measures for this intersection are required due to traffic generated by Tracts K and L, which create the need for a signal; these improvements should be implemented once Tracts K and L are fully constructed by the year 2030.

  - Construct a signal at this intersection.
  - Construct a southbound left turn lane along Iowa Ln that consists of 335' of storage length and a 100-foot taper.
  - Construct a westbound right turn lane along SH 6 that consists of 250' of storage length, 340' of deceleration length and a 100-foot taper.

  Freeway segments were evaluated using density parameters, and conditions are expected to remain acceptable. However, it is recommended that the posted speed limit along this section of SH 6 be reevaluated due to the addition of multiple new driveways, which increase turning movements and potential conflict points. To improve corridor safety, we recommend based on a review of similar density and corridor conditions within the vicinity of SH 6 and I-69/US 59, where the speed limit is reduced to 45 mph due to increased access points and higher potential for conflicts. Therefore, a lower speed limit would better reflect future conditions and help improve safety for all users.

- **SH 6 and Manvel Pkwy:**
    - Update signal modification due to the connection of Manvel Pkwy, e.g. new signal design, optimization of new signal turn types, addition of signal heads for the southbound approach, removal and reconstruction of the existing median and shoulder along the westbound approach.
    - Restripe the existing eastbound only U-turn lane to left turn lane.
    - Construct 2 dual southbound left turn lanes.
    - Construct a westbound right turn lane along SH 6 that consists of 430' of storage length, 340' of deceleration length and a 100-foot taper.

      Freeway segments were evaluated using density parameters, and conditions are expected to remain acceptable. However, it is recommended that the posted speed limit along this section of SH 6 be reevaluated due to the addition of multiple new driveways, which increase turning movements and potential conflict points. To improve corridor safety, we recommend based on a review of similar density and corridor conditions within the vicinity of SH 6 and I-69/US 59, where the speed limit is reduced to 45 mph due to increased access points and higher potential for conflicts. Therefore, a lower speed limit would better reflect future conditions and help improve safety for all users.

- **Manvel Pkwy and Driveway 1:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 110' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound right turn lane along Manvel Pkwy that consists of 190' of storage length (95th Queue), and a 100-foot taper.
    - Construct an eastbound right turn lane along Driveway 1 that consists of 265' of storage length (95th Queue), and a 100-foot taper.

- **Manvel Pkwy and Charlotte St:**
    - Construct a signal at this intersection.
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a northbound right turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a southbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct an eastbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper.
    - Construct a westbound left turn lane along Charlotte Street that consists of 100' of storage length (95th Queue), and a 100-foot taper.

- **Manvel Pkwy and Driveway 2:**
    - Construct a northbound left turn lane along Manvel Pkwy that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

      Please Note: Driveway 2 will be a 3-lane roadway with one lane in each direction and a center two-way left turn lane (TWLTL).

- **Driveway 2 and Driveway 3:**
    - Construct an eastbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct a westbound left turn lane along Driveway 2 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

      Please Note: Driveway 2 will be a 3-lane roadway with one lane in each direction and a center two-way left turn lane (TWLTL).

- **Driveways 1 & 3 and Charlotte St**
    - Construct a northbound left turn lane along Driveway 1 that consists of 100' of storage length (95th Queue) and a 100-foot taper.
    - Construct a southbound left turn lane along Driveway 3 that consists of 100' of storage length (95th Queue) and a 100-foot taper.

- **SH 288 NB Frontage Road and Charlotte St:**
    - Construct a northbound right turn lane along SH 288 northbound frontage road that consists of 120' storage length (95th Queue), 340' of deceleration length and a 100-foot taper.

- **SH 288 NB Frontage Road and Driveway 2:**
    - Construct a northbound right turn lane along SH 288 northbound frontage road that consists of 230' storage length (95th Queue), 340' of deceleration length and a 100-foot taper.

- **SH 288 NB Frontage Road and SH 6:**
    - Update signal timings (Done by TxDOT).

- **SH 288 SB Exit Ramp and SH 6:**
    - Update signal timings (Done by TxDOT).

References

1. Highway Capacity Manual 7th Edition, Transportation Research Board, National Research Council, Washington D.C., 2018.
2. TxDOT Access Management Manual, Texas Department of Transportation, July 2011
3. Trip Generation Manual, 2025 12th Edition, Institute of Transportation Engineers
4. A Policy on Geometric Design of Highways and Streets, 7th Edition, 2018, American Association of State Highway and Transportation Officials.

Appendix A

Proposed Site Plan

LEGEND
- SINGLE-FAMILY DETACHED RESIDENTIAL
- URBAN DENSITY RESIDENTIAL
- DRAINAGE / DETENTION
- COMMERCIAL (PAD, OFFICE, HOTEL)
- LIFT FACILITIES

STATE HIGHWAY 288

STREET X 80'ROW

STREET Y 60'ROW

MANVEL PARKWAY 120'ROW

CHARLOTTE STREET 80'ROW

STREET Y 60' ROW

STATE HIGHWAY 6

IOWA LANE

Gulf Coast Water Authority Brazoria County Mud No. 43 Drainage Easement

Valencia

TRACT D ± 50 Ac.

TRACT E ± 30.9 Ac.

TRACT F ± 15.2 Ac.

TRACT G ± 9.1 Ac.

TRACT H ± 3.8 Ac.

TRACT I ± 14.7 Ac.

TRACT J ± 24.0 Ac.

TRACT K ± 12.8Ac.

TRACT L ± 19.1 Ac.

TRACT A1 ± 12.7 Ac.

TRACT A2 ± 10.0 Ac.

TRACT A3 ± 1.7 Ac.

TRACT A4 ± 5.8 Ac.

TRACT A5 ± 1.6 Ac.

TRACT B1 ± 10.5 Ac.

TRACT B2 ± 7.7 Ac.

TRACT B3 ± 1.8 Ac.

TRACT B4 ± 12.2 Ac.

TRACT C ± 5.8 Ac.

PAD A1 ± 1.2 Ac.

PAD A2 ± 1.3 Ac.

PAD A3 ± 1.2 Ac.

PAD A4 ± 1.5 Ac.

PAD A5 ± 1.5 Ac.

PAD B1 ± 1.5 Ac.

PAD B2 ± 1.8 Ac.

PAD B3 ± 2.3 Ac.

PAD B4 ± 1.9 Ac.

PAD B5 ± 1.8 Ac.

PAD B6 ± 0.8 Ac.

PAD C1 ± 1.9 Ac.

PAD C2 ± 1.6 Ac.

PAD C3 ± 1.6 Ac.

PAD C4 ± 1.6 Ac.

PAD C5 ± 2.1 Ac.

PAD D1 ± 8.3 Ac.

PAD D2 ± 3.7 Ac.

DETENTION ± 11.5 Ac.

DETENTION ± 17.4 Ac.

DETENTION ± 9.7 Ac.

DETENTION ± 1.0 Ac.

DETENTION ± 9.8 Ac.

DETENTION ± 29.5 Ac.

LIFT STATION ± 0.5 Ac.

± 394.2 Ac 35(6,',2 Ã 0$67(5 3/$1

PLANNED UNIT DEVELOPMENT

LOCATION: Manvel, Texas CLIENT ¸ 'LYHUVLIHG 5HDO (VWDWH;OU RXS DATE

S:\Planning\01 Planning\1140-09004\07-Exhibits\1140-09004_Presidio Master Plan_07.30.2025.pdf

0 100 200 400

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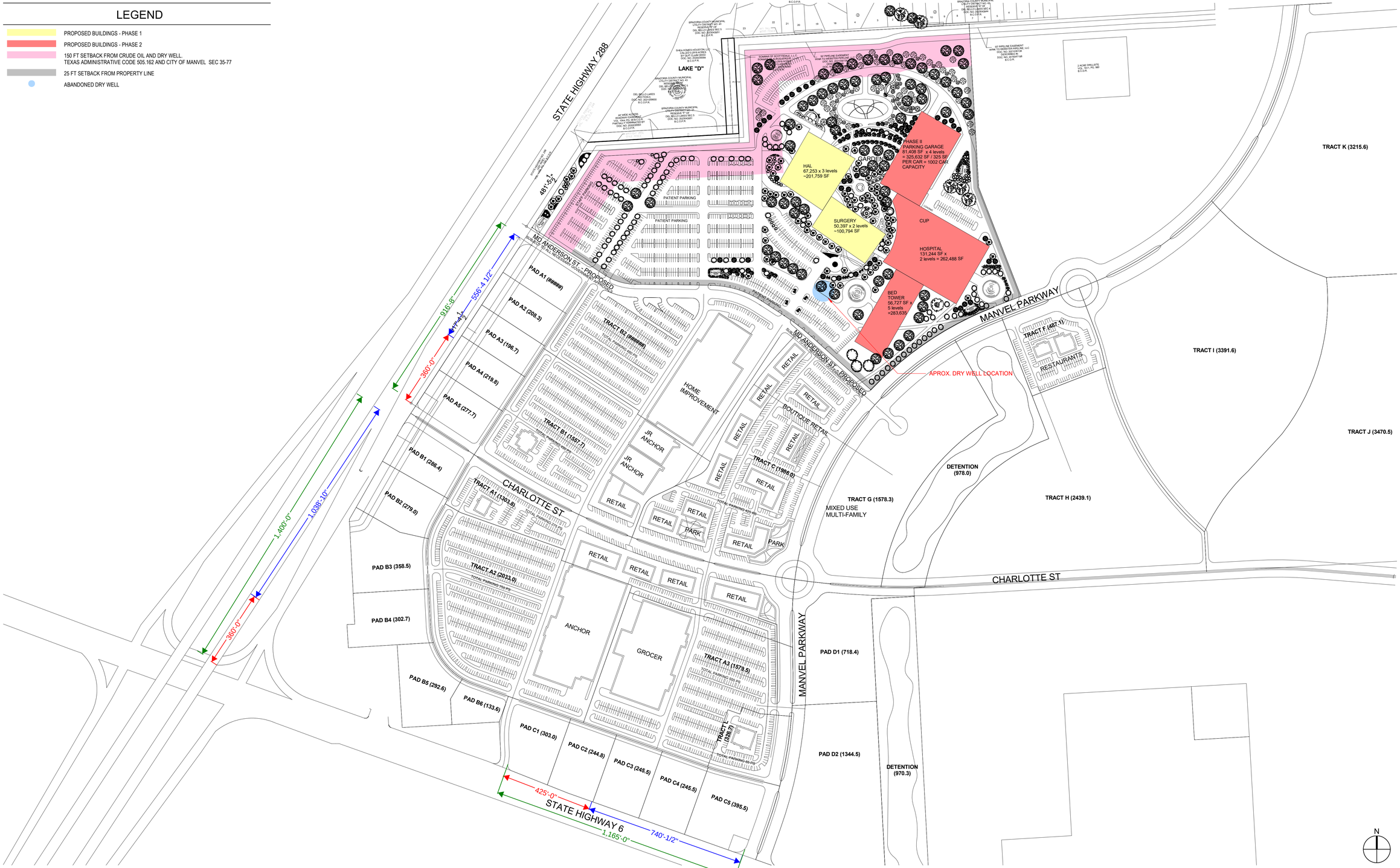
LEGEND

- PROPOSED BUILDINGS - PHASE 1
- PROPOSED BUILDINGS - PHASE 2
- 150 FT SETBACK FROM CRUDE OIL AND DRY WELL. TEXAS ADMINISTRATIVE CODE 505.162 AND CITY OF MANVEL SEC 35-77
- 25 FT SETBACK FROM PROPERTY LINE
- ABANDONED DRY WELL



1 SITE PLAN - FINAL CONCEPT
1" = 200'-0"

MANVEL HAL SITE ANALYSIS

THESE DOCUMENTS ARE INTENDED FOR INTERIM REVIEW ONLY AND NOT FOR PERMIT OR CONSTRUCTION PURPOSES.

THE UNIVERSITY OF TEXAS
MD Anderson Cancer Center
Making Cancer History®

SITE PLAN - FINAL CONCEPT

SCALE: As indicated
SHEET ISSUE DATE: 2025 12 17
PROJECT NUMBER: 25-0054-00

JOHNSTON
2603 Augusta Drive, Suite 1600
Houston, TX 77057
713.244.8300
www.johnstonllc.com

Appendix B

Traffic Counts

National Data & Surveying Services

Intersection Turning Movement Count

Location: Manvel Pkwy & Del Bello Blvd
City: Manvel
Control: 4-Way Stop

Project ID: 25-450176-001
Date: 8/26/2025

Data - Totals

NS/EW Streets:	Manvel Pkwy				Manvel Pkwy				Del Bello Blvd				Del Bello Blvd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	6	0	1	0	0	1	1	0	0	0	0	0	0	21	0	0	30
6:15 AM	5	2	1	0	1	0	1	0	0	1	0	0	1	16	0	0	28
6:30 AM	14	2	1	0	1	0	0	0	0	1	0	0	0	19	1	0	39
6:45 AM	17	1	2	0	0	0	0	0	1	1	1	0	0	40	2	0	65
7:00 AM	15	0	2	0	0	1	0	0	0	5	1	0	1	34	0	0	59
7:15 AM	20	0	1	0	1	0	0	0	0	4	0	0	0	39	0	0	65
7:30 AM	25	0	0	0	3	1	1	0	2	4	0	0	0	31	1	0	68
7:45 AM	18	1	1	0	1	0	0	0	2	2	0	1	0	27	1	0	54
8:00 AM	6	2	0	0	1	0	1	0	1	2	0	0	0	25	2	0	40
8:15 AM	8	0	1	0	0	0	1	0	0	3	0	0	0	18	3	0	34
8:30 AM	5	1	0	0	1	0	0	0	0	4	1	1	0	18	2	0	33
8:45 AM	4	0	0	0	2	0	0	0	1	0	2	0	0	7	1	0	17
9:00 AM	4	2	0	0	2	2	1	0	0	3	1	0	0	8	1	0	24
9:15 AM	4	0	0	0	1	0	0	0	0	2	1	0	1	15	0	0	24
9:30 AM	2	1	0	0	0	0	0	0	0	5	0	0	0	6	0	0	14
9:45 AM	7	2	0	1	2	1	0	0	0	2	2	0	0	11	0	0	28
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	160	14	10	1	16	6	6	0	7	39	9	2	3	335	14	0	622
APPROACH %'s :	86.49%	7.57%	5.41%	0.54%	57.14%	21.43%	21.43%	0.00%	12.28%	68.42%	15.79%	3.51%	0.85%	95.17%	3.98%	0.00%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	77	1	5	0	4	2	1	0	3	14	2	0	1	144	3	0	257
PEAK HR FACTOR :	0.770	0.250	0.625	0.000	0.333	0.500	0.250	0.000	0.375	0.700	0.500	0.000	0.250	0.900	0.375	0.000	0.945
	0.830				0.350				0.792				0.881				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	3	1	0	0	0	1	1	0	0	3	5	0	0	15	0	0	29
10:15 AM	5	1	0	0	0	0	0	0	1	3	2	1	0	8	1	0	22
10:30 AM	3	0	0	0	1	0	0	0	1	1	2	1	1	11	0	0	21
10:45 AM	5	0	0	0	2	0	2	0	0	3	1	0	0	11	1	0	25
11:00 AM	3	0	0	0	0	0	0	0	0	4	0	0	0	2	0	0	9
11:15 AM	4	1	0	0	0	0	1	0	1	3	2	0	0	11	3	0	26
11:30 AM	4	0	0	0	0	0	2	0	0	3	2	2	1	13	0	0	27
11:45 AM	1	0	0	0	0	0	0	0	1	5	3	1	0	12	1	0	24
12:00 PM	4	1	1	0	1	0	1	0	0	3	2	0	1	9	1	0	24
12:15 PM	3	1	0	0	2	0	1	0	0	3	4	0	0	3	2	0	19
12:30 PM	2	0	1	0	0	0	0	0	0	4	4	1	0	5	0	0	17
12:45 PM	1	1	0	0	1	3	0	0	0	1	3	1	0	11	0	0	22
1:00 PM	5	0	0	0	0	1	1	0	1	5	3	2	0	5	0	0	23
1:15 PM	3	0	0	0	0	1	3	0	0	2	2	0	0	4	1	0	16
1:30 PM	5	1	1	0	0	0	0	0	1	0	2	1	1	7	0	0	19
1:45 PM	2	0	1	0	1	0	0	0	0	3	2	1	0	10	0	0	20
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	53	7	4	0	8	6	12	0	6	46	39	11	4	137	10	0	343
APPROACH %'s :	82.81%	10.94%	6.25%	0.00%	30.77%	23.08%	46.15%	0.00%	5.88%	45.10%	38.24%	10.78%	2.65%	90.73%	6.62%	0.00%	
PEAK HR :	11:15 AM - 12:15 PM																TOTAL
PEAK HR VOL :	13	2	1	0	1	0	4	0	2	14	9	3	2	45	5	0	101
PEAK HR FACTOR :	0.813	0.500	0.250	0.000	0.250	0.000	0.500	0.000	0.500	0.700	0.750	0.375	0.500	0.865	0.417	0.000	0.935
	0.667				0.625				0.700				0.929				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	3	1	1	0	0	0	0	0	0	5	1	0	0	9	3	0	23
2:15 PM	5	0	0	0	0	1	1	0	0	6	1	0	0	6	0	0	20
2:30 PM	4	1	0	0	0	0	1	0	0	4	3	1	0	11	0	0	25
2:45 PM	2	0	1	0	1	1	0	0	1	3	3	0	2	8	1	0	23
3:00 PM	8	3	0	0	1	1	1	0	0	10	2	3	0	12	0	0	41
3:15 PM	4	0	0	0	2	0	0	0	0	4	1	0	0	13	1	1	26
3:30 PM	2	2	0	0	1	0	0	0	0	4	7	0	1	14	4	0	35
3:45 PM	5	2	0	0	0	2	0	0	0	6	5	0	0	18	0	0	38
4:00 PM	1	0	0	0	1	0	0	0	1	2	3	0	0	14	2	0	24
4:15 PM	5	0	0	0	1	1	1	0	0	6	1	3	0	13	1	1	33
4:30 PM	4	5	1	0	0	1	0	0	0	1	1	0	0	10	1	0	24
4:45 PM	3	1	1	0	0	0	0	0	0	2	1	2	0	17	0	0	27
5:00 PM	7	1	0	0	1	1	0	0	2	7	3	3	1	12	3	0	41
5:15 PM	4	0	0	0	0	2	0	0	0	5	1	0	0	19	2	0	33
5:30 PM	6	2	0	0	1	0	0	0	0	8	0	0	1	14	0	0	32
5:45 PM	6	5	0	0	0	0	0	0	0	5	3	0	1	11	2	0	33
6:00 PM	7	0	0	0	1	0	2	0	0	14	3	0	0	18	1	0	46
6:15 PM	3	2	0	0	0	1	0	0	0	7	4	0	1	13	0	0	31
6:30 PM	2	0	0	0	0	0	0	0	0	2	8	0	0	11	0	0	23
6:45 PM	2	0	1	0	1	1	2	0	1	4	2	0	2	13	1	0	30
7:00 PM	3	1	0	0	1	0	2	0	0	7	2	1	0	6	0	0	23
7:15 PM	2	0	0	0	1	0	1	0	0	3	8	0	2	15	2	0	34
7:30 PM	1	0	1	0	0	0	0	0	0	2	2	0	0	12	0	0	18
7:45 PM	0	2	0	0	0	0	0	0	0	4	1	0	0	2	0	0	9
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	89	28	6	0	13	12	11	0	5	121	66	13	11	291	24	2	692
APPROACH %'s :	72.36%	22.76%	4.88%	0.00%	36.11%	33.33%	30.56%	0.00%	2.44%	59.02%	32.20%	6.34%	3.35%	88.72%	7.32%	0.61%	
PEAK HR :	05:15 PM - 06:15 PM																TOTAL
PEAK HR VOL :	23	7	0	0	2	2	2	0	0	32	7	0	2	62	5	0	144
PEAK HR FACTOR :	0.821	0.350	0.000	0.000	0.500	0.250	0.250	0.000	0.000	0.571	0.583	0.000	0.500	0.816	0.625	0.000	0.783
	0.682				0.500				0.574				0.821				

Prepared by National Data & Surveying Services

Manvel Pkwy & Del Bello Blvd

Peak Hour Turning Movement Count

ID: 25-450176-001
City: Manvel

Day: Tuesday
Date: 8/26/2025

PEAK HOURS		COUNT PERIODS
06:45 AM - 07:45 AM	AM	6:00 AM - 10:00 AM
11:15 AM - 12:15 PM	NOON	10:00 AM - 02:00 PM
05:15 PM - 06:15 PM	PM	2:00 PM - 08:00 PM

Manvel Pkwy

SOUTHBOUND

AM	1	2	4	0	7	AM	6:00 AM - 10:00 AM
NOON	4	0	1	0	9	NOON	10:00 AM - 02:00 PM
PM	2	2	2	0	12	PM	2:00 PM - 08:00 PM

0 1 0 0

EASTBOUND

Del Bello Blvd

AM	NOON	PM	
222	65	87	
0	3	0	0
3	2	0	0
14	14	32	1
2	9	7	0
AM	NOON	PM	

WESTBOUND

Del Bello Blvd

	PM	NOON	AM
0	5	5	3
1	62	45	144
0	2	2	1
0	0	0	0
	34	16	23
	PM	NOON	AM

CONTROL

4-Way Stop

TEV	257	101	144
	AM	NOON	PM
PHF	0.94	0.94	0.78

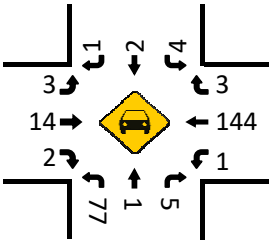
0 0 1 0

NORTHBOUND

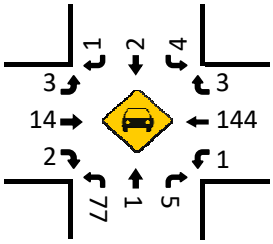
PM	11	0	23	7	0	PM
NOON	11	0	13	2	1	NOON
AM	5	0	77	1	5	AM

Manvel Pkwy

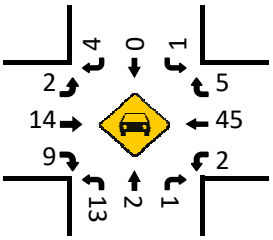
Totals (AM)



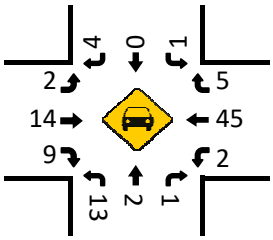
Totals (AM)



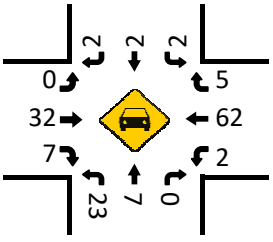
Totals (NOON)



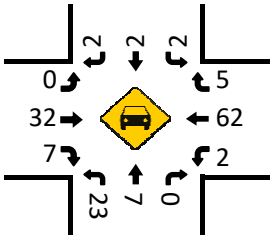
Totals (NOON)



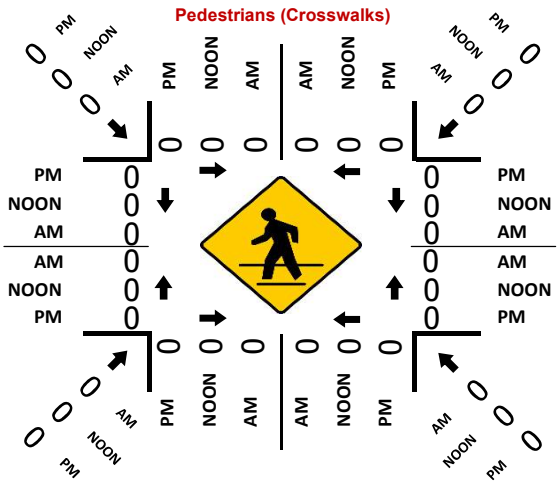
Totals (PM)



Totals (PM)



Pedestrians (Crosswalks)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Pollard Blvd & SR 6/Morris Ave
City: Manvel
Control: Signalized

Project ID: 25-450183-005
Date: 8/28/2025

Data - Totals

NS/EW Streets:	Pollard Blvd				Pollard Blvd				SR 6/Morris Ave				SR 6/Morris Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	1	0	1	0	1	3	0	0	0	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	10	0	18	0	9	339	0	0	0	320	8	2	706
6:45 AM	0	0	0	0	22	0	10	0	17	501	0	1	0	415	7	8	981
7:00 AM	0	0	0	0	34	0	18	0	26	524	0	1	0	424	18	6	1051
7:15 AM	0	0	0	0	27	0	16	0	26	362	0	2	0	454	28	4	919
7:30 AM	0	0	0	0	43	0	14	0	19	397	0	0	0	286	21	4	784
7:45 AM	0	0	0	0	25	0	14	0	18	411	0	0	0	357	14	7	846
8:00 AM	0	0	0	0	21	0	10	0	26	326	0	0	0	308	18	2	711
8:15 AM	0	0	0	0	18	0	15	0	17	342	0	0	0	356	13	6	767
8:30 AM	0	0	0	0	14	0	11	0	24	302	0	1	0	325	11	7	695
8:45 AM	0	0	0	0	8	0	15	0	15	242	0	1	0	291	9	1	582
9:00 AM	0	0	0	0	9	0	17	0	14	260	0	1	0	274	13	1	589
9:15 AM	0	0	0	0	10	0	16	0	11	215	0	1	0	242	8	2	505
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	241	0	174	0	222	4221	0	8	0	4052	168	50	9136
APPROACH %'s :					58.07%	0.00%	41.93%	0.00%	4.99%	94.83%	0.00%	0.18%	0.00%	94.89%	3.93%	1.17%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	0	0	0	0	126	0	58	0	88	1784	0	4	0	1579	74	22	3735
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.733	0.000	0.806	0.000	0.846	0.851	0.000	0.500	0.000	0.869	0.661	0.688	0.888
					0.807				0.851				0.862				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	1	0	1	0	1	3	0	0	0	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	0	0	0	0	11	0	16	0	23	391	0	0	0	397	10	4	852
4:15 PM	0	0	0	0	20	0	15	0	24	358	0	6	0	464	8	4	899
4:30 PM	0	0	0	0	9	0	9	1	23	404	0	1	0	422	16	3	888
4:45 PM	0	0	0	0	7	0	21	0	17	435	0	1	0	365	14	4	864
5:00 PM	0	0	0	0	10	0	13	0	22	426	0	0	0	392	10	5	878
5:15 PM	0	0	0	0	13	0	8	0	25	441	0	2	0	372	17	3	881
5:30 PM	0	0	0	0	11	0	8	0	29	395	0	1	0	369	17	3	833
5:45 PM	0	0	0	0	11	0	12	0	30	357	0	0	0	388	5	5	808
6:00 PM	0	0	0	0	20	0	9	0	27	378	0	0	0	342	13	3	792
6:15 PM	0	0	0	0	11	0	7	0	23	384	0	1	0	394	17	8	845
6:30 PM	0	0	0	0	11	0	12	0	27	331	0	0	0	358	9	3	751
6:45 PM	0	0	0	0	10	0	19	0	22	271	0	1	0	314	2	3	642
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	144	0	149	1	292	4571	0	13	0	4577	138	48	9933
APPROACH %'s :					48.98%	0.00%	50.68%	0.34%	5.99%	93.74%	0.00%	0.27%	0.00%	96.09%	2.90%	1.01%	
PEAK HR :	04:15 PM - 05:15 PM																TOTAL
PEAK HR VOL :	0	0	0	0	46	0	58	1	86	1623	0	8	0	1643	48	16	3529
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.575	0.000	0.690	0.250	0.896	0.933	0.000	0.333	0.000	0.885	0.750	0.800	0.981
					0.750				0.948				0.897				

Prepared by National Data & Surveying Services

Pollard Blvd & SR 6/Morris Ave

Peak Hour Turning Movement Count

ID: 25-450183-005
City: Manvel

Day: Thursday
Date: 8/28/2025

PEAK HOURS		COUNT PERIODS
06:45 AM - 07:45 AM	AM	6:30 AM - 09:30 AM
NONE	NOON	NONE
04:15 PM - 05:15 PM	PM	4:00 PM - 07:00 PM

SOUTHBOUND

AM	58	0	126	0	162	AM
NOON	0	0	0	0	0	NOON
PM	58	0	46	1	135	PM
	1	0	1	0		

EASTBOUND (SR 6/Morris Ave)

AM	NOON	PM	
1641	0	1709	
4	0	8	0
88	0	86	1
1784	0	1623	3
0	0	0	0
AM	NOON	PM	

WESTBOUND (SR 6/Morris Ave)

	PM	NOON	AM
0	48	0	74
3	1643	0	1579
0	0	0	0
0	16	0	22
	1685	0	1932
	PM	NOON	AM

CONTROL

Signalized

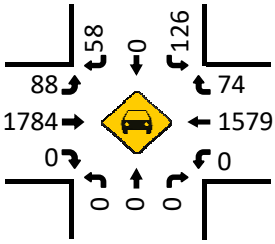
TEV	3735	0	3529
	AM	NOON	PM
PHF	0.89		0.98

NORTHBOUND

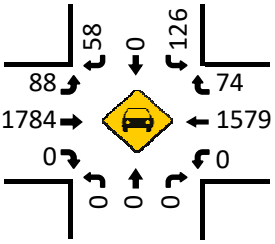
		0	0	0	0	
PM	0	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	0	0	0	0	0	AM

Pollard Blvd

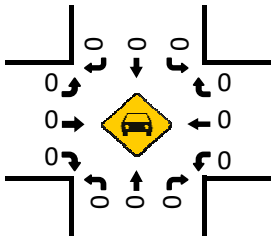
Totals (AM)



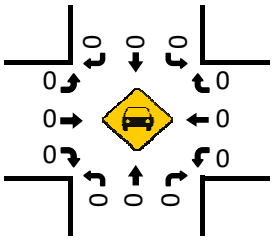
Totals (AM)



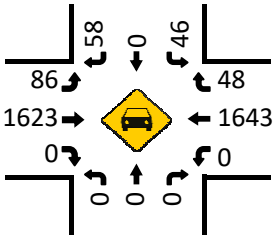
Totals (NOON)



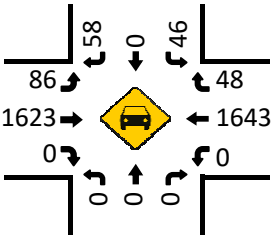
Totals (NOON)



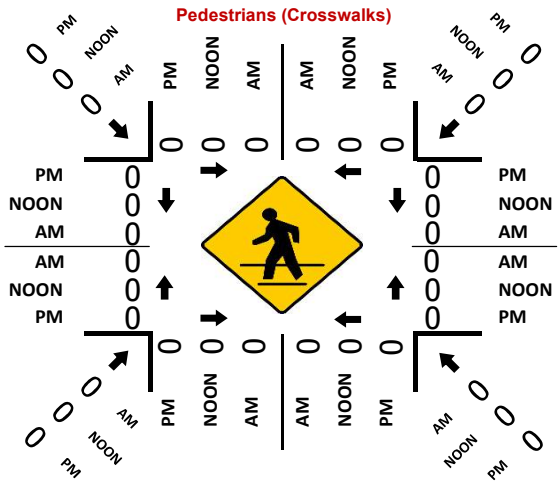
Totals (PM)



Totals (PM)



Pedestrians (Crosswalks)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Iowa Ln & Alvin Sugarland Rd/SR 6/Morris Ave
City: Manvel
Control: 2-Way Stop(NB/SB)

Project ID: 25-450183-004
Date: 8/28/2025

Data - Totals

NS/EW Streets:	Iowa Ln				Iowa Ln				Alvin Sugarland Rd/SR 6/Morris Ave				Alvin Sugarland Rd/SR 6/Morris Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	1	3	0	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	2	1	5	0	1	0	5	0	8	349	2	6	6	340	9	0	734
6:45 AM	3	3	4	0	5	0	5	0	7	515	2	8	6	392	6	0	956
7:00 AM	3	3	5	0	7	0	4	0	3	530	3	0	4	438	22	1	1023
7:15 AM	2	4	5	0	6	0	5	0	10	383	5	0	8	418	19	0	865
7:30 AM	3	3	7	0	9	0	7	0	2	400	4	1	6	292	29	1	764
7:45 AM	3	1	10	0	4	1	4	0	7	414	5	0	5	320	20	0	794
8:00 AM	4	0	7	0	1	1	5	0	8	340	4	0	8	330	7	1	716
8:15 AM	3	1	4	0	3	0	5	0	2	354	3	0	9	343	5	0	732
8:30 AM	2	2	4	0	3	0	7	0	4	331	3	1	6	334	9	0	706
8:45 AM	1	0	1	0	2	0	3	0	6	253	4	3	4	294	6	0	577
9:00 AM	0	0	7	0	3	0	6	0	6	260	4	31	2	274	3	0	596
9:15 AM	2	0	4	0	1	0	2	0	4	224	1	35	4	260	2	0	539
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	28	18	63	0	45	2	58	0	67	4353	40	85	68	4035	137	3	9002
APPROACH %'s :	25.69%	16.51%	57.80%	0.00%	42.86%	1.90%	55.24%	0.00%	1.47%	95.78%	0.88%	1.87%	1.60%	95.10%	3.23%	0.07%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	11	13	21	0	27	0	21	0	22	1828	14	9	24	1540	76	2	3608
PEAK HR FACTOR :	0.917	0.813	0.750	0.000	0.750	0.000	0.750	0.000	0.550	0.862	0.700	0.281	0.750	0.879	0.655	0.500	0.882
	0.865				0.750				0.874				0.883				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	1	3	0	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	9	1	19	0	2	0	6	0	11	391	8	0	7	416	5	2	877
4:15 PM	23	2	18	0	3	1	4	0	10	381	15	19	2	466	7	1	952
4:30 PM	9	3	14	0	4	0	5	0	10	404	12	2	2	441	5	0	911
4:45 PM	1	2	10	0	3	1	3	0	18	444	8	3	2	382	9	0	886
5:00 PM	0	1	12	0	1	1	5	0	27	442	13	1	4	393	5	0	905
5:15 PM	1	1	14	0	7	0	11	0	24	443	12	0	4	385	7	0	909
5:30 PM	2	1	14	0	2	0	9	0	15	399	5	1	5	353	18	0	824
5:45 PM	2	1	3	0	1	0	7	0	16	391	5	0	8	379	10	0	823
6:00 PM	1	1	3	0	2	0	6	0	22	397	9	0	3	338	6	0	788
6:15 PM	2	0	8	0	5	1	10	0	22	392	13	0	2	387	6	1	849
6:30 PM	0	1	2	0	1	0	5	0	7	350	6	0	9	347	3	1	732
6:45 PM	0	0	2	0	2	0	7	0	9	293	8	0	6	317	4	1	649
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	50	14	119	0	33	4	78	0	191	4727	114	26	54	4604	85	6	10105
APPROACH %'s :	27.32%	7.65%	65.03%	0.00%	28.70%	3.48%	67.83%	0.00%	3.78%	93.46%	2.25%	0.51%	1.14%	96.95%	1.79%	0.13%	
PEAK HR :	04:15 PM - 05:15 PM																TOTAL
PEAK HR VOL :	33	8	54	0	11	3	17	0	65	1671	48	25	10	1682	26	1	3654
PEAK HR FACTOR :	0.359	0.667	0.750	0.000	0.688	0.750	0.850	0.000	0.602	0.941	0.800	0.329	0.625	0.902	0.722	0.250	0.960
	0.552				0.861				0.936				0.903				

Prepared by National Data & Surveying Services

Iowa Ln & Alvin Sugarland Rd/SR 6/Morris Ave

Peak Hour Turning Movement Count

ID: 25-450183-004
City: Manvel

Day: Thursday
Date: 8/28/2025

PEAK HOURS	COUNT PERIODS
06:45 AM - 07:45 AM	6:30 AM - 09:30 AM
NONE	NONE
04:15 PM - 05:15 PM	4:00 PM - 07:00 PM

SOUTHBOUND (Iowa Ln)

AM	21	0	27	0	111	AM
NOON	0	0	0	0	0	NOON
PM	17	3	11	0	99	PM

EASTBOUND (Alvin Sugarland Rd/SR 6/Morris Ave)

AM	NOON	PM	
1581	0	1757	
9	0	25	0
22	0	65	1
1828	0	1671	3
14	0	48	0

WESTBOUND (Alvin Sugarland Rd/SR 6/Morris Ave)

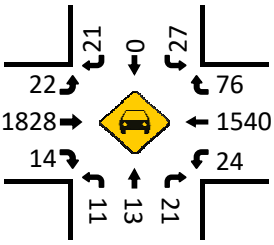
	PM	NOON	AM
0	26	0	76
3	1682	0	1540
1	10	0	24
0	1	0	2
	1737	0	1878

NORTHBOUND (Iowa Ln)

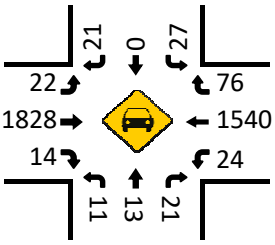
PM	61	0	33	8	54	PM
NOON	0	0	0	0	0	NOON
AM	38	0	11	13	21	AM

CONTROL			
2-Way Stop(NB/SB)			
TEV	3608 AM	0 NOON	3654 PM
PHF	0.88		0.96

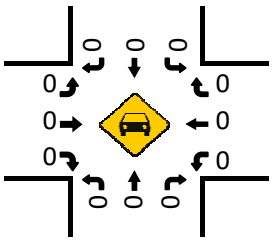
Totals (AM)



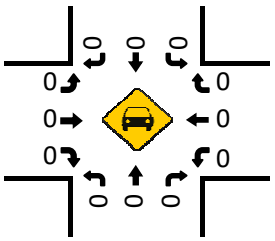
Totals (AM)



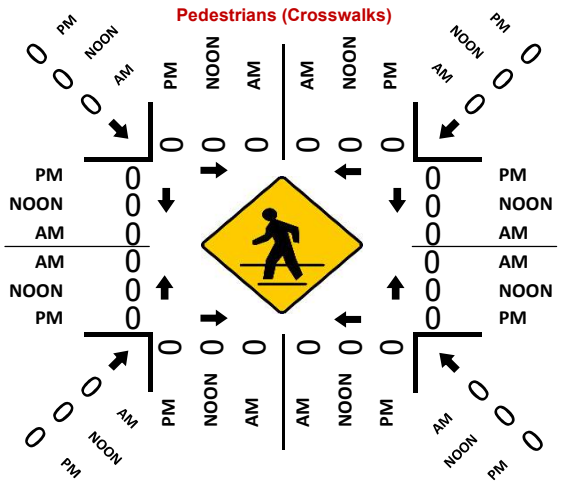
Totals (NOON)



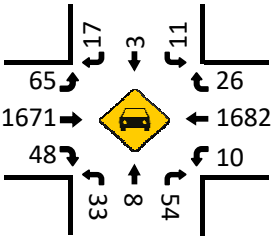
Totals (NOON)



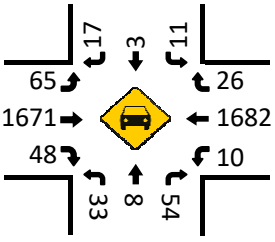
Pedestrians (Crosswalks)



Totals (PM)



Totals (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: SH 288 SB Ramps & Alvin Sugarland Rd/SR 6
City: Manvel
Control: Signalized

Project ID: 25-450183-001
Date: 8/28/2025

Data - Totals

NS/EW Streets:	SH 288 SB Ramps				SH 288 SB Ramps				Alvin Sugarland Rd/SR 6				Alvin Sugarland Rd/SR 6				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	2	0.5	1.5	1	0	4	1	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	159	4	130	11	0	320	49	0	40	197	0	0	910
6:45 AM	0	0	0	0	184	8	133	15	0	429	44	0	36	274	0	0	1123
7:00 AM	0	0	0	0	191	5	108	11	0	437	53	0	32	229	0	0	1066
7:15 AM	0	0	0	0	146	3	129	30	0	329	48	0	36	305	0	0	1026
7:30 AM	0	0	0	0	159	8	117	22	0	382	67	0	33	225	0	1	1014
7:45 AM	0	0	0	0	153	7	125	18	0	309	37	0	32	259	0	0	940
8:00 AM	0	0	0	0	163	11	109	16	0	318	47	0	35	200	0	0	899
8:15 AM	0	0	0	0	153	4	93	27	0	280	58	0	27	234	0	0	876
8:30 AM	0	0	0	0	158	12	87	48	0	289	44	0	22	209	0	0	869
8:45 AM	0	0	0	0	133	9	99	31	0	308	47	0	28	195	0	0	850
9:00 AM	0	0	0	0	131	4	92	34	0	246	41	0	37	164	0	1	750
9:15 AM	0	0	0	0	99	6	80	28	0	238	42	0	20	186	0	0	699
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	1829	81	1302	291	0	3885	577	0	378	2677	0	2	11022
APPROACH %'s :					52.21%	2.31%	37.17%	8.31%	0.00%	87.07%	12.93%	0.00%	12.37%	87.57%	0.00%	0.07%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	0	0	0	0	680	24	487	78	0	1577	212	0	137	1033	0	1	4229
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.890	0.750	0.915	0.650	0.000	0.902	0.791	0.000	0.951	0.847	0.000	0.250	0.941
						0.933				0.913				0.859			

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	2	0.5	1.5	1	0	4	1	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	0	0	0	0	194	19	121	28	0	346	68	0	43	220	0	0	1039
4:15 PM	0	0	0	0	185	27	104	23	0	381	78	0	42	281	0	0	1121
4:30 PM	0	0	0	0	210	34	115	26	0	377	84	1	43	293	0	0	1183
4:45 PM	0	0	0	0	214	19	121	22	0	366	111	0	58	332	0	0	1243
5:00 PM	0	0	0	0	194	27	108	26	0	382	104	0	48	327	0	1	1217
5:15 PM	0	0	0	0	207	22	121	24	0	374	88	0	51	295	0	0	1182
5:30 PM	0	0	0	0	204	29	109	21	0	305	94	0	50	303	0	0	1115
5:45 PM	0	0	0	0	176	17	114	25	0	319	76	0	34	305	0	1	1067
6:00 PM	0	0	0	0	194	24	115	26	0	296	90	1	44	312	0	0	1102
6:15 PM	0	0	0	0	193	24	131	33	0	285	81	0	33	328	0	0	1108
6:30 PM	0	0	0	0	195	20	146	37	0	249	69	0	34	244	0	0	994
6:45 PM	0	0	0	0	150	23	150	25	0	280	73	0	34	223	0	0	958
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	2316	285	1455	316	0	3960	1016	2	514	3463	0	2	13329
APPROACH %'s :					52.97%	6.52%	33.28%	7.23%	0.00%	79.55%	20.41%	0.04%	12.92%	87.03%	0.00%	0.05%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	825	102	465	98	0	1499	387	1	200	1247	0	1	4825
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.964	0.750	0.961	0.942	0.000	0.981	0.872	0.250	0.862	0.939	0.000	0.250	0.970
						0.968				0.971				0.928			

Prepared by National Data & Surveying Services

SH 288 SB Ramps & Alvin Sugarland Rd/SR 6

Peak Hour Turning Movement Count

ID: 25-450183-001
City: Manvel

Day: Thursday
Date: 8/28/2025

PEAK HOURS

AM: 06:45 AM - 07:45 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 6:30 AM - 09:30 AM
NOON: NONE
PM: 4:00 PM - 07:00 PM

SOUTHBOUND — SH 288 SB Ramps

AM	487	24	680	78	78	AM
NOON	0	0	0	0	0	NOON
PM	465	102	825	98	98	PM

1.5 | 0.5 | 2 | 0

EASTBOUND — Alvin Sugarland Rd/SR 6

AM	NOON	PM	
1520	0	1713	
0	0	1	0
0	0	0	0
1577	0	1499	4
212	0	387	1

WESTBOUND — Alvin Sugarland Rd/SR 6

PM	NOON	AM	
0	0	0	0
1247	0	1033	3
200	0	137	1
1	0	1	0
2325	0	2258	

CONTROL

Signalized

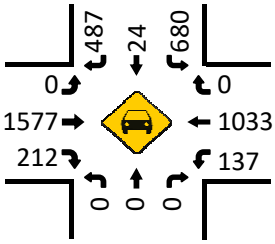
TEV	4229 AM	0 NOON	4825 PM
PHF	0.94		0.97

0 | 0 | 0 | 0

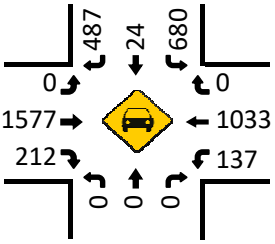
NORTHBOUND — SH 288 SB Ramps

PM	689	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	373	0	0	0	0	AM

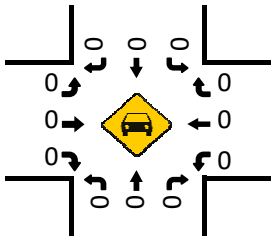
Totals (AM)



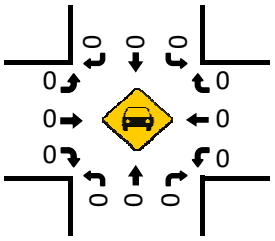
Totals (AM)



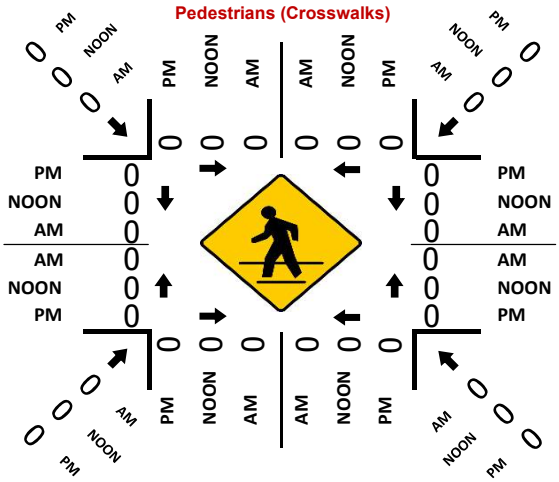
Totals (NOON)



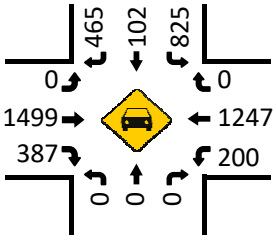
Totals (NOON)



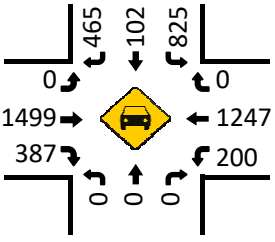
Pedestrians (Crosswalks)



Totals (PM)



Totals (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: SH 288 NB Ramps & Alvin Sugarland Rd/SR 6/Morris Ave
City: Manvel
Control: Signalized

Project ID: 25-450183-002
Date: 8/28/2025

Data - Totals

NS/EW Streets:	SH 288 NB Ramps				SH 288 NB Ramps				Alvin Sugarland Rd/SR 6/Morris Ave				Alvin Sugarland Rd/SR 6/Morris Ave				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	0.5	1	0	0	0	0	0	1.5	2.5	0	0	0	3.5	0.5	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	63	1	25	0	0	0	0	0	126	364	0	0	0	171	168	0	918
6:45 AM	46	3	22	0	0	0	0	0	127	486	0	5	0	260	179	0	1128
7:00 AM	39	6	28	0	0	0	0	0	120	518	0	1	0	222	171	0	1105
7:15 AM	50	1	32	0	0	0	0	0	138	344	0	0	0	290	123	0	978
7:30 AM	52	4	32	0	0	0	0	0	145	405	0	1	0	203	110	0	952
7:45 AM	68	4	55	0	0	0	0	0	121	346	0	1	0	221	152	0	968
8:00 AM	60	1	30	0	0	0	0	0	130	353	0	0	0	175	161	0	910
8:15 AM	70	0	39	0	0	0	0	0	106	326	0	0	0	196	167	0	904
8:30 AM	57	2	43	0	0	0	0	0	130	318	0	0	0	179	166	0	895
8:45 AM	60	0	33	0	0	0	0	0	147	294	0	0	0	168	152	0	854
9:00 AM	62	0	27	0	0	0	0	0	121	260	0	0	0	142	174	0	786
9:15 AM	54	2	27	0	0	0	0	0	129	205	0	0	0	152	169	0	738
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	681	24	393	0	0	0	0	0	1540	4219	0	8	0	2379	1892	0	11136
APPROACH %'s :	62.02%	2.19%	35.79%	0.00%					26.70%	73.16%	0.00%	0.14%	0.00%	55.70%	44.30%	0.00%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	187	14	114	0	0	0	0	0	530	1753	0	7	0	975	583	0	4163
PEAK HR FACTOR :	0.899	0.583	0.891	0.000	0.000	0.000	0.000	0.000	0.914	0.846	0.000	0.350	0.000	0.841	0.814	0.000	0.923
	0.895								0.896				0.887				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	0.5	1	0	0	0	0	0	1.5	2.5	0	0	0	3.5	0.5	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	24	0	17	0	0	0	0	0	146	422	0	0	0	233	191	0	1033
4:15 PM	39	1	25	0	0	0	0	0	175	377	0	0	0	279	212	0	1108
4:30 PM	55	0	42	0	0	0	0	0	169	429	0	0	0	284	191	0	1170
4:45 PM	75	4	62	0	0	0	0	0	117	435	0	3	0	313	119	0	1128
5:00 PM	76	3	52	0	0	0	0	0	141	466	0	2	0	294	143	0	1177
5:15 PM	88	5	51	0	0	0	0	0	117	454	0	3	0	246	145	0	1109
5:30 PM	81	4	63	0	0	0	0	0	106	412	0	2	0	261	136	0	1065
5:45 PM	70	16	38	0	0	0	0	0	115	372	0	1	0	263	125	0	1000
6:00 PM	96	3	44	0	0	0	0	0	104	398	0	5	0	257	128	0	1035
6:15 PM	73	3	38	0	0	0	0	0	110	383	0	0	0	297	130	0	1034
6:30 PM	53	1	32	0	0	0	0	0	99	347	0	1	0	220	160	0	913
6:45 PM	49	1	19	0	0	0	0	0	134	301	0	0	0	210	136	0	850
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	779	41	483	0	0	0	0	0	1533	4796	0	17	0	3157	1816	0	12622
APPROACH %'s :	59.79%	3.15%	37.07%	0.00%					24.16%	75.58%	0.00%	0.27%	0.00%	63.48%	36.52%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	294	12	207	0	0	0	0	0	544	1784	0	8	0	1137	598	0	4584
PEAK HR FACTOR :	0.835	0.600	0.835	0.000	0.000	0.000	0.000	0.000	0.805	0.957	0.000	0.667	0.000	0.908	0.783	0.000	0.974
	0.891								0.959				0.913				

Prepared by National Data & Surveying Services

SH 288 NB Ramps & Alvin Sugarland Rd/SR 6/Morris Ave

Peak Hour Turning Movement Count

ID: 25-450183-002
City: Manvel

Day: Thursday
Date: 8/28/2025

PEAK HOURS	COUNT PERIODS
06:45 AM - 07:45 AM	6:30 AM - 09:30 AM
NONE	NONE
04:30 PM - 05:30 PM	4:00 PM - 07:00 PM

CONTROL: Signalized

	AM	NOON	PM
TEV	4163	0	4584
PHF	0.92		0.97

SOUTHBOUND — SH 288 NB Ramps

AM	0	0	0	0	1127	AM
NOON	0	0	0	0	0	NOON
PM	0	0	0	0	1154	PM

EASTBOUND — Alvin Sugarland Rd/SR 6/Morris Ave

AM	NOON	PM	
1169	0	1439	
7	0	8	0
530	0	544	1.5
1753	0	1784	2.5
0	0	0	0

WESTBOUND — Alvin Sugarland Rd/SR 6/Morris Ave

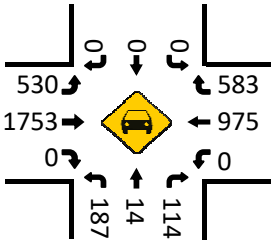
	PM	NOON	AM
0.5	598	0	583
3.5	1137	0	975
0	0	0	0
0	0	0	0
	1991	0	1867

NORTHBOUND — SH 288 NB Ramps

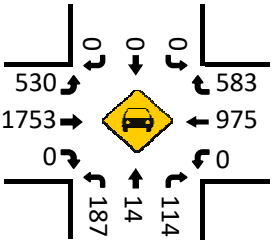
PM	0	0	294	12	207	PM
NOON	0	0	0	0	0	NOON
AM	0	0	187	14	114	AM

0 0 0 0 — 0 1.5 0.5 1

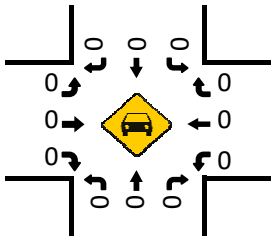
Totals (AM)



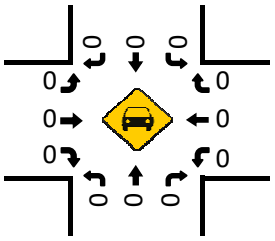
Totals (AM)



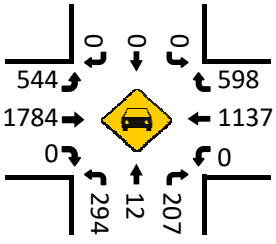
Totals (NOON)



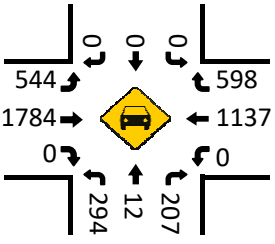
Totals (NOON)



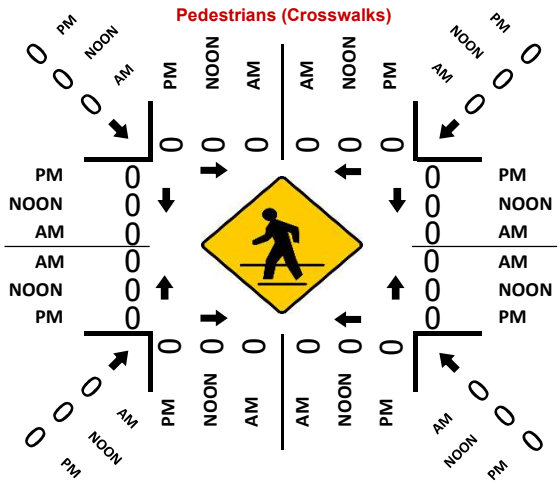
Totals (PM)



Totals (PM)



Pedestrians (Crosswalks)



National Data & Surveying Services Intersection Turning Movement Count

Location: SR 288 NB & Rodeo Palms Pkwy/Del Bello Blvd
City: Manvel
Control: 3-Way Stop(NB/EB/WB)

Project ID: 26-450043-002
Date: 2/24/2026

Data - Total

NS/EW Streets:	SR 288 NB				SR 288 NB				Rodeo Palms Pkwy/Del Bello Blvd				Rodeo Palms Pkwy/Del Bello Blvd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1.5	1	0	0	0	0	0	1	2	0	0	0	1.5	0.5	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	4	2	3	0	0	0	0	0	41	5	0	0	0	2	52	0	109
6:15 AM	3	7	1	0	0	0	0	0	28	3	0	0	0	1	53	0	96
6:30 AM	8	26	3	0	0	0	0	0	50	19	0	0	0	4	72	0	182
6:45 AM	5	27	7	0	0	0	0	0	40	18	0	0	0	8	84	1	190
7:00 AM	7	20	6	2	0	0	0	0	39	25	0	0	0	9	91	0	199
7:15 AM	11	37	4	0	0	0	0	0	37	23	0	0	0	15	114	0	241
7:30 AM	4	46	1	0	0	0	0	0	61	21	0	0	0	5	101	0	239
7:45 AM	2	26	4	0	0	0	0	0	33	25	0	0	0	4	80	0	174
8:00 AM	12	4	8	0	0	0	0	0	39	33	0	0	0	9	53	0	158
8:15 AM	8	2	8	0	0	0	0	0	30	33	0	0	0	7	57	0	145
8:30 AM	9	3	7	2	0	0	0	0	34	37	0	0	0	8	47	0	147
8:45 AM	9	3	10	1	0	0	0	0	34	25	0	0	0	5	45	0	132
9:00 AM	10	0	8	1	0	0	0	0	28	22	0	0	0	5	30	0	104
9:15 AM	11	0	6	0	0	0	0	0	21	28	0	0	0	4	24	0	94
9:30 AM	9	1	10	0	0	0	0	0	23	23	0	0	0	7	29	0	102
9:45 AM	12	1	11	1	0	0	0	0	27	25	0	0	0	7	32	0	116
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	124	205	97	7	0	0	0	0	565	365	0	0	0	100	964	1	2428
APPROACH %'s :	28.64%	47.34%	22.40%	1.62%					60.75%	39.25%	0.00%	0.00%	0.00%	9.39%	90.52%	0.09%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	27	130	18	2	0	0	0	0	177	87	0	0	0	37	390	1	869
PEAK HR FACTOR :	0.614	0.707	0.643	0.250	0.000	0.000	0.000	0.000	0.725	0.870	0.000	0.000	0.000	0.617	0.855	0.250	0.901
	0.851								0.805				0.829				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1.5	1	0	0	0	0	0	1	2	0	0	0	1.5	0.5	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	10	2	7	3	0	0	0	0	18	17	0	0	0	5	24	0	86
10:15 AM	8	2	7	1	0	0	0	0	23	37	0	0	0	5	18	1	102
10:30 AM	9	0	13	0	0	0	0	0	21	26	0	0	0	8	40	0	117
10:45 AM	9	2	6	0	0	0	0	0	16	28	0	0	0	14	30	0	105
11:00 AM	9	3	8	4	0	0	0	0	26	20	0	0	0	5	24	0	99
11:15 AM	15	3	5	1	0	0	0	0	20	16	0	0	0	7	25	0	92
11:30 AM	8	3	7	4	0	0	0	0	21	24	0	0	0	11	22	0	100
11:45 AM	12	1	10	0	0	0	0	0	13	26	0	0	0	5	25	0	92
12:00 PM	13	1	7	1	0	0	0	0	19	30	0	0	0	12	35	0	118
12:15 PM	13	2	5	3	0	0	0	0	31	30	0	0	0	10	28	0	122
12:30 PM	8	3	12	2	0	0	0	0	20	24	0	0	0	13	34	0	116
12:45 PM	9	1	10	4	0	0	0	0	14	20	0	0	0	2	33	0	93
1:00 PM	19	2	11	1	0	0	0	0	13	35	0	0	0	9	40	0	130
1:15 PM	15	0	10	2	0	0	0	0	12	28	0	0	0	15	24	0	106
1:30 PM	11	2	11	4	0	0	0	0	21	29	0	0	0	8	35	0	121
1:45 PM	9	3	10	5	0	0	0	0	21	15	0	0	0	8	23	0	94
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	177	30	139	35	0	0	0	0	309	405	0	0	0	137	460	1	1693
APPROACH %'s :	46.46%	7.87%	36.48%	9.19%					43.28%	56.72%	0.00%	0.00%	0.00%	22.91%	76.92%	0.17%	
PEAK HR :	12:15 PM - 01:15 PM																TOTAL
PEAK HR VOL :	49	8	38	10	0	0	0	0	78	109	0	0	0	34	135	0	461
PEAK HR FACTOR :	0.645	0.667	0.792	0.625	0.000	0.000	0.000	0.000	0.629	0.779	0.000	0.000	0.000	0.654	0.844	0.000	0.887
	0.795								0.766				0.862				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1.5	1	0	0	0	0	0	1	2	0	0	0	1.5	0.5	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	22	2	13	2	0	0	0	0	23	28	0	0	0	9	35	0	134
2:15 PM	13	2	15	2	0	0	0	0	31	29	0	0	0	9	20	0	121
2:30 PM	11	2	8	1	0	0	0	0	19	34	0	0	0	11	26	0	112
2:45 PM	20	3	8	4	0	0	0	0	31	30	0	0	0	6	34	0	136
3:00 PM	38	1	11	3	0	0	0	0	15	26	0	0	0	17	25	0	136
3:15 PM	22	1	6	2	0	0	0	0	15	39	0	0	0	6	45	0	136
3:30 PM	20	3	9	1	0	0	0	0	18	36	0	0	0	7	27	0	121
3:45 PM	26	2	12	3	0	0	0	0	20	39	0	0	0	12	32	0	146
4:00 PM	24	4	11	5	0	0	0	0	30	50	0	0	0	17	38	1	180
4:15 PM	7	10	6	2	0	0	0	0	27	53	0	0	0	11	43	0	159
4:30 PM	28	3	13	3	0	0	0	0	24	40	0	0	0	16	36	0	163
4:45 PM	27	4	10	3	0	0	0	0	28	44	0	0	0	6	35	0	157
5:00 PM	20	2	5	4	0	0	0	0	19	45	0	0	0	9	33	0	137
5:15 PM	20	3	10	2	0	0	0	0	22	48	0	0	0	11	41	0	157
5:30 PM	18	0	6	2	0	0	0	0	22	34	0	0	0	9	31	0	122
5:45 PM	17	3	6	1	0	0	0	0	20	64	0	0	0	8	47	0	166
6:00 PM	19	0	2	2	0	0	0	0	16	44	0	0	0	15	48	0	146
6:15 PM	21	4	17	1	0	0	0	0	26	43	0	0	0	12	43	0	167
6:30 PM	12	2	7	2	0	0	0	0	17	43	0	0	0	8	38	0	129
6:45 PM	13	0	8	0	0	0	0	0	21	35	0	0	0	9	34	0	120
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	398	51	183	45	0	0	0	0	444	804	0	0	0	208	711	1	2845
APPROACH %'s :	58.79%	7.53%	27.03%	6.65%					35.58%	64.42%	0.00%	0.00%	0.00%	22.61%	77.28%	0.11%	
PEAK HR :	04:00 PM - 05:00 PM																TOTAL
PEAK HR VOL :	86	21	40	13	0	0	0	0	109	187	0	0	0	50	152	1	659
PEAK HR FACTOR :	0.768	0.525	0.769	0.650	0.000	0.000	0.000	0.000	0.908	0.882	0.000	0.000	0.000	0.735	0.884	0.250	0.915
	0.851								0.925				0.906				

Prepared by National Data & Surveying Services

SR 288 NB & Rodeo Palms Pkwy/Del Bello Blvd

Peak Hour Turning Movement Count

ID: 26-450043-002
City: Manvel

Day: Tuesday
Date: 2/24/2026

PEAK HOURS

AM	06:45 AM - 07:45 AM
NOON	12:15 PM - 01:15 PM
PM	04:00 PM - 05:00 PM

COUNT PERIODS

AM	6:00 AM - 10:00 AM
NOON	10:00 AM - 02:00 PM
PM	2:00 PM - 07:00 PM

CONTROL

3-Way Stop(NB/EB/WB)

	AM	NOON	PM
TEV	869	461	659
PHF	0.90	0.89	0.92

SR 288 NB — SOUTHBOUND

	Left	Thru	Thru	Right		
AM	0	0	0	0	697	AM
NOON	0	0	0	0	221	NOON
PM	0	0	0	0	282	PM

EASTBOUND — Rodeo Palms Pkwy/Del Bello Blvd

AM	NOON	PM		
64	83	136	⇦	
0	0	0	↩	0
177	78	109	↱	1
87	109	187	→	2
0	0	0	↳	0
AM	NOON	PM		

WESTBOUND — Rodeo Palms Pkwy/Del Bello Blvd

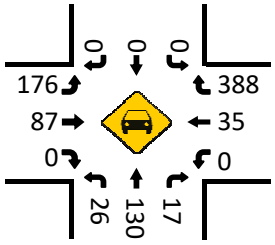
PM	NOON	AM		
152	135	390	↰	0.5
50	34	37	←	1.5
0	0	0	↩	0
1	0	1	↩	0
228	147	106	⇨	
PM	NOON	AM		

SR 288 NB — NORTHBOUND

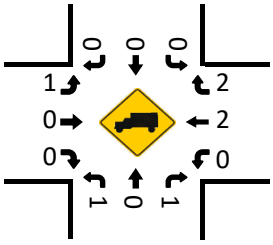
	Left	Thru	Thru	Right		
PM	13	13	86	21	40	PM
NOON	10	10	49	8	38	NOON
AM	2	2	27	130	18	AM

0 0 1.5 1

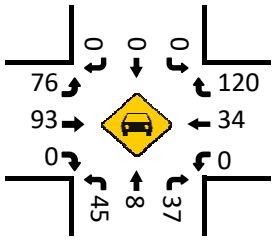
Cars (AM)



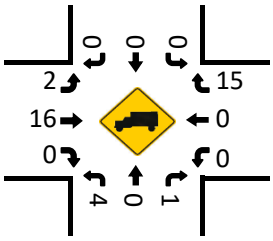
Total Trucks (AM)



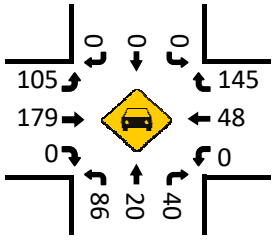
Cars (NOON)



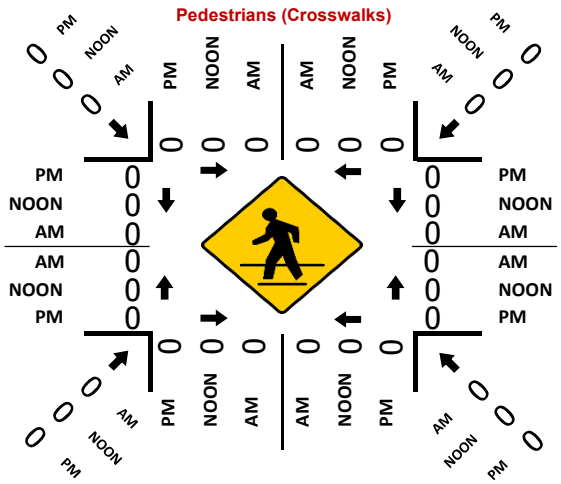
Total Trucks (NOON)



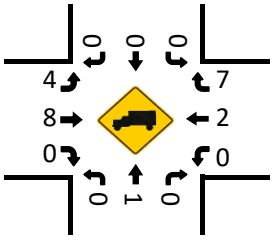
Cars (PM)



Pedestrians (Crosswalks)



Total Trucks (PM)



National Data & Surveying Services Intersection Turning Movement Count

Location: SR 288 SB & Rodeo Palms Pkwy/Del Bello Blvd
City: Manvel
Control: 3-Way Stop(SB/EB/WB)

Project ID: 26-450043-001
Date: 2/24/2026

Data - Total

NS/EW Streets:	SR 288 SB				SR 288 SB				Rodeo Palms Pkwy/Del Bello Blvd				Rodeo Palms Pkwy/Del Bello Blvd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	2	0	0	0	3	0	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	5	1	3	0	0	41	17	0	2	4	0	0	73
6:15 AM	0	0	0	0	3	3	10	0	0	28	23	0	1	3	0	0	71
6:30 AM	0	0	0	0	19	3	16	2	0	50	34	0	3	9	0	0	136
6:45 AM	0	0	0	0	15	10	18	1	0	43	72	0	5	8	0	0	172
7:00 AM	0	0	0	0	21	4	14	3	0	43	59	0	3	13	0	0	160
7:15 AM	0	0	0	0	21	8	14	2	0	39	34	0	8	18	0	0	144
7:30 AM	0	0	0	0	21	5	14	1	0	61	19	1	3	6	0	0	131
7:45 AM	0	0	0	0	22	2	12	1	0	36	20	0	1	5	0	0	99
8:00 AM	0	0	0	0	28	6	16	1	0	44	17	0	4	17	0	0	133
8:15 AM	0	0	0	0	30	2	16	1	0	33	26	0	3	12	0	0	123
8:30 AM	0	0	0	0	32	6	22	2	0	39	23	0	4	13	0	0	141
8:45 AM	0	0	0	0	23	1	19	2	0	36	28	0	4	10	0	0	123
9:00 AM	0	0	0	0	20	2	12	1	0	30	14	0	5	10	0	0	94
9:15 AM	0	0	0	0	28	5	15	0	0	21	12	0	4	11	0	0	96
9:30 AM	0	0	0	0	23	3	17	1	0	23	17	0	5	11	0	0	100
9:45 AM	0	0	0	0	23	2	19	0	0	29	10	0	6	13	0	0	102
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	334	63	237	18	0	596	425	1	61	163	0	0	1898
APPROACH %'s :					51.23%	9.66%	36.35%	2.76%	0.00%	58.32%	41.59%	0.10%	27.23%	72.77%	0.00%	0.00%	
PEAK HR :	06:30 AM - 07:30 AM																TOTAL
PEAK HR VOL :	0	0	0	0	76	25	62	8	0	175	199	0	19	48	0	0	612
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.905	0.625	0.861	0.667	0.000	0.875	0.691	0.000	0.594	0.667	0.000	0.000	0.890
					0.950				0.813				0.644				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	2	0	0	0	3	0	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	16	3	10	4	0	19	11	0	2	13	0	0	78
10:15 AM	0	0	0	0	35	2	9	1	0	25	20	0	4	9	0	0	105
10:30 AM	0	0	0	0	24	2	15	3	0	23	18	0	7	10	0	0	102
10:45 AM	0	0	0	0	25	5	16	3	0	19	12	0	13	10	0	0	103
11:00 AM	0	0	0	0	16	4	17	1	0	30	11	0	4	10	0	0	93
11:15 AM	0	0	0	0	16	3	16	0	0	20	13	1	6	16	0	0	91
11:30 AM	0	0	0	0	24	2	16	0	0	21	13	0	11	8	0	0	95
11:45 AM	0	0	0	0	25	6	17	1	0	14	17	0	5	12	0	0	97
12:00 PM	0	0	0	0	28	3	19	2	0	21	15	1	11	14	0	0	114
12:15 PM	0	0	0	0	28	9	20	0	0	33	14	0	8	15	0	0	127
12:30 PM	0	0	0	0	22	5	15	0	0	22	21	0	9	12	0	0	106
12:45 PM	0	0	0	0	20	4	21	2	0	14	10	0	2	9	0	0	82
1:00 PM	0	0	0	0	32	6	16	3	0	16	16	0	8	20	0	0	117
1:15 PM	0	0	0	0	25	2	17	1	0	15	12	0	14	16	0	0	102
1:30 PM	0	0	0	0	26	6	19	0	0	24	23	0	8	11	0	0	117
1:45 PM	0	0	0	0	15	2	14	1	0	21	16	0	6	11	0	0	86
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	377	64	257	22	0	337	242	2	118	196	0	0	1615
APPROACH %'s :					52.36%	8.89%	35.69%	3.06%	0.00%	58.00%	41.65%	0.34%	37.58%	62.42%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	0	0	0	0	103	23	71	3	0	90	67	1	33	53	0	0	444
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.920	0.639	0.888	0.375	0.000	0.682	0.798	0.250	0.750	0.883	0.000	0.000	0.874
					0.877				0.840				0.860				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	2	0	0	0	3	0	0	1	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	25	5	16	1	0	26	11	1	7	24	0	0	116
2:15 PM	0	0	0	0	26	4	13	6	0	34	18	0	8	14	0	0	123
2:30 PM	0	0	0	0	32	6	15	2	0	21	17	0	8	14	0	0	115
2:45 PM	0	0	0	0	30	4	22	3	0	31	18	0	5	21	0	0	134
3:00 PM	0	0	0	0	25	12	23	6	0	16	19	0	11	44	0	0	156
3:15 PM	0	0	0	0	36	10	33	7	0	18	13	0	3	25	0	0	145
3:30 PM	0	0	0	0	32	26	29	5	0	22	20	0	5	22	0	0	161
3:45 PM	0	0	0	0	37	75	36	3	0	22	22	0	6	32	0	0	233
4:00 PM	0	0	0	0	45	68	31	0	0	35	28	0	13	28	0	0	248
4:15 PM	0	0	0	0	46	81	35	2	0	34	33	0	10	8	0	0	249
4:30 PM	0	0	0	0	38	64	27	1	0	26	23	0	10	34	0	0	223
4:45 PM	0	0	0	0	43	38	26	1	0	29	20	0	6	27	0	0	190
5:00 PM	0	0	0	0	44	77	36	3	0	20	17	0	7	22	0	0	226
5:15 PM	0	0	0	0	44	29	34	3	0	26	23	0	9	22	0	0	190
5:30 PM	0	0	0	0	33	46	31	3	0	23	18	0	3	24	0	0	181
5:45 PM	0	0	0	0	61	36	35	5	0	23	23	0	6	19	0	0	208
6:00 PM	0	0	0	0	38	23	32	1	0	22	23	0	12	22	0	0	173
6:15 PM	0	0	0	0	39	52	38	3	0	30	26	0	10	23	0	0	221
6:30 PM	0	0	0	0	40	27	37	0	0	20	25	0	8	12	0	0	169
6:45 PM	0	0	0	0	28	17	28	2	0	28	15	0	7	15	0	0	140
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	742	700	577	57	0	506	412	1	154	452	0	0	3601
APPROACH %'s :					35.74%	33.72%	27.79%	2.75%	0.00%	55.06%	44.83%	0.11%	25.41%	74.59%	0.00%	0.00%	
PEAK HR :	03:45 PM - 04:45 PM																TOTAL
PEAK HR VOL :	0	0	0	0	166	288	129	6	0	117	106	0	39	102	0	0	953
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.902	0.889	0.896	0.500	0.000	0.836	0.803	0.000	0.750	0.750	0.000	0.000	0.957
					0.898				0.832				0.801				

Prepared by National Data & Surveying Services

SR 288 SB & Rodeo Palms Pkwy/Del Bello Blvd

Peak Hour Turning Movement Count

ID: 26-450043-001
City: Manvel

Day: Tuesday
Date: 2/24/2026

PEAK HOURS	COUNT PERIODS
06:30 AM - 07:30 AM	6:00 AM - 10:00 AM
11:45 AM - 12:45 PM	10:00 AM - 02:00 PM
03:45 PM - 04:45 PM	2:00 PM - 07:00 PM

SOUTHBOUND (SR 288 SB)

AM	62	25	76	8	8	AM
NOON	71	23	103	3	3	NOON
PM	129	288	166	6	6	PM
	0	2	0	0		

EASTBOUND (Rodeo Palms Pkwy/Del Bello Blvd)

AM	NOON	PM	
110	125	231	
0	1	0	0
0	0	0	0
175	90	117	3
199	67	106	0
AM	NOON	PM	

WESTBOUND (Rodeo Palms Pkwy/Del Bello Blvd)

PM	NOON	AM	
0	0	0	0
102	53	48	2
39	33	19	1
0	0	0	0
283	193	251	
PM	NOON	AM	

CONTROL

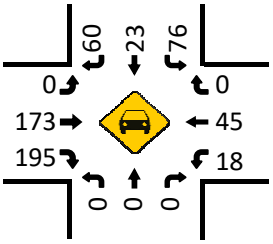
3-Way Stop(SB/EB/WB)

	AM	NOON	PM
TEV	612	444	953
PHF	0.89	0.87	0.96

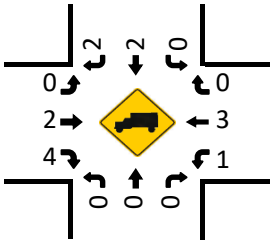
NORTHBOUND (SR 288 SB)

PM	433	0	0	0	0	PM
NOON	123	0	0	0	0	NOON
AM	243	0	0	0	0	AM
		0	0	0	0	

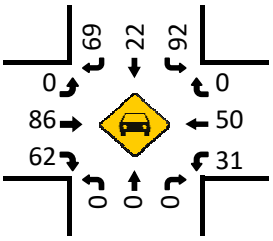
Cars (AM)



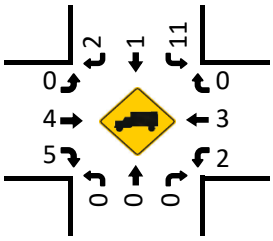
Total Trucks (AM)



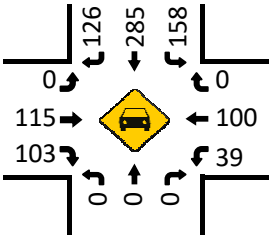
Cars (NOON)



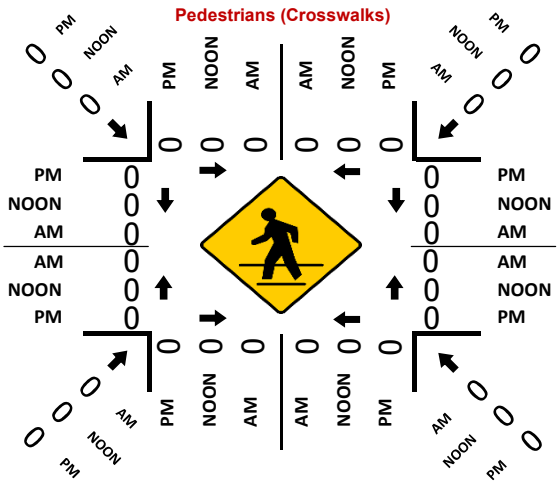
Total Trucks (NOON)



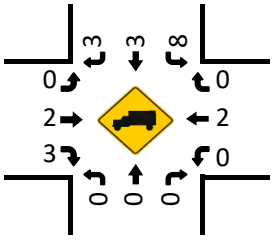
Cars (PM)



Pedestrians (Crosswalks)



Total Trucks (PM)



Appendix C

Trip Generation

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	Shopping Center (>150K)
ITE Code:	820
Independent Variable:	1000 Sq.Ft
Variable Value:	876

Acres	%	Sq Ft	1000 Fq Ft
134	0.15	875556	875.56

Daily Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		36.39			
Linear Equation:	T=		(X) +		
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	31,878		
	In	50%	15,939	15,939	
	Out	50%	15,939	15,939	

AM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.88			
Linear Equation:	T=		(X) +		
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	771		
	In	62%	478	478	
	Out	38%	293	293	

PM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		3.26			
Linear Equation:	T=		(X) +		
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	2,856		
	In	49%	1,399	1,399	
	Out	51%	1,457	1,456	

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	Multi Family Housing (Low Rise)
ITE Code:	220
Independent Variable:	Dwelling Units
Variable Value:	340

Daily Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		6.21			
Linear Equation:	T=	5.63	(X) +	120.45	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	**2,111**		
	In	50%	**1,056**	**1,056**	
	Out	50%	**1,055**	**1,056**	

AM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.41			
Linear Equation:	T=	0.35	(X) +	12.93	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	**139**		
	In	24%	**33**		
	Out	76%	**106**		

PM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.52			
Linear Equation:	T=	0.48	(X) +	7.35	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	**177**		
	In	62%	**110**		
	Out	38%	**67**		

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	Hospital + Bed Tower
ITE Code:	610
Independent Variable:	1000 Sq.Ft
Variable Value:	550

USE	Acres	%	Sq Ft	1000 Fq Ft
Hospital	-	-	262488	262.488
Bed Tower	-	-	283635	283.635
Total	-	-	546123	546.12

Daily Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		10.7			
Linear Equation:	T=	4.6	(X) +	120.45	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	5,885		
	In	50%	2,943	2,943	
	Out	50%	2,942	2,943	

AM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.79			
Linear Equation:	T=	0.56	(X) +	12.93	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	435		
	In	68%	295	295	
	Out	32%	140	139	

PM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.86			
Linear Equation:	T=		(X) +	7.35	
Exponential Equation:	Ln (T)=	0.58	Ln(X) +		
		%	Volume		
	Total Traffic	100%	473		
	In	34%	161	161	
	Out	66%	312	312	

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	Surgery
ITE Code:	610
Independent Variable:	1000 Sq.Ft
Variable Value:	100

USE	Acres	%	Sq Ft	1000 Fq Ft
Sugery	-	-	100794	100.794
Total	-	-	100794	100.79

Daily Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		10.7			
Linear Equation:	T=	4.6	(X) +	120.45	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	1,070		
	In	50%	535	535	
	Out	50%	535	535	

AM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.79			
Linear Equation:	T=	0.56	(X) +	12.93	
Exponential Equation:	Ln (T)=		Ln(X) +		
		%	Volume		
	Total Traffic	100%	79		
	In	68%	54	54	
	Out	32%	25	25	

PM Peak Traffic

Type of Equation: 1 (1 Rate, 2 Linear, 3 Exponential)

Average Rate:		0.86			
Linear Equation:	T=		(X) +	7.35	
Exponential Equation:	Ln (T)=	0.58	Ln(X) +		
		%	Volume		
	Total Traffic	100%	86		
	In	34%	29	29	
	Out	66%	57	57	

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	HAL
ITE Code:	630
Independent Variable:	1000 Sq.Ft
Variable Value:	200

USE	Acres	%	Sq Ft	1000 Fq Ft
Hospital				
Bed Tower				
Sugery				
HAL	-	-	201759	201.759
Total	-	-	201759	201.76

Daily Traffic

Type of Equation: 1

Average Rate:		37.6			1 Rate
Linear Equation:	T=	35.86	(X) +	34.88	2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	7,520		
	In	50%	3,760	3,760	
	Out	50%	3,760	3,760	

AM Peak Traffic

Type of Equation: 1

Average Rate:		2.75			1 Rate
Linear Equation:	T=	2.19	(X) +	8.68	2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	550		
	In	81%	446	446	
	Out	19%	104	105	

PM Peak Traffic

Type of Equation: 1

Average Rate:		3.67			1 Rate
Linear Equation:	T=	3.53	(X) +	2.9	2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	734		
	In	29%	213	213	
	Out	71%	521	521	

Trip Generation

Project:	Presidio
Job Number:	2013-2515
Phase	Ultimate
Land Use:	Single Family Detached Housing
ITE Code:	210
Independent Variable:	Dwelling Units
Variable Value:	392

Daily Traffic

Type of Equation: 1

Average Rate:		9.09			1 Rate
Linear Equation:	T=		(X) +	229.68	2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	3,563		
	In	50%	1,782	1,782	
	Out	50%	1,781	1,782	

AM Peak Traffic

Type of Equation: 1

Average Rate:		0.7			1 Rate
Linear Equation:	T=		(X) +		2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	274		
	In	27%	74	74	
	Out	73%	200	200	

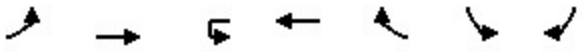
PM Peak Traffic

Type of Equation: 1

Average Rate:		0.93			1 Rate
Linear Equation:	T=		(X) +		2 Linear
Exponential Equation:	Ln (T)=		Ln(X) +		3 Exponential
		%	Volume		
	Total Traffic	100%	365		
	In	62%	226	226	
	Out	38%	139	139	

Appendix D

Intersection Capacity Analysis Reports



Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	92	1784	22	1579	74	126	58
Future Volume (vph)	92	1784	22	1579	74	126	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91		1.00	1.00
Frt	1.00	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	1770	5051		1770	1583
Flt Permitted	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	1770	5051		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	1939	24	1716	80	137	63
RTOR Reduction (vph)	0	0	0	8	0	0	45
Lane Group Flow (vph)	100	1939	24	1788	0	137	18
Turn Type	Prot	NA	Prot	NA		Prot	Perm
Protected Phases	7	4	3	8		6	
Permitted Phases							6
Actuated Green, G (s)	4.1	29.1	1.0	26.0		18.1	18.1
Effective Green, g (s)	4.1	29.1	1.0	26.0		18.1	18.1
Actuated g/C Ratio	0.07	0.47	0.02	0.42		0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	117	2398	28	2128		519	464
v/s Ratio Prot	c0.06	c0.38	0.01	0.35		c0.08	
v/s Ratio Perm							0.01
v/c Ratio	0.85	0.81	0.86	0.84		0.26	0.04
Uniform Delay, d1	28.5	13.9	30.3	16.0		16.7	15.6
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	41.9	2.1	108.8	3.2		1.2	0.2
Delay (s)	70.4	16.0	139.1	19.2		17.9	15.7
Level of Service	E	B	F	B		B	B
Approach Delay (s/veh)		18.7		20.7		17.2	
Approach LOS		B		C		B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	65.4

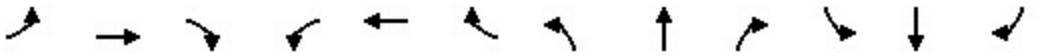
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	1828	14	26	1540	76	11	13	21	27	0	21
Future Vol, veh/h	31	1828	14	26	1540	76	11	13	21	27	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	1987	15	28	1674	83	12	14	23	29	0	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1757	0	0	2002	0	0	2788	3875	1001	2641	3841	878
Stage 1	-	-	-	-	-	-	2062	2062	-	1772	1772	-
Stage 2	-	-	-	-	-	-	726	1813	-	869	2070	-
Critical Hdwy	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	166	-	-	125	-	-	20	~ 3	207	~ 25	4	250
Stage 1	-	-	-	-	-	-	35	96	-	56	135	-
Stage 2	-	-	-	-	-	-	347	128	-	283	95	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	166	-	-	125	-	-	~ 11	~ 2	207	~ 14	2	250
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 11	~ 2	-	~ 14	2	-
Stage 1	-	-	-	-	-	-	28	76	-	44	104	-
Stage 2	-	-	-	-	-	-	244	99	-	164	76	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	0.53	0.67	$ 4216.6	$ 919.45
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	6	166	-	-	125	-	-	23
HCM Lane V/C Ratio	7.835	0.203	-	-	0.227	-	-	2.236
HCM Control Delay (s/veh)	$ 4216.6	32.1	-	-	42.1	-	-	$ 919.5
HCM Lane LOS	F	D	-	-	E	-	-	F
HCM 95th %tile Q(veh)	7.7	0.7	-	-	0.8	-	-	6.6

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1867	0	0	1572	0	0	0	0	0	0	0
Future Volume (vph)	0	1867	0	0	1572	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5							
Lane Util. Factor		0.91			0.91							
Frt		1.00			1.00							
Flt Protected		1.00			1.00							
Satd. Flow (prot)		5085			5085							
Flt Permitted		1.00			1.00							
Satd. Flow (perm)		5085			5085							
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2029	0	0	1709	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2029	0	0	1709	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA							
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		90.0			90.0							
Effective Green, g (s)		90.0			90.0							
Actuated g/C Ratio		1.00			1.00							
Clearance Time (s)		4.5			4.5							
Vehicle Extension (s)		3.0			3.0							
Lane Grp Cap (vph)		5085			5085							
v/s Ratio Prot		c0.40			0.34							
v/s Ratio Perm												
v/c Ratio		0.40			0.34							
Uniform Delay, d1		0.0			0.0							
Progression Factor		1.00			1.00							
Incremental Delay, d2		0.0			0.0							
Delay (s)		0.0			0.0							
Level of Service		A			A							
Approach Delay (s/veh)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.5
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

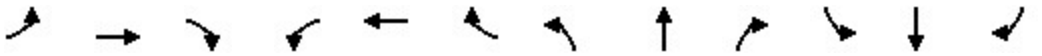
c Critical Lane Group

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	14	2	1	144	3	77	1	5	4	2	1
Future Vol, veh/h	3	14	2	1	144	3	77	1	5	4	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	15	2	1	157	3	84	1	5	4	2	1
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay, s/veh	7.7	8	8.1	7.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	93%	30%	0%	1%	0%	57%
Vol Thru, %	1%	70%	78%	99%	96%	29%
Vol Right, %	6%	0%	22%	0%	4%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	83	10	9	73	75	7
LT Vol	77	3	0	1	0	4
Through Vol	1	7	7	72	72	2
RT Vol	5	0	2	0	3	1
Lane Flow Rate	90	11	10	79	82	8
Geometry Grp	2	5	5	5	5	2
Degree of Util (X)	0.113	0.015	0.013	0.104	0.106	0.01
Departure Headway (Hd)	4.522	5.054	4.747	4.725	4.69	4.496
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	798	711	757	751	757	800
Service Time	2.523	2.763	2.456	2.502	2.467	2.499
HCM Lane V/C Ratio	0.113	0.015	0.013	0.105	0.108	0.01
HCM Control Delay, s/veh	8.1	7.8	7.5	8.1	8	7.5
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0	0	0.3	0.4	0

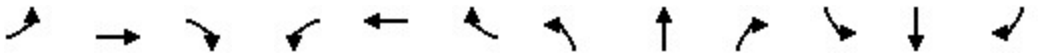


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	537	1753	0	0	975	583	187	14	114	0	0	0
Future Volume (vph)	537	1753	0	0	975	583	187	14	114	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.94		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1522	4799			6048		1681	1697	1583			
Flt Permitted	0.95	0.86			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1522	4120			6048		1681	1697	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	584	1905	0	0	1060	634	203	15	124	0	0	0
RTOR Reduction (vph)	0	0	0	0	119	0	0	0	64	0	0	0
Lane Group Flow (vph)	526	1963	0	0	1575	0	110	108	60	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	39.4	65.1			25.7		11.4	11.4	11.4			
Effective Green, g (s)	39.4	65.1			25.7		11.4	11.4	11.4			
Actuated g/C Ratio	0.44	0.72			0.29		0.13	0.13	0.13			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	666	3277			1727		212	214	200			
v/s Ratio Prot	c0.35	0.26			c0.26		c0.07	0.06				
v/s Ratio Perm		0.17							0.04			
v/c Ratio	0.79	0.60			1.09dr		0.52	0.50	0.30			
Uniform Delay, d1	21.7	6.1			31.1		36.7	36.7	35.7			
Progression Factor	1.12	2.41			1.00		1.00	1.00	1.00			
Incremental Delay, d2	3.9	0.2			8.5		2.1	1.9	0.9			
Delay (s)	28.2	14.8			39.6		38.9	38.5	36.5			
Level of Service	C	B			D		D	D	D			
Approach Delay (s/veh)		17.7			39.6			37.9			0.0	
Approach LOS		B			D			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1577	212	138	1033	0	0	0	0	680	24	487
Future Volume (vph)	0	1577	212	138	1033	0	0	0	0	680	24	487
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.98		1.00	1.00					1.00	0.86	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6294		1770	5085					3433	1529	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6294		1770	5085					3433	1529	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1714	230	150	1123	0	0	0	0	739	26	529
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	40	80
Lane Group Flow (vph)	0	1917	0	150	1123	0	0	0	0	739	240	195
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		31.7		11.3	47.5					33.5	33.5	33.5
Effective Green, g (s)		31.7		11.3	47.5					33.5	33.5	33.5
Actuated g/C Ratio		0.35		0.13	0.53					0.37	0.37	0.37
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2216		222	2683					1277	569	559
v/s Ratio Prot		c0.30		c0.08	0.22					c0.22	0.16	
v/s Ratio Perm												0.13
v/c Ratio		0.86		0.68	0.42					0.58	0.42	0.35
Uniform Delay, d1		27.2		37.6	12.9					22.6	21.0	20.4
Progression Factor		1.00		0.50	0.19					1.00	1.00	1.00
Incremental Delay, d2		4.8		4.4	0.1					0.6	0.5	0.4
Delay (s)		32.0		23.1	2.5					23.2	21.5	20.8
Level of Service		C		C	A					C	C	C
Approach Delay (s/veh)		32.0			5.0			0.0			22.3	
Approach LOS		C			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	177	87	0	0	38	390	27	130	18	0	0	0
Future Vol, veh/h	177	87	0	0	38	390	27	130	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	192	95	0	0	41	424	29	141	20	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	9.8	8.3	9.6
HCM LOS	A	A	A

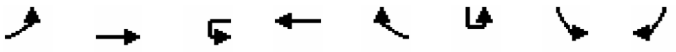
Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	38%	0%	0%	100%	75%	0%	0%	0%	0%
Vol Thru, %	62%	100%	0%	0%	25%	100%	100%	100%	2%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	98%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	87	18	89	118	58	15	15	398
LT Vol	27	0	0	89	89	0	0	0	0
Through Vol	43	87	0	0	29	58	15	15	8
RT Vol	0	0	18	0	0	0	0	0	390
Lane Flow Rate	76	94	20	96	128	63	17	17	432
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.131	0.156	0.029	0.169	0.22	0.071	0.026	0.026	0.398
Departure Headway (Hd)	6.162	5.97	5.271	6.322	6.198	4.073	5.75	5.75	3.314
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	584	603	682	569	581	882	619	619	1072
Service Time	3.874	3.682	2.983	4.036	3.911	1.787	3.516	3.516	1.08
HCM Lane V/C Ratio	0.13	0.156	0.029	0.169	0.22	0.071	0.027	0.027	0.403
HCM Control Delay, s/veh	9.8	9.8	8.1	10.3	10.7	7.1	8.7	8.7	8.3
HCM Lane LOS	A	A	A	B	B	A	A	A	A
HCM 95th-tile Q	0.4	0.5	0.1	0.6	0.8	0.2	0.1	0.1	1.9

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	175	199	19	48	0	0	0	0	76	25	62
Future Vol, veh/h	0	175	199	19	48	0	0	0	0	76	25	62
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	190	216	21	52	0	0	0	0	83	27	67
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	7.2	7.9	9
HCM LOS	A	A	A

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	11%	0%	86%	0%
Vol Thru, %	100%	100%	15%	0%	89%	100%	14%	17%
Vol Right, %	0%	0%	85%	0%	0%	0%	0%	83%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	70	234	17	18	32	89	75
LT Vol	0	0	0	17	2	0	76	0
Through Vol	70	70	35	0	16	32	13	13
RT Vol	0	0	199	0	0	0	0	62
Lane Flow Rate	76	76	254	19	19	35	96	81
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.11	0.11	0.204	0.032	0.031	0.038	0.156	0.109
Departure Headway (Hd)	5.226	5.226	2.882	6.15	5.7	3.9	5.854	4.846
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	688	688	1246	581	627	913	610	735
Service Time	2.944	2.944	0.6	3.896	3.446	1.645	3.613	2.605
HCM Lane V/C Ratio	0.11	0.11	0.204	0.033	0.03	0.038	0.157	0.11
HCM Control Delay, s/veh	8.6	8.6	6.3	9.1	8.6	6.8	9.7	8.2
HCM Lane LOS	A	A	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0.4	0.8	0.1	0.1	0.1	0.5	0.4



Movement	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Lane Configurations								
Traffic Volume (vph)	94	1623	16	1643	48	1	46	58
Future Volume (vph)	94	1623	16	1643	48	1	46	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91			1.00	1.00
Frt	1.00	1.00	1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	5085	1770	5064			1770	1583
Flt Permitted	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (perm)	1770	5085	1770	5064			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	1764	17	1786	52	1	50	63
RTOR Reduction (vph)	0	0	0	5	0	0	0	44
Lane Group Flow (vph)	102	1764	17	1833	0	0	51	19
Turn Type	Prot	NA	Prot	NA		Perm	Prot	Perm
Protected Phases	7	4	3	8			6	
Permitted Phases						6		6
Actuated Green, G (s)	4.1	28.5	1.0	25.4			18.7	18.7
Effective Green, g (s)	4.1	28.5	1.0	25.4			18.7	18.7
Actuated g/C Ratio	0.07	0.46	0.02	0.41			0.30	0.30
Clearance Time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	117	2348	28	2084			536	479
v/s Ratio Prot	c0.06	c0.35	0.01	c0.36				
v/s Ratio Perm							0.03	0.01
v/c Ratio	0.87	0.75	0.61	0.88			0.10	0.04
Uniform Delay, d1	28.5	13.7	30.2	16.7			15.4	15.2
Progression Factor	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	46.1	1.4	32.0	4.6			0.4	0.2
Delay (s)	74.6	15.1	62.1	21.4			15.8	15.3
Level of Service	E	B	E	C			B	B
Approach Delay (s/veh)		18.3		21.7			15.5	
Approach LOS		B		C			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	182.2

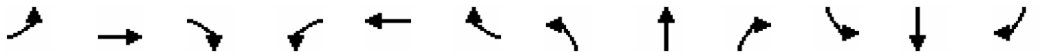
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	25	65	1671	48	11	1682	26	33	8	54	11	3	17
Future Vol, veh/h	25	65	1671	48	11	1682	26	33	8	54	11	3	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	71	1816	52	12	1828	28	36	9	59	12	3	18

Major/Minor	Major1				Major2			Minor1			Minor2		
Conflicting Flow All	1355	1857	0	0	1868	0	0	2795	3918	934	2793	3930	928
Stage 1	-	-	-	-	-	-	-	2038	2038	-	1866	1866	-
Stage 2	-	-	-	-	-	-	-	757	1880	-	927	2064	-
Critical Hdwy	5.64	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	2.32	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	278	148	-	-	146	-	-	~ 20	~ 3	229	20	~ 3	232
Stage 1	-	-	-	-	-	-	-	36	99	-	48	121	-
Stage 2	-	-	-	-	-	-	-	332	119	-	261	96	-
Platoon blocked, %			-	-		-	-						
Mov Cap-1 Maneuver	167	167	-	-	146	-	-	~ 7	~ 1	229	~ 6	~ 1	232
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 7	~ 1	-	~ 6	~ 1	-
Stage 1	-	-	-	-	-	-	-	~ 15	41	-	44	111	-
Stage 2	-	-	-	-	-	-	-	272	109	-	64	40	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.63	0.2	$ 6043.92	$ 2793.39
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	8	167	-	-	146	-	-	7
HCM Lane V/C Ratio	12.483	0.584	-	-	0.082	-	-	4.9
HCM Control Delay (s/veh)	$ 6043.9	52.9	-	-	31.9	-	-	$ 2793.4
HCM Lane LOS	F	F	-	-	D	-	-	F
HCM 95th %tile Q(veh)	14.5	3.1	-	-	0.3	-	-	5.6

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1991	0	0	1757	0	0	0	0	0	0	0
Future Volume (vph)	0	1991	0	0	1757	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5							
Lane Util. Factor		0.91			0.91							
Frt		1.00			1.00							
Flt Protected		1.00			1.00							
Satd. Flow (prot)		5085			5085							
Flt Permitted		1.00			1.00							
Satd. Flow (perm)		5085			5085							
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2164	0	0	1910	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2164	0	0	1910	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA							
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		90.0			90.0							
Effective Green, g (s)		90.0			90.0							
Actuated g/C Ratio		1.00			1.00							
Clearance Time (s)		4.5			4.5							
Vehicle Extension (s)		3.0			3.0							
Lane Grp Cap (vph)		5085			5085							
v/s Ratio Prot		c0.43			0.38							
v/s Ratio Perm												
v/c Ratio		0.43			0.38							
Uniform Delay, d1		0.0			0.0							
Progression Factor		1.00			1.00							
Incremental Delay, d2		0.0			0.0							
Delay (s)		0.0			0.0							
Level of Service		A			A							
Approach Delay (s/veh)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.5
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

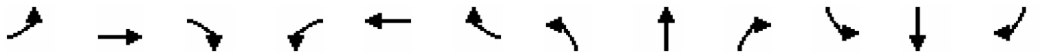
c Critical Lane Group

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	32	7	2	62	5	23	7	0	2	2	2
Future Vol, veh/h	0	32	7	2	62	5	23	7	0	2	2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	35	8	2	67	5	25	8	0	2	2	2
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay, s/veh	7.4	7.5	7.5	7.1
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	77%	0%	0%	6%	0%	33%
Vol Thru, %	23%	100%	60%	94%	86%	33%
Vol Right, %	0%	0%	40%	0%	14%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	21	18	33	36	6
LT Vol	23	0	0	2	0	2
Through Vol	7	21	11	31	31	2
RT Vol	0	0	7	0	5	2
Lane Flow Rate	33	23	19	36	39	7
Geometry Grp	2	5	5	5	5	2
Degree of Util (X)	0.039	0.03	0.023	0.046	0.049	0.007
Departure Headway (Hd)	4.289	4.641	4.363	4.655	4.527	4.022
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	825	770	818	769	790	876
Service Time	2.368	2.379	2.102	2.385	2.258	2.11
HCM Lane V/C Ratio	0.04	0.03	0.023	0.047	0.049	0.008
HCM Control Delay, s/veh	7.5	7.5	7.2	7.6	7.5	7.1
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0.1	0.2	0

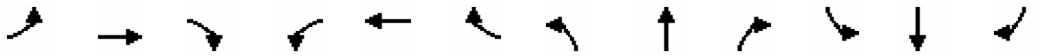


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	552	1784	0	0	1137	598	294	12	207	0	0	0
Future Volume (vph)	552	1784	0	0	1137	598	294	12	207	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1522	4799			6077		1681	1692	1583			
Flt Permitted	0.95	0.81			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1522	3887			6077		1681	1692	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	600	1939	0	0	1236	650	320	13	225	0	0	0
RTOR Reduction (vph)	0	0	0	0	105	0	0	0	61	0	0	0
Lane Group Flow (vph)	540	1999	0	0	1781	0	166	167	164	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	35.6	62.2			26.6		14.3	14.3	14.3			
Effective Green, g (s)	35.6	62.2			26.6		14.3	14.3	14.3			
Actuated g/C Ratio	0.40	0.69			0.30		0.16	0.16	0.16			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	602	3047			1796		267	268	251			
v/s Ratio Prot	c0.35	0.26			c0.29		0.10	0.10				
v/s Ratio Perm		0.19							c0.10			
v/c Ratio	0.90	0.66			1.12dr		0.62	0.62	0.65			
Uniform Delay, d1	25.5	7.9			31.6		35.3	35.3	35.5			
Progression Factor	1.16	1.67			1.00		1.00	1.00	1.00			
Incremental Delay, d2	8.7	0.3			18.8		4.4	4.5	5.9			
Delay (s)	38.4	13.4			50.4		39.8	39.8	41.5			
Level of Service	D	B			D		D	D	D			
Approach Delay (s/veh)		18.7			50.4			40.5			0.0	
Approach LOS		B			D			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1500	387	201	1247	0	0	0	0	825	102	465
Future Volume (vph)	0	1500	387	201	1247	0	0	0	0	825	102	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.97		1.00	1.00					1.00	0.90	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6211		1770	5085					3433	1597	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6211		1770	5085					3433	1597	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1630	421	218	1355	0	0	0	0	897	111	505
RTOR Reduction (vph)	0	51	0	0	0	0	0	0	0	0	33	87
Lane Group Flow (vph)	0	2000	0	218	1355	0	0	0	0	897	285	211
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		32.9		15.1	52.5					28.5	28.5	28.5
Effective Green, g (s)		32.9		15.1	52.5					28.5	28.5	28.5
Actuated g/C Ratio		0.37		0.17	0.58					0.32	0.32	0.32
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2270		296	2966					1087	505	476
v/s Ratio Prot		c0.32		c0.12	0.27					c0.26	0.18	
v/s Ratio Perm												0.14
v/c Ratio		0.88		0.74	0.46					0.83	0.56	0.44
Uniform Delay, d1		26.7		35.6	10.7					28.4	25.6	24.4
Progression Factor		1.00		0.50	0.16					1.00	1.00	1.00
Incremental Delay, d2		5.3		4.3	0.1					5.2	1.5	0.7
Delay (s)		32.0		22.1	1.7					33.7	27.0	25.1
Level of Service		C		C	A					C	C	C
Approach Delay (s/veh)		32.0			4.5			0.0			30.6	
Approach LOS		C			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	109	187	0	0	50	153	86	21	40	0	0	0
Future Vol, veh/h	109	187	0	0	50	153	86	21	40	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	118	203	0	0	54	166	93	23	43	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	8.3	6.9	9.3
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	92%	0%	0%	100%	17%	0%	0%	0%	0%
Vol Thru, %	8%	100%	0%	0%	83%	100%	100%	100%	6%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	94%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	14	40	96	75	125	20	20	163
LT Vol	86	0	0	96	13	0	0	0	0
Through Vol	7	14	0	0	62	125	20	20	10
RT Vol	0	0	40	0	0	0	0	0	153
Lane Flow Rate	101	15	43	104	82	136	22	22	177
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.168	0.023	0.058	0.169	0.123	0.135	0.034	0.034	0.158
Departure Headway (Hd)	5.988	5.527	4.829	5.834	5.419	3.591	5.607	5.607	3.204
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	596	645	737	614	660	992	638	638	1113
Service Time	3.747	3.286	2.588	3.58	3.165	1.336	3.345	3.345	0.941
HCM Lane V/C Ratio	0.169	0.023	0.058	0.169	0.124	0.137	0.034	0.034	0.159
HCM Control Delay, s/veh	10	8.4	7.9	9.8	8.9	6.9	8.5	8.5	6.5
HCM Lane LOS	A	A	A	A	A	A	A	A	A
HCM 95th-tile Q	0.6	0.1	0.2	0.6	0.4	0.5	0.1	0.1	0.6

Intersection	
Intersection Delay, s/veh	12.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	117	106	39	102	0	0	0	0	166	288	129
Future Vol, veh/h	0	117	106	39	102	0	0	0	0	166	288	129
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	127	115	42	111	0	0	0	0	180	313	140
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	8.9	9.5	14
HCM LOS	A	A	B

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	10%	0%	54%	0%
Vol Thru, %	100%	100%	18%	0%	90%	100%	46%	53%
Vol Right, %	0%	0%	82%	0%	0%	0%	0%	47%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	47	47	129	35	38	68	310	273
LT Vol	0	0	0	35	4	0	166	0
Through Vol	47	47	23	0	34	68	144	144
RT Vol	0	0	106	0	0	0	0	129
Lane Flow Rate	51	51	141	38	41	74	337	297
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.095	0.095	0.17	0.078	0.079	0.104	0.552	0.437
Departure Headway (Hd)	6.698	6.698	4.342	7.345	6.886	5.061	5.897	5.3
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	535	535	823	488	520	706	613	680
Service Time	4.442	4.442	2.085	5.091	4.633	2.807	3.623	3.026
HCM Lane V/C Ratio	0.095	0.095	0.171	0.078	0.079	0.105	0.55	0.437
HCM Control Delay, s/veh	10.1	10.1	8	10.7	10.2	8.4	15.7	12.1
HCM Lane LOS	B	B	A	B	B	A	C	B
HCM 95th-tile Q	0.3	0.3	0.6	0.3	0.3	0.3	3.4	2.2



Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	235	2230	28	1974	311	392	293
Future Volume (vph)	235	2230	28	1974	311	392	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91		1.00	1.00
Frt	1.00	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4982		1770	1583
Flt Permitted	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4982		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	2424	30	2146	338	426	318
RTOR Reduction (vph)	0	0	0	34	0	0	138
Lane Group Flow (vph)	255	2424	30	2450	0	426	180
Turn Type	Prot	NA	Prot	NA		Prot	Perm
Protected Phases	7	4	3	8		6	
Permitted Phases							6
Actuated Green, G (s)	5.3	29.2	2.0	25.9		18.0	18.0
Effective Green, g (s)	5.3	29.2	2.0	25.9		18.0	18.0
Actuated g/C Ratio	0.08	0.47	0.03	0.41		0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	149	2368	56	2057		508	454
v/s Ratio Prot	c0.14	c0.48	0.02	c0.49		c0.24	
v/s Ratio Perm							0.11
v/c Ratio	1.71	1.02	0.54	1.19		0.84	0.40
Uniform Delay, d1	28.7	16.8	29.9	18.4		21.0	18.0
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	346.9	24.8	9.5	91.1		15.2	2.6
Delay (s)	375.6	41.5	39.4	109.5		36.2	20.5
Level of Service	F	D	D	F		D	C
Approach Delay (s/veh)		73.3		108.7		29.5	
Approach LOS		E		F		C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	82.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	62.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2016.1

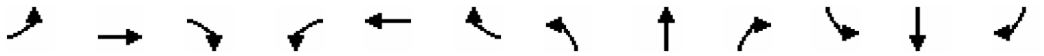
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	2405	18	32	2145	95	14	16	26	34	0	26
Future Vol, veh/h	39	2405	18	32	2145	95	14	16	26	34	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	42	2614	20	35	2332	103	15	17	28	37	0	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2435	0	0	2634	0	0	3711	5213	1317	3592	5171	1217
Stage 1	-	-	-	-	-	-	2709	2709	-	2453	2453	-
Stage 2	-	-	-	-	-	-	1002	2504	-	1139	2718	-
Critical Hdwy	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	75	-	-	59	-	-	~ 5	~ 0	127	~ 6	0	148
Stage 1	-	-	-	-	-	-	~ 11	44	-	~ 18	60	-
Stage 2	-	-	-	-	-	-	234	57	-	192	44	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	75	-	-	59	-	-	~ 1	~ 0	127	~ 1	0	148
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 1	~ 0	-	~ 1	0	-
Stage 1	-	-	-	-	-	-	~ 5	19	-	~ 7	25	-
Stage 2	-	-	-	-	-	-	78	23	-	~ 6	19	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	1.63	1.84	$ 148066.97	$ 24636.13
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	75	-	-	59	-	-	1
HCM Lane V/C Ratio	264.15	0.566	-	-	0.59	-	-	45.124
HCM Control Delay (s/veh)	$ 148067	103.1	-	-	131	-	-	$ 24636.1
HCM Lane LOS	F	F	-	-	F	-	-	F
HCM 95th %tile Q(veh)	9.9	2.4	-	-	2.4	-	-	10.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	2454	0	0	2185	0	0	0	0	0	0	0
Future Volume (vph)	83	2454	0	0	2185	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5							
Lane Util. Factor	1.00	0.91			0.91							
Frt	1.00	1.00			1.00							
Flt Protected	0.95	1.00			1.00							
Satd. Flow (prot)	1770	5085			5085							
Flt Permitted	0.06	1.00			1.00							
Satd. Flow (perm)	117	5085			5085							
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	2667	0	0	2375	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	90	2667	0	0	2375	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA							
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)	90.0	90.0			90.0							
Effective Green, g (s)	90.0	90.0			90.0							
Actuated g/C Ratio	1.00	1.00			1.00							
Clearance Time (s)	4.5	4.5			4.5							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	117	5085			5085							
v/s Ratio Prot		0.52			0.47							
v/s Ratio Perm	c0.77											
v/c Ratio	0.77	0.52			0.47							
Uniform Delay, d1	0.0	0.0			0.0							
Progression Factor	1.00	1.00			1.00							
Incremental Delay, d2	2.8	0.0			0.1							
Delay (s)	2.8	0.0			0.1							
Level of Service	A	A			A							
Approach Delay (s/veh)		0.1			0.1			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	0.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.5
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

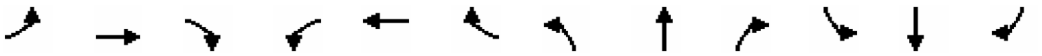
c Critical Lane Group

Intersection	
Intersection Delay, s/veh	12.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	386	3	35	501	16	96	1	63	20	3	1
Future Vol, veh/h	4	386	3	35	501	16	96	1	63	20	3	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	420	3	38	545	17	104	1	68	22	3	1
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay, s/veh	11.9	13.7	11.7	10.2
HCM LOS	B	B	B	B

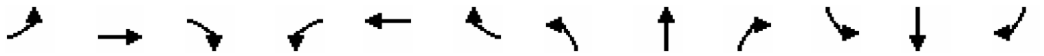
Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	60%	2%	0%	12%	0%	83%
Vol Thru, %	1%	98%	98%	88%	94%	13%
Vol Right, %	39%	0%	2%	0%	6%	4%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	160	197	196	286	267	24
LT Vol	96	4	0	35	0	20
Through Vol	1	193	193	251	251	3
RT Vol	63	0	3	0	16	1
Lane Flow Rate	174	214	213	310	290	26
Geometry Grp	2	5	5	5	5	2
Degree of Util (X)	0.295	0.354	0.351	0.5	0.458	0.049
Departure Headway (Hd)	6.112	5.952	5.931	5.801	5.696	6.81
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	588	604	607	621	631	525
Service Time	4.151	3.689	3.668	3.534	3.429	4.867
HCM Lane V/C Ratio	0.296	0.354	0.351	0.499	0.46	0.05
HCM Control Delay, s/veh	11.7	11.9	11.9	14.2	13.2	10.2
HCM Lane LOS	B	B	B	B	B	B
HCM 95th-tile Q	1.2	1.6	1.6	2.8	2.4	0.2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	671	2394	0	0	1483	729	234	18	142	0	0	0
Future Volume (vph)	671	2394	0	0	1483	729	234	18	142	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1522	4799			6091		1681	1697	1583			
Flt Permitted	0.95	0.76			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1522	3658			6091		1681	1697	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	729	2602	0	0	1612	792	254	20	154	0	0	0
RTOR Reduction (vph)	0	0	0	0	99	0	0	0	63	0	0	0
Lane Group Flow (vph)	656	2675	0	0	2305	0	137	137	91	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	38.1	63.8			25.7		12.7	12.7	12.7			
Effective Green, g (s)	38.1	63.8			25.7		12.7	12.7	12.7			
Actuated g/C Ratio	0.42	0.71			0.29		0.14	0.14	0.14			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	644	3076			1739		237	239	223			
v/s Ratio Prot	c0.43	0.37			c0.38		c0.08	0.08				
v/s Ratio Perm		0.25							0.06			
v/c Ratio	1.02	0.87			1.42dr		0.58	0.57	0.41			
Uniform Delay, d1	26.0	9.9			32.2		36.1	36.1	35.2			
Progression Factor	1.12	1.51			1.00		1.00	1.00	1.00			
Incremental Delay, d2	15.7	0.3			150.3		3.4	3.3	1.2			
Delay (s)	44.9	15.3			182.4		39.5	39.4	36.5			
Level of Service	D	B			F		D	D	D			
Approach Delay (s/veh)		21.1			182.4			38.4			0.0	
Approach LOS		C			F			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	85.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2174	265	173	1555	0	0	0	0	850	30	609
Future Volume (vph)	0	2174	265	173	1555	0	0	0	0	850	30	609
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.98		1.00	1.00					1.00	0.86	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6303		1770	5085					3433	1529	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6303		1770	5085					3433	1529	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2363	288	188	1690	0	0	0	0	924	33	662
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	0	0	9	80
Lane Group Flow (vph)	0	2627	0	188	1690	0	0	0	0	924	342	264
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		31.7		11.3	47.5					33.5	33.5	33.5
Effective Green, g (s)		31.7		11.3	47.5					33.5	33.5	33.5
Actuated g/C Ratio		0.35		0.13	0.53					0.37	0.37	0.37
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2220		222	2683					1277	569	559
v/s Ratio Prot		c0.42		c0.11	0.33					c0.27	0.22	
v/s Ratio Perm												0.18
v/c Ratio		1.18		0.85	0.63					0.72	0.60	0.47
Uniform Delay, d1		29.2		38.5	15.0					24.3	22.9	21.5
Progression Factor		1.00		0.49	0.19					1.00	1.00	1.00
Incremental Delay, d2		87.4		2.9	0.0					2.1	1.8	0.6
Delay (s)		116.6		21.9	2.9					26.3	24.6	22.2
Level of Service		F		C	A					C	C	C
Approach Delay (s/veh)		116.6			4.8			0.0			25.1	
Approach LOS		F			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	58.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	44.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Future Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	240	392	0	0	162	768	37	176	151	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	14.9	76.5	12.9
HCM LOS	B	F	B

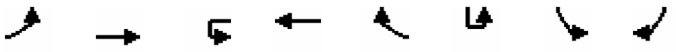
Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	39%	0%	0%	100%	22%	0%	0%	0%	0%
Vol Thru, %	61%	100%	0%	0%	78%	100%	100%	100%	4%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	96%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	108	139	188	153	241	60	60	737
LT Vol	34	0	0	188	33	0	0	0	0
Through Vol	54	108	0	0	120	241	60	60	30
RT Vol	0	0	139	0	0	0	0	0	707
Lane Flow Rate	96	117	151	204	167	262	65	65	801
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.206	0.247	0.289	0.451	0.351	0.416	0.134	0.134	1.107
Departure Headway (Hd)	8.019	7.823	7.112	8.264	7.864	5.983	7.426	7.426	4.978
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	451	463	509	439	460	607	486	486	737
Service Time	5.719	5.523	4.812	5.964	5.564	3.683	5.126	5.126	2.678
HCM Lane V/C Ratio	0.213	0.253	0.297	0.465	0.363	0.432	0.134	0.134	1.087
HCM Control Delay, s/veh	12.8	13.1	12.7	17.6	14.8	12.9	11.3	11.3	87.1
HCM Lane LOS	B	B	B	C	B	B	B	B	F
HCM 95th-tile Q	0.8	1	1.2	2.3	1.6	2	0.5	0.5	22.8

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Future Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	266	271	122	80	0	0	0	0	349	34	85
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	10.6	11.1	21.5
HCM LOS	B	B	C

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	95%	0%
Vol Thru, %	100%	100%	16%	0%	32%	100%	5%	17%
Vol Right, %	0%	0%	84%	0%	0%	0%	0%	83%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	98	98	298	60	76	49	337	94
LT Vol	0	0	0	60	51	0	321	0
Through Vol	98	98	49	0	25	49	16	16
RT Vol	0	0	249	0	0	0	0	78
Lane Flow Rate	107	107	324	66	83	54	366	102
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.201	0.201	0.397	0.142	0.175	0.082	0.705	0.166
Departure Headway (Hd)	6.779	6.779	4.409	7.787	7.62	5.495	6.943	5.884
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	526	526	807	458	468	645	519	607
Service Time	4.562	4.562	2.19	5.585	5.418	3.29	4.704	3.645
HCM Lane V/C Ratio	0.203	0.203	0.401	0.144	0.177	0.084	0.705	0.168
HCM Control Delay, s/veh	11.3	11.3	10.1	11.9	12	8.8	24.7	9.8
HCM Lane LOS	B	B	B	B	B	A	C	A
HCM 95th-tile Q	0.7	0.7	1.9	0.5	0.6	0.3	5.5	0.6



Movement	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Lane Configurations								
Traffic Volume (vph)	414	2029	20	2054	490	1	441	296
Future Volume (vph)	414	2029	20	2054	490	1	441	296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91			1.00	1.00
Frt	1.00	1.00	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4938			1770	1583
Flt Permitted	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4938			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	2205	22	2233	533	1	479	322
RTOR Reduction (vph)	0	0	0	63	0	0	0	140
Lane Group Flow (vph)	450	2205	22	2703	0	0	480	182
Turn Type	Prot	NA	Prot	NA		Perm	Prot	Perm
Protected Phases	7	4	3	8			6	
Permitted Phases						6		6
Actuated Green, G (s)	5.3	30.5	1.0	26.2			18.6	18.6
Effective Green, g (s)	5.3	30.5	1.0	26.2			18.6	18.6
Actuated g/C Ratio	0.08	0.48	0.02	0.41			0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	147	2438	27	2034			517	462
v/s Ratio Prot	c0.25	c0.43	0.01	c0.55				
v/s Ratio Perm							0.27	0.11
v/c Ratio	3.06	0.90	0.81	1.33			0.93	0.39
Uniform Delay, d1	29.2	15.2	31.2	18.7			21.9	18.0
Progression Factor	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	945.4	5.2	95.3	151.5			25.3	2.5
Delay (s)	974.5	20.4	126.5	170.2			47.2	20.5
Level of Service	F	C	F	F			D	C
Approach Delay (s/veh)		182.2		169.9			36.4	
Approach LOS		F		F			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	158.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	109.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	332.6

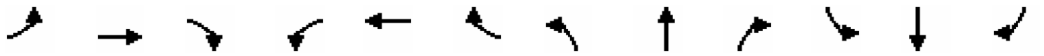
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	31	81	2385	60	14	2326	32	41	10	68	14	4	21
Future Vol, veh/h	31	81	2385	60	14	2326	32	41	10	68	14	4	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	88	2592	65	15	2528	35	45	11	74	15	4	23

Major/Minor	Major1				Major2			Minor1			Minor2		
Conflicting Flow All	1871	2563	0	0	2658	0	0	3912	5462	1329	3862	5477	1282
Stage 1	-	-	-	-	-	-	-	2868	2868	-	2576	2576	-
Stage 2	-	-	-	-	-	-	-	1044	2593	-	1286	2901	-
Critical Hdwy	5.64	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	2.32	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	142	~ 64	-	-	57	-	-	~ 4	~ 0	125	~ 4	~ 0	134
Stage 1	-	-	-	-	-	-	-	~ 9	36	-	~ 14	52	-
Stage 2	-	-	-	-	-	-	-	221	51	-	156	35	-
Platoon blocked, %			-	-		-	-						
Mov Cap-1 Maneuver	73	~ 73	-	-	57	-	-	~ 2	0	125	~ 1	0	134
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 2	0	-	~ 1	0	-
Stage 1	-	-	-	-	-	-	-	~ 9	0	-	~ 11	38	-
Stage 2	-	-	-	-	-	-	-	119	37	-	63	0	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	19.42	0.53	$ 10996.3	$ 8525.54
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	6	~ 73	-	-	57	-	-	3
HCM Lane V/C Ratio	22.647	1.657	-	-	0.266	-	-	14.66
HCM Control Delay (s/veh)	$ 10996.3	$ 443.3	-	-	89.2	-	-	$ 8525.5
HCM Lane LOS	F	F	-	-	F	-	-	F
HCM 95th %tile Q(veh)	18.1	10.4	-	-	0.9	-	-	7.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	2785	0	0	2419	0	0	0	0	0	0	0
Future Volume (vph)	131	2785	0	0	2419	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5							
Lane Util. Factor	1.00	0.91			0.91							
Frt	1.00	1.00			1.00							
Flt Protected	0.95	1.00			1.00							
Satd. Flow (prot)	1770	5085			5085							
Flt Permitted	0.05	1.00			1.00							
Satd. Flow (perm)	88	5085			5085							
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	142	3027	0	0	2629	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	142	3027	0	0	2629	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA							
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)	90.0	90.0			90.0							
Effective Green, g (s)	90.0	90.0			90.0							
Actuated g/C Ratio	1.00	1.00			1.00							
Clearance Time (s)	4.5	4.5			4.5							
Vehicle Extension (s)	3.0	3.0			3.0							
Lane Grp Cap (vph)	88	5085			5085							
v/s Ratio Prot		0.60			0.52							
v/s Ratio Perm	c1.61											
v/c Ratio	1.61	0.60			0.52							
Uniform Delay, d1	45.0	0.0			0.0							
Progression Factor	1.00	1.00			1.00							
Incremental Delay, d2	280.9	0.0			0.1							
Delay (s)	325.9	0.0			0.1							
Level of Service	F	A			A							
Approach Delay (s/veh)		14.6			0.1			0.0			0.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	1.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.5
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

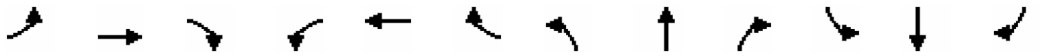
c Critical Lane Group

Intersection	
Intersection Delay, s/veh	28.6
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	731	9	75	732	10	29	9	81	3	3	3
Future Vol, veh/h	0	731	9	75	732	10	29	9	81	3	3	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	795	10	82	796	11	32	10	88	3	3	3
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay, s/veh	33.6	26.8	11.8	10.6
HCM LOS	D	D	B	B

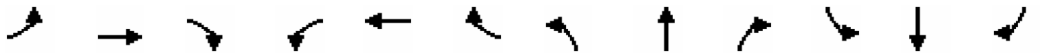
Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	24%	0%	0%	17%	0%	33%
Vol Thru, %	8%	100%	96%	83%	97%	33%
Vol Right, %	68%	0%	4%	0%	3%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	119	487	253	441	376	9
LT Vol	29	0	0	75	0	3
Through Vol	9	487	244	366	366	3
RT Vol	81	0	9	0	10	3
Lane Flow Rate	129	530	275	479	409	10
Geometry Grp	2	5	5	5	5	2
Degree of Util (X)	0.239	0.912	0.471	0.822	0.689	0.02
Departure Headway (Hd)	6.651	6.201	6.176	6.17	6.065	7.421
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	539	583	582	585	593	481
Service Time	4.694	3.96	3.935	3.924	3.819	5.486
HCM Lane V/C Ratio	0.239	0.909	0.473	0.819	0.69	0.021
HCM Control Delay, s/veh	11.8	43.6	14.4	31.4	21.3	10.6
HCM Lane LOS	B	E	B	D	C	B
HCM 95th-tile Q	0.9	11.2	2.5	8.4	5.4	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	690	2657	0	0	1779	747	367	15	259	0	0	0
Future Volume (vph)	690	2657	0	0	1779	747	367	15	259	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1522	4800			6124		1681	1692	1583			
Flt Permitted	0.95	0.74			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1522	3560			6124		1681	1692	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	750	2888	0	0	1934	812	399	16	282	0	0	0
RTOR Reduction (vph)	0	0	0	0	84	0	0	0	60	0	0	0
Lane Group Flow (vph)	675	2963	0	0	2662	0	207	208	222	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	34.1	60.7			26.6		15.8	15.8	15.8			
Effective Green, g (s)	34.1	60.7			26.6		15.8	15.8	15.8			
Actuated g/C Ratio	0.38	0.67			0.30		0.18	0.18	0.18			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	576	2870			1809		295	297	277			
v/s Ratio Prot	c0.44	0.39			c0.43		0.12	0.12				
v/s Ratio Perm		0.31							c0.14			
v/c Ratio	1.17	1.03			1.47		0.70	0.70	0.80			
Uniform Delay, d1	28.0	14.6			31.7		34.9	34.9	35.6			
Progression Factor	1.22	1.37			1.00		1.00	1.00	1.00			
Incremental Delay, d2	79.2	16.2			214.9		7.3	7.3	15.2			
Delay (s)	113.2	36.3			246.7		42.2	42.1	50.8			
Level of Service	F	D			F		D	D	D			
Approach Delay (s/veh)		50.6			246.7			45.7			0.0	
Approach LOS		D			F			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	126.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	96.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2302	484	251	1917	0	0	0	0	1031	128	581
Future Volume (vph)	0	2302	484	251	1917	0	0	0	0	1031	128	581
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.97		1.00	1.00					1.00	0.90	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6241		1770	5085					3433	1597	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6241		1770	5085					3433	1597	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2502	526	273	2084	0	0	0	0	1121	139	632
RTOR Reduction (vph)	0	42	0	0	0	0	0	0	0	0	5	87
Lane Group Flow (vph)	0	2986	0	273	2084	0	0	0	0	1121	393	286
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		32.9		15.1	52.5					28.5	28.5	28.5
Effective Green, g (s)		32.9		15.1	52.5					28.5	28.5	28.5
Actuated g/C Ratio		0.37		0.17	0.58					0.32	0.32	0.32
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2281		296	2966					1087	505	476
v/s Ratio Prot		c0.48		c0.15	0.41					c0.33	0.25	
v/s Ratio Perm												0.19
v/c Ratio		1.31		0.92	0.70					1.03	0.78	0.60
Uniform Delay, d1		28.6		36.9	13.2					30.8	27.9	26.0
Progression Factor		1.00		0.53	0.24					1.00	1.00	1.00
Incremental Delay, d2		142.4		5.0	0.1					35.6	7.4	2.1
Delay (s)		170.9		24.4	3.3					66.4	35.3	28.1
Level of Service		F		C	A					E	D	C
Approach Delay (s/veh)		170.9			5.7			0.0			52.3	
Approach LOS		F			A			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	86.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	96.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	56.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Future Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	148	768	0	0	349	637	116	28	291	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	55.9	90.8	20
HCM LOS	E	F	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	93%	0%	0%	100%	5%	0%	0%	0%	0%
Vol Thru, %	7%	100%	0%	0%	95%	100%	100%	100%	10%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	90%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	116	17	268	122	249	471	128	128	650
LT Vol	107	0	0	122	14	0	0	0	0
Through Vol	9	17	0	0	235	471	128	128	64
RT Vol	0	0	268	0	0	0	0	0	586
Lane Flow Rate	126	19	291	133	271	512	140	140	707
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.306	0.043	0.616	0.321	0.618	0.919	0.328	0.328	1.184
Departure Headway (Hd)	9.049	8.576	7.861	9.063	8.578	6.768	8.454	8.454	6.029
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	400	420	463	399	423	538	426	426	601
Service Time	6.749	6.276	5.561	6.763	6.278	4.468	6.205	6.205	3.779
HCM Lane V/C Ratio	0.315	0.045	0.629	0.333	0.641	0.952	0.329	0.329	1.176
HCM Control Delay, s/veh	15.7	11.7	22.4	16	24.2	47.2	15.3	15.3	120.6
HCM Lane LOS	C	B	C	C	C	E	C	C	F
HCM 95th-tile Q	1.3	0.1	4.1	1.4	4	11.1	1.4	1.4	24.4

Intersection	
Intersection Delay, s/veh	189.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Future Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	203	145	288	185	0	0	0	0	696	391	175
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	13.9	17.2	303
HCM LOS	B	C	F

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	78%	0%
Vol Thru, %	100%	100%	22%	0%	32%	100%	22%	53%
Vol Right, %	0%	0%	78%	0%	0%	0%	0%	47%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	75	170	143	179	113	820	341
LT Vol	0	0	0	143	122	0	640	0
Through Vol	75	75	37	0	57	113	180	180
RT Vol	0	0	133	0	0	0	0	161
Lane Flow Rate	81	81	185	156	194	123	891	371
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.189	0.189	0.314	0.366	0.448	0.214	1.873	0.705
Departure Headway (Hd)	9.692	9.692	7.302	9.742	9.577	7.411	7.566	6.843
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	372	372	496	372	378	488	481	526
Service Time	7.392	7.392	5.002	7.442	7.277	5.111	5.324	4.601
HCM Lane V/C Ratio	0.218	0.218	0.373	0.419	0.513	0.252	1.852	0.705
HCM Control Delay, s/veh	14.6	14.6	13.3	18	19.8	12.1	418.9	24.4
HCM Lane LOS	B	B	B	C	C	B	F	C
HCM 95th-tile Q	0.7	0.7	1.3	1.6	2.2	0.8	57.3	5.6



Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	235	2404	28	2250	311	392	293
Future Volume (vph)	235	2404	28	2250	311	392	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91		1.00	1.00
Frt	1.00	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4993		1770	1583
Flt Permitted	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4993		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	2613	30	2446	338	426	318
RTOR Reduction (vph)	0	0	0	28	0	0	138
Lane Group Flow (vph)	255	2613	30	2756	0	426	180
Turn Type	Prot	NA	Prot	NA		Prot	Perm
Protected Phases	7	4	3	8		6	
Permitted Phases							6
Actuated Green, G (s)	5.3	29.2	2.0	25.9		18.0	18.0
Effective Green, g (s)	5.3	29.2	2.0	25.9		18.0	18.0
Actuated g/C Ratio	0.08	0.47	0.03	0.41		0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	149	2368	56	2062		508	454
v/s Ratio Prot	c0.14	c0.51	0.02	c0.55		c0.24	
v/s Ratio Perm							0.11
v/c Ratio	1.71	1.10	0.54	1.34		0.84	0.40
Uniform Delay, d1	28.7	16.8	29.9	18.4		21.0	18.0
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	346.9	53.6	9.5	154.8		15.2	2.6
Delay (s)	375.6	70.4	39.4	173.2		36.2	20.5
Level of Service	F	E	D	F		D	C
Approach Delay (s/veh)		97.5		171.8		29.5	
Approach LOS		F		F		C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	122.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	62.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	1860.6

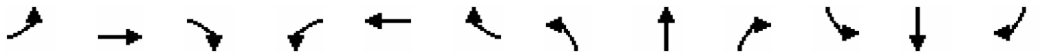
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	108	2527	18	32	2393	123	14	16	26	86	0	35
Future Vol, veh/h	108	2527	18	32	2393	123	14	16	26	86	0	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	117	2747	20	35	2601	134	15	17	28	93	0	38

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2735	0	0	2766	0	0	4101	5796	1383	4080	5739	1367
Stage 1	-	-	-	-	-	-	2991	2991	-	2738	2738	-
Stage 2	-	-	-	-	-	-	1110	2804	-	1342	3001	-
Critical Hdwy	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	~ 52	-	-	50	-	-	~ 3	~ 0	114	~ 3	0	117
Stage 1	-	-	-	-	-	-	~ 7	31	-	~ 11	43	-
Stage 2	-	-	-	-	-	-	201	39	-	143	31	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	~ 52	-	-	50	-	-	~ 1	0	114	~ 1	0	117
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 1	0	-	~ 1	0	-
Stage 1	-	-	-	-	-	-	~ 7	0	-	~ 3	13	-
Stage 2	-	-	-	-	-	-	42	~ 12	-	108	0	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	30.14	2.16	$ 21066.23	$ 72240.88
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	2	~ 52	-	-	50	-	-	1
HCM Lane V/C Ratio	38.194	2.248	-	-	0.692	-	-	144.385
HCM Control Delay (s/veh)	$ 21066.2	$ 740.4	-	-	172	-	-	$ 72240.9
HCM Lane LOS	F	F	-	-	F	-	-	F
HCM 95th %tile Q(veh)	9.8	11.9	-	-	2.8	-	-	18.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	456	2523	0	0	2284	138	0	0	0	122	0	287
Future Volume (vph)	456	2523	0	0	2284	138	0	0	0	122	0	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5						4.5	
Lane Util. Factor	1.00	0.91			0.91						0.95	
Frt	1.00	1.00			0.99						0.89	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1770	5085			5042						3120	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1770	5085			5042						3120	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	496	2742	0	0	2483	150	0	0	0	133	0	312
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	0	0	234	0
Lane Group Flow (vph)	496	2742	0	0	2626	0	0	0	0	0	211	0
Turn Type	Prot	NA		Perm	NA					Perm	NA	
Protected Phases	7	4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)	19.5	58.5			34.5						22.5	
Effective Green, g (s)	19.5	58.5			34.5						22.5	
Actuated g/C Ratio	0.22	0.65			0.38						0.25	
Clearance Time (s)	4.5	4.5			4.5						4.5	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	383	3305			1932						780	
v/s Ratio Prot	c0.28	0.54			c0.52							
v/s Ratio Perm											0.07	
v/c Ratio	1.30	0.83			1.36						0.27	
Uniform Delay, d1	35.3	12.0			27.8						27.1	
Progression Factor	1.00	1.00			1.00						1.00	
Incremental Delay, d2	150.9	1.8			165.0						0.9	
Delay (s)	186.2	13.8			192.8						28.0	
Level of Service	F	B			F						C	
Approach Delay (s/veh)		40.2			192.8			0.0			28.0	
Approach LOS		D			F			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	102.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	69	97	456	322	28
Future Vol, veh/h	35	69	97	456	322	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	75	105	496	350	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	824	190	380	0	-	0
Stage 1	365	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	311	819	1175	-	-	-
Stage 1	673	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	279	819	1175	-	-	-
Mov Cap-2 Maneuver	279	-	-	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	14.39	1.97	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	631	-	496	-	-
HCM Lane V/C Ratio	0.09	-	0.228	-	-
HCM Control Delay (s/veh)	8.4	0.6	14.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.9	-	-

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	17	43	52	86	0	55	330	114	22	254	14
Future Vol, veh/h	45	17	43	52	86	0	55	330	114	22	254	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	49	18	47	57	93	0	60	359	124	24	276	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	677	934	146	735	879	241	291	0	0	483	0	0
Stage 1	332	332	-	540	540	-	-	-	-	-	-	-
Stage 2	346	602	-	195	339	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	339	264	875	307	285	760	1267	-	-	1076	-	-
Stage 1	656	643	-	493	519	-	-	-	-	-	-	-
Stage 2	643	487	-	788	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	207	244	875	249	262	760	1267	-	-	1076	-	-
Mov Cap-2 Maneuver	207	244	-	249	262	-	-	-	-	-	-	-
Stage 1	640	628	-	466	491	-	-	-	-	-	-	-
Stage 2	492	460	-	707	623	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	23.04	36.82	1.1	0.79
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	292	-	-	312	257	254	-	-
HCM Lane V/C Ratio	0.047	-	-	0.366	0.583	0.022	-	-
HCM Control Delay (s/veh)	8	0.3	-	23	36.8	8.4	0.2	-
HCM Lane LOS	A	A	-	C	E	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	3.4	0.1	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	104	97	263	201	36
Future Vol, veh/h	9	104	97	263	201	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	113	105	286	218	39

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	592	129	258	0	-	0
Stage 1	238	-	-	-	-	-
Stage 2	354	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	438	897	1304	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	399	897	1304	-	-	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	681	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	10.19	2.45	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	970	-	816	-	-
HCM Lane V/C Ratio	0.081	-	0.151	-	-
HCM Control Delay (s/veh)	8	0.4	10.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.5	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	91	0	129	85	0	160
Future Vol, veh/h	91	0	129	85	0	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	99	0	140	92	0	174

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	273	116	0	0	233	0
Stage 1	186	-	-	-	-	-
Stage 2	87	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	693	914	-	-	1332	-
Stage 1	827	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	693	914	-	-	1332	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	926	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	11.05	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	693	1332	-
HCM Lane V/C Ratio	-	-	0.143	-	-
HCM Control Delay (s/veh)	-	-	11.1	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Intersection Delay, s/veh	16.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	386	72	104	501	16	139	1	106	20	3	1
Future Vol, veh/h	4	386	72	104	501	16	139	1	106	20	3	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	420	78	113	545	17	151	1	115	22	3	1
Number of Lanes	0	2	0	0	2	0	0	2	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	2
HCM Control Delay, s/veh	14.8	19.6	13.3	11.8
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	2%	0%	29%	0%	83%
Vol Thru, %	0%	0%	98%	73%	71%	94%	13%
Vol Right, %	0%	100%	0%	27%	0%	6%	4%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	107	197	265	355	267	24
LT Vol	139	0	4	0	104	0	20
Through Vol	1	1	193	193	251	251	3
RT Vol	0	106	0	72	0	16	1
Lane Flow Rate	152	116	214	288	385	290	26
Geometry Grp	5	5	5	5	5	5	4b
Degree of Util (X)	0.334	0.216	0.392	0.51	0.694	0.506	0.06
Departure Headway (Hd)	7.931	6.71	6.584	6.38	6.483	6.291	8.308
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	452	531	544	562	555	571	434
Service Time	5.713	4.491	4.363	4.159	4.256	4.064	6.308
HCM Lane V/C Ratio	0.336	0.218	0.393	0.512	0.694	0.508	0.06
HCM Control Delay, s/veh	14.7	11.4	13.6	15.7	22.8	15.4	11.8
HCM Lane LOS	B	B	B	C	C	C	B
HCM 95th-tile Q	1.4	0.8	1.9	2.9	5.4	2.8	0.2

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	69	110	55	14	61	14	9	41	36	9	0	69
Future Vol, veh/h	69	110	55	14	61	14	9	41	36	9	0	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	75	120	60	15	66	15	10	45	39	10	0	75

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	82	0	0	179	0	0	396	411	149	396	434	74
Stage 1	-	-	-	-	-	-	299	299	-	104	104	-
Stage 2	-	-	-	-	-	-	97	112	-	292	329	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1516	-	-	1396	-	-	564	530	897	564	515	988
Stage 1	-	-	-	-	-	-	709	666	-	901	809	-
Stage 2	-	-	-	-	-	-	910	803	-	716	646	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1516	-	-	1396	-	-	486	495	897	461	481	988
Mov Cap-2 Maneuver	-	-	-	-	-	-	486	495	-	461	481	-
Stage 1	-	-	-	-	-	-	670	629	-	891	800	-
Stage 2	-	-	-	-	-	-	831	794	-	601	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.21	1.2	11.99	9.57
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	608	498	-	-	273	-	-	873
HCM Lane V/C Ratio	0.154	0.049	-	-	0.011	-	-	0.097
HCM Control Delay (s/veh)	12	7.5	0	-	7.6	0	-	9.6
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.5	0.2	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	69	83	28	55	43	14	26	28	17	9	50	9
Future Vol, veh/h	69	83	28	55	43	14	26	28	17	9	50	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	75	90	30	60	47	15	28	30	18	10	54	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	62	0	0	121	0	0	449	437	105	429	445	54
Stage 1	-	-	-	-	-	-	255	255	-	174	174	-
Stage 2	-	-	-	-	-	-	193	182	-	255	271	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1541	-	-	1467	-	-	520	513	949	536	508	1013
Stage 1	-	-	-	-	-	-	749	696	-	828	755	-
Stage 2	-	-	-	-	-	-	808	749	-	749	685	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1541	-	-	1467	-	-	417	466	949	449	461	1013
Mov Cap-2 Maneuver	-	-	-	-	-	-	417	466	-	449	461	-
Stage 1	-	-	-	-	-	-	710	660	-	793	723	-
Stage 2	-	-	-	-	-	-	709	718	-	664	650	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.86	3.71	13.4	13.55
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	506	657	-	-	843	-	-	495
HCM Lane V/C Ratio	0.153	0.049	-	-	0.041	-	-	0.149
HCM Control Delay (s/veh)	13.4	7.5	0	-	7.6	0	-	13.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.5	0.2	-	-	0.1	-	-	0.5

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	78	1750	179	0	0
Future Vol, veh/h	0	78	1750	179	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	85	1902	195	0	0

Major/Minor	Minor1	Major1		
Conflicting Flow All	-	1048	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	224	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	224	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/v	30.5	1
HCM LOS	D	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	224
HCM Lane V/C Ratio	-	-	0.378
HCM Control Delay (s/veh)	-	-	30.5
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.7

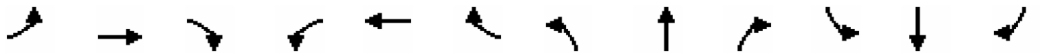
Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	139	1593	235	0	0
Future Vol, veh/h	0	139	1593	235	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	151	1732	255	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	993	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	244	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	244	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/v	41.1	0
HCM LOS	E	

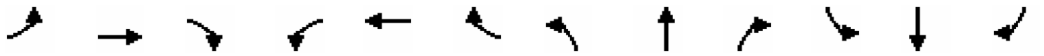
Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	244
HCM Lane V/C Ratio	-	-	0.619
HCM Control Delay (s/veh)	-	-	41.1
HCM Lane LOS	-	-	E
HCM 95th %tile Q(veh)	-	-	3.7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	809	2767	0	0	1787	757	234	87	211	0	0	0
Future Volume (vph)	809	2767	0	0	1787	757	234	87	211	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.98	1.00			
Satd. Flow (prot)	1522	4799			6122		1681	1730	1583			
Flt Permitted	0.95	0.72			1.00		0.95	0.98	1.00			
Satd. Flow (perm)	1522	3453			6122		1681	1730	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	879	3008	0	0	1942	823	254	95	229	0	0	0
RTOR Reduction (vph)	0	0	0	0	85	0	0	0	61	0	0	0
Lane Group Flow (vph)	791	3096	0	0	2680	0	173	176	168	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	36.3	62.0			25.7		14.5	14.5	14.5			
Effective Green, g (s)	36.3	62.0			25.7		14.5	14.5	14.5			
Actuated g/C Ratio	0.40	0.69			0.29		0.16	0.16	0.16			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	613	2921			1748		270	278	255			
v/s Ratio Prot	c0.52	0.43			c0.44		0.10	0.10				
v/s Ratio Perm		0.30							c0.11			
v/c Ratio	1.29	1.06			1.53		0.64	0.63	0.66			
Uniform Delay, d1	26.9	14.0			32.2		35.3	35.3	35.4			
Progression Factor	1.24	1.49			1.00		1.00	1.00	1.00			
Incremental Delay, d2	131.8	27.9			242.9		5.1	4.7	6.0			
Delay (s)	165.2	48.8			275.0		40.4	39.9	41.4			
Level of Service	F	D			F		D	D	D			
Approach Delay (s/veh)		72.5			275.0			40.7			0.0	
Approach LOS		E			F			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	147.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2519	265	260	1772	0	0	0	0	1016	30	609
Future Volume (vph)	0	2519	265	260	1772	0	0	0	0	1016	30	609
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.99		1.00	1.00					1.00	0.86	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6316		1770	5085					3433	1529	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6316		1770	5085					3433	1529	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2738	288	283	1926	0	0	0	0	1104	33	662
RTOR Reduction (vph)	0	19	0	0	0	0	0	0	0	0	4	80
Lane Group Flow (vph)	0	3007	0	283	1926	0	0	0	0	1104	347	264
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		31.7		11.3	47.5					33.5	33.5	33.5
Effective Green, g (s)		31.7		11.3	47.5					33.5	33.5	33.5
Actuated g/C Ratio		0.35		0.13	0.53					0.37	0.37	0.37
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2224		222	2683					1277	569	559
v/s Ratio Prot		c0.48		c0.16	0.38					c0.32	0.23	
v/s Ratio Perm												0.18
v/c Ratio		1.35		1.27	0.72					0.86	0.61	0.47
Uniform Delay, d1		29.2		39.4	16.2					26.1	22.9	21.5
Progression Factor		1.00		0.51	0.27					1.00	1.00	1.00
Incremental Delay, d2		161.4		126.9	0.1					6.3	1.9	0.6
Delay (s)		190.5		146.8	4.4					32.5	24.8	22.2
Level of Service		F		F	A					C	C	C
Approach Delay (s/veh)		190.5			22.7			0.0			29.0	
Approach LOS		F			C			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	96.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	44.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Future Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	240	392	0	0	162	768	37	176	151	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	14.9	76.5	12.9
HCM LOS	B	F	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	39%	0%	0%	100%	22%	0%	0%	0%	0%
Vol Thru, %	61%	100%	0%	0%	78%	100%	100%	100%	4%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	96%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	108	139	188	153	241	60	60	737
LT Vol	34	0	0	188	33	0	0	0	0
Through Vol	54	108	0	0	120	241	60	60	30
RT Vol	0	0	139	0	0	0	0	0	707
Lane Flow Rate	96	117	151	204	167	262	65	65	801
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.206	0.247	0.289	0.451	0.351	0.416	0.134	0.134	1.107
Departure Headway (Hd)	8.019	7.823	7.112	8.264	7.864	5.983	7.426	7.426	4.978
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	451	463	509	439	460	607	486	486	737
Service Time	5.719	5.523	4.812	5.964	5.564	3.683	5.126	5.126	2.678
HCM Lane V/C Ratio	0.213	0.253	0.297	0.465	0.363	0.432	0.134	0.134	1.087
HCM Control Delay, s/veh	12.8	13.1	12.7	17.6	14.8	12.9	11.3	11.3	87.1
HCM Lane LOS	B	B	B	C	B	B	B	B	F
HCM 95th-tile Q	0.8	1	1.2	2.3	1.6	2	0.5	0.5	22.8

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Future Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	266	271	122	80	0	0	0	0	349	34	85
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	10.6	11.1	21.5
HCM LOS	B	B	C

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	95%	0%
Vol Thru, %	100%	100%	16%	0%	32%	100%	5%	17%
Vol Right, %	0%	0%	84%	0%	0%	0%	0%	83%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	98	98	298	60	76	49	337	94
LT Vol	0	0	0	60	51	0	321	0
Through Vol	98	98	49	0	25	49	16	16
RT Vol	0	0	249	0	0	0	0	78
Lane Flow Rate	107	107	324	66	83	54	366	102
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.201	0.201	0.397	0.142	0.175	0.082	0.705	0.166
Departure Headway (Hd)	6.779	6.779	4.409	7.787	7.62	5.495	6.943	5.884
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	526	526	807	458	468	645	519	607
Service Time	4.562	4.562	2.19	5.585	5.418	3.29	4.704	3.645
HCM Lane V/C Ratio	0.203	0.203	0.401	0.144	0.177	0.084	0.705	0.168
HCM Control Delay, s/veh	11.3	11.3	10.1	11.9	12	8.8	24.7	9.8
HCM Lane LOS	B	B	B	B	B	A	C	A
HCM 95th-tile Q	0.7	0.7	1.9	0.5	0.6	0.3	5.5	0.6

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2979	2543	28	0	17
Future Vol, veh/h	0	2979	2543	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3238	2764	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1397
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	112
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	112
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	43.44
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	112
HCM Lane V/C Ratio	-	-	-	0.165
HCM Control Delay (s/veh)	-	-	-	43.4
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.6

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	9	9	62	14	14
Future Vol, veh/h	105	9	9	62	14	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	114	10	10	67	15	15

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	124	0	206	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	87	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1463	-	782	933
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	936	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1463	-	777	933
Mov Cap-2 Maneuver	-	-	-	-	777	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	930	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.95	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	848	-	-	228	-
HCM Lane V/C Ratio	0.036	-	-	0.007	-
HCM Control Delay (s/veh)	9.4	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2645	2404	28	0	17
Future Vol, veh/h	0	2645	2404	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2875	2613	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1322
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	126
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	126
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	38.44
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	126
HCM Lane V/C Ratio	-	-	-	0.147
HCM Control Delay (s/veh)	-	-	-	38.4
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.5

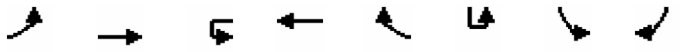
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2645	2414	28	0	17
Future Vol, veh/h	0	2645	2414	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2875	2624	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1327
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	125
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	125
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	38.77
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	125
HCM Lane V/C Ratio	-	-	-	0.148
HCM Control Delay (s/veh)	-	-	-	38.8
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.5



Movement	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Lane Configurations								
Traffic Volume (vph)	414	2540	20	2482	490	1	441	296
Future Volume (vph)	414	2540	20	2482	490	1	441	296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91			1.00	1.00
Frt	1.00	1.00	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4959			1770	1583
Flt Permitted	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4959			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	2761	22	2698	533	1	479	322
RTOR Reduction (vph)	0	0	0	46	0	0	0	140
Lane Group Flow (vph)	450	2761	22	3185	0	0	480	182
Turn Type	Prot	NA	Prot	NA		Perm	Prot	Perm
Protected Phases	7	4	3	8			6	
Permitted Phases						6		6
Actuated Green, G (s)	5.3	30.5	1.0	26.2			18.6	18.6
Effective Green, g (s)	5.3	30.5	1.0	26.2			18.6	18.6
Actuated g/C Ratio	0.08	0.48	0.02	0.41			0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	147	2438	27	2042			517	462
v/s Ratio Prot	c0.25	c0.54	0.01	c0.64				
v/s Ratio Perm							0.27	0.11
v/c Ratio	3.06	1.13	0.81	1.56			0.93	0.39
Uniform Delay, d1	29.2	16.5	31.2	18.7			21.9	18.0
Progression Factor	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	945.4	65.4	95.3	254.2			25.3	2.5
Delay (s)	974.5	81.9	126.5	272.9			47.2	20.5
Level of Service	F	F	F	F			D	C
Approach Delay (s/veh)		207.0		271.9			36.4	
Approach LOS		F		F			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	217.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	117.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	28059.9

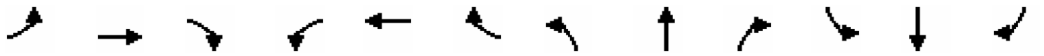
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	31	188	2742	60	14	2711	75	41	10	68	167	4	47
Future Vol, veh/h	31	188	2742	60	14	2711	75	41	10	68	167	4	47
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	540	-	-	710	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	204	2980	65	15	2947	82	45	11	74	182	4	51

Major/Minor	Major1				Major2			Minor1			Minor2		
Conflicting Flow All	2211	3028	0	0	3046	0	0	4700	6548	1523	4692	6540	1514
Stage 1	-	-	-	-	-	-	-	3489	3489	-	3018	3018	-
Stage 2	-	-	-	-	-	-	-	1211	3059	-	1674	3522	-
Critical Hdwy	5.64	5.34	-	-	5.34	-	-	6.44	6.54	7.14	6.44	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	7.34	5.54	-	7.34	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.74	5.54	-	6.74	5.54	-
Follow-up Hdwy	2.32	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Cap-1 Maneuver	91	~ 37	-	-	36	-	-	~ 1	~ 0	92	~ 1	~ 0	93
Stage 1	-	-	-	-	-	-	-	~ 3	17	-	~ 7	30	-
Stage 2	-	-	-	-	-	-	-	173	29	-	~ 88	16	-
Platoon blocked, %			-	-		-	-						
Mov Cap-1 Maneuver	37	~ 37	-	-	36	-	-	~ 0	0	92	~ 0	0	93
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 0	0	-	~ 0	0	-
Stage 1	-	-	-	-	-	-	-	~ 3	0	-	~ 4	17	-
Stage 2	-	-	-	-	-	-	-	~ 34	16	-	~ 17	0	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	991.78	0.83	$ 89684.45	$ 741003.12
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1	~ 37	-	-	36	-	-	-
HCM Lane V/C Ratio	178.736	6.408	-	-	0.425	-	1	544.963
HCM Control Delay (s/veh)	$ 89684.4	$ 2645.5	-	-	165.9	-	$ 7	41003.1
HCM Lane LOS	F	F	-	-	F	-	-	F
HCM 95th %tile Q(veh)	18.7	28.3	-	-	1.4	-	-	32.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	708	2892	0	0	2632	214	0	0	0	357	0	850
Future Volume (vph)	708	2892	0	0	2632	214	0	0	0	357	0	850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5						4.5	
Lane Util. Factor	1.00	0.91			0.91						0.95	
Frt	1.00	1.00			0.99						0.89	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1770	5085			5028						3119	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1770	5085			5028						3119	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	770	3143	0	0	2861	233	0	0	0	388	0	924
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	296	0
Lane Group Flow (vph)	770	3143	0	0	3084	0	0	0	0	0	1017	0
Turn Type	Prot	NA		Perm	NA					Perm	NA	
Protected Phases	7	4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)	19.5	58.5			34.5						22.5	
Effective Green, g (s)	19.5	58.5			34.5						22.5	
Actuated g/C Ratio	0.22	0.65			0.38						0.25	
Clearance Time (s)	4.5	4.5			4.5						4.5	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	383	3305			1927						779	
v/s Ratio Prot	c0.44	0.62			c0.61							
v/s Ratio Perm											0.33	
v/c Ratio	2.01	0.95			1.60						1.32dr	
Uniform Delay, d1	35.3	14.4			27.8						33.8	
Progression Factor	1.00	1.00			1.00						1.00	
Incremental Delay, d2	463.9	7.3			272.5						146.5	
Delay (s)	499.1	21.7			300.3						180.2	
Level of Service	F	C			F						F	
Approach Delay (s/veh)		115.7			300.3			0.0			180.2	
Approach LOS		F			F			A			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	194.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	144.0%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Intersection	
Int Delay, s/veh	118.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	102	204	150	708	952	43
Future Vol, veh/h	102	204	150	708	952	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	111	222	163	770	1035	47

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1769	541	1082	0	-	0
Stage 1	1058	-	-	-	-	-
Stage 2	711	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 75	486	641	-	-	-
Stage 1	295	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 50	486	641	-	-	-
Mov Cap-2 Maneuver	~ 50	-	-	-	-	-
Stage 1	199	-	-	-	-	-
Stage 2	448	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	$821.57	4.54	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	504	-	125	-	-
HCM Lane V/C Ratio	0.255	-	2.654	-	-
HCM Control Delay (s/veh)	12.5	2.8	$ 821.6	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	1	-	30.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	418.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	94	51	128	153	158	0	86	550	201	47	714	21
Future Vol, veh/h	94	51	128	153	158	0	86	550	201	47	714	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	102	55	139	166	172	0	93	598	218	51	776	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1461	1893	399	1412	1795	408	799	0	0	816	0	0
Stage 1	890	890	-	894	894	-	-	-	-	-	-	-
Stage 2	572	1003	-	518	901	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 90	69	600	~ 98	~ 80	592	819	-	-	807	-	-
Stage 1	304	359	-	302	358	-	-	-	-	-	-	-
Stage 2	473	318	-	509	355	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 70	~ 54	600	~ 59	~ 62	592	819	-	-	807	-	-
Mov Cap-2 Maneuver	~ 70	~ 54	-	~ 59	~ 62	-	-	-	-	-	-	-
Stage 1	279	330	-	257	304	-	-	-	-	-	-	-
Stage 2	175	270	-	299	326	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/veh	$ 857.44	$ 2201.76	1.77	1.23
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	269	-	-	109	60	208	-	-
HCM Lane V/C Ratio	0.114	-	-	2.712	5.593	0.063	-	-
HCM Control Delay (s/veh)	10	1.1	-	$ 857.4	$ 2201.8	9.8	0.7	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.4	-	-	27.5	38	0.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	306	150	506	463	68
Future Vol, veh/h	26	306	150	506	463	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	333	163	550	503	74

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1141	289	577	0	-	0
Stage 1	540	-	-	-	-	-
Stage 2	601	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	194	708	992	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	708	992	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	442	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	22.75	3.01	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	823	-	555	-	-
HCM Lane V/C Ratio	0.164	-	0.65	-	-
HCM Control Delay (s/veh)	9.3	1.1	22.8	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.6	-	4.7	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	175	0	321	194	0	282
Future Vol, veh/h	175	0	321	194	0	282
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	190	0	349	211	0	307

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	608	280	0	0	560	0
Stage 1	454	-	-	-	-	-
Stage 2	153	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	428	717	-	-	1007	-
Stage 1	606	-	-	-	-	-
Stage 2	859	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	428	717	-	-	1007	-
Mov Cap-2 Maneuver	428	-	-	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	859	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	19.99	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	428	1007	-
HCM Lane V/C Ratio	-	-	0.445	-	-
HCM Control Delay (s/veh)	-	-	20	0	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	2.2	0	-

Intersection	
Intersection Delay, s/veh	80.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	731	116	182	732	10	157	9	209	3	3	3
Future Vol, veh/h	0	731	116	182	732	10	157	9	209	3	3	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	795	126	198	796	11	171	10	227	3	3	3
Number of Lanes	0	2	0	0	2	0	0	2	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	2
HCM Control Delay, s/veh	73.7	112.8	19.8	13
HCM LOS	F	F	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	97%	0%	0%	0%	33%	0%	33%
Vol Thru, %	3%	2%	100%	68%	67%	97%	33%
Vol Right, %	0%	98%	0%	32%	0%	3%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	162	214	487	360	548	376	9
LT Vol	157	0	0	0	182	0	3
Through Vol	5	5	487	244	366	366	3
RT Vol	0	209	0	116	0	10	3
Lane Flow Rate	176	232	530	391	596	409	10
Geometry Grp	5	5	5	5	5	5	4b
Degree of Util (X)	0.443	0.51	1.11	0.794	1.27	0.851	0.025
Departure Headway (Hd)	9.69	8.48	7.924	7.692	7.941	7.751	9.738
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	374	427	461	473	465	470	370
Service Time	7.39	6.18	5.624	5.392	5.641	5.451	7.738
HCM Lane V/C Ratio	0.471	0.543	1.15	0.827	1.282	0.87	0.027
HCM Control Delay, s/veh	19.9	19.7	103	34	162.1	40.9	13
HCM Lane LOS	C	C	F	D	F	E	B
HCM 95th-tile Q	2.2	2.8	17.2	7.2	24.2	8.6	0.1

Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	107	171	86	21	179	21	26	64	68	26	0	204
Future Vol, veh/h	107	171	86	21	179	21	26	64	68	26	0	204
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	186	93	23	195	23	28	70	74	28	0	222

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	217	0	0	279	0	0	705	728	233	705	764	206
Stage 1	-	-	-	-	-	-	465	465	-	252	252	-
Stage 2	-	-	-	-	-	-	240	263	-	453	512	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1352	-	-	1283	-	-	351	350	807	351	334	835
Stage 1	-	-	-	-	-	-	577	563	-	753	699	-
Stage 2	-	-	-	-	-	-	763	691	-	586	536	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1352	-	-	1283	-	-	226	308	807	223	293	835
Mov Cap-2 Maneuver	-	-	-	-	-	-	226	308	-	223	293	-
Stage 1	-	-	-	-	-	-	518	505	-	737	685	-
Stage 2	-	-	-	-	-	-	549	677	-	412	481	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.33	0.75	21.44	14.25
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	388	496	-	-	168	-	-	637
HCM Lane V/C Ratio	0.443	0.086	-	-	0.018	-	-	0.392
HCM Control Delay (s/veh)	21.4	7.9	0	-	7.9	0	-	14.3
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.2	0.3	-	-	0.1	-	-	1.9

Intersection	
Int Delay, s/veh	15.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	107	128	43	86	128	21	77	43	51	26	90	26
Future Vol, veh/h	107	128	43	86	128	21	77	43	51	26	90	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	139	47	93	139	23	84	47	55	28	98	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	162	0	0	186	0	0	770	744	163	733	756	151
Stage 1	-	-	-	-	-	-	395	395	-	338	338	-
Stage 2	-	-	-	-	-	-	375	349	-	395	418	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1417	-	-	1389	-	-	318	343	882	336	337	896
Stage 1	-	-	-	-	-	-	630	605	-	677	641	-
Stage 2	-	-	-	-	-	-	646	634	-	630	590	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1417	-	-	1389	-	-	179	288	882	228	284	896
Mov Cap-2 Maneuver	-	-	-	-	-	-	179	288	-	228	284	-
Stage 1	-	-	-	-	-	-	572	549	-	627	593	-
Stage 2	-	-	-	-	-	-	484	587	-	491	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.99	2.85	43.88	27.82
HCM LOS			E	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	269	660	-	-	641	-	-	308
HCM Lane V/C Ratio	0.692	0.082	-	-	0.067	-	-	0.5
HCM Control Delay (s/veh)	43.9	7.8	0	-	7.8	0	-	27.8
HCM Lane LOS	E	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	4.7	0.3	-	-	0.2	-	-	2.6

Intersection	
Int Delay, s/veh	25.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	230	1938	278	0	0
Future Vol, veh/h	0	230	1938	278	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	250	2107	302	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	1204	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	~ 176	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	~ 176	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/veh	267.84	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	176
HCM Lane V/C Ratio	-	-	1.419
HCM Control Delay (s/veh)	-	-	267.8
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	15.3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	110

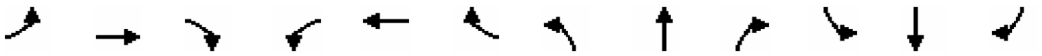
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	408	1805	363	0	0
Future Vol, veh/h	0	408	1805	363	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	443	1962	395	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	1178	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	~ 183	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	~ 183	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, $/s	$694.41	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	183
HCM Lane V/C Ratio	-	-	2.418
HCM Control Delay (s/veh)	-	-	$ 694.4
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	37

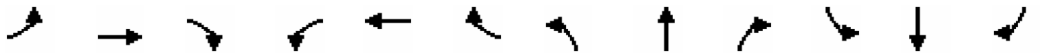
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	904	3234	0	0	2673	790	367	122	366	0	0	0
Future Volume (vph)	904	3234	0	0	2673	790	367	122	366	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.98	1.00			
Satd. Flow (prot)	1522	4799			6188		1681	1726	1583			
Flt Permitted	0.95	0.69			1.00		0.95	0.98	1.00			
Satd. Flow (perm)	1522	3303			6188		1681	1726	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	983	3515	0	0	2905	859	399	133	398	0	0	0
RTOR Reduction (vph)	0	0	0	0	59	0	0	0	58	0	0	0
Lane Group Flow (vph)	885	3613	0	0	3705	0	263	269	340	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	31.9	58.5			26.6		18.0	18.0	18.0			
Effective Green, g (s)	31.9	58.5			26.6		18.0	18.0	18.0			
Actuated g/C Ratio	0.35	0.65			0.30		0.20	0.20	0.20			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	539	2677			1828		336	345	316			
v/s Ratio Prot	c0.58	0.48			c0.60		0.16	0.16				
v/s Ratio Perm		0.40							c0.21			
v/c Ratio	1.64	1.35			2.03		0.78	0.78	1.07			
Uniform Delay, d1	29.1	15.7			31.7		34.1	34.1	36.0			
Progression Factor	1.23	1.38			1.00		1.00	1.00	1.00			
Incremental Delay, d2	289.6	157.6			464.0		11.3	10.6	71.9			
Delay (s)	325.3	179.2			495.7		45.4	44.8	107.9			
Level of Service	F	F			F		D	D	F			
Approach Delay (s/veh)		208.0			495.7			72.0			0.0	
Approach LOS		F			F			E			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	312.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	125.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2836	484	506	2555	0	0	0	0	1288	128	581
Future Volume (vph)	0	2836	484	506	2555	0	0	0	0	1288	128	581
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.98		1.00	1.00					1.00	0.90	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6268		1770	5085					3433	1597	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6268		1770	5085					3433	1597	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3083	526	550	2777	0	0	0	0	1400	139	632
RTOR Reduction (vph)	0	34	0	0	0	0	0	0	0	0	1	87
Lane Group Flow (vph)	0	3575	0	550	2777	0	0	0	0	1400	397	286
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		32.9		15.1	52.5					28.5	28.5	28.5
Effective Green, g (s)		32.9		15.1	52.5					28.5	28.5	28.5
Actuated g/C Ratio		0.37		0.17	0.58					0.32	0.32	0.32
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2291		296	2966					1087	505	476
v/s Ratio Prot		c0.57		c0.31	0.55					c0.41	0.25	
v/s Ratio Perm												0.19
v/c Ratio		1.56		1.86	0.94					1.29	0.79	0.60
Uniform Delay, d1		28.6		37.4	17.2					30.8	28.0	26.0
Progression Factor		1.00		0.64	0.54					1.00	1.00	1.00
Incremental Delay, d2		254.3		387.3	0.7					136.6	7.9	2.1
Delay (s)		282.9		411.2	10.0					167.4	35.9	28.1
Level of Service		F		F	B					F	D	C
Approach Delay (s/veh)		282.9			76.3			0.0			119.3	
Approach LOS		F			E			A			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	168.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	125.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	56.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Future Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	148	768	0	0	349	637	116	28	291	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	55.9	90.8	20
HCM LOS	E	F	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	93%	0%	0%	100%	5%	0%	0%	0%	0%
Vol Thru, %	7%	100%	0%	0%	95%	100%	100%	100%	10%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	90%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	116	17	268	122	249	471	128	128	650
LT Vol	107	0	0	122	14	0	0	0	0
Through Vol	9	17	0	0	235	471	128	128	64
RT Vol	0	0	268	0	0	0	0	0	586
Lane Flow Rate	126	19	291	133	271	512	140	140	707
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.306	0.043	0.616	0.321	0.618	0.919	0.328	0.328	1.184
Departure Headway (Hd)	9.049	8.576	7.861	9.063	8.578	6.768	8.454	8.454	6.029
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	400	420	463	399	423	538	426	426	601
Service Time	6.749	6.276	5.561	6.763	6.278	4.468	6.205	6.205	3.779
HCM Lane V/C Ratio	0.315	0.045	0.629	0.333	0.641	0.952	0.329	0.329	1.176
HCM Control Delay, s/veh	15.7	11.7	22.4	16	24.2	47.2	15.3	15.3	120.6
HCM Lane LOS	C	B	C	C	C	E	C	C	F
HCM 95th-tile Q	1.3	0.1	4.1	1.4	4	11.1	1.4	1.4	24.4

Intersection	
Intersection Delay, s/veh	189.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Future Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	203	145	288	185	0	0	0	0	696	391	175
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	13.9	17.2	303
HCM LOS	B	C	F

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	78%	0%
Vol Thru, %	100%	100%	22%	0%	32%	100%	22%	53%
Vol Right, %	0%	0%	78%	0%	0%	0%	0%	47%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	75	170	143	179	113	820	341
LT Vol	0	0	0	143	122	0	640	0
Through Vol	75	75	37	0	57	113	180	180
RT Vol	0	0	133	0	0	0	0	161
Lane Flow Rate	81	81	185	156	194	123	891	371
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.189	0.189	0.314	0.366	0.448	0.214	1.873	0.705
Departure Headway (Hd)	9.692	9.692	7.302	9.742	9.577	7.411	7.566	6.843
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	372	372	496	372	378	488	481	526
Service Time	7.392	7.392	5.002	7.442	7.277	5.111	5.324	4.601
HCM Lane V/C Ratio	0.218	0.218	0.373	0.419	0.513	0.252	1.852	0.705
HCM Control Delay, s/veh	14.6	14.6	13.3	18	19.8	12.1	418.9	24.4
HCM Lane LOS	B	B	B	C	C	B	F	C
HCM 95th-tile Q	0.7	0.7	1.3	1.6	2.2	0.8	57.3	5.6

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3600	3439	43	0	51
Future Vol, veh/h	0	3600	3439	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3913	3738	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1892
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	~ 51
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	~ 51
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	283.69
HCM LOS			F

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	51
HCM Lane V/C Ratio	-	-	-	1.09
HCM Control Delay (s/veh)	-	-	-	283.7
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	4.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	175	26	26	145	21	21
Future Vol, veh/h	175	26	26	145	21	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	190	28	28	158	23	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	218	0	418	204
Stage 1	-	-	-	-	204	-
Stage 2	-	-	-	-	214	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1351	-	591	836
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	822	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1351	-	578	836
Mov Cap-2 Maneuver	-	-	-	-	578	-
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	803	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.17	10.65
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	683	-	-	274	-
HCM Lane V/C Ratio	0.067	-	-	0.021	-
HCM Control Delay (s/veh)	10.6	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3249	2795	43	0	51
Future Vol, veh/h	0	3249	2795	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3532	3038	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1542
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	89
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	89
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	96.79
HCM LOS			F

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	89
HCM Lane V/C Ratio	-	-	-	0.623
HCM Control Delay (s/veh)	-	-	-	96.8
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	2.9

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3249	2787	43	0	51
Future Vol, veh/h	0	3249	2787	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3532	3029	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1538
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	90
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	90
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	95.59
HCM LOS			F

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	90
HCM Lane V/C Ratio	-	-	-	0.619
HCM Control Delay (s/veh)	-	-	-	95.6
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	2.9



Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	235	2404	28	2250	311	392	293
Future Volume (vph)	235	2404	28	2250	311	392	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91		1.00	1.00
Frt	1.00	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4993		1770	1583
Flt Permitted	0.95	1.00	0.95	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4993		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	2613	30	2446	338	426	318
RTOR Reduction (vph)	0	0	0	12	0	0	123
Lane Group Flow (vph)	255	2613	30	2772	0	426	195
Turn Type	Prot	NA	Prot	NA		Prot	Perm
Protected Phases	7	4	3	8		6	
Permitted Phases							6
Actuated Green, G (s)	18.5	96.2	5.6	83.3		36.5	36.5
Effective Green, g (s)	18.5	96.2	5.6	83.3		36.5	36.5
Actuated g/C Ratio	0.12	0.63	0.04	0.55		0.24	0.24
Clearance Time (s)	4.5	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	215	3222	65	2739		425	380
v/s Ratio Prot	c0.14	0.51	0.02	c0.56		c0.24	
v/s Ratio Perm							0.12
v/c Ratio	1.19	0.81	0.46	1.01		1.00	0.51
Uniform Delay, d1	66.7	20.9	71.6	34.3		57.7	49.9
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	120.7	1.6	5.1	20.2		44.2	1.2
Delay (s)	187.4	22.6	76.7	54.5		101.9	51.1
Level of Service	F	C	E	D		F	D
Approach Delay (s/veh)		37.2		54.7		80.2	
Approach LOS		D		D		F	

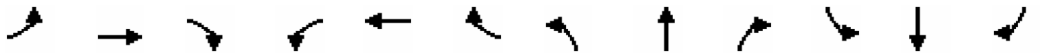
Intersection Summary			
HCM 2000 Control Delay (s/veh)	49.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	151.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	2527	18	32	2393	123	14	16	26	86	0	35
Future Volume (vph)	108	2527	18	32	2393	123	14	16	26	86	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5		4.5		4.5	4.5	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.94		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1770	5080		1770	5085	1583		1724		1770	1583	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.93		0.95	1.00	
Satd. Flow (perm)	1770	5080		1770	5085	1583		1622		1770	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	117	2747	20	35	2601	134	15	17	28	93	0	38
RTOR Reduction (vph)	0	0	0	0	0	59	0	24	0	0	29	0
Lane Group Flow (vph)	117	2767	0	35	2601	75	0	36	0	93	9	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	9.6	71.6		2.9	64.9	64.9		14.6		8.4	27.5	
Effective Green, g (s)	9.6	71.6		2.9	64.9	64.9		14.6		8.4	27.5	
Actuated g/C Ratio	0.08	0.62		0.03	0.56	0.56		0.13		0.07	0.24	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5		4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	147	3149		44	2857	889		205		128	376	
v/s Ratio Prot	c0.07	c0.54		0.02	0.51					c0.05	0.01	
v/s Ratio Perm						0.05		c0.02				
v/c Ratio	0.80	0.88		0.80	0.91	0.08		0.18		0.73	0.02	
Uniform Delay, d1	52.0	18.3		56.0	22.7	11.6		45.1		52.4	33.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2	25.0	3.1		62.9	4.9	0.0		0.4		18.5	0.0	
Delay (s)	77.0	21.4		118.9	27.6	11.7		45.5		70.9	33.7	
Level of Service	E	C		F	C	B		D		E	C	
Approach Delay (s/veh)		23.7			28.0			45.5			60.1	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	115.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	456	2523	0	0	2284	138	0	0	0	122	0	287
Future Volume (vph)	456	2523	0	0	2284	138	0	0	0	122	0	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5				4.5		4.5
Lane Util. Factor	1.00	0.91			0.91	1.00				0.97		1.00
Frt	1.00	1.00			1.00	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	5085			5085	1583				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	5085			5085	1583				3433		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	496	2742	0	0	2483	150	0	0	0	133	0	312
RTOR Reduction (vph)	0	0	0	0	0	72	0	0	0	0	0	7
Lane Group Flow (vph)	496	2742	0	0	2483	78	0	0	0	133	0	305
Turn Type	Prot	NA		Perm	NA	Perm				Prot		pm+ov
Protected Phases	7	4			8					1		7
Permitted Phases				8		8						6
Actuated Green, G (s)	33.0	115.5			78.0	78.0				25.5		58.5
Effective Green, g (s)	33.0	115.5			78.0	78.0				25.5		58.5
Actuated g/C Ratio	0.22	0.77			0.52	0.52				0.17		0.39
Clearance Time (s)	4.5	4.5			4.5	4.5				4.5		4.5
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	389	3915			2644	823				583		664
v/s Ratio Prot	c0.28	0.54			c0.49					0.04		c0.10
v/s Ratio Perm						0.05						0.09
v/c Ratio	1.28	0.70			0.94	0.09				0.23		0.46
Uniform Delay, d1	58.5	8.6			33.8	18.2				53.8		34.0
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	142.4	0.6			7.4	0.1				0.2		0.5
Delay (s)	200.9	9.2			41.1	18.2				54.0		34.5
Level of Service	F	A			D	B				D		C
Approach Delay (s/veh)		38.6			39.8			0.0			40.3	
Approach LOS		D			D			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	39.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

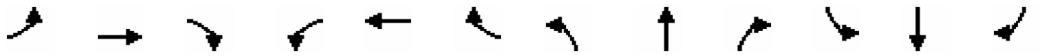
Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	69	97	456	322	28
Future Vol, veh/h	35	69	97	456	322	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	265	110	-	-	190
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	75	105	496	350	30

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	809	175	380	0	-	0
Stage 1	350	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	318	838	1175	-	-	-
Stage 1	684	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	290	838	1175	-	-	-
Mov Cap-2 Maneuver	290	-	-	-	-	-
Stage 1	623	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	12.94	1.47	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1175	-	290	838	-	-
HCM Lane V/C Ratio	0.09	-	0.131	0.09	-	-
HCM Control Delay (s/veh)	8.4	-	19.3	9.7	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.4	0.3	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	17	43	52	86	0	55	330	114	22	254	14
Future Volume (vph)	45	17	43	52	86	0	55	330	114	22	254	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.89		1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1661		1770	1863		1770	3539	1583	1770	3512	
Flt Permitted	0.85	1.00		0.69	1.00		0.51	1.00	1.00	0.54	1.00	
Satd. Flow (perm)	1585	1661		1285	1863		942	3539	1583	1001	3512	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	18	47	57	93	0	60	359	124	24	276	15
RTOR Reduction (vph)	0	42	0	0	0	0	0	0	68	0	3	0
Lane Group Flow (vph)	49	23	0	57	93	0	60	359	56	24	288	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	6.9	4.7		9.1	5.8		25.5	22.0	22.0	20.3	19.4	
Effective Green, g (s)	6.9	4.7		9.1	5.8		25.5	22.0	22.0	20.3	19.4	
Actuated g/C Ratio	0.14	0.10		0.19	0.12		0.52	0.45	0.45	0.42	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	231	159		271	220		550	1592	712	429	1393	
v/s Ratio Prot	0.01	0.01		c0.01	c0.05		c0.01	c0.10		0.00	0.08	
v/s Ratio Perm	0.02			0.02			0.05		0.04	0.02		
v/c Ratio	0.21	0.14		0.21	0.42		0.11	0.23	0.08	0.06	0.21	
Uniform Delay, d1	18.6	20.3		16.7	20.0		5.9	8.2	7.7	8.5	9.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.4		0.4	1.3		0.1	0.1	0.0	0.1	0.1	
Delay (s)	19.0	20.7		17.1	21.3		6.0	8.3	7.7	8.5	9.8	
Level of Service	B	C		B	C		A	A	A	A	A	
Approach Delay (s/veh)		20.0			19.7			7.9			9.7	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	48.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	104	97	263	201	36
Future Vol, veh/h	9	104	97	263	201	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	113	105	286	218	39

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	592	129	258	0	-	0
Stage 1	238	-	-	-	-	-
Stage 2	354	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	438	897	1304	-	-	-
Stage 1	779	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	402	897	1304	-	-	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	681	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	9.96	2.16	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1304	-	402	897	-	-
HCM Lane V/C Ratio	0.081	-	0.024	0.126	-	-
HCM Control Delay (s/veh)	8	-	14.2	9.6	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.1	0.4	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	91	0	129	85	0	160
Future Vol, veh/h	91	0	129	85	0	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	99	0	140	92	0	174

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	273	116	0	0	233	0
Stage 1	186	-	-	-	-	-
Stage 2	87	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	693	914	-	-	1332	-
Stage 1	827	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	693	914	-	-	1332	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	926	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	11.05	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	693	1332	-
HCM Lane V/C Ratio	-	-	0.143	-	-
HCM Control Delay (s/veh)	-	-	11.1	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Intersection Delay, s/veh	16.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	386	72	104	501	16	139	1	106	20	3	1
Future Vol, veh/h	4	386	72	104	501	16	139	1	106	20	3	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	420	78	113	545	17	151	1	115	22	3	1
Number of Lanes	0	2	0	0	2	0	0	2	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	2
HCM Control Delay, s/veh	14.8	19.6	13.3	11.8
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	2%	0%	29%	0%	83%
Vol Thru, %	0%	0%	98%	73%	71%	94%	13%
Vol Right, %	0%	100%	0%	27%	0%	6%	4%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	107	197	265	355	267	24
LT Vol	139	0	4	0	104	0	20
Through Vol	1	1	193	193	251	251	3
RT Vol	0	106	0	72	0	16	1
Lane Flow Rate	152	116	214	288	385	290	26
Geometry Grp	5	5	5	5	5	5	4b
Degree of Util (X)	0.334	0.216	0.392	0.51	0.694	0.506	0.06
Departure Headway (Hd)	7.931	6.71	6.584	6.38	6.483	6.291	8.308
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	452	531	544	562	555	571	434
Service Time	5.713	4.491	4.363	4.159	4.256	4.064	6.308
HCM Lane V/C Ratio	0.336	0.218	0.393	0.512	0.694	0.508	0.06
HCM Control Delay, s/veh	14.7	11.4	13.6	15.7	22.8	15.4	11.8
HCM Lane LOS	B	B	B	C	C	C	B
HCM 95th-tile Q	1.4	0.8	1.9	2.9	5.4	2.8	0.2

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	69	110	55	14	61	14	9	41	36	9	0	69
Future Vol, veh/h	69	110	55	14	61	14	9	41	36	9	0	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	75	120	60	15	66	15	10	45	39	10	0	75

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	82	0	0	179	0	0	396	411	149	396	434	74
Stage 1	-	-	-	-	-	-	299	299	-	104	104	-
Stage 2	-	-	-	-	-	-	97	112	-	292	329	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1516	-	-	1396	-	-	564	530	897	564	515	988
Stage 1	-	-	-	-	-	-	709	666	-	901	809	-
Stage 2	-	-	-	-	-	-	910	803	-	716	646	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1516	-	-	1396	-	-	490	499	897	464	484	988
Mov Cap-2 Maneuver	-	-	-	-	-	-	490	499	-	464	484	-
Stage 1	-	-	-	-	-	-	674	633	-	892	800	-
Stage 2	-	-	-	-	-	-	832	794	-	605	614	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.21	1.2	11.95	9.56
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	611	1516	-	-	1396	-	-	874
HCM Lane V/C Ratio	0.153	0.049	-	-	0.011	-	-	0.097
HCM Control Delay (s/veh)	12	7.5	-	-	7.6	-	-	9.6
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.5	0.2	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	69	83	28	55	43	14	26	28	17	9	50	9
Future Vol, veh/h	69	83	28	55	43	14	26	28	17	9	50	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	75	90	30	60	47	15	28	30	18	10	54	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	62	0	0	121	0	0	449	437	105	429	445	54
Stage 1	-	-	-	-	-	-	255	255	-	174	174	-
Stage 2	-	-	-	-	-	-	193	182	-	255	271	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1541	-	-	1467	-	-	520	513	949	536	508	1013
Stage 1	-	-	-	-	-	-	749	696	-	828	755	-
Stage 2	-	-	-	-	-	-	808	749	-	749	685	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1541	-	-	1467	-	-	417	466	949	449	461	1013
Mov Cap-2 Maneuver	-	-	-	-	-	-	417	466	-	449	461	-
Stage 1	-	-	-	-	-	-	710	660	-	793	723	-
Stage 2	-	-	-	-	-	-	709	718	-	664	650	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.86	3.71	12.71	13.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	417	577	657	-	-	843	-	-	449	503
HCM Lane V/C Ratio	0.068	0.085	0.049	-	-	0.041	-	-	0.022	0.128
HCM Control Delay (s/veh)	14.3	11.8	7.5	0	-	7.6	0	-	13.2	13.2
HCM Lane LOS	B	B	A	A	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0.2	0.3	0.2	-	-	0.1	-	-	0.1	0.4

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	78	1750	179	0	0
Future Vol, veh/h	0	78	1750	179	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	460	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	85	1902	195	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	951	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	260	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	260	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/v	25.37	0
HCM LOS	D	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	260
HCM Lane V/C Ratio	-	-	0.326
HCM Control Delay (s/veh)	-	-	25.4
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.4

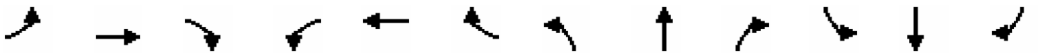
Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	139	1593	235	0	0
Future Vol, veh/h	0	139	1593	235	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	570	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	151	1732	255	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	866	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	297	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	297	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/v	29.09	0
HCM LOS	D	

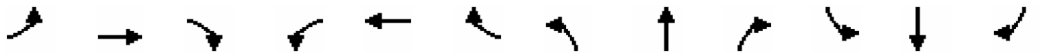
Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	297
HCM Lane V/C Ratio	-	-	0.509
HCM Control Delay (s/veh)	-	-	29.1
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	2.7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	809	2767	0	0	1787	757	234	87	211	0	0	0
Future Volume (vph)	809	2767	0	0	1787	757	234	87	211	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.98	1.00			
Satd. Flow (prot)	1522	4799			6122		1681	1730	1583			
Flt Permitted	0.95	0.66			1.00		0.95	0.98	1.00			
Satd. Flow (perm)	1522	3168			6122		1681	1730	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	879	3008	0	0	1942	823	254	95	229	0	0	0
RTOR Reduction (vph)	0	0	0	0	51	0	0	0	67	0	0	0
Lane Group Flow (vph)	791	3096	0	0	2714	0	173	176	162	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	67.1	119.1			52.0		17.4	17.4	17.4			
Effective Green, g (s)	67.1	119.1			52.0		17.4	17.4	17.4			
Actuated g/C Ratio	0.45	0.79			0.35		0.12	0.12	0.12			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	680	3244			2122		194	200	183			
v/s Ratio Prot	c0.52	0.43			c0.44		c0.10	0.10				
v/s Ratio Perm		0.33							0.10			
v/c Ratio	1.16	0.95			1.35dr		0.89	0.88	0.88			
Uniform Delay, d1	41.4	13.1			49.0		65.4	65.3	65.3			
Progression Factor	1.27	1.44			1.00		1.00	1.00	1.00			
Incremental Delay, d2	75.1	0.9			129.3		36.2	33.1	35.9			
Delay (s)	127.6	19.8			178.3		101.5	98.3	101.2			
Level of Service	F	B			F		F	F	F			
Approach Delay (s/veh)		41.8			178.3			100.4			0.0	
Approach LOS		D			F			F			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	98.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2519	265	260	1772	0	0	0	0	1016	30	609
Future Volume (vph)	0	2519	265	260	1772	0	0	0	0	1016	30	609
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.99		1.00	1.00					1.00	0.86	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6316		1770	5085					3433	1529	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6316		1770	5085					3433	1529	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2738	288	283	1926	0	0	0	0	1104	33	662
RTOR Reduction (vph)	0	11	0	0	0	0	0	0	0	0	10	74
Lane Group Flow (vph)	0	3015	0	283	1926	0	0	0	0	1104	341	270
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		63.8		23.9	92.2					48.8	48.8	48.8
Effective Green, g (s)		63.8		23.9	92.2					48.8	48.8	48.8
Actuated g/C Ratio		0.43		0.16	0.61					0.33	0.33	0.33
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2686		282	3125					1116	497	489
v/s Ratio Prot		c0.48		c0.16	0.38					c0.32	0.22	
v/s Ratio Perm												0.18
v/c Ratio		1.12		1.00	0.62					0.99	0.69	0.55
Uniform Delay, d1		43.1		63.1	17.9					50.3	43.9	41.6
Progression Factor		1.00		0.70	0.04					1.00	1.00	1.00
Incremental Delay, d2		60.6		16.9	0.0					24.1	3.9	1.4
Delay (s)		103.7		61.1	0.8					74.4	47.9	43.0
Level of Service		F		E	A					E	D	D
Approach Delay (s/veh)		103.7			8.6			0.0			63.2	
Approach LOS		F			A			A			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	63.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	44.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Future Vol, veh/h	221	361	0	0	149	707	34	162	139	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	240	392	0	0	162	768	37	176	151	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	14.9	76.5	12.9
HCM LOS	B	F	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	39%	0%	0%	100%	22%	0%	0%	0%	0%
Vol Thru, %	61%	100%	0%	0%	78%	100%	100%	100%	4%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	96%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	108	139	188	153	241	60	60	737
LT Vol	34	0	0	188	33	0	0	0	0
Through Vol	54	108	0	0	120	241	60	60	30
RT Vol	0	0	139	0	0	0	0	0	707
Lane Flow Rate	96	117	151	204	167	262	65	65	801
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.206	0.247	0.289	0.451	0.351	0.416	0.134	0.134	1.107
Departure Headway (Hd)	8.019	7.823	7.112	8.264	7.864	5.983	7.426	7.426	4.978
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	451	463	509	439	460	607	486	486	737
Service Time	5.719	5.523	4.812	5.964	5.564	3.683	5.126	5.126	2.678
HCM Lane V/C Ratio	0.213	0.253	0.297	0.465	0.363	0.432	0.134	0.134	1.087
HCM Control Delay, s/veh	12.8	13.1	12.7	17.6	14.8	12.9	11.3	11.3	87.1
HCM Lane LOS	B	B	B	C	B	B	B	B	F
HCM 95th-tile Q	0.8	1	1.2	2.3	1.6	2	0.5	0.5	22.8

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Future Vol, veh/h	0	245	249	112	74	0	0	0	0	321	31	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	266	271	122	80	0	0	0	0	349	34	85
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	10.6	11.1	21.5
HCM LOS	B	B	C

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	95%	0%
Vol Thru, %	100%	100%	16%	0%	32%	100%	5%	17%
Vol Right, %	0%	0%	84%	0%	0%	0%	0%	83%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	98	98	298	60	76	49	337	94
LT Vol	0	0	0	60	51	0	321	0
Through Vol	98	98	49	0	25	49	16	16
RT Vol	0	0	249	0	0	0	0	78
Lane Flow Rate	107	107	324	66	83	54	366	102
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.201	0.201	0.397	0.142	0.175	0.082	0.705	0.166
Departure Headway (Hd)	6.779	6.779	4.409	7.787	7.62	5.495	6.943	5.884
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	526	526	807	458	468	645	519	607
Service Time	4.562	4.562	2.19	5.585	5.418	3.29	4.704	3.645
HCM Lane V/C Ratio	0.203	0.203	0.401	0.144	0.177	0.084	0.705	0.168
HCM Control Delay, s/veh	11.3	11.3	10.1	11.9	12	8.8	24.7	9.8
HCM Lane LOS	B	B	B	B	B	A	C	A
HCM 95th-tile Q	0.7	0.7	1.9	0.5	0.6	0.3	5.5	0.6

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2979	2543	28	0	17
Future Vol, veh/h	0	2979	2543	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3238	2764	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1397
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	112
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	112
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	43.44
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	112
HCM Lane V/C Ratio	-	-	-	0.165
HCM Control Delay (s/veh)	-	-	-	43.4
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.6

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	9	9	62	14	14
Future Vol, veh/h	105	9	9	62	14	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	114	10	10	67	15	15

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	124	0	206	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	87	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1463	-	782	933
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	936	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1463	-	777	933
Mov Cap-2 Maneuver	-	-	-	-	777	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	930	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.95	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	848	-	-	228	-
HCM Lane V/C Ratio	0.036	-	-	0.007	-
HCM Control Delay (s/veh)	9.4	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2645	2404	28	0	17
Future Vol, veh/h	0	2645	2404	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2875	2613	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1322
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	126
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	126
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	38.44
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	126
HCM Lane V/C Ratio	-	-	-	0.147
HCM Control Delay (s/veh)	-	-	-	38.4
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.5

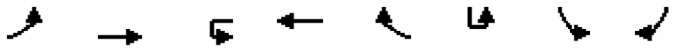
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2645	2414	28	0	17
Future Vol, veh/h	0	2645	2414	28	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2875	2624	30	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1327
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	125
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	125
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	38.77
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	125
HCM Lane V/C Ratio	-	-	-	0.148
HCM Control Delay (s/veh)	-	-	-	38.8
HCM Lane LOS	-	-	-	E
HCM 95th %tile Q(veh)	-	-	-	0.5



Movement	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Lane Configurations								
Traffic Volume (vph)	414	2540	20	2482	490	1	441	296
Future Volume (vph)	414	2540	20	2482	490	1	441	296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	0.91	1.00	0.91			1.00	1.00
Frt	1.00	1.00	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (prot)	1770	5085	1770	4959			1770	1583
Flt Permitted	0.95	1.00	0.95	1.00			0.95	1.00
Satd. Flow (perm)	1770	5085	1770	4959			1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	2761	22	2698	533	1	479	322
RTOR Reduction (vph)	0	0	0	21	0	0	0	190
Lane Group Flow (vph)	450	2761	22	3210	0	0	480	132
Turn Type	Prot	NA	Prot	NA		Perm	Prot	Perm
Protected Phases	7	4	3	8			6	
Permitted Phases						6		6
Actuated Green, G (s)	25.5	92.8	3.0	70.3			32.5	32.5
Effective Green, g (s)	25.5	92.8	3.0	70.3			32.5	32.5
Actuated g/C Ratio	0.18	0.65	0.02	0.50			0.23	0.23
Clearance Time (s)	4.5	4.5	4.5	4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	318	3327	37	2458			405	362
v/s Ratio Prot	c0.25	0.54	0.01	c0.65				
v/s Ratio Perm							0.27	0.08
v/c Ratio	1.42	0.83	0.59	1.31			1.19	0.36
Uniform Delay, d1	58.2	18.5	68.8	35.8			54.7	46.0
Progression Factor	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	204.4	1.8	23.1	140.8			105.7	0.6
Delay (s)	262.6	20.4	91.9	176.5			160.4	46.6
Level of Service	F	C	F	F			F	D
Approach Delay (s/veh)		54.3		176.0			114.7	
Approach LOS		D		F			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	115.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	141.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	117.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

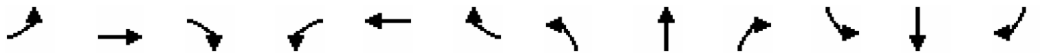
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	31	188	2742	60	14	2711	75	41	10	68	167	4
Future Volume (vph)	31	188	2742	60	14	2711	75	41	10	68	167	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5		4.5		4.5	4.5
Lane Util. Factor		1.00	0.91		1.00	0.91	1.00		1.00		1.00	1.00
Frt		1.00	1.00		1.00	1.00	0.85		0.92		1.00	0.86
Flt Protected		0.95	1.00		0.95	1.00	1.00		0.98		0.95	1.00
Satd. Flow (prot)		1770	5069		1770	5085	1583		1690		1770	1604
Flt Permitted		0.95	1.00		0.95	1.00	1.00		0.86		0.95	1.00
Satd. Flow (perm)		1770	5069		1770	5085	1583		1484		1770	1604
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	204	2980	65	15	2947	82	45	11	74	182	4
RTOR Reduction (vph)	0	0	2	0	0	0	34	0	42	0	0	40
Lane Group Flow (vph)	0	238	3043	0	15	2947	48	0	88	0	182	15
Turn Type	Prot	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA
Protected Phases	7	7	4		3	8		5	2		1	6
Permitted Phases							8					
Actuated Green, G (s)		10.5	78.8		2.9	71.2	71.2		9.5		13.5	27.5
Effective Green, g (s)		10.5	78.8		2.9	71.2	71.2		9.5		13.5	27.5
Actuated g/C Ratio		0.09	0.64		0.02	0.58	0.58		0.08		0.11	0.22
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5		4.5		4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)		151	3255		41	2950	918		114		194	359
v/s Ratio Prot		c0.13	0.60		0.01	c0.58					c0.10	0.01
v/s Ratio Perm							0.03		c0.06			
v/c Ratio		1.58	0.93		0.37	1.00	0.05		0.77		0.94	0.04
Uniform Delay, d1		56.1	19.7		59.0	25.7	11.1		55.5		54.2	37.3
Progression Factor		1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00
Incremental Delay, d2		288.6	5.9		5.5	16.2	0.0		26.1		46.7	0.0
Delay (s)		344.7	25.5		64.5	41.9	11.2		81.6		100.9	37.3
Level of Service		F	C		E	D	B		F		F	D
Approach Delay (s/veh)			48.7			41.2			81.6			86.1
Approach LOS			D			D			F			F

Intersection Summary			
HCM 2000 Control Delay (s/veh)	47.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	122.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	91.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	SBR
Lane Configurations	
Traffic Volume (vph)	47
Future Volume (vph)	47
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	51
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s/veh)	
Approach LOS	
Intersection Summary	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	708	2892	0	0	2632	214	0	0	0	357	0	850
Future Volume (vph)	708	2892	0	0	2632	214	0	0	0	357	0	850
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5				4.5		4.5
Lane Util. Factor	1.00	0.91			0.91	1.00				0.97		1.00
Frt	1.00	1.00			1.00	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1770	5085			5085	1583				3433		1583
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1770	5085			5085	1583				3433		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	770	3143	0	0	2861	233	0	0	0	388	0	924
RTOR Reduction (vph)	0	0	0	0	0	125	0	0	0	0	0	6
Lane Group Flow (vph)	770	3143	0	0	2861	108	0	0	0	388	0	918
Turn Type	Prot	NA		Perm	NA	Perm				Prot		pm+ov
Protected Phases	7	4			8					1		7
Permitted Phases				8		8						6
Actuated Green, G (s)	43.5	115.6			67.6	67.6				21.2		64.7
Effective Green, g (s)	43.5	115.6			67.6	67.6				21.2		64.7
Actuated g/C Ratio	0.30	0.79			0.46	0.46				0.15		0.44
Clearance Time (s)	4.5	4.5			4.5	4.5				4.5		4.5
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0		3.0
Lane Grp Cap (vph)	528	4031			2357	733				499		751
v/s Ratio Prot	c0.44	0.62			c0.56					0.11		c0.36
v/s Ratio Perm						0.07						0.22
v/c Ratio	1.46	0.78			1.21	0.15				0.78		1.22
Uniform Delay, d1	51.2	8.2			39.1	22.5				60.0		40.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	216.6	1.0			100.4	0.1				7.5		111.8
Delay (s)	267.7	9.2			139.5	22.6				67.5		152.3
Level of Service	F	A			F	C				E		F
Approach Delay (s/veh)		60.1			130.7			0.0			127.3	
Approach LOS		E			F			A			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	96.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.31		
Actuated Cycle Length (s)	145.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	30.3

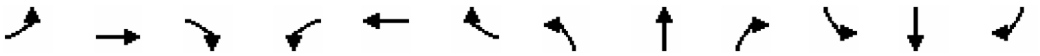
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	102	204	150	708	952	43
Future Vol, veh/h	102	204	150	708	952	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	265	110	-	-	190
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	111	222	163	770	1035	47

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1746	517	1082	0	-	0
Stage 1	1035	-	-	-	-	-
Stage 2	711	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 77	503	641	-	-	-
Stage 1	303	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 58	503	641	-	-	-
Mov Cap-2 Maneuver	~ 58	-	-	-	-	-
Stage 1	226	-	-	-	-	-
Stage 2	448	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/veh	$ 207.34	2.19	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	641	-	58	503	-	-
HCM Lane V/C Ratio	0.255	-	1.923	0.441	-	-
HCM Control Delay (s/veh)	12.5	-	$ 586.7	17.7	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	1	-	10.6	2.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	51	128	153	158	0	86	550	201	47	714	21
Future Volume (vph)	94	51	128	153	158	0	86	550	201	47	714	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.89		1.00	1.00		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1663		1770	1863		1770	3539	1583	1770	3524	
Flt Permitted	0.65	1.00		0.41	1.00		0.18	1.00	1.00	0.38	1.00	
Satd. Flow (perm)	1208	1663		764	1863		333	3539	1583	714	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	55	139	166	172	0	93	598	218	51	776	23
RTOR Reduction (vph)	0	115	0	0	0	0	0	0	122	0	2	0
Lane Group Flow (vph)	102	79	0	166	172	0	93	598	96	51	797	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	18.1	11.5		24.1	14.5		29.8	23.8	23.8	25.0	21.4	
Effective Green, g (s)	18.1	11.5		24.1	14.5		29.8	23.8	23.8	25.0	21.4	
Actuated g/C Ratio	0.27	0.17		0.36	0.22		0.45	0.36	0.36	0.38	0.32	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	384	287		422	406		278	1266	566	325	1134	
v/s Ratio Prot	0.03	0.05		c0.06	c0.09		c0.03	0.17		0.01	c0.23	
v/s Ratio Perm	0.05			0.09			0.12		0.06	0.05		
v/c Ratio	0.27	0.28		0.39	0.42		0.33	0.47	0.17	0.16	0.70	
Uniform Delay, d1	18.7	23.9		15.1	22.4		11.9	16.5	14.6	13.4	19.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.5		0.6	0.7		0.7	0.3	0.1	0.2	2.0	
Delay (s)	19.1	24.4		15.8	23.1		12.6	16.8	14.7	13.6	21.8	
Level of Service	B	C		B	C		B	B	B	B	C	
Approach Delay (s/veh)		22.6			19.5			15.9			21.3	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	26	306	150	506	463	68
Future Vol, veh/h	26	306	150	506	463	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	333	163	550	503	74

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1141	289	577	0	-	0
Stage 1	540	-	-	-	-	-
Stage 2	601	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	194	708	992	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	162	708	992	-	-	-
Mov Cap-2 Maneuver	162	-	-	-	-	-
Stage 1	458	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	15.86	2.14	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	992	-	162	708	-	-
HCM Lane V/C Ratio	0.164	-	0.174	0.47	-	-
HCM Control Delay (s/veh)	9.3	-	31.8	14.5	-	-
HCM Lane LOS	A	-	D	B	-	-
HCM 95th %tile Q(veh)	0.6	-	0.6	2.5	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	175	0	321	194	0	282
Future Vol, veh/h	175	0	321	194	0	282
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	190	0	349	211	0	307

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	608	280	0	0	560	0
Stage 1	454	-	-	-	-	-
Stage 2	153	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	428	717	-	-	1007	-
Stage 1	606	-	-	-	-	-
Stage 2	859	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	428	717	-	-	1007	-
Mov Cap-2 Maneuver	428	-	-	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	859	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	19.99	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	428	1007	-
HCM Lane V/C Ratio	-	-	0.445	-	-
HCM Control Delay (s/veh)	-	-	20	0	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	2.2	0	-

Intersection	
Intersection Delay, s/veh	80.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	731	116	182	732	10	157	9	209	3	3	3
Future Vol, veh/h	0	731	116	182	732	10	157	9	209	3	3	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	795	126	198	796	11	171	10	227	3	3	3
Number of Lanes	0	2	0	0	2	0	0	2	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	2
HCM Control Delay, s/veh	73.7	112.8	19.8	13
HCM LOS	F	F	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	97%	0%	0%	0%	33%	0%	33%
Vol Thru, %	3%	2%	100%	68%	67%	97%	33%
Vol Right, %	0%	98%	0%	32%	0%	3%	33%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	162	214	487	360	548	376	9
LT Vol	157	0	0	0	182	0	3
Through Vol	5	5	487	244	366	366	3
RT Vol	0	209	0	116	0	10	3
Lane Flow Rate	176	232	530	391	596	409	10
Geometry Grp	5	5	5	5	5	5	4b
Degree of Util (X)	0.443	0.51	1.11	0.794	1.27	0.851	0.025
Departure Headway (Hd)	9.69	8.48	7.924	7.692	7.941	7.751	9.738
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	374	427	461	473	465	470	370
Service Time	7.39	6.18	5.624	5.392	5.641	5.451	7.738
HCM Lane V/C Ratio	0.471	0.543	1.15	0.827	1.282	0.87	0.027
HCM Control Delay, s/veh	19.9	19.7	103	34	162.1	40.9	13
HCM Lane LOS	C	C	F	D	F	E	B
HCM 95th-tile Q	2.2	2.8	17.2	7.2	24.2	8.6	0.1

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	107	171	86	21	179	21	26	64	68	26	0	204
Future Vol, veh/h	107	171	86	21	179	21	26	64	68	26	0	204
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	186	93	23	195	23	28	70	74	28	0	222

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	217	0	0	279	0	0	705	728	233	705	764	206
Stage 1	-	-	-	-	-	-	465	465	-	252	252	-
Stage 2	-	-	-	-	-	-	240	263	-	453	512	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1352	-	-	1283	-	-	351	350	807	351	334	835
Stage 1	-	-	-	-	-	-	577	563	-	753	699	-
Stage 2	-	-	-	-	-	-	763	691	-	586	536	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1352	-	-	1283	-	-	231	314	807	228	300	835
Mov Cap-2 Maneuver	-	-	-	-	-	-	231	314	-	228	300	-
Stage 1	-	-	-	-	-	-	528	514	-	739	686	-
Stage 2	-	-	-	-	-	-	550	678	-	421	490	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.33	0.75	20.97	14.14
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	395	1352	-	-	1283	-	-	642
HCM Lane V/C Ratio	0.435	0.086	-	-	0.018	-	-	0.39
HCM Control Delay (s/veh)	21	7.9	-	-	7.9	-	-	14.1
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2.1	0.3	-	-	0.1	-	-	1.8

Intersection	
Int Delay, s/veh	11.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	107	128	43	86	128	21	77	43	51	26	90	26
Future Vol, veh/h	107	128	43	86	128	21	77	43	51	26	90	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	139	47	93	139	23	84	47	55	28	98	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	162	0	0	186	0	0	770	744	163	733	756	151
Stage 1	-	-	-	-	-	-	395	395	-	338	338	-
Stage 2	-	-	-	-	-	-	375	349	-	395	418	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1417	-	-	1389	-	-	318	343	882	336	337	896
Stage 1	-	-	-	-	-	-	630	605	-	677	641	-
Stage 2	-	-	-	-	-	-	646	634	-	630	590	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1417	-	-	1389	-	-	179	288	882	228	284	896
Mov Cap-2 Maneuver	-	-	-	-	-	-	179	288	-	228	284	-
Stage 1	-	-	-	-	-	-	572	549	-	627	593	-
Stage 2	-	-	-	-	-	-	484	587	-	491	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s/v	2.99	2.85	27.09	22.27
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	179	454	660	-	-	641	-	-	228	335
HCM Lane V/C Ratio	0.467	0.225	0.082	-	-	0.067	-	-	0.124	0.377
HCM Control Delay (s/veh)	41.6	15.2	7.8	0	-	7.8	0	-	23	22.1
HCM Lane LOS	E	C	A	A	-	A	A	-	C	C
HCM 95th %tile Q(veh)	2.2	0.9	0.3	-	-	0.2	-	-	0.4	1.7

Intersection	
Int Delay, s/veh	13.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	230	1938	278	0	0
Future Vol, veh/h	0	230	1938	278	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	460	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	250	2107	302	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	1053	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	~ 223	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	~ 223	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s/v	143.61	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	223
HCM Lane V/C Ratio	-	-	1.124
HCM Control Delay (s/veh)	-	-	143.6
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	11.6

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	63.7

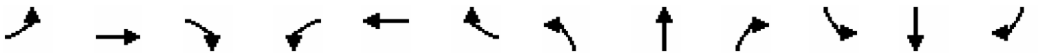
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	408	1805	363	0	0
Future Vol, veh/h	0	408	1805	363	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	570	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	443	1962	395	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	981	0	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.32	-	-
Pot Cap-1 Maneuver	0	~ 249	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	~ 249	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, $/#	$ 402.39	0
HCM LOS	F	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	249
HCM Lane V/C Ratio	-	-	1.783
HCM Control Delay (s/veh)	-	-	$ 402.4
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	29.9

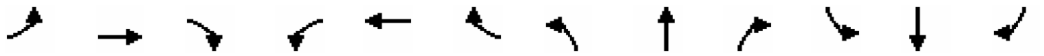
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	904	3234	0	0	2673	790	367	122	366	0	0	0
Future Volume (vph)	904	3234	0	0	2673	790	367	122	366	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	0.86	0.86			0.86		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.98	1.00			
Satd. Flow (prot)	1522	4799			6188		1681	1726	1583			
Flt Permitted	0.95	0.64			1.00		0.95	0.98	1.00			
Satd. Flow (perm)	1522	3076			6188		1681	1726	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	983	3515	0	0	2905	859	399	133	398	0	0	0
RTOR Reduction (vph)	0	0	0	0	36	0	0	0	65	0	0	0
Lane Group Flow (vph)	885	3613	0	0	3728	0	263	269	333	0	0	0
Turn Type	Prot	NA			NA		Split	NA	Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases									8			
Actuated Green, G (s)	57.5	114.0			56.5		22.5	22.5	22.5			
Effective Green, g (s)	57.5	114.0			56.5		22.5	22.5	22.5			
Actuated g/C Ratio	0.38	0.76			0.38		0.15	0.15	0.15			
Clearance Time (s)	4.5				4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	583	2998			2330		252	258	237			
v/s Ratio Prot	c0.58	0.46			c0.60		0.16	0.16				
v/s Ratio Perm		0.45							c0.21			
v/c Ratio	1.52	1.21			1.60		1.04	1.04	1.41			
Uniform Delay, d1	46.3	18.0			46.8		63.8	63.8	63.8			
Progression Factor	1.26	1.43			1.00		1.00	1.00	1.00			
Incremental Delay, d2	233.9	92.6			272.1		68.6	67.6	206.3			
Delay (s)	292.2	118.4			318.9		132.3	131.4	270.1			
Level of Service	F	F			F		F	F	F			
Approach Delay (s/veh)		152.6			318.9			191.0			0.0	
Approach LOS		F			F			F			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	224.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.53		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	125.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2836	484	506	2555	0	0	0	0	1288	128	581
Future Volume (vph)	0	2836	484	506	2555	0	0	0	0	1288	128	581
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5					4.5	4.5	4.5
Lane Util. Factor		0.86		1.00	0.91					0.97	0.95	0.95
Frt		0.98		1.00	1.00					1.00	0.90	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		6268		1770	5085					3433	1597	1504
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		6268		1770	5085					3433	1597	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	3083	526	550	2777	0	0	0	0	1400	139	632
RTOR Reduction (vph)	0	20	0	0	0	0	0	0	0	0	1	50
Lane Group Flow (vph)	0	3589	0	550	2777	0	0	0	0	1400	397	323
Turn Type		NA		Prot	NA					Split	NA	Perm
Protected Phases		2		1	2 1					4	4	
Permitted Phases												4
Actuated Green, G (s)		57.5		28.5	90.5					50.5	50.5	50.5
Effective Green, g (s)		57.5		28.5	90.5					50.5	50.5	50.5
Actuated g/C Ratio		0.38		0.19	0.60					0.34	0.34	0.34
Clearance Time (s)		4.5		4.5						4.5	4.5	4.5
Vehicle Extension (s)		3.0		3.0						3.0	3.0	3.0
Lane Grp Cap (vph)		2402		336	3067					1155	537	506
v/s Ratio Prot		c0.57		c0.31	c0.55					c0.41	0.25	
v/s Ratio Perm												0.21
v/c Ratio		1.49		1.64	0.91					1.21	0.74	0.64
Uniform Delay, d1		46.3		60.8	26.0					49.8	43.9	42.0
Progression Factor		1.00		0.57	0.40					1.00	1.00	1.00
Incremental Delay, d2		224.6		287.8	0.4					103.7	5.3	2.6
Delay (s)		270.8		322.3	10.7					153.4	49.2	44.7
Level of Service		F		F	B					F	D	D
Approach Delay (s/veh)		270.8			62.2			0.0			115.6	
Approach LOS		F			E			A			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	157.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	125.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	56.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Future Vol, veh/h	136	707	0	0	321	586	107	26	268	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	148	768	0	0	349	637	116	28	291	0	0	0
Number of Lanes	1	2	0	0	3	0	0	2	1	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	3	3
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	3	0	3
HCM Control Delay, s/veh	55.9	90.8	20
HCM LOS	E	F	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3
Vol Left, %	93%	0%	0%	100%	5%	0%	0%	0%	0%
Vol Thru, %	7%	100%	0%	0%	95%	100%	100%	100%	10%
Vol Right, %	0%	0%	100%	0%	0%	0%	0%	0%	90%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	116	17	268	122	249	471	128	128	650
LT Vol	107	0	0	122	14	0	0	0	0
Through Vol	9	17	0	0	235	471	128	128	64
RT Vol	0	0	268	0	0	0	0	0	586
Lane Flow Rate	126	19	291	133	271	512	140	140	707
Geometry Grp	5	5	5	6	6	6	6	6	6
Degree of Util (X)	0.306	0.043	0.616	0.321	0.618	0.919	0.328	0.328	1.184
Departure Headway (Hd)	9.049	8.576	7.861	9.063	8.578	6.768	8.454	8.454	6.029
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	400	420	463	399	423	538	426	426	601
Service Time	6.749	6.276	5.561	6.763	6.278	4.468	6.205	6.205	3.779
HCM Lane V/C Ratio	0.315	0.045	0.629	0.333	0.641	0.952	0.329	0.329	1.176
HCM Control Delay, s/veh	15.7	11.7	22.4	16	24.2	47.2	15.3	15.3	120.6
HCM Lane LOS	C	B	C	C	C	E	C	C	F
HCM 95th-tile Q	1.3	0.1	4.1	1.4	4	11.1	1.4	1.4	24.4

Intersection	
Intersection Delay, s/veh	89.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Future Vol, veh/h	0	187	133	265	170	0	0	0	0	640	360	161
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	203	145	288	185	0	0	0	0	696	391	175
Number of Lanes	0	3	0	1	2	0	0	0	0	0	2	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	3	3	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	3
HCM Control Delay, s/veh	13.9	17.2	303
HCM LOS	B	C	F

Lane	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2
Vol Left, %	0%	0%	0%	100%	68%	0%	78%	0%
Vol Thru, %	100%	100%	22%	0%	32%	100%	22%	53%
Vol Right, %	0%	0%	78%	0%	0%	0%	0%	47%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	75	170	143	179	113	820	341
LT Vol	0	0	0	143	122	0	640	0
Through Vol	75	75	37	0	57	113	180	180
RT Vol	0	0	133	0	0	0	0	161
Lane Flow Rate	81	81	185	156	194	123	891	371
Geometry Grp	6	6	6	6	6	6	6	6
Degree of Util (X)	0.189	0.189	0.314	0.366	0.448	0.214	1.873	0.705
Departure Headway (Hd)	9.692	9.692	7.302	9.742	9.577	7.411	7.566	6.843
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	372	372	496	372	378	488	481	526
Service Time	7.392	7.392	5.002	7.442	7.277	5.111	5.324	4.601
HCM Lane V/C Ratio	0.218	0.218	0.373	0.419	0.513	0.252	1.852	0.705
HCM Control Delay, s/veh	14.6	14.6	13.3	18	19.8	12.1	418.9	24.4
HCM Lane LOS	B	B	B	C	C	B	F	C
HCM 95th-tile Q	0.7	0.7	1.3	1.6	2.2	0.8	57.3	5.6

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3600	3439	43	0	51
Future Vol, veh/h	0	3600	3439	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3913	3738	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1892
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	~ 51
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	~ 51
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	283.69
HCM LOS			F

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	51
HCM Lane V/C Ratio	-	-	-	1.09
HCM Control Delay (s/veh)	-	-	-	283.7
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	4.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	175	26	26	145	21	21
Future Vol, veh/h	175	26	26	145	21	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	190	28	28	158	23	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	218	0	418	204
Stage 1	-	-	-	-	204	-
Stage 2	-	-	-	-	214	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1351	-	591	836
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	822	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1351	-	578	836
Mov Cap-2 Maneuver	-	-	-	-	578	-
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	803	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	1.17	10.65
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	683	-	-	274	-
HCM Lane V/C Ratio	0.067	-	-	0.021	-
HCM Control Delay (s/veh)	10.6	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3249	2795	43	0	51
Future Vol, veh/h	0	3249	2795	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3532	3038	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1542
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	89
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	89
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	96.79
HCM LOS			F

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	89
HCM Lane V/C Ratio	-	-	-	0.623
HCM Control Delay (s/veh)	-	-	-	96.8
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	2.9

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	3249	2787	43	0	51
Future Vol, veh/h	0	3249	2787	43	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3532	3029	47	0	55

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	1538
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	-	0	90
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	90
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s/v	0	0	95.59
HCM LOS			F

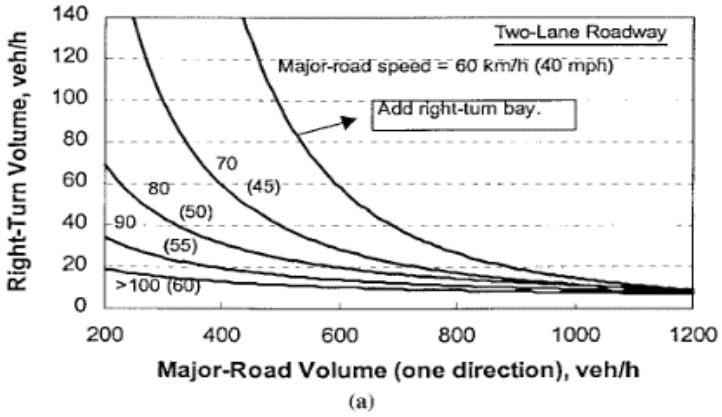
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	90
HCM Lane V/C Ratio	-	-	-	0.619
HCM Control Delay (s/veh)	-	-	-	95.6
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	2.9

Appendix E

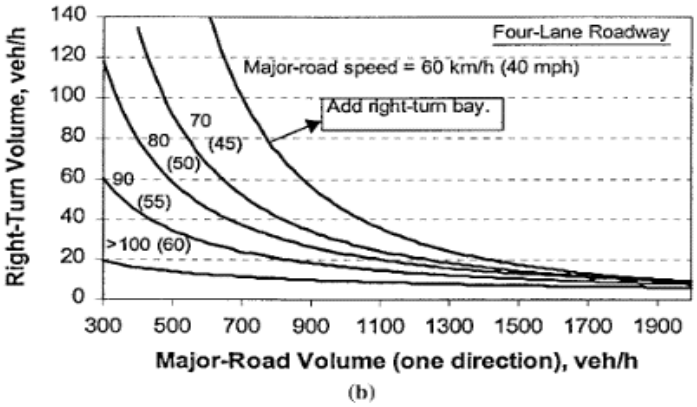
Right Turn Criteria

NCHRP 457 RT Turn Warrant Analysis					
Intersection	Year 2030				
	Advancing Volume	Opposing Volume	Right Turn Volume	AM	PM
Manvel Pkwy & Charlotte Street (NB & SB)	499(837)	290(782)	114(201)	**Yes**	**Yes**
Manvel Pkwy & Dogwood Ave (NB&SB)	214(515)	160(282)	85(194)	**No**	**No**
Driveway 2 & Driveway 3 (EB&WB)	234(364)	89(221)	55(86)	**No**	**No**
Driveway 1 & Charlotte Street (EB &WB)	180(278)	112(235)	28(43)	**No**	**No**
Driveway 1 & Charlotte Street (NB &SB)	71(171)	68(142)	17(51)	**No**	**No**
Manvel Pkwy & Charlotte Street (EB & WB)	105(273)	138(311)	43(128)	**No**	**No**
Manvel Pkwy & Driveway 1 (EB)	104(306)	0(0)	69(204)	**No**	**Yes**
Manvel Pkwy & Driveway 2 (EB)	113(332)	0(0)	104(306)	**No**	**Yes**
Manvel Pkwy & Driveway 1 (NB & SB)	350(995)	553(858)	28(43)	**No**	**Yes**
Manvel Pkwy & Charlotte Street (NB & SB)	290(782)	499(837)	14(21)	**No**	**No**
Manvel Pkwy & Driveway 2 (NB & SB)	237(531)	360(656)	36(68)	**No**	**No**
Driveway 2 & Driveway 3 (EB&WB)	89(221)	234(364)	14(21)	**No**	**No**
Driveway 1 & Charlotte Street (EB &WB)	112(235)	180(278)	14(21)	**No**	**No**
Driveway 1 & Charlotte Street (NB &SB)	68(142)	71(171)	9(26)	**No**	**No**

LEGEND:
AM Volume (PM Volume)



(a)



(b)

TxDOT Right Turn Warrant Analysis				
Intersection	Year 2030			
	Right Turn Volume	Threshold	AM	PM
SH 288 NB Frontage Road & Charlotte Street (NB)	179(278)	60	**Yes**	**Yes**
SH 288 NB Frontage Road & Driveway 2 (NB)	235(363)	60	**Yes**	**Yes**
SH 6 & Iowa Lane (EB&WB)	123(75)	50	**Yes**	**Yes**
SH 6 & Manvel Pkwy (EB&WB)	138(214)	50	**Yes**	**Yes**
SH 6 & Iowa Lane (NB&SB)	35(47)	60	**No**	**No**
SH 6 & Driveway 4 (EB&WB)	28(43)	50	**No**	**No**
SH 6 & Driveway 5 (EB&WB)	28(43)	50	No	No
SH 6 & Driveway 6 (EB&WB)	28(43)	50	No	No

LEGEND:
AM Volume (PM Volume)

Table 2-3: Auxiliary Lane Thresholds

Median Type	Left Turn to or from Property		Right Turn to or from Property (5)	
	Acceleration	Deceleration	Acceleration	Deceleration
Non-Traversable (Raised Median)	(2)	All	Right turn egress > 200 vph (4)	◆ > 45 mph where right turn volume is > 50 vph (3) ◆ ≤ 45 where right turn volume is > 60 vph (3)
Traversable (Undivided Road)	(2)	(1)	Same as above	Same as Above

(1) Refer to Table 3-11, TxDOT *Roadway Design Manual*, for alternative left-turn-bay operational considerations.

(2) A left-turn acceleration lane may be required if it would provide a benefit to the safety and operation of the roadway. A left-turn acceleration lane would interfere with the left-turn ingress movements to any other access connection.

(3) Additional right-turn considerations:

- Conditions for providing an exclusive right-turn lane when the right-turn traffic volume projections are less than indicated in Table 2-3:
  - High crash experience
  - Heavier than normal peak flow movements on the main roadway
  - Large volume of truck traffic
  - Highways where sight distance is limited
- Conditions for NOT requiring a right-turn lane where right-turn volumes are more than indicated in Table 2-3:
  - Dense or built-out corridor where space is limited
  - Where queues of stopped vehicles would block the access to the right turn lane
  - Where sufficient length of property width is not available for the appropriate design

(4) The acceleration lane should not interfere with any downstream access connection.

- The distance from the end of the acceleration lane taper to the next unsignalized downstream access connection should be equal to or greater than the distances found in Table 2-2.
- Additionally, if the next access connection is signalized, the distance from the end of the acceleration lane taper to the back of the 90th percentile queue should be greater than or equal to the distances found Table 2-2.

(5) Continuous right-turn lanes can provide mobility benefits both for through movements and for the turning vehicles.[a] Access connections within a continuous right turn lane should meet the spacing requirements found in Table 2-2. However, when combined with crossing left in movements, a continuous right-turn lane can introduce additional operational conflicts.

Appendix F

Left Turn Criteria

NCHRP 457 Left Turn Warrant Analysis					
Intersection	Year 2025				
	Advancing Volume	Opposing Volume	Left Turn Volume	AM	PM
Manvel Pkwy & Driveway 1 (NB & SB)	553(858)	350(995)	97(150)	Yes	Yes
Manvel Pkwy & Charlotte Street (NB & SB)	499(837)	290(782)	55(86)	Yes	Yes
Manvel Pkwy & Driveway 2 (NB & SB)	360(656)	237(531)	97(150)	No	Yes
Driveway 2 & Driveway 3 (EB&WB)	234(364)	89(221)	69(107)	No	Yes
Driveway 1 & Charlotte Street (EB &WB)	180(278)	112(235)	69(107)	No	No
Driveway 1 & Charlotte Street (NB &SB)	71(171)	68(142)	26(77)	No	No
Manvel Pkwy & Charlotte Street (EB & WB)	105(273)	138(311)	45(94)	No	Yes
Manvel Pkwy & Driveway 1 (EB)	104(306)	0(0)	35(102)	No	No
Manvel Pkwy & Driveway 2 (EB)	113(332)	0(0)	9(26)	No	No
Manvel Pkwy & Charlotte Street (NB & SB)	290(782)	499(837)	22(47)	No	Yes
Driveway 2 & Driveway 3 (EB&WB)	89(221)	234(364)	14(21)	No	No
Driveway 1 & Charlotte Street (EB &WB)	112(235)	180(278)	55(86)	No	No
Driveway 1 & Charlotte Street (NB &SB)	68(142)	71(171)	9(26)	No	No
Manvel Pkwy & Charlotte Street (EB & WB)	138(311)	105(273)	52(153)	No	Yes

LEGEND:
AM Volume (PM Volume)

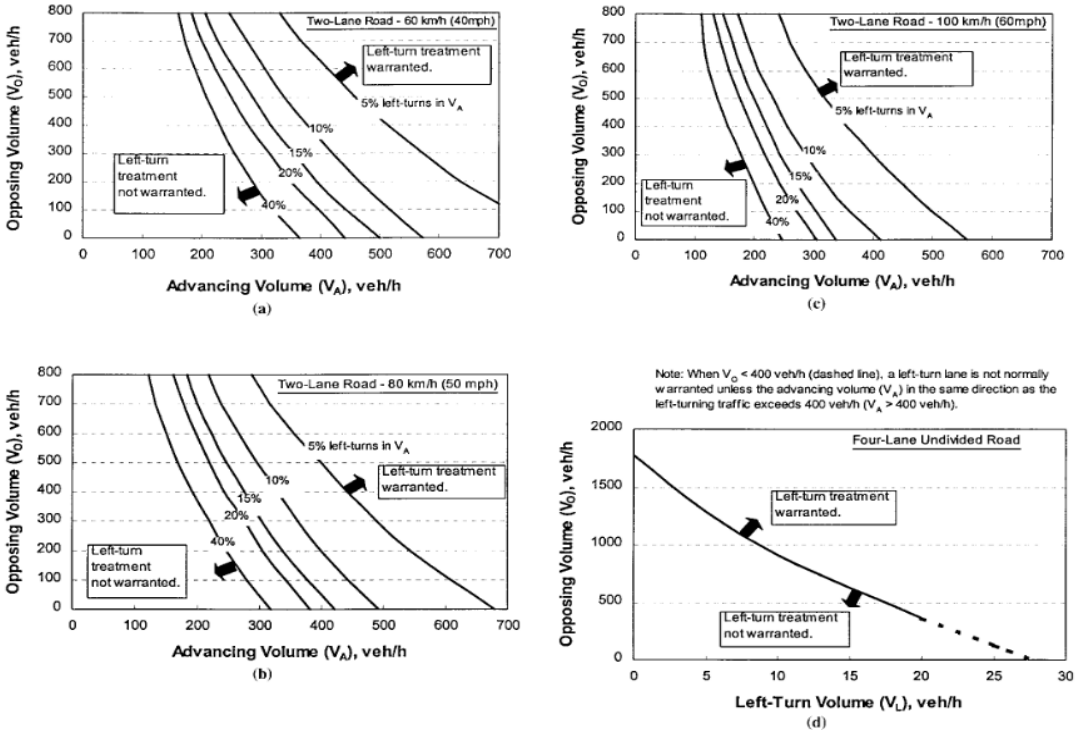


Figure 2-5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

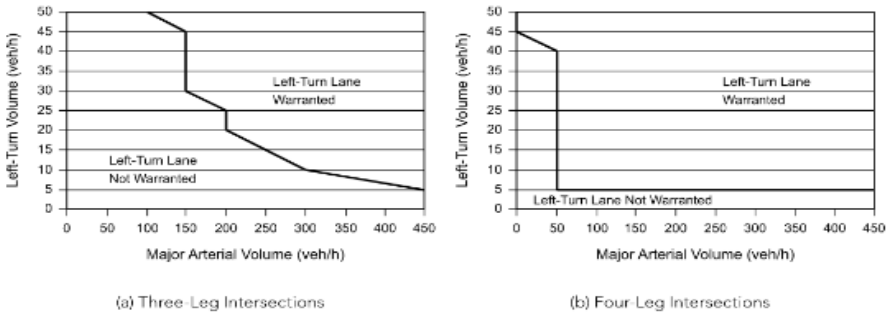
TxDOT Left Turn Warrant Analysis						
Intersection	Year 2030					
	Advancing Volume	Opposing Volume	Major Road Peak Hour Volume	Left Turn Volume	AM	PM
SH 6 & Iowa Lane (EB&WB)	2653(3021)	2548(2800)	867	108(188)	Yes	Yes
SH 6 & Manvel Pkwy (EB&WB)	2979(3600)	2422(2846)	900	456(708)	Yes	Yes
SH 6 & Iowa Lane (NB&SB)	121(218)	56(119)	44	86(167)	Yes	Yes

LEGEND:
AM Volume (PM Volume)

Table 4-17: Guide for Left-Turn Lane Warrants for Urban and Suburban Arterials

Source: AASHTO A Policy on Geometric Design of Highways and Streets

Left-Turn Lane Peak-Hour Volume (veh/hr)	Three-Leg Intersection, Major Urban and Suburban Arterial Volume (veh/hr/ln) That Warrants a Left-Turn Lane	Four-Leg Intersection, Major Urban and Suburban Arterial Volume (veh/hr/ln) That Warrants a Left-Turn Lane
5	450	50
10	300	50
15	250	50
20	200	50
25	200	50
30	150	50
35	150	50
40	150	50
45	150	< 50
50 or More	100	< 50
Notes:		
1. These guidelines apply where the major road is uncontrolled, and the minor-road approaches are stop- or yield-controlled. Both the left-turn peak-hour volume and the major-road volume warrants should be met as shown in Figure 4-11.		



(a) Three-Leg Intersections (b) Four-Leg Intersections

Figure 4-11: Suggested Left-Turn Warrants Based on Results from Benefit-Cost Evaluations for Intersections on Urban and Suburban Arterials

Source: AASHTO A Policy on Geometric Design of Highways and Streets

Appendix G

Traffic Signal Warrant Analysis

Traffic Survey - Count Analysis
2011 TMUTCD Warrants

Form TFF-TSCA
(8/18)
Page of

County: *Brazoria* District: *Houston*

City: *Manvel* Population: Survey Date:

	Route #	Name	Control	Section	85% Speed
Major		*SH 6*			*60*
Minor		*Iowa Lane*			*30*

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
5:00 PM	*4,354*	*N/A*	*139*	*N/A*
6:00 PM	*4,206*	*N/A*	*65*	*N/A*
8:00 AM	*4,188*	*N/A*	*61*	*N/A*
7:00 PM	*3,699*	*N/A*	*25*	*N/A*
9:00 AM	*3,340*	*N/A*	*36*	*N/A*
7:00 AM	*2,070*	*N/A*	*23*	*N/A*
10:00 AM	*1,388*	*N/A*	*16*	*N/A*
11:00 AM	*1,385*	*N/A*	*15*	*N/A*

Comments:
2030 No Build Conditions

Warrant 1. Eight Hour Vehicular Volume

◯ Yes ◉ No Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A. ***- or -*** Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B. ***- or -*** Meets 80%[b] of Conditions A and B. ***- or -*** Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph and population less than 10,000).

◯ Yes ◉ No

◯ Yes ◉ No

◯ Yes ◉ No

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*231%*	100%[a]	80%[b]	70%[c]	56%[d]	*10%*
1	1	500	400	350	280		150	120	105	84	
2 or more	1	600	480	420	336	*1,385*	150	120	105	84	*15*
2 or more	2 or more	600	480	420	336		200	160	140	112	
1	2 or more	500	400	350	280		200	160	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*254%*	100%[a]	80%[b]	70%[c]	56%[d]	*20%*
1	1	750	600	525	420		75	60	53	42	
2 or more	1	900	720	630	504	*1,385*	75	60	53	42	*15*
2 or more	2 or more	900	720	630	504		100	80	70	56	
1	2 or more	750	600	525	420		100	80	70	56	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 40 mph or in a community with a population less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

Contact/Help

Warrant 2. Four Hour Volumes

◉ Yes ○ No	Meets each of 4 Highest Hours (Warrant 2 - see Figure 1 and Figure 2).

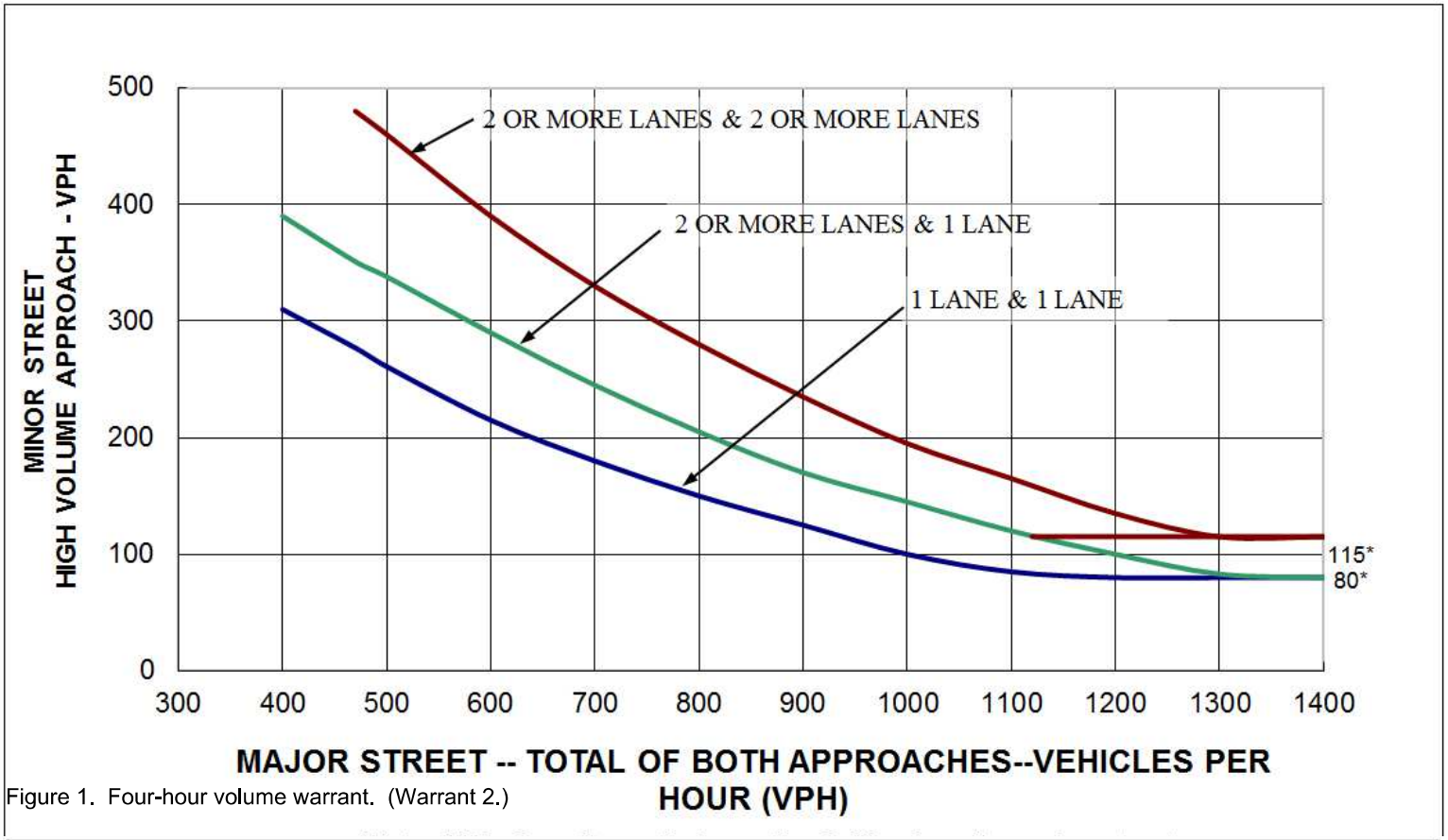


Figure 1. Four-hour volume warrant. (Warrant 2.)

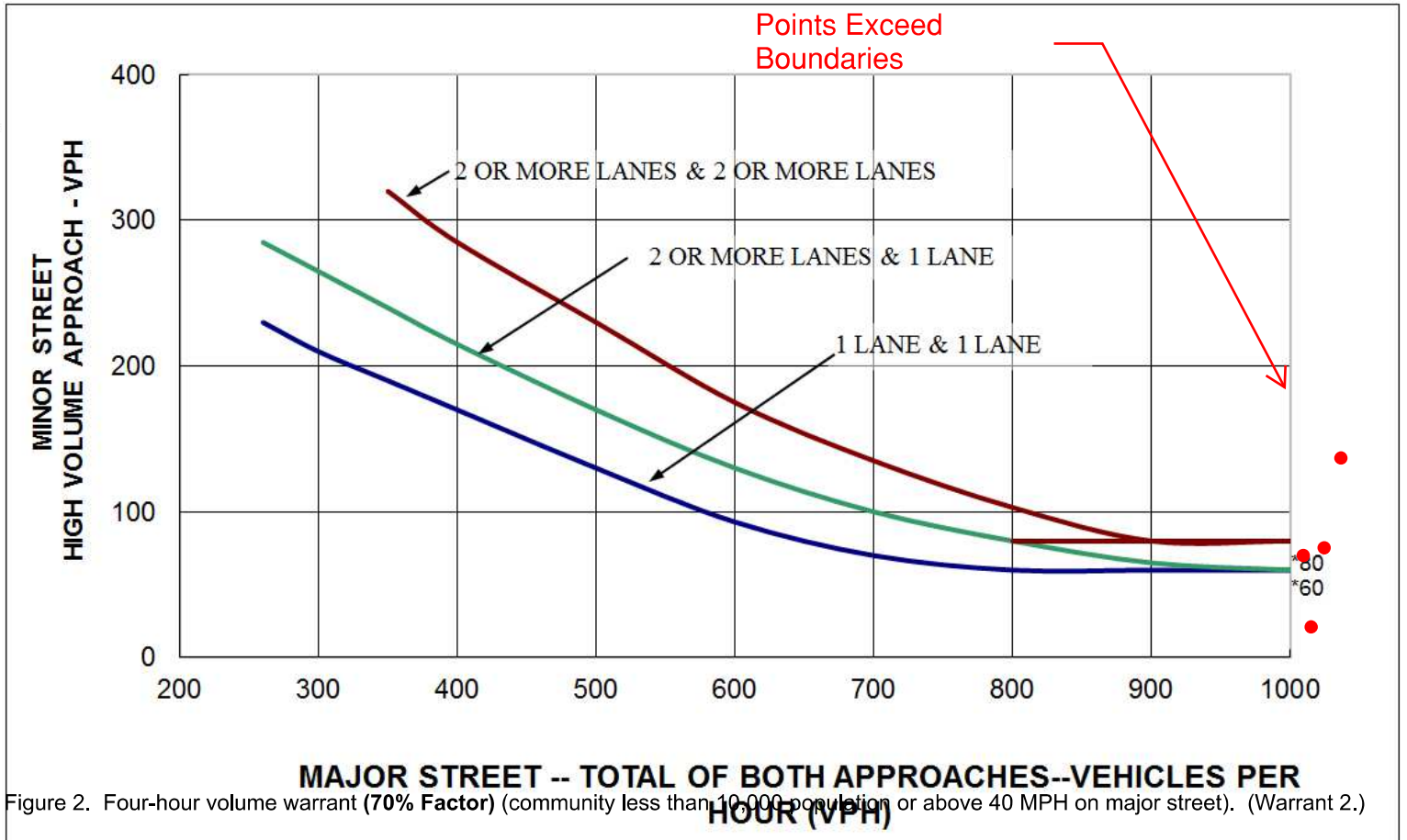


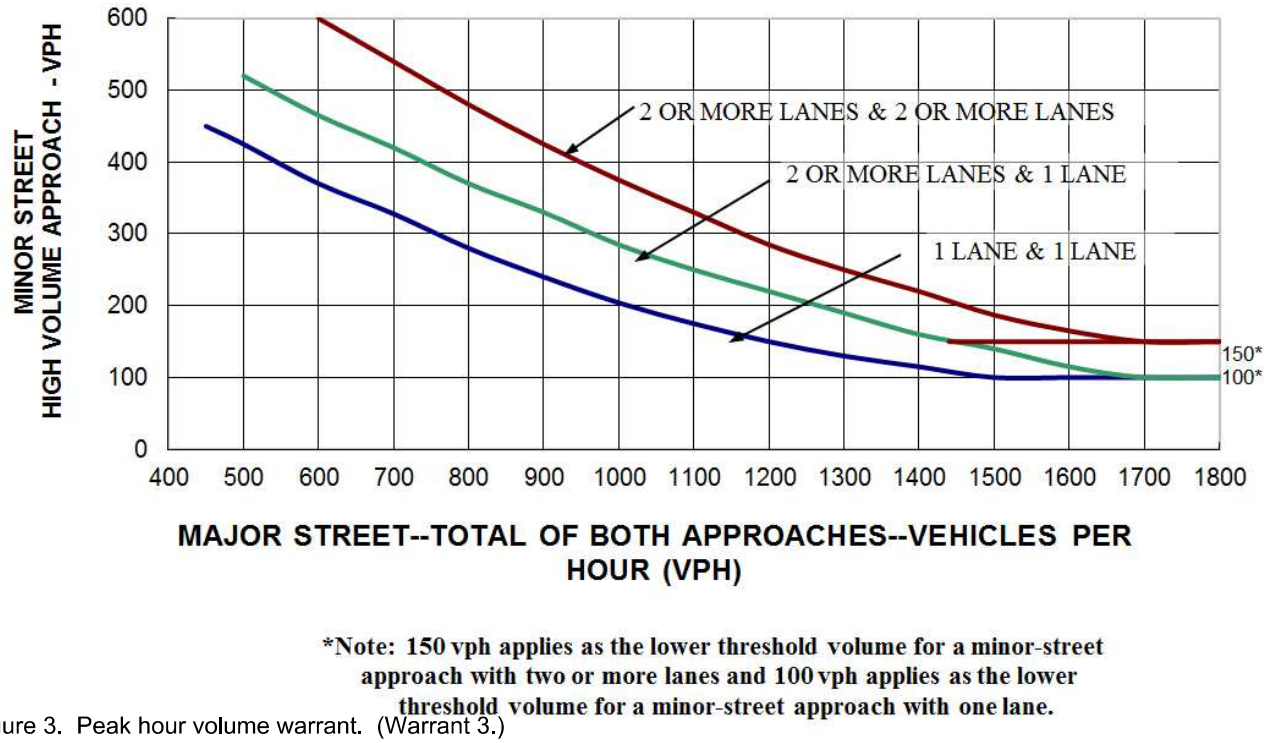
Figure 2. Four-hour volume warrant **(70% Factor)** (community less than 10,000 population or above 40 MPH on major street). (Warrant 2.)

***Note: 80 vph applies as the lower threshold volume for a minor-street**

Warrant 3. Peak Hour

○ Yes ◉ No Are all of the following conditions true for the same 1 hour (any four consecutive 15 minute periods)?
1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, *and*
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and*
3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches. **- *or* -** Meets one High Hour (Warrant 3 - see Figure 3 and Figure 4).

○ Yes ◉ No



***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 3. Peak hour volume warrant. (Warrant 3.)

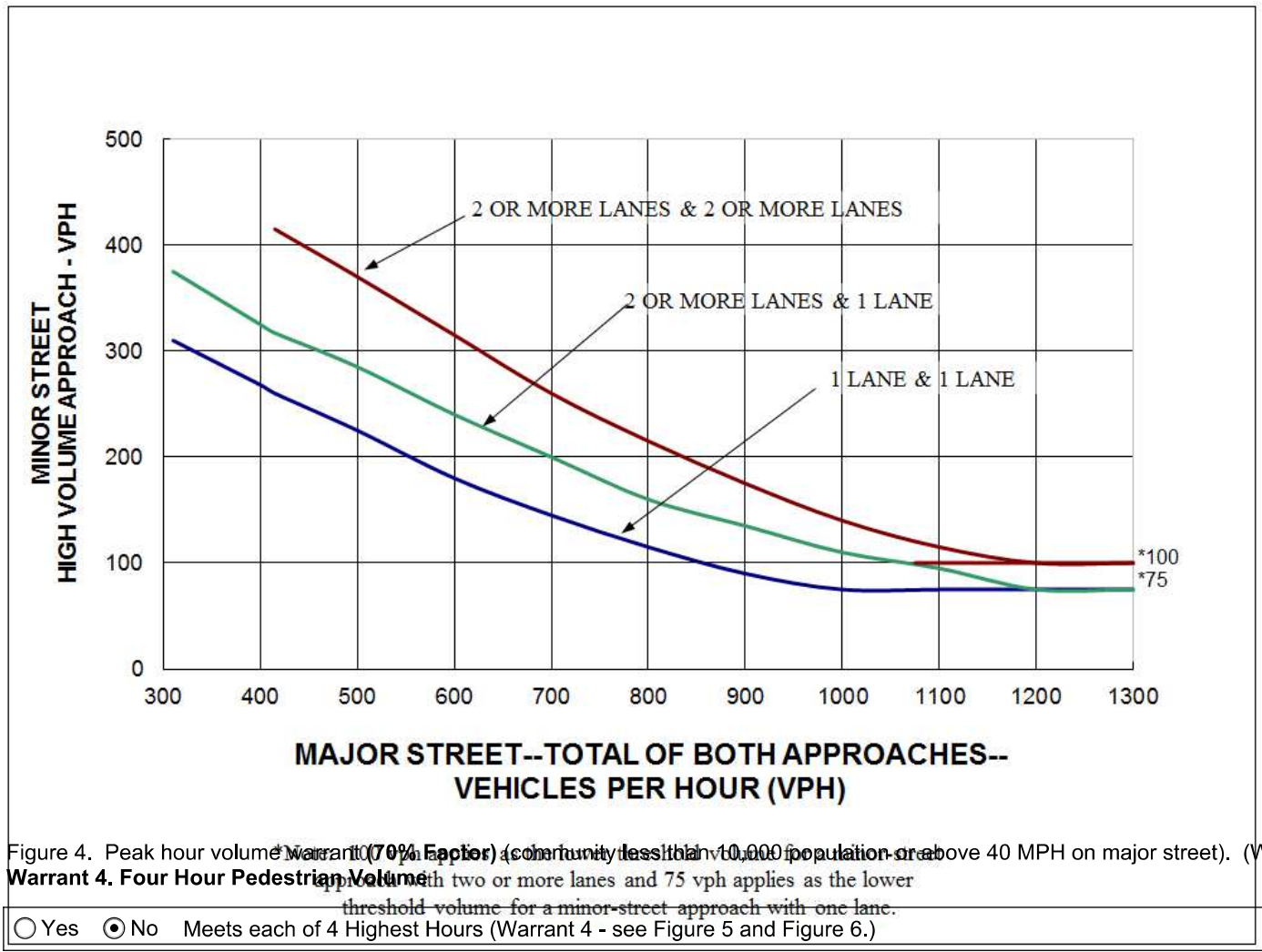
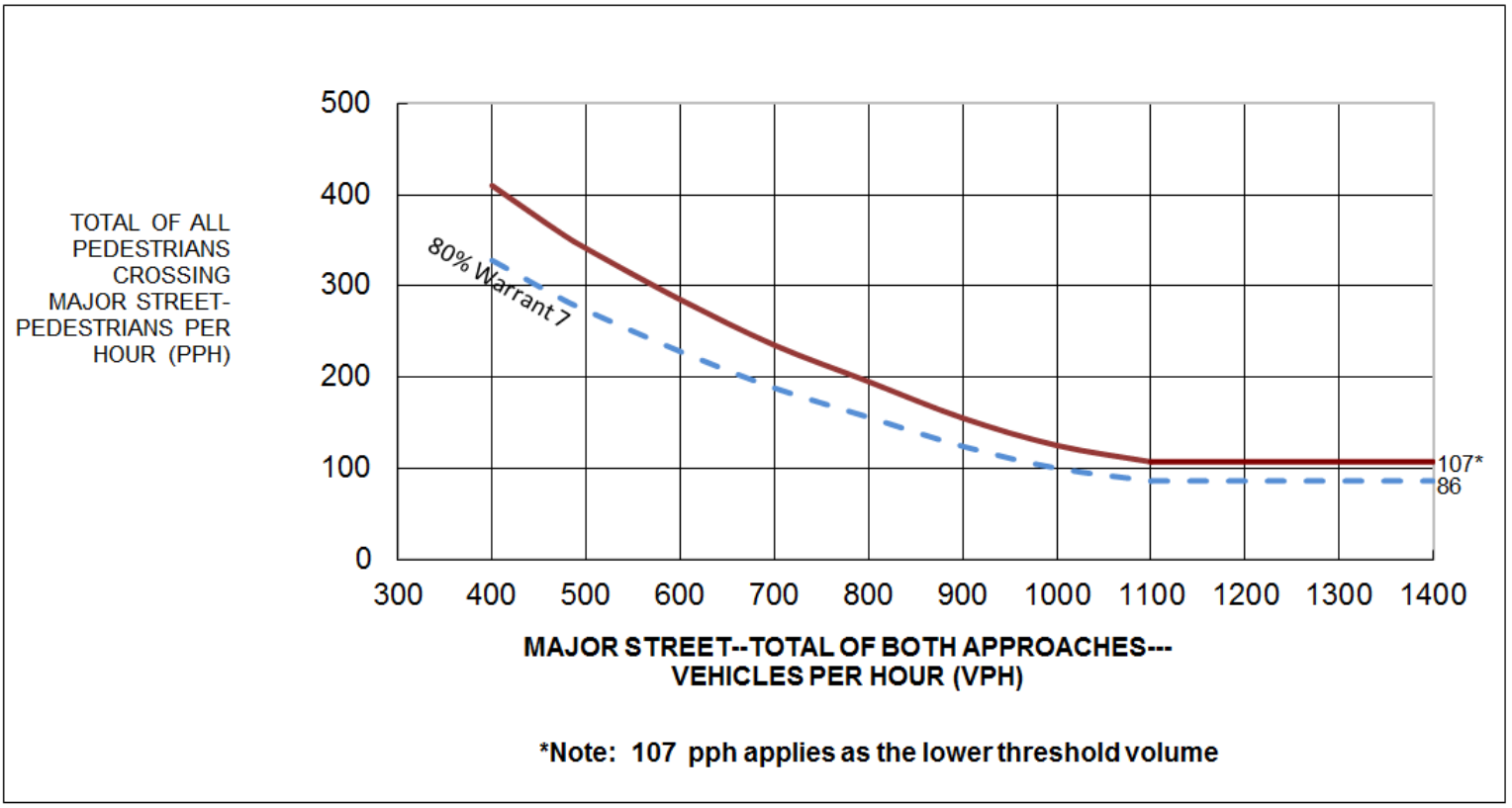


Figure 4. Peak hour volume warrant (**70% Factor**) (community less than 10,000 population or above 40 MPH on major street). (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volume

◯ Yes ◉ No Meets each of 4 Highest Hours (Warrant 4 - see Figure 5 and Figure 6.)



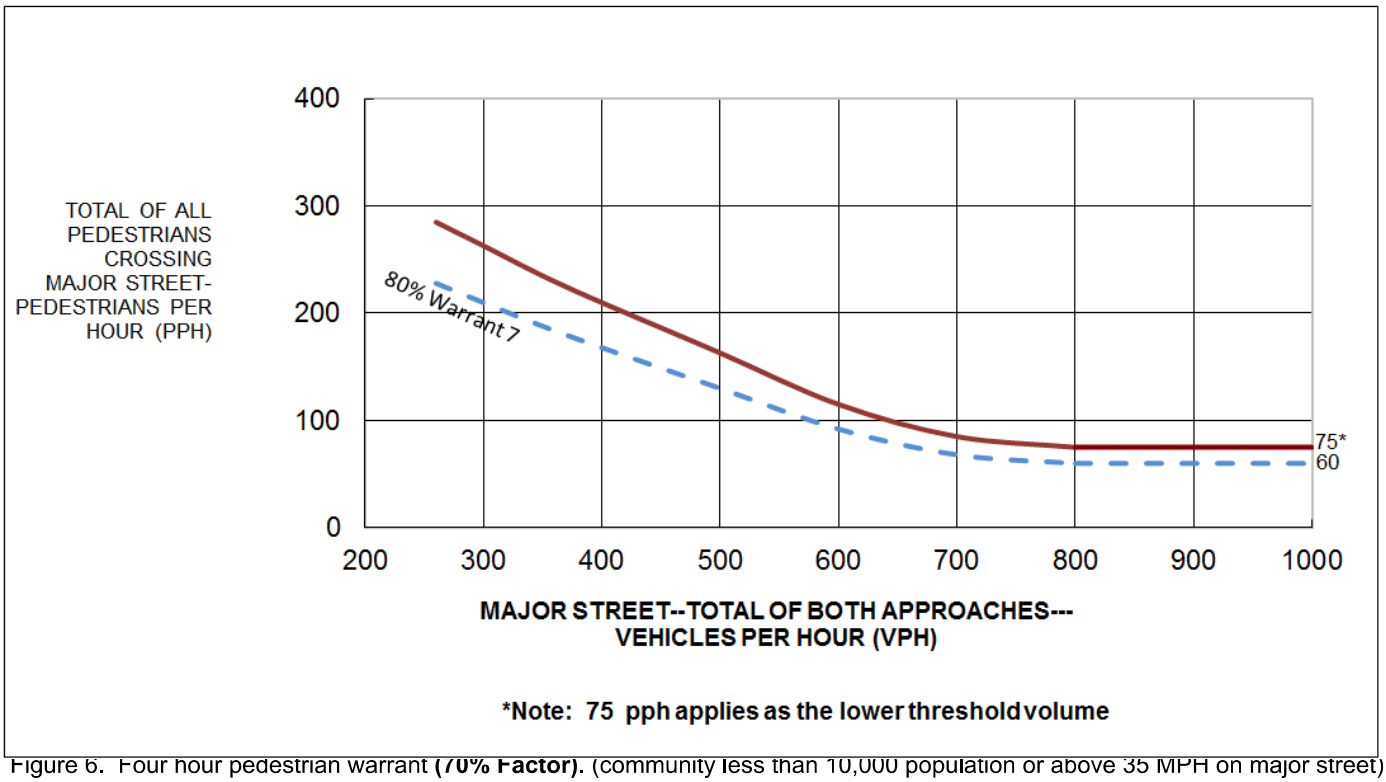


Figure 6. Four hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 35 MPH on major street). (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes

◯ Yes ◉ No Meets Peak Hour Pedestrian (Warrant 4 - see Figure 7 and Figure 8.)

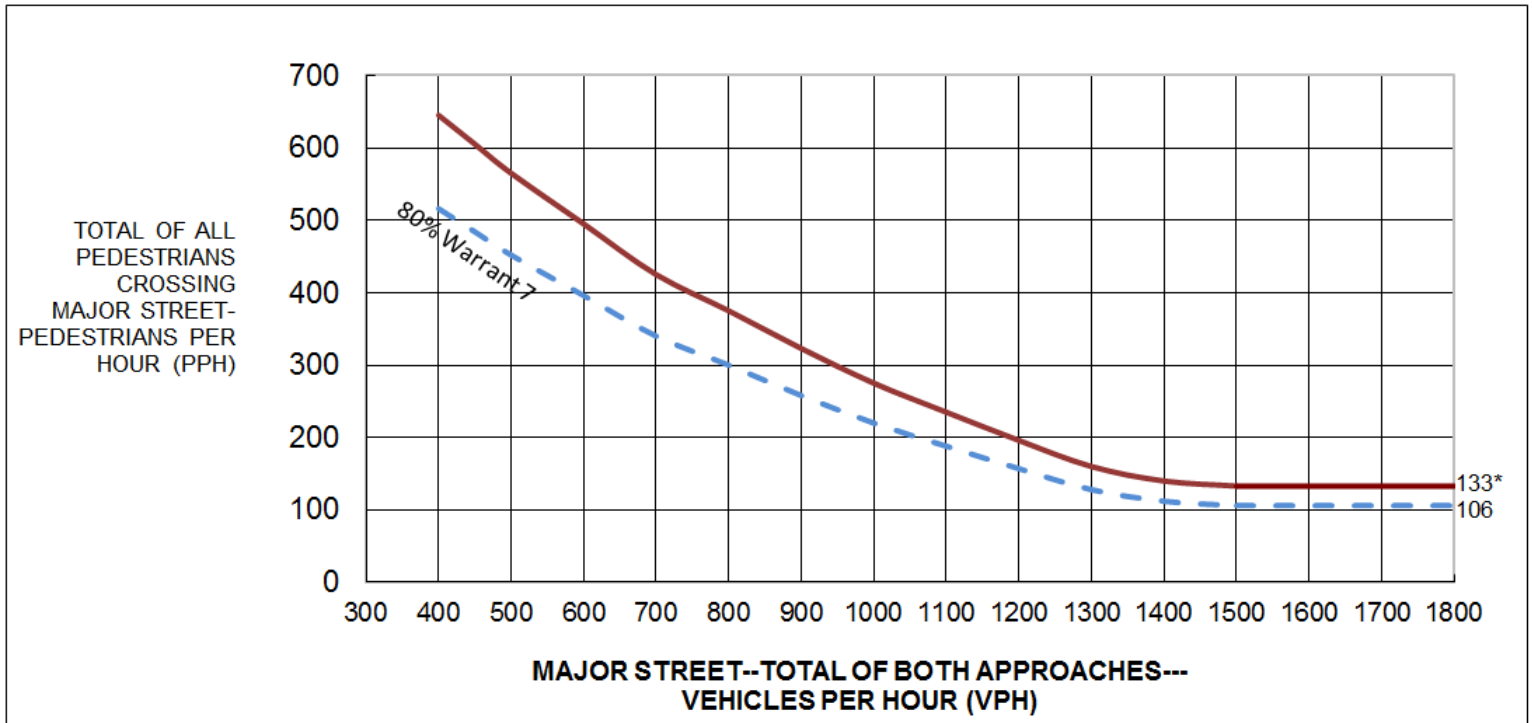


Figure 7. Four hour pedestrian warrant (Warrant 4.)

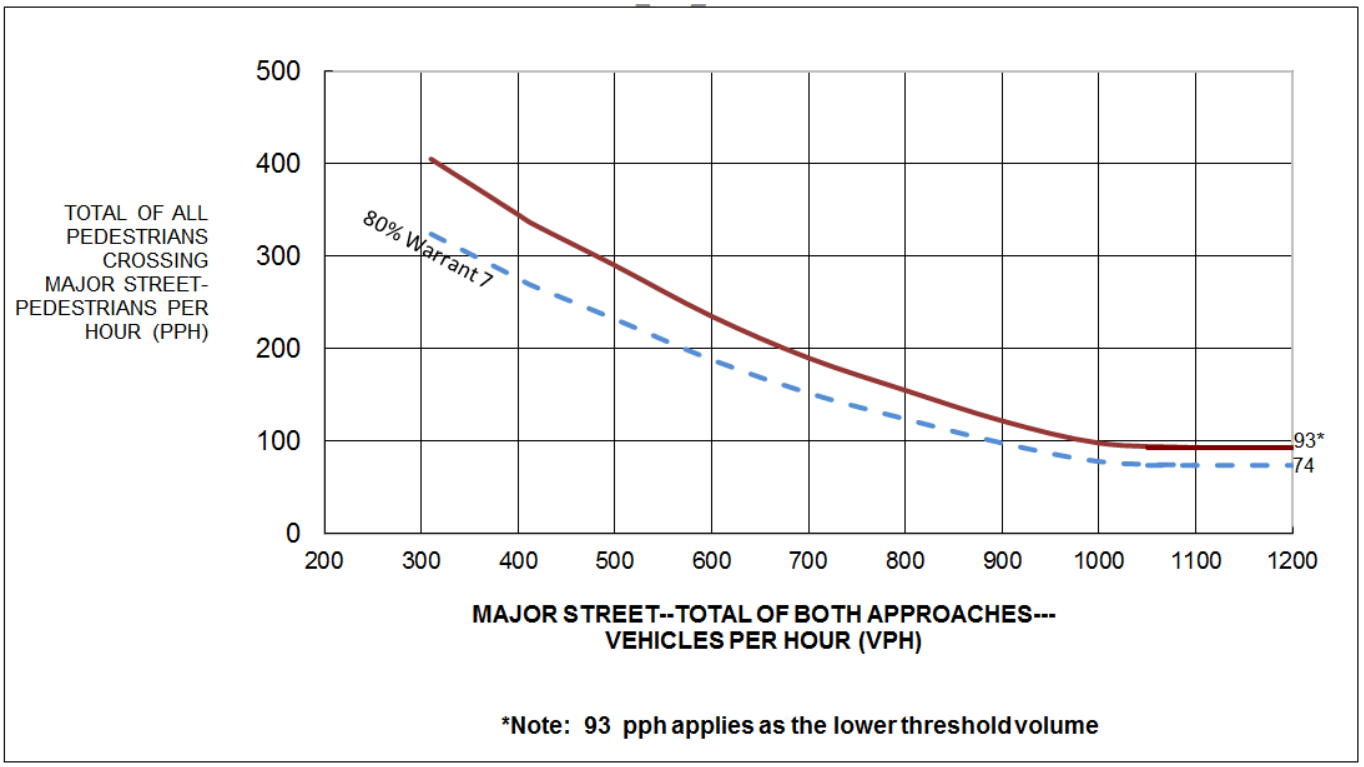


Figure 8. Peak hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 40 MPH on major street). (Warrant 4.)

Warrant 5. School Crossing

◯ Yes	⦿ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		- and -
◯ Yes	⦿ No	Are there a minimum of 20 students during the highest crossing hour?
		*- **and** -*
◯ Yes	⦿ No	Is the nearest signal on the major street located more than 300 feet away? (This warrant may be applied if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System

◯ Yes	⦿ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		- or -
◯ Yes	⦿ No	On a two-way street, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience

◯ Yes	⦿ No	Is one of the following conditions met?: ◆ 80% of Condition A or Condition B in Warrant 1 ◆ 56% of Conditions A or B in Warrant 1 (major-street speed exceeding 40 mph and population less than 10,000) ◆ 80% or more of Warrant 4
		- and -
◯ Yes	⦿ No	Have there been 5 or more reported crashes susceptible to correction by a traffic signal in 12 months?

Warrant 8. Roadway Network

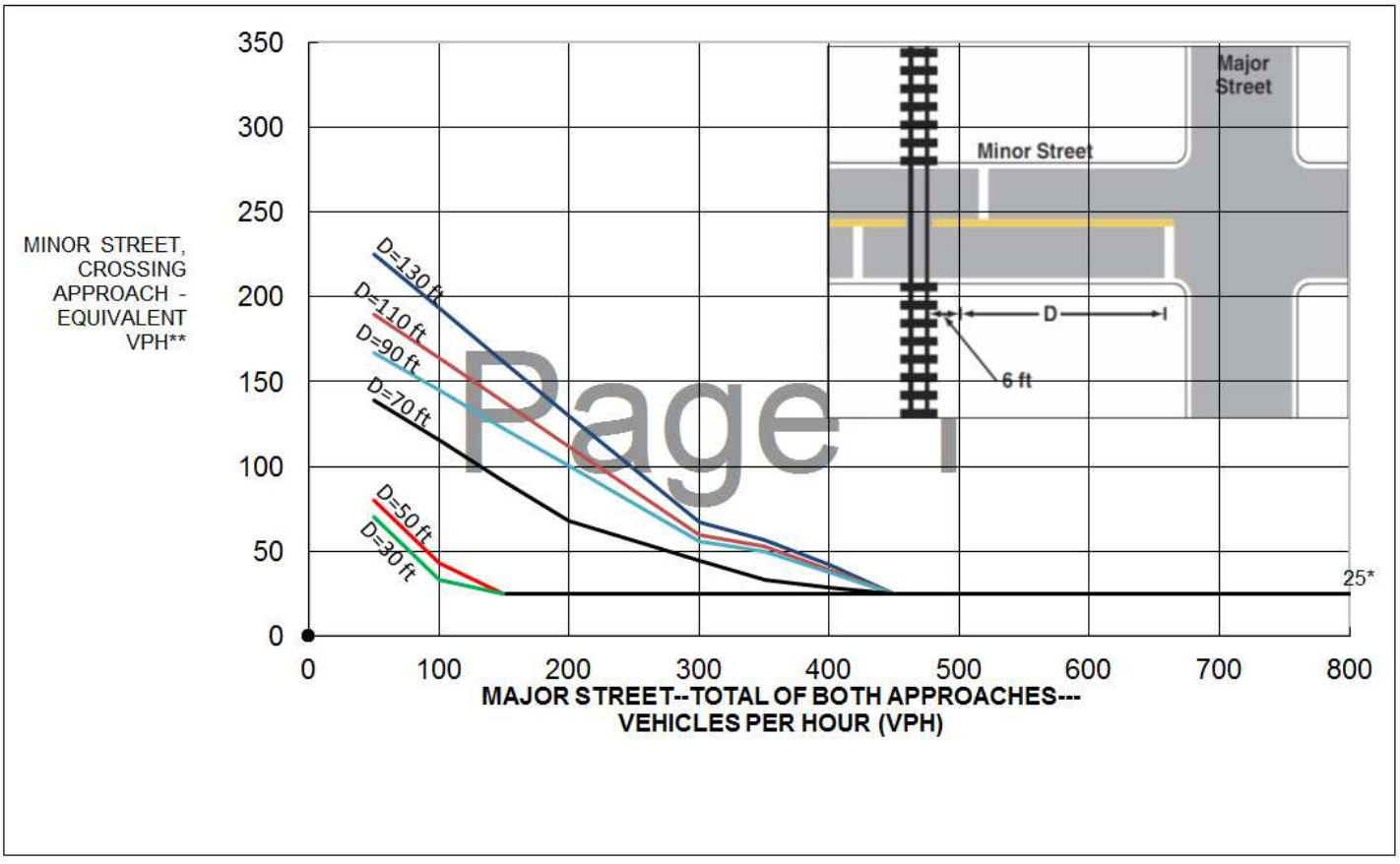
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		- or -
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route (only 1 needs to be checked):

Major Street	Minor Street	
◯ Yes	⦿ No	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
◯ Yes	⦿ No	It includes rural or suburban highways outside, entering, or traversing a city.
◯ Yes	⦿ No	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.
◯ Yes	⦿ No	It connects areas of principal traffic generation.
◯ Yes	⦿ No	It has surface street freeway or expressway ramp terminals.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

◯ Yes	⦿ No	Meets one High Hour (Warrant 9 - see Figure 9.)



Page 1

Warrant 9. Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

◯ Yes ◉ No Meets one High Hour (Warrant 9 - see Figure 10.)

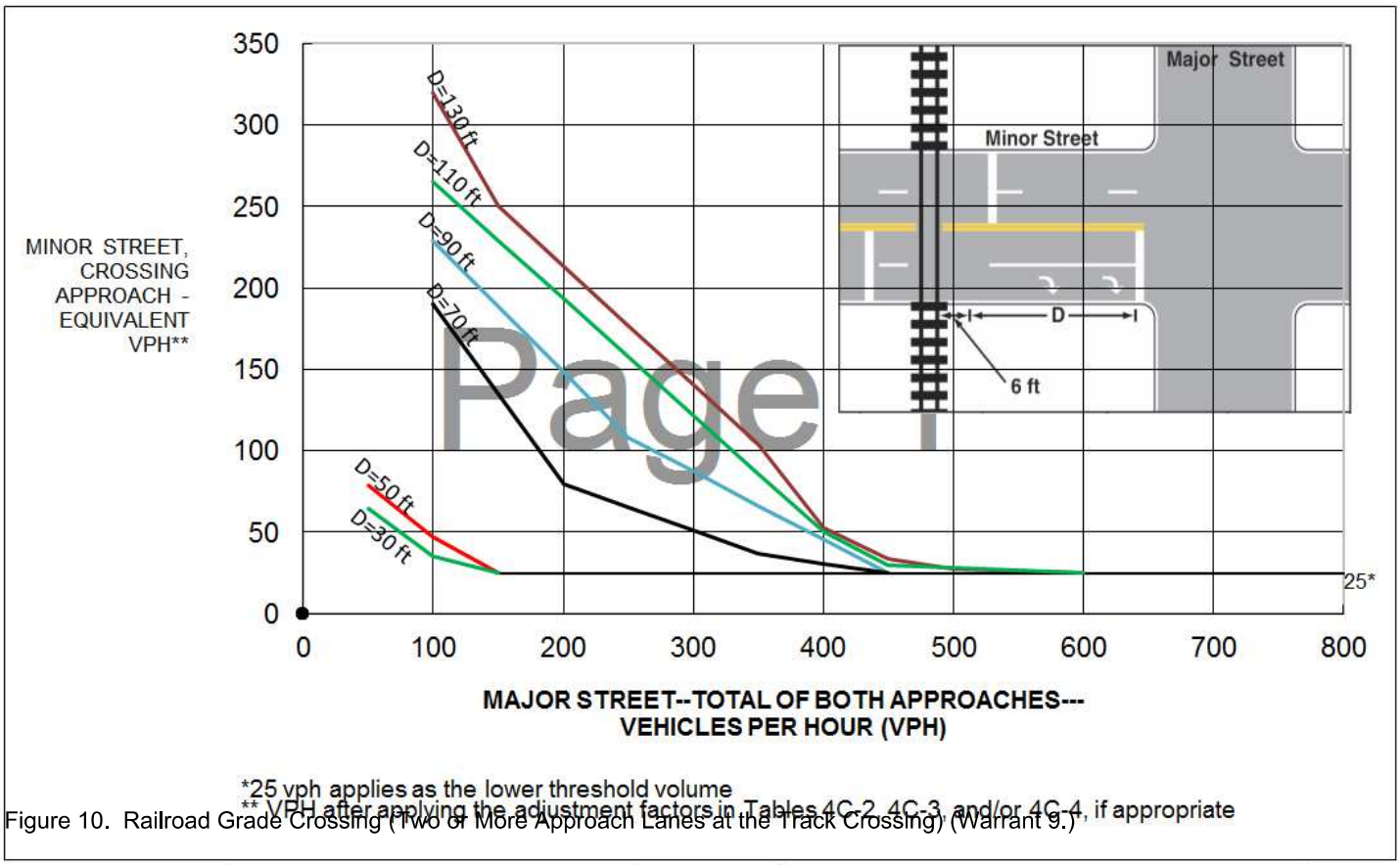


Figure 10. Railroad Grade Crossing (Two or More Approach Lanes at the Track Crossing) (Warrant 9.)

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Remarks:

A Traffic Signal Does NOT Warrant At this Intersection

Traffic Survey - Count Analysis
2011 TMUTCD Warrants

Form TFF-TSCA (8/18)
Page of

County: *Brazoria* District: *Houston*

City: *Manvel* Population: Survey Date:

	Route #	Name	Control	Section	85% Speed
Major		*SH 6*			*60*
Minor		*Iowa Lane*			*30*

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
5:00 PM	*5,202*	*N/A*	*305*	*N/A*
6:00 PM	*5,022*	*N/A*	*228*	*N/A*
8:00 AM	*4,561*	*N/A*	*110*	*N/A*
7:00 PM	*4,364*	*N/A*	*149*	*N/A*
9:00 AM	*3,833*	*N/A*	*100*	*N/A*
7:00 AM	*2,258*	*N/A*	*46*	*N/A*
11:00 AM	*2,070*	*N/A*	*126*	*N/A*
10:00 AM	*1,940*	*N/A*	*98*	*N/A*

Comments:
2030 Build Conditions

Warrant 1. Eight Hour Vehicular Volume

◯ Yes ◉ No Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A. ***- or -*** Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B. ***- or -*** Meets 80%[b] of Conditions A and B. ***- or -*** Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph and population less than 10,000).

◯ Yes ◉ No

◯ Yes ◉ No

◯ Yes ◉ No

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*323%*	100%[a]	80%[b]	70%[c]	56%[d]	*30%*
1	1	500	400	350	280		150	120	105	84	
2 or more	1	600	480	420	336	*1,940*	150	120	105	84	*46*
2 or more	2 or more	600	480	420	336		200	160	140	112	
1	2 or more	500	400	350	280		200	160	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*216%*	100%[a]	80%[b]	70%[c]	56%[d]	*61%*
1	1	750	600	525	420		75	60	53	42	
2 or more	1	900	720	630	504	*1,940*	75	60	53	42	*46*
2 or more	2 or more	900	720	630	504		100	80	70	56	
1	2 or more	750	600	525	420		100	80	70	56	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 40 mph or in a community with a population less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

Contact/Help

Warrant 2. Four Hour Volumes

◉ Yes ○ No Meets each of 4 Highest Hours (Warrant 2 - see Figure 1 and Figure 2).

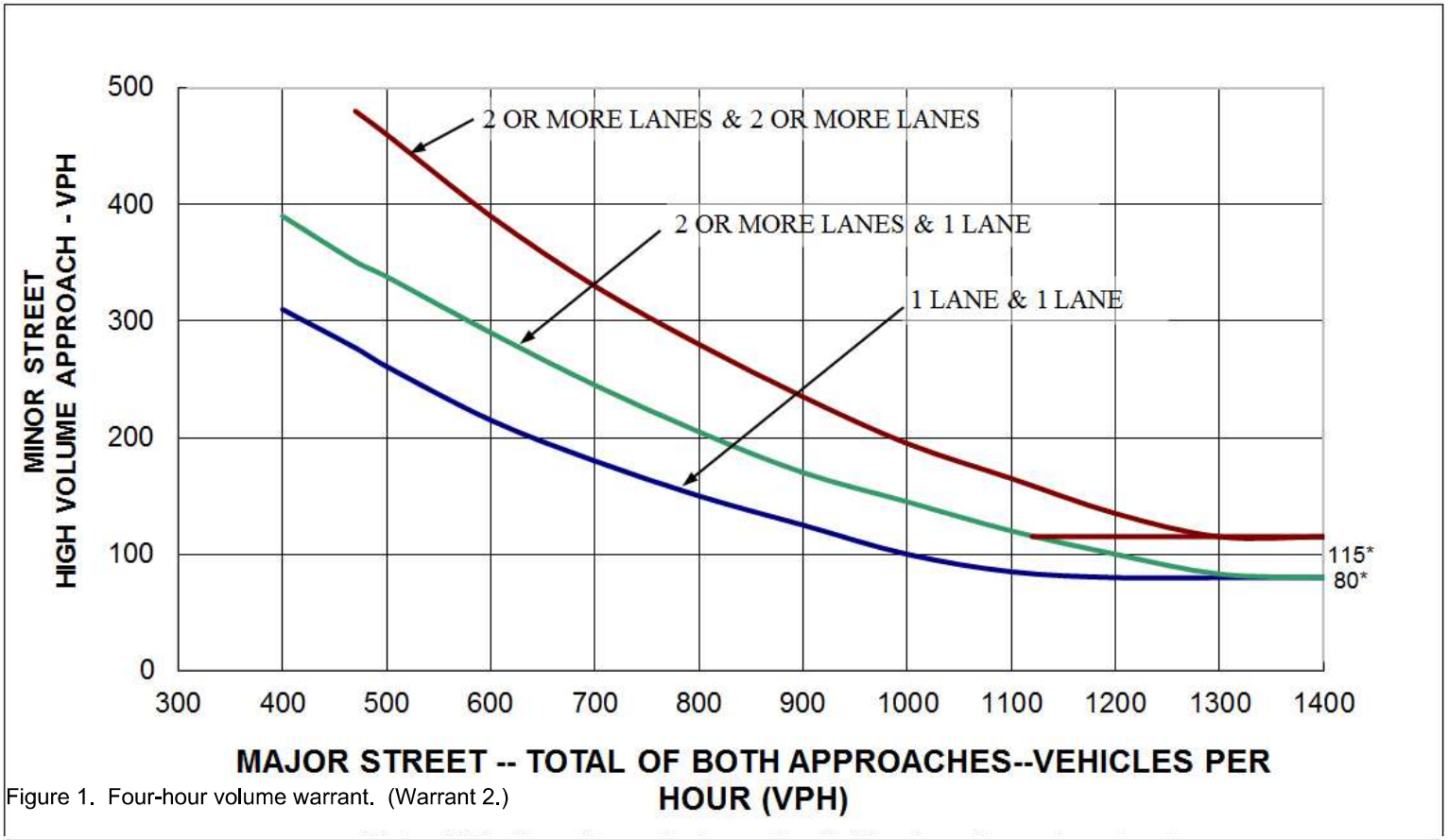


Figure 1. Four-hour volume warrant. (Warrant 2.)

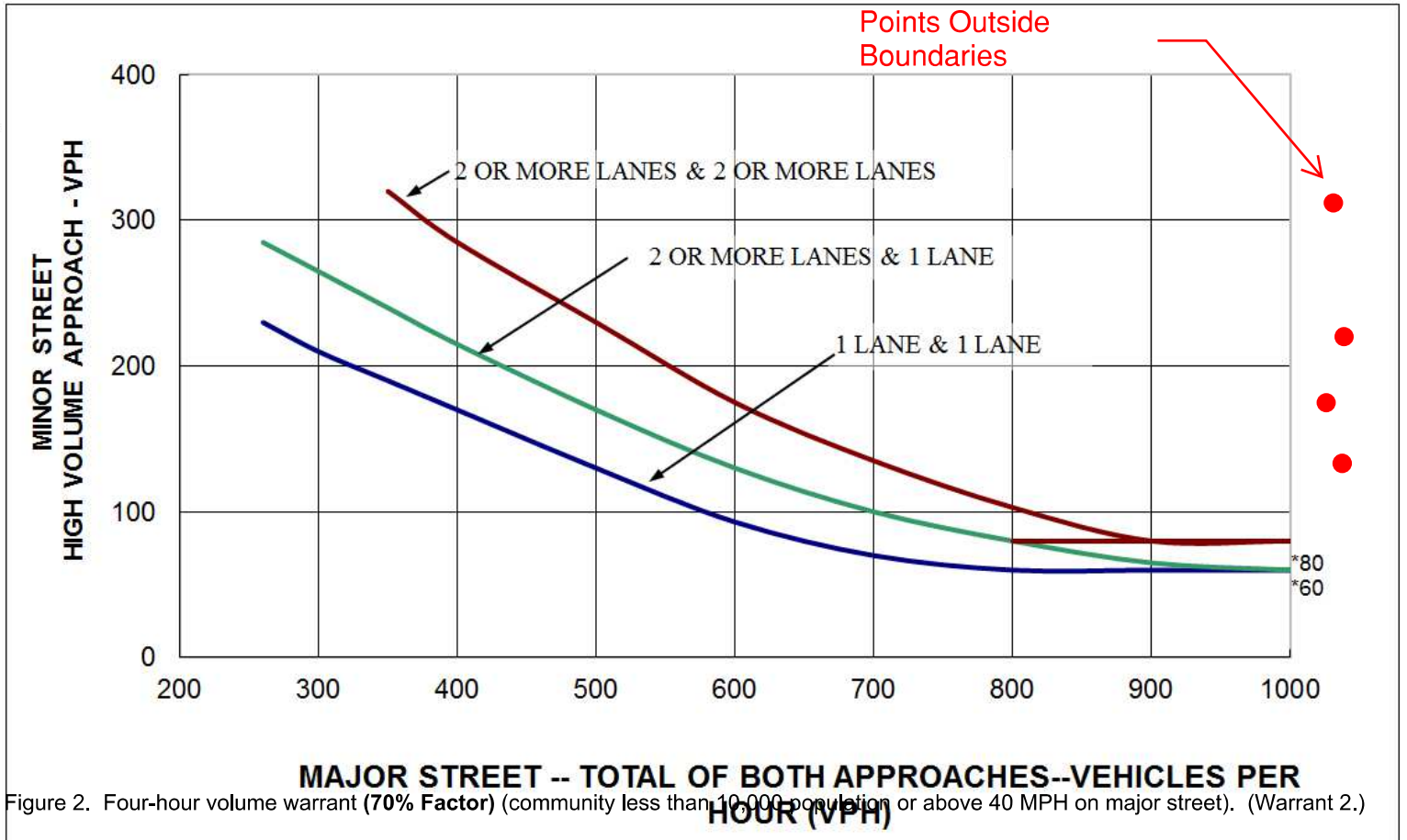


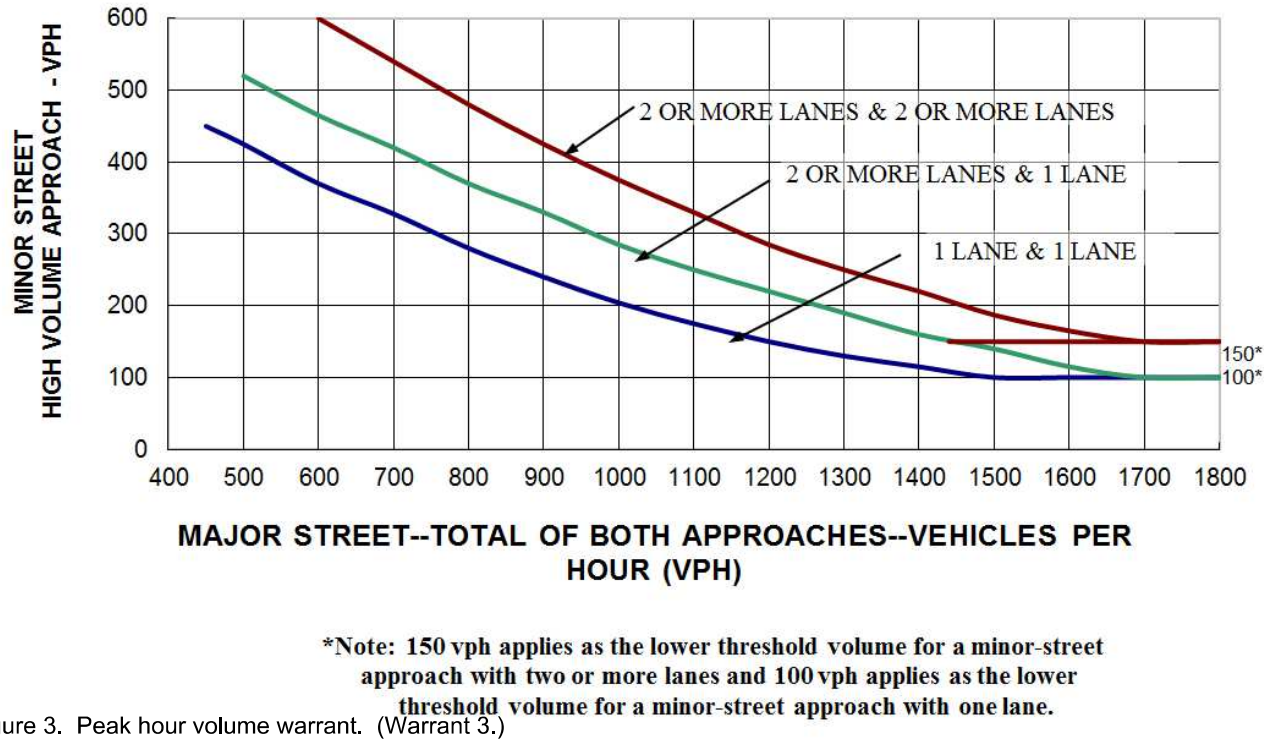
Figure 2. Four-hour volume warrant **(70% Factor)** (community less than 10,000 population or above 40 MPH on major street). (Warrant 2.)

***Note: 80 vph applies as the lower threshold volume for a minor-street**

Warrant 3. Peak Hour

◯ Yes ◉ No Are all of the following conditions true for the same 1 hour (any four consecutive 15 minute periods)?
1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, *and*
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and*
3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches. **- *or* -** Meets one High Hour (Warrant 3 - see Figure 3 and Figure 4).

◯ Yes ◉ No



***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 3. Peak hour volume warrant. (Warrant 3.)

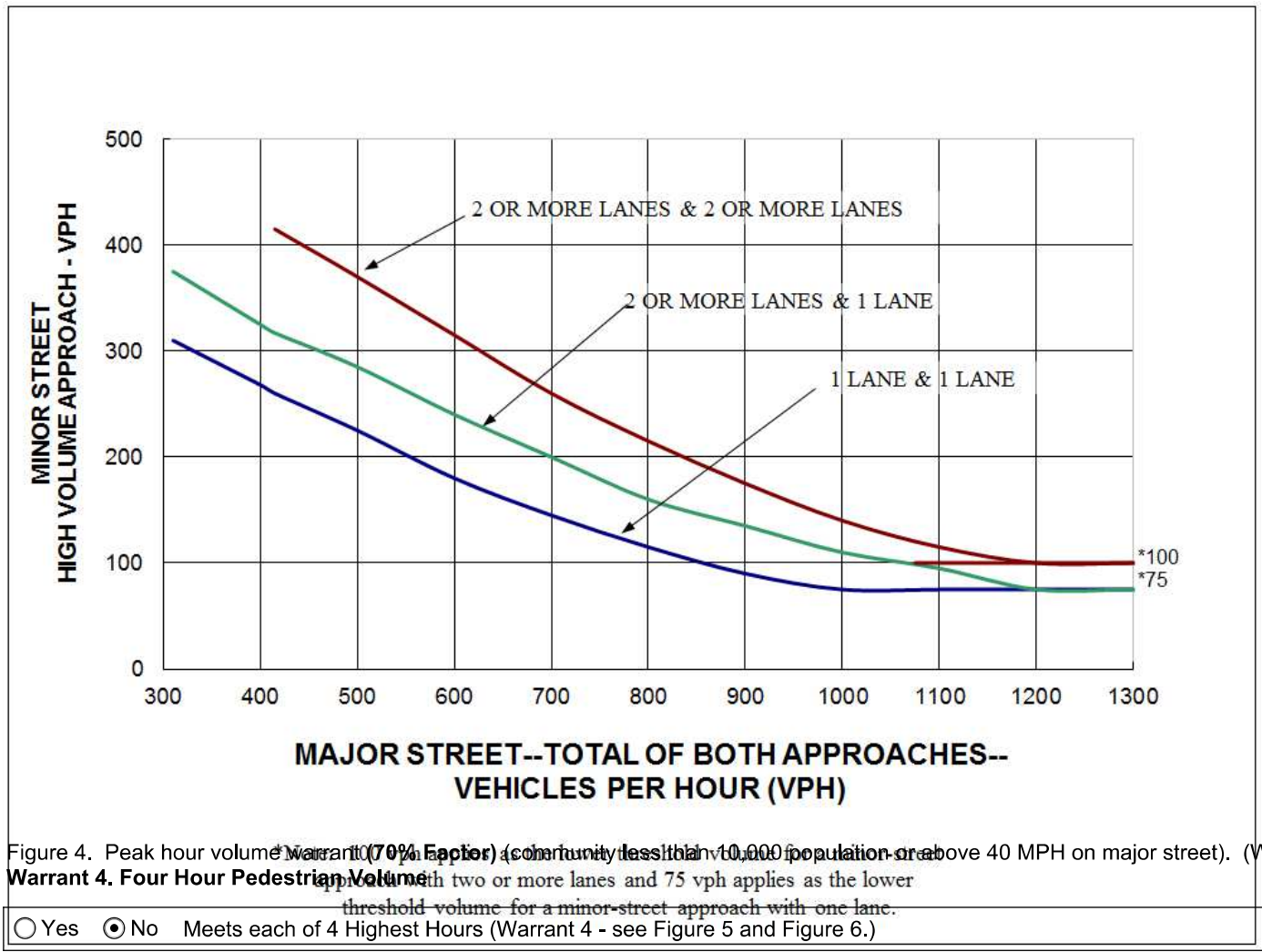
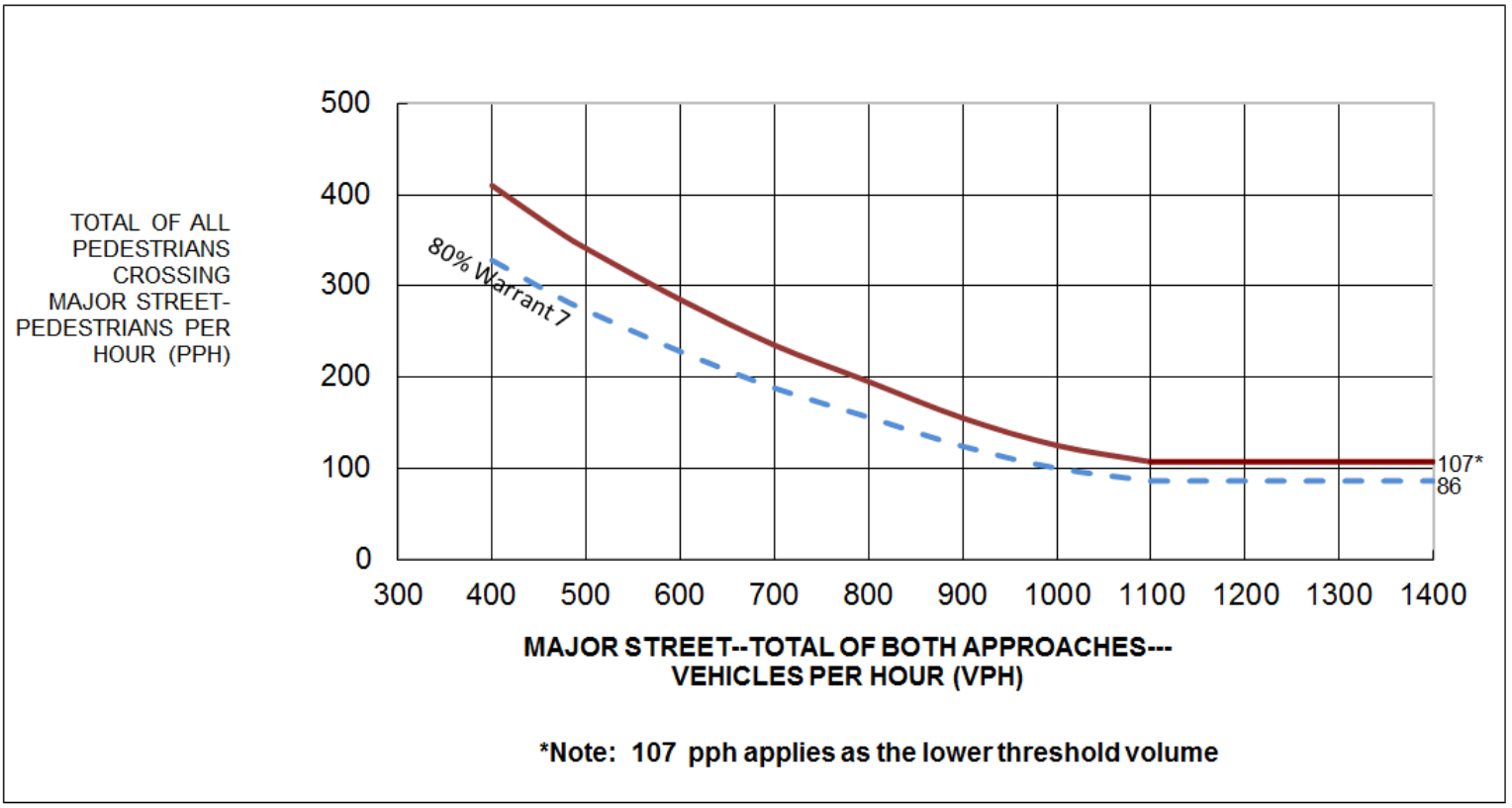


Figure 4. Peak hour volume warrant (**70% Factor**) (community less than 10,000 population or above 40 MPH on major street). (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volume

◯ Yes ◉ No Meets each of 4 Highest Hours (Warrant 4 - see Figure 5 and Figure 6.)



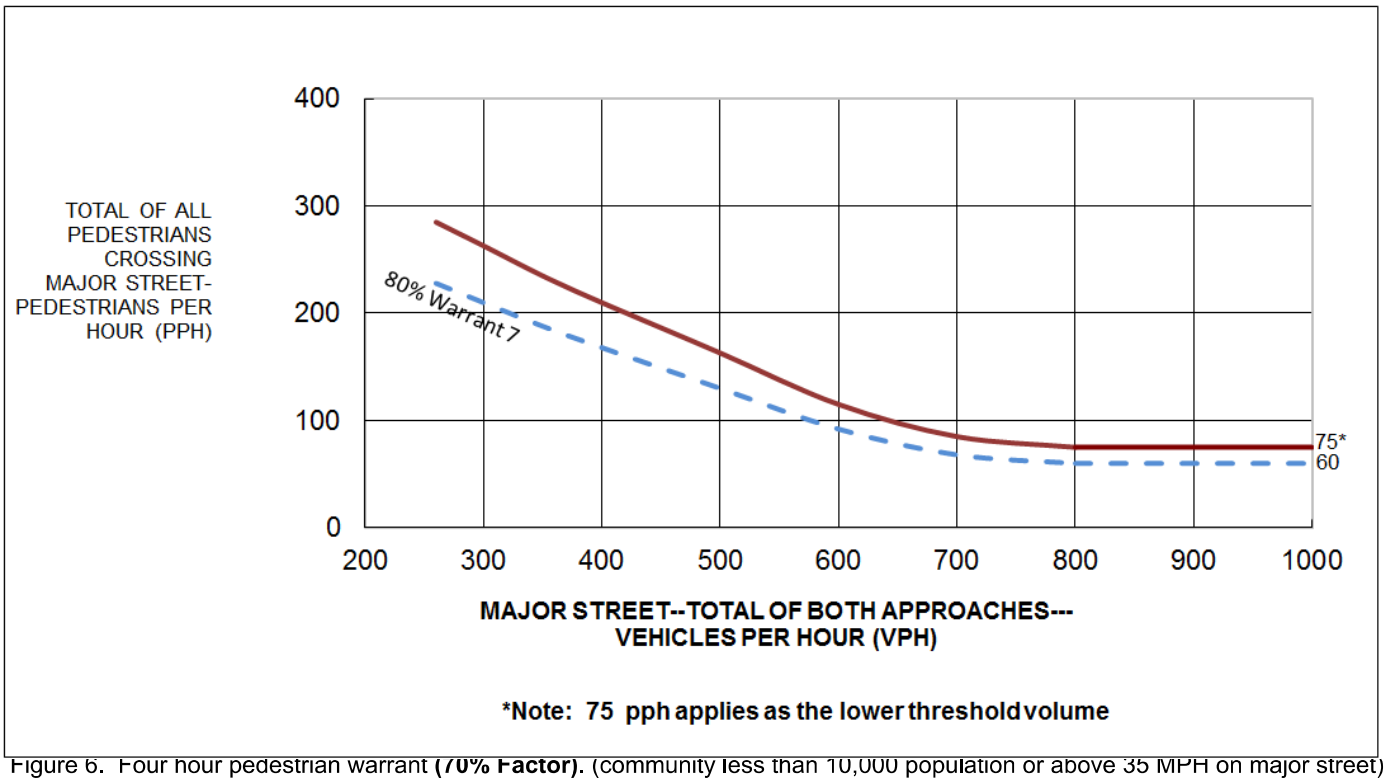


Figure 6. Four hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 35 MPH on major street). (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes

◯ Yes ◉ No Meets Peak Hour Pedestrian (Warrant 4 - see Figure 7 and Figure 8.)

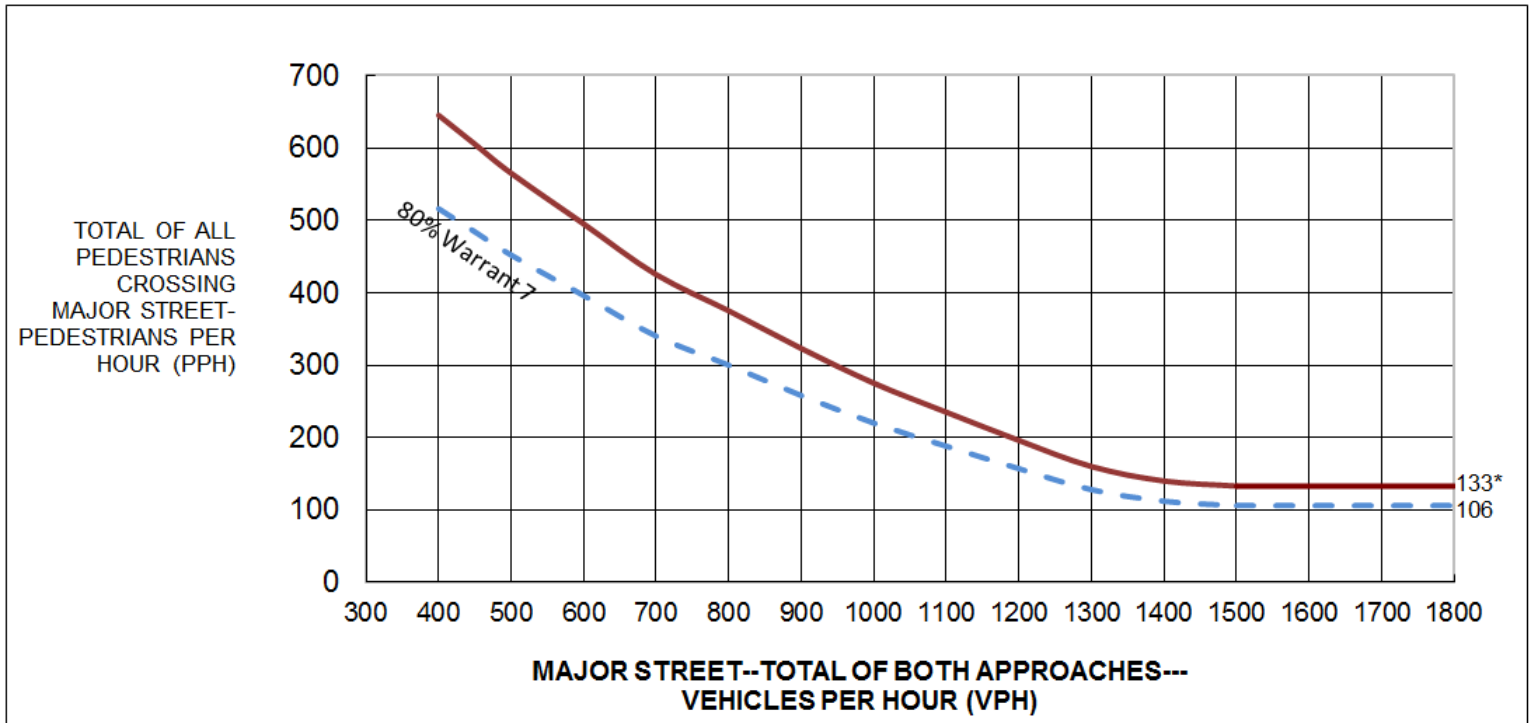


Figure 7. Four hour pedestrian warrant (Warrant 4.)

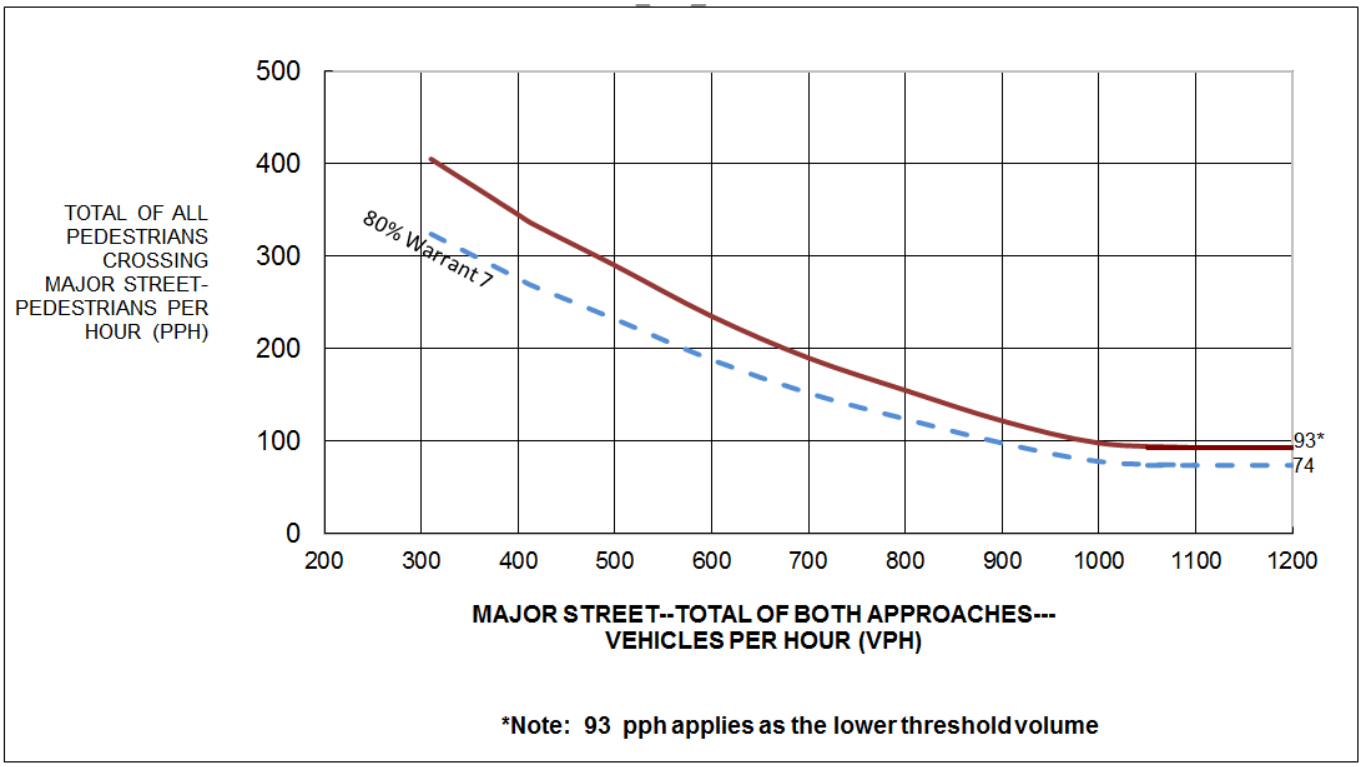


Figure 8. Peak hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 40 MPH on major street). (Warrant 4.)

Warrant 5. School Crossing

◯ Yes	⦿ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		- and -
◯ Yes	⦿ No	Are there a minimum of 20 students during the highest crossing hour?
		*- **and** -*
◯ Yes	⦿ No	Is the nearest signal on the major street located more than 300 feet away? (This warrant may be applied if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System

◯ Yes	⦿ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		- or -
◯ Yes	⦿ No	On a two-way street, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience

◯ Yes	⦿ No	Is one of the following conditions met?: ◆ 80% of Condition A or Condition B in Warrant 1 ◆ 56% of Conditions A or B in Warrant 1 (major-street speed exceeding 40 mph and population less than 10,000) ◆ 80% or more of Warrant 4
		- and -
◯ Yes	⦿ No	Have there been 5 or more reported crashes susceptible to correction by a traffic signal in 12 months?

Warrant 8. Roadway Network

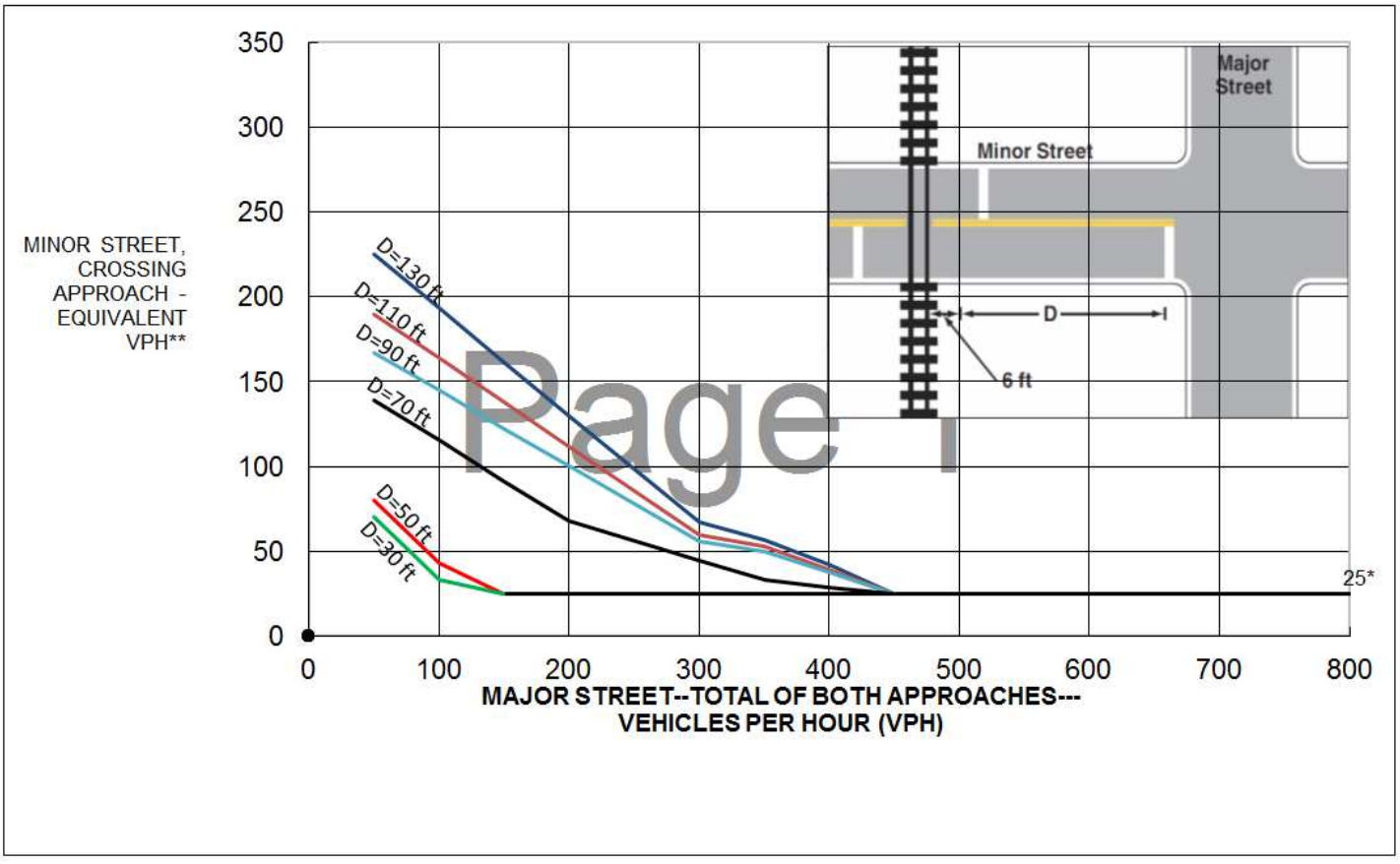
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		- or -
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route (only 1 needs to be checked):

Major Street	Minor Street	
◯ Yes	⦿ No	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
◯ Yes	⦿ No	It includes rural or suburban highways outside, entering, or traversing a city.
◯ Yes	⦿ No	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.
◯ Yes	⦿ No	It connects areas of principal traffic generation.
◯ Yes	⦿ No	It has surface street freeway or expressway ramp terminals.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

◯ Yes	⦿ No	Meets one High Hour (Warrant 9 - see Figure 9.)



Page 1

Warrant 9. Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

◯ Yes ⦿ No Meets one High Hour (Warrant 9 - see Figure 10.)

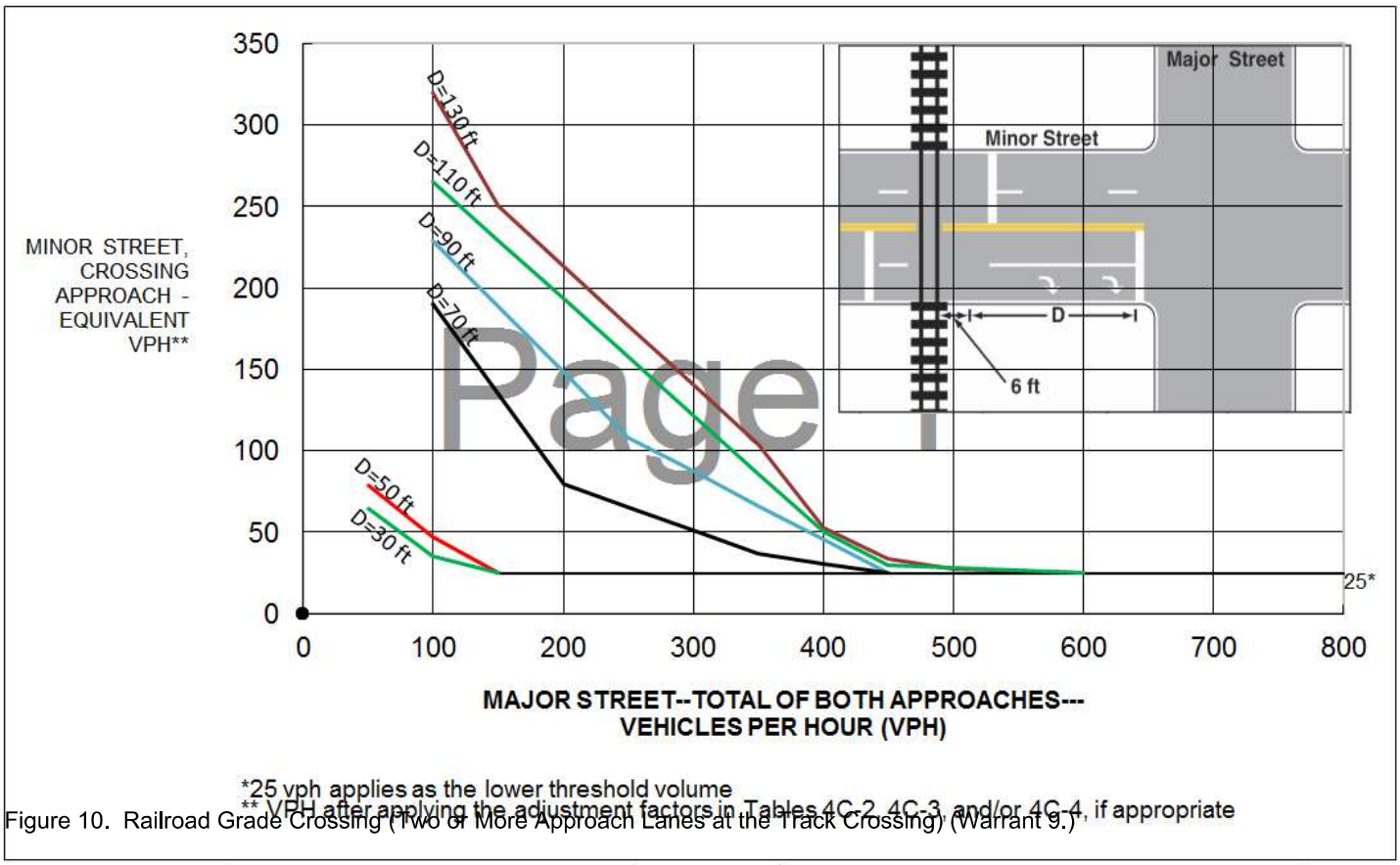


Figure 10. Railroad Grade Crossing (Two or More Approach Lanes at the Track Crossing) (Warrant 9.)

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Remarks:

A Traffic Signal Warrants At This Intersection

Traffic Survey - Count Analysis
2011 TMUTCD Warrants

Form TFF-TSCA
(8/18)
Page of

County: *Brazoria* District: *Houston*

City: *Manvel* Population: Survey Date:

	Route #	Name	Control	Section	85% Speed
Major		*Manvel Pkwy*			*40*
Minor		*Charlotte Street*			*35*

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
1:00 PM	*1,289*	*N/A*	*289*	*N/A*
5:00 PM	*1,280*	*N/A*	*293*	*N/A*
4:00 PM	*1,246*	*N/A*	*282*	*N/A*
6:00 PM	*1,236*	*N/A*	*284*	*N/A*
2:00 PM	*1,225*	*N/A*	*273*	*N/A*
3:00 PM	*1,182*	*N/A*	*267*	*N/A*
12:00 PM	*1,165*	*N/A*	*261*	*N/A*
7:00 PM	*996*	*N/A*	*225*	*N/A*

Comments:
2030 Build Conditions

Warrant 1. Eight Hour Vehicular Volume

(●) Yes ( ) No Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A. ***- or -*** Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B. ***- or -*** Meets 80%[b] of Conditions A and B. ***- or -*** Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph and population less than 10,000).

(●) Yes ( ) No

(●) Yes ( ) No

(●) Yes ( ) No

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*166%*	100%[a]	80%[b]	70%[c]	56%[d]	*113%*
1	1	500	400	350	280		150	120	105	84	
2 or more	1	600	480	420	336		150	120	105	84	
2 or more	2 or more	600	480	420	336	*996*	200	160	140	112	*225*
1	2 or more	500	400	350	280		200	160	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*111%*	100%[a]	80%[b]	70%[c]	56%[d]	*225%*
1	1	750	600	525	420		75	60	53	42	
2 or more	1	900	720	630	504		75	60	53	42	
2 or more	2 or more	900	720	630	504	*996*	100	80	70	56	*225*
1	2 or more	750	600	525	420		100	80	70	56	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 40 mph or in a community with a population less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

Contact/Help

Warrant 2. Four Hour Volumes

◉ Yes ○ No Meets each of 4 Highest Hours (Warrant 2 - see Figure 1 and Figure 2).

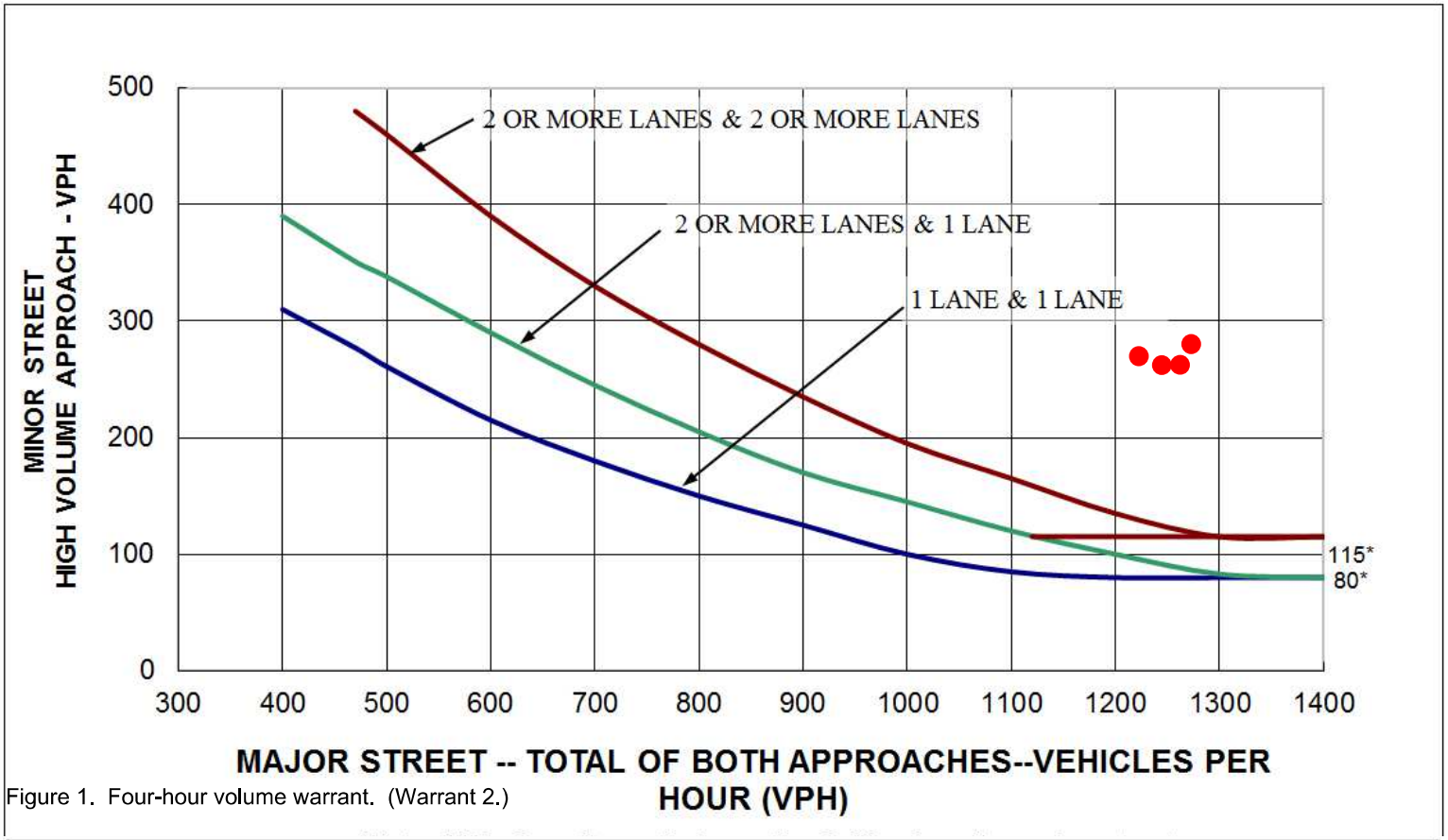


Figure 1. Four-hour volume warrant. (Warrant 2.)

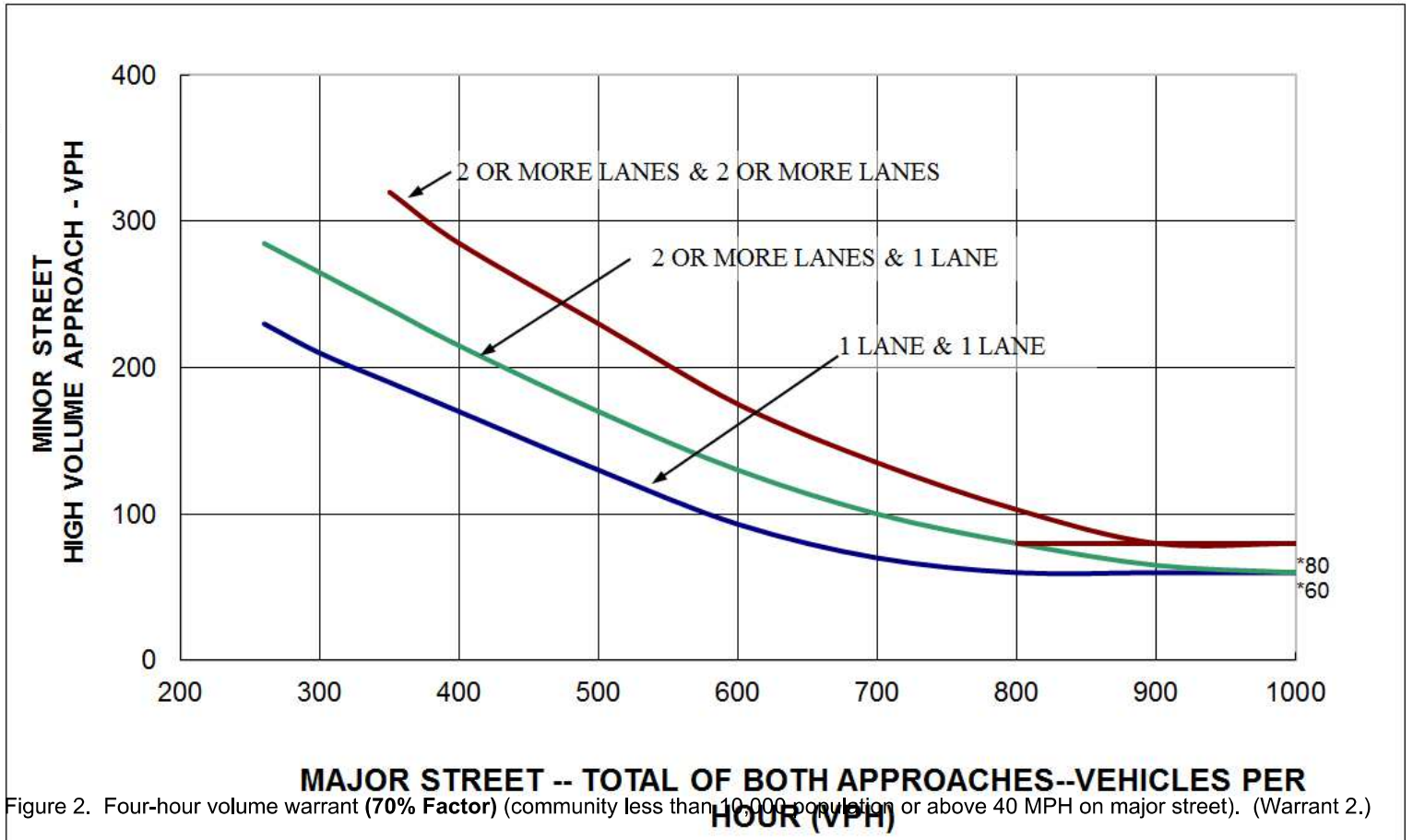


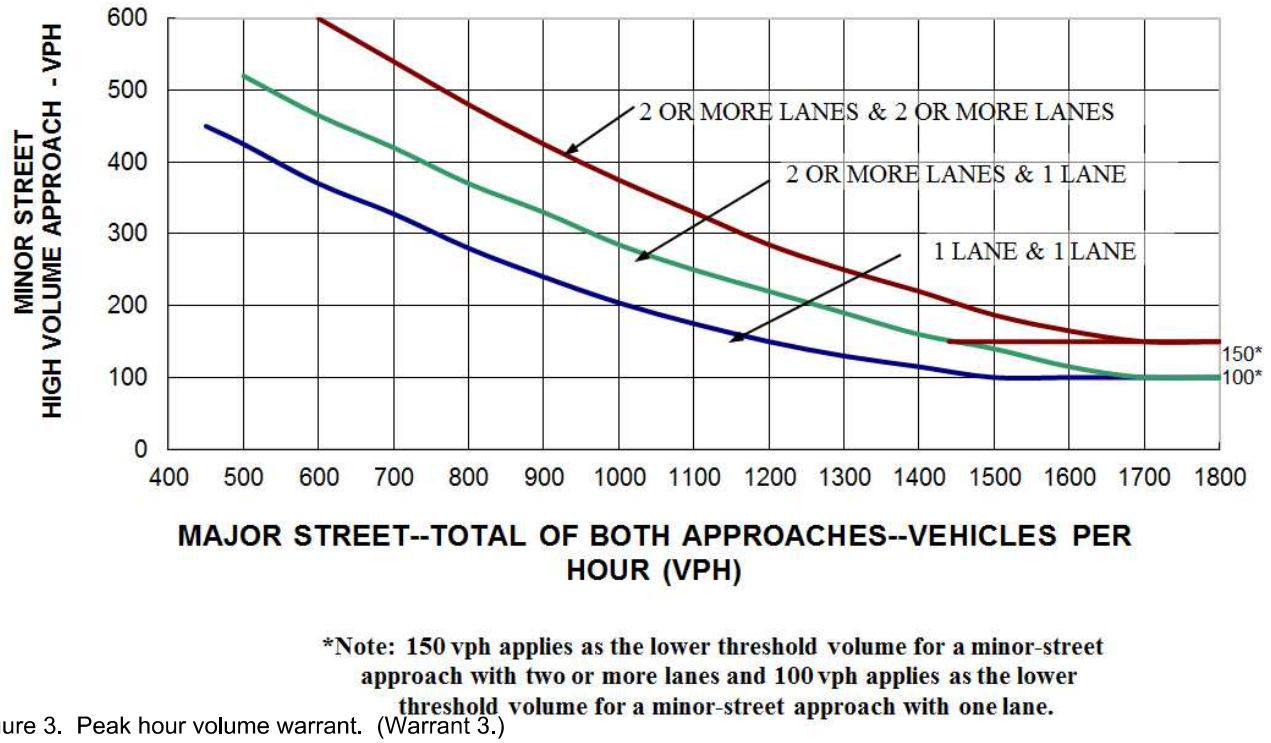
Figure 2. Four-hour volume warrant **(70% Factor)** (community less than 10,000 population or above 40 MPH on major street). (Warrant 2.)

***Note: 80 vph applies as the lower threshold volume for a minor-street**

Warrant 3. Peak Hour

◯ Yes ◉ No Are all of the following conditions true for the same 1 hour (any four consecutive 15 minute periods)?
1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, *and*
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and*
3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches. **- *or* -** Meets one High Hour (Warrant 3 - see Figure 3 and Figure 4).

◯ Yes ◉ No



***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 3. Peak hour volume warrant. (Warrant 3.)

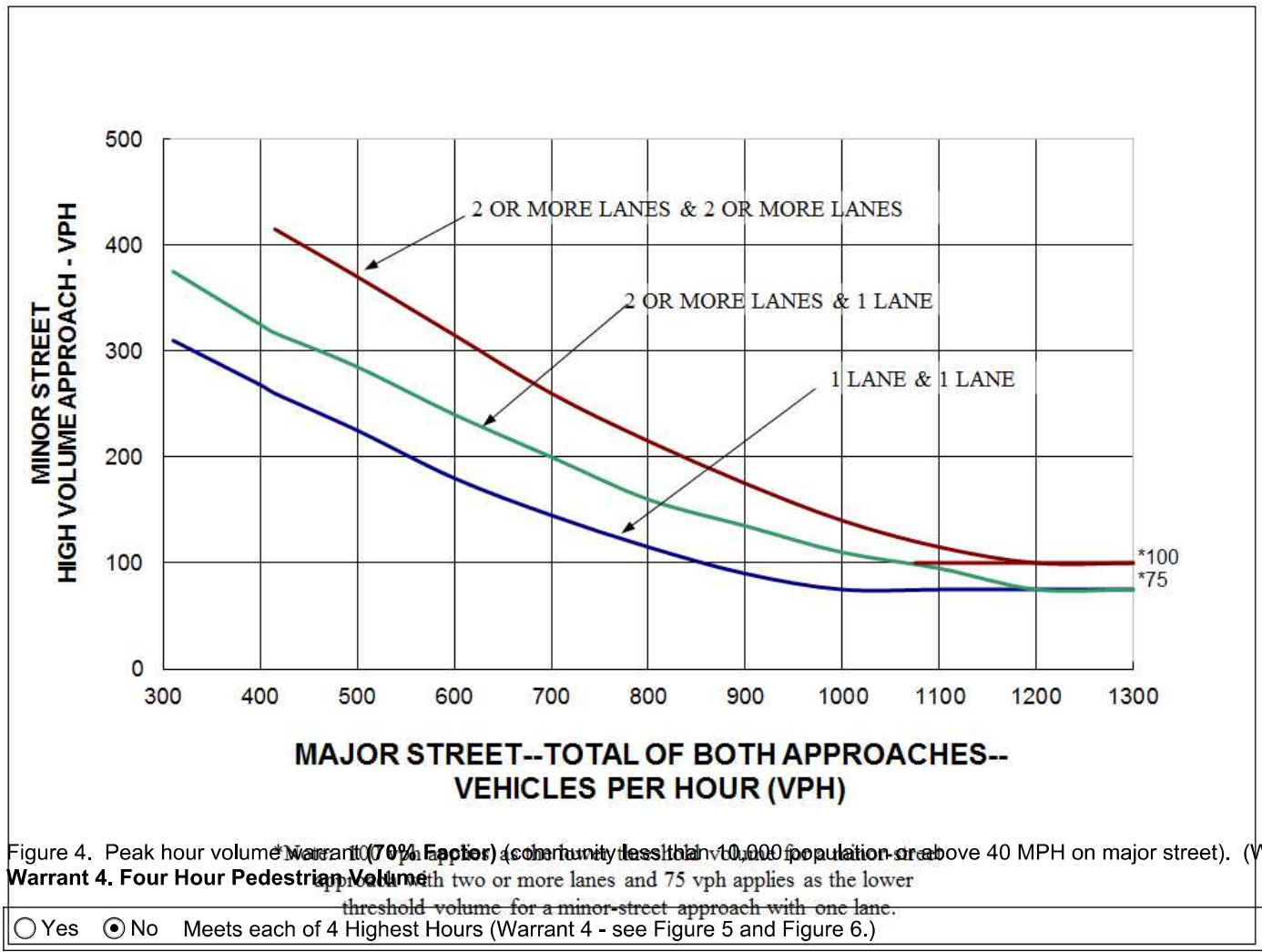
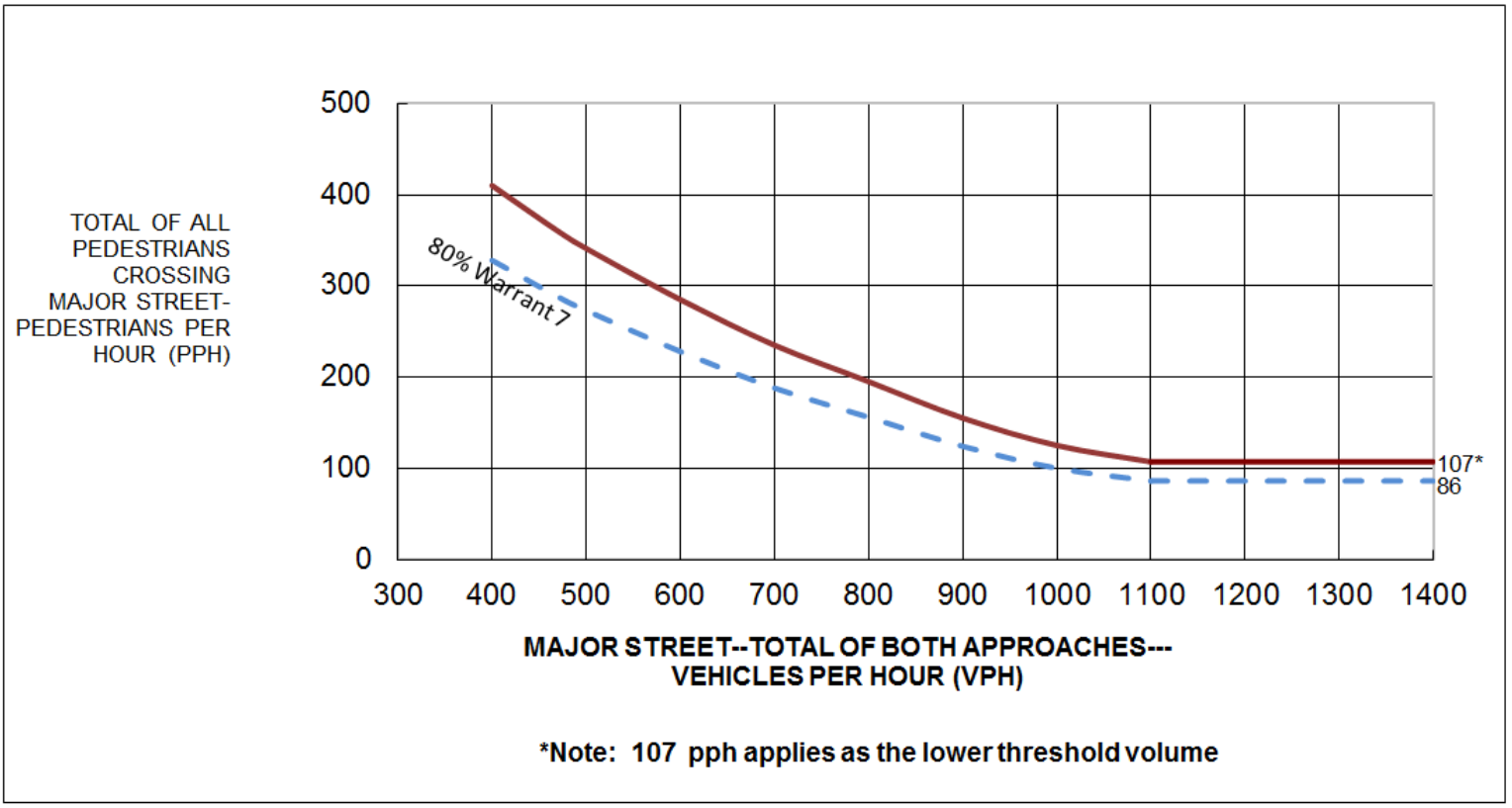


Figure 4. Peak hour volume warrant (**70% Factor**) (community less than 10,000 population or above 40 MPH on major street). (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volume

◯ Yes ◉ No Meets each of 4 Highest Hours (Warrant 4 - see Figure 5 and Figure 6.)



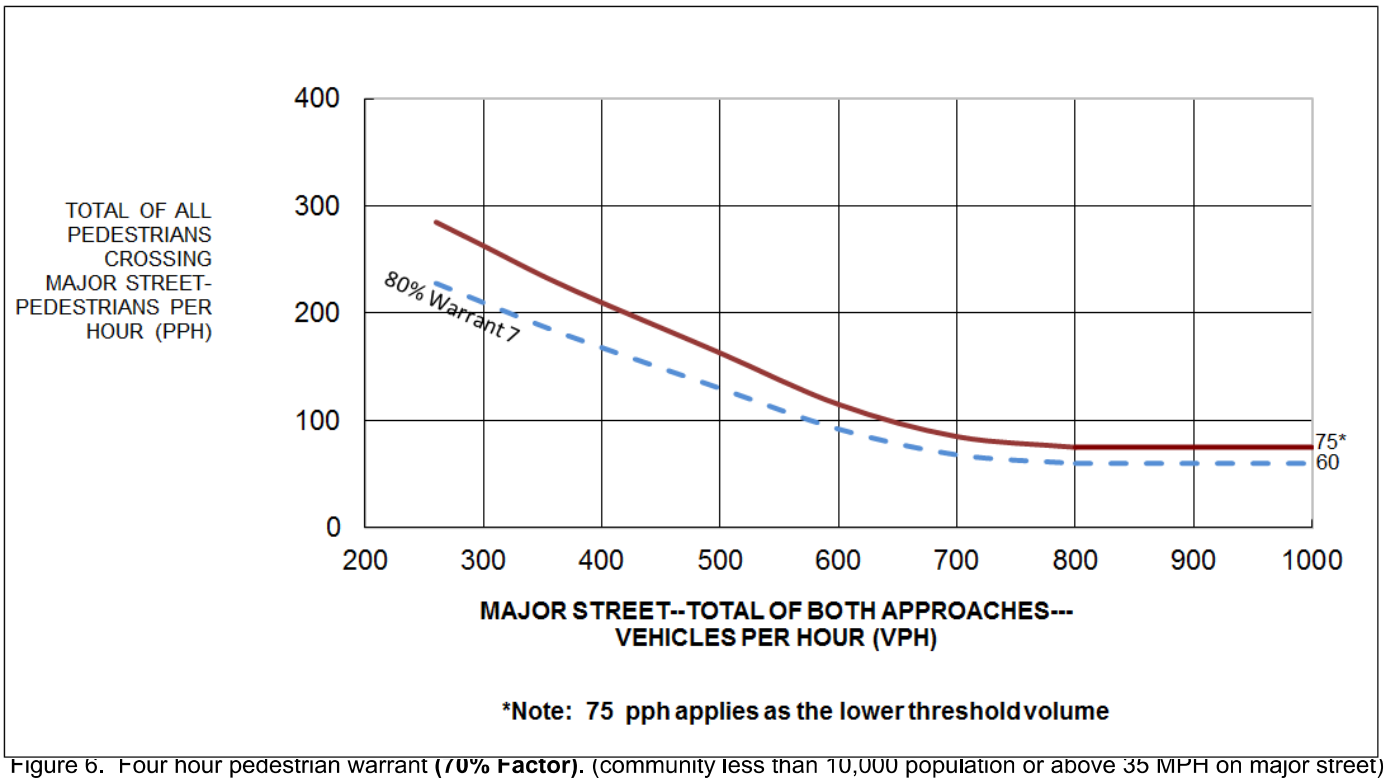


Figure 6. Four hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 35 MPH on major street). (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes

◯ Yes ◉ No Meets Peak Hour Pedestrian (Warrant 4 - see Figure 7 and Figure 8.)

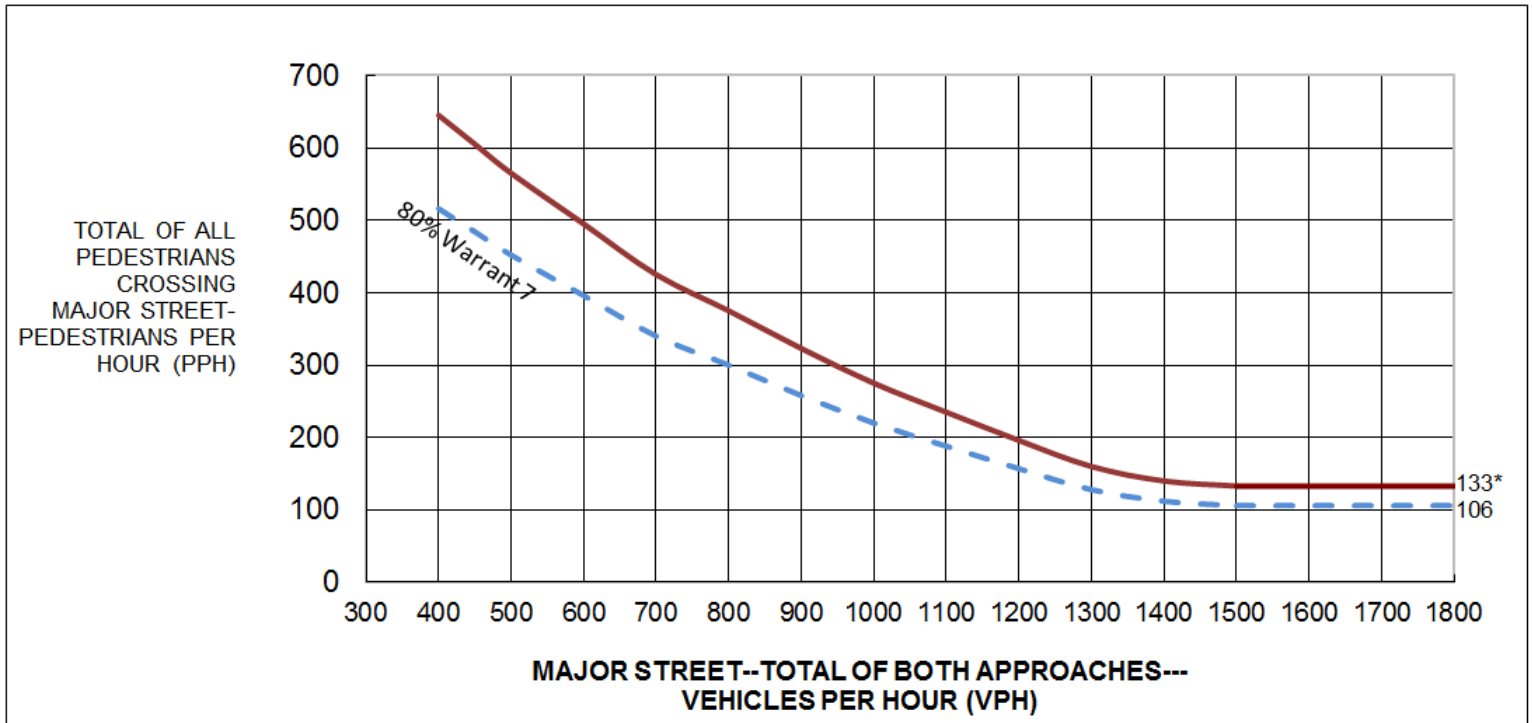


Figure 7. Four hour pedestrian warrant (Warrant 4.)

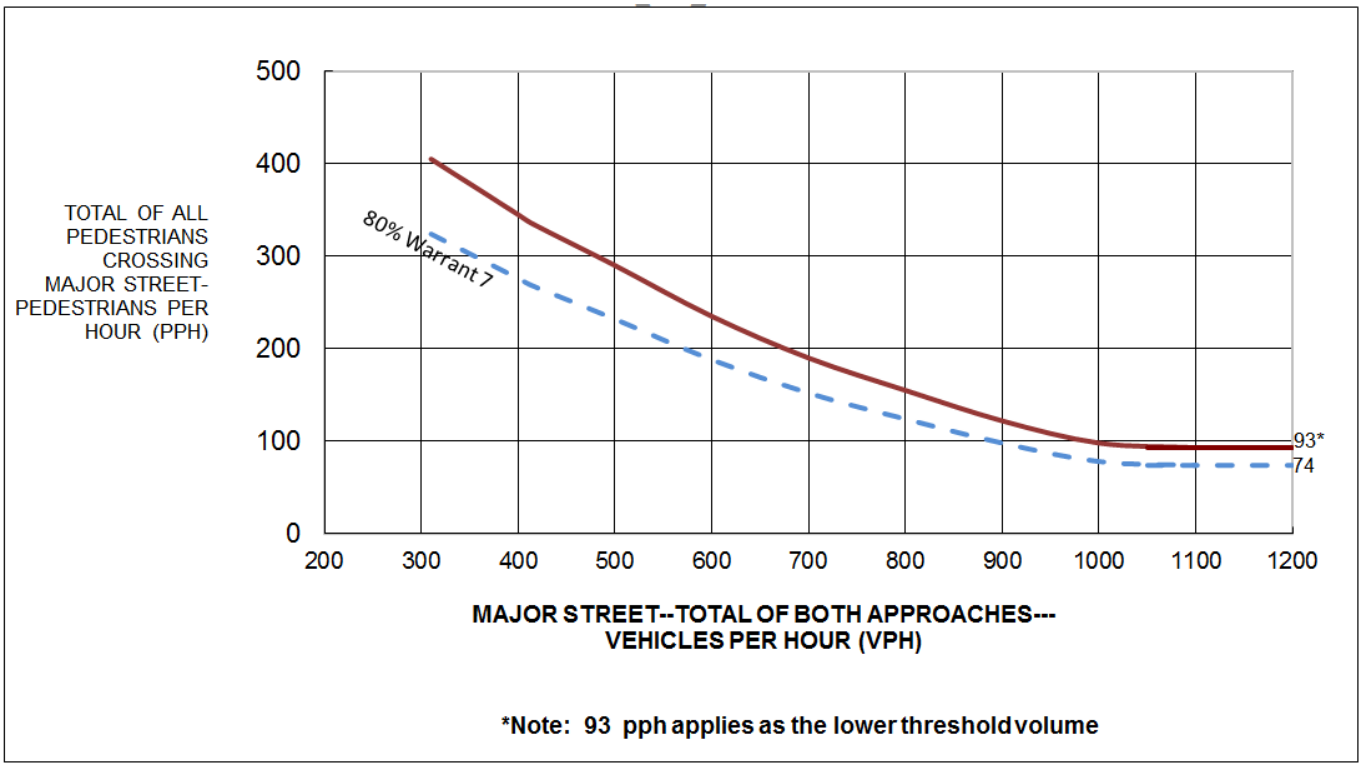


Figure 8. Peak hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 40 MPH on major street). (Warrant 4.)

Warrant 5. School Crossing

◯ Yes	⦿ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		- and -
◯ Yes	⦿ No	Are there a minimum of 20 students during the highest crossing hour?
		*- **and** -*
◯ Yes	⦿ No	Is the nearest signal on the major street located more than 300 feet away? (This warrant may be applied if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System

◯ Yes	⦿ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		- or -
◯ Yes	⦿ No	On a two-way street, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience

◯ Yes	⦿ No	Is one of the following conditions met?: ◆ 80% of Condition A or Condition B in Warrant 1 ◆ 56% of Conditions A or B in Warrant 1 (major-street speed exceeding 40 mph and population less than 10,000) ◆ 80% or more of Warrant 4
		- and -
◯ Yes	⦿ No	Have there been 5 or more reported crashes susceptible to correction by a traffic signal in 12 months?

Warrant 8. Roadway Network

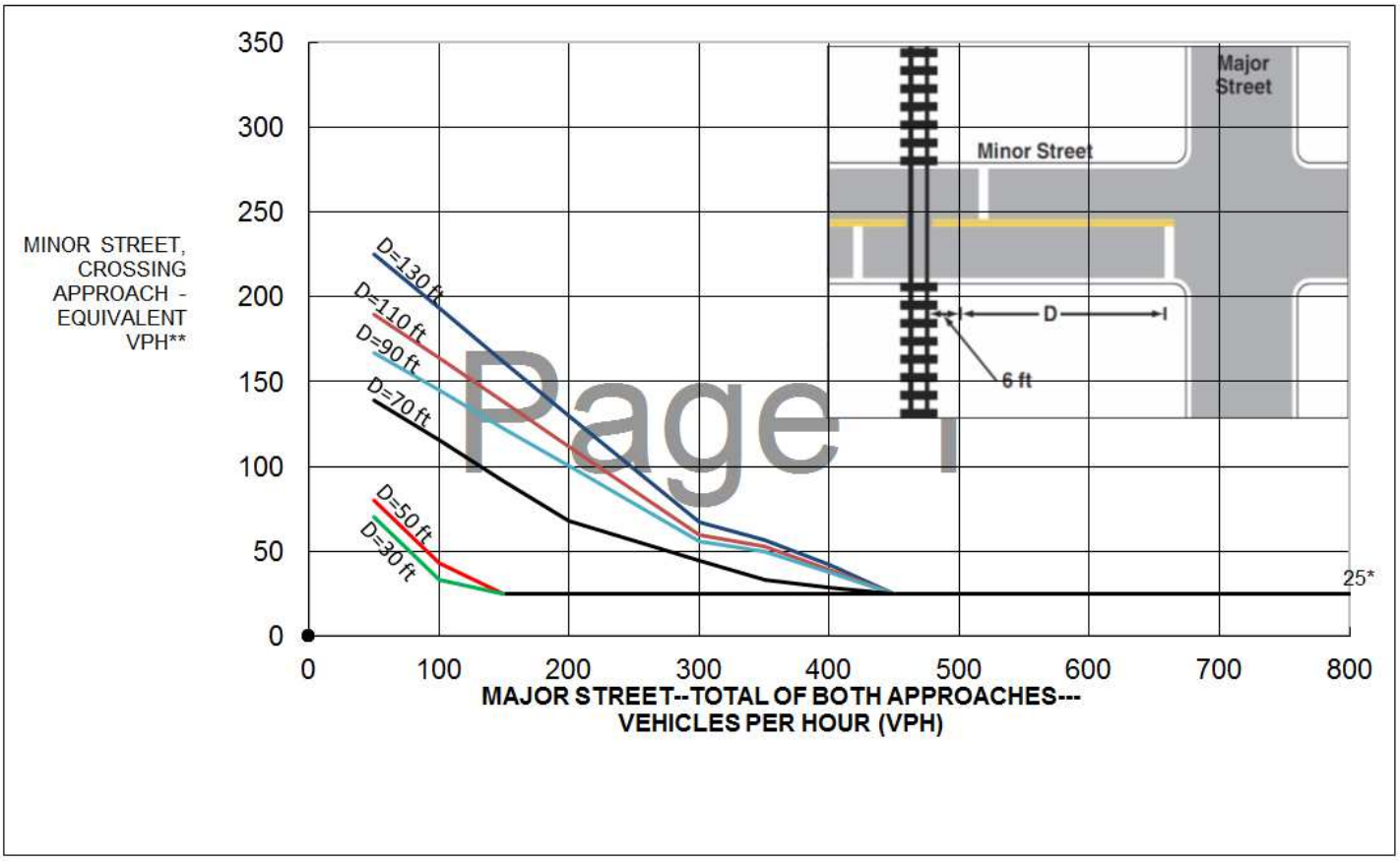
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		- or -
◯ Yes	⦿ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route (only 1 needs to be checked):

Major Street	Minor Street	
◯ Yes	⦿ No	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
◯ Yes	⦿ No	It includes rural or suburban highways outside, entering, or traversing a city.
◯ Yes	⦿ No	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.
◯ Yes	⦿ No	It connects areas of principal traffic generation.
◯ Yes	⦿ No	It has surface street freeway or expressway ramp terminals.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

◯ Yes	⦿ No	Meets one High Hour (Warrant 9 - see Figure 9.)



Page 1

Warrant 9. Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

◯ Yes ⦿ No Meets one High Hour (Warrant 9 - see Figure 10.)

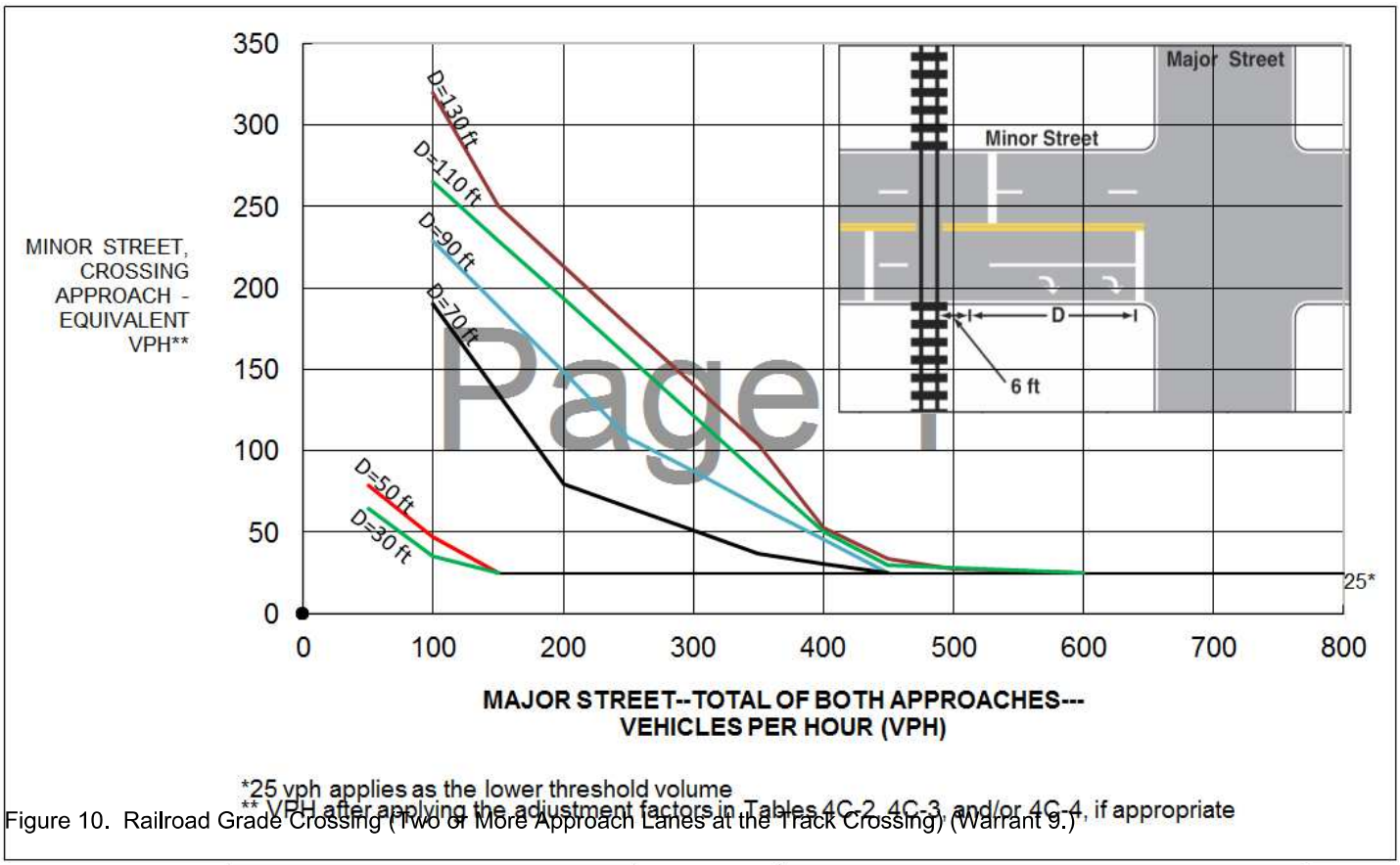


Figure 10. Railroad Grade Crossing (Two or More Approach Lanes at the Track Crossing) (Warrant 9.)

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Remarks:

A Traffic Signal Warrants At This Intersection

Traffic Survey - Count Analysis
2011 TMUTCD Warrants

Form TFF-TSCA (8/18)
Page of

County: *Brazoria* District: *Houston*

City: *Manvel* Population: Survey Date:

	Route #	Name	Control	Section	85% Speed
Major		*SH 288 Ramps*			*45*
Minor		*RodeoPalms/Del Bello*			*35*

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
5:00 PM	*1,497*	*N/A*	*898*	*N/A*
6:00 PM	*1,355*	*N/A*	*776*	*N/A*
7:00 PM	*1,092*	*N/A*	*849*	*N/A*
4:00 PM	*1,177*	*N/A*	*695*	*N/A*
8:00 AM	*744*	*N/A*	*824*	*N/A*
3:00 PM	*717*	*N/A*	*676*	*N/A*
1:00 PM	*619*	*N/A*	*683*	*N/A*
2:00 PM	*636*	*N/A*	*657*	*N/A*

Comments:
2030 No Build Conditions With Background Volumes

Warrant 1. Eight Hour Vehicular Volume

(●) Yes ( ) No Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A. ***- or -*** Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B. ***- or -*** Meets 80%[b] of Conditions A and B. ***- or -*** Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph and population less than 10,000).

( ) Yes (●) No

( ) Yes (●) No

(●) Yes ( ) No

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*103%*	100%[a]	80%[b]	70%[c]	56%[d]	*329%*
1	1	500	400	350	280		150	120	105	84	
2 or more	1	600	480	420	336		150	120	105	84	
2 or more	2 or more	600	480	420	336	*619*	200	160	140	112	*657*
1	2 or more	500	400	350	280		200	160	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*69%*	100%[a]	80%[b]	70%[c]	56%[d]	*657%*
1	1	750	600	525	420		75	60	53	42	
2 or more	1	900	720	630	504		75	60	53	42	
2 or more	2 or more	900	720	630	504	*619*	100	80	70	56	*657*
1	2 or more	750	600	525	420		100	80	70	56	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 40 mph or in a community with a population less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

Contact/Help

Warrant 2. Four Hour Volumes

◉ Yes ○ No Meets each of 4 Highest Hours (Warrant 2 - see Figure 1 and Figure 2).

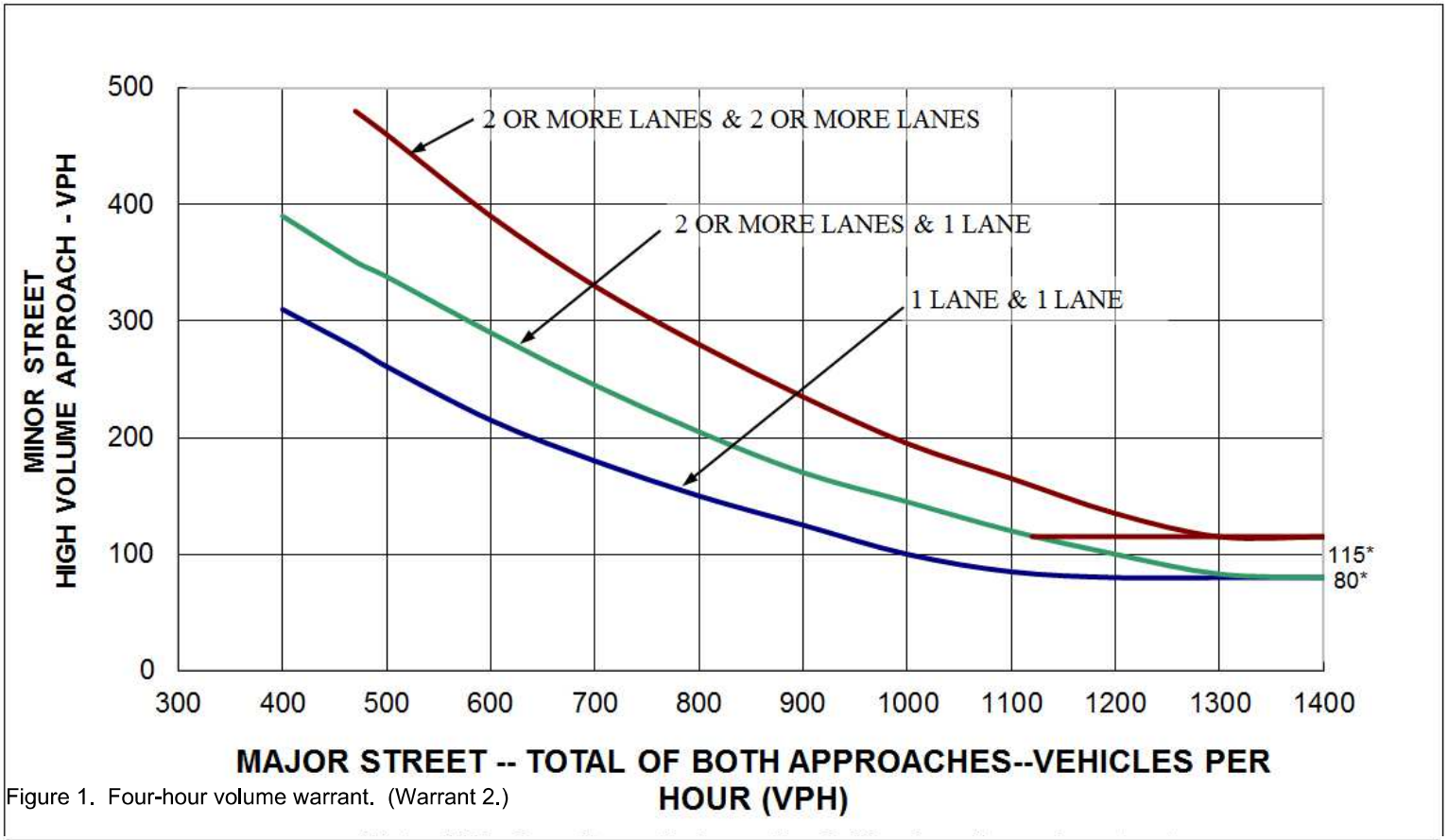


Figure 1. Four-hour volume warrant. (Warrant 2.)

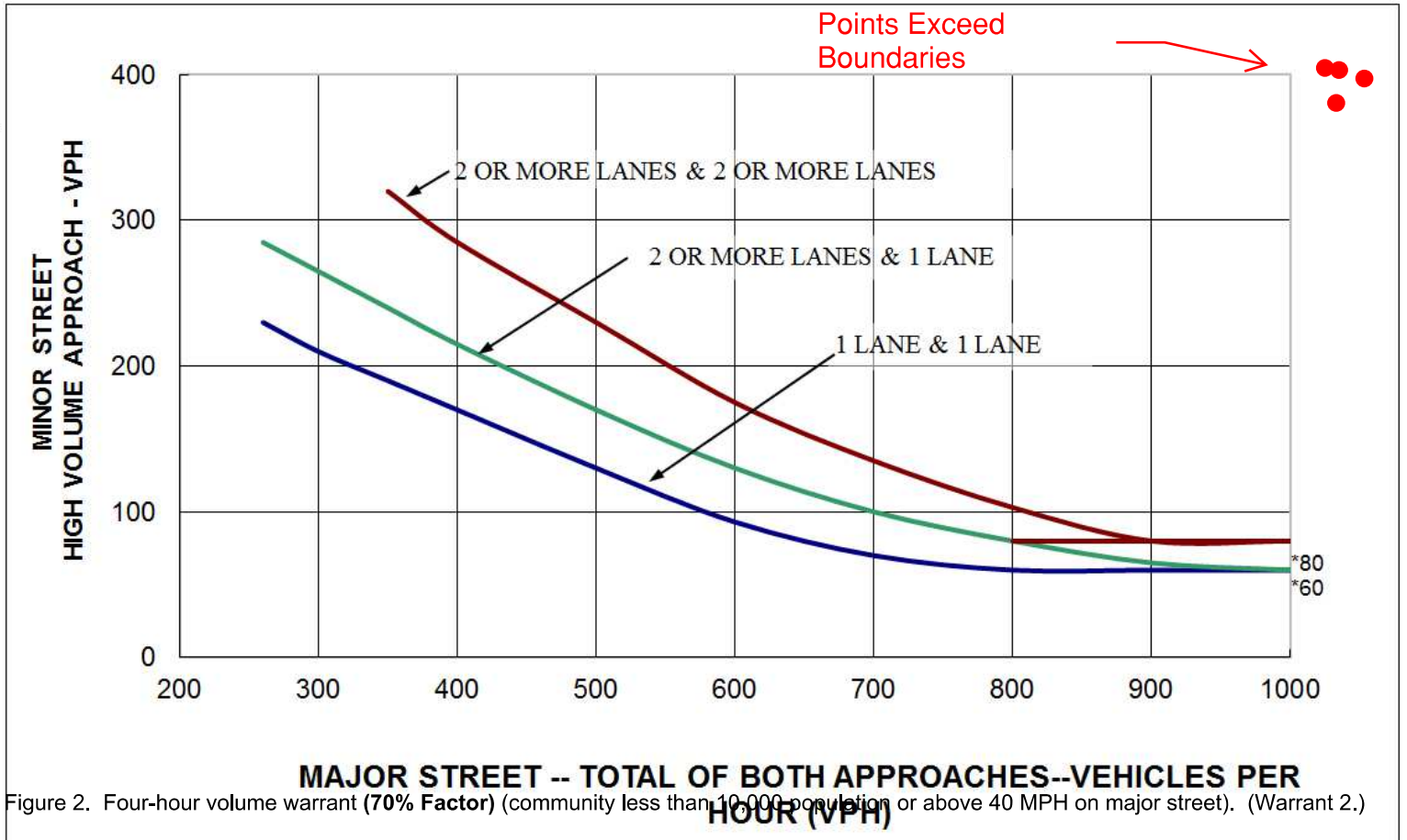


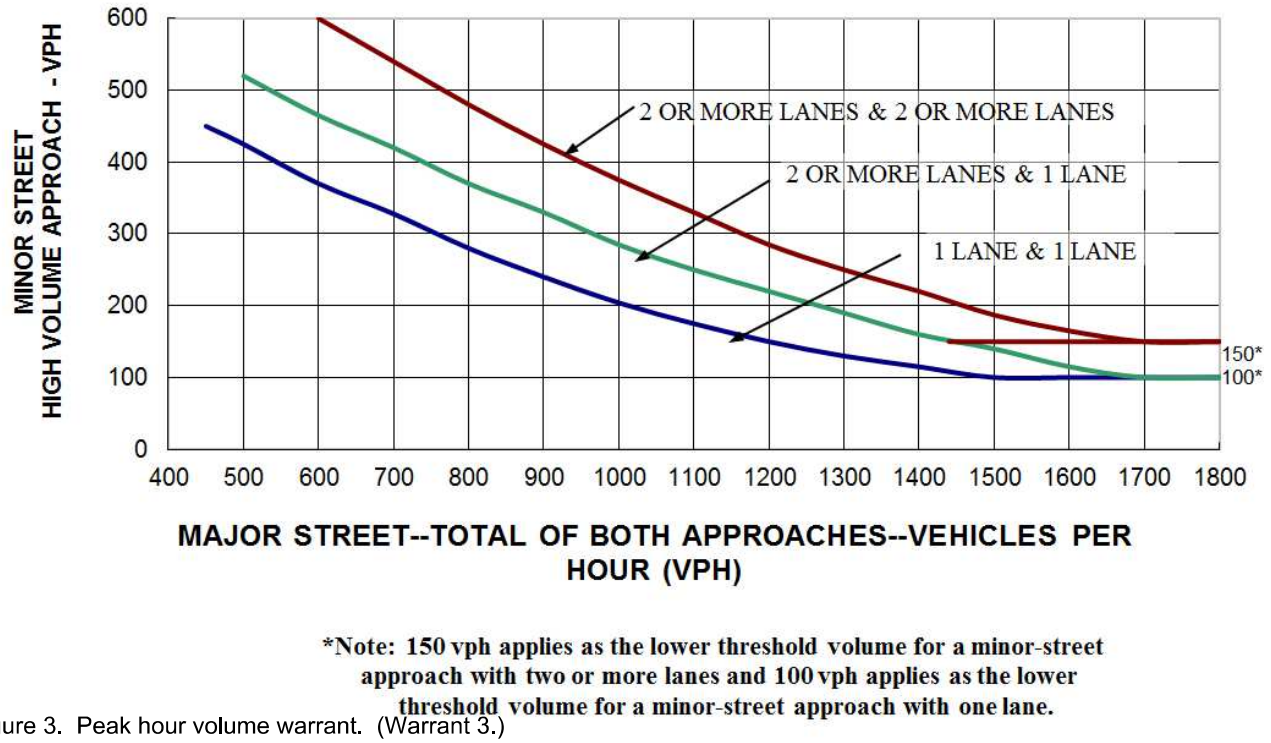
Figure 2. Four-hour volume warrant **(70% Factor)** (community less than 10,000 population or above 40 MPH on major street). (Warrant 2.)

***Note: 80 vph applies as the lower threshold volume for a minor-street**

Warrant 3. Peak Hour

◯ Yes ◉ No Are all of the following conditions true for the same 1 hour (any four consecutive 15 minute periods)?
1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, *and*
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and*
3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches. **- *or* -** Meets one High Hour (Warrant 3 - see Figure 3 and Figure 4).

◯ Yes ◉ No



***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 3. Peak hour volume warrant. (Warrant 3.)

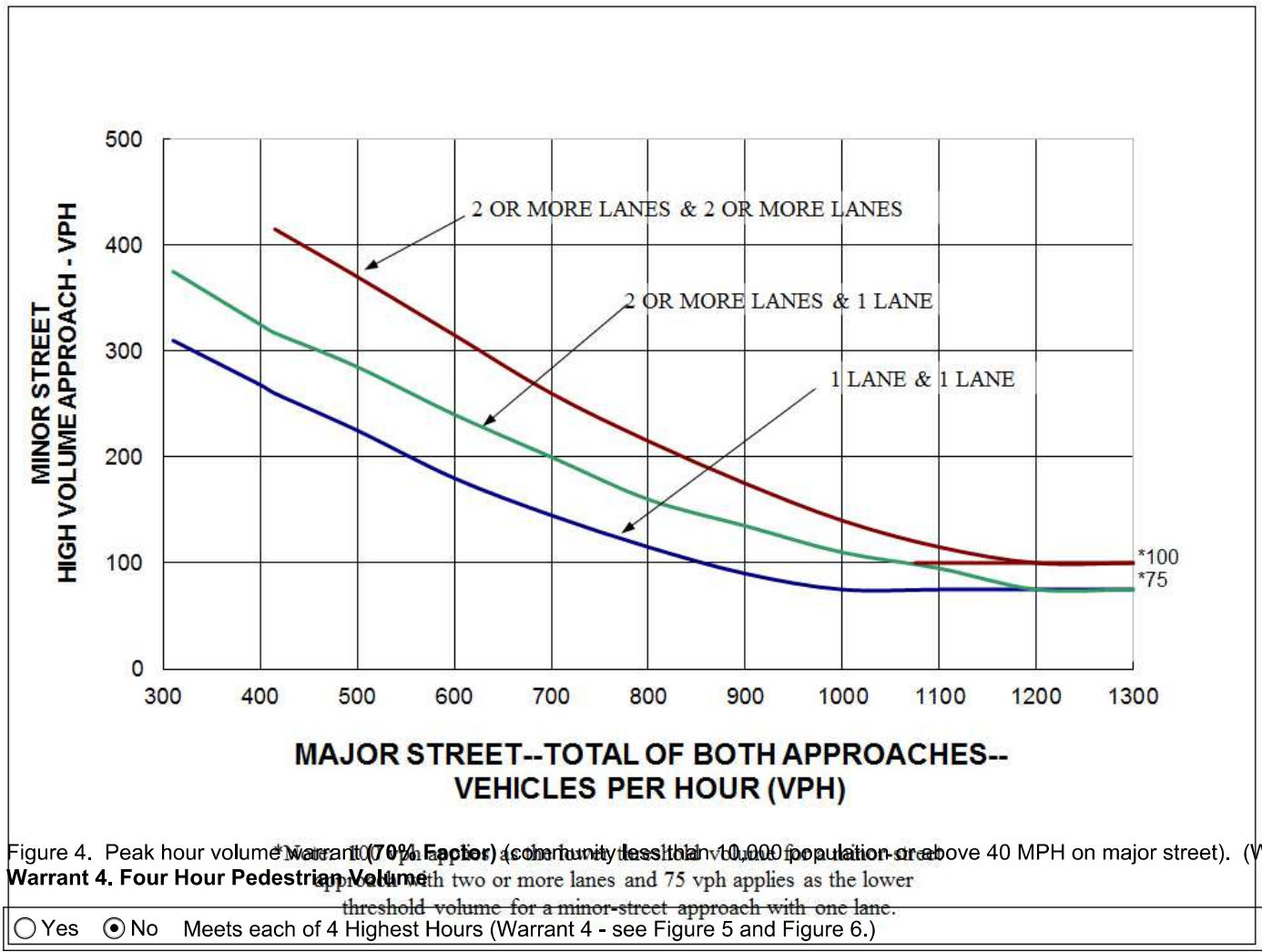
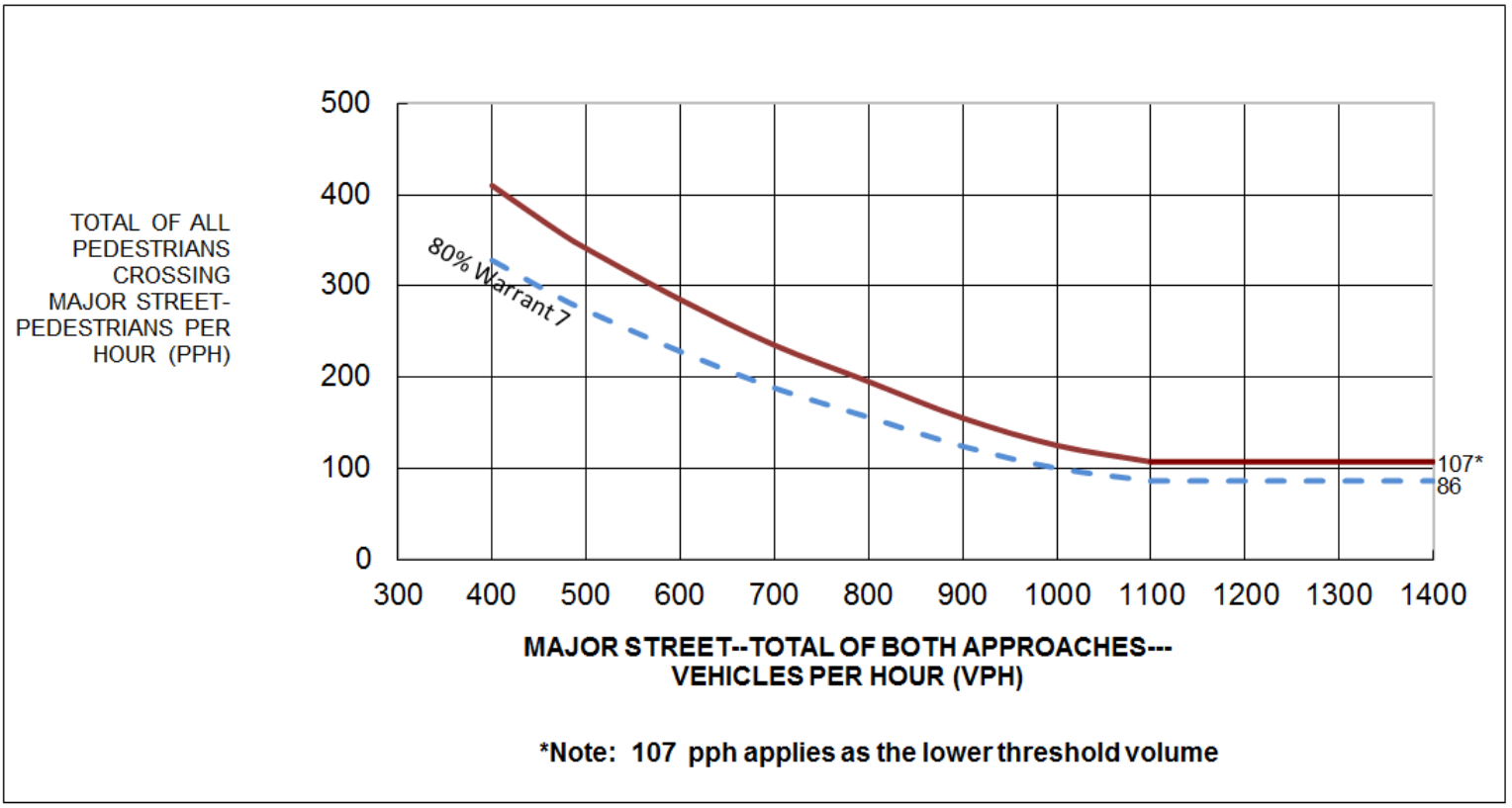


Figure 4. Peak hour volume warrant (**70% Factor**) (community less than 10,000 population or above 40 MPH on major street). (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volume

◯ Yes ◉ No Meets each of 4 Highest Hours (Warrant 4 - see Figure 5 and Figure 6.)



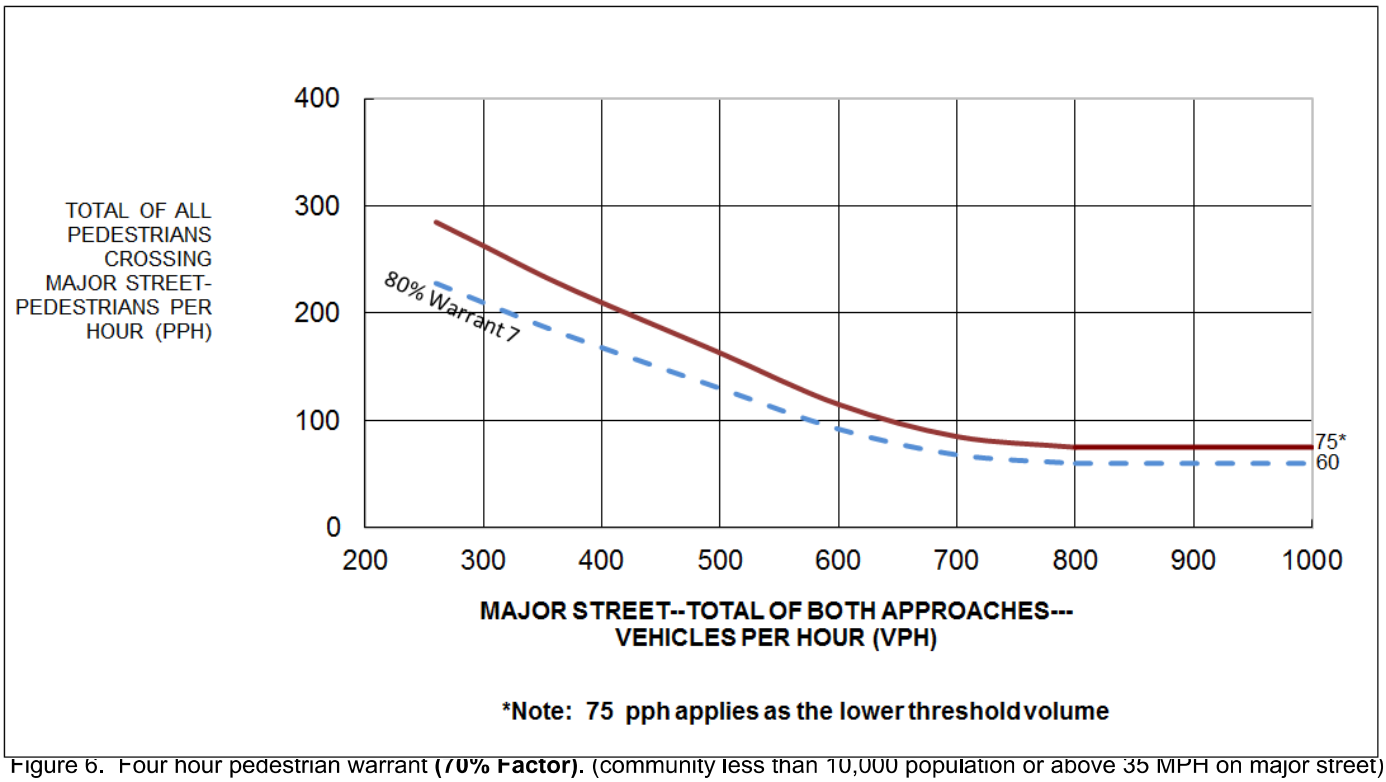


Figure 6. Four hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 35 MPH on major street). (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes

◯ Yes ◉ No Meets Peak Hour Pedestrian (Warrant 4 - see Figure 7 and Figure 8.)

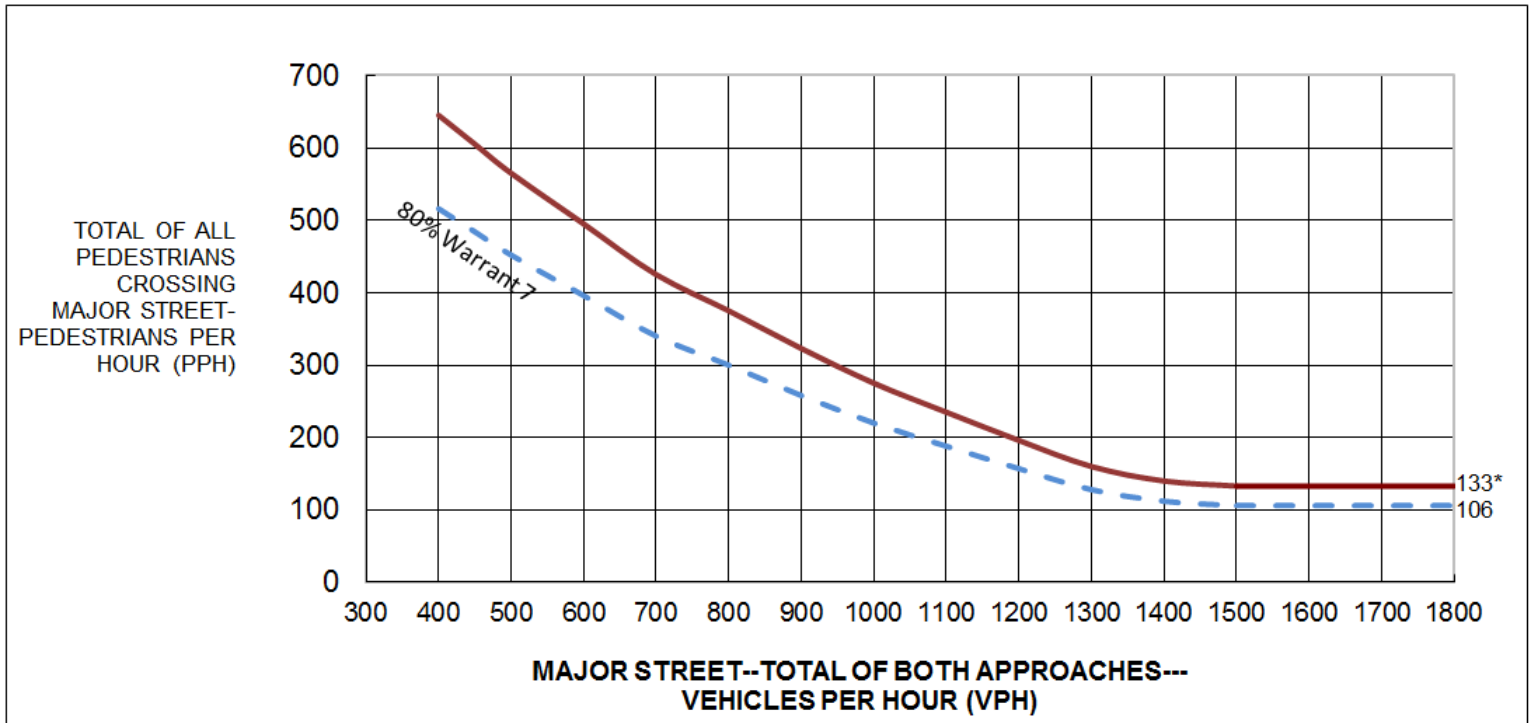


Figure 7. Four hour pedestrian warrant (Warrant 4.)

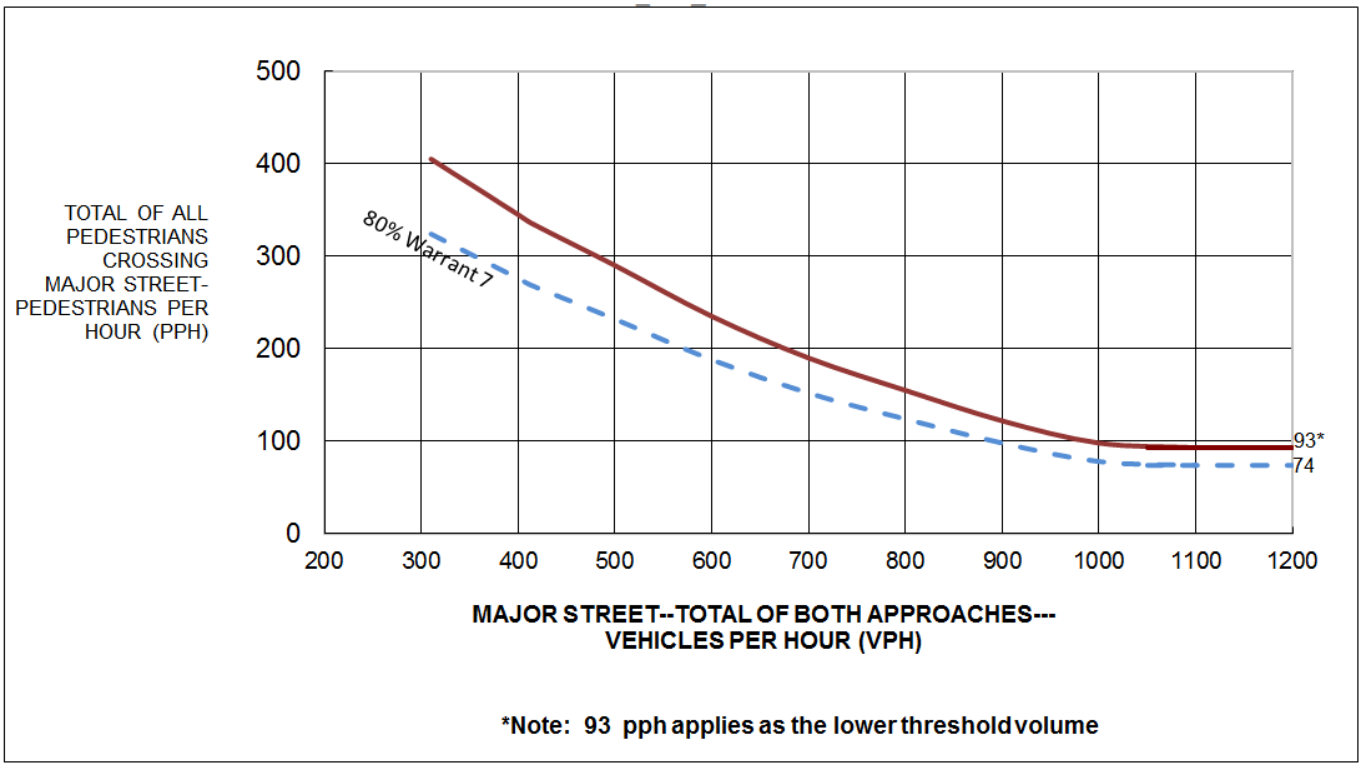


Figure 8. Peak hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 40 MPH on major street). (Warrant 4.)

Warrant 5. School Crossing

○ Yes	◉ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		- and -
○ Yes	◉ No	Are there a minimum of 20 students during the highest crossing hour?
		*- **and** -*
○ Yes	◉ No	Is the nearest signal on the major street located more than 300 feet away? (This warrant may be applied if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System

○ Yes	○ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		- or -
◉ Yes	○ No	On a two-way street, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience

◉ Yes	○ No	Is one of the following conditions met?: ◆ 80% of Condition A or Condition B in Warrant 1 ◆ 56% of Conditions A or B in Warrant 1 (major-street speed exceeding 40 mph and population less than 10,000) ◆ 80% or more of Warrant 4
		- and -
○ Yes	○ No	Have there been 5 or more reported crashes susceptible to correction by a traffic signal in 12 months?

Warrant 8. Roadway Network

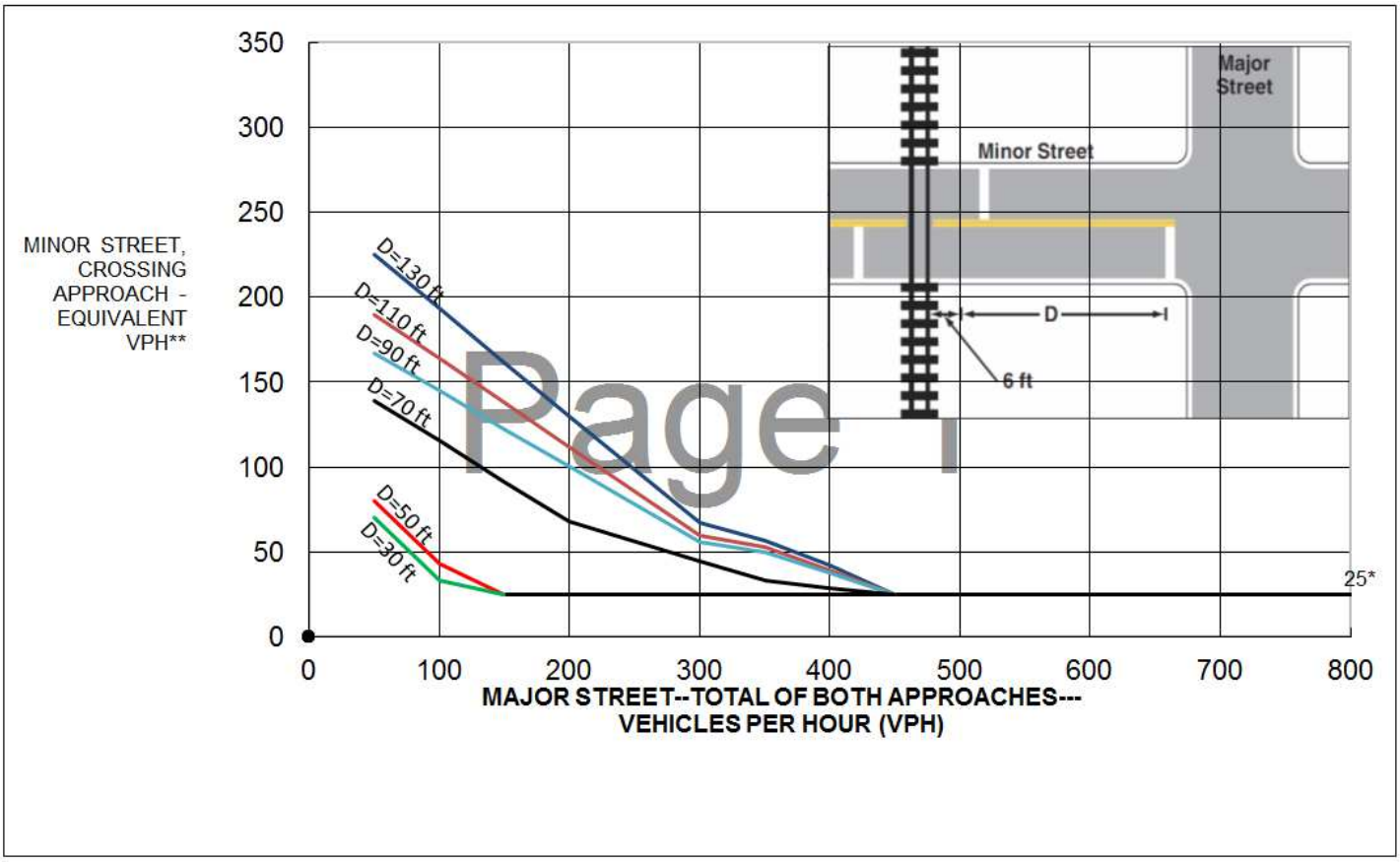
○ Yes	◉ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		- or -
○ Yes	◉ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route (only 1 needs to be checked):

Major Street	Minor Street	
○ Yes	◉ No	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
○ Yes	◉ No	It includes rural or suburban highways outside, entering, or traversing a city.
○ Yes	◉ No	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.
◉ Yes	○ No	It connects areas of principal traffic generation.
○ Yes	◉ No	It has surface street freeway or expressway ramp terminals.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

○ Yes	◉ No	Meets one High Hour (Warrant 9 - see Figure 9.)



Page 1

Warrant 9. Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

◯ Yes ◉ No Meets one High Hour (Warrant 9 - see Figure 10.)

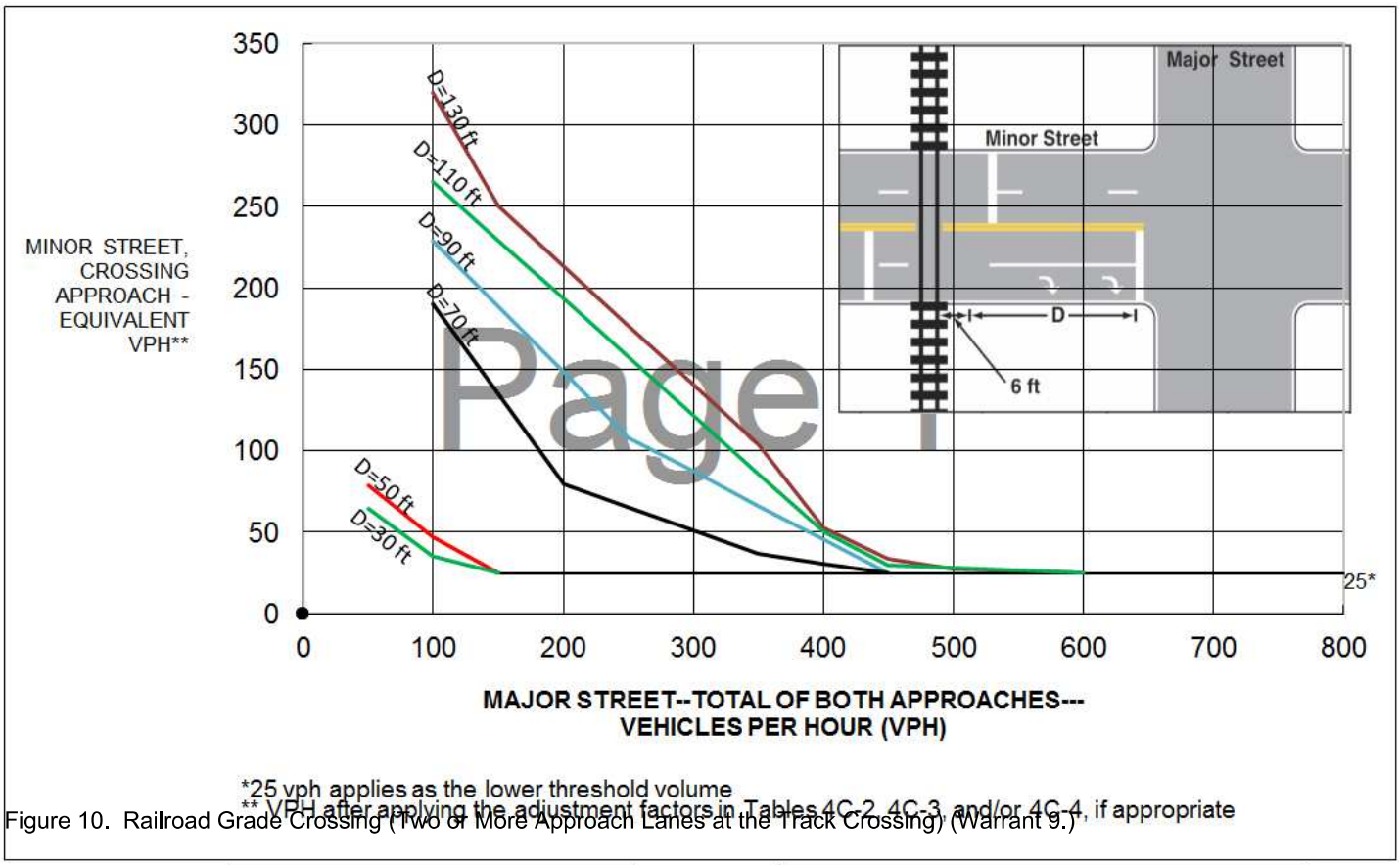


Figure 10. Railroad Grade Crossing (Two or More Approach Lanes at the Track Crossing) (Warrant 9.)

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Remarks:

A Traffic Signal Does Warrant

Traffic Survey - Count Analysis
2011 TMUTCD Warrants

Form TFF-TSCA (8/18)
Page of

County: *Brazoria* District: *Houston*

City: *Manvel* Population: Survey Date:

	Route #	Name	Control	Section	85% Speed
Major		*Del Bello Blvd*			*35*
Minor		*Manvel Pkwy*			*40*

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
4:00 PM	*1,964*	*N/A*	*137*	*N/A*
6:00 PM	*1,909*	*N/A*	*149*	*N/A*
7:00 PM	*1,946*	*N/A*	*98*	*N/A*
5:00 PM	*1,519*	*N/A*	*106*	*N/A*
3:00 PM	*1,260*	*N/A*	*93*	*N/A*
1:00 PM	*1,075*	*N/A*	*93*	*N/A*
2:00 PM	*982*	*N/A*	*99*	*N/A*
8:00 AM	*921*	*N/A*	*157*	*N/A*

Comments:
2030 No Build Conditions With Background Volumes

Warrant 1. Eight Hour Vehicular Volume

○ Yes ◉ No Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A. ***- or -*** Meets 70%[c] (and major-street speed exceeds 40 mph and population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B. ***- or -*** Meets 80%[b] of Conditions A and B. ***- or -*** Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph and population less than 10,000).

◉ Yes ○ No

○ Yes ◉ No

◉ Yes ○ No

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*154%*	100%[a]	80%[b]	70%[c]	56%[d]	*62%*
1	1	500	400	350	280		150	120	105	84	
2 or more	1	600	480	420	336	*921*	150	120	105	84	*93*
2 or more	2 or more	600	480	420	336		200	160	140	112	
1	2 or more	500	400	350	280		200	160	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St. (Total of both Approaches)					Vehicles per hour on higher-volume Minor St. approach (One Direction Only)				
Major Street	Minor Street	Required				Existing	Required				Existing
		100%[a]	80%[b]	70%[c]	56%[d]	*102%*	100%[a]	80%[b]	70%[c]	56%[d]	*124%*
1	1	750	600	525	420		75	60	53	42	
2 or more	1	900	720	630	504	*921*	75	60	53	42	*93*
2 or more	2 or more	900	720	630	504		100	80	70	56	
1	2 or more	750	600	525	420		100	80	70	56	

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 40 mph or in a community with a population less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

Contact/Help

Warrant 2. Four Hour Volumes

◉ Yes ○ No Meets each of 4 Highest Hours (Warrant 2 - see Figure 1 and Figure 2).

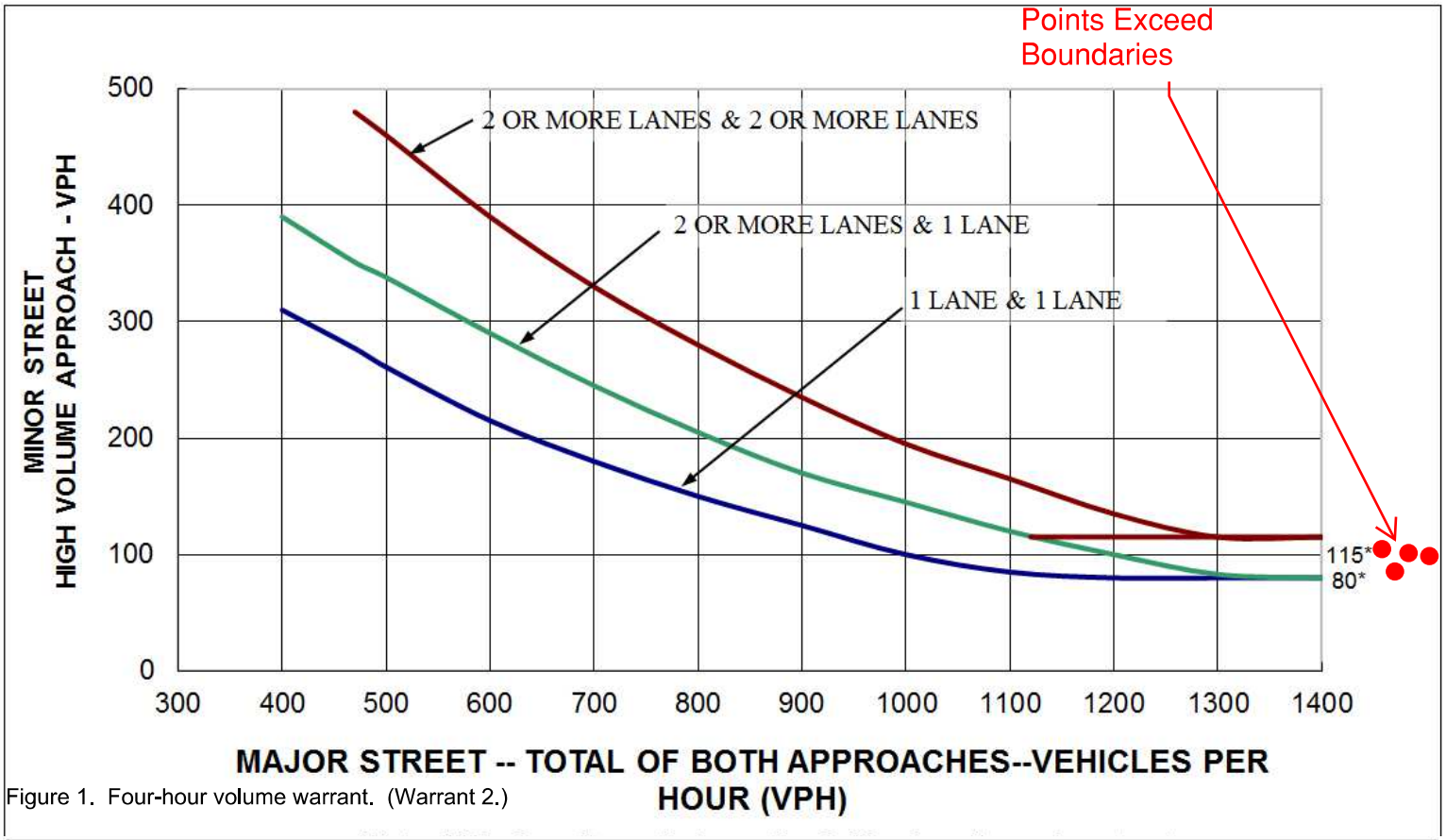


Figure 1. Four-hour volume warrant. (Warrant 2.)

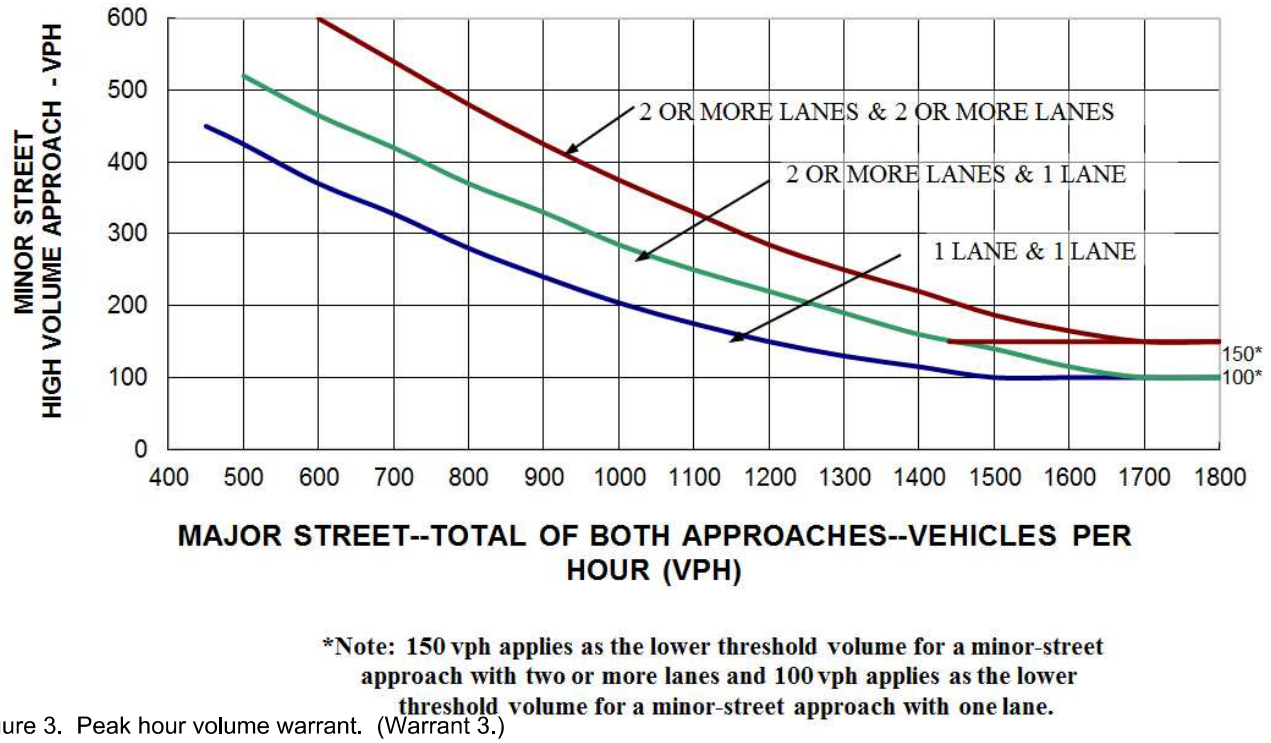


Figure 2. Four-hour volume warrant **(70% Factor)** (community less than 10,000 population or above 40 MPH on major street). (Warrant 2.)

Warrant 3. Peak Hour

◯ Yes ◉ No Are all of the following conditions true for the same 1 hour (any four consecutive 15 minute periods)?
1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, *and*
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and*
3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches. **- *or* -** Meets one High Hour (Warrant 3 - see Figure 3 and Figure 4).

◯ Yes ◉ No



***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 3. Peak hour volume warrant. (Warrant 3.)

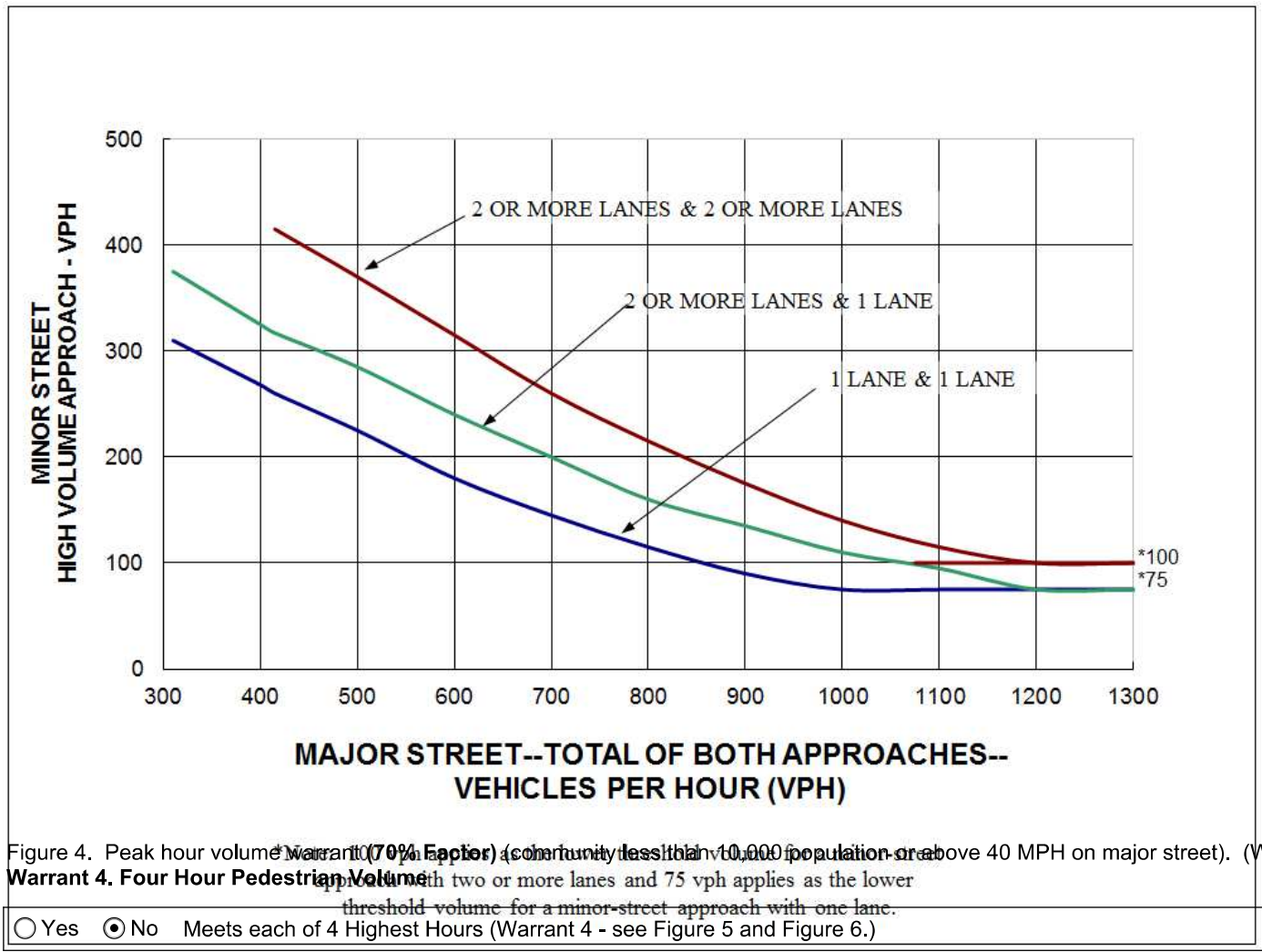
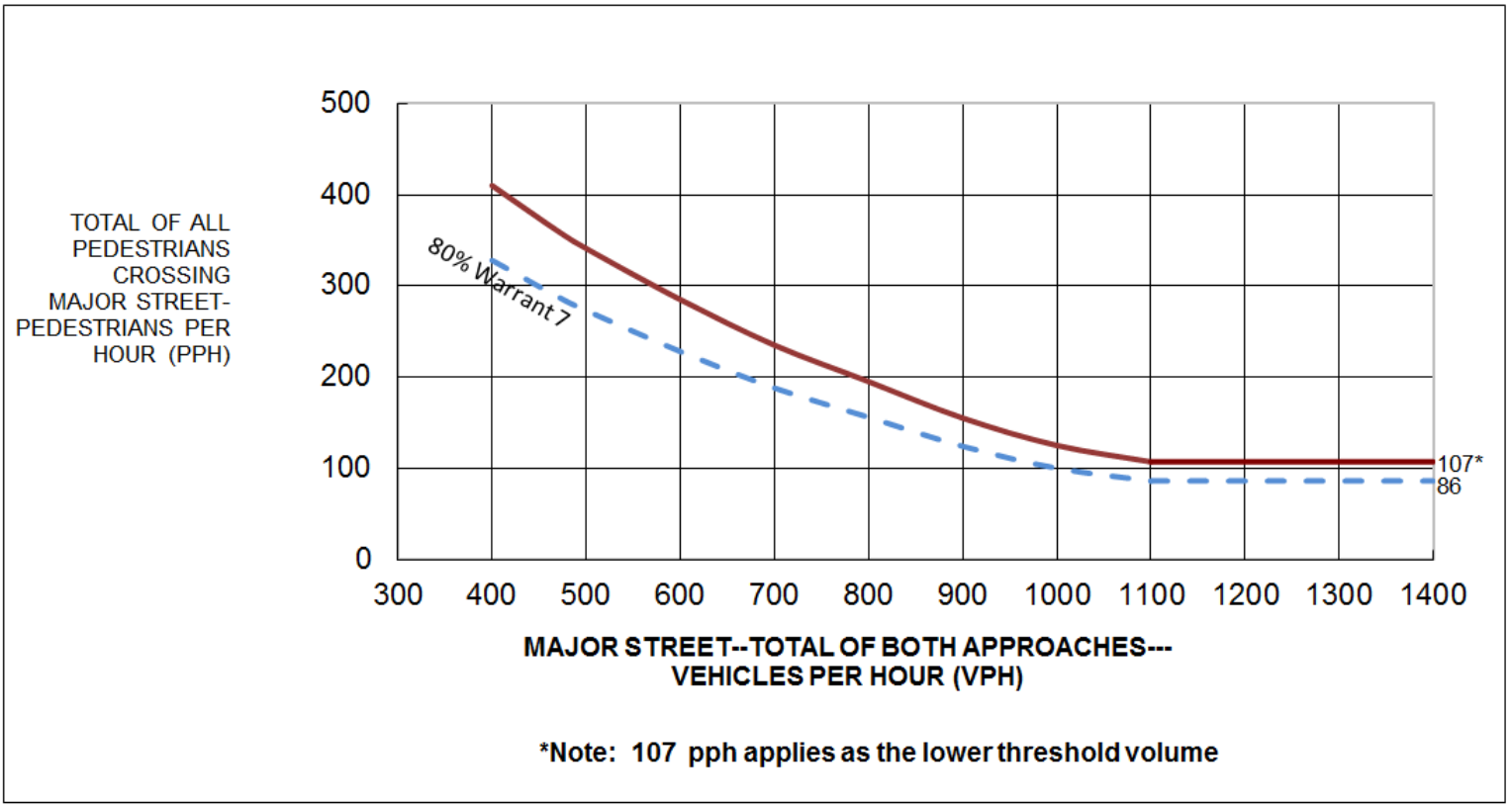


Figure 4. Peak hour volume warrant (**70% Factor**) (community less than 10,000 population or above 40 MPH on major street). (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volume

◯ Yes ◉ No Meets each of 4 Highest Hours (Warrant 4 - see Figure 5 and Figure 6.)



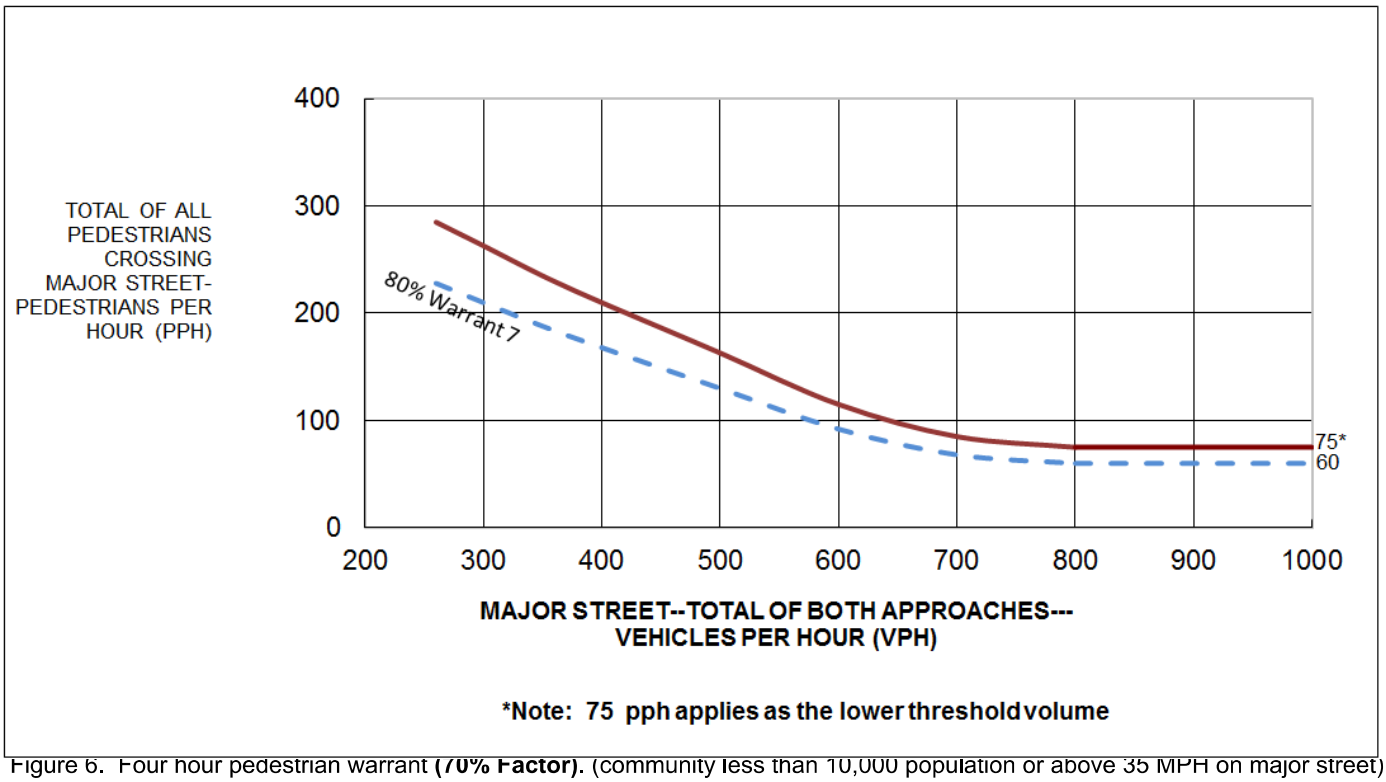


Figure 6. Four hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 35 MPH on major street). (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes

◯ Yes ◉ No Meets Peak Hour Pedestrian (Warrant 4 - see Figure 7 and Figure 8.)

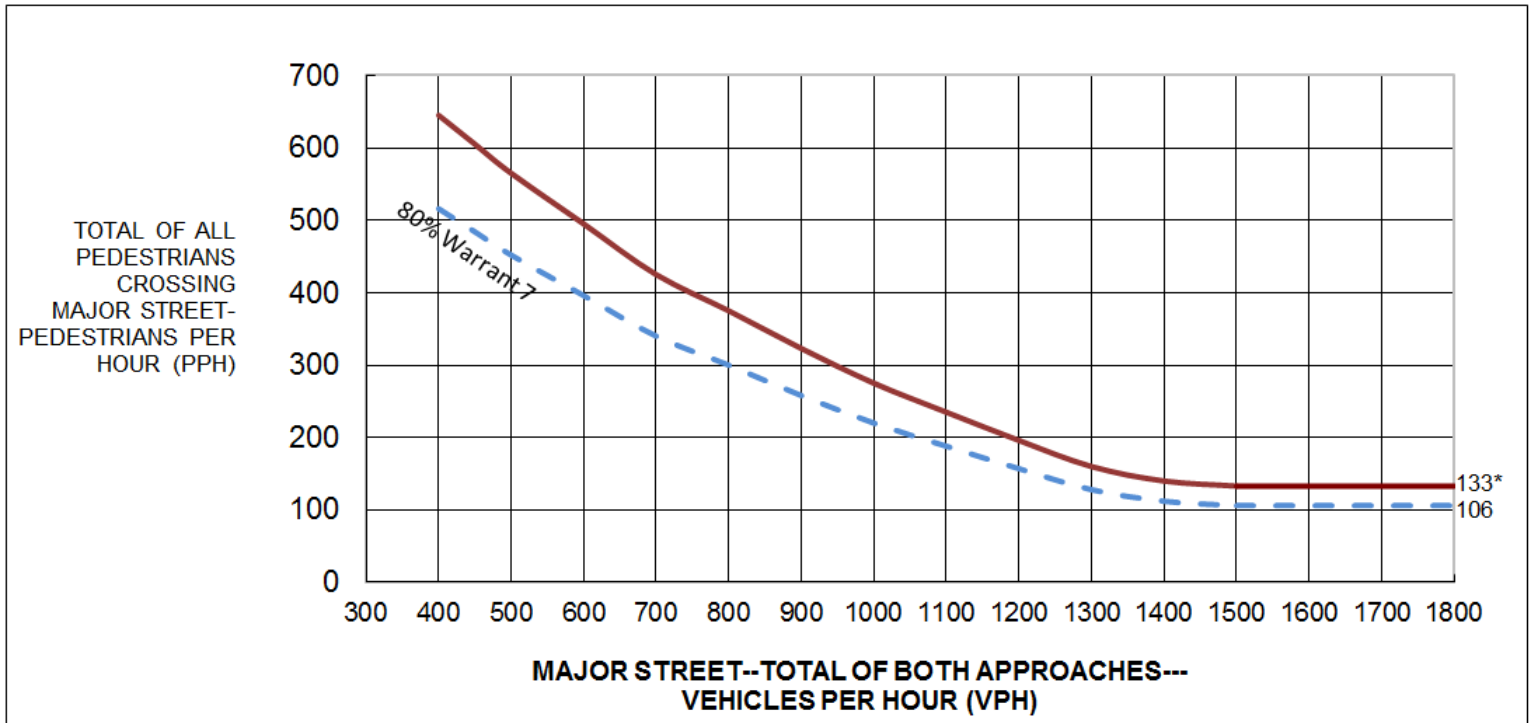


Figure 7. Four hour pedestrian warrant (Warrant 4.)

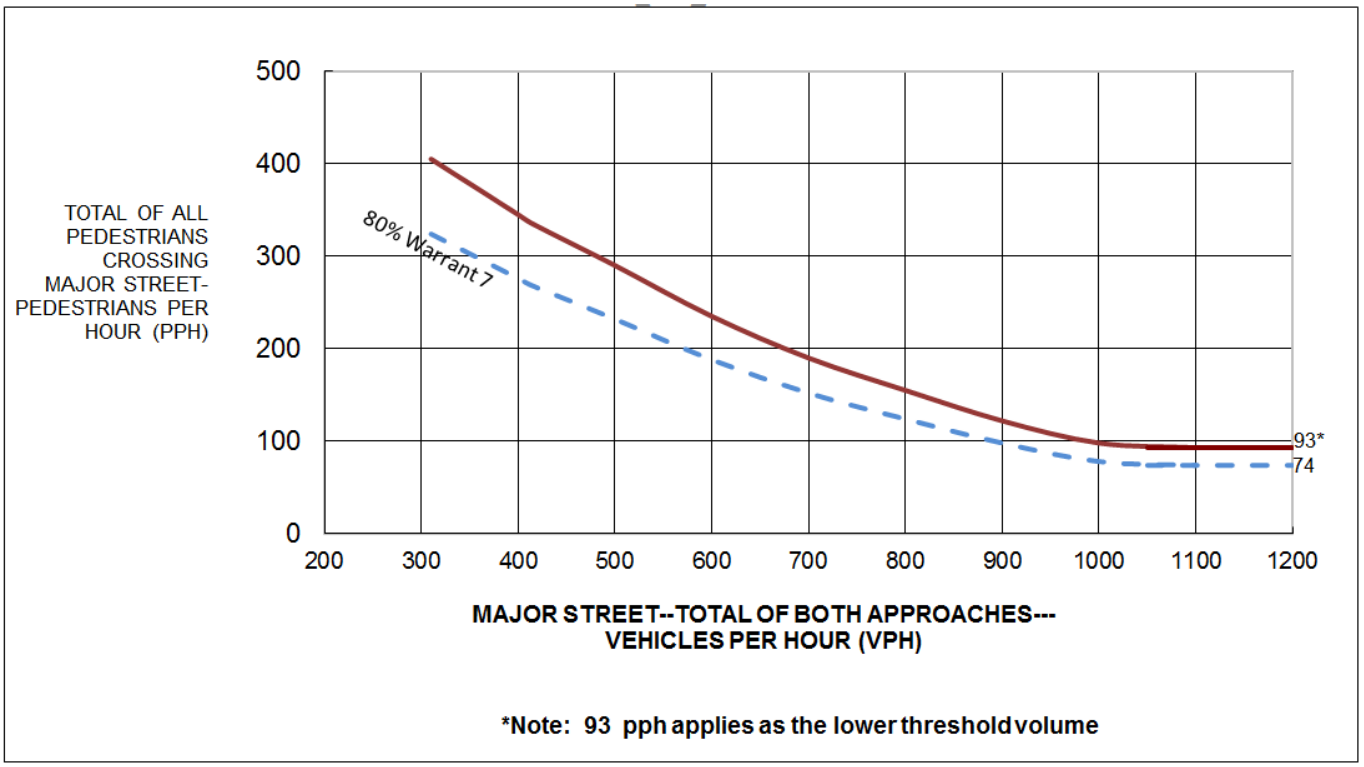


Figure 8. Peak hour pedestrian warrant **(70% Factor)**. (community less than 10,000 population or above 40 MPH on major street). (Warrant 4.)

Warrant 5. School Crossing

○ Yes	◉ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		- and -
○ Yes	◉ No	Are there a minimum of 20 students during the highest crossing hour?
		*- **and** -*
○ Yes	◉ No	Is the nearest signal on the major street located more than 300 feet away? (This warrant may be applied if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System

○ Yes	○ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		- or -
◉ Yes	○ No	On a two-way street, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience

◉ Yes	○ No	Is one of the following conditions met?: ◆ 80% of Condition A or Condition B in Warrant 1 ◆ 56% of Conditions A or B in Warrant 1 (major-street speed exceeding 40 mph and population less than 10,000) ◆ 80% or more of Warrant 4
		- and -
○ Yes	○ No	Have there been 5 or more reported crashes susceptible to correction by a traffic signal in 12 months?

Warrant 8. Roadway Network

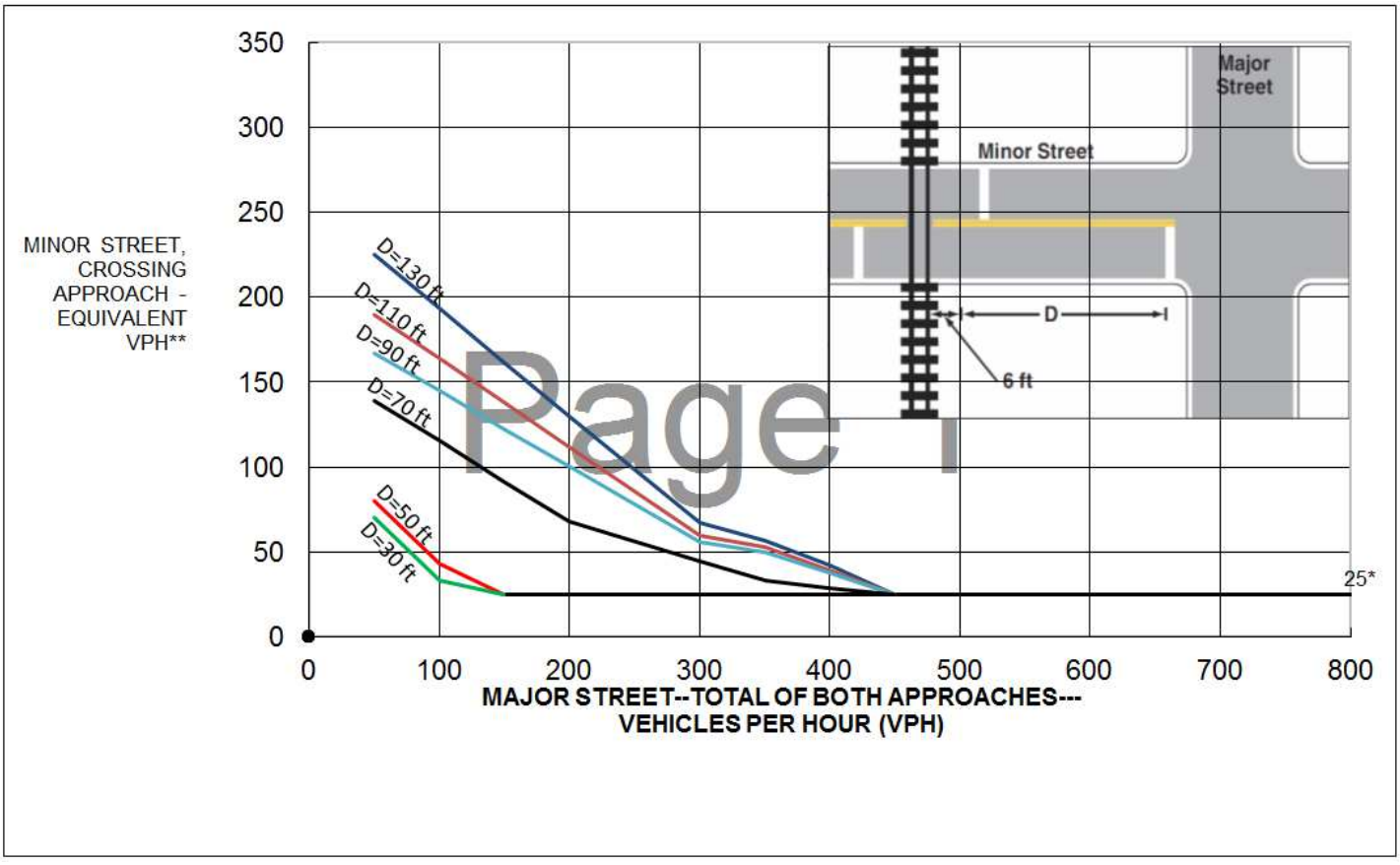
○ Yes	◉ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		- or -
○ Yes	◉ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route (only 1 needs to be checked):

Major Street	Minor Street	
○ Yes	◉ No	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
○ Yes	◉ No	It includes rural or suburban highways outside, entering, or traversing a city.
○ Yes	◉ No	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.
◉ Yes	○ No	It connects areas of principal traffic generation.
○ Yes	◉ No	It has surface street freeway or expressway ramp terminals.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)

○ Yes	◉ No	Meets one High Hour (Warrant 9 - see Figure 9.)



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Warrant 9. Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

◯ Yes ◉ No Meets one High Hour (Warrant 9 - see Figure 10.)

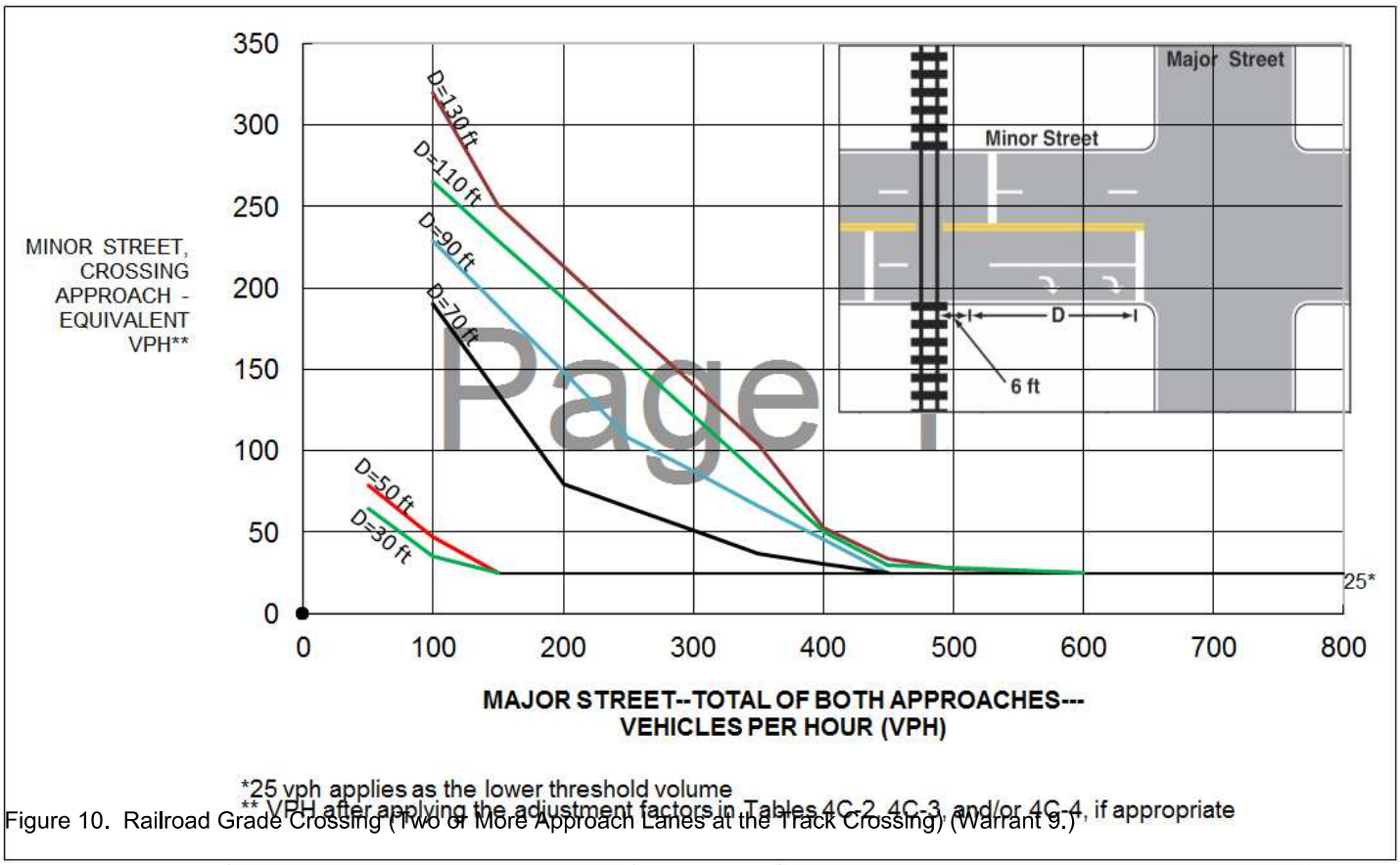


Figure 10. Railroad Grade Crossing (Two or More Approach Lanes at the Track Crossing) (Warrant 9.)

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Remarks:

A Traffic Signal Does Warrant

Appendix H

Queue Length Analysis

Intersection: 1: SH 6 & Pollard Blvd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	U	T	T	TR	L	R
Maximum Queue (ft)	222	372	369	423	347	744	726	707	350	248
Average Queue (ft)	127	151	171	173	36	423	422	446	271	118
95th Queue (ft)	223	339	352	376	138	700	716	738	369	210
Link Distance (ft)		2533	2533	2533	692	692	692	692	298	298
Upstream Blk Time (%)						2	2	4	23	
Queuing Penalty (veh)						0	0	0	0	
Storage Bay Dist (ft)	475									
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 2: SH 6 & Iowa Lane

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	T	TR	L	T	T	T	R	LTR	L	TR
Maximum Queue (ft)	138	265	235	241	55	452	506	568	200	653	114	53
Average Queue (ft)	55	83	96	118	12	237	271	312	96	456	64	27
95th Queue (ft)	110	178	200	229	38	462	502	556	259	807	112	53
Link Distance (ft)		842	842	842		2533	2533	2533		656		440
Upstream Blk Time (%)										42		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)	540				710				100		265	
Storage Blk Time (%)								29				
Queuing Penalty (veh)								36				

Intersection: 3: SH 6 & Manvel Pkwy

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	483	282	169	209	728	782	812	200	122	137	299
Average Queue (ft)	253	81	89	106	365	430	483	74	35	57	134
95th Queue (ft)	409	175	152	173	646	755	807	213	84	103	224
Link Distance (ft)		1259	1259	1259	1007	1007	1007			526	526
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	710							100	230		
Storage Blk Time (%)					0		43				
Queuing Penalty (veh)					0		59				

Intersection: 4: Manvel Pkwy & Driveway 1

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	24	43	76
Average Queue (ft)	14	18	23
95th Queue (ft)	32	34	64
Link Distance (ft)	1179		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	100
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Manvel Pkwy & Charlotte Street

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	65	52	87	70	65	62	72	55	33	26	86
Average Queue (ft)	17	25	28	32	17	23	24	7	5	3	12
95th Queue (ft)	42	46	60	62	46	49	58	26	16	14	44
Link Distance (ft)		1688		634		637	637			850	850
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		100			100	100		
Storage Blk Time (%)			0								
Queuing Penalty (veh)			0								

Intersection: 6: Driveway 2 & Manvel Pkwy

Movement	EB	EB	NB	SB
Directions Served	L	R	L	TR
Maximum Queue (ft)	24	99	96	20
Average Queue (ft)	4	29	19	1
95th Queue (ft)	17	53	56	6
Link Distance (ft)	1918			1792
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100	100	
Storage Blk Time (%)		0	0	
Queuing Penalty (veh)		0	0	

Intersection: 7: Manvel Pkwy & Dogwood Ave

Movement	WB
Directions Served	LR
Maximum Queue (ft)	72
Average Queue (ft)	37
95th Queue (ft)	62
Link Distance (ft)	993
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Manvel Pkwy & Del Bello Blvd

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LTR
Maximum Queue (ft)	52	91	77	118	112	42	30
Average Queue (ft)	32	49	45	64	29	20	16
95th Queue (ft)	52	75	68	96	61	34	39
Link Distance (ft)	1973	1973	948	948	1797	1797	434
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 9: Driveway 3 & Driveway 2

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	28	29	97	74
Average Queue (ft)	7	3	25	32
95th Queue (ft)	26	16	51	59
Link Distance (ft)		1918	530	144
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 10: Driveway 1/Driveway 3 & Charlotte Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	30	28	78	53
Average Queue (ft)	3	3	29	28
95th Queue (ft)	17	18	66	47
Link Distance (ft)	414	1688	406	530
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: SH 288 NB (Exit/Entrance Ramp) & Charlotte Street

Movement	WB
Directions Served	R
Maximum Queue (ft)	69
Average Queue (ft)	27
95th Queue (ft)	53
Link Distance (ft)	414
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 12: SH 288 NB (Exit/Entrance Ramp) & Driveway 2

Movement	WB
Directions Served	R
Maximum Queue (ft)	101
Average Queue (ft)	49
95th Queue (ft)	92
Link Distance (ft)	329
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 13: SH 288 NB (Exit/Entrance Ramp) & SH 6

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	LT	T	T	T	T	T	TR	L	LT	R
Maximum Queue (ft)	436	487	481	448	558	770	1142	1160	566	590	125
Average Queue (ft)	287	345	277	214	215	411	453	1014	264	516	100
95th Queue (ft)	415	453	442	359	464	718	814	1538	611	721	179
Link Distance (ft)	465	465	465	465	1143	1143	1143	1143	551	551	
Upstream Blk Time (%)		1	0	0			0	17	6	71	
Queuing Penalty (veh)		8	2	0			0	109	0	0	
Storage Bay Dist (ft)											100
Storage Blk Time (%)										71	7
Queuing Penalty (veh)										149	14

Intersection: 14: SH 6 & SH 288 SB Exit Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	TR	L	T	T	T	L	L	TR	R
Maximum Queue (ft)	756	745	756	738	251	44	47	28	208	244	204	223
Average Queue (ft)	681	693	688	660	170	7	5	2	60	187	116	133
95th Queue (ft)	870	829	845	881	260	26	26	12	147	284	221	245
Link Distance (ft)	693	693	693	693	465	465	465	465	204	204	204	204
Upstream Blk Time (%)	68	87	62	26					2	47	0	2
Queuing Penalty (veh)	0	0	0	0					7	195	0	9
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 15: SH 288 NB (Exit/Entrance Ramp) & Del Bello Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	LT	T	T	T	TR	LT	T	R
Maximum Queue (ft)	71	66	56	238	274	308	54	54	50
Average Queue (ft)	37	42	36	29	42	169	29	24	25
95th Queue (ft)	56	61	53	93	134	303	49	44	42
Link Distance (ft)	266	266	266	1973	1973	1973	730	730	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)									350
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 16: Rodeo Palms Pkwy & SH 288 SB Exit Ramp

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	T	T	TR	L	LT	T	LT	TR
Maximum Queue (ft)	36	75	160	56	48	44	108	50
Average Queue (ft)	14	30	50	23	24	12	57	25
95th Queue (ft)	27	55	95	41	39	34	90	41
Link Distance (ft)	1237	1237	1237	266	266	266	440	440
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 17: SH 6

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	1298	1307	1259	159
Average Queue (ft)	270	427	562	40
95th Queue (ft)	992	1216	1333	110
Link Distance (ft)	1259	1259	1259	343
Upstream Blk Time (%)	0	0	0	
Queuing Penalty (veh)	1	2	1	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 18: Driveway 1

Movement	NB
Directions Served	LR
Maximum Queue (ft)	53
Average Queue (ft)	14
95th Queue (ft)	41
Link Distance (ft)	343
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 19: SH 288 SB Exit Ramp

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	775	772	792	568	397
Average Queue (ft)	480	525	560	313	172
95th Queue (ft)	788	763	754	600	371
Link Distance (ft)	1011	1011	1011	1011	1011
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 20:

Movement	EB
Directions Served	L
Maximum Queue (ft)	483
Average Queue (ft)	160
95th Queue (ft)	367
Link Distance (ft)	465
Upstream Blk Time (%)	3
Queuing Penalty (veh)	8
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 21: SH 6 & Driveway 5

Movement	SB
Directions Served	R
Maximum Queue (ft)	52
Average Queue (ft)	20
95th Queue (ft)	50
Link Distance (ft)	311
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 22: SH 6 & Driveway 6

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (ft)	19	51	52
Average Queue (ft)	1	2	13
95th Queue (ft)	6	16	37
Link Distance (ft)	842	842	354
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 45:

Movement	EB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	7
95th Queue (ft)	28
Link Distance (ft)	261
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 46: SH 288 SB Exit Ramp

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 47: SH 288 NB (Exit/Entrance Ramp)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 48:

Movement	WB
Directions Served	L
Maximum Queue (ft)	30
Average Queue (ft)	3
95th Queue (ft)	17
Link Distance (ft)	225
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 598

Intersection: 1: SH 6/Pollard Blvd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	U	T	T	TR	UL	R
Maximum Queue (ft)	418	271	330	356	707	731	731	755	361	313
Average Queue (ft)	188	103	136	147	643	671	678	681	309	170
95th Queue (ft)	337	236	271	294	962	871	887	892	359	326
Link Distance (ft)		2533	2533	2533	692	692	692	692	298	298
Upstream Blk Time (%)					40	48	68	54	58	8
Queuing Penalty (veh)					0	0	0	0	0	0
Storage Bay Dist (ft)	475									
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 2: SH 6 & Iowa Lane

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	SB	SB
Directions Served	UL	T	T	TR	L	T	T	T	R	LTR	L	TR
Maximum Queue (ft)	188	272	221	230	35	634	631	663	200	671	189	74
Average Queue (ft)	83	103	109	128	3	376	408	421	72	576	104	32
95th Queue (ft)	149	205	192	218	14	644	668	693	227	862	168	68
Link Distance (ft)		703	703	703		2533	2533	2533		656		440
Upstream Blk Time (%)										74		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)	540				710				100		205	
Storage Blk Time (%)								46			0	
Queuing Penalty (veh)								35			0	

Intersection: 3: SH 6 & Manvel Pkwy

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	408	132	188	195	1083	1094	1099	200	329	570	546
Average Queue (ft)	251	47	68	70	578	619	649	130	151	333	482
95th Queue (ft)	404	115	152	159	1118	1138	1152	272	287	649	655
Link Distance (ft)		1213	1213	1213	1071	1071	1071			523	523
Upstream Blk Time (%)					7	8	9			8	35
Queuing Penalty (veh)					63	70	79			47	202
Storage Bay Dist (ft)	710							100	230		
Storage Blk Time (%)					19		53		0	9	
Queuing Penalty (veh)					0		113		0	16	

Intersection: 4: Manvel Pkwy & Driveway 1

Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	1179	200	138	620	661	200
Average Queue (ft)	512	155	46	217	285	48
95th Queue (ft)	1193	264	108	564	633	190
Link Distance (ft)	1171			642	642	
Upstream Blk Time (%)	14				0	
Queuing Penalty (veh)	26				2	
Storage Bay Dist (ft)		100	100			100
Storage Blk Time (%)	16	72	3		47	
Queuing Penalty (veh)	34	74	11		20	

Intersection: 5: Manvel Pkwy & Charlotte Street

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	103	116	106	116	74	102	102	71	54	116	137
Average Queue (ft)	38	48	58	66	29	30	36	20	13	51	76
95th Queue (ft)	82	85	92	105	65	74	81	50	36	105	132
Link Distance (ft)		1688		634		642	642			850	850
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		115		100			100	100		
Storage Blk Time (%)	0	1	0	0		0	0			1	
Queuing Penalty (veh)	0	1	0	1		0	1			1	

Intersection: 6: Driveway 2 & Manvel Pkwy

Movement	EB	EB	NB	SB
Directions Served	L	R	L	TR
Maximum Queue (ft)	45	109	77	56
Average Queue (ft)	9	52	20	3
95th Queue (ft)	29	86	57	22
Link Distance (ft)	1918			1792
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100	100	
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 7: Manvel Pkwy & Dogwood AVE

Movement	WB
Directions Served	LR
Maximum Queue (ft)	76
Average Queue (ft)	48
95th Queue (ft)	74
Link Distance (ft)	993
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Manvel Pkwy & Del Bello Blvd

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	LT	TR	LT	TR	LT	TR	LTR
Maximum Queue (ft)	97	98	138	169	67	101	29
Average Queue (ft)	52	63	83	84	30	32	5
95th Queue (ft)	79	89	129	132	52	74	22
Link Distance (ft)	1970	1970	948	948	1797	1797	434
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 9: Driveway 3 & Driveway 2

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	28	72	73	111
Average Queue (ft)	6	3	31	49
95th Queue (ft)	25	25	55	80
Link Distance (ft)		1918	530	206
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 10: Driveway 1/Driveway 3 & Charlotte Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	52	78	75
Average Queue (ft)	7	7	40	34
95th Queue (ft)	28	31	67	56
Link Distance (ft)	414	1688	398	530
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: SH 288 NB (Exit/Entrance Ramp) & Charlotte Street

Movement	WB
Directions Served	R
Maximum Queue (ft)	131
Average Queue (ft)	64
95th Queue (ft)	116
Link Distance (ft)	414
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 12: SH 288 NB (Exit/Entrance Ramp) & Driveway 2

Movement	WB
Directions Served	R
Maximum Queue (ft)	315
Average Queue (ft)	111
95th Queue (ft)	228
Link Distance (ft)	329
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 13: SH 288 NB (Exit/Entrance Ramp) & SH 6

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	LT	T	T	T	T	T	TR	L	LT	R
Maximum Queue (ft)	327	468	479	465	1229	1228	1209	1229	566	590	125
Average Queue (ft)	197	323	261	195	847	874	892	958	439	554	94
95th Queue (ft)	287	437	449	364	1549	1540	1516	1529	705	666	178
Link Distance (ft)	465	465	465	465	1185	1185	1185	1185	551	551	
Upstream Blk Time (%)		0	0	0	17	17	10	19	5	83	
Queuing Penalty (veh)		4	2	1	149	147	83	167	0	0	
Storage Bay Dist (ft)											100
Storage Blk Time (%)										76	5
Queuing Penalty (veh)										278	14

Intersection: 14: SH 6 & SH 288 SB Exit Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	TR	L	T	T	T	L	L	TR	R
Maximum Queue (ft)	734	745	732	745	492	88	69	73	222	241	221	219
Average Queue (ft)	702	708	703	698	416	24	24	24	123	212	130	137
95th Queue (ft)	769	771	784	828	606	60	59	54	242	234	225	229
Link Distance (ft)	693	693	693	693	465	465	465	465	204	204	204	204
Upstream Blk Time (%)	77	90	81	54	12				9	54	2	1
Queuing Penalty (veh)	0	0	0	0	97				44	269	9	7
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 15: SH 288 NB (Exit/Entrance Ramp) & Del Bello Blvd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	LT	T	T	T	TR	LT	T	R
Maximum Queue (ft)	66	76	72	71	111	201	74	23	82
Average Queue (ft)	33	42	44	28	37	84	27	3	30
95th Queue (ft)	48	68	67	49	69	139	54	15	56
Link Distance (ft)	266	266	266	1970	1970	1970	593	593	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)									350
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 16: Rodeo Palms Pkwy & SH 288 SB Exit Ramp

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	T	T	TR	L	LT	T	LT	TR
Maximum Queue (ft)	41	68	91	70	126	49	476	470
Average Queue (ft)	9	37	41	36	40	28	415	328
95th Queue (ft)	22	60	68	63	74	53	588	570
Link Distance (ft)	1243	1243	1243	266	266	266	450	450
Upstream Blk Time (%)							26	1
Queuing Penalty (veh)							150	8
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 17: SH 6 & Driveway 4

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	T	T	T	TR	R
Maximum Queue (ft)	592	960	865	1254	1251	1256	72
Average Queue (ft)	18	51	48	566	576	584	31
95th Queue (ft)	186	386	360	1502	1524	1543	61
Link Distance (ft)	1185	1185	1185	1213	1213	1213	211
Upstream Blk Time (%)				0	1	3	
Queuing Penalty (veh)				5	16	29	
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 18: Driveway 4 & Driveway 1

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	320	31	31
Average Queue (ft)	38	4	16
95th Queue (ft)	198	20	41
Link Distance (ft)	517	1171	211
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 19: SH 288 SB Exit Ramp

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	T
Maximum Queue (ft)	675	697	696	648	337
Average Queue (ft)	515	547	599	296	143
95th Queue (ft)	803	770	780	546	335
Link Distance (ft)	1011	1011	1011	1011	1011
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 20:

Movement	EB	NB	NB
Directions Served	L	T	T
Maximum Queue (ft)	484	22	298
Average Queue (ft)	213	1	21
95th Queue (ft)	487	7	140
Link Distance (ft)	465	183	183
Upstream Blk Time (%)	4		2
Queuing Penalty (veh)	16		14
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 21: SH 6 & Driveway 5

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	554	546	542	182
Average Queue (ft)	104	105	108	39
95th Queue (ft)	433	441	451	80
Link Distance (ft)	527	527	527	285
Upstream Blk Time (%)	3	3	5	
Queuing Penalty (veh)	25	23	44	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: SH 6 & Driveway 6

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	591	614	634	118
Average Queue (ft)	35	45	45	38
95th Queue (ft)	241	266	276	79
Link Distance (ft)	703	703	703	314
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 45:

Movement	EB
Directions Served	L
Maximum Queue (ft)	30
Average Queue (ft)	7
95th Queue (ft)	27
Link Distance (ft)	277
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 46: SH 288 SB Exit Ramp

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	513	531	518
Average Queue (ft)	283	363	338
95th Queue (ft)	684	691	684
Link Distance (ft)	479	479	479
Upstream Blk Time (%)	53	55	52
Queuing Penalty (veh)	0	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 47:

Movement	WB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	10
95th Queue (ft)	34
Link Distance (ft)	235
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 48: SH 288 NB (Exit/Entrance Ramp)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

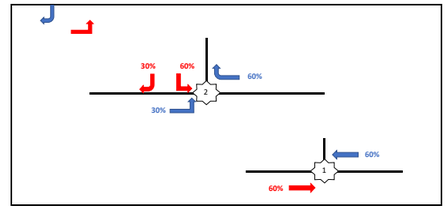
Network Summary

Network wide Queuing Penalty: 2397

Appendix I

Total AM & PM Distribution

	IN	OUT
Outside	100%	100%
Inside	100%	100%



Rodeo Palms Pkwy

Del bello Blvd

Del bello Blvd

Manvel PKWY

Dogwood Avenue

Driveway 2

Driveway 3

Driveway 1

Charlotte Street

Charlotte Street

Iowa Lane

Pollard Blvd

SH 6

SH 6

SH 6

SH288SB

SH288NB

SH 288 NB RAMP

SH 288 NB

SH 288 SB

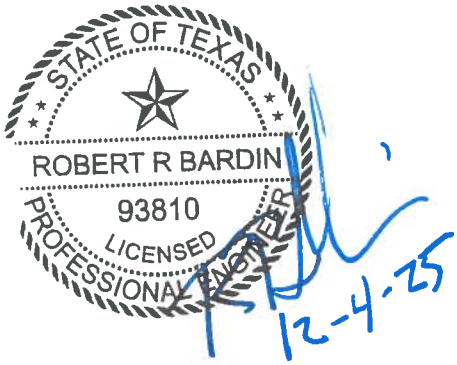
Turn

U-Turn

Drainage Impact Analysis
Presidio at Manvel

December 2025

Drainage Impact Analysis
Presidio at Manvel



Prepared for
Brazoria Drainage District No. 4
Brazoria County

December 2025

LJA Engineering, Inc.
3600 W Sam Houston Pkwy S, Suite 600
Houston, Texas 77042
Telephone: 713.953.5200
Fax: 713.953.5026

LJA Job Number 2013-2512
LJA Firm Registration No. F-1386

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EXECUTIVE SUMMARY

Presidio at Manvel is an approximately 358-acre development in the upper reaches of the Chocolate Bayou watershed. The project is bordered to the west by State Highway 288, the south by Highway 6, the east by Cooper Ditch, and the north by Del Bello. The entire site is located within the jurisdiction of the Brazoria Drainage District No. 4 (BDD4), which is responsible for approving outfall drainage for the tract. This drainage plan addresses the ultimate level of development to demonstrate that the proposed development will not adversely impact the watershed and current drainage within it.

In its undeveloped condition, this area is a part of a larger drainage area that ultimately routes under SH 6 and through a siphon under the Gulf Coast Water Authority's Canal, just south of 6. The allowable flow from the proposed detention facility is governed by the capacity of two existing 72-inch CMP siphons under the Gulf Coast Water Authority (GCWA) canal. The capacity of each culvert is approximately 111 cfs for the 100-year event. Therefore, the total capacity of the siphon is approximately 222 cfs.

The two existing 72-inch CMP siphons under the GCWA canal and 4 existing 8' x 4' reinforced concrete box (RCB) culverts limit the depth of an outfall channel and substantial land area would be needed to construct a traditional detention facility. Therefore, the developers of BCMUD 30 are proposing a combination of gravity/pumped detention, limiting the peak discharge to a pro rata share, or 37 cfs, of the total siphon capacity. **Figure ES-1** shows the development limits and existing drainage features in the vicinity of the tract.

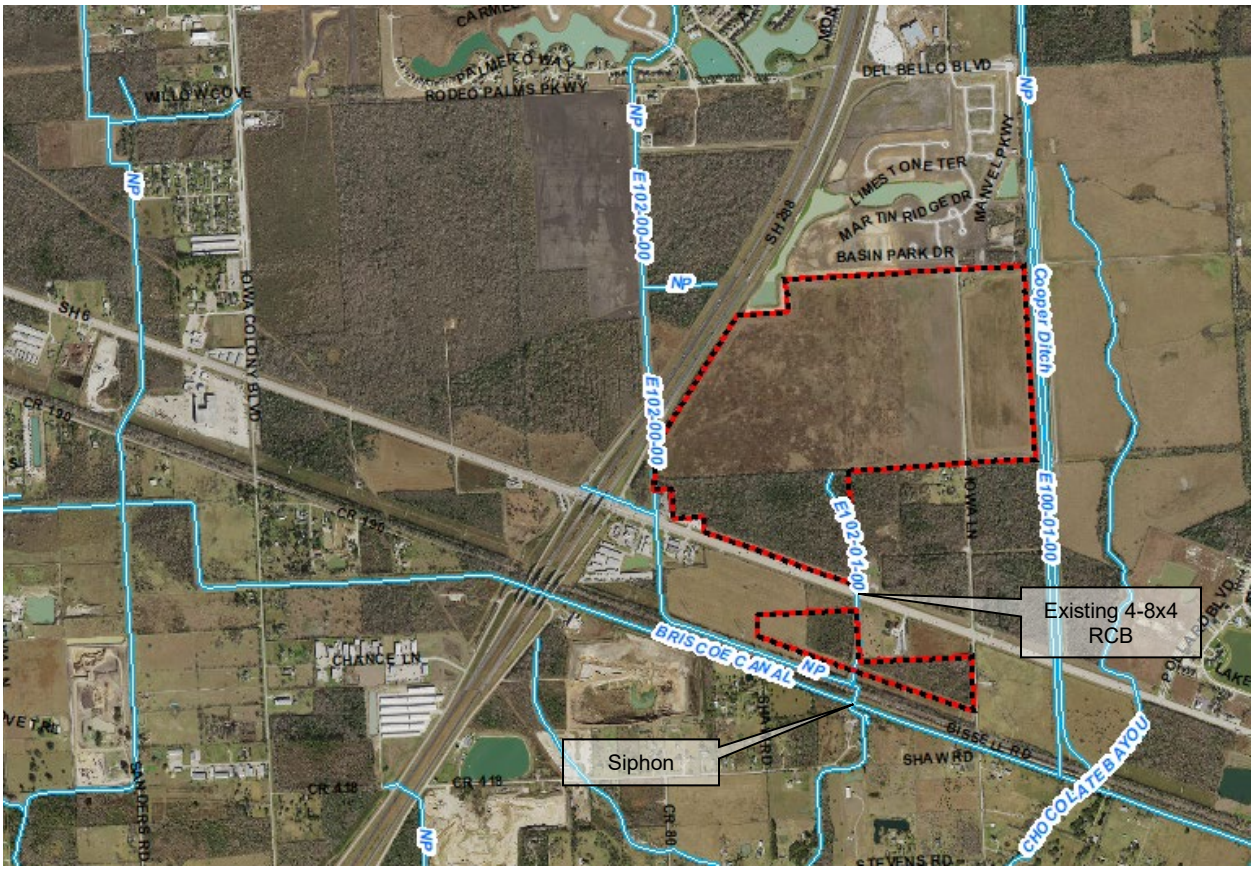


Figure ES-1 Presidio at Manvel Analysis Area

A series of detention ponds and culverts will be constructed to provide detention and conveyance for the proposed development. The ponds are a combination of gravity and pumped outfalls that will provide adequate detention and conveyance for the site. The allowable discharge from the siphon was pro-rated to the allowable discharge from the development area contributing to the siphon. In order to demonstrate no adverse impacts, the existing flows into the siphon will not exceed the pro rated capacity. The downstream limits of the analysis are located just upstream of the siphons under the canal.

The allowable discharge through the existing SH6 culverts was also considered in this study. Based on a comparison to the resulting discharges at SH6 from a prior study titled Brazoria County Municipal Utility District No. 30 Final Drainage Analysis dated June 29, 2005 by LJA Engineering, Inc., the post project flows from the Presidio development will not exceed allowable flows. The June 2005 (revised existing) and post project peak discharges are compared in **Table ES-1**.

Table ES-1
Discharge Comparisons

Outfall ID	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.
	2-year Q			10-year Q			100-year Q		
Hwy6	525**	269	-256	673	464	-209	869	818	-51
Siphon	--	--	--	--	--	--	37.1	37.0	-0.1

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2yr analysis.

It should be noted that the June 2005 analysis did not reflect Atlas 14 precipitation, whereas the flows computed for the Presidio drainage used Atlas 14 precipitation in accordance with the current BDD4 DCM. Additionally, the revised existing conditions flow from the 2005 DIA was based on a 3-year storm event. The post project flows are based on a 2-year Atlas 14 storm event. These assumptions incur some conservatism in the drainage recommendations for the proposed development.

According to the Brazoria County Flood Insurance Rate Map (FIRM) Panel 48039C0110K, dated December 30, 2020, approximately 31.5 acres will be developed within a Special Flood Hazard Area (SFHA) Zone AO. Zone AO indicates that no base flood elevation has been determined, but shallow flooding occurs, usually from sheet flow, and is indicated as a depth on the FIRM. The AO Zone depth affecting the development is 2 feet. Approximately 1.7 acres of the SFHA area will be reclaimed for development, thus displacing approximately 3.4 acre-feet of floodplain volume. The remaining 29.8 acres are in an area that is proposed for a detention facility and will remain a SFHA. 13.63 acre-feet of compensating storage is provided in the freeboard for Basin D. Additionally, because the flooding occurs due to backflow, filling in the floodplain will not affect conveyance in Chocolate Bayou.

Presidio at Manvel will be developed in phases, whereas this report details the ultimate conditions development. The detention ponds for the tract will provide approximately 479 acre-feet of storage for mitigating increased runoff resulting from the development, as well as offsite areas draining to the site. This results in a detention rate of 1.34 acre-feet per acre.

Storage will be provided in four detention ponds that will connect through equalizer culverts until the ultimate outfall from Basin D into the siphon. Three of the ponds, located upstream of SH 6 will rely on gravity-based discharge, the fourth pond, located south of SH 6 and north of the canal, will provide a combination of gravity and pumped detention. The pump activates only when water levels are too low for gravity discharge. In this case, the proposed pump will operate only when water surface elevations in Basin D are below 47.44'. **Table ES-2** summarizes the detention provided by the proposed drainage system.

Table ES-2 **Detention Summary**				
Description				
Detention Service Area (ac)	358.4			
Pond ID	Basin A	Basin B	Basin C	Basin D
100-year Water Surface Elevation (ft)	53.71	53.60	53.31	52.92
10-year Water Surface Elevation (ft)	51.84	51.80	51.71	46.69
2-year Water Surface Elevation (ft)	50.85	50.84	50.80	41.35
Highbank Elevation (ft)	54.75	54.75	54.50	54.50
100-year Freeboard (ft)	1.04	1.15	1.19	1.58
100-year Detention Volume (ac-ft)	84.06	69.09	15.94	309.92
100-year Detention Rate (ac-ft/ac)*	1.34 ac-ft/ac			
Required Floodplain Mitigation (ac-ft)	3.4 ac-ft			
Provided Floodplain Mitigation (ac-ft)	13.6 ac-ft*			
Total 100yr Detention Volume (ac-ft)	479.01 ac-ft			
Pumped Volume (ac-ft)	196.62 ac-ft (41% Total Volume)			
Gravity Volume (ac-ft)	282.39 ac-ft (59% Total Volume)			

*Provided in the freeboard above the 100-year detention WSE.

Proposed improvements for mitigating the developed runoff are summarized below:

- Approximately 479.01 acre-feet of storage will be provided during a 100-year storm event in 4 ponds totaling 63 acres per the land plan used in this analysis.
- Basin A will discharge via 100% gravity into Basin B through 3-7x5 Reinforced Concrete Box (RCB) culverts with flowlines of 41.5 (sufficiently deep enough to be submerged below the amenity water level).
- Basin B will discharge via 100% gravity into Basin C through 4-7x5 RCB culverts with a flowline of 41.50’ (submerged below the amenity water level).
- Basin C will discharge across SH6 via 100% gravity into Basin D through the existing 4-8x4 Reinforced Concrete Box (RCB) culverts with an upstream flowline of approximately 48.44’.
- Basin D will discharge into the siphon under the Brisco Canal through a combination pump and gravity discharge.
- A proposed pump discharge of 16,600 gpm (37 cfs) will provide drainage when water surface elevations in Basin D are below the flowline of the gravity discharge (47.50’).
- Gravity discharge will provide drainage for the development through 1-27” RCP culvert when the water surface elevation in Basin D is higher than 47.50’.

Construction of the proposed improvements as recommended will mitigate the impacts from the increased discharges, runoff volume, and floodplain fill, resulting in no adverse impacts to the receiving stream and adjacent properties for storm events up to and including the 100-year storm event.

The analysis presented in this report was prepared from a conceptual development plan, and LiDAR topography was used for determining physical geometries and, thus, resulting water surface elevations. However, relative comparisons of pre project and post project conditions conclude that the proposed drainage plan will be sufficient for mitigating the 2-, 10-, and 100-year storm events. As development progresses and changes occur, or more details become available, the analysis will be updated to reflect such changes in future amendments.

1.0 INTRODUCTION

This report supports a drainage impact analysis (DIA) for the proposed ~360-acre development, called Presidio at Manvel, in the Chocolate Bayou watershed in Brazoria County, approximately 20 miles south of downtown Houston, and 2 miles northwest of Manvel. Jurisdiction over the Tract is provided by Brazoria County Drainage District No. 4 (BDD4). The development is located in the upper reaches of the Chocolate Bayou watershed. The objective, methodology, results, and conclusions for the detailed hydrologic and hydraulic analysis are discussed in this report.

1.1 Site Location and Description

Presidio at Manvel is an approximately 360 acre planned development in Brazoria County within the city limits of Manvel, Texas. The site is located at the northeastern intersection of SH 288 and SH 6, approximately 20 miles south of downtown Houston, Texas and two miles northwest of Manvel. Jurisdictional boundaries, major roadways, and streams are illustrated in **Exhibit 1.1**.

Currently undeveloped, the site's topography is relatively flat with elevations ranging from 56 feet at the north end to 53 feet in the south (based on lidar data). **Figure 1-1** illustrates the existing topography in the vicinity of the Tract. Cooler, green colors reflect lower elevations and warmer, maroon/red colors reflect the higher elevations.

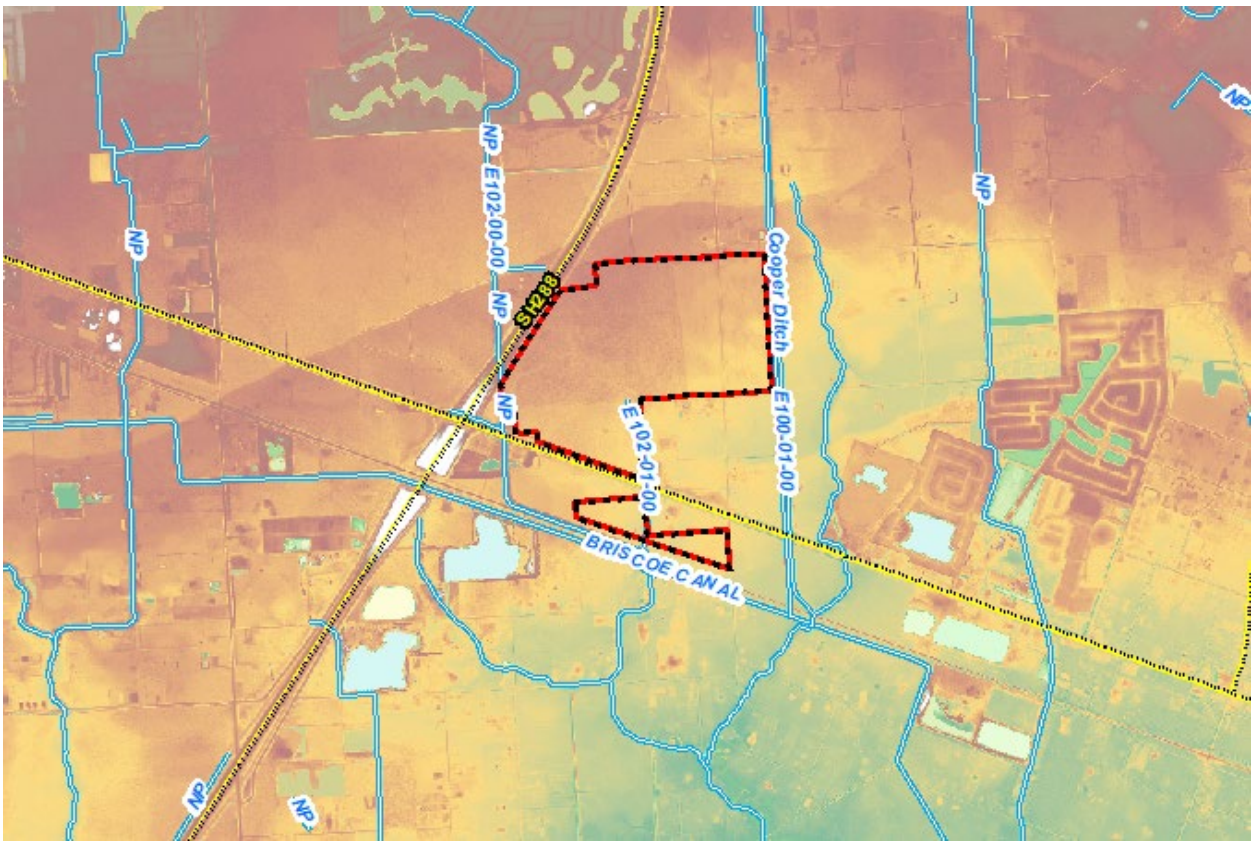


Figure 1-1 Existing Topography

Existing ground cover consists of open-pastures in the northern sections while the southern portion is comprised of varying vegetation common to post-clear cutting regrowth that includes marshy grasses, dense underbrush, and sparsely placed pine and oak trees throughout the area. Soils in the area are mostly Lake Charles clay, Bernard clay loam, or Bernard-Edna complex, which is about 60 percent Bernard clay and 40 percent Edna fine sandy loam. All of these soils are represented by Soil Conservation Service (SCS) soil Group D, which indicates they are somewhat poorly drained and very slowly permeable (less than 0.06 inches per hour in saturated soil).

Annual rainfall averages 52 inches, with periods of intense rainfall associated with tropical storms and localized thunderstorms occurring frequently throughout the year. About 60 percent of the precipitation usually occurs from April to September. **Exhibit 1.2** provides a wider topographic illustration with contour elevations and existing land cover.

1.2 Purpose and Objective

The objective of this analysis is to determine the necessary drainage features to mitigate impacts associated with the development. This report was prepared for submittal to BDD4 and the City of Manvel with the following objectives:

- Describe the proposed land use within the Tract and summarize the drainage elements necessary to convey runoff from the tract into Chocolate Bayou.
- Evaluate the proposed development's impacts of increased rainfall runoff on Chocolate Bayou for the 2-, 10-, and 100-year storm events.
- Demonstrate no adverse impacts (increases) to the flows and water surface elevations from pre-project conditions riverine analysis in the watershed using dynamic 1D modeling (XP-SWMM)

1.3 Prior Studies

The analysis presented in this report uses information from prior studies. The prior studies used in this analysis were not updated, or in any way altered in this analysis unless specified. Information from the following studies was used in this analysis, and to prepare this report.

- Brazoria County Municipal Utility District No. 30 Final Drainage Analysis, June 29, 2005, LJA Engineering, Inc.
- Southpoint Crossing Drainage Impact Analysis, July 24, 2018, LJA Engineering, Inc.
- BCMUD 30 and BCMUD 43 Prorated Siphon Capacity, January 10, 2007, LJA Engineering, Inc

1.4 Project Datum

Because prior studies of Presidio (BCMUD 30) are tied to the National Geodetic Vertical Datum (NGVD) 1987 adjustment, equations were established to adjust the elevations to the project datum and topography datum for Presidio (NAVD 88, 2001 adj). The following equations were obtained from the June 2005 DIA to adjust prior vertical datums:

- NAVD 88, 2001 adjustment = NAVD 29, 1987 adjustment - 0.32 feet
- NGVD 29, 1987 adjustment = NGVD 29, 1973 adjustment - 1.27 feet
- NAVD-88, 2001 adjustment = NGVD 29, 1973 adjustment - 1.59 feet

Elevations referenced in this report are on NAVD 88, 2001 adjustment, unless otherwise noted.

1.5 Effective Floodplain

According to the Brazoria County Flood Insurance Rate Map (FIRM) Panel 48039C0110K, dated December 30, 2020, approximately 31.5 acres will be developed within a Special Flood Hazard Area (SFHA) designated as Zone AO. Zone AO indicates that no base flood elevation has been determined, but shallow flooding occurs, usually from sheet flow, and is indicated as a depth on the FIRM. The AO Zone depth affecting the development is 2 feet. **Exhibit 1.3** shows the Effective Special Flood Hazard Area in the vicinity of the Tract.

Of the 31.5 acres that encroach into the Zone AO SFHA, approximately 1.5 acres will be filled to reclaim land for development. The remaining ~30 acres lie within a proposed pond easement and will remain Zone AO post development. Based on the AO depth of 2 feet, the volume displaced by fill in the floodplain is approximately 3 acre-feet.

Upon completion of the fill, a Letter of Map Revision based on Fill (LOMR-F) can be requested from FEMA to revise the Zone AO delineation.

1.6 Proposed Development

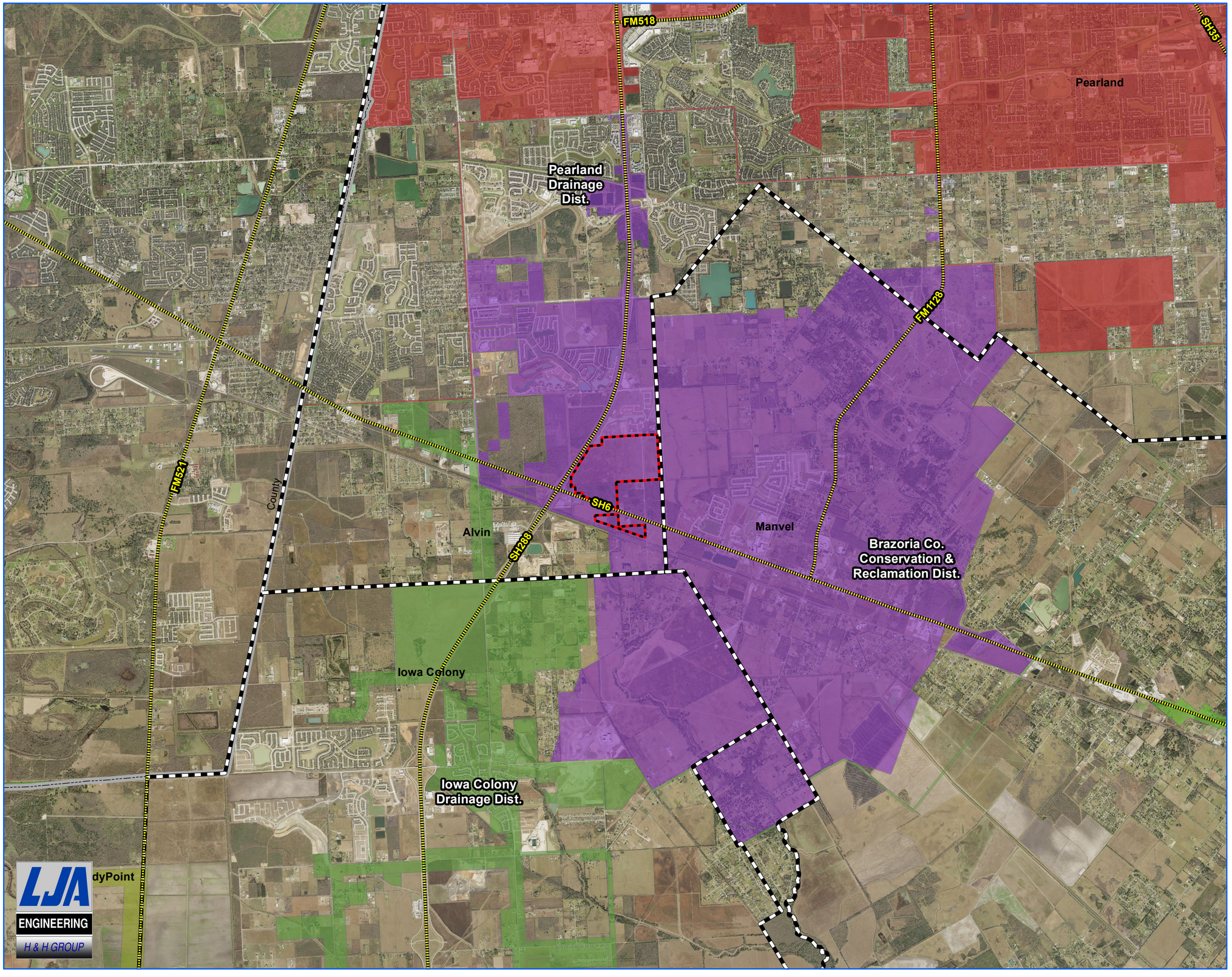
The proposed development will add 160.15 acres of commercial use, 84.80 acres of single family use, 18.01 acres of multi-family use, 63.43 acres of detention ponds, 8.01 acres of improved easements and buffers, 24.00 acres of collector roads. The remaining areas consist of existing ROWs and channel easements that will remain unchanged. **Exhibit 1.4** illustrates the proposed land use in the Presidio Tract. The excess runoff from the development will be captured and attenuated in 4 proposed ponds. Mitigation for the developed runoff and lost floodplain storage will be provided with the drainage improvements summarized below.

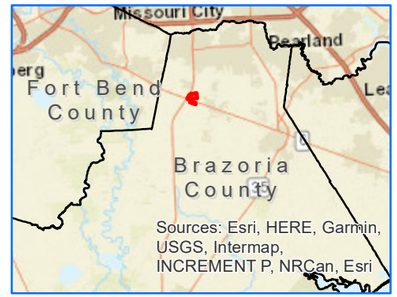
1.7 Regulatory Jurisdictions

The Tract lies within both Brazoria County and the City Manvel City Limits. The Tract is also within the boundaries of Brazoria Drainage District No. 4 (BDD4). Brazoria County and the City of Manvel are participants in the National Flood Insurance Program (NFIP) and as such are required to regulate new development to comply with the minimum requirements of the NFIP, including coordination with adjoining jurisdictions. In its enabling legislation BDD4 was given all of the powers of a conservation and reclamation district created under Section 52, Article III, or Section 39, Article XVI, Texas Constitution, and governed by Chapters 50 and 56, Texas Water Code. Therefore, BDD4 is responsible for the “improvement of rivers, creeks, and streams to prevent overflows" and must ensure that any proposed improvements comply with BDD4’s adopted drainage criteria.

This analysis has been conducted to comply with all drainage criteria outlined by BDD4’s Rules, Regulations, and Guidelines, adopted August 8, 2023 and amended March 6, 2024. BDD4 will approve the proposed drainage plan if the following conditions are met:

- There is no increase in the 2-year, 10-year, and 100-year peak discharge from the site and no increase in the 10-year and 100-year peak discharge or water levels in the affected drainage artery.
- Adequate provisions are made to detain the drainage peak discharge to offset any increased in the 2-year, 10-year, and 100-year site runoff discharge rate, as well as the 10-year and 100-year peak discharge or water levels in the affected drainage artery; or
- Drainage artery deficiencies are corrected or improved, at developer's expense, to carry any projected additional load resulting from the proposed development to a regional detention facility.





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Miles
0 0.5 1 2
One Inch Equals 1 Mile

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- Drainage Districts
- Manvel City Limits
- Iowa Colony City Limits

Exhibit 1.1

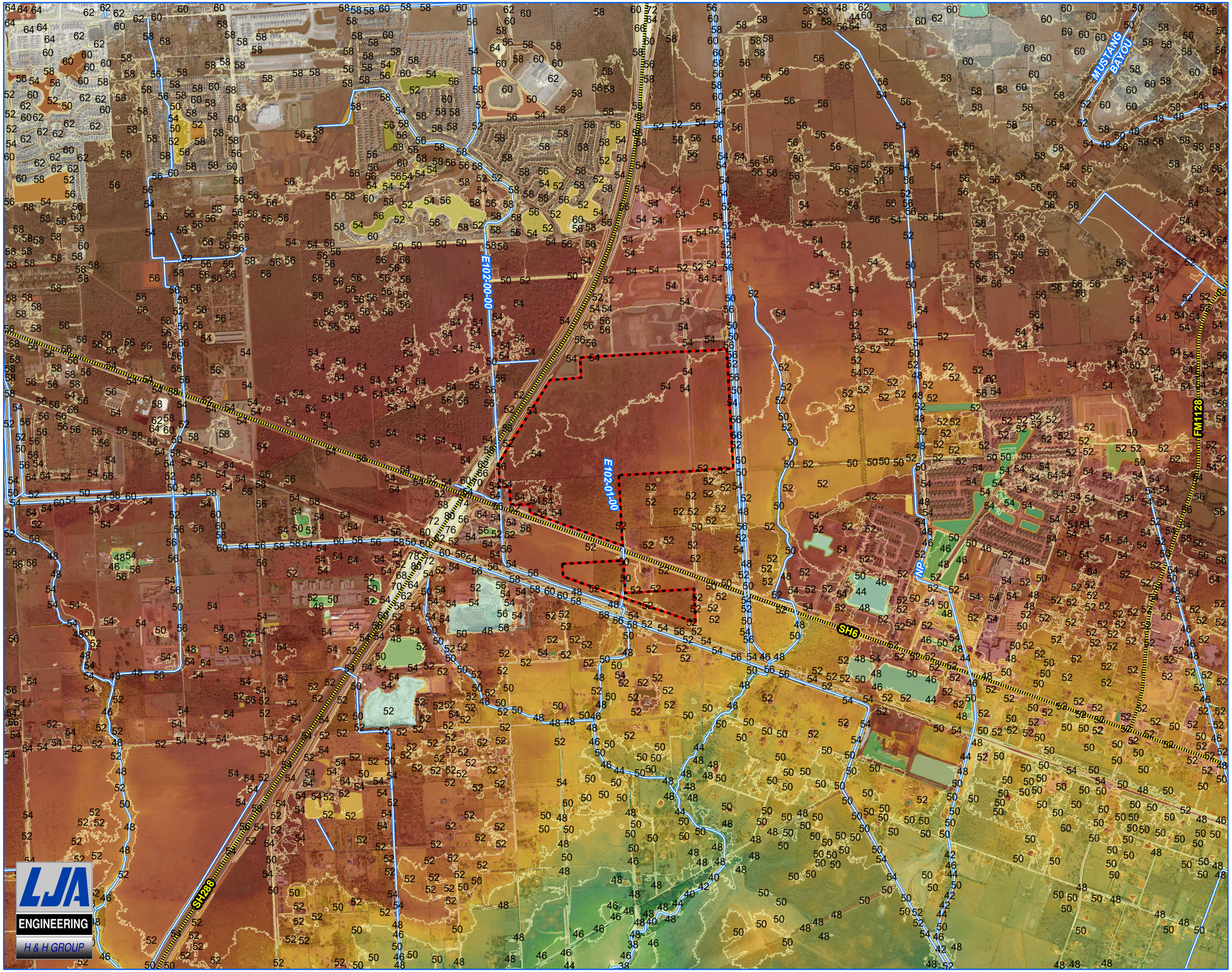
PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

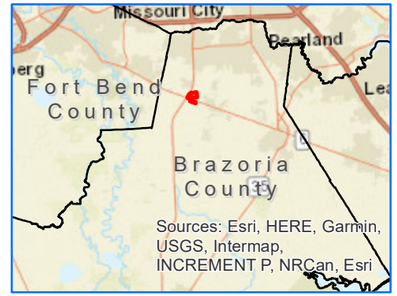
VICINITY MAP

Date: November 2025 Job No. 2013-2512

LJA ENGINEERING
H & H GROUP

LJA LAND DEVELOPMENT





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Feet

0 1,000 2,000 4,000

One Inch Equals 2000 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- 2' Interval Contour (TNRIS)

LJA ENGINEERING
H & H GROUP

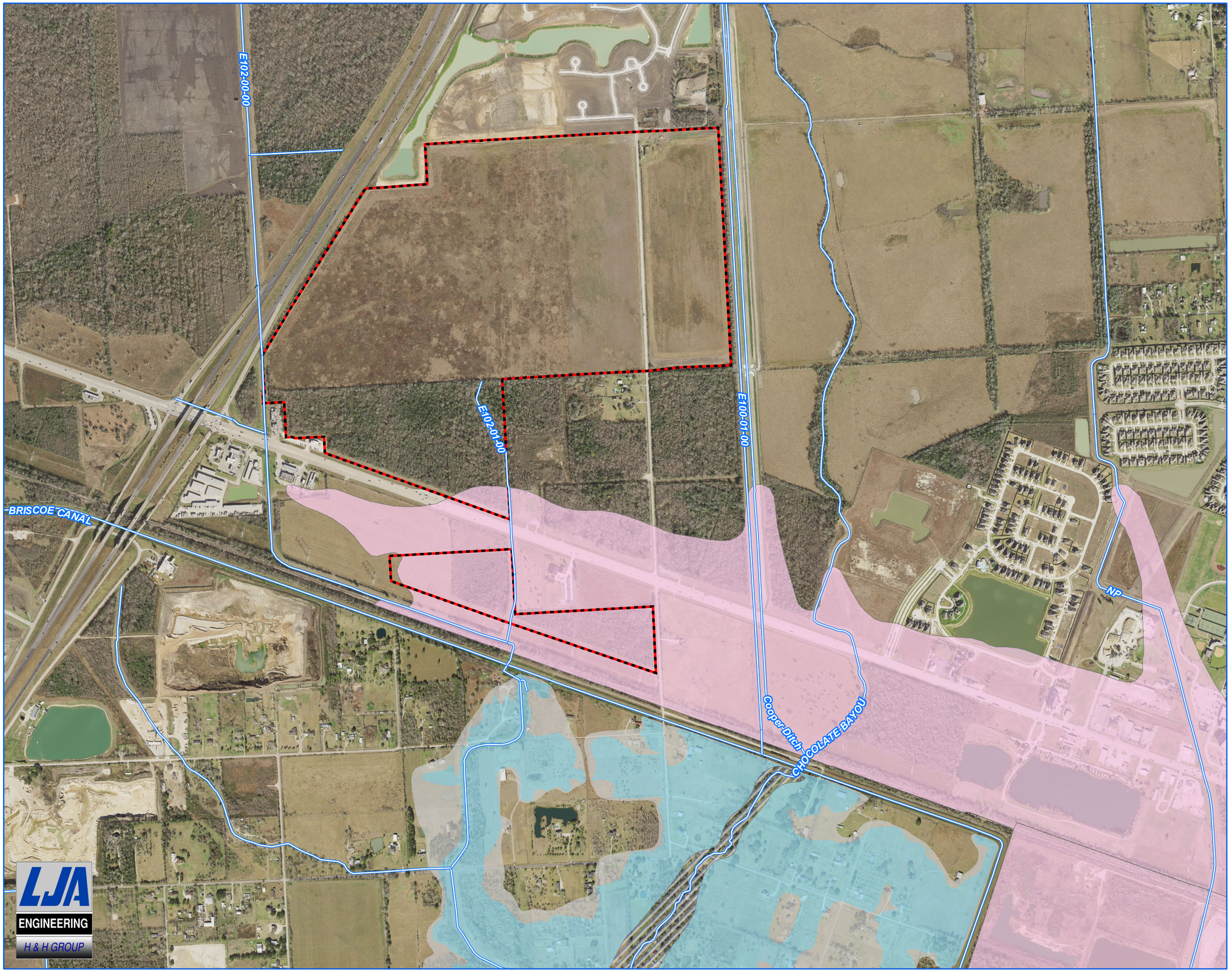
Exhibit 1.2

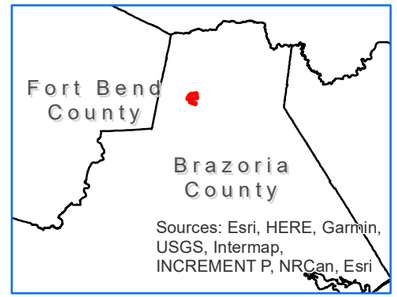
PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

EXISTING TOPOGRAPHY

Date: November 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT







Feet
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One Inch Equals 1000 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- HEC-RAS Cross Section
- 18.2 Effective 100-Year WSE
- Effective 100-Year Floodplain
- Effective Regulatory Floodway
- Effective 500-Year Floodplain
- Effective Zone AO Floodplain (2')

LJA ENGINEERING
H & H GROUP

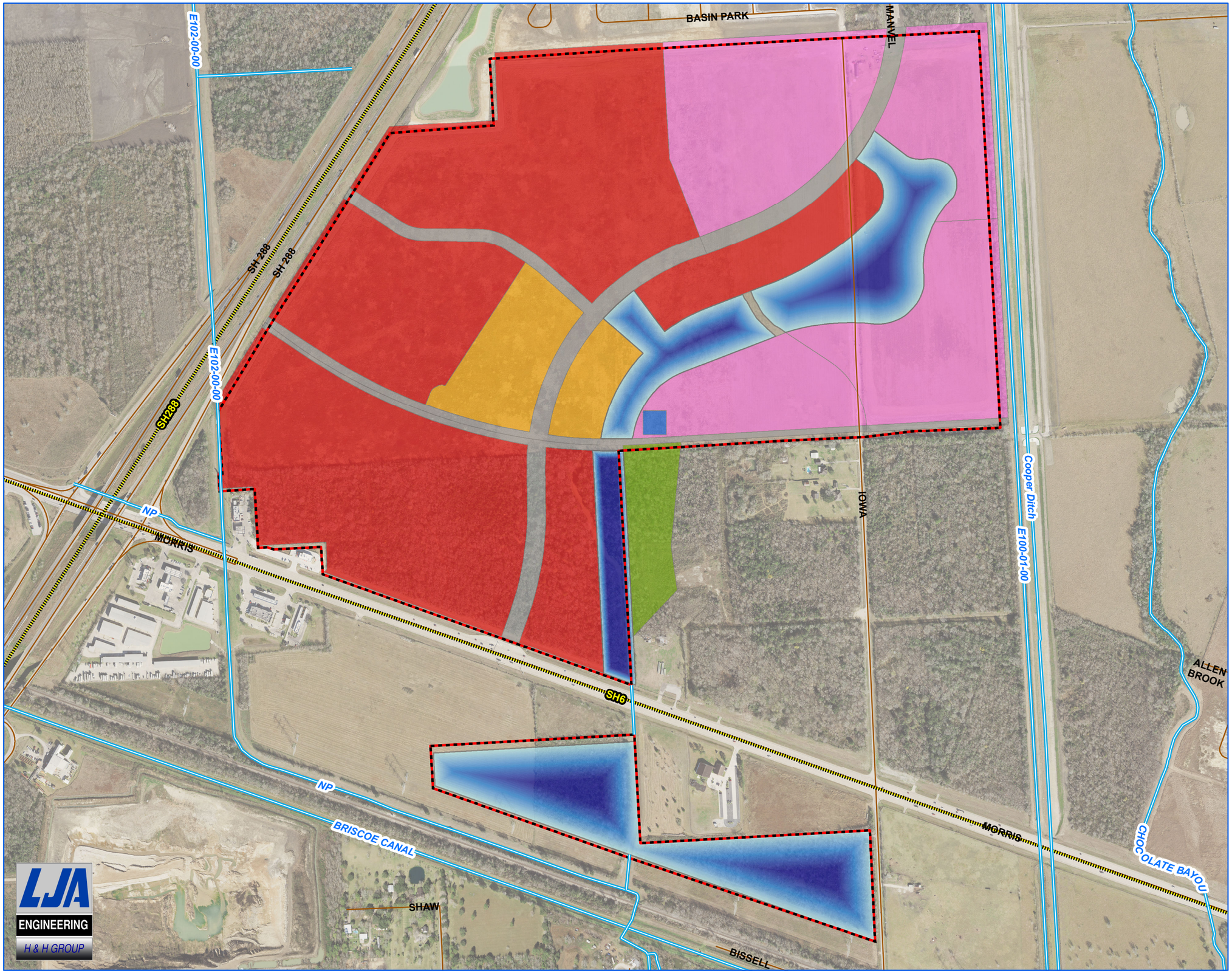
Exhibit 1.3

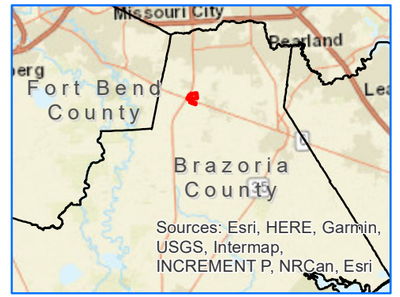
PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

FEMA EFFECTIVE SFHA

Date: November 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT





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Feet
0 300 600 1,200
One Inch Equals 600 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

Development Limits

PROPOSED LAND USE

- SF Residential (84.80 acres)
- Detention (63.40 acres)
- Multi Family (18.00 acres)
- Commercial (160.15)
- Open Area (8.01 acres)
- Roadway (24.01 acres)

Exhibit 1.4

PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

PROPOSED DEVELOPMENT

Date: November 2025 Job No. 2013-2512

LJA ENGINEERING
H & H GROUP

LJA LAND DEVELOPMENT

2.0 HYDROLOGY

The Chocolate Bayou Watershed experiences annual rainfall averages of 52 inches, with periods of intense rainfall associated with tropical storms and localized thunderstorms occurring frequently throughout the year. To effectively convey runoff from a development without adversely impacting the watershed or its receiving streams, drainage criteria has been established that provides a method for draining runoff so that property upstream or downstream of the proposed development is not impacted.

The drainage criteria used for the analysis of Presidio at Manvel follows Section 32 of the BDD4 Criteria amended March 6, 2024. The methodology of the hydrologic models for the development follows these criteria and is described in the following sections.

2.1 Hydrologic Methodology

The methodology used to determine the peak rainfall runoff for Presidio at Manvel adheres to the method recommended in the Regulations, and Guidelines of Brazoria County Drainage District No. 4, effective date August 8, 2023, which calls for the Rational Method to be used in determining peak flows for areas less than 300 acres.

Runoff hydrographs for each drainage area were generated using the Clark's Unit Hydrograph method in HEC-HMS. Clark's Time of Concentrations (Tc) was estimated using a velocity-based method. The storage coefficient (R) was calibrated until the peak flow from HEC-HMS matched the peak flow calculated using Site Runoff Curves.

2.1.1 Peak Discharge Calculations

In areas smaller than 300 acres, peak discharges were calculated using Rational Method as presented in the DCM to determine the peak discharge for the 2-year, 10-year, and 100-year events. The Rational Method uses drainage area, a runoff coefficient, and rainfall intensity to calculate the peak runoff from a drainage area. The equation for calculating the peak flow using Rational Method is shown below:

$$Q = CiA$$

where Q = peak runoff for a given storm event (cfs)
C = runoff coefficient
i = rainfall intensity (in/hr)
A = area of the sub-watershed (acres)

The rainfall intensity is the average rainfall rate in inches per hour, which is considered for a particular basin and is selected on the basis of design rainfall duration and design frequency of occurrence. The intensity is calculated from rainfall runoff coefficients and Time of Concentration using the following equation:

$$\mathrm{i} = \frac{\mathrm{b}}{(\mathrm{Tc}+\mathrm{d})^{\mathrm{e}}}$$

The e,b,d coefficients along with the time of concentration are used to calculate the rainfall intensity. Table 34-3 of the DCM includes the e, b, d coefficients recommended by BDD4. The e, b, d coefficients used in this analysis are shown in **Table 2.1**

Table 2.1 **EBD Coefficients – Brazoria County Drainage District No. 4**			
Return period	e	b	d
2-year	0.754	57.44	11.511
5-year	0.712	58.019	9.236
10-year	0.676	57.515	7.777
25-year	0.618	52.78	5.022
50-year	0.574	49.157	3.081
100-year	0.533	46.316	1.555

Time of concentration (Tc) was determined from velocity based calculations as a function of the longest flow path for overland flow, shallow concentrated flow, and channel flow conditions. The time of concentration for various flow regimes, including sheet flow, shallow concentrated flow, and channel flow, can be approximated by the following equation:

$$T_c = \frac{L}{60\mathrm{V}} + Ti$$

where Tc = Time of Concentration (channel)
L = Channel flow length (Feet)
Ti = Initial Time (min)\

The initial time is 10 minutes for developed flows and 15 minutes for undeveloped flows. Various flow conditions and their associated velocities are presented in **Table 2.2**.

Table 2.2 **Representative Velocities for Varying Flow Conditions**		
Flow Condition	**Min Velocity (fps)**	**Max Velocity (fps)**
Thick Vegetation	0.25	0.35
Grass	0.35	0.50
Bare Ground	1.50	1.50
Paved Area	1.50	1.50
Ditch/Channel	2.00	2.50
Storm Sewer	3.00	3.00

The computed time of concentration from the Rational Method was used as the Clark's Time of Concentration to calculate the runoff hydrograph using Clark's Unit Hydrograph Method for areas less than 300 acres. To match the resulting peak flow from Clark's Unit Hydrograph Method to that computed from the Rational Method, the Storage Coefficient (R) was adjusted until the peak flow from HEC-HMS matched the peak flow calculated with the Rational Method.

2.1.2 Clark's Unit Hydrograph Method

The Clark Unit Hydrograph method is the preferred methodology to generate a storm runoff hydrograph representative of a drainage area. The Clark Unit Hydrograph is described by three parameters: the Time of concentration (TC) , storage coefficient (R) and a time-area curve. The Army Corps of Engineers HEC-HMS (Version 3.5) computer program was used to generate storm runoff hydrographs for the proposed development.

2.1.3 Design Storm Rainfall Distribution

BDD4 requires the 50% annual chance (2-year), 10% annual chance (10-year), and 1% annual chance (100-year) events to be analyzed to demonstrate no impacts from the proposed development. Rainfall distribution is based on the National Oceanic Atmospheric Administration's (NOAA) Atlas 14 rainfall data. The rainfall distribution used for this Drainage Impact analysis is shown below in **Table 2.3**.

Table 2.3
Rainfall Distribution for Brazoria County Drainage District No. 4

Duration	Recurrence Interval (Years)						
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	500-Yr
	Depth (Inches)						
5 min	0.60	0.74	0.86	1.04	1.17	1.31	1.65
10 min	0.95	1.18	1.3	1.65	1.87	2.09	2.59
15 min	1.21	1.49	1.73	2.07	2.34	2.61	3.27
30 min	1.73	2.13	2.47	2.94	3.30	3.68	4.66
60 min	2.31	2.86	3.33	3.99	4.50	5.05	6.56
2 hr	2.90	3.63	4.32	5.36	6.24	7.23	9.91
3 hr	3.25	4.11	4.97	6.29	7.48	8.84	12.50
6 hr	3.88	4.99	6.15	7.97	9.66	11.60	17.00
12 hr	4.55	5.98	7.43	9.72	11.80	14.30	21.20
24 hr	5.27	7.05	8.83	11.60	14.10	17.00	25.30

2.1.4 Basin Delineations

According to prior studies summarized in Section 1.3, the proposed development lies within Drainage Areas 2 and Drainage Area 3 according to TxDOT construction plans for SH6 and SH288 improvements dated February 1, 1993. Drainage Area 2 drains across SH6 through 3-8x4 RCB culverts by way of E102-01-00. Downstream of SH6, E102-01-00 combines with E102-00-00 before its confluence with the siphons under the Brisco Canal. Drainage areas were not provided in the report, and the referenced TxDOT construction plans were too illegible to distinguish drainage area features from other linework. Therefore, the pre development drainage areas are not illustrated. However, the TxDOT plans found in the June 2005 study are included in the Appendix of this drainage analysis.

Proposed condition drainage areas were delineated based on the proposed land use concept.

2.1.5 Infiltration Losses

Precipitation abstractions were calculated using the Green and Ampt method. Analysis parameters are provided in **Table 2.4**.

Table 2.4
Green and Ampt Parameters for Chocolate Bayou

Parameter	Value
Initial Content	0.1 inches
Saturated Content	0.385 inches
Suction	12.45 inches
Conductivity	0.024 inches/hour

Impervious cover values were obtained from the BDD4 DCM. Typical values for Imperviousness and Runoff Coefficients are shown in **Table 2.5**.

Table 2.5 Brazoria County Drainage District 4 Impervious and Rational 'C' Values		
Land Use Type	**Impervious (%)**	**Rational Coefficient**
Paved Areas/Major Thoroughfares	90	1.00
Multi-Family/Apartments	85	0.85
Commercial/Industrial	95	0.95
Lakes/Ponds/Detention Facilities	100	1.00
Undeveloped	0	0.20
Residential – Lots 8000 sf - ¼ acre	40	0.55

2.2 Base Conditions Hydrology

Hydrologic models for existing conditions were not utilized for this analysis because the no impact conclusion is based on a comparison to the resulting discharges and water surface elevations at SH6 and the siphon from the June 2005 drainage impact analysis. **Table 2.6** summarizes the peak discharges across SH6 and the pro rated discharge at the siphon based on the June 2005 DIA.

Table 2.6 Base Condition Peak Discharges in E102-01-00*			
	3yr**	10yr	100yr
State Highway 6	525	673	869
Canal Siphons	32.4	32.4	32.4

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2yr analysis.

2.3 Revised Existing Conditions Hydrology

The peak discharges for the canal siphons are based on a pro rata share of the total contributing drainage area for that discharge point as explained in the 2005 DIA. The contributing drainage area to the siphons has since been modified as a result of development, thus affecting the pro rata share of the peak discharge. The revised existing conditions hydrology was analyzed with consideration to development, which changed the drainage area contributing runoff to the siphons.

2.3.1 Siphon Capacity

The siphon capacity was determined from the headloss across the siphon and flowline and size of the siphon taken from survey. This information was used to compute a peak flow through the siphon. The June 2005 DIA explains this in more detail. **Table 2.7** summarizes the siphon capacity for each storm event.

Table 2.7 Siphon Capacity for Each Storm Event			
	3yr**	10yr	100yr
2-72" CMP Siphons	124 cfs	166 cfs	222 cfs

**From DCM as of 2005. Current DCM now requires a 2yr analysis.

According to the June 2005 DIA and TxDOT construction plans for SH 6, two drainage areas contribute runoff to the existing siphons; TxDOT Drainage Area 1 drains to four 10-foot by 8-foot box culverts under SH 6 by way of E-102-00-00. E-102-00-00 then turns to the east and abuts the GCWA canal, joining with E-102-01-00 just upstream of the siphons. The BCMUD 30 development will not change the flow regime for the E102-00-00 drainage area. TxDOT Drainage Area 2 drains approximately 428 acres to three 8-foot by 4-foot box culverts by way of E-102-01-00. Approximately 105 acres south of SH 6 also drains to the siphons. Therefore, the total drainage area contributing runoff to the siphons is approximately 2,287 acres.

Since the June 2005 DIA, development has occurred within the siphon area described above, thus altering the flow regime. The Del Bello development north of Presidio has since been constructed, and runoff now drains to Cooper Ditch rather than E102-01-00. A proposed development, identified as the Morris Tract, southeast of Presidio, will also divert runoff from E102-01-00 to E100-00-00. Therefore, the total drainage area contributing to the siphons as of the date of this report is 1,889 acres. **Figure 2-1** illustrates the revised existing siphon area relative to the proposed development.

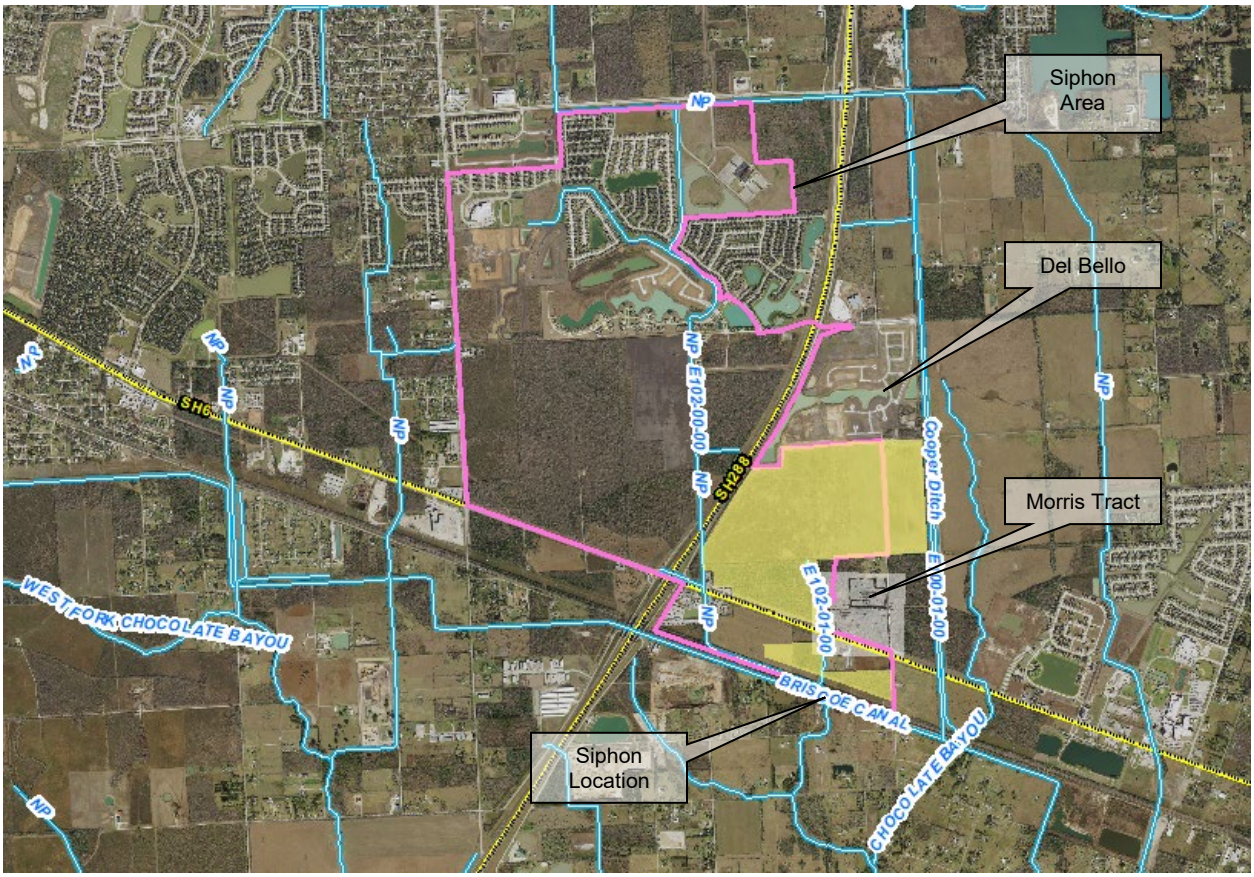


Figure 2-1 Revised Existing Siphon Area

Approximately 44 acres of the 358-acre Presidio Tract do not drain to E-102-01-00. Therefore, the total area within the Tract that currently drains to the siphons is approximately 314 acres, or approximately 16.6 percent of the total area draining to the siphons. The pro-rated capacity of the siphons is, therefore, 16.7 percent of 222 cfs, or 37.1 cfs.

Table 2.8 summarizes the revised existing peak discharges across SH6 and the pro rated discharge at the siphon.

Table 2.8
Revised Existing Condition Peak Discharges in E102-01-00*

	3yr**	10yr	100yr
State Highway 6	525	673	869
Canal Siphons	37.1	37.1	37.1

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2yr analysis.

The discharges from the proposed Presidio detention system will not exceed the pre-developed rates at State Highway 6 or the siphon.

2.4 Proposed Conditions Hydrology

The post-project drainage areas were delineated based on a proposed land use concept to reflect the proposed development. **Figure 2-2** illustrates the post project drainage areas and land use for Presidio.

Peak discharges from the proposed condition drainage areas were input into a post project conditions XP-SWMM model of the internal drainage and detention system to analyze the effects of the development during various storm events.



Figure 2-2 Post-Project Internal Drainage Areas

The proposed conditions Rational Method parameters and peak flows for the 2-, 10-, and 100-year events are shown in **Table 2.9**. The HMS calibrated R-values and peak flows for the proposed conditions are shown in **Table 2.10**. The proposed condition drainage areas and flow parameters are shown in **Exhibit 2.3**.

Table 2.9
Proposed Condition Rational Method Peak Flows

Drainage Area	Area	Runoff Coef.	% Imp	Tc	I_2	I_{10}	I_{100}	$*Q_2$	$*Q_{10}$	$*Q_{100}$
	ac			min	in/hr	in/hr	in/hr	cfs	cfs	cfs
BasinA	103.00	0.69	58.11	20.46	4.2	6.0	8.9	299.3	427.1	633.2
BasinB	138.32	0.90	87.77	21.30	4.1	5.9	8.7	515.7	735.7	1090.6
BasinC	87.51	0.89	86.37	28.20	3.6	5.1	7.6	278.2	396.8	590.2
BasinD	29.50	1.00	100.0	14.44	4.9	7.1	10.6	145.4	208.5	311.7

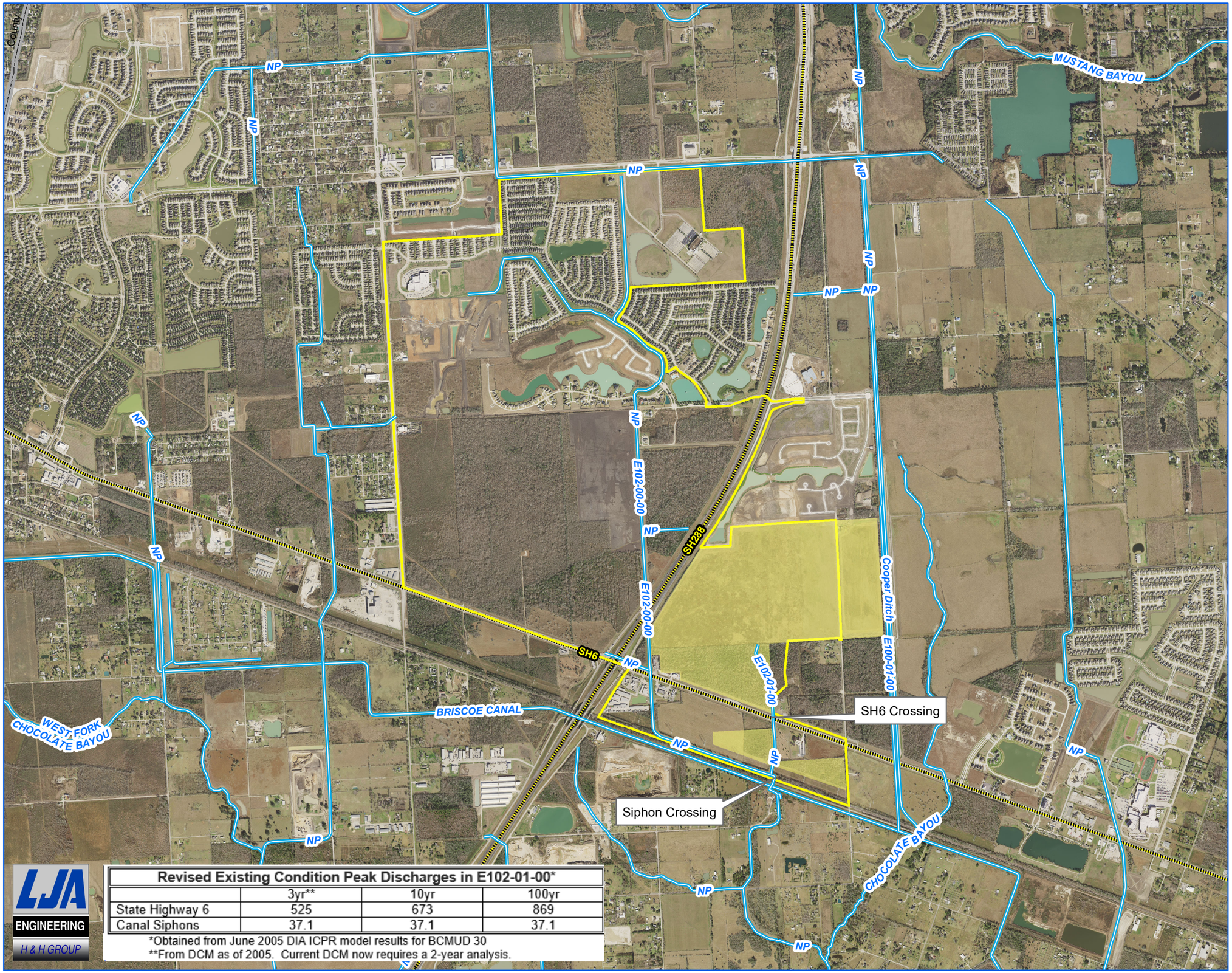
*Rational Method calculations may vary slightly from calibrated HMS flows in Table 2.9

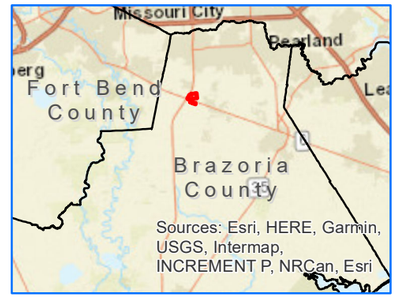
Table 2.10
Proposed Condition HMS Peak Flows

Drainage Area	Area	Tc	R_2	R_{10}	R_{100}	*Q_2	*Q_{10}	*Q_{100}
	mi^2	hr	hr	hr	Hr	cfs	cfs	cfs
BasinA	0.161	0.34	0.340	0.355	0.391	299.6	427.1	634.1
BasinB	0.216	0.35	0.161	0.167	0.185	515.8	736.0	1090.6
BasinC	0.137	0.47	0.232	0.243	0.265	278.2	396.5	590.7
BasinD	0.046	0.24	0.050	0.048	0.052	145.4	208.4	311.6

*From HMS Results; used in proposed condition hydraulic routing

The proposed conditions hydrologic models and supporting data for all the storm events can be found in the Appendix.





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Feet
0 1,000 2,000 4,000
One Inch Equals 2000 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- Current Siphon Area

Revised Existing Condition Peak Discharges in E102-01-00*			
	3yr**	10yr	100yr
State Highway 6	525	673	869
Canal Siphons	37.1	37.1	37.1

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2-year analysis.

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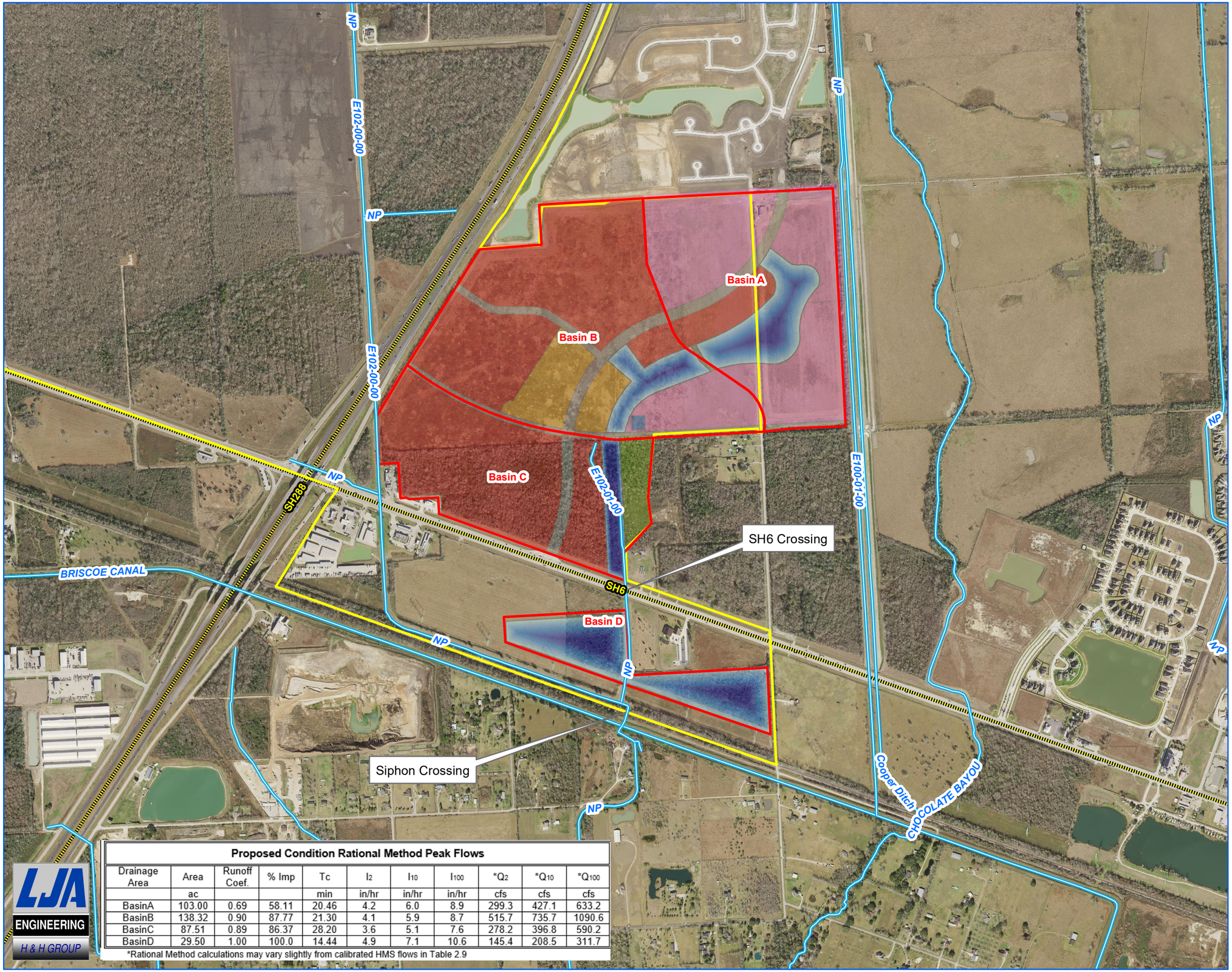
Exhibit 2.1

PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

REVISED EXISTING HYDROLOGY

Date: November 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT

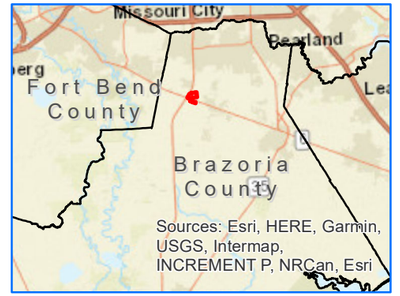


Proposed Condition Rational Method Peak Flows

Drainage Area	Area	Runoff Coef.	% Imp	Tc	I_2	I_{10}	I_{100}	$*Q_2$	$*Q_{10}$	$*Q_{100}$
	ac			min	in/hr	in/hr	in/hr	cfs	cfs	cfs
BasinA	103.00	0.69	58.11	20.46	4.2	6.0	8.9	299.3	427.1	633.2
BasinB	138.32	0.90	87.77	21.30	4.1	5.9	8.7	515.7	735.7	1090.6
BasinC	87.51	0.89	86.37	28.20	3.6	5.1	7.6	278.2	396.8	590.2
BasinD	29.50	1.00	100.0	14.44	4.9	7.1	10.6	145.4	208.5	311.7

*Rational Method calculations may vary slightly from calibrated HMS flows in Table 2.9

LJA ENGINEERING H & H GROUP



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0 500 1,000 2,000
One Inch Equals 1000 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- Current Siphon Area
- Proposed Site Drainage Areas

Exhibit 2.2

PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

PROPOSED HYDROLOGY

Date: November 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT

3.0 HYDRAULICS

Dynamic 1D hydraulic modeling with XP-SWMM v2021 was performed to evaluate the peak discharge and freeboard in the proposed drainage system during a 2-, 10-, and 100-year storm event.

3.1 Hydraulic Methodology

XP-SWMM was selected as the preferred software for the detailed detention analysis because of its ability to simulate a variety of complex conveyance systems including looped systems. XP-SWMM dynamically routes storm water through ponds, open channels, and/or closed conduits, and can simulate a variety of complex conveyance systems, including looped systems. The calculation accurately models backwater effects, flow reversal, surcharging, pressure flow, and interconnected ponds. This means that bi-directional flow can be modeled and the tail water elevation at an outfall is considered in the calculations. Therefore, for analyzing a series of lakes, connected by culverts or controlled by weirs, XP-SWMM provides a more “real world” model.

3.2 Existing Conditions Hydraulics

Existing conditions hydraulics were not analyzed in this drainage study. The no impact conclusion is based on a comparison to the resulting water surface elevations and discharges at SH6 from the June 2005 DIA, and the current existing conditions discharges at the siphon as discussed in Section 2.3.

3.3 Proposed Conditions Hydraulics

The purpose of the hydraulic analysis is to route developed discharges through a proposed system of ponds and control structures to determine the detained peak discharge at the outfall into the siphon to demonstrate no increases in peak flows when compared to allowable peak discharges at the same locations. The hydraulic analysis of Presidio excludes consideration of backwater effects from the receiving streams, thus resulting in a worst-case discharge scenario and to demonstrate adequate freeboard in the ponds and detention rate for the proposed development pursuant to the DCM.

XP-SWMM uses a link→node concept to represent real-world systems. This concept requires that the drainage system be simplified into a network of nodes and links. A node is a discrete location in the drainage system where conservation of mass or continuity is maintained. Nodes are placed upstream and downstream of any structure (e.g., weirs, culverts, drop structures). In the XP-SWMM model, a node is placed at each point where a stage calculation is needed. Runoff hydrographs are assigned to nodes. All of the lakes and storage facilities are specified as nodes. Additional nodes can be added at the upstream and downstream ends of culverts or channel reaches to properly model these connections.

Links are connections between nodes and are used to transfer or convey water through the system. The entire system of nodes and links forms the nodal network and serves as the computation framework for XP-SWMM.

The proposed drainage system for Presidio will consist of 4 interconnected ponds (nodes) that will drain through a series of equalizer culverts (links), then ultimately draining to the siphon (downstream boundary condition) through a combination pump and gravity outfall.

In accordance with BDD4 DCM, the proposed pumped volume will not total more than 75% of the total detention volume. Additionally, the pump shall not operate at elevations above the gravity discharge elevation.

Figure 3-1 illustrates the node-link schematic for the proposed drainage system in the Tract.

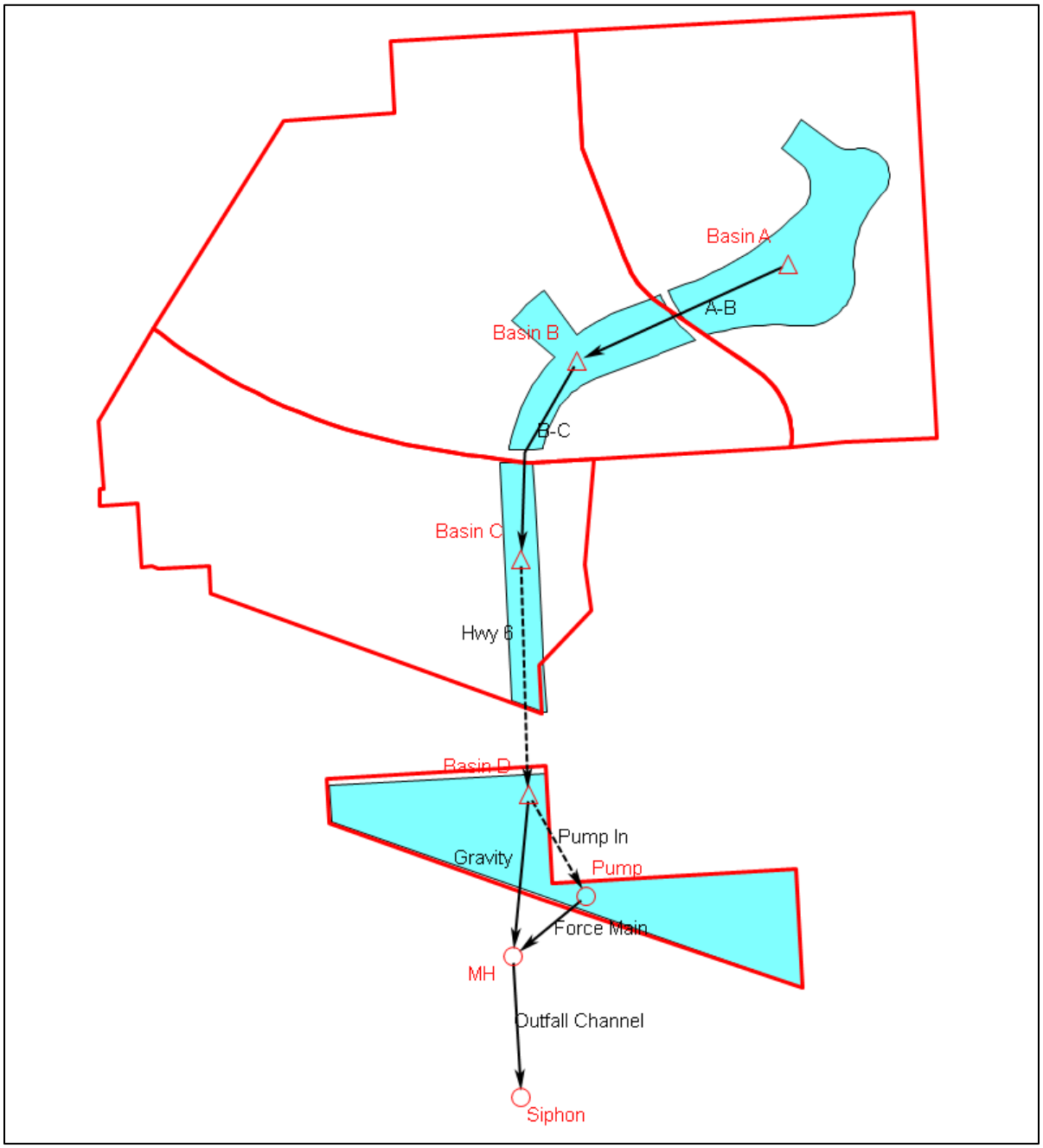


Figure 3-1 Proposed XP-SWMM Drainage Schematic

3.3.1 Boundary Conditions

Every drainage system must have boundaries, or limits. While the upstream boundaries of a system typically do not require special consideration, downstream boundaries are important. The drainage system for Presidio at Manvel uses normal depth outfall at the downstream limits of the model to simulate a free outfall.

3.3.2 Lake Modeling

In XP-SWMM lakes are modeled as level pools. This implies that the water surface within the storage area is flat and rises or falls uniformly across the surface. A single node is used to model each lake's sub-area with a stage-area relationship to describe the water holding capacity of the lakes. The proposed drainage system for the tract includes four proposed ponds. A stage-area curve shown in **Table 3.1** was used to represent the storage capacity in each pond. The area reflects only the wet surface and does not include area for maintenance berms or other easements.

Table 3.1
Detention Pond Stage vs. Volume Relationship

Basin A			**Basin B**		
Elevation (ft)	Area (ac)	Volume (ac-ft)	Elevation (ft)	Area (ac)	Volume (ac-ft)
48.50*	15.12	0.00	48.50*	12.71	0
48.75	15.21	3.79	48.75	12.78	3.19
49.00	15.30	7.61	49.00	12.86	6.39
49.25	15.40	11.44	49.25	12.94	9.62
49.50	15.49	15.30	49.50	13.02	12.86
49.75	15.58	19.19	49.75	13.11	16.13
50.00	15.68	23.09	50.00	13.19	19.41
50.25	15.77	27.03	50.25	13.27	22.72
50.50	15.87	30.98	50.50	13.35	26.05
50.75	15.96	34.96	50.75	13.44	29.40
51.00	16.06	38.96	51.00	13.52	32.77
51.25	16.15	42.99	51.25	13.60	36.16
51.50	16.25	47.04	51.50	13.68	39.57
51.75	16.34	51.11	51.75	13.77	43.00
52.00	16.44	55.21	52.00	13.85	46.45
52.25	16.53	59.33	52.25	13.93	49.93
52.50	16.63	63.47	52.50	14.02	53.42
52.75	16.72	67.64	52.75	14.10	56.93
53.00	16.82	71.83	53.00	14.18	60.47
53.25	16.92	76.05	53.25	14.27	64.03
53.50	17.01	80.29	53.50	14.35	67.60
53.75	17.11	84.56	53.75	14.43	71.20
54.00	17.20	88.85	54.00	14.52	74.82
54.25	17.30	93.16	54.25	14.60	78.46
54.50	17.40	97.50	54.50	14.68	82.12
54.75**	17.50	101.86	54.75**	14.78	85.80
Basin C			**Basin D**		
Elevation (ft)	Area (ac)	Volume (ac-ft)	Elevation (ft)	Area (ac)	Volume (ac-ft)
48.50*	2.67	0.00	35.00*	12.46	0.00
49.00	2.80	1.37	35.50	12.70	6.29
49.50	2.93	2.80	36.00	12.95	12.70
50.00	3.06	4.29	36.50	13.20	19.24
50.50	3.20	5.86	37.00	13.46	25.90
51.00	3.33	7.49	37.50	13.72	32.70
51.50	3.47	9.19	38.00	13.98	39.62
52.00	3.61	10.97	38.50	14.24	46.68
52.50	3.75	12.80	39.00	14.50	53.86
53.00	3.89	14.71	39.50	14.76	61.18
53.50	4.03	16.69	40.00	15.03	68.63
54.00**	4.17	18.74	40.50	15.29	76.21
--	--	--	41.00	15.56	83.92

Table 3.1 Detention Pond Stage vs. Volume Relationship					
--	--	--	41.50	15.83	91.77
--	--	--	42.00	16.10	99.75
--	--	--	42.50	16.37	107.87
--	--	--	43.00	16.64	116.13
--	--	--	43.50	16.92	124.52
--	--	--	44.00	17.19	133.04
--	--	--	44.50	17.47	141.71
--	--	--	45.00	17.74	150.51
--	--	--	45.50	18.02	159.45
--	--	--	46.00	18.30	168.53
--	--	--	46.50	18.58	177.75
--	--	--	47.00	18.87	187.12
--	--	--	47.50	19.15	196.62
--	--	--	48.00	19.43	206.27
--	--	--	48.50	19.73	216.06
--	--	--	49.00	20.43	226.10
--	--	--	49.50	20.74	236.39
--	--	--	50.00	21.04	246.83
--	--	--	50.50	21.35	257.43
--	--	--	51.00	21.66	268.18
--	--	--	51.50	21.97	279.09
--	--	--	52.00	22.28	290.15
--	--	--	52.50	22.59	301.37
--	--	--	53.00	22.90	312.74
--	--	--	53.50	23.22	324.27
--	--	--	54.00**	23.54	335.96

*Normal Pool Elevation
**High Bank Elevation

3.3.3 Major Surface Water Inflow Points

In XP-SWMM, all inflows are assigned to nodes (point loading). This means that the rainfall runoff is assigned to specific nodes for routing through the drainage system. Hydrographs generated by HEC-HMS discussed in Section 2 were imported directly into corresponding nodes in the XP-SWMM model of the drainage system as inflow hydrographs. **Table 3.2** summarizes the inflow locations in the XP-SWMM model.

Table 3.2 Proposed Condition XP-SWMM Flow Locations					
HMS Node	Peak Inflow			Boundary Type	XP Node
	2yr	10yr	100yr		
Basin A	299.6	427.1	634.1	Flow Hydrograph	Basin A
Basin B	515.8	736.0	1090.6	Flow Hydrograph	Basin B
Basin C	278.2	396.5	590.7	Flow Hydrograph	Basin C
Basin D	145.4	208.4	311.6	Flow Hydrograph	Basin D

3.3.4 Conduit Modeling

Generally, closed conduits, weirs, and channels comprise the links used to connect the lake system. In XP-SWMM the flow direction can be set to both, positive only, or no flow. "Both" is the normal setting and allows for flow reversals to occur. The positive flow option allows flow only in the direction indicated by designating a "from" node and a "to" node. The outfalls for Basins A through C are set to "both" to allow equalization between the ponds. The Basin D gravity outfall is set to positive only to reflect a proposed flap-gate on the downstream end so that pumped discharge cannot backflow into the system. The Basin D pumped discharge (forcemain) outfall is also set to positive only since only pumped discharge can occur through this conduit. Details of the proposed major drainage elements within the Tract are summarized in **Table 3.3**.

Table 3.3
Proposed Drainage System Components

XP Link ID	From Node (U/S)	To Node (D/S)	Flow line (U/S)	Flow line (D/S)	Link Description
A-B**	Basin A	Basin B	41.50'	41.50'	3-7x5 RCB, 200'L
B-C**	Basin B	Basin C	41.50'	41.50'	4-7x5 RCB, 215'L
Hwy6	Basin C	Basin D	48.44'	48.36'	3-8x4 RCB, 285'L
Gravity	Basin D	MH	47.50'	47.40'	1-27" RCP, 200'L
Pump In	Basin D	Pump	--	--	16,600gpm (Firm Cap.)*
Force Main	Pump	MH	47.40'	47.40'	1-30" RCP, 100'L
Outfall Channel	MH	Siphon	47.40'	47.20'	Existing Natural Channel

*Firm capacity reflects the largest pump inoperable.
**Submerged culvert

3.3.5 Hydraulic Results

Table 3.4 summarizes the detention routing results for the 2-, 10-, and 100-year storm events. The freeboard will provide a factor of safety for storm events greater than the 100-year event.

Table 3.4
Detention Summary

Pond ID	Static WSE/FL	Highbank Elev.	100yr WSE	100yr Freeboard (ft)	100-year Volume (ac-ft)
Basin A	48.50	54.75	53.71	1.04	84.06
Basin B	48.50	54.75	53.60	1.15	69.09
Basin C	48.50	54.50	53.31	1.19	15.94
Basin D	35.00	54.50	52.92	1.58	309.92
				Total	**478.79**

The total detention volume provided by the proposed detention system is 479.01 acre-feet. This volume equates to a detention rate of 1.34 acre-feet per acre of detention provided for the 358.4 acres of development.

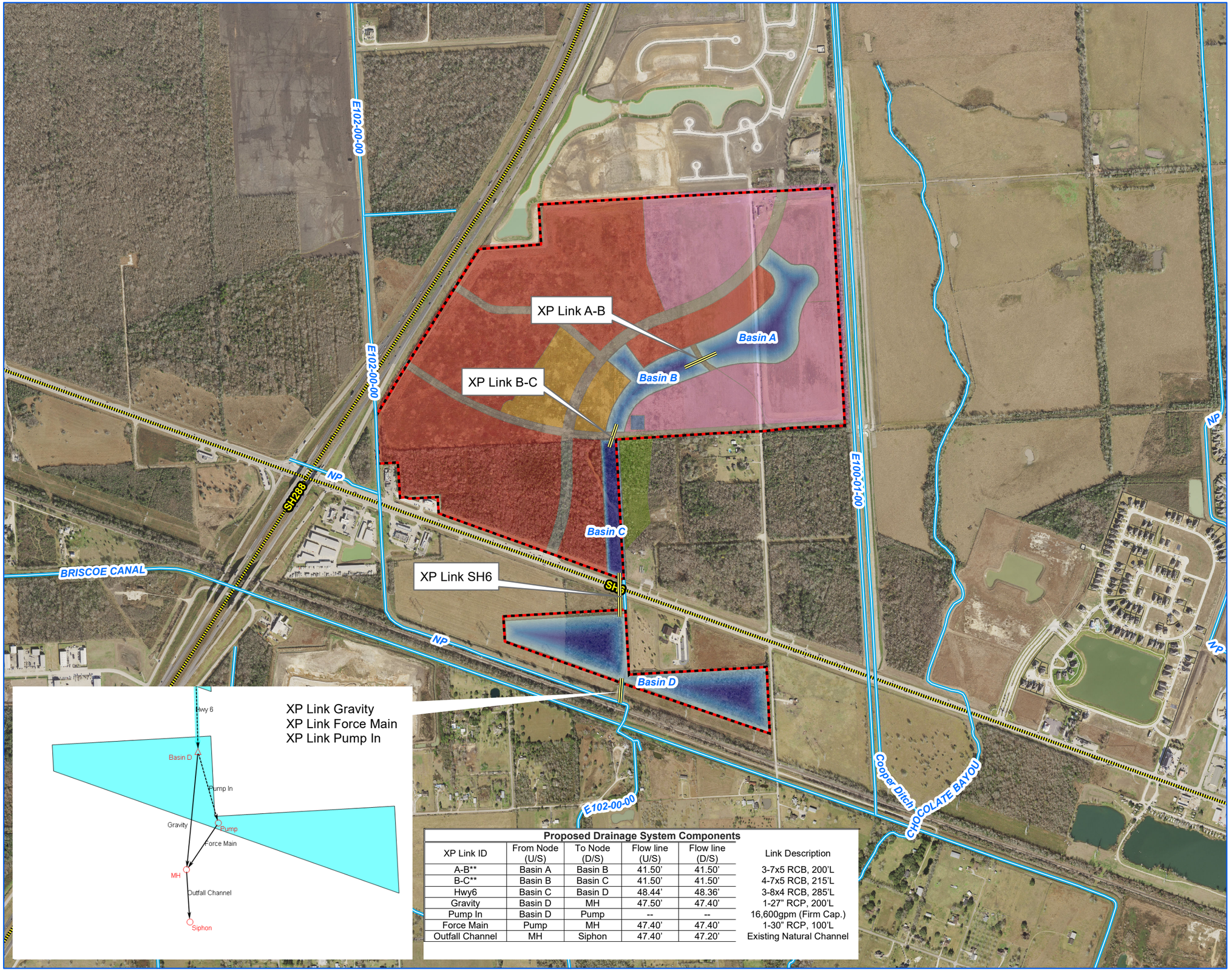
The volume of storage available in the freeboard is 13.6 acre-feet, which is sufficient surplus for mitigating lost floodplain storage due to fill.

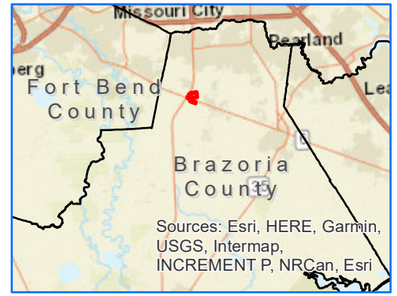
The XP-SWMM results also produced peak water surface elevations for the 2-year, 10-year, and 100-year storm events. **Table 3.5** provides the peak water surface elevations at key locations within the proposed system for these events.

Table 3.5
Water Surface Elevation Summary

Pond ID	Static WSE/FL	Highbank Elev.	2yr WSE	10yr WSE	100yr WSE	100-year Freeboard
Basin A	48.50	54.75	50.85	51.84	53.72	1.04
Basin B	48.50	54.75	50.84	51.80	53.60	1.15
Basin C	48.50	54.50	50.80	51.71	53.31	1.19
Basin D	35.00	54.50	41.35	46.69	52.88	1.58

Extreme event conveyance will be facilitated in the streets so that runoff is channeled to a receiving pond. Extreme event overflows between the ponds can occur across sags in the streets in the vicinity of the ponds. Extreme event features will be analyzed in more detail as development progresses, and more details are made available.





Proposed Drainage System Components

XP Link ID	From Node (U/S)	To Node (D/S)	Flow line (U/S)	Flow line (D/S)	Link Description
A-B**	Basin A	Basin B	41.50'	41.50'	3-7x5 RCB, 200'L
B-C**	Basin B	Basin C	41.50'	41.50'	4-7x5 RCB, 215'L
Hwy6	Basin C	Basin D	48.44'	48.36'	3-8x4 RCB, 285'L
Gravity	Basin D	MH	47.50'	47.40'	1-27" RCP, 200'L
Pump In	Basin D	Pump	--	--	16,600gpm (Firm Cap.)
Force Main	Pump	MH	47.40'	47.40'	1-30" RCP, 100'L
Outfall Channel	MH	Siphon	47.40'	47.20'	Existing Natural Channel



Feet
0 500 1,000 2,000
One Inch Equals 1000 feet

Note:
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Data Source:
HGAC_2020_Aerials

LEGEND

- Development Limits
- Proposed XP Link

Exhibit 3.1

PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

PROPOSED HYDRAULICS

Date: December 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT

4.0 RESULTS AND CONCLUSIONS

4.1 Presidio Local Storm Event

Detention routing was performed on the proposed drainage system for Presidio to demonstrate that sufficient freeboard and detention volume is provided in the proposed development as discussed in Section 3. This analysis reflects a local storm event over the development and normal depth discharge at the outfalls (no backwater effects from Chocolate Bayou). Results of the local event detention routing are summarized in **Table 4.1**. Results from this table demonstrate sufficient freeboard and peak discharges. Consideration should be given to other water surface elevations such as FEMA SFHA's and previous watershed studies for grading or setting minimum slab elevations.

Table 4.1
Detention Summary – Presidio Local Storm Event

Pond ID	Static WSE/FL	Highbank Elev.	2yr WSE	10yr WSE	100yr WSE	100yr Frbd. (ft)	100-year Vol (ac-ft)
Basin A	48.50	54.75	50.85	51.84	53.72	1.04	84.06
Basin B	48.50	54.75	50.84	51.80	53.60	1.15	69.09
Basin C	48.50	54.50	50.80	51.71	53.31	1.19	15.94
Basin D	35.00	54.50	41.35	46.69	52.88	1.58	309.92
						Total	**479.01**

During a 100-year storm event, approximately 479.01 ac-ft of developed runoff will be stored in the detention ponds. This detention rate equates to 1.34 acre-feet per acre for 358.4 acres of development.

The Presidio detention analysis also produced peak discharges at the outfalls, which were compared to the revised existing condition peak discharges summarized in Table 2.7. The revised existing and post project peak discharges are compared in **Table 4.2**.

Table 4.2
Discharge Comparisons

Outfall ID	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.
	2-year Q			10-year Q			100-year Q		
Hwy6	525**	269	-256	673	464	-209	869	818	-51
Siphon	--	--	--	--	--	--	37.1	37.0	-0.1

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2yr analysis.

It should be noted that the June 2005 analysis did not reflect Atlas 14 precipitation, whereas the flows computed for the Presidio drainage used Atlas 14 precipitation in accordance with the current BDD4 DCM. Additionally, the revised existing conditions flow from the 2005 DIA was based on a 3-year storm event. The post project flows are based on a 2-year Atlas 14 storm event. These assumptions incur some conservatism in the drainage recommendations for the proposed development.

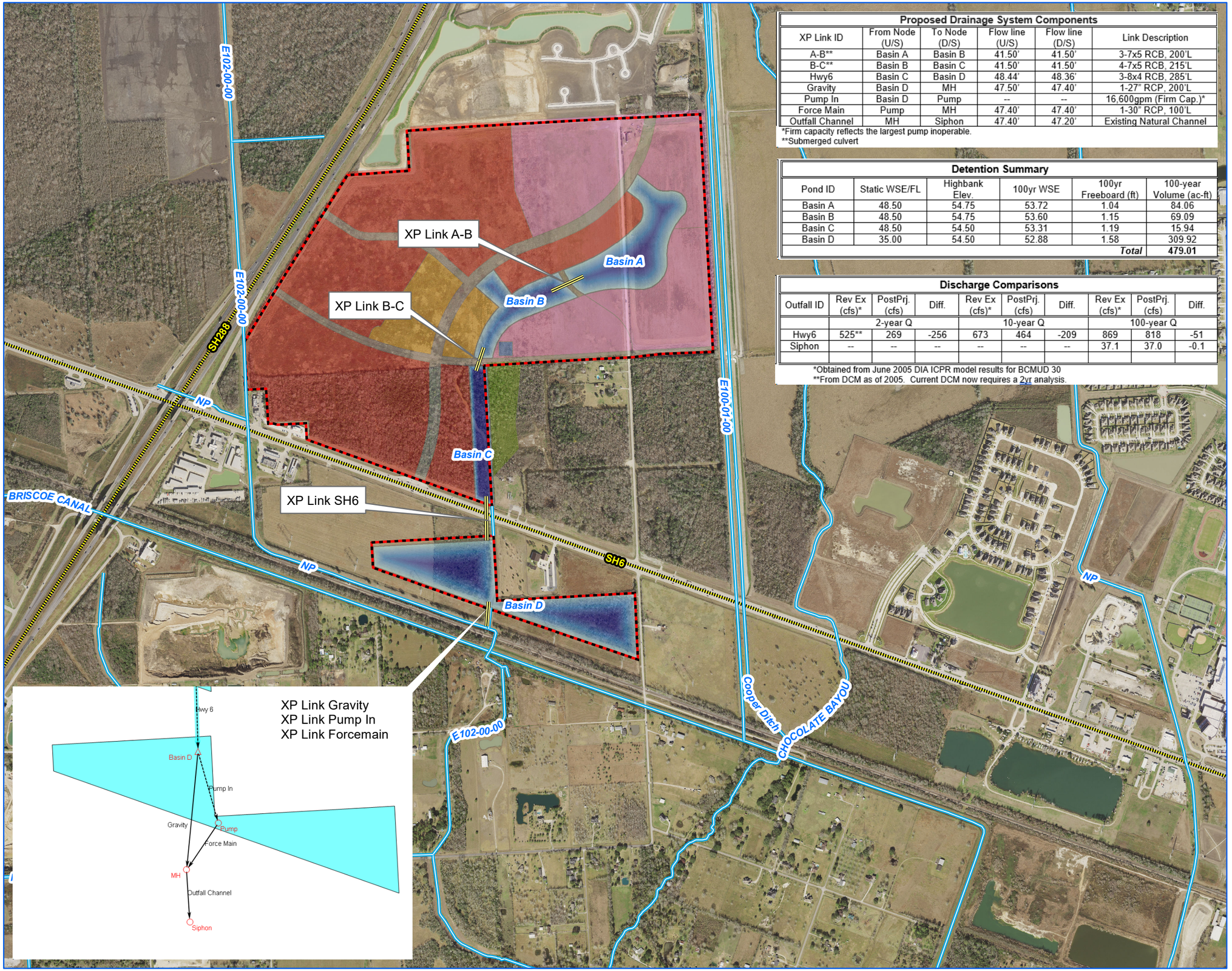
4.2 Conclusion

The proposed Presidio at Manvel development will add approximately 360 acres of development within the Chocolate Bayou Watershed. Results from the drainage analysis presented in this report show that the proposed development and corresponding drainage improvements can be constructed without adversely impacting the watersheds for storm events up to and including the 100-year storm event.

The proposed development will include reclaiming approximately 1.5 acres of land from the floodplain defined in the FEMA Effective Flood Insurance Rate Map. The lost floodplain storage can be mitigated with the proposed drainage improvements, which include floodplain and conveyance mitigation. As fill is placed in the FEMA regulatory floodplain, Letters of Map Change will be requested, as needed, to revise the effective flood insurance rate maps (FIRMs).

The analysis presented in this report was prepared from a conceptual development plan, and LiDAR topography was used for determining physical geometries and, thus, resulting water surface elevations. However, relative comparisons of pre project and post project conditions conclude that the proposed drainage plan will be sufficient for mitigating the 2-, 10-, and 100-year storm events. As development progresses and changes occur, or more details become available, the analysis will be updated to reflect such changes in future amendments.

For development to occur orderly and economically, proper planning is essential. The drainage analysis presented in this report was performed in accordance to BDD4 drainage criteria current as of the date of this report. The analysis shows that the proposed development can occur with no adverse impacts to the watershed provided it is constructed as designed. As development progresses and changes, additional and cumulative drainage reports supporting the proposed development will be submitted as needed.



Proposed Drainage System Components

XP Link ID	From Node (U/S)	To Node (D/S)	Flow line (U/S)	Flow line (D/S)	Link Description
A-B**	Basin A	Basin B	41.50'	41.50'	3-7x5 RCB, 200'L
B-C**	Basin B	Basin C	41.50'	41.50'	4-7x5 RCB, 215'L
Hwy6	Basin C	Basin D	48.44'	48.36'	3-8x4 RCB, 285'L
Gravity	Basin D	MH	47.50'	47.40'	1-27" RCP, 200'L
Pump In	Basin D	Pump	--	--	16,600gpm (Firm Cap.)*
Force Main	Pump	MH	47.40'	47.40'	1-30" RCP, 100'L
Outfall Channel	MH	Siphon	47.40'	47.20'	Existing Natural Channel

*Firm capacity reflects the largest pump inoperable.
**Submerged culvert

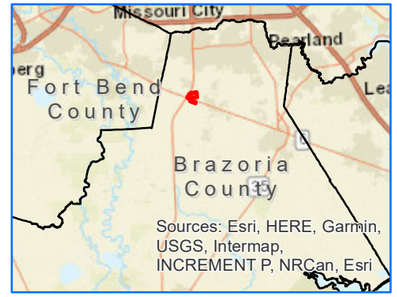
Detention Summary

Pond ID	Static WSE/FL	Highbank Elev.	100yr WSE	100yr Freeboard (ft)	100-year Volume (ac-ft)
Basin A	48.50	54.75	53.72	1.04	84.06
Basin B	48.50	54.75	53.60	1.15	69.09
Basin C	48.50	54.50	53.31	1.19	15.94
Basin D	35.00	54.50	52.88	1.58	309.92
				Total	**479.01**

Discharge Comparisons

Outfall ID	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.	Rev Ex (cfs)*	PostPrj. (cfs)	Diff.
	2-year Q			10-year Q			100-year Q		
Hwy6	525**	269	-256	673	464	-209	869	818	-51
Siphon	--	--	--	--	--	--	37.1	37.0	-0.1

*Obtained from June 2005 DIA ICPR model results for BCMUD 30
**From DCM as of 2005. Current DCM now requires a 2yr analysis.



N
W E
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Feet
0 500 1,000 2,000
One Inch Equals 1000 feet

Note:
This exhibit shows pertinent items necessary to illustrate the information described in the text and is not intended to include all physical characteristics of the area.

Data Source:
HGAC_2020_Aerials

LEGEND

Development Limits

Proposed XP Link

Exhibit 4.1

PRESIDIO AT MANVEL
DRAINAGE IMPACT ANALYSIS

PROPOSED DRAINAGE PLAN

Date: December 2025 Job No. 2013-2512

LJA LAND DEVELOPMENT

ORDINANCE NO. 2026-O-16

AN ORDINANCE OF THE CITY OF MANVEL, TEXAS AMENDING THE ZONING ORDINANCE OF THE CITY, BY CHANGING THE ZONING CLASSIFICATION OF A CERTAIN TRACT OF LAND CONSTITUTING APPROXIMATELY 392.98 ACRES FROM OPEN PLANNED USE DEVELOPMENT (O-PUD) DISTRICT TO PLANNED USE DEVELOPMENT (PUD) DISTRICT, SUCH TRACT BEING DESCRIBED AS BEING LOCATED IN H.T.& B. R. R COMPANY SURVEY SECTION 72; A.K.A. KATE EHRMANN SURVEY A-460 AND THE H.T. & B.R.R. COMPANY SURVEY SECTION 65, A-291, BRAZORIA COUNTY, TEXAS, PROVIDING FOR THE AMENDMENT OF THE CITY'S OFFICIAL ZONING MAP; PROVIDING FOR SEVERABILITY; AND PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000 FOR EACH DAY OF VIOLATION OF ANY PROVISION HEREOF.

* * * * *

WHEREAS, Milestone South Six Development, LTD., Tharaldson Ethanol Plant LLC., Sonmar of Scottsdale LLC., and Houston 118 LLC., are the owners (the "Owner") of certain 392.98-acre tract of land presently zoned in the Open Planned Use Development (O-PUD) District, pursuant to the City's Zoning Ordinance, as amended; and

WHEREAS, the aforementioned 392.98 acres of land was part of a Development Plan for 394.232 acres (The Presidio at Manvel) adopted by City Council by passing Ordinance No. 2007-O-26; and

WHEREAS, Ordinance No. 2007-O-26 indicates that in adopting the Development Plan, the City Council specifically finds that the Development Plan does not fully satisfy the requirements of Section 77-29 (d) of the City's Code of Ordinances and that the Owner must amend this Development Plan to provide additional information required by Section 77-29 (d) prior to any building permit being issued for construction of any structure on the property; and

WHEREAS, on December 23, 2025, the Owner, through LJA Engineering Inc ("Applicant"), made an application to the City to change the zoning classification of said land,

said land being more particularly described in Exhibit "A" attached hereto and for all things made a part hereof, from the Open Planned Use Development (O-PUD) District to the Planned Use Development (PUD) District; and

WHEREAS, the Planning, Development, and Zoning Commission and the City Council have conducted, in the time and manner required by law and the Zoning Ordinance of the City, a public hearing on such request; and

WHEREAS, the Planning, Development, and Zoning Commission has recommended approval of the application and the City Council deems it appropriate to grant such request, subject to certain regulations, restrictions, and conditions; now, therefore,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MANVEL, TEXAS:

Section 1. The facts and matters set forth in the preamble of this Ordinance are hereby found to be true and correct.

Section 2. The zoning classification of the 392.98 acre tract, generally located along the east side of SH 288 with majority of the acreage on the north side of SH 6 and about 45.5 acres on the south side, South of Del Bello residential development and west of Valencia residential development, and more particularly described by metes and bounds in Exhibit "A," and map/survey shown in Exhibit "B", attached hereto and for all things made a part hereof, is hereby changed from the Open Planned Use Development (O-PUD) District to Planned Use Development (PUD) District for uses as permitted within such zone classification, subject to the regulations, restrictions, and conditions hereinafter set forth.

Section 3. Development of the Property shall strictly comply with the **PUD Document**, attached hereto as Exhibit "C" and made a part hereof for all purposes, and the Development Plan adopted through Ordinance No. 2007-O-26 is hereby declared void.

Section 4. The Zoning District Map of the City of Manvel shall be revised and amended to show the designation of said land, as described and as provided in Section 2 above, with the appropriate reference thereon to the number and effective date of this Ordinance and a brief description of the nature of the change.

Section 5. The City Council hereby finds and determines that said rezoning comports to the City's comprehensive land use plan, and to the extent of any conflict, amends said comprehensive land use plan. This Ordinance shall in no manner amend, change, supplement, or revise any provision of any ordinance of the City of Manvel, save and except the change in zoning classification of said tract(s) as described above.

Section 6. In the event any section, paragraph, subdivision, clause, phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstance shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Manvel, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, or whether there be one or more parts.

Section 7. Any person who shall intentionally, knowingly, recklessly or with criminal negligence violate any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed $2,000.00. Each day of violation shall constitute a separate offense.

PASSED AND APPROVED on first reading this _____ day of _____, 2026.

PASSED, APPROVED, AND ADOPTED on second and final reading this _____ day of _____ , 2026.

_____
Dan Davis, Mayor

ATTEST:

_____
Tammy Bell, City Secretary

APPROVED AS TO FORM:

_____
Robert Gervais, City Attorney

May 11, 2026
Job No. 1140-2501

EXHIBIT A

DESCRIPTION OF
392.98 ACRES

Being 392.98 acres (17,118,302 square feet) of land located in the H.T. & B.R.R. Company Survey, Section 72, also known as Kate R. Ehrmann Survey, Abstract Number 460, the H.T. & B.R.R. Company Survey, Section 71, Abstract Number 291 and the H.T. & B.R.R. Company Survey, Section 65, Abstract Number 285 Brazoria County, Texas, a portion of which being out of and a part of Emigration Land Company Subdivision, a subdivision of record under Volume 2, Page 81 of the Map Records of Brazoria County, Texas (B.C.M.R.) and being all of that certain called 120.000 acre tract (exhibit "A"), all of that certain called certain called 23.595 acre tract (exhibit "B", part one), all of that certain called 1.000 acre tract (exhibit “B”, part two), and all of that certain called 30.244 acre tract (exhibit "B", part three), conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Las Cruses LLC, Sonmar Inn of Las Cruces L.L.C., and Midwest Heritage Inn of Gurnee Mills Inc. by an instrument of record under Document Number 2006018645 of the Official Records of Brazoria County, Texas (B.C.O.R.), all of that certain called 95.710 acre tract described as part one of a called 149.658 acre tract and all of the residue of that certain called 53.948 acre tract conveyed to Sonmar of Scottsdale, L.L.C., by an instrument of record under Document Number 2006021816, B.C.O.R., all of that certain called 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque L.L.C., by and instrument of record under Document Number 2020030095 of the Official Public Records of Brazoria County, Texas (B.C.O.P.R.), all of the residue of that certain called 3.8029 acre tract, all of the residue of that certain called 38.1005 acre tract, all of the residue of that certain called 6.115 acre tract, all of the residue of that certain called 10.2 acre tract, all of the residue of that certain called 17.1449 acre tract, all of the residue of that certain called 12.7523 acre tract, all of that certain called 3.3719 acre tract and all of the residue of that certain called 25.5279 acre tract conveyed to Milestone South Six Development, LTD. by an instrument of record under Document Number 2003061748, B.C.O.P.R., all of that certain called 8.995 acre tract conveyed to Tharaldson Motels II Inc by an instrument of record under Document Numbers 2007018499 and 2023046143, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “A” conveyed to Milestone South Six Development, LTD by an instrument of record under Document Number 2021074148, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “B” conveyed to Sonmar of Scottsdale, L.L.C. by an instrument of record under Document Number 2025030923, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “C” conveyed to A. Hasan Syed by an instrument of record under Document Number 2013057871, B.C.O.P.R., all of that certain called 0.115 acre tract, Directors Lot “D” conveyed to Sonmar of Scottsdale, L.L.C. by an instrument of record under Document Number 2017015185, B.C.O.P.R. and all of that certain 0.115 acre tract, Directors Lot “E” conveyed to Sonmar of Scottsdale,

L.L.C. by an instrument of record under Document Number 2020003757, B.C.O.P.R., said 392.98 acre tract being more particularly described by metes and bounds, in five (5) parts, as follows (all bearings referenced to the Texas Coordinate System, South Central Zone, NAD 83):

PART 1

BEGINNING at a 5/8-inch iron rod with cap stamped "WILSON SURVEYING GROUP", found, for the southwest corner of Reserve "F" of Del Bello Lakes Section 5, a subdivision of record under Document Number 2021059600, B.C.O.P.R., said Reserve "F" conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043951, B.C.O.P.R., same being the northwest corner of said called 120.000 acre tract and lying on the east right of way line of State Highway 288, called 420 feet wide, conveyed to the State of Texas by an instrument of record under Volume 1056, Page 748 of the Deed Records of Brazoria County, Texas (B.C.D.R.);

Thence, North 86° 40' 38" East, departing said east right-of-way line of State Highway 288, with a south line of said Reserve "F", same being the north line of said called 120.000 acre tract, 673.33 feet to a 5/8 inch iron rod with cap stamped "LJA SURVEY", found, for the southwest corner of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque L.L.C., same being the southeast corner of that certain called 0.2918 acre tract conveyed to Shea Homes Houston, L.L.C. by an instrument of record under Document Number 2020030094, B.C.O.P.R;

Thence, North 03° 05' 49" West, with the east line of said 0.2918 acre tract conveyed to Shea Homes Houston, L.L.C., same being the west line of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque, L.L.C., 443.26 feet to a 5/8 inch iron rod found for the common north corner of said 0.2918 acre tracts, same being the most northerly northwest corner of the herein described tract and lying in an easterly interior line of Reserve "C" of said Del Bello Lakes Section 5, said Reserve "C" conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2022015173, B.C.O.P.R.;

Thence, North 86° 40' 18" East, with an easterly interior line of said Reserve "C", a portion of the south line of Reserve "B" of said Del Bello Lakes Section 5 conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043951, B.C.O.P.R., same being the north lines of said 0.2918 acre tract conveyed to Sonmar of Scottsdale L.L.C., Sonmar of Albuquerque, L.L.C. and said 120.000 acre tract, at 29.27 feet pass the common north corner of said

0.2918 acre tract and said 120.000 acre tract, continuing with the north line of said 120.000 acre tract and the south line of said Reserve "B", in all a total distance of 751.39 feet to a 5/8 inch iron rod with cap stamped "LJA SURVEY", found, for the northeast corner of said 120.000 acre tract, same being the northwest corner of the aforementioned 23.595 acre tract;

Thence, North 86° 38' 04" East, continuing with the south line of said Reserve "B", the south line of Reserve “A” of Del Bello Lakes Section 4, subdivision of record under Document Number 2020036283, B.C.O.P.R., said Reserve “A” conveyed to Brazoria County Municipal Utility District Number 43 by an instrument of record under Document Number 2023043944, B.C.O.P.R. and the south line of Reserve “B” of Del Bello Lakes Section 3, A subdivision of record under Document Number 2020006365, B.C.O.P.R., same being the north line of said called 23.595 acre tract, and the herein described tract, 1,511.07 feet to a 5/8 inch iron rod with cap stamped “KALKOMEY”, found, for the northeast corner of said called 95.710 acre tract and the herein described tract, said point lying in the west right of way line of County Road 82, also known as Iowa Lane, called 60 feet wide;

Thence, South 02° 29' 45" East, with the west right of way line of said County Road 82, same being the east line of said called 95.710 acre tract, 2,595.70 feet to a 5/8 inch iron rod, found, for the southeast corner of said called 95.710 acre tract, and the herein described tract, said point lying in the north line of a 25 foot wide road right of way easement per plat of said Emigration Land Company Subdivision;

Thence, South 86° 49' 17" West, with the north line of said road right of way easement, same being a southeast interior line of the herein described tract and in part a southeast interior line of said called 23.595 acre tract, 1,512.55 feet to a point for corner;

Thence, South 02° 56' 05" East, with a southeast interior line of said called 23.595 acre tract and the herein described tract, same being the west lines of that certain called tract of land conveyed to Christy N. Ngo by an instrument of record under Document Number 2019034949, B.C.O.P.R., that certain called 10 acre tract conveyed to William C. Allen by an instrument of record under Document Number 2017061766, B.C.O.P.R. and that certain called 3.030 acre tract conveyed to Milestone South Six Development, LTD by an instrument of record under Document Number 2019026571, B.C.O.P.R., 1,549.24 feet to a 5/8 inch iron rod, found for the southwest corner of said called 3.030 acre tract, same being the southeast corner of said called 23.595 acre tract, said point lying on the north right of way line of State Highway 6, called 200 feet wide;

Thence, North 70° 28' 11" West, with the north right of way line of said State Highway 6, same being the south lines of said called 23.595 acre tract, the aforementioned 3.8029 acre tract, the aforementioned 120.000 acre tract, the aforementioned residue of a called 6.115 acre tract and the herein described tract, 2,147.18 feet to a point for corner for the southwest corner of said residue tract, same being the southeast corner of that certain called 1.166 acre tract conveyed to Global New Millenium Partners, LTD by an instrument of record under Document Number 2017054867, B.C.O.P.R.;

Thence, North 02° 37' 58" West, with the east line of said called 1.166 acre tract, same being the west line of said residue tract and a southwest interior line of the herein described tract, 206.42 feet to a point for corner for the north common corner of said called 1.166 acre tract and said residue tract, said point lying in the south line of the aforementioned 8.995 acre tract;

Thence, South 86° 42' 16" West, with the north line of said called 1.166 acre tract, same being the south line of said called 8.995 acre tract and a southwest interior line of the herein described tract, 416.54 feet to a point for corner for the northwest corner of said called 1.166 acre tract, same being the southwest corner of said called 8.995 acre tract;

Thence, North 03° 28' 32" West, with a west line of said called 8.995 acre tract, 384.02 feet to a point for corner;

Thence, South 86° 32' 02" West, with a northwesterly interior line of said called 8.995 acre tract, 226.68 feet to a point for corner said point lying in the east line of that certain called 1.580 acre tract conveyed to Charles Barclay Burrage, et al by an instrument of record under Document Number 2023004956, B.C.O.P.R.;

Thence, North 03° 22' 47" West, with the east line of said called 1.580 acre tract, same being the northwest line of said called 8.995 acre tract, 107.16 feet to a point for corner said point lying in the south line of a 50 foot road right of way easement per said plat of Emigration Land Company Subdivision;

Thence, North 86° 50' 19" East, with the south line of said roadway easement, same being the north line of said called 8.995 acre tract, 36.02 feet to a point for corner;

Thence, North 02° 56' 34" West, over and across said road right of way easement, with the west line of the aforementioned 120.000 acre tract, 486.40 feet to a 5/8 inch iron rod with cap stamped 'LJA SURVEY', found lying in the east right of way line of aforementioned State Highway 288;

Thence, North 29° 41' 19" East, with the east right of way line of said State Highway 288, same being the west line of said called 120.000 acre tract, 492.89 feet to a point for corner;

Thence, North 33° 09' 08" East, continuing with the east right of way line of said State Highway 288, same being the west line of said called 120.000 acre tract, 1,573.96 feet to the POINT OF BEGINNING and containing 260.60 acres (11,351,795 square feet) of land.

Part 2

BEGINNING at a 1/2-inch iron rod found on the east right-of-way line of County Road No. 82, Iowa Lane, 60.0 feet wide, and being the northwest corner of said 53.948 acre tract, same being the southwest corner of that certain called 1.367 acre tract conveyed to Joan Banneyer, by an instrument of record under Document Number 2005003981, B.C.O.R.;

Thence North 86° 38' 25" East, along the north line of said 53.948 acre tract and the south line of said 1.367 acre tract and the south line of Manvel Parkway (120 feet wide) as shown on Del Bello Boulevard and Manvel Parkway Street Dedication, a subdivision of record under Document Number 2019062193, and along the south line of the remainder of that certain called 56.104 acre tract conveyed to Shea Homes Houston, LLC by an instrument of record under Document Number 2018049942, B.C.O.R., 866.40 feet to the northwest corner of that certain called 7.57 acre tract conveyed to Gulf Coast Water Authority by an instrument of record under 2020044179, B.C.O.R.;

Thence South 03° 20' 50" East, departing the north line of said 53.948 acre tract and the south line of said 56.104 acre tract, and along the west line of said 7.57 acre tract, 2,598.60 feet to a point for corner on the south line of said 53.948 acre tract, said point being on the common line between the aforesaid Kate R. Ehrmann Survey, A-460 and the H.T.&B.R.R. Company Survey, Section 65, A-285;

Thence South 86° 50' 08" West, along the south line of said 53.948 acre tract and said common survey line, 910.84 feet to a 5/8-inch iron rod found for the southwest corner of said 53.948 acre tract and on the east right-of-way line of County Road No. 82, Iowa Lane;

Thence North 02° 29' 45" West, departing said common survey lines, and along the east right-of-way line of said County Road No. 82, Iowa Lane and with the west line of said 53.948 acre tract, 2,595.79 feet to the POINT OF BEGINNING and containing 52.98 acres (2,307,789 square feet) of land.

Part 3

"COMMENCING for reference at an old one (1) inch axle found marking the northeast corner of Lot No. 254 of said Emigration Land Company Subdivision, same being on the west right-of-way line of County Road No. 82 (Iowa Lane), varying width, and the northeast corner of that certain tract called 9.51 acres conveyed to B.J. Reynolds, et al, Trustee, by an instrument of record in File No. 97-004363 of the B.C.P.R.;

Thence South 02° 37' 36" East, 489.15 feet with the east line of Lot No. 254, the west right-of-way line of said County Road No. 82 and the east line of said 9.51 acre tract to the POINT OF BEGINNING of the herein described tract, same being the southeast corner of said 9.51 acre tract, the southeast corner of said Lot No. 254, the northeast corner of the aforesaid 12.7523 acre tract and the northeast corner of Lot No. 229 of said subdivision;

Thence South 02° 37' 36" East, with the west right-of-way line of said County Road No. 82, with the east line of said Lot No. 229 and the east line of said 12.7523 acre tract, at 660.82 feet pass the southeast corner of said Lot No. 229, the southeast corner of said 12.7523 acre tract and the north line of the aforesaid 40.0 foot wide Platted Roadway (not open), at 700.83 feet pass the northeast corner of Lot No. 228 of said subdivision, the northeast corner of said 17.1449 acre tract and the south line of said 40.0 foot wide Platted Roadway (not open) and continue with said west right-of-way line, the east line of Lot No. 228 and Lot No. 203, with the east line of said 17.1449 acre tract and with the east line of the aforesaid 3.3719 acre tract in all a total of 1631.61 feet to a point for corner from which a TxDOT brass disk in concrete bears South 40° 25' 35" East, 1.22 feet;

Thence South 53° 19' 57" West, 30.42 feet departing said east and west lines to a point for corner on the northerly right-of-way line of State Highway No. 6, 200.0 feet wide;

Thence North 70° 28' 11" West, 1231.29 feet with said northerly right-of-way line to a point for corner on a west line of the aforesaid 17.1449 acre tract and on the east line of that certain tract called 3.030 acres conveyed to Todd Properties, Ltd., by an instrument of record in File No. 98-036507 of the B.C.P.R.;

Thence North 02° 46' 47" West, with the common line between said 17.1449 acre and 3.030 acre tracts, at 472.70 feet pass the common north corner of said 17.1449 acre and 3.030 acre tracts, same being on the south line of the aforesaid 40.0 foot wide Platted Roadway (not open), and continue in all a total of 492.70 feet to a point for corner on the centerline of said 40.0 foot wide Platted Roadway (not open);

Thence North 86° 50' 47" East, 329.67 feet with the centerline of said 40.0 foot wide Platted Roadway (not open) to a point for corner;

Thence North 03° 18' 49" West, departing said centerline, at 20.00 feet pass the common south corner of Lot No. 229 and Lot No. 230 of said subdivision, the southwest corner of the aforesaid 12.7523 acre tract, the southeast corner of that certain tract called 10.0 acres conveyed to Jayne Meadows Cotter Allen, Trustee, by an instrument of record in File No. 03-043040 of the B.C.P.R. and continue with the common line between Lot No. 229 and Lot No. 230 and with the common line between said 12.7523 acre and 10.0 acre tracts in all a total of 680.20 feet to a point for corner, the common north corner of Lot No. 229 and Lot No. 230, the common north corner of said 12.7523 acre and 10.0 acre tracts, the common south corner of Lot No. 253 and Lot No. 254, the common south corner of the aforesaid 9.51 acre tract and that certain tract called 7.41 acres conveyed to Fredrick Lee Huffman, et al, by an instrument of record in File No. 01-052769 of the B.C.P.R.

Thence North 86° 48' 20" East, with the common line between said Lot No. 229 and Lot No. 254 and with the common line between said 12.7523 acre and 9.51 acre tracts, at 605.67 feet pass the northwest corner of the aforesaid 1.000 acre tract, at 815.43 feet pass the northeast corner of said 1.000 acre tract and continue with the common line between said Lot No. 229 and Lot No. 254 and with the common line between said 12.7523 acre and 9.51 acre tracts in all a total of 845.43 feet to the POINT OF BEGINNING and containing 32.821 acres of land."

Part 4

"BEGINNING at the southeast corner of Lot 58 of said Emigration Land Company Subdivision, same being the southeast corner of aforementioned residue of a called 10.2 acre tract and the herein

described tract, from which a 5/8 inch iron rod, found for the southerly west corner of aforementioned 120.000 acre tract bears South 61° 06’ 30” East, 47.08 feet;

Thence, South 86° 49’ 17” West with the south line of said residue tract and the herein described tract, 240.35 feet to the southwest corner of the said residue tract and the herein described tract, said point lying in the east right of way line of State Highway 288, called 420 feet wide and recorded under Volume 1056, Page 748, B.C.D.R.;

Thence, North 29° 41’ 19” West, with the east right of way line of said State Highway 288, same being the west line of said residue tract and the herein described tract, 445.72 feet to the north corner of said residue tract and the herein described tract, said point lying in the east line of said Lot 58;

Thence, South 02° 56’ 34” East, with the east line of said Lot 58, the east line of said residue tract and the herein described tract, 374.38 feet to the POINT OF BEGINNING and containing 1.033 acres (44,990 square feet) of land.”

Part 5

“COMMENCING for reference at an old one (I) inch axle found marking the northeast corner of Lot No. 254 of said Emigration Land Company Subdivision and on the west right-of-way line of County Road No. 82 (Iowa Lane), varying width;

Thence South 02° 37' 36" East, with said west right-of-way line and with the east line of said subdivision, at 1189.97 feet pass the south line of a 40.0 foot wide platted road (not open) and the northeast corner of Lot No. 228 of said subdivision, at 2509.88 feet pass the southeast corner of Lot No. 203 of said subdivision, the southeast corner of that certain tract called 6.327 acres conveyed to William G. Neumann, Jr., by an instrument of record in File No. 97- 014478 of the B.C.P.R. and on the north line of a 40.0 foot wide platted roadway (not open) and continue in all a total of 2549.88 feet to the POINT OF BEGINNING of the herein described tract, same being on the south line of said 40.0 foot wide platted roadway (not open), the northeast corner of Lot 202 of said subdivision, the northeast corner of the aforesaid 25.5279 acre tract and the northeast corner of the 30.244 acre tract;

Thence South 02° 37' 36" East, 962.69 feet continuing with said west right-of-way line, with the east line of said subdivision, with the east line of said Lot No. 202 and with the east of said 25.5279 acre tract, to a point for corner, the southeast corner of said Lot 202, the southeast corner of said 25.5279

acre tract and on the northerly right-of-way line of the Topeka & Santa Fe Railroad Company's 150.00 foot wide right-of-way line;

Thence North 70° 28' 24" West, departing said east and west lines, with the south line of said Lot No. 202 and Lot No. 201 of said subdivision, with the south line of said 25.5279 acre tract and with said northerly right-of-way line, at 2494.26 feet pass the west corner of said Lot No. 201, the west corner of said 25.5279 acre tract and on the south line of a 40.0 foot wide platted roadway (not open), at 2597.90 feet pass the north right-of-way line of said 40.0 foot wide platted road (not open), the westerly southeast corner of Lot No. 206 of said subdivision, a westerly southeast corner of the aforesaid 19.1938 acre tract and continue with said northerly right-of-way line and with a south line of said 19.1938 acre tract in all a total of 3029.05 feet to a point for corner, the southwest corner of Lot No. 206 and the southwest corner of said 19.1938 acre tract, same being the southeast corner of Lot No. 207 and that certain tract called "All of Lot No. 207, Lot No. 208 and Lot No. 225" conveyed to Fred McCutcheon by an instrument of record in File No. 99-030488 of the B.C.P.R.;

Thence North 03° 08' 59" West, 493.86 feet with the common line between said 19.1938 acre tract and said McCutcheon tract and with the common line between said Lot No. 206 and Lot No. 207 to a point for corner on the east line of said Lot No. 207, same being the northwest corner of said Lot No. 206, the northwest corner of said 30.244 acre tract and the southwest corner of said Lot No. 225;

Thence North 86° 46' 37" East, with the north line of said 30.244 acre tract, the south line of said McCutcheon tract, the south line of that certain tract called 3.696 acres conveyed to Douglas B. Wilson, Trustee, by an instrument of record in File No. 02-048631 of the B.C.P.R., with the common line between Lot No. 206 and Lot No. 225 and Lot No. 205 and Lot No. 226, at 1314.41 feet pass a found one (1) inch iron pipe and continue in all a total of 1317.67 feet to a point for corner, the northeast corner of said 30.244 acre tract and the common corner of Lot No. 204, Lot No. 205, Lot No. 226 and Lot No. 227 of said subdivision and on a west line of that certain tract called 5.021 acres conveyed to Grace United Methodist Church of Manvel and Iowa Colony, Texas by an instrument of record in File No. 2004-039311of the B.C.P.R.;

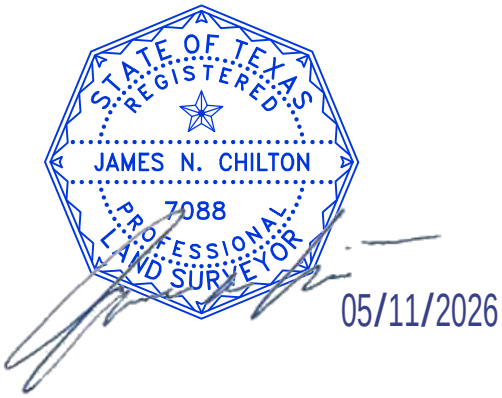
Thence South 03° 03' 09" East, with the east line of said 30.244 acre tract, with the west line of said 5.021 acre tract and with the common line between said Lot No. 205 and Lot No. 204, at 661.35 feet pass the common south corner of the aforesaid 19.1938 acre and 5.021 acre tracts and the common south corner of said Lot No. 205 and Lot No. 204 and continue in all a total of 701.35 feet to a point for

corner on the south line of the aforesaid 40.0 foot wide platted road (not open) and on the north line of said 30.244 acre tract;

Thence North 86° 49' 27" East, 1487.21 feet with the south line of said 40.0 foot wide platted roadway (not open) and the north line of said 30.244 acre tract to the POINT OF BEGINNING and containing 45.548 acres of land."

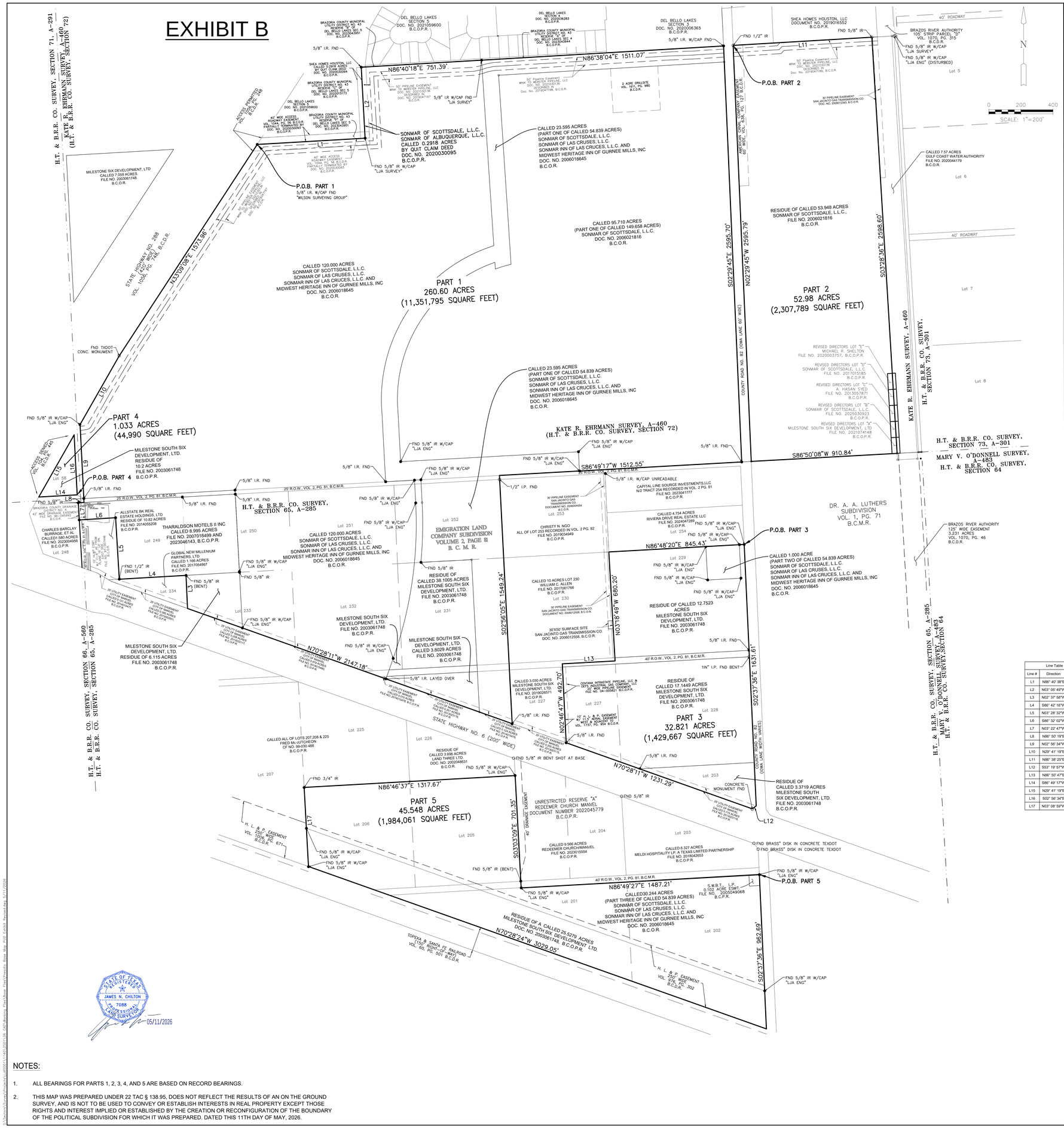
Said Parts 1, 2, 3, 4, and 5 containing a total of 392.98 acres of land.

This document was prepared under 22 Texas Administrative Code § 138.95, does not reflect the results of an on the ground survey, and is not to be used to convey or establish interests in real property except those rights and interests implied or established by the creation or reconfiguration of the boundary of the political subdivision for which it was prepared.



LJA Surveying, Inc.

EXHIBIT B


H.T. & B.R.R. CO. SURVEY, SECTION 71, A-291
KATE R. EHRMANN SURVEY, A-460
(H.T. & B.R.R. CO. SURVEY, SECTION 72)
PART 1
260.60 ACRES
(11,351,795 SQUARE FEET)
PART 2
52.98 ACRES
(2,307,789 SQUARE FEET)
PART 3
32.821 ACRES
(1,429,667 SQUARE FEET)
PART 4
1.033 ACRES
(44,990 SQUARE FEET)
PART 5
45.548 ACRES
(1,984,061 SQUARE FEET)
P.O.B. PART 1
5/8" I.R. W/CAP FND
"WILSON SURVEYING GROUP"
P.O.B. PART 2
P.O.B. PART 3
P.O.B. PART 4
P.O.B. PART 5
FND 5/8" I.R. W/CAP "LJA SURVEY"
FND 5/8" I.R. W/CAP "LJA ENG"
FND 1/2" IR
FND 5/8" IR
FND 5/8" I.R. FND
5/8" I.R. FND
FND 5/8" IR W/CAP "LJA ENG" (DISTURBED)
FND 5/8" IR W/CAP "LJA SURVEY"
FND 1/2" I.P.
FND 5/8" IR (BENT)
FND 5/8" IR BENT SHOT AT BASE
FND 3/4" IR
FND TXDOT CONC. MONUMENT
5/8" I.R. W/CAP UNREADABLE
1/2" I.P. FND
1IN" I.P. FND BENT
N86°40'18"E 751.39'
N86°38'04"E 1511.07'
N03°09'08"E 1573.98'
S02°29'45"E 2595.70'
N02°29'45"W 2595.79'
S03°28'36"E 2598.60'
S86°50'08"W 910.84'
S86°49'17"W 1512.55'
N86°48'20"E 845.43'
S02°56'05"E 1549.24'
N03°18'49"W 680.20'
N02°46'47"W 492.70'
S02°37'36"E 1631.61'
N70°28'11"W 2147.18'
N70°28'11"W 1231.29'
N86°46'37"E 1317.67'
S03°03'09"E 701.35'
N86°49'27"E 1487.21'
N70°28'24"W 3029.05'
S02°37'56"E 962.69'
L1
L2
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L6
L7
L8
L9
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L16
L17
SONMAR OF SCOTTSDALE, L.L.C.
SONMAR OF ALBUQUERQUE, L.L.C.
CALLED 0.2918 ACRES
BY QUIT CLAIM DEED
DOC. NO. 20200300095
B.C.O.P.R.
CALLED 23.595 ACRES
(PART ONE OF CALLED 54.839 ACRES)
SONMAR OF SCOTTSDALE, L.L.C.
SONMAR OF LAS CRUSES, L.L.C. AND
SONMAR INN OF LAS CRUCES, L.L.C. AND
MIDWEST HERITAGE INN OF GURNEE MILLS, INC
DOC. NO. 2006018645
B.C.O.R.
CALLED 95.710 ACRES
(PART ONE OF CALLED 149.658 ACRES)
SONMAR OF SCOTTSDALE, L.L.C.
DOC. NO. 2006021816
B.C.O.R.
CALLED 120,000 ACRES
SONMAR OF SCOTTSDALE, L.L.C.
SONMAR OF LAS CRUSES, L.L.C.
SONMAR INN OF LAS CRUCES, L.L.C. AND
MIDWEST HERITAGE INN OF GURNEE MILLS, INC
DOC. NO. 2006018645
B.C.O.R.
RESIDUE OF CALLED 53.948 ACRES
SONMAR OF SCOTTSDALE, L.L.C.,
FILE NO. 2006021816
B.C.O.R.
CALLED 7.57 ACRES
GULF COAST WATER AUTHORITY
FILE NO. 2020044179
B.C.O.R
MILESTONE SIX DEVELOPMENT, LTD
CALLED 7.099 ACRES
FILE NO. 2003061748
B.C.O.R.
STATE HIGHWAY NO. 288
(200' WIDE)
VOL. 1005, PG. 748, B.C.O.R.
COUNTY ROAD NO. 82 (IOWA LANE 40' WIDE)
KATE R. EHRMANN SURVEY, A-460
H.T. & B.R.R. CO. SURVEY, SECTION 72
H.T. & B.R.R. CO. SURVEY, SECTION 71, A-291
H.T. & B.R.R. CO. SURVEY, SECTION 65, A-285
H.T. & B.R.R. CO. SURVEY, SECTION 66, A-560
MARY V. O'DONNELL SURVEY, A-483
H.T. & B.R.R. CO. SURVEY, SECTION 64
DEL BELLO LAKES SECTION 5 DOC. NO. 2021059600 B.C.O.P.R.
DEL BELLO LAKES SECTION 3 DOC. NO. 2020006365 B.C.O.P.R.
SHEA HOMES HOUSTON, LLC DOCUMENT NO. 2019016552 B.C.O.P.R.
BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 43 RESERVE "A" DEL BELLO LAKES SEC. 5 DOC. NO. 2023043093 B.C.O.P.R.
DEL BELLO LAKES SECTION 4 DOC. NO. 2020043044 B.C.O.P.R.
BRAZORIA COUNTY MUNICIPAL UTILITY DISTRICT NO. 43 RESERVE "A" DEL BELLO LAKES SEC. 5 DOC. NO. 2023043093 B.C.O.P.R.
SHEA HOMES HOUSTON, LLC CALLED 7.8748 ACRES DOC. NO. 2020030094 B.C.O.P.R.
DEL BELLO LAKES SECTION 5 DOC. NO. 2021059600 B.C.O.P.R.
ACCESS EASEMENT VOL. 1005, PG. 748 B.C.O.R.
40' WIDE ACCESS ROADWAY EASEMENT VOL. 1044, PG. 74, B.C.O.R. PARTIALLY TERMINATED BY DOC. NO. 2020030095 B.C.O.P.R.
40' WIDE ACCESS ROADWAY EASEMENT VOL. 1044, PG. 74, B.C.O.R. PARTIALLY TERMINATED BY DOC. NO. 2020030095 B.C.O.P.R.
50' PIPELINE EASEMENT WNK TO WEBSTER PIPELINE, LLC DOC. NO. 2020030130 DESIGNED IN VOL. 2, PG. 36 DOC. NO. 2019047197 B.C.O.R.
50' PIPELINE EASEMENT WNK TO WEBSTER PIPELINE, LLC DOC. NO. 2020030130 DESIGNED IN VOL. 2, PG. 36 DOC. NO. 2019047199, B.C.O.R.
2 ACRE DRILLSITE VOL. 1611, PG. 980 B.C.O.R.
AMERICAN CANAL COMPANY EASEMENT 40' WIDE - VOL. 4, PG. 74, B.C.D.R.
30' PIPELINE EASEMENT SAN JACINTO GAS TRANSMISSION CO. DOC. NO. 2006012093, B.C.O.R.
40' ROADWAY
Lot 5
Lot 6
Lot 7
Lot 8
REVISED DIRECTORS LOT "E" MICHAEL R. SHELTON FILE NO. 2020003757, B.C.O.P.R.
REVISED DIRECTORS LOT "D" SONMAR OF SCOTTSDALE, L.L.C. FILE NO. 2017015185 B.C.O.P.R.
REVISED DIRECTORS LOT "C" A. HASAN SYED FILE NO. 2013057871 B.C.O.P.R.
REVISED DIRECTORS LOT "B" SONMAR OF SCOTTSDALE, L.L.C. FILE NO. 2025030923 B.C.O.P.R.
REVISED DIRECTORS LOT "A" MILESTONE SOUTH SIX DEVELOPMENT, LTD FILE NO. 2021074148 B.C.O.P.R.
H.T. & B.R.R. CO. SURVEY, SECTION 73, A-301
MARY V. O'DONNELL SURVEY, A-483
H.T. & B.R.R. CO. SURVEY, SECTION 64
DR. A. A. LUTHERS SUBDIVISION VOL. 1, PG. 71 B.C.M.R.
BRAZOS RIVER AUTHORITY 125' WIDE EASEMENT 3.231 ACRES VOL. 1070, PG. 46 B.C.D.R.
BRAZOS RIVER AUTHORITY 105' STRIP PARCEL "D" VOL. 1070, PG. 315 B.C.O.R.
CAPITAL LINE SOURCE INVESTMENTS,LLC N/2 TRACT 254 RECORDED IN VOL. 2 PG. 81 FILE NO. 2023041777 B.C.O.P.R.
CALLED 4.754 ACRES RIVIERA DRIVE REAL ESTATE LLC FILE NO. 2024047288 B.C.O.P.R.
CALLED 1.000 ACRE (PART TWO OF CALLED 54.839 ACRES) SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
RESIDUE OF CALLED 12.7523 ACRES MILESTONE SOUTH SIX DEVELOPMENT, LTD. FILE NO. 2003061748 B.C.O.P.R.
RESIDUE OF CALLED 17.1449 ACRES MILESTONE SOUTH SIX DEVELOPMENT, LTD. FILE NO. 2003061748 B.C.O.P.R.
RESIDUE OF CALLED 3.3719 ACRES MILESTONE SOUTH SIX DEVELOPMENT, LTD. FILE NO. 2003061748 B.C.O.P.R.
CALLED 23.595 ACRES (PART ONE OF CALLED 54.839 ACRES) SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
CALLED 10 ACRES LOT 230 WILLIAM C. ALLEN FILE NO. 2017061766 B.C.O.P.R.
CALLED 120,000 ACRES SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
CALLED 23.595 ACRES (PART ONE OF CALLED 54.839 ACRES) SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
CALLED 3.030 ACRES MILESTONE SOUTH SIX DEVELOPMENT, LTD. FILE NO. 2019029571 B.C.O.P.R.
CALLED ALL OF LOTS 207,208 & 225 FRED Mc cUTCHEON CF NO. 99-030.488 B.C.O.P.R.
RESIDUE OF CALLED 3.696 ACRES LAND THREE LTD. DOC. NO. 2020048631 B.C.O.R.
UNRESTRICTED RESERVE "A" REDEEMER CHURCH MANVEL DOCUMENT NUMBER 2022045779 B.C.O.P.R.
CALLED 9.566 ACRES REDEEMER CHURCH/MANVEL FILE NO. 2023031554 B.C.O.P.R.
CALLED 6.327 ACRES MELDI HOSPITALITY LP, A TEXAS LIMITED PARTNERSHIP FILE NO. 2018042653 B.C.O.P.R.
CALLED30.244 ACRES (PART THREE OF CALLED 54.839 ACRES) SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. AND SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
RESIDUE OF A CALLED 25.5279 ACRES MILESTONE SOUTH SIX DEVELOPMENT, LTD DOC. NO. 2003061748, B.C.O.P.R.
S.W.B.T., L.P. 0.102 ACRE ESMT FILE NO. 2005049068 B.C.P.R.
CALLED 0.000 ACRES SONMAR OF SCOTTSDALE, L.L.C. SONMAR OF LAS CRUSES, L.L.C. SONMAR INN OF LAS CRUCES, L.L.C. AND MIDWEST HERITAGE INN OF GURNEE MILLS, INC DOC. NO. 2006018645 B.C.O.R.
EMIGRATION LAND COMPANY SUBDIVISION VOLUME 2, PAGE 81 B. C. M. R.
MILESTONE SOUTH SIX DEVELOPMENT, LTD. RESIDUE OF 10.82 ACRES FILE NO. 2003061748 B.C.O.P.R.
MILESTONE SOUTH SIX DEVELOPMENT, LTD. RESIDUE OF 10.2 ACRES FILE NO. 2003061748 B.C.O.P.R.
MILESTONE SOUTH SIX DEVELOPMENT, LTD. RESIDUE OF 6.115 ACRES FILE NO. 2003061748 B.C.O.P.R.
MILESTONE SOUTH SIX DEVELOPMENT, LTD. CALLED 38.1005 ACRES FILE NO. 2003061748 B.C.O.P.R.
MILESTONE SOUTH SIX DEVELOPMENT, LTD. CALLED 3.8029 ACRES FILE NO. 2003061748 B.C.O.P.R.
ALLSTATE BK REAL ESTATE HOLDINGS, LTD RESIDUE OF 10.82 ACRES FILE NO. 2014055208 B.C.O.P.R.
THARALDSON MOTELS II INC CALLED 8.995 ACRES FILE NO. 2007018499 AND 2023046143, B.C.O.P.R.
GLOBAL NEW MILLENNIUM PARTNERS, LTD CALLED 1.168 ACRES FILE NO. 2017054867 B.C.O.P.R.
CHARLES BARCLAY BURRAGE, ET AL CALLED1.580 ACRES FILE NO. 2023004956 B.C.O.P.R.
CHRISTY N. NGO ALL OF LOT 253 RECORDED IN VOL. 2 PG. 82 FILE NO. 2019034949 B.C.O.P.R.
CONTINA INTRASTATE PIPELINE, LLC, & DCP3 INDUSTRIAL OLC CONTINA, LLC FILE NO. 04-000821 B.C.O.P.R.
10' I.L. & P. EASEMENT W/ 113' X 40'ADDL EASEMENT MISC. R. ACCESS VOL. 1737, PG. 954 B.C.O.R.
BRAZORIA COUNTY DRAINAGE DISTRICT NO. 4 EASEMENT 42' WIDE DRAINAGE EASEMENT FILE NO. 5-045592
H. L. & P. EASEMENT VOL. 700, PG. 671 B.C.D.R.
H. L. & P. EASEMENT VOL. 700, PG. 671 B.C.D.R.
H. L. & P. EASEMENT VOL. 850, PG. 302 B.C.D.R.
TOPEKA & SANTA FE RAILROAD RIGHT-OF-WAY VOL. 60, PG. 501 B.C.D.R.
20' UTILITY EASEMENT CALLED 0.1148 ACRES FILE NO. 2019018472 B.C.O.P

MANVEL
PD&Z / CITY COUNCIL
DATA SHEET

TOPIC:	☐ Rezoning
	☐ New Planned Unit Development (PUD)
	☐ PUD Amendment
	☒ Specific Use Permit (SUP): NAICS Use 812113 "Nail Salons"

DATES:	☒ 7/13/2026 : 1st Public Hearing and PDZ recommendation to City Council.
	☒ 7/20/2026 : 2nd Public Hearing and 1st reading of the Ordinance.
	☐ 8/3/2026 : Second and Final reading of the Ordinance.

PROJECT DETAILS:

Applicant: Thue Le, T&L Designs

Project Name: The Muse Nail Lounge

Property Owner: Jimmy Nguyen

Property Address: 18909 Morris Avenue/Highway 6, Manvel, Texas 77578, Suite 300

Location: Northeast corner of intersection of Hwy 6 and Pollard Blvd

Legal Description: Reserve "B" of Bluewater Retail Center Minor Plat, recorded in Brazoria County Clerk's File (B.C.C.F.) No. 2025010899 (PID: 710337)

Total Acreage: 1.683-acre

Current Landuse: Vacant lease space within an existing shopping center

Proposed Landuse: NAICS Use 812113 "Nail Salons"

Background: The subject site is zoned Light Commercial District / State Highway 6 Overlay (LC/SH6). Section 77-50 of the Zoning Ordinance requires an SUP for the proposed Nail Salon use.

CONFORMANCE TO CITY ADOPTED PLANS:

- Conforms to the guiding principles of the 2045 Strategic Plan: ☒ **YES** ☐ **NO**
- Conforms to the goals of Manvel 2045 Comprehensive Plan: ☒ **YES** ☐ **NO**
- Conforms to Future Land Use and Character Map: ☒ **YES** ☐ **NO**
- Conforms to Major Thoroughfare Plan: ☒ **YES** ☐ **NO**

Note: Details and staff analysis are included in the attached staff report.

PUBLIC INPUT: Public hearing notices were published in a newspaper of general circulation, a notice sign was posted on-site, and all property owners within 200 feet were notified. At the time of preparation of this report, no inquiries or opposition have been received.

MANVEL
PD&Z / CITY COUNCIL
DATA SHEET

STAFF RECOMMENDATION:

☐ Approval ☒ Conditional Approval ☐ Not Approval

Conditions:

1. This Specific Use Permit applies only for 18909 Hwy 6 # 300 with floor area not to exceed 2,200 square feet.
2. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;
3. All waiting and/or lobby areas shall maintain an unobstructed view from the outside; and
4. All doors shall remain unlocked and accessible during normal business hours.

PD&Z RECOMMENDATION:

☐ Approval ☒ Conditional Approval ☐ Not Approval

Vote: **7 "Yeas"** and **0 "Nays"**

Conditions:

1. This Specific Use Permit applies only for 18909 Hwy 6 # 300 with floor area not to exceed 2,200 square feet.
2. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;
3. All waiting and/or lobby areas shall maintain an unobstructed view from the outside; and
4. All doors shall remain unlocked and accessible during normal business hours.

`

ATTACHMENTS:	☒ Staff Report / PD&Z Final Report to Council
	☒ Proposed Ordinance No. 2026-O-17
	☐ PUD Document and associated Exhibits
	☐ Other

FUNDING ISSUES

_X_ Not applicable
___ Not budgeted
___ Full amount already budgeted
___ Funds to be transferred from Acct.#

SUBMITTING STAFF MEMBER	**FINANCE DIRECTOR APPROVAL** _NA_
Ellie Roohbakhsh, Senior Planner	**ZONING OFFICIAL APPROVAL_YES_**
	CITY MANAGER APPROVAL _YES_

FINAL REPORT TO CITY COUNCIL

Specific Use Permit

Agenda of:	July 20, 2026	**Initiated By:**	Jose Abraham Director, Development Services
Subject:	LC/SH6 to LC/SH6 -SUP	**Presented By:**	Ellie Roohbakhsh Senior Planner
Recommended Action:	A Public Hearing followed by Consideration and Possible Action to Approve Ordinance No. 2026-O-17		

SUMMARY

The applicant, Thue Le with The Muse Nail Lounge, representing property owner Jimmy Nguyen, is requesting approval of a Specific Use Permit (SUP) for an approximate 1.683-acre tract of land being Reserve "B" of Bluewater Retail Center Minor Plat, as recorded in Brazoria County Clerk's File (B.C.C.F.) No. 2025010899 (PID: 710337), located at 18909 Morris Avenue/Highway 6, Manvel, Texas 77578. The subject site is currently developed as the Shops at Bluewater retail center with associated parking and is zoned Light Commercial District / State Highway 6 Overlay (LC/SH6).

The request is to change the zoning classification to Light Commercial District / State Highway 6 Overlay with a Specific Use Permit (LC/SH6-SUP) to allow NAICS Use 812113 – "Nail Salons" within an existing 2,128-square-foot lease space (Suite 300). No exterior modifications are proposed, and any interior tenant improvements will be reviewed and permitted separately to ensure compliance with all applicable building, fire, and life safety codes.

Staff Recommendation: Approval with conditions
PD&Z Recommendation: Approval with conditions

EXHIBITS

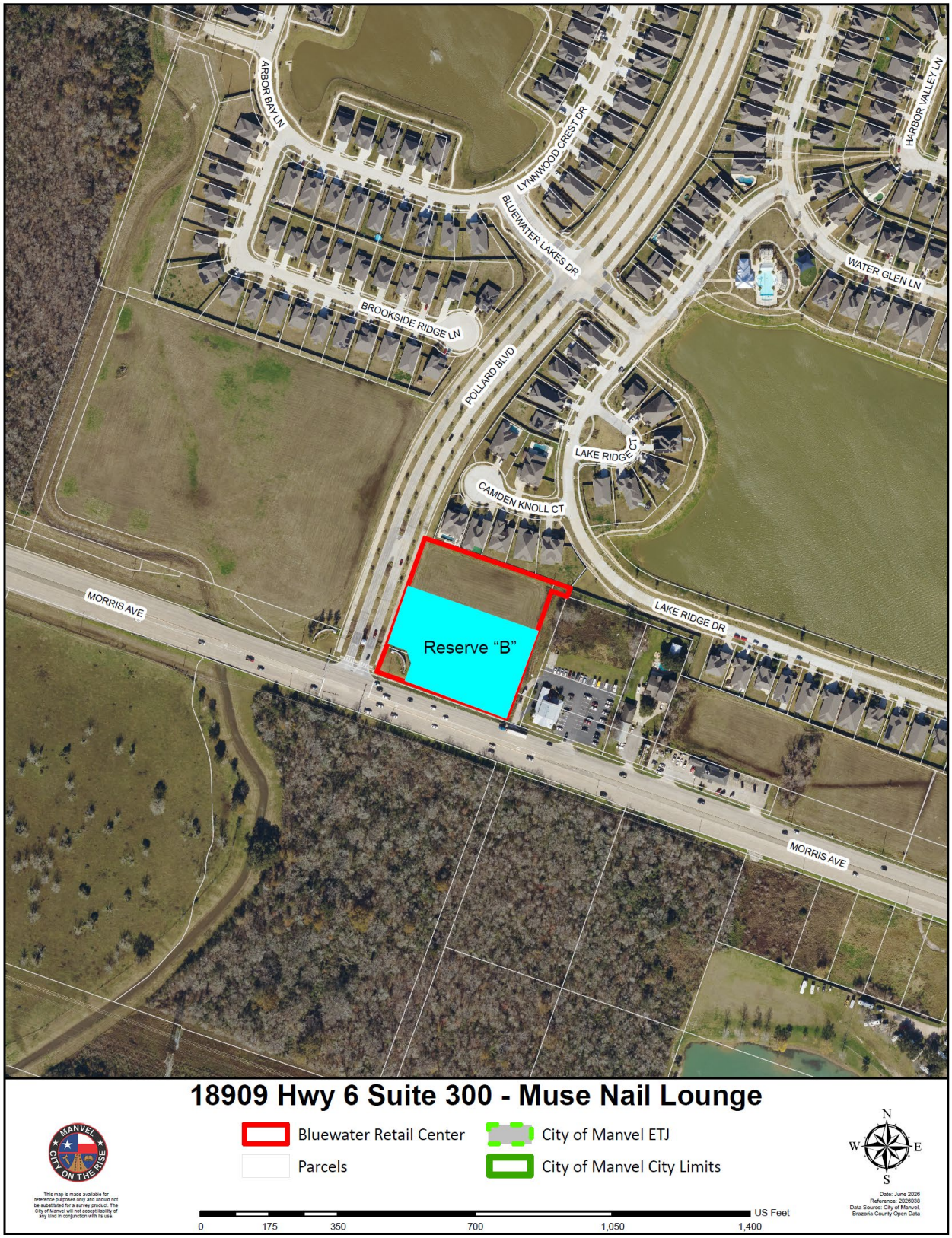
Aerial Vicinity Map, Zoning Vicinity Map, Major Thoroughfare Plan Map, Application, Letter of Authorization, Letter of Request, Recorded Plat, Conceptual Floor Plan, Permit Application, Public Hearing Notice, and Site Pictures.

GENERAL SITE INFORMATION

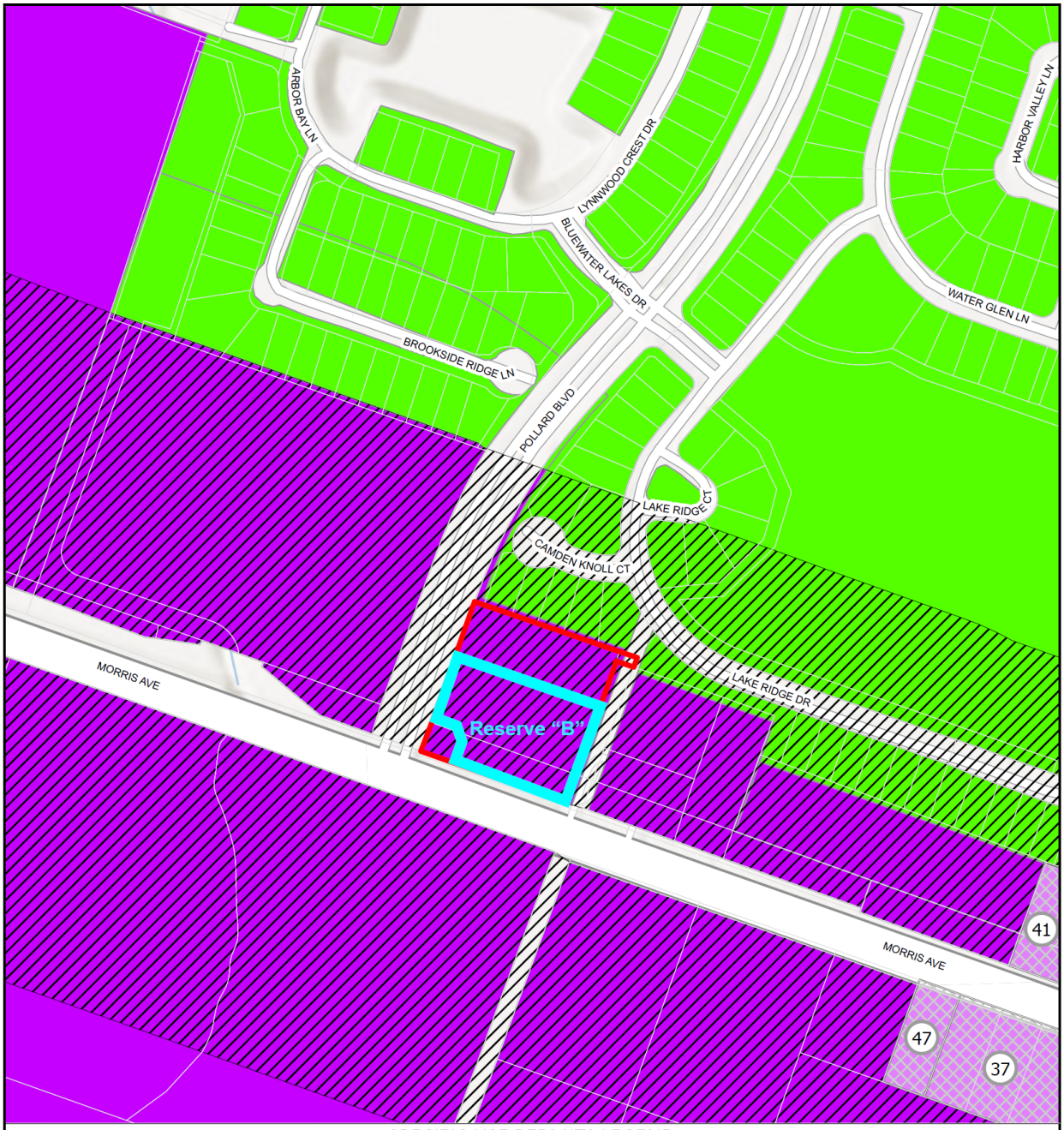
The following is a summary of general site information.

Surrounding Property Zoning	**North:** Single–Family Residential District (SFR)/ State Highway 6 Overlay District (SH-6) **South:** Light Commercial District /State Highway 6 Overlay District (LC/SH-6) **East:** Light Commercial District /State Highway 6 Overlay District (LC/SH-6) **West:** Light Commercial District /State Highway 6 Overlay District (LC/SH-6)
Surrounding Land Use	**North:** Residential (Bluewater Lakes) **South:** Vacant/Undeveloped **East:** Commercial (The Burger Barn) **West:** Vacant (Proposed Retail Center – Plats & Plans are under review)
Major Thoroughfare	Subject site is located at the intersection of Hwy 6 and Pollard Blvd

AERIAL VICINITY MAP



ZONING VICINITY MAP



SPECIFIC USE PERMITS LEGEND

Label No	Address	Specific Use Description	Ordinance No	Effective Date	Zoning Classification
37	State Highway 6/ Morris Ave and Bluewater Street	NAICS USE 811192 "CAR WASHES"	2023-O-09	2/21/2023	LC/SH6-SUP
41	19201 Morris Ave	NAICS USE 441310 "Automotive Parts and Accessories Stores"	2024-O-01	2/5/2024	LC/SH6-SUP
47	19200 Morris Avenue	NAICS use 621111"Offices of physicians (except mental health specialists)"	2025-O-23	8/4/2025	LC/SH6-SUP

18909 Hwy 6 Suite 300 - Muse Nail Lounge

Bluewater Retail Center
Parcels
City of Manvel ETJ
City of Manvel City Limits
Specific Use Permits
State Highway 6 Overlay District
Light Commercial District
Single-Family Residential District

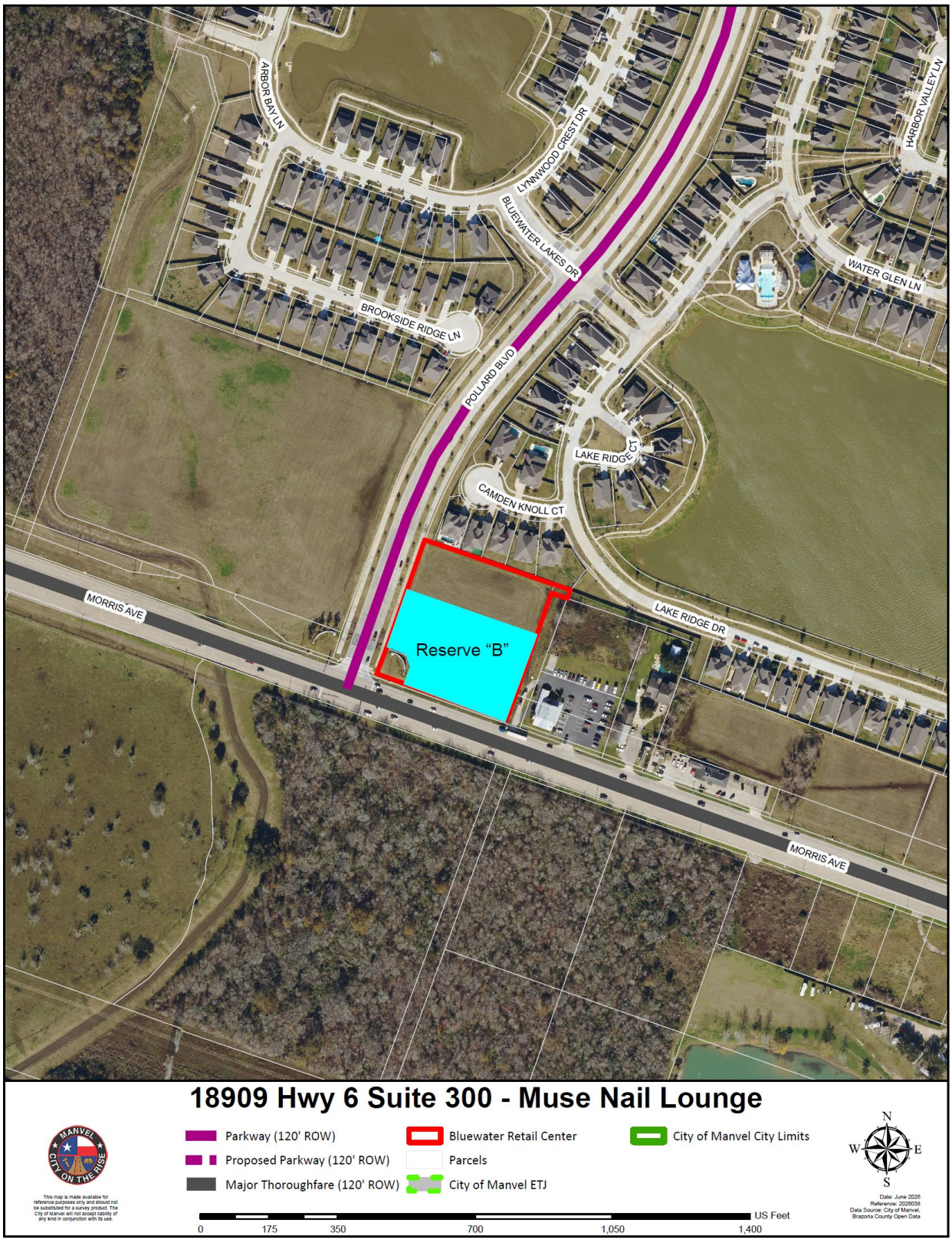
N W E S

This map is made available for reference purposes only and should not be substituted for a survey product. The City of Manvel will not accept liability of any kind in conjunction with its use.

US Feet
0 175 350 700 1,050 1,400

Date: June 2026
Reference: 2026038
Data Source: City of Manvel, Brazoria County Open Data

MAJOR THOROUGHFARE PLAN MAP



ZONING ORDINANCE PROVISIONS FOR SPECIFIC USE PERMITS

In Section 77-50 (a) *Uses Requiring Specific Use Permit*, of the Zoning Ordinance it states *"certain uses of land, buildings or structures may not be appropriate under all circumstances in any given zoning district but may be appropriate where adequate precautions can be taken to assure compatibility with surrounding uses, public need, and the orderly development of the city as a whole. This section provides City Council and Planning, Development, and Zoning the opportunity to deny or to conditionally approve those uses for which specific use permits are required. These uses generally have unusual characteristics or are of a public or semipublic character often essential or desirable for the general convenience and welfare of the community. However, because of the nature of use, the importance of the use's relationship to the comprehensive plan, or possible adverse impact on neighboring properties of the use, review, evaluation, and exercise of planning judgement relative to the location and site plan of the proposed use are required."*

In Section 77-50 (b) of the Zoning Ordinance it further states, *"the City Council, after receiving the recommendation of the planning, development and zoning commission, may by ordinance, grant a specific use permit for the permitted uses, as herein qualified by the permitted use table, in locations and zoning districts to permit a use where they are not otherwise permitted by this article, and may impose any appropriate conditions and safeguards to protect property and property values, and in the interest of health, safety or welfare."*

PROJECT DETAILS

The applicant is requesting a Specific Use Permit (SUP) to allow NAICS Use 812113 – Nail Salons within an existing 2,128-square-foot lease space (Suite 300) located at 18909 Morris Avenue/Highway 6, Manvel, Texas 77578, within the Shops at Bluewater retail center. The subject site is developed as a multi-tenant commercial center with shared on-site parking. Existing tenants currently include Four Two Café, and Pilates Addiction is planned as a future tenant within the shopping center.

The proposed use, The Muse Nail Lounge, will provide manicure, pedicure, and nail care services. The proposed layout includes manicure stations, pedicure chairs, a reception and waiting area, staff/work area, and support spaces. Operations will include approximately four (4) employees, with business hours from 9:00 AM to 7:00 PM, Monday through Sunday.

No exterior modifications are proposed. The interior build-out and any tenant improvements will be reviewed and permitted separately for compliance with all applicable building, health, fire, and life safety codes. According to the applicant, no chemical manufacturing or industrial activities will be conducted on the site.

PREDETERMINED CONDITIONS FOR THE PROPOSED USE (Section77-50 (g)).

Section 77-50(g) of the Zoning Ordinance provides the following predetermined conditions that apply to the proposed use:

a. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;
b. All waiting and/or lobby areas shall maintain an unobstructed view from the outside;
c. All doors shall remain unlocked and accessible during normal business hours. Please note that the proposed use meets the predetermined condition for Other Personal Care Services use.

Please note that the proposed use meets the predetermined condition for Other Personal Care Services use.

SUP CRITERIA FOR APPROVAL AND STAFF ANALYSIS

Section 77-50(e) of the Zoning Ordinance provides the following approval criteria for SUP requests. These criteria help in determining whether the proposed use is in harmony with existing surrounding uses and zoning districts.

1. *Conformance to Comprehensive Plan*: The Land Use and Community Character section of the Manvel 2045 Comprehensive Plan emphasizes the desired character of Highway 6 and other major corridors, supporting community-oriented development, compatibility between land uses, and development that reflects community values rather than commercial sprawl. The Goals for Land Use and Community Character further promote character-based planning, well-supported local businesses, managed growth, and high-quality development. Additionally, the Key Planning Issues note resident concerns about aesthetics and a preference for community-oriented development along major corridors like Highway 6. Overall, the subject site, located along Highway 6 within an established commercial corridor, is an appropriate location for the proposed Nail Salon and aligns with the recently adopted Comprehensive Plan and Future Land Use and Character Map.
2. *Compatibility with the character of the neighborhood:* The proposed Nail Salon will occupy an existing retail lease space and will not result in any new development. The proposed use is compatible with the surrounding context, as Highway 6 functions as a commercial corridor. The proposed use is not significantly different from the existing commercial uses in the area in terms of intensity and traffic generation. Staff notes that there is currently one active nail salon within the City limits (Manvel Town Center) and two active nail salons within the City's ETJ (Magnolia Parkway, and Bailey Road in Sedona Lakes). The proposed use would add an additional personal service business within an existing commercial shopping center along the Highway 6 corridor.
3. *The suitability of the property for the uses permitted by right*: The subject site is currently zoned LC/SH6 and abuts LC/SH6-zoned properties on three sides. The existing strip shopping center currently includes multi-tenant and is appropriate for retails uses permitted by right as well as the proposed Nail Salon.
4. *Detrimental impact on nearby property:* The proposed use will not have detrimental impact on nearby properties considering the commercial nature of Highway 6 corridor.
5. *Traffic and Parking issues:* The proposed use will be located within an existing shell space in a shopping center with sufficient parking. No significant changes in traffic patterns are anticipated.
6. *Harm to the value of nearby properties:* The surrounding properties are zoned LC and consist of undeveloped land, single-family homes, and future commercial uses. Given this context, the proposed use is not expected to have a negative impact on nearby property values. Additionally, the presence of LC/SH6 zoning in the area supports the appropriateness of the use.

7. *Impedance to orderly development surrounding vacant property*: The subject site is already developed, and the proposed use of the existing lease space will not impede the orderly development of nearby vacant land.
8. *Utility Provisions:* The proposed use will not have any additional impact on utility services.
9. *Safe site development and layout:* The proposed Nail Salon will not include any exterior site improvements, and the existing improvement offers a safe site layout.
10. *Lighting:* No changes to existing lighting are proposed.
11. *Landscaping and screening:* No changes to existing landscaping and screening are proposed.
12. *Other appropriate conditions and safeguards in the interest of health, safety or welfare*: The proposed use shall comply with all applicable building and safety codes, ensuring that it does not pose risks to public health, safety, or welfare.

STAFF RECOMMENDATION

Based on the above discussion, staff recommends approval of this SUP request for the subject site to allow NAICS Use No. 812113 "Nail Salons" with the following conditions:

1. This Specific Use Permit applies only for 18909 Hwy 6 # 300 with floor area not to exceed 2,200 square feet.
2. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;
3. All waiting and/or lobby areas shall maintain an unobstructed view from the outside; and
4. All doors shall remain unlocked and accessible during normal business hours.

PUBLIC HEARING

The Notice of Public Hearing was published in the newspaper of general circulation and a sign was posted on the subject site. All property owners within 200 feet of the property were notified. Staff has not received any written letter of opposition at the time of writing this Final Report.

PLANNING, DEVELOPMENT AND ZONING COMMISSION DISCUSSION AND RECOMMENDATION

At the July 13, 2026, Planning, Development, and Zoning (PD&Z) Commission meeting, a public hearing was held to receive input on this request. The Commission generally discussed the SUP requirement and asked clarification questions regarding the proposed business and other regulations that may apply to the proposed use. Staff and the applicant responded to provide clarification.

The PD&Z Commission is recommending approval of this request with conditions provided by staff. The motion to approve passed with a vote of seven (7) "Yeas" to zero (0) "Nays." Therefore, the Planning, Development, and Zoning Commission is recommending approval of proposed Ordinance No. 2026-O-17.

APPLICATION

DEVELOPMENT SERVICES
20025 HIGHWAY 6
MANVEL, TX 77578
P: 281-489-0630
F: 281-489-0634

SPECIFIC USE PERMIT APPLICATION

PROJECT INFORMATION

Project Name: MUSE NAIL LOUNGE
Project Location/Address: 18909 HWY 6, #300, MANVEL, TX 77578
Legal Description: SHOPS AT BLUEWATER
Current Zoning: Light Commercial Proposed Land Use: Retail Trip Center NAICS No.: 812113
Parcel/Tax ID# (s): 6398-0023-107 Total Acreage: 2.94 Acres

APPLICANT INFORMATION

Applicant Name: THUC LE
Company Name: T&L DESIGNS
Address: City: Houston State: TX Zip: 77085
Phone #: Email: m

This is to certify that the information on this form is COMPLETE, TRUE, and CORRECT, and I, the undersigned, am authorized to make this application on behalf of the owner(s). I understand that this application will expire one year from the date submitted.

Applicant Signature (**REQUIRED**) 05/18/26 Date

PROPERTY OWNER INFORMATION

Owner(s) Name: JIMMY NGUYEN
Address: City: MANVEL State: TX Zip: 77578
Phone #: Email: com

PROPERTY OWNER'S AUTHORIZATION **(Required – If owner is also the applicant, must sign as both)**:
I am the owner of the property for which this application is being made. I authorize the above person (Applicant) to submit this application and to correspond with the City of Manvel regarding this application on my behalf.

Owner's Signature (**REQUIRED**) 05/18/26 Date

APPLICATION

DEVELOPMENT SERVICES
20025 HIGHWAY 6
MANVEL, TX 77578
P: 281-489-0630
F: 281-489-0634

SUBMITTAL CHECKLIST

So that we may efficiently review your project in a timely manner, it is important that all required documents and fees listed on the "Submittal Checklist" below are submitted with your application. One or more of the required documents may be waived due to the nature of the development; however, it is incumbent upon the applicant to inquire about these exceptions for your project **before** submitting an application. Answers to specific use permit applications can be obtained by attending a pre-development meeting with our Development Review Committee (DRC) prior to submitting a formal application. Please call the phone number on the application to schedule an appointment. Submit application and accompanying documents to the Permits and Inspections at the address above Monday through Thursday between the hours of 7:30 a.m. and 5:30 p.m. and Friday between the hours of 7:30 a.m. and 11:30 a.m.

SPECIFIC USE PERMIT SUBMITTAL CHECKLIST ITEMS	REQUIRED (PLEASE CHECK)
Completed Specific Use Permit Application (with all signatures)	✓
Two (2) Copies of a Conceptual Plan (building, parking, landscaping, etc. locations)	
Two (2) Legal Descriptions of Property (metes & bounds description if not platted)	
Two (2) Copies of Recorded Plat (if platted)	
Two (2) Applicant Letters of Request	
Traffic Impact Analysis, (if applicable)	
Paid Application Fee	

APPLICANT CERTIFICATION

By signing below, I acknowledge that I have reviewed the Submittal Checklist and have included the required submittal items and reviewed them for completeness and accuracy. I also acknowledge that my application will be rejected if it is deemed incomplete.

Applicant Signature — Date: 05/18/26

LETTER OF AUTHORIZATION

DEVELOPMENT SERVICES
20025 HIGHWAY 6
MANVEL, TX 77578
P: 281-489-0630
F: 281-489-0634

LETTER OF AUTHORIZATION

Have property owner complete and sign, if applicant differs from property owner.

JIMMY NGUYEN
Owner Name

18909 HWY 6
Owner Address

MANVEL, TX 77578
Owner City, State Zip

05/18/26
Date

Building and Inspections
20025 Highway 6
Manvel, TX 77578

Dear City of Manvel Permits and Inspections,

I, JIMMY NGUYEN, certify that I am the owner of the project property located at [illegible] VEL, TX 77578 and that the forgoing statements and answers made and all data, information, and evidence herewith submitted are in all respects to the best of my knowledge and belief, true, and correct. I appoint THUC LE with the company T&L DESIGNS (if applicable) to act as my representative for this project. I agree to be responsible for payment of bills due to the City of Manvel related to this application. Furthermore, I understand that any material misrepresentation of this application, failure to comply with ordinances, and /or failure to remit payment for services can lead to delays in this project – up to and including rejecting the project and forfeiting any fees paid.

Please contact me directly at __ _____ if you have any questions.

Sincerely,

Owner Name JIMMY NGUYEN

Owner Signature

REQUEST LETTER

Letter of Request – Description of Proposed Business Use

To Whom It May Concern,

This letter is submitted to describe the proposed use of the tenant space for Muse Nail Lounge.

Muse Nail Lounge will operate as a nail salon providing professional manicure and pedicure services to the public. No chemical manufacturing or industrial activities will be conducted on the premises.

The proposed business hours are:

- Monday through Sunday: 9:00 AM – 7:00 PM

The salon is expected to have approximately four (4) employees during normal business operations.

The equipment to be used is limited to standard nail salon equipment, including:

- Pedicure chairs
- Manicure stations
- Washer and dryer
- Refrigerator
- Small countertop appliances and standard salon tools used for manicure and pedicure services

The services provided will include:

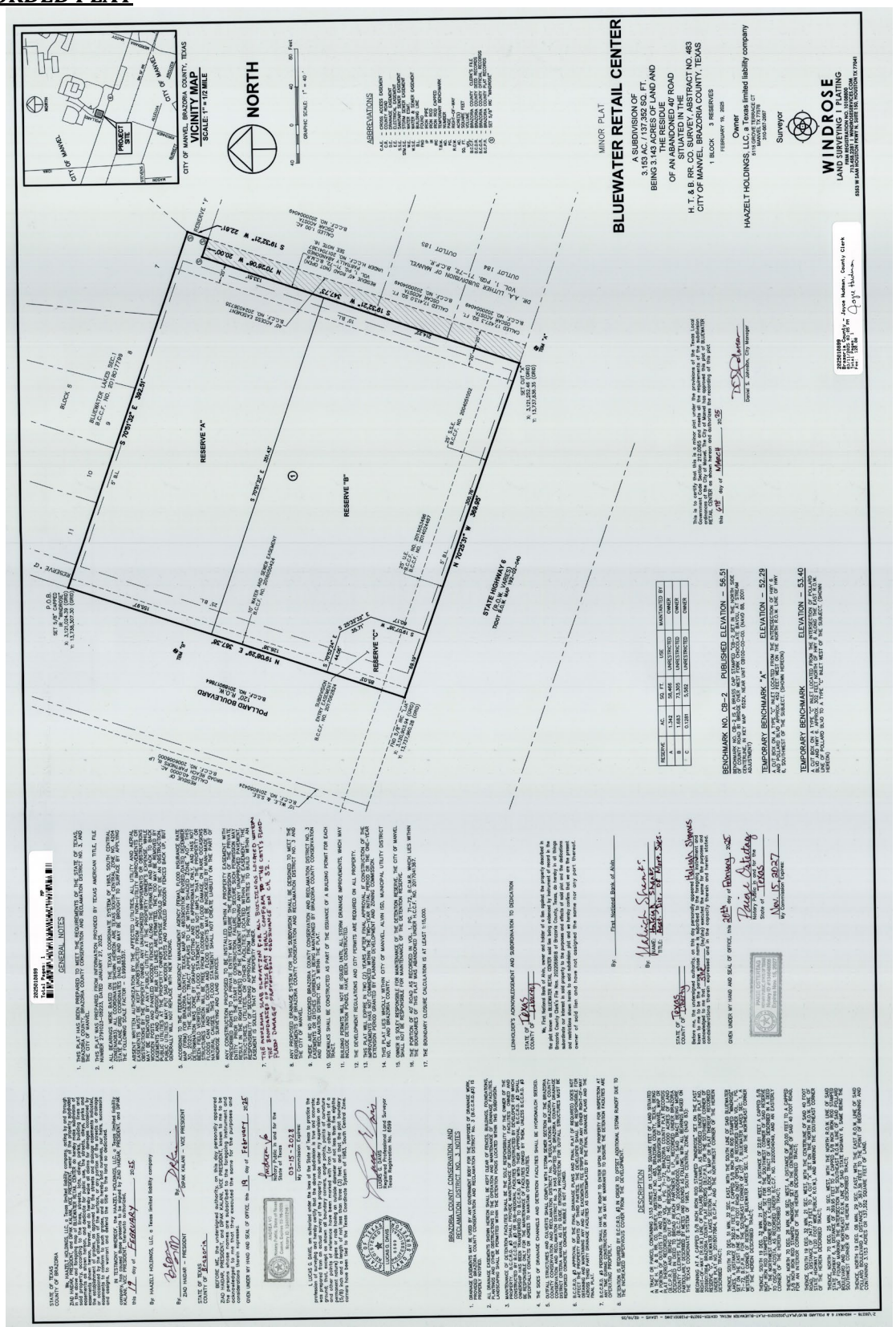
- Manicures
- Pedicures
- Nail care and grooming services

Thank you for your consideration. Please let us know if any additional information is required.

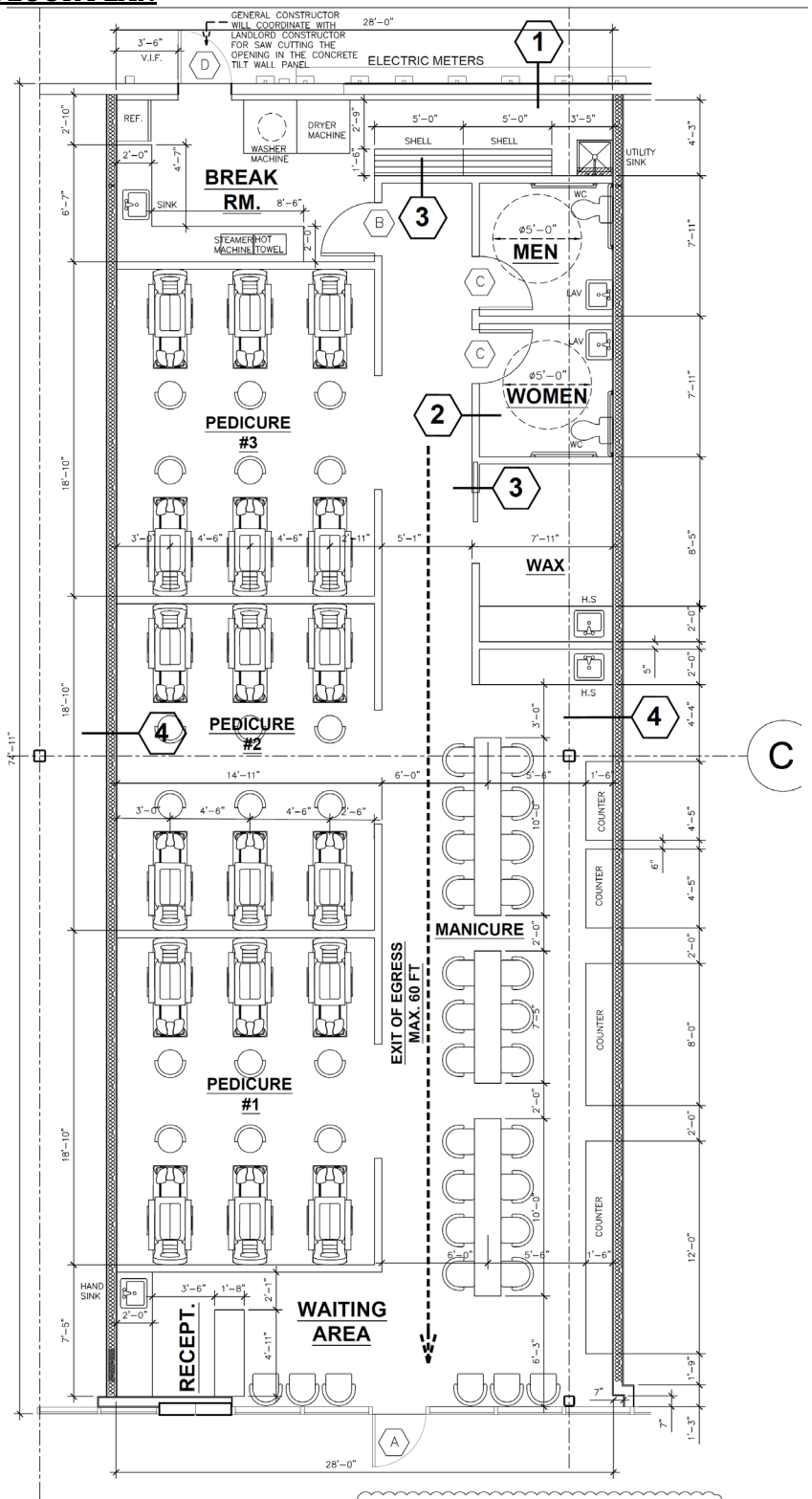
Sincerely,

Muse Nail Lounge

RECORDED PLAT


MINOR PLAT
BLUEWATER RETAIL CENTER
A SUBDIVISION OF
3.153 AC. / 137,352 SQ. FT.
BEING 3.143 ACRES OF LAND AND
THE RESIDUE
OF AN ABANDONED PORTION OF
H. T. & B. RR. CO. SURVEY, ABSTRACT NO. 483
CITY OF MANVEL, BRAZORIA COUNTY, TEXAS
1 BLOCK 3 RESERVES
FEBRUARY 19, 2025
Owner
HAZELT HOLDINGS, LLC, a Texas limited liability company
5114 GROVE TERRACE CT
PEARLAND, TX 77584
310-907-2957
Surveyor
WINDROSE
LAND SURVEYING
GENERAL NOTES
VICINITY MAP
SCALE: 1" = 1/2 MILE
NORTH
ABBREVIATIONS
BENCHMARK NO. CB-2 PUBLISHED ELEVATION = 56.51
TEMPORARY BENCHMARK "A" ELEVATION = 52.29
TEMPORARY BENCHMARK ELEVATION = 53.40
DESCRIPTION
BRAZORIA COUNTY CONSERVATION AND RECLAMATION DISTRICT NO. 3 NOTES
STATE OF TEXAS
COUNTY OF BRAZORIA
STATE OF TEXAS
COUNTY OF BRAZORIA
BRAZORIA COUNTY CLERK'S CERTIFICATE
STATE OF TEXAS
COUNTY OF BRAZORIA
LIENHOLDER'S ACKNOWLEDGEMENT AND SUBORDINATION TO DEDICATION
STATE OF TEXAS
COUNTY OF BRAZORIA
STATE OF TEXAS
COUNTY OF BRAZORIA
POLLARD BOULEVARD
STATE HIGHWAY 6
RESERVE "A"
RESERVE "B"
RESERVE "C"
BLUEWATER LAKES SEC 1
BLUEWATER LAKES SEC 2
OUTLOT 184
OUTLOT 185
DK AA LITTREE SUBDIVISION OF MANVEL
P.O.B.
SET 5/8" CAPPED
X: 3,133,328.38 (GRID)
Y: 13,727,408.58 (GRID)
SET CUT "X"
X: 3,131,255.46 (GRID)
Y: 13,727,804.18 (GRID)
N 70°26'39" W 380.65'
N 19°26'28" E 357.38'
S 70°33'32" E 382.87'
S 19°26'28" W 347.73'
N 70°26'39" W 20.00'
S 19°26'28" W 22.81'
S 70°33'32" E 30.43'
S 70°33'32" E 44.06'
S 19°26'28" W 80.00'
N 70°26'39" W 380.65'
S 19°26'28" W 347.73'
S 70°33'32" E 382.87'
N 19°26'28" E 357.38

CONCEPTUAL FLOOR PLAN



1 FLOOR PLAN
SCALE: 1/4" =1'-0"

PROVIDE SIGN "THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED, " WITH 1" HIGH LETTERS CONTRASTING TO BACK GROUND

PERMIT APPLICATION

DEVELOPMENT SERVICES
20025 HIGHWAY 6
MANVEL, TX 77578
P: 281-489-0630
F: 281-668-5061

COMMERCIAL PERMIT APPLICATION – INDUSTRIAL, COMMERCIAL AND MULTI-FAMILY

Please complete Appliation Completely

1. PROJECT ADDRESS
18909 Hwy 6, suite 300,Manvel,TX 77578

2. BUSINESS / COMPLEX NAME
MUSE NAIL LOUNGE

3. LEGAL (Lot, Block, and Subdivision)

4. OWNER INFORMATION
Name JIMMY NGUYEN
Address 18909 Hwy 6, suite 300,Manvel,TX 77578
City Manvel State TEXAS Zip 77578
Phone
Email Address

5. CONTRACTOR NAME & PHONE NUMBER
Name Jimmy Nguyen Phone

6. VALUATION
$
Include all costs for constructing the project, such as architectural, structural, electrical, mechanical, and plumbing.

7. PROJECT TYPE
☐ New Commercial Building ☐ New Multi-Family Building
☐ New Commercial – Shell Only ☐ Add-On or Remodel – Commercial
☒ New Commercial – Finish Only ☐ Add-On or Remodel – Multi-Family

8. PROJECT INFORMATION
Lot Size: 1.03 ☐ SF ☑ ACRE
Setbacks Front: Left:
Back: Right:
NAICS# ~~58~~ 812113 "NAIL SALONS"
No. of Stories 1 No. of Units
Occupancy: **a)** Type COMMERCIAL **b)** Load 58
Construction Type: 2B

9. PROJECT SIZE (SQ FT)
New Building Add-On
Shell Only Remodel
Finish Only 2128 SF Total 2128SF

10. Water Meter Size
Irrigation 2" Domestic Fire

11. READ AND SIGN
I hereby certify by my signature below that: **1)** I understand that I am the person solely responsible for inspections and all related fees and charges, **2)** I agree to abide by all laws and ordinances governing this type of work whether specified herein or not, and **3)** I have read and examined this application and know the same to be true and correct.

Signature:
Date Signed: 05/11/26

Notes:
Will any consumables be offered, served or sold at the establishment?
Yes ☐ No ☒

EFIS material are not allowed on the outside building facade (City Ord. 77-51(i)(1))

Elevation Certificates are required for projects in the floodplain

All documents and plans for a commercial project will be submitted via email to: permits@cityofmanvel.com

One hard copy of civil drawings apart from the architectural plans to be submitted to 20025 Hwy 6, Manvel, TX 77578

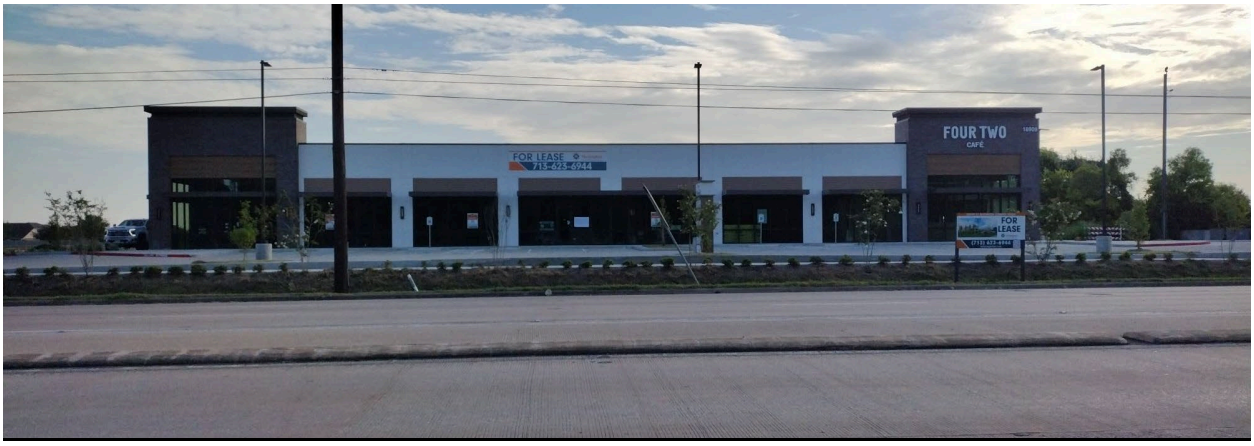
Inspections:
Must be scheduled before 5:00pm in order to be scheduled next business day.

Public Hearing Notice to run on 06/28/2026

A PUBLIC HEARING WILL BE HELD AT MANVEL CITY HALL, 20031 HWY 6, MANVEL, TX, 77578 AT 6:00 P.M. ON MONDAY, JULY 13, 2026, BEFORE THE MANVEL PLANNING, DEVELOPMENT, AND ZONING COMMISSION AND AT 6:00 P.M. ON MONDAY, JULY 20, 2026, BEFORE THE MANVEL CITY COUNCIL TO HEAR INPUT FROM THE PUBLIC REGARDING AN ORDINANCE OF THE CITY OF MANVEL, TEXAS, AMENDING THE ZONING CLASSIFICATION OF AN APPROXIMATE 1.683-ACRE TRACT OF LAND BEING RESERVE "B" OF BLUEWATER RETAIL CENTER MINOR PLAT, AS RECORDED IN BRAZORIA COUNTY CLERK'S FILE (B.C.C.F.) NUMBER 2025010899 (PID: 710337); CURRENTLY, DEVELOPED AS A RETAIL CENTER WITH ASSOCIATED PARKING (SHOPS AT BLUEWATER), LOCATED AT 18909 MORRIS AVENUE/HIGHWAY 6, MANVEL, TEXAS, FROM LIGHT COMMERCIAL DISTRICT / STATE HIGHWAY 6 OVERLAY DISTRICT (LC/SH6) TO LIGHT COMMERCIAL DISTRICT/ STATE HIGHWAY 6 OVERLAY DISTRICT WITH SPECIFIC USE PERMIT (LC/SH6-SUP); PROVIDING FOR THE GRANTING OF A SPECIFIC USE PERMIT WITH CONDITIONS TO AUTHORIZE THE USE OF PROPERTY FOR NAICS USE 812113 "NAIL SALONS" WITHIN THE LEASE SPACE "SUITE 300;" PROVIDING FOR THE AMENDMENT OF THE CITY'S OFFICIAL ZONING MAP; PROVIDING FOR SEVERABILITY; AND PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000 FOR EACH DAY OF VIOLATION OF ANY PROVISION HEREOF. /S/ TAMMY BELL, CITY SECRETARY.



SITE PICTURES



View of the subject site from Highway 6



View of the subject site from Pollard Blvd



View of the subject site from eastern driveway

ORDINANCE NO. 2026-O-17

AN ORDINANCE OF THE CITY OF MANVEL, TEXAS AMENDING THE ZONING ORDINANCE OF THE CITY, BY AMENDING THE ZONING CLASSIFICATION OF AN APPROXIMATE 1.683-ACRE TRACT CURRENTLY, DEVELOPED AS A RETAIL CENTER WITH ASSOCIATED PARKING, LOCATED AT 18909 MORRIS AVENUE /HIGHWAY 6 (PID: 710337) FROM LIGHT COMMERCIAL DISTRICT / STATE HIGHWAY 6 OVERLAY DISTRICT (LC/SH6) TO LIGHT COMMERCIAL DISTRICT/ STATE HIGHWAY 6 OVERLAY DISTRICT WITH SPECIFIC USE PERMIT (LC/SH6-SUP); PROVIDING FOR THE GRANTING OF A SPECIFIC USE PERMIT WITH CONDITIONS TO AUTHORIZE THE USE OF PROPERTY FOR NAICS USE 812113 "NAIL SALONS" WITHIN THE LEASE SPACE "SUITE 300;" PROVIDING FOR THE AMENDMENT OF THE CITY'S OFFICIAL ZONING MAP; PROVIDING FOR SEVERABILITY; AND PROVIDING A PENALTY IN AN AMOUNT NOT TO EXCEED $2,000 FOR EACH DAY OF VIOLATION OF ANY PROVISION HEREOF

* * * * * * * * *

WHEREAS, Thue Le with T&L Designs (the "Applicant"), representing the owner, Jimmy Nguyen, (the "Owner") of a certain 1.683-acre tract of land located at 18909 Morris Avenue/Highway 6, Manvel, Texas, at the northeast corner of intersection of Highway 6 and Pollard Blvd., being Reserve "B" of Bluewater Retail Center Minor Plat, recorded in Brazoria County Clerk's File (B.C.C.F.) No. 2025010899., attached hereto as Exhibit "A"; and

WHEREAS, the 1.683-acre tract is currently zoned Light Commercial District and Highway 6 Overlay District (LC-SH6); and

WHEREAS, the applicant, has filed an application to change the zoning classification of the 1.683-acre tract to Light Commercial District and Highway 6 Overlay District with a Specific Use Permit (LC-SH6-SUP) allowing the proposed use of the property for NAICS use 812113 "Nail Salons" specifically within the lease space with floor plan depicted on Exhibit "B"; and

WHEREAS, the Planning, Development, and Zoning Commission and the City Council have conducted, in the time and manner required by law and the Zoning Ordinance of the City, a public hearing on such request; and

WHEREAS, the Planning, Development, and Zoning Commission has recommended in its report the approval of such request, and the City Council deems it appropriate to approve said amendment to the zoning and specific use permit; now, therefore,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MANVEL, TEXAS:

Section 1. The facts and matters set forth in the preamble of this Ordinance are hereby found to be true and correct.

Section 2. The zoning classification of a certain 1.683 tract of land located 18909 Morris Avenue/Highway 6, Manvel, Texas, at the northeast corner of intersection of Highway 6 and Pollard Blvd., being Reserve "B" of Bluewater Retail Center Minor Plat, recorded in Brazoria County Clerk's File (B.C.C.F.) No. 2025010899, attached hereto as Exhibit "A" shall be changed from Light Commercial and State Highway 6 Overlay District (LC-SH6) to Light Commercial and State Highway 6 Overlay District with a Specific Use Permit (LC-SH6-SUP)), for uses as permitted within such zone classification, subject to the regulations, regulations, and conditions hereinafter set forth:

1. Nail Salons – (NAICS 812113)

Section 3. The request meets the criteria set forth in Section 77-50 of the City of Manvel Zoning Ordinance for a Specific Use Permit. The City of Manvel Zoning Ordinance is hereby further amended by granting a Specific Use Permit authorizing use of the Property for the NAICS use listed in Section 2, above.

Section 4. The City Council hereby finds it appropriate to impose the conditions to the granting of the Specific Use Permit as shown in Exhibit "C", attached hereto and incorporated herein as if set out in full. This proposed uses of an "Nail Salons" and site may not be changed or expanded except by amendment of this Specific Use Permit.

Section 5. The Specific Use Permit issued under this ordinance, or a specific use listed herein, shall expire one year after its date of issuance if construction or if the listed use authorized hereunder is not substantially under way or in use prior to the expiration of said one year period. If, prior to the expiration of such one-year period, the owner of the property to which the Specific Use Permit applies in writing, for an extension, the City Council may, after recommendation from the Planning, Development, and Zoning Commission, grant such extension for one additional year. If the Specific Use Permit expires, the underlying zoning [Light Commercial and State Highway 6 Overlay District (LC-SH6)] shall apply.

Section 6. The Zoning District Map of the City of Manvel shall be revised and amended to show the designation of said tract, as described and as provided in Section 2, above, with the appropriate reference thereon to the number and effective date of this Ordinance and a brief description of the nature of the change.

Section 7. The City Council hereby finds and determines that said rezoning comports to the City's Comprehensive Master Plan and Future Land Use and Character Map. This Ordinance shall in no manner amend, change, supplement, or revise any provision of any ordinance of the City of Manvel, save and except the change in zoning classification of said tract(s) as described above.

Section 8. In the event any section, paragraph, subdivision, clause, phrase, provision, sentence, or part of this Ordinance or the application of the same to any person

or circumstance shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Manvel, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, or whether there be one or more parts.

Section 9. Any person who shall intentionally, knowingly, recklessly or with criminal negligence violate any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed $2,000.00. Each day of violation shall constitute a separate offense.

Section 10. Revocation. This Specific Use Permit may be revoked or modified by the City Council, in whole or in part, after notice and hearing, for either of the following reasons:

(1) The Specific Use Permit was obtained or extended by misrepresentation, fraud or deception: or

(2) That one or more of the conditions imposed by the permit has not been met or has been violated.

PASSED AND APPROVED on first reading this _____ day of _____, 2026.

PASSED, APPROVED, AND ADOPTED on second and final reading this _____ day of _____, 2026.

_____

_____

Dan Davis, Mayor

ATTEST:

_____

Tammy Bell, City Secretary

APPROVED AS TO FORM:

_____

Robert Gervais, City Attorney

Exhibit A

Reserve “B” of Bluewater Retail Center Minor Plat, recorded in Brazoria County Clerk’s File (B.C.C.F.) No. 2025010899.

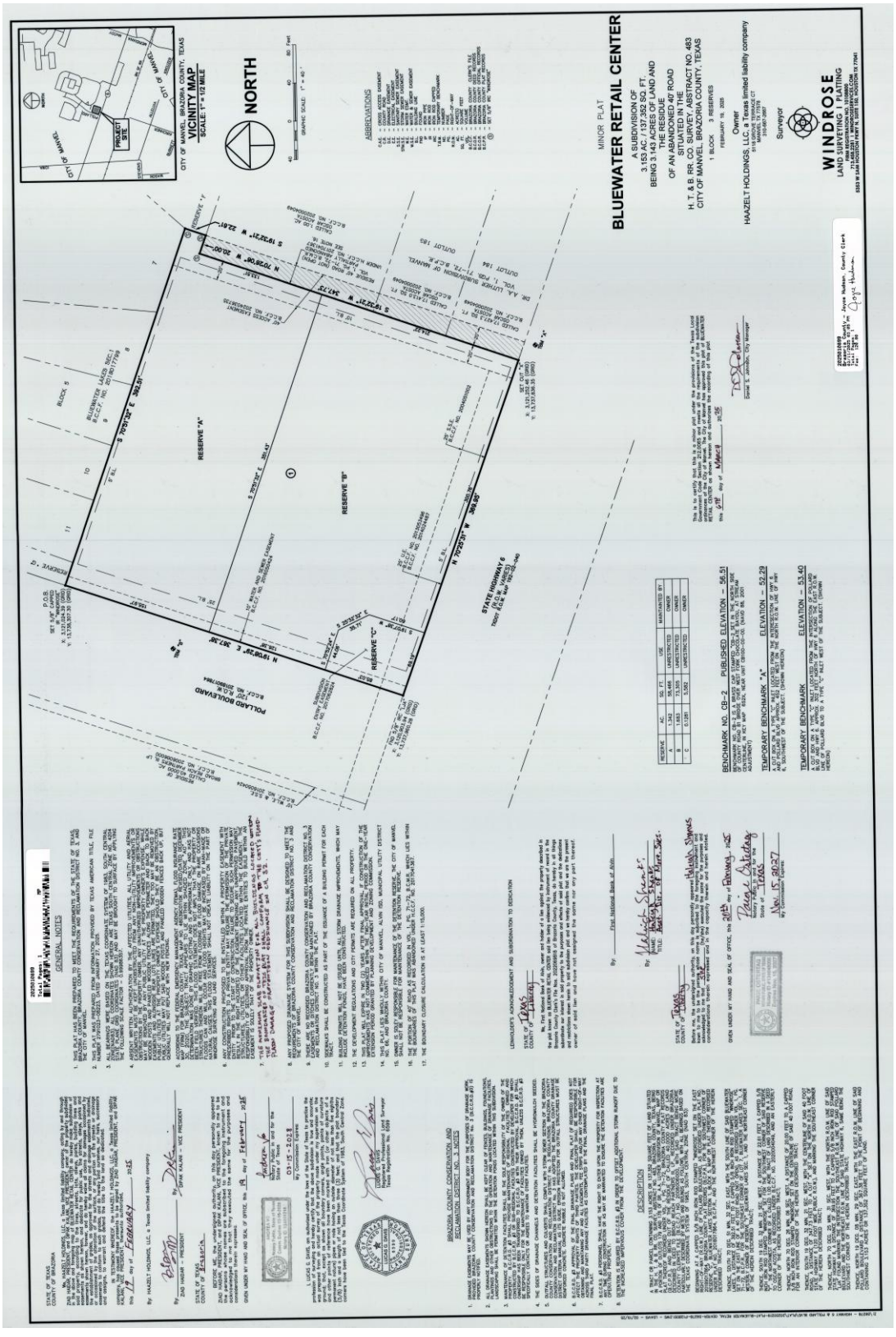
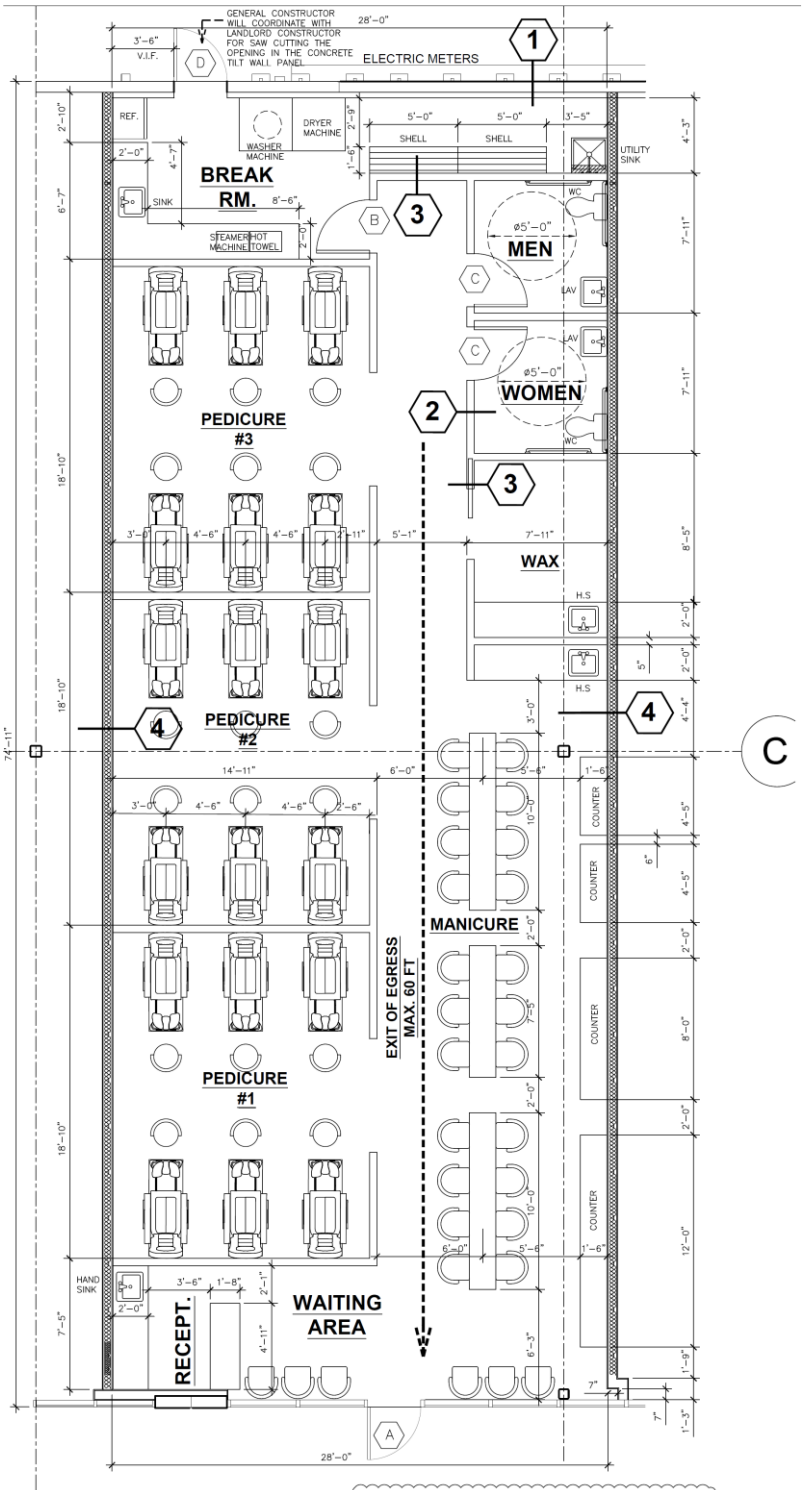


Exhibit B



1 FLOOR PLAN
SCALE: 1/4" =1'-0"

PROVIDE SIGN "THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED, " WITH 1" HIGH LETTERS CONTRASTING TO BACK GROUND

Exhibit C

Conditions of Approval:

1. This Specific Use Permit applies only for 18909 Hwy 6 # 300 with floor area not to exceed 2,200 square feet.
2. Unless otherwise required by state law or regulation, the facility is only permitted to operate during the hours of 7:00 a.m. to 10:00 p.m. each day;
3. All waiting and/or lobby areas shall maintain an unobstructed view from the outside; and
4. All doors shall remain unlocked and accessible during normal business hours.

CITY OF MANVEL
TRAFFIC SIGNAL AT CROIX ROAD AND RODEO DRIVE
RFP# FY2026-03
BID EVALUATION

	TSC Incorporated	Creacom Incorporated	Traf-Tex Inc	Reliable Signal and Lighting SOL
Evaluator	**$ 295,295.00**	$ 312,230.48	$ 324,657.00	$ 316,587.00
City Engineer	79	74	70	70
Public Works	78	70	65	68
Administration	80	68	62	70
Design Engineer	78	71	63	67
Finance	78	73	67	72
Total Points	393	283	260	275
% of Maximum Points (400)	98%	71%	65%	69%

Description	Criteria (up to)
Cost/ Time Frame For The Project	50
General Company Information	10
Avalibility Of Technical Staff & Field Personnel	10
References	10
Total Points:	80

Project 2026-03 Traffic Signal at Croix Road and Rodeo Drive

Bid Opening 7/9/2026 @ 10:00 AM

Name of Bidder	Duplicate	Bid Bond	Base Bid	Alternant (if any)	Addendums addressed (if any)	Total Bid
TSC Incorporated		Yes	$295,295.00			**$295,295.00**
Creacom Incorporated		Yes	$312,230.48			**$312,230.48**
Traf-Tex Inc		Yes	$324,657.00			**$324,657.00**
Reliable Signal and Lighting SOL		Yes	$316,587.00			**$316,587.00**

SECTION 1

GENERAL COMPANY INFORMATION AND HISTORY

Traffic Systems Construction, Inc

P. O. Box 1346
Dickinson, Texas 77539-1346

Office (281) 337-1926
Fax 1 (281) 337-2968

STATEMENT OF QUALIFICATIONS

Traffic Systems Construction, Inc. was incorporated in July of 1999 in the state of Texas. Combined, the owners Steve Kass and Jesse Martinez have 70 years of experience in the Traffic Signal industry. TSC, Inc.'s area of expertise include: Fiber Optics, VIVDS Camera Systems, CCTV, Loop Detectors, Radar Sensing Devices, Traffic Signal Installation, High Mast Lighting, Duct Banks, and Street Lighting to name a few. Our Client list range from City, State, and local municipalities like TXDOT, City of Houston, HCTRA, UPTOWN, METRO, City of League City, and the Port of Houston, to private corporations like AUTOZONE. TSC, Inc.'s maintains a modern fleet of bucket trucks, derrick diggers, trenchers, drill trucks, bore rigs, and back hoes which enables TSC to handle any aspect of construction. TSC, Inc.'s work history includes over 625 projects completed in the Houston, Texas area. TSC, Inc. pursues work ranging from a few thousand dollars to the $25 million dollar range. Our workforce is highly skilled, properly managed, and dedicated to completing each project both efficiently and safely. The factors outlined above allow TSC to maintain a favorable advantage and compete as the leading Civil Electrical contractor in the region.

Company Name	Traffic Systems Construction, Inc.
Address (Mailing)	P.O. Box 1346, Dickinson, TX 77539
Address (Physical)	520 FM 646 N, Dickinson, TX 77539
Telephone Number/ Fax Number	(281) 337-1926 / (281) 337-2968
Owner's Name	Steven Kass
Bank Reference	Texas First Bank
Bank Telephone Number	(281) 412-8513
Bank Contact	Tyler Garrett
Surety	International Fidelity Insurance Company
Bonding Company	Technical Assurance, L.L.C.
Bonding Agent	Edward Arens
Bonding Agent Contact Telephone Number	(281) 296-9997
Accounting Firm	Ham, Langston & Brezina
Accountant	Bill Ansell
Accountant Contact information	(409) 765-9311
Federal Tax Identification Number	76-0612247

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY
CERTIFICATION OF FILING

Certificate Number:
2026-1486963

Date Filed:
07/09/2026

Date Acknowledged:

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.
Traffic System Construction, Inc.
Dickinson, TX United States

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.
City of Manvel

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.
FY2026-03, RFP# FY2026-03
TRAFFIC SIGNAL AT CROIX ROAD AND RODEO DRIVE

4 Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. [X]

6 UNSWORN DECLARATION

My name is STEVE M. KASS, and my date of birth is 02-03-62.

My address is 520 FM 646 N, DICKINSON (city), TX (state), 77539 (zip code), USA (country).

I declare under penalty of perjury that the foregoing is true and correct.

Executed in GALVESTON County, State of TX, on the 09 day of 07 (month), 2026 (year).

Signature of authorized agent of contracting business entity
(Declarant)

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 05/11/2026

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Mickaela Slaughter	
Texas First Insurance 7900 Emmett F. Lowry Expy Texas City TX 77591	PHONE (A/C, No, Ext): (409) 934-8000	FAX (A/C, No): (409) 935-1883
	E-MAIL ADDRESS: mickaela.slaughter@texasfirst.insurance	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Arch Insurance Company	11150
INSURER B : Travelers Lloyds Ins Co	41262
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED: Traffic Systems Construction, Inc.
PO Box 1346
Dickinson TX 77539

COVERAGES **CERTIFICATE NUMBER:** 25-26 August Rnwls **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC [ ] OTHER:			41PKG2099800	08/01/2025	08/01/2026	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG Employee Benefits-Each	$ 1,000,000 $ 300,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000 $ 1,000,000
A	AUTOMOBILE LIABILITY [X] ANY AUTO [X] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [X] HIRED AUTOS ONLY [ ] NON-OWNED AUTOS ONLY			41PKG2099800	08/01/2025	08/01/2026	~~COMBINED~~ SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) Underinsured motorist	$ 1,000,000 $ $ $ $ 1,000,000
A	[ ] UMBRELLA LIAB [X] OCCUR [X] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $			41UFP2099800	08/01/2025	08/01/2026	~~COMBINED SINGLE LIMIT~~ EACH OCCURRENCE AGGREGATE 	$ 5,000,000 $ 5,000,000 $
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [N] (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		45WCI2099800	08/01/2025	08/01/2026	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
B	Leased & Rented Equipment Installation Floater			QT-660-8J92054A-TLC-25	08/01/2025	08/01/2026	Any One Item Any One Location	$250,000 $600,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

The General Liability and Auto Liability policies include a blanket automatic additional insured endorsement that provides additional insured status to the certificate holder only when there is a written contract between the named insured and the certificate holder. The General Liability, Auto Liability and Workers Compensation policies include a blanket automatic waiver of subrogation endorsement that provides waiver of subrogation wording to the certificate holder. These endorsements, to the extent provided in the policy, all apply when there is a written contract between the named insured and the certificate holder that requires such status. The General Liablility policy will pay for a covered loss on a primary basis and the Company will not seek contribution from the Certificate Holder for such loss. Excess Policy is follow form. The General Liability, Business Auto, Inland Marine, and Umbrella policies include a 30 day notice of cancellation to certificate holders endorsement, providing for 30 days advance notice if the policy is cancelled by the company other than for

CERTIFICATE HOLDER

SAMPLE

TX 77469

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

R. C. Blyst

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TEXAS DEPARTMENT OF LICENSING AND REGULATION
P.O. Box 12157
Austin, Texas 78711-2157
1-800-803-9202 (512) 463-6599
http://www.tdlr.texas.gov

If you cut around the border of the registration certificate it will fit in a standard 5" x 7" frame.

The certificate at the bottom of this page should be prominently displayed at your primary business location.

Master: JAMES R MAYNARD JR, License# 11658

TRAFFIC SYSTEMS CONST INC
PO BOX 1346
DICKINSON TX 77539-1346

Rick Figueroa
Chair

Thomas F. Butler
Vice Chair

Gerald R. Callas, M.D., F.A.S.A.
Nora Castañeda
Sujeeth Draksharam
Lori High, RN, NP, Retired
Gary F. Wesson, D.D.S., M.S

Electrical Contractor

TRAFFIC SYSTEMS CONST INC

License Number: 18374

The business named above is licensed by the Texas Department of Licensing and Regulation

License Expires: MARCH 20 2027

Courtney Arbour
Executive Director

lic-037.dff

TEXAS DEPARTMENT OF LICENSING & REGULATION

Licensing Division • PO Box 12157 • Austin, Texas 78711 • (512) 463-6599 • Fax (512) 475-2871

www.tdlr.texas.gov

TRAFFIC SYSTEMS CONST INC
PO BOX 1346
DICKINSON, TX 77539-1346

The Texas Department of Licensing and Regulation (TDLR) is responsible for licensing and regulating a broad range of occupations, businesses, facilities, and equipment in Texas. Our purpose is to protect the health and safety of Texans and ensure they are served by qualified professionals. We foster a predictable regulatory climate and avoid unreasonable government interference. In all of these endeavors, we:

- are open and transparent;
- apply clear, consistent, and common-sense standards;
- keep costs low and efficiency high; and
- deliver exceptional customer service.

TDLR's Mission:
To earn the trust of Texans every day by providing innovative regulatory solutions for our licensees and those they serve.

TDLR's Vision:
To be the best at creating 'next' practices that deliver low-cost licensing and regulatory services and an exceptional customer experience.

TDLR's Core Values:
Accountability
Customer Service
Innovation
Integrity
Open and Free Communication
Respect
Teamwork

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For assistance contact Customer Service
Customer.service@tdlr.texas.gov
512-463-6599
800-803-9202 (toll free statewide)

Visit us on the web at www.tdlr.texas.gov

STATE OF TEXAS

TRAFFIC SYSTEMS CONST INC

ELECTRICAL CONTRACTOR

TDLR
TEXAS DEPARTMENT OF LICENSING & REGULATION

LICENSE NUMBER 18374
EXPIRES 3/20/2027

TEXAS DEPARTMENT OF LICENSING & REGULATION

EXHIBIT A

EACH CONTRACTOR SUBMITTING A PROPOSAL MUST FULLY ANSWER IN WRITING EACH OF THE QUESTIONS. FAILURE TO FULLY ANSWER ANY QUESTION OR COMPLY WITH THE INSTRUCTIONS IS REASON FOR DISQUALIFICATION OF THE PROPOSAL.

A. General Company Information and History (10 Points)

1. General History

1.1 How many years has your organization been in business as a General Contractor? 26 YEARS

1.2 How many years has your organization been in business under its present business name? 26 YEARS

1.2.1 Under what other or former names has your organization operated? N/A

1.3 If your organization is a corporation, please provide the following:

1.3.1 Date of incorporation; July 31, 1999
1.3.2 State of incorporation; TEXAS
1.3.3 President's name; Steven Kass
1.3.4 Vice-president's name(s); Kenneth Marcisan
1.3.5 Secretary's name; 1.3.6 Treasurer's name. Charlotte Davis
MISTI GANN

1.4 If your organization is a partnership, please provide the following:

1.4.1 Date of organization; N/A
1.4.2 Type of partnership (if applicable); 1.4.3 Names of all partners.

1.5 If your organization is individually owned, please provide the following:

1.5.1 Date of organization N/A
1.5.2 Name of owner

2. Licensing

2.1 Please provide a list of jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable. SEE ATTACHED

2.2 Please provide a list of jurisdictions in which your organization, partnership or trade name is filed. SEE ATTACHED

3. Experience

3.1 Describe the major construction projects your organization has completed in the past five (5) years, giving the name and location of project, owner, architect, original and final contract amount, scheduled and actual date of completion. SEE ATTACHED

3.2 Please provide total worth of work (1) in progress and (2) under contract. SEE ATTACHED

B. Availability of Personnel and Experience (10 Points)

1. Personnel

1.1. Please provide resumes for key project personnel and include information regarding the Project Executive, Project Manager, and Superintendent:

1.1.1. Education
1.1.2. Work History (by company), in reverse chronological order.
1.1.3. Project experience, in reverse chronological order. Please list project name, contract amount, type and size of facility, owner, architect, engineer and capacity or position the key person served. Please note if the project was bid or negotiated.

C. References (10 Points)

1. References

1.1 References from previous clients on similar projects as this (minimum 5 project), including contact names, numbers and projects. Details of prior experience and similar projects SEE ATTACHED

OPEN CONTRACTS

	CLIENT	OWNER	PROJECT	LEFT	CONTRACT AMOUNT
J546	WILLIAMS BROTHER	TXDOT	IH 610	443,908.96	8,818,176.49
J568	WILLIAMS BROTHER	TXDOT	IH 45 Galveston 517 - 1764	3,167,761.86	9,645,309.18
J569	Ship Channel Constructors	HCTRA	Ship Channel Bridge	30,960,462.21	42,593,177.25
[illegible]	WILLIAMS BROTHER	TXDOT	IH 45 Galveston WB 523	5,453,631.81	9,289,113.09
J602	WILLIAMS BROTHER	TXDOT	Wharton	3,226,012.25	8,731,464.18
J613	WILLIAMS BROTHER	TX	IH-45 FM 1764 to Bayou Vista	9,891,168.30	11,760,187.37
J626	TSC	CITY OF HOUSTON	Traffic Signal WO FY21	1,096,800.60	5,157,790.27
J635	WILLIAMS BROTHER	TXDOT	US 69 - Jefferson County	898,258.62	1,985,747.70
J676	TSC	CITY OF HOUSTON	Traffic Signal Work Order FY23 #1	1,657,289.96	3,536,737.50
J680	TSC	CITY OF HOUSTON	Traffic Signal Work Order FY23 #2	419,953.85	3,623,250.00
J696	Zachry	TXDOT	FM 723 from FM 1093	1,122,283.08	2,850,375.56
J708	TSC	HARRIS COUNTY	Traffic Signal System Improvements	9,171,218.21	10,367,557.45
J712	TSC	CITY OF HOUSTON	FY 24 #1	3,444,644.61	4,880,225.00
J714	Resicom	HARRIS COUNTY	Quitman Bike Lanes	326,213.00	363,653.00
J719	Zachry	HCTRA	SH-225	5,095,826.15	9,095,999.00
J723	Webber	TXDOT	I-10 Heights to I45	5,790,329.88	9,636,680.40
J724	Austin Commercial	MD ANDERSON	Old Spanish Trail	35,424.86	157,080.00
J725	TSC	TOMBALL ISD	FM 2920	53,588.00	578,050.00
J729	Durwood Greene	BRAZOIRA COUNTY	Coral Haven Street	260,593.80	520,101.50
J731	TSC	ASHTON OAK HOME	Broadway at Shadow Grove Lane	358,708.00	454,773.00
J734	Texas Sterling	CITY OF PEARLAND	Smith Road Recon.	4,336.30	194,824.47
J736	James Construction	TXDOT	FM 1764	83,496.25	198,171.68
J737	ICON	HOUSTON AIRPORT SYSTEM	Kenswicck Dr Extension	389,142.25	525,525.00
J740	CITY OF HOUSTON	CITY OF HOUSTON	FY 25 #1	4,909,491.20	4,909,491.20
J746	Gulf Coast - Angel Bro.	TXDOT	Galveston SH 87	113,586.50	812,329.18
J748	Enviromental Allies	TXDOT	Brazoria SH 35	28,235.00	28,235.00
J749	Mainlaines	HCTRA	HCTRA #243 System Wide	387,017.62	680,542.28
J750	Jerdon	CITY OF PEARLAND	Sienna Pkwy at SH 6	34,535.50	68,995.50
J751	TSC	FORT BEND COUNTY	S Mason Rd at Bellaire Blvd	199,324.05	450,450.00
J752	TSC	ELEVATION LAND SOLUTIONS	FM 1097 Fort Bend County	175,431.00	250,250.00
[illegible]	CBDR Industrial	HARRIS COUNTY	Five Oaks at Gossling Rd	371,959.00	371,959.00
[illegible]	TSC	GALVESTON MUD 59	Lago Mar Traffic Signal	26,678.50	326,868.13
J755	Webber	TXDOT	FM 2100 at 1960	461,078.25	492,358.25
J757	Rexcon	FORT BEND COUNTY	Harlem Rd West Airport	322,775.00	442,455.00
J758	TSC	FORT BEND MUD 147	FM 2218 @ Koeblen Rd Turn Lane	180,539.00	180,539.00
J759	Metro City	CITY OF PEARLAND	Broadway at Pearland Pkwy	499,109.00	541,769.00
J760	Cissel Mueller Const.	QUICK TIME	FM 517 & Hughes Ln QT	88,275.19	389,304.15
J763	Blazer Building	PARK AT TOUR 18	Will Clayton Pkwy @ Hunters Terrace I	325,000.00	325,000.00
J764	TSC	FORT BEND MUD 50	Peek Rd at SH 99	391,534.00	488,488.00
J765	For6t Bend MUD 152	FORT BEND MUD 152	Irby Cobb	130,227.00	313,615.00
J769	Jerdon	HCES DISTRICT 9	N Houston Rd at Country View Dr	295,295.00	295,295.00
J770	Drymalla	LAMAR ISD	Brookwater 38	95,520.00	190,560.00
J771	MBN	METRO	Post Oak	60,913.50	60,913.50
J772	TSC	HARRIS COUNTY	Traffic Signal System Improvements	13,000,000.00	13,000,000.00
J773	Harper Brothers	CITY OF BAYTOWN	Garth Rd Baytown	2,179,498.90	2,633,000.00
J774	Metro City	CITY OF PEARLAND	Dixie Farm at Hastings	342,457.00	342,457.00
J775	Mainlaines	NORTH HOUSTON RED. TIRZ 11	Ella @ Rankin	137,500.00	250,000.00
J777	Scout 5 Construction	TXDOT	Hwy 6 @ Delany	379,291.00	386,971.00
J778	Texas Materials/Gulf Coast	MONTGOMERY CO MUD 123	Fish Creek Thoroughfare	59,875.00	59,875.00
J779	LJA	BAYBROOK MUD NO. 1	Bay Area Blvd at Beamer	109,832.00	109,832.00
J780	R Construction	CITY OF RICHMOND	Pinevale Tract	173,900.00	173,900.00
J781	Drymalla	LAMAR ISD	FM 1640 @ Stadium Dr	95,851.35	195,101.35
J782	R Construction	HOUSTON COUNTRY CLUB	Houston Country Club	46,860.00	46,860.00
J783	TSC	WALLER COUNTY MUD 4	Clay Rd at Pitts Rd	292,656.00	292,656.00
J784	Jerdon	BRAZOIRA COUNTY	FM 523	188,720.00	188,720.00
J785	MBN	METRO	Metro Boost 82 West Segment	261,508.00	261,508.00
J786	Fisk	UNIVERSITY OF HOUSTON	MLK @ University	96,820.00	96,820.00
[illegible]	Phuel	QUICK TIME	QT 4633 (Chambers County)	338,338.00	338,338.00
[illegible]	TSC	GENERATION PARK MGM DIST	Lake Houston Parkway at Timber Fores	807,807.00	807,807.00
				$110,958,491.37	$175,767,231.63

Most Recent Completeted Projects

	Job #	Prime/TSC	Project Owner	Project Name	Description	CONTRACT AMOUNT
1	J-479	TSC, Inc.	City of Houston	Citywide Traffic Signal Rebuild #7	Traffic Signalized Intersection	$2,596,217.61
2	J-493	TSC, INC	CITY OF HOUSTON	Citywide Redesign Safety #6	Traffic Signalized Intersection	$1,043,740.14
3	J-523	Williams Brothers	TXDOT	IH 45 Galveston	CTMS, OVHD SIGNS, Lighting, TRF SIG, CCTV	$5,862,238.12
4	J-537	TSC, Inc.	CITY OF HOUSTON	Citywide Rebuild #10	Traffic Signalized Intersection	$4,118,460.10
5	J-591	Harper Brothers	City of Houston	72-inch Water Line Emancipation	Traffic Signalized Intersection & Roadway Lighting	$2,198,621.63
6	J-607	TSC, Inc.	City of Houston	Traffic Signal Work Order	Traffic Signalized Intersection	$4,041,575.57
7	J-618	Primoris	TXDOT	FM 1097- Montgomery	Traffic Signalized Intersection	$354,390.50
8	J-632	TSC, Inc.	Fort Bend County	FM 1463 at Pine Mill Ranch	Traffic Signalized Intersection	$115,531.65
9	J-636	Joslin Construction	FB Toll Road Authority	Fort Bend Toll Road @ Hwy 6	Traffic Signalized Intersection	$98,754.00
10	J-637	TSC, Inc.	City of Richmond	FM 762 @ Wildwood	Traffic Signalized Intersection	$212,212.00
11	J-638	TSC, Inc.	Fort Bend County	University, Winding Water, Riverstone	Traffic Signalized Intersection	$938,108.38
12	J-639	Mainlaines	TXDOT	Grand Parkway SH99	Overhead Sign Bridges & Signs	$528,796.76
13	J-641	Mainlaines	TXDOT	FM 529	Traffic Signalized Intersection	$417,031.00
14	J-642	TSC, Inc.	HCTRA	21/0377, BW 8-US 59 to US 290	Hi-Mast Lighting Installation	$12,834,103.00
15	J-647	Triple B Services	Private Developer	Tanyard Creek	Traffic Signalized Intersectino	$232,137.00
16	J-651	TSC, Inc.	Fort Bend County Mud No.1	Harlem Rd at Harvest Home DR	Traffic Signal & Roadway Modification	$375,657.05
17	J-654	Durwood Greene	TXDOT	SH 35	Traffic Signal & Roadway Modification	$199,429.14
18	J-655	Texas Wall & Landscaping	Harris County MUD 61	Colonial Parkway	Bike Bath & Park Illumination	$358,358.00
19	J-656	TSC, Inc.	Wood Partners	Alta Fry Road	Traffic Signalized Intersection	$69,138.11
20	J-659	TSC, Inc.	Taylor Morrison	FM 2234 & Greendale Drive	Traffic Singal & Roadway Modificatino	$842,281.42
21	J-662	TSC, Inc.	Galveston County Mud	Madrid Lane	Traffic Signalized Intersection	$533,958.00
22	J-665	Statewide Services	Harris County	Ella Boulevard	Traffic Signalized Intersection	$906,846.85
23	J-706	Durwood Greene	TXDOT	Waller FM 362	Traffic Signalized Intersection	$159,171.63
24	J-711	TSC, Inc.	Mediastar Corp	Colonial Parkway	Traffic Signalized Intersection	$408,518.30
25	J-716	TSC, In.c	Valley Ranch Town Center	SH 99 at Valley Ranch	Traffic Signalized Intersection	$69,908.00
26	J-718	UNITAS Construction	MUD NO. 593	Mason Road	Traffic Signalized Intersection	$404,919.75
27	J-721	Prime Contractors	ISD	Ferndell Henry Ctr	Traffic Signalized Intersection	$143,645.00
28	J-722	Harvey Builders	Harris County	Atascocita Road	Traffic Signalized Intersection	$64,150.00
29	J-730	FORDE Construction	TXDOT	IH-610 Entrance Ramp	Overhead Sign Bridges & Signs	$235,662.37
30	J-735	TSC, Inc.	Elevation Land Solution	Canopies Parkway	Traffic Signalized Intersection	$401,916.75
31	J-738	FORDE Construction	TXDOT	US 290 & FM 2920	Hi-Mast Lighting Installation	$171,171.00
32	J-741	Durwood Greene	TXDOT	FM 646 at Grand Avenue	Traffic Signalized Intersection	$425,473.00
						$41,362,121.83

TSCI TRAILER LIST

TSCI VEH NO. INTERNAL	TSCI ASSET DESCRIPTION	VIN NO.	PLATE NO.
TR2	00 LOAD TRAILER - 40ft goosencek	4ZECF2021Y1133554	412137M
TR5	00 LOAD TRAILER	4ZECF2026Y1140242	850-616J
TR6	01 LOAD TRAILER-Dump - **no inspection**	4ZESH122911142151	807754K
TR10	02 LOAD TRAILER	4ZECF202X21152921	344-52D
TR12	2000 BELS 34320	16JF02035Y1034320	569-20F
TR19	2010 Load Trailer-Steve's	4ZECH2021A1070990	596737M
TR20	06 Gooseneck	5BEBF32206C140579	505641M
TR22	07 Bray-Trailer-Dump	24454	
TR23	07 TX Bragg Gooseneck	17XFG252671075655	Z09160
TR24	88 TRAIL KING LOWBOY not on insurance	1TKH04826JM110215	158250F
TR25	07 TX BRAGG DUMP TRAILER inspection	17XFG202461060870	Y81261
TR26	14 Utility Trailer LAMA	5RVUT202XEM018078	412242M
TR#27	Load Trailer 1995 Flatbed - yellow token no	1TKC02420SM032231	Y19791
TR#29	Boat Trailer 2000 Load - **no inspection rec**	4YPAB3336XT016315	937-81K
TR#32	2011 UTILITY CM - white enclosed 'fair'	49TCB1820A1096800	357248F
TR#35	2015 Horse Trailer WWTR UT	11WES1423FW313486	200316J
TR#36	2013 DRAGON	1UNST4222DL130130	Y19788
TR#39	2016 LAMAR GOOSENECK 14000GVW	5RVHG2026GP039548	412133M
TR#40	2016 LAMAR U68	5RVU62029GP039948	591320j
TR#41	2017 LAMAR GOOSENECK LOWBOY	5RVHG2025HP045018	654-848J
TR#42	2017 LAMAR HG832027 GOOSENECK	5RVHG2022HP046711	086140K
TR# 44	2017 LAMAR UT7	5RVUT1629HP049133	885821J
TR# 45	2007 Belshe BF9T Equipment Trailer - Alex	16JF0183771043419	970749J
TR#47	2019 Lamar Black U68 UT	5RVU62026KP069434	577813K
TR#48	2018Lamar Trailer	5RVUT1425KP072774	044995M
TRL#49	2014 MMDI UT Trailer 510RCMPH	5631B1729EM011497	412222M
TRL#50	2012 Pinnacle AL470 Frac Tank	SN AL4162	
TRL#51	2019 Utility FS2CH 53 Ft T/A Spread Axle F	1UYFS2530K5799904	962993k
TR# 52	HOLLAND SLIDING FIFTH WHEEL	STEVE'S??	
TR# 53	2013 DRAGON 130 BBL T/A VACUUMN T	1UNST4226DL114898	016B132
TRL#161	2018 Anderson HP35 Hydra Platform	1H9US3335JS196504	326-714k
	Fiber Trailer??	9535	1b42??

4/29/2024

TSSCI HEAVY EQUIPMENT

TSCI VEHICLE # INTERNAL	TSCI ASSET DESCRIPTION	VIN
HE-13	VERMEER DT750 TANK ASSY	1VRT160D0Y1001025
HE-20	08' JOHN DEERE BACK HOE	
HE-22	10 John Deer Backhoe 310J	1T0310EKLLCG222107
HE-25	05 John Deer Backhoe 310G - yellow	612-7175788 / OMT191038
HE-26	05 John Deer Backhoe 310G 4x4	T0310GX950137
HE-31	BAGWELL BROS 500 GAL FUEL TANK	
HE-32	800 GALLON POLY WATER TANK	
HE-33	PORTABLE FRAC TANK	
HE-39	LINCOLN WELDER	
HE-42	Solar Tech Arrowboard	
HE-43	Allmand Brothers Arrowboard	
HE-44	2000 National Sign Arrowboard Model 14077	59A71013YL358077GVW225
HE-45	2006 Atlas Copco Generator AS78JDS-TQ	
HE-47	2012 Vermeer D20X22 Directional Bore	1VR6180T3C1000783
HE-49	2016 John Deere 26G Compact Excavator	1FF026GXJFK261186
HE-50	2016 John Deere 35G compact Excavator (Carlos)	1FF035GXCFK273629
~~**HE-51**~~	~~2016 John Deere 35G compact Excavator (Manual) STOLEN?~~	~~stolen 9/7/22?????~~
HE-52	310J John Deere Backhoe 2wd	
HE-53	310K John Deere Backhoe 2wd	T0310JX177878
HE-54	310J John Deere Backhoe 2wd	1T0310JXVB0194735
HE-55	Loop Sealant Pump	
HE-56	2016 Shin Kobe II T1010C Portable Restroom	
HE-57	DigiTrak ET (Black) Sonde	
HE-58	2016 Vermeer D20x22 S3 Directional Drill Bore	1VRA170V8G1000421
HE-61	Ryobi Generator RY903600 090930278	
~~HE-62~~	Air Compressor Sulair 13-239	201011300054
HE-63	STIHL Weedeater - DO NOT ADD TO INSURANCE	
HE-64	Ditch Witch 1991 Trencher	
HE-65	2007 Ditch Witch RT95 4x4 Trencher	CMWRT95HK70000183
HE-66	Magnum Plus 4000 PSI Portable Hot Water Pressure Washer	
HE-67	2017 Heavy Duty Wheel Balancer	
HE-68	2017 Heavy Duty Tire Changer	
HE-69	2011 APT 190 Pnematic Breaker	
HE-70	APT 190 Pneumatci Breaker	
HE-71	2016 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-72	2017 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-73	2017 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-74	2017 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-75	2017 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-76	2017 Wacker Neuson IRFU57 Electric Concrete Vibrator	
HE-77	2011 Wacker Neuson BTS630 Saw	PA6-GF15
HE-78	2011 Wacker Neuson BTS630 Saw	PA6-GF15
HE-79	2011 Wacker Neuson BTS630 Saw	
HE-80	Custombuilt Fuel Tank (large tank)	
HE-81	John Deere 35G ZTS Excavator with Bucket AT316557	1FF035GXJHK280167
HE-82	Ryobi Generator	
HE-83	2017 JD 75G Excavator	1FF075GXLHJ016270
HE-83a	75G THUMB FOR HE-83	31199-3HR
HE-83B	18" BUCKET FOR HE-83	29432-18L
HE-83C	36" BUCKET FOR HE-83	29432-73L
HE-84	Welder Power Mig 256 - Electric	M3161009661
HE-85	ICE MACHINE AND ALL COMPONENTS	
HE-87	1996 VERMEER MTE37 MUD MIXING SYSTEM	1VRP05070T1000149
HE-88	SULLAIR 185 MAX PRESSURE 125 PSIG ENGINE RPM 2800	200603080029
HE-89	Husqvarna Concrete Saw FS66DOD T3 26" 2014	966885404
HE-90	9000 WAAT PORTABLE GENERATOR PREDATOR 9000/7250 WATT	

4/29/2024

TSSCI HEAVY EQUIPMENT

HE-91	DRUMMOND 3/4HP SUBMERSIBLE UTILITY PUMP	
HE-92	2015 MILLER BIG BLUE 400 PRO PORTABLE WELDER	
HE-93	2014 Ancira Office Trailer	3A9AA1125ES051165
HE-94	Husqvarna Chopsaw for TK 92 Marcos Sanchez	20173400910
HE-95	25 Light Solar Arrowboard	
HE-96	Stihl TS 420 14" Cutoff Saw	
HE-97	2010 MILLER BIG BLUE 300 PRO WELDER/DEUTZ 4/CYL	
HE-98	STIHL FS 70 Weedeater	
HE-99	STIHL FS 70 Weedeater	
HE-100	3500 Watt GFCI Generator	
HE-101	2012 Vermeer D36x50 Series II Crawler Directional Bore	1VR4230D7C1000947
HE-102	KOHLER 18RY62 18 KW SKID MOUNTED GEN SET	
HE-103	2016 DOOSAN C185WKU PORTABLE AIR COMPRESSOR	
HE-104	2016 DOOSAN C185WKUB PORTABLE AIR COMPRESSOR	
HE-105	Tri-Flo Mud Screen Assembly	
HE-106	Trii-Flo Mud Cleaner Assembly	
HE-107	Skid Mounted Mud System Tank	
HE-108	Used Skid Mounted Mud System Tank	
HE-109	John Deere 75G Exc with bucket - NEW AGE	
HE-110	FCD Falcon Comp 111401	
HE-111	FORD 9N 2WD TRACTOR	
HE-112	1940 MCCORMICK FARMALL 2WD TRACTOR	
HE-113	Echo Weedeater SRM-3020 Grass Trimmer/Brush Cutter	
HE-115	FALCON F5 IGPS	
HE-116	FCD Falcon Comp 111401	
HE-117 - stole	Preowned Digitrak F2 Locator with FCD Remote Display & Sonde Package	
HE-118	Pressure Washer Simpson Pro Series TS60982	
HE-119	STIHL FS 56 Weedeater	
HE-120	Falcon Locator	
HE-121	JCB 930 Forklift	

NA-2	Yale Model GLC050VXNVSE083,	
NA-6	Farmhand Grinder 665D, Model F892A,	
NA-7	1976 International 1566,	
NA-8	Campbell Housefield Commercial Air Compressor, Model CE705200AJ,	
NA-10	2 Banding Carts & tools for 1/2 inch Plastic Banding.	
NA-11	Haven-Busch F002, drill press	
NA-28	2008 Volvo EC35C Mini Excavator	
NA-31	1999 CATERPILLAR TH63 6000 LB 4X4X4 TELOSCOPIC FOR	3NN00750
NA-39	Case 586G Forklift	
NA-39	2004 ALLMAND BROS. NIGHT LITE PRO PORTABLE LIGHT TOWER	

TRUCK LIST

	A	B	F	H
2	TSCI	TSCI		
3	VEHICLE #	ASSET		
4	INTERNAL	DESCRIPTION	VIN NO.	PLATE NO.
10	TK41	96 MACK TRUCK-texoma Mack CH600 **COMBO**	1M1AA18Y0TW057401	IMO 4678
40	TK82	85 Freightliner-Orange Texoma	1FUPYSYB3FH259920	BE6-6179
43	TK85	02 INTERNATIONAL 4300 - STEVE SAY SCRAP	1HTMMAAN42H502295	1C3-9870
44	TK86	85 Mack RS600 pressure digger?	1M2N179Y7FA001469	TWG-0228
50	TK92	12 Dodge 4500 RAM 4500 CREW CAB CHASSIS 4X2 197.4" WB	3C7WDKFL9CG109250	TBF5334
82	TK 113	05 International 4300 (crash cushion)	1HTMMAAM15H675204	SXR2454
85	TK 115	06 Sterling LT7500 - CRANE TRUCK	2FZHATDC26AM23362	CRG9332
87	TK 117	14 FORD F250 (Jesse)	1FT7W2BT7EEB85514	RDH4436
92	TK 122	12 GMC SIERRA C3500 CREW CAB Denali (Joel)	1GT426C86CF244544	FKJ2413
96	TK 125	13 Chevy Silverado (Shop)	1GC1CXC85DF146063	FWM8947
97	TK 126	2015 GMC SIERRA (now little Steven)	1GT120E88FF570783	FNT0003
99	TK 127	2008 HINO 268 (water truck) bore	5PVNV8JTX82S50845	GKC1075
102	TK-130	2014 HINO 195	JHHVDM2H6EK001635	HBY3333
104	TK-132	2015 Ford Digger Derrick F-750	3FRXF7FK1FV554763	HTJ4006
105	TK-133	2017 HINO - flatbed	JHHWDM2H7HK004973	HSD1684
107	TK-135	2016 Ford F550	1FDUF5GT0GED32686	HRD1337
108	TK-136	2016 Ford F550 - BUCKET TRUCK	1FDUF5GT0GED42652	HRD1338
109	TK-137	2016 Ford F550	1FDUF5GT4GED42654	HRD1339
110	TK-138	2016 Ford F550	1FDUF5GT2GED42653	RDH4524
111	TK-139	2016 Ford F550 - BUCKET TRUCK	1FDUF5GT9GED32685	HJT4550
113	TK-141	2012 Ford F150 XL Pickup	1FTMF1CM5CKD58725	HVV9995
115	TK-143	2017 Hino 195 Dual Cab	JHHWDM2H2HK004976	NGY4277
116	TK-144	2017 Hino 195DC	JHHWDM2H5HK005958	JMB3968
117	TK-145	2017 Hino 268	5PVNE8JT4H4S57133	KKR9771
118	TK-146	2007 Mack CXP613 Dump Truck - green	1M1AP02Y37N001367	SCT2974
119	TK-147	2016 International 4300SBA Flatbed bore	3HAMMMML7GL738338	KLR0274
120	TK-148	2017 Ford F550 AT37G Bucket - (1017DE20631)	1FDUF5GT8HDA05122	KGX9247
121	TK-149	2017 Ford F550 AT37G Bucket - (1017DE20631)	1FDUF5GTXHED20059	KGX9245
122	TK-150	2017 Ford F550	1FDUF5GT0HED60943	KYP5743
124	TK-152	2017 FORD F350 SUPER DUTY (Kurt)	1FT8W3BT2HEB21895	KTR2386
128	TK-156	2002 Mack RD688S T/A Winch Tractor-22,000lbs	1M2P324C92M061084	LKM7886
129	TK-157	2006 Altec DE2050-TR Digger Derrick	2NPLLZ9X56M644199	LHG5924
130	TK-158	2006 Altec DE2050-TR Digger Derrick	2NPLHZ7X17M687685	LHG5922
132	TK-160	2019 Hino 195DC	JHHWDM2H9KK009258	LJT8367
135	TK-163	2003 Kenworth T300 Digger Derrick D3060TR	2NKMLZ9X73M899118	MJH6489
136	TK-164	2013 Kenworth Flatbed - loop truck	2NKHHM6XXDM350511	MHR5089
137	TK-165	1999 Kenworth T800 Digger Derrick - tan - **HEAVY USE TAX**	1NKDMU0X9XR814422	1M04634
138	TK-166	1999 Mack CH613 Truck - **HEAVY USE TAX**	1M1AA13Y9XW115471	NYH8373
139	TK-167	AT37G Torsion F550 18,000 GVWR 4x2 9/10/20	1FDUF5GT2MDA03814	RDH4826
140	TK-168	AT37G Torsion F550 18,000 GVWR 4x2 11/4/20	1FDUF5GT9MDA03812	RDH4825
141	TK-169	2017 Freightliner Tri-Drive 122SD with 2017 Texoma 800-95 Drill - **HEAVY U**	3ALPGNDV3HDJF0393	1MO4661
142	TK-170	2015 MACK CHU613 6X4 (T/A) DAY CAB TRUCK TRACTOR **HEAVY USE**	1M2AN07YXFM020013	
143	TK-171	2024 GMC SIERRA 1500 (Melvin's new truck)	1GTUUCE80RZ258534	

4/29/2024

SECTION 2
PROJECT PERSONNEL
AND EXPERIENCE

Melvin Rogers

281-667-8383	melvinrogers@trafficsci.com

Project Superintendent

Results-oriented, versatile professional with comprehensive experience in all phases of construction, and superior capabilities in building teams, mentoring staff, and resolving problems. Background includes Heavy Highway construction in the areas of Illumination, Small and Large Highway Signs and Traffic signal Projects.

PROFESSIONAL EXPERIENCE

Traffic Systems Construction, Inc. **1999-Present**

We specialize in Traffic Signal Construction & ITS services which include, but are not limited to the maintenance, testing, repair, and replacement of traffic signals, digital cellular technology upgrades, call boxes, spread spectrum radio, side fired radar, CMS/DMS signs, energy efficiency upgrades and streetlights.

Superintendent

- Perform maintenance and repair Traffic Signals, Luminaries, Controller Cabinets.
- Install upgrades to NextPhase operations systems.
- Perform testing on CMUs, MMUs, BIUs, AMU, SIU.
- Troubleshoot intersections
- Supervise emergency call out crews for Harris County

Traffic Maintenance ., Houston, Tx **1993- 1999**

We specialize in Intelligent Transportation Services which include, but are not limited to the maintenance, testing, repair, and replacement of traffic signals, digital cellular technology upgrades, call boxes, spread spectrum radio, side fired radar, CMS/DMS signs, energy efficiency upgrades and streetlights.

Foreman

- Perform maintenance and repair Traffic Signals, Luminaries, Controller Cabinets.
- Install upgrades to NextPhase operations systems.
- Perform testing on CMUs, MMUs, BIUs, AMU, SIU.
- Troubleshoot intersections
- Supervise emergency call out crews for Harris County

Burks Plumbing & Utility **1983-1993**

Foreman

- Supervised crews and general labor

- Coordinated scheduling of contractors and inspections
- Prepared daily construction logs for ongoing projects

EDUCATION

MADISON HIGH SCHOOL, HOUSTON, TX

Diploma 1983

Dominique Outten

130 Rocky Cove Lane
Dickinson, TX 77539
832-221-0899
domoutten2006@yahoo.com

SUMMARY OF QUALIFICATIONS

- Over 19 years of management experience.
- Energetic with a strong work ethic.
- Excellent interpersonal and customer service skills.
- Strong oral and written communication skills.
- Outgoing, team player who strives to meet deadlines.
- Advanced in Microsoft Word, Excel, Access, and PowerPoint.
- Working knowledge of ANSI, NFPA and Workers Compensation regulations
- OSHA 30
- American Red Cross CPR/ First Aid certified

EDUCATION

B.B.A. in Business Management - May 2014
Texas Southern University - Jesse H. Jones School of Business, Houston, Texas

Clear Brook High School - May 2010
Friendswood, Texas

HONORS/AWARDS

GPA: 3.10/4.00
Recipient of the Wolverine Fighting Heart Award - 2010

Dean's List- 2013-2014

WORK EXPERIENCE

Traffic Systems Construction, Inc., Dickinson, TX
Vice President-Safety and Health 2013-Present

- Evaluate construction safety, health and environmental risk and ensure on-site safety and health compliance
- Act as principal liaison with contractors to facilitate construction
- Partner with respective superintendents to develop a project site safety plan
- Represent the company with local governments, authorities, working groups and organizations
- Responsible for conducting construction safety inspections, implementing safety training programs, conducting accident investigation, investigate and manage claims and evaluate and inspect subcontractors to ensure compliance with government and local regulations.
- Compile, analyze, and interpret statistical data related to the construction safety program
- Maintain an open line of communication with project shareholders and participate in job safety meetings with construction personnel
- Provide leadership on the maintenance for inventory of PPE and safety materials
- Make sure emergency preparedness and crisis communication protocols internally and externally are arranged.

Steven Kass, Sr.

To utilize 40 years of experience in the traffic signal and street lighting construction industry, in order to further the growth and solvency of Traffic Systems Construction, Inc.

July 1999-current | Traffic Systems Construction, Inc. | Dickinson, TX

CEO (Owner)

- Promulgate price structure, analyze cost proposals, outline company policies
- Bid preparation to include the review and comprehension of RFP's, Design-Build Proposals, Specifications and Drawings, breakdown of scope of work into definable tasks
- Assist and manage projects with the installation of traffic signals, OSC pole foundations, communication duct banks, and track power duct banks
- Responsible for Client-firm relationship and administrative procedures

1989-1999 | Traffic Maintenance & Construction | Houston, TX

Estimator

- Prepare estimates of project costs based on engineering drawings, specifications and sketches
- Communicate directly with client, subcontractor, and internal proposal team members during bid development
- Development of Review-packages and participation in management bid reviews

1987-1989 | Michelle Electric | Baytown, TX

Foreman

- Supervise crew's of up to 12 men
- Provide a positive and productive leadership role
- Integrate orders for material and equipment in an efficient manner in order to maintain optimum production capability
- Responsibilities to include: Scheduling, Supervision of hourly employees, Daily reports, and documentation

1985-1987 | Pfieffer and Son | La Porte, TX

Apprentice

- Install, maintain, repair and upgrade traffic signals, street lights, and other electronic equipment
- Ensure electrical compatibility and safety of components
- Perform routine inspections and preventative maintenance work on traffic signals, controllers, and street lights

Education:

Steven Kass, Sr.

1976-1980 Morton H.S.

- Diploma
- Electrical Journeyman License
- IMSA Level One
- Work Zone Certified

References : Available upon request

SECTION 4
PRICE PROPOSAL

DOCUMENT 00300
UNIT PRICE FORM

To: The Honorable Mayor and City Council of the City of Manvel
20025 Morris (State Highway 6)
Manvel, Texas 77578

Project: **Traffic Signal at Croix Road and Rodeo Drive**
Project No.: FY2026-03
Bid No.: RFP# FY2026-03

Bidder: Traffic Systems Construction, Inc.
(Print or type full name of partnership, corporation, or joint venture.)

PART 1: OFFER $295,295.00 (TWO HUNDRED NINTY FIVE THOUSAND AND TWO HUNDRED NINETY FIVE DOLLARS AND NO CENTS)

1.1 Total Bid Price: Having examined the Project location and all matters referred to in the Bid Documents for the Project, we, the undersigned, offer to enter into a Contract to perform the Work for the Total Bid Price shown on the signature page of this Document

1.2 Security Deposit: Included with the Bid is a Security Deposit (Bid Bond) in the amount of five percent (5%) of the Total Bid Price subject to terms described in Document 00115B – Instructions to Bidders.

1.3 Period for Bid Acceptance: This offer is open to acceptance and is irrevocable for one hundred eighty days (180 D) from Bid Date. That period may be extended by mutual written agreement of the City and Bidder.

1.4 Addenda: All Addenda have been received. Modifications to Bid Documents have been considered, and all related costs are included in the Total Bid Price.

1.5 Bid Supplements: The following documents are attached:

Security Deposit (Bid Bond)

1.6 This document constitutes a government record, as defined by § 37.01 of the Texas Penal Code. Submission of a false government record is punishable as provided in § 37.10 of the Texas Penal Code.

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, THAT WE Traffic Systems Construction, Inc.
P O Box 1346, Dickinson, TX 77539

as Principal, hereinafter called the Principal, and Harco National Insurance Company
4200 Six Forks Road, Suite 1400, Raleigh, NC 27609

a corporation duly organized under the laws of the State of IL

as Surety, hereinafter called the Surety, are held and firmly bound unto City of Manvel

as Obligee, hereinafter called the Obligee, in the sum of Five Percent of the Greatest Amount Bid
Dollars ($ 5% G.A.B.),
for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Traffic Signal at Croix and Rodeo Drive, Job No. FY2026-03

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this 9th day of July 2026

TRAFFIC SYSTEMS CONSTRUCTION INC. TEXAS

Misti Cann
(Witness)

Traffic Systems Construction, Inc.
(Principal) (Seal)

By: K. Morrison
KENNETH MORRISON
VICE PRESIDENT
(Title)

Debbie Bledsoe
(Witness)

Harco National Insurance Company
(Surety) (Seal)

By: Michele M Bonnin
Attorney-in-Fact Michele M Bonnin
(Title)

HARCO NATIONAL INSURANCE COMPANY CORPORATE SEAL 1984 ILLINOIS

Surety Phone No.

POWER OF ATTORNEY
HARCO NATIONAL INSURANCE COMPANY
INTERNATIONAL FIDELITY INSURANCE COMPANY
Member companies of IAT Insurance Group, Headquartered: 4200 Six Forks Rd, Suite 1400, Raleigh, NC 27609

Bond # Bid Bond

Principal Traffic Systems Construction, Inc.

Obligee City of Manvel

KNOW ALL MEN BY THESE PRESENTS: That **HARCO NATIONAL INSURANCE COMPANY**, a corporation organized and existing under the laws of the State of Illinois, and **INTERNATIONAL FIDELITY INSURANCE COMPANY**, a corporation organized and existing under the laws of the State of New Jersey, and having their principal offices located respectively in the cities of Rolling Meadows, Illinois and Newark, New Jersey, do hereby constitute and appoint

Michele M Bonnin

their true and lawful attorney(s)-in-fact to execute, seal and deliver for and on its behalf as surety, any and all bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof, which are or may be allowed, required or permitted by law, statute, rule, regulation, contract or otherwise, including but not limited to Proposal Bonds and Consents of Surety, and the execution of such instrument(s) in pursuance of these presents, shall be as binding upon the said **HARCO NATIONAL INSURANCE COMPANY** and **INTERNATIONAL FIDELITY INSURANCE COMPANY**, as fully and amply, to all intents and purposes, as if the same had been duly executed and acknowledged by their regularly elected officers at their principal offices.

This Power of Attorney is executed, and may be revoked, pursuant to and by authority of the By-Laws of **HARCO NATIONAL INSURANCE COMPANY** and **INTERNATIONAL FIDELITY INSURANCE COMPANY** and is granted under and by authority of the following resolution adopted by the Board of Directors of **INTERNATIONAL FIDELITY INSURANCE COMPANY** at a meeting duly held on the 3rd day of June 2025 and by the Board of Directors of **HARCO NATIONAL INSURANCE COMPANY** at a meeting held on the 3rd day of June 2025.

"**RESOLVED**, that (1) the Chief Executive Officer, President, Executive Vice President, Senior Vice President, Vice President, or Secretary of the Corporation shall have the power to appoint, and to revoke the appointments of, Attorneys-in-Fact or agents with power and authority as defined or limited in their respective powers of attorney, and to execute on behalf of the Corporation and affix the Corporation's seal thereto, bonds, undertakings, recognizances, contracts of indemnity and other written obligations in the nature thereof or related thereto; and (2) any such Officers of the Corporation may appoint and revoke the appointments of joint-control custodians, agents for acceptance of process, and Attorneys-in-fact with authority to execute waivers and consents on behalf of the Corporation; and (3) the signature of any such Officer of the Corporation and the Corporation's seal may be affixed by facsimile to any power of attorney or certification given for the execution of any bond, undertaking, recognizance, contract of indemnity or other written obligation in the nature thereof or related thereto, including but not limited to Proposal Bonds and Consents of Surety, such signature and seals when so used whether heretofore or hereafter, being hereby adopted by the Corporation as the original signature of such officer and the original seal of the Corporation, to be valid and binding upon the Corporation with the same force and effect as though manually affixed."

IN WITNESS WHEREOF, **HARCO NATIONAL INSURANCE COMPANY** and **INTERNATIONAL FIDELITY INSURANCE COMPANY** have each executed and attested these presents on this 9th day of July, 2026

INTERNATIONAL FIDELITY INSURANCE COMPANY CORPORATE SEAL 1904 NEW JERSEY

STATE OF NEW JERSEY
County of Essex

STATE OF ILLINOIS
County of Cook

HARCO NATIONAL INSURANCE COMPANY CORPORATE SEAL 1984 ILLINOIS

Michael F. Zurcher
Executive Vice President, Harco National Insurance Company
and International Fidelity Insurance Company

On this 9th day of July, 2026, before me came the individual who executed the preceding instrument, to me personally known, and, being by me duly sworn, said he is the therein described and authorized officer of **HARCO NATIONAL INSURANCE COMPANY** and **INTERNATIONAL FIDELITY INSURANCE COMPANY**; that the seals affixed to said instrument are the Corporate Seals of said Companies; that the said Corporate Seals and his signature were duly affixed by order of the Boards of Directors of said Companies.

CATHY CRUZ NOTARY PUBLIC STATE OF NEW JERSEY

IN TESTIMONY WHEREOF, I have hereunto set my hand affixed my Official Seal, at the City of Newark, New Jersey the day and year first above written.

Cathy Cruz a Notary Public of New Jersey
My Commission Expires April 16, 2029

CERTIFICATION

I, the undersigned officer of **HARCO NATIONAL INSURANCE COMPANY** and **INTERNATIONAL FIDELITY INSURANCE COMPANY** do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Sections of the By-Laws of said Companies as set forth in said Power of Attorney, with the originals on file in the home office of said companies, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

IN TESTIMONY WHEREOF, I have hereunto set my hand this 9th day of July, 2026

Irene Martins, Assistant Secretary

IMPORTANT NOTICE

To obtain information or make a complaint:

You may contact Harco National Insurance Company at:

1-800-333-4167

You may also write to: Harco National Insurance Company c/o IAT Surety at:

Attn: Claims Department
One Newark Center, 20th Floor
Newark, NJ 07102

You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights or complaints at:

1-800-252-3439

You may write the Texas Department of Insurance:

P. O. Box 149104
Austin, TX 78714-9104
Fax: (512) 490-1007
Web: www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

PREMIUM OR CLAIM DISPUTES:
Should you have a dispute concerning your premium or about a claim you should contact the agent or the company first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR BOND:
This notice is for information only and does not become a part or condition of the attached document.

AVISO IMPORTANTE

Para obtener información o para presentar una queja:

Usted puede comunicarse con su Harco National Insurance Company al:

1-800-333-4167

Usted tambien puede escribir a Harco National Insurance Company c/o IAT Surety at:

Attn: Claims Department
One Newark Center, 20th Floor
Newark, NJ 07102

Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de companias, coberturas, derechos o quejas al:

1-800-252-3439

Puede escribir al Departamento de Seguros de Texas:

P. O. Box 149104
Austin, TX 78714-9104
Fax: (512) 490-1007
Web: www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

DISPUTAS SOBRE PRIMAS O RECLAMOS:
Si tiene una disputa concerniente a su prima o a un reclamo, debe comunicarse con el agente o la compania primero. Si no se resuelve la disputa, puede entonces comunicarse con el departamento (TDI).

UNA ESTE AVISO A SU FIANZA DE GARANTIA:
Este aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.

TRAFFIC SYSTEMS CONSTRUCTION, INC.

PH. (281) 337-1926 FAX 1 (281) 337-2968
www.trafficsci.com

COUNTY: BRAZOIRA
PROJECT No. : RFP FY2026-03
LOCATION: CROIX ROAD
BID DATE: 07/09/2026

BASE UNIT PRICES FOR:
$295,295.00

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT BID	TOTAL
1	The Traffic Signal at Croix Road and Rodeo Drive Project shall be bid as a lump sum item for the complete installation of the traffic signal in accordance with the construction plans. The lump sum bid shall include all labor, materials, equipment, permits, utility coordination, traffic control, testing, inspections, and all other work necessary to provide a complete and operational traffic signal system as shown in the plans and specifications. The Contractor shall be responsible for all required coordination, permitting, construction, and project closeout activities necessary to complete the work.	LS	1.00	$295,295.00	$295,295.00
	GRAND TOTAL				**$295,295.00**

SECTION 5
REFERENCES

REFERENCES

NAME	TITLE	OWNER		CONTACT
Ed Kupferer	Traffic Manager	City Of Pearland 2559 Hillhouse Rd Pearland, TX 77581	Traffic Signals & Roadway Illumination	(281) 850-0000 ekupferer@ci.pearland.tx.us
David Tickell	Traffic Operation Superintendent	City of League City 144 Park Ave Suite 100	Traffic Signals & Roadway Lighting	(281) 554-1083 david.tickell@leaguecitytx.gov
Greg Karr	ITS Network Manager	Office of the County Engineer	Wireless Comms. Systems	713-843-5417 Greg.Karr@harriscountytx.gov
Joe Hanak	Senior Project Manager	City of Houston 6922 Katy Road Houston, TX 77024	Traffic Signals & Roadway Work	713-843-5436 Joe.Hanak@houstontx.gov
Bashar Khalil	Project Manager	City of Houston 6922 Katy Road Houston, TX 77024	Traffic Signals & Roadway Lighting	(832) 395-2241 Bashar.khalil@houstontx.gov
Kenny Payne	ITS Network Administrator	Office Of The County Engineer	Wireless Comms. Systems	713-843-5438 kenneth.payne@harriscountytx.gov
Mark Browne	Senior Estimator	Forde Construction	Traffic Signals	713-576-6288 mbrowne@fordeconst.com
Seth Schulgen	Vice President	Williams Brothers 3800 Milam Street Houston, TX 77006	Roadway Lighting	(832) 435-4601 SSchulgen@wbctx.com
Mike McCoy	PM/Engineer	METRO/McCoy Engineering	Park & Ride Illumination	(713) 857-3525 mccoyeng@sbcglobal.net
Kyle Macey,	PM/Engineer	EHRA	Traffic Signal	713-337-7434 kmacy@ehra.team

FEDERAL AID PROJECT NO.			
CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		1

INDEX OF SHEETS

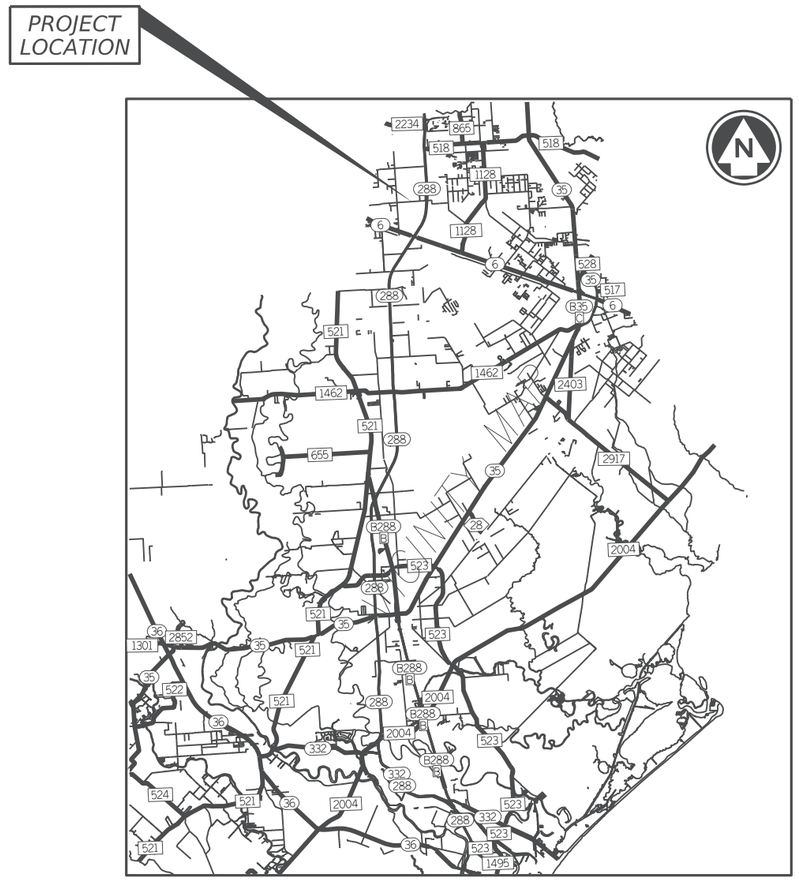
SHEET NO.	DESCRIPTION

SEE SHEET NO.2 FOR DETAILED INDEX OF SHEETS

CITY OF MANVEL

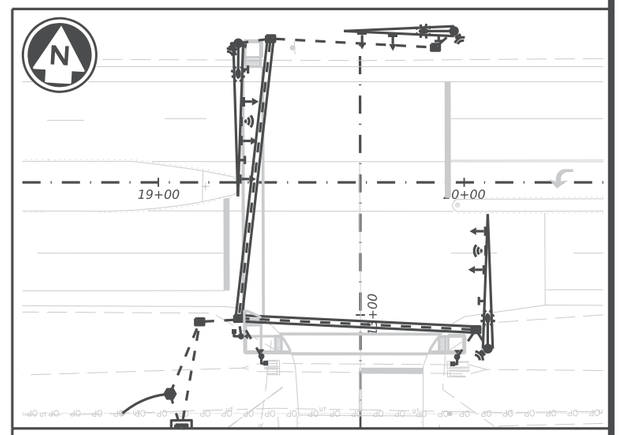
PLANS OF PROPOSED TRAFFIC SIGNAL

CROIX RD AT RODEO DR
CITY OF MANVEL



PROJECT LAYOUT
N.T.S.

EQUATIONS - NONE
EXCEPTIONS - NONE
RAILROAD GRADE CROSSINGS - NONE



BRAZORIA COUNTY
N.T.S.

KEY MAP	BLOCK
652	H

CROIX RD

DESIGN SPEED: 45 MPH
FUNCTIONAL CLASSIFICATION: MAJOR PARKWAY

RODEO DR

DESIGN SPEED: 30 MPH
FUNCTIONAL CLASSIFICATION: LOCAL ROAD

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

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STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell
3/10/2026

TDLR INSPECTION NOT REQUIRED.

SPECIFICATIONS ADOPTED BY THE CITY OF MANVEL, JANUARY, 2020, AND THE TEXAS DEPARTMENT OF TRANSPORTATION, SEPTEMBER 1, 2024, AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FROM FHWA 1273, OCTOBER 23, 2023).

FOR BARRICADES AND SIGNING AT INDIVIDUAL INTERSECTIONS UNDER SIGNAL CONSTRUCTION, REFER TO STANDARD SHEETS CITY OF MANVEL BARRICADES AND MISCELLANEOUS DETAILS, BC(1)-21 THRU BC(12)-21, TCP(1-1)-18, TCP(1-3)-18, AND WZ(BTWS-1)-13 THRU WZ(BTS-2)-13.

CITY OF MANVEL

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SHEET NO.		DESCRIPTION
		GENERAL
1		TITLE SHEET
2		INDEX OF SHEETS
3		PERMANENT TRAFFIC SIGNAL NOTES
3A		CITY OF MANVEL CONSTRUCTION NOTES (1 OF 2)
3B		CITY OF MANVEL CONSTRUCTION NOTES (2 OF 2)
4		SUMMARY OF QUANTITIES
		TRAFFIC SIGNAL - CROIX RD AT RODEO DR
5-6		TRAFFIC SIGNAL LAYOUT EXISTING CONDITIONS
7		TRAFFIC SIGNAL LAYOUT PROPOSED CONDITIONS
8		PROPOSED TRAFFIC SIGNAL DETAILS
9-10		PROPOSED PAVEMENT MARKINGS AND PEDESTRIAN ACCESS PADS
		TRAFFIC CONTROL STANDARDS
11		*CITY OF MANVEL BARRICADES AND MISCELLANEOUS DETAILS
12-23	#	*BC(1)-21 THRU BC(12)-21
24	#	*TCP(1-1)-18
25	#	*TCP(1-3)-18
26-27	#	*WZ(BTS-1)-13 THRU WZ(BTS-2)-13
		TRAFFIC SIGNAL STANDARDS
28-34	#	*ED(1)-25, ED(3)-25 THRU ED(8)-25
35	#	*TS-BP-20
36	#	*OSNS/MD
37	#	*SD/SCFD
38	#	*SD/S BSM
39-43	#	*LMA(1)-12 THRU LMA(5)-12
44-45	#	*SMA-100(1)-12 THRU SMA-100(2)-12
46	#	*TS-FD-12
47	#	*CFA-12
48	#	*LUM-A-12
49	#	*MC-C-12
50	#	*MA-D-12
51	#	*MA-DPD-20
52		*CITY OF MANVEL PAVING STANDARD DETAILS (1 OF 2)
52A		*CITY OF MANVEL PAVING STANDARD DETAILS (2 OR 2)
53-56	#	*PED-18
57	#	*CD/PMPS
58	#	*ACCRD
59	#	*CCCG-22
		PAVEMENT MARKING STANDARDS
60		*CITY OF MANVEL PERMANENT PAVEMENT MARKING DETAILS
		ENVIRONMENTAL ISSUES
61		*CITY OF MANVEL STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS

NOTES:
1. TXDOT STANDARDS WERE USED IN SUPPLMENT TO THE CITY OF MANVEL STANDARDS AND ARE IDENTIFIED WITH #.
2. THE STANDARD SHEETS SPECIFICALLY IDENTIFIED (*) HAVE BEEN SEELCTED BY ME OR UNDER RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell

3/10/2026

CITY OF MANVEL

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CROIX RD

INDEX OF SHEETS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		2

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DW: CC: DW: CPC:

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DW:
CK:
DW:

NOTES FOR PERMANENT TRAFFIC SIGNALS:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISED CITY OF MANVEL DESIGN CRITERIA MANUAL.

2. ALL EQUIPMENT UTILIZED FOR THE TRAFFIC SIGNAL INSTALLATION MUST CONFORM TO, AND BE INSTALLED IN ACCORDANCE WITH THE CITY OF MANVEL AND TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) STANDARDS AND SPECIFICATIONS.

3. THE CONTRACTOR TO FURNISH AND INSTALL ALL EQUIPMENT CALLED FOR AND REQUIRED AS NEEDED FOR A FULLY OPERATIONAL TRAFFIC SIGNAL.

4. PHASING SEQUENCE AND SIGNAL TIMING WILL BE DETERMINED BY THE CITY OF MANVEL AND IS SUBJECT TO THE APPROVAL OF THE ENGINEER.

5. ASSUME OWNERSHIP OF THE REMOVED EXISTING SIGNS.

6. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING RADAR DETECTION, VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, CONDUIT, CONDUCTORS, GROUND BOXES, AND ELECTRIC SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

7. THE CONTRACTOR IS RESPONSIBLE FOR THE SIGNAL CARRYING CAPABILITY AND PERFORMANCE OF THE CABLE. INSTALL EACH WIRE WITH A LIGHTNING PROTECTION DEVICE UNLESS OTHERWISE NOTED.

8. CONTRACTOR SHALL CLEAN THE JOBSITE OF ALL DEBRIS, LOOSEN EXCESS EXCAVATED MATERIALS, ETC. ACCUMULATED AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT.

9. ELECTRICAL POWER TO OPERATE THE TRAFFIC SIGNAL INSTALLATION(S) WILL BE REPLACED IN THE CITY OF MANVEL'S NAME. THIS INCLUDES ALL POWER TO OPERATE THE SIGNAL(S) DURING THE VARIOUS PHASES OF CONSTRUCTION AND DURING THE TEST PERIOD PRIOR TO ACCEPTANCE OF THE WORK BY THE CITY.

10. RESPOND IMMEDIATELY (24 HOURS A DAY) TO REPORTED TRAFFIC SIGNAL MALFUNCTIONS AT THE SIGNALIZED INTERSECTION AFTER ASSUMING RESPONSIBILITY FOR THE MAINTENANCE OF THE SIGNAL EQUIPMENT AS OUTLINED ABOVE.

11. PROVIDE A FULL TIME QUALIFIED TRAFFIC SIGNAL TECHNICIAN RESPONSIBLE FOR THE MAINTENANCE AND/OR REPLACEMENT OF ALL TRAFFIC SIGNAL DEVICES.

12. TRENCH SAFETY SYSTEM TO MEET, AS A MINIMUM, THE REQUIREMENTS OF OSHA SAFETY AND HEALTH REGULATIONS, LATEST EDITION.

13. ALL CONDUIT UNDER NATURAL GROUND SHALL BE TRENCHED AND BURIED. CONTRACTOR SHALL BACK-FILL, COMPACT, AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT GROUND.

14. ALL CONDUITS SHALL BE INSTALLED WITH A MINIMUM OF 30" GROUND COVER.

15. PROVIDE CONTINUOUS CONDUCTORS WITHOUT SPLICES FROM SIGNAL CONTROLLERS TO SIGNAL HEADS. PROVIDE CONTINUOUS CONDUCTORS WITHOUT SPLICES FROM LUMINAIRES (IF REQUIRED) TO SERVICE ENCLOSURE. IF USING EXISTING SERVICE, PROVIDE NEW SERVICE ENCLOSURE (IF NECESSARY) WITH PHOTOELECTRIC CONTROL TO ACCOMMODATE THE LUMINAIRE CABLE.

16. THE CONTRACTOR SHALL INSTALL A CLOSED NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) TO PREVENT ABRASION TO SIGNAL CABLE WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

17. SEAL WITH WATERPROOF SEALANT EACH END OF THE COMMUNICATIONS CABLE THAT IS EXPOSED TO THE ELEMENTS DURING STORAGE OR AFTER INSTALLATION.

18. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.

19. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL. EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS PERMANENT CONDUIT SEALANT. DO NOT USE SILICON CAULK AS A CONDUIT SEALANT.

20. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713-223-4567) FOR CENTERPOINT AND AT&T TELEPHONE AND TEXAS ONE-CALL SYSTEM (1-800-245-4545) FOR PIPELINES AND CABLE TV.

21. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE DEPTH, ELEVATIONS, LOCATION AND EXISTENCE OF ALL EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION.

22. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD. ANY EXISTING UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR AT HIS/HER OWN EXPENSE.

23. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE COMMENCING WORK. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY AND ALL DISCREPANCIES TO THE OWNER AND THE ENGINEER IN A TIMELY MANNER.

24. CONTRACTOR SHALL ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, TREES, SHRUBS, OTHER PERMANENT OBJECTS AND ADJOINING PROPERTY.

25. NO OPEN EXCAVATIONS SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED, AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AREAS; 3/4 INCH PLYWOOD, WOOD PLANKING WITH OSHA ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS, OR AS APPROVED BY THE CITY OF MANVEL.

26. EXISTING PAVEMENT, CURBS, SIDEWALKS AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION BY THE CONTRACTOR FOR THEIR CONVENIENCE SHALL BE REPLACED PER CURRENT DESIGN CRITERIA MANUAL BY THE CONTRACTOR AT THEIR EXPENSE.

27. CONTRACTOR SHALL PLAN, SCHEDULE, AND PERFORM THEIR WORK SO AS TO PROVIDE AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS NON-INCONVENIENCE TO ALL PROPERTY OWNERS ALONG THE PROJECT RIGHT OF WAYS DURING CONSTRUCTION PERIOD.

28. FOR LOCATIONS WHERE OPEN CUT CONSTRUCTION IS REQUIRED IN STREETS THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE BARRICADES, WARNING AND DIRECTING SIGNS, FLAGS, AND LIGHTS, NOTIFY CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630).

29. ALL SIGNS, BARRICADES, PAVEMENT MARKINGS, TRAFFIC SIGNALS, AND CHANNELIZING DEVICES USED TO HANDLE TRAFFIC SHALL BE SHOWN ON A TRAFFIC CONTROL PLAN (TO BE APPROVED BY THE CITY OF MANVEL) AND SHALL CONFORM TO THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), "PART VI-TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS."

30. CONTRACTOR SHALL NOTIFY THE CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630) 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

31. NO INSPECTABLE WORK CAN BE CONDUCTED ON SATURDAYS.

32. THE CITY SHALL NOT BE RESPONSIBLE FOR REPLACING OR THE COST ASSOCIATED WITH REPLACING ANY STRUCTURE OR APPARATUS THAT IS PLACED WITHIN A CITY RIGHT-OF-WAY OR EASEMENT.

33. CONTRACTOR SHALL NOTIFY THE CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630), TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.

34. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.

35. INSTALL SIGNALS HORIZONTALLY ON MAST ARM, 17 FT.-6 IN. ABOVE THE ROADWAY.

36. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACKPLATES WITH TWO INCH RETROREFLECTIVE YELLOW BORDER.

37. FURNISH VEHICLE AND PEDESTRIAN SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

38. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

39. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

40. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION. DO NOT USE BURLAP.

41. CONTRACTOR TO ADJUST SIGNAL HEAD ALIGNMENT. AS NEEDED, USING ARTICULATING SIGNAL BRACKET ASSEMBLIES WITH A MAXIMUM OF THREE ADJUSTABLE AXES.

42. LOCATE CONTROLLER, STEEL MAST ARM POLES, RADAR DETECTION, ETC., AS APPROVED.

43. GAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

44. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE EQUIPMENT GROUND CONDUCTORS FROM THE CONDUITS.

45. THE CONTRACTOR SHALL VERIFY PROPOSED SIGNAL POLE LOCATIONS AGAINST EXISTING UTILITIES PRIOR TO ORDERING THE POLES.

46. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR THIS SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.

47. ALL TRAFFIC SIGNAL POLE FOUNDATION LOCATIONS SHALL BE APPROVED BY THE ENGINEER OR REPRESENTATIVE IN THE FIELD PRIOR TO DRILLING.

48. EXACT LOCATION OF POLES, CABINET, SIGNAL HEADS AND PULL BOXES SHALL BE DETERMINED IN THE FIELD. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT LOCATIONS WITH CITY OF MANVEL, PRIOR TO ANY CONSTRUCTION.

49. ROUTE CABLE FOR LUMINAIRES (#12/4C TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

50. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

51. PROVIDE 250 WATT HPS EQUIVALENT LIGHT EMITTING DIODE (LED) LAMP LUMINAIRES OPERATING AT 240 VOLTS.

52. LUMINAIRES MOUNTED ON TRAFFIC SIGNAL POLES SHALL BE IN COMPLIANCE WITH TXDOT STANDARDS.

53. USE TYPE C HIGH SPECIFIC INTENSITY GRADE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

54. FURNISH AND INSTALL FULLY-ACTUATED CONTROLLER, WITH INTERNAL TIME BASE COORDINATION UNIT IN A CABINET, MOUNTED ON AN 18-INCH BASE EXTENSION.

55. FURNISH MATERIALS NECESSARY TO INSTALL ACCESSIBLE PEDESTRIAN SIGNAL UNITS AND SIGNS AS SHOWN IN THE PLANS. INSTALL AT 3 FT.-6IN. TO 4FT.-0IN. ABOVE THE SIDEWALK OR CONCRETE WALKWAY.

56. FURNISH SYMBOL TYPE PEDESTRIAN COUNTDOWN SIGNALS. INSTALL USING MOUNTING HEIGHT IN ACCORDANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

57. THE LOCATION OF THE RADAR DETECTION ZONE IS APPROXIMATE. THE EXACT LOCATION WILL BE DETERMINED BY THE ENGINEER AND/OR THE DEPARTMENT TRAFFIC OPERATIONS SECTION.

58. THE RADAR PRESENCE DETECTOR AND RADAR ADVANCE DETECTION DEVICES MUST BE COMPATIBLE WITH EACH OTHER AND FROM THE SAME MANUFACTURER.

59. THE VENDOR'S REPRESENTATIVES OF THE RADAR EQUIPMENT SUPPLIED FOR THIS PROJECT MUST SUPERVISE THE INSTALLATION, SETUP AND TESTING OF THE EQUIPMENT AND BE FACTORY CERTIFIED. THE REPRESENTATIVE MUST BE ON SITE DURING THIS TIME. ANY EQUIPMENT REQUIRED FOR SETUP AND OPERATION OF THE RADAR DEVICES MUST BE PROVIDED TO THE CITY OF MANVEL UPON COMPLETION. THE VENDOR'S REPRESENTATIVE MUST PROVIDE TRAINING TO THE REPRESENTATIVES WHO WILL BE RESPONSIBLE FOR THE MAINTENANCE OF THE RADAR EQUIPMENT AFTER ACCEPTANCE OF THE PROJECT.

60. RADAR PRESENCE DETECTION DEVICE MUST UTILIZE TRUE-PRESENCE DETECTION. SYSTEMS USING LOCKING ALGORITHMS TO ATTEMPT PRESENCE DETECTION WILL NOT BE ACCEPTED.

61. RADAR ADVANCE DETECTION DEVICE MUST CONTINUOUSLY TRACK VEHICLE SPEED, DISTANCE, AND ESTIMATED TIME OF ARRIVAL.

62. COMMUNICATION AND POWER TO THE RADAR DEVICES SHALL BE VIA CONTINUOUS CABLE RUN OF UP TO 1000 FEET WITH THE USE OF REPEATERS.

63. THE LOCATIONS OF RADAR DEVICES SHOWN ON THIS PLAN ARE APPROXIMATE. THE EXACT PLACEMENT SHALL BE DETERMINED IN COORDINATION WITH THE MANUFACTURER'S REPRESENTATIVE. THE CONTRACTOR WILL VERIFY RADAR UNIT LOCATIONS WITH THE MANUFACTURER PRIOR TO INSTALLING DETECTION CABLE. FINAL PLACEMENT OF RADAR DEVICES IS SUBJECT TO APPROVAL BY THE ENGINEER.

64. THE CONTRACTOR SHALL FOLLOW MANUFACTURER SPECIFICATIONS FOR THE RADAR SYSTEM INSTALLATION.

65. WORK IN THE CONTROLLER CABINET SHALL INCLUDE INSTALLING THE EQUIPMENT AND PEFORMING THE WORK NECESSARY TO CONNECT AND OPERATE THE RADAR SYSTEM AT THE INTERSECTION.

66. REMOVE THE EXISTING PAVEMENT MARKING AS DIRECTED. REMOVE THE PAVEMENT MARKING TO THE EXTENT THAT THEY ARE EITHER COMPLETELY REMOVED OR OBLITERATED TO THE SATISFACTION OF THE ENGINEER.

67. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

68. WHEN REMOVING EXISTING INTERSECTION STOP CONTROL SIGNS, CITY OF MANVEL WILL DETERMINE WHICH ITEMS WILL BE SALVAGED. ITEMS DEEMED SALVAGEABLE WILL BE DELIVERED TO CITY OF MANVEL. CAREFULLY REMOVE THE MATERIALS SO THAT THEY WILL NOT BE MARRED OR DAMAGED. REPLACE MATERIALS THAT ARE SCARRED, BATTERED, OR BROKEN BY THE CONTRACTOR AT NO EXPENSE TO THE DEPARTMENT. DISPOSE OF OTHER ITEMS REMOVED BY THE CONTRACTOR AT NO EXPENSE TO CITY OF MANVEL.

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STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell

3/10/2026

CITY OF MANVEL

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TBPE Registration No. F-1046

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CROIX RD

PERMANENT TRAFFIC SIGNAL NOTES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		3

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISED CITY OF MANVEL DESIGN CRITERIA MANUAL.
2. TRENCH SAFETY SYSTEM TO MEET, AS A MINIMUM, THE REQUIREMENTS OF OSHA SAFETY AND HEALTH REGULATIONS, LATEST EDITION.
3. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713-223-4567) FOR CENTERPOINT AND AT&T TELEPHONE AND TEXAS ONE-CALL SYSTEM (1-800-245-4545) FOR PIPELINES AND CABLE TV.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE DEPTH, ELEVATIONS, LOCATION AND EXISTENCE OF ALL EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION.
5. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD BEFORE COMMENCING WORK. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPORT ANY AND ALL DISCREPANCIES TO THE OWNER AND THE ENGINEER IN A TIMELY MANNER.
6. CONTRACTOR SHALL ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, TREES, SHRUBS, OTHER PERMANENT OBJECTS AND ADJOINING PROPERTY.
7. NO OPEN EXCAVATIONS SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE COVERED, AS A MINIMUM, WITH STEEL PLATING WHEN IN PAVED AREAS; 3/4 INCH PLYWOOD, WOOD PLANKING WITH OSHA ORANGE PLASTIC EXPANDED MESH BARRIER AROUND PERIMETER IN UNPAVED AREAS, OR AS APPROVED BY THE CITY OF MANVEL.
8. EXISTING PAVEMENT, CURBS, SIDEWALKS AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION BY THE CONTRACTOR FOR THEIR CONVENIENCE SHALL BE REPLACED PER CURRENT DESIGN CRITERIA MANUAL BY THE CONTRACTOR AT THEIR EXPENSE.
9. CONTRACTOR SHALL PLAN, SCHEDULE, AND PERFORM THEIR WORK SO AS TO PROVIDE AND MAINTAIN SAFE PUBLIC TRAFFIC (INGRESS AND EGRESS) AS WELL AS NON-INCONVENIENCE TO ALL PROPERTY OWNERS ALONG THE PROJECT RIGHT OF WAYS DURING CONSTRUCTION PERIOD.
10. FOR LOCATIONS WHERE OPEN CUT CONSTRUCTION IS REQUIRED IN STREETS THE CONTRACTOR SHALL FURNISH AND MAINTAIN ADEQUATE BARRICADES, WARNING AND DIRECTING SIGNS, FLAGS, AND LIGHTS, NOTIFY CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630).
11. ALL SIGNS, BARRICADES, PAVEMENT MARKINGS, TRAFFIC SIGNALS, AND CHANNELIZING DEVICES USED TO HANDLE TRAFFIC SHALL BE SHOWN ON A TRAFFIC CONTROL PLAN (TO BE APPROVED BY THE CITY OF MANVEL) AND SHALL CONFORM TO THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), "PART VI-TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS."
12. CONTRACTOR SHALL NOTIFY THE CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630) 48 HOURS PRIOR TO THE START OF CONSTRUCTION.
13. NO INSPECTABLE WORK CAN BE CONDUCTED ON SATURDAYS.
14. THE CITY SHALL NOT BE RESPONSIBLE FOR REPLACING OR THE COST ASSOCIATED WITH REPLACING ANY STRUCTURE OR APPARATUS THAT IS PLACED WITHIN A CITY RIGHT-OF-WAY OR EASEMENT.

TESTING:

1. ALL TESTING, WETHER FOR UTILITIES OR FOR SUBGRADE OR ANY OTHER TESTING THAT REQUIRES A LAB TECHNICIAN, IN ORDER TO BE SUCCESSFUL, SHALL BE WITNESSED BY A CITY INSPECTOR.
2. EXCAVATION AND BACKFILL FOR UTILITIES:
3. BACKFILL SHALL BE PLACED IN MAXIMUM LIFTS OF EIGHT (8) INCHES AND COMPACTED TO A DENSITY OF NOT LESS THAN 95% STANDARD PROCTOR WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE OR AS OTHERWISE SPECIFIED BY THE SOILS LABORATORY. TEST SHALL BE TAKEN EVERY LIFT, EVERY 500 LINEAR FEET, OR BETWEEN MANHOLES, WHICHEVER RESULTS IN THE GREATEST NUMBER OF DENSITY TESTS.
4. FIELD MOISTURE/DENSITY TEST SHALL BE PERFORMED AT A FREQUENCY OF AT LEAST ONE (1) TEST PER 500 SQUARE YARDS OF COMPACTED LIFT. THE DENSITY SHALL NOT BE LESS THAN 95% OF STANDARD PROCTOR WITH A MOISTURE CONTENT OF PLUS (+) OR MINUS (-) THREE PERCENT (3%) OF OPTIMUM MOISTURE, OR AS DETERMINED BY SOILS LABORATORY. MAXIMUM LIFT FOR TESTING COMPACTED FILL SHALL NOT EXCEED TWELVE (12) INCHES.
5. CAST-IN-PLACE CONCRETE MANHOLES AND PRECAST CONCRETE MANHOLES SHALL CONFORM TO TCEQ REQUIREMENTS 217.59
6. EX-FILTRATION TEST SHALL BE REQUIRED FOR EACH MANHOLE SYSTEM.
7. EACH MANHOLE IS TO BE PLUGGED, FILLED TO THE TOP OF THE RIM WITH WATER FOR THIRTY (30) MINUTES WITH ALLOWABLE LEAKAGE OF NOT MORE THAN ¼".
8. PLUG MANHOLE AND VACUUM TEST PER CITY OF MANVEL REQUIREMENTS.

WATER LINES
PRESSURE TEST:

9. A TEST, TO BE SUCCESSFUL SHALL BE WITNESSED BY THE CITY OF MANVEL PROJECT MANAGER FOR A FOUR (4) HOUR PERIOD, DURING REASONABLE HOURS. THE ALLOWABLE LEAKAGE SHALL BE NO GREATER THAN 1 PSI
10. FIRE LINES SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHALL. LEAKAGE SHALL BE CALCULATED AS STATED ABOVE.
BACTERIA TEST (BAC-TS)
11. BACTERIA SAMPLE IS REQUIRED FOR EACH 1,000 FEET OF WATER MAIN, OR CLOSER DEPENDING ON FIRE HYDRANT LOCATIONS, OR PORTIONS THEREOF. ALSO DEAD ENDS ARE SUBJECT TO TESTING, SUCH AS CUL-DE-SACS. THE FORM NEEDS TO BE LABELED "CONSTRUCTION" OR "SPECIAL".
GRAVITY SANITARY SEWERS:
12. LOW PRESSURE AIR TEST - THE PIPE SHALL UNDERGO A LOW PRESSURE AIR TEST WHICH SHALL CONFORM TO TCEQ REQUIREMENTS 217.57.
13. MANDREL DEFLECTION TEST - FLEXIBLE AND SEMI-RIGID PIPE DIAMETER DEFLECTION TEST SHALL BE DONE NO SOONER THAN THIRTY (30) DAYS AFTER FINAL BACKFILL. RUN TEST WITH MANDREL HAVING A DIAMETER EQUAL TO 95% OF THE INSIDE NOMINAL DIAMETER OF THE PIPE BEING TESTED. MANDREL SHALL BE NINE (9) ARM WITH STEEL PROVING RING 2" INCH RING WIDTH. TO PASS, MANDREL SHALL PASS FREELY THROUGH THE PIPE, PULLED BY ONE (1) WORKER. NO MECHANICAL MEANS SHALL BE ALLOWED TO PULL THE MANDREL.
FORCE MAIN TEST:
14. FORCE MAINS SHALL BE TESTED IN THE SAME MANNER AS WATER MAINS ACCORDING TO PARAGRAPH 3.1.1.
15. ALL GRAVITY SANITARY SEWER MAIN LINES SHALL BE TELEVISED AT THE ONE-YEAR WARRANTY PERIOD PRIOR TO FINAL ACCEPTANCE.
16. MANHOLE VACUUM TEST - MANHOLE SHALL REMAIN NEGATIVE TEN (-10) FOR TWO (2) MINUTES. NO DROP IN MERCURY WILL BE ALLOWED.
17. LOW PRESSURE TEST - 12" PIPES AND UNDER SHALL MAINTAIN 5 PSI FOR FIVE (5) MINUTES. ANY PIPES GREATER THAN 12" SHALL MAINTAIN 5 PSI FOR SEVEN (7) MINUTES.
LIME STABILIZED SUBGRADE:
LIME
18. PERCENT LIME DETERMINATION TEST SHALL BE TAKEN BY A CERTIFIED TESTING LABORATORY IN ACCORDANCE WITH ASTM C977-92, BUT SHALL NOT BE LESS THAN 6%.
19. THE PERCENT LIME USED SHALL BRING THE SOIL TO A P.I. OF NOT MORE 15
20. HYDRATED LIME SHALL BE SAMPLED AND TAKEN AT THE DISTRIBUTION AREA OF THE TANKER TRUCK AND TESTED.
SUBGRADE:
21. ALL SUBGRADE SHALL MEET THE FOLLOWING REQUIREMENTS WHEN TEST DRY BY LABORATORY SIEVES:
22. MINIMUM PASSING 1 ½" INCH SIEVE - 100%
23. MINIMUM PASSING ¾" INCH SIEVE - 85%
24. MINIMUM PASSING #4 SIEVE - 60%
25. ALL SUBGRADE SHALL PASS A DENSITY TEST OF NOT LESS THAN 95% STANDARD PROCTOR. METHOD OF TESTING AS PER ASTM D698. TEST TO BE TAKEN EVERY 200 FEET AS MEASURED ALONG CENTERLINE OF THE ROADWAY AT VARYING DISTANCES FROM CENTERLINE OF THE ROADWAY, OR AS DIRECTED BY THE CITY OF MANVEL.
26. THICKNESS TEST SHALL BE TAKEN EVERY 200 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.
27. IF A SINGLE STORM EVENT PRODUCES ONE (1) INCH OR MORE OF RAINFALL, CONTRACTOR SHALL RE-TEST THE SUBGRADE FOR DENSITY. THE INTERVAL FOR DENSITY RE-TESTS SHALL NOT BE LESS THAN 500 FEET AS MEASURED ALONG THE CENTERLINE OF THE ROADWAY.
28. CONCRETE PAVING: (INCLUDING CURBS, MEDIANS, SIDEWALKS, CAST-IN-PLACE MANHOLES AND INLETS, ETC.)
29. THE CONCRETE PAVEMENT WILL BE CORE DRILLED EACH 1,000 FEET SQUARE YARDS OR FOR EACH STREET, WHICHEVER IS GREATER, AND WILL BE TESTED FOR DEPTHS IN ACCORDANCE WITH ASTM C174 TEST OR OTHER APPROVED TESTING METHOD. THICKNESS SHALL NOT BE DEFICIENT BY MORE THAN ¼" INCH. THE CORE SHALL ALSO BE TESTED FOR COMPREHENSIVE STRENGTH.
STRUCTURAL CONCRETE:
30. THE SLUMP, WHEN PLACING CONCRETE, SHALL NOT BE GREATER THAN FIVE (5) INCHES. THE TEST SHALL BE TAKEN FOR EVERY FIFTY (100) CUBIC YARDS OF CONCRETE, BUT MAY BE TAKEN WHEN IN DOUBT BY THE TESTING LABORATORY TECHNICIAN OR THE CITY OF MANVEL PROJECT MANAGER.
31. TEMPERATURE OF THE CONCRETE WILL BE TAKEN AS DIRECTED BY THE CITY OF MANVEL PROJECT MANAGER AND SHALL BE LESS THAN 95° F.
32. THERE SHALL BE CYLINDERS TAKEN BY THE TESTING LABORATORY TECHNICIAN NUMBERING FOUR (4) CYLINDERS PER 100 CUBIC YARDS OF PAVING OR PART THEREOF FOR EACH DAYS PLACEMENT. TWO (2) CYLINDERS SHALL BE TESTED AT SEVEN (7) AND TWO (2) CYLINDERS SHALL BE TESTED AT TWENTY-EIGHT (28) DAYS WITH A MINIMUM COMPREHENSIVE STRENGTH OF 4,000 PSI IN TWENTY-EIGHT (28) DAYS IN ACCORDANCE WITH ASTM C31 TEST.

STORM SEWERS:

1. STORM SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISIONS.
2. ALL STORM SEWER PIPE SHALL BE REINFORCED CONCRETE PIPE (RCP), ASTM C76, CLASS III, TONGUE AND GROOVE, RAM-NEK JOINTS UNLESS OTHERWISE NOTED.
3. REINFORCED CONCRETE STORM SEWER (PIPE, BOX, ETC.) SHALL BE INSTALLED, BEDDED AND BACKFILLED IN CONFORMITY WITH CITY OF MANVEL STANDARD DETAILS. STORM SEWER PIPE INSTALLED UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR EXISTING PAVEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND, (1.1 SACKS OF CEMENT PER TON OF SAND), TO THE BOTTOM OF THE SUBGRADE.
4. CONCRETE FOR INLETS AND MANHOLES SHALL BE CLASS "A" AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT TWENTY-EIGHT (28) DAYS.
5. ALL MANHOLES SHALL BE ADJUSTED TO FINISHED GRADE AFTER PAVING IS COMPLETE.
6. MINIMUM STORM SEWER SIZE IS TWENTY-FOUR (24) INCH DIAMETER. MINIMUM UPSTREAM ROADSIDE DITCH CULVERT SIZE IS EIGHTEEN (18) INCH DIAMETER.
7. ALL STORM SEWER MANHOLE COVERS MUST INCLUDE THE WORDS, "STORM SEWER" AND "CITY OF MANVEL" AND HAVE THE "CITY SEAL." MANHOLE COVERS SHALL BE THIRTY-TWO (32) INCHES IN DIAMETER EXCEPT AT CURB INLET COVERS WHICH ARE TWENTY-FOUR (24) INCHES.
8. CONTRACTOR SHALL PROVIDE A MINIMUM OF SIX (6) INCHES CLEARANCE AT ALL UTILITY CROSSINGS WITH STORM SEWERS.
9. ALL INLETS IN RESIDENTIAL DEVELOPMENTS TO BE TYPE "H-2" OR TYPE "B-B" WITH GRATES. ALL INLETS IN COMMERCIAL DEVELOPMENTS AND ON MAJOR THOROUGHFARES TO BE TYPE "H-2" ONLY, UNLESS OTHERWISE APPROVED BY THE CITY OF MANVEL.
10. ALL DISTURBED AREAS IN DRAINAGE EASEMENTS OR DETENTION PONDS, SHALL BE HYDROMULCHED.
11. ALL STORM SEWER SHALL BE TELEVISED AT THE ONE-YEAR WARRANTY PERIOD PRIOR TO FINAL ACCEPTANCE.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, THE CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS REMAIN OPEN AND ARE MAINTAINED TO ENSURE POSITIVE DRAINAGE. CONVEYANCES ARE NOT TO BE IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS AND ANY OTHER SUBSTANCES THAT MAY DAMAGE THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. AT COMPLETION OF WORK, THE CONTRACTOR SHALL FILL ALL LOW SPOTS, GRADE ALL RIGHTS-OF WAY, AND UTILITY EASEMENTS, AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.

PAVING:

1. PAVEMENT SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISIONS.
2. CONTRACTOR SHALL NOTIFY THE CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630), TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL RETURNS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.
5. ALL FILL IN EXISTING OR PROPOSED RIGHTS-OF WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF EIGHT (8) INCHES OR LESS AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT OF ± THREE PERCENT (3%) OF OPTIMUM MOISTURE.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE SIXTY (60), NO. FOUR (4) REBAR, SPACED AT EIGHTEEN (18) INCH ON CENTERS EACH WAY.
7. ALL PAVEMENT TO BE A MINIMUM OF SIX (6) INCHES THICK REINFORCED CONCRETE UNLESS OTHERWISE NOTED.
8. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF SIXTY FEET (60).
9. ALL CONCRETE USED FOR PAVEMENT SHALL BE CLASS "A" CONCRETE AND A MINIMUM 4,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND A MINIMUM OF 6.0 SACKS OF CEMENT PER CUBIC YARD, UNLESS OTHERWISE NOTED.
10. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF SIX PERCENT (6%) BY WEIGHT.
11. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF MANVEL DESIGN CRITERIA MANUAL.
12. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
13. FOR ALL CONCRETE TO BE REMOVED, A TWO (2) INCH DEEP SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
14. REPRESENTATIVES FROM THE CITY OF MANVEL, THE OWNER AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL DENSITY TESTS, LIME OPERATIONS AND PLACEMENT OF CONCRETE PAVING. NO INSPECTABLE WORK CAN BE CONDUCTED ON SATURDAYS.
15. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TEST AND/OR CONCRETE CYLINDERS HAVE BEEN TAKEN.
16. BLUE REFLECTORIZED PAVEMENT MARKERS SHALL BE PLACED AT FIRE HYDRANT LOCATIONS AND OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY. REFLECTORS SHALL FACE FLOW OF TRAFFIC.
17. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET B/B OF CURB:
18. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.
19. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.
20. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET B/B OF CURB AND ALL MAJOR ARTERIAL THOROUGHFARES:
21. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.
22. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.
23. BLOCKOUTS SHALL BE INSTALLED AROUND ALL MANHOLES, JUNCTION BOXES, WATER VALVES, ETC. THAT LIE WITHIN THE PAVEMENT AREA.
24. BLOCKOUTS SHALL EXTEND A MINIMUM OF SIX (6) INCHES PAST THE LARGEST DIMENSION OF THE ITEM THAT IS BEING BLOCKED OUT AND SHALL HAVE AN EXPANSION JOINT BETWEEN THE BLOCKOUT AND THE PAVING.
25. CITY UTILITIES UNDER COMMERCIAL PAVED DRIVEWAYS, PARKING LOTS OR STRUCTURES SHALL HAVE A TEN (10) FOOT WIDE EXPANSION JOINT CENTERED OVER THE CITY UTILITY.
26. FLY ASH IS NOT ALLOWED IN ANY CONCRETE MIX DESIGN.

WATER:

1. WATER LINE CONSTRUCTION AND TESTING IS TO BE PERFORMED IN ACCORDANCE WITH CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISION.
2. ALL WATER MAINS SHALL HAVE A MINIMUM COVER OF FOUR 4 FEET MEASURED FROM CENTERLINE OF STREET OR EXISTING NATURAL GROUND WHICHEVER DEPTH IS GREATER, UNLESS OTHERWISE NOTED. WATER MAINS 16" AND LARGER SHALL HAVE A MINIMUM OF 5 FEET OF COVER.
3. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 150 PSI FOR FOUR (4) HOURS AND WITNESSED BY THE CITY OF MANVEL PROJECT MANAGER, EXCEPT FIRE LINES WHICH SHALL BE TESTED AT 200 PSI FOR TWO (2) HOURS AND SHALL BE WITNESSED BY THE FIRE MARSHAL.
4. SINGLE METER SERVICE LINES SHALL BE ONE (1) INCH MINIMUM I.D., C.T.S. POLYETHYLENE, SDR-9 WITH 1" TO ¾" REDUCER.
5. CONTRACTOR TO FURNISH AND INSTALL SINGLE SERVICE METER BOXES AT FINISH GRADE.
6. FIRE HYDRANT ASSEMBLIES SHALL INCLUDE ONE (1) EACH LINE SIZE BY SIX (6) INCH TEE, ONE (1) EACH SIX (6) INCH GATE VALVE AND BOX, ONE (1) EACH FIRE HYDRANT WITH SIX (6) INCH LEAD PIPING AND TIE BACKS. 5" STORZ CONNECTIONS ARE REQUIRED ON ALL HYDRANTS. HYDRANTS SHALL HAVE REFLECTIVE BAND AROUND QUICK CONNECT.
7. WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C-500, OPEN COUNTER CLOCKWISE (LEFT), EQUIPPED WITH TWO (2) INCH SQUARE OPERATING NUT. OPERATING NUT SHALL BE A MAXIMUM OF FIVE (5) FEET BELOW FINISH GRADE.
8. WATER LINES FOUR (4) INCH THROUGH TWELVE (12) INCH I.D. SHALL COMPLY WITH THE REQUIREMENTS OF AWWA STANDARD C-900-75, CLASS 235, SDR-18, WITH CAST IRON OUTSIDE DIAMETER AND GASKET BELL END. FITTINGS ARE TO BE MECHANICAL JOINTS IN ACCORDANCE WITH AWWA C-100 OR C-110. WATERLINE PIPE SHALL BE OF THE COLOR BLUE.
9. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL BE CLASS "C" AND HAVE A MINIMUM OF 2,500 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND CONFORM TO CITY OF MANVEL DESIGN CRITERIA MANUAL.
10. DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C-110 AND END JOINTS OF FITTINGS AND MAIN VALVES SHALL CONFORM TO AWWA C-110 AND END JOINTS TO FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C-111 FOR RUBBER GASKETED JOINTS. DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
11. MINIMUM BURY FOR ALL FIRE HYDRANTS SHALL BE FOUR (4) FEET UNLESS OTHERWISE NOTED. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE. PUMPER SERVICE CONNECTION TO FACE CURB.
12. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
13. CONTRACTOR SHALL NOTIFY CITY OF MANVEL PROJECT MANAGER SEVENTY-TWO (72) HOURS PRIOR TO START OF CONSTRUCTION.
14. ALL WATER LINES TO BE BACKFILLED TO ONE (1) FOOT ABOVE TOP OF PIPE WITH BANK SAND. FOR PORTIONS OF PIPE LOCATED UNDER PAVEMENT, BACKFILL FROM INITIAL BACKFILL OF BANK SAND TO ONE (1) FOOT BELOW PROPOSED SUBGRADE UNDER PAVEMENT WITH CEMENT-STABILIZED SAND (1.1 SACKS OF CEMENT PER TON OF SAND).
15. ALL FIRE HYDRANTS ARE TO BE LOCATED AS SHOWN ON THE PLANS AND SET THREE (3) FEET BEHIND THE CURB, ONE (1) FOOT FROM PROPERTY LINE FOR STREETS WITH DITCHES OR AT AN APPROVED LOCATION ON RURAL SECTION ROADS. ALL FIRE HYDRANTS SHALL BE AUDITED, SANDBLASTED AND PAINTED AS PER CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISION.
16. ALL TAPPING SLEEVES SHALL BE STAINLESS STEEL FULL CIRCLE WITH MECHANICAL JOINT TAPPING SLEEVE.
17. THE CONTRACTOR SHALL NOT OPERATE EXISTING CITY WATER VALVES. THE CONTRACTOR SHALL NOTIFY THE CITY PROJECT MANAGER AND CONTACT THE PUBLIC WORKS DEPARTMENT TWENTY-FOUR (24) HOURS MINIMUM, FOR ANY VALVE OPERATION NECESSARY FOR THE PROJECT. IF ANY VALVE CLOSING RESULTS IN INTERRUPTED SERVICE TO RESIDENTS OR BUSINESSES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO THE AFFECTED PARTIES TWENTY-FOUR (24) HOURS IN ADVANCE OF THE INTERRUPTION.
18. FOR ALL CONSTRUCTION WATER USAGE ON THE PROJECT, A FIRE HYDRANT METER SHALL BE OBTAINED FROM THE CITY. A DEPOSIT SHALL BE REQUIRED FOR THE METER AND A FEE SHALL BE CHARGED FOR ALL METERED WATER USAGE. THE CONTRACTOR SHALL SUPPLY A BACKFLOW PREVENTER FOR THE FIRE HYDRANT METER.
19. ALL WATER VALVES SHALL TURN ON IN THE COUNTER CLOCKWISE DIRECTION.
20. CONTRACTOR TO INSTALL TRACING LINE ON ALL PUBLIC WATER LINES AND SERVICE LINES UP TO THE PUBLIC ROW OR WATERLINE EASEMENT BOUNDARY.
21. ALL ROAD AND CREEK CROSSINGS SHALL BE CASED WITH A LARGER DIAMETER SDR PVC PIPE.
22. LONG SERVICE LEADS ARE TO BE CASED IN 2" SCHEDULE 40 PVC EXTENDED 2' FROM EACH EDGE OF PAVEMENT. CASING SHALL BE 3FT MINIMUM BELOW GRADE.
23. NON-POTABLE WATER SHALL BE PURPLE PIPE.

CAUTION: AT&T CABLES

THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF AT&T FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING THE CONTRACTOR SHALL EXPOSE THE AT&T FACILITIES.

WHEN AT&T TELEPHONE FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

CAUTION: UNDERGROUND GAS FACILITIES

THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 713-223-4567 OR 1-800-669-8344 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE CALL 713-967-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF THE INDICATED LOCATION OF CENTER ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

CAUTION: UNDERGROUND GAS FACILITIES (CONT.)

WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

CAUTION: OVERHEAD POWER LINES

TEXAS LAW ARTICLE 1436C, PROHIBITS ALL ACTIVITIES IN WHICH PERSONS OF EQUIPMENT MAY COME WITHIN SIX (6) FEET OF ENERGIZED OVERHEAD POWER LINES, AND FEDERAL REGULATIONS, TITLE 29, PART 1910, 180 (1) AND PART 1926.550 (A) (15) REQUIRE A MINIMUM CLEARANCE OF TEN (10) FEET FROM THESE FACILITIES. THE ABOVE LAWS CARRY BOTH CRIMINAL AND CIVIL LIABILITIES. IF THE CONTRACTOR PERFORMS ANY WORK NEAR OVERHEAD POWER LINES HE MUST CALL 281-896-0453 FOR THE LINES TO BE DE-ENERGIZED AND/OR MOVED AT HIS EXPENSE PRIOR TO PERFORMING THE WORK.

TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE, FORBIDS ALL ACTIVITIES WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES. CONTRACTORS ARE LEGALLY RESPONSIBLE FOR SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY POWER COMPANY.

CONTRACTOR TO NOTIFY THE "UNDERGROUND UTILITY COORDINATING COMMITTEE" TELEPHONE 713-223-4567 FORTY-EIGHT (48) HOURS BEFORE STARTING WORK IN STREET RIGHTS-OF-WAY OR EASEMENTS.

DATE APPROVED: JANUARY 20, 2024
REVISED DATE: | JANUARY 20, 2024 SCALE: NTS

GENERAL CONSTRUCTION NOTES 1 OF 2

PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		3A

SANITARY:

1. FINISHED ELEVATION ON SANITARY MANHOLE RIMS SHALL BE THREE (3) INCHES ABOVE FINISHED GRADE WITHIN THE UTILITY EASEMENT. IF MANHOLE IS LOCATED ADJACENT TO A PUBLIC STREET, THE FINAL ELEVATION OF THE MANHOLE RIM SHALL BE TWO (2) INCHES ABOVE THE CURB OR CENTERLINE OF STREET FOR STREETS WITHOUT PERIMETER CURB.

2. WATER LINES AND SANITARY SEWERS SHALL BE INSTALLED IN SEPERATE TRANCHES AND HAVE A MINIMUM SEPEP NINE (9) FEET.

3. POLYVINYL CHLORIDE (PVC) SHALL BE IN ACCORDANCE WITH ASTM D2241, SDR 26 FOR ALL DEPTHS UNLESS OTHERWISE NOTED ON THE CONSTRUCTION PLANS. SANITARY SEWER LINE SHALL BE THE COLOR GREEN.

4. ALL PVC PIPES (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE A RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477. SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SANITARY SEWER LINES.

5. ALL DUCTILE IRON (DI) PIPE SHALL BE 150 PSI WITH EIGHT (8) MIL BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI/AWWA A21.5/C105.

6. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISION. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS. ALL SANITARY SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CITY OF MANVEL DESIGN CRITERIA MANUAL.

7. SANITARY SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT ARE TO BE BACKFILLED WITH CEMENT-STABILIZED SAND BACKFILL AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE. BEDDING WILL BE CEMENT-STABILIZED SAND BACKFILL (1.) SACKS CEMENT PER TON OF SAND) FOR ALL SANITARY SEWERS.

8. WATER LINE/NEW SEWER LINE SEPARATION. WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO WATER LINES THAN NINE (9) FEET IN ALL DIRECTIONS. SEWERS THAT PARALLEL TO WATER LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHEN NINE (9) FEET OF SEPARATION CANNOT BE MAINTAINED, THE FOLLOWING GUIDELINES APPLY: AT ALL TIMES WATER AND SANITARY CROSSINGS OR SEPARATIONS SHALL CONFORM TO TCEQ REQUIREMENTS - SEE NOTES 28-35 BELOW FOR MORE DETAIL.

9. WHEN THE SANITARY SEWER PARALLELS A WATER LINE, THE SANITARY SEWER SHALL BE CONSTRUCTED OF PVC. CAST IRON OR DUCTILE IRON WILL REQUIRE APPROVAL BY CITY OF MANVEL. SANITARY SEWER SHALL MEET ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO (2) FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR (4) FEET BETWEEN OUTSIDE DIAMETERS. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE.

10. WHEN A SANITARY SEWER CROSSES A WATER LINE AND THE SEWER IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI, AN ABSOLUTE MINIMUM OF SIX (6) INCHES BETWEEN OUTSIDE DIAMETERS SHALL BE MAINTAINED. THE SANITARY SEWER SHALL BE LOCATED BELOW THE WATER LINE WHEN POSSIBLE AND ONE (1) LENGTH OF THE SANITARY SEWER PIPE MUST BE CENTERED ON THE WATER LINE. SEE NOTES 28-35 BELOW FOR MORE DETAIL.

11. WHEN A SANITARY SEWER CROSSES UNDER A WATER LINE AND THE SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIPE WITH GASKETED JOINTS, A MINIMUM OF TWO (2) FEET OF SEPARATION SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT-STABILIZED SAND (MINIMUM 1.) SACKS OF CONCRETE PER TON OF SAND) FOR ALL SECTIONS OF SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE. THE INITIAL BACKFILL SHALL BE FROM ✓ DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE PIPE DIAMETER (BUT NOT LESS THAN TWELVE (12 INCHES) ABOVE THE PIPE. SEE NOTES 28-35 BELOW FOR MORE DETAIL.

12. WHEN A SANITARY SEWER CROSSES OVER A WATER LINE, ALL PORTIONS OF THE SANITARY SEWER WITHIN NINE (9) FEET OF THE WATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. IN LIEU OF THIS PROCEDURE THE NEW WATERLINE MAY BE ENCASED IN A JOINT OF 150 PSI PRESSURE CLASS PIPE AT LEAST EIGHTEEN (18) FEET LONG AND TWO (2) NOMINAL SIZES LARGER THAN THE NEW WATERLINE. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT INTERVALS OF FIVE (5) FEET WITH SPACERS OR BE FILLED TO THE SPRINGLINE WITH WASHED SAND. THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH NON-SHRINK CEMENT GROUT OR WITH A MANUFACTURED SEAL. SEE NOTES 28-35 BELOW FOR MORE DETAIL.

13. ALL PROPOSED SANITARY SEWER LINES SHALL BE DUCTILE IRON OR SDR 26 PVC. DUCTILE IRON PIPE SHALL ONLY BE USED AS APPROVED BY THE CITY OF MANVEL.

14. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS.

15. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED. ALL SANITARY SEWER MANHOLES SHALL BE AT LEAST THREE
16. (3) INCHES ABOVE FINISHED GRADE OR ABOVE 100-YEAR BASE FLOOD ELEVATION (BFE). FOR MANHOLES LOCATED IN THE 100-YEAR FLOOD PLAIN,
17. VENT AND SEAL (BOLTED MANHOLE LID WITH FOUR (4) BOLTS, NO HOLES IN THE LID) THE MANHOLE TOP AND PROVIDE INFLOW PROTECTION INSERT UNDER COVER. SECTIONS OF PRECAST MANHOLES SHALL BE JOINED WITH "RAM-NEK" IN FLOOD PLAIN.

18. SANITARY SEWER LINE IN PIPE ZONE INSIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT-STABILIZED SAND OR SELECT FILL MATERIAL WITH A PI BETWEEN 20 AND 40.

19. IF WET SAND IS ENCOUNTERED IN TRENCH, USE SPECIAL BEDDING.

20. SANITARY SEWERS CROSSING UTILITIES OTHER THAN WATER LINES SHALL HAVE A MINIMUM CLEARANCE OF SIX (6) INCHES.

21. ALL PRECAST MANHOLES SHALL HAVE THE TOP ADJUSTMENT CONSTRUCTED OF PRECAST FCC RINGS NO GREATER THAN TWENTY-FOUR (24) INCHES IN HEIGHT, SEALED WITH NON-SHRINK GROUT INSIDE AND OUT. BRICK MANHOLES SHALL NOT BE ALLOWED.

22. ALL SANITARY SEWER MANHOLE COVERS MUST INCLUDE THE WORDS "SANITARY SEWER" AND "CITY OF MANVEL". THEY MUST ALSO HAVE THE CITY SEAL.

23. SANITARY SEWER MANHOLE COVERS SHALL BE A MINIMUM OF THIRTY-TWO (32) INCHES IN DIAMETER.

24. ALL SANITARY SEWER MANHOLES SHALL HAVE A STAINLESS STEEL INFLOW PROTECTOR.

25. CONTRACTOR TO INSTALL TRACING LINE ON ALL PUBLIC FORCE MAINS.

26. ALL INTERIOR CONCRETE OF THE MANHOLES, LIFT STATION WET WELLS AND SANITARY SEWER AIR RELEASE MANHOLES SHALL BE COATED COMPLETE WITH RAVEN 405 PROTECTIVE COATING WITH A MINIMUM THICKNESS OF 125 MIL OR APPROVED EQUAL. SEWPERCOAT ONLY USED AS AN ALTERNATIVE IF APPROVED BY THE CITY OF MANVEL.

27. ALL MANHOLES WITHIN ANY FLOODZONE OTHER THAN ZONE X AND SHADED X SHALL HAVE THEIR COVERS BOLTED TO THE FRAME.

28. WHERE A NEW POTABLE WATERLINE CROSSES ABOVE A WASTEWATER MAIN OR LATERAL, THE SEGMENT OF THE WATERLINE SHALL BE CENTERED OVER AND MUST BE PERPENDICULAR TO THE WASTEWATER MAINOR LATERAL SUCH THAT THE JOINTS OF THE WATERLINE PIPE ARE EQUIDISTANT AND AT LEAST NINE FEET HORIZONTALLY FROM THE CENTERLINE OF THE WASTEWATER MAIN OR LATERAL. WHEN CROSSING AN EXISTING WASTEWATER MAIN OR LATERAL AND IT IS DISTURBED OR SHOWS SIGNS OF LEAKING, THE WASTEWATER MAIN OR LATERAL SHALL BE REPLACED FOR AT LEAST NINE FEET IN BOTH DIRECTIONS (18 FEET TOTAL) WITH AT LEAST 150 PSI PRESSURE RATED PIPE EMBEDDED IN CEMENT STABILIZED SAND (SEE ITEM 26 BELOW) FOR THE TOTAL LENGTH OF ONE PIPE SEGMENT PLUS 12 INCHES BEYOND THE JOINT ON EACH END.

29. THE POTABLE WATERLINE SHALL BE AT LEAST TWO FEET ABOVE AN EXISTING, NON-PRESSURE RATED WASTEWATER MAIN OR LATERAL.

30. THE POTABLE WATERLINE SHALL BE AT LEAST SIX INCHES ABOVE AN EXISTING, PRESSURE RATED WASTEWATER MAIN OR LATERAL.

31. WHERE A NEW POTABLE WATER LINE CROSSES A NEW NON PRESSURE RATED WASTEWATER MAIN OR LATERAL, THE SEGMENT OF THE WATERLINE PIPE SHALL BE CENTERED OVER AND SHALL BE PERPENDICULAR TO THE WASTEWATER MAIN OR LATERAL SUCH THAT THE JOINTS OF THE WATERLINE PIPE ARE EQUIDISTANT AND AT LEAST NINE FEET HORIZONTALLY FROM THE CENTERLINE OF THE WASTEWATER MAIN OR LATERAL. THE POTABLE WATERLINE SHALL BE AT LEAST TWO FEET ABOVE THE WASTEWATER MAIN OR LATERAL. WHENEVER POSSIBLE, THE CROSSING SHALL BE CENTERED BETWEEN THE JOINTS OF THE WASTEWATER MAIN OR LATERAL. THE WASTEWATER PIPE SHALL HAVE A MINIMUM PIPE STIFFNESS OF 115 PSI AT 5% DEFLECTION. THE WASTER WATER MAIN OR LATERAL SHALL BE EMBEDDED IN CEMENT STABILIZED SAND (SEE ITEM 26 BELOW) FOR THE TOTAL LENGTH OF ONE PIPE SEGMENT PLUS 12 INCHES BEYOND THE JOINT ON EACH END. THE MATERIAL AND METHOD OF INSTALLATION SHALL CONFORM TO ONE OF THE FOLLOWING OPTIONS:

32. WITHIN NINE FEET HORIZONTALLY OF EITHER SIDE OF THE WATERLINE, THE WASTEWATER PIPE AND JOINTS SHALL BE CONSTRUCTED WITH PIPE MATERIAL HAVING A MINIMUM PRESSURE RATING OF 150 PSI. AN ABSOLUTE MINIMUM VERTICAL SEPARATION DISTANCE OF TWO FEET SHALL BE PROVIDED. THE WASTEWATER MAIN OR LATERAL SHALL BE LOCATED BELOW THE WATERLINE.

33. ALL SECTION OF WASTEWATER MAIN ORT LATERAL WITHIN NINE FEET HORIZONTALLY OF THE WATERLINE SHALL BE ENCASED IN AN 18FOOT OR LONER SECTION OF PIPE. FLEXIBLE ENCASING PIPE SHALL A MINIMUM PIPE STIFFNESS OF 115 PSI AT 5% DEFLECTION. THE ENCASING PIPE SHALL BE CENTERED ON THE WATERLINE AND SHALL BE AT LEAST TWO NOMINAL PIPE SIZES LARGER THAN THE WASTEWATER MAIN OR LATERAL. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT FIVE FOOT INTERVALS (OR LESS) WITH SPACERS OR BE FILLED TO THE SPRING LINE WITH WASHED SAND. EACH END OF THE CASING SHALL BE SEALED WITH WATER TIGHT NON-SHRINK CEMENT GROUT OR A MANUFACTURED WATER TIGHT SEAL. AN ABSOLUTE MINIMUM SEPARATION DISTANCE OF SIX INCHES BETWEEN THE ENCASEMENT PIPE AND THE WATERLINE SHALL BE PROVIDED. THE WASTEWATER LINE SHALL BE LOCATED BELOW THE WATERLINE.

34. WHEN A NEW WATERLINE CROSSES UNDER A WASTEWATER MAIN OR LATERAL, THE WATERLINE SHALL BE ENCASED AS DESCRIBED FOR WASTEWATER MAINS OR LATERALS IN ITEM 23 OR CONSTRUCTED IN DUCTILE IRON OR STEEL PIPE WITH MECHANICAL OR WELDED JOINTS AS APPROPRIATE. AN ABSOLUTE MINIMUM SEPARATION DISTANCE OF ONE FOOT BETWEEN THE WATERLINE AND THE WASTEWATER MAIN OR LATERAL SHALL BE PROVIDED. WHEN A NEW WATERLINE CROSSES UNDER A WASTEWATER MAIN, THE PROCEDURES IN TCEQ 217.53(D) (RELATING TO PIPE DESIGN) MUST BE FOLLOWED.

35. WHERE A NEW POTABLE WATERLINE CROSSES A NEW, PRESSURE RATED WASTEWATER MAIN OR LATERAL, ONE SEGMENT OF THE WATERLINE PIPE SHALL BE CENTERED OVER AND SHALL BE PERPENDICULAR TO THE WASTEWATER LINE SUCH THAT THE JOINTS OF THE WATERLINE PIPE ARE EQUIDISTANT AND AT LEAST NINE FEET HORIZONTALLY FROM THE CENTER LINE OF THE WASTEWATER MAIN OR LATERAL. THE POTABLE WATERLINE SHALL BE AT LEAST SIX INCHES ABOVE THE WASTEWATER MAIN OR LATERAL. WHENEVER POSSIBLE, THE CROSSING SHALL BE CENTERED BETWEEN THE JOINTS OF THE WASTEWATER MAIN OR LATERAL. THE WASTEWATER PIPE SHALL HAVE A PRESSURE RATING OF AT LEAST 150 PSI. THE WASTEWATER MAIN OR LATERAL SHALL BE EMBEDDED IN CEMENT STABILIZED SAND (SEE ITEM 26 BELOW) FOR THE TOTAL LENGTH OF ONE PIPE SEGMENT LENGTH PLUS 12 INCHES BEYOND THE JOINT ON EACH END.

36. WHERE CEMENT STABILIZED SAND BEDDING IS REQUIRED, THE CEMENT STABILIZED SAND SHALL HAVE A MINIMUM OF 10% CEMENT PER CUBIC YARD OF CEMENT STABILIZED SAND MIXTURE, BASED ON LOOSE DRY WEIGHT VOLUME (AT LEAST 2.5 BAGS OF CEMENT PER CUBIC YARD OF MIXTURE). THE CEMENT STABILIZED SAND BEDDING SHALL BE A MINIMUM OF SIX INCHES ABOVE AND FOUR INCHES BELOW THE WASTEWATER MAIN OR LATERAL. THE USE OF BROWN COLORING IN CEMENT STABILIZED SAND FOR WASTEWATER MAIN OR LATERAL BEDDING IS RECOMMENDED FOR THE IDENTIFICATION OF PRESSURE RATED WASTEWATER MAINS DURING FUTURE CONSTRUCTION.

37. ALL SANITARY SEWER SHALL BE TELEVISED AT THE ONE-YEAR WARRANTY PERIOD PRIOR TO FINAL ACCEPTANCE.

CAUTION: AT&T CABLES

THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF AT&T FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING THE CONTRACTOR SHALL EXPOSE THE AT&T FACILITIES.

WHEN AT&T TELEPHONE FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

CAUTION: UNDERGROUND GAS FACILITIES

THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 713-223-4567 OR 1-800-669-8344 A MINIMUM OF FORTY-EIGHT (48) HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE CALL 713-967-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.

WHEN EXCAVATING WITHIN TWENTY-FOUR (24) INCHES OF THE INDICATED LOCATION OF CENTER ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

CAUTION: UNDERGROUND GAS FACILITIES (CONT.)

WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

CAUTION: OVERHEAD POWER LINES

TEXAS LAW ARTICLE 1436C, PROHIBITS ALL ACTIVITIES IN WHICH PERSONS OF EQUIPMENT MAY COME WITHIN SIX (6) FEET OF A ENERGIZED OVERHEAD POWER LINES, AND FEDERAL REGULATIONS, TITLE 29, PART 1910, 180 (1) AND PART 1926.550 (A) (15) REQUIRE A MINIMUM CLEARANCE OF TEN (10) FEET FROM THESE FACILITIES. THE ABOVE LAWS CARRY BOTH CRIMINAL AND CIVIL LIABILITIES. IF THE CONTRACTOR PERFORMS ANY WORK NEAR OVERHEAD POWER LINES HE MUST CALL 281-996-0453 FOR THE LINES TO BE DE-ENERGIZED AND/OR MOVED AT HIS EXPENSE PRIOR TO PERFORMING THE WORK.

TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE, FORBIDS ALL ACTIVITIES WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES. CONTRACTORS ARE LEGALLY RESPONSIBLE FOR SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY POWER COMPANY.

CONTRACTOR TO NOTIFY THE "UNDERGROUND UTILITY COORDINATING COMMITTEE" TELEPHONE 713-223-4567 FORTY-EIGHT (48) HOURS BEFORE STARTING WORK IN STREET RIGHTS-OF-WAY OR EASEMENTS.

GENERAL CONSTRUCTION NOTES 2 OF 2

DATE APPROVED: JANUARY 20, 2020		PROJECT NUMBER:	DATE SUBMITTED:	SHEET: 3B
REVISED DATE:	JANUARY 20, 2020 SCALE: NTS			

CK:
DW:
CK:
DW:

SUMMARY OF QUANTITIES

ITEM NO.	DESC. CODE	ITEM DESCRIPTION (WRITTEN IN WORDS)	UNIT	CROIX RD AT RODEO DR
0416	7044	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	30
0416	7046	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	22
0529	7002	CONC CURB (TY II)	LF	71
0505	7001	TMA (STATIONARY)	DAY	30
0531	7001	CONC SIDEWALKS (4")	SY	22
0618	7060	CONDT (PVC) (SCH 80) (3")	LF	265
0618	7064	CONDT (PVC) (SCH 80) (4")	LF	195
0618	7065	CONDT (PVC) (SCH 80) (4") (BORE)	LF	215
0620	7007	ELEC CONDR (NO.8) BARE	LF	675
0620	7008	ELEC CONDR (NO.8) INSULATED	LF	55
0621	7006	TRAY CABLE (4 CONDR) (12 AWG)	LF	820
0624	7008	GROUND BOX TY D (162922)W/APRON	EA	5
0628	7191	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)	EA	1
0636	7001	ALUMINUM SIGNS (TY A)	SF	37.5
		*SIGN, "RODEO DR" (90"x18"=11.25 SF)	EA	2
		*SIGN, "CROIX RD" (90"x18"=7.5 SF)	EA	1
		*SIGN, "LEFT TURN SIGNAL" (30"X36"=7.5 SF)	EA	1
0644	7073	REMOVE SM RD SN SUP&AM	EA	1
0666	7233	RE PM TY III (W)(4")(SLD)	LF	223
0666	7234	RE PM TY III (W)(4")(BRK)	LF	105
0666	7242	RE PM TY III (W)(12")(SLD)	LF	263
0666	7244	RE PM TY III (W)(24")(SLD)	LF	90
0666	7346	PAVEMENT SLER 4"	LF	328
0666	7350	PAVEMENT SLER 12"	LF	263
0666	7352	PAVEMENT SLER 24"	LF	90
0666	7353	PAVEMENT SLER (ARROW)	EA	2
0666	7354	PAVEMENT SLER (WORD)	EA	2
0668	7091	PREFAB PM TY C (W)(ARROW)	EA	2
0668	7103	PREFAB PM TY C (W)(WORD)	EA	2
0677	7001	ELIM EXT PM & MRKS (4")	LF	77
0677	7008	ELIM EXT PM & MRKS (24")	LF	20
0677	7009	ELIM EXT PM & MRKS (ARROW)	EA	2
0677	7015	ELIM EXT PM & MRKS (WORD)	EA	2
0678	7001	PAV SURF PREP FOR MRK (4")	LF	328
0678	7006	PAV SURF PREP FOR MRK (12")	LF	263
0678	7008	PAV SURF PREP FOR MRK (24")	LF	90
0678	7009	PAV SURF PREP FOR MRK (ARROW)	EA	2
0678	7016	PAV SURF PREP FOR MRK (WORD)	EA	2
0680	7003	INSTALL HWY TRF SIG (SYSTEM)	EA	1
		*TRAFFIC SIGNAL CONTROLLER, FULLY ACTUATED	EA	1
		*TRAFFIC SIGNAL CABINET	EA	1
		*CONTROLLER CABINET FOUNDATION	EA	1
		*18" CABINET BASE EXTENSION	EA	1
		*ROD, 5/8"X10" COPPER-CLAD GROUND (FOR	EA	1
		*DETECTOR UNIT (DUAL CHANNEL)	EA	1
		*DETECTOR CARD RACK (8 SLOTS AND 4 SLOTS)	EA	1
		*MAST ARM DAMPING PLATE	EA	3
		*LED RDWY LUMINARES (0.25 KW HPS EQ)	EA	3
		*LUMINARE ARM (8-FT)	EA	3
0682	7001	VEH SIG SEC (12")LED(GRN)	EA	6
0682	7002	VEH SIG SEC (12")LED(GRN ARW)	EA	1
0682	7003	VEH SIG SEC (12")LED(YEL)	EA	6
0682	7004	VEH SIG SEC (12")LED(YEL ARW)	EA	1
0682	7005	VEH SIG SEC (12")LED(RED)	EA	6
0682	7006	VEH SIG SEC (12")LED(RED ARW)	EA	2
0682	7018	PED SIG SEC (LED)(COUNTDOWN)	EA	4
0682	7037	BACKPLATE W/REFL BRDR(4 SEC)	EA	1
0682	7054	BACKPLATE W/REFL BRDR(3 SEC)	EA	6
0684	7008	TRF SIG CBL (TY A)(12 AWG)(3 CONDR)	LF	675
0684	7010	TRF SIG CBL (TY A)(12 AWG)(5 CONDR)	LF	695
0684	7012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	2190
0686	7039	INS TRF SIG PL AM(S)1 ARM(36')LUM	EA	1
0686	7047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	1
0686	7055	INS TRF SIG PL AM(S)1 ARM(50')LUM	EA	1
0687	7001	PED POLE ASSEMBLY	EA	3
		*SCREW-IN ANCHOR FOUNDATION	EA	3
0688	7001	PED DETECT PUSH BUTTON (APS)	EA	4
		*PEDESTRIAN PUSH BUTTON SIGN "R30-3eR" (9"X15")	EA	2
		*PEDESTRIAN PUSH BUTTON SIGN "R30-3eL" (9"X15")	EA	2
0688	7003	PED DETECTOR CONTROLLER UNIT	EA	1
6007	7001	BBU SYSTEM (EXTERNAL BATTERY CABINET)	EA	1
6008	7001	RVDS (PRESENCE DETECTION ONLY)	EA	3
		*18 AWG 2 CONDR CABLE/22 AWG 4 CONDR CABLE	LF	820
6008	7002	RVDS (ADVANCE DETENTION ONLY)	EA	2
		*18 AWG 2 CONDR CABLE/22 AWG 4 CONDR CABLE	LF	580

*MATERIALS AND LABOR SUBSIDIARY TO PERTINENT

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3/10/2026

CITY OF MANVEL

BGE, Inc.
10777 Westhelmer Rd, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

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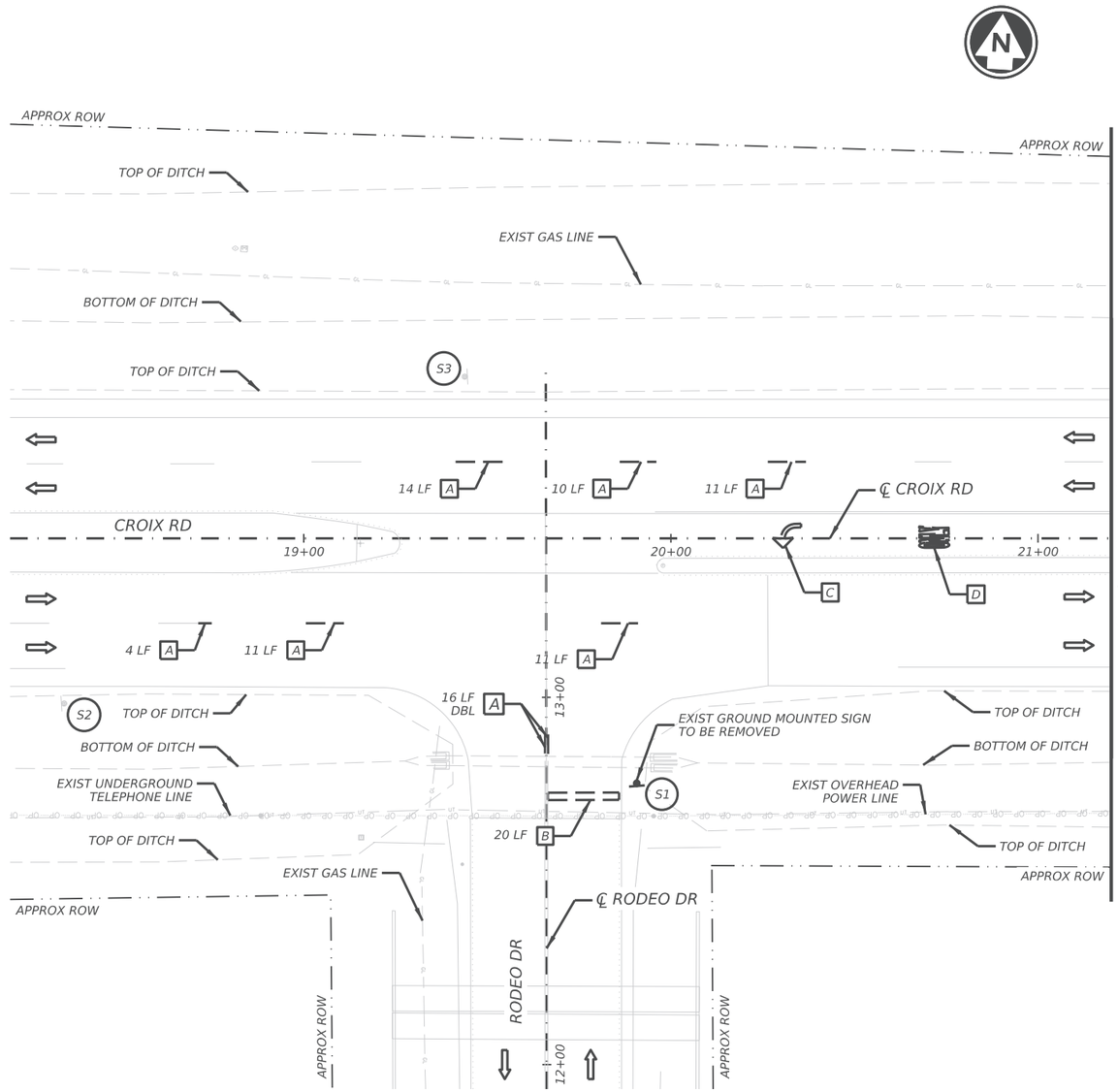
CROIX RD

SUMMARY OF QUANTITIES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		4



EXISTING GROUND MOUNTED SIGN:



S1
R1-1
TO BE REMOVED



S2
TX1-1T



S3
TX1-1T

LEGEND:

- EXIST GROUND MOUNTED SIGN (TO BE REMOVED)
- EXIST GROUND MOUNTED SIGN (TO REMAIN)
- APPROXIMATE ROW
- DIRECTION OF TRAFFIC
- A — ELIM EXT PAV MRK & MRKS (4")
- B — ELIM EXT PAV MRK & MRKS (24")
- C — ELIM EXT PAV MRK & MRKS (ARROW)
- D — ELIM EXT PAV MRK & MRKS (WORD)

0 20 40
SCALE: 1" = 40'

PAVEMENT TYPE:
CROIX RD = CONCRETE
RODEO DR = CONCRETE

POSTED SPEED LIMITS:
CROIX RD = 45 MPH
RODEO DR = 30 MPH

NOTES:
1. ALL EXISTING EQUIPMENT LOCATIONS ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY.
2. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 72 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.
3. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell

3/10/2026

CITY OF MANVEL

BGE, Inc.
10777 Westheimer Rd, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

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CROIX RD

TRAFFIC SIGNAL LAYOUT EXISTING CONDITIONS

CROIX RD @ RODEO DR

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		5

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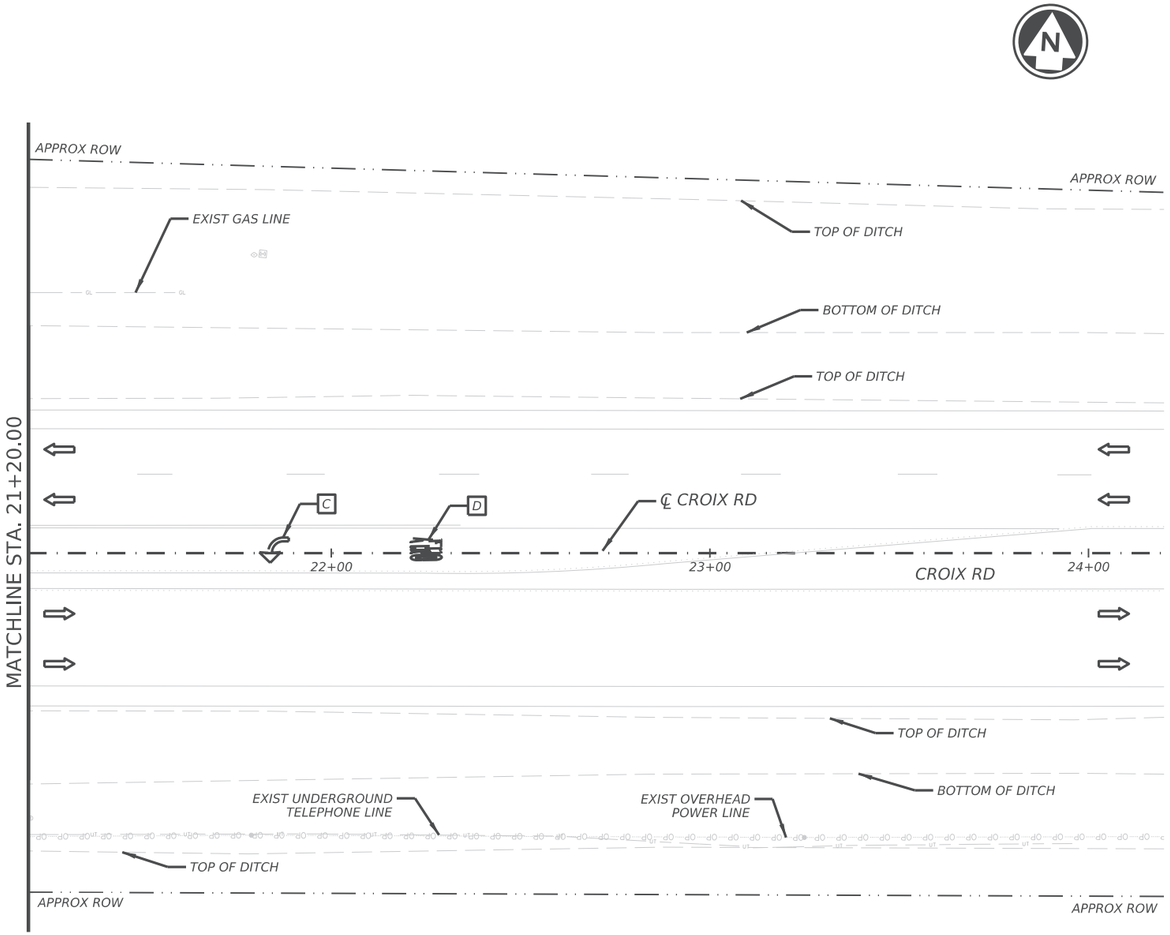

EXISTING GROUND MOUNTED SIGN:



S1
R1-1
TO BE REMOVED



S2
TX1-1T



S3
TX1-1T

LEGEND:

- EXIST GROUND MOUNTED SIGN (TO BE REMOVED)
- EXIST GROUND MOUNTED SIGN (TO REMAIN)
- APPROXIMATE ROW
- DIRECTION OF TRAFFIC
- A — ELIM EXT PAV MRK & MRKS (4")
- B — ELIM EXT PAV MRK & MRKS (24")
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SCALE: 1" = 40'

PAVEMENT TYPE:
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POSTED SPEED LIMITS:
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RODEO DR = 30 MPH

NOTES:
1. *ALL EXISTING EQUIPMENT LOCATIONS ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY.*
2. *THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 72 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.*
3. *THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.*

STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell

3/10/2026

CITY OF MANVEL

BGE, Inc.
10777 Westheimer Rd, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

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CROIX RD

TRAFFIC SIGNAL LAYOUT EXISTING CONDITIONS

CROIX RD @ RODEO DR

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		6

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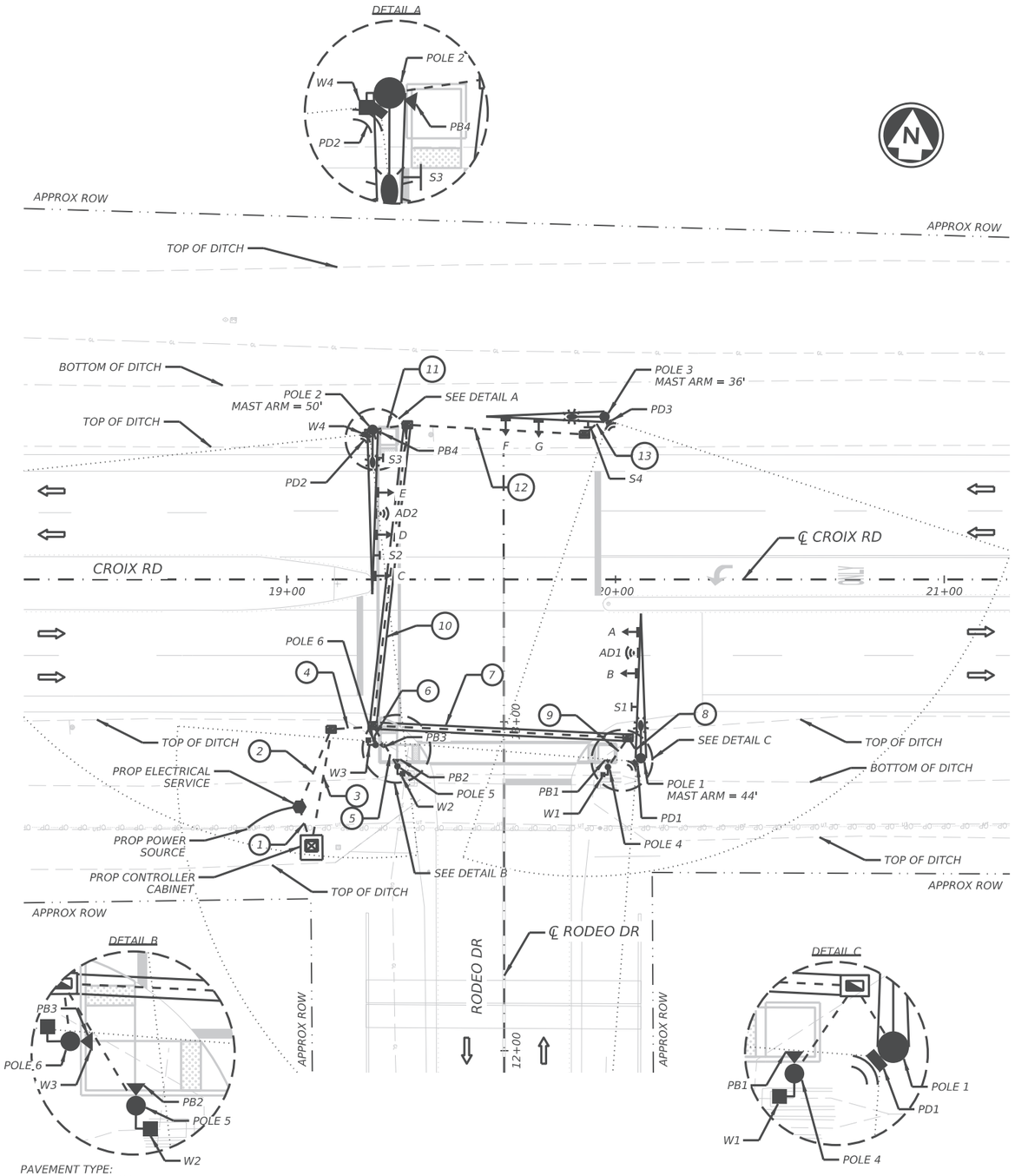

PAVEMENT TYPE:
CROIX RD = CONCRETE
RODEO DR = CONCRETE

POSTED SPEED LIMITS:
CROIX RD = 45 MPH
RODEO DR = 30 MPH

PROPOSED VEHICLE SIGNALS

12" 3-SECTION HORIZONTAL SIGNAL HEAD — A,B,D,E F,G

12" 4-SECTION HORIZAONTAL SIGNAL HEAD — C

PROPOSED MAST ARM SIGNS

RODEO DR — S1,S3

LEFT TURN SIGNAL — S2

CROIX RD — S4

PROPOSED PEDESTRIAN SIGNALS (APS)

W1-W4

R10-3eR — PB1,PB3

R10-3eL — PB2,PB4

LEGEND:

- PROP SIGNAL POLE W/ MAST ARM
- PROP SIGNAL HEAD
- PROP OVERHEAD SIGN
- PROP LUMINAIRE
- PROP TRAFFIC SIGNAL CABINET W/ CONTROLLER
- PROP SERVICE METER
- PROP CONDUIT (TRENCH/BORE)
- PROP GROUND BOX
- PROP PEDESTRIAN POLE
- PROP PUSH BUTTON
- PROP PEDESTRIAN HEAD
- PROP PRESENCE RADAR
- PROP ADVANCE RADAR
- PROP RADAR DETECTION ZONE
- APPROXIMATE ROW
- DIRECTION OF TRAFFIC

0 20 40
SCALE: 1" = 40'

PROPOSED POLE SUMMARY

POLE NO.	DESCRIPTION
CONTROLLER	GROUND MOUNTED CABINET W/ CONTROLLER ON CONCRETE (BASE) FOUNDATION W/ BATTERY BACK-UP SYSTEM
PROP SERVICE	METER POLE W/ SAFETY SWITCH
1	30' POLE W/ 44' MAST ARM W/ LUMINAIRE
2	30' POLE W/ 50' MAST ARM W/ LUMINAIRE
3	30' POLE W/ 36' MAST ARM W/ LUMINAIRE
4	10' PEDESTAL POLE W/ SCREW-IN FOUNDATION
5	10' PEDESTAL POLE W/ SCREW-IN FOUNDATION
6	10' PEDESTAL POLE W/ SCREW-IN FOUNDATION

NOTES:
1. ALL EXISTING EQUIPMENT LOCATIONS AND RIGHT-OF-WAY ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY.
2. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 72 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.
3. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
4. CONTRACTOR TO ALIGN FACE OF SIGNAL HEAD WITH CENTER OF LINE.
5. CONTRACTOR TO MAINTAIN A MINIMUM OF 8' SEPARATION BETWEEN ALL SIGNAL HEADS.
6. LOCATION OF TRAFFIC SIGNAL POLES, CONTROLLER ASSEMBLES, AND ELECTRICAL SERVICE SHALL BE VERIFIED AND APPROVED BY ENGINEER PRIOR TO CONSTRUCTION.
7. LUMINAIRES SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY INTENDING TO BE LIT.
8. CONTRACTOR TO CONFIRM ALL POLES CAN BE STOOD AND ARE NOT IN CONFLICT WITH POWER LINES PRIOR TO ORDERING POLES OR POURING FOUNDATIONS.

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CROIX RD

TRAFFIC SIGNAL LAYOUT PROPOSED CONDITIONS

CROIX RD @ RODEO DR

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		7

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PROPOSED ELECTRICAL SCHEDULE

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						CONDUCTORS (620)				TRAY CABLE (621)		CABLES (684)						RADAR DETECTION CABLE (6008)			
	PVC						GROUND		POWER		LUMINAIRE		PUSH BUTTON		PEDESTRIAN SIGNAL		VEHICLE SIGNAL		PRESENCE		ADVANCE	
	3" (SCHD 80)		4" (SCHD 80)				#8 BARE		#8 INSULATED		#12/4C TRAY CABLE		#12/3C		#12/5C		#12/7C		#18/2C & #22/4C		#18/2C & #22/4C	
	(7060)		(7064)		(7065)		(7007)		(7008)		(7006)		(7008)		(7010)		(7012)		SUBSIDIARY		SUBSIDIARY	
	NO.	TRENCH	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	1	25					1	25	2	25												
2	1	40					1	40			3	40										
3			2	50			2	50					4	50	4	50	7	50	3	50	2	50
4			2	25			2	25			3	25	4	25	4	25	7	25	3	25	2	25
5	1	25					1	25					1	25	1	25						
6	1	20					1	20					1	20	1	20						
7					1	90	1	90			1	90	1	90	1	90	2	90	1	90	1	90
8	1	20					1	20			1	20					2	20	1	20	1	20
9	1	25					1	25					1	25	1	25						
10					1	105	1	105			2	105	1	105	1	105	5	105	2	105	1	105
11			1	25			1	25			1	25	1	25	1	25	3	25	1	25	1	25
12	1	65					1	65			1	65					2	65	1	65		
13	1	20					1	20			1	20					2	20	1	20		
POLE 1											1	40					2	20	1	30	1	20
POLE 2											1	40	1	5	1	10	3	20	1	30	1	20
POLE 3											1	40					2	20	1	30		
POLE 4													1	5	1	10						
POLE 5													1	5	1	10						
POLE 6													1	5	1	10						
MAST ARM 1																	2	45			1	45
MAST ARM 2																	3	55			1	50
MAST ARM 3																	2	40				
TOTAL (LF)		240		175		195		610		50		745		610		630		1990		745		525
EST. TOTAL		265		195		215		675		55		820		675		695		2190		820		580

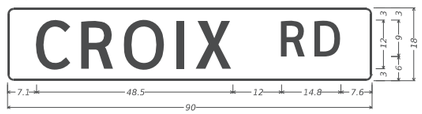
PROPOSED MAST ARM SIGNS

S1,S3



D3-3T;
1.5" Radius, 0.5" Border, White on Green;
"RODEO", ClearviewHwy-3-W; "DR", ClearviewHwy-3-W;
Table of letter and object lefts

S4



D3-3T;
1.5" Radius, 0.5" Border, White on Green;
"CROIX", ClearviewHwy-3-W; "RD", ClearviewHwy-3-W;
Table of letter and object lefts

S2



R10-10L_30x36;

RADAR DETECTION CHART

DETECTOR	PHASE	FUNCTION
PD1	PRESENCE	CALL & EXTEND NORTHBOUND APPROACH
PD2	PRESENCE	CALL & EXTEND EASTBOUND APPROACH
PD3	PRESENCE	CALL & EXTEND WESTBOUND APPROACH
AD1	ADVANCE	EXTEND EASTBOUND APPROACH
AD2	ADVANCE	EXTEND WESTBOUND APPROACH

PROPOSED ELECTRICAL SCHEDULE

ELECTRICAL SERVICE DATA SHEET

INTERSECTION	ELECTRICAL SERVICE CALLOUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5,6,7&8)-25)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD/ LOADCENTER AMP RATING	CIRCUIT USE	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
CROIX RD (CR 58) AT RODEO DR	PROPOSED SERVICE METER	ELEC SERV TY D 120/240 060 (NS) SS (E) SP (O)	2"	3/#4	N/A	2P/60	30	70	TRAFFIC SIGNAL	1P/50	40	6.2
									ILLUMINATION	2P/20	6	

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CK: DW: CC: DW:

STATE OF TEXAS
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124831
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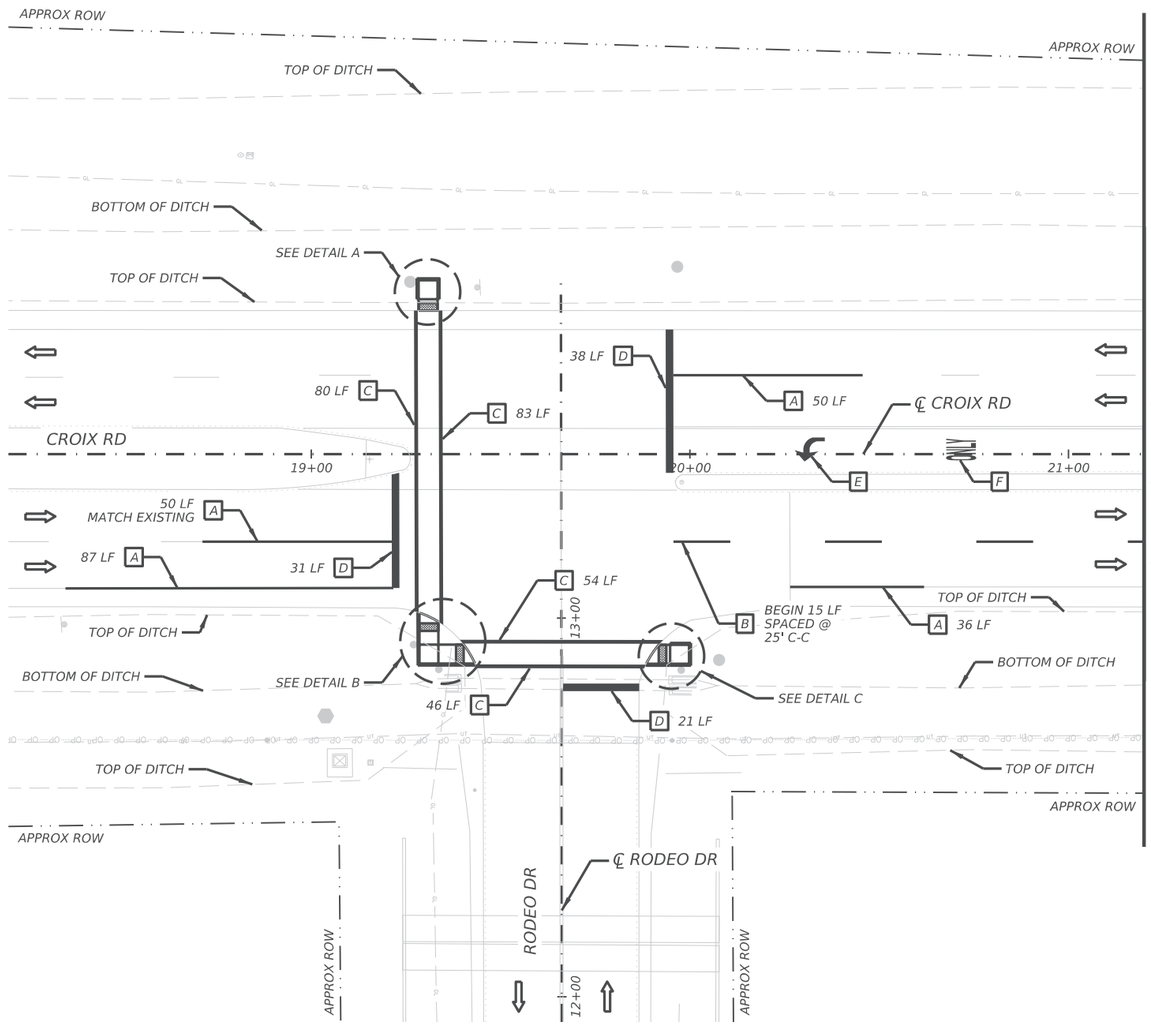
CROIX RD

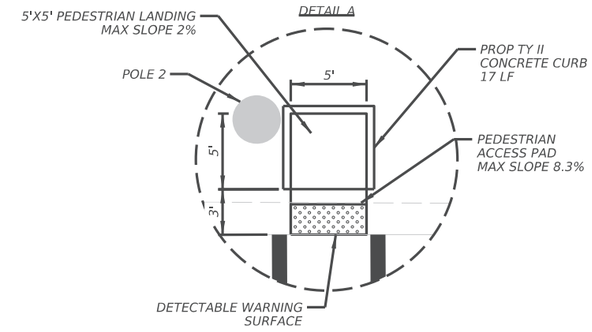
PROPOSED TRAFFIC SIGNAL DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		8



DETAIL A



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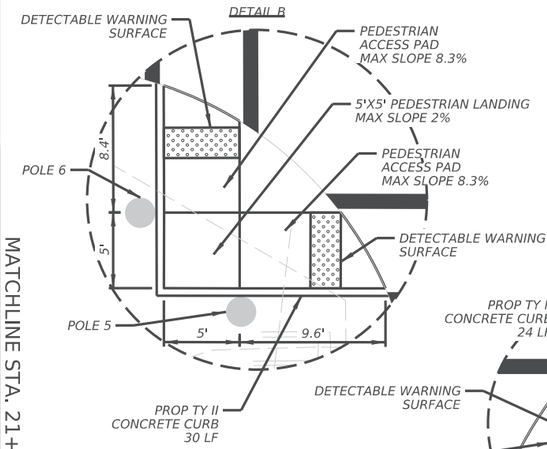

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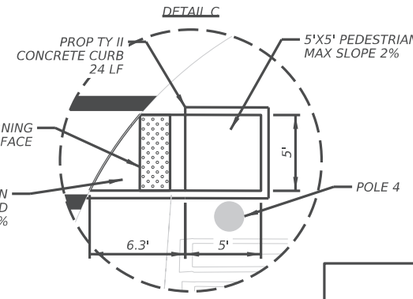
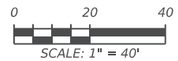
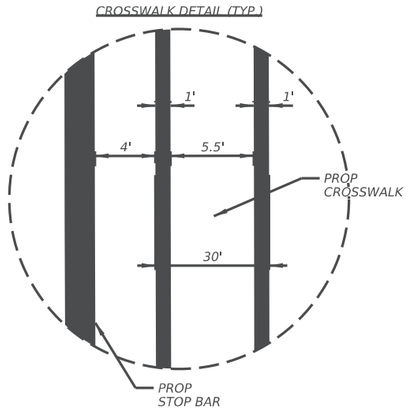




CROSSWALK DETAIL (TYP.)



LEGEND:

A	RE PM TY III (W) (4") (SLD)
B	RE PM TY III (W) (4") (BRK)
C	RE PM TY III (W) (12") (SLD)
D	RE PM TY III (W) (24") (SLD)
E	PREFAB PM TY C (W) (ARROW)
F	PREFAB PM TY C (W) (WORD)
	APPROXIMATE ROW
	DIRECTION OF TRAFFIC

PAVEMENT TYPE:
CROIX RD = CONCRETE
RODEO DR = CONCRETE

POSTED SPEED LIMITS:
CROIX RD = 45 MPH
RODEO DR = 30 MPH

NOTES:
1. ALL EXISTING EQUIPMENT LOCATIONS AND RIGHT-OF-WAY ARE APPROXIMATE, CONTRACTOR TO FIELD VERIFY.
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3. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
4. INSTALL NEW LANE LINES, CROSSWALK PAVEMENT MARKINGS, AND STOP BAR MARKINGS AT THE INTERSECTION AS SHOWN ON THE PLANS.
5. CONTRACTOR TO ADJUST EXISTING VALVES, GROUND BOXES, AND UTILITIES TO FINAL GRADE WITHIN PROPOSED RAMPS AND LANDING PADS.

STATE OF TEXAS
HIDI M. CRISWELL
124831
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3/10/2026

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CROIX RD

PROPOSED PAVEMENT MARKINGS AND PEDESTRIAN ACCESS PADS

CROIX RD @ RODEO DR

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		9

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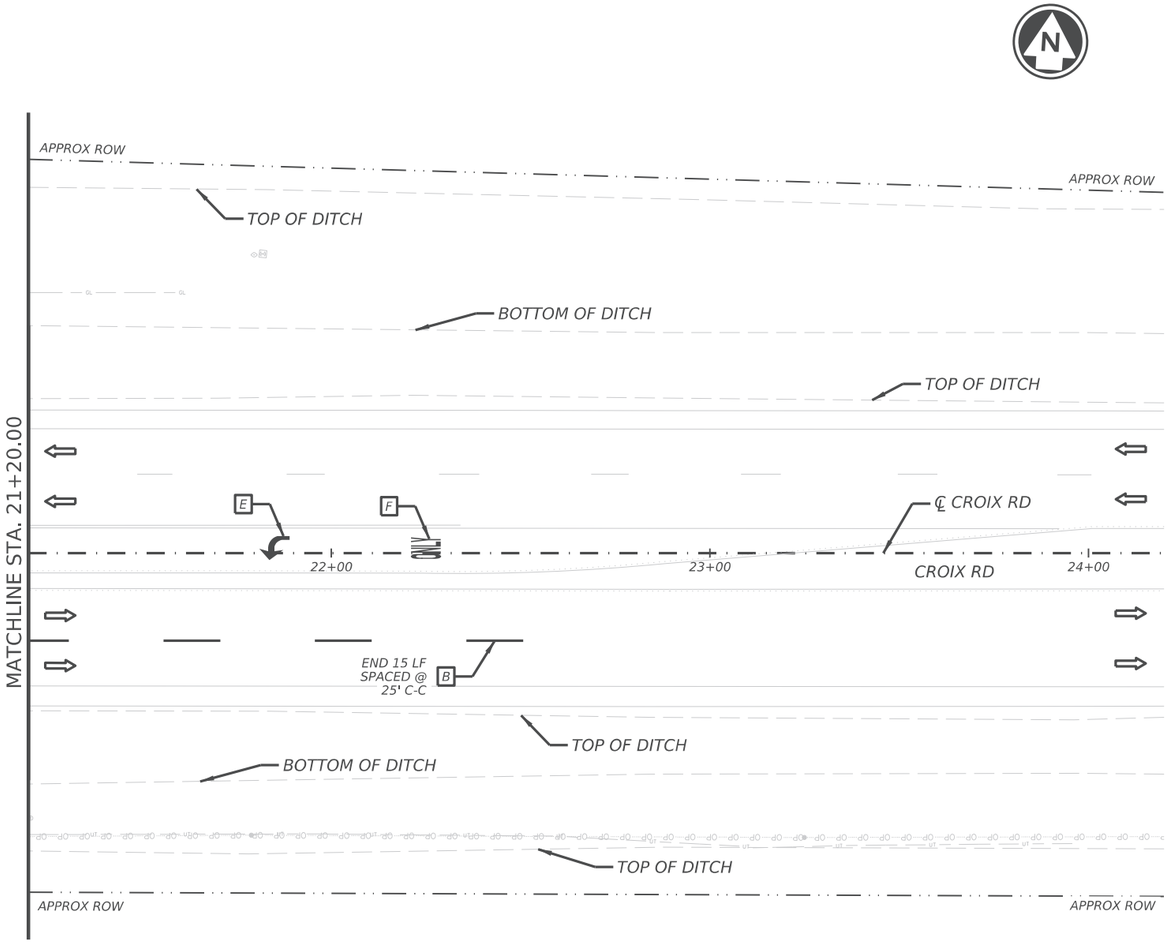

LEGEND:

- A — *RE PM TY III (W) (4") (SLD)*
- B — *RE PM TY III (W) (4") (BRK)*
- C — *RE PM TY III (W) (12") (SLD)*
- D — *RE PM TY III (W) (24") (SLD)*
- E — *PREFAB PM TY C (W) (ARROW)*
- F — *PREFAB PM TY C (W) (WORD)*
- *APPROXIMATE ROW*
- *DIRECTION OF TRAFFIC*

0 20 40
SCALE: 1" = 40'

PAVEMENT TYPE:
CROIX RD = CONCRETE
RODEO DR = CONCRETE

POSTED SPEED LIMITS:
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RODEO DR = 30 MPH

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3. *THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.*
4. *INSTALL NEW LANE LINES, CROSSWALK PAVEMENT MARKINGS, AND STOP BAR MARKINGS AT THE INTERSECTION AS SHOWN ON THE PLANS.*
5. *CONTRACTOR TO ADJUST EXISTING VALVES, GROUND BOXES, AND UTILITIES TO FINAL GRADE WITHIN PROPOSED RAMPS AND LANDING PADS.*

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CROIX RD

PROPOSED PAVEMENT MARKING AND PEDESTRIAN ACCESS PADS

CROIX RD @ RODEO DR

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		10

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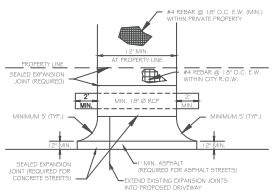
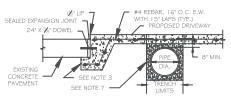
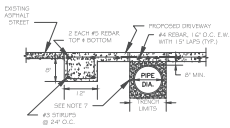


PLAN - ALL STREETS



PROFILE - CONCRETE STREETS



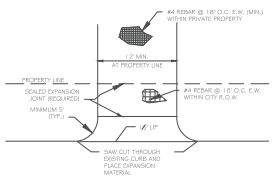
PROFILE - ASPHALT STREETS

RESIDENTIAL CONCRETE DRIVEWAY

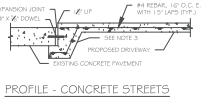
(OPEN DITCH STREETS)

NOTES:

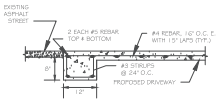
1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH ½" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. ½" LIP CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4' X 12" MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF MANVEL PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS "A", 3,500 PSI AT TWENTY-EIGHT DAYS.
7. USE MATERIAL AND DIMENSION AS SPECIFIED IN STORM SEWER DETAILS FOR TRENCH WIDTHS AND BACKFILL.
8. NO MORE THAN ONE (1) DRIVEWAY ON LOTS WITH LESS THAN 120' OF FRONTAGE.



PLAN - ALL STREETS



PROFILE - CONCRETE STREETS



PROFILE - ASPHALT STREETS

RESIDENTIAL CONCRETE DRIVEWAY

(CURB & GUTTER STREETS)

NOTES:

1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH ½" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
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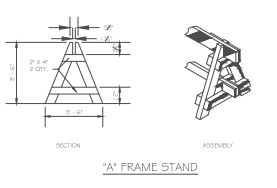
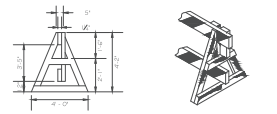
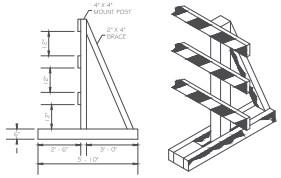


"A" FRAME STAND

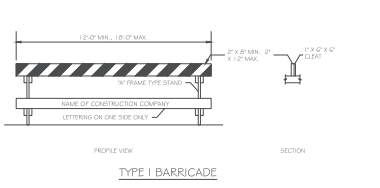


MODIFIED "A" FRAME STAND

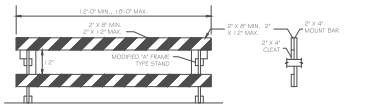


SKID & POST STAND

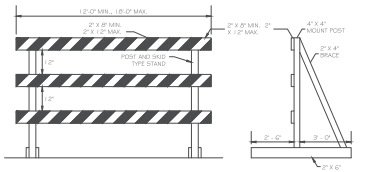
BARRICADE STANDS



TYPE I BARRICADE



TYPE II BARRICADE



TYPE III BARRICADE

TEMPORARY BARRICADES

BARRICADE AND MISCELLANEOUS CONSTRUCTION NOTES:

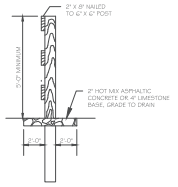
1. BARRICADES SHALL BE CONSTRUCTED OF CLEAN SOUND LUMBER SURFACED ON TWO SIDES CUT TO THE NOMINAL DIMENSION SHOWN ON THESE DETAILS. BARRICADES SHALL BE PAINTED WITH TWO (2) COATS OF AN APPROVED BRAND OF WHITE PAINT TO PROVIDE THOROUGH COVERAGE AND A UNIFORM WHITE COLOR. THE PAINT FOR BARRICADE STRIPES SHALL BE AN APPROVED BRAND OF RED OR ORANGE AND WHITE PAINT APPLIED TO PROVIDE UNIFORM COLOR, AND THEY SHALL BE RELECTORIZED.
2. REFLECTORIZATION FOR BARRICADES OR SIGNS MAY BE BY MEANS OF APPROVED REFLECTIVE COATINGS ON THE SIGN BACKGROUND WHICH SHALL CONSIST OF EITHER GLASS BEADS ON PAINT, REFLECTIVE SHEETING, REFLECTIVE LIQUID, OR RETRO-DIRECTIVE REFLECTORS. THE RETRO-DIRECTIVE REFLECTORS MAY BE EITHER GLASS OR CRYSTAL PLASTIC REFLECTOR BUTTONS. ALL REFLECTING ELEMENTS SHALL REFLECT WHITE LIGHT, UNLESS OTHERWISE INDICATED IN THE DETAILS.
3. ALL BARRICADES EXTENDING ACROSS MOVING LANES OR FOR DELINEATION THROUGH A PROJECT SHALL BE SUPPLEMENTED BY LIGHTS, PLACED SO AS NOT TO INTERFERE WITH THE VISIBILITY OF REFLECTOR BUTTONS OR REFLECTORIZED SURFACES. THESE LIGHTS SHALL BE MAINTAINED IN CONTINUOUS OPERATION FROM SUNSET TO SUNRISE AND SHALL BE OF THE FLASHING ELECTRIC TYPE, WITH THE RATE OF FLASHING BETWEEN SEVENTY (70) AND ONE HUNDRED-TWENTY (120) FLASHES PER MINUTE. FLASHING ELECTRIC LIGHTS SHALL NOT BE CONNECTED IN SERIES. ALL LIGHTS SHALL BE OF THE COLOR YELLOW.
4. BARRICADE TYPE III SHALL BE TREATED WITH EIGHT POUND (8 LB.) PENTACHLOROPHENOL (OR SIMILAR TREATMENT ALLOWED BY AWPA) WOOD PRESERVATIVE AND PAINTED WITH A PRIME COAT CONSISTING OF SPAR VARNISH VEHICLE ALUMINUM PAINT, FOLLOWED WITH ONE (1) COAT OF EXTERIOR GRADE WHITE PAINT STRIPED WITH ALTERNATE DIAGONAL ORANGE OR RED REFLECTIVE STRIPES WHERE SPECIFIED.
5. BARRICADES FOR CONSTRUCTION SHALL BE ALTERNATE ORANGE AND WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF FORTY-FIVE DEGREES (45°) IN THE DIRECTION TRAFFIC IS TO PASS. BARRICADES USED OTHER THAN FOR CONSTRUCTION SHALL BE ALTERNATE RED AND WHITE STRIPES. THE ORANGE AND WHITE, AND RED AND WHITE MARKINGS SHALL NOT BE INTERMIXED IN THE SAME INSTALLATION AREA.
6. PERMANENT BARRICADES SHALL HAVE RED AND WHITE STRIPING.
7. TEMPORARY CONSTRUCTION BARRICADES SHALL HAVE ORANGE AND WHITE STRIPING.
8. SIGNS FOR BARRICADES SHALL BE MADE FROM WOOD, HARDBOARD, METAL OR PLASTIC CONFORMING WITH THESE REQUIREMENTS:

8.1. METAL OR PLASTIC - SIGNS SHALL CONSIST OF STEEL, ALUMINUM ALLOY, OR PLASTIC WITH SUFFICIENT THICKNESS TO RETAIN RIGIDITY UNDER NORMAL CONDITIONS.

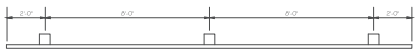
8.2. WOOD - SIGN STOCK SHALL BE TWO INCH (2") STOCK B & B GRADE, KILN-DRIED LUMBER, OR EQUAL, OR WATERPROOF RESIN-BONDED EXTERIOR GRADE PLYWOOD, DOUGLAS FIR PLYWOOD ASSOCIATION OR EQUAL. ALL WOODEN SIGNS CONSTRUCTED OF TWO (2) OR MORE BOARDS SHALL HAVE A ONE INCH (1") BY SIX INCH (6") CLEAT FASTENED TO THE BACK OF THE SIGN AT EACH END AND EXTENDING FULL DEPTH OF THE SIGN. IN ADDITION TO CLEATS, THE BOARDS SHALL BE FASTENED TOGETHER WITH ONE-HALF INCH (½") CORRUGATED FASTENERS SPACED AT NOT MORE THAN TWELVE INCH (12") CENTERS DRIVEN FROM THE BACK OF THE SIGN. IT IS RECOMMENDED THAT WOOD USED FOR SIGNS BE TREATED WITH EITHER CHROMATED ZINC CHLORIDE, WOLMAN SALTS OR PENTACHLOROPHENOL. ALL WOOD PRESERVATIVES SHALL BE OF A TYPE WHICH WILL PROHIBIT THE BLEEDING OF PRESERVATIVE THROUGH PAINT COATINGS.

8.3. HARDBOARD - SIGN STOCK SHALL BE TEMPERED DUOLUX, THREE-EIGHTHS INCH (⅜") NOMINAL THICKNESS, LAMINATED WITH WATERPROOF CASEIN GLUE, OR EQUAL.

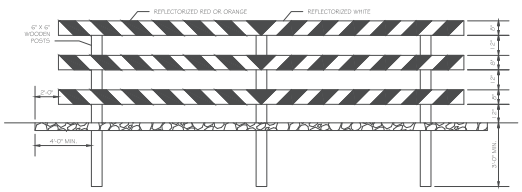
9. ALL SIGN LETTERING SHALL BE WELL-DEFINED, REFLECTIVE, OPEN ROUNDED TYPE CAPITAL LETTERS, AS APPROVED BY THE JOINT COMMITTEE ON UNIFORM TRAFFIC CONTROL DEVICES AND PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO EXCAVATION. DURING THE COURSE OF ANY AND ALL CLEARING, GRUBBING, FILL, GRADING, EXCAVATION OR OTHER CONSTRUCTION, CONTRACTOR SHALL ENSURE THAT STORM DRAINAGE PATHWAYS ARE MAINTAINED AND REMAIN OPEN TO ENSURE POSITIVE DRAINAGE AND THAT SUCH CONVEYANCES ARE NOT IMPEDED OR BLOCKED IN ANY WAY. STORM SEWER INLETS SHALL BE PROTECTED FROM ENTRY OF SILT, TRASH, DEBRIS, AND ANY SUBSTANCES DELETERIOUS TO THE STORM SEWER SYSTEM AND/OR WATERWAYS RECEIVING STORM WATER RUNOFF. CONTRACTOR SHALL, AT COMPLETION OF WORK, FILL LOW SPOTS AND GRADE ALL RIGHTS-OF-WAY AND UTILITY EASEMENTS AND REGRADE/RESTORE DITCHES AS NECESSARY TO MAINTAIN AND/OR ESTABLISH POSITIVE DRAINAGE.



SIDE VIEW



PLAN

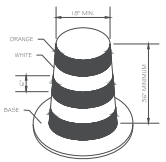


FRONT VIEW

PERMANENT TYPE III BARRICADE

NOTE:

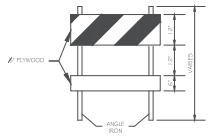
1. USE ORANGE AND WHITE REFLECTORIZED STRIPES DURING CONSTRUCTION ONLY. ALL OTHER TIMES RED AND WHITE REFLECTORIZED STRIPES SHALL BE USED.



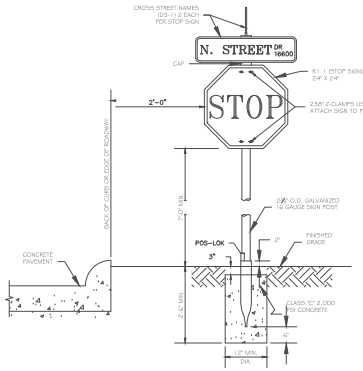
BARREL DETAIL

NOTES:

1. TWO (2) WHITE STRIPES SHALL BE REFLECTORIZED AND SHALL BE 4" TO 8".
2. FLASHING OR STEADY BURN LIGHTS SHALL BE USED ON BARRICADES, PANELS AND BARRELS AS NEEDED.
3. METAL BARRELS ARE NOT PERMITTED.



PORTABLE TYPE I BARRICADE



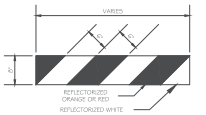
TYPICAL SIGN MOUNT DETAIL

NOTES:

1. SIGN MATERIAL CONSISTS OF PRESSURE ACTIVATED WHITE BACKING MADE OF SUPER HIGH DENSITY OR DIAMOND/PRISMATIC VINYL WITH MINIMUM TEN (10) YEAR RETROREFLECTIVITY WARRANTY. LETTERING CUT OUT OF SIGN MAKING FILM E.S.M. OR 3M TRANSPARENT VINYL SHEETING CUT ON CAD SIGN PLOTTER.
2. SIGN BLANKS SHALL BE .080" FLAT TRAFFIC GRADE (5052) ALUMINUM.
3. STREET SIGN BLANKS SHALL BE COVERED WITH WHITE DIAMOND/PRISMATIC VINYL. FOUR (4) INCH LETTERS IN FONT TYPE "B", ALL CAPITALS, CUT OUT OF GREEN TRANSPARENT VINYL SHALL BE PLACE OVER THE WHITE DIAMOND/PRISMATIC VINYL TO PROJECT WHITE LETTERING WITH GREEN BACKGROUND.
4. PER T.M.U.T.C.D. ALL STREET SIGNS POSTED ON THOROUGHFARES AND MAJOR ROADWAYS WITH A POSTED SPEED LIMIT OF 25 MPH OR GREATER SHALL BE ON 9" BLANKS WITH 6" LETTERING.
5. ALL CUL-DE-SAC STREETS SHALL HAVE A SIGN WITH A "NO OUTLET" DESIGNATION.
6. NO OUTLET SIGN TO BE REPLACED IF STREET BECOMES A THRU STREET.
7. STOP SIGNS SHALL BE RED 3M REFLECTIVE COATING ON WHITE DIAMOND/PRISMATIC VINYL BACKING. THOROUGHFARES AND MAJOR ROADWAYS POSTED GREATER THAN 25 MPH SHALL USE 30" X 30" SIGNS.
8. SIGN POST SHALL BE 2½" O.D., 16 GAUGE GALVANIZE 1.00 CPOLY STEEL POST (OR), TEN (10) FEET LONG.
9. SIGN POST SHALL BE MOUNTED WITH "POS-LOK" OR SIMILAR SYSTEM CONSISTING OF 27" GALVANIZED SLEEVE AND REMOVABLE WEDGE.



STREET SIGN



STRIPING

DATE APPROVED: JANUARY 20, 2020

REVISED DATE: JANUARY 20, 2020 SCALE: NTS

BARRICADE AND MISCELLANEOUS DETAILS

PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		11

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13				CROIX RD
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	HOU	BRAZORIA		12

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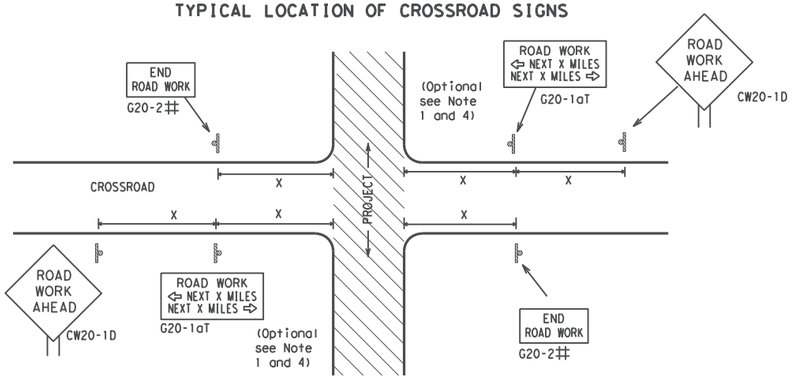
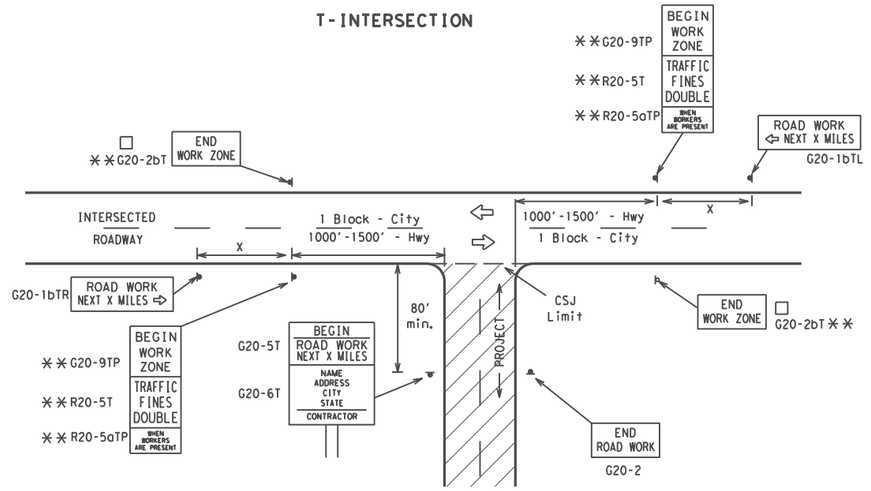
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

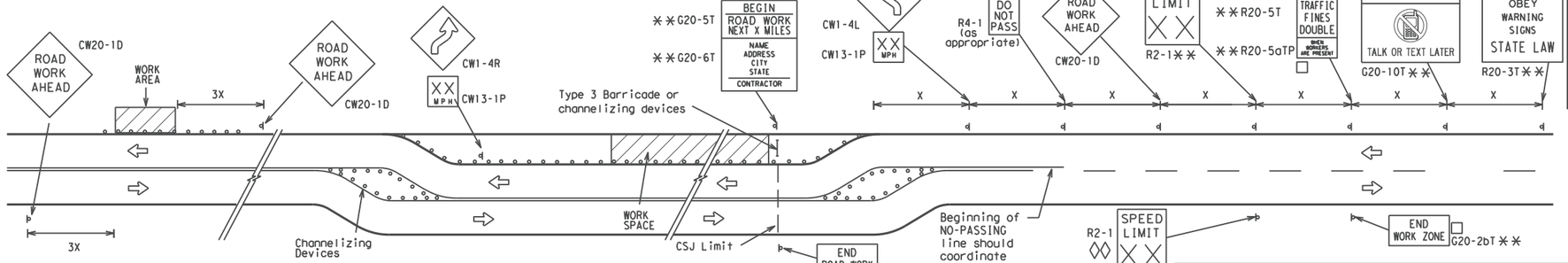
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

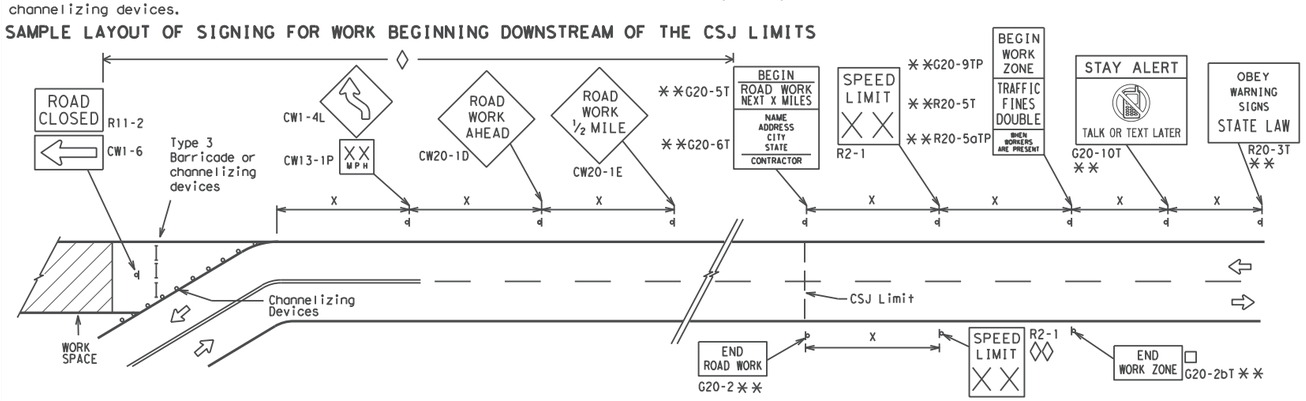
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	BRAZORIA		13

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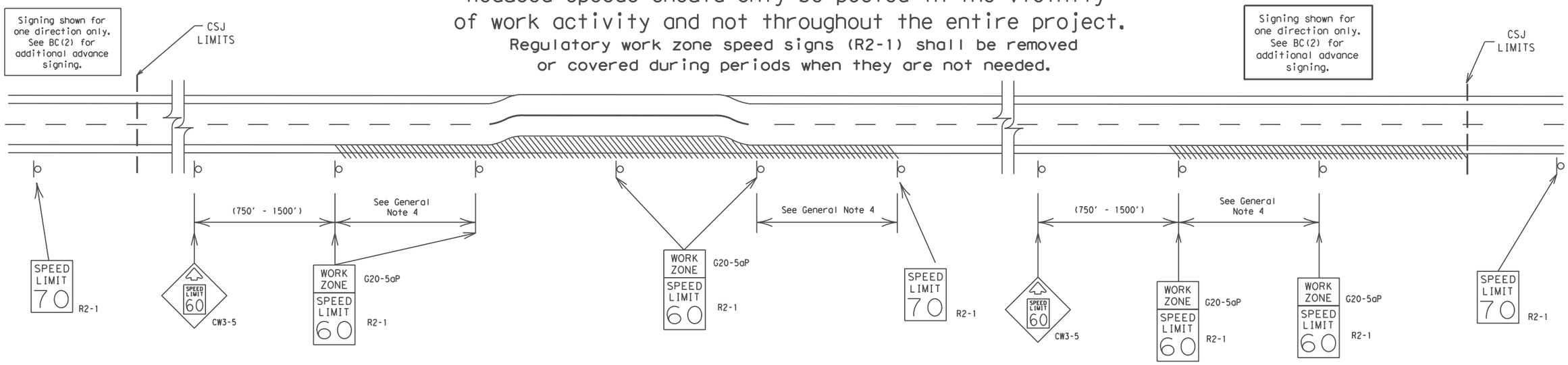
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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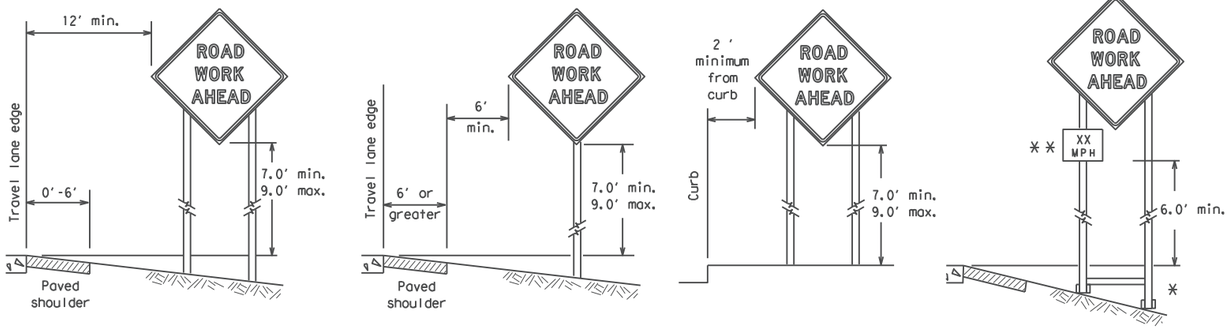
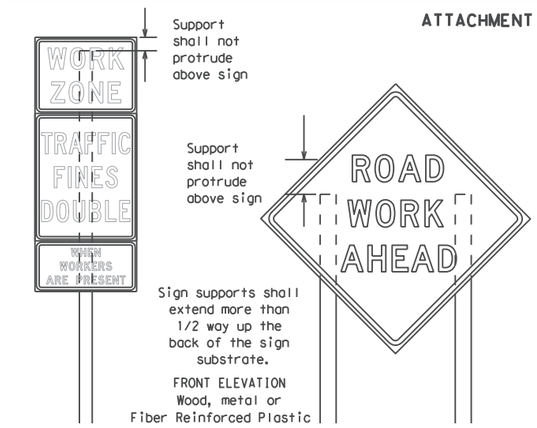
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

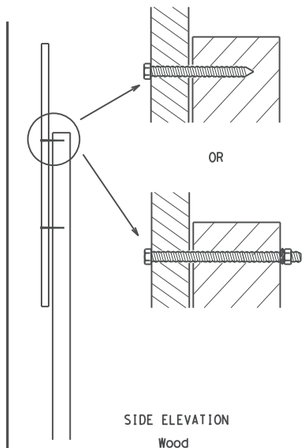


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





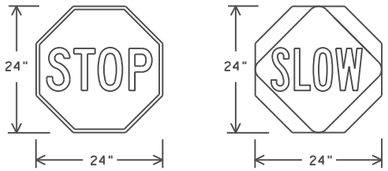
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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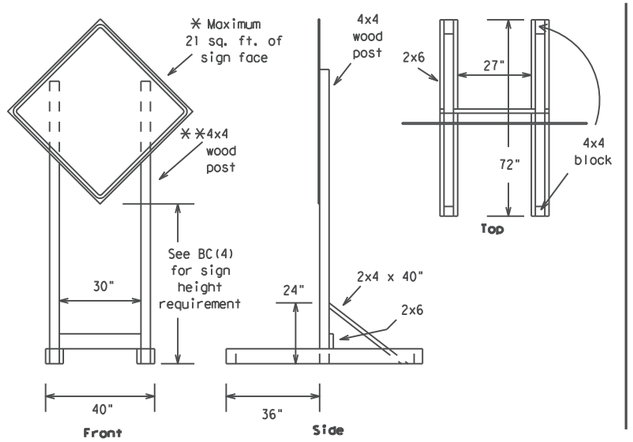
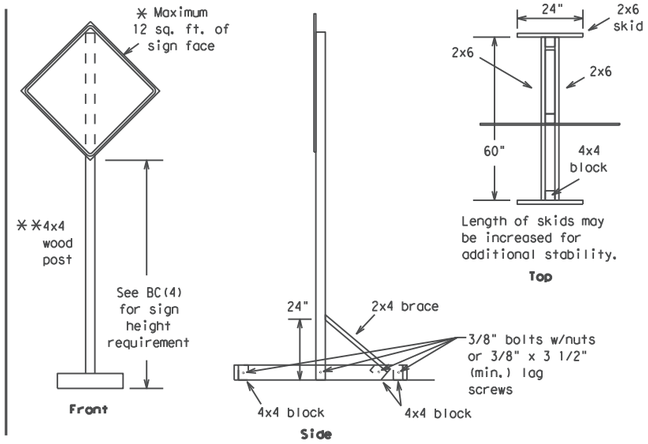
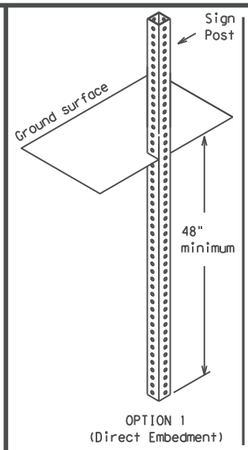
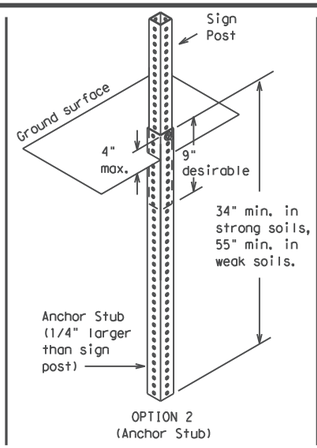


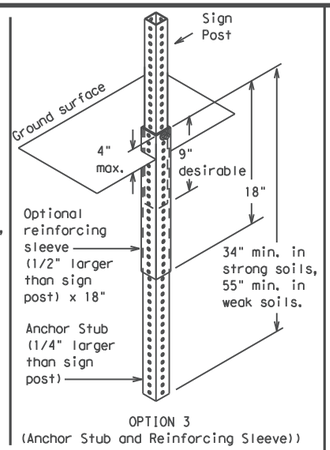


SKID MOUNTED WOOD SIGN SUPPORTS

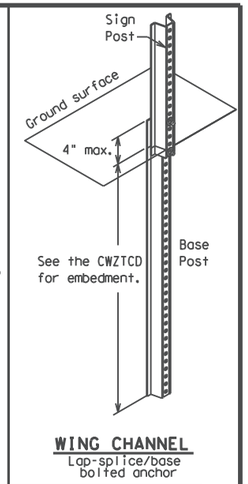
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







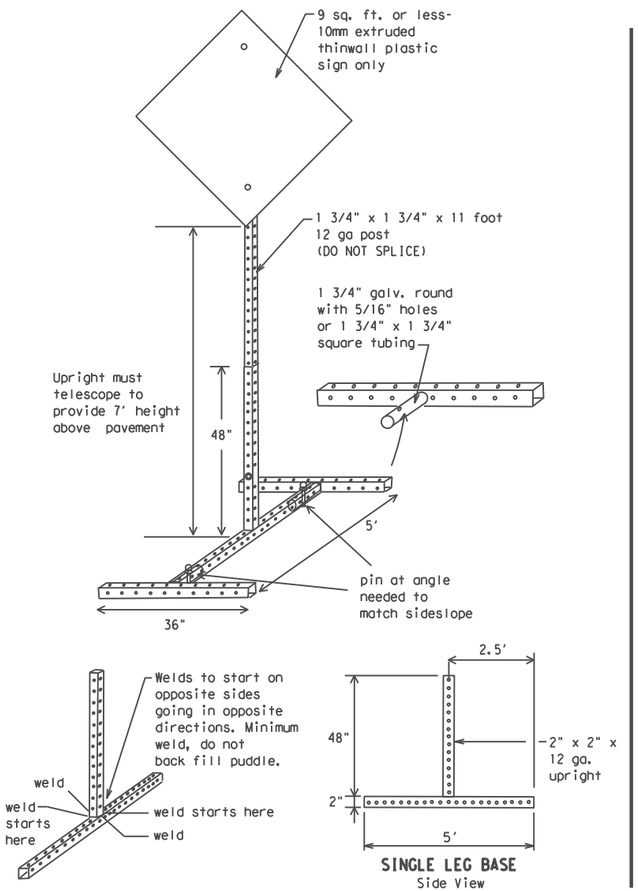
PERFORATED SQUARE METAL TUBING

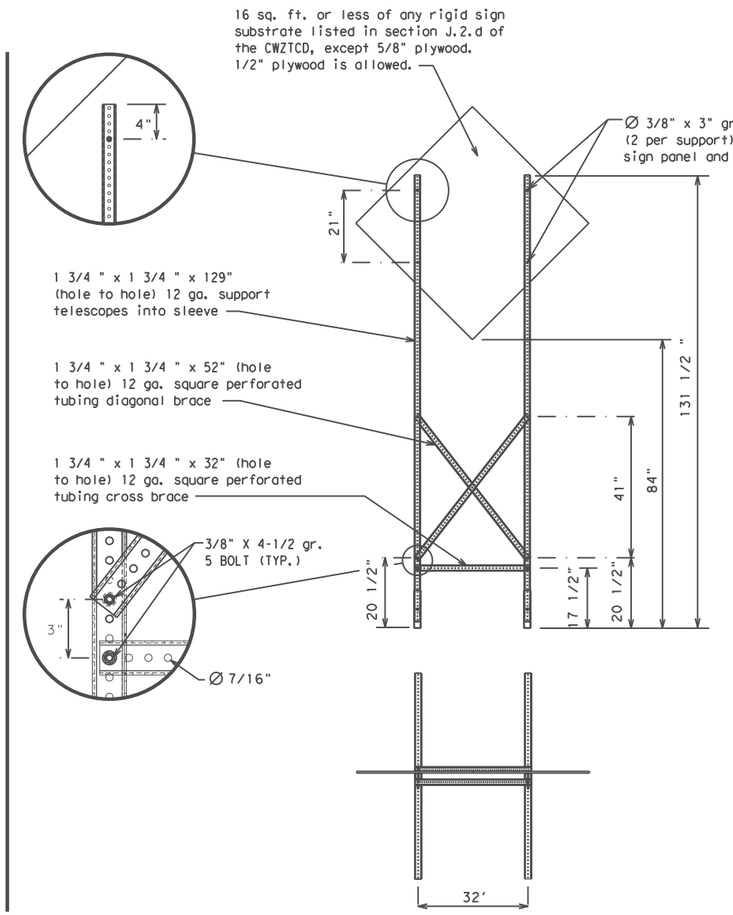


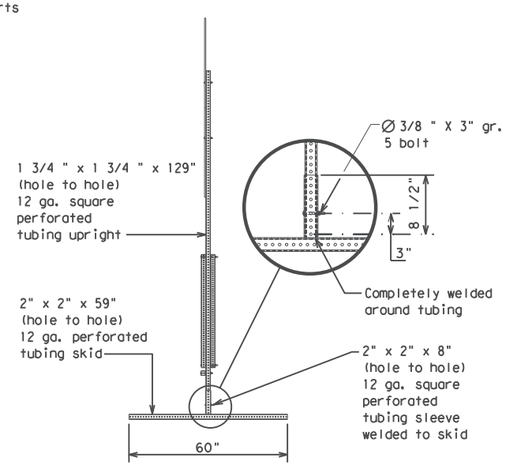
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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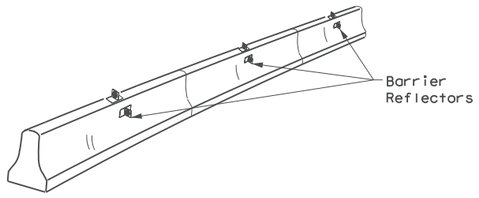
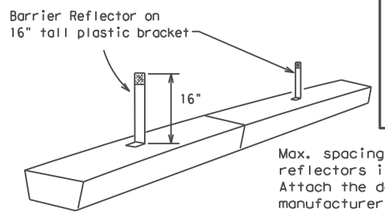
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



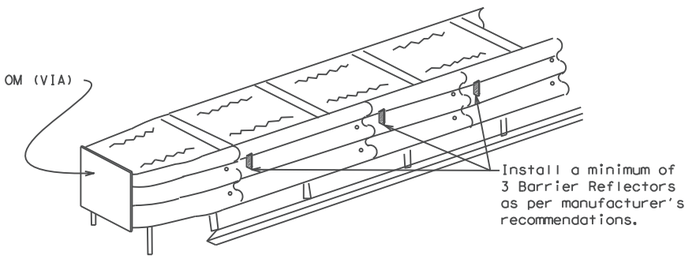
CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

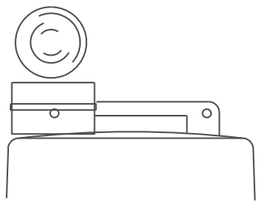
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

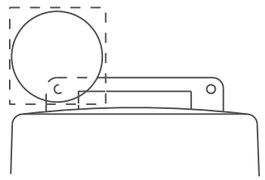
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

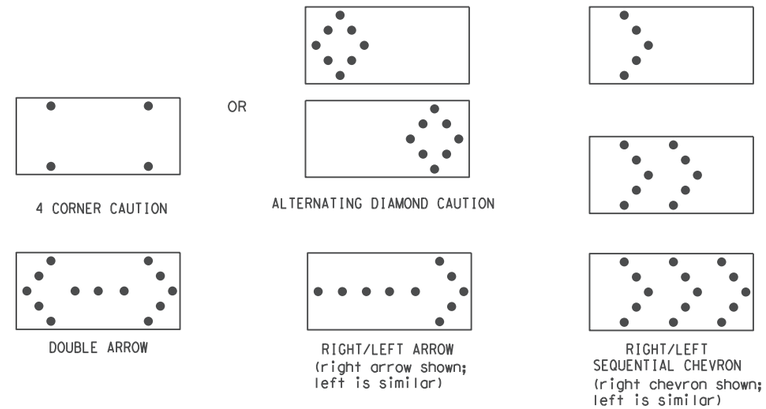
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

SHEET 7 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

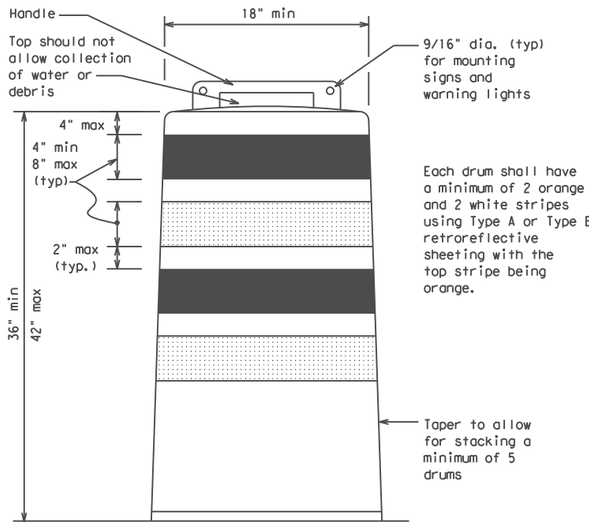
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

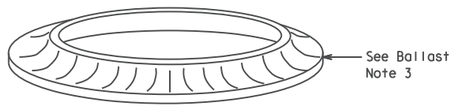
RETROREFLECTIVE SHEETING

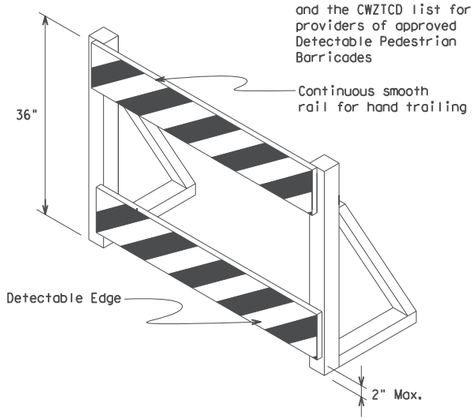
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.





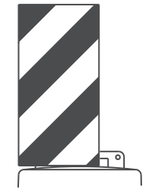


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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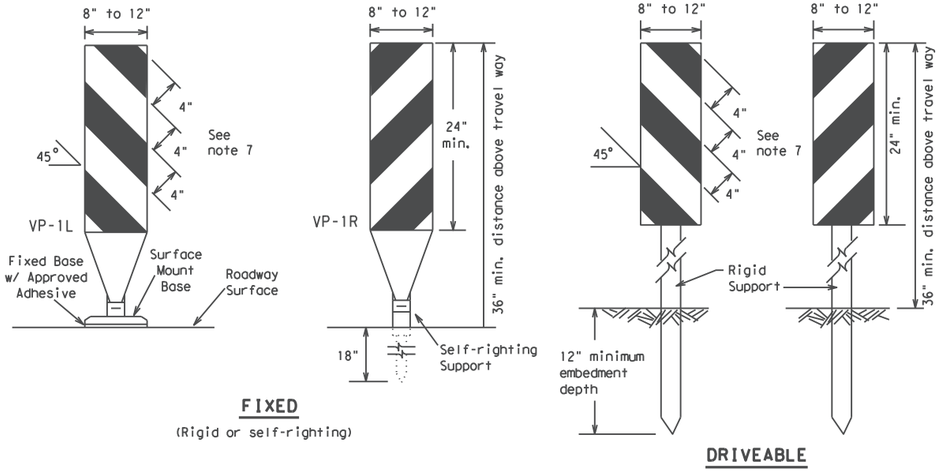
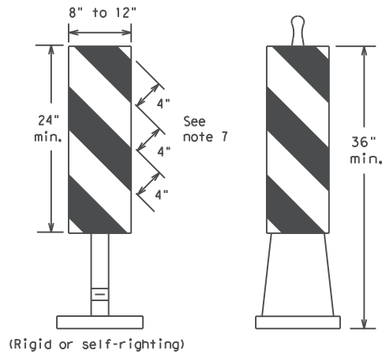


FIXED
(Rigid or self-righting)

DRIVEABLE

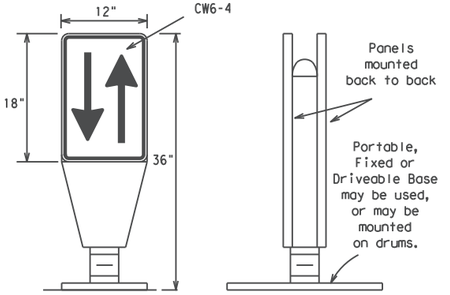


(Rigid or self-righting)

PORTABLE

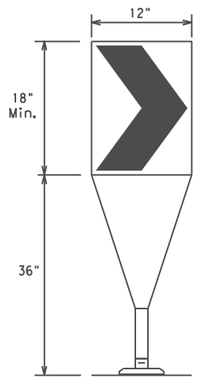
VERTICAL PANELS (VPs)

1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



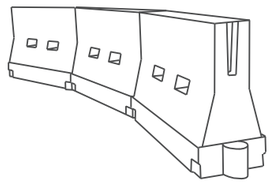
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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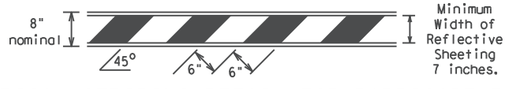
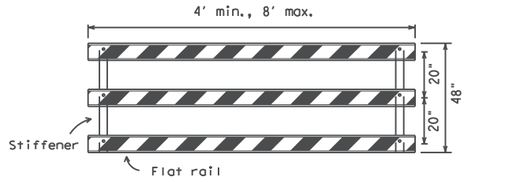
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



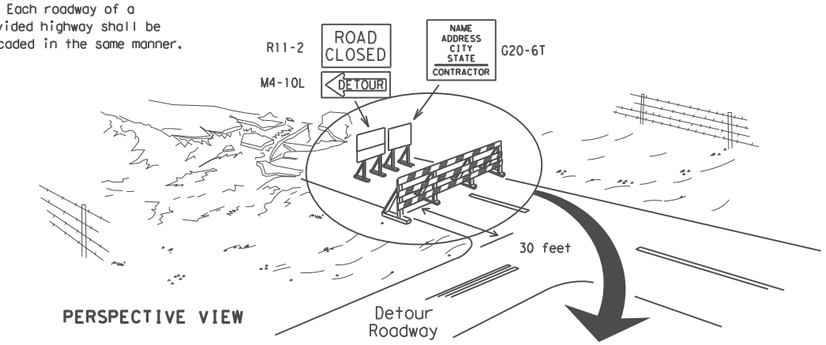
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

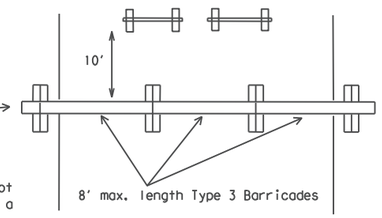
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

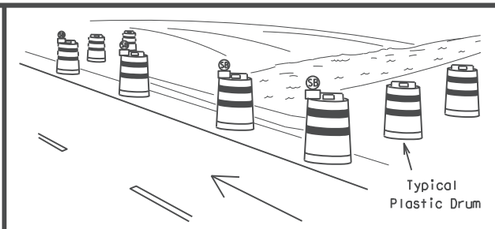
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

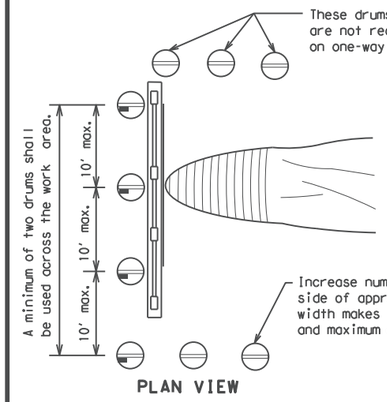
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

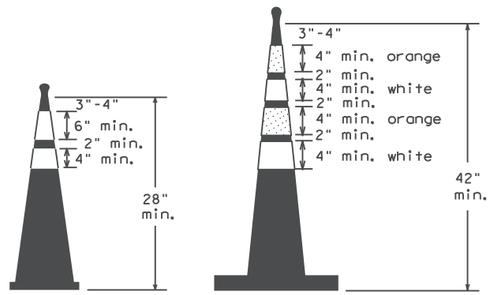
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

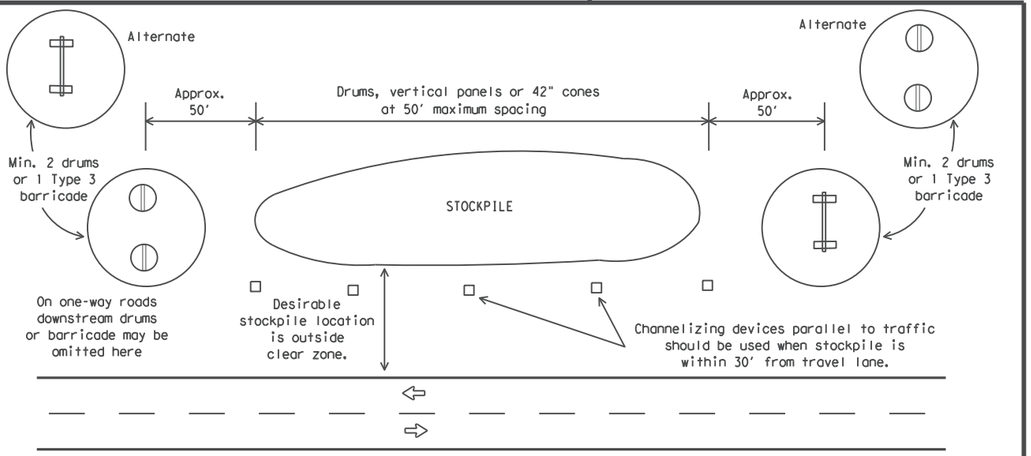
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

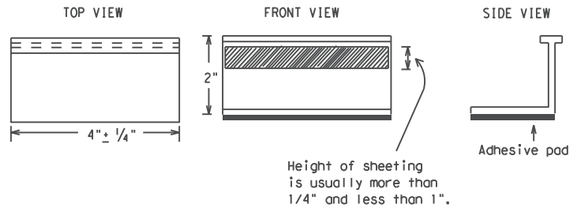
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		22

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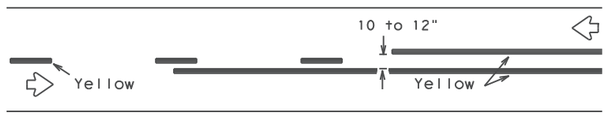
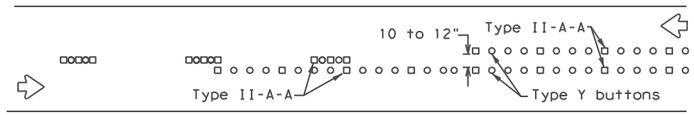
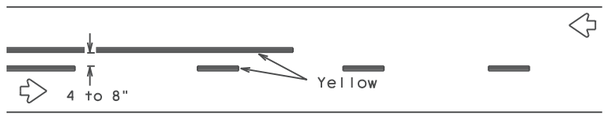
PAVEMENT MARKING PATTERNS



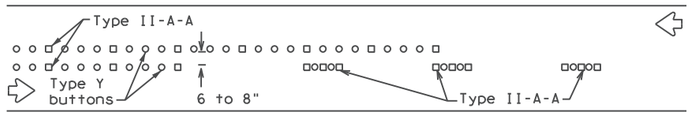
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



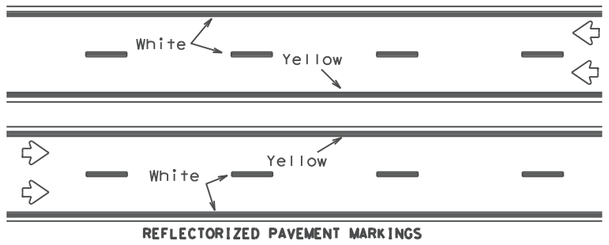
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



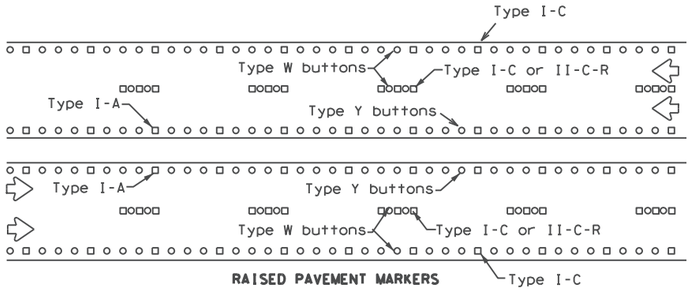
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



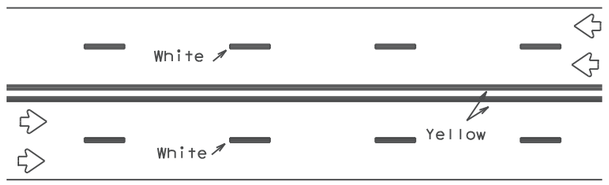
REFLECTORIZED PAVEMENT MARKINGS



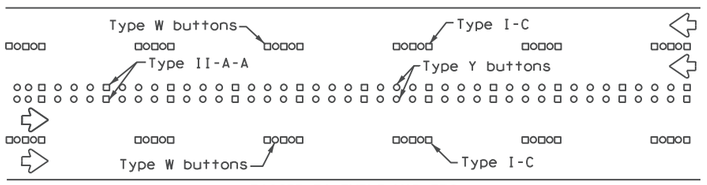
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



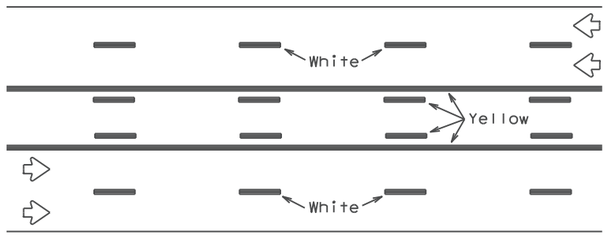
REFLECTORIZED PAVEMENT MARKINGS



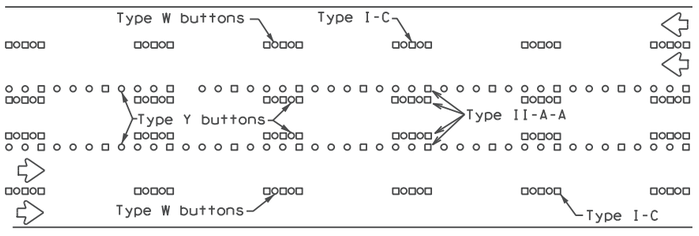
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

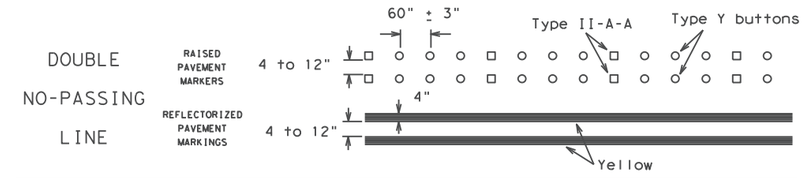
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

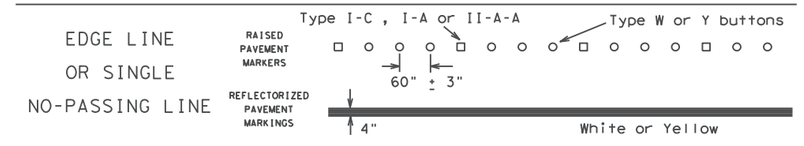
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

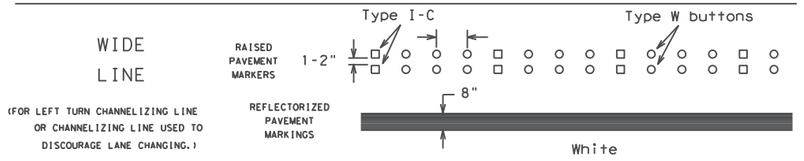


EDGE LINE OR SINGLE NO-PASSING LINE



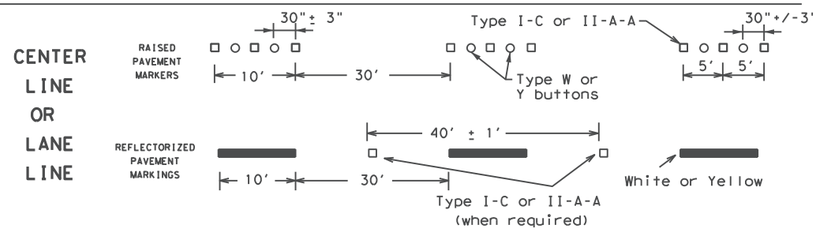
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

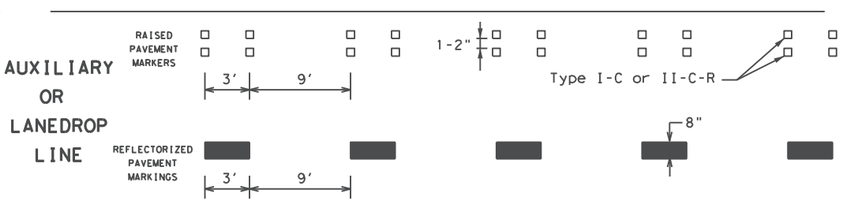


BROKEN LINES

CENTER LINE OR LANE LINE

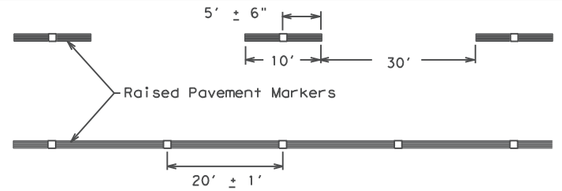


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21				CROIX RD
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	HOU	BRAZORIA		23

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DATE: 3/10/2026 10:19:14 AM
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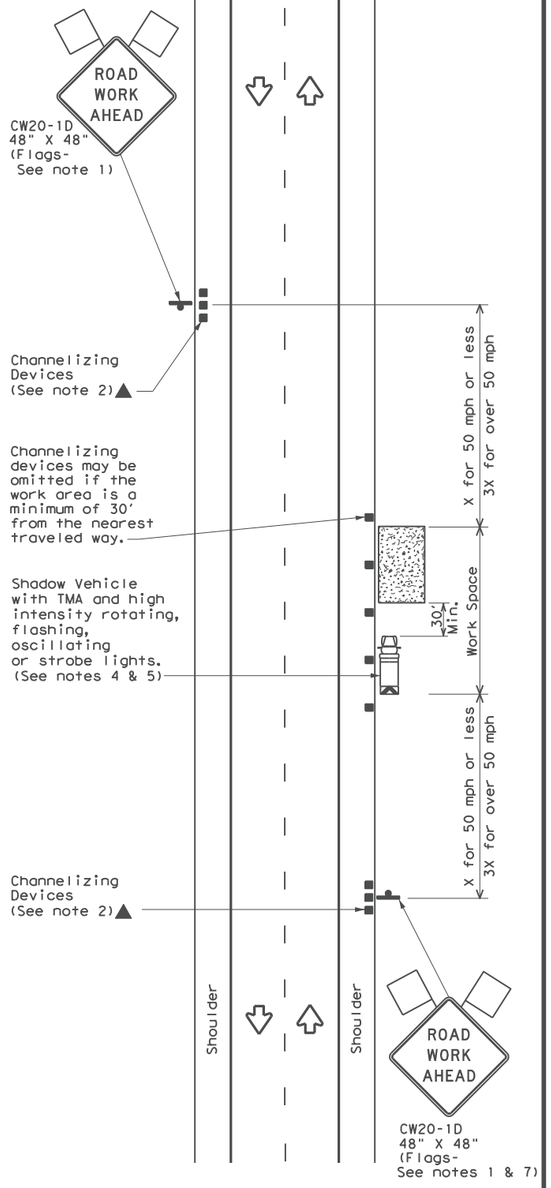
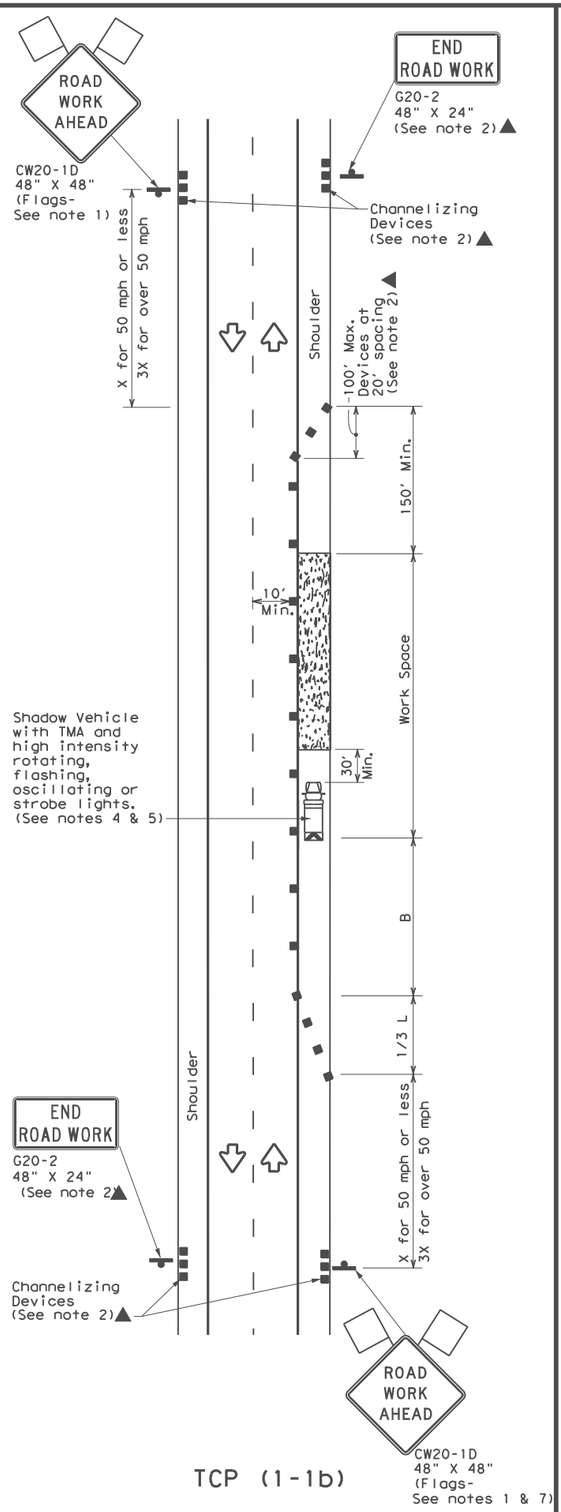


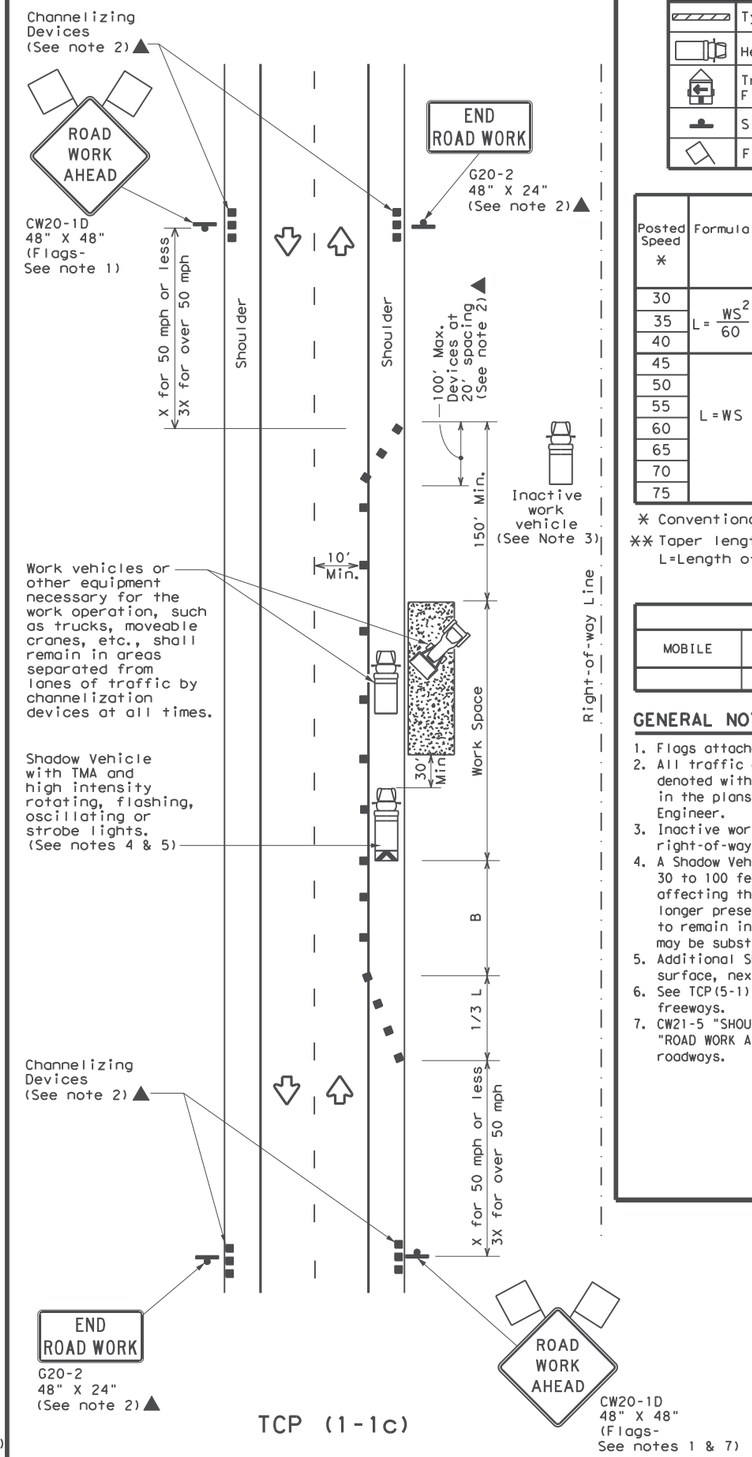
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98				CROIX RD
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	HOU	BRAZORIA		24

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DATE: 3/10/2026 10:19:30 AM
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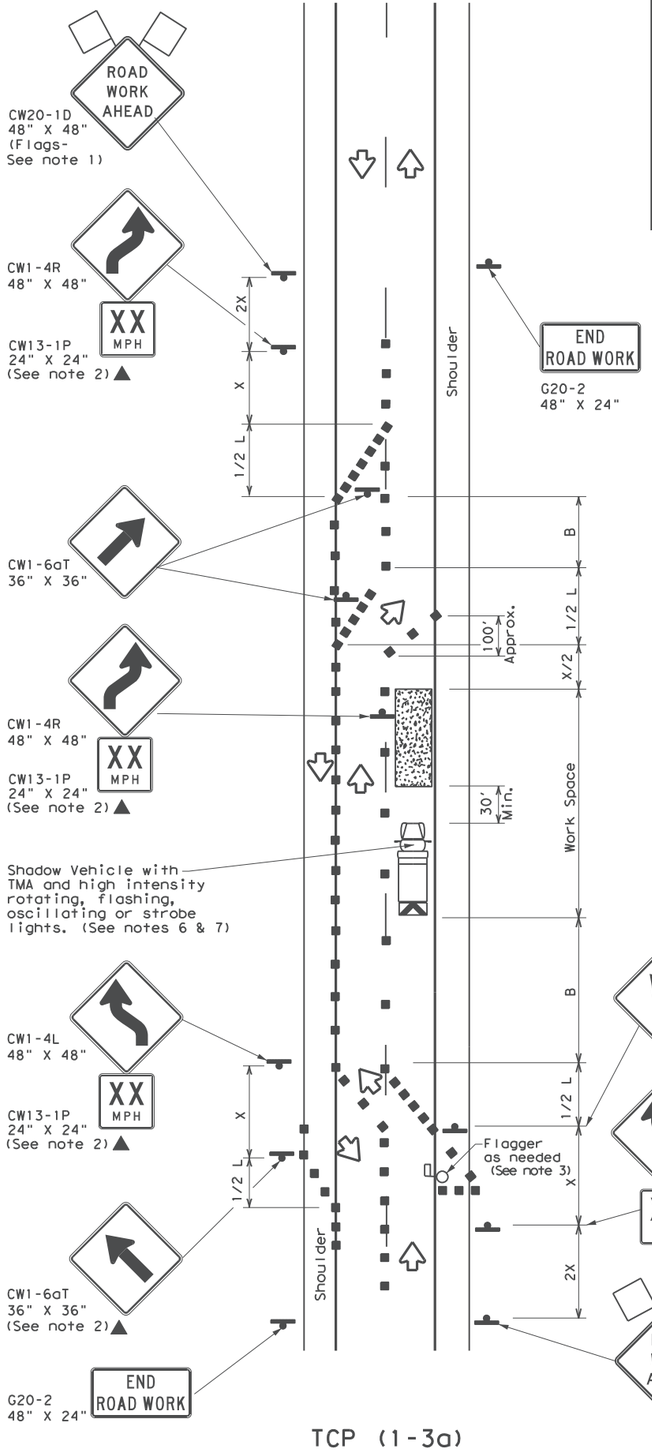
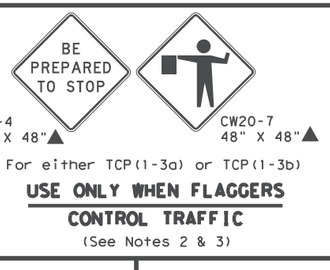


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

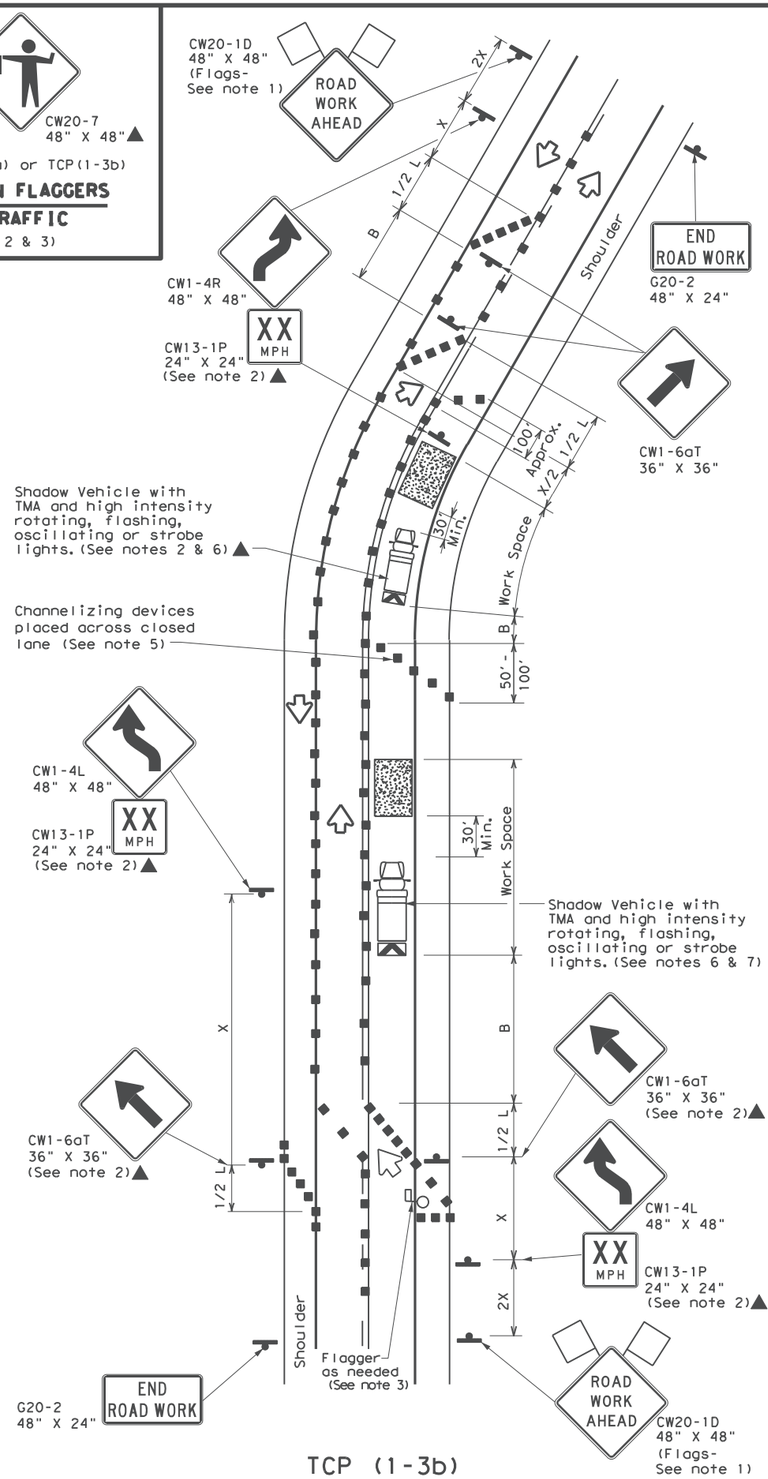
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	BRAZORIA		25
1-97 2-18				

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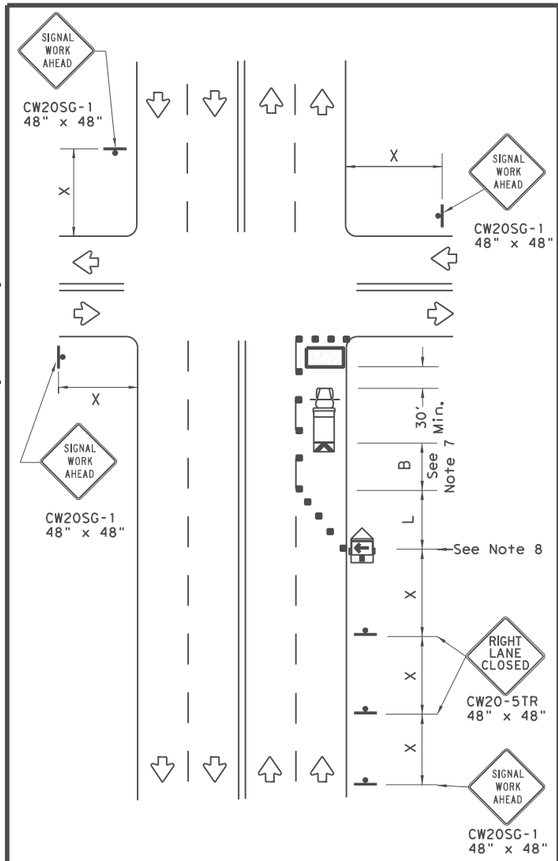
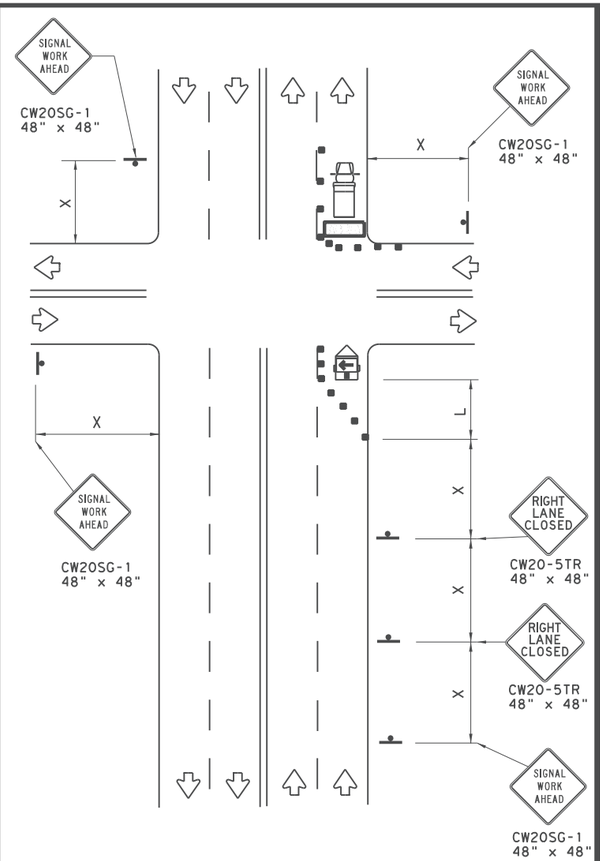


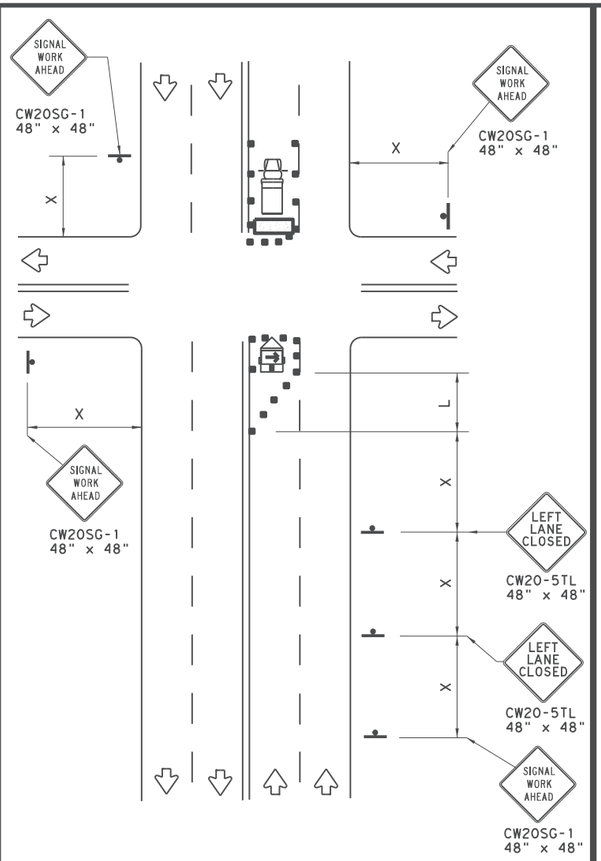
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

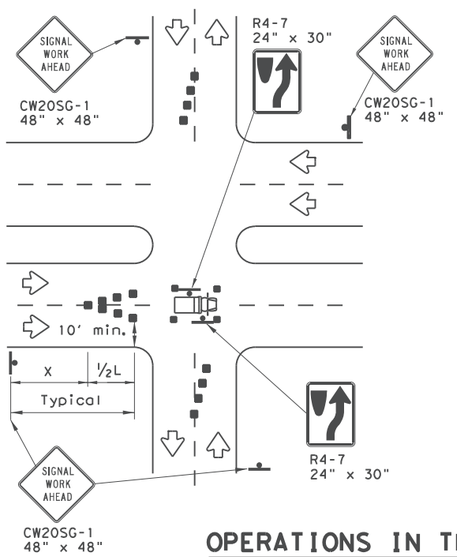
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

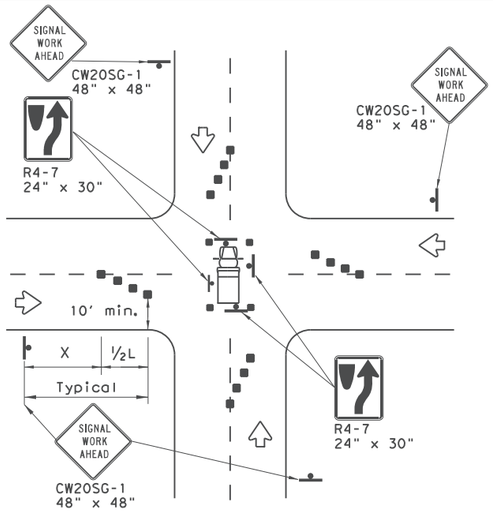
Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	BRAZORIA		26

DATE: 3/10/2026 10:19:45 AM
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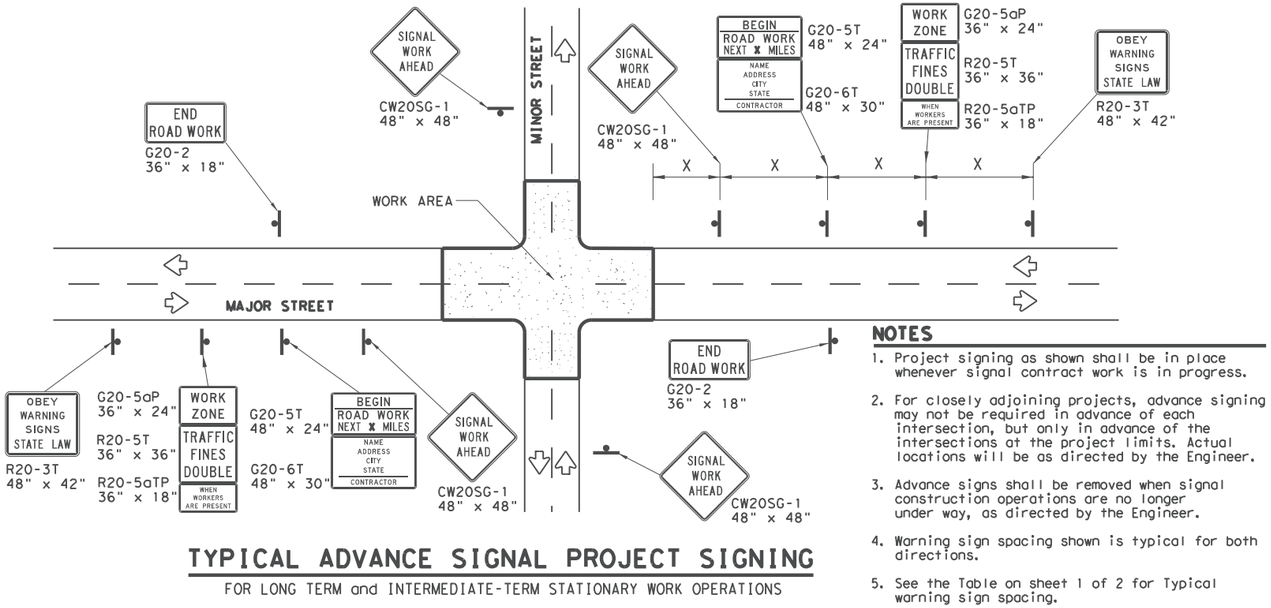


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

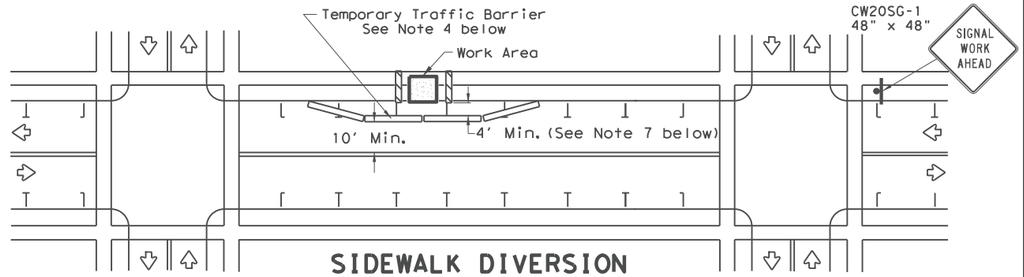
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber, such as tire inner tubes, shall not be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fastners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

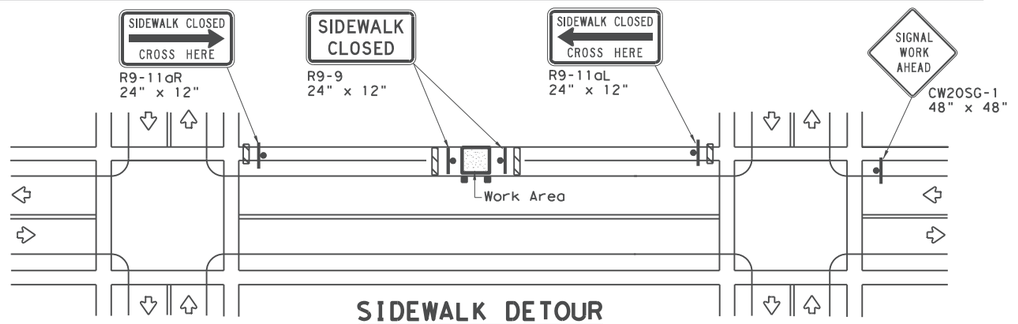
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

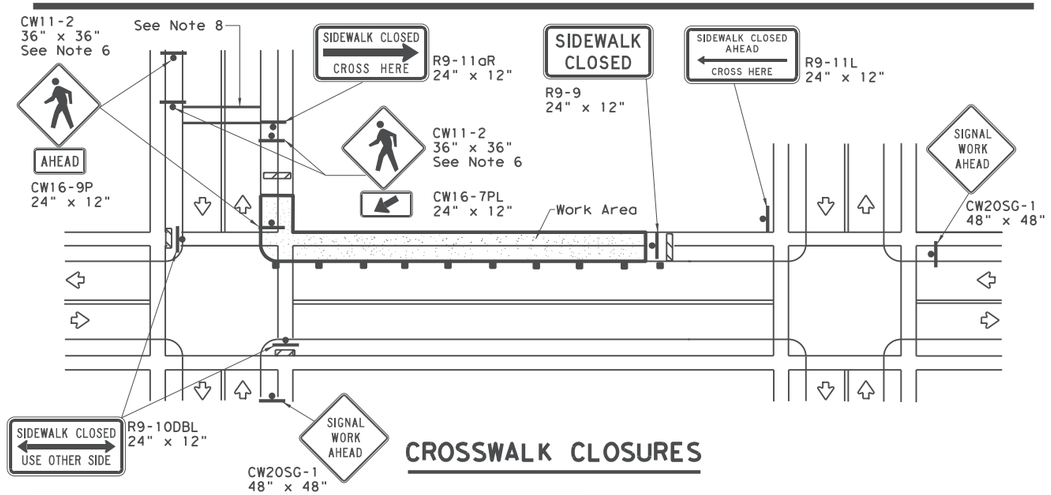
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new, unused, and undamaged materials. Ensure that all materials and installations comply with the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as CSA Group, Intertek Testing Services, or FM Approvals can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to NEMA. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts, and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits, metal poles, luminaires, and metal enclosures are bonded to an equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producer List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware per TxDOT Departmental Material Specification DMS-11030, "Conduit" and Item 618, "Conduit" of TxDOT's "Standard Specifications for Construction and Maintenance of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide Liquidtight Flexible Metal Conduit (LFMC) when flexible conduit is called for on galvanized steel Rigid Metal Conduit (RMC) systems. Provide Liquidtight Flexible Nonmetallic Conduit (LFNC) when flexible conduit is called for on Polyvinyl Chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes are present, count the conductors as if all are of the larger size. For situations not applicable to this table, size junction boxes per the NEC.

JUNCTION BOX SIZES

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with internal volumes up to 100 cu. in. and that are supported by entering raceways must have threaded entries or hubs identified for the intended purpose and be supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the box or within 18 in. of the box if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. in.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use Intermediate Metal Conduit (IMC) or Electrical Metallic Tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes sized as directed above, listed and approved for outdoor use, unless otherwise noted on the plans. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows, unless otherwise shown in the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system.

A. MATERIALS (CONTINUED)

9. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in. below grade or bottom of the ground box, ground the RMC elbow with a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. Elbows are subsidiary to various bid items.

10. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to DMS-11060, "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors according to DMS-11030 for PVC conduit bid under Item 618. Provide conduit of the size and schedule as shown on the plans. Do not extend HDPE conduit into ground boxes or foundations. Provide PVC elbows at all ground boxes and foundations.

11. Use two-hole straps or strut straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized strut straps or stand-off straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surfaces of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit supports within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams, except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the subgrade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the subbase of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items: 110, "Excavation;" 400, "Excavation and Backfill for Structures;" 401, "Flowable Backfill;" 402, "Trench Excavation Protection;" and 403, "Temporary Special Shoring."

6. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly affix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

7. Ensure conduit entry into the top of an enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

8. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding bushing on all metal conduit terminations.

9. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

10. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

11. After completion of conductor installation, immediately seal ends of all conduits emerging from ground with duct seal, expandable foam, or other methods approved by the Engineer. Do not use silicone caulking. Do not use duct tape as a permanent seal.

12. File smooth the cut ends of all mounting strut and conduit. To avoid overspray, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% min. zinc content as specified on DMS-8103 and listed on the MPL for Galvanizing Repair Paints) before installing. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with zinc rich paint as an alternative for materials required to be galvanized.

13. For all conduits, ensure the burial depth is 18" min. For conduits placed under a roadway, ensure the burial depth is 24" min.

Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-25

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated copper conductors in accordance with Departmental Material Specification DMS-11040, "Conductors" and Item 620, "Electrical Conductors." Provide conductors as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620.

2. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape at each accessible location.

3. Insulated grounding conductors may be substituted for bare conductors, unless otherwise shown in the plans. Insulated grounding conductors must be color coded green in accordance with Note 2.

4. Provide a 6 AWG bare solid copper grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS-11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

5. Where two or more circuits are present in one conduit or enclosure, permanently label the conductors of each branch circuit by attaching a non-metallic, weather resistant tag around both circuit conductors at each accessible location. Provide one-piece tags with two $\frac{3}{16}$" straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

6. Use listed compression connectors, mechanical lugs, terminal blocks, or split bolt connectors for splicing as specified in DMS-11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system.

2. Leave 2 ft. to 3 ft. of length for each conductor up to the splice in ground boxes. Leave 3 ft. to 4 ft. of length for each conductor in ground boxes when pulled through with no splice. Leave 1 ft. to 1.5 ft. of length for each conductor at enclosures and pole bases. Leave 1.5 ft. to 3 ft. of length as required by electric utility for conductors exiting weatherheads.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression connectors, mechanical lugs, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between each conductor and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned or overheated is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged or that fail an insulation resistance test at no additional cost to the Department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

B. CONSTRUCTION METHODS (CONTINUED)

10. Do not terminate more than one conductor under a single lug unless it is rated for multiple conductors. Do not exceed the lug's listing for maximum number and size of conductors allowed.

11. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure a waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor in the conduit. Bond all EGCs together at every accessible location. For ITS installations, bond and ground metal ground box covers and other metal equipment as shown on ITS standards.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for powering portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. When installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS-11040 and the plans. Larger diameter or longer length rods may be called for in some locations. Concrete encased grounding electrodes may be called for in some locations including electrical services — see plan sheets.

B. CONSTRUCTION METHODS

1. Furnish and install ground rods in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber or concrete pole.

3. Install ground rods so the imprinted part number is at the upper end of the rod.

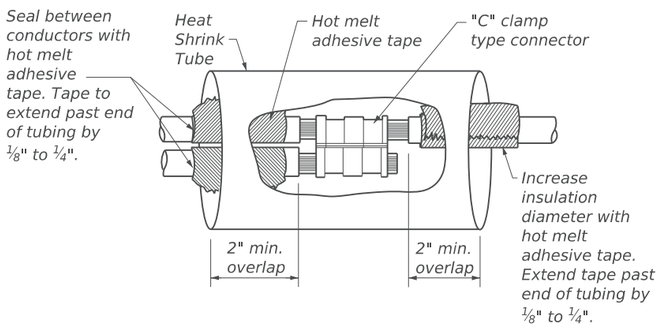
4. Remove all non-conductive material such as concrete splatter from the rod at the clamp location.

5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of 4 in.

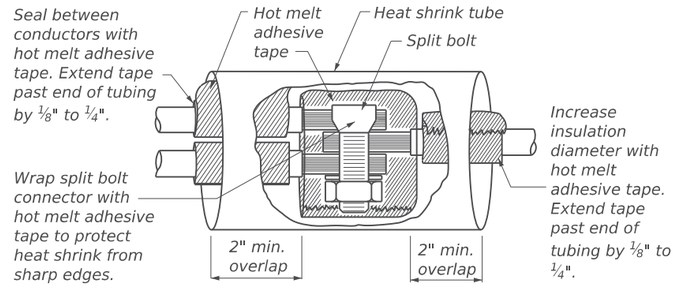
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding bushing and properly sized bonding jumper on each end of the metal conduit.

7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.

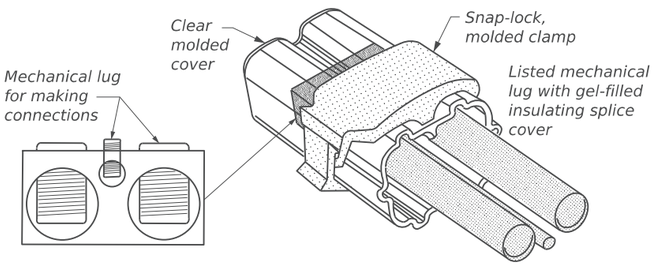
COMPRESSION SPLICE
OPTION 1



SPLIT BOLT SPLICE
OPTION 2



GEL-FILLED INSULATED SPLICE
OPTION 3



Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-25

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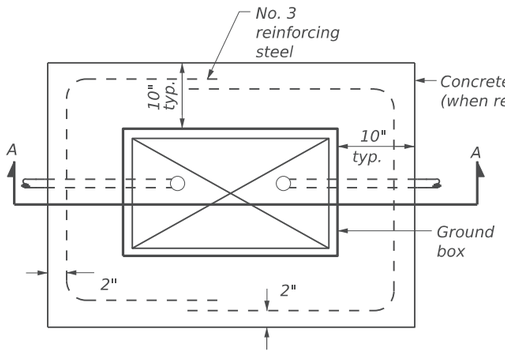
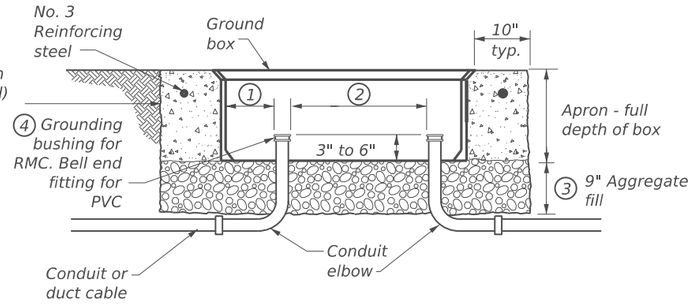
APRON FOR GROUND BOX

PLAN VIEW



SECTION A - A



SECTION A - A NOTES:

1. Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
2. Maintain sufficient space between conduits to allow for proper installation of bushing.
3. Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
4. Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOXES	
TYPE	OUTSIDE DIMENSIONS (Width x Length X Depth)
A	12" X 23" X 11"
B	12" X 23" X 22"
C	16" X 29" X 11"
D	16" X 29" X 22"
E	12" X 23" X 17"

NOTES:

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16 in. x 30 in. x 24 in. (W x L x D) or smaller in accordance with Departmental Material Specification DMS-11070, "Ground Boxes" and Item 624, "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS-11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

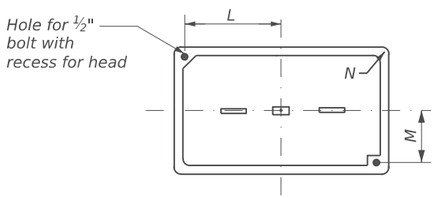
B. CONSTRUCTION METHODS

1. Before setting ground box and after placing and capping conduits, lay an aggregate bed a minimum of 9 in. deep that extends 10 in. beyond the sides of the ground box. Provide coarse aggregate sized 3/4 in. to 2 in., with no more than 20% material passing through a no. 8 sieve, and as defined by the current ASTM C33/33M standard. Clean aggregate and dirt from conduits according to Item 618.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and elbows in a professional and skillful manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit seal. Do not use silicone caulk as a sealant.
7. Bond all equipment grounding conductors in a ground box together with listed connectors.
8. When a Type B or D ground box is stacked to meet volume requirements, an appropriately sized hole may be cut for conduit entry in the side wall at least 18 in. below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper that is the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

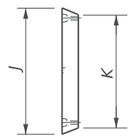
GROUND BOX COVERS								
TYPE	DIMENSIONS							
	H	I	J	K	L	M	N	P
A, B & E	23 ¼"	23"	13 ¾"	13 ½"	9 ⅞"	5 ⅛"	1 ⅜"	2"
C & D	30 ½"	30 ¼"	17 ½"	17 ¼"	13 ¼"	6 ¾"	1 ⅜"	2"

GROUND BOX COVER

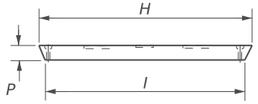
PLAN VIEW



END



SIDE



Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-25

FILE: ed4-25.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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ELECTRICAL SERVICES NOTES

1. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS)-11080, "Electrical Services" and Item 628, "Electrical Services." Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

2. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

3. Provide a Master Lock, Model No. 2, M1, or 6121, keyed to code 2195. Master Lock 2195 keys and locks become property of the Department. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

4. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

5. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

6. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify conductors per ED(3). Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 1.5 ft. to 3 ft. as required by electric utility.

7. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 in. underground and then couple to the type and schedule of the conduit shown on the plans. Install a grounding bushing on the RMC where it terminates in the service enclosure.

8. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees from each other. Size this LFMC the same size as the service entrance conduit. LFMC must not exceed 3 ft. in length. Strap LFMC within 1 ft. of each end. Terminate each end of the LFMC with a grounding bushing or fitting. The LFMC must contain a grounded (neutral) conductor. Ensure bends in LFMC do not exceed 180 degrees. A pull test is required on all installed conductors, with at least 6 in. of free conductor movement demonstrated to the satisfaction of the Engineer.

9. Ensure all mounting hardware and installation details of services conform to utility company specifications.

10. Provide the following documents in the electrical service document pocket: schematic drawing unique to the service from the UL 508 shop; plan sheet showing Electrical Service Data Chart for the service; plan sheets for the circuits powered by the service; and red lined plan sheets if installation differs from the original design. Reduce larger sheets to 8 ½ in. x 11 in. and laminate all documents.

11. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. When the enclosure has no door pocket, deliver these drawings to the Engineer before completion of the work.

12. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a watertight conduit hub or meter hub.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle, if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

ELECTRICAL SERVICE DATA (EXAMPLE)∗

ELEC. SERVICE ID	PLAN SHEET NUMBER	ELECTRICAL SERVICE DESCRIPTION	SERVICE CONDUIT SIZE ∗∗	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMPS	LIGHTING CONTACTOR AMPS	PANELBOARD/ LOADCENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	2P/100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60	2P/30	100	Sig. Controller	1P/30	23	5.3
									Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

∗ Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

∗∗ Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

ELECTRICAL SERVICE BID ITEM DESCRIPTIONS

ELEC SERV TY X XXX/XXX XXX(XX)XX(X)XX(X)

SCHEMATIC TYPE

SERVICE VOLTAGE

DISCONNECT AMP RATING
NOTE: 000 indicates main lug only, typically Type T

SAFETY SWITCH
(SS) = Safety Switch Ahead of Meter - Check with Utility
(NS) = No Safety Switch Ahead of Meter - Check with Utility

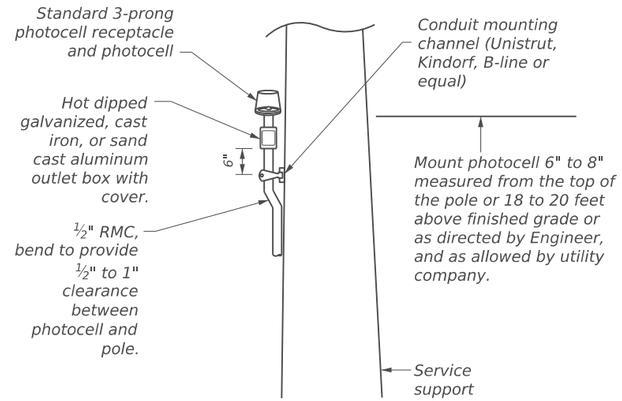
ENCLOSURE TYPE
GS = Galvanized steel ("off the shelf")
SS = Stainless steel (Custom Enclosure) - See MPL
AL = Aluminum (Custom Enclosure) - See MPL

PHOTOCELL MOUNTING LOCATION
(E) = Inside Service/Enclosure Mounted
(T) = Top of pole
(L) = Luminaire mounted
(N) = None - No Photocell or Lighting Contactor Required

SERVICE SUPPORT TYPE
GC = Granite concrete
OC = Other concrete
TP = Timber pole
SP = Steel pole
SF = Steel frame
OT = Pole by others or paid for separately
EX = Existing pole
TS = Service on traffic signal pole
PS = Pedestal Service

SERIVCE FEED
O = Overhead Service Feed from Utility
U = Underground Service Feed from Utility

TOP MOUNTED PHOTOCELL



Install conduit strap maximum 3 ft. from box. Spacing between straps supporting conduit is 5 ft. maximum.

Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-25

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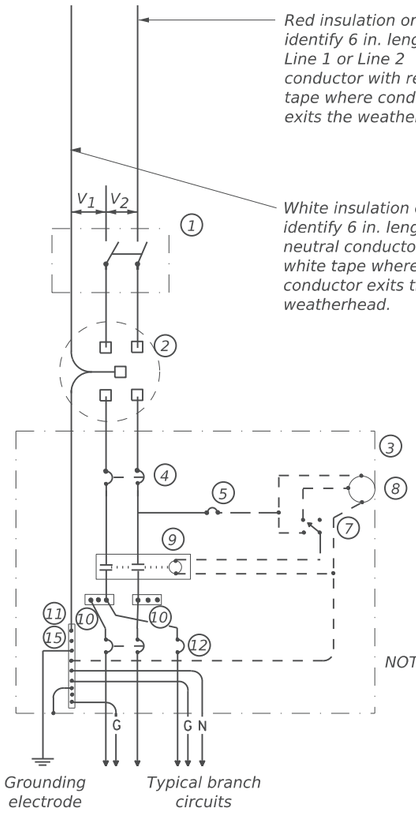
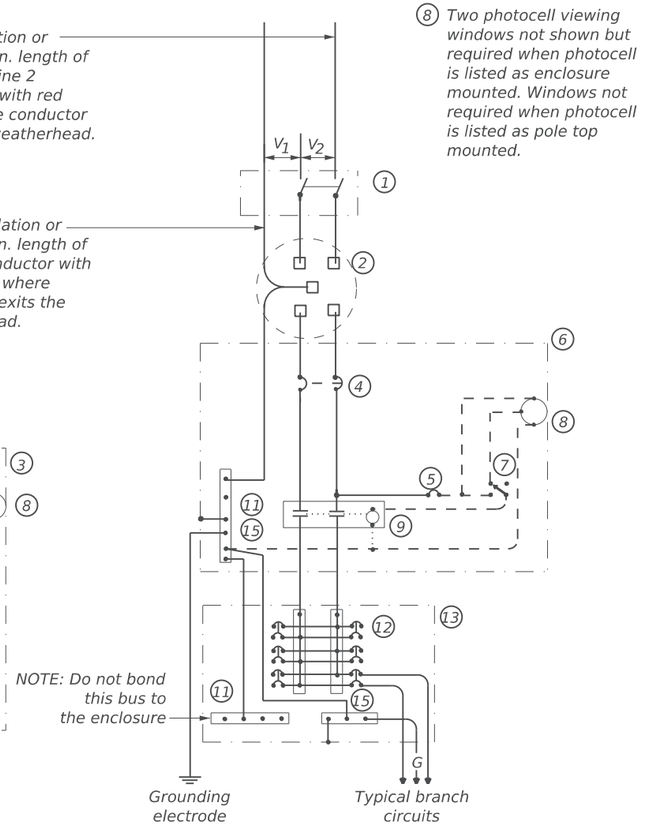
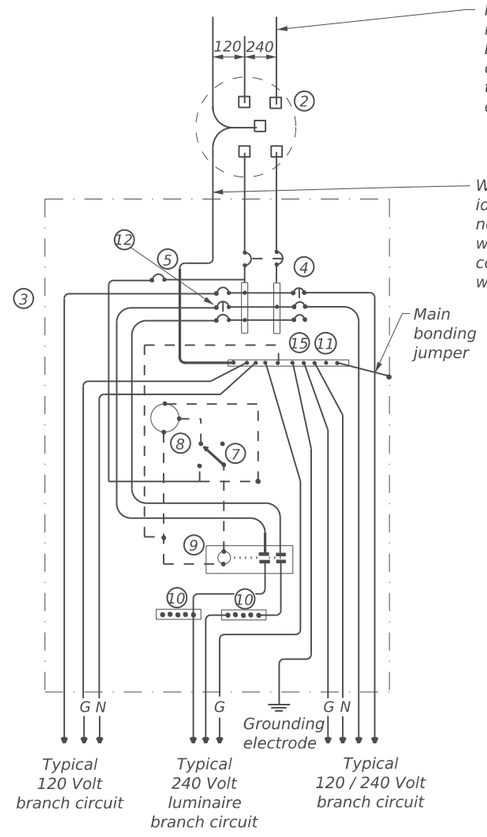
TYPE A
THREE WIRE



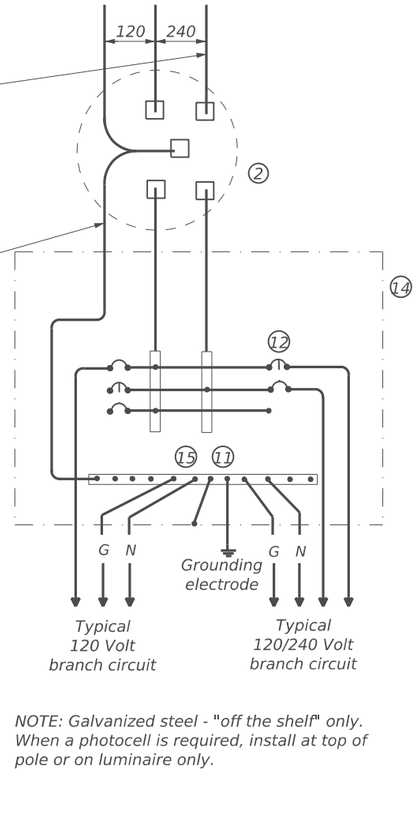
TYPE C
THREE WIRE



TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



TYPE T
120/240 VOLTS - THREE WIRE



NOTE: Galvanized steel - "off the shelf" only. When a photocell is required, install at top of pole or on luminaire only.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor (always required)

SCHEMATIC NOTES:

1. Safety Switch (when required)
2. Meter (when required - verify with electric utility provider)
3. Service Assembly Enclosure
4. Main Disconnect Breaker (See Electrical Service Data)
5. Circuit Breaker, 15 Amp (Control Circuit)
6. Auxiliary Enclosure
7. Control Station ("H-O-A" Switch)
8. Photo Electric Control (enclosure-mounted shown)
9. Lighting Contactor
10. Power Distribution Terminal Blocks
11. Neutral Bus
12. Branch Circuit Breaker (See Electrical Service Data)
13. Separate Circuit Breaker Panelboard
14. Load Center
15. Ground Bus

Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS SERVICE SCHEMATICS AND NOTES

ED(6)-25

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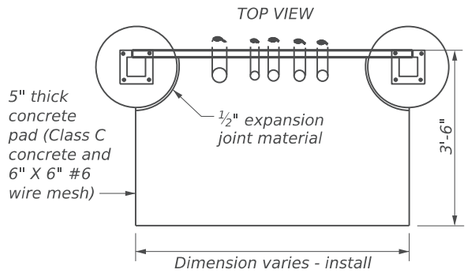
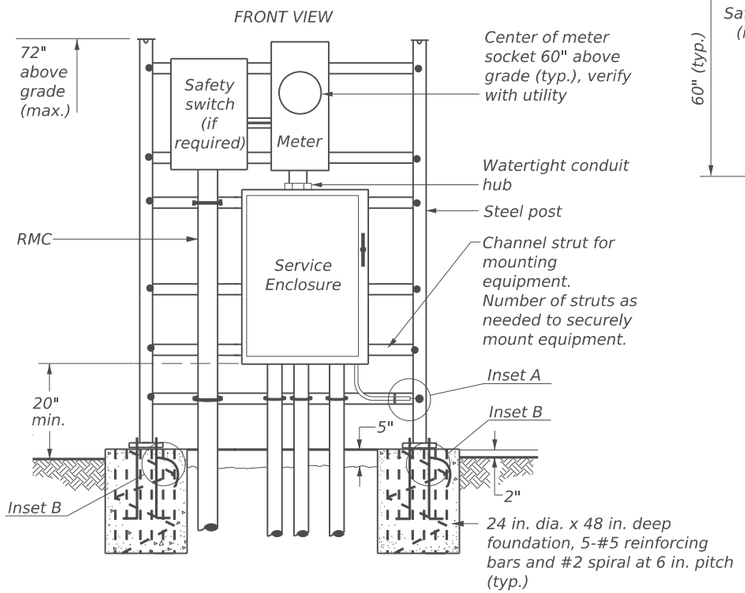
SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF) NOTES:

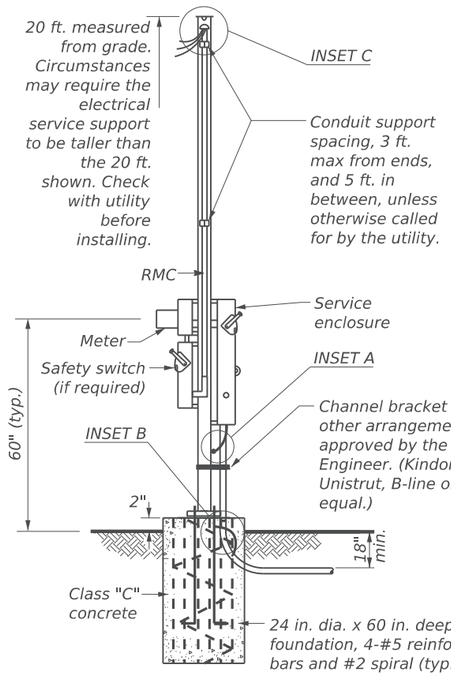
1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification DMS-11080, "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Drill, tap, and bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field-cut ends of all channel with zinc-rich paint before installing.
2. Install a one point rack or eye bolt bracket 6 in. to 12 in. below the weatherhead as an overhead service drop anchoring point for the electric utility. Attaching bolt must pass through the pole and use a nut, washer, and locking washer on the other size. Self-tapping screws or lag bolts are not allowed.
3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in. of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Use Class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3 in. of unobstructed concrete cover.
5. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.
6. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
7. Placement of the meter and service enclosure may vary based on the installation of a safety switch.
8. Drill and tap steel poles and frames for ½ in. x 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. directly below the electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting.
9. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See SF, SP details and Inset A for more information.
10. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a watertight conduit hub or meter hub.
11. If steel pole or frame is painted, bond each separate painted piece with a bonding jumper and lugs screwed into tapped holes.
12. Provide ¼ in. x 20 UNC machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install 6 AWG or larger stranded copper bonding jumpers. Make up all threaded bonding connections wrench-tight.
13. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

TYPE SF(U)
UNDERGROUND SERVICE

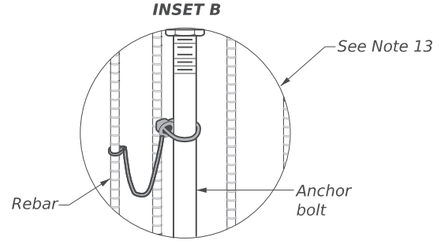




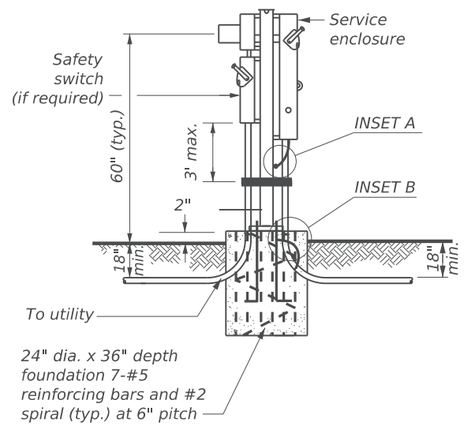
TYPE SP(O)
OVERHEAD SERVICE



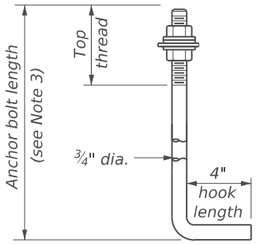
INSET B



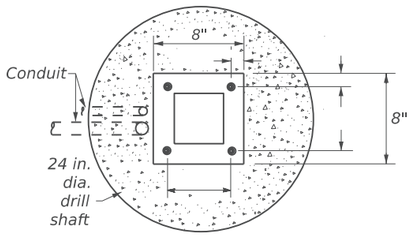
TYPE SP(U)



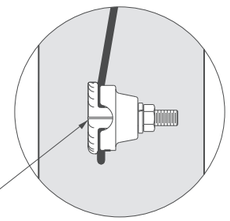
HOOKED ANCHOR DETAIL



BASE PLATE DETAIL

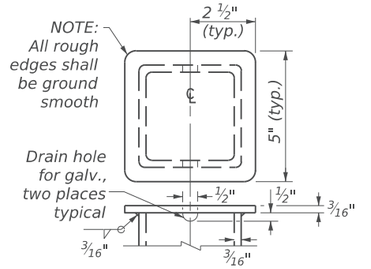


INSET A
FRONT VIEW

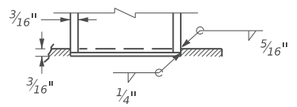


Drill, tap, and thread ½" x 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 8.

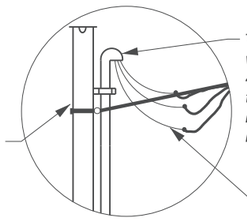
POLE TOP PLATE DETAIL



BOTTOM OF POLE DETAIL
TYPES SF & SP



INSET C
SIDE VIEW



Identify conductors red, black, and white as specified in ED(3), Electrical Conductors, Note A.2. Provide 1.5 ft. to 3 ft. of conductor length as required by electric utility.

Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-25

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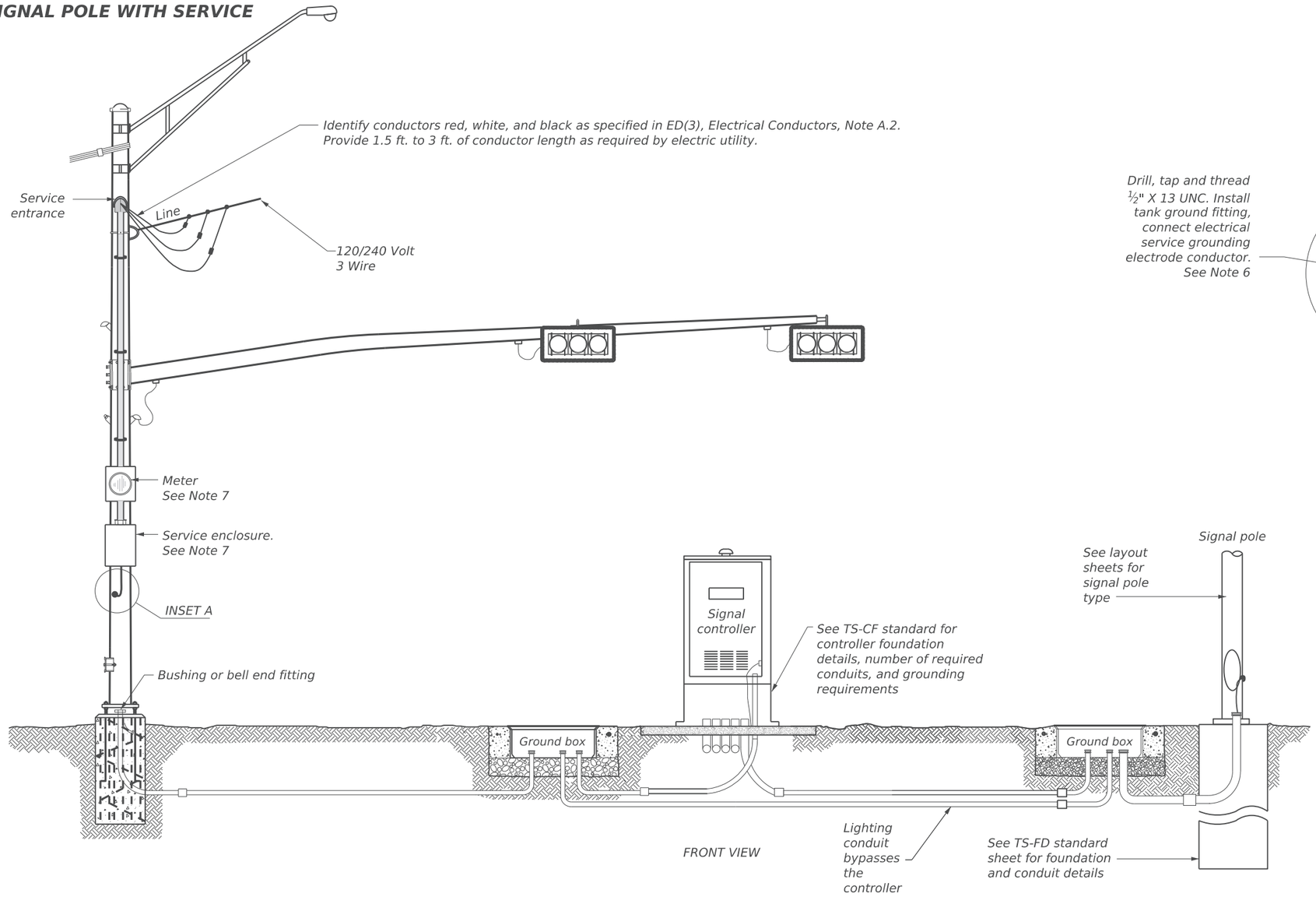
NOTES:

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. Ground internally lighted street name (ILSN) signs to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. x 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are at least ¾ in. wide. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
9. Terminate conduits entering the top of enclosures with a watertight conduit hub or meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.

SIGNAL POLE WITH SERVICE



FRONT VIEW

INSET A

Texas Department of Transportation

Traffic Safety Division Standard

ELECTRICAL DETAILS
TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS
ED(8)-25

FILE: ed8-25.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2025	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
1-92 3-03 4-25 4-98 5-03 12-00 10-14	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		34

71H

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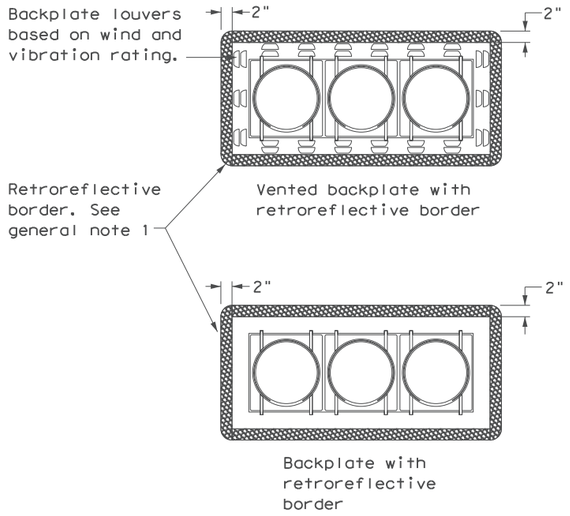
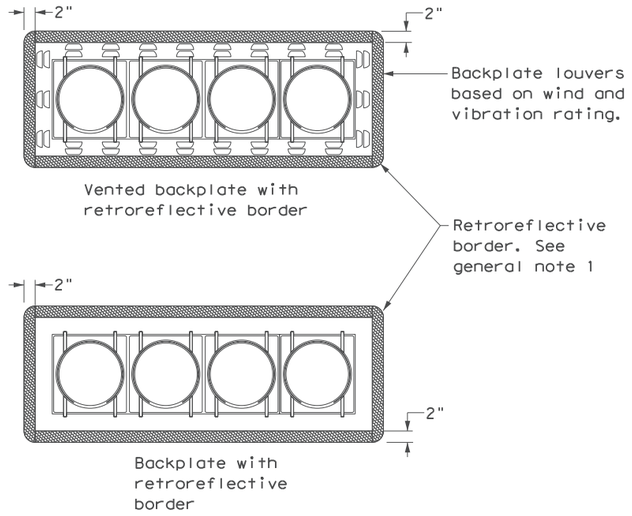


THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



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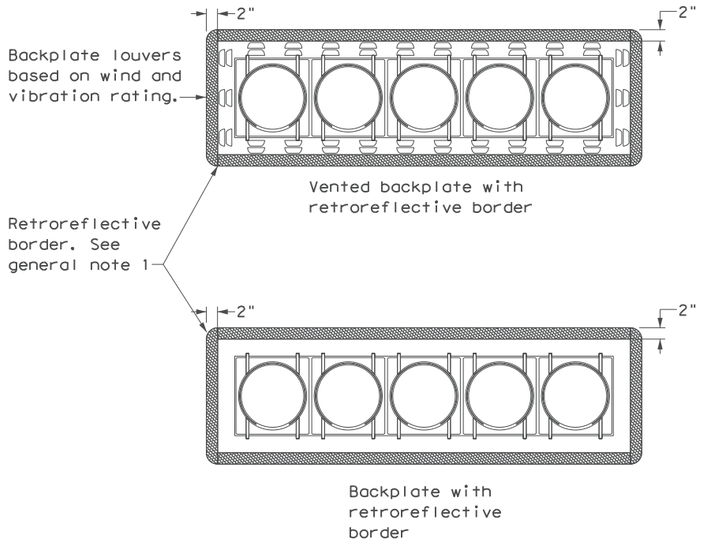

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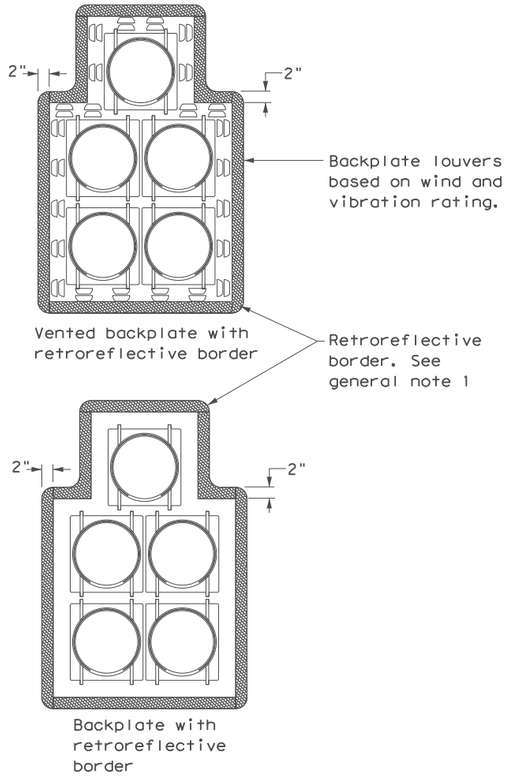
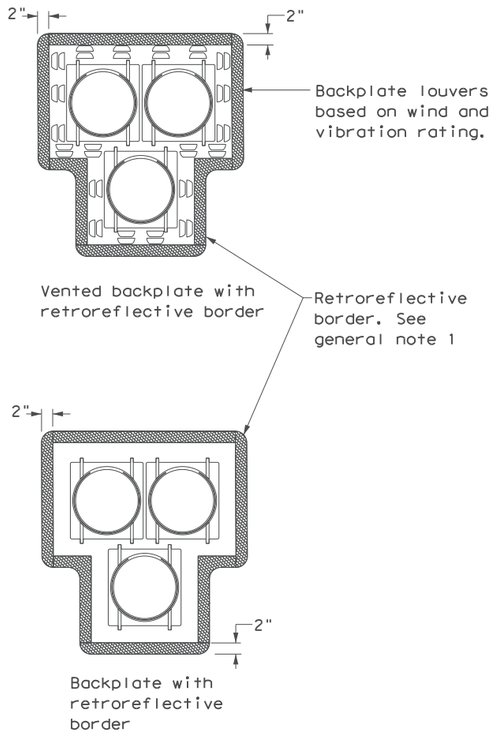


FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

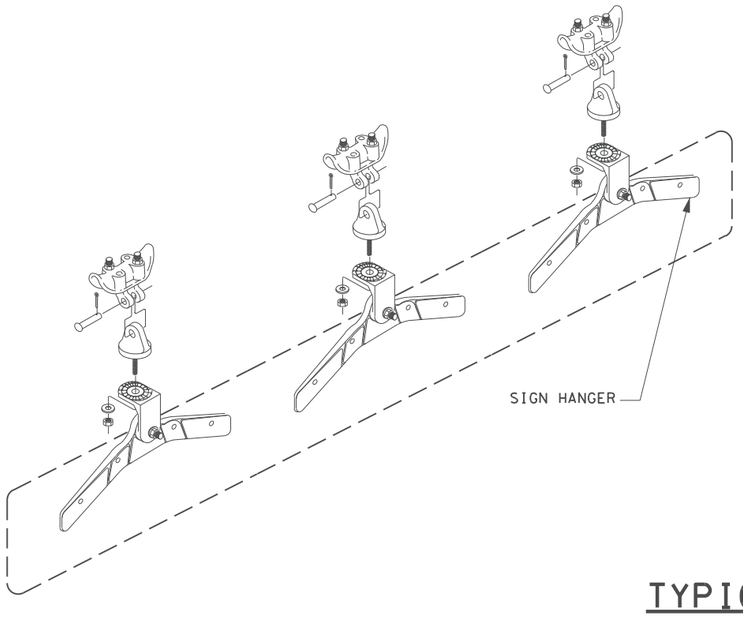
Texas Department of Transportation

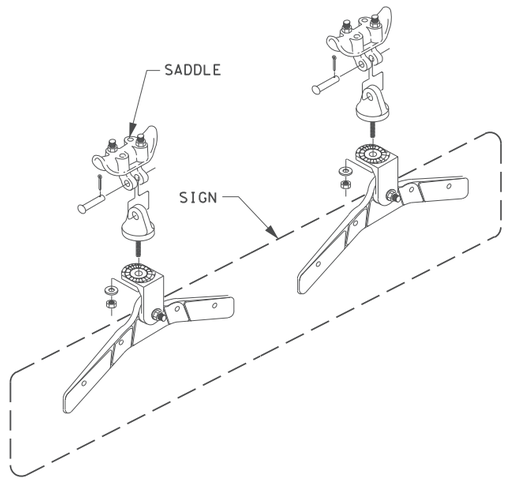
Traffic Safety Division Standard

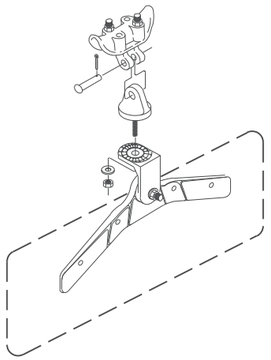
TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		35



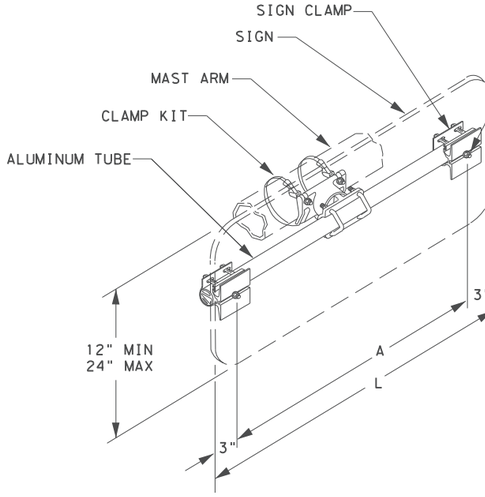


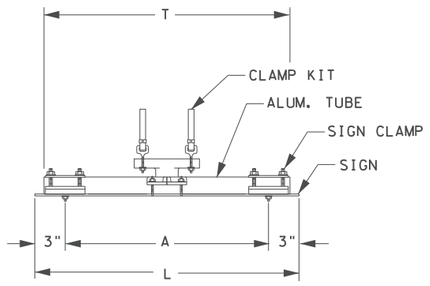


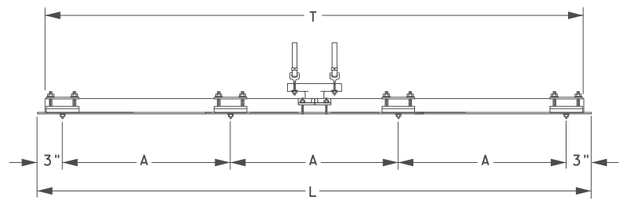


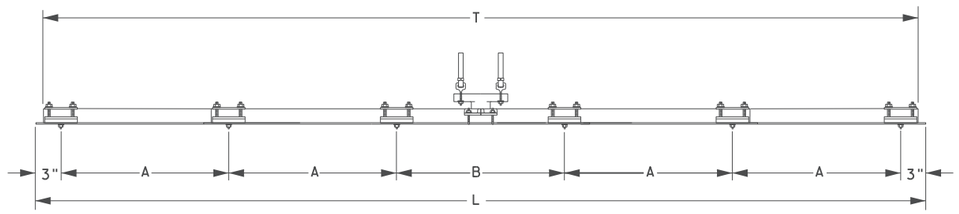
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

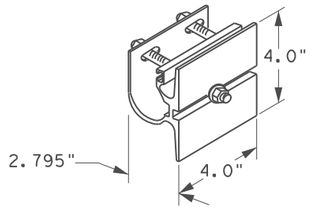
SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"



SIGN CLAMP DETAIL



GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS OVERHEAD STREET NAME SIGN MOUNTING DETAILS

OSNS/MD

	DN:	CK:	DW:	CK:	
© TxDOT 2004	DIST	FED REG	PROJECT NO.		SHEET
	HOU	6			36
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	BRAZORIA					CROIX RD

STD-M12

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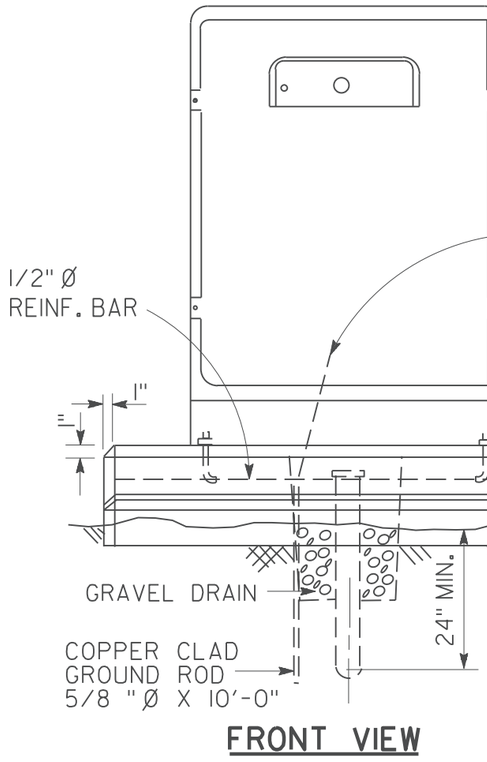
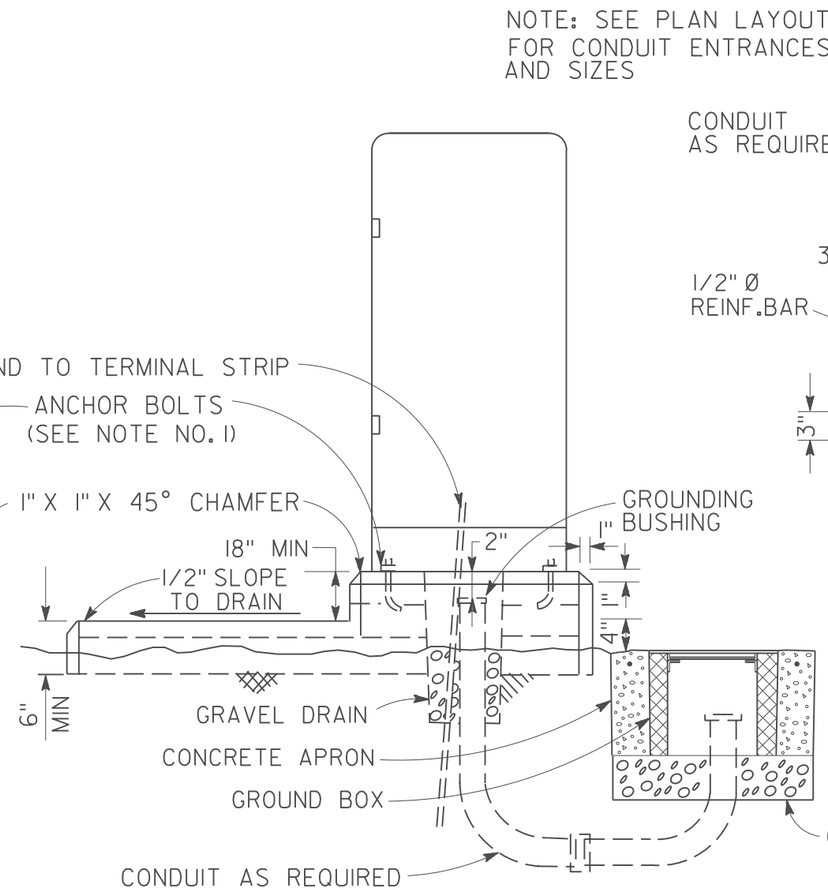
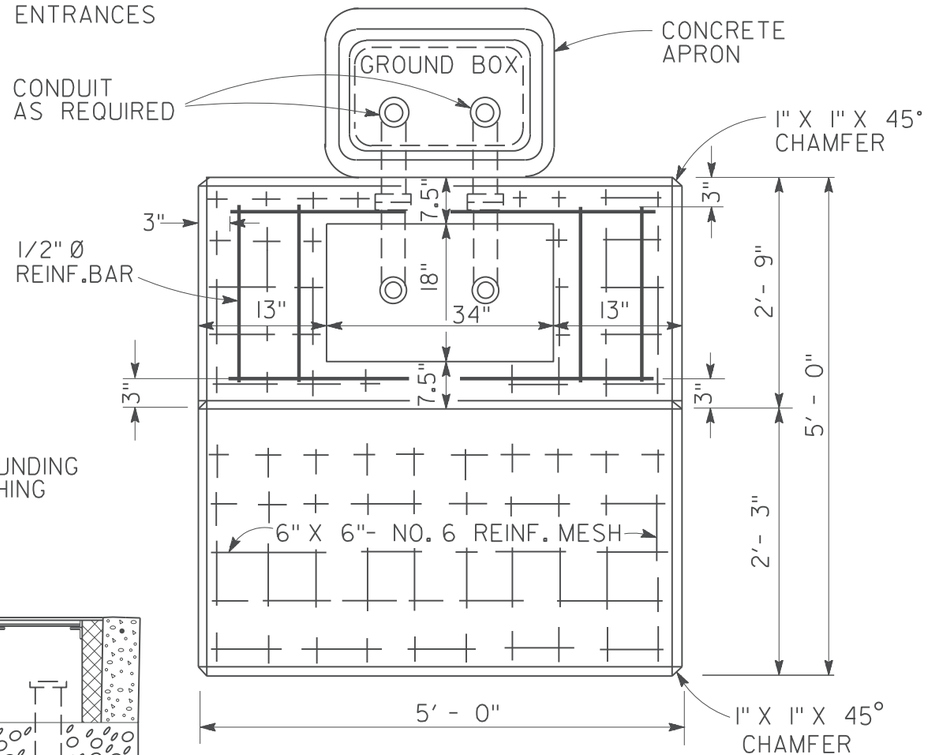


FRONT VIEW



SIDE VIEW



TOP VIEW
(LESS CABINET)

NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONTROLLER FOUNDATION DETAIL

SD/SCFD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 08-04 03-07	HOU	6		37
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BRAZORIA				CROIX RD

STD-M1

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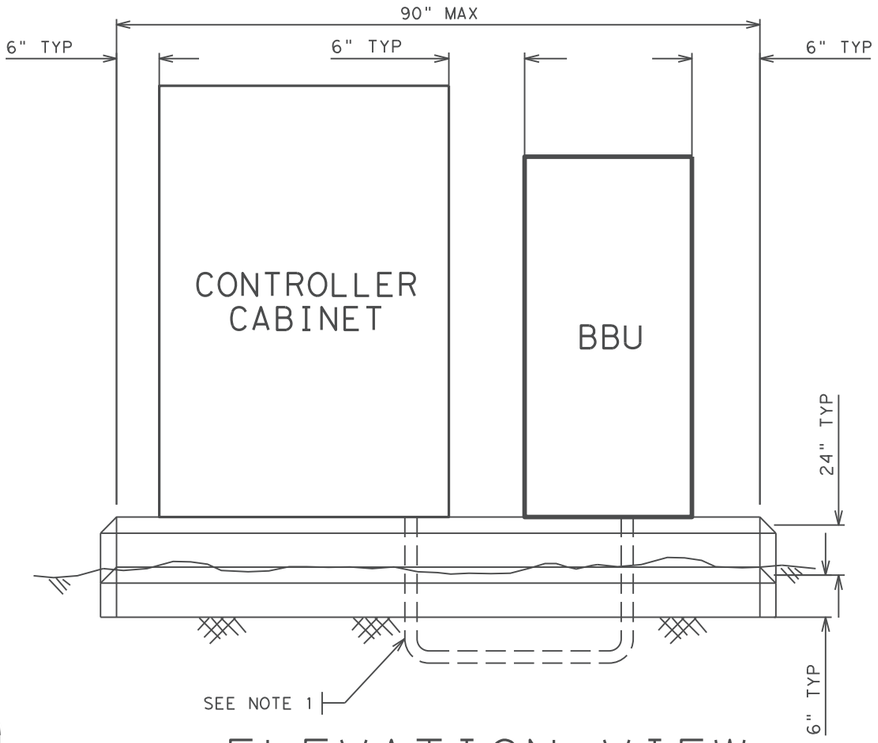
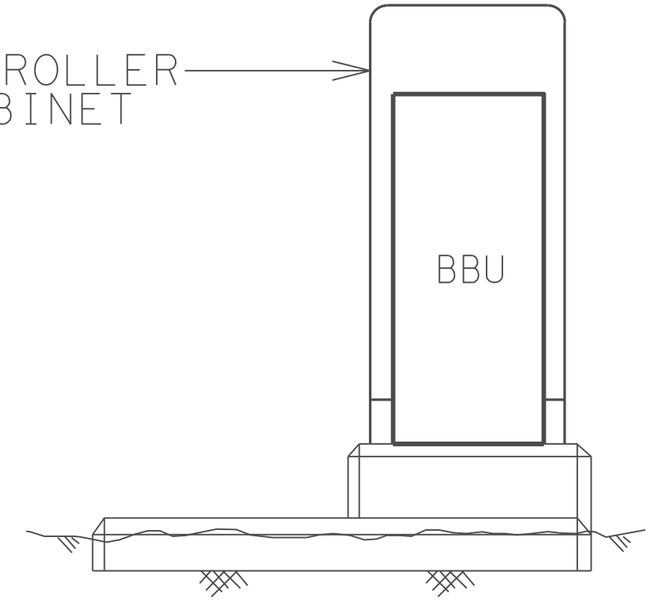
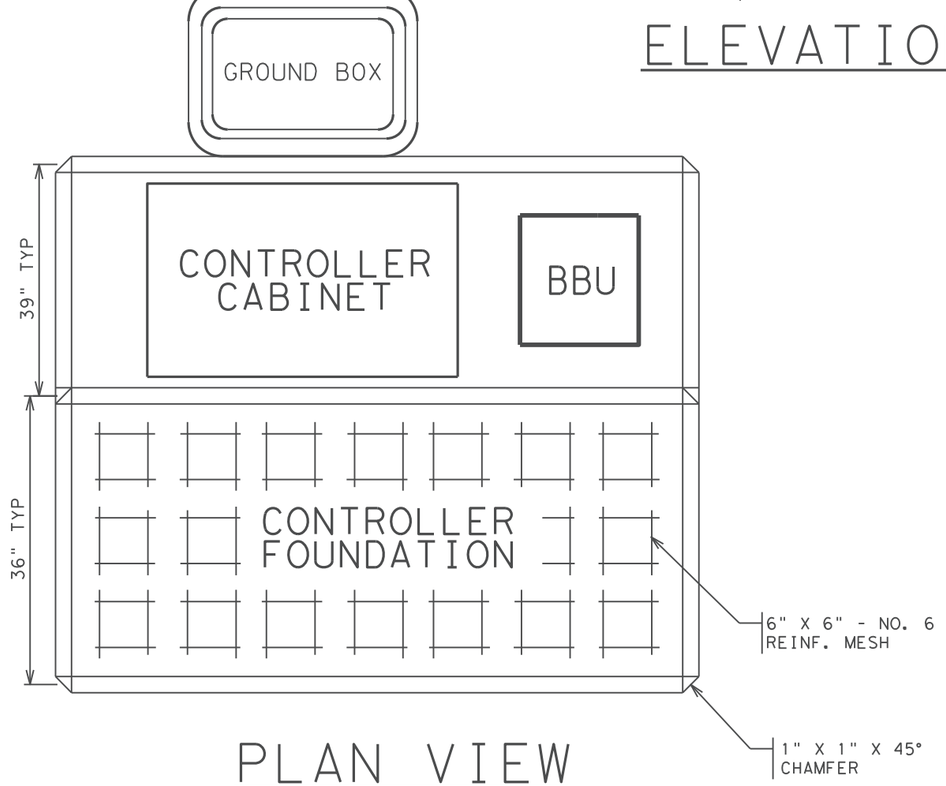


ELEVATION VIEW



SIDE VIEW



PLAN VIEW

NOTES:

1. INSTALL 1-1/2 " PVC CONDUIT WITH FIVE #6 AWG CONDUCTORS, TWO #18 AWG CONDUCTORS AND ONE CAT 5 CABLE WITH CONNECTOR BETWEEN THE TWO CABINETS.
2. EXTEND THE CONCRETE CONTROLLER PAD (REFER TO SD/SCFD) UNDER THE BBU. MODIFY PAD DIMENSIONS TO FIT EQUIPMENT, AS NEEDED.
3. THE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. USE 6" X 6" - NO. 6 REINFORCING MESH IN FOUNDATION WITH 1" X 1" X 45° CHAMFER AT ALL CORNERS.

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10777 Westheimer, Suite 400, Houston, TX 77042
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STATE OF TEXAS
HEIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Heidi M. Criswell
3/10/2026

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Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
BBU SIDE MOUNT
SD/S BSM

SCALE	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY
N.T.S.	6	TEXAS					CROIX RD
REVISIONS	STATE DISTRICT	COUNTY		CONTROL	SECTION	JOB	SHEET NO.
	HOU	BRAZORIA					38

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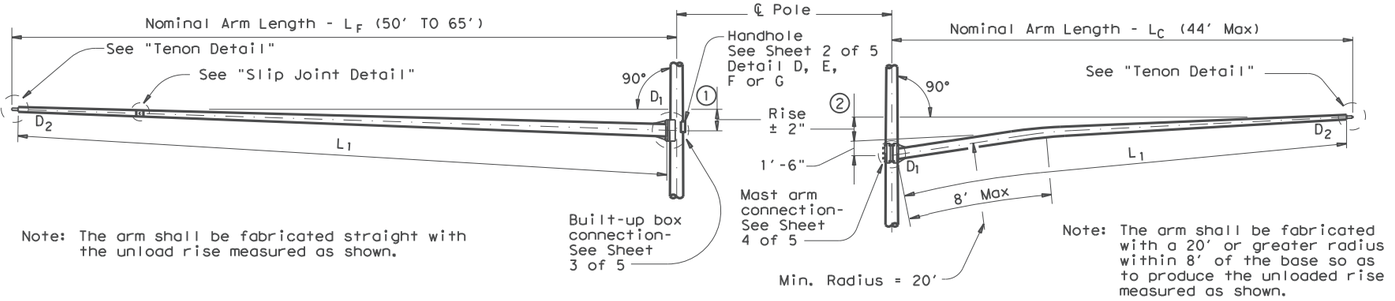
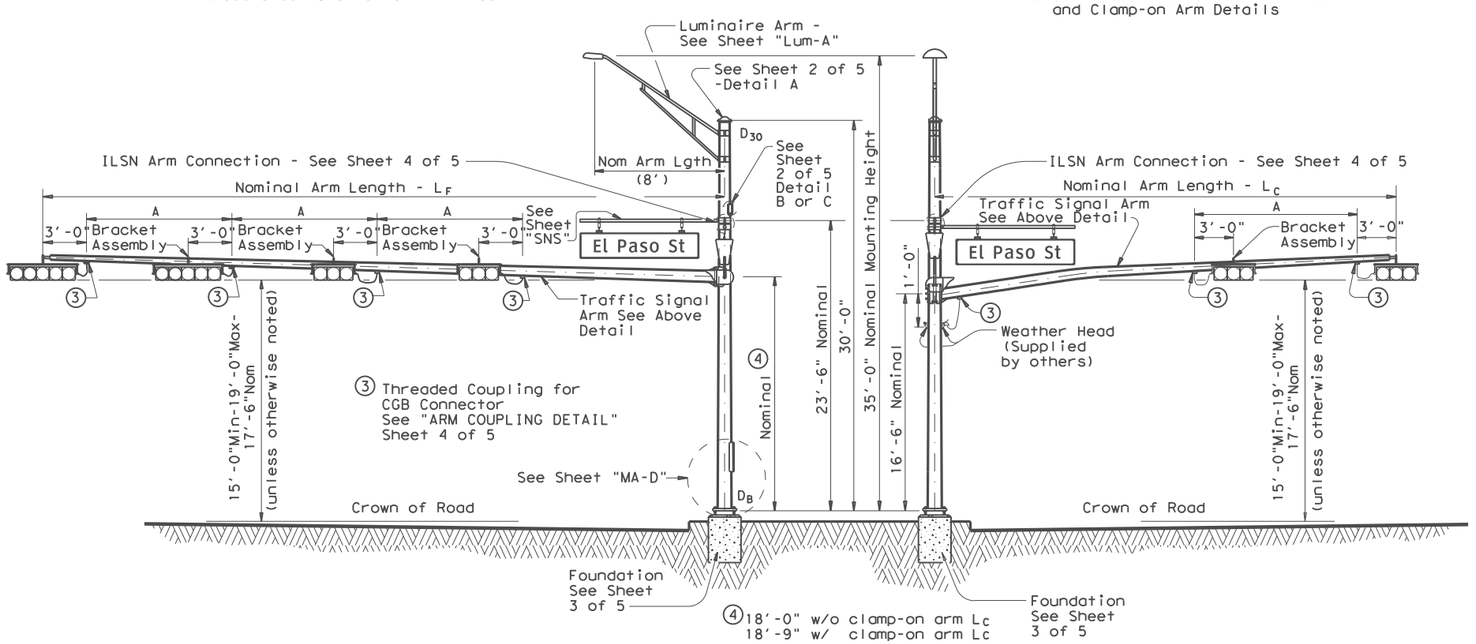


FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise

CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

② See Sheet 4 of 5 for Arm Rise and Clamp-on Arm Details

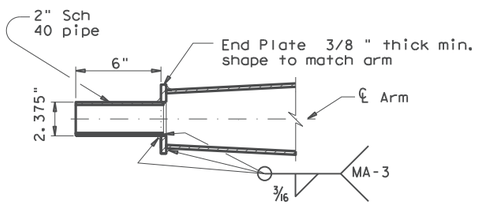


ELEVATION
(Showing fixed mount arm)

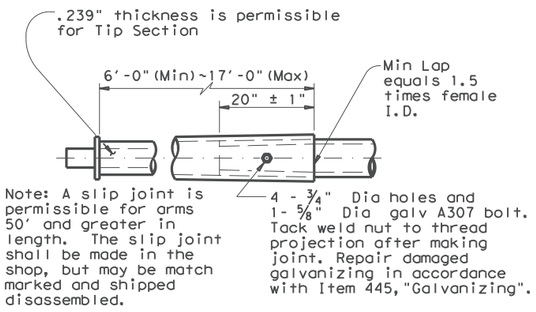
STRUCTURE ASSEMBLY

ELEVATION
(Showing clamp-on arm)

TABLE OF DIMENSIONS "A"										
Arm Length	24'	28'	32'	36'	40'	44'	50'	55'	60'	65'
Arm Type II	10'	11'	12'	13'						
Arm Type III			10'	11'	12'	12'				
Arm Type IV							12'	12'	12'	12'



TENON DETAIL



SLIP JOINT DETAIL (FIXED MOUNT ARM)

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name (ILSN) signs and two traffic signal arms with limited length combinations.

Each arm with its related attachment is shown below

Arm	Equivalent DL ⑤	WL EPA ⑤⑥
8' Luminaire Arm	Luminaire 60 lbs	1.6 sq ft
9' ILSN Arm	Sign 85 lbs	11.5 sq ft
50' to 65' Fixed Mount Arm	Signal Loads 310 lbs	52 sq ft
Up to 44' Clamp-on Arm	Signal Loads 180 lbs	32.4 sq ft

⑤ Equivalent dead load plus horizontal wind load applied at the end of arm except ILSN arm, which applied 4.5' from the centerline of the pole.

⑥ Effective projected area (actual area times drag coefficient) for the application of horizontal wind load.

Except as noted in Sheet 1 thru 5 of 5, other details not covered shall refer to Standard Sheet "MA-D" for pole details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Material, fabrication tolerances, and shipping practices shall also meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing" after fabrication.

Deviations from the details and dimensions shown herein require submission of shop drawings in accordance with the Item 441, "Steel Structures". Alternate designs are not acceptable.

Installation of damping plate for the long mast arm is not recommended.

Provision of the bracket assembly used to support the traffic signal heads shall be under the direction of the Engineer for approval.

Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)
LMA(1)-12

Sheet 1 of 5

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REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		39

131A

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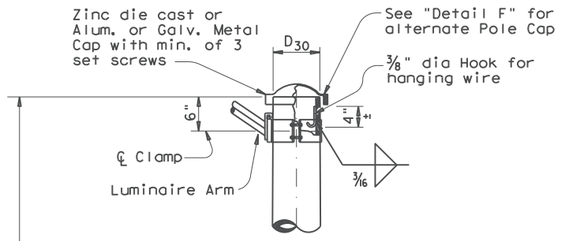
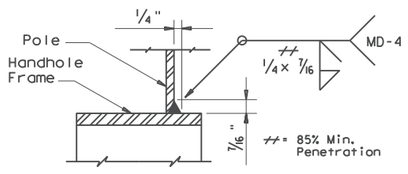
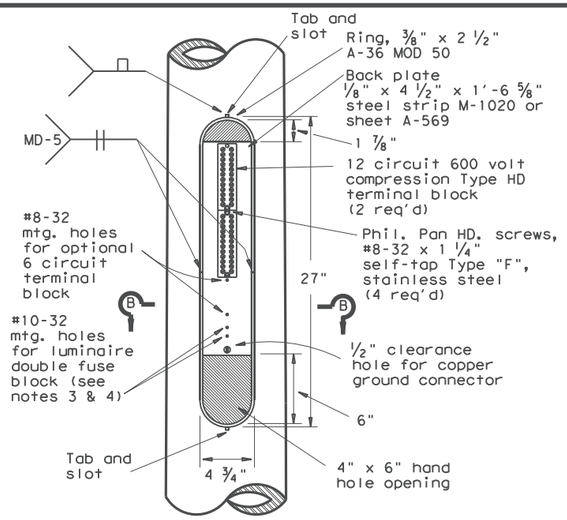


DETAIL A

(for pole with luminaire)



DETAIL H

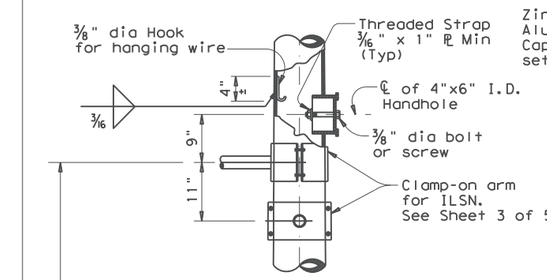


ACCESS COMPARTMENT

MATERIALS	
Round Shafts or Polygonal Shafts (7)	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 (8)
Plates (7)	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325, or A449 except where noted
Pin Bolts	ASTM A325
Pipe (7)	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

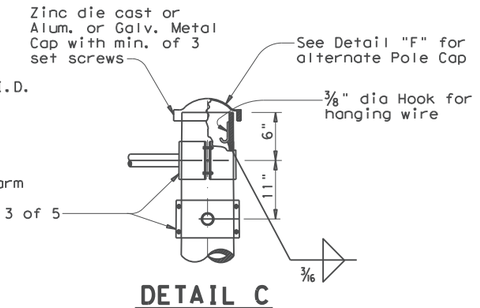
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

(8) ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

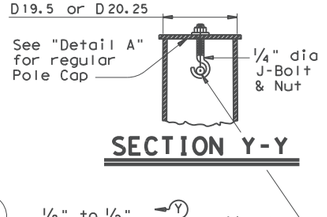


DETAIL B

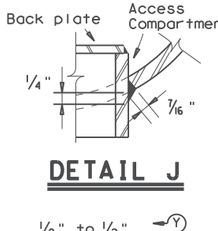
(If ILSN applied)



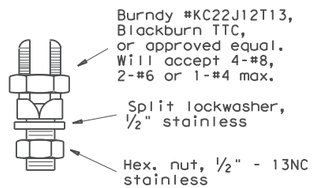
DETAIL C



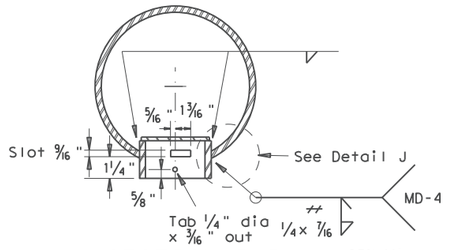
SECTION Y-Y



DETAIL J

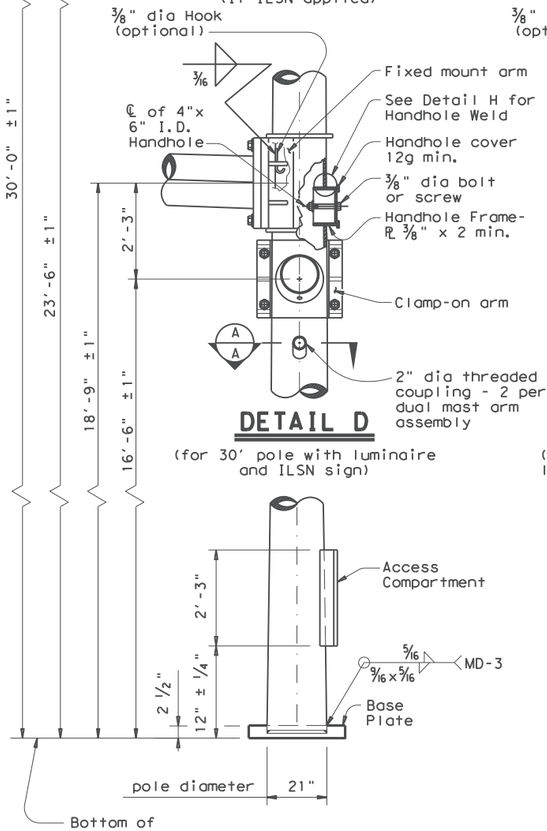


COPPER GROUND CONNECTOR



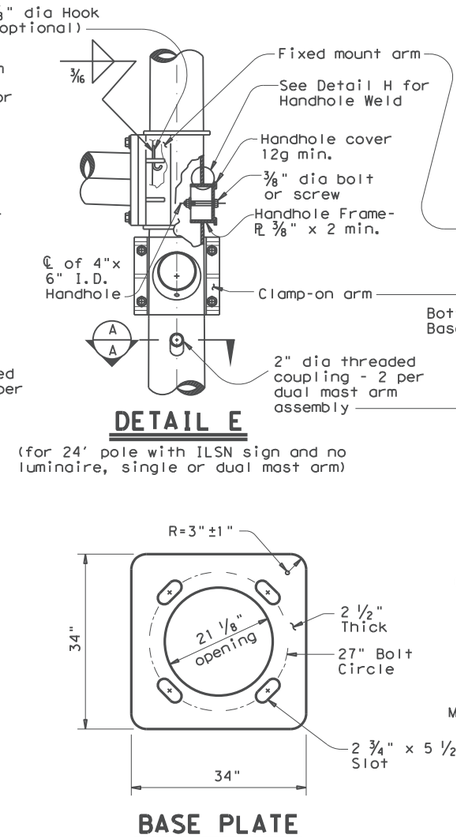
SECTION B-B

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



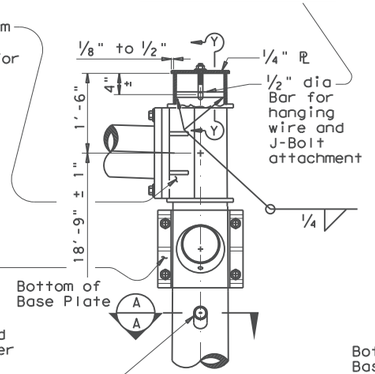
DETAIL D

(for 30' pole with luminaire and ILSN sign)



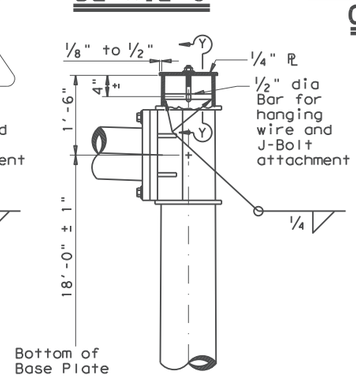
DETAIL E

(for 24' pole with ILSN sign and no luminaire, single or dual mast arm)



DETAIL F

(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)

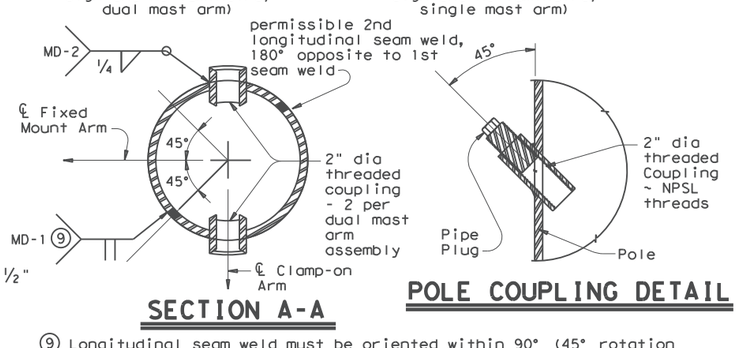


DETAIL G

(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)

POLE ELEVATION

BASE PLATE



SECTION A-A

POLE COUPLING DETAIL

(9) Longitudinal seam weld must be oriented within 90° (45° rotation each side) along the fixed mount arm. 60% min penetration required, 100% penetration within 6" of circumferential base weld.

ACCESS COMPARTMENT NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 2 of 5

LMA(2)-12

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REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		40

131B

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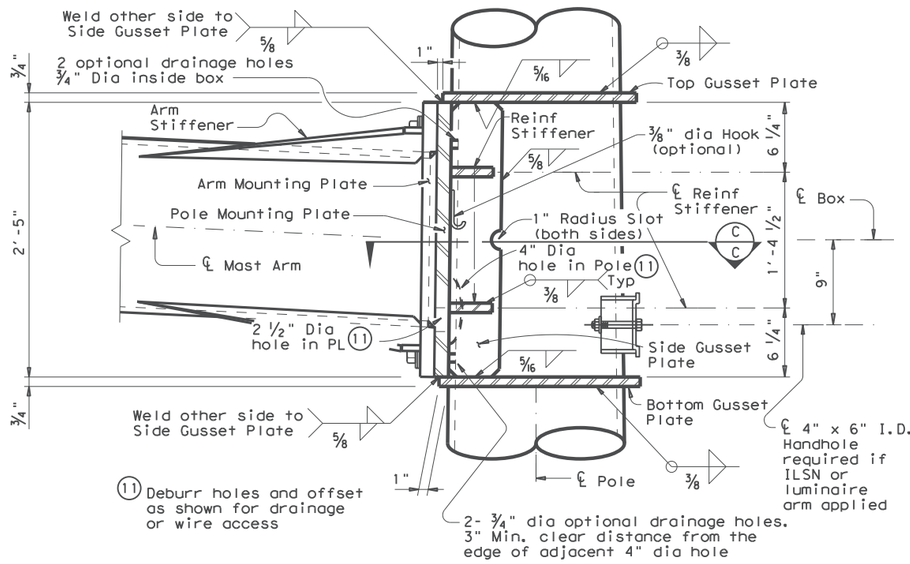
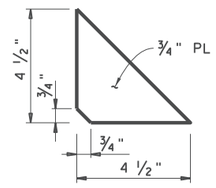
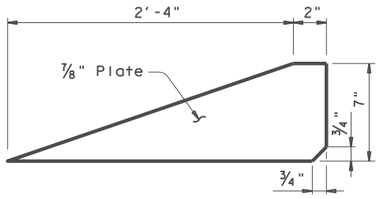


BUILT-UP BOX CONNECTION

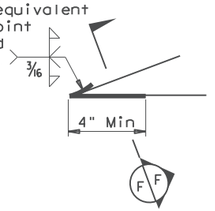


REINFORCING STIFFENER



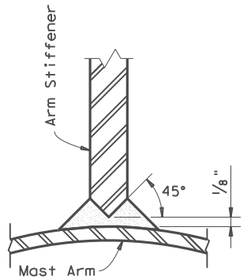
ARM STIFFENER
(Cut to match arm inclination and taper)

Provide Detail shown in SECTION F-F or equivalent 100% complete joint penetration weld from both sides.



Only 4" length at tip of Arm Stiffener requires a complete joint penetration weld. Smooth weld radius to connect Stiffener. Only a fillet weld is required for the remaining weld length.

DETAIL "K"



SECTION F-F

Fixed Mount Arm L_F	ROUND POLES (13)					Foundation Type
	D_B	$D_{19.5}$ or $D_{20.25}$	D_{24}	D_{30}	(12) thk	
ft.	in.	in.	in.	in.	in.	
50', 55' 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L_F	ROUND ARMS (13)				
	L_1	D_1	D_2	(12) thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'-11"
65	64	18.5	9.6	.3125	4'- 4"

D_B = Pole Base O.D.
$D_{19.5}$ = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)
$D_{20.25}$ = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

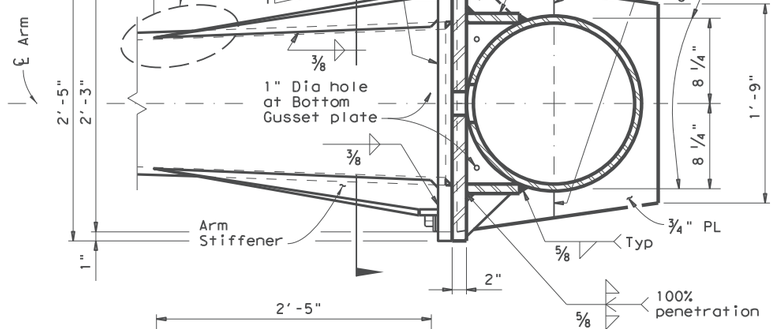
(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.

GENERAL NOTES:

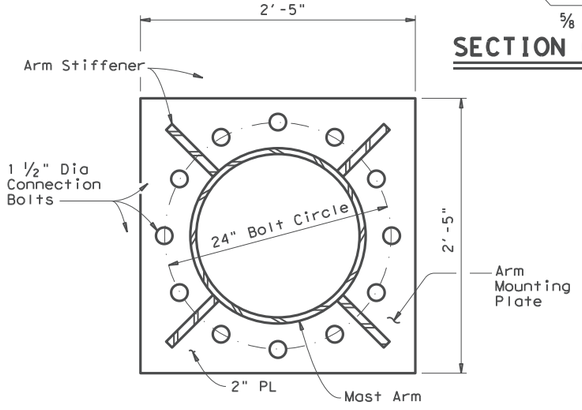
Built-up Box Connection: For the welded arm-to-pole connection as a build-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, arm-to-plate socket connection, and arm rise creation. Specify the proper location of drain holes along the pole. 2 1/2" dia hole in the pole mounting plate and 4" dia hole in the pole need to be aligned for wiring access or drainage. Arm stiffeners cut to match arm inclination and taper shall also be included.

The deviation from flat for either arm or pole mounting plate shall not exceed 1/32 in., which is measured along the center of mounting plate to a radial distance of 13.5 in. The deformed-from-flat connection between arm and pole mounting plates shall not be allowed if the center of both mounting plates cannot contact directly.

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

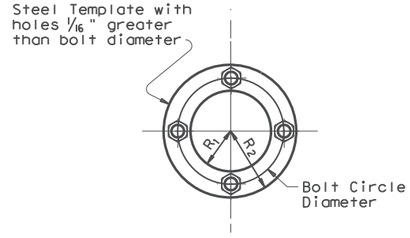


SECTION C-C



SECTION D-D

NUT ANCHOR
(TYPE 2)



TEMPLATE DETAIL

ANCHOR BOLT ASSEMBLY

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length ‡	Top Thread	Bottom Thread	Bolt Circle	R_2	R_1
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

‡ Min dimension given, longer bolts are acceptable.

FOUNDATION DESIGN TABLE													
FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft (16), (17), (18)			ANCHOR BOLT DESIGN (14)				FOUNDATION DESIGN LOAD (15)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
48-A	48"	20 #9	#4 at 6"	21.9	19.5	14.7	2 1/2"	55	27"	2	490	10	50' to 65' Mast arm assembly.

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

(14) Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

(15) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

(18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 3 of 5 — LMA(3)-12

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	HOU	BRAZORIA		41

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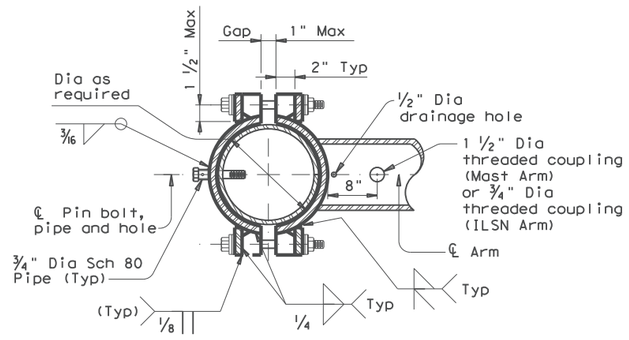
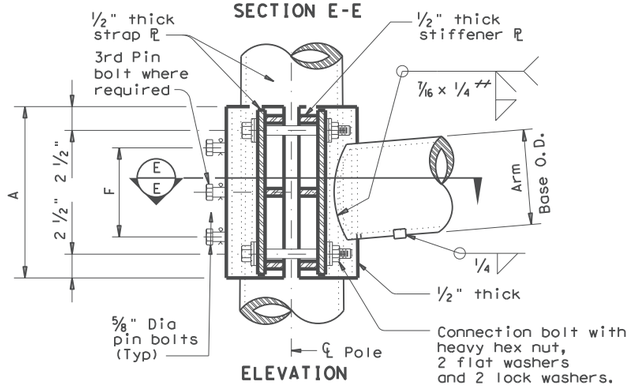


SECTION E-E



ELEVATION
(Mast Arm or ILSN Arm to pole)

⇈ = 85% Min. Penetration

CLAMP-ON CONNECTION

80 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

100 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

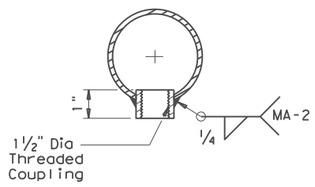
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
Lc = Clamp-on Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

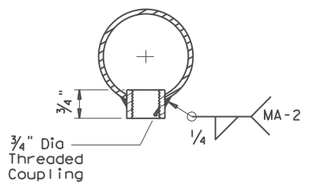
CLAMP-ON ARM CONNECTION

ILSN Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Sch 40 pipe Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
3	.216	10	4	¾	2

Mast Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼	3



ARM COUPLING DETAIL



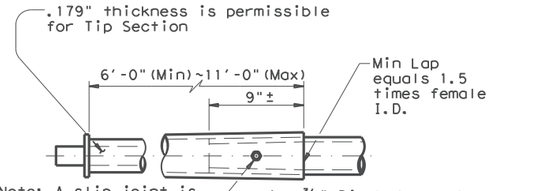
ILSN ARM COUPLING DETAIL

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 ½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 ½" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and ¾" diameter pipe shall have 3/16" diameter holes for a ⅛" diameter galvanized cotter pin. Back clamp plate shall be furnished with a ¾" diameter hole for each pin bolt. An 11/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

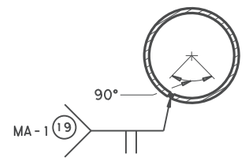


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (CLAMP-ON ARM)

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

(19) Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.
60% Min penetration
100% penetration within 6" of circumferential base welds.

Texas Department of Transportation
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TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 4 of 5 LMA(4)-12

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	HOU	BRAZORIA		42

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Shipping Parts List

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.

Nominal Arm Length	30' Poles with Luminaire: See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		24' Poles with ILSN: See note above plus one small hand hole		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN: See note above	
Single Mast Arm						
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	50L	*1*	50S		50	
55	55L		55S		55	
60	60L		60S		60	
65	65L		65S		65	
Dual Mast Arm						
Lf ft. / Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50 / 20	5020L		5020S		5020	
24	5024L		5024S		5024	
28	5028L		5028S		5028	
32	5032L		5032S		5032	
36	5036L		5036S		5036	
40	5040L		5040S		5040	
44	5044L		5044S		5044	
55 / 20	5520L		5520S		5520	
24	5524L		5524S		5524	
28	5528L		5528S		5528	
32	5532L		5532S		5532	
36	5536L		5536S		5536	
40	5540L		5540S		5540	
44	5544L		5544S		5544	
60 / 20	6020L		6020S		6020	
24	6024L		6024S		6024	
28	6028L		6028S		6028	
32	6032L		6032S		6032	
36	6036L		6036S		6036	
40	6040L		6040S		6040	
44	6044L		6044S		6044	
65 / 20	6520L		6520S		6520	
24	6524L		6524S		6524	
28	6528L		6528S		6528	
32	6532L		6532S		6532	
36	6536L		6536S		6536	
40	6540L		6540S		6540	
44	6544L		6544S		6544	

Foundation Summary Table **

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet) 48-A
POLE 2	*10*	*10*	*22*
Total Drill Shaft Length			*22*

Shipping Parts List

Traffic Signal Arms (Fixed Mount) (1 per pole)
Ship each arm with listed equipment attached

Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors	
ft.	Designation	Quantity
50	50IV	*1*
55	55IV	
60	60IV	
65	65IV	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	*1*

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	

Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
2 1/2 "	5' - 3"	*1*

Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.

Notes

** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

*** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Abbreviations
Lf= Fixed Arm Length
Lc= Clamp-on Arm Length (44' Max.)

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HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell
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Texas Department of Transportation
Traffic Operations Division

LONG MAST ARM ASSEMBLY PARTS LIST

LMA(5)-12

Sheet 5 of 5

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DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		43

131E

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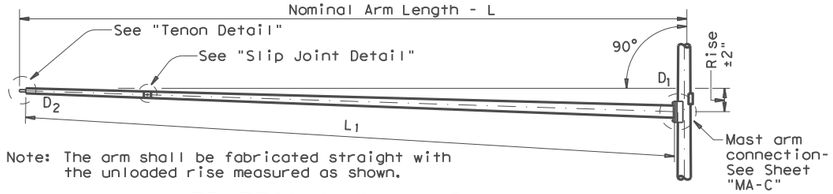
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

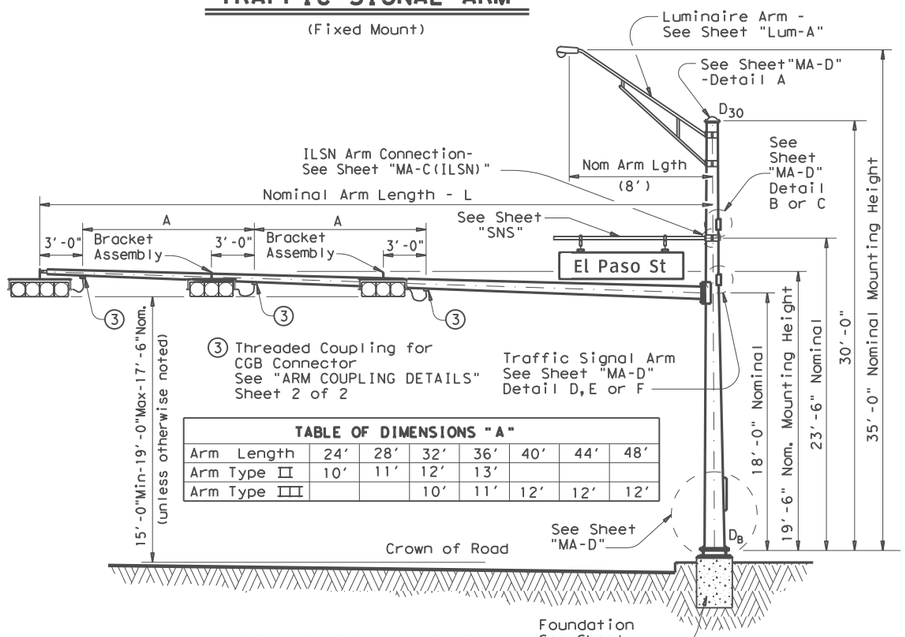


TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100	*1*	36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100	*1*	44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100	*1*	36III-100	
40					40III-100	
44					44III-100	*1*

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	*2*

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	
1 ¾"	3'-10"	*1*
2"	4'-3"	*1*

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

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STATE OF TEXAS
HIDI M. CRISWELL
124831
LICENSED
PROFESSIONAL ENGINEER

Hidi M. Criswell
3/10/2026

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

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REVISIONS
5-96
11-99
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CONT	SECT	JOB	HIGHWAY
			CROIX RD

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HOU	BRAZORIA	44

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123A

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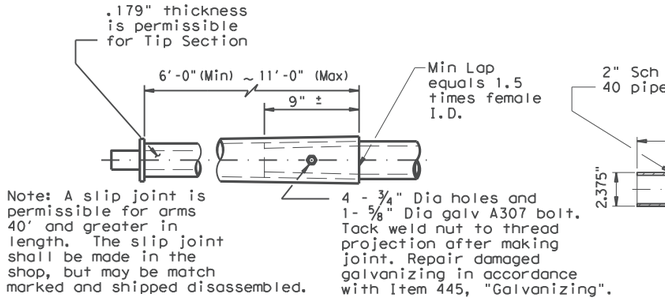
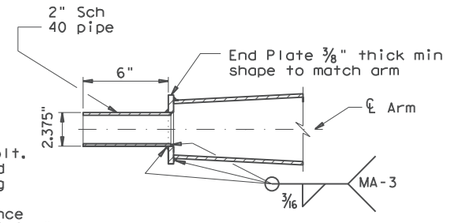


SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

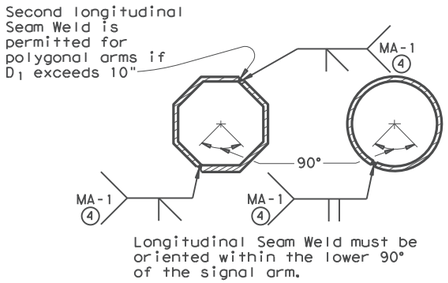
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

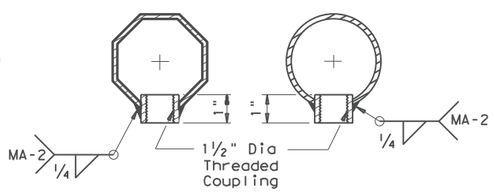
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

④ 60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(2)-12

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CONT	SECT	JOB	HIGHWAY
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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

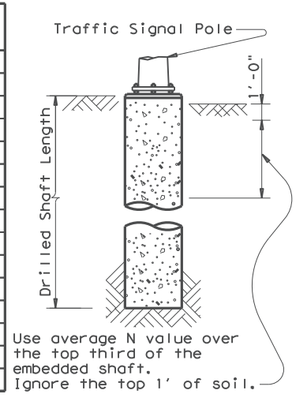
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
POLE 1	*10*	*36-B*	*1*				*16*	
POLE 3	*10*	*36-A*	*1*			*14*		
TOTAL DRILLED SHAFT LENGTHS						*14*	*16*	

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'



Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

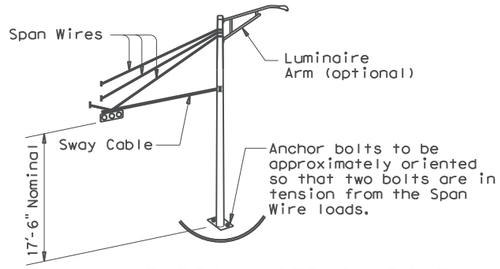
Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

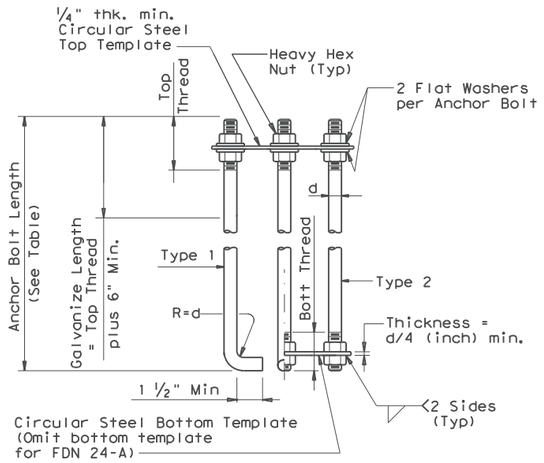
Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



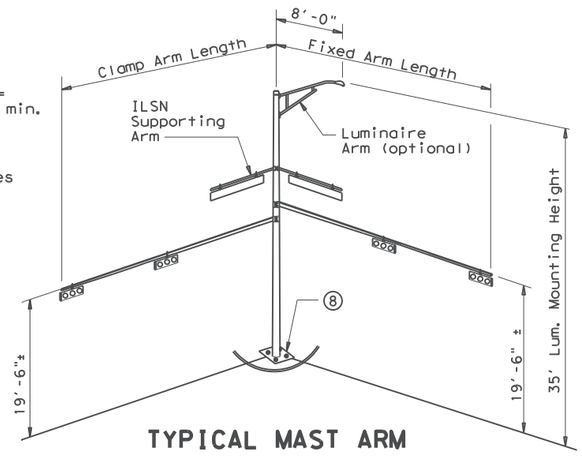
TYPICAL STRAIN POLE ASSEMBLY



HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



TYPICAL MAST ARM ASSEMBLY

TOP VIEW

ELEVATION

FOUNDATION DETAILS

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HIDI M. CRISWELL
124831
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Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

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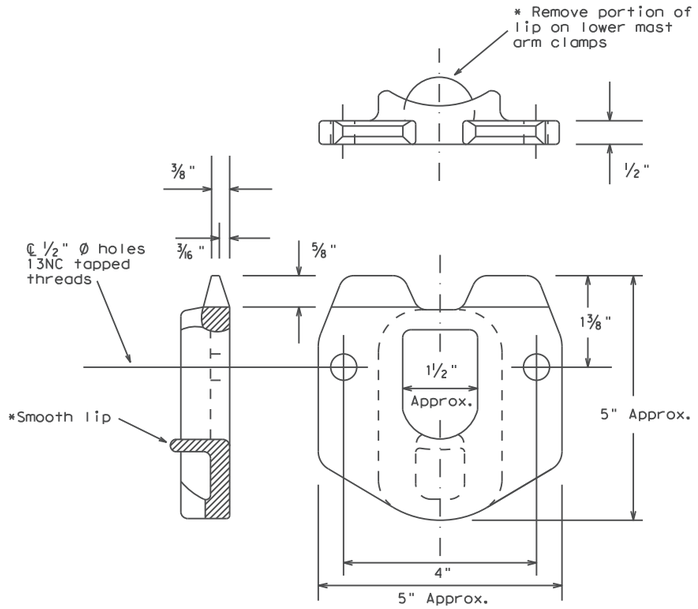


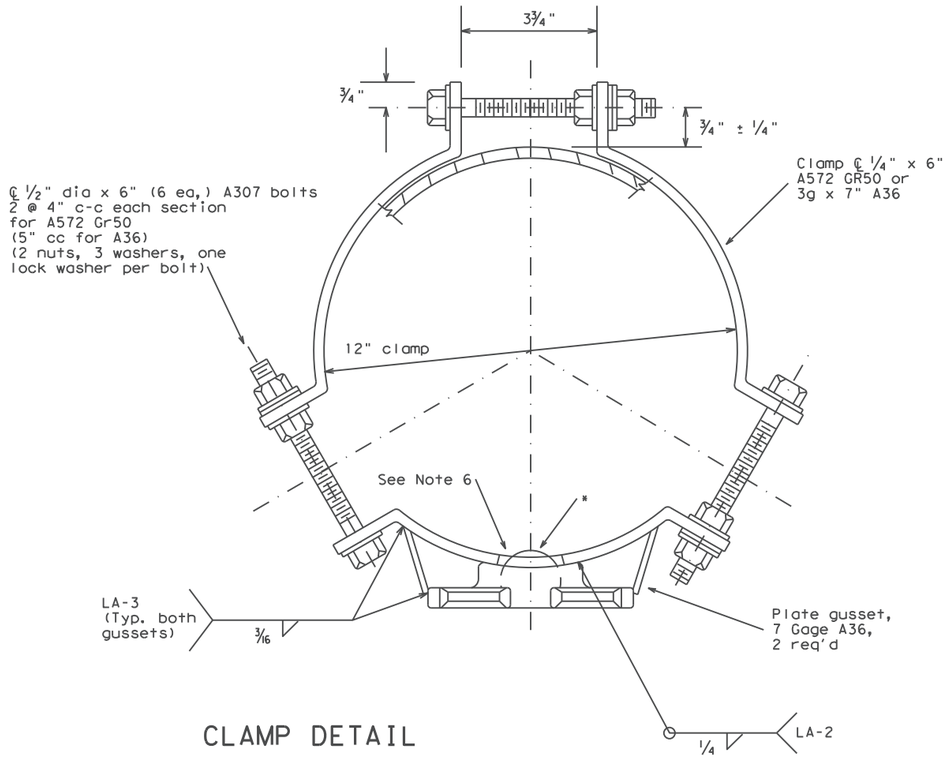
POLE SIMPLEX DETAILS

OTHER MATERIALS:

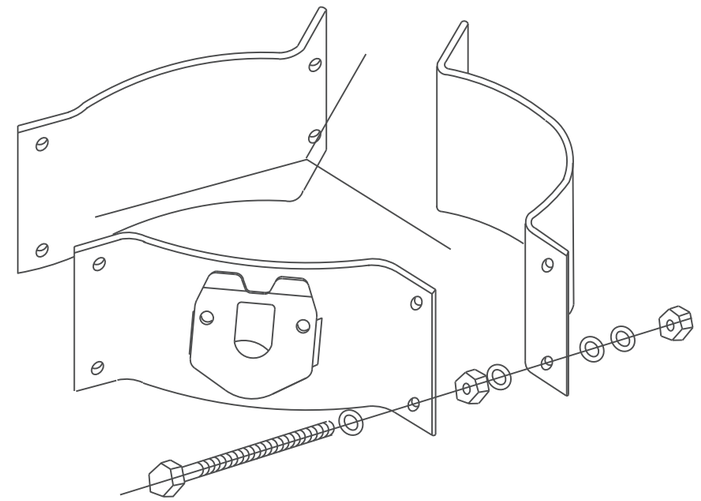
1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.



CLAMP DETAIL



PROJECTION

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

© TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99				CROIX RD
1-12	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		47

DATE:
FILE:

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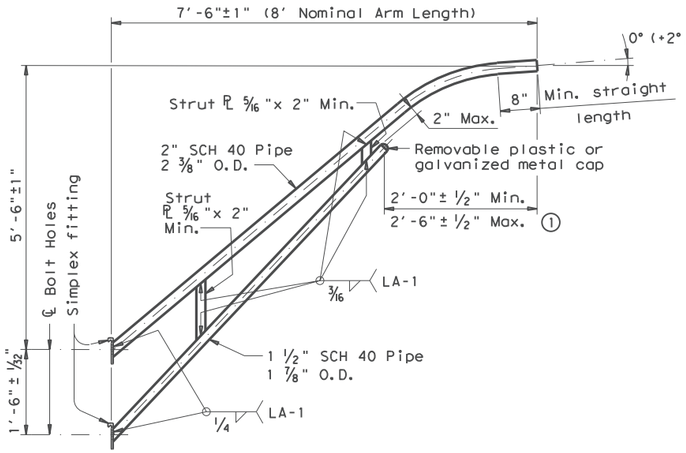
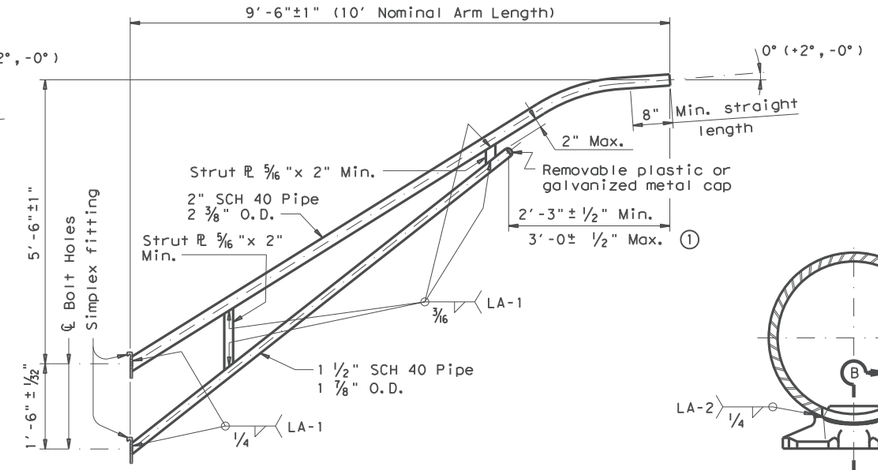


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

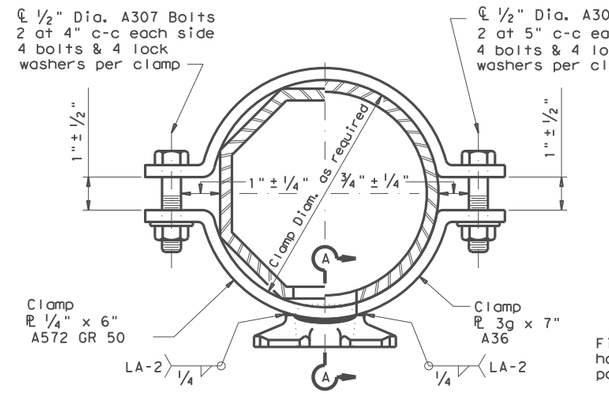
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

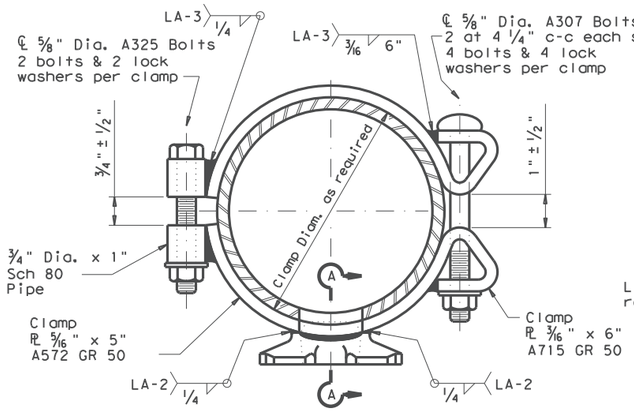
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



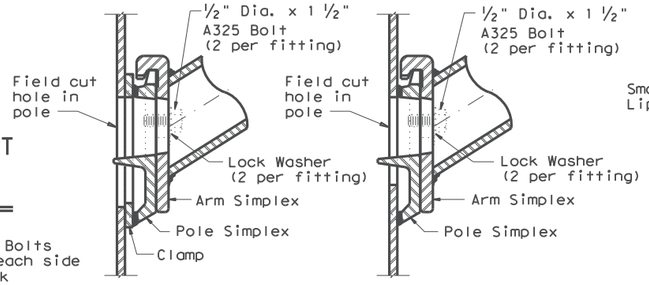
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



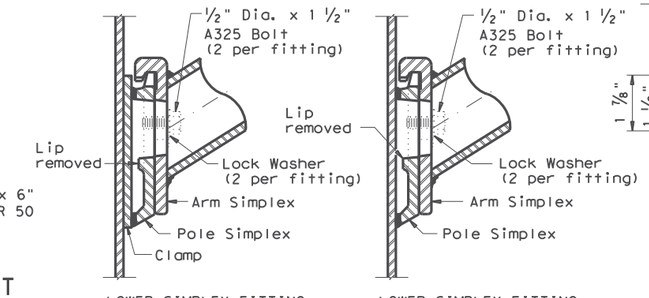
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

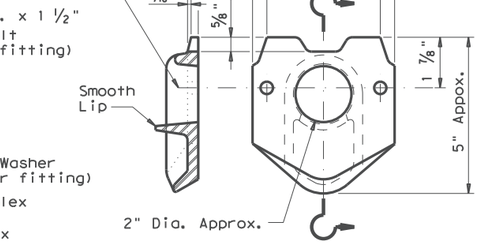


LOWER SIMPLEX FITTING

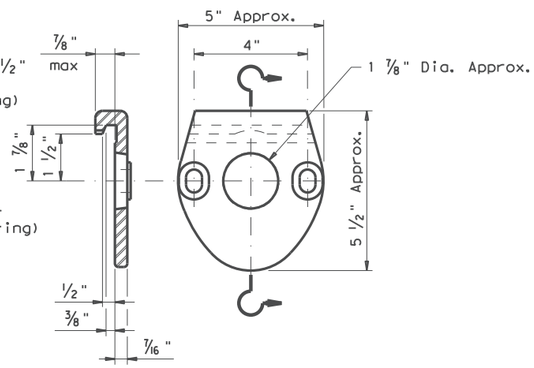
LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

©TxDOT August 1995

DN: LEH	CK: JSY	DW: LTT	CK: TEB

REVISIONS
5-96
1-99
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD

DIST	COUNTY	SHEET NO.
HOU	BRAZORIA	48

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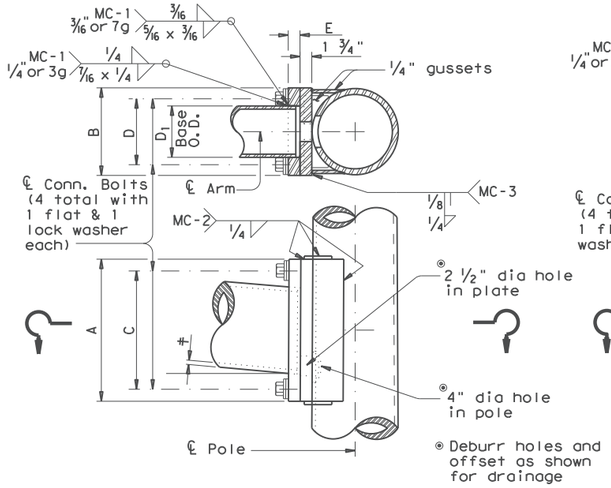
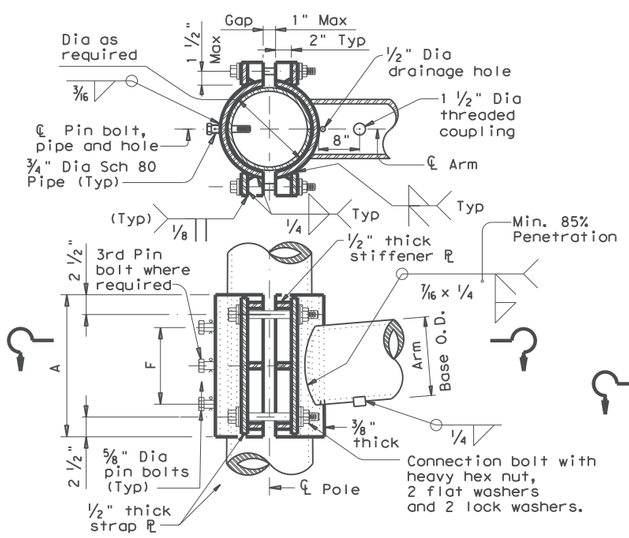
DATE:
FILE:

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	B in.	C in.	D in.	E in.	CONN BOLT DIA in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



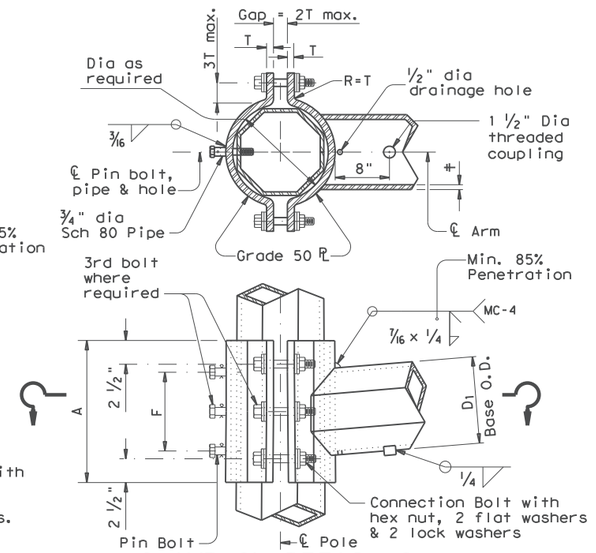
FIXED MOUNT DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 ¼	3	5/8
9.5	.239	18	12	4	1 ¼	3	5/8
10.0	.239	18	12	4	1 ¼	3	5/8

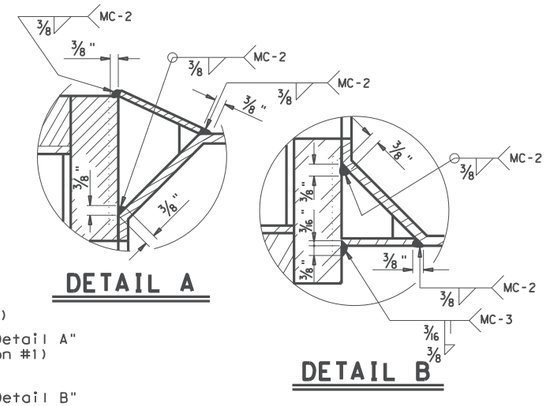


CLAMP-ON DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	T in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

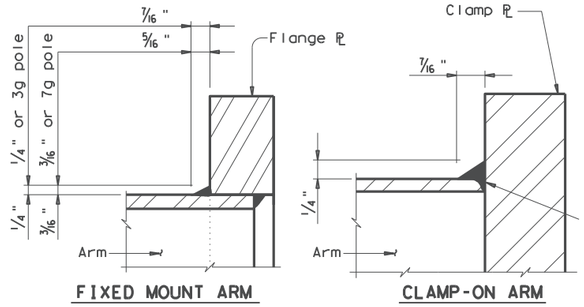


CLAMP-ON DETAIL 2



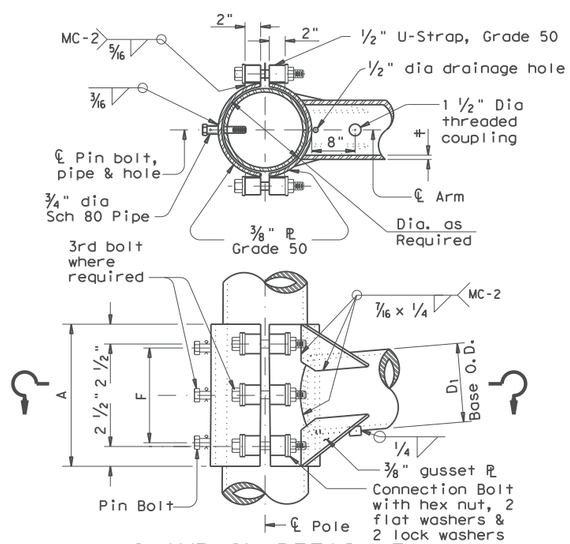
DETAIL A

DETAIL B



ARM BASE WELD DETAILS

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



MATERIALS

Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

©TxDOT August 1995

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
5-09
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		49

126A

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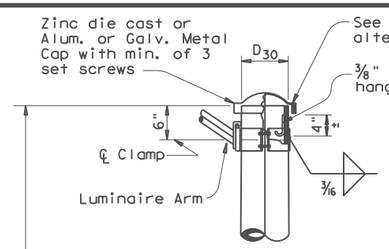
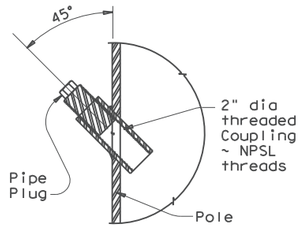
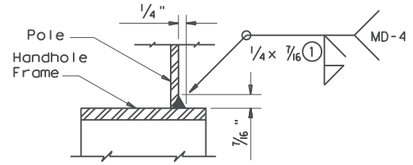


DETAIL A

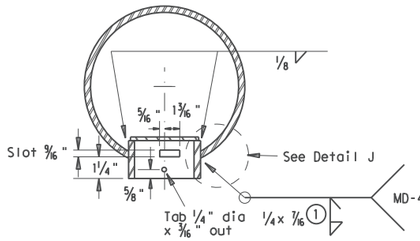
(for pole with luminaire)



POLE COUPLING DETAIL

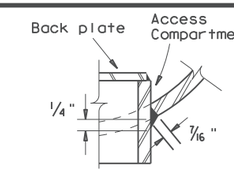


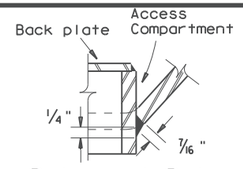
DETAIL G



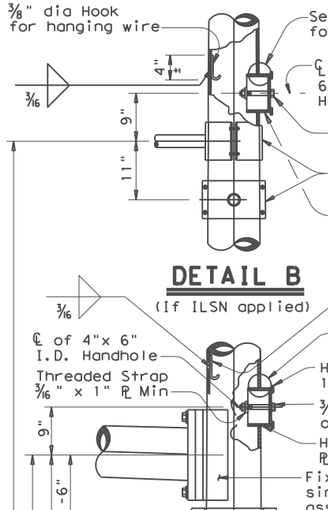
SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



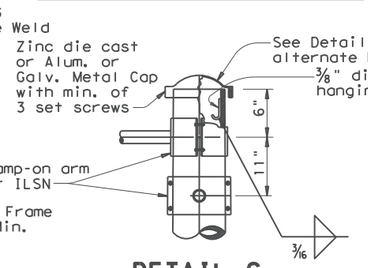


DETAIL J

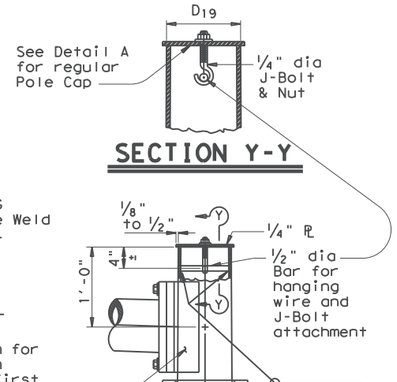


DETAIL B

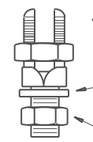
(If ILSN applied)



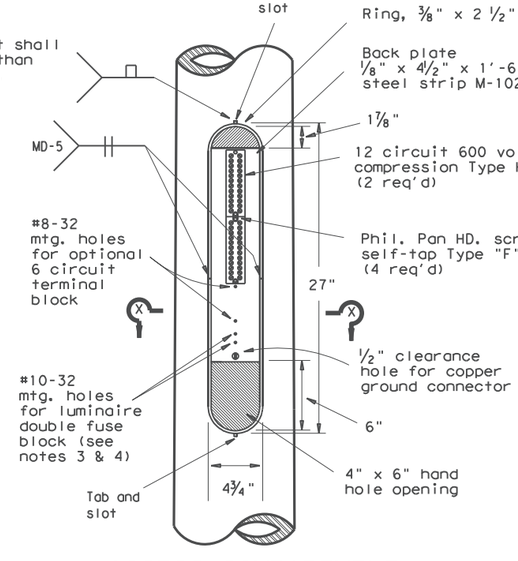
DETAIL C



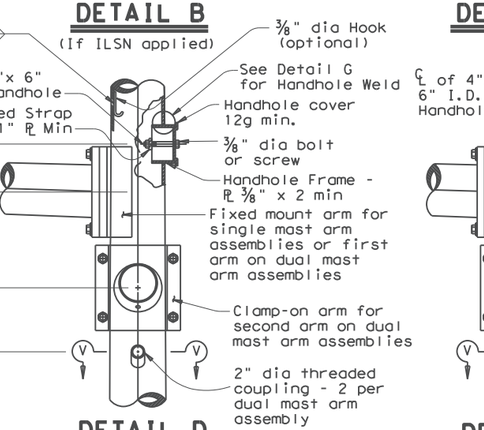
SECTION Y-Y



COPPER GROUND CONNECTOR

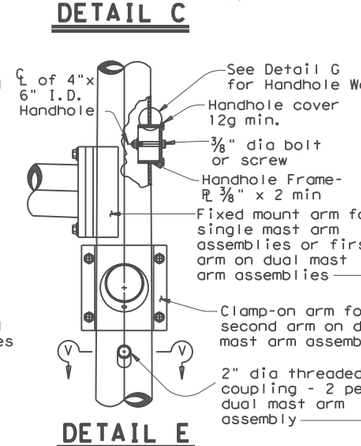


ACCESS COMPARTMENT



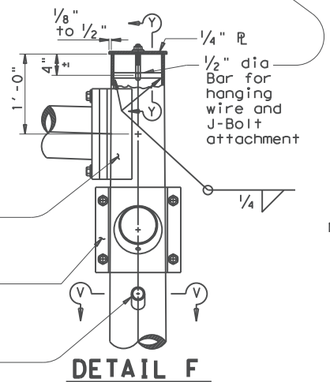
DETAIL D

(for 30' pole with luminaire and ILSN sign)



DETAIL E

(for 24' pole with ILSN sign and no luminaire)



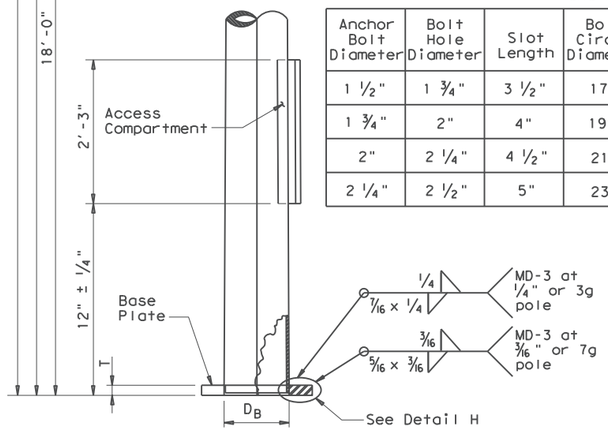
DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

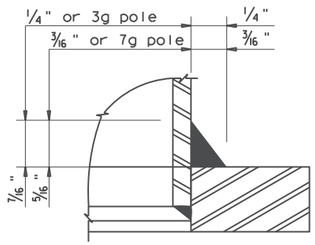


SECTION V-V

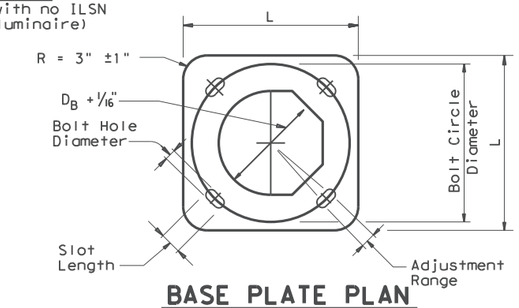
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

© TxDOT August 1995

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
			CROIX RD
DIST	COUNTY		SHEET NO.
HOU	BRAZORIA		50

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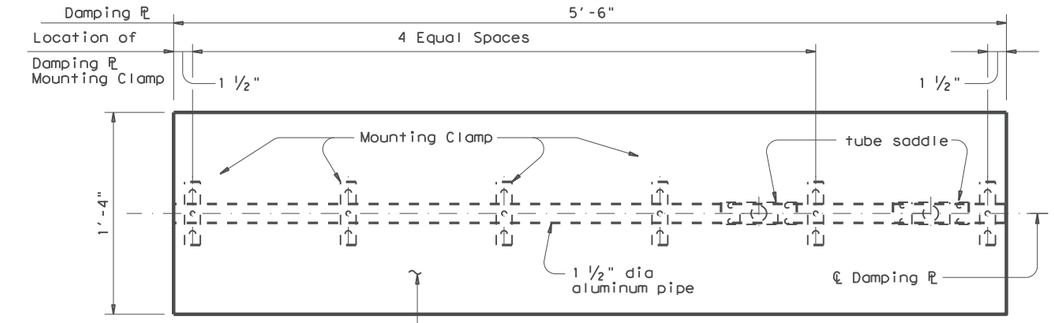
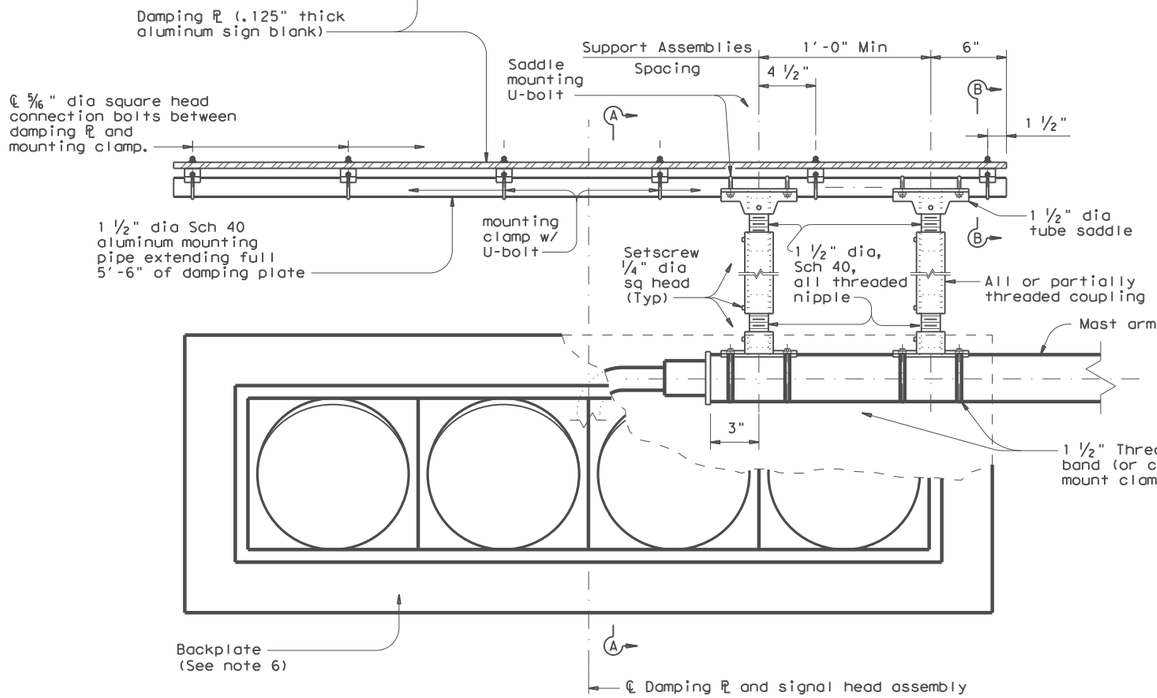


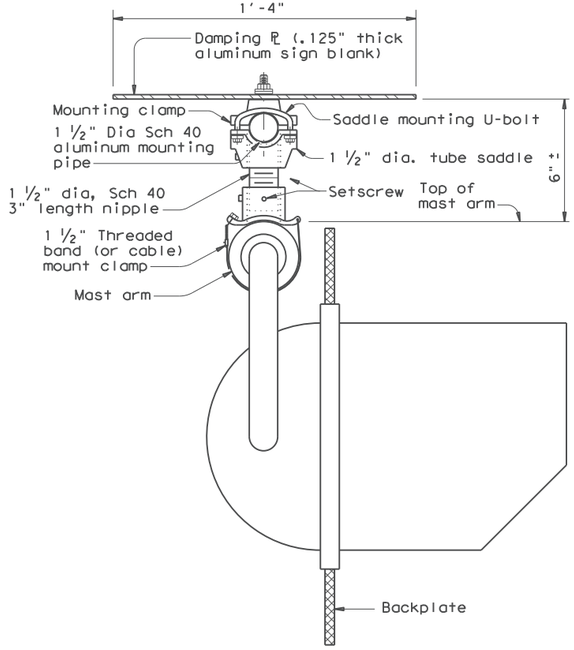
PLAN



ELEVATION

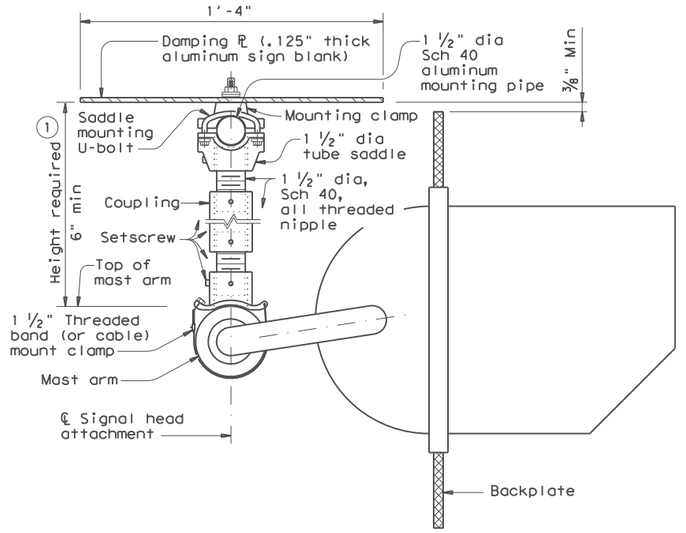
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



SECTION A-A

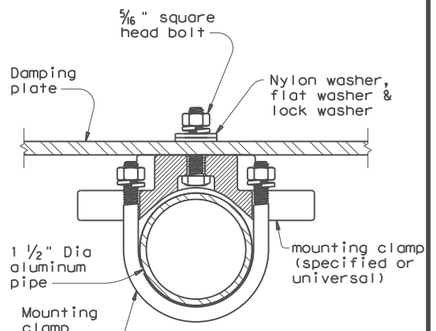
(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.

3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate)and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

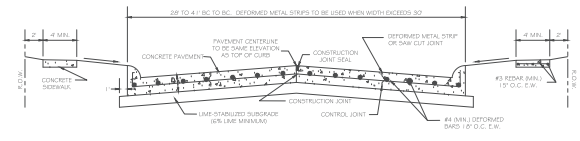
Texas Department of Transportation

Traffic Safety Division Standard

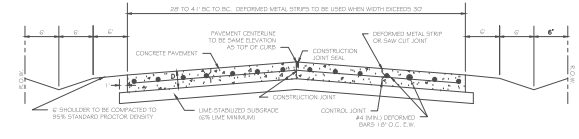
MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

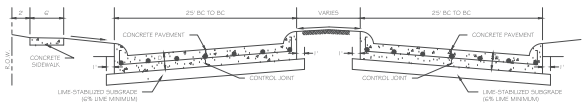
FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
6-20	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		51



SINGLE ROADWAY CURB SECTION



SINGLE ROADWAY OPEN DITCH SECTION

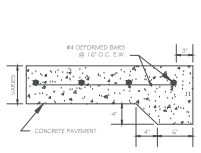


DOUBLE ROADWAY SECTION

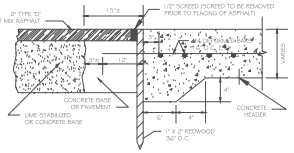
ROADWAY SECTIONS

NOTES:

1. FOR ALL SIX (6) AND SEVEN (7) INCH PAVING USE #4 REBAR ON EIGHTEEN (18) INCH CENTERS EACH WAY.
2. ALL REINFORCING BAR SHALL CONFORM TO ASTM A615-04T AND A305-53T.
3. THE LOCATION OF CONSTRUCTION JOINTS, CONTROL JOINTS AND DEFORMED STRIPS MAY BE VARIED, WITH THE APPROVAL OF THE CITY OF MANVEL, TO SUIT THE PROPOSED CONSTRUCTION METHODS OF THE CONTRACTOR. THE MAXIMUM LENGTH BETWEEN LONGITUDINAL JOINTS SHALL NOT EXCEED 15' - 0".
4. ALL PAVEMENT CROSS-SECTION SHALL EITHER BE HYPERBOLIC OR TANGENT CROWN. MINIMUM SLOPE SHALL BE ONE-QUARTER ¼" INCH PER FOOT.
5. D = SIX (6) INCH OR SEVEN (7) INCH. SEE PAVING CONSTRUCTION ITEMS ON THIS SHEET.
6. MINIMUM SLOPE FOR ANY MEDIAN SHALL BE ONE-HALF ½" INCH PER FOOT.

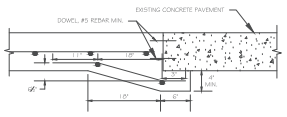


CONCRETE PAVING HEADER

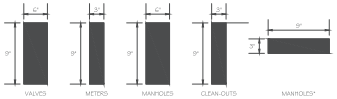


ASPHALT PAVING HEADER

PAVING HEADERS



UNDERCUT DETAIL

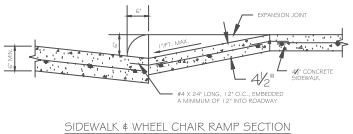


WATER LINES SANITARY SEWER STORM SEWER

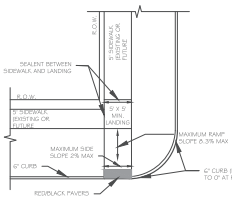
UTILITY MARKINGS

NOTES:

1. SAW CUT CURB OR EDGE AND APPLY APPROPRIATE MARKING AS LISTED BELOW.
2. WATER VALVE MARKING SHALL BE 12" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
3. WATER METER MARKING SHALL BE 3" X 9" IN SIZE MARKED IN BLUE PAINT ON CURB OR EDGE OF STREET.
4. SANITARY SEWER MANHOLE MARKING SHALL BE 12" X 9" IN SIZE MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
5. SANITARY SEWER CLEAN-OUT MARKING SHALL BE 3" X 9" IN SIZE AND MARKED IN GREEN PAINT ON CURB OR EDGE OF STREET.
6. STORM SEWER MANHOLE MARKING SHALL BE 3" X 9" IN SIZE AND MARKED IN BLACK PAINT. *ONLY STORM SEWER MANHOLES SHALL BE MARKED NOT, INLETS.



SIDEWALK & WHEEL CHAIR RAMP SECTION

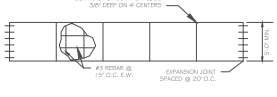


WHEELCHAIR RAMP - PLAN VIEW

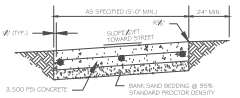
NOTES:

1. ALL RAMPS SHALL BE TXDOT TYPE 7 STYLE WITH REDGBACK PAVERS.
2. RAMP SHALL MEET ADA (AMERICANS WITH DISABILITIES ACT) AND TABA (TEXAS ARCHITECTURAL BARRIERS ACT).
3. CONTRACTOR SHALL MAKE ADJUSTMENTS TO RAMPS TO FIT LOCAL CONDITION.
4. ALL CUTOUTS MUST HAVE BARRICADES INSTALLED UNTIL WHEELCHAIR RAMPS ARE COMPLETED.
5. MINIMUM CLEARANCE WIDTH OF RAMP SHALL BE SIXTY (60) INCHES.
6. FINISH SURFACES OF RAMP AND SIDE SLOPE SHALL BE TREATED WITH COLOR SO THAT THE SURFACES ARE IN CONTRAST WITH SURFACE COLOR OF ADJACENT SIDEWALKS AND STREETS.
7. CONTRAST COLOR OF WHEELCHAIR RAMPS AND SIDE SLOPES SHALL BE THE BLACK PAVERS.
8. CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, LANDING OR TRANSITION TO STREET.

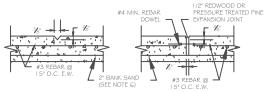
SIDEWALKS AND WHEELCHAIR RAMPS



SIDEWALK PLAN VIEW



SIDEWALK SECTION



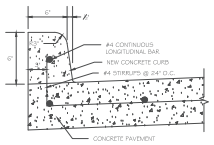
CONTRACTION JOINT

EXPANSION JOINT

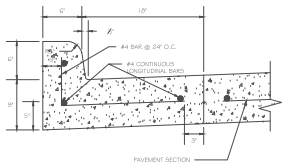
SIDEWALK JOINTS

NOTES:

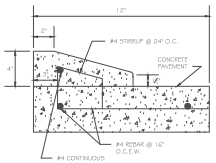
1. ALL EDGES SHALL BE ROUNDED WITH ¼" RADIUS.
2. CONTRACTION JOINTS SHALL BE PLACED AT 5'-0" INTERVALS.
3. CONTRACTION JOINTS SHALL BE ¼" DEEP AND HAVE TROWEL EDGE.
4. ¾" EXPANSION JOINT MATERIAL REQUIRED WHERE SIDEWALKS ABUT BUILDINGS, CURBS, DRIVEWAYS, OR EXISTING SIDEWALKS.
5. EXPANSION JOINTS SHALL BE PLACED AT 20'-0" INTERVALS.
6. 2" INCH CLEAN BANK SAND SHALL BE TAMPED TO 95% STANDARD PROCTOR.
7. WHERE NEW SIDEWALK IS PLACED AGAINST EXISTING SIDEWALK, SAW CUT EXISTING SIDEWALK TO AN EVEN STRAIGHT LINE PRIOR TO INSTALLATION OF THE NEW SIDEWALK INSTALL #4 REBAR DOWEL INTO EXISTING SIDEWALK.
8. PROVIDE 12 INCHES OF DOWEL WITH 6 INCH SLEEVES WHERE NEW SIDEWALK IS PLACED AGAINST PROPOSED OR FUTURE SIDEWALK.



TYPE I - 6" CONCRETE CURB



TYPE II - MONOLITHIC CONCRETE CURB AND GUTTER

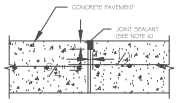


TYPE III - 4" x 12" CONCRETE CURB

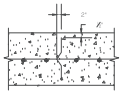
CONCRETE CURB

NOTE:

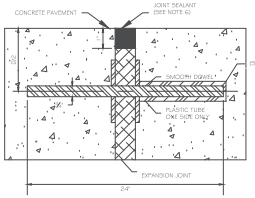
1. WHEN CONCRETE CURB IS TO BE PLACED ON EXISTING CONCRETE BASE - #4 DEFORMED BARS, 7" LONG, 24" O.C. DOWELED 4" MIN. AND SET IN EPOXY.
2. REDWOOD EXPANSION JOINTS SHALL BE INSTALLED AT ALL PAVEMENT EXPANSION JOINTS.
3. MORTAR FINISH IS NOT REQUIRED WHEN CURB IS PLACED BY A MACHINE, BUT CURB SHALL STILL HAVE THE SAME OUTSIDE DIMENSIONS.



CONSTRUCTION JOINT



DEFORMED METAL STRIP

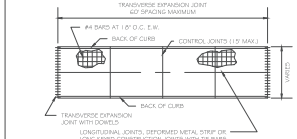


DOWEL EXPANSION JOINT

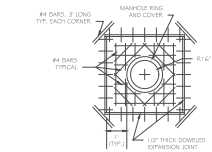
NOTES:

1. CANTILEVER TYPE, CAST MALLEABLE IRON LOAD TRANSMISSION UNIT-STARLUG MODEL D-27 OR EQUAL OR 22" O.C. ARE ACCEPTABLE ALTERNATIVES.
2. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED A MINIMUM OF 60'. MATCH TO EXPANSION JOINTS IN PAVING PANELS.
3. STAKES FOR TRANSVERSE JOINTS SHALL NOT BE PLACED CLOSER THAN 6" TO A LONGITUDINAL JOINT. THE TOP OF STAKE SHALL NOT BE LESS THAN ½" BELOW THE FINISH SURFACE.
4. LOCATION OF CONSTRUCTION JOINTS AND DEFORMED STRIPS MAY BE VARIED WITH THE APPROVAL OF THE CITY, TO SUIT PROPOSED CONSTRUCTION OF THE CONTRACTOR.
5. CONTROL JOINTS SHALL BE SPACED AT A MAXIMUM OF 15'-0".
6. JOINTS AND SEALANTS SHALL ADHERE TO CITY OF MANVEL TECHNICAL SPECIFICATION 02640 - CONCRETE PAVEMENT JOINTS.
7. PLASTIC TUBE SHALL EXTEND BEYOND THE DOWEL AT A LENGTH EQUAL TO THE WIDTH OF THE EXPANSION JOINT.

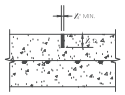
PAVEMENT JOINTS



PAVING PANEL



MANHOLE BLOCKOUT



CONTRACTION JOINT

NOTES:

1. D = DEPTH OF CONCRETE.
2. SAW-CUT CONTRACTION JOINT TO DIMENSIONS SHOWN.

PAVING CONSTRUCTION NOTES:

1. PAVEMENT SUBGRADE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF MANVEL DESIGN CRITERIA MANUAL, LATEST REVISIONS.
2. CONTRACTOR SHALL NOTIFY THE CITY OF MANVEL PERMIT DEPARTMENT (281-489-0630), TWENTY-FOUR (24) HOURS PRIOR TO ALL LIMING AND PAVING OPERATIONS.
3. ALL RETURNS SHALL HAVE A TWENTY-FIVE (25) FOOT RADIUS AT BACK OF CURB UNLESS OTHERWISE NOTED.
4. GUIDELINES SET FORTH IN THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.
5. ALL FILL IN EXISTING OR PROPOSED RIGHTS-OF WAY, INCLUDING BACKDRESSING BEHIND THE CURB, SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF EIGHT (8) INCHES OR LESS AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY WITH A MOISTURE CONTENT OF ± THREE PERCENT (3%) OF OPTIMUM MOISTURE.
6. MINIMUM PAVEMENT REINFORCEMENT REQUIREMENT SHALL BE GRADE SIXTY (60), NO. FOUR (4) REBAR, SPACED AT EIGHTEEN (18) INCH ON CENTERS EACH WAY.
7. ALL PAVEMENT TO BE A MINIMUM OF SIX (6) INCHES THICK REINFORCED CONCRETE UNLESS OTHERWISE NOTED.
8. PAVING EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM OF SIXTY FEET (60').
9. ALL CONCRETE USED FOR PAVEMENT SHALL BE CLASS "A" CONCRETE AND A MINIMUM 4,000 PSI COMPRESSIVE STRENGTH AT TWENTY-EIGHT (28) DAYS AND A MINIMUM OF 6.0 SACKS OF CEMENT PER CUBIC YARD, UNLESS OTHERWISE NOTED.
10. CLASS "A" HYDRATED LIME SHALL BE APPLIED FOR SUBGRADE STABILIZATION AT A MINIMUM OF SIX PERCENT (6%) BY WEIGHT.
11. CONTRACTOR SHALL INSTALL STREET SIGNS AND STOP SIGNS PER CITY OF MANVEL DESIGN CRITERIA MANUAL.
12. ALIGNMENTS, CENTERLINE CURVE DATA, AND STATIONING FOR ALL CONSTRUCTION SHALL BE DETERMINED FROM SUBDIVISION PLAT.
13. FOR ALL CONCRETE TO BE REMOVED, A TWO (2) INCH DEEP SAW CUT SHALL BE PROVIDED PRIOR TO REMOVAL.
14. REPRESENTATIVES FROM THE CITY OF MANVEL, THE OWNER AND THE TESTING LABORATORY SHALL BE PRESENT FOR ALL DENSITY TESTS, LIME OPERATIONS AND PLACEMENT OF CONCRETE PAVING. NO INSPECTABLE WORK CAN BE CONDUCTED ON SATURDAYS.
15. UNDER NO CIRCUMSTANCES SHALL WATER BE ADDED TO A CONCRETE LOAD AFTER SLUMP TEST AND/OR CONCRETE CYLINDERS HAVE BEEN TAKEN.
16. BLUE REFLECTORIZED PAVEMENT MARKERS SHALL BE PLACED AT FIRE HYDRANT LOCATIONS AND OFFSET SIX (6) INCHES FROM THE CENTERLINE OF THE ROADWAY. REFLECTORS SHALL FACE FLOW OF TRAFFIC.
17. FOR PAVEMENT WIDTHS LESS THAN OR EQUAL TO TWENTY-EIGHT (28) FEET B/B OF CURB:

17.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE SIX (6) INCHES.

17.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SIX (6) INCHES.

18. FOR PAVEMENT WIDTHS GREATER THAN TWENTY-EIGHT (28) FEET B/B OF CURB AND ALL MAJOR ARTERIAL THOROUGHFARES:

18.1. MINIMUM STABILIZED SUBGRADE THICKNESS SHALL BE EIGHT (8) INCHES.

18.2. MINIMUM CONCRETE SLAB THICKNESS SHALL BE SEVEN (7) INCHES.

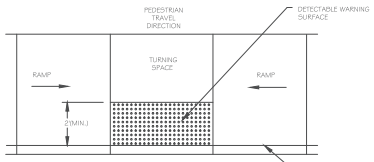
19. BLOCKOUTS SHALL BE INSTALLED AROUND ALL MANHOLES, JUNCTION BOXES, WATER VALVES, ETC. THAT LIE WITHIN THE PAVEMENT AREA. BLOCKOUTS SHALL EXTEND A MINIMUM OF SIX (6) INCHES PAST THE LARGEST DIMENSION OF THE ITEM THAT IS BEING BLOCKED OUT AND SHALL HAVE AN EXPANSION JOINT BETWEEN THE BLOCKOUT AND THE PAVING.
20. CITY UTILITIES UNDER COMMERCIAL PAVED DRIVEWAYS, PARKING LOTS OR STRUCTURES SHALL HAVE A TEN (10) FOOT WIDE EXPANSION JOINT CENTERED OVER THE CITY UTILITY.
21. FLY ASH IS NOT ALLOWED IN ANY CONCRETE MIX DESIGN.

DATE APPROVED:	JANUARY 20, 2020
REVISED DATE:	JANUARY 20, 2020 SCALE: NTS

PAVING
STANDARD DETAILS 1 OF 2

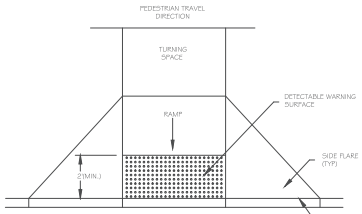
PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		52

DETECTABLE WARNING SURFACE DETAILS



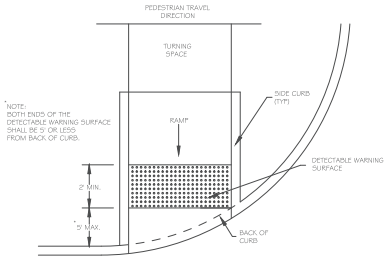
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



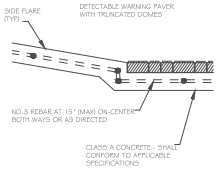
PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



SECTION VIEW DETAIL

CURB RAMP AT DETECTABLE WARNINGS

DETECTABLE WARNING MATERIAL

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPLYING WITH PROWAG. THE SURFACE MUST CONTRAST VISUALLY WITH ADJOINING SURFACES, INCLUDING SIDE FLARES. FURNISH AND INSTALL AN APPROVED CAST-IN-PLACE DARK BROWN OR DARK RED DETECTABLE WARNING SURFACE MATERIAL ADJACENT TO UNCOLORED CONCRETE, UNLESS SPECIFIED ELSEWHERE IN THE PLANS.
2. DETECTABLE WARNING MATERIALS MUST MEET TXDOT DEPARTMENTAL MATERIALS SPECIFICATION DMS 4350 AND BE LISTED ON THE MATERIAL PRODUCER LIST. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. DETECTABLE WARNING SURFACES MUST BE FIRM, STABLE AND SLIP RESISTANT.
4. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24 INCHES IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL WIDTH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
5. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS AT THE BACK OF CURB AND NEITHER END OF THAT EDGE IS GREATER THAN 5 FEET FROM THE BACK OF CURB. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.
6. SHADED AREAS ON SHEET 2 OF 2 INDICATE THE APPROXIMATE LOCATION FOR THE DETECTABLE WARNING SURFACE FOR EACH CURB RAMP TYPE.

DETECTABLE WARNING PAVERS (IF USED)

7. FURNISH DETECTABLE WARNING PAVER UNITS MEETING ALL REQUIREMENTS OF ASTM C-936, C-33. LAY IN A TWO BY TWO UNIT BASKET WEAVE PATTERN OR AS DIRECTED.
8. LAY FULL-SIZE UNITS FIRST FOLLOWED BY CLOSURE UNITS CONSISTING OF AT LEAST 25 PERCENT (25%) OF A FULL UNIT. CUT DETECTABLE WARNING PAVER UNITS USING A POWER SAW.

DATE APPROVED: JANUARY 20, 2026	
REVISED DATE:	JANUARY 20, 2026 SCALE: NTS

PAVING
STANDARD DETAILS 2 OF 2

PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		52A

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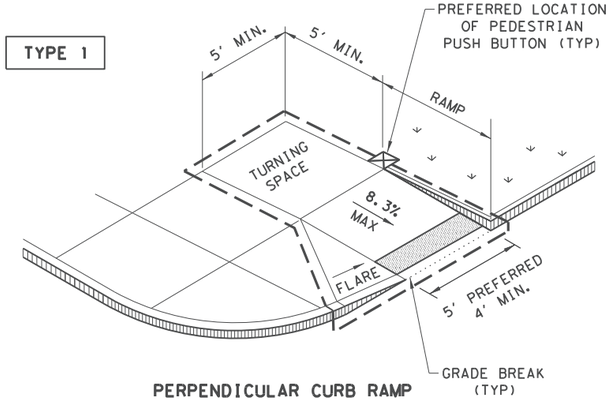
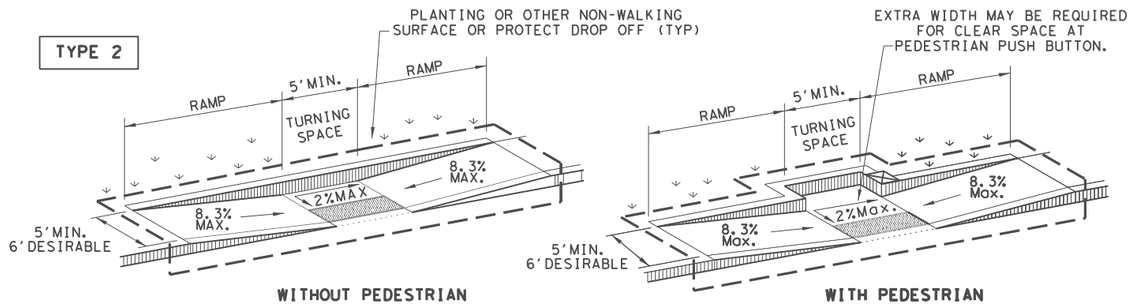
DATE: 3/10/2026
FILE: c:\pwworkdir\bgepw-projects\timtran@bgeinc.com\dms53696\ped18-1.dgn

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

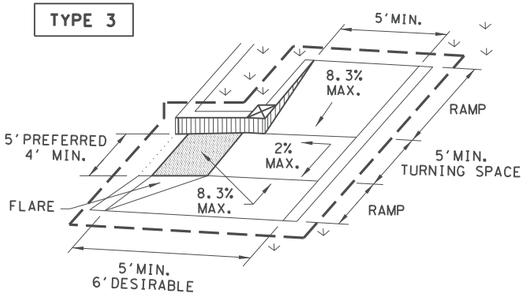


WITHOUT PEDESTRIAN PUSH BUTTON

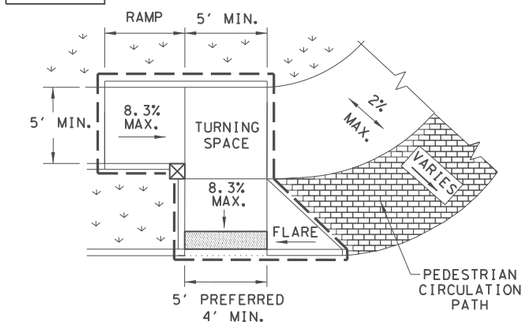
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

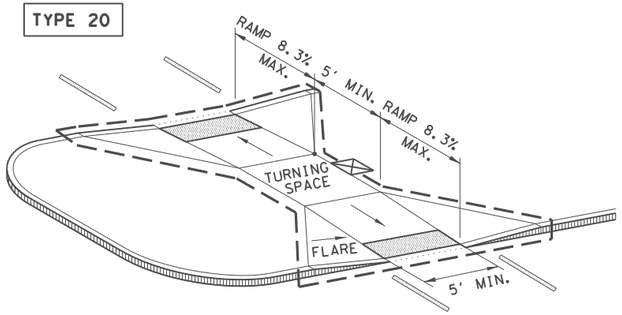


TYPE 6



COMBINATION CURB RAMPS

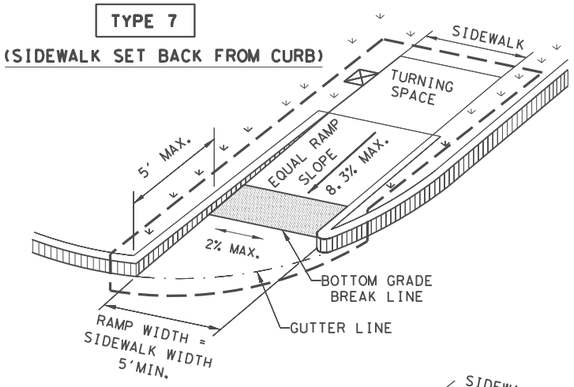
TYPE 20



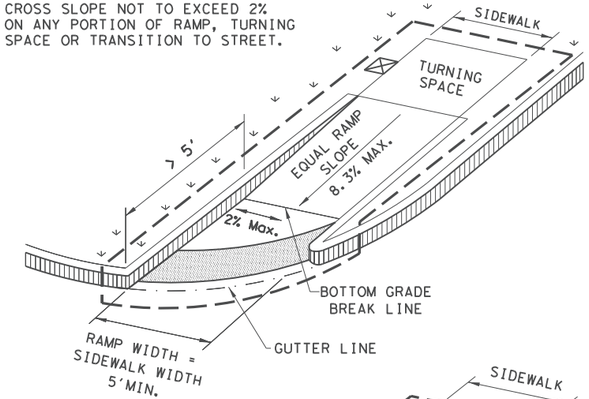
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

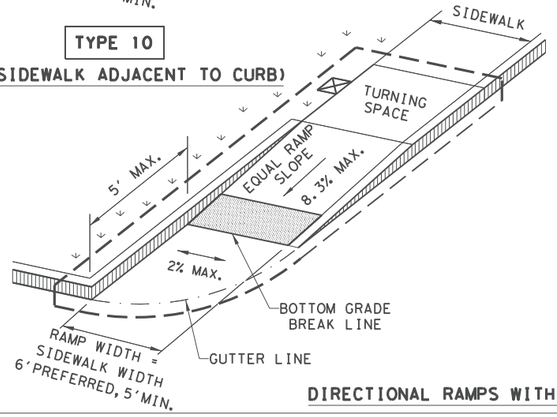


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

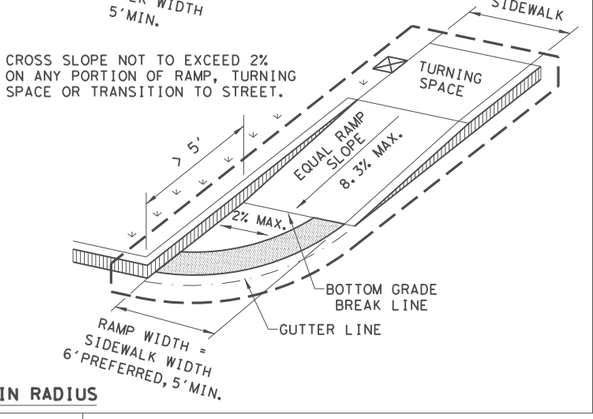


TYPE 10

(SIDEWALK ADJACENT TO CURB)

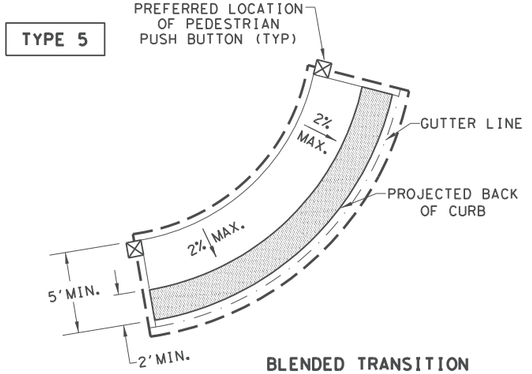


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

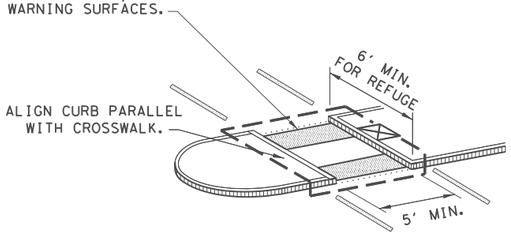
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

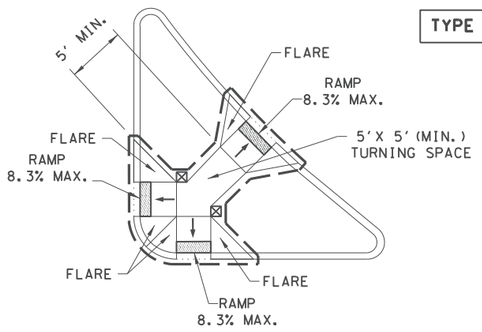
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



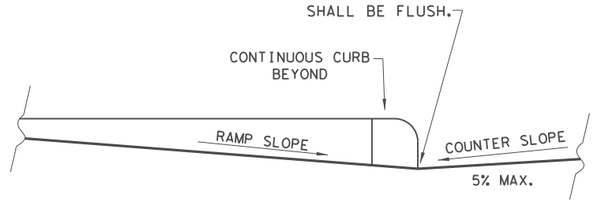
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				CROIX RD
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		53

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DATE: 3/10/2026
FILE: c:\pwworkdir\bgepw-projects\timtran@bgeinc.com\dms53696\ped18-2.dgn

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

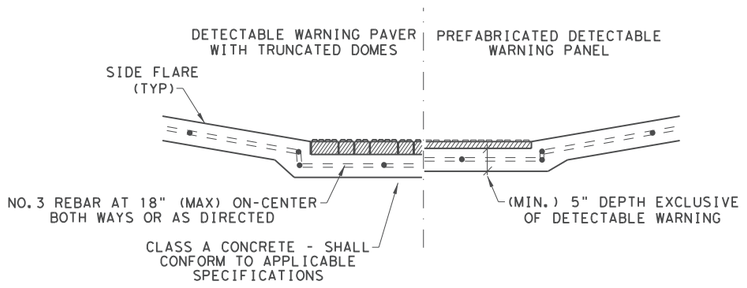
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

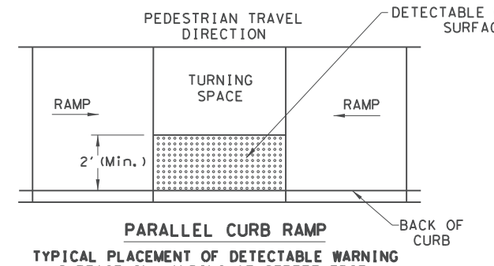
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

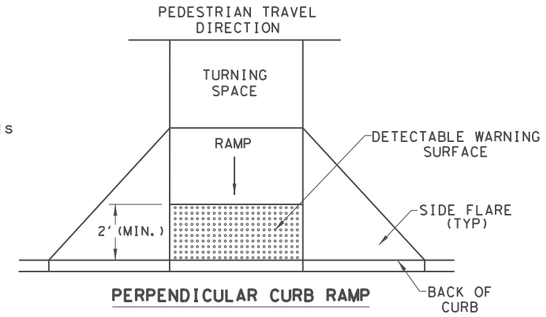


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

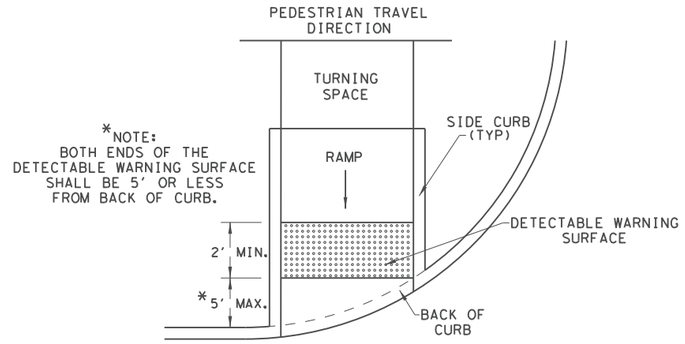
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

SHEET 2 OF 4

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS					CROIX RD
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.
	HOU	BRAZORIA			54

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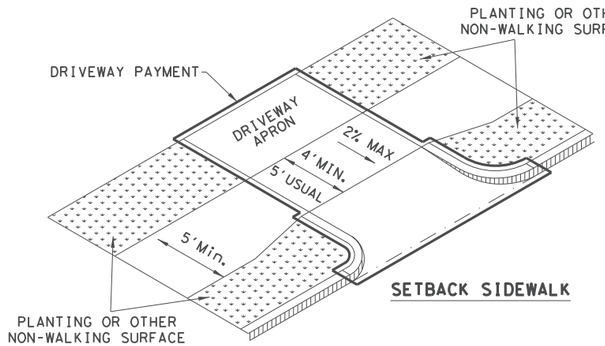
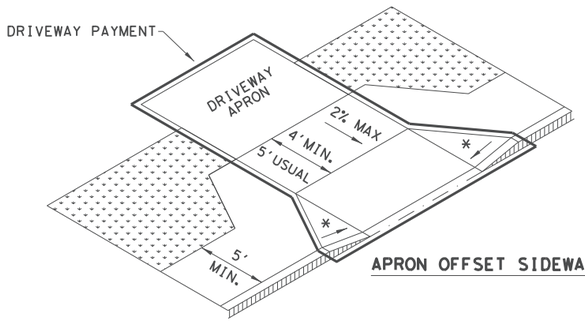
DATE: 3/10/2026
FILE: c:\pwworkdir\bgepw-projects\timtran@bgeinc.com\dms53696\ped18-3.dgn

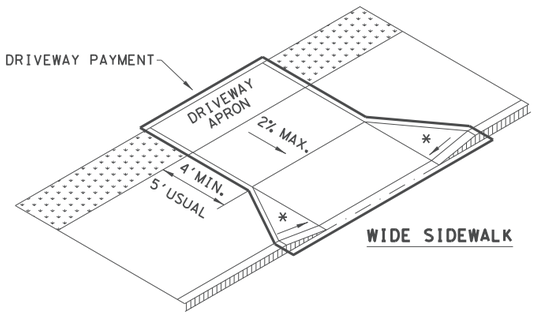
SIDEWALK TREATMENT AT DRIVEWAYS



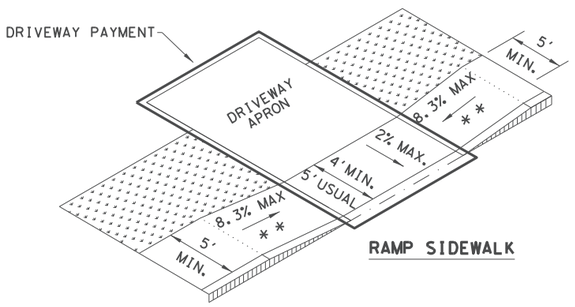
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

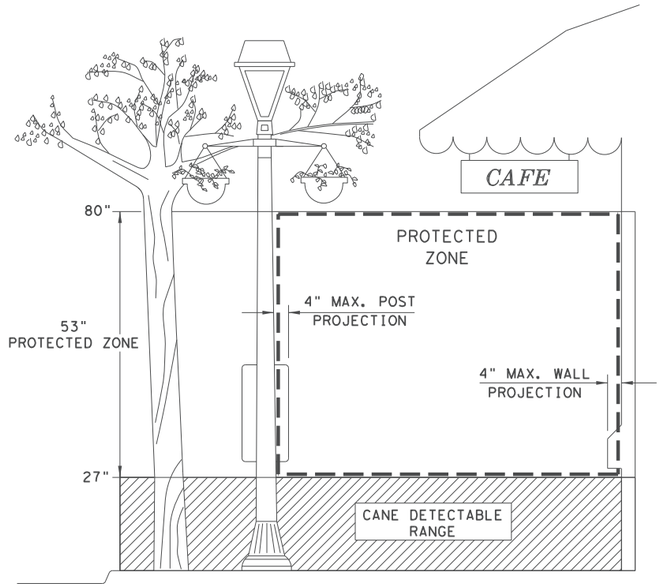


RAMP SIDEWALK

NOTES:

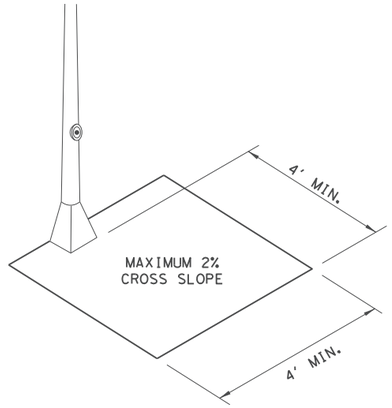
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

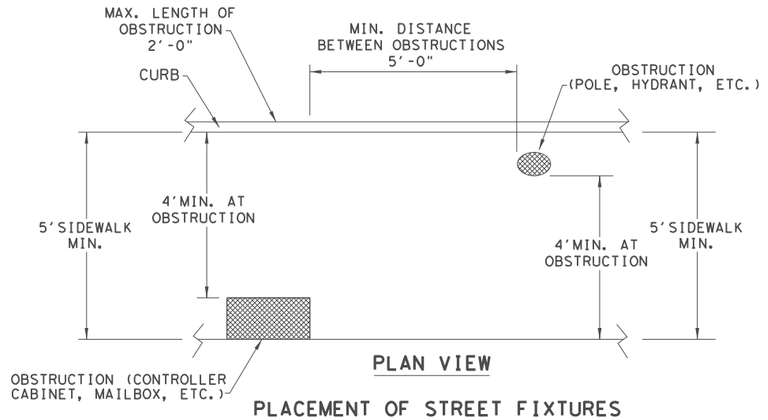


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



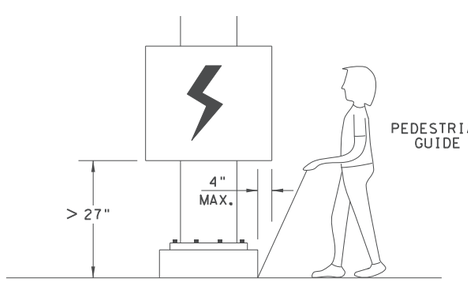
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



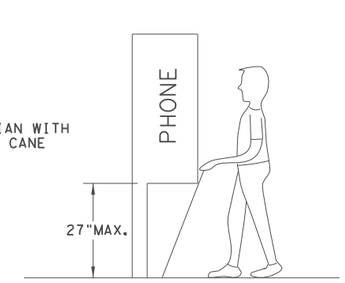
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS				CROIX RD	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.	
	HOU	BRAZORIA		55	

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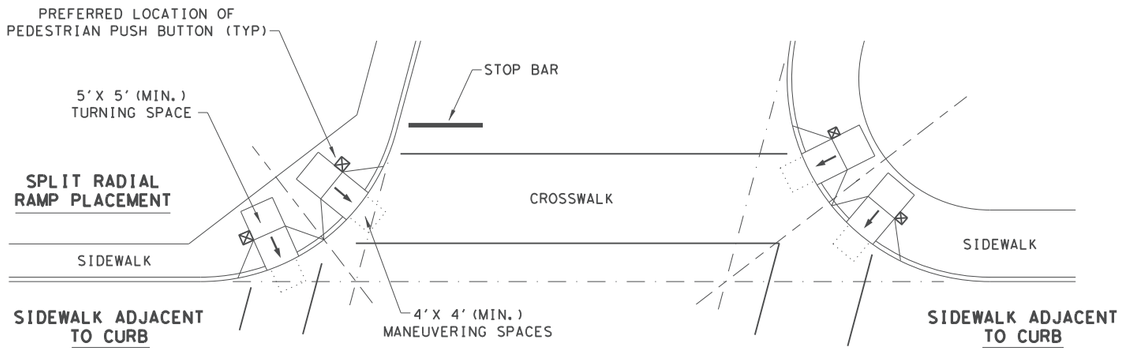
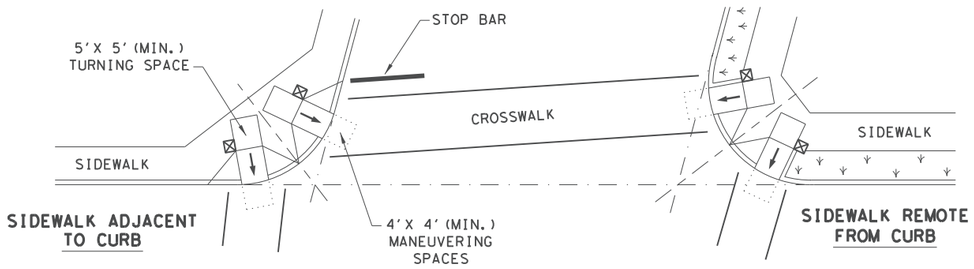
FILE: c:\pwworkdir\bgepw-projects\timtran@bgeinc.com\dms53696\ped18-4.dgn

TYPICAL CROSSING LAYOUTS

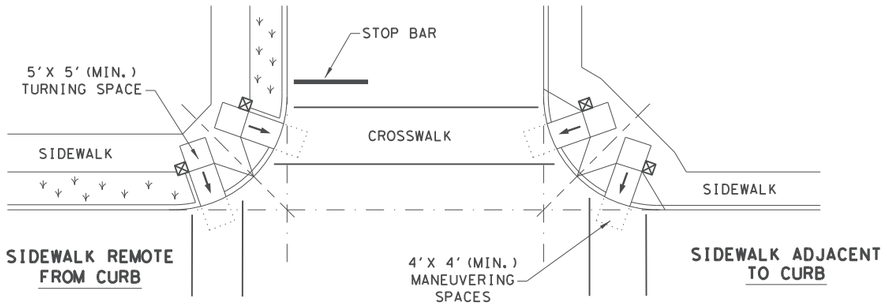
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



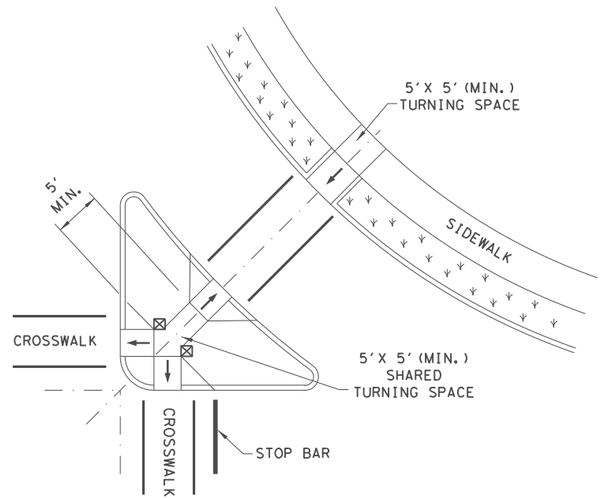
SKEWED INTERSECTION WITH "LARGE" RADIUS



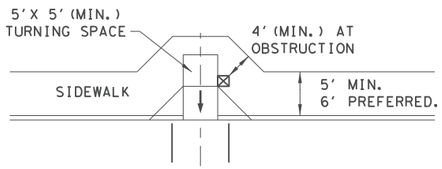
SKEWED INTERSECTION WITH "SMALL" RADIUS

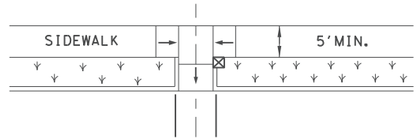


NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND





MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

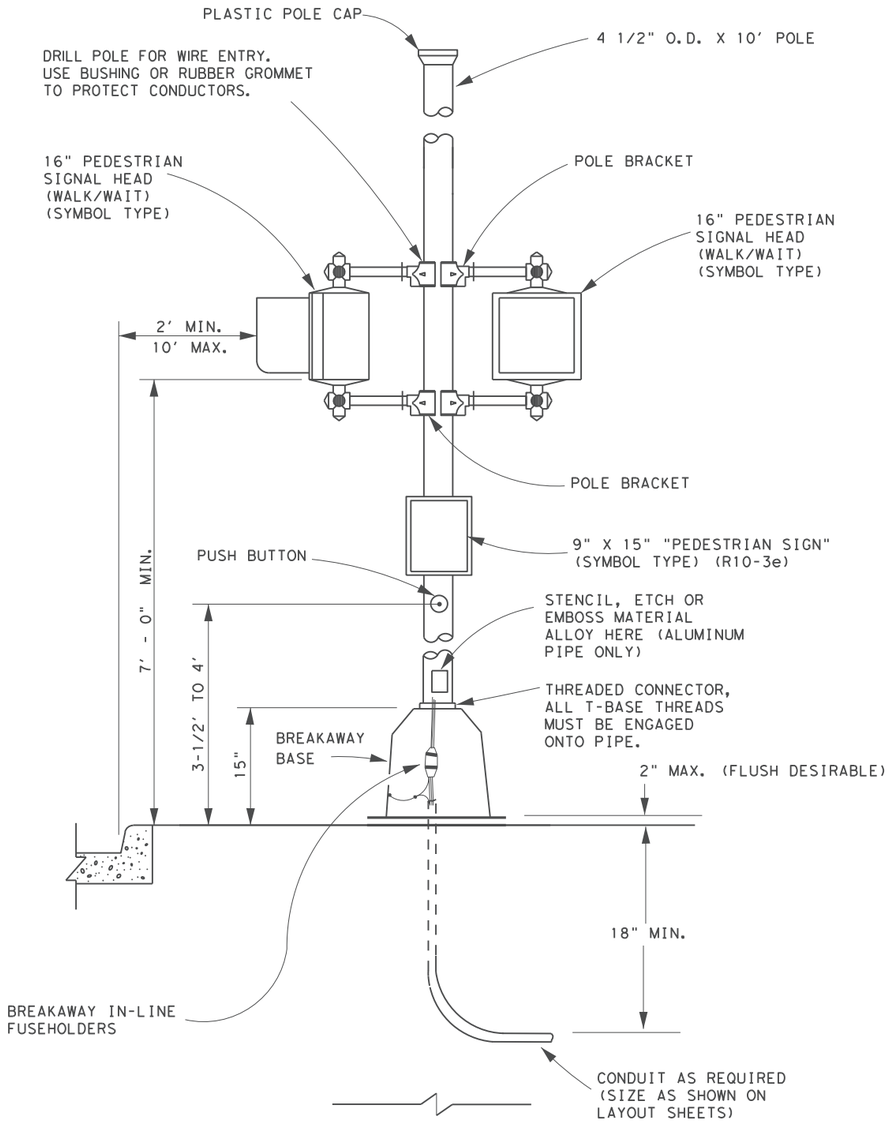
Texas Department of Transportation

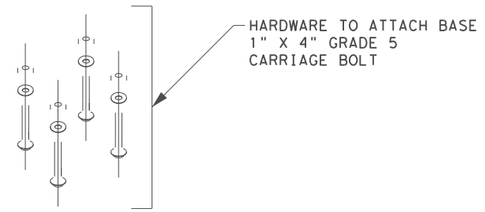
Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

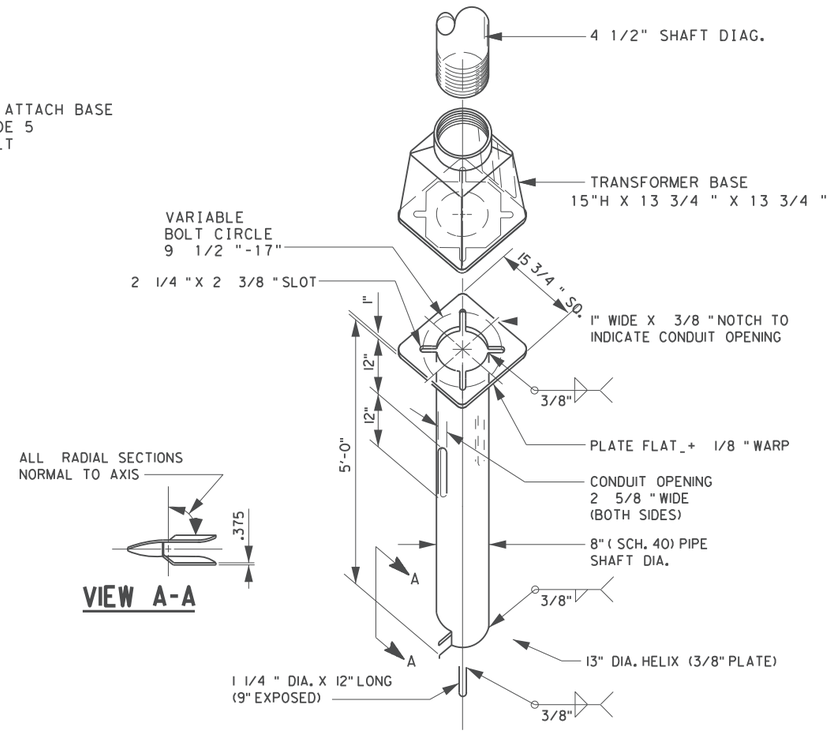
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS					CROIX RD
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	HOU	BRAZORIA			56





HARDWARE DETAIL



VIEW A-A

SCREW ANCHOR FOUNDATION DETAIL

NOTE:

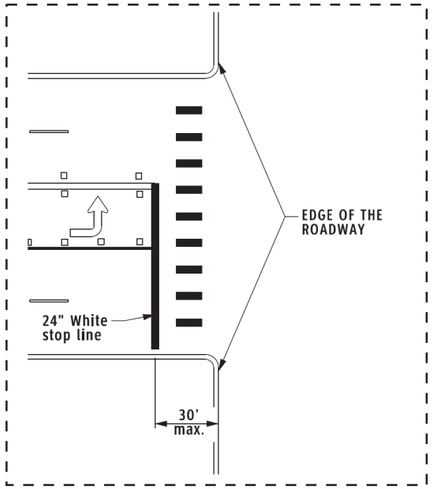
SEE STANDARD (RFBA - 13) FOR NOTES AND
NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

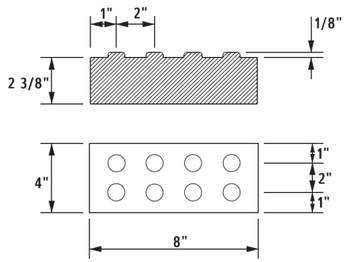
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED PEDESTRIAN SIGNALS

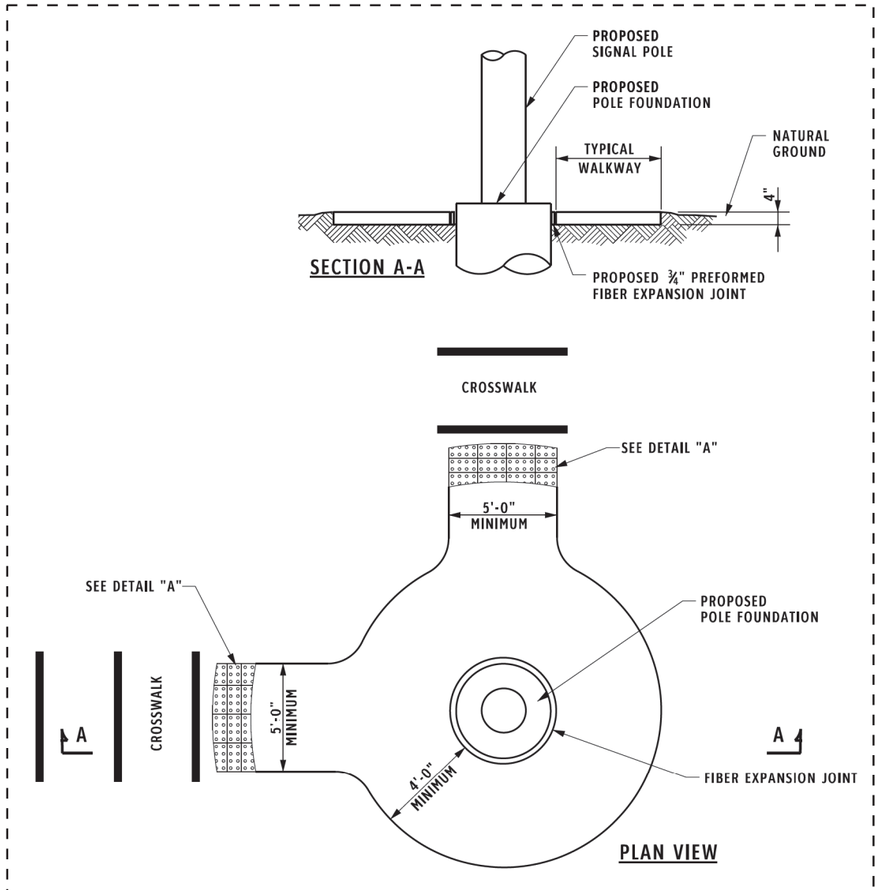
CD/PMPS

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 04-05 11-08 02-15 05-05 01-14 03-07 07-14	HOU	6		57
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	BRAZORIA				CROIX RD





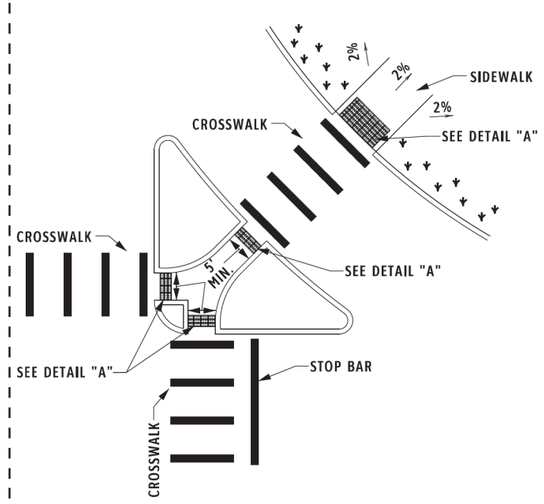
DETAIL "A"



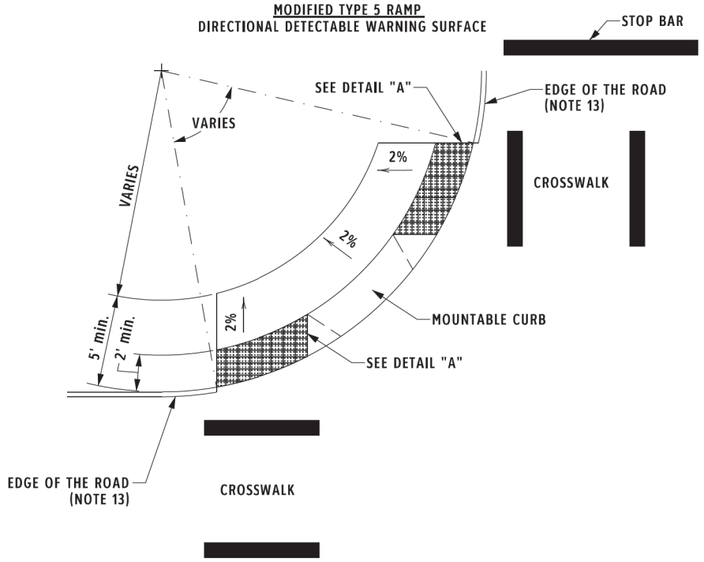
PLAN VIEW

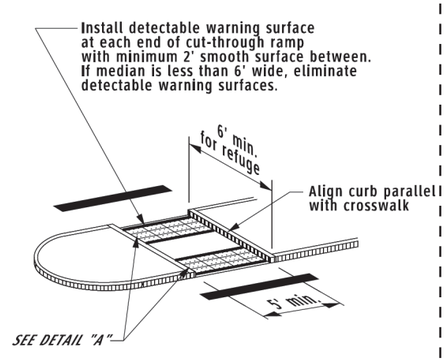
Pedestrian Facilities
General Notes

1. All slopes are maximum allowable. The least possible slope that will still drain properly should be used. Adjust access pad length or grade of approach sidewalks as directed.
2. Detectable Warning Paver shown in Detail "A" will be subsidiary to the Bid Item 531.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the edge of pavement, a 6' sidewalk width is encouraged. Where a 5' sidewalk can not be provided due to site constraints, a minimum 3' sidewalk with 5'x 5' passing areas at intervals not to exceed 200' is required.
4. Landings shall be 5'x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Additional information on access pads/sidewalks location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC §68.102.
8. To serve as a pedestrian refuge area, the median should be a minimum of 5' wide. Medians should be designed to provide accessible passage over or through them.
9. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
10. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.
11. Access pads/side walks and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
12. Provide a smooth transition where the access pad/side walk connect to the street.
13. If ramps are in rural locations, curbs may not exist and shoulders may be present.



MODIFIED TYPE 5 RAMP
DIRECTIONAL DETECTABLE WARNING SURFACE





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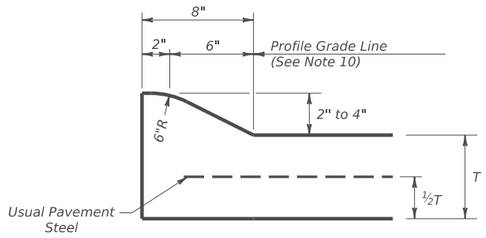
TEXAS DEPARTMENT OF TRANSPORTATION
HOUSTON DISTRICT

ACCESS PAD RAMP DETAILS

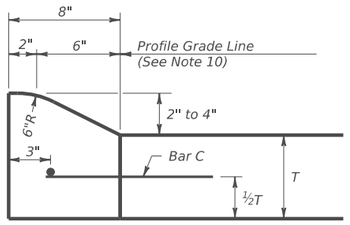
ACCRD

SCALE	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY
N. T. S.	6	TEXAS					CROIX RD
REVISIONS	STATE DISTRICT	COUNTY		CONTROL	SECTION	JOB	SHEET NO.
	HOU	BRAZORIA					58

DATE: $DATE$ $TIME$
FILE: $FILE$



TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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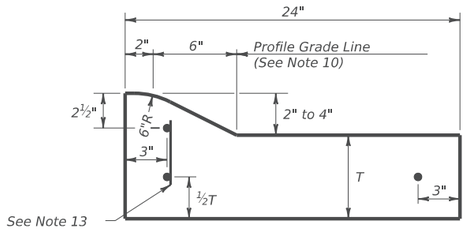
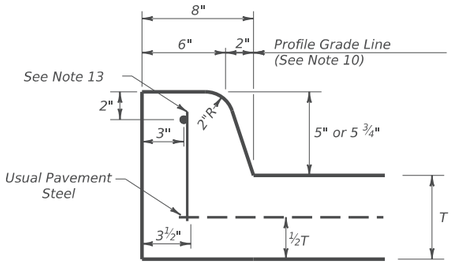
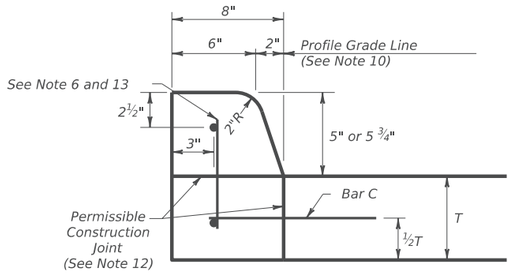


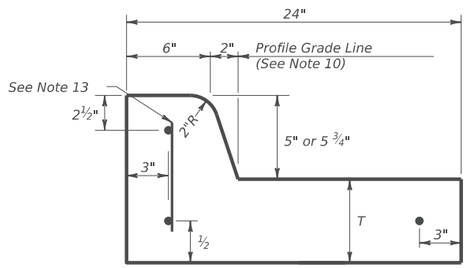
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



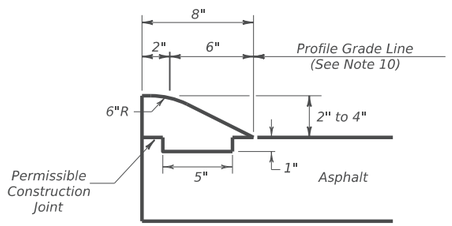
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



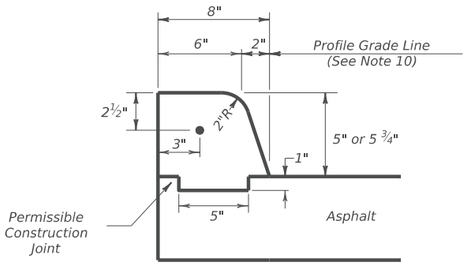
TYPE II CURB
5" - 5 ¾" HEIGHT



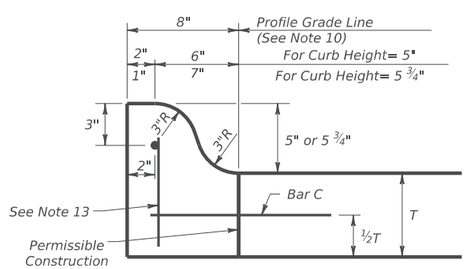
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



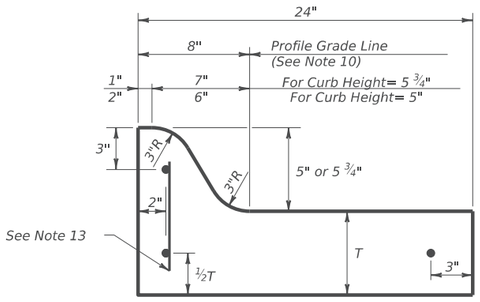
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT

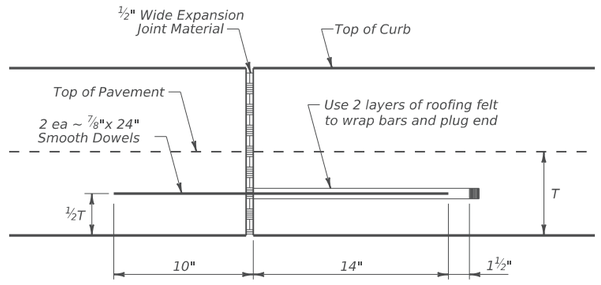


TYPE IIa CURB
5" - 5 ¾" HEIGHT

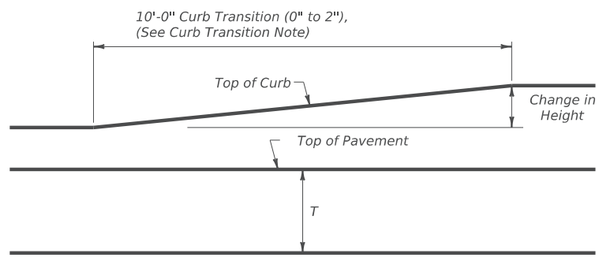


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans,or as directed by the Engineer.



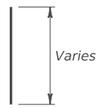
EXPANSION JOINT DETAIL



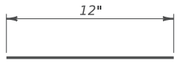
CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



BAR B



BAR C

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Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
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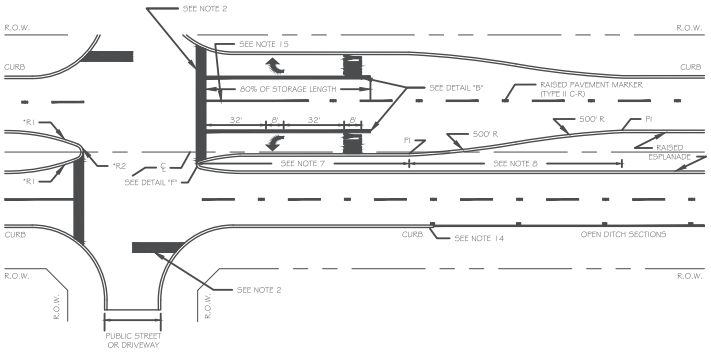
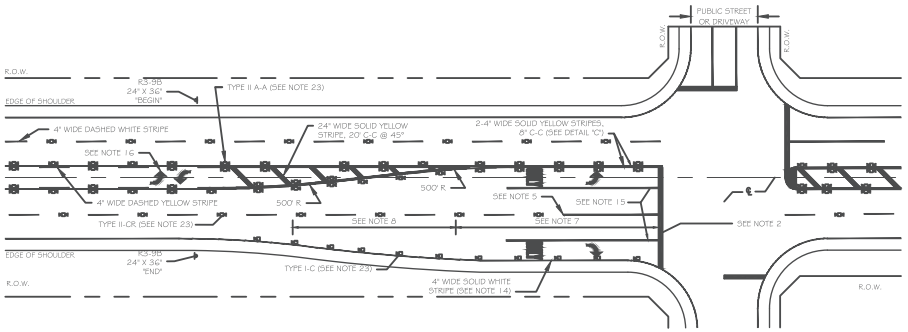
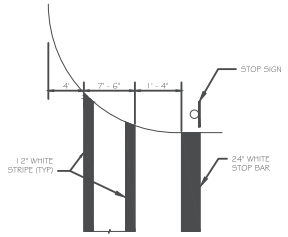
REVISIONS				CROIX RD
	DIST	COUNTY		SHEET NO.
	HOU	BRAZORIA		59



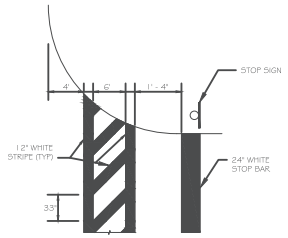
TYPICAL RAISED ESPLANADE SECTION



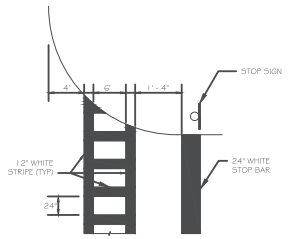
TYPICAL TWO-WAY LEFT TURN SECTION



STANDARD TYPE



SCHOOL ZONE TYPE 1

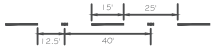


SCHOOL ZONE TYPE 2

TYPICAL CROSSWALK PLACEMENT

ESPLANADE	*R1	*R2
<8'	N/A	W/2
8'-38'	90'	W/5
>38'	N/A	15'

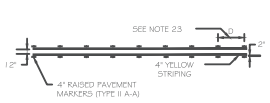
RADIUS DIMENSIONS



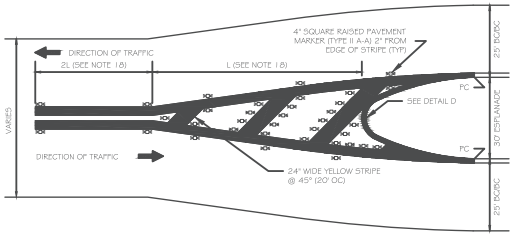
DETAIL "A"



DETAIL "B"



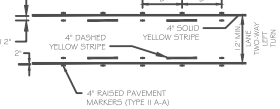
DETAIL "C"



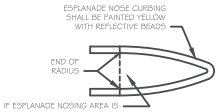
UNDIVIDED STREET TO ESPLANADE SECTION



DETAIL "D"



DETAIL "E"



ESPLANADE NOSING PLAN VIEW

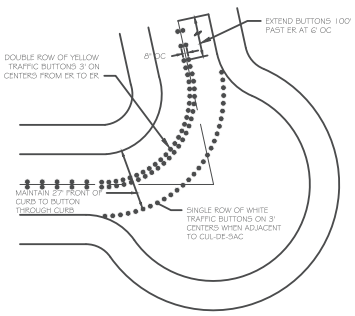


TYPICAL CURB SECTION

DETAIL "F"

NOTE:

1. PAINT FROM THE BACK OF THE CURB TO THE GUTTER LINE.



TYPICAL BUTTON DETAIL FOR CURVES > 60°

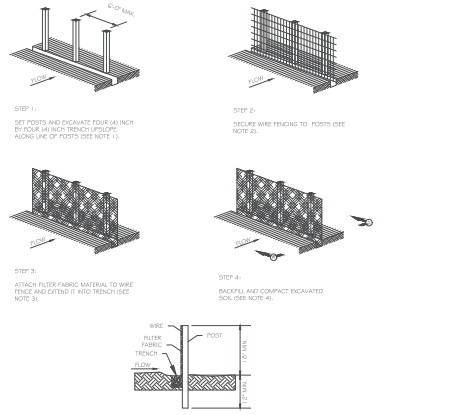
PERMANENT PAVEMENT MARKING CONSTRUCTION NOTES:

1. IF A CROSSWALK IS REQUIRED, SEE TYPICAL CROSSWALK PLACEMENT DETAIL AND CONFIRM WITH CITY TYPE TO BE USED AND LOCATION OF CROSSWALK.
2. ALL INTERSECTIONS WHERE A STOP SIGN/SIGNAL IS LOCATED SHALL HAVE A STOP BAR. STOP BARS SHALL BE LOCATED 4'-0" BEHIND CROSSWALKS, WHERE PEDESTRIAN CROSSWALKS ARE PROVIDED. STOP BARS SHALL BE 24" WIDE SOLID WHITE STRIPE EXTENDING ACROSS ALL APPROACH LANES TO INDICATE THE POINT AT WHICH THE STOP IS INTENDED OR REQUIRED TO BE MADE.
3. CROSSWALKS SHALL BE A MINIMUM INSIDE WIDTH OF 5'. AT LOCATIONS WHERE ADDITIONAL VISIBILITY IS REQUIRED, WHERE TRAFFIC CONTROL DEVICES ARE NOT PRESENT, CONTINENTAL TYPE CROSSWALKS SHALL BE USED.
4. NOT ALL INTERSECTIONS ARE FOUR-WAY STOP CONTROLLED. AS SUCH, NOT ALL STRIPING AND MARKINGS MAY APPLY.
5. ON APPROACH TO INTERSECTION - BEGINNING WITH STOP BAR, INSTALL A 4" WIDE SOLID WHITE LINE FOR 50' FROM BACK OF STOP BAR, SKIP 25' AND BEGIN NORMAL LANE LINE.
6. ON EXIT FROM INTERSECTION - BEGINNING WITH THE CROSSWALK, OR 12' FROM CURB LINE OF INTERSECTING STREET, INSTALL 4" SOLID WHITE LINE FOR 50' AND BEGIN NORMAL LANE LINE.
7. TURN STORAGE BAYS SHALL BE A MINIMUM OF 100' FOR MINOR STREETS AND 150' FOR MAJOR STREETS.
8. TRANSITIONS TO STORAGE BAYS SHALL BE A MINIMUM OF 100', THOUGH 160' IS DESIRABLE.
9. ALL STREET CROSSINGS SHALL COMPLY WITH T.A.S AND A.D.A DETAILS AND CRITERIA.
10. PAVEMENT SURFACE AREAS PRIOR TO PLACEMENT OF PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL BE CLEANED IN ACCORDANCE WITH CITY OF MANVEL DESIGN CRITERIA MANUAL (COPTS). AREAS SHALL BE FREE OF CURING MEMBRANE, DIRT, GREASE, LOOSE AND/OR FLAKING EXISTING MARKERS AND OTHER FORMS OF DEBRIS. SURFACES SHALL BE DRY BEFORE APPLYING PAVEMENT MARKINGS OR RAISED PAVEMENT MARKERS.
- 10.1. CONCRETE SURFACES SHALL BE CLEANED BY ABRASIVE BLASTING MEDIUM.
- 10.2. ASPHALTIC PAVEMENT SURFACES SHALL BE CLEANED BY BRUSHING,WASHING, COMPRESSED AIR, AND/OR HIGH-PRESSURE WATER.
11. ALL PAVEMENT MARKINGS AT INTERSECTIONS SHALL BE THERMOPLASTIC IN ACCORDANCE WITH C.O.P.T.S. APPROVED PRODUCTS LIST.
12. ALL PAVEMENT MARKINGS SHALL BE SHOWN ON THE APPROVED CONSTRUCTION PLANS. ALL PAVEMENT MARKINGS SHALL BE RETRO-REFLECTIVE MATERIAL APPLIED TO ROAD SURFACE IN A MOLTEN STATE BY SCREEDEXTRUSION, SUSPENDED EXTRUSION OR SPRAY MEANS, WITH A SURFACE APPLICATION OF GLASS BEADS.
13. ALL ESPLANADE NOSING, AND CURBS IN LEFT TURN STORAGE BAYS SHALL BE PAINTED WITH YELLOW REFLECTORIZED PAINT AND SHALL COMPLY WITH T.M.U.T.C.D., A.D.A AND T.A.S AND ALL REVISIONS THEREOF.
14. ALL ROADWAYS WITHOUT CURB SHALL HAVE A 4" SOLID WHITE REFLECTORIZED STRIPE 12" INSIDE THE EDGE OF PAVEMENT (SEE DETAIL "D").
15. INTERSECTIONS HAVING TWO-LANES IN ONE DIRECTION SHALL SEPARATE LANES BY INSTALLING A 8" SOLID WHITE STRIPE FROM STOP BAR TO 80% OF TURN STORAGE BAY LENGTH (SEE DETAIL "B").
16. REPEAT CENTER TURN ARROWS AT APPROXIMATELY EVERY 1000' THROUGHOUT TWO-WAY CENTER TURN LANE.
17. ALL PAVEMENT MARKINGS, AND/OR RAISED PAVEMENT MARKERS SHALL COMPLY WITH T.M.U.T.C.D., A.D.A., T.A.S., AND C.O.P.T.S. AND ALL REVISIONS THEREOF.
18. TRANSITIONS FROM UNDIVIDED TO DIVIDED AND/OR ESPLANADE SECTIONS:
- 18.1. FOR SPEEDS 45 MPH AND GREATER USE L=W*S.
- 18.2. S = POSTED OR STATUTORY SPEED LIMIT.
- 18.3. W = WIDTH OF CENTER LANE OR ESPLANADE OR OFFSET DISTANCE.
- 18.4. MINIMUM L IN URBAN AREAS SHALL BE 100'.
- 18.5. MINIMUM L IN RURAL AREAS SHALL BE 200'.
- 18.6. L SHALL BE EXTENDED AS REQUIRED FOR SIGHT DISTANCE CONDITIONS.
19. THE COLOR OF RAISED PAVEMENT MARKERS UNDER DAYLIGHT AND NIGHTTIME CONDITIONS SHALL CONFORM TO THE COLOR OF THE MARKING FOR WHICH THEY SERVE AS A POSITIONING GUIDE OR FOR WHICH THEY SUPPLEMENT OR SUBSTITUTE.
20. ALL TRAFFIC BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES AT APPROXIMATELY 2" FROM EDGE OF BUTTON/MARKER TO STRIPE.
21. ALL BUTTONS AND RAISED PAVEMENT MARKERS SHALL BE INSTALLED WITH AN APPROVED EPOXY.
22. A BLUE REFLECTORIZED RAISED PAVEMENT MARKER (TYPE II B-B) SHALL BE SET 6" OFF CENTERLINE OF ROADWAY OR PAVEMENT STRIP ON THE ADJACENT SIDE OF ALL FIRE HYDRANTS.
23. SPACING OF RAISED PAVEMENT MARKERS TYPE II A-A, TYPE II C-R AND TYPE I-C:
- 23.1. IN STORAGE BAYS AND TRANSITIONS TO STORAGE BAYS D=5' O.C.
- 23.2. IN CURVES D=20' O.C.
- 23.3. IN NORMAL ROADWAY D=40' O.C.
24. ALL MARKINGS SHALL HAVE A UNIFORM CROSS-SECTION, AND THE DENSITY AND QUALITY OF THE MARKINGS SHALL BE UNIFORM THROUGHOUT THEIR THICKNESS.
25. PAVEMENT MARKINGS, BUTTONS AND RAISED PAVEMENT MARKERS THAT ARE NOT IN ALIGNMENT OR SEQUENCE, AS SHOWN IN THE DRAWINGS OR STATED IN THE PROJECTS' SPECIFICATIONS SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS' EXPENSE.

PERMANENT PAVEMENT MARKING DETAILS

DATE APPROVED: JANUARY 20, 2024	
REVISED DATE:	JANUARY 20, 2024 SCALE: NTS

PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		60

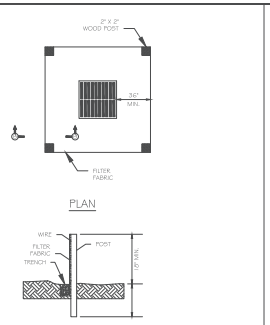


NOTES:

1. SET TWO (2) INCH BY TWO (2) INCH WOODEN STAKES EMBEDDED TWELVE (12) INCHES INTO GROUND. SPACING SHALL BE A MAXIMUM OF SIX (6) FEET APART FOR REINFORCED FILTER FABRIC FENCE AND A MAXIMUM OF THREE (3) FEET APART FOR NON-REINFORCED FILTER FABRIC FENCE.
2. REINFORCED FILTER FABRIC FENCE SHALL HAVE WOVEN WIRE FENCE WHICH SHALL BE FASTENED SECURELY TO FENCE POSTS.
3. FASTEN FILTER FABRIC FENCE AS FOLLOWS:
   3.1. REINFORCED FILTER FABRIC FENCE SHALL SECURELY FASTENED TO WOVEN WIRE FENCE WITH TIES SPACED EVERY TWENTY-FOUR (24) INCHES AT TOP AND MIDSECTION.
   3.2. NON-REINFORCED FILTER FABRIC FENCE SHALL BE FASTENED AT EVERY WOOD POST AT TOP AND MIDSECTION.
4. MINIMUM HEIGHT OF FILTER FABRIC SHALL BE EIGHTEEN (18) INCHES ABOVE NATURAL GROUND AND A MAXIMUM OF THIRTY-SIX (36) INCHES ABOVE NATURAL GROUND.
5. FILTER FABRIC SHALL EXTEND INTO THE FOUR (4) INCH BY FOUR (4) INCH TRENCH DOWN THE SIDE CLOSEST TO THE WOODEN POSTS, ACROSS THE BOTTOM OF THE TRENCH AND HALF WAY UP THE OPPOSITE SIDE.
6. ALL INSTALLATIONS OF SILT FENCE SHALL BE IN ACCORDANCE WITH THE CITY OF MANVEL TECHNICAL SPECIFICATION SECTION 023005 - FILTER FABRIC SILT FENCE.
7. METAL STAKES OR T POSTS MAY BE USED IN LIEU OF WOOD POSTS.

SC	STABILIZED CONSTRUCTION EXIT
FF	FILTER FABRIC SILT FENCE
RFB	REINFORCED FILTER FABRIC BARRIER
IPB-I	INLET PROTECTION BARRIER TYPE I
IPB-II	INLET PROTECTION BARRIER TYPE II
IPB-III	INLET PROTECTION BARRIER TYPE III
CW-A	CONCRETE WASHOUT AREA - ABOVE GROUND
CW-B	CONCRETE WASHOUT AREA - BELOW GROUND

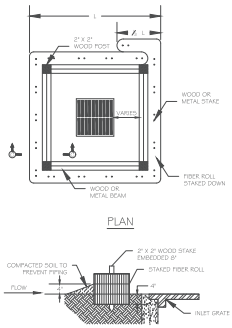
SWPPP SYMBOLS



INLET PROTECTION TYPE I

NOTES:

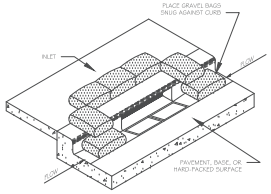
1. **MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.**
2. **PLACEMENT OF FILTER FABRIC BARRIER FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE A MINIMUM OF THIRTY-SIX (36) INCHES FROM INLET EDGE.**



INLET PROTECTION TYPE II

NOTES:

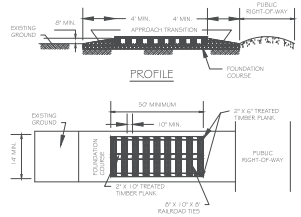
1. MAXIMUM POST SPACING SHALL BE FOUR (4) FEET. ADDITIONAL POSTS MAY BE ADDED AS NEEDED. POSTS SHALL BE PLACED A MINIMUM AT EACH CORNER AS SHOWN.
2. PLACEMENT OF FIBER ROLL FROM INLET SHALL VARY ACCORDING TO SITE CONDITIONS. TYPICAL PLACEMENT SHALL BE TWENTY-FOUR (24) INCHES FROM INLET.
3. FIBER ROLLS SHALL BE UTILIZED ONLY WHEN SITE CONDITIONS DO NOT PERMIT THE USE OF FILTER FABRIC BARRIER.
4. IF UNDERLYING MATERIAL IS BASE OR OTHER HARD PACKED MATERIAL, THEN FIBER ROLLS MAY BE PLACED ON HARD PACKED SURFACE AND WEIGHTED DOWN WITH GRAVEL BAGS.



INLET PROTECTION BARRIER TYPE III

NOTES:

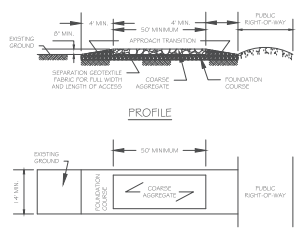
1. IPB TYPE III SHALL BE USED FOR EXISTING OR PROPOSED STAGE II TYPE "B", "B-B" AND "F-2" INLETS ONLY.
2. PLACE GRAVEL BAG IN THE GUTTER ON EACH SIDE OF THE INLET OPENING. GRAVEL BAG SHALL BE PLACED TIGHTLY AGAINST THE FACE OF CURB.
3. PLACE GRAVEL BAGS AT BACK OF CURB ALONG INLET.
4. DO NOT PLACE BAGS TO BLOCK THROAT OF INLET, UNLESS DIRECTED BY THE ENGINEER AND APPROVED BY THE CITY OF MANVEL.



CONSTRUCTION ACCESS TYPE I

NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MINIMUM, AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
5. THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH ½" X 6" MINIMUM LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE CITY.
6. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
7. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
8. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE, ALLOWING DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
9. CONSTRUCTION ACCESS SHALL ADHERE TO CITY OF MANVEL SPECIFICATION 020301 - STABILIZED CONSTRUCTION ACCESS, ROADS, PARKING AND WASH AREAS.
10. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
11. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR TRUCK WASHING AREA.
12. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.



CONSTRUCTION ACCESS TYPE II

NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN FIFTY (50) FEET.
2. THICKNESS SHALL BE A MINIMUM OF EIGHT (8) INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
4. APPROACH TRANSITION SHALL BE A MINIMUM OF EIGHT (8) INCHES IN DEPTH AND 6:1 SLOPE MINIMUM.
5. FOUNDATION COURSE SHALL BE A MINIMUM OF SIX (6) INCHES. FOUNDATION COURSE MATERIAL SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL APPROVED BY THE CITY.
6. ACCESS SHALL BE GRADED TO PREVENT RUN-OFF FROM LEAVING SITE.
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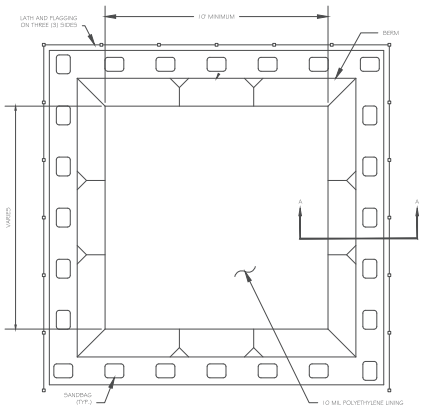

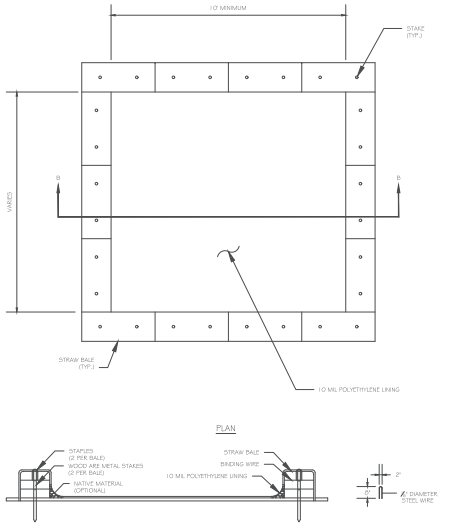

CONCRETE WASHOUT AREA

NOTES:

1. ACTUAL LAYOUT TO BE DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN THREE (3) FEET OF THE CONCRETE WASHOUT FACILITY.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) STANDARD DETAILS

DATE APPROVED:	JANUARY 20, 2022
REVISED DATE:	JANUARY 20, 2022 SCALE: NTS

PROJECT NUMBER:	DATE SUBMITTED:	SHEET:
		61

TML
INTERGOVERNMENTAL RISK POOL

June 17, 2026

TO: All TML Intergovernmental Risk Pool Members
FROM: David Reagan – TMLIRP Board Secretary
RE: Nominations to the Board of Trustees of the Texas Municipal League Intergovernmental Risk Pool

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It's time for nominations to fill four positions on the TML Intergovernmental Risk Pool Board of Trustees. The Board is comprised of fifteen voting members, twelve of whom are elected by the Pool's membership to serve staggered, six-year terms.

- **WHO/WHAT:** Every even-numbered year, the term of office for one-third of the elected Trustees expires, and an election is held to fill those designated Places. Terms for Trustees in Places 1 – 4 expire October 1, 2026. (Place 5 is an appointed, rather than elected, public member.) Those places are currently held by the following individuals:

  - Place 1 – J.W. "Buzz" Fullen, Commissioner, Henderson Housing Authority
  - Place 2 – Emily Crawford, City Manager, Abilene
  - Place 3 – David Rutledge, Mayor, Bridge City
  - Place 4 – Austin Bleess, City Manager, Jersey Village

  The composition of the entire Board is on the back of this notice. Eligibility requirements for Places 1 - 4 are as follows:

  - Place 1 – Elected official or employee of any Pool Member
  - Places 2, 3, & 4 – Only elected officials or employees of a municipality that is a Pool Member

- **WHEN**: **Nominations must be received by the Board Secretary at the address below by 11:59 p.m. on Friday, August 2, 2026.**

- **WHERE/HOW:** Each Board member is elected to a designated Place on the Board, and all nominations must show WHICH of the Places – 1, 2, 3, or 4 – for which the nomination is made. (No residency or other requirement applies.) The governing body of each Member of the Pool may nominate one qualified person for the election. Nominations must be mailed to the Board Secretary, with a short biographical sketch of the nominee and showing the designated Place for which the nomination is made, to the following address:

  Trustee Nomination
  Board Secretary
  P. O. Box 149194
  Austin, Texas 78714-9194

The Board Secretary will distribute a ballot to each Pool Member by August 17, 2026. Questions? Contact David Reagan, Board Secretary, at 512-491-2300.

Current Texas Municipal League Intergovernmental Risk Pool Board of Trustee Members and the date their terms expire include:

Place 5 **(Oct. 1, 2026)**
Bert Lumbreras, Chair
Appointed Public Member

Place 4 **(Oct. 1, 2026)**
Austin Bleess, Vice Chair
City Manager, City of Jersey Village

Place 1 **(Oct. 1, 2026)**
J.W. "Buzz" Fullen
Commissioner, Henderson Housing Authority

Place 2
Emily Crawford **(Oct. 1, 2026)**
City Manager, City of Abilene

Place 3 **(Oct. 1, 2026)**
David Rutledge
Mayor, City of Bridge City

Place 6 **(Oct. 1, 2028)**
Kimberly Meismer
Assistant City Manager, City of Kerrville

Place 7 **(Oct. 1, 2028)**
Mary M. Dennis
Mayor, City of Live Oak

Place 8 **(Oct. 1, 2028)**
Chris Coffman
City Manager, City of Granbury

Place 9 **(Oct. 1, 2028)**
Opal Mauldin-Jones.
City Manager, City of Lancaster

Place 10 **(Oct. 1, 2028)**
Michael Alexander
Appointed Public Member

Place 11 **(Oct. 1, 2030)**
Randy Criswell,
City Manager, City of Wolfforth

Place 12 **(Oct. 1, 2030)**
Allison Heyward
Councilmember, City of Schertz

Place 13 **(Oct. 1, 2030)**
Harlan Jefferson
Deputy City Manager, City of Burleson

Place 14 **(Oct. 1, 2030)**
Mike Land
City Manager, City of Coppell

Place 15 **(Oct. 1, 2030)**
Rickey Childers
Appointed Public Member

TML Representative
Holly Gray
Mayor Pro Tem, City of Roanoke

TML Representative
Monty Wynn
Executive Director, Texas Municipal League