



**Monday, May 6, 2019
Regular Combined City Council Meeting**

**Council Chambers
3815 Sachse Road, Building B
6:30 p.m.**

The City of Sachse reserves the right to reconvene, recess or realign the workshop meeting, regular meeting, called Executive Session or order of business at any time prior to adjournment.

As authorized by Section 551.071(2) of the Texas Government Code, these meetings may be convened into closed Executive Session at any time during the City Council workshop or regular meeting for the purpose of seeking confidential legal advice from the City Attorney on any workshop or regular meeting agenda item listed herein.

A. 6:30 PM WORKSHOP MEETING

1. Call to Order: The City Council of the City of Sachse will hold a Workshop Meeting on Monday, May 6, 2019 at 6:30 p.m. in the Council Chambers at Sachse City Hall, 3815 Sachse Road, Building B, Sachse, Texas to consider the following items of business:
2. Receive training on the BoardDocs meeting and voting software.
3. Discuss and review applications for the 2019 City of Sachse Scholarship.
4. Discussion of City Council meeting agenda items.
5. Adjournment.

B. 7:30 PM REGULAR MEETING

1. Call to Order: The City Council of the City of Sachse will hold a Regular Meeting on Monday, May 6, 2019 at 7:30 p.m. in the Council Chambers at Sachse City Hall, 3815 Sachse Road, Building B, Sachse, Texas to consider the following items of business:
2. Invocation and Pledges of Allegiance.

C. Consent Agenda - All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.

1. Approve the minutes of the April 15, 2019, combined meeting.
2. Accept the monthly revenue and expenditure report for the period ending March 31, 2019.
3. Authorize the purchase of a Dell "VxRail" Hyperconverged Server and backup solution along with all associated software as well as five (5) years of Next Business Day solution support, directly from DellEMC through the Texas Department of Information Resources (DIR) cooperative purchasing contract #DIR-TSO-4299 in the amount of one hundred forty-three thousand, eight hundred and one dollars and seventy-three cents. (\$143,801.73)
4. Approve an ordinance correcting Ordinance 3906 adopted on January 22, 2019, to correct a scrivener's error; by amending Chapter 11 titled "Zoning" by amending Exhibit 1 titled "Zoning Ordinance" by amending Article 2 titled "Definitions" to include a definition for Retail CBD and Hemp Based Products; by amending Article 3 titled "Districts" by amending Section 13 titled "Use Designations" by amending 13.2 titled "Use Chart Organization" by amending use Chart 13.2.4 titled "Commercial Uses" to include Retail CBD and Hemp Based Products; by amending Article 4 titled "General Provisions Applying to All or Several Districts" by amending Section 5 titled "Off-Street Automobile

and Vehicle Parking and Loading" by amending Section 5.4 titled "Off-Street Parking" to include parking requirements for Retail CBD and Hemp Based Products.

5. Approve an ordinance amending the Code of Ordinances by amending Chapter 10 titled "Utilities" by amending Article 1 titled "in general" by amending Section 10-7 titled "Water Conservation and Drought Contingency and Water Emergency Response Plan" by renaming Section 10-7 "Water Conservation Plan" and by adopting the "2019 Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers."

6. Approve the Consent Agenda Items as presented.

D. Special Announcements

1. Mayor and City Council announcements regarding special events, current activities, and local achievements.

E. Citizen Input

1. Citizen Input: The public is invited at this time to address the Council. Please come to the microphone and state your name and address for the record. If your remarks pertain to a specific agenda item, please hold them until that item, at which time the Mayor may solicit your comments. Time limit is 3 minutes per speaker. The City Council is prohibited by state law from discussing any item not posted on the agenda according to the Texas Open Meetings Act, but may take them under advisement. Issues raised may be referred to City Staff for research and possible future action.

F. Regular Agenda Items

1. Receive an update on the administration of the City's Public Improvement District and Tax Increment Financing Reinvestment Zone and authorize the City Manager to negotiate and execute an agreement with P3 Works for Public Improvement District and Tax Increment Financing Reinvestment Zone Administrative Services.

2. Receive the 2018 Year in Review from the Sachse Fire Department.

3. Conduct a public hearing to consider and act on an ordinance amending the Code of Ordinances by amending Chapter 8 titled "Subdivisions".

4. Consider and act on an ordinance adopting an Engineering Design Manual.

5. Discuss policy goals pertaining to traffic signalization needs and intersection improvements within city limits.

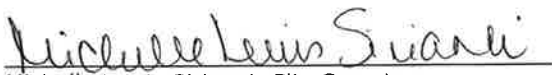
6. Discuss the 2019-2020 Capital Improvement Plan (CIP).

7. Discuss and review applications for the 2019 City of Sachse Scholarship.

G. Regular Meeting Closing

1. Adjournment.

I, the undersigned authority, do hereby certify that this notice of meeting was posted in accordance with the regulations of the Texas Open Meetings Act and was posted on the bulletin board, an accessible location at Sachse City Hall.


Michelle Lewis Sirianni, City Secretary

Accommodation requests for persons with disabilities should be made at least 48 hours prior to the meeting by contacting Lauren Rose, ADA Coordinator, via phone at 972.429.4770, via email at lrose@cityofsachse.com, or by appointment at 3815 Sachse Road, Building B, Sachse, Texas 75048.

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	A. 6:30 PM WORKSHOP MEETING
Subject	2. Receive training on the BoardDocs meeting and voting software.
Access	Public
Type	Discussion

Public Content**BACKGROUND**

A representative from BoardDocs will be onsite to conduct a training for the City Council during its workshop session. The purpose of this training is to specifically cover the voting component of the system.

POLICY CONSIDERATIONS

There are no policy considerations affiliated with this item.

RECOMMENDATION

Participate in the training as appropriate.

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	A. 6:30 PM WORKSHOP MEETING
Subject	3. Discuss and review applications for the 2019 City of Sachse Scholarship.
Access	Public
Type	Discussion
Goals	Provide a high quality of life environment for families, individuals, businesses, and other organizations in Sachse.

Public Content**BACKGROUND**

The City of Sachse's contract with Community Waste Disposal (CWD) provides for \$1,000.00 to be used for a scholarship to a local youth residing in Sachse. This is the 6th year for the City of Sachse scholarship. Staff received 14 applications this year. Staff met and reviewed the applications and narrowed those down to the top seven candidates for the City Council to review.

RECOMMENDATION

Staff recommends that the City Council discuss, review, and select a recipient for the 2019 City of Sachse Scholarship.

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	C. Consent Agenda - All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.
Subject	1. Approve the minutes of the April 15, 2019, combined meeting.
Access	Public
Type	Action (Consent), Minutes
Recommended Action	Approve as submitted.
Minutes	View Minutes for Apr 15, 2019 - Regular Combined City Council Meeting

Public Content**BACKGROUND**

Minutes of the April 15, 2019, combined meeting.

POLICY CONSIDERATIONS

There are no policy considerations affiliated with this item.

RECOMMENDATION

Approve the minutes of the April 15, 2019, combined meeting.

04.15.19 Combined Minutes.pdf (248 KB)

All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.

CITY COUNCIL OF THE CITY OF SACHSE
MEETING MINUTES
APRIL 15, 2019

The City Council of the City of Sachse held a workshop and regular meeting on Monday, April 15, 2019 at 6:30 p.m. at the City Council Chambers, 3815 Sachse Road, Sachse, Texas. Those present were Mayor Mike Felix, Mayor Pro Tem Cullen King, Councilmembers Brett Franks, Michelle Howarth, Paul Watkins, Bill Adams, and Jeff Bickerstaff; City Manager, Gina Nash; City Secretary, Michelle Lewis Sirianni; Assistant to the City Manager, Lauren Rose; Director of Public Works and Engineering, Greg Peters; Finance Director, Teresa Savage; IT Manager, Danny Wheeler; Parks and Recreation Director, Lance Whitworth; Human Resources Director, Melinda Walter; Sachse Economic Development CEO, Leslyn Blake; Fire Chief, Marty Wade; and Police Lieutenant, Marty Cassidy.

Mayor Felix opened the workshop meeting at 6:33 p.m.

MERRITT ROAD PROJECT UPDATE:

Receive an update on the Merritt Road project.

Mr. Dennis Satre with Halff Associates (Halff) presented a project implementation timeline for the Merritt Road project design, right-of-way and environmental assessment project as well as an overview of the project including limits, existing conditions, and all those involved with the project. Mr. Satre stated that they are in the process of developing a website, which will be updated as the project progresses and will allow citizens to stay informed. The design, right of way and environmental assessment project is estimated to be completed in late 2022 or early 2023. Project construction will start after that.

Mr. Satre stated tonight is part of the data collection process. They are seeking information from residents and will also allow them to ask any questions regarding the project.

The Halff team brought maps and set up tables to allow citizens to view, discuss, and provide input regarding the project.

There were no further comments or discussion.

ADJOURNMENT:

Mayor Felix adjourned the workshop at 7:35 p.m.

Mayor Felix opened the regular meeting at 7:36 p.m.

INVOCATION AND PLEDGE OF ALLEGIANCE TO U.S. AND STATE FLAG: The invocation was offered by Mayor Pro Tem King and pledges by Councilman Watkins.

CONSENT AGENDA: All items listed on the Consent Agenda are considered routine and will be acted on by one motion, with no separate discussion of these items unless a City Councilmember or citizen so requests.

- 1. Approve the minutes of the April 1, 2019, combined meeting.**
- 2. Authorize the City Manager to extend the depository contract with American National Bank through May 31, 2020.**
- 3. Approve a resolution amending authorized signers to transact business on behalf of the City of Sachse and American National Bank related to Treasury Management Services.**

Councilman Bickerstaff made a motion to approve the consent agenda items as presented. Mayor Pro Tem King seconded that motion and the motion was unanimously approved.

MAYOR AND CITY COUNCIL ANNOUNCEMENTS REGARDING SPECIAL EVENTS:

Councilwoman Howarth announced upcoming Library events and reminded everyone that City offices will be closed Friday, April 19 for Good Friday.

Councilman Franks complimented staff on the redesigned egg hunt events planned by the Parks Department since weather prevented the original plan from moving forward.

CITIZENS INPUT:

Lola Smith, 6025 Big Valley Lane, thanked the City Council and stated it was her first time attending.

REGULAR AGENDA ITEMS:

Conduct a public hearing and take action on a revised water and sewer rate plan.

Mrs. Savage presented a review of the proposed water and sewer rate plan. She explained the 2014 adopted five-year rate plan and the proposed rates from the current rate study. Mrs. Savage explained where the City's expenditures come from, what the five-year rate plan included, and how the proposed changes will affect an average monthly bill. She encouraged residents to consult watermyyard.org and to sign up for the *My Water Advisor* application, which allows residents to view their account and consumption in detail. Mrs. Savage indicated that she will be doing a Facebook live meeting on April 24 to provide another opportunity for questions. The new rates

will take effect for the bills that will go out in May to provide maximum relief during the traditionally high water consumption months during the summer.

Mayor Felix opened the public hearing.

Lola Smith, 6025 Big Valley Lane, expressed concerns over the new rates due to consumption.

Mayor Felix closed the public hearing.

Councilman Adams reinforced the accuracy of using watermyyard.org.

Mayor Pro Tem King stated that the City currently receives its water from North Texas Municipal Water District (NTMWD) and the proposed rates are designed to provide relief in the middle tiers, which is where he feels that they could help residents most with the rising costs.

Councilman Franks made a motion to approve the revised water and sewer rate plan as presented. Councilman Bickerstaff seconded that motion and the motion was unanimously approved.

Consider a resolution amending the Master Fee Schedule by amending library service fees, refuse service fees and water and wastewater rates and providing an effective date.

Mrs. Savage stated the amendments in the Master Fee Schedule will include the updates of the water, sewer, and refuse rates. It will also include updated library fees from the recently approved circulation policy, as well as clarifications in language and reorganization by category for the Building Permits section.

Mayor Pro Tem King made a motion to approve a resolution amending the Master Fee Schedule by amending library service fees, refuse service fees, and water and wastewater rates and providing an effective date. Councilman Bickerstaff seconded that motion and the motion was unanimously approved.

Consider a resolution awarding the bid for the construction of the Vicksburg-Ponderosa Drainage Improvement Project to KIK Underground, LLC in an amount not to exceed four hundred fifty-one thousand four hundred eight dollars and seventy-five cents (\$451,408.75).

Mr. Peters stated the City identified key drainage problems in the city and formally created the Stormwater Utility with a monthly fee of \$1.66/month. Mr. Peters highlighted projects completed with funding from the fee. In 2015, multiple Vicksburg properties experienced significant flooding issues. It was determined that individual projects on a single property would not be an effective solution and a larger-scale comprehensive solution would be required. Mr. Peters outlined existing conditions and potential solutions that were explored by staff. Staff determined that although an underground system is more expensive, it better serves the needs of surrounding residents. Mr. Peters outlined the bid process. Two bids were received and the lowest qualified bid came from KIK Underground, LLC. Staff is recommending that the Utility Fund provide the initial funding for the project since the Stormwater Utility does not have sufficient funding to pay for this project in its entirety. Since this is one of the primary projects identified in the original stormwater utility study and because the drainage conditions have worsened in the area, staff recommends this approach in order to work towards a solution sooner rather than later. The Stormwater Utility

would then pay back the Utility Fund on an annual basis at a rate of \$75,000 per year, beginning this year, with the total payback period being just over six years. Staff is recommending approval.

The City Council discussed the contingency funds included in the bids and staff's recommendation for additional contingency funds.

Councilman Franks made a motion to approve a resolution awarding the bid for the construction of the Vicksburg-Ponderosa Drainage Improvement Project to KIK Underground, LLC in an amount not to exceed four hundred fifty-one thousand four hundred eight dollars and seventy-five cents (\$451,408.75). Councilman Watkins seconded that motion and the motion was unanimously approved.

Consider an amendment to Section 8.09, Market Adjustments, of the City's Personnel Policies and Procedures Manual, regarding market adjustments and receive an update on market cities.

Mrs. Walter stated the City contracted with Evergreen consulting in 2014 to conduct a citywide compensation and classification study. In 2015, eighteen market comparison cities were recommended by Evergreen and integrated as a part of the City analyses. Mrs. Walter indicated that on average cities designate 8-12 comparison cities. Market comparison cities are typically chosen based on location and size. Other factors considered are the frequency of classification matches for positions and the cities that tend to hire away Sachse employees. As a part of this amendment, staff is recommending to also clean up the current language and remove references to any specific market cities in the City's Personnel Policies and Procedures Manual. In addition, staff is proposing modifications to the current list of market cities. Staff will continue to monitor compensation changes of cities removed.

The City Council discussed the list of proposed comparison cities, the recommended changes, and how the list is comprised.

Mayor Pro Tem King made a motion to approve the item as presented. Councilman Watkins seconded that motion and the motion was unanimously approved.

Discuss and consider design of light pole banners on State Highway 78.

Ms. Blake stated a branding initiative is proposed in the form of street pole banners along SH 78 as a part of the Sachse Economic Development Corporation's (EDC) marketing plan. The purpose being to identify the City and promote emerging commercial areas. She indicated that the EDC would produce and install the banners. The EDC Board approved the banners during its March meeting. Staff is presenting two options for the Council to consider and approve. Ms. Blake stated option one has a bright color palette, is simple, and plays on the community's German heritage by using the 'S' in old English style. Option two, while using the same color palette, offers a variety of images by placing four different pictures of City projects on one of the banners.

The City Council discussed the options and also indicated that they would like the caboose to be added as an option for one of the banners.

Councilman Bickerstaff made a motion to approve option one (1) adding a banner with the caboose on it. Mayor Pro Tem King seconded that motion and the motion was unanimously approved.

ADJOURNMENT:

Mayor Felix adjourned the regular meeting at 8:44 p.m.

MIKE J. FELIX, MAYOR

ATTEST:

Michelle Lewis Sirianni, City Secretary

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	C. Consent Agenda - All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.
Subject	2. Accept the monthly revenue and expenditure report for the period ending March 31, 2019.
Access	Public
Type	Action (Consent)
Preferred Date	May 06, 2019
Recommended Action	Accept the monthly revenue and expenditure report for the period ending March 31, 2019.
Goals	Be a model of financial stewardship through growth management, responsible investment, and financial transparency.

Public Content**BACKGROUND**

The Finance Department prepares a report each month to update the City Council regarding revenues and expenditures for the City. Included in the report are unaudited summaries for the General Fund, Utility Fund, Debt Service Fund, Sachse Economic Development Corporation, and Sachse Municipal Development District, as well as an analysis of sales tax revenues received year-to-date.

POLICY CONSIDERATIONS

The City Charter requires that the City Manager submit a monthly report covering revenues and expenditures.

RECOMMENDATION

Accept the monthly revenue and expenditure report for the period ending March 31, 2019.

[Sales Tax Analysis May 2019.pdf \(78 KB\)](#)

[All Funds 3-31-19-LR.pdf \(263 KB\)](#)

All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.

CITY OF SACHSE

2018/2019 SALES TAX ANALYSIS

FY 2018	Total Sales Tax	General Fund Sales Tax	General Fund Year-To-Date	YTD Percent of Budget	FY 2019	Total Sales tax	General Fund Sales Tax	General Fund Year-To-Date	YTD Percent of Budget
October	192,025	109,723	109,723	9.00%	October	208,112	118,915	118,915	9.75%
November	419,139	239,496	349,219	24.94%	November	295,677	168,950	287,865	19.52%
December	192,626	110,067	459,286	32.81%	December	216,610	123,771	411,635	27.91%
January	208,475	119,123	578,409	41.31%	January	230,470	131,690	543,326	36.84%
February	313,995	179,416	757,825	54.13%	February	337,215	192,685	736,011	49.90%
March	181,691	103,818	861,644	61.55%	March	209,463	119,687	855,698	58.01%
April	185,503	105,996	967,640	69.12%	April	200,166	114,375	970,073	65.77%
May	268,970	153,689	1,121,329	80.09%	May				
June	222,767	127,295	1,248,624	89.19%	June				
July	241,223	137,835	1,386,459	99.03%	July				
August	281,001	160,564	1,547,023	110.50%	August				
September	208,158	118,941	1,665,964	119.00%	September				
TOTAL	2,915,572	1,665,964			TOTAL	1,697,713	970,073		
BUDGET		1,400,000			BUDGET		1,475,000		

City of Sachse

Monthly Revenue and Expenditure Report

March 31, 2019

(Unaudited)

GENERAL FUND

50% of Year Completed

	Annual Budget	Current Month Actual	Actual YTD	YTD Actual as a Percent of Budget	Note Reference
Revenue Summary					
Property Tax	\$ 12,019,803	\$ 114,943	\$ 12,040,816	100.17%	A
Sales Tax	1,508,000	119,687	873,891	57.95%	
Franchise Fees	1,710,775	47,723	895,933	52.37%	
Licenses and Permits	566,500	37,825	218,194	38.52%	
Service Fees	709,600	64,193	466,980	65.81%	
Fines	250,000	24,308	114,916	45.97%	
Interest Income	50,000	28,250	122,980	245.96%	
Miscellaneous Income	326,618	23,650	168,582	51.61%	
Intergovernmental Revenue	1,182,205	98,517	591,103	50.00%	
Total Revenue	\$ 18,323,501	\$ 559,097	\$ 15,493,395	84.55%	
Expenditure Summary					
City Manager	\$ 426,258	\$ 39,110	\$ 232,671	54.58%	B
City Secretary	193,198	17,198	90,103	46.64%	
Human Resources	374,546	29,714	174,474	46.58%	
Finance	592,461	36,675	302,278	51.02%	
Municipal Court	236,104	17,589	103,767	43.95%	
Parks & Recreation	1,224,007	142,592	552,717	45.16%	
Senior Programs	167,466	38,435	93,686	55.94%	
Library Services	468,323	42,447	233,492	49.86%	
Community Development	908,890	95,652	415,776	45.75%	
Streets & Drainage	1,988,077	657,053	1,196,640	60.19%	
Facility Maintenance	522,749	100,554	284,361	54.40%	
Police	5,238,314	508,147	2,686,317	51.28%	
Animal Control	232,199	24,176	117,370	50.55%	
Fire/EMS	4,254,812	478,971	2,190,527	51.48%	
Combined Services	390,630	16,951	276,085	70.68%	
City Engineer	272,381	18,839	86,069	31.60%	
Information Technology	753,684	34,213	339,891	45.10%	
Total Expenditures	\$ 18,244,099	\$ 2,298,316	\$ 9,376,225	51.39%	
Total Revenue Over/Under Expenses	\$ 79,402	\$ (1,739,220)	\$ 6,117,170		

Explanation of Major Variances:

A Property Tax receipts peak in December and January

B Total annual property and liability premium paid in October

City of Sachse
Monthly Revenue and Expenditure Report
March 31, 2019
(Unaudited)

UTILITY FUND

50% of Year Completed

	Annual Budget	Current Month Actual	Actual YTD	YTD Actual as a Percent of Budget	Note Reference
Revenue Summary					
Water Revenue	\$ 6,421,324	\$ 438,450	\$ 2,834,834	44.15%	
Sewer Revenue	4,768,010	408,726	2,454,000	51.47%	
Drainage Revenue	204,000	17,410	104,444	51.20%	
Fees	159,500	15,137	103,369	64.81%	
Interest Income	100,000	35,906	246,101	246.10%	
Transfer In-Impact Fee	30,000	30,000	30,000	100.00%	
Miscellaneous Income	-	-	-	-	
Total Revenue	\$ 11,682,834	\$ 945,631	\$ 5,772,748	49.41%	
Expenditure Summary					
Utility Administration	\$ 428,484	\$ 41,243	\$ 180,781	42.19%	
Water Operations	6,631,947	519,112	4,046,289	61.01%	A
Sewer Operations	3,952,224	638,194	5,463,938	138.25%	A
Drainage Projects	255,000	-	15,375	6.03%	
Meter Reading	-	-	-	-	B
Total Expenditures	\$ 11,267,655	\$ 1,198,549	\$ 9,706,383	86.14%	
Total Revenue Over/Under Expenses	\$ 415,179	\$ (252,919)	\$ (3,933,634)		

Explanation of Major Variances:

- A** Budget includes capital allocations
- B** Department eliminated in FY2018-2019

City of Sachse
Monthly Revenue and Expenditure Report
March 31, 2019
(Unaudited)

	DEBT SERVICE FUND				50% of Year Completed
	Annual Budget	Current Month Actual	Actual YTD	YTD Actual as a Percent of Budget	Note Reference
				0%	
Revenue Summary					
Property Tax	\$ 4,474,801	\$ 42,403	\$ 4,445,775	99.35%	
Interest Income	1,000	881	4,921	492.14%	
Miscellaneous Receipts					
Total Revenue	\$ 4,475,801	\$ 43,284	\$ 4,450,697	99.44%	
Expenditure Summary					
Fees	\$ 3,000	\$ -	\$ 1,256	41.88%	
Principal	3,033,558	-	2,030,000	66.92%	A
Interest	1,430,051	-	731,204	51.13%	A
Transfer Out-Utility Fund					
Total Expenditures	\$ 4,466,609	\$ -	\$ 2,762,460	61.85%	
Total Revenue Over/Under Expenses	\$ 9,192	\$ 43,284	\$ 1,688,237		

A Principal payments are due in February and interest payments in February and August

City of Sachse
Monthly Revenue and Expenditure Report
March 31, 2019
(Unaudited)

SACHSE ECONOMIC DEVELOPMENT CORPORATION

50% of Year Completed

	Annual Budget	Current Month Actual	Actual YTD	YTD Actual as a Percent of Budget	Note Reference 0%
Revenue Summary					
Sales Tax	\$ 737,500	\$ 59,844	\$ 427,849	58.01%	
Other Income	\$ 27,550	\$ 250	\$ 10,223	37.11%	
Interest Income	2,500	679	4,105	164.18%	
Total Revenue	\$ 767,550	\$ 60,773	\$ 442,177	57.61%	
Expenditure Summary					
Expenditures	767,183	61,514	289,254	37.70%	
Total Expenditures	\$ 767,183	\$ 61,514	\$ 289,254	37.70%	
Total Revenue Over/Under Expenses	\$ 367	\$ (741)	\$ 152,924		

Explanation of Major Variances:

City of Sachse

Monthly Revenue and Expenditure Report

March 31, 2019

(Unaudited)

MUNICIPAL DEVELOPMENT DISTRICT

50% of Year Completed

	Annual Budget	Current Month Actual	Actual YTD	YTD Actual as a Percent of Budget	Note Reference
Revenue Summary					
Sales Tax	\$ 350,000	\$ 26,144	\$ 189,892	54.25%	
Other Income	\$ -				
Interest Income	1,000	14	76	7.63%	
Total Revenue	\$ 351,000	\$ 26,158	\$ 189,968	54.12%	
Expenditure Summary					
Expenditures	455,000	-	49,628	10.91%	
Total Expenditures	\$ 455,000	\$ -	\$ 49,628	10.91%	
Total Revenue Over/Under Expenses	\$ (104,000)	\$ 26,158	\$ 140,340		

Explanation of Major Variances:



Agenda Item Details

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Subject	3. Authorize the purchase of a Dell "VxRail" Hyperconverged Server and backup solution along with all associated software as well as five (5) years of Next Business Day solution support, directly from DellEMC through the Texas Department of Information Resources (DIR) cooperative purchasing contract #DIR-TSO-4299 in the amount of one hundred forty-three thousand, eight hundred and one dollars and seventy-three cents. (\$143,801.73)
Access	Public
Type	Action (Consent)
Preferred Date	May 06, 2019
Fiscal Impact	Yes
Dollar Amount	143,801.73
Budgeted	Yes
Budget Source	Approved as part of FY 2018-2019 IT Department's Budget
Recommended Action	Approve as presented.
Goals	Provide excellent government services to Sachse citizens.

Public Content

BACKGROUND

The City's aging server infrastructure has reached a point where the IT department can no longer guarantee the safety of the data stored on the hardware. Failures are becoming more commonplace and new technologies have made most of the equipment obsolete. Most of the hardware has reached its end of life and is no longer under any support contract. The City needs to replace the hardware and software as well as implement a cohesive backup strategy to ensure uninterrupted service to users. As such, the IT Department has conducted an evaluation of technology solutions to replace the city server infrastructure.

OVERVIEW

The IT Department has selected VxRail, a DellEMC/VMware solution that will replace most of the City's current obsolete physical and virtual servers with a solution that integrates processing, network, and storage into one easy to manage server and backup solution. DellEMC has been a leader in IT equipment and solutions for decades. VMware has been the industry leader in server virtualization since the early 2000's. This integrated solution will reduce administrative strain on the IT Department while drastically increasing the availability and reliability of the servers that provide services to the city departments. The solution includes two VxRail clusters consisting of three nodes and two Data Domain backup appliances. A cluster and backup appliance will be placed at City Hall and Public Safety and will have the ability to replicate between sites. The solution cost also includes five (5) years of prepaid maintenance on the solution as a whole with Next Business Day (NBD) support directly from the manufacturer. The solution will be purchased directly from DellEMC through the Texas Department of Information Resources (DIR) cooperative purchasing contract #DIR-TSO-4299. This cooperative purchasing contract allows for the City to purchase these through pre-negotiated competitive pricing agreements that comply with Local Government Code procurement laws.

POLICY CONSIDERATIONS

There are no policy considerations affiliated with this item.

RECOMMENDATION

Authorize the purchase of (2) Dell "VxRail" Hyperconverged Server Clusters and (2) Data Domain Backup Appliances along with all associated software as well as (5) years of Next Business Day support, directly from DellEMC through the Texas Department of Information Resources (DIR) cooperative purchasing contract #DIR-TSO-4299 in the amount of one hundred forty-three thousand, eight hundred and one dollars and seventy-three cents. (\$143,801.73)

DellEMC - VxRail Quote.pdf (66 KB)

All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.

Quote



EMC Corporation
176 South Street
HOPKINTON MA 01748
USA

Quote Prepared By: Nick Helser

Email: nicolas.helser

Quote #: 6002390711 V15

Date: 5/2/2019

Valid Until: 6/1/2019

Contract #:

CMC ID:

Payment Terms: NET 30

Sold To:	Bill To:	Ship To:	End User:
SACHSE, TEXAS	SACHSE, TEXAS	SACHSE, TEXAS	SACHSE, TEXAS
6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA

Item	Description	Qty	UOM	Extended Price (USD)	Months	Annual Maintenance Renewal Price (USD)	Renewal Price Validity Period
	Hardware Summary			\$73,141.32			
	Software Summary			\$18,260.16			
	Services Summary			\$1,679.13			
	Prepaid HW Maintenance Summary			\$36,571.56			
	Prepaid SW Maintenance Summary			\$13,800.56			

Quote



EMC Corporation
176 South Street
HOPKINTON MA 01748
USA

Quote Prepared By: Nick Helser

Email: nicolas.helser

Quote #: 6002390711 V15

Date: 5/2/2019

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6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA	6232 HIGHWAY 78 GARLAND TX 75048 USA

Item	Description	Qty	UOM	Extended Price (USD)	Months	Annual Maintenance Renewal Price (USD)	Renewal Price Validity Period
	Total Products and Services (USD)			\$143,452.73			
	Total Freight (USD)			\$349.00			
	Total Price (USD)			\$143,801.73			

Notes:

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	C. Consent Agenda - All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.
Subject	4. Approve an ordinance correcting Ordinance 3906 adopted on January 22, 2019, to correct a scrivener's error; by amending Chapter 11 titled "Zoning" by amending Exhibit 1 titled "Zoning Ordinance" by amending Article 2 titled "Definitions" to include a definition for Retail CBD and Hemp Based Products; by amending Article 3 titled "Districts" by amending Section 13 titled "Use Designations" by amending 13.2 titled "Use Chart Organization" by amending use Chart 13.2.4 titled "Commercial Uses" to include Retail CBD and Hemp Based Products; by amending Article 4 titled "General Provisions Applying to All or Several Districts" by amending Section 5 titled "Off-Street Automobile and Vehicle Parking and Loading" by amending Section 5.4 titled "Off-Street Parking" to include parking requirements for Retail CBD and Hemp Based Products.
Access	Public
Type	Action (Consent)
Fiscal Impact	No
Budgeted	No
Recommended Action	Approve as presented.

Public Content**BACKGROUND**

The City Council approved an ordinance in January 2019 to amend the Code of Ordinances to add a definition for Retail CBD and Hemp Based products and to amend the permitted use schedule to add a category for Retail CBD and Hemp Based products.

OVERVIEW

Ordinance 3906 was adopted using the previously adopted use categories and Staff located this error upon reviewing the zoning ordinances when the City transitioned from using Municode to Franklin Legal to host the City's Code of Ordinances.

The proposed ordinance will correct the scrivener's error from the ordinance adopted in January 2019. This is a correction to a written error and in no way changes the policy decision that was acted upon by the City Council.

POLICY CONSIDERATIONS

There are no policy considerations affiliated with this item.

RECOMMENDATION

Approve an ordinance of the City of Sachse, Texas, correcting Ordinance 3906 adopted on January 22, 2019.

[Ordinance Amending Ordinance 3906 to Correct a Scrivener's Error.pdf \(28 KB\)](#)

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF SACHSE, TEXAS, CORRECTING ORDINANCE 3906 ADOPTED ON JANUARY 22, 2019, TO CORRECT A SCRIVENER’S ERROR; BY AMENDING CHAPTER 11 TITLED “ZONING” BY AMENDING EXHIBIT 1 TITLED “ZONING ORDINANCE” BY AMENDING ARTICLE 2 TITLED “DEFINITIONS” TO INCLUDE A DEFINITION FOR RETAIL CBD AND HEMP BASED PRODUCTS; BY AMENDING ARTICLE 3 TITLED “DISTRICTS” BY AMENDING SECTION 13 TITLED “USE DESIGNATIONS” BY AMENDING 13.2 TITLED “USE CHART ORGANIZATION” BY AMENDING USE CHART 13.2.4 TITLED “COMMERCIAL USES” TO INCLUDE RETAIL CBD AND HEMP BASED PRODUCTS; BY AMENDING ARTICLE 4 TITLED “GENERAL PROVISIONS APPLYING TO ALL OR SEVERAL DISTRICTS” BY AMENDING SECTION 5 TITLED “OFF-STREET AUTOMOBILE AND VEHICLE PARKING AND LOADING” BY AMENDING SECTION 5.4 TITLED “OFF-STREET PARKING” TO INCLUDE PARKING REQUIREMENTS FOR RETAIL CBD AND HEMP BASED PRODUCTS; PROVIDING FOR A REPEALING CLAUSE; PROVIDING FOR A SEVERABILITY CLAUSE; PROVIDING A SAVINGS CLAUSE; PROVIDING FOR A PENALTY OF FINE NOT TO EXCEED TWO THOUSAND DOLLARS (\$2,000.00); AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, after holding the required public hearings under law, the City Council of the City of Sachse, Texas adopted Ordinance 3906 on January 22, 2019, amending the Code of Ordinances by amending Chapter 11 titled “Zoning Ordinance” by amending Exhibit 1 by amending Article 2 titled “Definitions” and by incorrectly amending Schedule 1 titled “Permitted Uses”; and

WHEREAS, the City Council has determined that Ordinance No. 3906 shall be amended to correct the scrivener’s error;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SACHSE, TEXAS:

SECTION 1. That Ordinance 3906 is amended to read as follows:

“CHAPTER 11

ZONING

....

EXHIBIT 1 ZONING ORDINANCE

...

ARTICLE 2. DEFINITIONS

...

Retail CBD and Hemp Based Products. A business establishment for which more than 50 percent (50%) of sales are based on the retail sale of products related to or derived from CBD oil (cannabidiol) or hemp. This includes, but is not limited to oils, vitamins, supplements, food, personal care and garments.

...

ARTICLE 3. DISTRICTS

...

Sec. 13. Use designations.

...

13.2 Use chart organization.

...

Use Chart 13.2.4 Commercial Uses

SF-RE	SF-39	SF-15	SF-12	SF-10	Section	AG	C1	C2	I-1	I-2
Single Family Estate	Single Family 39	Single Family 15	Single Family 12	Single Family 10	Commercial Uses	Agricultural	Commercial One	Commercial Two	Industrial One	Industrial Two
					...					
					Retail CBD Oil or Hemp Based Products				P	P
					...					"

...

ARTICLE 4. GENERAL PROVISIONS APPLYING TO ALL OR SEVERAL DISTRICTS

...

Sec. 5 Off-street automobile and vehicle parking and loading.

...

5.4 Off-street parking. Developments shall provide parking, per the following table:

...	
Retail CBD Oil or Hemp Based Products	One space for every 200 square feet of gross floor area
...	

...”

SECTION 2. That all provisions of the Ordinances of the City of Sachse, Texas, in conflict with the provisions of this ordinance be, and the same are hereby, repealed, and all other provisions of the Ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3. An offense committed before the effective date of this ordinance is governed by prior law and the provisions of the Code of Ordinances, as amended, in effect when the offense was committed and the former law is continued in effect for this purpose.

SECTION 4. That should any word, sentence, paragraph, subdivision, clause, phrase or section of this ordinance, be adjudged or held to be void or unconstitutional, the same shall not affect the validity of the remaining portions of said ordinance, which shall remain in full force and effect.

SECTION 5. That any person violating any of the provisions or terms of this Ordinance shall be subject to the same penalty as provided for in the Code of Ordinances of the City of Sachse as heretofore amended and upon conviction shall be punished by a fine not to exceed the sum of Two Thousand Dollars (\$2,000.00) for each offense.

SECTION 6. This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law and charter in such cases provides.

PASSED AND APPROVED by the City Council of the City of Sachse, Texas on the _____ day of _____, 2019.

APPROVED:

Mike Felix
Mayor

DULY ENROLLED:

Michelle Lewis Sirianni
City Secretary

APPROVED AS TO FORM:

Joseph J. Gorfida, Jr.
City Attorney
(05-01-2019:TM107683)

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	C. Consent Agenda - All items listed on the consent agenda will be considered by the City Council and will be enacted on by one motion. There will be no separate discussion of these items unless a Councilmember or citizen so requests.
Subject	5. Approve an ordinance amending the Code of Ordinances by amending Chapter 10 titled "Utilities" by amending Article 1 titled "in general" by amending Section 10-7 titled "Water Conservation and Drought Contingency and Water Emergency Response Plan" by renaming Section 10-7 "Water Conservation Plan" and by adopting the "2019 Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers."
Access	Public
Type	Action (Consent)
Preferred Date	May 06, 2019
Absolute Date	May 06, 2019
Fiscal Impact	No
Budgeted	No
Recommended Action	Approve as presented.
Goals	Provide excellent government services to Sachse citizens.

Public Content**BACKGROUND**

Sachse purchases wholesale treated water from the North Texas Municipal Water District and supplies it to customers via our public water system. As a part of being a public water provider, the City of Sachse is responsible for adopting a water conservation plan every 5 years in accordance with TCEQ and TWDB requirements.

OVERVIEW

This item is to adopt the North Texas Municipal Water District's Water Conservation Plan for the City of Sachse.

POLICY CONSIDERATIONS

As a public water system, the City of Sachse is required to adopt a Water Conservation Plan every 5 years in accordance with State law.

RECOMMENDATION

Staff recommends approval of an ordinance amending the Code of Ordinances by amending Chapter 10 titled "Utilities" by amending Article 1 titled "in general" by amending Section 10-7 titled "Water Conservation and Drought Contingency and Water Emergency Response Plan" by renaming Section 10-7 "Water Conservation Plan" and by adopting the "2019 Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers."

20190502-SACHSE Ordinance Adopting 2019 Model Water Conservation Plan for North Texas Municipal Water Cities-107711 with exhibit.doc.pdf (4,099 KB)

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF SACHSE, TEXAS, AMENDING THE CODE OF ORDINANCES BY AMENDING CHAPTER 10 TITLED "UTILITIES" BY AMENDING ARTICLE 1 TITLED "IN GENERAL" BY AMENDING SECTION 10-7 TITLED "WATER CONSERVATION AND DROUGHT CONTINGENCY AND WATER EMERGENCY RESPONSE PLAN" BY RENAMING SECTION 10-7 "WATER CONSERVATION PLAN" AND BY ADOPTING THE "2019 MODEL WATER CONSERVATION PLAN FOR NORTH TEXAS MUNICIPAL WATER DISTRICT MEMBER CITIES AND CUSTOMERS"; PROVIDING A REPEALING CLAUSE; PROVIDING A SAVINGS CLAUSE; PROVIDING A SEVERABILITY CLAUSE; PROVIDING FOR A PENALTY OF FINE NOT TO EXCEED THE SUM OF TWO THOUSAND DOLLARS (\$2,000.00) FOR EACH OFFENSE; AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the City of Sachse, Texas (the "City"), recognizes that the amount of water available to its water customers is limited; and

WHEREAS, the City recognizes that due to natural limitations, drought conditions, system failures and other acts of God which may occur, the City cannot guarantee an uninterrupted water supply for all purposes at all times; and

WHEREAS, the Water Code and the regulations of the Texas Commission on Environmental Quality (the "Commission") require that the City adopt a Water Conservation Plan; and

WHEREAS, the City has determined an urgent need in the best interest of the public to adopt a Water Conservation Plan; and

WHEREAS, pursuant to Chapter 54 of the Local Government Code, the City is authorized to adopt such Ordinances necessary to preserve and conserve its water resources; and

WHEREAS, the City Council desires to amend the Code of Ordinances by adopting the "2019 Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers" attached hereto as Exhibit "A," incorporated herein by reference and made a part hereof, as official City policy;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SACHSE, TEXAS:

SECTION 1. That the City of Sachse Code of Ordinances is amended by amending Chapter 10 titled "Utilities" by amending Article 1 titled "In General" by amending Section 10-7, amended to read as follows:

“Chapter 10

UTILITIES

....

ARTICLE I. IN GENERAL

...

Sec. 10-7. Water conservation plan.

The city council hereby approves and adopts the “2019 Model Water Conservation Plan for North Texas Municipal Water District Member Cities and Customers” (the “plan”), attached hereto as Addendum A, as if recited verbatim herein. The city commits to implement the requirements and procedures set forth in the adopted plan.

Addendum “A” is hereby adopted by reference for the city and made part hereof for all purposes, the same as if fully copied herein.

...”

SECTION 2. That all provisions of the Ordinances of the City of Sachse, Texas, in conflict with the provisions of this ordinance be, and the same are hereby, repealed, and all other provisions of the Ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3. An offense committed before the effective date of this ordinance is governed by prior law and the provisions of the Code of Ordinances, as amended, in effect when the offense was committed and the former law is continued in effect for this purpose.

SECTION 4. That should any word, sentence, paragraph, subdivision, clause, phrase or section of this ordinance, be adjudged or held to be void or unconstitutional, the same shall not affect the validity of the remaining portions of said ordinance, which shall remain in full force and effect.

SECTION 5. That any person violating any of the provisions or terms of this Ordinance shall be subject to the same penalty as provided for in the Code of Ordinances of the City of Sachse as heretofore amended and upon conviction shall be punished by a fine not to exceed the sum of Two Thousand Dollars (\$2,000.00) for each offense.

SECTION 6. This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law and charter in such cases provides.

PASSED AND APPROVED by the City Council of the City of Sachse, Texas on the _____ day of _____, 2019.

APPROVED:

Mike Felix
Mayor

DULY ENROLLED:

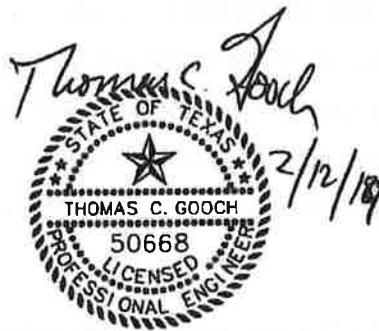
Michelle Lewis-Sirianni
City Secretary

APPROVED AS TO FORM:

Joseph J. Gorfida, Jr.
City Attorney
(05-02-2019:TM107711)

2019 MODEL WATER CONSERVATION PLAN FOR NORTH TEXAS MUNICIPAL WATER DISTRICT MEMBER CITIES AND CUSTOMERS

JANUARY 2019



FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

Prepared by:

FREESE AND NICHOLS, INC.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300

FOREWARD

This 2019 Model Water Conservation Plan (WCP) was prepared by Freese and Nichols for the North Texas Municipal Water District (NTMWD). It is intended to be used as a guide by NTMWD Member Cities and Customers as they develop their own water conservation plans. The model plan was prepared pursuant to Texas Commission on Environmental Quality (TCEQ) rules. Some material is based on the existing water conservation plans listed in Appendix A.

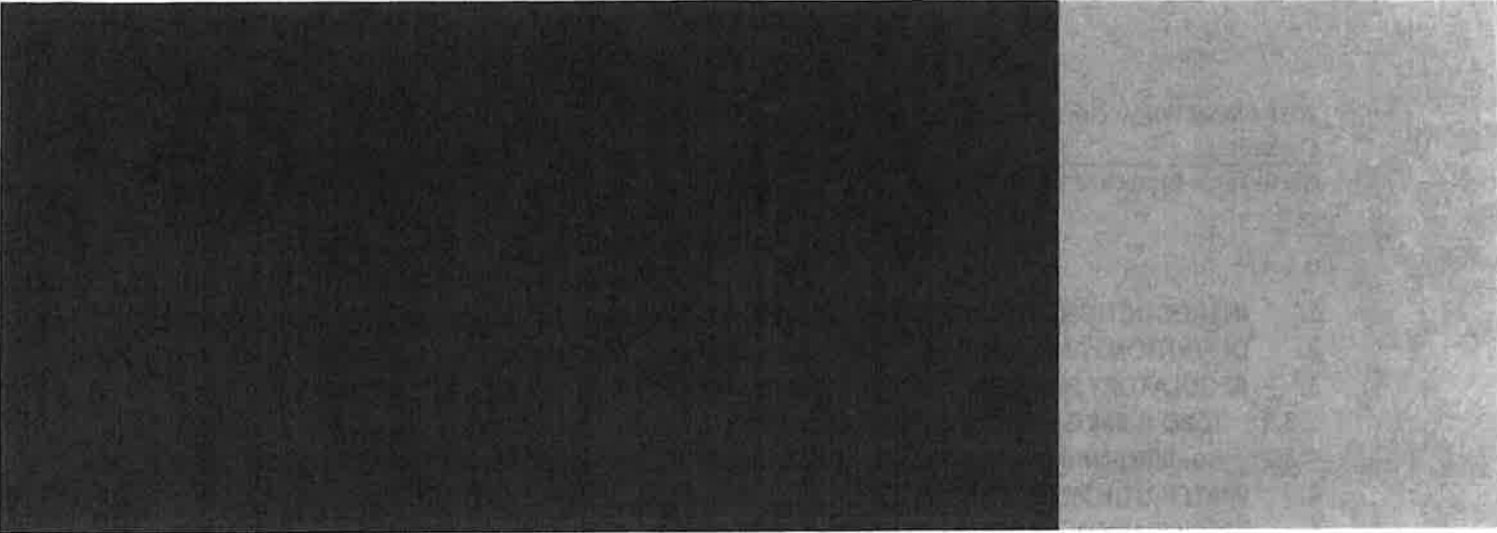
Questions regarding this Model Water Conservation plan should be addressed to the following:

Jeremy Rice
Freese and Nichols, Inc.
(817) 735-7300
jjr@freese.com

Denise Hickey
North Texas Municipal Water District
(972) 442-5405
dhickey@ntmwd.com

This 2019 Model Water Conservation Plan is based on the Texas Administrative Code in effect on January 18, 2019 and considers water conservation best management practices from Texas Water Development Board (TWDB) Report 362, *Water Conservation Best Management Practices Guide*. In 2007, the state legislature created the Water Conservation Advisory Council (WCAC) as a council with expertise in water conservation representing various interest with one of their charges to regularly review existing Best Management Practices (BMPs) and add additional new BMPs as appropriate. The draft WCAC BMPs available as of November 30, 2018 have also been considered in the preparation of this plan.

None of the currently proposed BMPs will cause this plan to be obsolete. The most current annual report form should be obtained from TCEQ¹ when preparing the annual report (Appendix J) to submit to the TCEQ. A copy of the annual report should be sent to the TWDB as well as to the TCEQ.



WATER CONSERVATION PLAN FOR CITY OF SACHSE

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APPENDICES

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APPENDIX B	Texas Commission on Environmental Quality Rules on Water Conservation Plans for Municipal Uses by Public Water Suppliers • Texas Administrative Code Title 30, Chapter 288, Subchapter A, Section 288.1 – Definitions (Page B-1) • Texas Administrative Code Title 30, Chapter 288, Subchapter A, Rule Section 288.2 – Water Conservation Plans for Municipal Uses by Public Water Suppliers (Page B-4)
APPENDIX C	TCEQ Water Utility Profile
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APPENDIX E	Considerations for Landscape Water Management Regulations
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APPENDIX I	Sample Landscape Ordinance
APPENDIX J	TCEQ Water Conservation Implementation Report



1. INTRODUCTION AND OBJECTIVES

Water supply has always been a key issue in the development of Texas. In recent years, the increasing population and economic development of North Central Texas have led to growing demands for water supplies. At the same time, local and less expensive sources of water supply are largely already developed. Additional supplies to meet future demands will be expensive and difficult to secure. Severe drought conditions in recent years have highlighted the importance of efficient use of our existing supplies to make them last as long as possible. This will delay the need for new supplies, minimize the environmental impacts associated with developing new supplies, and delay the high cost of additional water supply development.

Recognizing the need for efficient use of existing water supplies, the TCEQ has developed guidelines and requirements governing the development of water conservation and drought contingency plans for municipal uses by public water suppliers.² The TCEQ guidelines and requirements for wholesale suppliers are included in Appendix B. The North Texas Municipal Water District ("NTMWD or District") has developed this Model Water Conservation Plan to be consistent with TCEQ guidelines and requirements. The best management practices established by the Water Conservation Implementation Task Force³ were also considered in the development of the water conservation measures.

This Model Water Conservation Plan includes measures that are intended to result in ongoing, long-term water savings. This plan replaces the previous plans dated August 2004, April 2006, March 2008 and April 2014⁴.

The objectives of this water conservation plan are as follows:

- To reduce water consumption from the levels that would prevail without conservation efforts.
- To reduce the loss and waste of water.
- To improve efficiency in the use of water.
- Encourage efficient outdoor water use.
- To maximize the level of recycling and reuse in the water supply.
- To extend the life of current water supplies by reducing the rate of growth in demand.



The water conservation plan presented in this document is a Model Water Conservation Plan intended for adoption by the NTMWD Member Cities and Customers. In order to adopt this plan, each Member City and Customer will need to do the following:

- Complete the water utility profile (provided in Appendix C).
- Set five-year and ten-year goals for per capita water use.
- Adopt ordinance(s) or regulation(s) approving the model plan.
- Complete the annual water conservation implementation report (in Appendix J).

The water utility profile, goals, and ordinance(s) or regulations should be provided to NTMWD in draft form for review and comments. Final adopted versions should also be provided to NTMWD, as well as TCEQ and should be attached to the adopted water conservation plan as Appendix G. This Model Water Conservation Plan includes all the elements of such plans required by TCEQ. Some elements of this model plan go beyond TCEQ requirements. Any water supplier wishing to adjust elements of the Model Water Conservation Plan should coordinate with NTMWD.

*Superscripted numbers match references listed in Appendix A.



2. DEFINITIONS AND ABBREVIATIONS

1. **ATHLETIC FIELD** means a public sports competition field, the essential feature of which is turf grass, used primarily for organized sports practice, competition or exhibition events for schools; professional sports and league play sanctioned by the utility providing retail water supply.
2. **COOL SEASON GRASSES** are varieties of turf grass that grow best in cool climates primarily in northern and central regions of the U.S. Cool season grasses include perennial and annual rye grass, Kentucky blue grass and fescues.
3. **CUSTOMERS** include those entities to whom NTMWD provides wholesale water that are not members of NTMWD.
4. **DRIP IRRIGATION** is a type of micro-irrigation system that operates at low pressure and delivers water in slow, small drips to individual plants or groups of plants through a network of plastic conduits and emitters; also called trickle irrigation.
5. **EVAPOTRANSPIRATION (ET)** represents the amount of water lost from plant material to evaporation and transpiration. The amount of ET can be estimated based on the temperature, wind, and relative humidity.
6. **ET/SMART CONTROLLERS** are irrigation controllers that adjust their schedule and run times based on weather (ET) data. These controllers are designed to replace the amount of water lost to evapotranspiration.
7. **IRRIGATION SYSTEM** means a permanently installed, custom-made, site-specific system of delivering water generally for landscape irrigation via a system of pipes or other conduits installed below ground.
8. **LANDSCAPE** means any plant material on a property, including any tree, shrub, vine, herb, flower, succulent, ground cover, grass or turf species, that is growing or has been planted out of doors.
9. **MEMBER CITIES** include the cities of Allen, Farmersville, Forney, Frisco, Garland, McKinney, Mesquite, Plano, Princeton, Richardson, Rockwall, Royse City, and Wylie, Texas, which are members of NTMWD.



10. **MUNICIPAL USE** means the use of potable water provided by a public water supplier as well as the use of treated wastewater effluent for residential, commercial, industrial, agricultural, institutional, and wholesale uses.
11. **REGULATED IRRIGATION PROPERTY** means any (customer class, i.e. commercial) property that uses (over a certain amount) of water or more for irrigation purposes in a single calendar year or is greater than (certain size).
12. **RESIDENTIAL GALLONS PER CAPITA PER DAY** means (Residential GPCD) the total gallons sold for residential use by a public water supplier divided by the residential population served and then divided by the number of days in the year.
13. **RETAIL CUSTOMERS** include those customers to whom the utility provides retail water from a water meter.
14. **TOTAL GALLONS PER CAPITA PER DAY (Total GPCD)** means the total amount of water diverted and/or pumped for potable use divided by the total permanent population divided by the days of the year. Diversion volumes of reuse as defined in TAC 288.1 shall be credited against total diversion volumes for the purposes of calculating GPCD for targets and goals.
15. **WATER CONSERVATION PLAN** means the Member City or Customer water conservation plan approved and adopted by the utility.

Abbreviations

Abbreviation	Full Nomenclature
BMP	Best Management Practices
NTMWD or District	North Texas Municipal Water District
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
WCAC	Water Conservation Advisory Council
WCP	Water Conservation Plan

3. REGULATORY BASIS FOR WATER CONSERVATION PLAN

3.1 TCEQ Rules Governing Conservation Plans

The TCEQ rules governing development of water conservation plans for municipal uses by public water suppliers are contained in Title 30, Chapter 288, Subchapter A, Section 288.2 of the Texas Administrative Code, which is included in Appendix B. For the purpose of these rules, a water conservation plan is defined as “[a] strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water.”² The water conservation plan elements required by the TCEQ water conservation rules that are covered in this water conservation plan are listed below.

Minimum Conservation Plan Requirements

The minimum requirements in the Texas Administrative Code for Water Conservation Plans for Municipal Uses by Public Water Suppliers are covered in this water conservation plan as follows:

- 288.2(a)(1)(A) – Utility Profile – Section 4 and Appendix C
- 288.2(a)(1)(B) – Record Management System – Section 6.1.5
- 288.2(a)(1)(C) – Specific, Quantified Goals – Section 5
- 288.2(a)(1)(D) – Accurate Metering – Section 6.1.1
- 288.2(a)(1)(E) – Universal Metering – Section 6.1.2
- 288.2(a)(1)(F) – Determination and Control of Water Loss – Sections 6.1.3 and 6.1.4
- 288.2(a)(1)(G) – Public Education and Information Program – Section 6.2
- 288.2(a)(1)(H) – Non-Promotional Water Rate Structure – Section 6.6
- 288.2(a)(1)(I) – Reservoir System Operation Plan – Section 6.3
- 288.2(a)(1)(J) – Means of Implementation and Enforcement – Section 8
- 288.2(a)(1)(K) – Coordination with Regional Water Planning Group – Section 6.4 and Appendix F
- 288.2(c) – Review and Update of Plan – Section 9

Conservation Additional Requirements (Population over 5,000)

- The Texas Administrative Code includes additional requirements for water conservation plans for drinking water supplies serving a population over 5,000
- 288.2(a)(2)(A) – Leak Detection, Repair, and Water Loss Accounting – Sections 6.1.4
- 288.2(a)(2)(B) – Requirement for Water Conservation Plans by Wholesale Customers – Section 6.5

Additional Conservation Strategies

The TCEQ requires that a water conservation implementation report be completed and submitted on an annual basis. The template for this report is included in Appendix J.

In addition to the TCEQ required elements of a water conservation plan, NTMWD also requires the following water conservation strategies to be included in the Member City and Customer water conservation plans:

- 288.2(a)(3)(A) – Conservation Oriented Water Rates – Section 6.6
- 288.2(a)(3)(F) – Considerations for Landscape Water Management Regulations – Section 7.4 and Appendix E

TCEQ rules also include options of, conservation measures that may be adopted by public water suppliers but are not required. NTMWD recommends that the following strategies be included in Member City and Customer water conservation plans:

- 288.2(a)(3)(B) – Ordinances, Plumbing Codes or Rules on Water-Conserving Fixtures – Section 7.1
- 288.2(a)(3)(C) – Replacement or Retrofit of Water-Conserving Plumbing Fixtures – Section 7.5
- 288.2(a)(3)(D) – Reuse and Recycling of Wastewater – Section 7.2
- 288.2(a)(3)(F) – Considerations for Landscape Water Management Regulations – Section 7.3, 7.4
- 288.2(a)(3)(G) – Monitoring Method – Section 7.6
- 288.2(a)(3)(H) – Additional Conservation Practices – Section 7.5

3.2 Guidance and Methodology for Reporting on Water Conservation and Water Use

In addition to TCEQ rules regarding water conservation, this plan also incorporates elements of the Guidance and Methodology for Reporting on Water Conservation and Water Use developed by TWDB and TCEQ⁵, in consultation with the WCAC (the "Guidance"). The Guidance was developed in response to a charge by the 82nd Texas Legislature to develop water use and calculation methodology and guidance for preparation of water use reports and water conservation plans in accordance with TCEQ rules.

4. WATER UTILITY PROFILE

Appendix C to this Model Water Conservation Plan is a template water utility profile based on the format recommended by the TCEQ. In adopting this Model Water Conservation Plan, each Member City and Customer will provide a draft water utility profile to NTMWD for review and comment. A final water utility profile will be provided to NTMWD as well as to TCEQ.

5. SPECIFICATION OF WATER CONSERVATION GOALS

TCEQ rules require the adoption of specific water conservation goals for a water conservation plan. As part of plan adoption, each Member City and Customer must develop 5-year and 10-year goals for water savings, including goals for per capita municipal use and for water loss programs. These goals should be submitted to NTMWD in draft form for review. The goals for this water conservation plan include the following:

- Maintain the total and residential per capita water use below the specified amount in gallons per capita per day in a dry year, as shown in the completed Table 5-1. NTMWD will publish the amount of reuse to be is calculating the credit for reuse.
- Maintain the water loss percentage in the system below 12 percent annually in 2018 and subsequent years, as discussed in Section 6.1.3. (The 12 percent goal for water loss is recommended but is not required. Systems with long distances between customers, such as rural systems, may adopt a higher percent nonrevenue water goal.)
- Implement and maintain a program of universal metering and meter replacement and repair, as discussed in Section 6.1.2.
- Increase efficient water usage through a water conservation ordinance, order or resolution as discussed in Section 7.4 and Appendix E. (This ordinance is required by NTMWD.)
- Decrease waste in lawn irrigation by implementation and enforcement of landscape water management regulations, as discussed in Section 7.5. (These landscape water management regulations are recommended but are not required.)
- Raise public awareness of water conservation and encourage responsible public behavior by a public education and information program, as discussed in Section 6.2.
- Develop a system specific strategy to conserve water during peak demands, thereby reducing the peak use.

Table 5-1 Five-Year and Ten-Year Per Capita Water Use Goals (GPCD)

Description	Current Average (GPCD)	5-Year Goal (GPCD)	10-Year Goal (GPCD)
Current 5-Year Average Total Per Capita Use with Credit for Reuse	113	108	105
Current 5-Year Average Residential Per Capita Use	86	98	97
Water Loss (GPCD) ¹	12	10	8
Water Loss (Percentage) ²	11%	9%	8%
Expected Reduction due to Low-Flow Plumbing Fixtures			
Projected Reduction Due to Elements in this Plan			
Water Conservation Goals (with credit for reuse)			

1. Water Loss GPCD = (Total Water Loss ÷ Permanent Population) ÷ 365

2. Water Loss Percentage = (Total Water Loss ÷ Total Gallons in System) x 100; or (Water Loss GPCD ÷ Total GPCD) x 100

6. BASIC WATER CONSERVATION STRATEGIES

6.1 Metering, Water Use Records, Control of Water Loss, and Leak Detection and Repair

One of the key elements of water conservation is tracking water use and controlling losses through illegal diversions and leaks. It is important to carefully meter water use, detect and repair leaks in the distribution system and provide regular monitoring of real losses.

6.1.1 Accurate Metering of Treated Water Deliveries from NTMWD

Water deliveries from NTMWD are metered by NTMWD using meters with accuracy of $\pm 2\%$. These meters are calibrated on an annual basis by NTMWD to maintain the required accuracy.

6.1.2 Metering of Customer and Public Uses and Meter Testing, Repair, and Replacement

The provision of water to all customers, including public and governmental users, should be metered. In many cases, Member Cities and Customers already meter retail and wholesale water users. For those Member Cities and Customers who do not currently meter all internal water uses, as well as all subsequent users.

Most Member Cities and Customers test and replace their customer meters on a regular basis. All customer meters should be replaced on a minimum of a 15-year cycle. Those who do not currently have a meter testing and replacement program should implement such a program.

6.1.3 Determination and Control of Water Loss

Total water loss is the difference between the water delivered to a Member City or Customer from NTMWD (and other supplies, if applicable) and the metered water sales to customers plus water authorized for use but not sold. (Authorized for use but not sold would include use for fire fighting, releases for flushing of lines, uses associated with new construction, etc.) Total water loss includes two categories:

- **Apparent Losses** – Includes inaccuracies in customer meters (customer meters tend to run more slowly as they age and under-report actual use); Losses due to

illegal connections and theft. (included in Appendix H); accounts that are being used but have not yet been added to the billing system.

- **Real Losses** – Includes physical losses from the system or mains, reported breaks and leaks, storage overflow and unreported losses.

Measures to control water loss should be part of the routine operations of Member Cities and Customers. Maintenance crews and personnel should look for and report evidence of leaks in the water distribution system. A leak detection and repair program is described in Section 6.1.4 below. Meter readers should watch for and report signs of illegal connections so that they can be quickly addressed.

Total water loss should be calculated in accordance with the provisions of Appendix J. With the measures described in this plan, Member Cities and Customers should maintain a water loss percentage below 12 percent in 2018 each year. If total water loss exceeds this goal, the Member City or Customer should implement a more intensive audit to determine the source(s) of loss and to reduce the water loss. The annual conservation report described below is the primary tool that should be used to monitor water loss.

As advance metering technology advances utilities that have these systems should consider as a BMP utilizing the capabilities of these system to provide leak alerts. Retail customers whose accounts demonstrate leaks can be notified by their water provider of potential leak situations for account holder remediation.

6.1.4 Leak Detection and Repair

As described above, water utility crews and personnel should look for and report evidence of leaks in the water distribution system. Areas of the water distribution system in which numerous leaks and line breaks occur should be targeted for replacement as funds are available.

6.1.5 Record Management System

As required by TAC Title 30, Chapter 288, Section 288.2(a)(1)(B), a record management system should allow for the separation of water sales and uses into residential, commercial, public/institutional, and industrial categories. This information should be included in an annual water conservation report, as described in Section 7.6 below.

Those entities whose record management systems do not currently comply with this requirement should move to implement such a system within the next five years.

6.2 Continuing Public Education and Information Campaign

The continuing public education and information campaign on water conservation includes the following elements:

- Utilize the “Water IQ: Know Your Water” and other public education materials produced by NTMWD.
- Utilize the “Water4Otter” campaign for students.
- Insert water conservation information with water bills. Inserts will include material developed by Member Cities’ and Customers’ staff and material obtained from the TWDB, TCEQ, and other sources.
- Encourage local media coverage of water conservation issues and the importance of water conservation.
- Notify local organizations, schools, and civic groups that Member City or Customer staff and staff of NTMWD are available to make presentations on the importance of water conservation and ways to save water.
- Promote the *Texas Smartscape* web site (www.txsmartscape.com) and provide water conservation brochures and other water conservation materials available to the public at City Hall and other public places.
- Make information on water conservation available on the Member City’s or Customer’s website (if applicable) and include links to the “Water IQ: Know Your Water” website, *Texas Smartscape* website and to information on water conservation on the TWDB and TCEQ web sites and other resources.
- NTMWD is an EPA Water Sense Partner and participates in the EPA Water Sense sponsored “Fix a Leak Week.” NTMWD encourages all member cities and customers to become EPA Water Sense Partners.
- Utilize the Water My Yard website and encourage customers to sign-up to receive weekly watering advice.

6.3 NTMWD Reservoir System Operation Plan

Member Cities and Customers of NTMWD purchase treated water from NTMWD and do not have surface water supplies for which to implement a reservoir system operations plan. NTMWD operates multiple sources of water supply as a system. The operation of the reservoir system is intended to optimize the use of the District's sources (within the constraints of existing water rights) while minimizing energy use cost for pumping, maintaining water quality, minimizing potential impacts on recreational users of the reservoirs and fish and wildlife.

6.4 Coordination with Regional Water Planning Group and NTMWD

Appendix F includes a letter sent to the Chairs of the water planning group accompanied by this Model Water Conservation Plan. The adopted ordinance(s) or regulation(s) and the adopted water utility profile will be sent to the Chair of the appropriate Water Planning Group and to NTMWD.

6.5 Requirement for Water Conservation Plans by Wholesale Customers

Every contract for the wholesale sale of water by a Member City and/or Customer that is entered into, renewed, or extended after the adoption of this water conservation plan will include a requirement that the wholesale customer and any wholesale customers of that wholesale customer develop and implement a water conservation plan meeting the requirements of Title 30, Chapter 288, of the Texas Administrative Code. This requirement extends to each successive wholesale customer in the resale of the water.

6.6 Increasing Block Water Rate Structure

Each Member City and Customer must adopt, if it has not already done so, an increasing block rate water structure that is intended to encourage water conservation and to discourage excessive use and waste of water upon completion its next rate study or within five years. An example water rate structure is as follows:

Residential Rates

1. Monthly minimum charge. This can (but does not have to) include up to 2,000 gallons water use with no additional charge.
2. Base charge per 1,000 gallons up to the approximate average residential use.

3. 2nd tier (from the average to 2 times the approximate average) at 1.25 to 2.0 times the base charge.
4. 3rd tier (above 2 times the approximate average) at 1.25 to 2.0 times the 2nd tier.
5. Additional tiers with further increases if desired.
6. The residential rate can also include a lower tier for basic household use up to 4,000 gallons per month or a determined basic use.

Commercial/Industrial Rates

Commercial/Industrial rates should include at least 2 tiers, with rates for the 2nd tier set at 1.25 to 2.0 times that of the first tier. Higher water rates for commercial irrigation use are encouraged, but not required.

7. ENHANCED WATER CONSERVATION STRATEGIES

7.1 Ordinances, Plumbing Codes, or Rules on Water-Conserving Fixtures

The state has required water-conserving fixtures in new construction and renovations since 1992. The state standards call for flows of no more than 2.5 gallons per minute (gpm) for faucets, 2.5 gpm for showerheads. As of January 1, 2014, the state requires maximum average flow rates of 1.28 gallons per flush (gpf) for toilets and 0.5 gpf for urinals. Similar standards are now required under federal law. These state and federal standards assure that all new construction and renovations will use water-conserving fixtures. Rebate programs to encourage replacement of older fixtures with water conservation programs are discussed in Section 7.5.

7.2 Reuse and Recycling of Wastewater

Most Member Cities and Customers do not own and operate their own wastewater treatment plants. Their wastewater is treated by NTMWD. NTMWD currently has the largest wastewater reuse program in the state. NTMWD has water rights allowing reuse of up to 71,882 acre-feet per year of treated wastewater discharges from the Wilson Creek Wastewater Treatment Plant for municipal purposes. In addition, NTMWD has also developed the East Fork Reuse Project which can divert up to 157,393 acre-feet per year based on treated wastewater discharges by NTMWD. With the addition of the Main Stem Pump station the District will be able to increase flows through the East Fork Reuse Project up to an additional 56,100 acre-feet per year. When fully developed, these three reuse projects will provide up to 42 percent of the NTMWD's currently permitted water supplies. NTMWD also provides treated effluent from its wastewater treatment plants available for direct reuse for landscape irrigation and industrial use.

Those Member Cities and Customers who own and operate their own wastewater treatment plants should move toward reusing treated effluent for irrigation purposes at their plant site over the next three years. These entities should also seek other alternatives for reuse of recycled wastewater effluent.

7.3 Interactive Weather Stations / "Water My Yard" Program

NTMWD has developed the Water My Yard program to install weather stations throughout its service area in order to provide consumers with a weekly e-mail and information through the "Water My Yard" website to assist consumers in determining an adequate amount of

supplemental water to maintain healthy grass in a specific location. This service represents the largest network of weather stations providing ET-based irrigation recommendations in the State of Texas, and provides the public advanced information regarding outdoor irrigation needs, thereby reducing water use. Through a series of selections on the type of irrigation system a consumer has, a weekly email is provided that will determine how long (in minutes) an irrigation system needs to run based on the past seven days of weather. This recommendation provides the actual amount of supplemental water that is required for a healthy lawn based on research of the Texas A&M Agrilife Extension Service and proven technologies. This innovative program has been available to those within the NTMWD service area since May 2013. The city/utility will encourage customers to subscribe to weekly watering updates through Water My Yard or other similar program in an effort to reduce outdoor water consumption.

7.4 Compulsory Landscape and Water Management Measures

The following landscape water management measures are required by NTMWD for this plan. These measures represent minimum measures to be implemented and enforced in order to irrigate the landscape appropriately and are to remain in effect on a permanent basis unless water resource management stages are declared.

1. Landscape Water Management Measures

- Limit landscape watering with sprinklers or irrigation systems at each service address to no more than two days per week (April 1 – October 31), with education that less than twice per week is usually adequate. (NTMWD has identified assigning designated watering days as a BMP and suggests implementing a watering schedule as part of this measure). Additional watering of landscape may be provided by hand-held hose with shutoff nozzle, use of dedicated irrigation drip zones. An exception is allowed for landscape associated with new construction that may be watered as necessary for 30 days from the installation of new landscape features.
- Limit landscape watering with sprinklers or irrigation systems at each service address to no more than one day per week beginning November 1 and ending March 31 of each year, with education that less than once per week is usually adequate.

- Estimated savings from the year-round watering restrictions, mentioned above, since the District terminated drought stages in 2015 is approximately 2.5 to 3.5 percent on an average annualized basis.
- Prohibit lawn irrigation watering from 10 AM to 6 PM (April 1 – October 31).
- Prohibit the use of irrigation systems that water impervious surfaces. (Wind-driven water drift will be taken into consideration.)
- Prohibit outdoor watering during precipitation or freeze events.
- Prohibit use of poorly maintained sprinkler systems that waste water.
- Prohibit excess water runoff or other obvious waste.
- Require rain and freeze sensors and/or ET or Smart controllers on all new irrigation systems. Rain and freeze sensors and/or ET or Smart controllers must be maintained to function properly.
- Prohibit overseeding, sodding, sprigging, broadcasting or plugging with cool season grasses or watering cool season grasses, except for golf courses and athletic fields.
- Require that irrigation systems be inspected at the same time as initial backflow preventer inspection.
- Requirement that all new irrigation systems be in compliance with state design and installation regulations (Texas Administrative Code Title 30, Chapter 344).
- Require the owner of a regulated irrigation property to obtain an evaluation of any permanently installed irrigation system on a periodic basis. The irrigation evaluation shall be conducted by an licensed irrigator in the State of Texas and be submitted to the local water provider (i.e., city, water supply corporation).

2. Additional Water Management Measures

- Prohibit the use of potable water to fill or refill residential, amenity, and any other natural or manmade ponds. A pond is considered to be a still body of water with a surface area of 500 square feet or more.
- Non-commercial car washing can be done only when using a water hose with a shut-off nozzle.
- Hotels and motels shall offer a linen reuse water conservation option to customers.

- Restaurants, bars, and other commercial food or beverage establishments may not provide drinking water to customers unless a specific request is made by the customer for drinking water.

Member Cities and Customers are responsible for developing regulations, ordinances, policies, or procedures for enforcement of water conservation guidelines.

Appendix E is a summary of considerations for landscape water management regulations adopted as part of the development of this water conservation plan. These regulations are intended to minimize waste in landscape irrigation. Appendix E includes the required landscape water measures laid out in this section.

7.5 Additional Water Conservation Measures (Not Required)

NTMWD also urges its Member Cities and Customers to consider including the following additional water conservation measures in their plans. Member Cities and Customers are responsible for developing regulations, ordinances, policies, or procedures for enforcement of water conservation guidelines.

1. Landscape Water Management Regulations

- Requirement that all existing irrigation systems be retrofitted with rain and freeze sensors and/or ET or Smart controllers capable of multiple programming. Rain and freeze sensors and/or ET or Smart controllers must be maintained to function properly.
- Requirement that all new athletic fields be irrigated by a separate irrigation system from surrounding areas.
- Implementation of other measures to encourage off-peak water use.

2. Landscape Ordinance

- Landscape ordinances are developed by a city to guide developers in landscaping requirements for the city. A sample landscape ordinance is provided in Appendix I and is intended as a guideline for adopting a landscape ordinance to promote water-efficient landscape design.
- Native, drought tolerant or adaptive plants should be encouraged.

- Drip irrigation systems should be promoted.
- ET/Smart controllers that only allow sprinkler systems to irrigate when necessary should be promoted.

3. Water Audits

- Water audits are useful in finding ways in which water can be used more efficiently at a specific location. NTMWD recommends that Member Cities and Customers offer water audits to customers.

4. Industrial, Commercial, and Institutional Customers

In order to target programs towards this customer base, the District hired Alan Plummer Associates to conduct the “North Texas Municipal Water District Industrial, Commercial, and Institutional Water Use Efficiency Study.” The primary scope items in the study are as follows:

- Develop ICI Customer Database
- Calculate per Capita Consumptions
- Identify, Define and Categorize
- Establish Base Use Estimates
- Identify Trends
- Select sectors for detailed analysis
- Benchmarking
- Identify Potential for Reduction
- Estimate Potential Demand Reduction by Strategy
- Program Development

The kick-off meeting was held on September 10, 2018 and the project is currently in the process of data collection. It is not anticipated that any recommended programs will be identified prior to the publication of this plan. Once the results are published, the District will develop, in cooperation with the District’s Member Cities and Customers and in collaboration with ICI water users within the District’s service area, a program to reduce the per unit or per capita ICI water use within the District.

5. Rebates

In addition to the conservation measures described above, NTMWD also recommends the following water conservation incentive programs for consideration by Member Cities and Customers:

- Commercial clothes washer rebates for the purchase and installation of high efficiency card- or coin -operated commercial clothes washers;
- Low-flow toilet replacement and rebate programs;
- Rebates for rain/freeze sensors and/or ET or Smart controllers;
- Low-flow showerhead and sink aerators replacement programs or rebates;
- Residential water efficient clothes washer rebates;
- Pressure reducing valve installation programs or rebates;
- Rain barrel rebates;
- Pool covers;
- On-demand hot water heater rebates; and/or
- Other water conservation incentive programs.

7.6 Monitoring of Effectiveness and Efficiency - NTMWD Annual Water Conservation Report

Appendix D is a form that should be used in the development of an annual water conservation report by Member Cities and Customers. This form should be completed by March 31 of the following year and used to monitor the effectiveness and efficiency of the water conservation program and to plan conservation-related activities for the next year. The form records the water use by category, per capita municipal use, and total water loss for the current year and compares them to historical values. As part of the development of Appendix D, Member Cities and Customers will complete the tracking tool by March 31 of the following year and submit them to NTMWD. The annual water conservation report should be sent to NTMWD, which will monitor NTMWD Member Cities' and Customers' water conservation trends.



7.7 Water Conservation Implementation Report

Appendix J includes the TCEQ-required water conservation implementation report. The report is due to the TCEQ by May 1 of every year. This report lists the various water conservation strategies that have been implemented, including the date the strategy was implemented. The report also calls for the five-year and ten-year per capita water use goals from the previous water conservation plan. The reporting entity must answer whether or not these goals have been met and if not, why not. The amount of water saved is also requested.

8. IMPLEMENTATION AND ENFORCEMENT OF THE WATER CONSERVATION PLAN

Appendix G contains a draft ordinance, order, or resolution which may be tailored to meet Member or Customer City needs and may be adopted by the City Council or governing board regarding the Model Water Conservation Plan. The ordinance, order, or resolution designates responsible officials to implement and enforce the water conservation plan. Appendix E, the considerations for landscape water management regulations, also includes information about enforcement. Appendix H includes a copy of an ordinance, order, or resolution that may be adopted related to illegal connections and water theft.



9. REVIEW AND UPDATE OF WATER CONSERVATION PLAN

TCEQ requires that the water conservation plans be updated every five years. The plan will be updated as required and as appropriate based on new or updated information.

APPENDIX A

LIST OF REFERENCES



APPENDIX A

LIST OF REFERENCES

1. Texas Commission on Environmental Quality Water Conservation Implementation Report.
<https://www.tceq.texas.gov/assets/public/permitting/forms/20645.pdf>
2. Title 30 of the Texas Administrative Code, Part 1, Chapter 288, Subchapter A, Rules 288.1 and 288.5, and Subchapter B, Rule 288.22, downloaded from
[http://texreg.sos.state.tx.us/public/readtac\\$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=288](http://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=288),
November 2019.
3. Water Conservation Implementation Task Force: "Texas Water Development Board Report 362, Water Conservation Best Management Practices Guide," prepared for the Texas Water Development Board, Austin, November 2004.
4. Freese and Nichols, INC.: Model Water Conservation Plan for NTMWD Members Cities and Customers, prepared for the North Texas Municipal Water District, Fort Worth, March 2014.
5. Texas Water Development Board, Texas Commission on Environmental Quality, Water Conservation Advisory Council: Guidance and Methodology for Reporting on Water Conservation and Water Use, December 2012
6. Freese and Nichols Inc., Alan Plummer and Associates, CP & Y Inc. and Cooksey Communications. "2016 Region C Regional Water Plan"

APPENDIX B

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULES ON MUNICIPAL WATER CONSERVATION PLANS

APPENDIX B

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULESON MUNICIPAL WATER CONSERVATION PLANS

Texas Administrative Code	
<u>TITLE 30</u>	ENVIRONMENTAL QUALITY
<u>PART 1</u>	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
<u>CHAPTER 288</u>	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
<u>SUBCHAPTER A</u>	WATER CONSERVATION PLANS
RULE §288.1	Definitions

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Agricultural or Agriculture--Any of the following activities:

(A) cultivating the soil to produce crops for human food, animal feed, or planting seed or for the production of fibers;

(B) the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or non-soil media by a nursery grower;

(C) raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;

(D) raising or keeping equine animals;

(E) wildlife management; and

(F) planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure.



- (2) Agricultural use--Any use or activity involving agriculture, including irrigation.
- (3) Best management practices--Voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and that can be implemented within a specific time frame.
- (4) Conservation--Those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.
- (5) Commercial use--The use of water by a place of business, such as a hotel, restaurant, or office building. This does not include multi-family residences or agricultural, industrial, or institutional users.
- (6) Drought contingency plan--A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s).
- (7) Industrial use--The use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, and the development of power by means other than hydroelectric, but does not include agricultural use.
- (8) Institutional use--The use of water by an establishment dedicated to public service, such as a school, university, church, hospital, nursing home, prison or government facility. All facilities dedicated to public service are considered institutional regardless of ownership.
- (9) Irrigation--The agricultural use of water for the irrigation of crops, trees, and pastureland, including, but not limited to, golf courses and parks which do not receive water from a public water supplier.
- (10) Irrigation water use efficiency--The percentage of that amount of irrigation water which is beneficially used by agriculture crops or other vegetation relative to the amount of water diverted from the source(s) of supply. Beneficial uses of water for irrigation purposes include, but are not limited to, evapotranspiration needs for vegetative maintenance and growth, salinity management, and leaching requirements associated with irrigation.
- (11) Mining use--The use of water for mining processes including hydraulic use, drilling, washing sand and gravel, and oil field re-pressuring.



(12) Municipal use--The use of potable water provided by a public water supplier as well as the use of sewage effluent for residential, commercial, industrial, agricultural, institutional, and wholesale uses.

(13) Nursery grower--A person engaged in the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or nonsoil media, who grows more than 50% of the products that the person either sells or leases, regardless of the variety sold, leased, or grown. For the purpose of this definition, grow means the actual cultivation or propagation of the product beyond the mere holding or maintaining of the item prior to sale or lease, and typically includes activities associated with the production or multiplying of stock such as the development of new plants from cuttings, grafts, plugs, or seedlings.

(14) Pollution--The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

(15) Public water supplier--An individual or entity that supplies water to the public for human consumption.

(16) Regional water planning group--A group established by the Texas Water Development Board to prepare a regional water plan under Texas Water Code, §16.053.

(17) Residential gallons per capita per day--The total gallons sold for residential use by a public water supplier divided by the residential population served and then divided by the number of days in the year.

(18) Residential use--The use of water that is billed to single and multi-family residences, which applies to indoor and outdoor uses.

(19) Retail public water supplier--An individual or entity that for compensation supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants when that water is not resold to or used by others.

(20) Reuse--The authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either



disposed of or discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

(21) Total use--The volume of raw or potable water provided by a public water supplier to billed customer sectors or nonrevenue uses and the volume lost during conveyance, treatment, or transmission of that water.

(22) Total gallons per capita per day (GPCD)--The total amount of water diverted and/or pumped for potable use divided by the total permanent population divided by the days of the year. Diversion volumes of reuse as defined in this chapter shall be credited against total diversion volumes for the purposes of calculating GPCD for targets and goals.

(23) Water conservation coordinator--The person designated by a retail public water supplier that is responsible for implementing a water conservation plan.

(24) Water conservation plan--A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).

(25) Wholesale public water supplier--An individual or entity that for compensation supplies water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants as an incident of that employee service or tenancy when that water is not resold to or used by others, or an individual or entity that conveys water to another individual or entity, but does not own the right to the water which is conveyed, whether or not for a delivery fee.

(26) Wholesale use--Water sold from one entity or public water supplier to other retail water purveyors for resale to individual customers.



Source Note: The provisions of this §288.1 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective August 15, 2002, 27 TexReg 7146; amended to be effective October 7, 2004, 29 TexReg 9384; amended to be effective January 10, 2008, 33 TexReg 193; amended to be effective December 6, 2012, 37 TexReg 9515; amended to be effective August 16, 2018, 43 TexReg 5218

Texas Administrative Code

<u>TITLE 30</u>	ENVIRONMENTAL QUALITY
<u>PART 1</u>	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
<u>CHAPTER 288</u>	WATER CONSERVATION PLANS, DROUGHT CONTINGENCY PLANS, GUIDELINES AND REQUIREMENTS
<u>SUBCHAPTER A</u>	WATER CONSERVATION PLANS
<u>RULE §288.2</u>	Water Conservation Plans for Municipal Uses by Public Water Suppliers

(a) A water conservation plan for municipal water use by public water suppliers must provide information in response to the following. If the plan does not provide information for each requirement, the public water supplier shall include in the plan an explanation of why the requirement is not applicable.

(1) Minimum requirements. All water conservation plans for municipal uses by public water suppliers must include the following elements:

(A) a utility profile in accordance with the Texas Water Use Methodology, including, but not limited to, information regarding population and customer data, water use data (including total gallons per capita per day (GPCD) and residential GPCD), water supply system data, and wastewater system data;

(B) a record management system which allows for the classification of water sales and uses into the most detailed level of water use data currently available to it, including, if possible, the sectors listed in clauses (i) - (vi) of this subparagraph. Any new billing system purchased by a public water supplier must be capable of reporting detailed water use data as described in clauses (i) - (vi) of this subparagraph:

(i) residential;



- (I) single family;
 - (II) multi-family;
 - (ii) commercial;
 - (iii) institutional;
 - (iv) industrial;
 - (v) agricultural; and,
 - (vi) wholesale.
- (C) specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for municipal use in total GPCD and residential GPCD. The goals established by a public water supplier under this subparagraph are not enforceable;
- (D) metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply;
- (E) a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement;
- (F) measures to determine and control water loss (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections; abandoned services; etc.);
- (G) a program of continuing public education and information regarding water conservation;
- (H) a water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water;
- (I) a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies; and
- (J) a means of implementation and enforcement which shall be evidenced by:



(i) a copy of the ordinance, resolution, or tariff indicating official adoption of the water conservation plan by the water supplier; and

(ii) a description of the authority by which the water supplier will implement and enforce the conservation plan; and

(K) documentation of coordination with the regional water planning groups for the service area of the public water supplier in order to ensure consistency with the appropriate approved regional water plans.

(2) Additional content requirements. Water conservation plans for municipal uses by public drinking water suppliers serving a current population of 5,000 or more and/or a projected population of 5,000 or more within the next ten years subsequent to the effective date of the plan must include the following elements:

(A) a program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system;

(B) a requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

(3) Additional conservation strategies. Any combination of the following strategies shall be selected by the water supplier, in addition to the minimum requirements in paragraphs (1) and (2) of this subsection, if they are necessary to achieve the stated water conservation goals of the plan. The commission may require that any of the following strategies be implemented by the water supplier if the commission determines that the strategy is necessary to achieve the goals of the water conservation plan:

(A) conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;



(B) adoption of ordinances, plumbing codes, and/or rules requiring water-conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition;

(C) a program for the replacement or retrofit of water-conserving plumbing fixtures in existing structures;

(D) reuse and/or recycling of wastewater and/or graywater;

(E) a program for pressure control and/or reduction in the distribution system and/or for customer connections;

(F) a program and/or ordinance(s) for landscape water management;

(G) a method for monitoring the effectiveness and efficiency of the water conservation plan; and

(H) any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(b) A water conservation plan prepared in accordance with 31 TAC §363.15 (relating to Required Water Conservation Plan) of the Texas Water Development Board and substantially meeting the requirements of this section and other applicable commission rules may be submitted to meet application requirements in accordance with a memorandum of understanding between the commission and the Texas Water Development Board.

(c) A public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan every five years to coincide with the regional water planning group.



Source Note: The provisions of this §288.2 adopted to be effective May 3, 1993, 18 TexReg 2558; amended to be effective February 21, 1999, 24 TexReg 949; amended to be effective April 27, 2000, 25 TexReg 3544; amended to be effective October 7, 2004, 29 TexReg 9384; amended to be effective December 6, 2012, 37 TexReg 9515

APPENDIX C

TCEQ WATER UTILITY PROFILE



Texas Commission on Environmental Quality
UTILITY PROFILE AND WATER CONSERVATION PLAN
REQUIREMENTS FOR MUNICIPAL WATER USE
BY RETAIL PUBLIC WATER SUPPLIERS

This form is provided to assist retail public water suppliers in water conservation plan development. If you need assistance in completing this form or in developing your plan, please contact the conservation staff of the Resource Protection Team in the Water Availability Division at (512) 239-4691.

Name: City of Sachse
Address: 3815- B Sachse Road, Sachse, TX 75048
Telephone Number: (972) 495-7600 Fax: (972) 4954104
Water Right No.(s): _____
Regional Water Planning Group: C
Form Completed by: Sarah Perkins
Title: Public Works Coordinator
Person responsible for implementing conservation program: Gregory Peters Phone: (972) 495 7600
Signature:  Date: 5/1/19

NOTE: If the plan does not provide information for each requirement, include an explanation of why the requirement is not applicable.



UTILITY PROFILE

I. POPULATION AND CUSTOMER DATA

A. Population and Service Area Data

1. Attach a copy of your service-area map and, if applicable, a copy of your Certificate of Convenience and Necessity (CCN). 10096
2. Service area size (in square miles): 10
(Please attach a copy of service-area map)
3. Current population of service area: 27,360
4. Current population served for:
 - a. Water 27,360
 - b. Wastewater _____

5. Population served for previous five years:

<i>Year</i>	<i>Population</i>
2017	25,039
2016	24,554
2015	23,681
2014	22,026

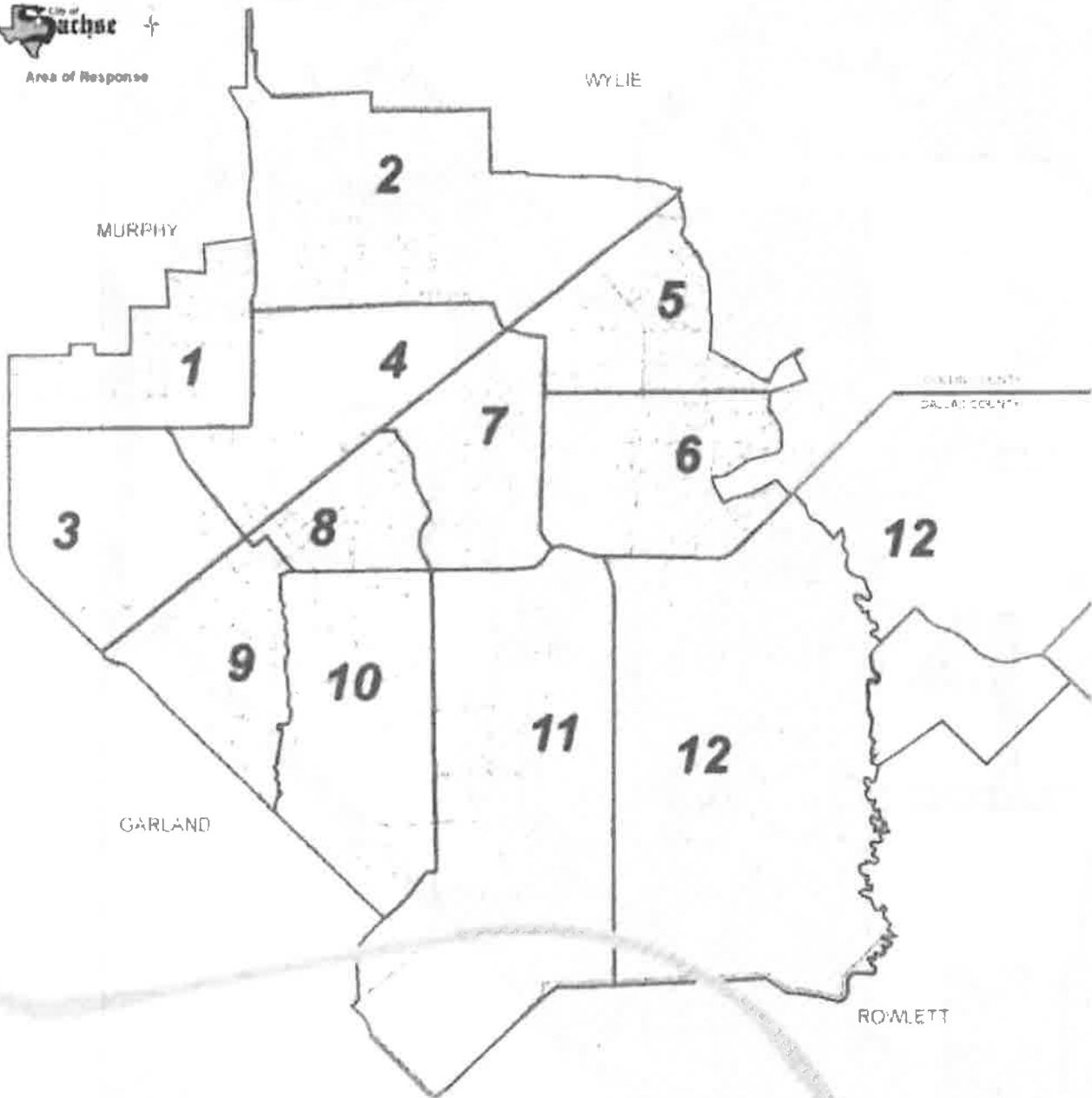
6. Projected population for service area in the following decades:

<i>Year</i>	<i>Population</i>
2020	29,000
2030	29,000
2040	29,000
2050	29,000
2060	29,000

7. List source or method for the calculation of current and projected population size.
2017 Comprehensive Plan, 2010 Census, NCTCOG data

B. Customers Data

Senate Bill 181 requires that uniform consistent methodologies for calculating water use and conservation be developed and available to retail water providers and certain other water use sectors as a guide for preparation of water use reports, water conservation plans, and reports on water conservation efforts. A water system must provide the most detailed level of customer and



City of Sachse CCN Map



May 1, 2019

1:36,112

0 0.25 0.5 1 mi
0 0.4 0.8 1.6 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan,



water use data available to it, however, any new billing system purchased must be capable of reporting data for each of the sectors listed below. http://www.tceq.texas.gov/assets/public/permitting/watersupply/water_rights/sb181_guidance.pdf

1. Current number of active connections. Check whether multi-family service is counted as ☒ Residential or ☐ Commercial?

<i>Treated Water Users</i>	<i>Metered</i>	<i>Non-Metered</i>	<i>Totals</i>
Residential	8,751	0	8,751
Single-Family	8,145	0	8,145
Multi-Family	606	0	606
Commercial	280	0	280
Industrial/Mining	0	0	0
Institutional	89	0	89
Agriculture	0	0	0
Other/Wholesale	0	0	0

2. List the number of new connections per year for most recent three years.

<i>Year</i>	2018	2017	2016
<i>Treated Water Users</i>			
Residential	308	221	285
Single-Family	232	92	220
Multi-Family	76	129	38
Commercial	14	10	43
Industrial/Mining	0	0	0
Institutional	0	3	7
Agriculture	0	0	0
Other/Wholesale	0	0	0

3. List of annual water use for the five highest volume customers.

	<i>Customer</i>	<i>Use (1,000 gal/year)</i>	<i>Treated or Raw Water</i>
1.	Olympus Woodbridge	11,777,800	Treated
2.	Garland ISD High School Irrigation	9,187,000	Treated
3.	Garland ISD Hudson Drive	4,452,000	Treated



4.	Garland ISD High School	4,367,300	Treated
5.	City of Sachse Hudson Park	3,953,400	Treated

II. WATER USE DATA FOR SERVICE AREA

A. Water Accounting Data

- List the amount of water use for the previous five years (in 1,000 gallons).
Indicate whether this is ☐ diverted or ☒ treated water.

Year	2018	2017	2016	2015	2014
<i>Month</i>					
January	55,900,000	50,585,000	56,270,000	5,600,800	5,900,100
February	54,387,000	51,106,000	55,965,000	48,698,000	54,681,000
March	64,603,000	68,354,000	61,654,000	52,065,000	57,133,000
April	72,414,000	74,675,000	72,193,000	57,753,000	70,203,000
May	110,696,000	96,094,000	69,657,000	57,238,000	88,891,000
June	117,273,000	93,402,000	101,605,000	86,874,000	84,500,000
July	152,220,000	111,622,000	144,878,000	143,990,000	94,961,000
August	149,764,000	110,728,000	133,601,000	198,190,000	107,979,000
September	64,358,000	120,292,000	100,384,000	149,190,000	102,954,000
October	64,500,5000	99,538,000	94,174,000	124,774,000	79,817,000
November	63,683,000	75,725,000	66,252,000	57,321,000	63,379,000
December	57,287,000	64,005,000	62,745,000	50,950,000	52,600,000
Totals	1,026,874,000	1,016,126,000	1,019,378,000	1,032,643,800	862,998,100

Describe how the above figures were determine (e.g, from a master meter located at the point of a diversion from the source, or located at a point where raw water enters the treatment plant, or from water sales).

- Amount of water (in 1,000 gallons) delivered/sold as recorded by the following account types for the past five years.

Year	2017	2016	2015	2014	2013
<i>Account Types</i>					
Residential					
Single-Family	729,909,900	728,333,000	771,101,000	656,389,000	771,688,000
Multi-Family	34,131,400	31,740,000	25,956,000	30,254,000	16,454,000
Commercial	82,317,600	80,697,000	89,587,000	46,458,000	40,603,000



Industrial/Mining	0	0	0	0	0
Institutional	51,629,800	51,166,000	55,303,000	60,037,000	33,103,000
Agriculture	0	0	0	0	0
Other/Wholesale	0	0	0	0	0

3. List the previous records for water loss for the past five years (the difference between water diverted or treated and water delivered or sold).

<i>Year</i>	<i>Amount (gallons)</i>	<i>Percent %</i>
2017	104,137,300	10.25%
2016	113,442,000	11.13%
2015	123,106,206	11.78%
2014	108,961,000	11.89%
2013	207,848,000	19.07%

B. Projected Water Demands

If applicable, attach or cite projected water supply demands from the applicable Regional Water Planning Group for the next ten years using information such as population trends, historical water use, and economic growth in the service area over the next ten years and any additional water supply requirements from such growth.

III. WATER SUPPLY SYSTEM DATA

A. Water Supply Sources

List all current water supply sources and the amounts authorized (in acre feet) with each.

<i>Water Type</i>	<i>Source</i>	<i>Amount Authorized</i>
Surface Water		
Groundwater		
Contracts	North Texas Municipal Water District	4,088 acre feet
Other		



B. Treatment and Distribution System

1. Design daily capacity of system (MGD):
2. Storage capacity (MGD):
 - a. Elevated 2,150,000
 - b. Ground 6,000,000
3. If surface water, do you recycle filter backwash to the head of the plant?
☐ Yes ☒ No If yes, approximate amount (MGD):

IV. WASTEWATER SYSTEM DATA

A. Wastewater System Data (if applicable)

1. Design capacity of wastewater treatment plant(s) (MGD):
N/A The City of Garland treats all of Sachse's wastewater
2. Treated effluent is used for ☐ on-site irrigation, ☐ off-site irrigation, for ☐ plant wash-down, and/or for ☐ chlorination/dechlorination.

If yes, approximate amount (in gallons per month):
3. Briefly describe the wastewater system(s) of the area serviced by the water utility. Describe how treated wastewater is disposed. Where applicable, identify treatment plant(s) with the TCEQ name and number, the operator, owner, and the receiving stream if wastewater is discharged.

N/A The City of Garland treats all of Sachse's wastewater

B. Wastewater Data for Service Area (if applicable)

1. Percent of water service area served by wastewater system: _____ %
2. Monthly volume treated for previous five years (in 1,000 gallons):

Year					
Month					
January					
February					
March					
April					
May					



June					
July					
August					
September					
October					
November					
December					
Totals					

V. ADDITIONAL REQUIRED INFORMATION

In addition to the utility profile, please attach the following as required by Title 30, Texas Administrative Code, §288.2. Note: If the water conservation plan does not provide information for each requirement, an explanation must be included as to why the requirement is not applicable.

A. Specific, Quantified 5 & 10-Year Targets

The water conservation plan must include specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for municipal use in gallons per capita per day. Note that the goals established by a public water supplier under this subparagraph are not enforceable

B. Metering Devices

The water conservation plan must include a statement about the water suppliers metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply.

C. Universal Metering

The water conservation plan must include and a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement.

D. Unaccounted- For Water Use

The water conservation plan must include measures to determine and control unaccounted-for uses of water (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections; abandoned services; etc.).

E. Continuing Public Education & Information

The water conservation plan must include a description of the program of continuing public education and information regarding water conservation by the water supplier.



F. Non-Promotional Water Rate Structure

The water supplier must have a water rate structure which is not “promotional,” i.e., a rate structure which is cost-based and which does not encourage the excessive use of water. This rate structure must be listed in the water conservation plan.

G. Reservoir Systems Operations Plan

The water conservation plan must include a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin. The reservoir systems operations plan shall include optimization of water supplies as one of the significant goals of the plan.

H. Enforcement Procedure and Plan Adoption

The water conservation plan must include a means for implementation and enforcement, which shall be evidenced by a copy of the ordinance, rule, resolution, or tariff, indicating official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan.

I. Coordination with the Regional Water Planning Group(s)

The water conservation plan must include documentation of coordination with the regional water planning groups for the service area of the wholesale water supplier in order to ensure consistency with the appropriate approved regional water plans.

J. Plan Review and Update

A public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. The revised plan must also include an implementation report.

VI. ADDITIONAL REQUIREMENTS FOR LARGE SUPPLIERS

Required of suppliers serving population of 5,000 or more or a projected population of 5,000 or more within ten years

A. Leak Detection and Repair

The plan must include a description of the program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted for uses of water.

B. Contract Requirements

A requirement in every wholesale water supply contract entered into or renewed after official adoption of the plan (by either ordinance, resolution, or tariff), and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements in this chapter. If the customer intends to resell the water, the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so that each successive customer in the resale of the water will be required to implement water conservation measures in accordance with the provisions of this chapter.

VII. ADDITIONAL CONSERVATION STRATEGIES

A. Conservation Strategies

Any combination of the following strategies shall be selected by the water supplier, in addition to the minimum requirements of this chapter, if they are necessary in order to achieve the stated water conservation goals of the plan. The commission may require by commission order that any of the following strategies be implemented by the water supplier if the commission determines that the strategies are necessary in order for the conservation plan to be achieved:

1. Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates;

2. Adoption of ordinances, plumbing codes, and/or rules requiring water conserving plumbing fixtures to be installed in new structures and existing structures undergoing substantial modification or addition;
3. A program for the replacement or retrofit of water-conserving plumbing fixtures in existing structures;
4. A program for reuse and/or recycling of wastewater and/or graywater;
5. A program for pressure control and/or reduction in the distribution system and/or for customer connections;
6. A program and/or ordinance(s) for landscape water management;
7. A method for monitoring the effectiveness and efficiency of the water conservation plan; and
8. Any other water conservation practice, method, or technique which the water supplier shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

Best Management Practices

The Texas Water Developmental Board's (TWDB) Report 362 is the Water Conservation Best Management Practices (BMP) guide. The BMP Guide is a voluntary list of management practices that water users may implement in addition to the required components of Title 30, Texas Administrative Code, Chapter 288. The Best Management Practices Guide broken out by sector, including Agriculture, Commercial, and Institutional, Industrial, Municipal and Wholesale along with any new or revised BMP's can be found at the following link on the Texas Water Developments Board's website: <http://www.twdb.state.tx.us/conservation/bmps/index.asp>

Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact 512-239-3282.



APPENDIX D

NTMWD MEMBER CITY AND CUSTOMER ANNUAL WATER CONSERVATION REPORT

Due: March 31 of every year

Sachse
Sarah Perkins
(972) 495-7600
sperkins@cityofsachse.com

2018
9,120
27,360
TCEQ number based on retail population
5,531

Recorded Deliveries and Sales by Month (in Million Gallons):

Recorded Deliveries and Sales by Month (in million gallons).

Month	Deliveries from NTMWD	Other Supplies	Sales by Category							
			Residential	Commercial	Public/ Institutional	Industrial	Metered Irrigation	Wholesale	Other	Total
January	55.900		46.741	2.999	1.216					50.956
February	54.387		43.710	3.302	2.294					49.306
March	64.603		38.890	2.629	1.817					43.337
April	72.414		50.633	4.061	2.764					57.458
May	110.696		70.348	6.069	5.288					81.704
June	117.273		103.632	9.627	8.914					122.172
July	152.220		119.499	11.539	10.628					141.666
August	149.764		121.136	12.731	9.386					143.253
September	64.358		91.977	10.038	7.994					110.009
October	64.505		53.301	5.563	5.563					64.428
November	63.683		47.946	4.414	4.414					56.773
December	57.287		45.536	4.200	4.200					53.937
TOTAL	1,027.090		833.349	77.172	64.478					975.000

Peak Day Usage	
Peak Day (MG)	7.152
Average Day (MG)	2.814
Peak/Average Day Ratio	2.542

Authorized Consumption and Water Loss

Total System Input Volume:	1,027.090
Billed Metered:	975.000
Billed Unmetered:	
Unbilled Metered:	
Unbilled Unmetered:	14.000
Total Authorized Consumption:	989.000
Water Losses:	38.091
Total Loss Percent:	3.71%
Goal for Total Loss Percent:	12.00%

Per Capita Use (Gallons per person per day)

Municipal Use (MG)	1,027
Residential Use (MG)	833.349
Total Per Capita Use (gpcd)	103
Municipal Per Capita Use (gpcd)	103
Residential Per Capita Use (gpcd)	83
5-year Per Capita Goal	142
10-year Per Capita Goal	137

Recorded Wholesale Sales by Month (in Million Gallons):

Month	Sales to...	Sales to...	Sales to...	Sales to...	Sales to...	Sales to...	Sales to...	Sales to...	Total Wholesale Sales
January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
TOTAL									

Information on Wholesale Customers:

Customer	Estimated Total Population

Unusual Circumstances (use additional sheets if necessary):

Progress in Implementation of Conservation Plan (use additional sheets if necessary):

The city continues to educate the public in the importance of water conservation. In 2018, the City held it's third annual H2O XPO, to increase awareness of the need for water conservation in our region. Flyers, brochures, and utility bills provide residents water conservation tips. City staff attends monthly meetings with NTMWD to discuss regional programs, initiatives, and ideas related to water conservation. The city will continue to follow water restrictions recommended by NTMWD during periods of drought.

Conservation measures planned for next year (use additional sheets if necessary):

The City will be holding our third annual H2O XPO on April 6th of 2019. This event provides water conservation tips to citizens and encourages signing up for the water-my-yard program with a bill credit for all homes that sign up.

Assistance requested from North Texas Municipal Water District (use additional sheets if necessary):

The City would like to continue to see NTMWD get involved at the City level with residents and City staff in regards to water conservation, education, and promotion of smart water use.

Other (use additional sheets if necessary):

Historical Water Use Data for Sachse

Year	Connections	Estimated Population	Deliveries from NTMWD (MG)	Other Supplies (MG)	Metered Sales by Category (Million Gallons)							
					Residential	Commercial	Public/ Institutional	Industrial	Metered Irrigation	Wholesale	Other	Total
1990	0	5,346	0	0	0	0	0	0	0	0	0	0
1991	0	5,400	0	0	0	0	0	0	0	0	0	0
1992	0	5,550	0	0	0	0	0	0	0	0	0	0
1993	0	5,850	0	0	0	0	0	0	0	0	0	0
1994	0	6,600	0	0	0	0	0	0	0	0	0	0
1995	0	7,000	0	0	0	0	0	0	0	0	0	0
1996	2,477	7,250	321	0	0	0	0	0	0	0	0	0
1997	2,566	7,570	351	0	0	0	0	0	0	0	0	0
1998	2,798	7,840	492	0	0	0	0	0	0	0	0	0
1999	3,379	9,514	539	0	0	0	0	0	0	0	0	0
2000	3,952	9,751	659	0	0	0	0	0	0	0	0	0
2001	4,496	10,975	633	0	0	0	0	0	0	0	0	0
2002	4,742	12,195	768	0	0	0	0	0	0	0	0	0
2003	5,191	13,029	1,019	0	640	39	0	0	0	0	102	781
2004	5,682	15,210	932	0	646	55	0	0	0	0	62	762
2005	5,938	16,335	1,091	0	818	53	0	0	0	0	101	972
2006	6,200	16,518	1,087	0	877	55	0	0	0	0	68	1,000
2007	6,426	17,650	831	0	642	50	0	0	0	0	47	738
2008	6,707	18,717	1,158	0	801	67	0	0	0	0	76	944
2009	6,731	19,840	1,036	0	721	66	0	0	0	0	67	854
2010	7,536	20,329	1,088	0	845	73	0	0	0	0	89	1,007
2011	7,612	20,570	1,295	0	950	67	0	0	0	0	114	1,131
2012	7,666	20,800	1,076	0	802	59	0	0	0	0	75	936
2013	7,826	21,596	1,090	0	788	41	33	0	0	0	0	862
2014	8,343	22,026	916	0	687	46	60	0	0	0	0	793
2015	8,651	23,681	1,084	0	797	90	55	0	0	0	0	942
2016	8,952	24,554	1,019	0	760	81	51	0	0	0	0	892
2017	9,050	25,039	1,016	0	764	82	52	0	0	0	0	898
2018	9,120	27,360	1,027	0	833	77	64	0	0	0	0	975

Historical Per Capita Use Data and Water Loss for Sachse

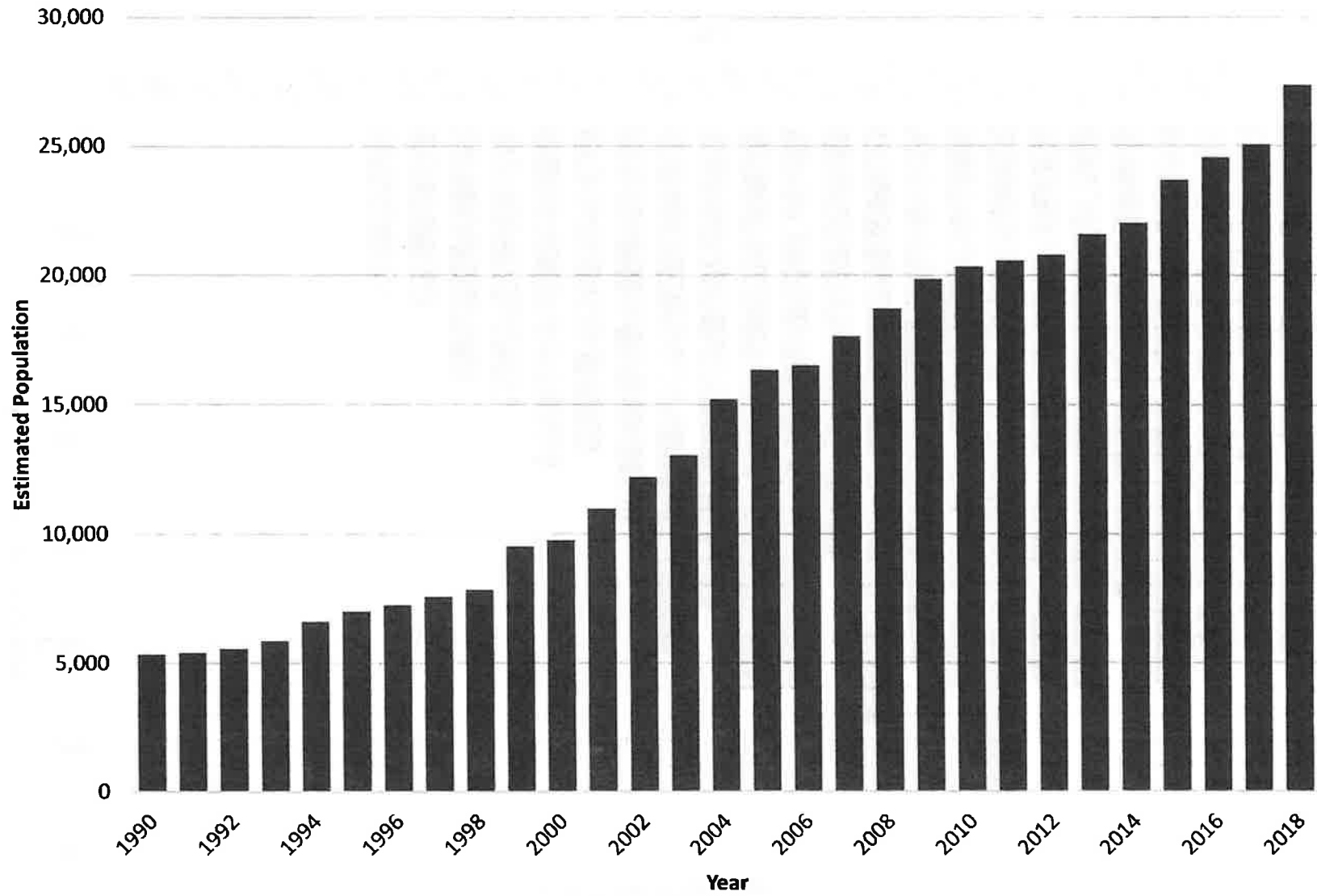
Year	Estimated Population	In-City Municipal Use (MG)	Per Capita Municipal Use (gpcd)	Per Capita Residential Use (gpcd)	Deliveries from NTMWD (MG)	Other Supplies (MG)	Wholesale Sales (MG)	Billed Metered (MG)	Billed Unmetered (MG)	Unbilled Metered (MG)	Unbilled Unmetered (MG)	Water Losses (MG)	% Water Loss
1995	7,000	0	0	0	0	0	0	0		0	0	0	0.00%
1996	7,250	321	121	0	321	0	0	0		0	0	0	0.00%
1997	7,570	351	127	0	351	0	0	0		0	0	0	0.00%
1998	7,840	492	172	0	492	0	0	0		0	0	0	0.00%
1999	9,514	539	155	0	539	0	0	0		0	0	0	0.00%
2000	9,751	659	185	0	659	0	0	0		0	0	0	0.00%
2001	10,975	633	158	0	633	0	0	0		0	0	0	0.00%
2002	12,195	768	172	0	768	0	0	0		0	0	0	0.00%
2003	13,029	917	193	134	1,019	0	0	781		0	0	238	23.33%
2004	15,210	869	157	116	932	0	0	762		0	0	169	18.15%
2005	16,335	990	166	137	1,091	0	0	972		0	0	119	10.90%
2006	16,518	1,019	169	145	1,087	0	0	1,000		0	0	87	8.01%
2007	17,650	784	122	99	831	0	0	738		0	0	93	11.19%
2008	18,717	1,082	158	117	1,158	0	0	944		1	1	212	18.31%
2009	19,840	969	134	99	1,036	0	0	854		9	18	155	14.94%
2010	20,329	999	135	114	1,088	0	0	1,007		2	12	67	6.15%
2011	20,570	1,181	157	126	1,295	0	0	1,131		2	12	150	11.59%
2012	20,800	1,002	132	105	1,076	0	0	936		1	11	128	11.93%
2013	21,596	1,090	138	100	1,090	0	0	862		2	18	208	19.07%
2014	22,026	916	114	85	916	0	0	793		2	12	109	11.89%
2015	23,681	1,084	125	92	1,084	0	0	942		2	12	128	11.78%
2016	24,554	1,019	114	85	1,019	0	0	892		2	12	113	11.13%
2017	25,039	1,016	111	84	1,016	0	0	898	0	0	14	104	10.25%
2018	27,360	1,027	103	83	1,027	0	0	975	0	0	14	38	3.71%

Note:

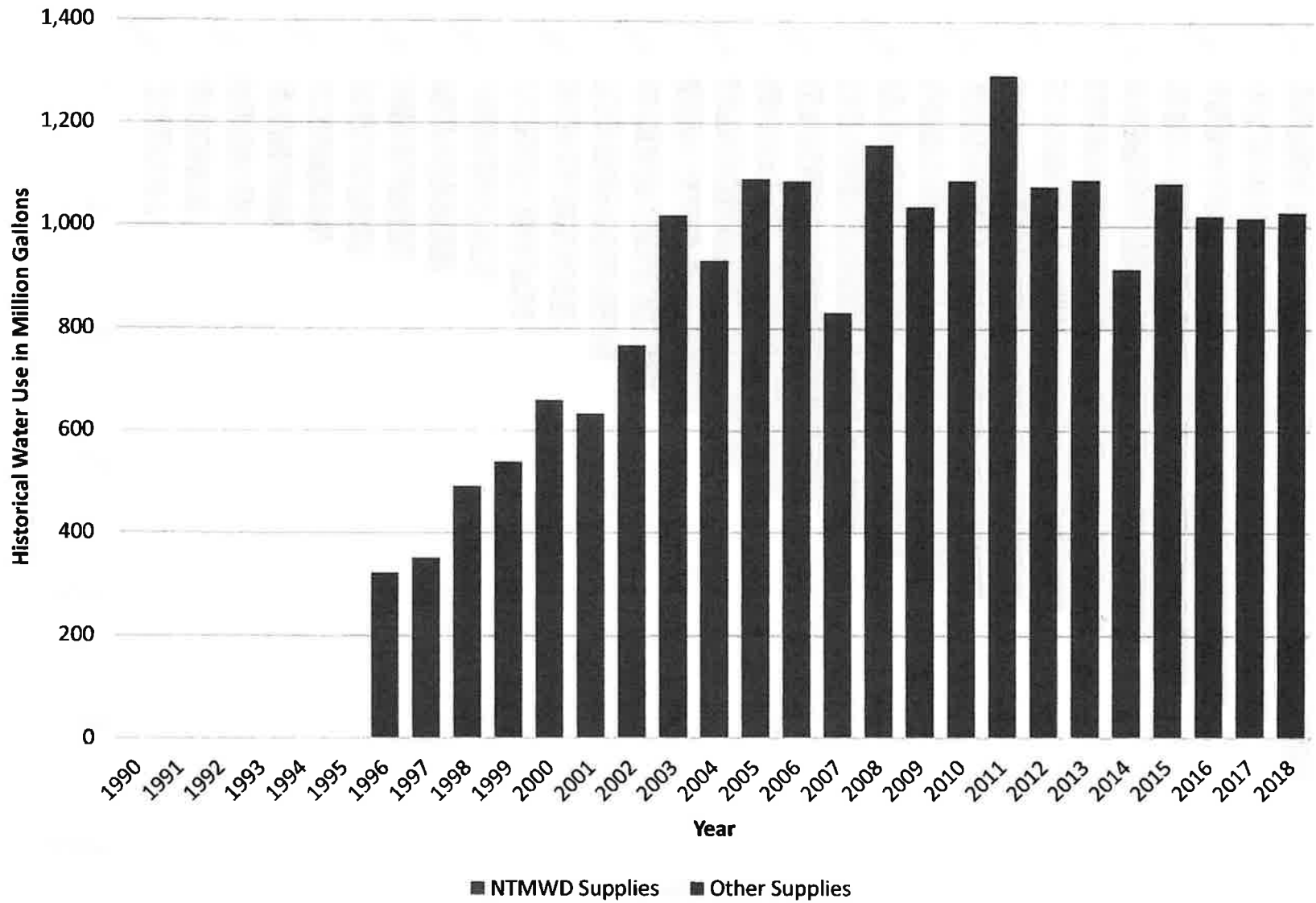
In-city municipal use = total water supplied less sales to industry, metered irrigation, wholesale sales and other sales.

After 2017 - Unaccounted Water has been removed and replaced with Water Losses (per TWDB definition). This category is inclusive of real and apparent losses. Categories for authorized consumption were also added; Unbilled metered replaced estimated fire use, unbilled unmetered replaced estimated line flushing, and a new category for billed unmetered sales was added.

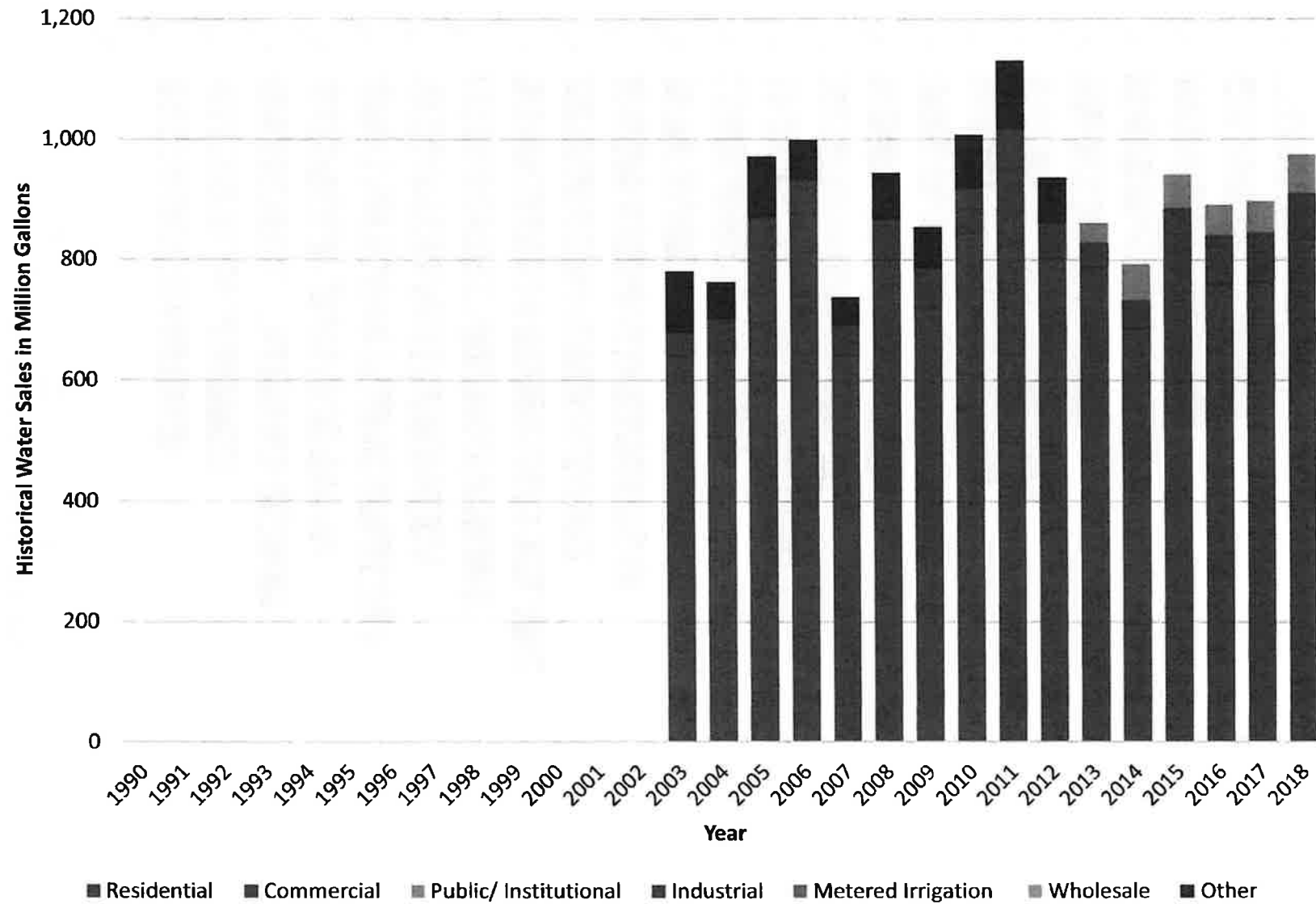
Estimated Historical Population



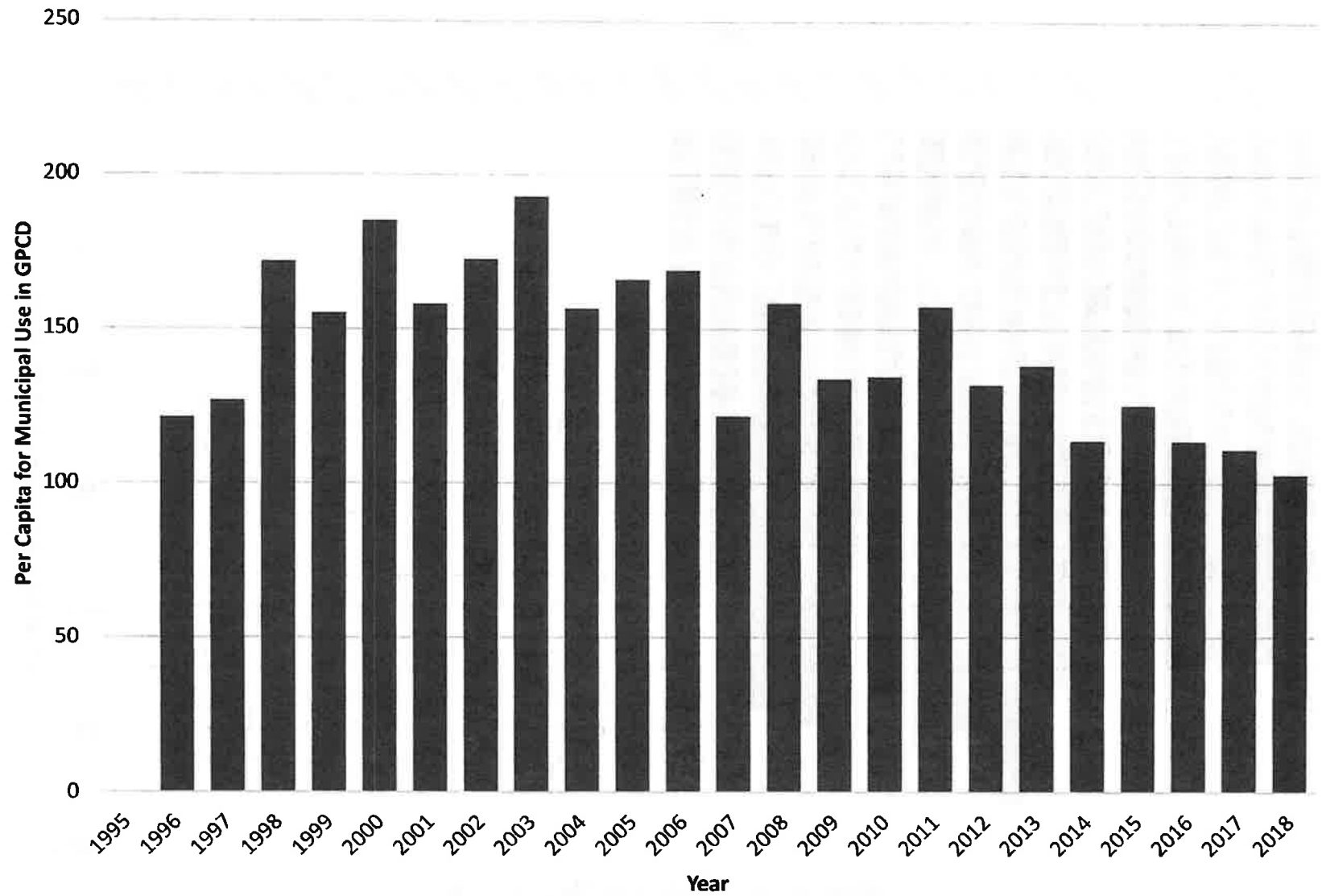
Historical Water Use



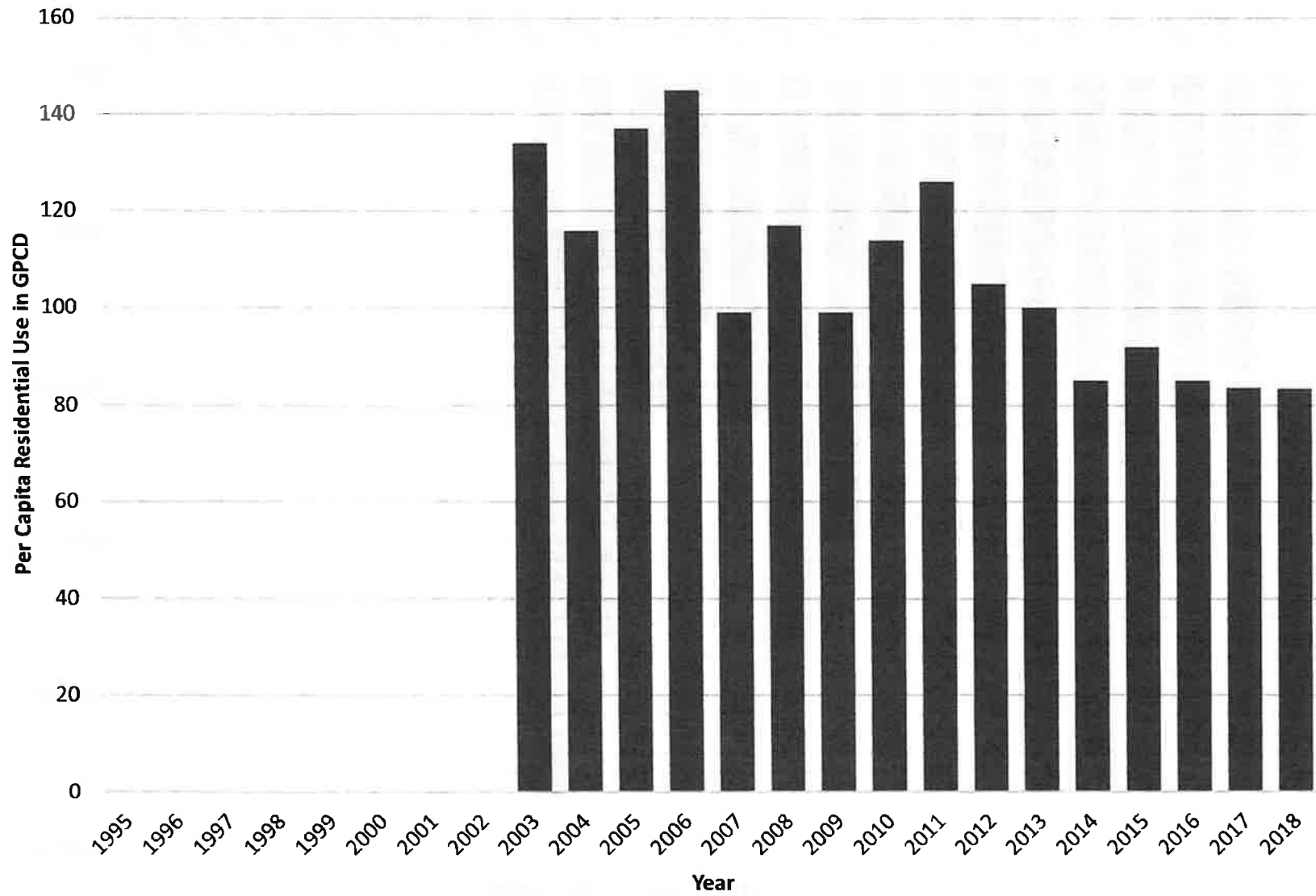
Historical Water Sales by Classification



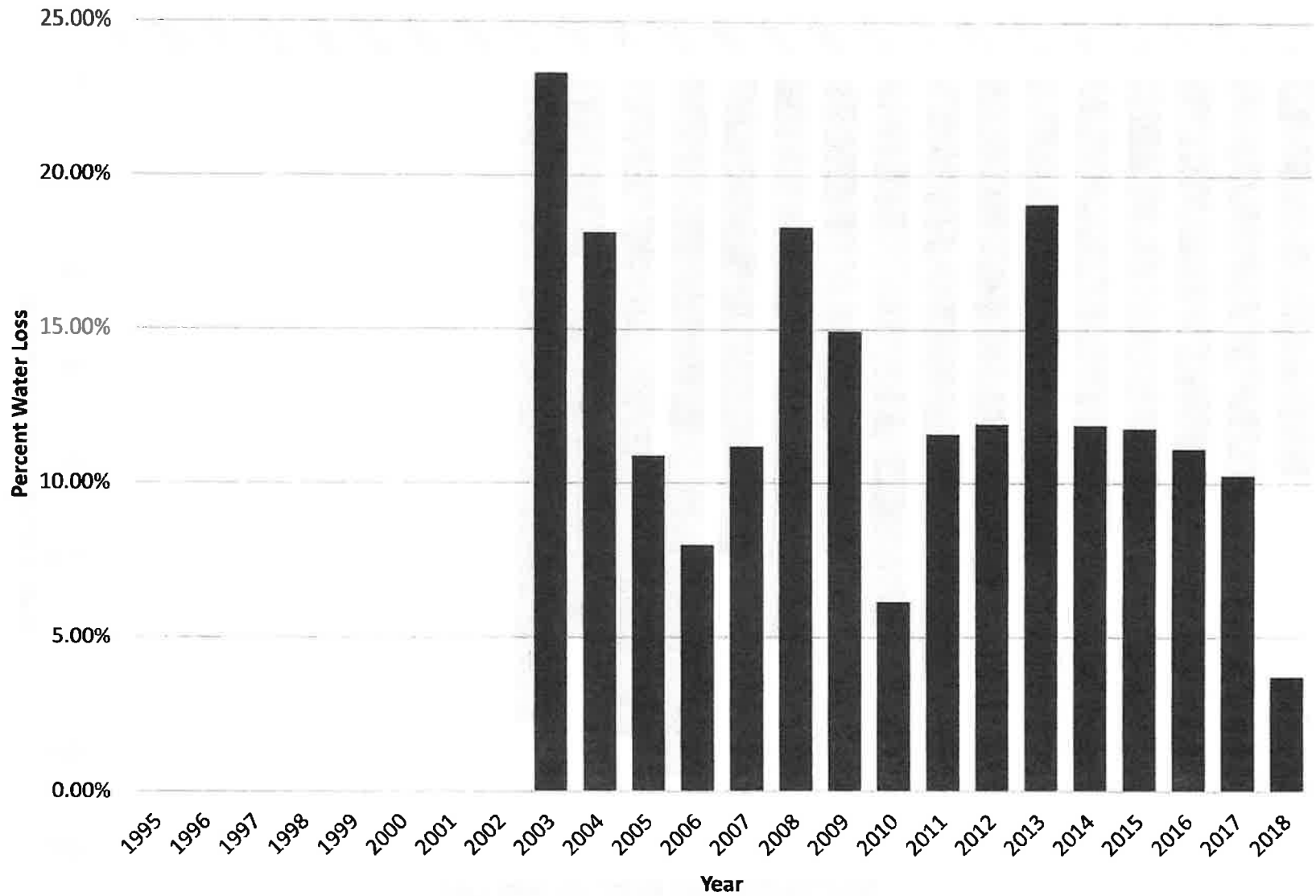
Historical Per Capita for Municipal Use



Historical Per Capita for Residential Use



Historical Percent Water Loss





APPENDIX E

CONSIDERATIONS FOR LANDSCAPE WATER MANAGEMENT REGULATIONS

APPENDIX E

CONSIDERATIONS FOR LANDSCAPE WATER MANAGEMENT REGULATIONS

A. Purpose

The purpose of these proposed landscape water management regulations is to provide a consistent mechanism for preventing the waste of water resources. To enact these provisions, entities must verify legal authority to adopt such provisions, and must promulgate valid rules, orders, or ordinances.

B. Required Measures

The following landscape water conservation measures are required to be included in the landscape management regulations adopted and enforced in this plan.

1. Lawn and Landscape Irrigation Restrictions

- a. A person commits an offense if the person irrigates, waters, or knowingly or recklessly causes or allows the irrigation or watering of any lawn or landscape located on any property owned, leased, or managed by the person between the hours of 10:00 a.m. and 6:00 p.m. from April 1 through October 31 of any year.
- b. A person commits an offense if the person knowingly or recklessly irrigates, waters, or causes or allows the irrigation or watering of lawn or landscape located on any property owned, leased, or managed by that person in such a manner that causes:
 - 1) over-watering lawn or landscape, such that a constant stream of water overflows from the lawn or landscape onto a street or other drainage area; or
 - 2) irrigating lawn or landscape during any form of precipitation or freezing conditions. This restriction applies to all forms of irrigation, including automatic sprinkler systems; or
 - 3) the irrigation of impervious surfaces or other non-irrigated areas, wind driven water drift taken into consideration.
- c. A person commits an offense if the person knowingly or recklessly allows the irrigation or watering of any lawn or landscape located on any property owned, leased, or managed by the person more than two days per week.

2. Rain and Freeze Sensors and/or ET or Smart Controllers

Any new irrigation system installed on or after November 4, 2004, must be equipped with rain and freeze sensing devices and/or ET or Smart controllers in compliance with state design and installation regulations.

- a. A person commits an offense on property owned, leased or managed if the person:
 - 1) knowingly or recklessly installs or allows the installation of new irrigation systems in violation of Subsection B.2.a; or
 - 2) knowingly or recklessly operates or allows the operation of an irrigation system that does not comply with Subsection B.2.a.

3. Filling or Refilling of Ponds

A person commits an offense if the person knowingly or recklessly fills or refills any natural or manmade pond located on any property owned, leased, or managed by the person by introducing any treated water to fill or refill the pond. This does not restrict the filling or maintenance of pond levels by the effect of natural water runoff or the introduction of well water into the pond. A pond is considered to be a still body of water with a surface area of 500 square feet or more.

4. Washing of Vehicles

A person commits an offense if the person knowingly or recklessly washes a vehicle without using a water hose with a shut-off nozzle on any property owned, leased, or managed by the person.

5. Enforcement

Each entity will develop its own set of penalties for violations of the ordinance, order, or resolution. The ordinance, order, or resolution will designate the responsible official(s) to implement and enforce the landscape water conservation measures.

C. Recommended Measures

1. Lawn and Landscape Irrigation Restrictions

- a. A person commits an offense if the person knowingly or recklessly operates a lawn or irrigation system or device on property that the person owns, leases, or manages that:
 - 1) has broken or missing sprinkler head(s); or
 - 2) has not been properly maintained to prevent the waste of water.

- b. A person commits an offense if the person knowingly or recklessly overseeds a lawn with rye or winter grass on property that the person owns, leases, or manages. Golf courses and public athletic fields are exempt from this restriction.
 - c. All new athletic fields must have separate irrigation systems that are capable of irrigating the playing fields separately from other open spaces.
2. Rain and Freeze Sensors
- a. Existing irrigation systems must be retrofitted with similar rain and freeze sensors and be capable of multiprogramming within 5 years.

D. Variances

1. In special cases, variances may be granted to persons demonstrating extreme hardship or need. Variances may be granted under the following circumstances:
- a. the applicant must sign a compliance agreement agreeing to irrigate or water the lawn and/or landscape only in the amount and manner permitted by the variance; and
 - b. the variance must not cause an immediate significant reduction to the water supply; and
 - c. the extreme hardship or need requiring the variance must relate to the health, safety, or welfare of the person making the request; and
 - d. the health, safety, and welfare of the public and the person making the request must not be adversely affected by the requested variance.
2. A variance will be revoked upon a finding that:
- a. the applicant can no longer demonstrate extreme hardship or need; or
 - b. the terms of the compliance agreement are violated; or
 - c. the health, safety, or welfare of the public or other persons requires revocation.



APPENDIX F

LETTERS TO REGION C AND REGION D WATER PLANNING GROUPS



APPENDIX F

LETTERS TO REGION C AND REGION D WATER PLANNING GROUPS

Date

Region C Water Planning Group
c/o Trinity River Authority
P.O. Box 60
Arlington, TX 76004

Dear Sir:

Enclosed please find a copy of the Model Water Resource and Emergency Management Plan for Member Cities and Customers of the North Texas Municipal Water District. I am submitting a copy of this plan to the Region C Water Planning Group in accordance with the Texas Water Development Board and Texas Commission on Environmental Quality rules. The Board of the North Texas Municipal Water District adopted the updated model plan on _____, 2019.

Sincerely,

Insert Entity Contact Name
Insert Entity Name



Date

Mr. Richard LeTourneau
Chair, Region D Water Planning Group
P.O. Box 12071
Longview, TX 75607

Dear Mr. LeTourneau:

Enclosed please find a copy of the recently updated Model Water Resource and Emergency Management Plan for Member Cities and Customers of the North Texas Municipal Water District. I am submitting a copy of this plan to the Region C Water Planning Group in accordance with the Texas Water Development Board and Texas Commission on Environmental Quality rules. The Board of the North Texas Municipal Water District adopted the updated model plan on _____, 2019.

Sincerely,

Insert Entity Contact Name
Insert Entity Name

APPENDIX G

ADOPTION OF WATER CONSERVATION PLAN



APPENDIX G

ADOPTION OF WATER CONSERVATION PLAN

Municipal Ordinance Adopting Water Conservation Plan

Ordinance No. _____

AN ORDINANCE ADOPTING A WATER CONSERVATION PLAN FOR THE CITY OF _____ TO PROMOTE RESPONSIBLE USE OF WATER AND TO PROVIDE FOR PENALTIES AND/OR THE DISCONNECTION OF WATER SERVICE FOR NONCOMPLIANCE WITH THE PROVISIONS OF THE WATER CONSERVATION PLAN.

WHEREAS, the City of _____, Texas (the "City"), recognizes that the amount of water available to its water customers is limited; and

WHEREAS, the City recognizes that due to natural limitations, drought conditions, system failures and other acts of God which may occur, the City cannot guarantee an uninterrupted water supply for all purposes at all times; and

WHEREAS, the Water Code and the regulations of the Texas Commission on Environmental Quality (the "Commission") require that the City adopt a Water Conservation Plan; and

WHEREAS, the City has determined an urgent need in the best interest of the public to adopt a Water Conservation Plan; and

WHEREAS, pursuant to Chapter 54 of the Local Government Code, the City is authorized to adopt such Ordinances necessary to preserve and conserve its water resources; and

WHEREAS, the City Council of the City of _____ desires to adopt the North Texas Municipal Water District (the "NTMWD") Model Water Conservation Plan as official City policy for the conservation of water.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF _____ THAT:

Section 1. The City Council hereby approves and adopts the NTMWD Model Water Conservation Plan (the "Plan"), attached hereto as Addendum A, as if recited verbatim herein. The City commits to implement the requirements and procedures set forth in the adopted Plan.

Section 2. Any customer, defined pursuant to 30 Tex. Admin. Code Chapter 291, failing to comply with the provisions of the Plan shall be subject to a fine of up to two thousand dollars (\$2,000.00) and/or discontinuance of water service by the City. Proof of a culpable mental state is not required for a



conviction of an offense under this section. Each day a customer fails to comply with the Plan is a separate violation. The City's authority to seek injunctive or other civil relief available under the law is not limited by this section.

Section 3. The City Council does hereby find and declare that sufficient written notice of the date, hour, place and subject of the meeting adopting this Ordinance was posted at a designated place convenient to the public for the time required by law preceding the meeting, that such place of posting was readily accessible at all times to the general public, and that all of the foregoing was done as required by law at all times during which this Ordinance and the subject matter thereof has been discussed, considered and formally acted upon. The City Council further ratifies, approves and confirms such written notice and the posting thereof.

Section 4. Should any paragraph, sentence, clause, phrase or word of this Ordinance be declared unconstitutional or invalid for any reason, the remainder of this Ordinance shall not be affected.

Section 5. The City Manager or his designee is hereby directed to file a copy of the Plan and this Ordinance with the Commission in accordance with Title 30, Chapter 288 of the Texas Administrative Code.

Section 6. The City Secretary is hereby authorized and directed to cause publication of the descriptive caption of this ordinance as an alternative method of publication provided by law.

Section 7. {If Applicable} Ordinance No. _____, adopted on _____, is hereby repealed.

Passed by the City Council on this ____ day of _____, ____.

Mayor

Attest:



City Secretary

**Municipal Utility District Order
Adopting Water Conservation Plan**

Order No. _____

AN ORDER ADOPTING A WATER CONSERVATION PLAN FOR THE _____ MUNICIPAL UTILITY DISTRICT TO PROMOTE THE RESPONSIBLE USE OF WATER AND TO PROVIDE FOR PENALTIES AND/OR THE DISCONNECTION OF WATER SERVICE FOR NONCOMPLIANCE WITH THE PROVISIONS OF THE WATER CONSERVATION PLAN.

WHEREAS, the _____ Municipal Utility District (the "District"), recognizes that the amount of water available to its water customers is limited; and

WHEREAS, the District recognizes that due to natural limitations, drought conditions, system failures and other acts of God which may occur, the District cannot guarantee an uninterrupted water supply for all purposes at all times; and

WHEREAS, the Water Code and the regulations of the Texas Commission on Environmental Quality (the "Commission") require that the District adopt a Water Conservation Plan; and

WHEREAS, the District has determined an urgent need in the best interest of the public to adopt a Water Conservation Plan; and

WHEREAS, pursuant to Chapter 49 of the Water Code, the District is authorized to adopt such policies necessary to accomplish the purposes for which it was created, including but not limited to the preservation and conservation of water resources; and

WHEREAS, the Board of Directors of the District desires to adopt the North Texas Municipal Water District (the "NTMWD") Model Water Conservation Plan as official District policy for the conservation of water.

NOW THEREFORE, BE IT ORDERED BY THE BOARD OF DIRECTORS OF THE _____ MUNICIPAL UTILITY DISTRICT THAT:



Section 1. The Board of Directors hereby approves and adopts the NTMWD Model Water Conservation Plan (the "Plan"), attached hereto as Addendum A, as if recited verbatim herein. The District commits to implement the requirements and procedures set forth in the adopted Plan.

Section 2. Any customer, defined pursuant to 30 Tex. Admin. Code Chapter 291, failing to comply with the provisions of the Plan shall be subject to a monetary fine as allowed by law, and/or discontinuance of water service by the District. Proof of a culpable mental state is not required for a conviction of an offense under this section. Each day a customer fails to comply with the Plan is a separate violation. The District's authority to seek injunctive or other civil relief available under the law is not limited by this section.

Section 3. The Board of Directors does hereby find and declare that sufficient written notice of the date, hour, place and subject of the meeting adopting this Order was posted at a designated place convenient to the public for the time required by law preceding the meeting, that such place of posting was readily accessible at all times to the general public, and that all of the foregoing was done as required by law at all times during which this Order and the subject matter thereof has been discussed, considered and formally acted upon. The Board of Directors further ratifies, approves and confirms such written notice and the posting thereof.

Section 4. The General Manager or his designee is hereby directed to file a copy of the Plan and this Ordinance with the Commission in accordance with Title 30, Chapter 288 of the Texas Administrative Code.

Section 5. Should any paragraph, sentence, clause, phrase or word of this Order be declared unconstitutional or invalid for any reason, the remainder of this Order shall not be affected.

Section 6. {If Applicable} Order No. _____, adopted on _____, is hereby repealed.

Approved and adopted by the Board of Directors on this ____ day of _____, ____.

President, Board of Directors

Attest:

APPENDIX H

ILLEGAL WATER CONNECTIONS AND THEFT OF WATER



APPENDIX H

ILLEGAL WATER CONNECTIONS AND THEFT OF WATER

MUNICIPAL ORDINANCE

PERTAINING TO ILLEGAL WATER CONNECTIONS AND THEFT OF WATER

Ordinance No. _____

AN ORDINANCE PERTAINING TO ILLEGAL WATER CONNECTIONS AND/OR THE THEFT OF WATER
RELATED TO THE WATER SUPPLY FOR THE CITY OF _____.

WHEREAS, the City of _____, Texas (the "City") recognizes that the amount of water available to its water customers is limited; and

WHEREAS, pursuant to Chapter 54 of the Local Government Code, the City is authorized to adopt such policies necessary to preserve and conserve available water supplies; and

WHEREAS, the City seeks to adopt an ordinance pertaining to illegal water connections and theft of water.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF _____ THAT:

Section 1. The City Council hereby approves and adopts this Ordinance as described herein.

Section 2. A person commits an offense of theft of water by any of the following actions:

(a) A person may not knowingly tamper, connect to, or alter any component of the City's water system including valves, meters, meter boxes, lids, hydrants, lines, pump stations, ground storage tanks, and elevated storage tanks. This shall include direct or indirect efforts to initiate or restore water service without the approval of the City.

(b) If, without the written consent of the City Manager or the City Manager's designee, the person knowingly causes, suffers or allows the initiation or restoration of water service to the property after termination of service(s). For purposes of this section, it shall be assumed that the owner, occupant, or person in control of the property caused, suffered, or allowed the unlawful initiation or restoration of service(s).



(c) A person may not knowingly make or cause a false report to be made to the City of a reading of a water meter installed for metered billing.

(d) A person commits a separate offense each day that the person performs an act prohibited by this section or fails to perform an act required by this section.

Section 3. An offense under this Ordinance is a Class C misdemeanor punishable by a fine of up to two thousand dollars (\$2,000.00) and/or discontinuance of water service by the City.

Section 4. The City Council does hereby find and declare that sufficient written notice of the date, hour, place and subject of the meeting considering this Ordinance was posted at a designated place convenient to the public for the time required by law preceding the meeting, that such place of posting was readily accessible at all times to the general public, and that all of the foregoing was done as required by law at all times during which this Ordinance, and the subject matter thereof, has been discussed, considered and formally acted upon. The City Council further ratifies, approves and confirms such written notice and the posting thereof.

Section 5. Should any paragraph, sentence, clause, phrase or word of this Ordinance be declared unconstitutional or invalid for any reason, the remainder of this Ordinance shall not be affected.

Section 6. The City Secretary is hereby authorized and directed to cause publication of the descriptive caption of this ordinance as an alternative method of publication provided by law.

Section 7. {If Applicable} Ordinance No. _____, adopted on _____, is hereby repealed.

Passed by the City Council on this ____ day of _____, ____.

Mayor

Attest:

APPENDIX J

TCEQ WATER CONSERVATION IMPLEMENTATION REPORT



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Water Availability Division - MC-160, P.O. Box 13087 Austin, Texas 78711-3087
Telephone (512) 239-4691, FAX (512) 239-2214

WATER CONSERVATION IMPLEMENTATION REPORT FORM AND SUMMARY OF UPDATES/REVISIONS TO WATER CONSERVATION PLAN

(Texas Water Code §11.1271(b) and Title 30 Texas Administrative Code §288.30(1) to (4))

Please note, this form replaces the following forms: TCEQ-20645 (Non-Public Water Suppliers) and TCEQ-20646 (Public Water Suppliers)

This Form is applicable to the following entities:

- 1. Water Right Holders of 1,000 acre-feet or more for municipal, industrial, and other non-irrigation uses.**
- 2. Water Right Holders of 10,000 acre-feet or more for irrigation uses.**

The above noted entities are required by rule to submit updates to their water conservation plan(s) and water conservation implementation report(s) every five years. The most current five-year submittal deadline is **May 1st, 2019**. See 30 Texas Administrative Code (TAC) §288.30(1) to (4). Entities must also submit any revisions to their water conservation plan within 90 days of adoption when the plans are revised in between the five-year submittal deadlines. This form may be used for the five-year submittal or when revisions are made to the water conservation plans in the interim periods between five-year submittals. Please complete the form as directed below.

1. Water Right Holder Name: N/A
2. Water Right Permit or Certificate Nos. N/A

3. Please Indicate by placing an 'X' next to all that Apply to your Entity:

Water Right Holder of 1,000 acre-feet or more for non-irrigation uses

- ☐ Municipal Water Use by Public Water Supplier
☐ Wholesale Public Water Supplier
☐ Industrial Use
☐ Mining Use
☐ Agriculture Non-Irrigation

Water Right Holder of 10,000 acre-feet or more for irrigation uses

- ☐ Individually-Operated Irrigation System
☐ Agricultural Water Suppliers Providing Water to More Than One User

Water Conservation Implementation Reports/Annual Reports

4. Water Conservation Annual Reports for the previous five years were submitted to the Texas Water Development Board (TWDB) for each of the uses indicated above as required by 30 TAC §288.30(10)(C)? Yes X No

TCEQ no longer requires submittal of the information contained in the detailed implementation report previously required in Forms TCEQ-20645 (Non-Public Water Suppliers) and TCEQ-20646 (Public Water Suppliers). However, the Entity must be up-to-date on its Annual Report Submittals to the TWDB.

Water Conservation Plans

5. For the five-year submittal (or for revisions between the five-year submittals), attach your updated or revised Water Conservation Plan for each of the uses indicated in Section 3, above. Every updated or revised water conservation plan submitted must contain each of the minimum requirements found in the TCEQ rules and must be duly adopted by the entity submitting the water conservation plan. Please include evidence that each water conservation plan submitted has been adopted.

- Rules on minimum requirements for Water Conservation Plans can be found in 30 TAC 288.
http://texreg.sos.state.tx.us/public/readtac%24ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=288
- Forms which include the minimum requirements and other useful information are also available to assist you. Visit the TCEQ webpage for Water Conservation Plans and Reports. https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/conserve.html

Call 512-239-4691 or email to wcp@tceq.texas.gov for assistance with the requirements for your water conservation plan(s) and report(s).

6. For each Water Conservation Plan submitted, state whether the five and ten-year targets for water savings and water loss were met in your *previous* water conservation plan.

Yes X No

If the targets were not met, please provide an explanation.

7. For each five-year submittal, does each water conservation plan submitted contain *updated* five and ten-year targets for water savings and water loss?

Yes No

If yes, please identify where in the water conservation plan the updated targets are located (page, section).

8. In the box below (or in an attachment titled "Summary of Updates or Revisions to Water Conservation Plans), please identify any other revisions/updates made to each water conservation plan that is being updated or revised. Please specify the water conservation plan being updated and the location within the plan of the newly adopted updates or revisions.

N/A - City of Sachse does not have water rights for surface water. We adopt the North Texas Municipal Water District's Water Conserv. Plan.

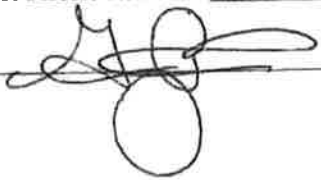
9. Form Completed by (Point of Contact):
(If different than name listed above, owner and contact may be different individual(s)/entities)

Contact Person Title/Position: Greg Peters

Contact Address: 3815-B Sachse Road

Contact Phone Number: 972-495-7600 Contact Email Address: gpeters@cityofsachse.com

Signature: _____



Date: _____

5/1/19

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	1. Receive an update on the administration of the City's Public Improvement District and Tax Increment Financing Reinvestment Zone and authorize the City Manager to negotiate and execute an agreement with P3 Works for Public Improvement District and Tax Increment Financing Reinvestment Zone Administrative Services.
Access	Public
Type	Action, Discussion
Recommended Action	Authorize the City Manager to negotiate and execute an agreement with P3 Works for Public Improvement District and Tax Increment Financing Reinvestment Zone administrative services.

Public Content**BACKGROUND**

The City of Sachse entered into a Development Agreement with PMB Acquisitions for the development of approximately 120 acres along the President George Bush Turnpike. A component of the Development Agreement was the creation of a public improvement district (PID) and a tax increment financing reinvestment zone (TIRZ). State law requires that an administrator be appointed by the City to manage the public improvement district and to create a Service and Assessment Plan (SAP) annually. Because the PID has as a TIRZ overlay, staff recommends that the same administrator provide support to both the PID and the TIRZ.

The City worked with its financial advisor, Hilltop Securities, to conduct a request for proposals. In total, the City received four submissions for SAP Consulting/PID administrative services. After an extensive interview process, the City and Hilltop Securities selected P3 Works to serve as the SAP Consultant/PID/TIRZ Administrator for the City of Sachse. Mary Petty and Jon Snyder with P3 Works will introduce themselves to the City Council as a part of this agenda item.

POLICY CONSIDERATIONS

The administrator position works directly for the City, not the developer. The administrator will assist the City in meeting all statutory requirements of the PID and the TIRZ, and will serve as a liaison between the City and the developer on these items. Funds to pay for the administrator come from the revenue generated within the public improvement district. The funds do not come out of the City's General Fund.

RECOMMENDATION

Authorize the City Manager to negotiate and execute an agreement with P3 Works for Public Improvement District and Tax Increment Financing Reinvestment Zone Administrative services.

P3 Works Draft Contract.pdf (630 KB)

STATE OF TEXAS
COUNTY OF DALLAS

§
§
§

AGREEMENT FOR PUBLIC IMPROVEMENT DISTRICT
ADMINISTRATION SERVICES

This Agreement for Public Improvement District Administration Services and Tax Reinvestment Zone Administration ("Agreement") is entered into by and between the City of Sachse, Texas ("City") and P3Works, LLC, a Texas limited liability company ("P3Works"), and the City of Sachse, Texas ("City") (collectively referred to as "Parties" and individually as a "Party"), by and through their authorized representatives

RECITALS

WHEREAS, the City Council passed Resolution No. 3905 on January 22, 2019, approving and authorizing the creation of The City of Sachse Public Improvement District No. 1 ("PID" or "District") to finance the costs of certain public improvements for the benefit of property as authorized by Chapter 372 of the Texas Local Government Code, as amended ("PID Act"); and

WHEREAS, the City Council passed Ordinance No. 2049 creating Tax Increment Finance Reinvestment Zone Number One ("Zone" or "TIRZ"), as amended by Ordinance No. 2196, and Ordinance No. 3897, to promote the development or redevelopment of the area, as authorized by Chapter 311 of the Texas Tax Code ("TIRZ Act"), as amended; and

WHEREAS, the City may consider issuing bonds to fund certain improvements in the PID as authorized by the Public Improvement District Act, Texas Local Government Code, Chapter 372, as amended; and

WHEREAS, the City requires specialized services related to the revision and updating of the Service and Assessment Plan ("Service and Assessment Plan"), bond issuance, and the administration of the District, creation, revision and updating of the TIRZ Final Project and Finance Plan ("Final Plan") and the Annual Reporting of the TIRZ as more fully set forth in this Agreement; and

WHEREAS, P3Works has the expertise to properly establish and administer the District and ensure compliance with Texas Local Government Code Chapter 372; and

WHEREAS, the City desires to engage the services of P3Works as an independent contractor, and not as an employee, to provide District administration services set forth in Exhibit "A" (the "Scope of Services"); and

WHEREAS, the P3Works desires to render services for the City on the terms and conditions set forth in this Agreement;

NOW THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, and for other good and valuable consideration, the sufficiency and receipt of which are hereby acknowledged, the Parties agree as follows:

ARTICLE I

Term; Termination

1.1 This Agreement shall commence on the last date of execution hereof ("Effective Date") and continue for a period of three (3) years. Thereafter the term of this Agreement shall automatically renew for successive terms of one year each, unless sooner terminated as provided herein.

1.2 Notwithstanding any other provisions of this Agreement, either Party may terminate this Agreement without cause at any time by providing sixty (60) days prior written notice to the other Party. In the event of termination City shall pay P3Works, within thirty (30) days of such termination, all of P3Works' fees and expenses accrued or incurred to and including the date of termination, including any amount incurred or accrued in connection with work in progress.

ARTICLE II

Scope of Services

2.1 P3Works shall provide Public Improvement District and Tax Increment Reinvestment Zone administrative services to the City related to the administration of the District and the Zone as set forth in the Scope of Services

2.2 No substantial changes in the scope of services shall be made without the prior written approval of P3Works and the City.

2.4 P3Works shall furnish the facilities, equipment and personnel necessary to perform the services required under this Agreement unless otherwise provided herein.

2.5 Should any errors caused by P3Works be found in any services or work products, P3Works will correct those errors, and if the errors are in final services or products, make such corrections at no additional charge, by revising the services and work products as necessary to eliminate the errors.

2.6 As part of the work and services to be performed, P3Works shall furnish intermediate reports to the City from time to time, when requested, in such form and number as may be required by the City; and shall make such final reports as may be required by the City concerning the work and services performed.

2.7 The City shall provide access to all documents reasonably necessary to the performance of P3Works' duties under this Agreement. All such documents shall remain the property of the City. P3Works shall not use or disclose information concerning the City to third parties without prior written consent of the City.

2.8 P3Works may not disclose non-public information relating to the work and services performed under this Agreement to any person not entitled to receive it. Notwithstanding the foregoing, City shall have full access to all information relating to work and services performed

by P3Works under this Agreement.

ARTICLE III

Payment Terms and Conditions

3.1 In consideration for the services to be performed by P3Works, the City agrees to pay P3Works the fees for all services and related costs and expenses set forth in the Scope of Services, beginning on the Effective Date. Once assessments have been levied, the Basic District Administration Services Monthly Collection Fees will begin, and then the February 1, following the levy of assessments, and each February 1 thereafter, the Monthly Fees may increase with the prior written approval of the City.

3.2 Monthly invoices shall be submitted to the City for work completed. City agrees to pay the amount due to P3Works within thirty (30) days after receipt of each invoice.

3.3 Copies of all invoices to P3Works for expenses, materials, or services provided to P3Works will accompany the invoice to the City. P3Works will pass any third-party cost through to the City without markup; and P3Works shall not incur any expense in excess of \$200.00 without prior written consent of the City.

3.4 The only source of payment for P3Works' District fees and services shall be the District or funds advanced by the developer of the District. The City general fund shall never be used to pay for any expenses relating to P3Works' administration of the District. In the event there is insufficient District funds in a given year to pay P3Works' fees and expenses, P3Works agrees to defer the fees and expenses until such time as there are sufficient District funds or funds advanced by the developer of the District to pay such fees and costs.

3.5 The only source of payment for P3Works' Zone fees and services shall be the TIF Fund or funds advanced by the developer of the District. The City general fund shall never be used to pay for any expenses relating to P3Works' administration of the Zone. In the event there is insufficient Zone funds in a given year to pay P3Works' Zone fees and expenses, P3Works agrees to defer the fees and expenses until such time as there are sufficient TIF funds or funds advanced by the developer of the District to pay such fees and costs.

ARTICLE IV

General Provisions

4.1 This Agreement including any exhibits supersedes any other agreements, either oral or written, between the Parties hereto with respect to rendering of services by P3Works for the City and contains all the covenants and agreements between the Parties with respect to the rendering of such services in any manner whatsoever. Each Party of this Agreement acknowledges that no representations, inducements, promises, or agreements, orally or otherwise, have been made by any Party which are not embodied herein and that no other agreement, statement, or promise not contained in this Agreement shall be valid or binding.

4.2 This Agreement shall be governed by the laws of the State of Texas without regard to choice of law rules. Exclusive venue for any action shall be in the state district court of Dallas County, Texas. The Parties agree to submit to the personal and subject matter jurisdiction of said court. This Agreement shall not be construed for or against any Party by reason of who drafted the provisions set forth herein.

4.3 Neither this Agreement or any duties or obligations under this Agreement may be assigned by P3Works without the prior written consent of the City.

4.4 The waiver by either Party of a breach or violation of any provision of this Agreement will not operate as or be construed to be a waiver of any subsequent breach thereof.

4.5 All records, reports, and other documents excepted as noted in Section 4.6, prepared by P3Works for the purposes of providing the services described in this Agreement shall be property of the City. All such documents shall be made available to the City upon written request. P3Works shall maintain such records for a period of four (4) years after termination of this Agreement.

4.6 The City acknowledges P3Works' ownership of its software, programs, inventions, know-how, trade secrets, confidential knowledge, source code, or other proprietary information relating to products, processes, services, software, formulas, developmental or experimental work, business plans, financial information, or other subject matter ("Confidential Information") pertaining to the business of P3Works. This Agreement shall not in any way give rise to any requirement or obligation for P3Works to disclose or release any Confidential Information.

4.7 The headings and article titles of this Agreement are not a part of this Agreement and shall have no effect upon the construction or interpretation of any part hereof.

4.8 Should either Party commence any legal action or proceeding against the other based upon this Agreement, the prevailing Party shall be entitled to an award of reasonable attorney's fees and costs.

4.9 All notices, requests, demands, and other communications which are required to be given under this agreement shall be in writing and shall be deemed to have been duly given upon the delivery by registered or certified mail, return receipt requested, postage prepaid thereon, as follows:

If to City, to:

City of Sachse, Texas
Attn: Gina Nash
City Manager
3815 Sachse Road
Building B
Sachse, Texas 75048

With a copy to:

Peter G. Smith
Nichols, Jackson, Dillard, Hager
& Smith, L.L.P.
1800 Ross Tower
500 N. Akard Street
Dallas, Texas 75201

If to P3Works, to:

P3Works, LLC
Attn: Mary V. Petty
Managing Partner
P3Works, LLC
350 Rufe Snow Drive, Suite 200
Keller, Texas 76248

4.10 The Parties hereby warrant that the persons executing this Agreement are authorized to execute this Agreement and are authorized to obligate the respective Parties to perform this Agreement. A facsimile signature on this Agreement shall be treated for all purposes as an original signature.

4.11 Indemnification.

P3WORKS DOES HEREBY COVENANT AND CONTRACT TO WAIVE ANY AND ALL CLAIMS, RELEASE, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS CITY COUNCIL, OFFICERS, EMPLOYEES, AND AGENTS, FROM AND AGAINST ALL LIABILITY, CAUSES OF ACTION, CITATIONS, CLAIMS, COSTS, DAMAGES, DEMANDS, EXPENSES, FINES, JUDGMENTS, LOSSES, PENALTIES OR SUITS, CAUSED BY OR RESULTING FROM THE NEGLIGENCE, INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT, OR FAILURE TO PAY A SUBCONTRACTOR OR SUPPLIER COMMITTED BY THE P3WORKS, ITS AGENT, ITS CONSULTANT UNDER CONTRACT, OR ANY OTHER ENTITY OVER WHICH THE P3WORKS EXERCISES CONTROL SUBJECT TO THE LIMITATIONS IN TEXAS LOCAL GOVERNMENT CODE § 271.904 AND TEXAS CIVIL PRACTICE AND REMEDIES CODE, § 130.002 (B). INDEMNIFIED ITEMS SHALL INCLUDE REASONABLE ATTORNEYS' FEES AND COSTS, COURT COSTS, AND SETTLEMENT COSTS IN PROPORTION TO THE P3WORKS'S LIABILITY. THE P3WORKS'S OBLIGATIONS UNDER THIS SECTION SHALL NOT BE LIMITED TO THE LIMITS OF COVERAGE OF INSURANCE MAINTAINED OR REQUIRED TO BE MAINTAINED BY P3WORKS UNDER THIS AGREEMENT. THIS PROVISION SHALL SURVIVE THE TERMINATION OF THIS AGREEMENT.

4.12 Insurance.

(a) P3Works shall during the term hereof maintain in full force and effect the following insurance: (i) a comprehensive general liability policy of insurance for bodily injury, death and property damage including the property of the City, its officers, contractors, agents and employees (collectively referred to as the "City") relating to the work and services provided by the P3Works pursuant to this Agreement with a minimum combined single limit of not less than \$1,000,000.00 per occurrence for injury to persons (including death), and for property damage and \$2,000,000.00 aggregate including products and completed operations coverage of \$1,000,000.00. This policy shall be primary to any policy or policies carried by or available to the City; (ii) policy of automobile liability insurance covering any vehicles owned, non-owned and hired and/or operated by P3Works, its officers, agents, and employees, and used in the performance of this Agreement with policy limits of not less than \$1,000,000.00 combined single limit for bodily injury, death and property damage; (iii) statutory Worker's Compensation Insurance at the statutory limits and Employers Liability covering all of P3Works's employees involved in the provision of services under this Agreement with policy limit of not less than \$1,000,000.00; and (iv) Professional Liability with policy limit of not less than \$1,000,000.00 per claim and \$2,000,000.00 in the aggregate, covering negligent acts, errors and omissions by P3Works, its contractors, sub-contractors, consultants and employees in the performance of services pursuant to this Agreement.

(b) All insurance shall be endorsed to provide the following provisions: (1) name the City, its officers, and employees as additional insureds as to all applicable coverage with the exception of Workers Compensation Insurance and Professional Liability; (2) provide for a waiver of subrogation against the City for injuries, including death, property damage, or any other loss to the extent the same is covered by the proceeds of insurance, except for Professional Liability Insurance. A specific endorsement needs to be added to all policies, with a copy of the endorsement provided to the City that indicates the insurance company will provide to the City at least a thirty (30) day prior written notice for cancellation, non-renewal, and/or material changes of the policy except to the Professional Liability policy. In the event the companies providing the required insurance are prohibited by law to provide any such specific endorsements, the P3Works shall provide at least thirty (30) days prior written notice to the City of any cancellation, non-renewal and/or material changes to any of the policies of insurance. P3Works shall provide written notice to City of any cancellation, non-renewal, and or changes to the Professional Liability Policy required herein.

(c) All insurance companies providing the required insurance shall be authorized to transact business in Texas and rated at least "A" by AM Best or other equivalent rating service. All policies must be written on a primary basis, non-contributory with any other insurance coverage and/or self-insurance maintained by the City.

(d) A certificate of insurance and copies of policy endorsements evidencing the required insurance shall be submitted to the City prior to commencement of services. On every date of renewal of the required insurance policies, the P3Works shall cause a certificate of insurance and policy endorsements to be issued evidencing the required insurance herein and delivered to the City. In addition, the P3Works shall within ten (10) business days after written request provide the City with certificates of insurance and policy endorsements for the insurance required herein. The delivery of the certificates of insurance and policy endorsements to the City is a condition precedent to the payment of any amounts due to P3Works by the City. The failure

to provide valid certificates of insurance and policy endorsements shall be deemed a default and/or breach of this Agreement.

4.13 Counterparts. This Agreement may be executed by the Parties hereto in separate counterparts, each of which when so executed and delivered shall be an original, but all such counterparts shall together constitute one and the same instrument. Each counterpart may consist of any number of copies hereof each signed by less than all, but together signed by all the Parties hereto.

4.14 Exhibits. The exhibits attached hereto are incorporated herein and made a part hereof for all purposes.

4.15 Independent Contractor. It is understood and agreed by and between the Parties that the P3Works, in satisfying the conditions of this Agreement, is acting independently, and that the City assumes no responsibility or liabilities to any third party in connection with these actions. All services to be performed by P3Works pursuant to this Agreement shall be in the capacity of an independent contractor, and not as an agent or employee of the City. P3Works shall supervise the performance of its services and shall be entitled to control the manner and means by which its services are to be performed, subject to the terms of this Agreement.

4.16 Severability. In the event any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions, and the Agreement shall be construed as if such invalid, illegal, or unenforceable provision had never been contained in it.

4.17 Prohibition of Boycott Israel. P3Works verifies that it does not Boycott Israel and agrees that during the term of this Agreement will not Boycott Israel as that term is defined in Texas Government Code Section 808.001, as amended.

(signature page to follow)

EXECUTED on this _____ day of _____, 2019.

CITY OF SACHSE, TEXAS

By: _____
Gina Nash, City Manager

EXECUTED on this _____ day of _____, 2019.

P3WORKS, LLC

By: _____
Mary V. Petty, Managing Partner

EXHIBIT A
SERVICES TO BE PROVIDED

PID FORMATION, SERVICE AND ASSESSMENT PLAN PREPARATION, AND BOND ISSUANCE SUPPORT SERVICES

Billed at P3Works' prevailing hourly rates, which are currently as follows:

<i>Title</i>	<i>Hourly Rate</i>
<i>Managing Partner</i>	<i>\$250</i>
<i>Vice President</i>	<i>\$185</i>
<i>Senior Associate</i>	<i>\$160</i>
<i>Associate</i>	<i>\$135</i>
<i>Administrative</i>	<i>\$100</i>

**P3Works' hourly rates may be adjusted from time to time to reflect increased costs of labor and/or adding/reclassifying titles. Travel times will be billed at hourly rates. Increased hourly rates must be approved by City.*

District Due Diligence and Preparation of PID Plan of Finance

1. P3Works will review project information and review the plan of finance for the proposed transaction, including
2. Assessed value schedules, value to lien analysis, and overall structuring to achieve City goals and objectives
3. Identify areas of risk with the City's Financial Advisor, and solutions to mitigate the risks,
4. Bond sizing and bond phasing by improvement area,
5. Sources and uses of funds by improvement area,
6. Debt service schedules, and;
7. Assessment allocation and associated estimated annual installment by lot type for each improvement area.

Preparation of Service and Assessment Plan

1. P3Works will prepare a complete and final Service and Assessment Plan to be adopted by City Council and included in the Official Statement for the Bonds based on the Plan of Finance.
2. P3Works will present the Service and Assessment Plan to City Council and request approval of Assessment Roll.

Bond Issuance Support

1. P3Works will ensure bond documents, including the PID financing agreement, bond indenture, and official statement are all consistent with the Service and Assessment Plan.
2. P3Works will provide ad-hoc analysis as requested by the City and the underwriter in preparation of the preliminary official statement.

Participation in Presentations to City Council or other Public Forums

1. P3Works will prepare and present information as requested to the City Council or any other public forum.

BASIC DISTRICT ADMINISTRATION SERVICES

monthly collection fees will begin once assessments are levied

If no bonds are sold:

Monthly Fee = \$1,500 beginning the first of the month following execution of this Agreement for the first improvement area; and \$1,000 per month for each improvement area thereafter. (Proration will occur for any partial month if not begun on the 1st day of the month.)

If bonds are sold:

Monthly Fee amounts will be \$2,500 for the first improvement area beginning the first month following the issuance of bonds; and \$1,250 per month for each improvement area thereafter.

For PIDs that P3Works did not create: Monthly Collection Fees will not begin until the first Annual SAP Update is drafted by P3Works and approved by Council, therefore all work completed to that point will be billed hourly.

See Section below related to "Consulting Services Relating to Future Improvement Areas and related Bond Issuance" for hourly fees if bonds are contemplated.

Prepare Annual Service and Assessment Plan Update

1. If possible, obtain updated construction cost estimates (or actual costs for completed facilities) for District improvements, and update service and assessment plan text and tables.
2. Update service and assessment plan text and tables as necessary to account for any changes in development plan or land uses.
3. Update annual District assessment roll.
4. Identify parcel subdivisions, conveyance to owners' associations, changes in land use, and any other information relevant to the levy of special assessments.
5. Review maps of tax parcels to compile/audit list of parcels that are within the District for the upcoming bond year. Classify each parcel pursuant to the approved service and assessment plan.
6. Identify any parcels dedicated to any property types classified as exempt by the service and assessment plan.
7. Update District database with newly subdivided parcels and property type classifications.
8. Calculate annual special assessment for each parcel. Verify the sum of annual installments for all parcels in the District is sufficient to meet the annual debt service requirement, administration expenses, and any provisions for delinquency or prepayment reserves.
9. Calculate other funds available, such as reserve fund income, capitalized interest, and interest income. Reduce annual assessment based on findings according to approved service and assessment plan.
10. Present preliminary annual assessment roll to City. Upon approval by City, submit final

annual assessment roll to County Tax Collector

Administration of Bond Funds (if bonds are sold)

1. Review and reconcile the account statements for the funds maintained by the trustee. Ensure annual special assessment calculation is compliant with Indenture as it relates to each fund.
2. Provide annual summary of all District accounts maintained by Trustee at the time the annual service and assessment plan update is performed.

Provide Public Information Request Support

1. If requested, P3Works will respond to any calls and or emails relating to the District. P3Works will only provide technical answers relating to the annual assessments or the District generally. P3Works will not provide any commentary on City policy relating to PIDs.
2. If the City receives a notice from a property owner alleging an error in the calculation of any matters related to the annual assessment roll for the District, P3Works will review and provide a written response to the City. If a calculation error occurred, P3Works will take corrective action as required to correct the error.

Delinquency Management

1. After the end of the annual assessment installment collection period, P3Works will prepare a delinquent special assessment report, which details which parcels are delinquent and the amount of delinquency.
2. P3Works will notify the City what action must be taken relating to delinquent parcels, if any, to remain in compliance with the District bond documents.

Website Setup

1. Prepare website database searchable by property tax ID for use by property owners, title companies, mortgage companies, or other interested parties. The search results will provide assessment information, including outstanding principal, annual installment amount, payment information, and a breakdown of the assessment installment by use (principal, interest, reserve fund accounts, administrations, etc.)
2. Prepare "District Information" page for website. Information will include a background of the District formation and bond issuance process, District boundary map, and description of improvements. In additions, P3Works will provide a link to District documents.

DISTRICT ADMINISTRATION SETUP SERVICES

\$7,500 One Time Lump Sum Fee

1. Prepare District Administration Manual
2. P3Works will review the full bond transcript and identify all requirements of the City relating to District administration and/or disclosure requirements.
3. Prepare written summary of all City administration and disclosure requirements.

4. Prepare calendar of all relevant dates and deadlines for District administration and disclosure requirements.
5. Meet with County Assessor's office to establish procedure for obtaining parcel information for assessment roll.
6. Meet with County Tax Office to establish procedure to include District assessment roll on property tax bill.
7. Meet with City representatives to finalize policies and procedures relating to District Administration.

ADDITIONAL DISTRICT SERVICES

Billed at P3Works' prevailing hourly rates, which are currently as follows:

<i>Title</i>	<i>Hourly Rate</i>
<i>Managing Partner</i>	<i>\$250</i>
<i>Vice President</i>	<i>\$185</i>
<i>Senior Associate</i>	<i>\$160</i>
<i>Associate</i>	<i>\$135</i>
<i>Administrative</i>	<i>\$100</i>

**P3Works' hourly rates may be adjusted from time to time to reflect increased costs of labor and/or adding/reclassifying titles. Travel will be billed at the hourly rates. Increased rates must be approved by the City.*

Continuing Disclosure Services

1. P3Works will prepare the form of the annual report as required by the continuing disclosure agreements and work with the City and the developer of the District to complete.
2. P3Works will request from developer of the District the reports due pursuant to the developer disclosure agreement and disseminate these reports pursuant to the disclosure agreement; including Seller's Disclosures.
3. Upon notification by any responsible party or if P3Works independently becomes aware of such knowledge, P3Works will prepare notices of material events covering the events enumerated in the disclosure agreements.
4. P3Works will coordinate with the Trustee or the City's dissemination agent to disseminate the annual reports, quarterly reports from the developer, and notice of significant events to the Municipal Securities Rulemaking Board (MSRB) and any other parties required in the continuing disclosure agreement.

Developer Payment Request Administration

1. P3Works will review all developer payment requests to ensure the request complies with the PID Financing Agreement, the District service and assessment plan, and any other relevant provisions contained in the District documents.
2. P3Works will audit the developer payment request to ensure there is proper backup documentation and that the accounting is accurate.
3. P3Works will coordinate with the City's designated representative to ensure the improvements were built to the standards of the accepting governing body.

4. P3Works will ensure improvements to be dedicated are free and clear of all liens and encumbrances.

Consulting Services Relating to Future Improvement Areas and related Bond Issuance (to be paid from Developer funds advanced to City)

1. P3Works will update the Service and Assessment Plan to comply with Bond documents.
2. P3Works will prepare an updated Assessment Roll including the future Improvement Area
3. P3Works will coordinate with City's bond counsel, financial advisor, and the bond underwriter to ensure the Bonds and all related documents are in compliance with State Law.
4. P3Works will prepare any additional reports or analyses as needed to successfully issue the Bonds.

Development Agreement Review Specific to the PID/TIRZ Boundary

1. Participate in meetings or calls at City Manager's, or designee, direction.
2. Review and comment on Development Agreement drafts.
3. Prepare Ad hoc analysis as requested.

TAX INCREMENT REINVESTMENT ZONE SERVICES TO BE PROVIDED when requested by the City

TIRZ FORMATION, PRELIMINARY AND FINAL PROJECT AND FINANCE PLAN PREPARATION SERVICES

Billed at P3Works' prevailing hourly rates, which are currently as follows:

Title	Hourly Rate
<i>Managing Partner</i>	<i>\$250</i>
<i>Vice President</i>	<i>\$185</i>
<i>Senior Associate</i>	<i>\$160</i>
<i>Associate</i>	<i>\$135</i>
<i>Administrative</i>	<i>\$100</i>

**P3Works' hourly rates may be adjusted from time to time to reflect increased costs of labor and/or adding/reclassifying titles with approval of the City:*

1. At the direction of Staff, facilitate presentations to the Council and the TIRZ Board.
2. Estimated annual TIRZ Credit by lot type for each improvement area.

Preparation of Final Project Plan

1. P3Works will if requested by the City to prepare a Final Project and Finance Plan ("FPFP") to be adopted by the TIRZ Board and the City Council and included in the Official Statement for the PID Bonds based on the Plan of Finance.
2. P3Works will present the FPFP to the Council after conducting all necessary steps for public hearings and notifications and request approval of TIRZ FPFP.

Bond Issuance Support

1. P3Works will ensure bond documents, including the bond indenture and official statement are all consistent with the TIRZ FPFP.
2. P3Works will provide ad-hoc analysis as requested by the City and underwriter in preparation of the preliminary official statement.

Participation in Presentations to City Council or other Public Forums

1. P3Works will prepare and present information as requested to the City Council or any other public forum.
2. If requested by the City, P3Works will respond to any calls and or emails relating to the TIRZ.
3. P3Works will only provide technical answers relating to the annual TIRZ Credit or the TIRZ generally.
4. P3Works will not provide any commentary on City policy relating to TIRZs.

BASIC ZONE ADMINISTRATION SERVICES when requested by the City

Billed at P3Works' prevailing hourly rates, which are currently as set forth below. Any Increased

rates must be approved by the City.

<i>Title</i>	<i>Hourly Rate</i>
<i>Managing Partner</i>	<i>\$250</i>
<i>Vice President</i>	<i>\$185</i>
<i>Senior Associate</i>	<i>\$160</i>
<i>Associate</i>	<i>\$135</i>
<i>Administrative</i>	<i>\$100</i>

Preparation of the Annual Report to be filed with the applicable state agencies and then presented to the TIRZ Board and City Council for approval.

Prepare Annual Report

1. If possible, obtain updated construction cost estimates (or actual costs for completed facilities) for TIRZ improvements
2. Update Annual Report as necessary to account for any changes in development plan or land uses.
3. Identify parcel subdivisions, conveyance to owners' associations, changes in land use, and any other information relevant to anticipated estimate of Tax Increment to be generated.
4. Calculate annual TIRZ Credit for the PID for each parcel.
5. Present preliminary Annual Report to TIRZ Board. Upon approval by TIRZ Board, submit final Annual Report to the applicable state agencies.

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	2. Receive the 2018 Year in Review from the Sachse Fire Department.
Access	Public
Type	Information

Public Content**BACKGROUND**

Chief Wade will present an overview of staffing, operational statistics, departmental training efforts, prevention and community outreach, major accomplishments, an update on CERT, and plans for 2019.

POLICY CONSIDERATIONS

There are no policy considerations affiliated with this item.

RECOMMENDATION

There are no recommendations affiliated with this item. This is a presentation only.

2018 SFR Annual Update .pdf (1,287 KB)



Sachse Fire-Rescue

2018 ANNUAL UPDATE

MAY 6, 2019

MARTY WADE – FIRE CHIEF

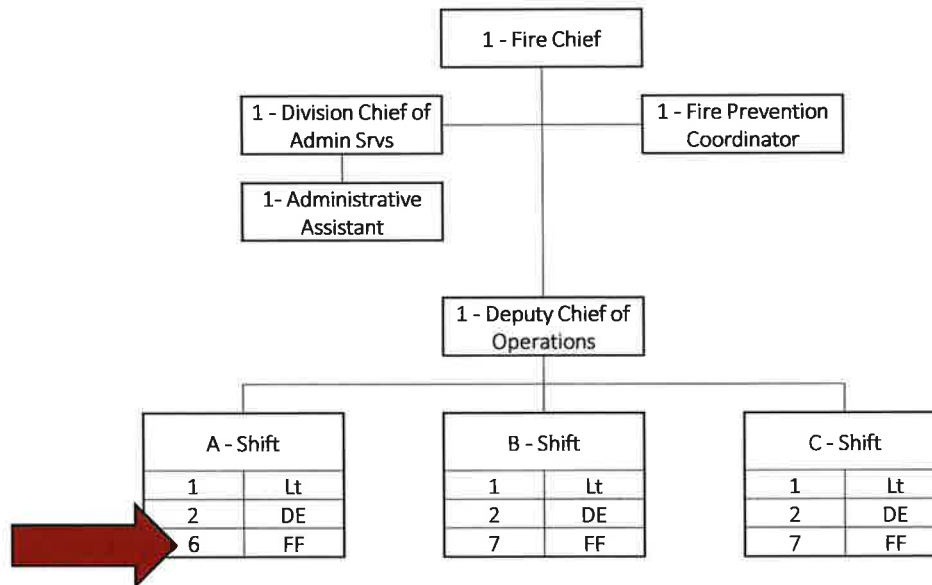
OBJECTIVES

- * Staffing
- * Operational Statistics
- * Training
- * Prevention & Community Outreach
- * Major Accomplishments
- * What's Next



STAFFING - CURRENT

SFR Personnel 2018/2019

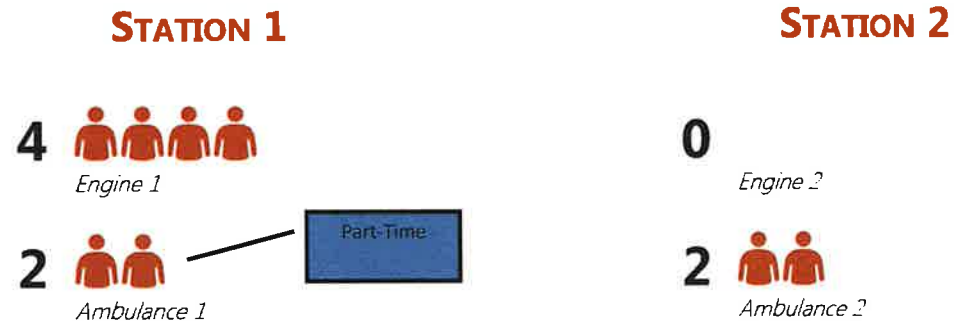


1	Fire Chief
1	Division Chief of Administrative Services
1	Fire Prevention Coordinator
1	Administrative Assistant
1	Deputy Chief of Operations (Vacant)
3	Lieutenants
6	Driver Engineers
20	Firefighters



STAFFING – Historical

January 2016 – 6 full-time and 2 part-time personnel protected the city utilizing 2 fire stations each day.



STAFFING – Current (FY 18/19)

A Shift has 9 full-time positions assigned to protect the city utilizing 2 fire stations. (B & C-Shift Have 10 Assigned due to 1 additional Firefighter FY 18/19)

STATION 1

4 
Engine 1

2 
Ambulance 1

STATION 2

3 
Engine 2

0
Ambulance 2

SFR Maintains a minimum of 3 personnel at Station 2.

The Part-Time Firefighter Program has been discontinued



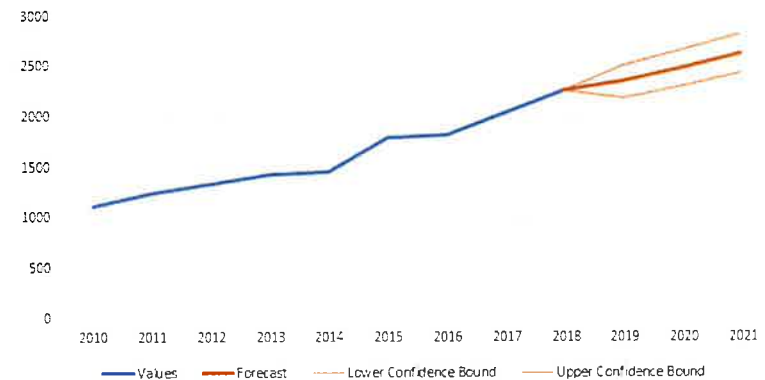
OPERATIONAL STATISTICS

Response Data – Total Incidents

The total number of Incidents projected for 2017 was 2,021; the actual number was **2,034**.

The total number of incidents projected for 2018 was 2,108; the actual number was **2,257**.

Timeline	Values	Forecast	Lower Confidence Bound	Upper Confidence Bound
2010	1110			
2011	1248			
2012	1331			
2013	1423			
2014	1455			
2015	1780			
2016	1813			
2017	2034			
2018	2257	2257	2257.00	2257.00
2019		2337.0313	2175.40	2498.66
2020		2474.7905	2294.01	2655.57
2021		2612.5497	2414.40	2810.70



OPERATIONAL STATISTICS

Response Data – Types of Calls

EMS

65.6% 63.13% **64.51%**

General Service

17.9% 22.17% **22.42%**

False Alarm

7.9% 8.75% **7.71%**

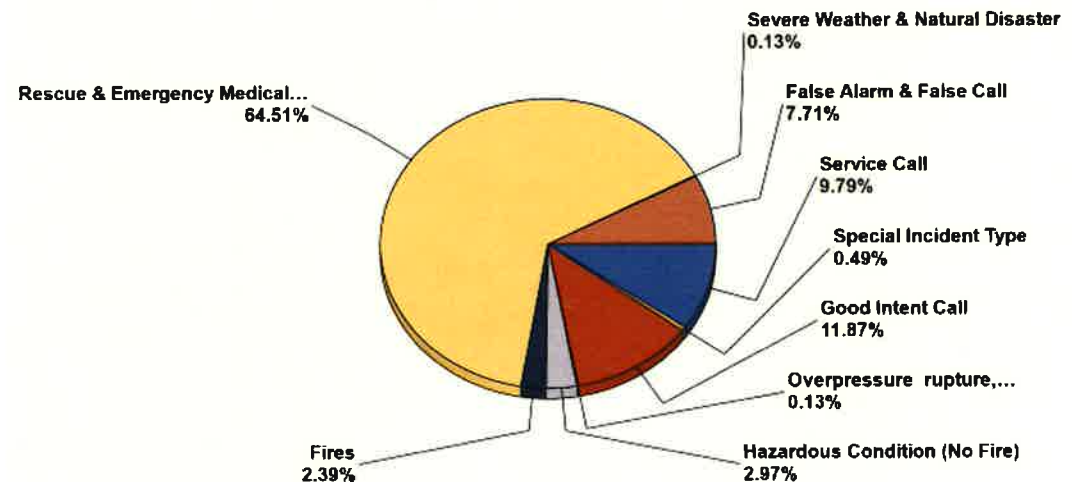
Hazardous Condition - No Fire

5.4% 3.54% **2.97%**

Fire

4.7% 2.41% **2.39%**

Red – 2016
Black – 2017
Blue - 2018



OPERATIONAL STATISTICS

Calls Per Month

Busiest Months

2018 – October & **December**

2017 – **May & December**

2016 – April & **May**

Busiest Days of the Week

2018 – **Tuesday** & Friday

2017 – **Tuesday & Wednesday**

2016 – **Wednesday** & Saturday

Busiest Time of Day

8 AM to 8 PM – approximately

OPERATIONAL STATISTICS

Fire Loss vs. Save Data

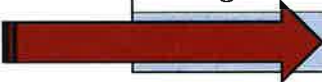
54 Fires Total
7 Structure Fires with over 10% loss

	2016	2017	2018
Total Property Value	4,298,641	2,573,933	1,680,982
Fire Loss Value	465,989	67,400	699,440
Fire Loss Percentage	10.80%	2.60%	42%



OPERATIONAL STATISTICS

Ambulance Service Fees

	Charge	Sachse Resident	Non-Resident
Advanced life Support 2 (ALS-2)	\$1,000	*Waive	\$1,000
Advanced Life Support (ALS)	\$850	*Waive	\$850
Basic Life Support (BLS)	\$750	*Waive	\$750
Mileage	\$15 / Mile	*Waive	\$15 / Mile
 * CO-Pays & Deductibles are Waived for Citizens of Sachse			

OPERATIONAL STATISTICS

Revenue - **\$445,575**

Ambulance Transports

2015 - \$246,102

2016 - \$289,838

2017 - \$292,404

2018 - \$387,875

Mutual Aid Calls
Murphy – 39 (1)
Wylie – 51 (7)
Rowlett – 2 (3)
Garland – 1 (3)

County Calls Revenue
2017 – \$43,800
2018 – \$53,100

Fire Inspection Fees

2015 – \$ 5,200

2016 – \$ 4,750

2017 - \$ 11,175

2018 - \$ 4,600

Dallas County Mutual Aid Agreement

Type	Incidents	Revenue
Fire Apparatus Response	69 @ \$450	\$31,050
EMS (Ambulance) Response	63 @ \$350	\$22,050
Total Billed		\$53,100

TRAINING



SFR Personnel completed **5,543** hours of training

- Averaging **205** hours per firefighter
- **4,100** of these hours are ISO requirements



PREVENTION & COMMUNITY OUTREACH

Fire Investigations - 3

Fire Inspections - 76

Plans Reviewed - 14

Permits Issued – 18

Public Education Presentations – 15

Community Events – 38

Station Tours - 15



PREVENTION & COMMUNITY OUTREACH

Interacting with over 4,000 People

- | | | | |
|---------------------------|----------------------------|---|------------------|
| * Fire Station Tours | * Block Parties | * Parades | * JABiztown |
| * Walks & Runs | * Birthday Party Tours | * Special Requests | * Mustang Splash |
| * Hands Only CPR | * Pancakes with Santa | * Pop In Visits | |
| * CPR Classes | * PD – Cops and Campers | * Scout Tours & Badge | |
| * School Fire Safety | * Fire Extinguisher Class | * Eagle Scout Projects | |
| * Fired Up for Literature | * Sparky | * H2O XPO | |
| * Sachse Clean-Up | * R W & B Blast Splashdown | * EMT-Ride Outs | |
| * Fire Station Open House | * Reading at the Library | * Seniors – Remember When | |
| * Puppet Shows | * Whitt Walk | * Christmas Extravaganza – Tunnel of Lights | |
| * Sachse HS Tech Class | * Sprinkler Demonstration | * R W & B Blast First Aid Station | |



2017 Total Hours = 2718.75

2018 Total Hours = **1225**

Meetings	286 attendees	475 hours
Events	293 volunteers	750 hours



Adding 7 New Responders in 2018
the CERT Program is Thriving!



MAJOR ACHIEVEMENTS

Customer Satisfaction



144 Surveys were randomly mailed out

38 were returned (26.4%)

4 Categories were Rated

- Did the Fire Department Arrive in a Timely Manner?
- Did you like the Services Provided?
- Were the Responders Nice and Receptive?
- How Would You Rate the Responders' Appearance?

Results:

132 – Exceeded Expectations

20 – Met Expectations

0 - Did Not Meet Expectations (3rd Consecutive Year)



Major Achievements

City of Sachse Emergency Operations Plan (EOP) – Basic Plan Revised and Approved

Increased Staffing by 1 Full-Time Firefighter Position

Eliminated the Part-Time Firefighter Program

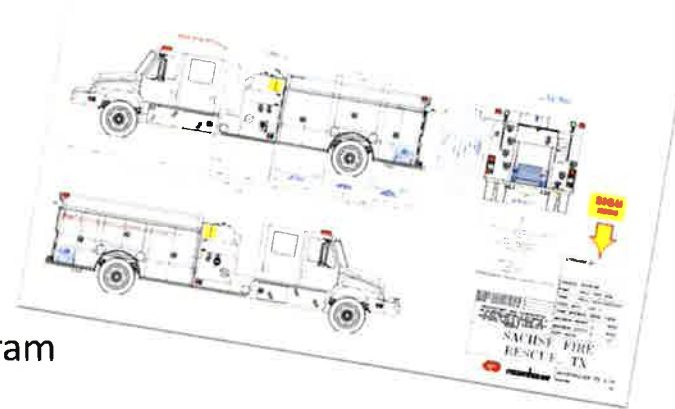
Re-Organized the Fire Prevention Bureau / Fire Marshal

- Added a Fire Prevention Specialist
- Added a Deputy Chief Position – To be filled in 2019

Completed a Draft “Firefighter Book” Credentialing Program

Received a New Ambulance

Ordered a Commercial Cab Fire Engine to replace Engine 3 – To be delivered in 2019



What's Next

ISO 1

Growth Impact evaluation and plan

Revise EOP Emergency Support Functions & Annexes

Training Needs – Facility & Props

Apparatus – New Ambulance (VERF)

Redefining our Fire Prevention Bureau

Community Outreach & Public Education

The City Council Mini Fire Academy (June 1, 2019)



What's Next Cont.

STAFFING, STATIONS, & SERVICES.....A SELF-ASSESSMENT **Community Risk Assessment & Standards of Cover**

- Community Baseline
- Risk Assessment
- Standards, Goals, and Objectives
- Critical Task Capabilities
- Set Service Level Objectives
- Evaluate Reliability of Fire Companies
 - Distribution & Concentration
- Policy Recommendations



This Self-Assessment is a Data Driven Analysis



Questions?



**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	3. Conduct a public hearing to consider and act on an ordinance amending the Code of Ordinances by amending Chapter 8 titled "Subdivisions".
Access	Public
Type	Action, Discussion, Information
Fiscal Impact	No
Budgeted	No
Recommended Action	Staff recommends approval of the proposed ordinance amendment

Public Content**BACKGROUND**

- The maintenance of existing ordinances is considered routine in order to provide a healthy and functioning regulatory framework that meets the needs of the community.
- Proposed revisions are intended to:
 - Update regulations to implement standards adopted by the PGBT and Old Town zoning districts;
 - Streamline processes to facilitate development; and
 - Clean up outdated references and provisions.

OVERVIEW

- The Subdivision Regulations provide for the safe, efficient, and orderly development of the city by facilitating the adequate provision of transportation, water, sewage, parkland, and other public requirements.
- The Subdivision Regulations are one of the tools used to implement the City's Comprehensive Plan.
- As part of the City's 2017 Comprehensive Plan implementation strategy, the ongoing maintenance of regulations and the streamlining of processes and provisions are identified tasks.

POLICY

- Facilitating development within the PGBT and Old Town zoning districts by enacting standards that align with the existing zoning regulations for those areas.
- The creation of a separate Engineering Design Manual to house all specifications and standards for all infrastructure and other related improvements. This item is to be acted upon in a separate resolution.
- Streamlining the processing of plats to have final approval authority take place at the Planning & Zoning Commission unless a waiver or variance is requested.

RECOMMENDATION

Staff recommends approval of the proposed amendments to the Subdivision Regulations. The Planning & Zoning Commission voted 7-0 to recommend approval of the proposed amendment at its April 22, 2019 meeting.

Subdivision Ordinance Amenment - Staff Presentation.pdf (1,683 KB)

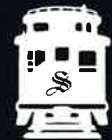
Chapter 8 Subdivisions - Redline.pdf (447 KB)

Proposed Ordinance.pdf (58 KB)

Subdivision Ordinance Amendment

CITY COUNCIL

MAY 6, 2019



Request

Conduct a public hearing to consider and act on an ordinance amending the Code of Ordinances by amending Chapter 8 “Subdivisions”.

Overview

Proposed revisions are intended to:

- Update regulations to implement standards established by the PGBT and Old Town zoning districts;
- Streamline processes to facilitate development; and
- Clean up outdated references and provisions.

Notable Proposed Changes

- Plat approval authority

- ☐ Planning & Zoning Commission would act as final approval board for Preliminary Plats

- Plats are ministerial and State law requires that a plat must be approved if meeting the City's Subdivision Regulations; streamlines the process
- While plats are ministerial, waiver requests are discretionary and the proposed amendment would have Council retain final approval authority on plats with waiver requests.

- ☐ Allows for 90-day filing extension to be approved by the Director of Development Services

- Preliminary plats expire after two (2) years and currently require any extensions to be approved by the Planning & Zoning Commission.

- ☐ Addition of administratively complete section

- The 30-day window for action on a plat is no longer triggered at submittal, but at the point the application is deemed complete (i.e. meets all requirements of the subdivision regulations).

Notable Proposed Changes (cont'd.)

•Block requirements

- ☐ Update requirements to align with block length and block perimeter requirements established under the PGBT Zoning District.

•Lot requirements

- ☐ Within the PGBT Zoning District, allow residential lots to front directly onto a park, open space, or common area on a case-by-case basis. Adequate provisions for access and fire safety would be required.
 - All lots are currently required to abut a public street; this provision would allow for lots to front on common areas, parks, or open spaces on a limited basis with adequate access, safety and parking provisions.
- ☐ Update requirements to align with requirements established under the PGBT Zoning District
 - Allow for single family detached lots to be no less than 90 feet in depth and townhome lots to be no less than 80' in depth in the PGBT zoning district.
- ☐ Allow lots within the R-E Single-Family Dwelling District to be served by private drives as currently permitted under the existing zoning regulations.
 - Current procedure requires a variance to the subdivision regulations, despite being permitted by right under the zoning standards.

Residential Lot Frontage – Park/Muse/Open Space lots



Notable Proposed Changes (cont'd.)

- Creation and update of Engineering Design Manual

- ☐ Consolidates and replaces the design requirements for Water & Wastewater Design, Drainage and Stormwater Pollution Prevention Design, and Paving Design – places them in a single easy to follow document.
- ☐ Removes design criteria from the Subdivision Regulations and places into a separate document adopted by the Council.
- ☐ Updates street and alley design guidelines to facilitate development within the PGBT Zoning District and in estate residential areas – incorporates street/alley cross-sections adopted with the PGBT Zoning District and those previously adopted in Pleasant Valley Estates for rural residential (1+ acre lots).

Engineering Design Manual

- Current design standards are located within multiple sections of the City Code of Ordinances, including Building Regulations, the Subdivision Ordinance, and the Zoning Ordinance.
- This situation can make it difficult and confusing for developers and engineers to locate the appropriate design standards.
- A complete Engineering Design Manual will place all of these standards/requirements in a simple, easy to follow document, which will be posted to the City Website in the Engineering Department.

Engineering Design Manual (cont'd.)

- The PGBT zoning includes new street cross-sections with different street and alley standards from those utilized in the rest of the city.

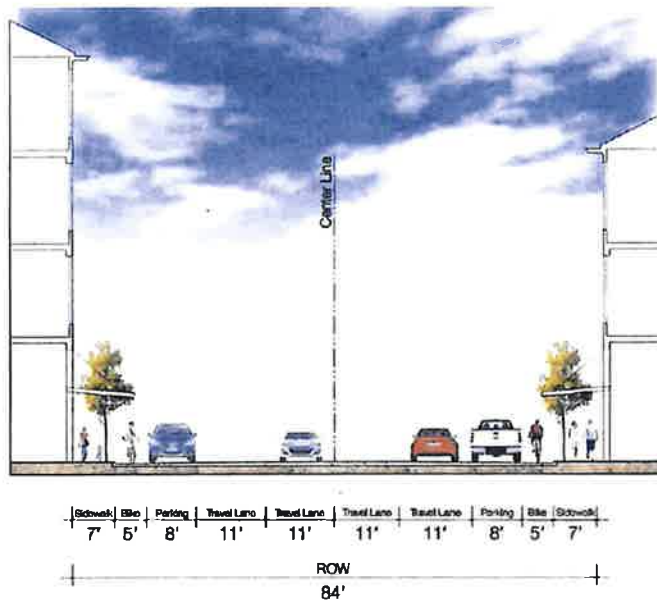
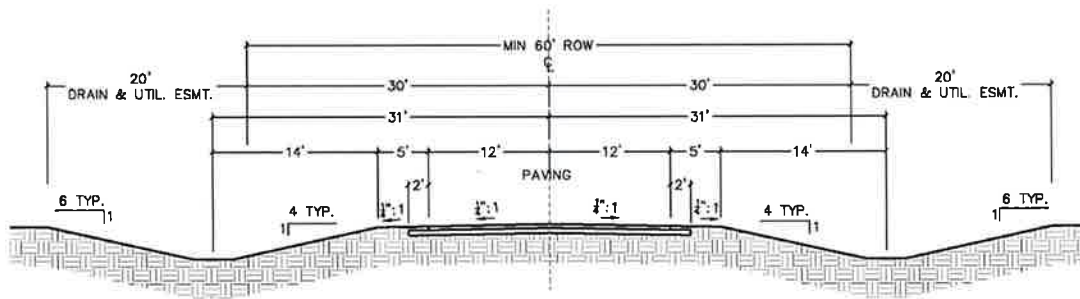


TABLE 14.8.1 STREET CLASSIFICATIONS

Street Type	ROW (Recommended Min.)		Number of Lanes	Number of Bike Lanes	Vehicle Lane Widths	Bike Lane Width	On-Street Parking	Parkway/Tree Well
	Paved Area	Ped. Realm						
A	72 FT (Angled or Parallel)	12 FT	4	2	11 FT	5 FT	Yes	5 x 5 FT (Min.)
B	42 FT	12 FT	2	N/A	12 FT	N/A	Yes, Parallel	5 x 5 FT (Min.)
General	40 FT	12 FT	2	N/A	11 FT	N/A	Yes, Parallel	5 x 5 FT (Min.)
Alley	32 FT (Garage to Garage)	None	N/A	None	N/A	N/A	None	None

Engineering Design Manual (cont'd.)

- In estate residential areas (1+ acre lots), the design needs for streets and drainage systems is different than what is needed in standard suburban residential areas.



TYPICAL PAVEMENT SECTION
ESTATE RESIDENTIAL (CONCRETE) STREET
N.T.S.



Recommendation & Next Steps

- Staff recommends approval of the proposed ordinance amendment.
- The Planning & Zoning Commission unanimously recommended approval (7-0) of the proposed amendment at its meeting on April 22, 2019.

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF SACHSE, TEXAS, AMENDING THE CODE OF ORDINANCES BY AMENDING CHAPTER 8 TITLED “SUBDIVISION”; PROVIDING A REPEALING CLAUSE; PROVIDING A SAVINGS CLAUSE; PROVIDING A SEVERABILITY CLAUSE; PROVIDING FOR A PENALTY OF FINE NOT TO EXCEED THE SUM OF TWO THOUSAND DOLLARS (\$2,000.00) FOR EACH OFFENSE; AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the Planning and Zoning Commission of the City of Sachse and the governing body of the City of Sachse, in compliance with state laws applying to amending the Comprehensive Zoning Ordinance and Map, have given the requisite notice by publication and otherwise, and after holding due hearings and affording a full and fair hearing to all property owners generally, the governing body of the City of Sachse is of the opinion that said comprehensive zoning ordinance should be amended as provided herein;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SACHSE, TEXAS:

SECTION 1. That Chapter 8 “Subdivision” of the City of Sachse Code of Ordinances be, and the same is hereby, amended to read as follows:

“Chapter 8

SUBDIVISION

....

Sec. 8-5. Definitions

....

City engineer. Person employed by the city as the director of public works and engineering or their designee.

...

City staff. The director of development services or designee and other officials of the city designated by the city manager.

...

Design standards. Deleted in its entirety.

...

Director of community development. Deleted in its entirety.

Director of development services. Person employed by the city as director of development services.

Drainage and Stormwater Pollution Prevention Design Manual. Deleted in its entirety.

...

Engineering design manual or City of Sachse engineering design manual. The current engineering design manual adopted by the City, and as such engineering design manual is thereafter amended.

...

May. Deleted in its entirety.

...

Paving Design Manual. Deleted in its entirety

...

Property owner. The record title holder of the lot or tract.

...

Standard construction details. Deleted in its entirety.

...

Thoroughfare. Means any planned or existing roadway within the city.

...

Water and Wastewater Design Manual. Deleted in its entirety.

...

Sec. 8.7. Previously filed applications.

Deleted in its entirety. Renumber remaining sections.

Sec. 8.7. Waivers

...

Sec. 8.9. Preliminary platting procedures.

...

B. Generally.

- (1) The developer shall submit the required number of copies of the preliminary plat of the proposed subdivision with the city for submission to the planning and zoning commission and include the required filing fees and tax certificates showing all taxes have been paid on the property being platted.

...

- (7) The actions of the planning and zoning commission shall be noted on two copies of the preliminary plat. One copy shall be returned to the developer and the other retained in the files of the development services department.

...

- (8) Approval of a preliminary plat by the planning and zoning commission and/or the city council is not approval of the final plat but is an expression of approval of the layout shown subject to satisfaction of specified conditions. The preliminary plat serves as a guide in the preparation of a final plat.

...

D. Data Requirement. All preliminary plat applications shall include the following at the time of submittal:

- (1) A preliminary drainage plan and study, including the 100-year floodplain, and any existing or proposed drainage easements affecting the plan;

...

- (4) The number of copies, page sizes and specific data requirements shall be in accordance with application guidelines provided by the development services department.
- (5) A preliminary plat shall not be determined to be complete if it does not conform to the requirements of this Code. A preliminary plat shall be considered filed on the date the application is considered complete.

E. Effect of approval. Approval of a preliminary plat by the planning and zoning commission or city council constitutes authorization for the property owner to submit engineering plans for review by the city engineer.

F. Changes or alterations to approved preliminary plat. No previously approved preliminary plat may be changed or altered, except to bring the plat in conformance with the conditions and

requirements stipulated by the planning and zoning commission and/or city council. Minor changes as outlined below shall be permitted at the discretion of the director of development services:

...

- (3) If the director of development services determines that the proposed changes are minor, a revised preliminary plat may be approved administratively. A revised preliminary plat shall include all property within the boundary of the original preliminary plat. A revision to a preliminary plat shall not affect the expiration date of the plat and shall carry the same expiration as outlined below.

G. Expiration of preliminary plat approval.

- (1) The approval of a preliminary plat expires 24 months after the date of approval unless a final plat is submitted and has received approval by the planning and zoning commission for the property within such period, or the period is extended by the director of development services in accordance with the extension and reinstatement guidelines contained herein.

H. Extension and reinstatement of expired preliminary plat.

- (1) Prior to the expiration of preliminary plat approval, the time for filing of the application for the final plat may be extended at the written request of the subdivider. The first filing extension (not to exceed 90 days) may be granted by the director of development services. Any further requests for extension shall be considered by the planning and zoning commission.

...

Sec. 8.10. Final platting procedures.

A. Generally.

- (1) After approval of the preliminary plat by the planning and zoning commission and, upon substantial completion of the required public improvements and issuance of a substantial completion letter from the city engineer to the developer or the provision of an improvement agreement as allowed herein, the owner shall submit a final plat for the property for approval.

...

- (4) The development services department shall accumulate the comments of the city departments and agencies and conduct a developer/city staff conference to report the comments and requested corrections to the developer. The developer shall make comments or make the required corrections and submit the corrected final plat to

the development services department for submission to the planning and zoning commission.

- (5) The final plat shall be submitted to the planning and zoning commission at the next available meeting with any appropriate comments and recommendations by the development services department. The planning and zoning commission shall act on the final plat within 30 days after the official filing date. If no action is taken by the planning and zoning commission within such period, the final plat shall be deemed approved. A certificate showing the filing date and failure to take action thereon within the 30-day period shall on request be issued by the planning and zoning commission, which shall be sufficient in lieu of a written endorsement of approval. The planning and zoning commission shall be the final approval authority for final plats. The denial of approval of a final plat shall not be appealable to the city council.

...

- (9) Final plats disapproved by the planning and zoning commission shall be returned to the developer by the development services department.

...

C. Data requirement.

- (1) The subdivider shall submit to the development services department the necessary copies of the final plat and required supporting data prepared in accordance with the requirements set forth in the application guidelines provided by the development services department. All documents shall be signed and dated by the applicant or person preparing the plans.

...

E. Expiration of final plat approval.

...

- (2) **Delete in its entirety. Renumber remaining subparagraph.**

- (2) An approved, unexpired final plat may upon written request by the subdivider be extended once by the director of development services for a period not to exceed 90 days. The planning and zoning commission upon written request, may extend approval once for a period not to exceed 12 months provided:

- (a) Good cause is shown by the developer; and
(b) There has been no significant change in development conditions affecting the subdivision; and

- (c) The final plat continues to comply with all applicable, regulations, standards and this chapter.

Sec. 8.11. Vacating plats, replats and amending plats.

...

D. Administrative approval of certain amending plats, minor plats and re-plats.

- (1) The director of development services is authorized to approve the following:
 - (a) Amending plats described by Section 212.016 Texas Local Government Code;
 - (b) Minor plats involving four or fewer lots fronting an existing street and not requiring the creation of any new street or extension of municipal facilities; and
 - (c) A replat under Section 212.0145 Tex. Loc. Gov't Code that does not require the creation of any new street or the extension of municipal facilities.
- (2) The director of development services may for any reason elect to present an amending plat, minor plat or re-plat meeting the requirements of section 8-11 D.(1) above to the planning and zoning commission for approval.
- (3) Any amending plat, minor plat or re-plat meeting the requirements of this section which the director of development services fails or refuses to approve shall be submitted to the planning and zoning commission for approval.

...

Sec. 8-14. Completion and maintenance of public improvements.

A. Construction plan procedure.

...

- (2) Construction plan review procedure. Copies of the construction plans, including a copy of the approved preliminary plat and payment for the construction plan review fee shall be submitted to the city engineer for final approval. The plans shall contain all necessary information for construction of the project, including screening walls and other special features. The design of all public improvements shall be in accordance with the engineering design manual. Each sheet of the plans shall contain a title block including space for the notation of revisions. This space is to be completed with each revision to the plan sheet and shall clearly note the nature of the revision and the date the revision was made. The city engineer will release

the plans for construction, after payment of all inspection fees and a pre-construction conference is held. Upon such release, each contractor shall maintain one set of plans stamped with city release at the project site at all times during construction.

...

B. Improvement agreements.

- (1) Substantial completion of improvements. Except as provided below, before the final plat is approved by the planning and zoning commission or the director of development services, all applicants shall be required to make substantially complete, in accordance with the city's direction and to the satisfaction of the city engineer, all street, sanitary and other public improvements, including lot improvements on the individual residential lots of the subdivision as required in these regulations and specified in the final plat, and to dedicate those public improvements to the city. As used in this section, "lot improvements" refers to grading and installation of improvements required for proper drainage and prevention of soil erosion.

...

D. Inspection of public improvements.

- (1) General procedure. Construction inspection shall be supervised by the city engineer. Construction shall be in accordance with the approved plans and the engineering design manual of the city. Any change in design required during construction should be made by the engineer whose seal and signature are shown on the plans. Another engineer may make revisions to the original engineering plans if so authorized by the owner of the plans and if those revisions are noted on the plans or documents, provided such revisions are permitted by the Texas Engineering Practice Act. All revisions shall be approved by the city engineer. If the city engineer's inspection finds that any of the required public improvements have not been constructed in accordance with the city's engineering design manual, the owner shall be responsible for completing and/or correcting the public improvements.

...

Sec. 8.15. General requirements and design standards.

A. Improvements. The improvements referenced herein must be constructed per the engineering design manual and accepted by the city engineer prior to filing an associated plat for record with the county clerk, unless otherwise specified in an approved improvement agreement.

B. Utilities.

- (1) The sanitary sewers, storm sewers, water mains, street improvements, with all appurtenances pertaining to the above and facilities of other agencies as may be required, shall be constructed and installed in each new subdivision in accordance with the engineering design manual.

- (2) Water.

- (a) All subdivisions shall be provided with an approved water system designed and constructed in accordance with the master plan when available and in accordance with the engineering design manual. In the corporate limits of the City of Sachse all subdivisions shall be connected with the City of Sachse water supply distribution system.

- (3) Sewer improvements.

- (a) Sanitary sewer facilities shall be provided per the engineering design manual to adequately service the subdivision and conform to the city wastewater master plan.

...

C. Drainage.

- (1) An adequate storm sewer system consisting of inlets, pipes and other underground drainage structures with approved outlets shall, at a minimum, be designed and constructed to the standards of the city's engineering design manual where runoff of storm water and the prevention of erosion cannot be accomplished satisfactorily by surface drainage facilities. Areas subject to flood conditions as established by the city will not be considered for development until adequate drainage has been provided. Storm drainage facilities shall be designed in accordance with the engineering design manual.

...

D. Streets and Alleys.

- (1) The planning, design, construction and standards of all streets, alleys, right-of-way improvements and any other related roadway improvements by any person, firm, public utility, corporation, or business in the city shall conform to the requirements of the engineering design manual, as it may now exist or may hereafter be amended.
- (2) The engineering design manual shall be utilized by all persons designing streets, right-of-way improvements, and any other related roadway improvements in the city, whether said person is subdividing property or constructing without a subdivision.

...

E. Easements.

...

- (4) Where adequate access for firefighting purposes may not otherwise be provided, easements for fire lanes shall be required. Fire lane easements shall be maintained by the property owner, shall be marked as such on the ground, and shall be kept free and clear at all times.

F. Blocks.

...

- (2) In general intersecting streets, determining the blocks, lengths and widths shall be provided at such intervals as to serve cross traffic adequately, and to meet exiting streets or customary subdivision practices. Block length and block perimeter shall meet the minimum requirements of the established zoning district. Where no existing subdivision controls and no block length or block perimeter is established for the zoning district, blocks shall not be less than 500 feet in length and the block lengths should not exceed 1,000 feet, with a maximum of 1,200 feet in length. However, in cases where physical barriers or property ownership creates conditions where it is appropriate that these standards be varied, the length may be increased or decreased to meet the existing conditions having due regard for connecting streets, circulation of traffic and public safety.

...

G. Lots.

...

- (2) Each lot shall be provided with adequate access to an existing or proposed street by frontage on such street, or as provided for by an approved plat reflecting a series of mutual access easements connecting lots with no street frontage to a public street.
 - (a) For all single-family and two-family (duplex) lots the following shall also apply:
 - (i) Lots shall abut a public street. On a case-by-case basis, residential lots located within the PGBT Zoning District may be permitted to front onto a park, open space or common area provided that provisions are in place for fire accessibility and parking.

- (ii) Lots within the R-E single-family dwelling district may be served by private drives as permitted within the R-E single family dwelling zoning district.

...

- (5) Except for lots located within the PGBT Zoning District, no lot shall be platted less than 100 feet in depth except in cases where an irregular shaped tract is platted into lots and remnant piece of property is of sufficient area to plat one or more lots, the council may waive the depth requirement to prevent a hardship on the developer. Single-family detached residential lots located within the PGBT Zoning District may not be less than 90' in depth and townhome lots shall not be less than 80' in depth.

...

- (8) In areas where city sewer is not immediately available, a lot shall be platted of such area as to meet the minimum requirements of Dallas and/or Collin Counties and the guide lines of the Texas State Department of Health pertaining to septic tank construction and operation.

...

- (9) When an applicant exhibits a duly executed and recorded deed covering a lot having dimensions of 50 feet by 120 feet or more has been sold by metes and bounds prior to passage of this chapter and such lot is being assessed for city taxes and conforms to the established lot pattern and zoning classification in the block where located, then a building permit may be issued provided the requested use of such property conforms to the permanent zoning of the property covered by the application.

...

- (10) All lots developed under this chapter shall be shaped, graded, and finished by the developer to a finished grade elevation conforming with the lot grading plan and/or standard building code requirements providing for positive drainage and access.

H. Building lines. The building line is a line beyond which buildings must be set back from a street right-of-way line or property line. Building lines shall be determined by the appropriate zoning classification.

...

Sec. 8.16. Water and sewer main extensions.

...

C. Main extensions for individual property owners.

...

- (2) Business, industrial, commercial, apartment and property other than single-family residential.

...

- (c) All proposed water and sanitary sewer installations to be installed by the applicant's contractor shall be designed by a registered professional engineer in the State of Texas in accordance with the engineering design manual of the City of Sachse.

...

- (e) Where extension is requested by an industrial or commercial user, such extension may be made at the discretion of the city council, provided 40 percent of the estimated annual revenue for such customer will support interest and principal payments on the total cost of the extension required to serve.

D. Main extension for developers and subdivisions.

...

- (5) Methods by which water and sewer mains can be extended for subdivisions or developments.

- (a) On-site facilities. On-site water and sewer facilities shall be constructed by private contract at the developer's expense in accordance with the city subdivision regulations and engineering design manual of the City of Sachse.

- (b) Off-site facilities.

- (i) Private contract. Off-site water and sewer facilities shall be constructed by private contract at the developer's expense in accordance with the city subdivision regulations and engineering design manual of the City of Sachse.

...

Sec. 8.17 Street extensions and pro rata charges.

...

E. Extensions for property subdivided or platted for development basis.

...

(2) Extensions within property to be developed.

- (a) Developers of such property will defray the entire cost of streets within their subdivision. The size and construction of such streets and alleys shall be in conformance with this subdivision regulation and in accordance with the engineering design manual of the City of Sachse.

...

F. Methods of construction.

- (1) By private contract. The construction of streets may be awarded on a private contract in accordance with provisions of the City of Sachse engineering design manual. Such streets or alleys, when constructed and dedicated, shall become the property of the city free and clear of all encumbrances. The city specifically reserves the option to advertise for bids and install any or all portions of the extensions.

...

Sec. 8.18 Street design and construction costs.

...

B. Street, design construction costs and escrow requirement.

...

- (2) The owner shall be responsible for the construction of the following width perimeter streets to his development.

...

- (c) When developing land zoned "I-1," "I-2," the owner shall be responsible for the construction of one-half of the street actually proposed for construction, pursuant to the thoroughfare plan and engineering design manual of the City of Sachse.

...

Sec. 8.20. Impact fees.

...

C. Advisory committee.

...

- (5) In the event of any conflict between this subsection 8-20(c) and applicable state law, state law shall control.

...”

SECTION 2. That all provisions of the Ordinances of the City of Sachse, Texas, in conflict with the provisions of this ordinance be, and the same are hereby, repealed, and all other provisions of the Ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3. An offense committed before the effective date of this ordinance is governed by prior law and the provisions of the Code of Ordinances, as amended, in effect when the offense was committed and the former law is continued in effect for this purpose.

SECTION 4. That should any word, sentence, paragraph, subdivision, clause, phrase or section of this ordinance, be adjudged or held to be void or unconstitutional, the same shall not affect the validity of the remaining portions of said ordinance, which shall remain in full force and effect.

SECTION 5. That any person violating any of the provisions or terms of this Ordinance shall be subject to the same penalty as provided for in the Code of Ordinances of the City of Sachse as heretofore amended and upon conviction shall be punished by a fine not to exceed the sum of Two Thousand Dollars (\$2,000.00) for each offense.

SECTION 6. This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law and charter in such cases provides.

PASSED AND APPROVED by the City Council of the City of Sachse, Texas on the _____ day of _____, 2019.

APPROVED:

Mike J. Felix
Mayor

DULY ENROLLED:

Michelle Lewis Sirianni
City Secretary

APPROVED AS TO FORM:

Joseph J. Gorfida, Jr.
City Attorney
(04-25-2019:TM107562)

Sec. 8-1. Title.

This chapter shall be known and may be cited as “The City of Sachse Subdivision Ordinance.” (~~Ordinance 3401, sec. 1, adopted 7/2/12~~)

Sec. 8-2. Authority.

This chapter is adopted under the authority of the City Charter, the Constitution and Laws of the State of Texas, including Chapter 212 of the Texas Local Government Code, as amended. (~~Ordinance 3401, sec. 1, adopted 7/2/12~~)

Sec. 8-3. Intent and purpose.

A. Intent. In the interpretation and application of the provisions of these regulations, it is the intention of the city council that the principles, standards and requirements provided for herein shall be minimum requirements for the platting and developing of subdivisions in the City of Sachse and, where other ordinances of the city are more restrictive in their requirements, such other ordinances shall control.

B. Purpose.

- (1) Promote and develop the utilization of land in a manner to assure the best possible community environment in accordance with the adopted plans and regulations of the City of Sachse;
- (2) Guide and assist the developers in the correct procedures to be followed and to inform them of the standards which shall be required;
- (3) Protect the public interest by supervising the location, design, class and type of streets, sidewalks, utilities and essential areas and services required; and
- (4) Protect and promote the public health, safety and general welfare.

C. Every owner of any tract of land situated within the corporate limits of the city who divides the tract in two or more parts to lay out a subdivision of the tract, including an addition to the city, to lay out a building lot or other lots, or to lay out streets, alleys, squares, parks or other parts of the tract intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on or adjacent to the streets, alleys, squares, parks or other parts must have a plat of the subdivision prepared and approved according to this chapter. A division of a tract under this chapter includes a division regardless of whether it is made by using a metes and bounds description in a deed of conveyance or in a contract for a deed, by using a contract of sale or other executing contract, or by using any other method. A division of land does not include a division of land into parts greater than five acres, where each part has access and no public improvement is dedicated.

D. The procedure for approving a plat requires a preliminary plat and final plat. The requirement for a preliminary plat may be omitted with the approval of the city manager. Except as otherwise

council is required for the construction of public improvements on the property. The preliminary plat and the associated engineering plans for the property may be amended during construction, with only major changes requiring re-approval by the planning and zoning commission. Upon completion of the required public improvements, or the provision of an improvement agreement, the owner may submit a corrected final plat for the subdivision. Lots may be sold and building permits obtained after approval of the final plat by the planning and zoning commission, and the recording thereof.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-4. Applicability.

This chapter shall apply to all Subdivisions of land within the corporate limits and within the extra territorial jurisdiction of the City of Sachse, Texas, and for other areas as may be authorized by Chapter 212 of Local Government Code. ~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-5. Definitions.

The following terms shall have the meanings herein ascribed:

City. The City of Sachse, Texas.

City council. The governing body of the City of Sachse, Texas.

City engineer. Person employed by the city as the ~~city engineer~~ director of public works and engineering or their designee.

City manager. Person employed by the city as city manager.

City staff. The director of ~~community~~-development services or designee and other officials of the city designated by the city manager.

Comprehensive plan. The comprehensive plan of the city adopted by the city council, as amended from time to time. The comprehensive plan indicates the general locations recommended for various land uses, transportation routes, streets, parks and other public and private developments and improvements.

Comprehensive zoning ordinance. The city comprehensive zoning ordinance, as amended.

~~Design standards. Collectively means the Drainage and Stormwater Pollution Prevention Design Manual, Paving Design Manual, and Water and Wastewater Design Manual adopted by resolution or ordinance from time to time, as amended.~~

Development. The subdivision of land and/or the construction or reconstruction of one or more buildings or the structural alteration, relocation or enlargement of any buildings or structures on a lot, tract, or tracts of land.

Developer. The owner of property or the person authorized by the owner to develop the property.

Director of ~~community~~-development services. Person employed by the city as director of ~~community~~ development services.

~~Drainage and Stormwater Pollution Prevention Design Manual. The City of Sachse Drainage Standards adopted by ordinance from time to time, as amended.~~

Easement. One or more of the property rights granted by the owner to and/or for the use by the public or another person or entity.

Engineer. A person licensed as a professional engineer duly authorized under the provisions of the Texas Engineering Practice Act, as amended, to practice the profession of engineering.

Engineering design manual or City of Sachse engineering design manual. The current engineering design manual adopted by the City, and as such engineering design manual is thereafter amended.

Engineering plans. The drawings and specifications prepared by a registered professional engineer submitted to the city and required for plat approval.

Improvement agreement. A contract entered into by the developer and the city by which the developer

as a facilities agreement, developer's agreement or other similar contract title as entered into by the developer and the city.

Lot. An undivided tract or parcel of land under one ownership having frontage on a public street, and either occupied or intended to be occupied by one main building and the required parking, or a group of main buildings, and accessory buildings, which parcel of land is designated as a separate and distinct tract and building site.

~~**May.** The word "may" is permissive.~~

Owner. Fee simple title owner of the land comprising a subdivision or the owner's authorized representative.

~~**Paving Design Manual.** The City of Sachse Paving Standards adopted by ordinance from time-to-time, as amended.~~

Plat. The graphic representation of a subdivision, resubdivision, combination of lots or tracts, or recombination of lots or tracts. Plat includes, a replat, minor plat and amending plat.

Plat, amending. A plat as described by the Texas Local Government Code Section 212.016, as amended.

Plat, final. The final plat of a proposed development submitted for approval by the planning and zoning commission prepared in accordance with the provisions of this chapter and requested to be filed with the appropriate County Clerk of either Dallas County or Collin County.

Plat, minor. A plat which contains four or fewer lots fronting on an existing street and not requiring the creation of any new street or extension of municipal facilities as described by the Texas Local Government Code Section 212.0065, as amended.

Plat, preliminary. The initial plat or working draft map or plan of a proposed development submitted to the planning and zoning commission and the city council for approval.

Planning and zoning commission. The Planning and Zoning Commission of the City of Sachse, Texas.

~~**Property owner.** The record title holder of the lot or tract.~~

Shall. The word "shall" is always mandatory and nondiscretionary.

~~**Standard construction details.** Means the city's standard construction details, as adopted by the city, and amended from time to time.~~

Storm drainage master plan. The Master Plan for the City of Sachse for storm drainage facilities adopted by ordinance from time-to-time, as amended.

Street. A public way for vehicular traffic, whether designated as a street, highway, thoroughfare, parkway, throughway, road, avenue, boulevard, private place or however otherwise designated, other than an alley or driveway.

Structure. Anything constructed or erected, the use of which requires location on the ground, or which is attached to something having a location on the ground.

Subdivision. The division of any tract of land situated within the corporate limits, or within the city's extraterritorial jurisdiction, in two or more parts, or the identification of a single tract, for the purpose of laying out any subdivision of any tract of land or any addition to the city, or for laying out suburban lots or building lots, or any lots, streets, alleys, squares, parks or other parts intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on or adjacent to the streets, alleys, squares, parks, or other parts for the purpose, whether immediate or future, of creating building sites. A division of a tract includes a division regardless of whether it is made by using metes and bounds description in a deed of conveyance or in a contract for a deed, by using a contract of sale or other executory contract to convey, or by using any other method. Subdivision includes re-subdivision, but it does not include the division of land into parts greater than five acres, where each part has access and no public improvement is dedicated.

Substantial completion. Shall mean that stage in the progression of the work when the work is sufficiently complete in accordance with the approved construction plans that the city can enjoy beneficial use or occupancy of the public improvement and can utilize the public improvement for its intended purpose,

public improvements are substantially complete and allowing the developer to submit the final plat to the city for staff review.

Surveyor. A registered professional land surveyor as authorized by state law to practice the profession of surveying as authorized by the Land Survey Practices Act, as amended.

Temporary improvement. Improvements built and maintained by an owner during construction of the development of the subdivision or addition and prior to the acceptance of the performance bond or improvements required for the short term use of the property.

Thoroughfare. Means any planned or existing roadway within the city.

Thoroughfare plan. The thoroughfare plan of the city and area traffic circulation plans included in the comprehensive plan, as it may be amended from time to time.

Vicinity location map. A small vicinity location map which shows sufficient streets, collector and arterial street names, and major features of the surrounding area to locate the area being subdivided.

Wastewater master plan. The Master Plan for the City of Sachse for wastewater facilities adopted by ordinance from time-to-time, as amended.

~~**Water and Wastewater Design Manual.** The City of Sachse Water and Wastewater Standards adopted by ordinance from time to time, as amended.~~

Water master plan. The Master Plan for the City of Sachse for water facilities adopted by ordinance from time to time, as amended.

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3594, sec. 1, adopted 6/2/14)~~

Sec. 8-6. Filing fees.

A. Preliminary and final plats.

(1) Filing fees for plats as shown in the master fee schedule established by resolution of the city council from time-to-time shall be paid by the developer at time of application.

(2) Plat recordation fees which are charged by Dallas County and/or Collin County shall be paid by the developer directly to the appropriate county when the developer records the plat with that county.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

~~Sec. 8-7. Previously filed applications.~~

~~A. Where an application was filed for review prior to July 2, 2012, the city regulations in effect prior to that date shall apply but the developer may elect to develop the property under this subdivision ordinance. This election shall be made in writing at the time of application and shall be binding for the life of the project. The developer shall not be allowed to select provisions from both the regulations and the developer shall not be granted any waiver to this elective requirement.~~

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-87. Waivers.

A. **Authorization.** The city council may authorize a waiver from these regulations when in its opinion undue hardship will result from requiring strict compliance. In granting waiver, the city council shall prescribe only conditions that it deems necessary or desirable to the public interest and making the findings herein below required. The city council shall take into account the nature of the proposed use of land involved and existing uses of the land in the vicinity, the number of

No waiver will be granted unless the city council finds:

- (1) That there are special circumstances or conditions affecting the land involved such that the strict application of the provisions of this ordinance would deprive the applicant of the reasonable use of their land.
- (2) That the waiver is necessary for the preservation and enjoyment of a substantial property right of the applicant, that the granting of the waiver will not be detrimental to the public health, safety or welfare or injurious to other property in the area.
- (3) That the granting of the waiver will not have the effect of preventing the orderly Subdivision of other lands in the area in accordance with the provisions of this chapter. Such finding of the city council together with the specific facts on which such findings are based shall be incorporated under the official minutes of the city council meeting at which such waiver is granted. Waivers may be granted only when in harmony with the general purpose and intent of this chapter so that the public health, safety and welfare may be secured and substantial justice done. Pecuniary hardship to the sub-divider, standing alone, shall not be deemed to constitute undue hardship.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-98. Penalty and enforcement.

A. Any individual (including any officer, agent or employee acting in behalf of any individual, firm, association or corporation) who shall violate any provision of this chapter within the corporate limits or within the extra territorial jurisdiction of the city, shall be guilty of a misdemeanor and, upon conviction shall be subject to a fine not to exceed \$2,000.00, and each day that such violation continues shall constitute a separate offense. ~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-109. Preliminary platting procedures.

A. Pre-development meeting. A pre-development meeting shall be held between the applicant and city staff prior to submission of a preliminary plat application for the purpose of advising the applicant as to the general restrictions, requirements, and other planning and engineering matters applicable to the plat. If an issue arises during the pre-development meeting that directly concerns a city department not represented, the appropriate city staff will be contacted.

B. Generally.

~~(1) Prior to the filing of a preliminary plat, the developer shall meet with the city staff for a pre-development meeting.~~

(21) ~~After the pre-development meeting,~~ the developer shall file-submit the required number of copies of the preliminary plat of the proposed subdivision with the city for submission to the planning and zoning commission, and include the required filing fees and tax certificates showing all taxes have been paid on the property being platted.

(32) The following notice shall be stamped on the face of each preliminary plat: "Preliminary Plat

~~For information purposes only and is not an official or approved form or document."~~

provided an opportunity to attend a developer/city staff meeting for the purpose of notifying the developer of necessary corrections.

(54) The community development department shall accumulate the comments of the city departments, and conduct a developer/city staff meeting to report the comments and requested corrections to the developer. The developer shall be allowed to make comment or make required corrections and submit the corrected preliminary plat to the community development department for submission to the planning and zoning commission. The corrected preliminary plat shall be submitted within 30 days of the date the original preliminary plat was officially filed and prior to the meeting of the planning and zoning commission at which such preliminary plat is scheduled for consideration. Upon timely receipt, the director of community development shall submit the corrected preliminary plat to the planning and zoning commission.

(65) A written report shall be prepared by city staff and submitted to the planning and zoning commission stating the review comments of the preliminary plat noting any unresolved issues.

(76) Following review of the preliminary plat and other materials submitted in conformity with this chapter, the planning and zoning commission shall act on a preliminary plat, within 30 days after the date the preliminary plat is officially filed. The planning and zoning commission may either:

- (a) Approve the preliminary plat as presented;
- (b) Approve the preliminary plat with conditions; or
- (c) Disapprove the preliminary plat. If disapproved, the planning and zoning commission upon written request, shall state the reasons for disapproval. A conditional approval shall be considered a disapproval until the conditions have been satisfied.

(87) The actions of the planning and zoning commission shall be noted on two copies of the preliminary plat. One copy shall be returned to the developer and the other retained in the files of the ~~community~~ development services department.

~~(9) The planning and zoning commission shall, in its action on the preliminary plat, consider the physical arrangement of the subdivision and determine the adequacy of the street and thoroughfare rights-of-way and alignment and the compliance of the streets and thoroughfares with the major thoroughfare plan, the existing street pattern in the area and with any other applicable provisions of the zoning ordinance and comprehensive plan. The planning and zoning commission, based on city staff recommendations, shall also ascertain that adequate easements for proposed or future utility service and surface drainage are provided, and that the lot sizes and area comply with the zoning ordinance and are adequate to comply with the minimum requirements for the type of sanitary sewage disposal proposed. All on-site sewage disposal systems shall meet the minimum standards required by the City Code of Ordinances and the regulations of Dallas or Collin Counties and of the Texas Commission on Environmental Quality or their successors.~~

~~development department shall forward the preliminary plat to the city council for consideration at the next available city council meeting.~~

~~(11) The city council shall act on the preliminary plat within 30 days after the date the preliminary plat is approved by the planning and zoning commission or is considered approved by the inaction of the planning and zoning commission. A preliminary plat shall be considered approved by the city council unless it is disapproved within that period.~~

~~(128)~~ Approval of a preliminary plat by the planning and zoning commission and/or the city council is not approval of the final plat but is an expression of approval of the layout shown subject to satisfaction of specified conditions. The preliminary plat serves as a guide in the preparation of a final plat.

C. **Standards for approval.** No preliminary plat shall be approved unless the following standards have been met:

- (1) The preliminary plat conforms to the applicable zoning and all other requirements of this chapter and the City Code of Ordinances; and
- (2) A tree management plan has been approved in accordance with the regulations in the City Code of Ordinances.

D. **Data requirement.** All preliminary plat applications shall include the following at the time of submittal:

- (1) ~~An approved~~A preliminary drainage plan and study, including the 100-year floodplain, and any existing or proposed drainage easements affecting the plan;
- (2) Preliminary water extension and layout plan;
- (3) Preliminary sanitary sewer extension and layout plan;
- (4) The number of copies, page sizes and specific data requirements shall be in accordance with application guidelines provided by the ~~community~~ development services department.
- (5) A preliminary plat shall not be determined to be complete if it does not conform to the requirements of this Code. A preliminary plat shall be considered filed on the date the application is considered complete.

E. **Effect of approval.** Approval of a preliminary plat by the planning and zoning commission ~~and or~~ city council constitutes authorization for the property owner to submit engineering plans for review by the city engineer.

F. **Changes or alterations to approved preliminary plat.** No previously approved preliminary plat may be changed or altered, except to bring the plat in conformance with the conditions and requirements stipulated by the planning and zoning commission and or city council. Minor changes as outlined below shall be permitted at the discretion of the director of ~~community~~ development

minor in nature. Changes to street classifications, connections to perimeter streets, or extensions to the subdivision's perimeter to un-subdivided property shall not be considered minor alterations.

(2) A net increase, not to exceed three percent of the total residential lots (rounded to the nearest whole number) in the overall lot yield of the approved preliminary plat may be made, except as elsewhere prohibited by these regulations.

(3) If the director of ~~community~~ development services determines that the proposed changes are minor, a revised preliminary plat may be approved administratively. A revised preliminary plat shall include all property within the boundary of the original preliminary plat. A revision to a preliminary plat shall not affect the expiration date of the plat and shall carry the same expiration as outlined below.

G. Expiration of preliminary plat approval.

(1) The approval of a preliminary plat expires 24 months after the date of ~~city council~~ approval unless a final plat is submitted and has received approval by the planning and zoning commission for the property within such period, or the period is extended by the ~~planning and zoning commission~~ director of development services in accordance with the extension and reinstatement guidelines contained herein.

(2) If the time period is not extended, or a final plat is not submitted and approved by the planning and zoning commission within the 24-month-period, the preliminary plat approval shall be null and void and the owner shall be required to submit a new plat for the property subject to the then existing zoning, subdivision and other regulations.

H. Extension and reinstatement of expired preliminary plat.

(1) ~~Sixty days prior to or following the lapse of approval for a preliminary plat as provided in these regulations, the owner may request the planning and zoning commission to extend or reinstate the approval.~~ Prior to the expiration of preliminary plat approval, the time for filing of the application for the final plat may be extended at the written request of the subdivider. The first filing extension (not to exceed 90 days) may be granted by the director of development services. Any further requests for extension shall be considered by the planning and zoning commission.

(2) In determining whether to grant such request, the planning and zoning commission shall take into account the reasons for lapse, the ability of the owner to comply with any conditions attached to the original approval and the extent to which newly adopted zoning and subdivision regulations shall apply to the preliminary plat. The planning and zoning commission may extend or reinstate the preliminary plat or deny the request, in which instance the owner must submit a new preliminary plat application for approval.

~~(3) The planning and zoning commission may extend or reinstate the approval subject to additional conditions based upon newly enacted regulations such as are necessary to issue~~

~~original preliminary plat approval.~~

I. Waiver of requirement for preliminary plat. A preliminary plat is not required when a minor plat or conveyance plat is submitted in accordance with the requirements of this chapter.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-~~41~~10. Final platting procedures.

A. Generally.

- (1) After approval of the preliminary plat by the planning and zoning commission ~~and the city council~~ and, upon substantial completion of the required public improvements and issuance of a substantial completion letter from the city engineer to the developer or the provision of an improvement agreement as allowed herein, the owner shall submit a final plat for the property for approval.
- (2) The final plat shall conform substantially to the approved preliminary plat and, if desired by the developer, may cover only a phase of the approved preliminary plat; provided, however, such phase conforms to all the requirements of this chapter and the approved preliminary plat indicated the phasing of such development.
- (3) The final plat shall be distributed to the city departments and other agencies for review and comment in the same manner as a preliminary plat.
- (4) The ~~community~~ development services department shall accumulate the comments of the city departments and agencies and conduct a developer/city staff conference to report the comments and requested corrections to the developer. The developer shall make comments or make the required corrections and submit the corrected final plat to the ~~community~~ development services department for submission to the planning and zoning commission. ~~The corrected final plat shall be submitted within 30 days of the date the original final plat was officially filed and prior to the meeting of the planning and zoning commission at which the original final plat is scheduled for consideration.~~
- (5) The final plat shall be submitted to the planning and zoning commission at the next available meeting with any appropriate comments and recommendations by the ~~community~~ development services department. The planning and zoning commission shall act on the final plat within 30 days after the official filing date. If no action is taken by the planning and zoning commission within such period, the final plat shall be deemed approved. A certificate showing the filing date and failure to take action thereon within the 30-day period shall on request be issued by the planning and zoning commission, which shall be sufficient in lieu of a written endorsement of approval. The planning and zoning commission shall be the final approval authority for final plats. The denial of approval of a final plat shall not be appealable to the city council.
- (6) The planning and zoning commission shall consider the final plat, including all proposals by the owner with respect to the dedication of right-of-way for public use the construction of utilities

- (7) The approval of the final plat by the planning and zoning commission shall authorize the planning and zoning commission chairperson to execute the certificate of approval on the final plat.
- (8) The approved final plat shall then be filed of record in the plat records of the appropriate county clerk.
- (9) Final plats disapproved by the planning and zoning commission shall be returned to the developer by the ~~community~~ development services department.
- (10) In the event a final plat is approved by the planning and zoning commission for a subdivision in phases, the final plat of each phase shall carry the same name throughout the entire subdivision, but bear a distinguishing letter, number or subtitle. Lot and block numbers shall run consecutively throughout the entire subdivision, even though such subdivision may be finally approved in phases.

B. **Standards for approval.** No final plat shall be approved unless the following standards have been met:

- (1) The final plat substantially conforms to the preliminary plat;
- (2) The city engineer has issued a substantial completion letter indicating required public improvements have been substantially constructed, and/or an improvement agreement has been approved by the city for the subsequent completion of the public improvements;
- (3) The final plat conforms to the applicable zoning and all other requirements of this chapter;
- (4) Provisions have been made for adequate public facilities under the terms of this chapter; and
- (5) All required fees have been paid.

C. **Data requirement.**

- (1) The subdivider shall submit to the ~~community~~ development services department the necessary copies of the final plat and required supporting data prepared in accordance with the requirements set forth in the application guidelines provided by the ~~community~~ development services department. All documents shall be signed and dated by the applicant or person preparing the plans.
- (2) The final plat shall be prepared and signed by a registered professional land surveyor.
- (3) A final plat shall not be determined to be complete if it does not conform to the requirements of this Code. A final plat shall be considered filed on the date the application is considered complete.

D. **Execution and recordation.**

- (1) When an improvement agreement and security are required, the chairperson of the planning and zoning commission shall endorse approval on the final plat after the improvement agreement and security have been approved by the city attorney and all the conditions pertaining to the final plat have been satisfied. A final plat for which an improvement agreement has been approved shall

"This Subdivision is subject to an Improvement Agreement pursuant to the City of Sachse, Texas Subdivision Ordinance. All or some of the public infrastructure were not constructed and accepted by the City of Sachse, Texas prior to approval of this Final Plat."

(2) When substantial completion of the public improvements is required prior to recordation of the Final Plat, the Chairperson of the Planning and Zoning Commission shall endorse approval on the Final Plat after all conditions of approval have been satisfied and all public improvements are substantially completed as provided for a written substantial completion letter by the City Engineer. There shall be written evidence that the required public improvements have been substantially completed and have been completed in a manner satisfactory to the City as shown by a letter signed by the City Engineer stating that the necessary dedication of public lands and substantial completion of public improvements have been accomplished.

(3) The property owner shall be responsible for filing the final plat with the appropriate county clerk. Simultaneously with the filing of the final plat, the property owner shall record such other agreements of dedication and legal documents as shall be required to be recorded by the planning and zoning commission and the city attorney. The final plat, bearing all required signatures, shall be recorded after final approval and within five working days of its receipt. One copy of the recorded final plat, with street addresses assigned, will be forwarded to the owner by the city staff.

(4) Approval of a final plat shall certify compliance with the regulations of the City of Sachse pertaining to the subdivision. An approved and signed final plat may be filed with the appropriate county clerk as a record of the Subdivision and may be used to reference lots and interests in property thereon defined for the purpose of conveyance and development as allowed by these regulations.

E. Expiration of final plat approval.

(1) If public improvements for a subdivision have not been constructed and accepted by the city and the corresponding final plat for said subdivision has not been filed in the appropriate county plat records within two years after the date of final plat approval by the planning and zoning commission, said final plat shall be null and void and shall conclusively be deemed to be withdrawn without further action by the city. This provision shall not apply to final plats approved by the city prior to the effective date of this section.

~~(2) Final plats approved prior to the effective date of this section shall become null and void and shall be conclusively deemed to be withdrawn without further action by the city on July 3, 2014, if the public improvements for the subdivision have not been constructed and accepted by the city and the corresponding final plat for said subdivision filed in the appropriate county plat records.~~

~~(32) An approved, unexpired final plat may upon written request by the subdivider be extended once by the director of development services for a period not to exceed 90 days. ~~once by~~ The planning and zoning commission upon written request, may extend approval once for a period not~~

- (a) Good cause is shown by the developer; and
- (b) There has been no significant change in development conditions affecting the subdivision; and
- (c) The final plat continues to comply with all applicable, regulations, standards and this chapter.

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3594, sec. 1, adopted 6/2/14)~~

Sec. 8-1211. Vacating plats, replats and amending plats.

A. Vacating plats.

- (1) The owners of the tract covered by a plat may vacate the plat at any time before any lot in the plat is sold. The plat is vacated when a signed, acknowledged instrument declaring the plat vacated is approved and recorded in the manner prescribed for the original plat.
- (2) If lots have been sold, the plat, or any part of the plat may be vacated on the application of all the owners of lots in the plat with approval obtained in the manner prescribed for the original plat.
- (3) The planning and zoning commission and city council shall disapprove any vacating instrument which abridges or destroys public rights in any of the public uses, improvements, streets or alleys.
- (4) Upon approval and recording with the appropriate county clerk, the vacated plat has no effect.

B. Re-platting without vacating preceding plat.

- (1) A re-plat of a subdivision or part of a subdivision may be recorded and is controlled over the preceding plat without vacation of that plat if the replat:
 - (a) Is signed and acknowledged by only the owners of the property being platted;
 - (b) Does not attempt to amend or remove any covenants or restrictions; and
 - (c) Is approved, after a public hearing on the matter, by the planning and zoning commission.
- (2) An application for a replat shall follow the same procedure required for preliminary and final plats.

C. Additional requirements for certain replats.

- (1) In addition to compliance with section 8-11 B., a replat without vacation of the preceding plat must conform to the requirements of this section if:
 - (a) During the preceding five years any of the area to be replatted was limited by an interim or permanent zoning classification to residential use for not more than two residential units per lot; or
 - (b) Any lot in the preceding plat was limited by deed restrictions to residential use for not more than two residential units per lot.
- (2) Notice of the public hearing as required in section 8-11 B. shall be given before the 15th day

- (a) Publication in the official newspaper; and
 - (b) By written notice, with a copy of Texas Local Government Code Section 212.015(c) attached, forwarded to the owners of lots that are in the original subdivision and that are within 200 feet of the lots to be replatted as indicated on the most recently approved city tax rolls of the property upon which the replat is requested.
- (3) If the proposed re-plat requires a waiver and is protested in accordance with this subsection, the proposed re-plat must receive, in order to be approved, the affirmative vote of at least three-fourths of the members present at the meeting of the planning and zoning commission. For a legal protest, written instruments signed by owners of at least 20 percent of the area of the lots or land immediately adjoining the area covered by the proposed re-plat and extending 200 feet from that area, but within the original subdivision, must be filed with the planning and zoning commission prior to the close of the public hearing.
- (4) In computing the percentage of land area under section 8-11 C.(3) above, the area of streets and alleys shall be included.
- (5) Compliance with section 8-11 C.(3) and (4) is not required for approval of a replat of part of a preceding plat if the area to be re-platted was designated or reserved for other than single or duplex family residential use by notation on the last legally recorded plat or in the legally recorded restrictions applicable to the plat.

D. Administrative approval of certain amending plats, minor plats and re-plats.

- (1) The director of ~~community~~ development services is authorized to approve the following:
- (a) Amending plats described by Section 212.016 Texas Local Government Code;
 - (b) Minor plats involving four or fewer lots fronting an existing street and not requiring the creation of any new street or extension of municipal facilities; and
 - (c) A replat under Section 212.0145 Tex. Loc. Gov't Code that does not require the creation of any new street or the extension of municipal facilities.
- (2) The director of ~~community~~ development services may for any reason elect to present an amending plat, minor plat or re-plat meeting the requirements of section 8-11 D.(1) above to the planning and zoning commission for approval.
- (3) Any amending plat, minor plat or re-plat meeting the requirements of this section which the director of ~~community~~ development services fails or refuses to approve shall be submitted to the planning and zoning commission for approval.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-4312. Conveyance plats.

- A. Generally. A conveyance plat is a boundary survey drawn as a plat. Easements, dedications and reservations may be recorded on a conveyance plat. Engineering plans are not required to

property. Development fees are not collected at the time of conveyance plat approval.

B. **Purpose.** The purpose of a conveyance plat is to subdivide land and to provide for recordation of same, for the purpose of conveying (i.e., selling) the property without developing it. A conveyance plat may be used to convey the property or interests therein; however, a conveyance plat does not constitute approval for any type of development on the property. A Conveyance Plat is an interim step in the subdivision and development of land.

C. **Applicability.** A conveyance plat may be used in lieu of a final plat to record the subdivision of property in the following instances:

(1) To record the remainder of a parent tract that is larger than five acres, and that is created by the record platting of a portion of the parent tract, provided that the remainder is not intended for immediate development; or

(2) To record the subdivision of a property into parcels, five acres or smaller in area, that are not intended for immediate development, provided that each parcel has direct access to all required public improvements (water, sanitary sewer, storm sewer) via dedicated easements or direct adjacency to existing infrastructure, each parcel has frontage on an existing public right-of-way, and each parcel has frontage on an existing public right-of-way, and the proposed lot meets the minimum lot dimension requirements as stipulated in this Code.

D. **Certification.** The conveyance plat shall contain a certification note on the plat face, as follows:

“This Conveyance Plat shall not convey any rights to Development or guarantee of public utilities, public or private access, or issuance of addressing and permits, without compliance with all Subdivision rules and regulations and the approval and recording of a Final Plat. A Conveyance Plat is filed for record in the appropriate County Clerk office upon administrative approval by the Director of Community Development.”

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-1413. Public sites and open spaces.

A. **Location of public sites.** The sub-divider shall give consideration to suitable sites for schools, parks, playgrounds and other areas for public use so as to conform with the recommendations of the city council. Any provision for schools, parks, etc. shall be indicated on the preliminary plat.

B. **Development adjacent to public sites.** In cases where a subdivision contains or abuts a school, park or playground, the subdivider shall dedicate one-half plus five feet of a normal street but not less than 30 feet, and provide for one-half the cost of paving and the full cost of all the utilities necessary. The interested agency shall provide the necessary right-of-way for the remainder of the street.

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-1514. Completion and maintenance of public improvements.

A. Construction plan procedure

supervision of a professional engineer or architect registered in the State of Texas as required by state law governing such professions. Plans submitted for review by the city shall be dated and bear the responsible engineer's or architect's name, serial number and the designation of "engineer," "professional engineer" or "P.E." or "architect" and an appropriate stamp or statement near the engineer's or architect's identification, stating that the documents are for preliminary review and are not intended for construction. Final plans acceptable to the city shall bear the seal and signature of the engineer or architect and the date signed on all sheets of the plans. Public works construction in streets, alleys or easements which will be maintained by the city shall be designed by a professional engineer registered in the State of Texas.

(2) **Construction plan review procedure.** Copies of the construction plans, including a copy of the approved preliminary plat and payment for the construction plan review fee shall be submitted to the city engineer for final approval. The plans shall contain all necessary information for construction of the project, including screening walls and other special features. The design of all public improvements shall be in accordance with the engineering design manual. ~~All materials specified shall conform to the standard specifications and standard construction details of the city.~~ Each sheet of the plans shall contain a title block including space for the notation of revisions. This space is to be completed with each revision to the plan sheet and shall clearly note the nature of the revision and the date the revision was made. The city engineer will release the plans for construction, after payment of all inspection fees and a pre-construction conference is held. Upon such release, each contractor shall maintain one set of plans stamped with city release at the project site at all times during construction.

(3) **Failure to commence construction.** If commencement of construction has not occurred within one year after approval of the plans, resubmittal of plans may be required by the City engineer for meeting current standards and engineering requirements. For purposes of this section "Commencement of Construction" shall mean:

- (a) Issuance of construction permit(s); and
- (b) Grading of the land.

B. Improvement agreements.

(1) **Substantial completion of improvements.** Except as provided below, before the final plat is approved by the planning and zoning commission or the director of ~~community~~ development services, all applicants shall be required to make substantially complete, in accordance with the city's direction and to the satisfaction of the city engineer, all street, sanitary and other public improvements, including lot improvements on the individual residential lots of the subdivision as required in these regulations and specified in the final plat, and to dedicate those public improvements to the city. As used in this section, "lot improvements" refers to grading and installation of improvements required for proper drainage and prevention of soil erosion.

commission, may waive the requirement that the applicant complete and dedicate all public improvements prior to approval of the final plat, and may permit the owner to enter into an improvement agreement by which the owner covenants to complete all required public improvements no later than two years following the date on which the final plat is signed. The city council may also require the owner to complete and dedicate some required public improvements prior to approval of the final plat and to enter into an improvement agreement for completion of the remainder of the required improvements during such two-year period. The improvement agreement shall contain such other terms and conditions as are agreed to by the owner and the city.

(3) **Improvement agreement required for oversize reimbursement.** The city shall require an improvement agreement pertaining to any public improvement for which the developer shall request reimbursement from the city for oversize costs.

(4) **Security.** The improvement agreement shall require the owner to provide sufficient security covering the completion of the public improvements. The security shall be in the form of cash escrow or, where authorized by the city, a letter of credit or other security acceptable to the city attorney. Security shall be in an amount equal to 100 percent of the city's estimated cost of completion of the required public improvements and lot improvements. In addition to all other security, for completion of those public improvements where the city participates in the cost, the owner shall provide a performance bond from the contractor, with the city as a co-obligee. The issuer of any surety bond and letter of credit shall be subject to the approval of the city attorney.

(5) **Letter of credit.** If the planning and zoning commission authorizes the owner to post a letter of credit as security for its promises contained in the improvement agreement, the letter of credit shall:

- (a) Be irrevocable;
- (b) Be for a term sufficient to cover the completion, maintenance and warranty periods but in no event less than two years; and
- (c) Require only that the city present the issuer with a sight draft and a certificate signed by an authorized representative of the city certifying to the city's right to draw funds under the letter of credit.

(6) **Letter of credit reductions.** As portions of the public improvements are completed, the developer may make application to the city engineer to reduce the amount of the original letter of credit.

- (a) The city engineer, if satisfied that such portion of the improvements has been completed in accordance with city construction standards, may cause the amount of the letter of credit to be reduced by such amount deemed appropriate, so that the remaining amount of the letter of credit adequately insures the completion of the remaining public improvements.

the owner is not in breach of the improvement agreement. The remaining security shall be security for the owner's covenant to maintain the required public improvements and the warrant that the improvements are free from defect for two years thereafter.

(7) **Temporary improvements.** The owner shall build and pay for all costs of temporary improvements required by the planning and zoning commission and shall maintain those temporary improvements for the period specified by the planning and zoning commission. Prior to construction of any temporary improvement, the owner shall file with the city a separate improvement agreement and escrow, or where authorized, a letter of credit, in an appropriate amount for such temporary improvements, which improvement agreement and escrow or letter of credit shall ensure that the temporary improvements will be properly constructed, maintained, and removed.

(8) **Units of government.** Governmental units may file, in lieu of the contract and security, a certified resolution or ordinance agreeing to comply with the provisions of this section.

(9) **Failure to complete improvements.** For plats for which no improvement agreement has been executed and no security has been posted, if the public improvements are not completed within the period specified by the city, the preliminary plat approval shall be deemed to have expired. In those cases where an improvement agreement has been executed and security has been posted and required public improvements have not been installed within the terms of the agreement, the city may:

- (a) Declare the agreement to be in default and require that all the public improvements be installed regardless of the extent of completion of the development at the time the improvement agreement is declared to be in default;
- (b) Suspend final plat approval until the public improvements are completed and record a document to that effect for the purpose of public notice;
- (c) Obtain funds under the security and complete or cause the public improvements to be completed;
- (d) Assign its right to receive funds under the security to any third party, including a subsequent owner of the subdivision for which public improvements were not constructed, in whole or in part, in exchange for that subsequent owner's promise to complete the public improvements in the subdivision; and
- (e) Exercise any other rights available under the law.

(10) **Acceptance of dedication offers.** Acceptance of formal offers of dedication of street, public areas, easements, and parks shall be by authorization of the city engineer. The approval by the planning and zoning commission of a plat, whether preliminary or final, shall not in and of itself be deemed to constitute or imply the acceptance by the city of any street, easement, or park shown on plat. The planning and zoning commission may require the plat to be endorsed with appropriate

improvements for a period of two years following the acceptance by the city and shall provide a warranty that all public improvements shall be free from defect for a period of two years following such acceptance by the city.

C. Construction procedures.

(1) Permit required. A permit is required from the city prior to commencement of any subdivision development work in the city which affects erosion control, vegetation or tree removal or a floodplain.

(2) Preconstruction conference. The city engineer may require that all contractors participating in the construction meet for a preconstruction conference to discuss the project prior to release of a permit.

(3) Conditions prior to authorization. Prior to authorizing release of a construction permit, the city engineer shall be satisfied that the following conditions have been met:

- (a) The preliminary plat shall be approved by the planning and zoning commission;
- (b) All required contract documents shall be completed and filed with the city engineer;
- (c) All necessary off-site easements or dedications required for city infrastructure and not shown on the final plat must be conveyed solely to the city, with proper signatures affixed. The original of the documents shall be returned to the engineering department prior to approval and release of the engineering plans and issuance of a permit;
- (d) All contractors participating in the construction shall be provided, at the developer's cost, with a set of approved plans bearing the stamp of release of the engineering department. One set of these plans shall remain on the job site at all times;
- (e) A complete list of the contractors, their representatives on the site, and telephone numbers where a responsible party may be reached at all times must be submitted to the City Engineer at least 24 hours prior to the preconstruction meeting; and
- (f) All applicable fees must be paid to the city.

D. Inspection of public improvements.

(1) General procedure. Construction inspection shall be supervised by the city engineer. Construction shall be in accordance with the approved plans and the engineering design manual, ~~the standard specifications, and the standard construction details~~ of the city. Any change in design required during construction should be made by the engineer whose seal and signature are shown on the plans. Another engineer may make revisions to the original engineering plans if so authorized by the owner of the plans and if those revisions are noted on the plans or documents, provided such revisions are permitted by the Texas Engineering Practice Act. All revisions shall be approved by the city engineer. If the city engineer's inspection finds that any of the required public improvements have not been constructed in accordance with the city's standard construction

completing and/or correcting the public improvements.

(2) **Certificate of satisfactory completion.** The city will not accept dedication of required public improvements until the applicant's engineer or surveyor has certified to the city engineer, through submission of record drawings, indicating location, dimensions, materials, and other information required by the planning and zoning commission or city engineer that all required public improvements have been completed. The record drawings shall also include a complete set of drawings of the paving, drainage, water, sanitary sewer or other public improvements, showing that the layout of the line and grade of all public improvements is in accordance with construction plans for the plat, and all changes made in the plans during construction and containing on each sheet a record drawing stamp bearing the signature of the engineer and the date. The engineer or surveyor shall also furnish a paper copy of the final plat and engineering plans along with digital copies of the plans in Portable Document Format ("PDF") and Computer Assisted Design Drawings ("CADD"), in such a format that is compatible with the city's CADD system. The developer shall provide a maintenance bond executed by a corporate surety duly authorized to do business in the State of Texas, payable to the city and approved by the city as to form, to guarantee the maintenance of the construction for a period of two years after its completion and acceptance by the city. In lieu of a maintenance bond the developer may submit either an irrevocable letter of credit payable to the city and approved by the city as to form, or a cash bond payable to the city and approved as to form. The amount of the maintenance bond, letter of credit or cash bond shall be at least ten percent of the full cost of the infrastructure in the subdivision, as determined by the construction costs. When such requirements have been met the city engineer shall thereafter accept the public improvements.

(3) Acceptance of the development shall mean that the developer has transferred all rights to all the public improvements to the city for use and maintenance.

(4) Upon acceptance of the required public improvements, the city engineer shall submit a certificate to the developer stating that all required public improvements have been satisfactorily completed.

E. **Deferral of required improvements.**

(1) The planning and zoning commission may upon petition of the owner defer at the time of final approval, subject to appropriate conditions, the provision of any or all public improvements are not required in the interests of the public health, safety and general welfare.

(2) Whenever a petition to defer the construction of any public improvement required under these regulations is granted by the planning and zoning commission, the owner shall deposit in escrow the developer's share of the costs of the future public improvements with the city prior to approval of the final plat, or the owner may execute a separate improvement agreement secured by a cash escrow or, where authorized, a letter of credit guaranteeing completion of the deferred

F. Issuance of building permits and certificates of occupancy. No building permit shall be issued for a lot or building site unless the lot or site has been officially recorded by a final plat approved by the City of Sachse, and all public improvements as required for Final Plat approval have been completed, except as permitted below:

(1) Building permits may be issued for nonresidential and multi-family (apartments) development provided that a preliminary plat is approved by the city and civil construction plans have been released by the city engineer. Building construction will not be allowed to surpass the construction of fire protection improvements.

(2) The city engineer may authorize residential building permits for a portion of a subdivision, provided that a preliminary plat has been approved and all public improvements have been completed for that portion of the development, including but not limited to those required for fire and emergency protection. Notwithstanding, no lot may be sold or title conveyed until a final plat approved by the city has been recorded.

(3) No certificate of occupancy shall be issued for a building or the use of property unless all subdivision improvements have been completed and a final plat approved by the city has been recorded. Notwithstanding the above, the city building official may authorize the occupancy of a structure provided that an agreement providing cash escrow, a letter of credit, or other sufficient surety is approved by the city for the completion of all remaining public improvements.

G. Utility connections. Utility connections for individual lots are not authorized until a final plat has been approved in accordance with this chapter.

H. Withholding improvements.

(1) The city hereby defines its policy to be that the city will withhold all city improvements of whatsoever nature, including the maintenance of streets and the furnishing of sewage facilities and water service from all additions which have not been constructed and approved in accordance with this chapter.

(2) The City of Sachse may withhold the issuing of a street number or building permit for the erection of any building in the City of Sachse on a newly subdivided parcel of land until all the requirements of these subdivision regulations have been complied with, including installation of and acceptance by the city of all water works, sewage and paving improvements for the area designated.

I. As-built plans.

(1) The developer or his engineer shall present the city with one reproducible (sepia) and three blue line or black line complete "AS BUILT" sets of plans for all paving, drainage structures, water mains and sewer mains within 60 days after completion of each contract and before final acceptance of the new developments.

A. Streets:Improvements

The improvements referenced herein must be constructed per the engineering design manual and accepted by the city engineer prior to filing an associated plat for record with the county clerk, unless otherwise specified in an approved improvement agreement.

~~(1) The arrangement, character, extent, width, grade, and location of all streets shall conform to the City of Sachse thoroughfare plan when available, shall conform to the standard specifications and standard construction details of the City of Sachse, and shall be considered in their relation to existing and planned streets, to topographical conditions, to public safety and in their appropriate relation to the proposed uses of the land to be served by such streets.~~

~~(2) When such street is not on the master thoroughfare plan, when available, the arrangement of streets in a subdivision shall either:~~

~~(a) Provide for the continuation or appropriate projection of existing streets in surrounding areas; or~~

~~(b) Conform to a plan for the neighborhood approved or adopted by the council to meet a particular situation where topographical or other conditions make continuance or conformity to existing streets impracticable:~~

~~(3) Minor streets shall be so laid out that their use by through traffic will be discouraged.~~

~~(4) Where a subdivision abuts or contains an existing or proposed arterial street, the council may require marginal access streets, reverse frontage, deep lots with rear service alleys, or such treatment as may be necessary for adequate protection to residential properties and to afford separation of through and local traffic:~~

~~(5) Reserve strips controlling access to streets shall be prohibited except where their control is definitely placed in the city under conditions approved by the council.~~

~~(6) Street center line offsets of less than 150 feet shall be avoided, unless approved by the city engineer:~~

~~(7) Arterial street intersections shall be at least 90° angles. Other street intersections shall be laid out so as to intersect as nearly as possible at right angles, and no street shall intersect at less than 75°.~~

~~(8) Sight distance triangles will be required where driveways intersect streets to allow sufficient drive sight distance for proper decision making on entering or crossing the roadway. No landscaping, grading, signs or screening shall be permitted in the sight distance triangle from two and one-half feet to eight feet in height, measured from the top of the adjacent curb. Minimum dimensions of sight distance triangles shall be in accordance with the tables and figures below:~~

TABLE 1 SIGHT DISTANCES

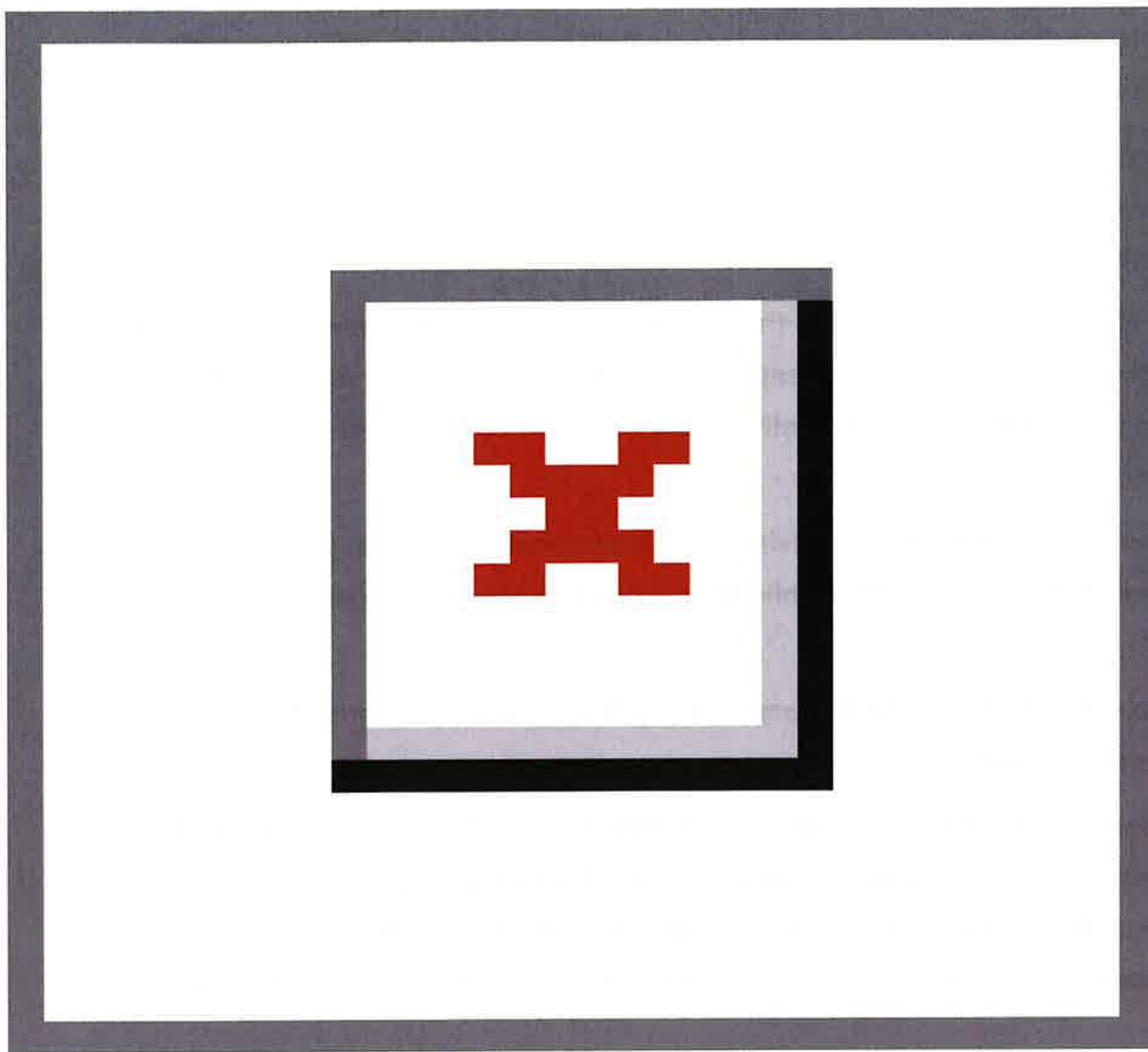
(SEE FIGURE 1)

SPEED	DISTANCE FEET	WIDTH						
			NEAR SIDE	FAR SIDE	MINIMUM	DESIRABLE	MINIMUM	DESIRABLE
25	150	26'	200	260	150	220	150	260
30	200	26'	200	260	200	260	200	300
35	240	36'	250	275	200	275	220	310
40	275	44'	300	350	275	350	305	425
45	315	2-33'	375	450	320	450	450	580

FOR DISTANCE ADJUSTMENTS DUE TO GRADE OR STREET USE TABLE 2

TABLE 2 SIGHT DISTANCE ADJUSTMENTS DUE TO GRADE

DESIGN SPEED	UPGRADES (DECREASE)			DOWNGRADES (INCREASE)		
	3	6	10	3	6	10
25	5	10	15	5	15	25
30	10	15	20	10	20	30
35	15	20	-	15	25	-
40	20	25	-	20	35	-
45	25	30	-	25	50	-



~~(9) — Street right-of-way widths shall be as shown on the master thoroughfare plan, when available, and where not shown therein shall be not less than as follows:~~

~~(a) — Principal and minor arterials: Minimum 90 feet; maximum 140 feet, depending upon the location and the city street plan with which the major thoroughfare is to be connected, unless otherwise authorized by the city engineer.~~

~~(b) — Collector streets: 60 feet (min.).~~

~~(c) — Local streets in residential areas: 50 feet.~~

~~(d) — Access or service road: 40 feet.~~

~~(e) — Local streets in apartment, commercial or industrial areas: 60 feet~~

~~(10) — Local residential streets shall be paved 31 feet wide from back of curb to back of curb. Local streets in apartment, commercial, and industrial areas, and collector streets shall be paved 37 feet wide from back of curb to back of curb.~~

~~(11) — Half streets shall be prohibited, except when essential to the reasonable development of the subdivision in conforming with the other requirements of these regulations, and where the council finds it will be practical to require the dedication of the other one-half when the adjoining property~~

~~line and the ultimate planned width is 60 feet, the first dedication will be 35 feet; where the ultimate planned width is 70 feet, the first dedication will be 40 feet.~~

~~(12) A cul-de-sac shall not be longer than 600 feet and at the closed end shall have a turn-around provided for, having an outside roadway diameter of at least 80 feet and a street property line diameter of at least 100 feet.~~

~~(13) New streets of like alignment shall bear the names of existing streets and shall be dedicated at equal or greater widths than the existing streets. No street names shall be used which will duplicate or be confused with the names of existing streets. Street names shall be subject to the approval of the council.~~

~~(14) All new streets dedicated within a subdivision shall be constructed in accordance with Standard Specifications of the NCTCOG for Public Works and the Standard Construction Details of the City of Sachse.~~

~~(15) Where traffic conditions require, traffic engineering studies may be required by the council from the developer to provide technical data.~~

~~(16) Within the corporate limits of the City of Sachse, street signs shall be furnished and installed by the subdivider at each intersection and shall be of a type approved by the City of Sachse and shall be installed in accordance with the standards of the City of Sachse. In subdivisions lying beyond the corporate limits of the said city, the same requirements shall apply.~~

B. Utilities.

(1) The sanitary sewers, storm sewers, water mains, street improvements, with all appurtenances pertaining to the above and facilities of other agencies as may be required, shall be constructed and installed in each new subdivision in accordance with the ~~standard specifications and standard construction details~~ engineering design manual of the City of Sachse.

(2) Water.

(a) All subdivisions shall be provided with an approved water system designed and constructed in accordance with the master plan when available and in accordance with the ~~standard specifications and standard construction details~~ engineering design manual of the City of Sachse. In the corporate limits of the City of Sachse all subdivisions shall be connected with the City of Sachse water supply distribution system.

(3) Sewer improvements.

(a) Sanitary sewer facilities shall be provided per the engineering design manual to adequately service the subdivision and conform to the city wastewater master plan. All subdivisions shall be provided with an approved sewage disposal system and where the subdivision is inside the city limits of the City of Sachse, shall be connected to the City of Sachse Sanitary Sewer System.

~~(b) The developer shall furnish and install the complete sewage system, including the main~~

~~The sewage system shall be designed and constructed in accordance with the master plan when available and in accordance with the standard specifications and standard construction details of the City of Sachse.~~

~~(c) In locations where sanitary sewers are not available and where there is no immediate prospect for installation of sanitary sewers, then septic tanks of approved type may be installed in conformity with the rules, regulations and ordinances of the City of Sachse pertaining to public health, provided however that in no case shall septic tanks be installed without the express approval and inspection of the City of Sachse.~~

(4) All public or privately owned underground utilities shall stub out all services from mains in all directions to the property lines in streets; and in alleys the services shall be stubbed out 18 inches inside the rear property line of platted lots and to the property line of unplatted property prior to commencing paving operations.

(5) Electric utilities to be underground.

(a) No subdivision plat or site plan filed with or submitted to the city shall be approved unless such plan or plat requires all electric utility lateral and service lines to be constructed underground. In special or unique circumstances or to avoid undue hardship, the city council may authorize variances and exceptions from this requirement and permit the construction and maintenance of overhead electric utility lateral or service lines and may approve any plat with such approved variances or exceptions. It is the intent of this section that no overhead electric utility lateral or service lines be constructed without a variance or exception having been obtained for the subdivision plat or site plan.

(b) That all wires and lines providing other utility services, and electric lines serving street lights, shall be placed underground in all subdivisions and on all sites where the final subdivision plat or site plan approved by the city requires electric utility lateral and service lines to be placed underground. Utility support equipment, such as transformers, amplifiers, switching devices, etc., necessary for or used in connection with underground installations shall be deemed to be placed underground if actually constructed underground or if pad-mounted on the surface.

(c) Anything in this ordinance to the contrary notwithstanding, temporary construction service may be provided by overhead electric lines and facilities without obtaining a variance or exception.

(d) That nothing herein set forth shall prohibit or restrict any utility company from recovering the difference between the cost of overhead facilities and underground facilities. Each utility whose facilities are subject to the provisions of this ordinance shall develop policies and cost reimbursement procedures with respect to the installation and extension of underground service.

(e) As used in this chapter the terms "Utility service[s]", "feeder lines", "lateral lines", and "service lines" shall have the following meanings:

not normally or already required to be placed underground and are within the present or future city limits of the City of Sachse, Texas.

(ii) "Feeder lines" shall mean those high voltage supply electric lines that emanate from substations used to distribute power throughout an area.

(iii) "Lateral lines" shall mean those electric lines used to distribute power from a feeder line to an end user. These electric lines are normally connected to a feeder line through a sectionalizing device such as a fuse.

(iv) "Service lines" shall mean those electric lines used to connect between the utilities' supply system and the end user's service entrance.

C. Drainage.

(1) An adequate storm sewer system consisting of inlets, pipes and other underground drainage structures with approved outlets shall ~~, at a minimum,~~ be designed and constructed to the standards of the city's engineering design manual ~~standard specifications and standard construction details of the City of Sachse,~~ where runoff of storm water and the prevention of erosion cannot be accomplished satisfactorily by surface drainage facilities. Areas subject to flood conditions as established by the city will not be considered for development until adequate drainage has been provided. Storm drainage facilities shall be designed in accordance with the engineering design manual.

(2) No individual, partnership, firm or corporation shall deepen, widen, fill, re-route or change the course or location of any existing ditch, channel, stream or drainage way, without first obtaining written permission of the City of Sachse or other agency having jurisdiction.

~~(3) Stormwater detention facilities shall be constructed as required by the City of Sachse Code of Ordinances.~~

D. Streets and Alleys.

(1) ~~Alleys shall be provided in commercial and industrial districts, except that the commission may waive this requirement where other definite and assured provision is made for service access, such as off-street loading, unloading and parking consistent with and adequate for the use proposed. Service alleys in commercial and industrial districts shall be a minimum 25 feet in right-of-way width.~~ The planning, design, construction and standards of all streets, alleys, right-of-way improvements and any other related roadway improvements by an person, firm, public utility, corporation, or business in the city shall conform to the requirements of the engineering design manual, as it may now exist or may hereafter be amended.

(2) ~~In residential districts, alleys may be provided parallel, or approximately parallel, to the frontage of the street. Alleys in residential districts, where provided, shall be a minimum of 15 feet in right-of-way width, and paved ten feet in width.~~ The engineering design manual shall be utilized

subdivision.

~~(3) — Alleys may be provided in all new developments and replatting of old additions, as desired by the developer because of drainage or topographical features or existing conditions which may require the use of an alley in a particular location:~~

~~(4) — Alleys, where provided, shall be paved in accordance with the standard construction details of the City of Sachse:~~

~~(5) — Where the deflection of alley alignment exceeds 30° , a cutback of a minimum 15 feet or of such greater distance to provide safe vehicular movement shall be established on the inside property line and the paving of the alley shall be cut back in the same manner as shown in the city standard construction details:~~

~~(6) — Dead-end alleys shall be avoided where possible, but, if unavoidable, shall be provided with adequate turn-around facilities at the dead end as determined by the council:~~

~~(7) — Access to residential property may be permitted from the alley. Access from the alley shall not exclude another means of access from the front or side. No alley lot access to residential property shall be allowed from any arterial street, unless expressly waived by the council upon approval by the city engineer:~~

E. Easements.

(1) Easements across lots or centered on rear or side lot lines shall be provided for utilities where necessary and shall be of such widths as may be reasonably necessary for the utility or utilities using same, with minimum width of 15 feet. Any easements so established shall be maintained by the property owner.

(2) Where a subdivision is traversed by a water course, drainage way, channel or street, there shall be provided a storm easement or drainage right-of-way conforming substantially with such course and of such additional width as may be designated by the city administrative official that will be reasonably adequate for the purpose. Parallel streets or parkways may be required in connection with this. The drainage shall be designed to eliminate erosion of adjoining property and to facilitate routine maintenance.

(3) All easements may be included in the computation of lot sizes, with the exception of drainage easements, which will be in addition to the specified lot size.

(4) Where adequate access for firefighting purposes may not otherwise be provided, easements for fire lanes shall be required. Fire lane easements shall be maintained by the property owner, shall be marked as such on the ground, and shall be kept free and clear at all times.

F. Blocks.

(1) The length, width and shapes of blocks shall be determined with due regard to:

- (b) Zoning requirements as to lot sizes and dimensions.
- (c) Needs for convenient access, circulation, control and safety of street traffic.
- (2) In general intersecting streets, determining the blocks, lengths and widths shall be provided at such intervals as to serve cross traffic adequately, and to meet exiting streets or customary subdivision practices. Block length and block perimeter shall meet the minimum requirements of the established zoning district. Where no existing subdivision controls and no block length or block perimeter is established for the zoning district, blocks shall not be less than 500 feet in length and the block lengths should not exceed 1,000 feet, with a maximum of 1,200 feet in length. ~~Where no existing subdivision controls, the blocks shall not be less than 500 feet in length; h~~ However, in cases where physical barriers or property ownership creates conditions where it is appropriate that these standards be varied, the length may be increased or decreased to meet the existing conditions having due regard for connecting streets, circulation of traffic and public safety.
- (3) Where blocks in the vicinity of a school, park or shopping center are platted 1,000 feet or longer the council may require a walkway near the middle of the block or at a street that terminates between the streets at the ends of the block. The walkway shall not be less than four feet or more than eight feet in width, shall have a four foot concrete walk through the block from sidewalk to sidewalk, or the rear property line.
- (4) Where no existing subdivision controls, the block depth shall be platted to give lots with a depth to width ratio of generally not more than two and one-half to one and in no case more than four to one, and the platting shall be such that the block depth generally shall not exceed 350 feet nor be less than 215 feet. When possible, the block depth and length shall be such to allow two tiers of lots back to back to an alley.
- (5) Pedestrian walks not less than four feet wide shall be provided around the perimeter of all blocks. If the pedestrian walks are part of the current master hike and bike trail plan, a walkway not less than eight feet wide shall be provided.

G. Lots.

- (1) Lots shall conform to the minimum requirements of the established zoning district.
- (2) Each lot shall be provided with adequate access to an existing or proposed street by frontage on such street, or as provided for by an approved plat reflecting a series of mutual access easements connecting lots with no street frontage to a public street. ~~abut on a public street.~~
 - (a) For all single-family and two-family (duplex) lots the following shall also apply:
 - (i) Lots shall abut a public street. On a case-by-case basis, residential lots located within the PGBT Zoning District may be permitted to front onto a park, open space or common area provided that provisions are in place for fire accessibility and parking.
 - (ii) Lots within the R-E single-family dwelling district may be served by private drives as permitted

(3) Where corner lots are key lots, that is where lots face the frontage street and also other lots face the side street, the corner lot shall have a front building line on both streets, unless said key lot is separated from other lots by a dedicated street or alley.

(4) Key lots or irregular shaped lots shall have sufficient width at the building line to meet frontage requirements of the appropriate zoning district. Also, the rear width shall be sufficient to provide access for all utilities including garbage collection, but not less than ten feet.

(5) Except for lots located within the PGBT Zoning District, No no lot shall be platted less than 100 feet in depth except in cases where an irregular shaped tract is platted into lots and remnant piece of property is of sufficient area to plat one or more lots, the council may waive the depth requirement to prevent a hardship on the developer. Single-family detached residential lots located within the PGBT Zoning District may not be less than 90' in depth and townhome lots shall not be less than 80' in depth.

(6) Side lot lines shall be substantially at right angles or radial to street lines.

(7) Double frontage and reverse frontage lots should be avoided except where essential to provide separation of residential development from traffic arteries or to overcome specific disadvantage of topography and orientation. Where lots have double frontage, a front building line shall be established for each street.

~~(8) It shall be lawful to increase the size of lots from that originally platted, provided, however, that there is no remaining portion of a lot, or lots, smaller than the original lot and provided further that final plat is submitted in accordance with the requirements of a final plat as contained hereinabove; provided that chapter 212 of Local Government Code is complied with.~~

(9) In areas where city sewer is not immediately available, a lot shall be platted of such area as to meet the minimum requirements of Dallas and/or Collin Counties and the guide lines of the Texas State Department of Health pertaining to septic tank construction and operation.

~~(10) No lot shall be replatted to reduce the size of the lots originally platted by a common dedicatior, unless the consent of at least 66 2/3 percent of the property owners in the same subdivision has been obtained. Such required consent may be implied where another lot or lots in the subdivision as recorded have already been subdivided and built upon in the manner prescribed above. No lot will be reduced in width below a 60-foot frontage with an area of 7,200 square feet, except for property having a local retail, commercial or manufacturing zoning classification and not for residential use.~~

(11) When an applicant exhibits a duly executed and recorded deed covering a lot having dimensions of 50 feet by 120 feet or more has been sold by metes and bounds prior to passage of this chapter and such lot is being assessed for city taxes and conforms to the established lot pattern and zoning classification in the block where located, then a building permit may be issued provided the requested use of such property conforms to the permanent zoning of the property.

~~(12) Subdivision plats for housing projects, apartment areas, shopping centers and industrial districts will be required. Site plans shall be filed with the City of Sachse for approval by the council.~~

(13) All lots developed under this chapter shall be shaped, graded, and finished by the developer to a finished grade elevation conforming with the lot grading plan and/or standard building code requirements providing for positive drainage and access.

H. **Building lines.** ~~The building line is a line beyond which buildings must be set back from a street right-of-way line or property line. Building lines shall be determined by the appropriate zoning classification. along all streets shall be shown on the final plat on all lots intended for business and residential use and shall provide the minimum set-back as required by the zoning ordinance.~~

~~H.~~ **Monuments.** In all subdivisions and additions corners shall be established at the corner of each block in the subdivision consisting of an iron rod or pipe not less than three-quarter inch in diameter and 24 inches deep flush with the top of the sidewalk. Lot corner monuments shall be placed at all lot corners except corners which are also block corners, consisting of iron rods or pipes of a diameter of not less than one-half inch and 18 inches deep set flush with the top of the sidewalk.

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3594, sec. 1, adopted 6/2/14)~~

Sec. 8-~~1716~~. Water and sewer main extensions.

A. **Definitions.** The following terms shall have the meanings herein ascribed:

Consumer. The actual user of water from a city water connection.

Property owner. The record title holder of premises served with water from a connection by the city.

Pro rata. A charge made against the consumer or property owner to pay for installation of water and sanitary sewer mains as provided in this section.

Standard size water main. A water main eight inches or greater in diameter. No water main less than six inches shall be constructed unless approved by the city engineer.

Substandard size water main. A water main less than eight inches in diameter, unless approved by the city engineer.

B. **Pro rata charges.**

(1) **Existing main exempt.** All existing subdivisions which have existing internal water mains four inches in diameter and larger, and all customers connected to the Sachse water system at the time of passage of this section, shall be exempt from the water portion of the pro rata charges specified in this section. In unsubdivided areas with an existing water connection, the area to be exempt from the water pro rata portion of this section shall be actual frontage, or 150 feet, whichever is less.

(2) **Existing mains adjacent to property other than subdivisions.**

(a) Where an area, lot or tract of land abuts any existing water or sanitary sewer main, and when said water or sanitary sewer main spans the complete frontage of the area, lot or tract of land, then the following charges, known as "Pro Rata" shall be made against the owner of the area, lot or tract

- (i) Two dollars and fifty cents per front foot for the area, lot or tract of land seeking a connection to an existing water main.
- (ii) One dollar and fifty cents per front foot for the area, lot or tract of land seeking a connection to an existing sanitary sewer.
- (iii) Three dollars per foot front footage for the area, lot or tract of land seeking a connection to new construction of water main with a 250-foot maximum.
- (iv) Three dollars per foot front footage for the area, lot or tract of land seeking a connection to a new construction of the sanitary sewer with a 250-foot maximum.
- (b) All single-family residential lots, area or tracts of land located at a standard right angle street intersection shall only be charged a pro rata on the shortest street frontage, regardless of the locations of the water main or sanitary sewer.
- (c) Where lots or tracts are intended to be used for apartments, business, commercial or industrial purposes or have a depth greater than 150 feet from the street line, then the pro rata herein provided shall be paid on the frontage for all streets which the property may abut minus 150 feet frontage for each corner of the property abutting a street intersection. Should said property be re-subdivided, whereby water or sewer main extensions are required to serve the same, the terms of this section shall apply and additional pro rata charges shall be made based on such additional street frontage.
- (d) On lots, areas or tracts of land which extend through from one street to another, with frontage on both streets, and when the average distance of the property lines connecting the street lines is 255 feet or more, than a pro rata shall be charged on both frontages when the owner seeks a connection to an existing water main or sanitary sewer.
- (e) Where lots, areas or tracts of land are irregular in size or shape, then the pro rata charges shall be based upon the equivalent rectangular lots or tracts using one front foot for each 120 square feet of area, or the pro rata charges provided by this section on the average frontage of such tracts, whichever is least.

C. Main extensions for individual property owners.

(1) Single-family residential.

- (a) Upon request of the owner, or his agent, also referred to in this section as the applicant of a given lot or tract of land, the city shall extend, lay or construct all necessary water mains and sanitary sewers and their appurtenances, a maximum distance of 100 feet, plus the distance across the frontage necessary to provide the service for which the application is made, providing the necessary funds are available. The property owner to be served shall be required to pay the charges provided for in subsection B.(2)(a), at such time as their property is connected to such mains. Where an applicant for service secures an extension and service under this particular option for

figured in such manner as to leave out of the calculations that portion of any main adjacent to property already having other than a temporary water service and for which the pro rata charges thereon have been paid, credited or exempt under the terms of this section.

(b) In the event that the property seeking a water or sewer connection is outside the limits of the 100-foot rule, then the applicant shall extend the said water main or sanitary sewer from the nearest standard size existing water main or sanitary sewer as determined by the utility department. The extension, less the cost of 100 feet per applicant as provided in subsection C.(1)(a), shall be constructed by the city at the owner's expense and shall be extended across the complete frontage of said lot, area or tract of land seeking the connection when said main extension is located in a street right-of-way, alley or existing easement. If an additional easement is necessary to extend the water main or sanitary sewer across the said lot, area or tract of land, then the owner of the property seeking a connection shall provide the city with an easement, as required by the utility department. The owners of all intervening property served by the given main extension shall be required to pay the pro rata charges as established in subsection B.(2)(a), at such time as their property is connected to such main, and the pro rata charges collected by the city in accordance with this subsection, shall be refunded to the original investor, up to a period of ten years from the date of the total cost of the installation.

(2) **Business, industrial, commercial, apartment and property other than single-family residential.**

(a) When the owner of an area, lot or tract of land zoned other than single-family residential, seeks a water or sewer connection and no standard size water mains or sanitary sewers are adjacent to, upon or span the complete frontage or distance required across the front of said area, lot or tract of land, the owner shall extend the said water main or sanitary sewer from the nearest standard size existing main, as determined by the city engineer. The extension shall be constructed either by the city, or by the owner's contractor at the owner's expense and shall be extended across the complete frontage of said area, lot or tract of land when said main extension is located in a street right-of-way, alley, or an existing easement. If an additional easement is necessary to extend the water main or sanitary sewer across the said area, lot or tract of land, then the owner of the property seeking a connection shall provide the city with an easement, as required by the utility department.

(b) The city engineer shall determine the size of the required main extension in accordance with the city's master water and sewer plan, and shall also determine the location of all necessary appurtenances such as fire hydrants, valves, manholes, cleanouts and other items which may be necessary for proper operation and use of said water or sewer installation.

(c) All proposed water and sanitary sewer installations to be installed by the applicant's contractor shall be designed by a registered professional engineer in the State of Texas in accordance with the ~~standard specifications and standard construction details~~ engineering design

~~the plans and specifications and, if approved, shall mark them approved and return one set to the applicant's engineer. If not approved, two sets of the engineering plans shall be marked with the objections noted and returned to the applicant's engineer for correction. The same procedure shall be followed until the engineering plans are approved. After approval of the engineering plans and specifications, the applicant shall schedule a pre-construction meeting with the city. Once the pre-construction meeting has been held and approved construction plans stamped by the City of Sachse have been provided to the applicant, the applicant shall cause his contractor to install the water or sewer facilities in accordance with the approved engineering plans and specifications and these regulations. The applicant shall require his engineer to design, stake and supervise the construction of such improvements and shall require his contractor to construct the said improvements in accordance with these regulations and obtain the city inspection of the installation of the improvements. When found to be installed in accordance with the plans and specifications, and after the improvements have been completed and upon receipt by the city of a two-year maintenance bond in the amount of ten percent of the contract price, along with one set of "as-built" plans and digital files in accordance with these regulations, and upon receipt of a letter of the contractor's compliance with these regulations, then the city engineer shall receive and approve for the City of Sachse the title, use and normal maintenance of the improvements..~~

(d) When said main installations have been accepted by the city in accordance with the aforementioned criteria, the city will agree to refund to the applicant any pro rata collected from other parties, firms or corporations seeking a connection to the said water main or sanitary sewer installed by said applicant. The pro rata shall be collected at the rates established in subsection B.(2)(a) of this section and the city will only be responsible for refunding the collected pro rata funds for a period not to exceed ten years from the date of acceptance of the said water and sewer installation. All refunds shall be made on a semi-annual basis on the last day of June and December.

(e) Where extension is requested by an industry-industrial or commercial ~~concern using large quantities of water~~user, such extension may be made at the discretion of the city council, provided 40 percent of the estimated annual revenue for such customer will support interest and principal payments on the total cost of the extension required to serve.

D. Main extension for developers and subdivisions.

(1) **On-site extensions-Totally within property to be developed.** A developer shall defray the entire cost of water and sewer mains and all appurtenances that lie totally within a subdivision, except that the city will refund the oversize cost as established in subsection E. of any main larger than eight inches in diameter, unless such larger size is necessary to serve the developer's property in question. Size of mains necessary for adequate service shall be determined by the utility department in accordance with the city's master water and sewer plan. Refunds for oversize cost will be made upon final acceptance of the system by the city providing the funds are available

property other than the subdivision for which the extensions are made.

(a) For all water and sanitary sewer mains, the developer will be refunded any collected pro rata in accordance with subsection B.(2)(a) of this section, as adjacent property develops and said refunds shall only be made for a period not to exceed ten years from the date of acceptance of the said water and sewer installation.

(b) For water and sanitary sewer mains, larger than eight inches in diameter, the developer will be refunded the oversize cost as established in subsection G. and as adjacent property develops, the developer will be refunded any collected pro rata as established in subsection B.(2)(a) of this section.

(c) Where along-site mains exist, the developer shall pay to the city a pro rata in the amount as established in subsection B.(2)(a) of this section, and said pro rata payments shall be paid before any building permits are issued for any lot, area or parcel of land situated inside the boundaries of said subdivisions.

(3) Off-site extensions-Totally outside of property to be developed.

(a) Where water and/or sanitary sewer facilities are not available to a tract to be developed, mains may be extended by the city to the nearest subdivision property line at the expense of the developer requiring such extension or the developer shall cause his contractor to install said water or sewer facilities in accordance with subsection C.(2) of this section.

(b) Pro rata collections and refunds shall be made in the following manner:

(i) Water mains- As property adjacent to said water mains installation develops and pays all due pro rata in accordance with subsection B.(2)(a) of this section, then all pro rata collected by the city shall be refunded to the developer or investor who caused such water main to be installed. Refunds shall not exceed the actual cost of said water main installation and said refunds shall only be made for a period of ten years from the date of city's acceptance of said water main installation.

On all unplatted property which may connect to said water mains, a water main pro rata charge in the amount of \$100.00 per acre shall be collected from said property by the city and shall be refunded to the developer or investor who caused such water main installation to be installed.

(ii) Sanitary sewers- As property adjacent to the sanitary sewer develops and connects to said sanitary sewer installation and pays all due pro rata in accordance with subsection B.(2)(a) of this section, then all pro rata collected by the city shall be refunded to the developer or investor who caused said sanitary sewer installation to be installed.

As other property not adjacent to said sanitary sewer installation develops and connects to or produces a flow of sewage, either directly or indirectly, through the said sanitary sewer installation, the sanitary sewer acreage pro rata in the amount of \$100.00 per acre shall be collected from said property by the city and shall be refunded to the developer or investor who caused such sanitary

In the event where a single sanitary sewer line has been developed and constructed in more than one section and where more than one developer or investor is involved, then all acreage pro rata collected from property not adjacent to said sanitary sewer installation shall be refunded to the developer or investor who caused the initial section of said sanitary sewer facilities to be installed. As such time when the initial installation has been retired, then all collected pro rata shall be refunded to the developer or investor who caused the installation of said second section. This same procedure shall be followed with any number of developers or investors who cause said sanitary sewer line to be installed. Refunds shall not exceed the actual cost of said sanitary sewer main installation and said refunds shall only be made for a period of ten years from the date of city's acceptance of said sanitary sewer main installation.

(4) **Mains in place within the property to be developed.** Should an existing water main or sanitary sewer lie in a street, alley or easement within a tract of land to be subdivided and developed for resale, before extensions from or connections to such line shall be made by a developer, he shall pay to the city the following pro rata:

- (a) Five dollars per front foot for the area, lot or tract of land seeking a connection to an existing water main.
- (b) Three dollars per front foot for the area, lot or tract of land seeking a connection to any existing sanitary sewer.
- (c) Should such mains lie along the subdivision and serve one side only, one-half of the above costs shall be paid.

(5) **Methods by which water and sewer mains can be extended for subdivisions or developments.**

(a) **On-site facilities.** On-site water and sewer facilities shall be constructed by private contract at the developer's expense in accordance with the city subdivision regulations, ~~standard specifications~~ and ~~standard construction details~~ engineering design manual of the City of Sachse.

(b) **Off-site facilities.**

(i) **Private contract.** Off-site water and sewer facilities shall be constructed by private contract at the developer's expense in accordance with the city subdivision regulations, ~~standard specifications~~ and ~~standard construction details~~ engineering design manual of the City of Sachse.

(ii) **City contract.** A developer of a subdivision may deposit with the city the total estimated cost of such extensions required to serve his property, including the cost of approach and off-site mains fronting property not owned by the developer. The estimated cost of these extensions shall be prepared by a professional engineer licensed to practice in the State of Texas and shall be approved by the city engineer. Upon receipt of the required amount of money, the city will construct such mains and upon the determination of final completion cost will refund any excess amount deposited, or require from developer additional funds to defray the entire cost of the project.

(6) Temporary lines. When temporary lines are constructed as an expediency to develop a particular area, such as across easements within a subdivision of which no frontage can be connected, or where lines are constructed which are not required by the final plan of development, the developer will bear the total cost without refund.

E. Establishing refunding procedure. All refunds provided for in this section shall be made at six-month intervals (June 31 and December 31) of each year, and shall include funds then accrued to the credit of any developers and others. A refund contract entered into by any property owner and the city under the provisions of this section, shall be effective only for a period of ten years after the date of said contract. No refunds will be made by the city to any applicant or contracting party after this ten-year period has expired, nor shall the city ever be liable for payment of interest on any deposits or refunds provided herein. This section shall not affect or change any agreement or contract for providing water and sewer services which was entered into by the city on or before the effective date of this section.

F. Water and sewer connections.

(1) Water service connection.

(a) The city shall install and maintain all water service connections in the streets, alleys and easements and shall charge for the installation and maintenance of all such connections a sum sufficient to cover the cost thereof; such sum is to be determined by using the most current market cost of materials and labor. An updated list of these costs shall be kept in the water department billing office and made available upon request.

(b) The cost for the installation of service lines which require the boring of paved streets or alleys shall be estimated by the utility department, and a deposit of the estimated amount will be required before work is started on the installation of such connection. Should the final cost of the work be less than the amount of the deposit, a refund of over-payment will be immediately made to the person from whom the deposit was received.

(c) No streets or alleys shall be open-cut for the installation of water lines without written permission from the city engineer. The cost of extending water service lines under paved streets or alleys shall be paid by the owner of the property.

(d) Where service lines have been installed by developers, the water service connection charge shall be reduced by the amount of the tap charge as shown on current list kept in the water department billing office.

(e) All water service for construction purposes shall be subject to a standard deposit as determined by the City of Sachse and metered and subject to the same regulations and billings as permanent water accounts.

(2) Sanitary sewer service connections.

the main to the property line when the sewer main is located in an alley or a street right-of-way; if the sewer main is in an easement, the service connection shall be installed from the sewer main to the easement boundary line. The city shall charge for each sewer lateral connection an amount whose sum is equal to the most current market cost for materials and labor. An updated cost of these materials and labor shall be kept in the water department billing office and made available upon request.

(b) The property owner shall install a service line at his expense to the city's lateral, in accordance with city regulations and subject to the inspection of the city; and shall thereafter be responsible for normal maintenance of said service line from the house to the property line.

(c) No streets or alleys shall be open-cut for the installation of sewer lines without written permission from the city engineer.

(d) The property owner shall install a service line at his expense to the city's lateral, in accordance with city regulations and subject to the inspection of the city; and shall thereafter be responsible for normal maintenance of said service line from the house to the property line.

(e) Each house or building within the city shall be served by a separate and independent water and sanitary sewer connection. Where the service laterals have been installed by a developer to serve a lot or tract of land, said lot or tract of land shall be exempt from a connection charge.

G. **Evaluated prices for determination of oversize costs and off-site facilities.** All costs for oversized water mains and appurtenances and sanitary sewer mains and appurtenances shall be determined by using the most current market cost for materials and labor, and approved by the city engineer prior to construction.

H. **Purpose of section; where front foot rule inequitable.** The intent and purpose of this section is to provide an equitable charge for water and sanitary sewer connections as a proportionate distribution of the cost of water and sanitary sewer main extensions to serve property in the city on a front foot basis. In case property or a tract of land is so situated or shaped that the front foot rule creates an inequitable basis as between it and other tracts of land in the city, then in that event, the city council shall determine the proper charge in accordance with the intent and purpose of this section.

I. **Method of enforcing payment.** Nothing herein shall be deemed in anyway to be an exclusive methods of enforcing the payment of the pro rata charges against the consumer and property owners, nor shall be deemed in any manner to be a waiver of the city's right to validly assess the property owners and/or consumers concerned for cost of the installation of standard size water and sewer mains, and to fix and enforce liens against said property. The method of enforcing payment of charges imposed by this section shall be in the manner prescribed by law.

J. **Crediting of collections.** Any and all sums of money collected as a pro rata and/or service connection charge, as established by this section, shall be credited to the water and sewer system

- K. **If no funds available.** In no event may the city be required to install water or sewer main extensions under the provisions of this section if there are no funds available for that purpose.
- L. **Sewage lift stations and other special installations.** In the event a lift station or other special installations are required, the same shall be installed under separate agreements between the city and the developer.
- M. **Procedure for variance.** The city council may authorize a variance from the water and sewer line regulations when, in its opinion, undue hardships will result from the requiring of strict compliance. In granting variance, the council shall prescribe only conditions that it deems necessary or desirable to the public interest and making the findings herein below required. Pecuniary hardship to the applicant, standing alone, shall not be deemed to constitute undue hardship. No variance will be granted unless the council finds:
- (1) There are special circumstances or conditions such that the strict application of the provisions of this subsection would deprive the applicant of the reasonable use of his property; and
 - (2) The variances are necessary for the preservation and enjoyment of a substantial property right of the applicant; and
 - (3) The granting of the variance will not be detrimental to the public health, safety, or welfare or injurious to other property in the area and substantial justice done; and
 - (4) The variance be granted only in harmony with the general purpose and intent of water and sewer line extension ordinance.

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3594, sec. 1, adopted 6/2/14)~~

Sec. 8-1817. Street extensions and pro rata charges.

- A. **Definitions.** The following terms shall have the meanings herein ascribed:
- (1) **Developer or contractor.** The terms developer or contractor shall mean any private person or firm which constructs a street or streets to be dedicated to the City of Sachse, Texas, at his expense.
 - (2) **City.** The City of Sachse, Texas.
 - (3) **Pro rata.** A charge or fee to be collected from property owners other than the developer or contractor to defray the cost of the street construction which serves such property owner.
 - (4) **On-site street.** A street which is totally within or adjacent to a tract of land which has been or is to be subdivided and developed for resale.
 - (5) **Off-site street.** A street totally outside the tract of land which has been or is to be subdivided and developed for resale.
 - (6) **Property owner.** The record title holder of the lot or tract served by the street for which pro rata collections are applicable.

and/or alley.

C. **Pro rata charge established.** A charge, which shall be known as pro rata, shall be made against each lot or tract of land and the owner thereof whose property is served by the street and/or alley subject to pro rata collection as determined by the city.

(1) Charges will be one-half the average lineal foot cost of the construction of the street as determined by the city engineer.

(2) Average actual costs will be revised semi-annually on April 1 and October 1 and filed with the city secretary.

The above front foot rates shall apply to property fronting on streets in areas platted into the usual rectangular lots or tracts of land with a depth of not to exceed 150 feet. Where the lots or tracts have depths greater than 150 feet from the front street line and are occupied or are to be occupied exclusively as dwelling places, then the additional depth shall not be assessed. If the property is later subdivided, requiring an extension of streets to serve the same, then the terms of this section shall govern. On lots or tracts of land which extend through from one street to another with frontage on both streets and where the distance between the street lines is greater than 260 feet, then the pro rata charge herein provided for shall be paid on both frontages as applicable. Where lots or tracts are irregular in size or shape, the pro rata charges shall be based upon equivalent rectangular lots or tracts, using one foot for each 150 square feet of area or the pro rata charge provided herein on the average frontage of the development, whichever is least.

D. **Purpose.** The intent and purpose of this section is to provide an equitable charge for street construction as a proportionate distribution of the cost of street or alley extensions to serve property in the city on which is owned by persons or firms other than the developer or contractor which incurred the cost of the construction of the street or alley on a front foot basis. In case property or a tract of land is so situated or shaped that the front foot rule creates an inequitable basis as between it and other tracts of land in the city, then in that event, the city engineer shall determine the proper charges in accordance with the intent and purpose of this section.

E. **Extensions for property subdivided or platted for development basis.**

(1) **Generally.** Where the extensions of the streets are required to serve property which has been subdivided or platted for development for resale, streets may be extended to the properties on the following basis and in accordance with minimum standards and procedures described in this section. It shall be unlawful to improve any previously unimproved lot, tract or plot of land or any part thereof which fronts a street or alley for which pro rata charges are applicable even if such lot, tract or plot was originally purchased before construction and assessment of pro rata was accomplished.

(2) **Extensions within property to be developed.**

(a) Developers of such property will defray the entire cost of streets within their subdivision. The size and construction of such streets and alleys shall be in conformance with this subdivision regulation and in accordance with the ~~standard specifications and standard construction details~~ engineering design manual of the City of Sachse.

the subdivision for which the extensions are made:

The developer or contractor will be refunded one-half of the current average actual cost of the street constructed when the adjacent property is developed.

(3) **Where streets are in place in or adjacent to the property to be developed.**

(a) Should an existing street or alley in or along an area or tract of land to be subdivided and developed for resale before extensions from or connections to such street will be made by the developer, he shall pay the city the current average actual cost per lineal foot of his property along said street. Should such street lie along the subdivision on one side only, one-half these costs shall be paid unless such streets serve the subdivision in question exclusively. Such money shall be paid to the city pro rata fund and will constitute a charge for the use of such street in place.

(b) An exception to the normal pro rata charge for streets or alleys may be made on any existing street which runs along one or more sides of a five-acre tract or larger, which has not been subdivided. Before any building permit for a primary structure shall be given, the applicant shall pay a charge based on 100 feet of frontage and in accordance with the above rates. This in no way will exempt the remainder of the property from being charged pro rata charges under this section as such time as it is platted or developed.

(4) **Off-site extensions required to serve property development.** Where street facilities are not available to a tract to be developed, the developer or contractor shall extend such facilities, his expense, to an existing street, as approved by the city engineer.

F. **Methods of construction.**

(1) **By private contract.** The construction of streets may be awarded on a private contract in accordance with provisions of the City of Sachse ~~standard specifications and standard construction details~~ engineering design manual. Such streets or alleys, when constructed and dedicated, shall become the property of the city free and clear of all encumbrances. The city specifically reserves the option to advertise for bids and install any or all portions of the extensions.

(2) **By city contract.** Upon approval of the city, the developer or contractor of an addition or plat may design and prepare construction plans of streets or alleys to serve the subdivision, including any access or off-site facility that may be required. The developer of an addition or plat shall deposit with the city the total cost of such extensions required to serve, including the cost of approach or off-site streets fronting property not owned by the developer if required by the provisions of this section not covering off-site streets. The city will construct such streets, upon determination of final completion costs, will refund any excess amount deposited, or require such developer additional funds to defray the entire cost of the project on-site and of off-site facilities for which the developer or contractor is responsible.

G. **City not obligated to make extensions.** In no event shall the city be obligated to proceed under

Sec. 8-1918. Street design and construction costs.

A. Definitions. The following terms shall have the meanings herein ascribed:

- (1) Development shall mean any activity that requires the filing of a final subdivision plat, or first increment thereof, or one lot plat.
- (2) Escrow shall mean money placed in the possession of the city to accomplish the purposes set out in this section including, but not limited to, the following: Purchase of right-of-way, design and construction of drainage facilities, curb, gutter and pavement.
- (3) Street, unimproved shall mean any street proposed to be constructed as part of a development or an existing street without concrete curb and gutter, but not including state or federal highways.
- (4) Street, internal shall mean any street whose entire width is contained within a development.
- (5) Street, perimeter shall mean any street which abuts a development or one whose width lies partly within a development and partly without.

B. Street, design construction costs and escrow requirement.

- (1) The owner shall be responsible for the design and construction of all streets within his development and one-half of the same if an unimproved perimeter street.
- (2) The owner shall be responsible for the construction of the following width perimeter streets to his development:
 - (a) When developing land zoned residential or "F", the owner shall be responsible for the construction of one-half of a 37-foot collector street.
 - (b) When developing land zoned "C-1," "C-2," or "PD," the owner shall be responsible for construction of one-half of a 45-foot concrete street or one-half of the actual width of the proposed street, whichever is less.
 - (c) When developing land zoned "I-1," "I-2," the owner shall be responsible for the construction of one-half of the street actually proposed for construction, pursuant to the thoroughfare plan; ~~standard specifications, and standard construction details~~ and engineering design manual of the City of Sachse.
- (3) The owner shall construct all internal and perimeter streets at the time of development unless, from an engineering standpoint, it is not feasible to do so. Upon such determination, the owner shall be required to place an amount equal to his share of the construction costs plus six percent of such sum for future engineering costs in escrow with the city.
- (4) The owner shall be responsible for all of the engineering and design costs of all internal streets and also of all perimeter streets which are constructed either entirely by the owner or

footage requirement equal to the square root of the area of the property expressed in feet. In the event the property is bound by more than one unimproved perimeter street, such formula shall apply to each such street. A total waiver of perimeter street responsibility is not within the contemplation of these rules and regulations.

(6) However, in any event, perimeter street escrow responsibility shall not exceed the factor of 0.0035 times the current street cost per linear foot (one-half of the applicable street width, based on zoning) times the square footage of the plat, plus six percent of such sum for future engineering costs.

C. Participation and escrow.

(1) If the owner chooses to construct a wider street than required by the city or these regulations, the owner shall pay the entire cost for the street. However, in the event the city is required to participate in the construction costs as provided in this chapter, the city shall reimburse its proportionate share to the owner upon completion and acceptance of the streets and drainage improvements.

(2) The obligations and responsibilities delegated to the owner herein shall become those of the owner's transferees, successors and assigns; and the liability therefore, shall be joint and several.

(3) For the purpose of this section, the first step of developing is the submission of a preliminary plat or the submission of a final plat, as the requirements thereof may be.

(4) Payment of funds required to be placed in escrow shall be made after the preliminary plat is approved by the planning and zoning commission and prior to the approval of the final plat.

(5) Escrows which have been placed with the city under this section which have been held for a period of ten years from the date of such agreement, in the event that council has not authorized the preparation of plans and specifications for construction of such street which the escrow was made, shall be returned to the owner, with such interest as it has earned.

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3594, sec. 1, adopted 6/2/14)~~

Sec. 8-1920. Park land dedication by developers.

A. Assessment for park development. An owner shall pay to the City of Sachse the sum of \$1,100.00 for each lot contained within a residential subdivision and \$600.00 per multifamily dwelling unit. Such payment shall be made prior to recording the approved final subdivision plat. Such fund shall be deposited by the city into an account designated exclusively for park assessment fees, and used thereafter by the City of Sachse only for the purchase of land to be used for park purposes, or for the development, re-development or maintenance of existing parks within the City of Sachse.

B. Dedication of land in lieu of cash assessment. In lieu of the cash assessment provided in subsection A. of this section, an owner may dedicate land for public park purposes to the City of

completed dwelling units exceeds the figure upon which the original dedication was based, such additional dedication shall be required, and should be made by payment of money in lieu of land as provided in subsection A. of this section or by fee simple dedication of land to the city by separate instrument in the form of a warranty deed approved by the city. The city deems that the development of an area where the buildable area of public park is smaller than one acre in size is impracticable. Therefore, if fewer than 100 units are proposed by a plat filed for approval, the developer may be required to pay the applicable cash in lieu of park land dedication as provided in subsection A. of this section. Prior to such dedication, the owner shall submit his or her proposal for dedication to the city manager, along with a comprehensive narrative appraisal of the fair market value of such property prepared by an MAI appraiser. Acceptance of such policy in lieu of the cash assessment provided in subsection A. of this section shall be at the sole discretion of the city council. Should the city council agree to accept such offer of dedication, and should the fair market value of the property (as determined by the city council) be less than the amount the owner would be required to pay pursuant to the provisions of subsection A. of this section, then the owner shall pay to the city the difference in cash pursuant to the provisions of subsection A. of this section.

C. **Recommendation from the parks and recreation commission.** In all instances, the city council shall have the right to accept the dedication for approval on the final plat or accept the fee in lieu of land dedication. That determination shall be based upon existing circumstances at the time, and upon recommendation from the parks and recreation commission, and in accordance with the parks, recreation, and open space plan adopted by the city. Details of proposed dedication property may be submitted to the parks board for review and consideration prior to the preliminary plat process.

D. **Park dedication fund.** The park dedication fund will be administered by the city council to best benefit the development, provided that the establishment of a park site shall be within the discretion of the city council. The money paid by the applicant will be expended on such park site. All sums deposited to the fund shall be accounted for by the city and expended for such purposes as land acquisition, construction of improvements, and purchase of equipment (at the city's discretion).

~~(Ordinance 3401, sec. 1, adopted 7/2/12)~~

Sec. 8-2120. Impact fees.

A. **Purpose.** This section is intended to assure the provision of adequate public facilities to serve new development in the city by requiring each such development to pay its share of the costs of such improvements necessitated by and attributable to such new development.

B. **Definitions.** For purposes of this section, the following words and phrases shall have the meanings respectively ascribed to them by this subsection:

Advisory committee. The members of the planning and zoning commission, and the representatives appointed by the city council as required by the state law.

Capital improvement. Any of the following facilities that have a life expectancy of three or more years and are owned and operated by or on behalf of the city:

- (1) Water supply, treatment, and distribution facilities; wastewater collection and treatment facilities; and storm water, drainage, flood control facilities as they relate to the construction of roadway facilities, whether or not they are located within the service area; and
- (2) Roadway facilities.

Capital improvements plan. A plan contemplated by this section that identifies capital improvements or facility expansions for which impact fee may be assessed, adopted by the city from time to time, and on file in the city secretary's office.

City. The City of Sachse, Texas.

Credit. The amount of the reduction of an impact fee for fees, payments, or charges for or construction of the same type of facility.

Facility expansion. The expansion of the capacity of an existing facility that serves the same function as an otherwise necessary new capital improvement in order that the existing facility may serve new development. The term does not include the repair, maintenance, modernization, or expansion of an existing facility to better serve existing development.

Final plat approval or approval of a final plat. The point at which the applicant has complied with all conditions of approval and the plat has been released for filing with the county clerk.

Impact fee. A charge or assessment imposed as set forth in this section against new development. The term does not include:

- (1) Required dedications of land for public parks or payments in lieu thereof;
- (2) Dedication of rights-of-way or easements or construction or dedication of on-site or off-site water distribution, wastewater collection or drainage facilities, or streets, sidewalks, or curbs, if the dedication or construction is required by a valid ordinance and is necessitated by and attributable to the new development;
- (3) Lot or acreage fees, or pro rata fees, to be placed in trust funds for the purpose of reimbursing developers for over-sizing or constructing water or wastewater mains or lines; or
- (4) Other pro rata fees for reimbursement of water or wastewater mains or lines extended by the city.

Land use assumptions. A description of the service area and projections of changes in land uses, densities, intensities, and population and employment growth in the service area over at least a ten-year period, and adopted by the city, as may be amended from time to time, upon which the capital improvements plans are based, adopted by the city from time to time, and on file in the city secretary's office.

New development. A project involving the construction, reconstruction, redevelopment, conversion, structural alteration, relocation or enlargement of any structure, or any use or extension of the use of land, any of which has the effect of increasing the requirements for capital improvements or facility expansions, measured by the number of service units to be generated by such activity, and which requires either the approval of a plat pursuant to the city's subdivision regulations, the issuance of a building permit or connection to the city's water or wastewater system, and which has not been exempted from these regulations by provisions of this section. Installation of a larger water meter will constitute new development.

Off-site. A facility or expansion that is not a site-related facility, as defined herein. Located entirely on

which is for the primary purpose of safe and adequate provision of water and wastewater facilities to serve the new development and which is not included in the impact fee capital improvements plan and for which the developer or property owner is solely responsible under Subdivision and other applicable regulations.

Roadway facilities. Arterial or collector streets or roads that have been designated on the city's officially adopted roadway plan, together with all necessary appurtenances. The term includes, but is not limited to, the city's share of costs for roadways and associated improvements designated on the Federal or Texas Highway System, including, but not limited to, local matching funds and costs related to utility line relocation and the establishment of curbs, gutters, sidewalks and drainage appurtenances. The term also includes but is not limited to interests in land, traffic lanes, curbs, gutters, intersection improvements, traffic control devices, turn lanes, drainage facilities associated with the roadway or street lighting.

Service area. The area within the city and/or the city's extraterritorial jurisdiction, as identified in the land use assumptions, to be served by the capital improvements or facilities expansions specified in the capital improvements plan, for roadway facilities service area means any one of the individual services areas within the city's corporate boundaries as identified in the land use assumptions and the capital improvements plan.

Service unit. The standardized measure of consumption, use, generation or discharge attributable to an individual unit of development, that had been calculated in accordance with generally accepted engineering and/or planning standards, as indicated in the land use equivalency tables located in the "2011-2021 Capital Improvements Plan and Impact Fee Analysis for Water, Sanitary Sewer and Thoroughfares", which is attached hereto as Exhibit "D" and incorporated by reference herein, as may be amended from time to time.

Sanitary sewer facility. An improvement for providing wastewater collection, including, but not limited to, land or easements, lift stations, or interceptor mains. Sanitary sewer facility excludes sanitary sewer lines or mains which are reimbursed from pro rata charges paid by developers or owners of property in other subdivisions as a condition of connection to or use of such facility.

Site-related facility or on-site. An improvement or facility which is for the primary use or benefit of a new development and/or which is for the primary purpose of safe and adequate provision of water and wastewater facilities to serve the new development and which is not included in the impact fee capital improvements plan and for which the property owner is solely responsible under subdivision and other applicable regulations, or which is located at least partially on the plat which is being considered for impact fee assessment. Site-related facility includes that portion of an off-site water or wastewater main, equivalent to a standard size water or wastewater main, which is necessary to connect any new development with the city's water or wastewater system, the cost of which has not been included in the city's impact fee capital improvements plan.

Water facility. A water interceptor or main, pump station, storage tank or other facility or improvement used for providing water supply, treatment and distribution service included within the city's water storage or distribution system. Water facility includes, but is not limited to, land, easements or structures associated with such facilities. Water facility excludes a site-related facility.

Utility connection. A connection of an individual meter to the city's water or wastewater system, or an increase in the size of an existing meter.

Wastewater facility. A wastewater interceptor or main, lift station or other facility or improvement used for providing wastewater collection and treatment included within the city's collection system for wastewater. Wastewater facility includes, but is not limited to, land, easements or structures associated with such facilities. Wastewater facility excludes a site-related facility.

Water meter. A device for measuring the flow of water to a development, whether for domestic or for irrigation purposes.

C. **Advisory committee.**

- (1) The advisory committee shall consist of the planning and zoning commission. If the committee does not include at least one representative of the real estate, development or building

committee. If any impact fee is to be applied in the extraterritorial jurisdiction of the city, a representative from that area shall be appointed by the city council.

- (2) The advisory committee serves in an advisory capacity and is established to:
 - (a) Advise and assist the adoption of land use assumptions;
 - (b) Review the capital improvements plan and file written comments;
 - (c) Monitor and evaluate implementation of the capital improvements plan;
 - (d) File semi-annual reports with respect to the progress of the capital improvements plan and report to the city council any perceived inequities in implementing the plan or imposing the impact fee; and
 - (e) Advise the city staff and council of the need to update or revise the land use assumptions, capital improvements plan, and impact fee.
- (3) All professional reports concerning the development and implementation of the capital improvements plan shall be made available to the advisory committee.
- (4) The advisory committee shall elect a chairperson to preside at its meetings and a vice-chairperson to serve in his or her absence. All meetings of the committee shall be open to the public and posted at least 72 hours in advance. A majority of the membership of the committee shall constitute a quorum.
- (5) In the event of any conflict between this subsection 8-620(c) and applicable state law, state law shall control.

D. Periodic updates required.

- (1) The city shall update the land use assumptions and capital improvements plan upon which impact fees are based at least every five years, beginning with the date of adoption of such plans, and shall recalculate the impact fees based thereon in accordance with provisions set forth in Chapter 395, Texas Local Government Code, or any successor statute.
- (2) The city may review its land use assumptions, impact fees, capital improvements plans and other factors, such as market conditions, more frequently than provided in subsection (1) above to determine whether the land use assumptions and capital improvements plan should be updated and the impact fee recalculated accordingly.
- (3) If, at the time an update is required pursuant to subsection (1) above, the city council determines that no change to the land use assumptions, capital improvements plan or impact fee is needed, it may dispense with such update by following the procedures in Local Government Code, Section 395.0575, or its successor statute.

E. Impact fee as a condition of development approval/permit issuance. No final plat for new development shall be released for filing with the appropriate county, nor may any new development

permit shall be issued or utility connection made for new development until the property owner has paid the impact fee imposed herein.

F. Assessment of impact fees.

(1) For land which is un-platted at the time of application for a building permit or utility connection, or for a new development which received final plat approval prior to the effective date of this article, and for which no re-platting is necessary pursuant to the city's subdivision regulations prior to development, assessment of impact fees shall occur at the time application is made for the building permit or utility connection, whichever first occurs, and shall be the amount of the maximum impact fee per service unit in effect, as set forth in Exhibits A, B and C, attached hereto and made part hereof for all purposes. [Exhibits A-C are located at the end of this chapter.]

(2) For a new development which is submitted for approval pursuant to the city's subdivision regulations on or after the effective date of this section, or for which re-platting results in an increase in the number of service units after such date, assessment of impact fees shall be at the time of final plat recordation, and shall be the amount of the maximum impact fee per service unit in effect as set forth in Exhibits A, B and C.

(3) Following the initial assessment of impact fees for new development pursuant to subsection (1) above, the amount of impact fee assessment per service unit for that development cannot be increased, unless the owner proposes to change the approved development by the submission of a new application for final plat approval or other development application that results in approval of additional service units, in which case the impact fee will be reassessed for the increased meter size or additional meters or service units at the impact fee rate then in effect.

(4) Following the vacating of any plat or approval of any re-plat, a new assessment must be made in accordance with subsection (1) above.

(5) An application for an amending plat made pursuant to V.T.C.A. Texas Local Government Code, sec. 212.016 and the City Subdivision Ordinance, and for which no new development is proposed, is not subject to reassessment for an impact fee.

(6) Except for roadway facilities, impact fees-may be assessed but not collected for property where service is not available unless:

(a) The city commits to commence construction of necessary facilities identified in the capital improvements plan within two years and have service available in a reasonable time not exceeding five years; or

(b) The city agrees in writing to permit the owner of the property to construct or finance the required capital improvement or facility expansion and agrees that the costs incurred or funds advanced will either:

(i) Be credited against the impact fees otherwise due from the new development;

will use such capital improvements or facility expansions in which case fees shall be reimbursed to the owner at the time collected as other new development plats are recorded; or

(iii) The owner voluntarily requests that the city reserve capacity to serve future development and the city and the owner enter into agreement.

(7) Church facilities for the worship of a Supreme Being, and related religious training shall be exempt from the assessment of impact fees. These facilities shall include auditorium type buildings where worship services are conducted and class room type buildings in which the primary purpose of the room is for religious instruction. The definition of church facility shall exclude church-related schools, day care/child care functions, gymnasium, and other recreational facilities.

(8) Assessment of water or wastewater impact fees may be deferred for developments in the city which are not planned to connect to the city's water system or wastewater system due to the unavailability of the water or wastewater lines. These impact fees will be imposed on the property owner at the prevailing rates in the event of a subsequent connection to the city services.

G. Calculation of impact fees.

(1) Impact fees shall be determined by multiplying the number of service unit equivalents in the proposed development by the amount per service unit equivalent due under Exhibits A, B and C.

(2) The determination of impact fees shall be reduced by any allowable credits for the category of capital improvements as provided in this section.

(3) The total amount of unpaid impact fees shall be attached to the development application, or if to be paid at some later date, to the request for other permit or connection.

(4) Re-platting shall not require recalculation of impact fees unless the number of service units is increased or land uses change. If a proposed development increases the number of service units, the impact fee shall be recalculated as provided in this section.

H. Calculation and collection of impact fees.

(1) Impact fees for new development shall be collected at the time the city issues a building permit, or if a building permit is not required, at the time an application is filed for a new connection, to the city's water or wastewater system, or for an increase in water meter size, unless an agreement between the property owner and the city has been executed providing for a different time of payment.

(2) At the time of final plat approval, or the request for a utility connection for an area in the city's extraterritorial jurisdiction for which a final plat was not submitted to the city, for all new developments, the city shall compute the impact fees due for the new development in the following manner:

(a) The amount of each type of impact fee due (roadway, water, and/or wastewater) shall be determined by multiplying the number of each type of service units generated by the new

respectively.

(b) The amount of each impact fee due shall be reduced by any allowable credits for that category of capital improvements in the manner provided by this section.

(3) Whenever a property owner proposes to increase the number of service units for a new development, the additional impact fees collected for such new service units shall be determined by using the amount of impact fee per service unit in Exhibits A, B and C, then in effect, and such additional fee shall be collected at the time of issuance of a new building permit, or for an area in the city's extraterritorial jurisdiction for which a final plat was not required to be submitted to the city, prior to or at the time of enlargement of the connection to the city's water or wastewater system.

I. Credits.

(1) Any construction of, contributions to, or dedications of any facility appearing in the capital improvements plan that is required by the city to be constructed by the owner as a condition of development shall be credited against the impact fees otherwise due from the same category (roadway, water or wastewater) of impact fees assessed on the development.

(2) The amount of each credit for required construction of a facility in the capital improvements plan shall be calculated by multiplying the value of the facility assessed for the capital improvements plan by a fraction, the numerator of which is the impact fee per service unit equivalent due for the new development computed using the denominator of which is the maximum impact fee per service unit computed using the capital improvements plan.

(3) All credits against impact fees shall be subject to the following limitations and shall be granted based on this section and any additional administrative guidelines that may be adopted by the city.

(a) No credit shall be given for the dedication or construction of site-related facilities.

(b) No credit shall exceed an amount equal to the assessed impact fee.

(c) If a credit applicable to a final plat has not been exhausted within ten years, from the acquisition of the first building permit issued or utility connection made, after the effective date of the adoption of the applicable impact fees, or within such period as may otherwise be designated by contract, such credit shall lapse.

(d) In no event will the city reimburse the property owner or developer for a credit when impact fees for the new development can be collected pursuant to this section or for any amount exceeding the total impact fees collected or due for the new development for the category of capital improvement, unless otherwise agreed to by the city.

(4) The available credit associated with new development shall be applied against an impact fee in the following manner:

residential development, such credit shall be prorated equally among such lots, to be applied at the time of application of a building permit for each lot, against impact fees to be collected at the time the building permit is issued.

(b) For all other types of new development, including those involving mixed uses, the credit applicable to the new development shall be applied to the impact fee due at the time of approval.

(c) At its sole discretion, the city may authorize alternative credit agreements upon written agreement with the property owner in accordance with the city's administrative guidelines.

J. Establishment of accounts.

(1) All impact fees collected shall be deposited in interest bearing accounts clearly identifying the category of capital improvements or facility expansions within the service area for which the fee is collected.

(2) Interest earned on the account into which the impact fees are deposited, shall be considered funds of the account and shall be used only in the same manner as which the underlying funds may be used.

(3) Impact fees and the interest earned thereon may be spent only for the purposes for which such fees were imposed as shown in the capital improvements plan.

(4) The records of the accounts into which impact fees are deposited shall be open for public inspection and copying during ordinary business hours.

K. Use of proceeds of impact fee accounts.

(1) The impact fees collected for each service area may be used to finance or to recoup the costs of any capital improvements or facility expansion identified in the capital improvements plan for the service area, including but not limited to the construction contract price, surveying and engineering fees, land acquisition costs (including land purchases, court awards and costs, attorney's fees and expert witness fees). Impact fees may also be used to pay the principal sum and interest and other finance costs on bonds, notes or other obligations issued by or on behalf of the city to finance such capital improvements or facility expansion.

(2) Impact fees collected pursuant to this section shall not be used to pay for any of the following expenses:

(a) Construction, acquisition or expansion of public facilities or assets other than capital improvements or facility expansions identified in the capital improvements plan;

(b) Repair, operation or maintenance of existing or new capital improvements or facility expansions;

(c) Upgrade, update, expansion or replacement of existing capital improvements to provide better service to existing development; or

L. Refunds.

- (1) Upon application by an owner of property, any impact fee or portion thereof collected pursuant to city ordinance, which: (i) has not been expended within the service area within ten years from the date of payment, or (ii) existing facilities are available and service is denied, or (iii) the city has, after collecting the impact fee when service was not available, failed to commence construction within two years or service is not available within a reasonable period considering the type of improvement or expansion, but in no event later than five years from the date of payment, shall be refunded to the record owner of the property for which the impact fee was paid or, if the impact fee was paid by another governmental entity, to such governmental entity, together with interest calculated from the date of payment to the date of refund at the statutory rate set forth in the Texas Finance Code, sec. 302.002, or its successor statute. The application for refund pursuant to this section shall be submitted within 60 days after the expiration of the ten-year period for expenditure of the fee. An impact fee shall be considered expended on a first-in, first-out basis.
- (2) An impact fee collected pursuant to this section shall also be considered expended if the total expenditures for capital improvements or facilities expansion within the service area within ten years following the date of payment exceed the total fees collected within the service area for such improvements or facilities expansion during such period.
- (3) If a refund is due pursuant to subsection (1) above, the city shall divide the difference between the amount of expenditures and the amount of the fees collected by the total number of service units assumed within the service area for the period to determine the refund due per service unit. The refund to the record owner shall be calculated by multiplying the refund due per service unit by the number of service units for the development for which the fee was paid, and interest due shall be calculated upon that amount.
- (4) Upon completion of all the capital improvements or facility expansions identified in the capital improvements plan for the service area, the city shall recalculate the impact fee per service unit using the actual costs for the improvements or facilities expansions. If the impact fee per service unit based on actual cost is less than the impact fee per service unit paid, the city shall refund the difference, if such difference exceeds the impact fee paid by more than ten percent. If the difference is less than ten percent, no refund shall be due. The refund to the record owner shall be calculated by multiplying such difference by the number of service units for the development for which the fee was paid, and interest due shall be calculated upon that amount.

M. Appeals.

- (1) The property owner or applicant for new development may appeal the following decisions to the city council: (a) the applicability of an impact fee to the new development; (b) the method of calculating the amount of the impact fee due; (c) the availability or the amount of an offset, credit or rebate; (d) the application of an offset or credit against an impact fee due; or (e) the amount of a

(2) The burden of proof shall be on the appellant to demonstrate that the amount of the fee or the amount of the offset credit or rebate was not calculated according to the provisions of this article.

(3) The appellant must file a notice of appeal with the city secretary within 30 days following the determination of the amount of the impact fees to be paid by the development. If the notice of appeal is accompanied by a bond or other sufficient surety satisfactory to the city attorney in an amount equal to the original determination of the impact fee due, the development application may be processed while the appeal is pending.

N. Use of other financing mechanisms.

(1) The city may finance capital improvements or facilities expansions designated in the capital improvements plan through the issuance of bonds, through the formation of public utility districts or other assessment districts, or through any other authorized mechanism, in such manner and subject to such limitations as may be provided by law, in addition to the use of impact fees.

(2) Except as herein otherwise provided, the assessment and collection of an impact fee shall be additional and supplemental to, and not in substitution of, any other tax, fee, charge or assessment which is lawfully imposed on and due against the property.

O. Impact fees as additional and supplemental regulations. Impact fees established by this section are additional and supplemental to, and not in substitution of, any other requirements imposed by the city on the development of land or the issuance of building permits or certificates of occupancy. Such fees are intended to be consistent with and to further the policies of the city's comprehensive land use plan, the capital improvements plan, the zoning ordinance, subdivision regulations and other city policies, ordinances, codes and resolutions by which the city seeks to ensure the provision of adequate public facilities in conjunction with the development of land.

Exhibit "A"

Maximum Roadway Impact Fees

LAND USE CATEGORY	DEVELOPMENT UNIT	MAXIMUM IMPACT FEE	% OF MAXIMUM FEE	ADOPTED IMPACT FEE
Port and Terminal				
Truck Terminal	Acre	\$15,880.78	100%	\$15,880.78
Industrial				
General Light Industrial	1,000 SF GFA	\$2,356.57	100%	\$2,356.57
General Heavy	1,000 SF GFA	\$458.80	100%	\$458.80

Industrial Park	1,000 SF GFA	\$2,085.46	100%	\$2,085.46
Warehousing	1,000 SF GFA	\$771.62	100%	\$771.62
Mini-Warehouse	1,000 SF GFA	\$625.64	100%	\$625.64
Residential				
Single-Family Detached Housing	Dwelling Unit	\$2,450.42	100%	\$2,450.42
Apartment/Multi-Family	Dwelling Unit	\$1,501.53	100%	\$1,501.53
Residential Condominium/Townhome	Dwelling Unit	\$1,261.70	100%	\$1,261.70
Mobile Home Park/Manufactured Housing	Dwelling Unit	\$1,428.54	100%	\$1,428.54
Senior Adult Housing-Detached	Dwelling Unit	\$656.92	100%	\$656.92
Senior Adult Housing-Attached	Dwelling Unit	\$385.81	100%	\$385.81
Assisted Living	Beds	\$531.79	100%	\$531.79
Lodging				
Hotel	Room	\$1,428.54	53.31%	\$761.55
Motel/Other Lodging Facilities	Room	\$1,136.58	67.00%	\$761.51
Recreational				
Golf Driving Range	Tee	\$3,034.34	100.00%	\$3,034.34
Golf Course	Acre	\$729.91	100.00%	\$729.91
Recreational Community Center	1,000 SF GFA	\$3,514.00	58.72%	\$2,063.42
Ice Skating Rink	Seats	\$291.96	100.00%	\$291.96
Miniature Golf Course	Hole	\$802.90	100.00%	\$802.90

Theater				
Racquet/Tennis Club	Court	\$8,122.87	100.00%	\$8,122.87
Institutional				
Church	1,000 SF GFA	\$1,334.69	0.00%	\$0
Day Care Center	1,000 SF GFA	\$24,170.48	10.50%	\$2,537.90
Primary /Middle School(1-8)	Students	\$385.81	100.00%	\$385.81
High School	Students	\$312.82	100.00%	\$312.82
Junior/Community College	Students	\$291.96	100.00%	\$291.96
University/College	Students	\$510.94	100.00%	\$510.94
Medical				
Clinic	1,000 SF GFA	\$12,554.47	50.00%	\$6,277.74
Hospital	Beds	\$3,180.33	69.18%	\$2,200.15
Nursing Home	Beds	\$531.79	100.00%	\$531.79
Animal Hospital/Veterinary Clinic	1,000 SF GFA	\$9,155.17	50.00%	\$4,577.59
Office				
Corporate Headquarters Building	1,000 SF GFA	\$3,399.30	75.00%	\$2,549.48
General Office Building	1,000 SF GFA	\$3,607.85	75.00%	\$2,705.89
Medical-Dental Office Building	1,000 SF GFA	\$8,383.55	75.00%	\$6,287.66
Single Tenant Office Building	1,000 SF GFA	\$4,191.77	75.00%	\$3,143.83
Office Park	1,000 SF GFA	\$3,586.99	75.00%	\$2,690.24
Commercial Automobile Related				

Automobile Care Center	1,000 SF Occ. GFA	\$4,921.69	100.00%	\$4,921.69
Automobile Parts Sales	1,000 SF GFA	\$8,258.42	100.00%	\$8,258.42
Gasoline/Service Station	Vehicle Fueling Position	\$19,373.92	100.00%	\$19,373.92
Gasoline/Service Station w/Conv Market	Vehicle Fueling Position	\$14,274.97	100.00%	\$14,274.97
Gasoline/Service Station w/Conv Market and Car Wash	Vehicle Fueling Position	\$14,869.33	100.00%	\$14,869.33
New Car Sales	1,000 SF GFA	\$5,025.96	100.00%	\$5,025.96
Quick Lubrication Vehicle Shop	Servicing Bays	\$6,287.66	100.00%	\$6,287.66
Self-Service Car Wash	Stall	\$6,715.18	100.00%	\$6,715.18
Tire Store	1,000 SF GFA	\$7,246.97	100.00%	\$7,246.97
Commercial-Dining				
Fast Food Restaurant with Drive-Thru Window	1,000 SF GFA	\$40,583.05	29.71%	\$12,057.22
Fast Food Restaurant without Drive-Thru Window	1,000 SF GFA	\$31,698.99	14.01%	\$4,441.03
High Turnover (Sit-Down) Restaurant	1,000 SF GFA	\$15,411.55	12.35%	\$1,903.33
Quality Restaurant	1,000 SF GFA	\$10,166.62	12.48%	\$1,268.79
Coffee/Donut Shop with Drive-Thru Window	1,000 SF GFA	\$52,042.65	20.73%	\$10,788.44
Commercial-Other Retail				
Free-Standing Retail Store	1,000 SF GFA	\$8,727.65	50.00%	\$4,363.83

Center)				
Home Improvement Superstore	1,000 SF GFA	\$2,992.64	50.00%	\$1,496.32
Pharmacy/Drugstore w/o Drive-Thru Window	1,000 SF GFA	\$9,593.12	50.00%	\$4,796.56
Pharmacy/Drugstore w/Drive-Thru Window	1,000 SF GFA	\$12,794.30	50.00%	\$6,397.15
Shopping Center	1,000 SF GFA	\$5,964.42	50.00%	\$2,982.21
Supermarket	1,000 SF GFA	\$16,287.44	50.00%	\$8,143.72
Toy/Children's Superstore	1,000 SF GFA	\$8,466.97	50.00%	\$4,233.49
Department Store	1,000 SF GFA	\$3,023.92	50.00%	\$1,511.96
Video Rental Store	1,000 SF GFA	\$16,485.56	100.00%	\$16,485.56
Services				
Walk-In Bank	1,000 SF GFA	\$17,642.99	100.00%	\$17,642.99
Drive-In Bank	Drive-In Lanes	\$33,179.67	100.00%	\$33,179.67
Hair Salon	1,000 SF GFA	\$2,815.37	100.00%	\$2,815.37

Exhibit "B"
Water Impact Fee

Meter Type	Meter Size	Ratio to 5/8" Meter (Equiv # of EDU's)	Maximum Impact Fee	Adopted Impact Fee (70%)
Simple	5/8" × 3/4"	1.0	\$3,602.42	\$2,521.69
Simple-Residential	3/4"	1.0	\$3,602.42	\$2,521.69
Simple-Commercial	¾"	1.5	\$5,403.63	\$3,782.54
Simple	1"	2.5	\$9,006.06	\$6,304.24
Simple	1-1/2"	5.0	\$18,012.11	\$12,608.48

Compound	2"	8.0	\$28,819.38	\$20,173.57
Turbine	2"	10.0	\$36,024.22	\$25,216.95
Compound	3"	16.0	\$57,638.76	\$40,347.13
Turbine	3"	24.0	\$86,458.14	\$60,520.70
Compound	4"	25.0	\$90,060.56	\$63,042.39
Turbine	4"	42.0	\$151,301.74	\$105,911.22
Compound	6"	50.0	\$180,121.12	\$126,084.78
Turbine	6"	92.0	\$331,422.85	\$231,996.00
Compound	8"	80.0	\$288,193.79	\$201,735.65
Turbine	8"	160.0	\$576,387.57	\$403,471.30
Compound	10"	115.0	\$414,278.57	\$289,995.00
Turbine	10"	250.0	\$900,605.58	\$630,423.91
Turbine	12"	330.0	\$1,188,799.37	\$832,159.56

Exhibit "C"

Maximum Impact Fee per 5/8 Inch Meter Equivalent - Wastewater

Meter Type	Meter Size	Ratio to 5/8" Meter (Equiv # of EDU's)	Maximum Impact Fee	Adopted Impact Fee (100%)
Simple	5/8" × 3/4"	1.0	\$1,857.68	\$1,857.68
Simple-Residential	3/4"	1.0	\$1,857.68	\$1,857.68
Simple-Commercial	3/4"	1.5	\$2,786.53	\$2,786.53
Simple	1"	2.5	\$4,644.21	\$4,644.21
Simple	1-1/2"	5.0	\$9,288.42	\$9,288.42
Simple	2"	8.0	\$14,861.47	\$14,861.47
Compound	2"	8.0	\$14,861.47	\$14,861.47

Compound	3"	16.0	\$29,722.94	\$29,722.94
Turbine	3"	24.0	\$44,584.40	\$44,584.40
Compound	4"	25.0	\$46,442.09	\$46,442.09
Turbine	4"	42.0	\$78,022.71	\$78,022.71
Compound	6"	50.0	\$92,884.17	\$92,884.17
Turbine	6"	92.0	\$170,906.88	\$170,906.88
Compound	8"	80.0	\$148,614.68	\$148,614.68
Turbine	8"	160.0	\$297,229.36	\$297,229.36
Compound	10"	115.0	\$213,633.60	\$213,633.60
Turbine	10"	250.0	\$464,420.87	\$464,420.87
Turbine	12"	330.0	\$613,035.55	\$613,035.55

~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3443, sec. 1, adopted 12/3/12)~~

Sec. 8-2221. Inspection fees.

A. Each plat applicant shall pay to the city an inspection fee equal to set proportion of the estimated cost of public improvements in and adjacent to the requested plat. The inspection fee shall be in accordance with the City of Sachse Master Fee Schedule established by resolution of the city council. Public improvements include, but are not limited to, water, sewer, streets, and drainage. The determination of the inspection fee shall be based upon contracts provided by the applicant to estimate the construction costs of public improvements. The fee shall be paid before the release of engineering plans and/or site plans. ~~(Ordinance 3401, sec. 1, adopted 7/2/12; Ordinance 3443, sec. 2, adopted 12/3/12)~~

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	4. Consider and act on an ordinance adopting an Engineering Design Manual.
Access	Public
Type	Action, Discussion
Preferred Date	May 06, 2019
Absolute Date	May 06, 2019
Fiscal Impact	No
Budgeted	No
Recommended Action	Approve as presented.

Public Content**BACKGROUND**

The City of Sachse is updating the Subdivision Ordinance. The Engineering Design Manual is a companion item to this update.

OVERVIEW

The City of Sachse is updating the Subdivision Ordinance to better reflect the standards and requirements related to the recently approved zoning districts in the community. The Engineering Design Manual was created in order to provide prospective developers and consulting engineers with a singular location for all relevant design standards and requirements of new development in the city. Public infrastructure designed and built as a component of private development is operated and maintained by the City of Sachse upon final acceptance of the subdivision. The Engineering Design Manual provides the minimum standards and requirements for the design of such public infrastructure.

This design manual will also improve the ability of City staff to work with private developers and consulting engineers to ensure that new development projects are properly designed and constructed in accordance with the City's standards.

POLICY CONSIDERATIONS

The City Council of the City of Sachse has the authority to adopt standards and requirements pertaining to the design and construction of public infrastructure.

RECOMMENDATION

Staff recommends approval of an ordinance adopting the City of Sachse Engineering Design Manual; providing for a repealing clause; providing for a severability clause; and providing for an effective date.

Ordinance Adopting Engineering Design Manual .pdf (77 KB)

Exhibit A - Engineering Design Manual.pdf (5,223 KB)

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY OF SACHSE, TEXAS, ADOPTING THE CITY OF SACHSE ENGINEERING DESIGN MANUAL; PROVIDING FOR A REPEALING CLAUSE; PROVIDING FOR A SEVERABILITY CLAUSE; AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the City of Sachse Subdivision Ordinance is the controlling document for the standards and requirements for the development of new subdivisions in the City of Sachse; and

WHEREAS, the City of Sachse Engineering Design Manual shall be the controlling document for the design of public infrastructure related to the development of new subdivisions in the City of Sachse; and

WHEREAS, the City Council, in the exercise of its discretion, has concluded that the attached Engineering Design Manual should be approved;

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SACHSE, TEXAS:

SECTION 1. The City of Sachse Engineering Design Manual for the design of public infrastructure, attached hereto as Exhibit "A", is hereby adopted, with a copy being kept on file in the office of the City Secretary. All new development projects within the City of Sachse must be designed in compliance with this Engineering Design Manual.

SECTION 2. That all provisions of the Ordinances of the City of Sachse, Texas, in conflict with the provisions of this Ordinance be and the same are hereby, repealed, and that all other provisions of the Ordinances of the City of Sachse not in conflict with the provisions of this Ordinance shall remain in full force and effect.

SECTION 3. That should any sentence, paragraph, subdivision, clause, phrase or section of this Ordinance be adjudged or held to be unconstitutional, illegal, or invalid, the same shall not affect the validity of this Ordinance as a whole or any part or provision thereof other than the part thereof decided to be unconstitutional, illegal, or invalid.

SECTION 4. This ordinance shall take effect immediately from and after its passage.

DULY PASSED AND APPROVED by the City Council of the City of Sachse, Texas on the _____ day of _____, 2019.

APPROVED:

Mike J. Felix
Mayor

DULY ENROLLED:

Michelle Lewis Sirianni
City Secretary

APPROVED AS TO FORM:

Joseph J. Gorfida
City Attorney

City of Sachse, Texas



Manual for the Design of Public Infrastructure



Ordinance # _____

Revision Date: _____

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Section 0.1

General Requirements

A. Introduction

This manual is intended to aid and assist private engineers in the layout and design of paving improvements, drainage improvements, sanitary sewers and water lines to definite standards and to obtain uniformity in the plans. It is recognized that each addition has its individual challenges and that no fixed rules will apply to all cases; therefore, final acceptance of all or any part of any plans rests with the Director of Public Works & Engineering or his/her designee of the City of Sachse.

B. Submittal

It is recommended that the Developer or private engineer provide a preliminary project layout to the City prior to the submittal of a preliminary plat, in order to receive City input on the general layout and availability of public utilities.

C. Preliminary Plat

When submitting the preliminary plat, submit three sets of legible prints and one digital copy of the concept utility plan.

D. Construction Plans

Upon approval of the preliminary plat, the private engineer shall submit detailed civil construction plans for the project to the City, including 4 full size sets, 2 half size sets, and a digital copy of the plans in PDF format. In addition, payment of the City's plan review fee is due at this time.

E. Final Approval of Plans

Before you request approval of the plans, check the following:

- 1) The plans must be complete and correct.
- 2) The approved plat must have been submitted.
- 3) The street grades, storm sewer plans, and water and sanitary sewer plans must have been submitted and approved.
- 4) The plans must be signed and sealed by a Professional Engineer licensed in the State of Texas, who is responsible for the design.
- 5) All fees and other monies due must be paid in full.
- 6) Contractor's insurance must be in correct form.
- 7) Three full size and three half size sets of complete engineering plans are required for

City use. There should be additional approved plans available for Contractors and Engineering Consultants use during construction of the improvements. The City Representative will only recognize those plans with the "approved" stamp.

- 8) Upon completion of construction and prior to acceptance of that construction by the City, one set of prints and a digital copy of the record drawings must be submitted to the City.

F. Specifications are the Standard Specifications for Public Work Construction, North Central Texas latest addition as prepared by the North Central Texas Council of Governments.

G. Special Provisions are City of Sachse Special Provisions to the Specifications.

H. Standard Details are as prepared by the City of Sachse and NCTCOG with City of Sachse standards having precedence over NCTCOG standard details.

City of Sachse, Texas



Roadway Design



Section 1.1

General Thoroughfare Requirements

A. Introduction

The “Thoroughfare Design Standards” are intended to implement the provisions of the Subdivision Ordinance and to provide for the orderly, safe, healthy and uniform development of the area within the corporate city limits of the City of Sachse.

The City of Sachse “Standard Construction Details”, “Special Provisions” and the North Central Texas Council of Governments (NCTCOG) “Standard Specifications for Public Works Construction” are considered supplemental and are part of the Thoroughfare Design Standards. The Thoroughfare Design Standards are to be considered as the minimum requirements for engineering design. Adherence to the requirements of these standards and/or approval by the City of Sachse or its his/her designees in no way relieves the developer or his engineer for adequacy of design or for the completeness of the plans and specifications or the suitability of the completed facilities. Specific projects may require more stringent design standards. The City of Sachse may determine that design requirements other than those included in these standards are necessary and will inform the developer of such requirements before the final engineering review.

The developer shall notify the City of Sachse, in writing, of any known deviations from the requirements set for in the standards for thoroughfare design, construction details, or specifications.

B. Thoroughfare Design Standards

The Thoroughfare Design Standards are to be considered as the minimum requirements for engineering design. It is not intended that these standards cover all aspects of paving construction for any given development. The developer shall provide proper engineering design for all facilities not covered by these standards in accordance with good engineering practice and shall utilize first class workmanship and materials in all construction.

C. Special Provisions and Standard Specifications

The City of Sachse has adopted the most recent version of the NCTCOG Standard Specifications for Public Works Construction together with the Special Provisions to the Standard Specifications. These documents set forth the minimum requirements for materials and workmanship for public works construction.

D. Standard Construction Details

The City of Sachse has adopted a set of standard construction details in order to promote uniformity of development and to facilitate maintenance of various public works facilities. The standard construction details are to be considered as the minimum requirements for materials and workmanship for public works construction.

E. Inspection of Construction By City Personnel

Inspection of construction activities shall be conducted by staff of the City of Sachse under direction of the Director of Public Works & Engineering or his/her designee. The City inspector shall observe and check the construction in sufficient detail to satisfy himself that the work is proceeding in general conformance with the standards and specifications for the project, but he will not be a guarantor of the Contractor's performance. The City will not accept any development until City staff has approved all construction. The developer shall be responsible for any additional expense to the City for inspection that is necessary after normal business hours, or when the improvements will be privately owned. The City has an established rate for compensation and other expenses.

The developer will be responsible for furnishing the original reproducible engineering drawings corrected to show any revised construction conditions to the City before any improvements will be accepted. All public works improvements must be accepted by the City before City Building permits will be issued, except as noted in the Subdivision Ordinance.

Section 1.2

Street Design Standards

A. Definitions

Refer to Table 1 in Appendix A for Thoroughfare Definitions related to location and size of pavement, right-of-way, pavement, and parkway.

B. Minimum Horizontal Design Radius

Minimum Centerline Radius is defined by the design speed of the respective street. The design speed of each street in the City of Sachse, as defined by the Thoroughfare Plan, can be determined from Table 2.

TABLE 2
Maximum Design Speed of Each Type of Street

<u>Street Type</u>	<u>Design Speed</u>
Residential (Type E & E-1).....	30
Collector (Type D).....	35
Minor Arterial Thoroughfare (Type C).....	45
Major Arterial (Type B)	50

The minimum acceptable horizontal centerline radius, for each respective street's design speed, is shown in Table 3. The cross slope is assumed to be 1/4" per foot from the inside toward the outside.

TABLE 3**Minimum Horizontal Centerline Radius**

<u>Y</u> (mph)	<u>f</u>	<u>e</u> (ft/ft)	(e + f)	<u>R</u> (Calculated) (ft)	<u>R</u> (Rounded for Design) (ft)
25	0.170	-0.0208	0.1492	279.27	280
30	0.160	-0.0208	0.1392	431.03	440
35	0.150	-0.0208	0.1292	632.09	640
40	0.145	-0.0208	0.1242	858.83	860
45	0.142	-0.0208	0.1212	1,113.86	1,120
50	0.140	-0.0208	0.1192	1,398.21	1,400
55	0.130	-0.0208	0.1092	1,846.76	1,850
60	0.120	-0.0208	0.0992	2,419.35	2,420

(AASHTO P 177)

Minimum centerline design radius for residential streets shall be 280-feet for curves with a length over 125 feet long

C. Minimum Vertical Alignment

Vertical Alignment is a function of Stopping Sight Distance (SSD), which is given by:

$$SSD = 1.47PV + \frac{V^2}{30(f + g)}$$

Transportation and Traffic Engineering Handbook, Second Edition, Page 590)

Stopping Sight Distances are calculated for $g = 0$, rates of vertical curvature are derived from AASHTO Page 307, 312 and 316 and used (K) to determine crest curve lengths per Table 4.

The maximum grade for residential streets is 10% unless otherwise approved by the City where natural topography is such as to require steeper grades. The maximum grade for all other streets shall be 7.50% except by special permission from the Director of Public Works & Engineering or his/her designee. The minimum grade for all streets is 0.70% except by special permission from the Director of Public Works & Engineering or his/her designee.

TABLE 4

**Minimum Acceptance Crest Curve Given Speed and
Difference in Grade of Road**

S			K									
MPH Ft.			L-KA									
			A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	19	0	40	60	80	100	120	140	150	170	190
35	250	29	0	60	90	120	150	180	200	230	260	290
40	325	44	50	90	130	180	220	270	310	350	400	440
45	400	61	60	120	180	250	300	370	430	490	550	610
50	475	84	90	170	250	340	420	500	590	670	760	840
55	550	114	120	230	340	460	570	690	800	920	1030	1140
60	650	151	150	300	450	600	760	910	1060	1210	1360	1510

Note: No Crest Vertical Curves with a grade difference of less than 1.5% shall be constructed for residential streets. When the grade difference is 1.5% or less, the private engineer shall use a point of vertical influence.

TABLE 5

**Minimum Acceptable Sag Curve Given Speed and
Difference in Grade of Road**

S			K									
MPH Ft.			L-KA									
			A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	37	0	100	120	160	200	240	280	320	360	400
35	250	50	0	100	150	200	250	300	350	400	450	500
40	325	64	70	130	190	260	320	390	450	520	580	640
45	400	79	80	160	240	320	400	480	560	640	720	790
50	475	96	100	200	290	390	480	580	670	770	870	960
55	550	115	116	230	350	460	580	690	810	920	1040	1150
60	650	136	136	280	410	550	680	820	960	1090	1230	1360

D. Intersection Curb Radii

The radius shall be thirty (30) feet at the intersection of all **Major and Secondary Thoroughfare** intersecting streets unless otherwise approved by the Director of Public Works & Engineering or His/her designee.

See Detail, page 10.

Note: At many intersections, the curb radius encroaches on the right-of-way so as to not provide sufficient room for sidewalks, utilities, etc. within the parkway. Therefore, right-of-way will be dedicated at the intersection of all streets such that adequate room is provided.

E. Residential Frontage

Residential houses shall not front a Major Arterial or Minor Arterial unless parallel access roads are provided. Minimum distances between adjacent curbs or the thoroughfare and the access road shall be twenty (20) feet.

F. State Designated Roads

All such roads within the City of Sachse will conform to State Design Standards unless otherwise directed by the Director of Public Works & Engineering.

Section 1.3

Median and Left Turn Lane Design Standards

A. Width of Median

Median widths vary from a minimum of 4' (with left turn lanes) to a maximum of 24' (see table 1).

B. Required Median Opening and Left-Turn Lane

Median openings on divided thoroughfares shall be provided at all dedicated street intersections and at private drives where they conform to the City's spacing requirements. A left turn lane for the proposed drive or street shall accompany the median opening.

C. Cost of Median Openings and Left-Turn Lanes

Median openings and left-turn lanes constructed to serve private drives and new roads shall be paved to City standards, inspected by City Inspectors, and paid for by owners served by the median openings and left-turn lanes. The City shall be responsible for, and pay the costs of, the paving of median openings and left-turn lanes, constructed to serve existing dedicated streets, and those that exist for drives, when a part of the Capital Improvement widening program is undertaken by the City on an existing public street.

D. Minimum Left-Turn Storage Transition Length, and Median Opening Width, Location, and Spacing Requirements

1) Left Turn Storage

All left-turn storage areas shall be ten (10) feet wide with minimum storage requirements for left-turn lanes as in Table 6.

TABLE 6
Minimum Left Turn Storage Requirements

<u>Intersecting Thoroughfares</u>	<u>Minimum Storage</u>
Major with Major	150 feet
Major with Minor	100 feet
Major with Collector	60 feet
Major with Residential	60 feet
Minor with Major	100 feet
Minor with Collector	60 feet
Minor with Residential	60 feet

Note: Storage requirements listed herein are absolute minimums. Storage requirements may increase based upon actual and projected traffic demands.

2) Transition Length

The transition curves used in left-turn lanes shall be two 250-foot radius reverse curves, which will require a total transition length of 100-feet, except by special permission from the Director of Public Works & Engineering or his/her designee.

3) Median Openings

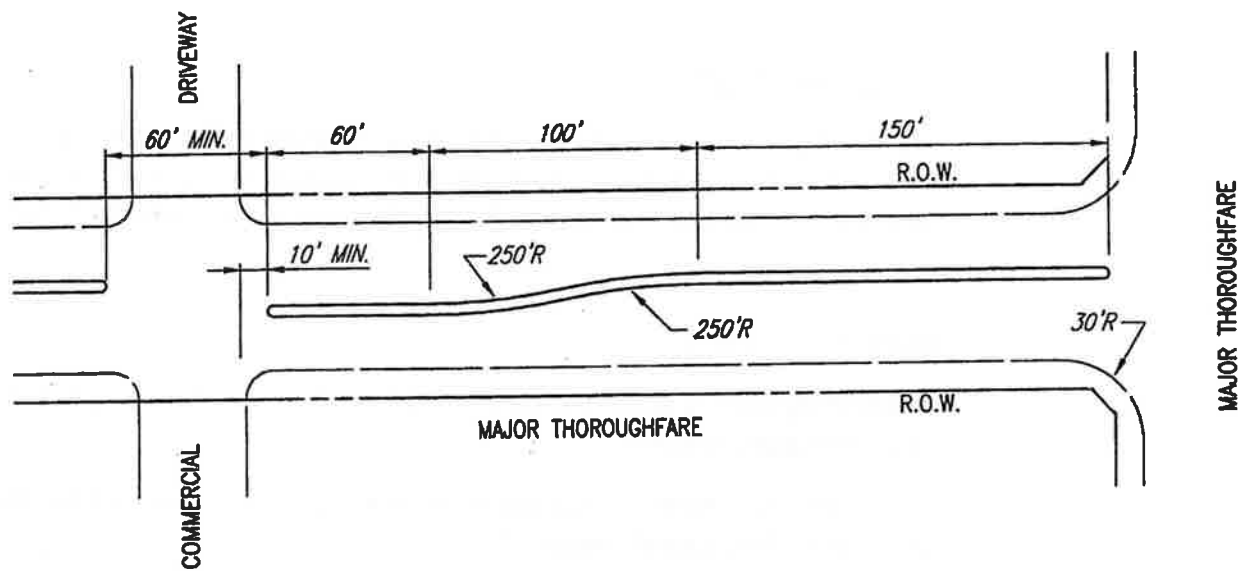
- a) Median openings at Intersections shall be from right-of-way to right-of-way or the intersecting street.
- b) The minimum width of mid-block median openings shall not be less than sixty (60) feet. See Detail, page 14.

4) Medians Where No Left-Turn Pocket is Needed

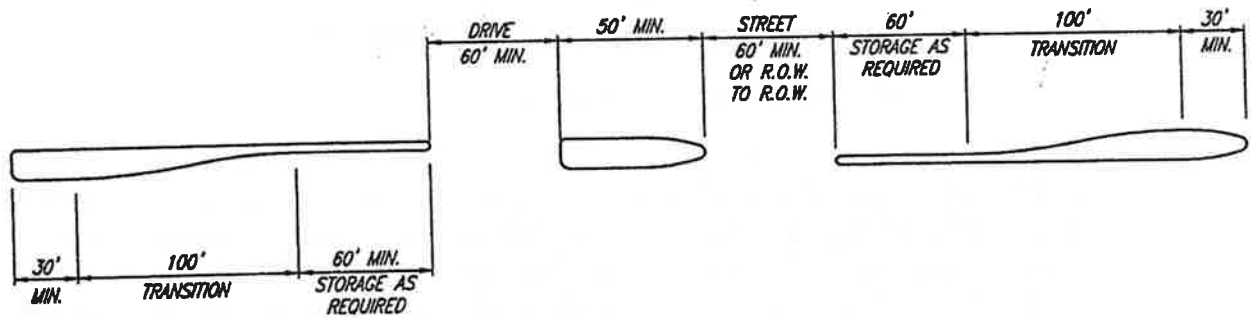
- a) If left-turn storage is provided in only one direction, (i.e., a drive cannot be installed for the other direction), the minimum length of median must be the required left-turn storage and transition length, plus 30-feet of median length beyond the end of the transition.
- b) If the left turn storage is not required in either direction, but the median is simply a spacer between two median openings, the minimum length of the spacer must be 50- feet. See Detail, page 15.

5) Medians into Developments on Public Streets

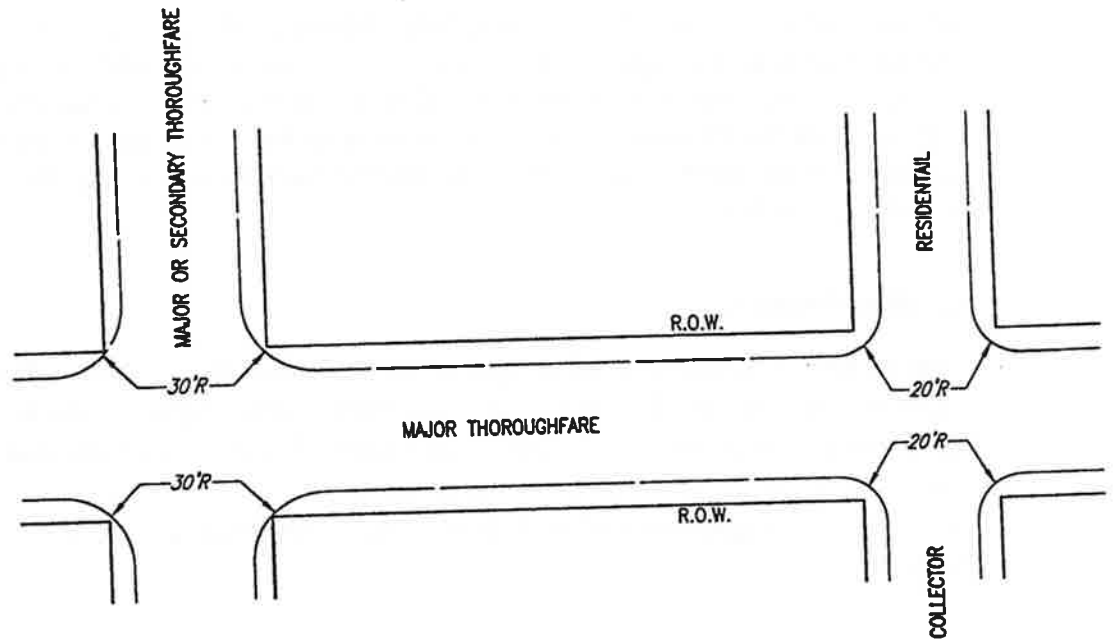
Medians installed on undivided streets at entrances to subdivisions for aesthetic or any other purpose will be a minimum of 4-feet wide and 75-feet long.



TYPICAL MEDIAN OPENING SPACING
MAJOR THOROUGHFARE



TYPICAL MEDIAN DIMENSIONS WITHOUT
BACK TO BACK LEFT TURN POCKETS



CURB RADII AT INTERSECTION

Section 1.4

Alley Design Standards

A. Alley Requirements for Developments

Alleys shall be constructed in accordance with City of Sachse Subdivision Ordinance. Alleys shall be paved with concrete in accordance with the City's Standard Construction Details. Alleys may be required in commercial and industrial developments. The City may waive the commercial and industrial alley requirement upon determination of the Council, if in its opinion adequate provisions are made for service access such as off-street loading, unloading and parking consistent with the uses proposed.

B. Alley Instructions

Alleys shall not intersect major arterials. Alleys shall not intersect minor arterials with medians except with special approval by the Director of Public Works & Engineering or his/her designee. Alleys which run parallel to and share a common right-of-way line with a minor thoroughfare shall turn away from the minor street not less than one subdivision lot width or a minimum of 50-feet (whichever is greater) from the cross street intersection.

C. Alley Widths

The minimum residential alley right-of-way width shall be fifteen (15) feet with a minimum 10-foot paved width. The minimum commercial alley right-of-way width shall be fifteen (20) feet with a minimum 15-foot paved width. Dead-end alleys shall not be permitted without special permission from the Director of Public Works & Engineering or His/her designee. The geometry of alley construction shall conform to the Standard Construction Details

D. Alley Radius

Alley radii at street intersections in residential developments shall not be less than 10-feet. Alley radii at street intersections in commercial and industrial developments shall not be less than 30-feet unless approved by the Director of Public Works & Engineering or His/her designee.

Section 1.5

Driveway Design Standards

A. Definition of Driveway Types

For purposes of interpreting the provisions of these Rules and Regulations, the following definitions shall apply:

- 1) A "residential" driveway provides access to a single-family residence or duplex. These drives shall intersect residential and collector roadways only. All access to residential property abutting all other thoroughfares shall be off the alley or a service road except by special permission from the Director of Public Works & Engineering or his/her designee. **All residential driveways shall be concrete except as provided in the City of Sachse Subdivision Ordinance.**
- 2) A "commercial" driveway provides access to an office, retail or institutional building, or to a multiple-family building. It is anticipated that such buildings will have incidental truck service. Commercial drives shall not access residential streets. **All Commercial driveways shall be concrete.**
- 3) An "industrial" driveway serves substantial numbers of truck movements to and from loading docks of an Industrial facility, warehouse, or truck terminal. A central retail development, such as a community or regional shopping center, may have one or more driveways specially designed, signed, and located to provide access for trucks and such driveways shall be considered industrial driveways. Industrial plant driveways whose principle function is to serve administrative or employee parking lots shall be considered commercial driveways. Industrial drives shall not access residential streets. **All Industrial driveways shall be concrete.**

Note: Two-way driveways shall always be designed to intersect the street at a 90^o angle. One-way driveways may be designed to intersect a street at a 45^o angle.

B. Driveway Width

As the term is used here, the width of a driveway refers to the width of pavement at the property line.

- 1) Residential driveways onto streets shall have a minimum width of 12-feet and a maximum width of 24-feet. Joint access residential drives shall have no less than nine (9) feet on any property. See Detail (a), page 20.

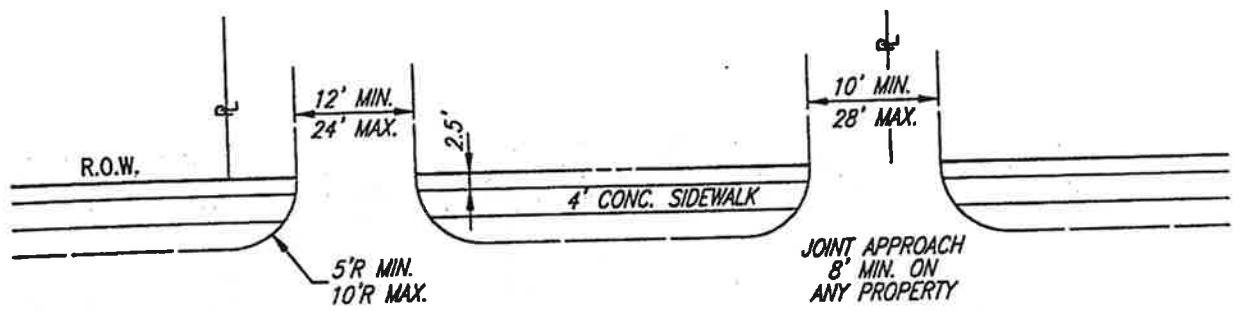
- 2) Commercial/Industrial. Two-way operation: See Detail (b), page 20.
 - a) Commercial driveways shall have a minimum width of twenty-four (24) feet and a maximum width of 30-feet.
 - b) Industrial driveways shall have a minimum width of 30-feet and a maximum width of 40-feet. Joint access commercial/industrial drives shall have no less than Ten (10) feet on any property, with the full drive width and access pavement to the property built for the development at the same time.
- 3) Commercial/Industrial - One way operation:
 - c) 90-degree drives shall have a width of 18-feet for ingress and 22-feet for egress, with the separation median width being a minimum of 4-feet and a maximum of 10-feet. See Detail (c), page 21.
 - d) 45-degree drives shall have a width of 18-feet for ingress and 16-feet for egress, with the separation median width being a minimum of 4-feet and a maximum of 10-feet. Joint access commercial/industrial drives shall have no less than 10-feet on any property, with the full drive width and access pavement to the property built for the development at the same time. See Detail (d), page 21.

C. Driveway Radius

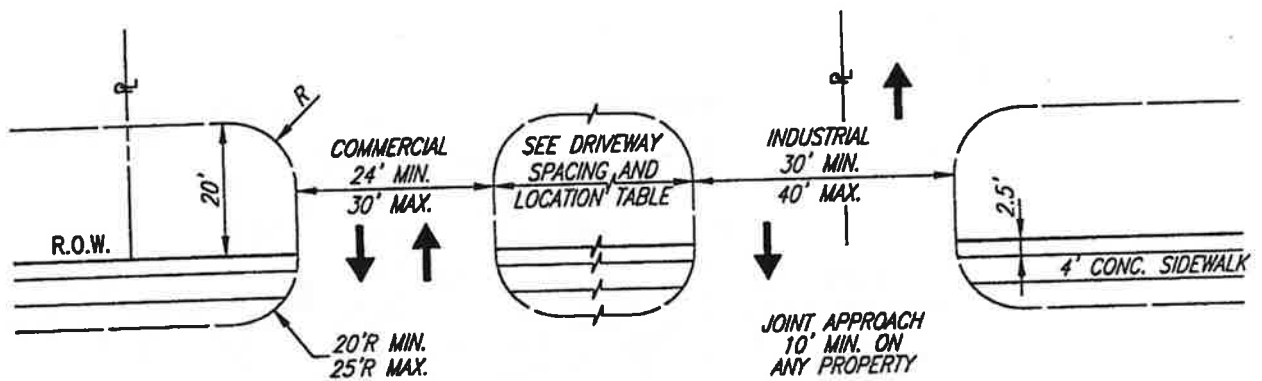
All driveways intersecting dedicated streets shall be built with a circular curb radius connecting the 6-inch raised curb of the roadway to the design width pavement of the driveway. All driveways shall provide for barrier free access. Driveway radii shall fall entirely within the subject property so as to begin at the street curb, at the extension of the property line.

- 1) 90-Degree Intersection (See Detail, page 23)
 - a. The curb radii for a residential drive shall be a minimum of 5-feet and a maximum of 10-feet.
 - b. The curb radii for commercial and industrial drives shall be 30-feet unless otherwise approved by the City.
- 2) 45-Degree Intersection
 - a. The Curb radii shall be 5-feet for the outside of the drive and 2 ½ feet for the median. See Detail, page 21.

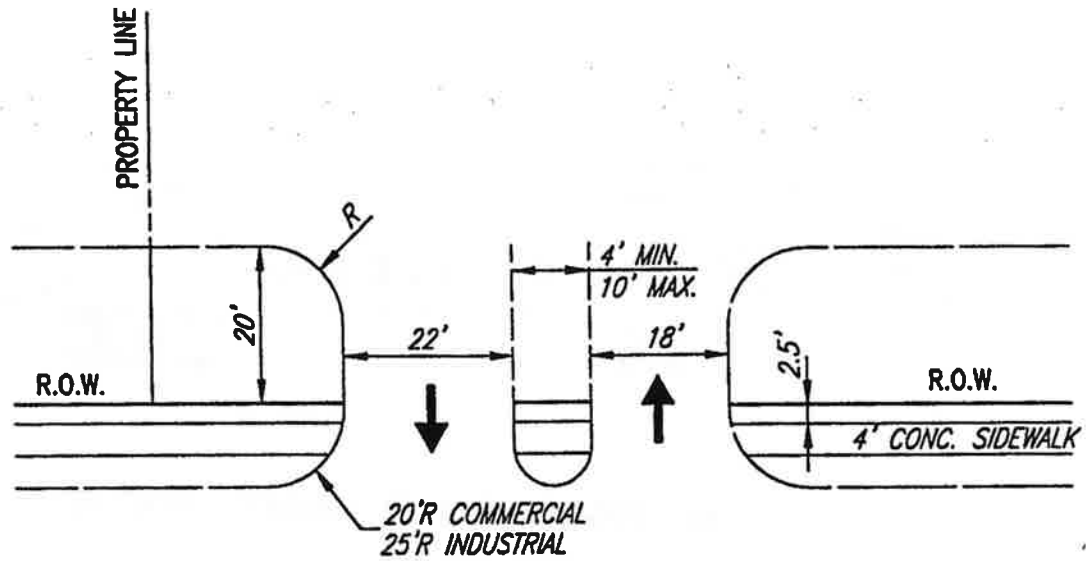
In order that the definition of the location of the edge of pavement for the thoroughfare may be maintained, driveway radii shall always be designed to become tangent to the street curb line. All commercial and industrial drives will have an unbroken curb length of not less than 20-feet from the right-of-way, or 30-feet from the roadway curb extending into the site on each side of the drive.



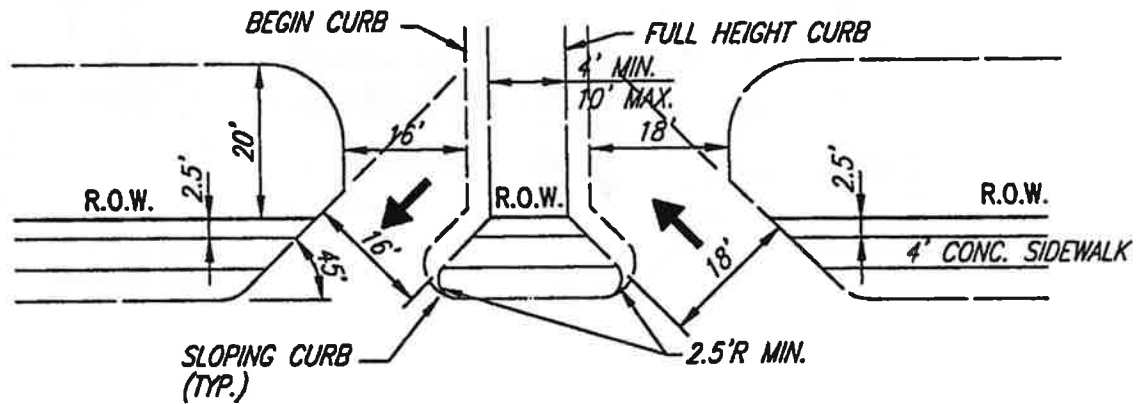
(a) DRIVEWAYS WIDTH, RADIUS, SPACING



(b) DRIVEWAYS WIDTH, RADIUS, SPACING



(c) DRIVEWAYS WIDTH, RADIUS, SPACING



(d) DRIVEWAYS WIDTH, RADIUS, SPACING

D. Driveway Spacing and Location in Relation to Other Drives

1) Residential

Driveway approaches on a tract of land devoted to one use shall not occupy more than 70% of the frontage abutting the roadway. No more than two driveway approaches shall be permitted on any parcel of property on each street.

2) Commercial and Industrial

The spacing and location of driveways shall be related to both existing adjacent driveways and those shown on approved development plans. The spacing between driveways shall depend upon the design speed of the street as shown Table 7. Driveways shall not be permitted in the transition area of a deceleration lane or a right turn lane.

TABLE 7

Driveway Spacing in Relation to Other Drives Given the Design Speed of the Street

<u>Design Speed (MPH)</u>	<u>Driveway Spacing (Ft.)</u>
30	90
35	100
40	120
45	150
50	200

The minimum spacing shall not be more than 10-feet less than shown above. Spacing between driveways will be measured along the property line from the edge of one driveway to the closest edge of the next driveway and not from centerline to centerline.

E. Driveway Spacing in Relation to a Cross Street

1) 90 Degree Intersection - Drive to Road

- a) Driveways that intersect at 90 degrees to a residential street shall be located a minimum of the drive radius from a residential street's end of curb radius.
- b) A residential driveway that intersects at 90 degrees to a collector shall be located a minimum of thirty (30) feet from an end of curb radius. (see Detail (a), page 25)
- c) A commercial or industrial driveway that intersects at 90 degrees to an arterial or collector shall be located a minimum of 100-feet from any intersecting street's right-of-way or from the end of any intersecting street's curb radius as determined by the Director of Public Works & Engineering. If the property length, along the street, is such that both the drive and the drive's curb radius cannot be totally within the proposed development, the drive will be situated so as to be a joint access drive. (see Detail (b), page 25)

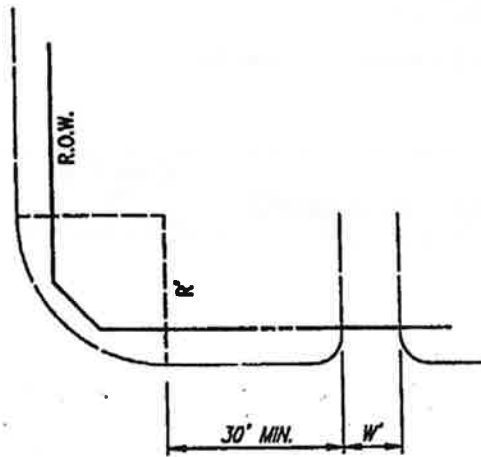
2) 45 degree Intersection - Drive to Road

- a) If one-way angle drives are used, the radius for the driveway may not begin less than 35-feet from an intersecting street's end of curb radius.
- b) On an arterial or collector the drive shall be located a minimum of 100-feet from any intersecting street's right-of-way. If a property length, along the street, is such that both the drive and drive's curb radius cannot be totally within the proposed development, the drive will be situated so as to be a joint access drive. (see Detail (c), page 23)

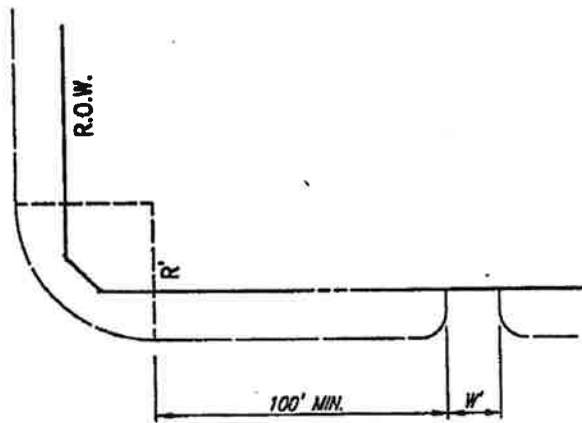
A summary of driveway widths, radii, and angle requirements are given in Table 8.

TABLE 8
Summary of Drive Requirements

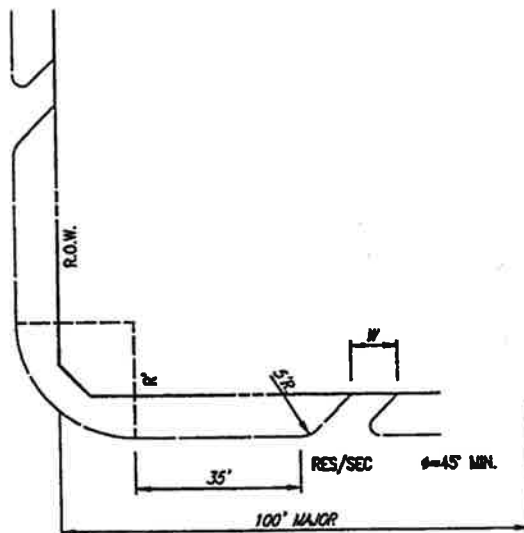
	Residential	Commercial	One-Way		Industrial
			In	Out	
Width (ft)					
Minimum	12	24			30
One-way (only)					
90°			18	22	
45°			18	16	
Maximum	24	30			40
Curb Radius (ft)					
45° (one-way)	5	10	10	10	10
90°	5 – 10	30	Same	Same	30
Intersection					
Angles (deg.)	90°	90°	90°	90°	90°
	45°	45°	45°	45°	45°



(a) Drive Intersecting a Residential Street



(b) 90° Drive Intersecting an Arterial or Collector



(c) Angle Drive

Section 1.6

Sidewalk and Location Design Standards

A. Definition of Sidewalk

A sidewalk is defined as that paved area in a roadway right-of-way between the curb lines or the edge of pavement or the roadway and the adjacent property lines for the use of pedestrians. The maximum cross slope of the sidewalk shall be ¼-inch per foot. These sidewalks shall conform to the following standards:

- 1) Zoning Classification Requiring Sidewalks: Concrete sidewalks designed and located according to City standards shall be constructed along all streets in all zoning classifications except agricultural zoning. The Owner shall build sidewalks at the time of site development. Should it be impractical to install the sidewalk at that time, funds for the sidewalk construction shall be placed in escrow with the City for use at a future date. Payment or escrow shall be made in accordance with the City of Sachse Subdivision Ordinance.
- 2) Residential Areas (Single Family, Two Family): Sidewalks shall be a minimum of 4-feet in width and located 1-foot from the right-of-way line, except as provided for in the City of Sachse Subdivision Ordinance and Zoning Ordinance. Along thoroughfares with inadequate right-of-way the sidewalk width shall be 5-feet in width and constructed adjacent to the back of curb.
- 3) Non-Residential Areas: Sidewalks shall be 5-feet in width and located 1-foot from the right-of-way line. Along thoroughfares with inadequate right-of-way the sidewalk width shall be 6-feet in width and constructed adjacent to the back of curb.
- 4) Exceptions: In areas where mailboxes interfere with a clear width of 4 or 5 feet for the sidewalk, the specified width shall be wrapped around the mailbox.
- 5) Waiver: The sidewalk required in non-residential areas may be waived by the City Council either temporarily or permanently at the time of site plan or final plat approval. Waiver may be granted based on site conditions and/or location of the tract.

- 6) Areas Without Screening Walls: In areas on arterial and collector roads where either screening is not required or a type of screening other than a wall is used, (e.g., a berm, foliage, etc.) a 5-foot sidewalk will be constructed not more than 2½-feet from the right- of-way line as required by the Thoroughfare Plan.
- 7) Areas with Screening Walls: In areas where a screening wall is provided, a concrete sidewalk shall be constructed contiguous with the screening wall. The street side of the sidewalk shall run parallel to the street curb. The sidewalk shall be a minimum of 5-feet wide and the measurement shall be made from the street side of the sidewalk.
- 8) Sidewalk on Bridges: Bridges on thoroughfares shall have a sidewalk constructed on each side of the bridge. The sidewalk shall be a minimum of 6-feet wide with a parapet wall provided adjacent to the curb of the thoroughfare and with a standard pedestrian bridge rail protecting the sidewalk on the outside edge of the bridge.
- 9) Sidewalks under Bridges: When new bridges are built as a part of the construction of a roadway or the reconstruction of a roadway and a pedestrian crossing is needed, a sidewalk or shared use path will be built as a part of the embankment design underneath the bridge structure in accordance with the City of Sachse Trail Master Plan. The sidewalk or shared use path shall be located generally along the toe of the embankment.

B. Barrier Free Ramps (Compliance shall be with the American Disability Act)

Curbs and walks constructed at intersections or all streets and thoroughfares must comply with the provisions of the American Disability Act and be constructed in a manner to be easily and safely negotiated by physically challenged persons.

Section 1.7

Public Right of Way Visibility

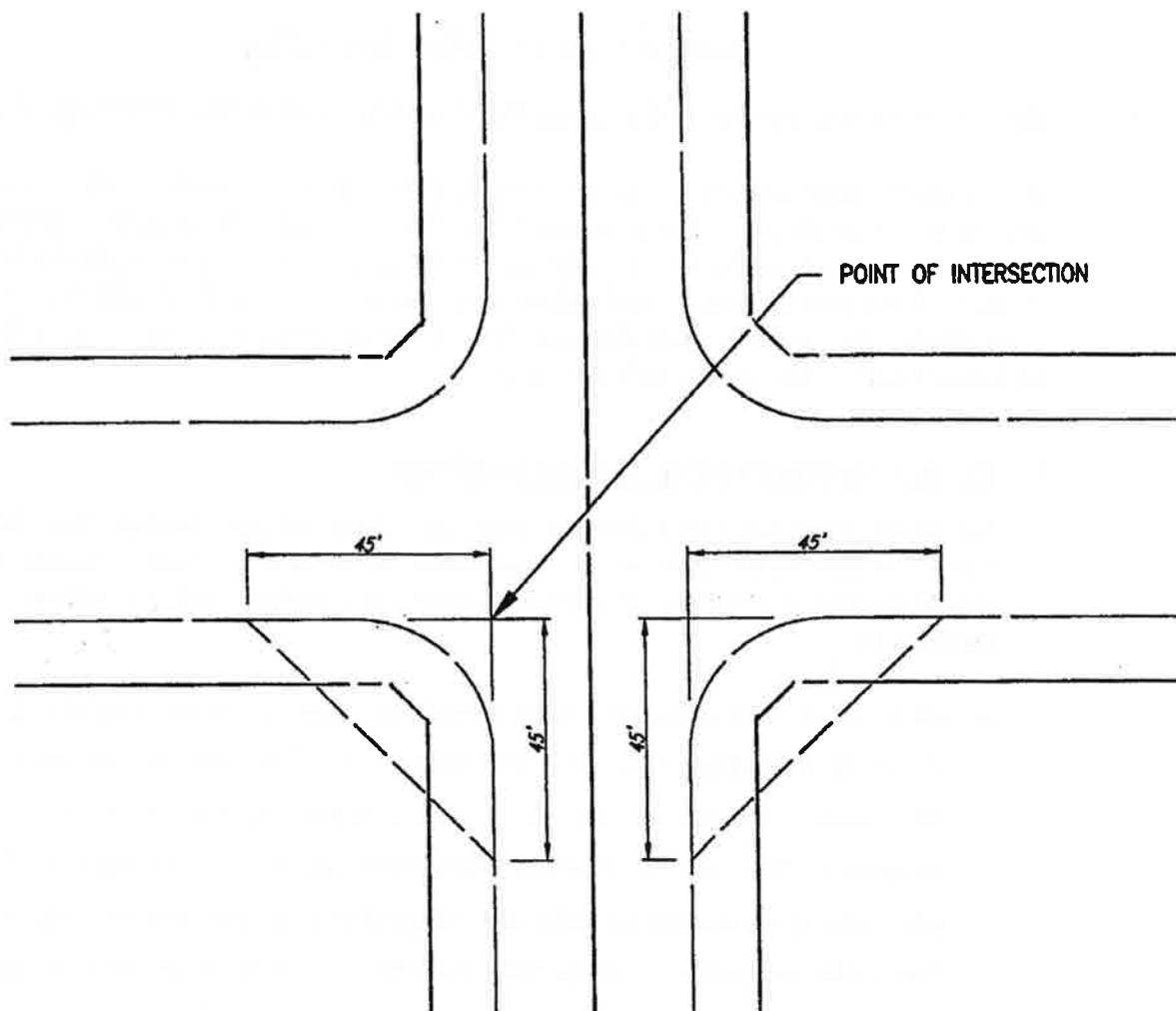
A. Street/Drive Intersection Visibility Obstruction Triangles- Frontage Plan/ Profile

A landscape plan showing the plan/profile of the street on both sides of each proposed drive/street to the proposed development with the grades, curb elevations, proposed street/drive locations, and all Items (both natural and man-made) within the visibility triangles as prescribed below shall be provided with all engineering plan submittals. This profile shall show no horizontal or vertical restrictions (either existing or future) within the areas defined below.

1) Obstruction/Interference Triangles-Defined

No fence, wall, screen, billboard, sign, structure, foliage, hedge, tree, bush, shrub, berm, or any other item, either manmade or natural shall be erected, planted, or maintained in a position, which will obstruct or interfere with the following minimum standards.

- a) Vision at all intersections where streets intersect at or near right angles shall be clear at elevation between 2½-feet and 9-feet above the average gutter elevation, except single trunk trees, within a triangular area formed by extending the two curb lines from their point of intersection, 45-feet, and connecting these points with an imaginary line, thereby making a triangle. If there are no curbs existing, the triangular area shall be formed by extending the property lines from their point of intersection 30-feet and connecting these points with an imaginary line, thereby making a triangle. (see Detail, page 23)
- b) Definitions for desirable minimum sight distance requirements for non-residential streets, commercial driveways, and industrial driveways that intersect at or near right angles are presented below (see Detail, page 25). The values presented are minimum sight distances which would permit the following:
 - T-Upon turning left or right, an existing vehicle could accelerate to the operating speed of the street.



HORIZONTAL CLEAR TRIANGLE

The desirable minimum sight distances are based on the premise that the approaching driver can observe the intersecting vehicle 2.5 seconds before he must apply the brakes and travel the minimum stopping distance for his approach speed. They are, therefore, particularly applicable to arterial streets. Actual sight distances provided at Intersections should be much greater than these minimum values if practical. The minimum sight distance triangle shall also apply to visibility obstructions at intersections.

Conditions for Intersection Sight Triangle-Plan/Profile:

- In the plan view, the horizontal clear area at the Intersection of a proposed street/drive shall be defined as being within a triangular area formed by:

- (I) A line that is on the centerline of the proposed street/drive, beginning at the intersecting street's tangent curb and continuing for a distance of 15-feet back into the proposed street/drive to the end point.
- (II) A line that is parallel to and 5-feet out from the intersecting street's curb, beginning at the centerline of the proposed street/drive and continuing for a distance "T" as prescribed in Table 9, to the end point.
- (III) A straight line that connects the end point of an:
 - That is on the centerline and 15-feet back into the proposed street/drive, and the end point of a
 - That is a distance "T" along and 5-feet out from the existing street's curb from the centerline or the proposed street/drive.

In the profile view, the clear window shall be defined as being within the horizontal clear area and clear between 2.5 feet and 9 feet above the average pavement elevation.

Note: Single trunk trees within the triangles and in the median shall be allowed and spaced so as to not cause a "picket fence" effect. Because of the large variation of ways in which trees can be planted, the spacing will be decided upon by the Director of Public Works & Engineering and the developer at the time of review of the landscape plans. Any other item that obstructs these lines so as to interfere with the above requirements will not be allowed.

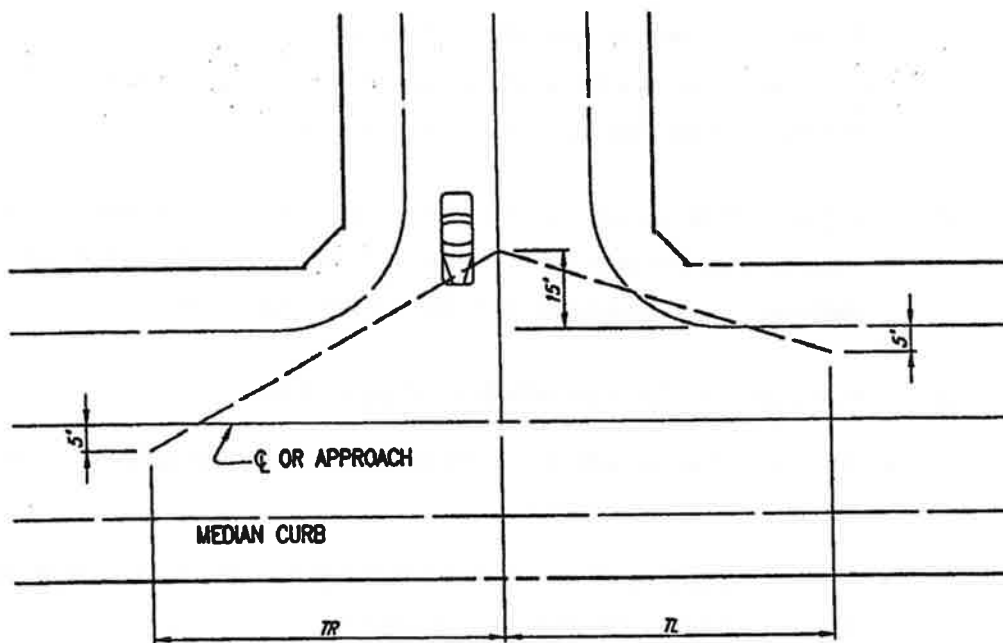


TABLE 9
 MINIMUM SIGHT DISTANCE FOR
 A CAR AT AN INTERSECTION

<u>MPH</u>	<u>I</u>
30	$110 + 200 = 310$
35	$130 + 250 = 380$
40	$130 + 325 = 475$
45	$165 + 400 = 565$
50	$190 + 475 = 665$

(AASHTO P138, BRAKE REACTION DISTANCE
 + STOPPING SITE DISTANCE)

TABLE 9
Minimum Sight Distance For a Car at Intersection
(For Level-Two Lane Streets)

MPH		T				
30		110	+	200	=	310
35		130	+	250	=	380
40		130	+	325	=	475
45		165	+	400	=	565
50		190	+	475	=	665

AASHTO P138, Break Reaction Distance + Stopping Site Distance

The aforementioned restrictions also apply to streets that do not intersect at right angles, except that the triangle dimensions shall not necessarily be minimum requirements. In such cases the Director of Public Works & Engineering shall have the authority to vary such requirements as he deems necessary to provide safety for both vehicular and pedestrian traffic.

B. R.O.W. Obstructions Outside the Visibility Triangles

- 1) Foliage of hedges, trees and shrubs in public right-of-ways which are not governed by Zoning Ordinance of the City, or the above triangles shall be maintained such that the minimum overhung above a sidewalk shall be 7-feet; the minimum overhang above a street shall be 14-feet.
- 2) All other areas within the street right-of-ways shall be clear at elevations between 2½-feet and 9-feet above the average street grade,
- 3) Plants in the public right-of-way that will grow over 30-inches (when mature) above the adjacent street's curb will conform to all of the above requirements, where applicable. All landscape plans shall show the locations and type of such plants, and show each of the prescribed triangles.
- 4) Ground elevations, within both triangles, will be shown by contour lines.

Note: No plantings over 30-inches above the adjacent gutter elevation are allowed in the median for the length of the left turn stacking space unless specifically agreed upon by the Director of Public Works & Engineering.

C. Alley Visibility Obstructions

No fence, wall, screen, billboard, sign, structure, or foliage of hedges, trees, bushes, or shrubs shall be erected, planted or maintained in any alley right-of-way. Foliage or hedges, trees, bushes, and shrubs planted adjacent to the alleys right-of-way which are not governed by the above triangles or by Zoning Ordinance of the City, shall be maintained such that the minimum overhang or encroachment shall be 14-feet above the alley surface at the edge of the pavement.

D. Exceptions

The provisions of this manual shall not apply to, or otherwise interfere with, the following:

- 1) Placement and maintenance of traffic control devices under governmental authority and control.
- 2) Existing and future screening requirements Imposed by the City Council.
- 3) Existing and future City, State and Federal Regulations.

Section 1.8

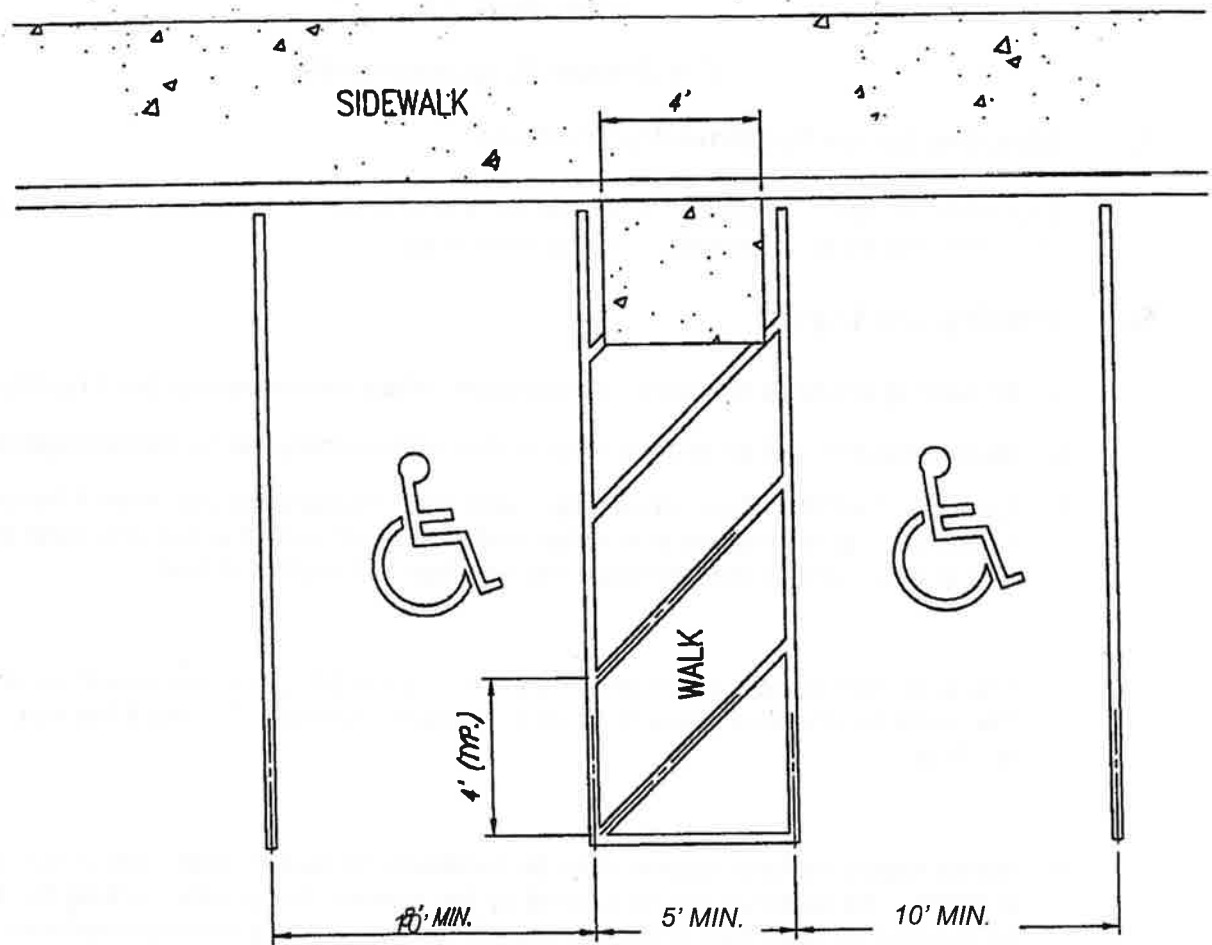
Off Street Requirements

A. Stacking Space For Drive-Up Windows

The minimum stacking space for the first vehicle stop for a commercial drive-through shall be 100-feet, and 40-feet thereafter, for any other stops.

B. Parking- Lot Layout

- 1) All parking lots shall be paved with concrete unless otherwise approved by City Council.
- 2) No parking area will be allowed to dead-end unless adequate turnaround space is proved.
- 3) Each standard 90⁰ off-street parking space shall measure not less than 9 feet by 18 feet, exclusive of access drives and aisles, and shall be of usable shape and condition. One-way angled parking shall measure not less than 9.5 feet by 18 feet.
- 4) The width for two-way aisles shall be a minimum of 24-feet and a maximum of 45-feet. The width for one-way aisles shall be a minimum of 20-feet (24-feet if the aisle is also a fire lane).
- 5) Handicapped parking spaces shall be minimum 10-feet in width with a 5-foot minimum walkway. The walkway can be shared by two spaces. For parallel parking the space shall be a minimum of 24-feet by a minimum 13-feet with a 3-foot minimum walkway one end in addition to the minimum 24-foot dimension. (see Detail, page 29)
- 6) Parking Overhang: No parking stall shall be situated so as to allow vehicle overhand into public right-of-way. Curb or parking stops shall be installed so that the distance between the face of the curb or car stop is a minimum of 2-feet from the public right-of-way.
- 7) Movements in Public Right-of-Way: No parking stall shall be so designed as to allow any movement into or out of the stall, upon public right-of-way.
- 8) Parking lot illumination shall be designed and constructed to direct the light to the parking lot and away from any adjoining property or street.
- 9) Fire lanes shall be constructed as required by Fire Department rules and regulations.



HEAD-IN OR ANGLE PARKING DIMENSIONS

APPENDIX “A”

Tables

TABLE 1

Street Designation	ROW (Min.)	Pavement Width (Face to Face)	Travel Lanes	Median (Face to Face)	Dedicated On-Street Parking	Parkway (Including Curb)	Sidewalks (Min.)	Hike/Bike Trail Required*
Major Arterial (Type A)	120'	2-36'	6	16'-24'	No	8-16'	5'	Per TMP
Minor Arterial (Type B-1)	80'-120'	2-24'	4	16'-24'	No	8-16'	5'	Per TMP
PGBT Type A Street (Type B-2)	80'-100'	2-22'	4	Varies	Yes	Varies	6'	Per TMP
PGBT Type B Street (Type B-3)	60'-80'	38'	2	N/A	Yes	Varies	6'	Per TMP
Commercial Collector (Type C-1)	60'	36'	2	N/A	No	7'	5'	Per TMP
Residential Collector (Type C-2)	60'	36'	2	N/A	No	7'	5'	Per TMP
Estate Residential Collector (Type C-3)	60'	36'	2	N/A	No	12'	N/A	Per TMP
Commercial Local Street (Type D-1)	50'	30'	2	N/A	No	10'	5'	Per TMP
PGBT Commercial Street (Type D-2)	60'	38'	2-11'	N/A	Yes - 8' on both sides	Varies	6'	N/A
Residential Local Street (Type E-1)	50'	30'	2	N/A	No	10'	4'	N/A
PGBT Residential Street (Type E-2)	50'	30'	2-11'	N/A	Yes - 8' on one side	Varies	5'	N/A
Estate Residential (Type E-3)	50'	24'	2	N/A	No	13'	N/A	N/A
PGBT Muse Residential Street (Type E-4)	24'	24'	2	N/A	No	0'	N/A	N/A
Commercial Alley (Type F-1)	20'	15'	1	N/A	No	2.5'	N/A	N/A
Residential Alley (Type F-2)	15'	10'	1	N/A	No	2.5'	N/A	N/A
PGBT Residential Alley (Type F-3)	15'	12'	1	N/A	No	1.5'	N/A	N/A

TABLE 2**Design Speed of Each Type of Street**

<u>Street Type</u>	<u>Design Speed</u>
Residential (Type E & E-1)	30
Collector (Type D).....	30
Secondary Thoroughfare (Type C).....	45
Major Thoroughfare (Type B).....	50

TABLE 3**Minimum Horizontal Centerline Radius**

<u>Y</u> <u>(mph)</u>	<u>f</u>	<u>e</u> <u>(ft/ft)</u>	<u>(e + f)</u>	<u>R</u> <u>(Calculated)</u> <u>(ft)</u>	<u>R</u> <u>(Rounded for</u> <u>Design)</u>
25	0.170	-0.0208	0.1492	279.27	280
30	0.160	-0.0208	0.1392	431.03	440
35	0.150	-0.0208	0.1292	632.09	640
40	0.145	-0.0208	0.1242	858.83	860
45	0.142	-0.0208	0.1212	1,113.86	1,120
50	0.140	-0.0208	0.1192	1,398.21	1,400
55	0.130	-0.0208	0.1092	1,846.76	1,850
60	0.120	-0.0208	0.0992	2,419.35	2,420

(AASHTO P 177)

TABLE 4

**Minimum Acceptable Crest Curve Given Speed and Difference
in Grade of Road**

S		K	L-KA									
MPH Ft.			A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	19	0	40	60	80	100	120	140	150	170	190
35	250	29	0	60	90	120	150	180	200	230	260	290
40	325	44	50	90	130	180	220	270	310	350	400	440
45	400	61	60	120	180	250	300	370	430	490	550	610
50	475	84	90	170	250	340	420	500	590	670	760	840
55	550	114	120	230	340	460	570	690	800	920	1030	1140
60	650	151	150	300	450	600	760	910	1060	1210	1360	1510

TABLE 5

**Minimum Acceptable Sag Curve Given Speed and Difference in
Grade of Road**

S		K	L-KA									
MPH Ft.			A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	37	0	100	120	160	200	240	280	320	360	400
35	250	50	0	100	150	200	250	300	350	400	450	500
40	325	64	70	130	190	260	320	390	450	520	580	640
45	400	79	80	160	240	320	400	480	560	640	720	790
50	475	96	100	200	290	390	480	580	670	770	870	960
55	550	115	116	230	350	460	580	690	810	920	1040	1150
60	650	136	136	280	410	550	680	820	960	1090	1230	1360

<u>TABLE 6</u>	
Minimum Left Turn Storage Requirement	
<u>Intersecting Thoroughfares</u>	<u>Minimum Storage</u>
Major with Major	150 feet
Major with Secondary	100 feet
Major with Residential	60 feet
Major with Private Drive	60 feet
Secondary with Major	100 feet
Secondary with Residential	60 feet
Secondary with Private Drive	60 feet

Note: Storage requirements listed herein are absolute minimums. Storage requirements may increase based upon actual and projected traffic demands.

TABLE 7
Driveway Spacing in Relation to Other Drives Given the Design Speed of the Street

<u>Design Speed (MPH)</u>	<u>Driveway Spacing (Ft.)</u>
25.....	65
30	90
35	100
40	120
45	150
50	200

TABLE 8
Summary of Drive Requirements

	Residential	Commercial	One-Way		Industrial
			In	Out	
Width (ft)					
Minimum	12	24			30
One-way (only)					
90°			18	22	
45°			18	16	
Maximum	24	30			40
Curb Radius (ft)					
45° (one-way)	5	10	10	10	10
90°	5 – 10	30	Same	Same	30
Intersection					
Angles (deg.)	90°	90°	90°	90°	90°
	45°	45°	45°	45°	45°

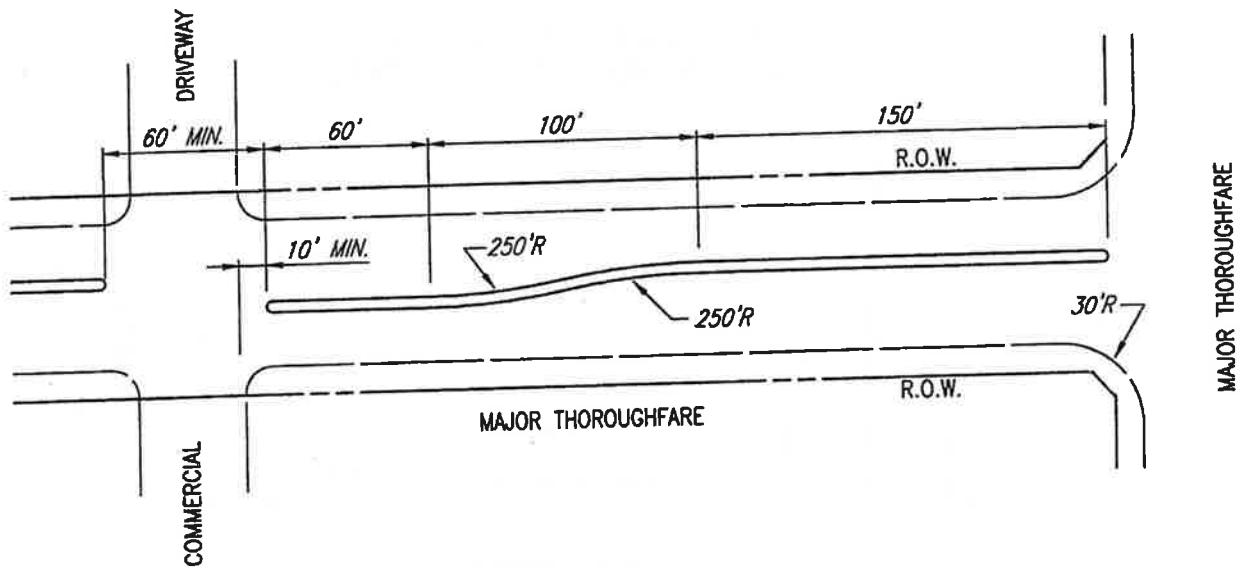
TABLE 9
Minimum Sight Distance for a Car at an Intersection
(For Level-Two Lane Streets)

MPH	T				
30		110	+	200	= 310
35		130	+	250	= 380
40		130	+	325	= 475
45		165	+	400	= 565
50		190	+	475	= 665

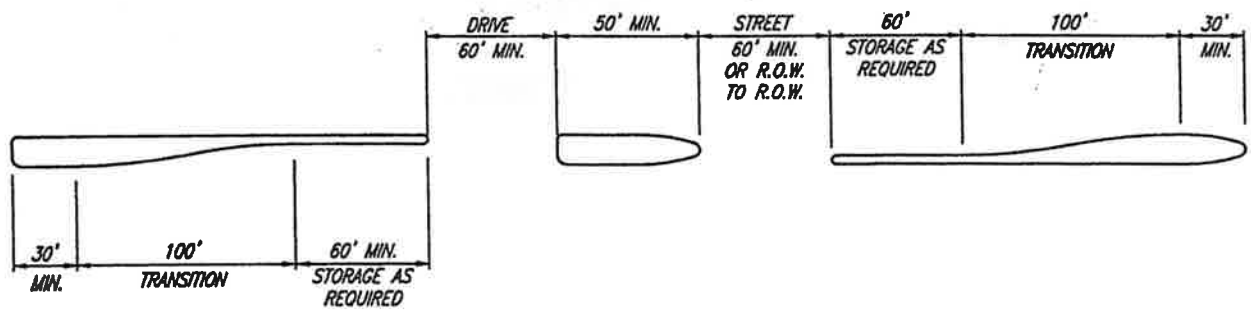
AASHTO P138, Break Reaction Distance + Stopping Site Distance

APPENDIX "B"

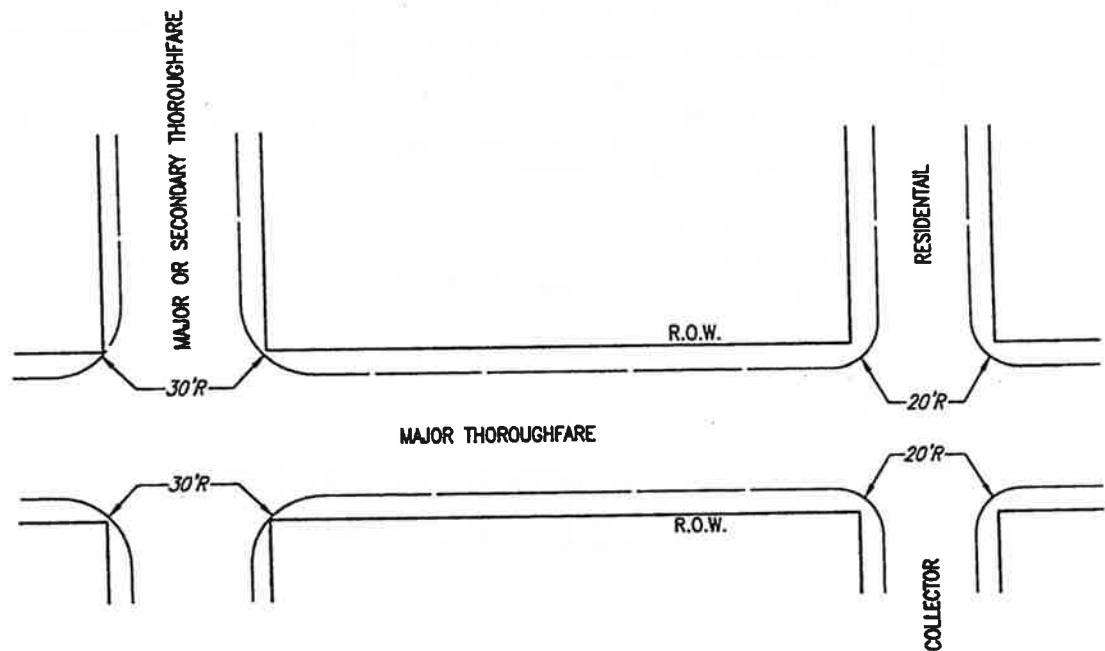
Figures



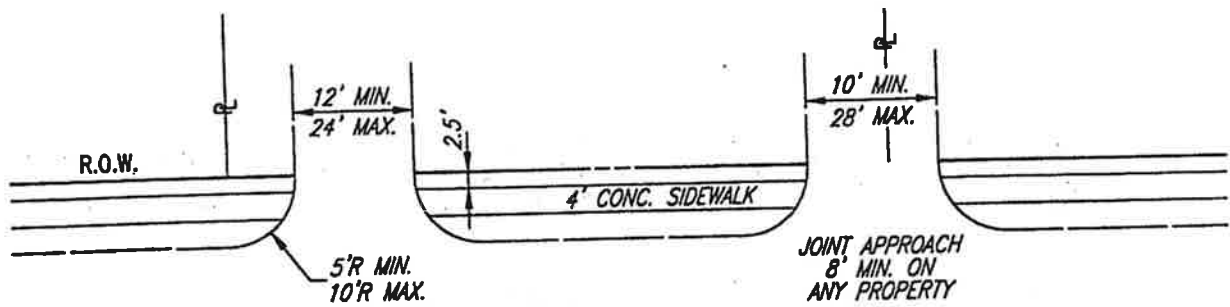
TYPICAL MEDIAN OPENING SPACING
MAJOR THOROUGHFARE



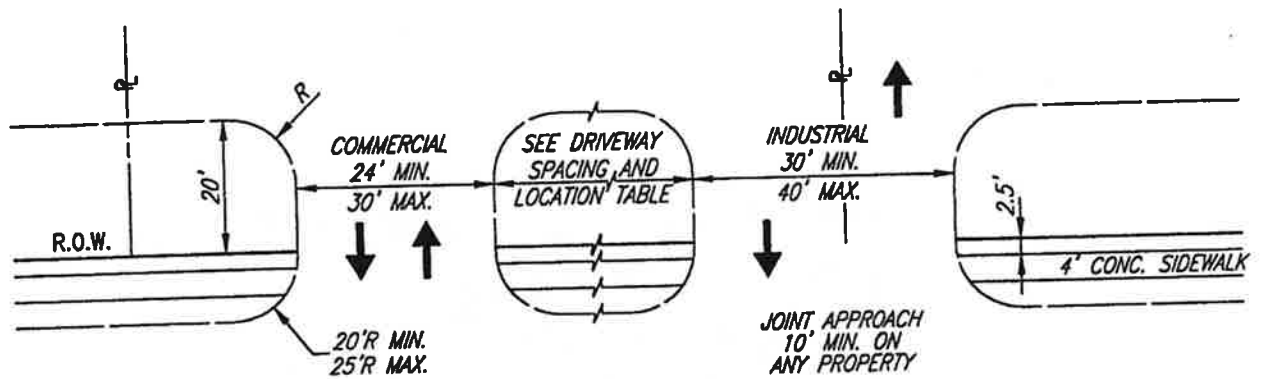
TYPICAL MEDIAN DIMENSIONS WITHOUT
BACK TO BACK LEFT TURN POCKETS



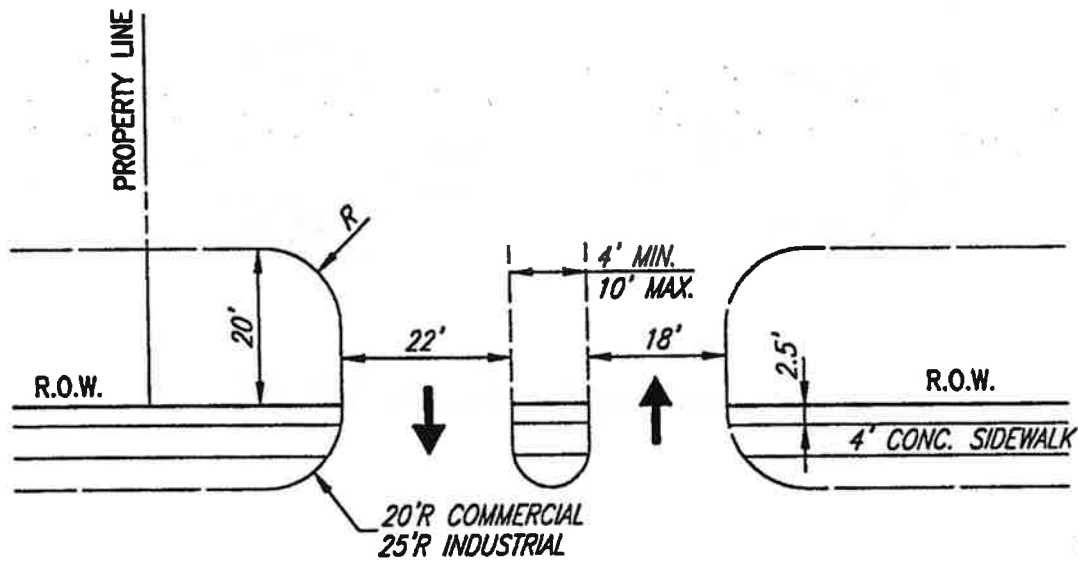
CURB RADII AT INTERSECTION



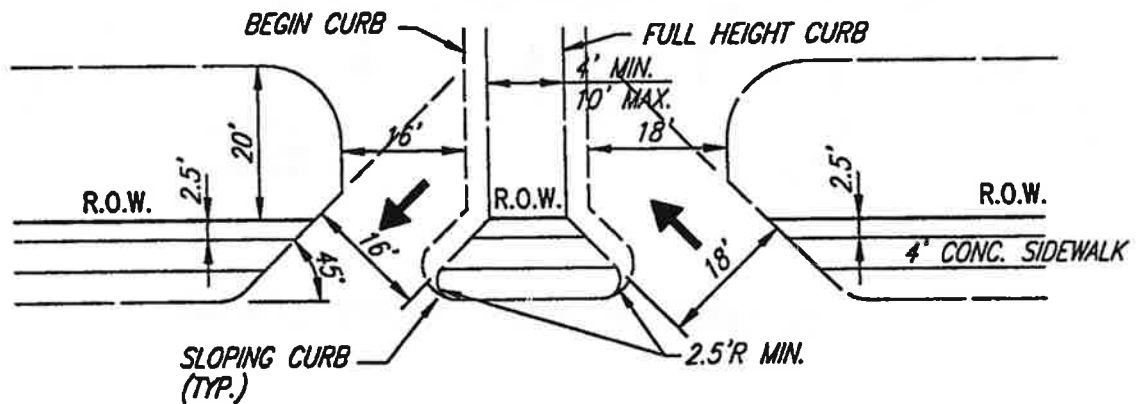
(a) DRIVEWAYS WIDTH, RADIUS, SPACING



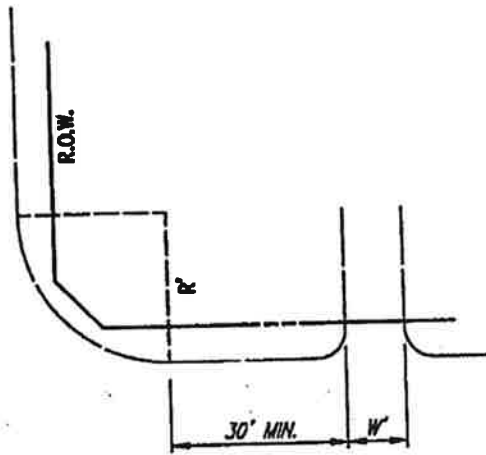
(b) DRIVEWAYS WIDTH, RADIUS, SPACING



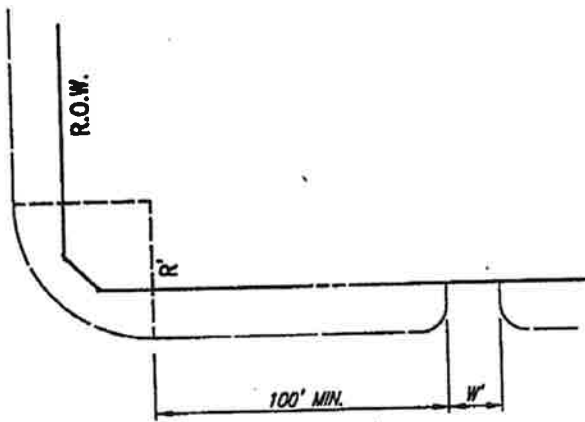
(c) DRIVEWAYS WIDTH, RADIUS, SPACING



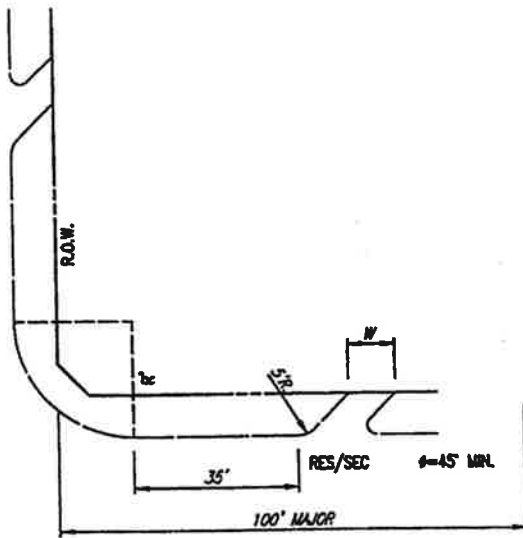
(d) DRIVEWAYS WIDTH, RADIUS, SPACING



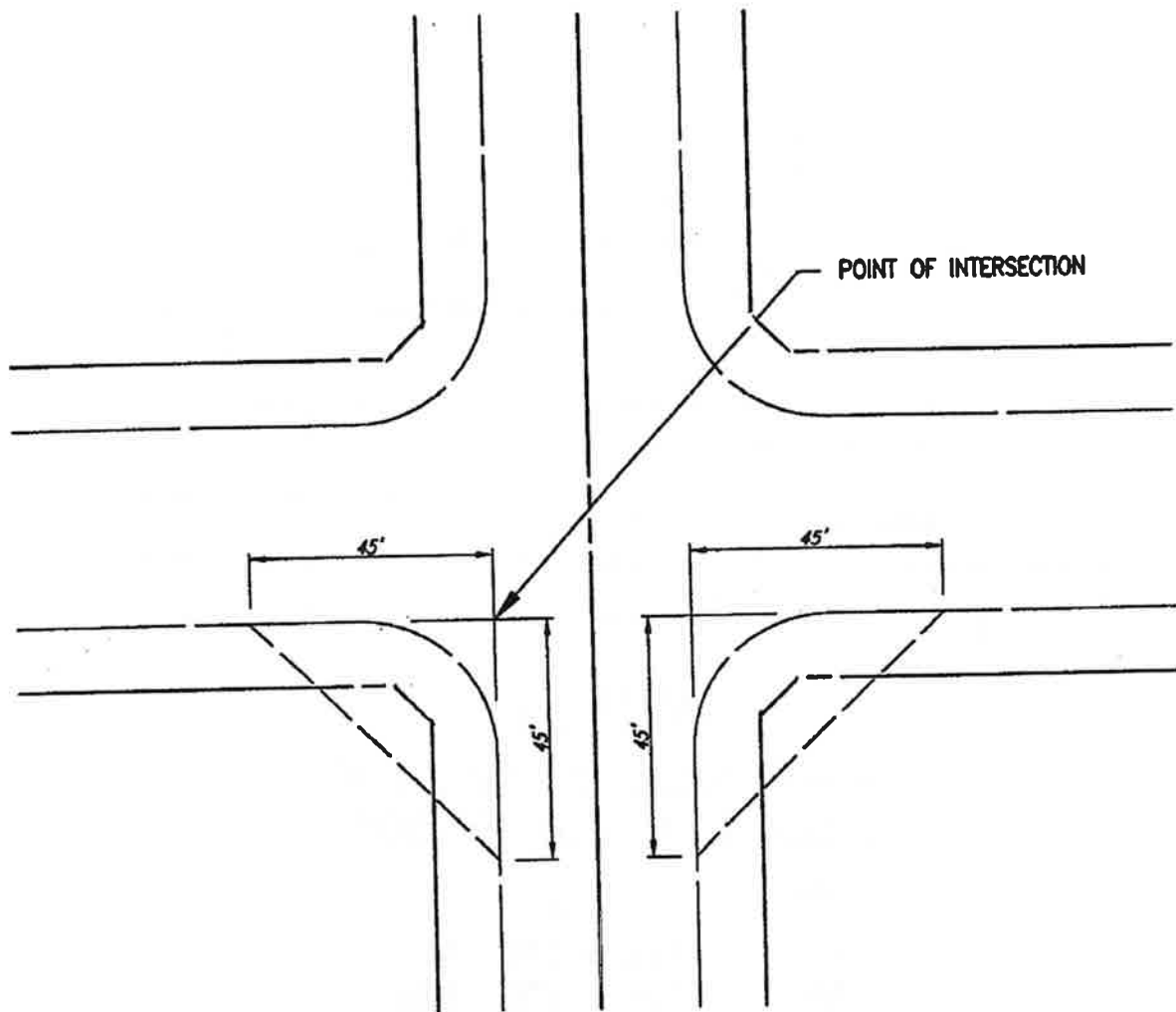
Drive Intersecting a Residential or Secondary



90° Drive Intersecting a Major



Angle Drive



HORIZONTAL CLEAR TRIANGLE

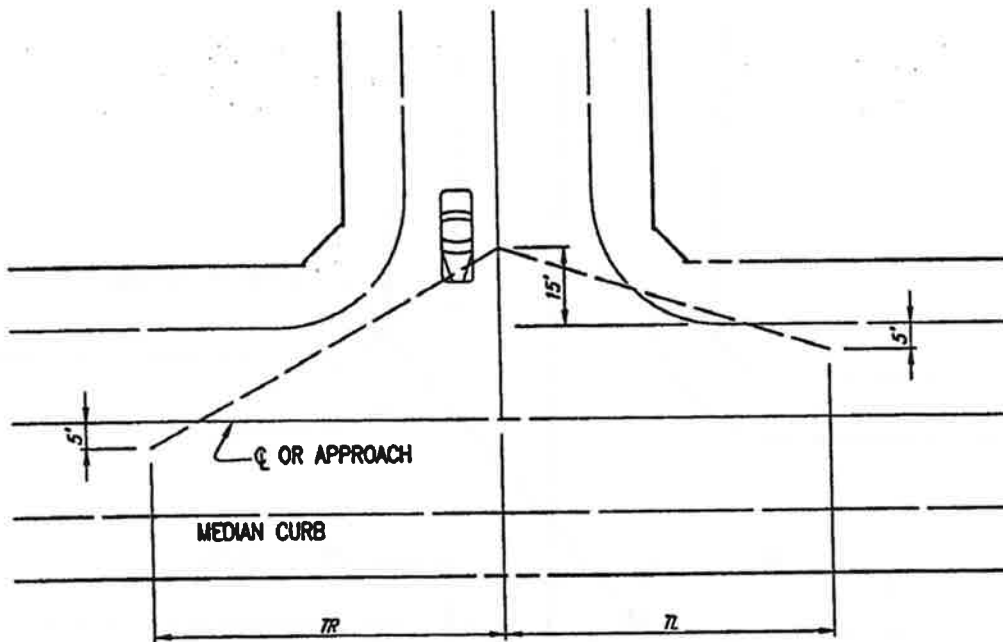
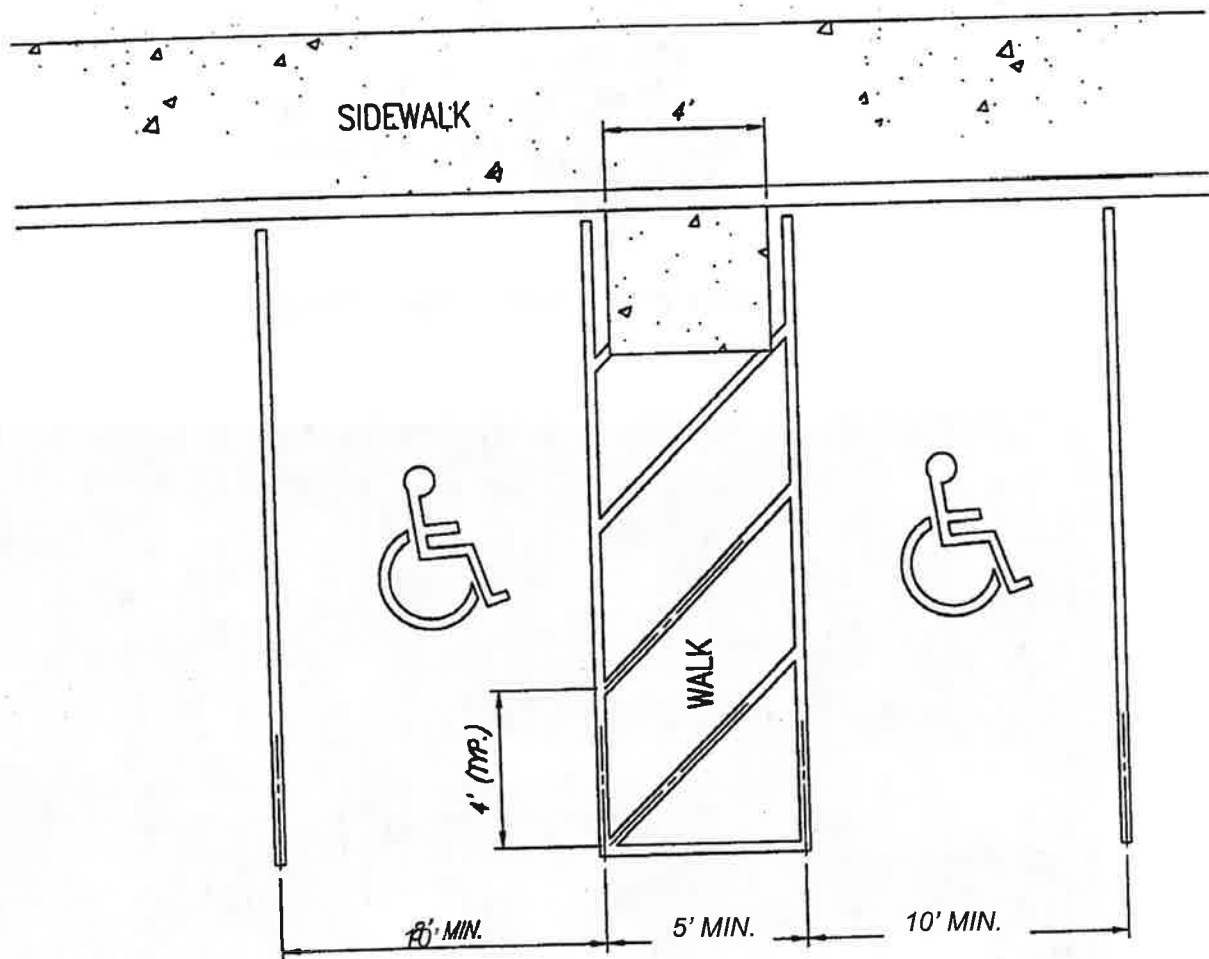


TABLE 9
 MINIMUM SIGHT DISTANCE FOR
 A CAR AT AN INTERSECTION

<u>MPH</u>	<u>I</u>
30	$110 + 200 = 310$
35	$130 + 250 = 380$
40	$130 + 325 = 475$
45	$165 + 400 = 565$
50	$190 + 475 = 665$

(AASHTO P138, BRAKE REACTION DISTANCE
 + STOPPING SITE DISTANCE)



HEAD-IN OR ANGLE PARKING DIMENSIONS

City of Sachse, Texas



Water & Sanitary Sewer Design



Section 2.1

Water Mains

In general, water mains are placed as shown in the Standard Construction Details, or otherwise as directed by the Director of Public Works & Engineering. Where applicable, line sizes will comply with the Water Distribution System Master Plan and shall be adequate to convey a fire flow. Fire flow analysis will be required on lines that are questioned by City staff. Starting pressures shall be obtained from the nearest junction node as stated in the City's Water Distribution Master Plan computer printouts or shall be provided by the City.

- A.** Minimum 8-inch pipe required in residential areas.
- B.** Minimum 12-inch pipe required on commercial, retail and industrial areas, except by special permission from the Director of Public Works & Engineering or his/her designee.
- C.** The length of dead-end mains shall not exceed 600 feet. A Fire Hydrant will be required at the end of the main.
- D.** No water main shall be located closer than 5-feet from any tree or structure.
- E.** Crosses shall not be used without permission from the Director of Public Works & Engineering or his/her designee.
- F.** Water Main Specifications:
 - 1) City mains shall have a minimum diameter of 8-inches, unless a larger line size is required by the Comprehensive Plan, Water Master Plan or to meet fire protection needs as determined by analysis. All water lines shall meet the requirements of AWWA and NCTCOG under the specifications shown on the following page.

Line Size	NCTCOG Item	AWWA Standard	Description
8" thru 12"	2.12.20	C900 DR18	PVC
Greater than 12" Pipe	2.12.5	C301 & C303	Reinforced Concrete Cylinder Pipe
	2.12.20	C905 DR18	PVC
	2.12.8	C151 Class 50	Ductile Iron Pipe

- 2) All mains supplying fire sprinkler systems outside of utility easements shall be minimum 200-PSI working pressure and U.L. listed.
 - 3) All water pipe shall be designed for a working pressure of 150-PSI unless otherwise directed by the Director of Public Works & Engineering or his/her designee.
- G.** Valves 12-inches and under shall be placed on or near street property lines not over 800 feet apart in residential, duplex and multi-family districts and not over 500 feet apart in all other districts: and in such a manner as to require preferably two, but not more than three valves to shut down each City block, or as may be required to prevent shutting off more than one fire hydrant. On cross-feed mains without services, a maximum of four valves shall be used to shut down each block. Also, valves shall be placed at or near the ends of mains in such manner that a shutdown can be made for a future main extension without causing loss of service on the existing main. Main line valves shall be placed at all fire hydrant leads. The location of valves larger than 12-inches will be as approved by the Director of Public Works & Engineering or his/her designee. Valves 12-inches and under will be Gate Valves meeting requirements of AWWA C500 or AWWA C509 (NCTCOG Item 2.13.1) with non-rising stems. Valves over 12-inches will be Butterfly Valves meeting requirements of AWWA C504 (NCTCOG Item 2.13.4). All valves over 14-inches shall be provided with a valve vault over the valve operator assembly to provide ease of access for routine maintenance.

H. Fire Hydrants

Section 1. Number and Locations

A sufficient number of fire hydrants shall be installed to provide hose stream protection for every point on the exterior wall of the building with the lengths of hose normally attached to the hydrants. There shall be sufficient hydrants to concentrate the required fire flow, as recommended by the publication "GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW" published by the Insurance Service Office, around any building with no hose line exceeding the distances hereinafter established and with an adequate flow available from the water system to meet this required flow. In addition, the following guidelines shall be met or exceeded:

- 1) Single Family and Duplex Residential - As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 500 feet between fire hydrants as measured along the route that fire hose is laid by a fire vehicle.
- 2) Multifamily Residential - As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 500 feet as measured along the length of the centerline of the roadway, and the front of any structure at grade shall be no further than 300 feet from a fire hydrant as measured along the route that a fire hose is laid by a fire vehicle.
- 3) Other Districts - As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 500 feet as measured along the length of the centerline of the roadway, and the front of any building at grade shall be no farther than 300 feet from a fire hydrant as measured along the route that the fire hose is laid by a fire vehicle.
- 4) Protected Properties - Fire hydrants required to provide a supplemental water supply for automatic fire protection systems shall be within 100 feet of the Fire Department connection for such system and located on the same side of the fire lane.
- 5) Building Fire Sprinkled – A minimum of a 6-inch fire line stub-out with valve shall be provided for all buildings to be sprinkled. A smaller stub-out can only be used with Fire Department approval.

- 6) Fire hydrants shall be installed along all fire lane areas as follows:
- a) Non-Residential Property or Use
 - Within 150 feet of the main entrance.
 - Within 100 feet of any Fire Department connection (same side of fire lane).
 - At a maximum intermediate spacing of 500 feet as measured along the length of the fire lane.
 - b) Apartment, Townhouse or Cluster Residential Property or Use
 - Within 100 feet of any Fire Department connection (same side of fire lane).
 - At maximum intermediate spacing of 500 feet as measured along the length of the fire lane.
- 7) Generally, no fire hydrant or fire hydrant connection (FDC) shall be located within the collapse zone of a non-residential building or structure unless approved by the Engineering and Fire Departments.
- 8) In instances where access between the fire hydrant and the building that it is intended to serve may be blocked, extra fire hydrants shall be provided to improve the fire protection. Railroads, divided thoroughfares, expressways and blocks that are subject to buildings restricting movement, and other man-made or natural obstacles are considered as barriers.
- 9) Generally, no fire hydrant shall be located closer than 50-feet to a non-residential building or structure unless approved by the Engineering and Fire Departments.

Section 2. Restrictions

- 1) All required fire hydrants shall be of the national standard 3-way breakaway type no less than 5¼-inches in size and shall conform to the provisions of the latest AWWA Standard C502 and shall be placed upon water mains of no less than 8-inches in size. Fire hydrants shall have a bury depth of five feet.
- 2) Valves shall be placed on all fire hydrants leads. Valves shall be flanged by mechanical joint.
- 3) Required fire hydrants shall be installed so the breakaway point will be no less than 2-inches, and no greater than 6-inches above the grade surface.
- 4) Fire hydrants shall be located a minimum of 2-feet and a maximum of 6-feet behind

the curb line, based on the location of the sidewalk. The fire hydrant shall not be in the sidewalk.

- 5) All required fire hydrants placed on private property shall be adequately protected by either curb stops or concrete posts or other methods as approved by the Director of Public Works & Engineering and Fire Chief and shall be in easements. Maintenance of such stops or posts to be the responsibility of the landowner on which the said fire hydrant is placed.
- 6) All required fire hydrants shall be installed so that the steamer connection will face the fire lane or street, or as directed by the Fire Department.
- 7) Fire hydrants, when placed at intersections or access drives to parking lots, when practical, shall be placed so that no part of the fire truck will block the intersection or parking lot access when connections to the fire hydrant are made.
- 8) Fire hydrants, required by this article, and located on private property, shall be accessible to the Fire Department at all times.
- 9) Fire hydrants shall be located at street or fire lane intersections, when feasible.
- 10) A Blue Stimsonite, Fire-Lite reflector (or approved equal) shall be placed in the center of the drive lane on the side of the fire hydrants.
- 11) In non-residential developments an 8-inch lead will be required on all fire hydrants that are located more than 100-feet from the looped main.
- 12) Fire hydrant bonnet shall be painted according to the size of the main to which it is attached. See chart on following page. The remainder of the hydrant above ground shall be painted aluminum.

<u>Water Main Size</u>	<u>Color</u>
4"	Not Allowed
6"	Not Allowed
8"	Blue
10"	Green
12" & Larger	Yellow

- I. Four-inch mains used for hydrant supply in existing construction shall be replaced with new construction and dead-ends shall be eliminated where practical. Six-inch lines shall be connected so that not more than one hydrant will be between intersecting lines and not more than two hydrants on an eight-inch main between intersecting lines.

- J. The minimum cover to the top of the pipe must vary with the valve stem. In general, the minimum cover below the top of the street subgrade should be as follows: 6-inch and smaller, 3.5 feet; 8-inch, 4.0 feet; 12-inch, 4.5 feet to 5 feet; 16-inch, 5.0 feet to 5.5 feet. Lines larger than 16-inch shall have a minimum of 6 feet of cover, or sufficient cover to allow water and sewer and other utilities to go over the large main. Increase the cover as required for water lines to be constructed along county-type roads commonly built with a high crown about the surrounding property, to allow for future paving grade and storm sewer changes.

- K. A service with a meter box is constructed from the main to a point just behind the curb line, usually in advance of paving. The location of the meter box is generally at or near the center of the front of the lot to be served. On multiple apartments and business properties, the Owner or Architect usually specifies the desired size and location. Minimum requirements for water service sizes are as follows:
 - 1) One-inch services are required to serve all residential lots including townhouse lots and patio homes. Separate services shall be provided for each of the family

units.

- 2) The size of apartment, condominium, or multi-family services will depend on the number of units served with a minimum of one meter per building.
 - 3) Fittings shall include mega-lugs and shall be polywrapped.
- L.** A domestic service connection shall not be allowed on fire hydrant leads except by special permission from the Director of Public Works & Engineering or his/her designee.
- M.** No meter boxes will be allowed in paved surfaces.

Section 2.2

Sanitary Sewer

- A.** Sizes and grades for sanitary sewer lines shall be based on serving the proposed development and all upstream areas in the drainage basin at full development. The minimum size for sanitary sewer mains shall be 8-inches. Design calculations for sizing lines shall be included in the plans, along with drainage area map. If feasible, sewers shall be placed in streets or as shown in the City Standard Construction Details. Sewers are usually located in the center of residential streets. Each addition has its challenges, therefore, no fixed rules will apply to all cases regarding the location of sanitary sewers.
- B.** Minimum cover shall be 3.5 feet; exceptions authorized by the Director of Public Works & Engineering or his/her designee shall have concrete protection. In general, the minimum depth for sewer to serve given property with a 4-inch lateral shall be 3-feet plus 2% times the length of the house lateral (the distance from the sewer to the center of the house). Thus, for a house 135 feet from the sewer, the depth would be 3-feet plus $2\% \times 135 \text{ feet} = 3.0 \text{ plus } 2.7 = 5.7 \text{ feet}$. The depth of the flow line of the sewer should then be at least 5.7 feet below the elevation of the ground at the point where the service enters the house. Profiles of the ground line 20-feet past the building line will be required to verify that this criterion is met. On lines deeper than 12 feet, a parallel sewer line will be required when laterals are to be attached. This requirement should be discussed with the Director of Public Works & Engineering.
- C.** Sewage flow shall be computed in accordance with Appendix "A", with the exceptions, as required by the Director of Public Works & Engineering. Pipes should be placed on such a grade that the velocity when flowing full is not less than two feet or more than 6-feet per second. Minimum grades shall be as follows.

Size	Minimum Slope
8"	0.35%
10"	0.26%
12"	0.22%
15"	0.16%
18"	0.12%
21"	0.10%
24"	0.09%

- D.** All grades shall be shown to the nearest 0.01%. Grades shall be evenly divisible by 4, and if practical, they should be even, such as: 0.20%, 0.40%, 0.60%, and 1.00%, etc., in order to facilitate field computations. When the slope of a sewer changes, a manhole will be required. No vertical curves will be allowed. Horizontal curves (pulling pipe not joints) with a minimum 200 foot Radius to match change in street direction will be allowed as approved by the Director of Public Works & Engineering, but will not be allowed across residential single family and duplex lots.
- E.** The sizes and locations of manholes, wyes, bends, tap connections, cleanouts, etc., shall be approved by the Director of Public Works & Engineering. In general, manholes shall be placed at all four-way connections and three-way connections. The diameter of a manhole constructed over the center of a sewer should vary with the size of the sewer. For 6", 8", and 10" sewers, the manhole shall be 4.0-foot minimum diameter; for 12", 15", 18", 21", 24" and 27" - 5.0 foot minimum diameter; 30" and 36" - 6-foot minimum diameter. In Flood Plains, sealed manholes with appropriate venting are to be used to prevent the entrance of storm water. Manholes in flood plains shall be vented as required by TNRCC. Manholes shall be placed on the ends of all lines. Drop manholes shall be required when the inflow elevation is more than 18-inches above the outflow elevation. Construct manholes at each end of lines that are installed by other than open cut and at each end of aerial crossing lines. Sewer mains and water mains shall be not less than nine feet apart as measured from outside to outside of pipe and shall meet all Texas Natural Resource Conservation Commission requirements.
- F.** Laterals- The sizes and locations of laterals shall be as approved by the Director of Public Works & Engineering. In general, for single family dwellings, the lateral size shall be 4" minimum; for multiple units, apartments, local retail and commercial - 6" minimum; for manufacturing and industrial, the size should be 8" or larger as required. House laterals usually come out 10 feet downstream from the center of the lot and shall have a 10-foot lateral separation from the water service. Manholes will be required on 6-inch and larger laterals where they connect to the main line. Laterals will not be attached to sewer mains that are deeper than 12 feet except by special permission from the Director of Public Works & Engineering or his/her designee. A minimum of one lateral per building shall be required. Also, a minimum of one lateral per residential lot shall be required. Duplexes shall have two laterals.
- G.** Railroad, State Highway and creek crossings, etc., shall be as approved by the Director of Public Works & Engineering or his/her designee. The developer is responsible for obtaining permits from the Railroad Company and from the Texas Department of Transportation and for ensuring that construction meets all the permit requirements.

- H.** The developer's Engineer shall furnish all line and grade stakes for construction. All property lines and corners must be properly staked to insure correct alignment. Monuments must be set at the corners of the property as shown in the Standard Construction Details. The City will not be liable for improper alignment or delay of any kind caused by improper or inadequate surveys by the developer or by interference of other utilities.
- I.** In order to provide access for sewer lines for cleaning, manholes shall be so located that 250 feet of sewer rod can reach any point in the line. This means that manhole spacing shall be a maximum of 500 feet.
- J.** No sewer line shall be located nearer than five feet from any tree or structure.
- K.** No sanitary sewer in alleys unless approved by the Director of Public Works & Engineering.
- L. Sewer Lines Specifications:**

- 1) All sewer lines shall be PVC and meet the requirement of ASTM and NCTCOG under the following specifications:

Pipe Diameter	NCTCOG Item	ASTM Standard
6" thru 15"	501.17	D3034/SDR 35 D3350/PE 345434C
15" thru 48"	501.17	F679 F794 F949 F180 3 D3350/PE 345434C

- 2) Sewer pipe shall conform to the Specifications and/or Special Provisions

M. Lift Stations (Shall be only as approved by the Director of Public Works & Engineering or His/her designee)

- 1) Lift station design shall be in full conformance to TNRCC Regulations, latest revision. Letter approval from the TNRCC must be provided at time of Preliminary Engineering plan submittal. Flows shall be as calculated by this manual.
- 2) Lift stations with peak flows under 1.4 MGD shall utilize submersible pumps as manufactured by Flygt Corporation or approved equal.
- 3) The current rules can be obtained at:
www.tceq.state.tx.us

Section 2.3

Form of Plans

- A.** Plans shall be clear, legible, and neatly drawn on bordered sheets, full size shall be 24" x 36", half size on 12" x 18" sheets. Each sheet shall clearly display the Texas Professional Engineer's seal of the Engineer under whose direction the plans were designed. A title block in the lower right-hand corner shall be filled in to include: (1) project name; (2) Engineer's name, address, and telephone number.
- B.** The plan sheet should generally be drawn so that the north arrow points to the top or to the right side of the sheet. It is important that the plan show sufficient surrounding streets, lots, and property lines so the existing water and sewer may be adequately shown and so that proper consideration may be given to future extensions. Proposed water and sewer lines shall be stubbed out to the addition extremities in order that future extensions may be made with a minimum of inconvenience. Unless it would make the plan very difficult to read, both water and sewer lines should be shown on the same sheet. The lines on the profile sheet shall be drawn in the same direction as on the plan. Lettering shall be oriented to be read upward or from left to right.
- C.** On large additions or layouts requiring the use of more than six sheets (total of plan & profile), key sheets may be required on a scale of 1" = 400' or 1" = 1000', as designated by the Director of Public Works & Engineering. They shall show the overall layout with the specific project clearly indicated with reference to individual sheets.
- D.** The use of "off-standard" scales will not be permitted. A plan shall be drawn to scales of 1" = 20', or 1" = 40'. Plans for water and sewer that do not involve great detail should be drawn on a scale of 1" = 50' or 1" = 60'. Plans in and along creeks, heavily wooded sections, streets with numerous utilities, or as may be required to produce a clean and legible drawing, shall be drawn on plan-profile sheets or separate plan and profile sheets on a scale 1" = 40'. If the plan is in an extremely congested area, a scale of 1" = 20' may be necessary. All profiles shall be drawn on a vertical scale (1" = 4') as required for clarity, and the horizontal scale shall be the same as for the plan unless otherwise directed by the Director of Public Works & Engineering.

Section 2.5

Data to be Included in Plans

- A. Sewer Data to be included on Plan Sheet:** The plan shall show the existing and proposed water and sewer lines and all appurtenances thereto. The plan should also have the storm sewer system dashed in. All lines shall be numbered, lettered or otherwise designated on both plan and profile sheets. All lines shall show sizes and direction of flow on both the plan and profile sheets. Stationing shall be shown to the nearest 0.1 foot and each new line shall begin at 0+00 at the outlet and increase up the sewer. Station pluses at all junctions of sewers, horizontal P.C.'s, and P.T.'s, bends, angle points, wyes, manholes, the centerlines of all cross streets and railroads, and all crossing utilities, etc., shall be shown on both plan and profile. The degree of angles and horizontal curve data shall be shown on the plan only. Minimum Radius for sanitary sewer mains is 200 feet by pulling pipe not joints. Sewer laterals shall be shown at a location most convenient to serve the property.

Sewer laterals will usually be near the center of the lot, either at the street or alley. If the lateral is to be adjacent to the water service, then show the lateral 10 feet downstream. The location shall be designated on the plans.

- B. Sewer Data to be included on the Profile Sheet:** The data for the profile sheet shall be obtained by running a line of levels along the actual route and by taking any other necessary observations. Profiles shall show the elevations to the nearest 0.1 foot of the ground at the centerline of the sewer, and to the right and left of the centerline of the sewer at the location of the approximate center of the proposed houses or buildings to be served, and the approved street or alley grade. Profiles shall also show the sewer pipe, manholes, etc. The size of the sewer, the direction of the flow, and the grade to the nearest 0.01% shall be indicated just over the "pipe" and the total linear footage of line, size, kind of pipe, and type of embedment or encasement shown below the "pipe". The design flow, pipe capacity and velocity must be shown in the profile. All of the information pertaining to the horizontal data, station pluses, appurtenances to be built, etc., is usually shown just above the ground line, whereas, the flow line (invert) elevations are shown below the pipe. Elevations of crossing and parallel utilities shall be shown. All invert elevations shall be shown to the nearest 0.01-foot. Invert elevations shall be recorded at all junctions (all lines-in and out), at grade breaks, the ends of lines, or other points as requested by the Director of Public Works & Engineering. City Benchmarks used shall also be clearly shown, giving the descriptive locations and elevations. Elevations must be from sea level datum, not assumed. Bench level circuits should begin at a City of Sachse Control monument and benchmark of second order accuracy established at least every one-half mile through the project. All existing water, sewer, gas, storm sewer, telephone, power, and other utilities parallel to or crossing the

proposed sewer or water line shall be adequately designated as to size, type, and location.

- C.** Data to be included for Water Plan and Profile: Indicate the location of any existing valves required for shutdown purposes and of any tees, ends, etc., to be tied into. Indicate clearly the sizes of the lines to be installed, and all proposed valves, fire hydrants, tees, bends, reducers, plugs, sleeves, wet connections, tap connections, creek, railroad or highway crossings, tunnels, meter boxes, valve vaults, and other appurtenances at each intersection or as required. Where the pipe is to be laid around a curve, the curve data must be provided. The size and type of services and the material, type of joint, and class of pipe may be indicated by adequate notation in the lower left or right hand corners of the plan sheet. Water services and meter boxes shall be indicated and shall be located at or near the center of the front of each lot. Waterline profiles are required on lines 12-inches and larger, follow the general procedures as outlined for sewers, except that the grades and elevations of the proposed water line usually need not be shown closer than the nearest 0.1-foot except at P.V.I.'s where the elevation shall be shown to the nearest 0.01-foot for field calculation purposes.

APPENDIX "A"

Sanitary Sewer Daily Flow Calculations

Apartment Sanitary Sewer Flow

95 gal. x .75 = 71.25 gal. per day per person

22 units per acre with 3 persons per unit

Calculations (71.25) (22) (3) = 4,702 or 4,700 gallons per day per acre.

Office Sanitary Sewer Flow

3100 parking spaces for 34.7

acres One person per parking

space

20 gallons per person per day

3100 = 89.33 persons per acre (20 gal) = 1,786.7 or 1,790 gal. per day per acre.

34.7 acres

Residential Sanitary Sewer Flow

95 gallons per person per day

4 units per acre

3.5 persons per unit

(95) (4) (3.5) = 1330 gallons per acre per day

Nursing Home Sanitary Sewer Flow

150 beds -heritage Manor

90 gallons per day per

bed

90 x 150 = 13,500 gallons per day

Patio Home Sanitary Sewer Flow

95 gallons per person per

day 10 units per acre

3.5 persons per unit

(95) (10) (3.5) = 3,325 gallons per day/acre

Add 500 gallon per acre per day for inflow and infiltration. Peaking factor shall be applied to daily flow calculations but not to inflow and infiltration. Peak factors shall be in accordance with ASCE Manual and Reports on Engineering Practice No. 60/WPCF Manual of Practice No. FD-5. Generally the following factors applies:

<u>Acres</u>	<u>Peaking Factor</u>
0 – 65	5
70	4.9
80	4.8
85	4.78
90	4.72
100	4.66
110	4.62
120	4.50
130	4.35
140	4.25
150	4.20

City of Sachse, Texas



Drainage Design



Section 3.1

Stormwater General

A. Introduction

Storm water runoff is that portion of the precipitation that flows over the ground surface during and for a period after a storm. The objective of designing storm sewer systems is to convey runoff in a functional and efficient way from places it is not wanted to the nearest acceptable discharge point. This transfer of runoff is done in sufficient time and methods to avoid damage and unacceptable amounts of inconvenience to the general public. Prior to the design of a storm drainage system, an overall drainage plan shall be submitted to the City for review as a part of the Preliminary Plat submittal. Upon approval of the preliminary plat by the City, the actual construction plans can be designed.

This manual provides guidelines for design of storm drainage facilities in the City of Sachse. The procedures outlined herein shall be followed for all drainage design and review of plans submitted to the City.

Section 3.2

Drainage Design Theory

A. Drainage Area Determination and System Designation

The size and shape of each drainage area and sub-area must be determined for each storm drainage facility. This size and shape should be determined from topographic maps at scale of 1 inch = 200 feet or less.

Where the contour interval is insufficient or physical conditions may have changed from those shown on existing maps, it may be necessary to supplement the maps with field topographic surveys. The actual conditions should always be verified by a reconnaissance survey. In preparing the drainage area maps, careful attention must be given to the gutter configurations at street intersections. The direction of flow in the gutters should be shown on the maps and on the construction plans. The performance of these surveys is the responsibility of the Engineer designing the drainage facility.

B. Rainfall

FIGURE 1, which shows anticipated rainfall rates for storm durations from 5 minutes to 6 hours, has been prepared utilizing the information contained in the U. S. Department of Commerce, Weather Bureau, HYDRO-35 (National Technical Information Service Publication No. PB272-112, dated June, 1977). Interpolation of rainfall rates versus durations from the isopluvial maps contained in HYDRO-35 were used to prepare FIGURE 1 for durations less than 60 minutes. For durations beyond 60 minutes the information shown in FIGURE 1 was derived from Weather Bureau Technical Paper No. 40, dated May, 1961.

C. Design Storm Frequency

The individual curves shown on FIGURE 1 labeled "5 Yr.", "10 Yr.", "25 Yr.", "50 Yr.", and "100 Yr." are referred to as "Design Storm Frequency". The term "100-year storm" does not mean that a storm of that severity can be expected once in any 100-year period, but rather that a storm of that severity has a one in one hundred chance of occurring in any given calendar year.

Each storm drainage facility shall be designed to convey the runoff which results from the 100-year design storm as shown in Section III, CRITERIA AND DESIGN PROCEDURES.

D. Determination of Design Discharge

Prior to hydraulic design of drainage facilities the amount of runoff from the particular drainage area must be determined. The Rational, the Unit Hydrograph, and the HEC-I Computer Program are the accepted methods, for computing volumes of storm water runoff. Data from the Flood Insurance Study shall be used in lieu of Rational Method, Unit Hydrograph or HEC-I for determination of drainage and floodway easement elevations and design discharge flows, if such data is available. However, all discharge values shall be based on full development of the drainage basin as outlined on the current zoning maps available from the City. In the event that the Flood Insurance Study is not based on current zoning, the study should be reanalyzed, revised and submitted to FEMA for acceptance. In the event that the revised study indicates a water surface is less than that shown on the Flood Insurance study the higher value shall be used if the study is not submitted to FEMA.

E. Rational Method

The use of the Rational Method, introduced in 1889, is based on the following assumptions:

- a) The peak rate of runoff at any point is a direct function of the average rainfall intensity during the time of concentration to that point.
- b) The frequency of the peak discharge is the same as the frequency of the average rainfall intensity.
- c) The time of concentration is the time required for the runoff to become established and flow from the most remote part of the drainage area to the design point.

The Rational Method is based on the direct relationship between rainfall and runoff expressed in the following equation:

$Q = C I A$, where

- "Q" is the storm flow at a given point in cubic feet per second (c.f.s.).
- "C" is a coefficient of runoff representing the ratio of runoff to rainfall.
- "I" is the average intensity of rainfall in inches per hour for a period equal to the time of flow from the farthest point of the drainage area to the point of design and is obtained from FIGURE 1.
- "A" is the area in acres that is tributary to the point of design.

The determination of the factors, runoff coefficient and time of concentration shown in this manual have been developed through past experience in the City's system and by review of values recommended by others. The time of concentration has been adopted from the Texas Department of Transportation Hydraulic Design Manual, revised March 2004.

F. Runoff Coefficient

The runoff coefficient "C" in the Rational Formula is dependent on the character of the soil and the degree and type of development in the drainage area. The nature and condition of the soil determine its ability to absorb precipitation. The absorption ability generally decreases as the duration of the rainfall increases until saturation occurs. Infiltration rates in the Sachse area generally are low due to the cohesive soils. As a drainage area develops the amount of runoff increases generally in proportion to the amount of impervious areas such as streets, parking areas and buildings.

G. Time of Concentration

The time of concentration is defined as the longest time that will be required for water to flow from the upper limit of a drainage area to the point of concentration, without interruption of flow by detention devices. This time is a combination of the inlet time, which is the time for water to flow over the surface of the ground from the upper limit of the drainage area to the first storm sewer inlet, and the flow time in the conduit or channel to the point of concentration. The flow time in the conduit or channel is computed by dividing the length of the conduit by the average velocity in the conduit. (Note: When accumulating times, base the time of concentration on the actual calculated time of concentration at the initial point of interception, even if it is less than the minimum time of concentration. For the design of the storm sewer use the minimum time of concentration as shown in TABLE 1 until such time that the actual time of concentration exceeds the minimum time.

Although the basic principles of the Rational Method are applicable to all sizes of drainage areas, natural retention of flow and other interruptions cause an attenuation of the runoff hydrograph resulting in over-estimation of rates of flow for larger areas. For this reason, in development of runoff rates in larger drainage areas, use of the Unit Hydrograph Method is recommended.

H. Unit Hydrograph Method

The Unit Hydrograph Method to be used in calculation of runoff shall be in accordance with Snyder's synthetic relationships.

The computation of runoff quantities utilizing the Unit Hydrograph Method is based on the following equations:

$$t_p = C_t (L L)^{0.3}$$

$$q_p = \frac{C_p^{640}}{t_p}$$

$$Q_p = q_p A$$

$$S_D = 1.2$$

$$R_T = S_D -$$

$$Q_u = R_T Q_p$$

- " t_p " is the lag time, in hours, from the midpoint of the unit rainfall duration to the peak of the unit hydrograph.
- " C_t " and " C_p^{640} " are coefficients related to drainage basin characteristics. Recommended values for these coefficients are found in TABLE 2.
- " L " is the measured stream distances in miles from the point of design to the upper limit of the drainage area.
- " L_{ca} " is the measured stream distance from the point of design to the centroid of the drainage area. This value may be obtained in the following manner:

- "q_p" is the peak rate of discharge of the unit hydrograph for unit rainfall duration in cubic feet per second per square mile.
- "Q_p" is the peak rate of discharge of the unit hydrograph in cubic feet per second.
- "A" is the area in square miles that is tributary to the point of design.
- "I" is the rainfall intensity at two hours in inches per hour for the appropriate design storm frequency.
- "S_D" is the design storm rainfall in inches for a two-hour period.
- "L_{is}" is the initial and subsequent losses, which have a recommended constant value of 1.11 inches.
- "R_T" is the total runoff in inches.
- "Q_u" is the design storm runoff in cubic feet per second.

I. Straight Crown Street Drainage

Storm water flow in a street having a straight crown slope may be expressed as follows:

$$Q = \frac{Z}{0.56 n} S^{1/2} Y^{8/3} \quad (\text{Equation 1})$$

- "Q" is quantity of gutter flow in cubic feet per second.
- "Z" is the reciprocal of the crown slope.
- "n" is the coefficient of roughness as used in Manning's Equation; a value of 0.0175 was used.
- "S" is the longitudinal slope of the street gutter in feet per foot.
- "Y" is the depth of flow in the gutter at the curb in feet.

J. Alley Capacity

FIGURE 6, CAPACITY OF ALLEY SECTIONS, was prepared based on solution of Manning's Equation:

$$Q = \frac{(1.486)}{n} (AR^{2/3}) (S^{1/2}) \quad (\text{Equation 2})$$

- "Q" is the alley capacity, flowing full, in cubic feet per second.
- "n" is the coefficient of roughness; a value of 0.0175 was used.
- "A" is the cross section flow area in square feet.
- "R" is the hydraulic radius in feet.
- "S" is the longitudinal slope in feet per foot.

K. Inlet Capacity Curves

The primary objective in developing the curves shown in FIGURES 8 through 22 was to provide the Engineer with a direct method for sizing inlets that would yield answers within acceptable accuracy limits.

L. Recessed and Standard Curb Opening Inlets on Grade

The basic curb opening inlet capacity curves, FIGURES 8 through 12, Recessed and Standard Curb Opening Inlets on Grade, were based upon solution of the following equation:

$$L = \frac{Q (H_1 - H_2)}{(H_1^{5/2} - H_2^{5/2}) (.70)} \quad (\text{Equation 6})$$

- "L" is the length of inlet, in feet, required to intercept the gutter flow.
- "Q" is the gutter flow in cubic feet per second.
- "H1" is the depth of flow, in feet, in the gutter approaching the inlet plus the inlet depression, in feet.
- "H2" is the inlet depression, in feet.

This is an empirical equation from "Hydraulic Manual", Texas Highway Department, dated September 1970. The data from solution of this equation was used to plot the curves shown on FIGURES 8 through 12.

M. Recessed and Standard Curb Opening Inlets at Low Point

FIGURE 13, Recessed and Standard Curb Opening Inlets at Low Point, was plotted from the solution of the following equation:

$$Q = 3.087 L h^{3/2} \quad (\text{Equation 7})$$

- "Q" is the gutter flow in cubic feet per second.
- "L" is the length of inlet, in feet, required to intercept the gutter flow.
- "h" is the depth of flow, in feet, at the inlet opening. This is the sum of the depth of the flow in the gutter, y_o , plus the depth of the inlet depression.

This equation expresses the capacity of a rectangular weir and is referenced in "The Design of Storm Water Inlets," dated June 1956, The John Hopkins University.

The calculated inlet capacities were reduced by ten percent of the preparation of FIGURE 13 due to the tendency of inlets at low points to clog from the collection of debris at their entrance.

N. Hydraulic Designs of Closed Conduits

All closed conduits shall be hydraulically designed through the application of Manning's Equation expressed as follows:

$$Q = A V$$

$$Q = \left(\frac{1.486}{n} \right) \left(A R^{2/3} \right) \left(S_f^{1/2} \right)$$

$$R = \frac{A}{P}$$

- "Q" is the flow in cubic feet per second.
- "A" is the cross sectional area of the conduit in square feet.
- "V" is the velocity of flow in the conduit in feet per second.
- "n" is the roughness coefficient of the conduit.
- "R" is the hydraulic radius, which is the area ("A") of flow divided by the wetted perimeter ("P").
- "S_f" is the friction slope of the conduit in feet per foot.
- "P" is the wetted perimeter.

O. Hydraulic Gradient of Conduits

A storm drainage conduit must have sufficient capacity to discharge a design storm with a minimum of interruption and inconvenience to the public using streets and thoroughfares. The size of the conduit is determined by accumulating runoff from contributing inlets and calculating the slope of a hydraulic gradient from Manning's Equation:

$$S = \left(\frac{Qn}{1.486 AR^{2/3}} \right)^2$$

Beginning at the upper most inlet on the system a tentative hydraulic gradient for the selected conduit size is plotted approximately 2 feet below the gutter between each contributing inlet to insure that the selected conduit will carry the design flow at an elevation below the gutter profile. As the conduit size is selected and the tentative hydraulic gradient is plotted between each inlet pickup point, a head loss due to a change in velocity and pipe size must be incorporated in the gradient profile. (See Table 6 for VELOCITY HEAD COEFFICIENTS FOR CLOSED CONDUITS.)

Also at each point where an inlet lateral enters the main conduit the gradient must be sufficiently low to allow the hydraulic gradient in the inlet to be below the gutter grade.

At the discharge end of the conduit (generally a creek or stream) the hydraulic gradient of the creek for the design storm (100-year) must coincide with the gradient of the storm drainage conduit and an adjustment is usually required in the tentative conduit gradient and, necessarily, the initial pipe selection could also change. The hydraulic gradient of the creek or stream for the design storm can be calculated by use of the HEC-2 or HEC-RAS Computer Program.

Concrete pipe conduit shall be used to carry the stormwater, a flow chart, Figure 23, based on Manning's Equation may be used to determine the various hydraulic elements including the pipe size, the hydraulic gradient and the velocity.

With the hydraulic gradient established, considerable latitude is available for establishment of the conduit flow line. The inside top of the conduit must be at or below the hydraulic gradient thus allowing the conduit to be lowered where necessary. The hydraulic gradient for the storm sewer line and associated laterals shall be plotted directly on the construction plan profile worksheet and adjusted as necessary.

There will be hydraulic conditions that cause the conduits to flow partially full and where this occurs, the hydraulic gradient should be shown at the inside crown (soffit) of the conduit. This procedure will provide a means for conservatively selecting a conduit size, which will carry the flood discharge.

P. Velocity in Closed Conduits

Storm sewers should operate within certain velocity limits to prevent excessive deposition of solids due to low velocities and to prevent invert erosion and undesirable outlet conditions due to excessively high velocity. A minimum velocity of 2.0 feet per second and a maximum velocity of 12 feet per second shall be observed.

Q. Roughness Coefficients for Closed Conduits

Roughness coefficients are directly related to construction procedures. When alignment is poor and joints have not been properly assembled, extreme head losses will occur. Coefficients used in this manner are related to construction procedures and assume that the pipe will be manufactured with a consistently smooth surface.

R. Minor Head Losses in Closed Conduits

The basic equation for calculation of minor head losses at manholes and bends in closed conduits is as follows:

$$h_j = K_j \frac{V^2}{2g}$$

- "h_j" is head loss in feet.
- "K_j" is coefficient of loss
- "V" is velocity in feet per second in conduit immediately downstream of point of loss.
- "g" is gravitation acceleration (32.2 feet per second per second).

The basic equations for calculation of minor head losses at wye branches (lateral connections to main storm sewer line) and pipe size change are as follows:

$$h_j = \frac{V_2^2 - V_1^2}{2g} \quad \text{Where } V_1 < V_2$$

$$h_j = \frac{V_2^2 - V_1^2}{4g} \quad \text{where } V_2 < V_1$$

- "h_j" is head loss in feet
- "V₂" is the downstream velocity in feet per second
- "V₁" is the upstream velocity in feet per second
- "g" is gravitational acceleration (32.2 feet per second per second)

S. Hydraulic Analysis of Existing Channels

The analysis of the carrying capacity of an existing channel is an application of Bernoulli's energy equation, which is written:

$$Z_1 + d_1 + h_{v1} = Z_2 + d_2 + h_{v2} + h_f + \text{other losses where}$$

- "Z1" and "Z2" is the streambed elevation with respect to a given datum at upstream and downstream sections, respectively.
- "d1" and "d2" is depth of flow at upstream and downstream sections, respectively.
- "h_{v1}" and "h_{v2}" is velocity head of upstream and downstream sections, respectively.
- "h_f" is friction head loss.

Other losses such as eddy losses are estimated as 10 percent of the friction head loss where the quantity h_{v2} minus h_{v1} is positive and 50 percent thereof when it is negative. Bend losses are disregarded as an unnecessary refinement.

The basic equations involved are:

$$Q = A V$$

$$h_v = \frac{V^2}{2g}$$

and Manning's Equation:

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

which is defined elsewhere in this chapter.

The friction head can be determined by using Manning's Equation in terms of the friction slope S_f, where:

$$S_f = \left(\frac{Q_n^2}{1.486^2 A R^{4/3}} \right)$$

thus giving the total friction head

$$h_f = L \left(\frac{S_{f1} + S_{f2}}{2} \right)$$

using the respective properties of Sections 1 and 2 for the calculation of S_{f1} and S_{f2}.

The velocity head h_v is found by weighing the partial discharges for each subdivision of the cross section, i.e.,

$$h_v = \frac{V_s^2}{2g} \frac{Q_s}{Q}$$

- "V_s" is velocity in subsection of the cross section.
- "A_s" is area of the subsection of the cross section.
- "Q_s" is discharge in the subsection of the cross section.
- "V_s" is $\frac{Q_s}{A_s}$

When severe constrictions occur the Momentum Equation may be required in determination of losses.

T. Design of Improved Channels

The hydraulic characteristics of improved channels are to be determined through the application of Manning's Equation as previously defined. In lieu of Manning's Equation a HEC-2 or HEC-RAS (Water Surface Profile) computer analysis can be utilized. The City, at its option, can require the use of a Computer Analysis in lieu of Manning's Equation. The HEC Computer Programs are available from the U.S. Army Corps of Engineers. The Hydrologic Engineering Center; 609 Second Street, Davis, California 95616, 916/440-2105 or can be downloaded from the Internet. User-friendly versions are available from a number of vendors.

U. Analysis & Design of Culverts Flowing with Inlet Control

Inlet control means that the discharge capacity of a culvert is controlled at the culvert entrance by the depth of the headwater and entrance geometry including the barrel shape and cross sectional area, and the type of inlet edge. Culverts flowing with inlet control can flow as shown on FORM "F", Case I (inlet not submerged) or as shown on FORM "F", Case II (inlet submerged).

Nomographs for determining culvert capacity for inlet control as shown on FIGURES 25 and 26. These nomographs were developed by the Division of Hydraulic Research, Bureau of Public Roads from analysis of laboratory research reported in National Bureau of Standards Report No. 4444, entitled "Hydraulic Characteristics of Commonly Used Pipe Entrances", by John L. French, and "Hydraulics of Conventional Highway Culverts", by H. G. Bossy.

Experimental data for box culverts with headwalls and wingwalls were obtained from an unpublished report of the U. S. Geological Survey.

V. Analysis & Design of Culverts Flowing with Outlet Control

Culverts flowing with outlet control can flow full as shown on FORM "F", Case III (outlet submerged), or part full for part of the barrel, as shown on FORM "F", Case IV (outlet not submerged).

The culvert is designed so that the depth of headwater, which is the vertical distance from the upstream culvert flow line to the elevation of the ponded water surface, does not encroach on the allowable freeboard during the design storm.

Headwater depth, HW, can be expressed by a common equation for all outlet control conditions:

$$HW = H + h_o - L (S_o)$$

- "HW" is headwater depth in feet.
- "H" is the head or energy required to pass a given discharge through a culvert.
- "h_o" is the vertical distance from the downstream culvert flow line to the elevation from which H is measured, in feet.
- "L" is length of culvert in feet.
- "S_o" is the culvert barrel slope in feet per foot.

The head, H, is made up of three parts including the velocity head, exit loss, H_v, an entrance loss, H_e, and a friction loss, H_f. This energy is obtained from ponding of water at the entrance and is expressed as:

$$H = H_v + H_e + H_f$$

- "H" is head or energy in feet of water.
- "H_v" is $\frac{V^2}{2g}$ where V is average velocity in culvert or $\frac{Q}{A}$
- "H_e" is K_e $\frac{V^2}{2g}$ where K_e is entrance loss coefficient
- "H_f" is energy required to overcome the friction of the culvert barrel and expressed as:

$$H_f = \frac{29.2n^2 L}{R^{1.33}} \frac{V^2}{2g}$$

- “n” is the coefficient of roughness (See TABLE 5).
- “L” is length of culvert barrel in feet.
- “V” is average velocity in the culvert in feet per second.
- “g” is gravitational acceleration (32.2 feet per second per second).
- “R” is hydraulic radius in feet.

Substituting into previous equation:

$$H = \frac{V^2}{2g} + K_e \frac{V^2}{2g} + \left(\frac{29.2n^2 L}{R^{1.33}} \right) \frac{V^2}{2g}$$

and simplifying:

$$H = \left(1 + K_e + \frac{29.2n^2 L}{R^{1.33}} \right) \frac{V^2}{2g} \quad \text{for full flow}$$

This equation for H may be solved using FIGURES 27 and 28.

For various conditions of outlet control flow, h_o is calculated differently. When the elevation of the water surface in the outlet channel is equal to or above the elevation of the top of the culvert opening at the outlet, h_o is equal to the tailwater depth or:

$$h_o = TW$$

If the tailwater elevation is below the top of the culvert opening at the outlet, h_o is the greater of two values: (1) Tailwater, TW, as defined above or (2) $d_c + D/2$ where d_c = critical depth. The critical depth, d_c , for box culverts may be obtained from FIGURE 29 or may be calculated from the formula:

$$d_c = 0.315 \left(\frac{Q^{2/3}}{B} \right)$$

- “ d_c ” is critical depth for box culvert in feet.
- “ Q ” is discharge in cubic feet per second.
- “ B ” is bottom width of box culvert in feet.

The critical depth for circular pipes may be obtained from FIGURE 30 or may be calculated by trial and error. Charts developed by the Bureau of Public Roads may be used for determining the critical depth. Try values of D , A and d_c which will satisfy the equation:

$$\frac{Q^2}{G} = \frac{A^3}{D}$$

- “ d_c ” is critical depth for pipe in feet.
- “ Q ” is discharge in cubic feet per second.
- “ D ” is diameter of pipe in feet.
- “ g ” is gravitational acceleration (32.2 feet per second per second).
- “ A ” is the cross sectional area of the trial critical depth of flow.

The equation is applicable also for trapezoidal or irregular channels, in which instances “ D ” becomes the channel top width in feet.

W. Detention of Storm Water Flow

As land changes from undeveloped to developed conditions, the peak rates of runoff and the total volume of runoff usually increase. This increase is due to an overall increase in impervious area as the watershed changes to a fully developed condition. Developments shall be required to provide adequate detention so that post-development peak flows do not exceed the peak flows calculated for the area using the rational method with the coefficient for runoff

appropriate for the conditions prior to development. The detention system shall be designed for both the 100-yr and 2-yr design storm events.

The criteria for the design of detention facilities are based on the concept that post-development peak flows should not create an adverse condition when compared to pre-development peak flows. In applying such a concept, it is necessary to consider peak flows from a number of different design storms. By considering a range of design storms, it is possible to design an outlet system to limit the discharge from the detention facility and achieve zero or very little increase in flow for a range of storms. Such a design will allow the detention system to achieve maximum effectiveness since both the more frequent and more severe storm events can be controlled.

A form of the Rational Method should be used to calculate inflow volumes from areas less than 50 acres. A form of the inflow hydrographs or unit hydrograph method shall be used for areas of 50 acres or more. No reduction in the design storm frequency shall be considered when utilizing detention systems within the overall storm drainage design.

X. Manholes

Place manholes for cleanout and inspection purposes on all storm sewer lines as shown in the table below.

Pipe Diameter (Inches)	Maximum Distance (feet)
12 - 24	350
24 - 36	400
39 - 54	500
=>60	900

Section 3.3

General Requirements

A. Design Storm Frequency

Each storm drainage facility, including street capacities, shall be designed to convey the runoff, which results from the 100-year design storm.

Drainage design requirements for open and closed systems shall provide protection for property during a 100-year Design Frequency Storm, with this projected flow carried in the streets and closed drainage systems in accordance with the following:

- a) Residential Streets: Based on a transverse slope of a positive $\frac{1}{4}$ " per foot behind the curb, the 100-year design storm frequency shall not exceed a depth of 1-inch over the top of curb. A maximum flow of 20 cfs will be allowed in each gutter or where gutter capacity is exceeded plus 1-inch. Bypass from upstream inlets shall not exceed 5 cfs through residential street intersections.
- b) Collector Streets: Based on parkway slopes of a positive $\frac{1}{4}$ " per foot behind the curb, the 100-year Design Frequency flows shall not exceed a depth of $\frac{1}{2}$ " over the top of curb or where gutter capacity $+\frac{1}{2}$ " is exceeded. A maximum flow of 20 cfs will be allowed in each gutter or where capacity $+\frac{1}{2}$ " gutter is exceeded. Bypass from upstream inlets shall not exceed 5 cfs through collector street inlets.
- c) Major Thoroughfares: Based on a transverse slope of a positive $\frac{1}{4}$ " per foot on the pavement, the 100-year Design Frequency flow shall not exceed the elevation of the lowest top of curb. A maximum of 35 cfs will be allowed in the street or where gutter capacity is exceeded. Bypass from upstream inlets shall be 0 cfs through major thoroughfare intersections.
- d) Alleys: The 100-year Design Frequency flows shall not exceed the capacity of the alley sections shown in FIGURE 6.
- e) Excavated Channels: Excavated channels shall have concrete pilot channels if deemed necessary by the Director of Public Works & Engineering, for access or erosion control as outlined below. All excavated channels shall have a design

water surface as outlined in 3.06 and be in accordance with FIGURE 24, Type II. Concrete lined channels shall be not less than Type III shown in FIGURE 24.

- f) Minimum Lot and Floor Elevations : Minimum lot and floor elevations shall be established as follows:
- i) Lots abutting a natural or excavated channel shall have a minimum elevation for the buildable area of the lot at least at the highest elevation of the drainage floodway easement described in (g) Easements.
 - ii) Any habitable structure on property abutting a natural or excavated channel shall have a finished floor elevation at least 2-feet above the 100-year design storm or F.I.A. floodway elevation, whichever is greater.
 - iii) Where lots do not abut a natural or excavated channel, minimum floor elevations shall be a minimum of 1-foot above the street curb or edge of alley; whichever is lower, unless otherwise approved by the Director of Public Works & Engineering.
- g) Easements: Drainage and floodway easements shall be provided for all open channels. Drainage and floodway easements for storm sewer pipe shall be the outside diameter of the conduit plus 10-feet with the minimum being 15 feet, and easement width for open or lined channels shall be at least 20 feet wider than the top of the channel, 15 feet of which shall be on one side to serve as an access for maintenance purposes.
- h) Positive Overflow: The approved drainage system shall provide for positive overflow at all Low Points. The term "Positive Overflow" means that when the inlets do not function properly or when the design capacity of the conduit is exceeded the excess flow can be conveyed overland along a paved course. Normally, this would mean along a street or alley but can require the dedication of special drainage easements on private property. Reasonable judgment should be used to limit the easements on private property to a minimum. In specific cases where the chances of substantial flood damages could occur, the City of Sachse may require special investigations and designs by the design engineer.
- i) Inlet Design: Inlet spacing shall be in accordance with the design criteria contained

in this manual, minimum 300 feet apart, or as required in Section 3.8, maximum length of inlets at one location shall not exceed 20 feet each side of street without prior approval from the Director of Public Works & Engineering.

- j) Culverts and Bridges: All drainage structures shall be designed to carry the 100-year Design Frequency flow. Bridges and culverts shall be designed for a water surface elevation as outlined in 3.6. Two feet of freeboard is required for these structures.
- k) Minimum Street or Alley Elevations: Streets or alleys adjacent to an open channel shall be designed with an elevation not lower than 1-foot above the drainage and floodway easements defined in (g) above or as directed by the Director of Public Works & Engineering.

B. Design Storm Frequency

The Rational Method for computing storm water runoff is to be used for hydraulic design of facilities serving a drainage area of less than 600 acres. For drainage areas of more than 600 acres and less than 1200 acres, the runoff shall be calculated by both the Rational Method and the Unit Hydrograph Method with the larger of the two values being used for hydraulic design. For drainage areas larger than 1200 acres the runoff shall be calculated by the Unit Hydrograph Method, or as outlined in 3.06 (l).

In lieu of the Unit Hydrograph Method a HEC-1 (Flood Hydrograph) Computer Analysis can be utilized. The City at its option can require the use of HEC-1 Computer Analysis in lieu of the unit Hydrograph Method. The HEC-1 Computer Program is available from the U.S. Army Corps of Engineers, the Hydrologic Engineering Center, 609 Second Street, Davis, California 95616, 916/440-2105 or can be downloaded from their Internet site. User-friendly versions are available from a number of vendors.

C. Flow in Gutters and Inlet Design

Unless there are specific agreements to the contrary prior to beginning design of the particular storm drainage project, the City of Sachse requires a storm drain conduit to begin, and consequently the first inlet to be located, at the point where the street gutter flows full based upon the appropriate design storm frequency. If, in the opinion of the Director of Public Works & Engineering, the flow in the gutter would be excessive under these conditions, then direction will be given to extending the storm sewer to a point where the gutter flow can be intercepted by more reasonable inlet locations.

D. Street Intersection Drainage

The use of surface drainage to convey storm water across a street intersection is subject to the following criteria:

- a) A major thoroughfare shall not be crossed with surface drainage unless approved by the Director of Public Works & Engineering.
- b) Wherever possible, a collector street shall not be crossed with surface drainage.
- c) Wherever possible, a residential street shall not be crossed with surface drainage in excess of 5 cfs.
- d) At any intersection, only one street shall be crossed with surface drainage and this shall be the lower classified street.

E. Procedure for Sizing and Locating Inlets

In order that the design procedure for determining inlet locations and sizes may be facilitated, a standard form, INLET DESIGN CALCULATIONS, FORM B, has been included in the Section VIII together with an explanation of how to use the form. Minimum distance between inlets on streets, especially major thoroughfares, shall be 300 feet or as required in Section 3.8. Remainder to be collected offsite before flowing into street.

F. Headwalls and Entrance Conditions

Headwalls are used to protect the embankment from erosion and the culvert from displacement. The headwalls, with or without wingwalls and aprons, shall be constructed in accordance with the standard drawings as required by the physical conditions of the particular installation.

In general, straight headwalls should be used where the approach velocities in the channel are below 6 feet per second, where headwater pools are formed and where no downstream channel protection is required. Headwalls with wingwalls and aprons should be used where the approach velocities are from 6 to 12 feet per second and downstream channel protection is desirable.

Special headwalls and wingwalls may be required where approach velocities are in excess of 12 to 15 feet per second. This requirement varies according to the axis of the approach velocity with respect to the culvert entrance.

A table of culvert entrance data is shown on FORM "F". The values of the entrance coefficient, K_e , are a combination of the effects of entrance and approach conditions. It is recognized that all possible conditions may not be tabulated, but an interpolation of values should be possible from the information shown. Where the term "round" entrance edge is used, it means a 6-inch radius on the exposed edge of the entrance.

G. Culvert Discharge Velocities

Velocities in culverts should be limited to no more than 15 feet per second, but downstream conditions very likely will impose more stringent controls. Consideration must be given to the effect of high velocities and turbulence on the channel, adjoining property and embankment. TABLE 8 is a tabulation of maximum allowable velocities based on downstream channel conditions.

H. Procedure for Filling in a Flood Plain

Fill and development of floodplains, which is not unreasonably damaging to the environment is permitted where it will not create other flood problems. Following are the engineering criteria for fill requested:

a) Alterations of the flood plain shall result in no increase in water surface elevation on other properties. No alteration of the channel or adjacent flood plain will be permitted which could result in any degree of increased flooding to other properties, adjacent, upstream, or downstream. Increased flood elevation could cause inundation and damage to areas not presently inundated by the "design flood". The "design flood" for a creek is defined by either the 100-year flood -- the flood having a one percent chance of being equaled or exceeded at least once in any given year -- or the maximum recorded flood, whichever results in the highest peak flood discharges. Streams on the Federal Insurance Rate Maps must be designed using the FIRM 100-year design or the City design, whichever is greater.

b) Alterations of the flood plain shall not create an erosive water velocity on or off site. The mean velocity of stream flow at the downstream end of the site after fill shall be no greater than the mean velocity of the stream flow under existing conditions.

No alteration to the flood plain will be permitted which would increase velocities of flood waters to the extent that significant erosion of flood plain soils will occur either on the subject property or on other property up or downstream. Soil erosion results in loss of existing vegetation as well as augments destructive sedimentation downstream. Eventual public costs in channel improvements and maintenance (such as removal of debris and dredging of lakes) can be expected as a result. Staff's determination of what constitutes an "erosive" velocity will be based on analysis of the surface material and permissible velocities for specific cross-sections affected by the proposed alteration, using standard engineering tables as a general guide.

c) Alterations of the flood plain shall be permitted only to the extent permitted by equal conveyance on both sides of the natural channel. Staff's calculation of the impact of the proposed alteration will be based on the "equal conveyance" principle in order to insure equitable treatment for all property owners. Under equal conveyance, if the City allows a change in the flood carrying capacity (capacity to carry a particular volume of water per unit of time) on one side of the creek due to a proposed alteration of the flood plain, it must also allow an equal change to the owner on the other side. The combined change in flood carrying capacity, due to the proposed alteration plus a corresponding alteration to the other side of the creek, may not cause either an increase in flood elevation or an erosive velocity (Criteria 1 and 2) or violate the other criteria. Conveyance is mathematically expressed as $KD = 1.486/n AR^{2/3}$ where n = Manning's friction factor, A = cross sectional area, and R = hydraulic radius.

d) The toe of any fill slope shall parallel the natural channel to prevent an unbalancing of stream flow in the altered flood plain. If the alignment of the proposed fill slope departs from the contours of the natural flood plain, the flow characteristics of the floodwaters may be altered, causing possible damaging erosion and deposition in the altered flood plain. If the fill slope flows the natural channel, it will also tend to minimize the visual impact of the alteration.

e) To insure maximum accessibility to the flood plain for maintenance and other purposes and to lessen the probability of slope erosion during periods of high water, maximum slopes of filled area shall usually not exceed 4 to 1. Vertical walls, terracing and other slope treatments will be considered only as a part of a landscaping plan submission and if no unbalancing of stream flow results. The purposes of the slope restrictions are to maintain stability and prevent erosion of the slopes, to ease maintenance (e.g. mowing) on the slopes themselves, and to provide accessibility to the areas below the slopes. Being more frequently inundated and therefore subject to greater hazard of erosion, cut slopes must be shallower than fill slopes.

f) Landscaping plan submission shall include plans for erosion control of cut and fill slopes, restoration of excavated areas, and tree protection where possible in and below fill area. Landscaping should incorporate natural materials (earth, stone, wood) on cut or fill slopes wherever possible. Applicant should show in plan the general nature and extent of existing vegetation on the tract, and which areas will be preserved, altered, or removed as a result of the proposed alterations. Locations and construction details should be provided showing how trees will be preserved in areas which will be altered by filling or paving within the drip line of those trees. Applicant should also submit plans showing location, type, and size of new plant materials and other landscape features planned for altered flood plain areas. Erosion control plans should demonstrate how the developer intends to minimize soil erosion and sedimentation from his site during and after the fill operation. Plans should include a timing schedule showing anticipated starting and completion dates for each step of the proposed operation. Area and time of exposed soils should be minimized, and existing vegetation should be retained and protected wherever feasible. Disturbed areas should be sodded or covered with mulch and/or temporary vegetation as quickly as possible. Structural measures (e.g. drop structures, sediment

ponds, etc.) should be utilized where necessary for effective erosion control, but measures should also minimize structures and materials that detract from the natural appearance of the flood plain.

I. Filling in 100 Year Floodway Fringe

a) Definitions

- i) 100 Year Flood Plain Elevation (100 Year F.P.El.): That water surface elevation established by applying the Manning Equation ($Q = 1.486/n AR^{1/2} S^{1/2}$) to the backwater analysis of a stream (river, creek or tributary) using the 100-year storm as the rate of flow (Q). The 100-Year F.P. Elevations are those based on the Corps of Engineer's analysis and form the basis of the Flood Insurance Rate Map (FIRM) as adopted by the Federal Insurance Administration, or subsequent amendments.
- ii) Flood Plain: Area of land lying below the 100-year flood plain elevation.
- iii) Floodway: That central portion of the flood plain which would remain clear of filling or other obstructions, unless modifications are made within or along the stream bed to offset the effect of additional filling or obstructions within the floodway.
- iv) Floodway Fringe: Area between flood plain line and the floodway line that, if filled, would not produce a significant rise in the 100-year flood plain elevation.
- v) Significant Rise: A rise in the 100-year water surface elevation greater than one (1) foot for fill on both sides of a stream or one-half (0.5) feet for fill on one side of a stream.
- vi) Floodway Line: The inter-boundary of the floodway fringe determined by filling within a flood plain along the entire reach of a stream in such a manner that the total cumulative effect of the filling will not create a significant rise in the 100-year water surface elevation.
- vii) Equal Conveyance Principle: An area of the cross section of a stream in its existing condition carrying a percentage of the stream flow, will continue to carry the same percentage of the stream flow after filling in the flood plain occurs without creating a significant rise in the 100-year flood plain elevation.

b) Criteria for Filling in the 100 Year Floodway Fringe

- i) Applies only to creeks or portions of creeks with a drainage area of five (5) square miles, or less.
- ii) Fill and development of the flood plains shall not create a "significant rise" in the 100-year flood plain elevation.
- iii) For fill and/or other development within the floodway, supporting hydraulic analysis will be required prior to or at the time of submittal of the preliminary plat demonstrating that the proposed development will not create a "significant rise"

in the "100-year flood plain elevation".

iv) In beginning a backwater analysis for development within a flood plain, the downstream water surface elevation will be determined as follows:

- For fill on one side only of a stream, add one-half (0.5) feet to the 100-year flood plain elevation at the downstream property line.
- For fill on both sides of a stream, add one (1.0) foot to the 100-year flood plain elevation at the downstream property line.

v) Alterations of the floodway shall not create velocities, which could produce maximum erosive velocities in excess of those set forth in Table 7.

vi) Floodway Line shall be established in accordance with the definition in (A) above.

vii) Equal Conveyance shall be required in accordance with the definition of Equal Conveyance Principle in (A) above.

viii) The requirements of 3.36, Paragraphs d, e and f shall apply.

ix) Final approval shall be by FEMA.

J. Detention Ponds

On-site detention shall be used to control post-development runoff. Where possible, regional detention systems are highly encouraged. Developments shall be required to provide adequate detention so that post-development peak flows do not exceed the peak flows calculated for the area using the rational method with the coefficient for runoff appropriate for the conditions prior to development. Inflow volumes shall be calculated for the 2 and 100-year storm frequencies. For areas less than 50 acres a form of the Rational Method will be acceptable, while for areas 50 acres and larger an inflow hydrograph, unit hydrograph or HEC-1 computer model will be required. A hydraulic study that illustrates no adverse conditions are created downstream as a result of development may be accepted in lieu of storm water detention. City Council may waive storm water detention requirements upon determination by the Council that such waiver is in the best interest of the City.

The detention system shall be designed for the 2-year and 100-year storm frequency, 24-hour design storm duration and a time to empty of 48 hours. Any type of pond design shall be designed with a freeboard of 30% the nominal depth of the pond, but not less than 2.0 feet. The maximum allowable headwater must be kept within the range of slope

stability of the embankment construction. All design calculations shall be a part of the construction plans.

An outlet control structure such as an orifice and weir placed at the inlet end of the outfall pipe is to provide an integrated stage-discharge such that a wide range of storms can be effectively controlled. Perforated riser pipes, weirs and special outlet control boxes are acceptable. Pipe/culvert type outlet control will only be allowed with written approval from the City. All vertical structures shall have anti-vortex and trash rack devices. Emergency overflow structures and paved positive overflow channels shall be included with the design of detention systems.

Whenever possible, detention ponds shall fit in the natural contour of the land, be aesthetically pleasing and be free draining. A grading plan with 2-foot intervals shall be placed on the construction plans. Maintenance access shall be provided for each pond. The bottom slope shall be a minimum of 1% towards the outfall structure. Detention basins shall be designed with short and long term erosion control. A detention system maintenance program shall be prepared and submitted to the City for approval before final acceptance of the construction plans

Section 3.4

Drainage Plan Preparation

A. Drainage Plan Requirements

1. The preliminary plat submittal shall include concept drainage plans in sufficient detail to allow review by the City of Sachse. To complete this phase, all topographic surveys should be furnished to allow establishment of alignment, grades and right-of-way requirements. These may be accomplished by on-the-ground field surveys, by aerial photogrammetric methods, or by use of topographic maps.
2. The civil plan submittal shall be made following approval of the preliminary plat. Detailed civil construction plans shall include the hydraulic design of the proposed facilities. All calculations shall be made on the appropriate forms and submitted with the plan set.

These plans shall show the alignment, drainage areas, size of facilities and grades.

a) Drainage Area Map

The scale of the drainage area map should be determined by the method to be used in calculating the runoff as discussed in Section III. Generally, a map having a scale of 1" = 200' (showing the street right-of-way) is suitable unless dealing with a large drainage area. For large drainage areas a map having a scale of 1" = 1000' is usually sufficient. When calculating runoff the drainage area map shall show the boundary of the drainage area contributing runoff into the proposed system. This boundary can usually be determined from a map having a contour interval of 2 to 5 feet. The area shall be further divided into sub-areas to determine flow concentration points or inlet locations.

Direction of flow within streets, alleys, natural and manmade drainage ways and at all system intersections shall be clearly shown on the drainage area map. Existing and proposed drainage inlets, storm sewer pipe systems and drainage channels shall be clearly shown and differentiated on the drainage area map. Plan-profile storm sewer or drainage improvement sheet limits shall also be shown.

The Drainage Area Map should show enough topography to easily determine its location within the City.

All offsite drainage within the natural drainage basin shall be shown and delineated. Runoff calculations including inlet calculations, shall be a part of the drainage area map.

b) Plan-Profile Sheets

Inlets shall be given the same number designation as the area or sub-area contribution runoff to the inlet. The inlet number designation shall be shown opposite the inlet.

Inlets shall be located at or immediately downstream of drainage concentration points. At intersections, where possible, the end of the inlet shall be ten feet from the curb radius and the inlet location shall also provide minimum interference with the use of adjacent property. Inlet locations directly above storm sewer lines shall be avoided.

Data opposite each inlet shall include paving or storm sewer stationing at centerline of inlet, size of inlet, type of inlet, number or designation, top of curb elevation and flow line of inlet as shown on the typical plans. Inlet laterals leading to storm sewers, where possible, shall enter the inlet at a 60 degree angle from the street side. Laterals shall be four and one-half feet from top of curb to flow line of inlet unless utilities or storm sewer depth requires otherwise. Laterals shall not enter the corners of inlets. Lateral profiles shall be drawn showing appropriate information including the Hydraulic Gradient.

In the plan view, the storm sewer designation, size of pipe, and length of each size pipe shall be shown adjacent to the storm sewer. The sewer plan shall be stationed at one hundred foot intervals and each sheet shall begin and end with even or fifty foot stationing. All storm sewer components shall be stationed.

The profile portion of the storm sewer plan-profile sheet shall show the existing ground profile along the centerline of proposed sewer, the hydraulic gradient of the sewer, the proposed storm sewer, and utilities which intersect the alignment of the proposed storm sewer. Also shown shall be the diameter of the proposed pipe in inches and the physical grade in percent. Hydraulic data for each length of storm sewer between interception points shall be shown on the profile. This data shall consist of pipe diameter in inches, discharge in cubic feet per second, slope of hydraulic gradient in percent, capacity of pipe in cubic feet per second and velocity in feet per second. Also, the head loss at each interception point shall be shown.

Elevations of the flow line of the proposed storm sewer shall be shown at one hundred

foot intervals on the profile. Stationing and flow line elevations shall also be shown at all pipe grade changes, pipe size changes, lateral connections, manholes and wye connection.

APPENDIX “A”

Definitions

A Definition of Terms

Angle of Flare: Angle between direction of wingwall and centerline of culvert or storm drain outlet.

Backwater Curve: The surface curve of a stream of water.

Conduit: Any closed device for conveying flowing water.

Control: The hydraulic characteristic, which determined the stage-discharge relationship in a conduit.

Critical Flow: The state of flow for a given discharge at which the specific energy is a minimum with respect to the bottom of the conduit.

Entrance Head: The head required to cause flow into a conduit or other structure; it includes both entrance loss and velocity head.

Entrance Loss: Head lost in eddies or friction at the inlet to a conduit, headwall or structure.

Flume: Any open conduit on a prepared grade, trestle or bridge.

Freeboard: The distance between the normal operating level and the top of the side of an open channel left to allow for wave action, floating debris, or any other condition or emergency without overflowing structure.

Headwater: Depth of water in the channel measured from the invert of the culvert inlet.

HEC-1: Computer Program to analyze a Flood Hydrograph. This program is available from the U. S. Army Corps of Engineers.

HEC-2/HEC-RAS: Computer Program to analyze a Water Surface Profile. This program is available from the U. S. Army Corps of Engineers.

Hydraulic Gradient: A line representing the pressure head available at any given point within the system.

Invert: The flow-line of conduit (pipe or box).

Manning's Equation: The uniform flow equation used to relate velocity, hydraulic radius and energy gradient slope.

Open Channel: A channel in which water flows with a free surface.

Rational Formula: The means of relating runoff with the area being drained and the intensity of the storm rainfall.

Soffit: The inside top of the conduit (pipe or box).

Steady Flow: Constant discharge.

Surcharge: Height of water surface above the crown of a closed conduit at the upstream end.

Tailwater: Total depth of flow in the downstream channel measured from the invert of the culvert outlet.

Time of Concentration: The estimated time in minutes required for runoff to flow from the most remote section of the drainage area to the point at which the flow is to be determined.

Total Head Line (Energy Line): A line representing the energy in flowing water. It is plotted a distance above the profiles of the flow line of the conduit equal to the normal depth plus the normal velocity head plus the pressure head for conduits flowing under pressure.

Uniform Channel: A channel with a constant cross section and roughness coefficient.

Uniform Flow: A condition of flow in which the discharge, or quantity of water flowing per unit of time, and the velocity are constant. Flows will be at normal depth and can be computed by the Manning Equation.

Watershed: The area drained by a stream or drainage system.

B Detention System Definitions

Detention Storage: Detention storage facilities are generally designed to control short, high-intensity local storms, as these are the major cause of flooding on small streams (1). Detention storage serves to attenuate the peak flow by reducing the peak outflow to a rate less than the peak inflow, which effectively lengthens the time base of the outflow hydrograph. The total volume of water discharged is the same; it is merely distributed over a long period of time (2). Discharge from detention storage facilities begins immediately at the start of the storm, and the facility is usually completely drained within a day after the storm event.

Retention Storage: Retention storage refers to those facilities where stormwater is collected and stored during the flood event. The stored water is released after the flood event by means of controlled outlet works. Alternatively, the water may be allowed to infiltrate into the ground or evaporate. For maximum effectiveness, the water contained in the retention storage facility must be released or lost before the next flood event occurs (2). In some cases, it may be desirable to maintain a permanent pool within the retention area. Such a facility is termed wet storage.

Conveyance Storage: As stormwater enters and flows in channels, floodplains, drains, and storm sewers, the flow is being stored in transient form and is termed conveyance storage. Conveyance storage is generally obtained by constructing low-velocity channels with large cross-sectional areas.

Upstream Storage: This storage occurs upstream of the design area to be protected. It is intended to contain runoff, which originates upstream and beyond the area to be protected.

Within-Area Storage: This storage occurs in the area to be protected. It is intended to store runoff originating in and around the area to be protected. It is common for such storage to be provided at the development sites.

Downstream Storage: This is storage located downstream from the area to be protected. The general purpose of downstream storage is to manage storm flows from the area to be protected and to control any detrimental downstream effects from development in the protected area.

Rainfall Storage: Rainfall storage refers to the storage of water in the vicinity of the rainfall occurrence or before storm water accumulates significantly (3). This storage classification is similar to "within-area storage" as described above.

Runoff Storage: Runoff storage refers to the storage of larger quantities of water, which have accumulated significantly and have begun to flow in the drainage system. This storage classification is closely related to "upstream storage" and "downstream storage" as described above.

Driveway Storage: This storage method involves the construction of depressed section in the driveway such that runoff from the lot and/or roof may be routed and stored there. A properly designed outlet system will regulate the discharge of this runoff into the drainage system (2).

Cistern/Infiltration: A cistern or tank can be located within the property area to collect runoff from the lot and roof. If local subsurface soil properties and geologic conditions permit, the water can be infiltrated after the storm subsides (2).

Cistern/Irrigation: This method is identical to the "cistern/infiltration" method except that the option is provided for the water in the cistern to be used for an irrigation water supply or to be discharged into the storm sewer system.

Rooftop Storage: This storage method is most applicable to industrial, commercial, and apartment buildings with large flat roofs. Rooftop storage is often an economical and effective alternative. Since it is common for buildings to be designed for snow loads, it is possible to accommodate an equivalent depth of water without significant structural changes. A six-inch depth of water is equivalent to 31.2 pounds per square foot, less than most snow load requirements in the northern United States and Canada (4).

Special roof drains with controlled outlet capacity are typically installed as an integral part of the rooftop storage method. With proper installation of such drains, peak runoff from roofs may be reduced by up to 90 percent (4).

An important consideration for the rooftop storage method would be to provide overflow mechanisms to ensure that the structural capacity of the roof is not exceeded. An additional consideration would be the water tightness of the rooftop.

Parking Lot Storage: Parking lots can be graded to route runoff to desired storage areas or areas of infiltration. If the flow is routed to a storage area, outlet works such as grated inlets or overflow weirs serve to regulate the design flow. Alternatively, the runoff may be routed to grass or gravel filled areas for infiltration and percolation.

On-Site Ponds: On-site ponds provide for the collected stormwater to be released in a controlled manner by overflow weirs or orifices. When properly designed, on-site ponds can serve the hydraulic function while providing recreational and aesthetic benefits.

Slow-Flow Drainage Patterns: This storage method involves the design of conveyance systems with reduced grades to provide reduced flow velocities. The desired effect is to obtain temporary ponding and a form of transient storage. Slow flow drainage may be augmented by providing controls (e.g., weirs, checks) along channels to create a system linear reservoirs (2). Use of such controls will provide temporary storage while allowing for a possible increase in infiltration.

Open Space Storage: Open spaces such as parks and recreation fields generally have a substantial area of grass covering and provide increased infiltration opportunities. Such open spaces produce only minimal quantities of runoff. Therefore, open spaces provide excellent opportunities for the temporary storage of storm runoff, provided the primary use of the open space is not altered. This is generally not a problem since recreation areas are seldom used during storm events.

Retention Reservoirs: Retention reservoirs located in a watershed catchment generally represent major storage facilities (2). They are most effective when located in valleys or recessed areas and should have the ability to regulate stream flow. Retention reservoirs maintain a permanent pool in the form of ponds or lakes. As such, they are well suited for water-oriented recreational features.

Detention Reservoirs: Detention reservoirs are generally located on streams and are frequently located above the reaches where there is a continuous flow (2). Since a permanent pool is not maintained, detention reservoirs do not provide opportunities for water-oriented recreation. However, they may be conveniently integrated into a park and open space plan.

Gravel Pits and Quarries: Gravel pits and quarries are located off-channel such that a side-channel spillway is necessary to intercept and direct the peak flow to the pit location. Outfall from such storage facilities must generally be pumped.

APPENDIX “B”

Tables

Table 1

Coefficients of Runoff and Minimum Inlet Times

Land Use	Runoff Coefficient C	Minimum Inlet Time In Minutes
Residential	0.5	15
Commercial	0.85	10
Industrial	0.9	10
Multiple Unit Dwelling	0.75	10
Parks	0.4	15
Cemeteries	0.4	15
Pasture	0.3	15
Woods	0.3	20
Cultivated	0.3	20
Shopping Centers	0.9	10
Paved Areas	0.95	10
Schools	0.7	10
Patio Homes	0.65	10
Churches	0.7	10

TABLE 2**Coefficients "C_t" AND "C_{p640}"**

Drainage Area Characteristics	Approximate Value of	Approximate Value of
Sparsely Sewered Area		
Flat Basin Slope (less than 0.50%)	0.65	350
Moderate Basin Slope (0.50% to 0.80%)	0.60	370
Steep Basin Slope (greater than 0.80%)	0.55	390
Moderately Sewered Area		
Flat Basin Slope (less than 0.50%)	0.55	400
Moderate Basin Slope (0.50% to 0.80%)	0.50	420
Steep Basin Slope (greater than 0.80%)	0.45	440
Highly Sewered Area		
Flat Basin Slope (less than 0.50%)	0.45	450
Moderate Basin Slope (0.50% to 0.80%)	0.40	470
Steep Basin Slope (greater than 0.80%)	0.35	490

TABLE 3

Minimum Slopes for Pipes
(n = 0.013)

Pipe Diameter (Inches)	Slope (Feet/100 Feet)
15	.250
18	.180
21	.150
24	.120
27	.110
30	.090
33	.080
36	.070
39	.062
42	.056
45	.052
48	.048

Pipe Diameter (Inches)	Slope (Feet/100 Feet)
51	.045
54	.041
60	.036
66	.032
72	.028
78	.025
84	.023
90	.021
96	.019
102	.018
108	.016

NOTE: Minimum pipe diameter to be used in construction of storm sewers shall be 18-inches

TABLE 4

Maximum Velocities in Closed Conduits

Type of Conduit	Maximum Velocity
Culverts	15 f.p.s.
Inlet Laterals	30 f.p.s.
Storm Sewers	12 f.p.s.

Storm sewers that discharge into open channels shall be at a maximum velocity of 8-feet per second unless channel protection is provided for the reach from the point of discharge until velocity is less than 8-feet per second in the channel. **THIS MAXIMUM VELOCITY MUST BE MAINTAINED IN THE LAST 200-FEET OF STORM SEWER.**

TABLE 5

Roughness Coefficients for Closed Conduits

<u>Material of Construction</u>	<u>Recommended Roughness Coefficient "n"</u>
New Monolithic Concrete Conduit.....	0.015
Concrete Pipe Storm Sewer	
Good Alignment, Smooth Joints	0.013
Fair Alignment, Ordinary Joints	0.015
Poor Alignment, Poor Joints	0.017
Concrete Pipe Culverts	0.012
Monolithic Concrete Culverts	0.012
Corrugated Metal Pipe	0.024
Corrugated Metal Arch Pipe.....	0.024
Corrugated Metal Pipe with Smooth Liner.....	0.015

NOTE: Reinforced concrete pipe is the accepted material for construction of storm sewers. The use of other materials for the construction of storm sewers shall have prior approval from the Director of Public Works & Engineering. For design of all pipe material an "n" of 0.013 shall be used.

TABLE 6
Velocity Head Loss Coefficients for Closed Conduits

MANHOLE AT CHANGE IN PIPE DIRECTION		
Description	Angle	Head Loss Coefficient K _j
Angle	90	1.00
	60	0.80
	45	0.65
	30	0.50
BEND IN PIPES		
Description	Angle	Head Loss Coefficient K _j
Angle	*90°	0.80
	*60°	0.60
	**45°	0.50
	**30°	0.45
ENLARGEMENTS IN PIPE SIZES WITH CONSTANT FLOW		
Description	Ratio of Upstream Diameter to Downstream Diameter	Head Loss Coefficient K _j
	0.81	1.00
	0.82	0.90
	0.84	0.80
	0.85	0.70
	0.86	0.60
	0.88	0.50
	0.90	0.40
	0.92	0.30

* Only as authorized by Director of Public Works & Engineering.

** Horizontal curves are the accepted method of construction.

TABLE 7**Roughness Coefficients for Open Channels**

Channel Description	Roughness Coefficient			Maximum m Ft/se
	Minimum	Normal	Maximum	
MINOR NATURAL STREAMS – TYPE I CHANNEL				
Moderately Well Defined Channel				
• Grass and Weeds, Little Brush	0.025	0.030	0.033	8
• Dense Weeds, Little Brush	0.030	0.035	0.040	8
• Weeds, Light Brush on Banks	0.030	0.035	0.040	8
• Weeds, Heavy Brush on Banks	0.035	0.050	0.060	8
• Weeds, Dense Willows on Banks	0.040	0.060	0.080	8
Irregular Channel with Pools and Meanders				
• Grass and Weeds, Little Brush	0.030	0.036	0.042	8
• Dense Weeds, Little Brush	0.036	0.042	0.048	8
• Weeds, Light Brush on Banks	0.036	0.042	0.048	8
• Weeds, Heavy Brush on Banks	0.042	0.060	0.072	8
• Weeds, Dense Willows on Banks	0.048	0.072	0.096	8
Flood Plain, Pasture				
• Short Grass, No Brush	0.025	0.030	0.035	8
• Tall Grass, No Brush	0.030	0.035	0.050	8
Flood Plain, Cultivated				
• No Crops	0.025	0.030	0.035	8
• Mature Crops	0.030	0.040	0.050	8
Flood Plain, Uncleared				
• Heavy Weeds, Light Brush	0.035	0.050	0.070	8
• Medium to Dense Brush	0.070	0.100	0.160	8
• Trees with Flood Stage below Branches	0.080	0.100	0.120	8
MAJOR NATURAL STREAMS - TYPE I CHANNEL				
The roughness coefficient is less than that for minor stream of similar description because banks offer less effective resistance.				
• Moderately Well Defined Channel	0.025	---	0.060	8
• Irregular Channel	0.035	---	0.100	8
UNLINED VEGETATED CHANNELS - TYPE II				
• Mowed Grass, Clay Soil	0.025	0.030	0.035	8
• Mowed Grass, Sandy Soil	0.025	0.030	0.035	6

TABLE 8

Culvert Discharge Velocities

Culvert Discharges On	Maximum Allowable Velocity (f.p.s.)
Earth (Sandy)	6
Earth (Clay)	8
Sodded Earth	8
Rock Gabions (Engineered)	12
Concrete	15
Shale (Lime Stone)	10

APPENDIX “C”

Figures

<u>Figure No.</u>	<u>Title</u>
1.	Rainfall Intensity and Duration
2.	Time of Concentration for Surface Flow
3.	Capacity of Triangular Gutters
4.	Capacity of Alley Sections
5.	Storm Drain Inlets
6.	Recessed and Standard Curb Opening Inlet on Grade (1/4”/1’ Cross Slope)
7.	Recessed and Standard Curb Opening Inlet on Grade (3/8”/1’ Cross Slope; 44’ and 48’ Streets)
8.	Recessed and Standard Curb Opening Inlet on Grade (1/2”/1’ Cross Slope; 36’ Street)
9.	Recessed and Standard Curb Opening Inlet on Grade (26’ Street)
10.	Recessed and Standard Curb Opening Inlet on Grade (10’x 12’, 16’ and 20’ Alleys)
11.	Recessed and Standard Curb Opening Inlet at Low Point
12.	Two Grade Combination Inlet on Grade
13.	Four Grate Combination Inlet on Grade
14.	Three Grate Inlet and Three Grate Combination Inlet on Grade
15.	Two Grate Inlet on Grade
16.	Four Grate Inlet on Grade
17.	Six Grate Inlet on Grade

<u>Figure No.</u>	<u>Title</u>
18.	Combination Inlet at Low Point
19.	Grate Inlet at Low Point
20.	Drop Inlet at Low Point
21.	Capacity of Circular Pipes Flowing Full
22.	Open Channel Types
23.	Headwater Depth for Box Culverts with Inlet Control
24.	Headwater Depth for Concrete Pipe Culverts with Inlet Control
25.	Head for Concrete Box Culverts Flowing Full
26.	Head for Concrete Pipe Culverts Flowing Full
27.	Critical Depth of Flow for Rectangular Conduits
28.	Critical Depth of Flow for Circular Conduits

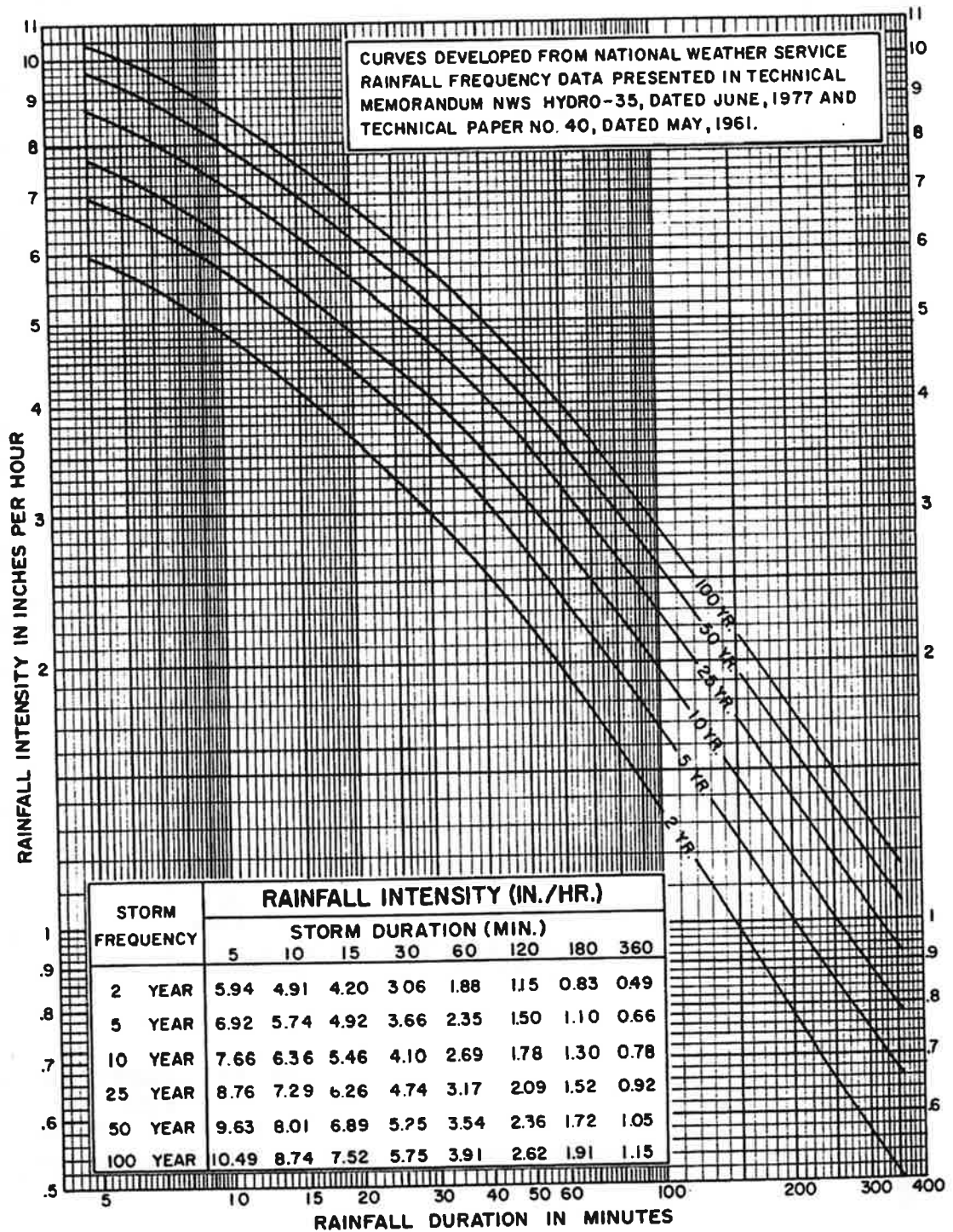


FIGURE 1

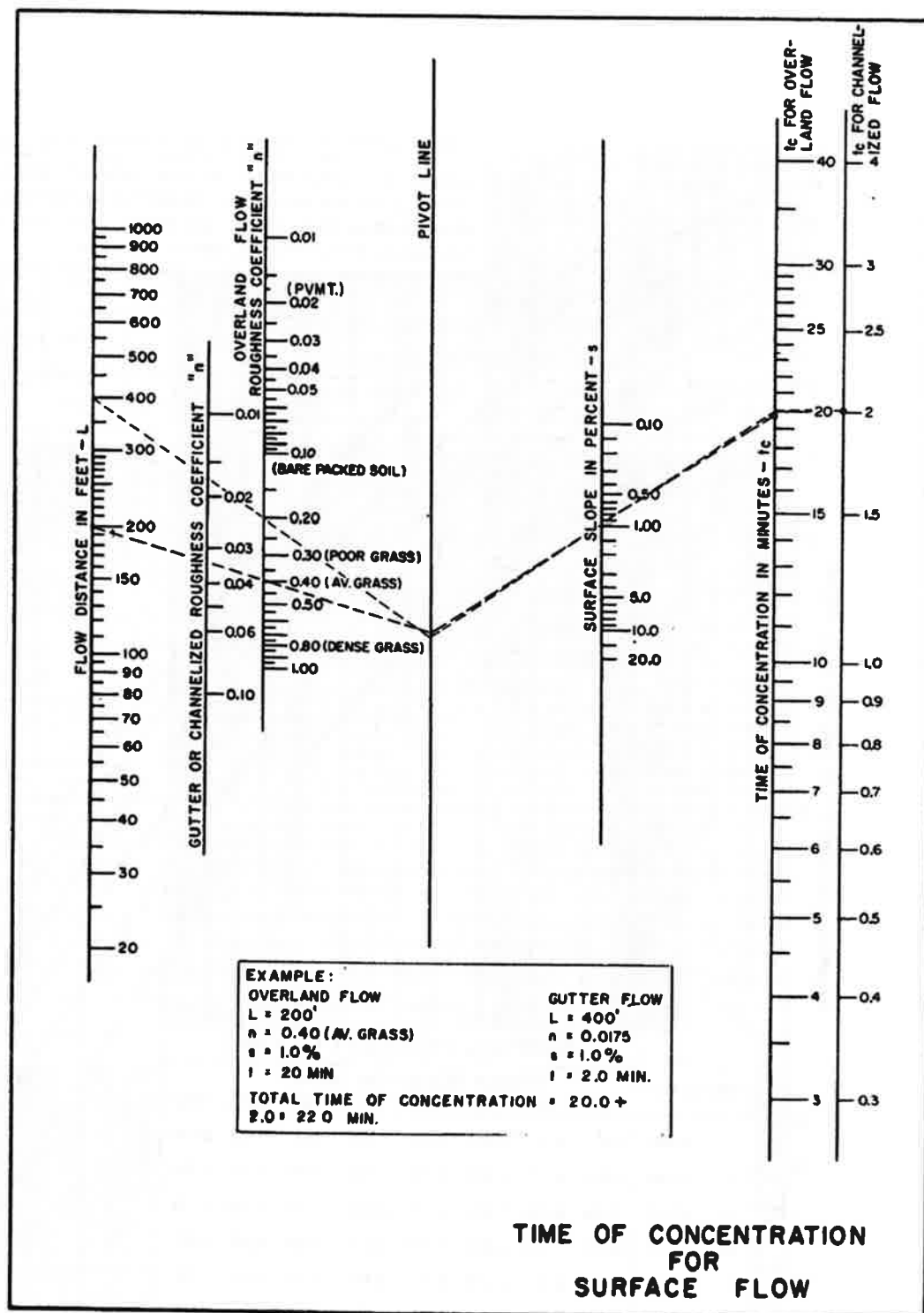


FIGURE 2

EXAMPLE

Known:

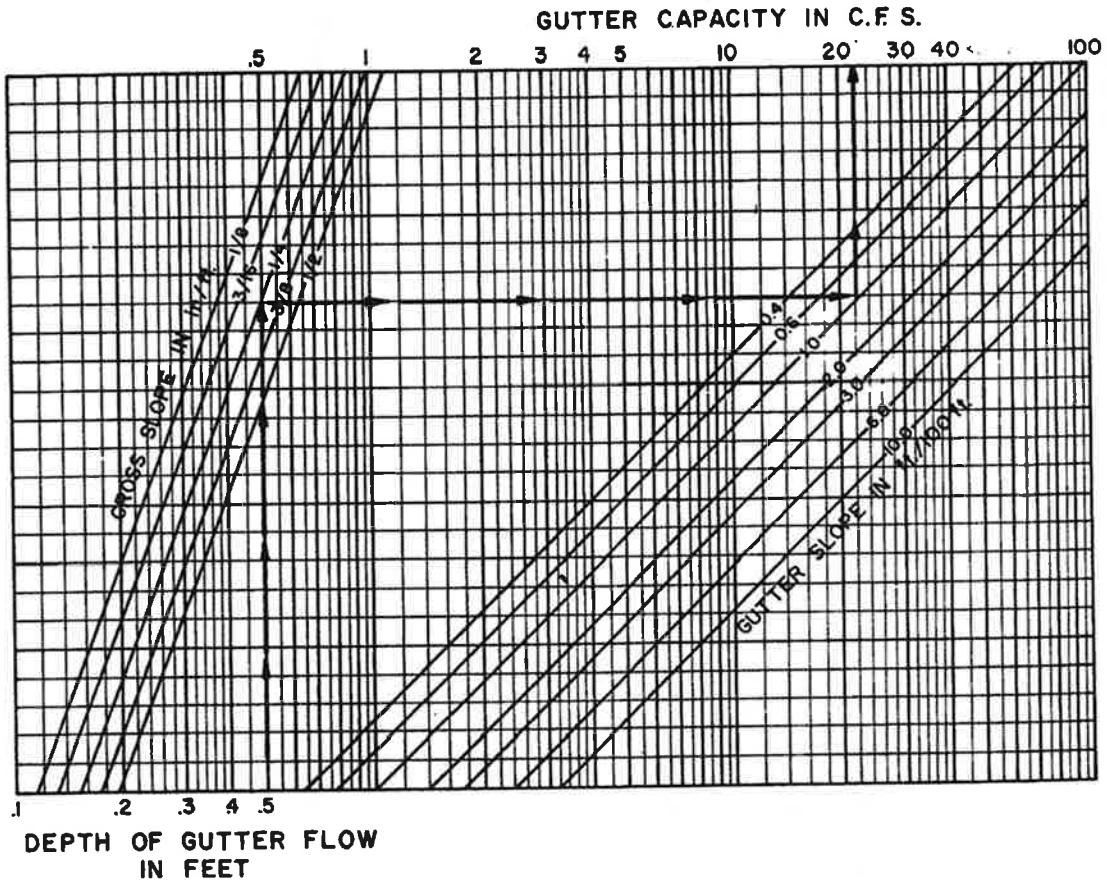
Major Thoroughfare, Type C
 Pavement Width = 33'
 Gutter Slope = 1.0%
 Pavement Cross Slope = 1/4"/1'
 Depth of Gutter Flow = .5'

Find:

Gutter Capacity

Solution:

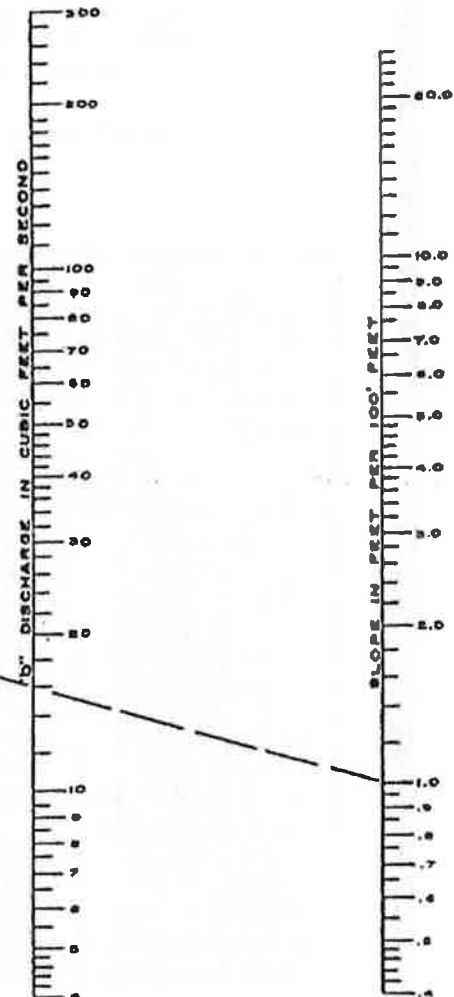
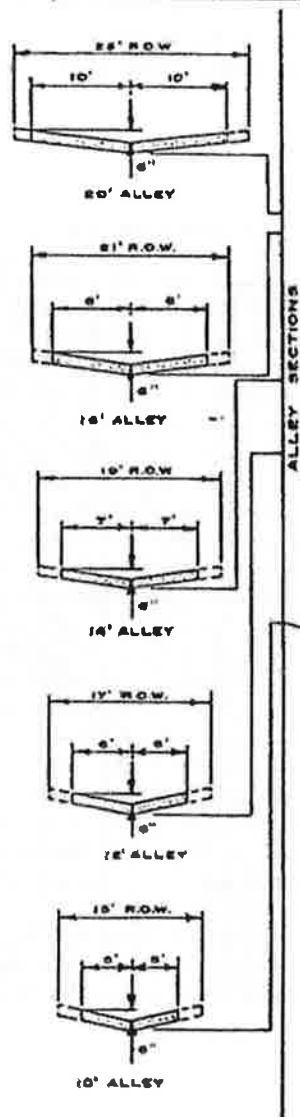
Enter Graph at .5'
 Intersect Cross Slope = 1/4"/1'
 Intersect Gutter Slope = 1.0%
 Read Gutter Capacity = 22 c.f.s.



(Roughness Coefficient $n = .0175$)

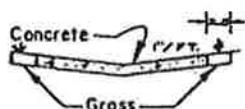
CAPACITY OF
 TRIANGULAR GUTTERS

FIGURE 3



NOTE:

1. All Alley Capacities Are 2½" Above Paving Edge.



2. The Capacities Obtained From This Nomograph are Based on a Straight Horizontal Alignment. Curved Alignments May Result in Reduced Capacity.

EXAMPLE

KNOWN:

Alley width = 10'
Alley depression = 5"
Gutter Slope = 1.0%

SOLUTION:

Connect the 10' alley section with slope = 1.0%. Read Q = 16 c.f.s

FIND:

Gutter Flow (Q)

CAPACITY OF ALLEY SECTIONS

Average $n = 0.020$
Revised: Feb. 1981

FIGURE 4

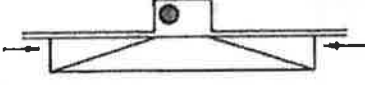
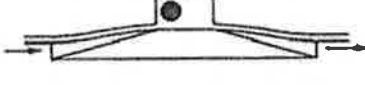
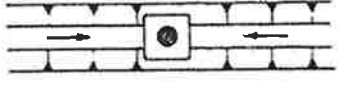
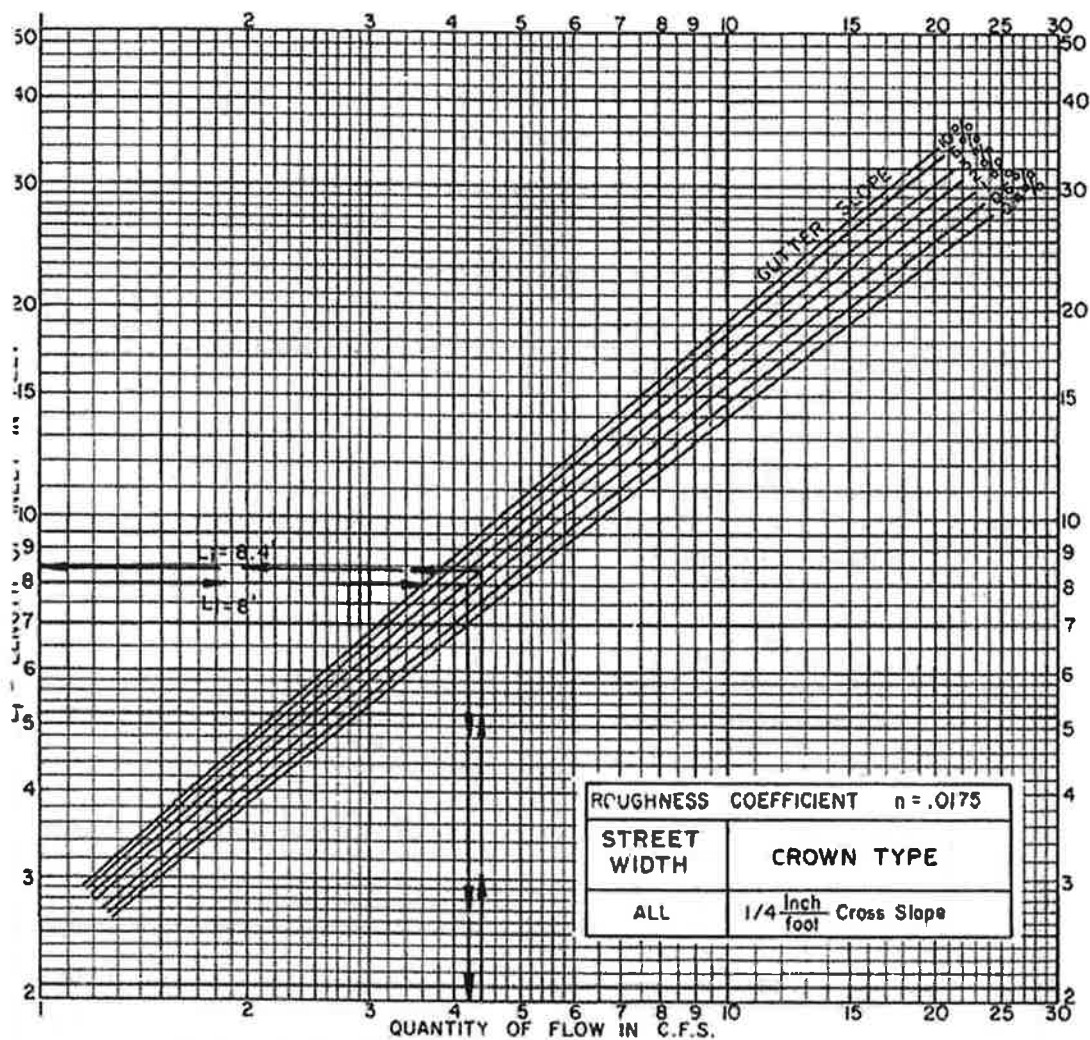
STORM DRAIN INLETS				
INLET TYPE	INLET DESCRIPTION	AVAIL. INLET SIZES	WHERE USED	DESIGN CURVES
I	 STANDARD CURB OPENING INLET ON GRADE	4' 6' 8' 10' 12' 14'	26' LOCAL STREET, TYPE H 36' COLLECTOR STREET, TYPE F ALLEY	FIGURES 8 THROUGH 12
IA	 STANDARD CURB OPENING INLET AT LOW POINT	4' 6' 8' 10' 12' 14'	26' LOCAL STREET, TYPE H 36' COLLECTOR STREET, TYPE F ALLEY	FIGURE 13
II	 RECESSED CURB OPENING INLET ON GRADE	4' 6' 8' 10' 12' 14'	44' COLLECTOR STREET, TYPE F 46' SECONDARY STREET, TYPE E 2-24' MAJOR STREET, TYPE D 2-33' MAJOR STREET, TYPE C 2-36' MAJOR STREET, TYPE B 2-36' MAJOR STREET, TYPE A	FIGURES 8 THROUGH 12
IIA	 RECESSED CURB OPENING INLET AT LOW POINT	4' 6' 8' 10' 12' 14'	44' COLLECTOR STREET, TYPE F 46' SECONDARY STREET, TYPE E 2-24' MAJOR STREET, TYPE D 2-33' MAJOR STREET, TYPE C 2-36' MAJOR STREET, TYPE B 2-36' MAJOR STREET, TYPE A	FIGURE 13
III	 COMBINATION INLET ON GRADE	4' 6' 8'	COMBINATION INLETS TO BE USED WHERE SPACE BEHIND CURB PROHIBITS OTHER INLET TYPES	FIGURES 14 THROUGH 16
IIIA	 COMBINATION INLET AT LOW POINT	4' 6' 8'	COMBINATION INLETS TO BE USED WHERE SPACE BEHIND CURB PROHIBITS OTHER INLET TYPES	FIGURE 20
IV	 GRATE INLETS	2 GRATE 3 GRATE 4 GRATE 6 GRATE	GRATE INLETS TO BE USED WHERE SPACE RESTRICTIONS PROHIBIT OTHER INLET TYPES OR AT LO- CATIONS WITH NO CURB.	FIGURES 16, 17, 18, 19 20, 21
V	 DROP INLET	2 x 2' 3 x 3' 4 x 4'	OPEN CHANNELS	FIGURE 22

FIGURE 5



EXAMPLE

Known:

Pavement Width = 24'
 Gutter Slope = 2.0 %
 Pavement Cross Slope = $\frac{1}{4}$ " / 1'
 Gutter Flow = 4.4 cfs

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 4.4 cfs
 Intersect Slope = 2.0 %
 Read $L_i = 8.4'$

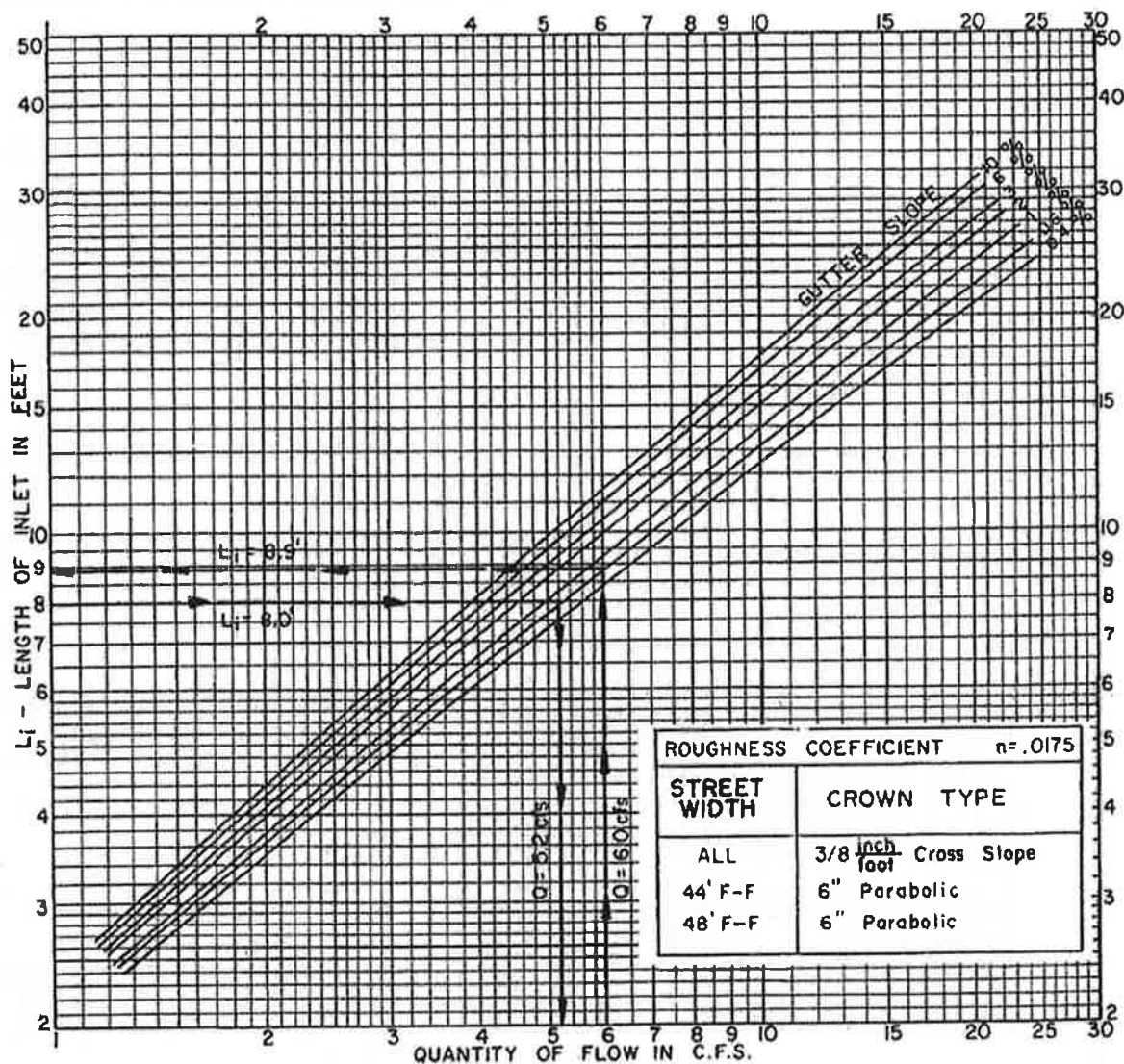
Decision:

1. Use 10' Inlet
 No Flow Remains in Gutter
 2. Use 8' Inlet
 Intercept Only Part of Flow
 Use 8' Inlet

Enter Graph at $L_i = 8'$
 Intersect Slope = 2.0 %
 Read $Q = 4.2$ cfs
 Remaining Gutter Flow =
 $4.4 \text{ cfs} - 4.2 \text{ cfs} = 0.2 \text{ cfs}$

RECESSED AND STANDARD
 CURB OPENING INLET
 CAPACITY CURVES
 ON GRADE

FIGURE 6



EXAMPLE

Known:

Pavement Width = 44'
 Gutter Slope = 0.6 %
 6" Parabolic Crown
 Gutter Flow = 6.0 cfs

Find:

Length of inlet Required (L_i)

Solution:

Enter Graph at 6.0 cfs
 Intersect Slope = 0.6 %
 Read $L_i = 8.9'$

Decision:

1. Use 10' Inlet
 No Flow Remains In Gutter
2. Use 8' Inlet

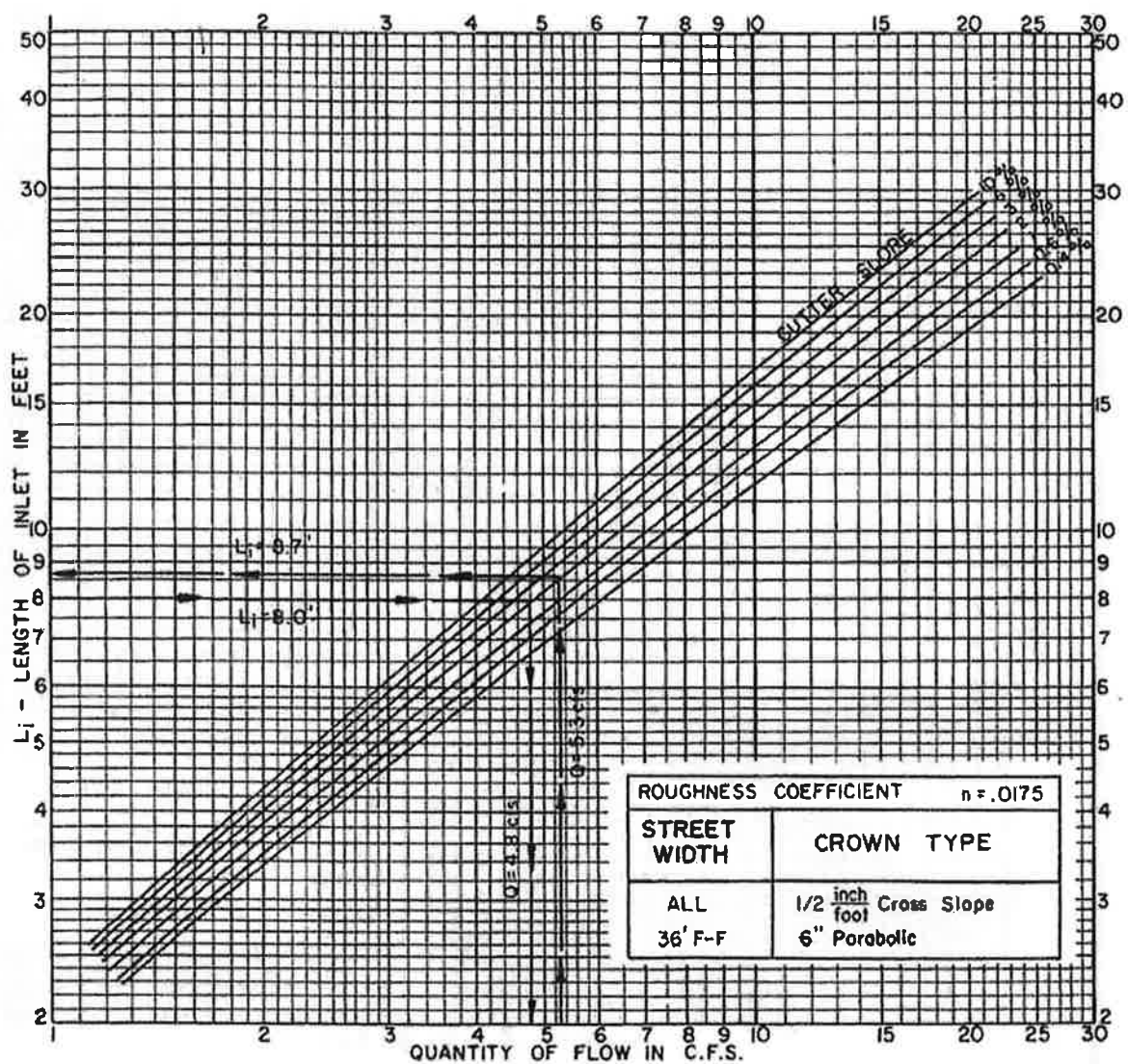
Intercept Only Part of Flow

Use 8' Inlet

Enter Graph at $L_i = 8'$
 Intersect Slope = 0.6 %
 Read $Q = 5.2$ cfs
 Remaining Gutter Flow =
 $6.0 \text{ cfs} - 5.2 \text{ cfs} = 0.8 \text{ cfs}$

RECESSED AND STANDARD
 CURB OPENING INLET
 CAPACITY CURVES
 ON GRADE

FIGURE 7



EXAMPLE

Known:

Pavement Width = 36'
 Gutter Slope = 2%
 6" Parabolic Crown
 Gutter Flow = 5.3 cfs

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 5.3 cfs
 Intersect Slope = 2%
 Read $L_i = 8.7'$

Decision:

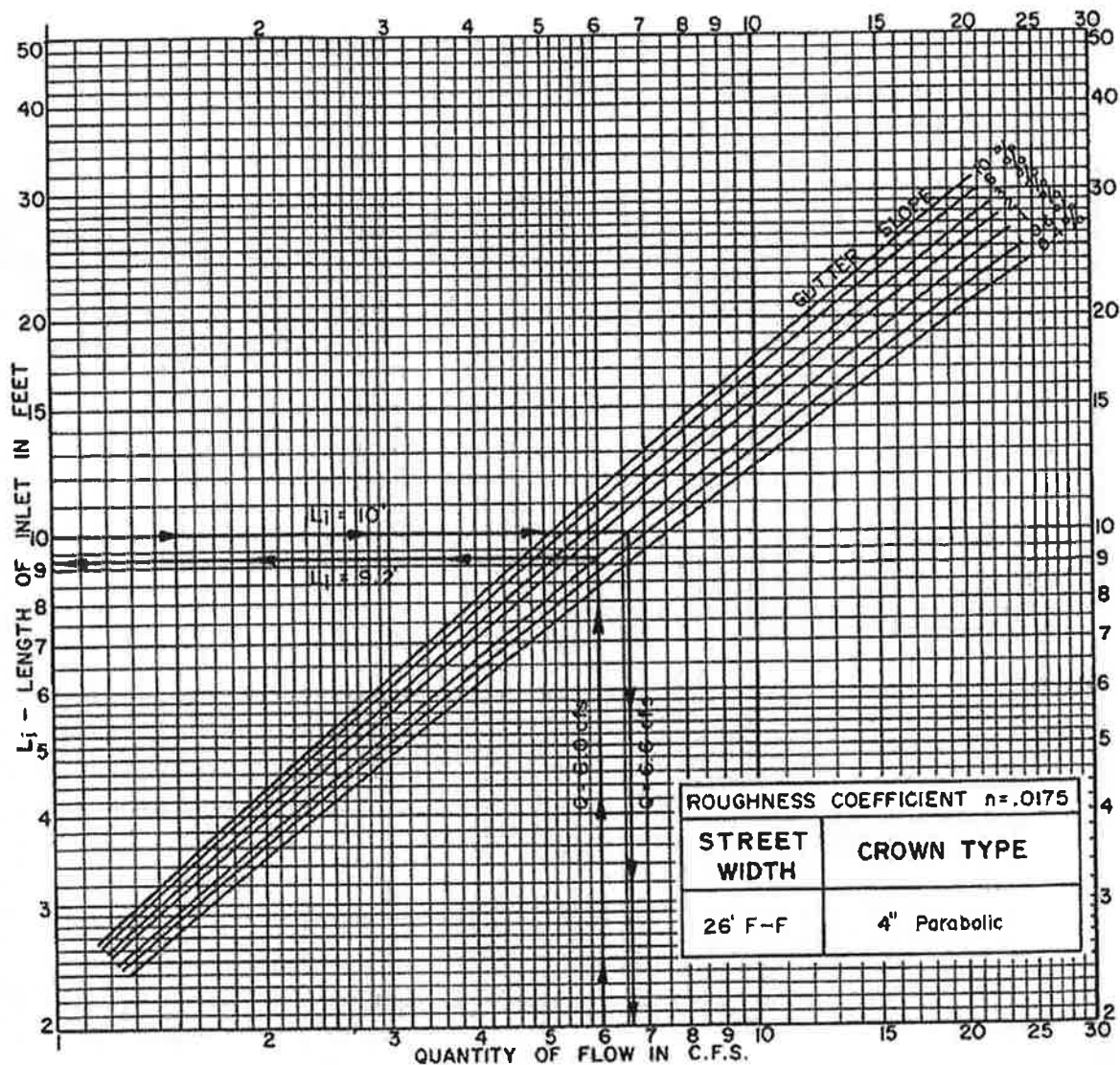
1. Use 10' Inlet
 No Flow Remains In Gutter
 2. Use 8' Inlet
 Intercept Only Part of Flow

Use 8' Inlet

Enter Graph at $L_i = 8'$
 Intersect Slope = 2%
 Read $Q = 4.8$ cfs
 Remaining Gutter Flow =
 $5.3 \text{ cfs} - 4.8 \text{ cfs} = 0.5 \text{ cfs}$

RECESSED AND STANDARD
 CURB OPENING INLET
 CAPACITY CURVES
 ON GRADE

FIGURE 8



EXAMPLE

Known:

Pavement Width = 26'
 Gutter Slope = 1%
 4" Parabolic Crown
 Gutter Flow = 6.0 cfs

Find:

Length of Inlet Required (L_j)

Solution:

Enter Graph at 6.0 cfs
 Intersect Slope = 1%
 Read $L_j = 9.2$

Decision:

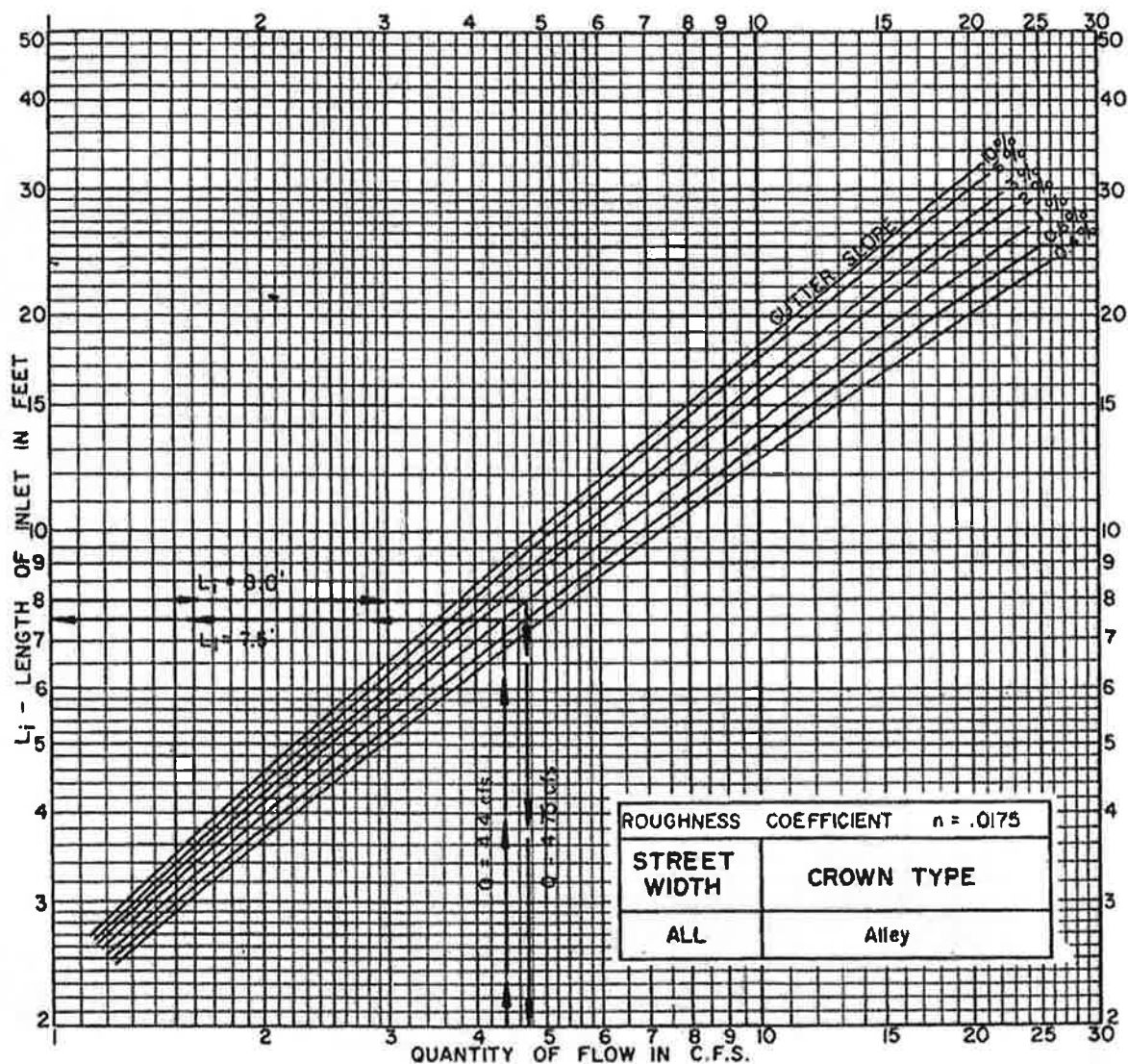
1. Use 10' Inlet
 No Flow Remains in Gutter
 2. Use 8' Inlet
 Intercept Only Part of Flow

Use 10' Inlet

Enter Graph at $L_j = 10'$
 Intersect Slope = 1%
 Read $Q = 6.6$ cfs
 No Flow Remains in Gutter

RECESSED AND STANDARD
 CURB OPENING INLET
 CAPACITY CURVES
 ON GRADE

FIGURE 9



EXAMPLE

Known:

Pavement Width = 16'
 Gutter Slope = 1%
 Pavement Cross Slope = $1/4''/1'$
 Gutter Flow = 4.4 cfs

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 4.4 cfs
 Intersect Slope = 1%
 Read $L_i = 7.5'$

Decision:

1. Use 8' Inlet
 No Flow Remains in Gutter
 2. Use 6' Inlet
 Intercept Only Part of Flow

Use 8' Inlet

Enter Graph at $L_i = 8'$

Intersect Slope = 1%

Read $Q = 4.75$ cfs

No Flow Remains in Gutter

RECESSED AND STANDARD
 CURB OPENING INLET
 CAPACITY CURVES
 ON GRADE

FIGURE 10

EXAMPLE

Known:

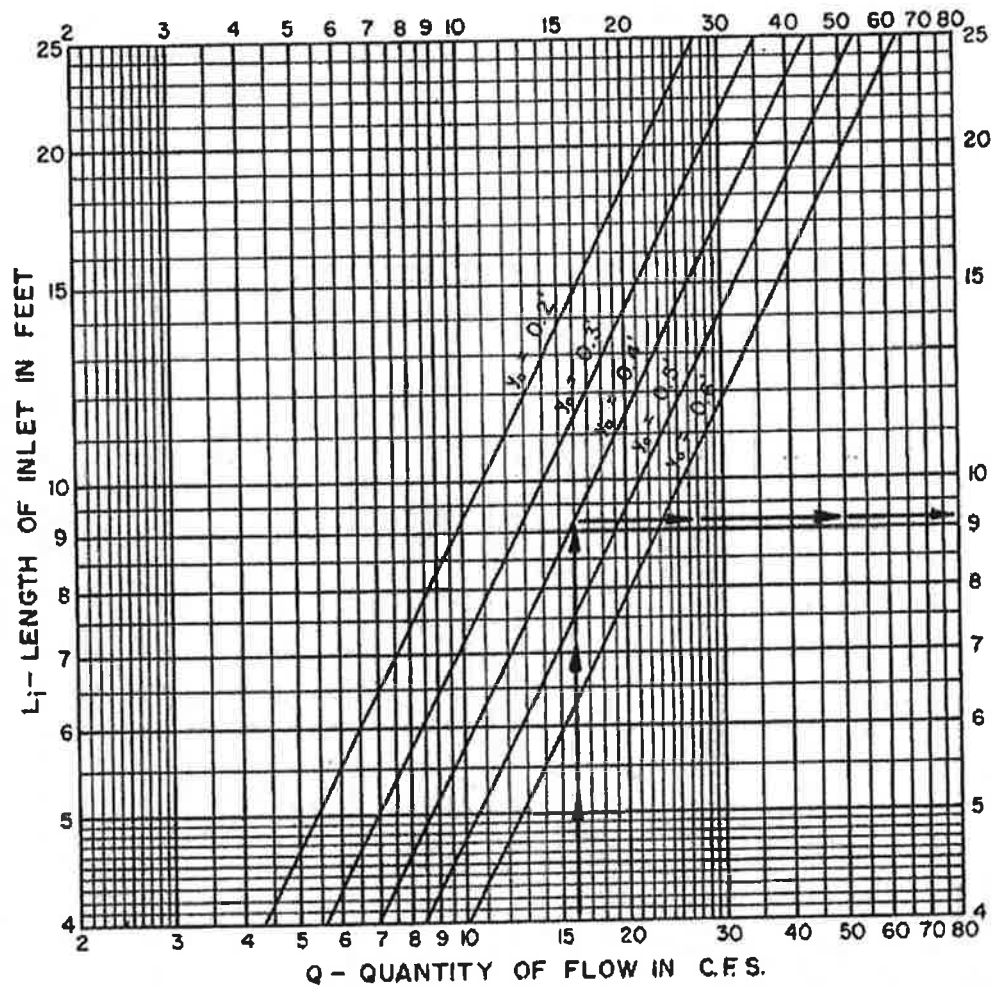
Quantity of Flow = 16.0 c.f.s.
Maximum Depth of Flow Desired
in Gutter At Low Point ($y_o = 0.4'$)

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 16.0 c.f.s.
Intersect $y_o = 0.4'$
Read $L_i = 9.2'$
Use 10' Inlet



ROUGHNESS COEFFICIENT $n = .0175$	
STREET WIDTH	CROWN TYPE
ALL	Straight and Parabolic

RECESSED AND STANDARD
CURB OPENING INLET
CAPACITY CURVES
AT LOW POINT

FIGURE 11

EXAMPLE

Known:

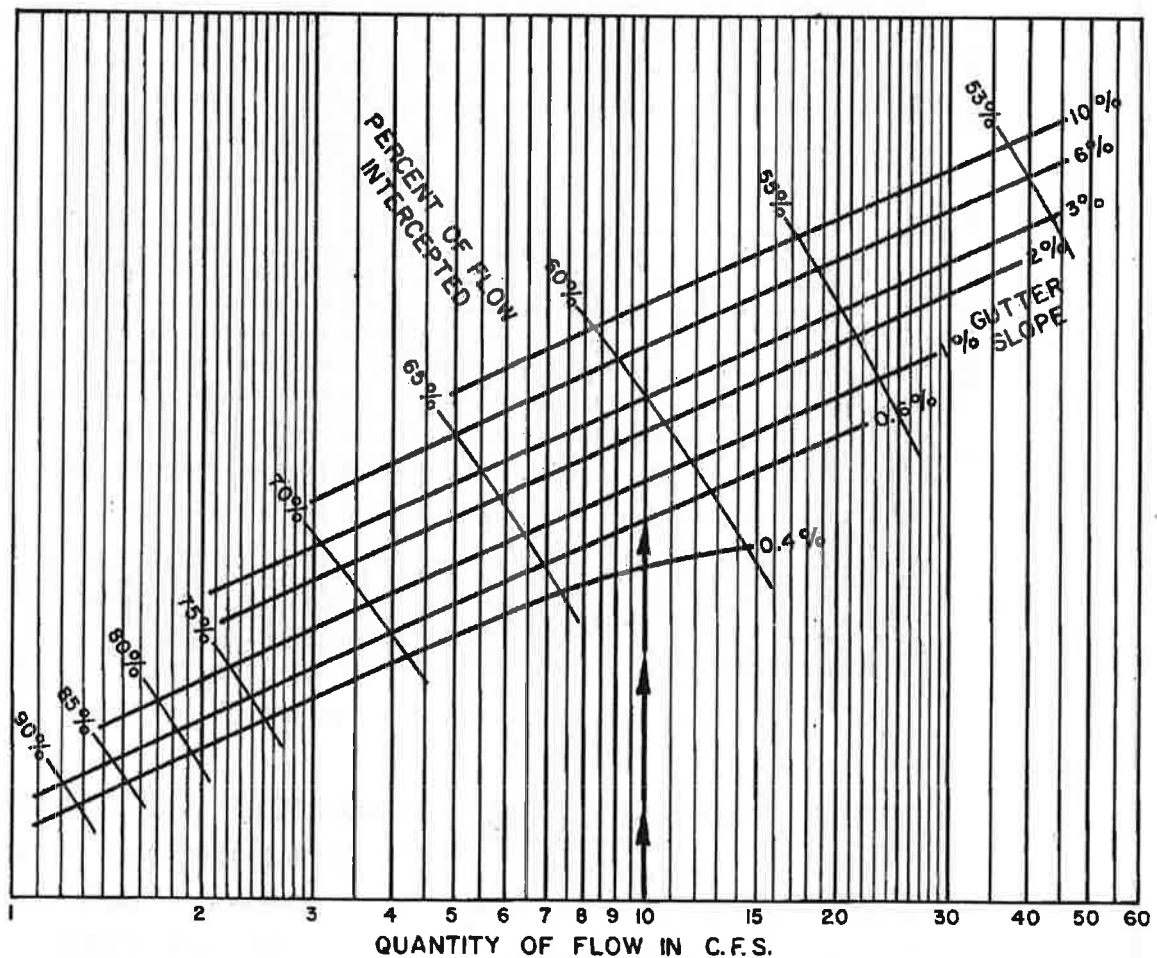
Quantity of Flow = 10.0 c.f.s.
Gutter Slope = 0.6 %

Find:

Capacity of Two Grate Combination
Inlet

Solution:

Enter Graph at 10.0 c.f.s.
Intersect Slope = 0.6 %
Read Percent of Flow
Intercepted = 62 %
62 % of 10.0 c.f.s. = 6.2 c.f.s.
as Capacity of Two Grate
Combination Inlet
Remaining Gutter Flow =
 $10.0 \text{ c.f.s.} - 6.2 \text{ c.f.s.} = 3.8 \text{ c.f.s.}$



TWO GRATE COMBINATION INLET
CAPACITY CURVES
ON GRADE

FIGURE 12

EXAMPLE

Known:

Quantity of Flow = 6.0 c.f.s.

Gutter Slope = 1.0 %

Find:

Capacity of Four Grate Combination
Inlet

Solution:

Enter Graph at 6.0 c.f.s.

Intersect Slope = 1.0 %

Read Percent of Flow

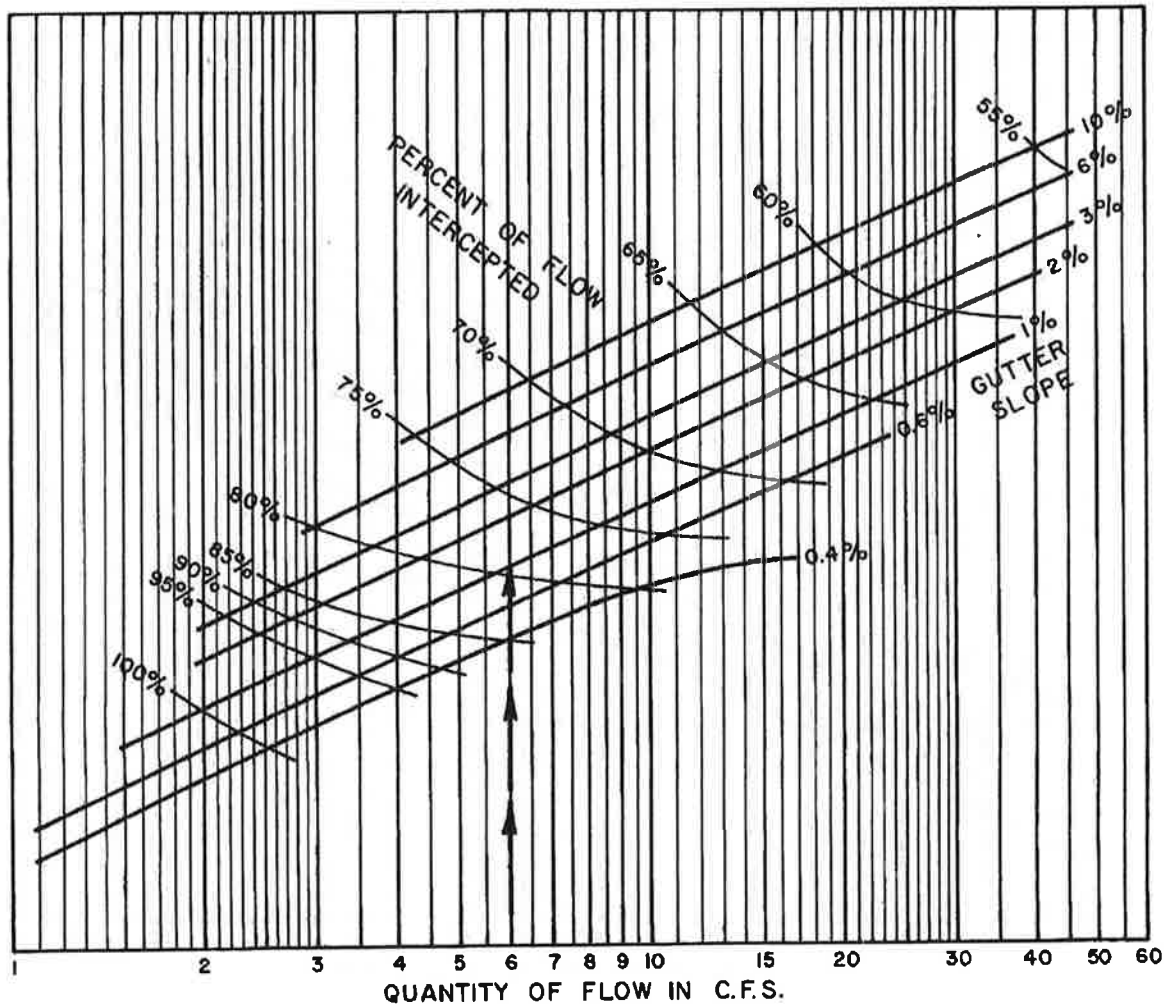
Intercepted = 79 %

79 % of 6.0 c.f.s. = 4.7 c.f.s.

as Capacity of Four Grate
Combination Inlet

Remaining Gutter Flow =

6.0 c.f.s. - 4.7 c.f.s. = 1.3 c.f.s.



FOUR GRATE COMBINATION INLET
CAPACITY CURVES
ON GRADE

FIGURE 13

EXAMPLE

Known:

Quantity of Flow = 8.0 c.f.s.

Gutter Slope = 0.4%

Find:

Capacity of Three Grate Inlet

Solution:

Enter Graph at 8.0 c.f.s.

Intersect Slope = 0.4%

Read Percent of Flow

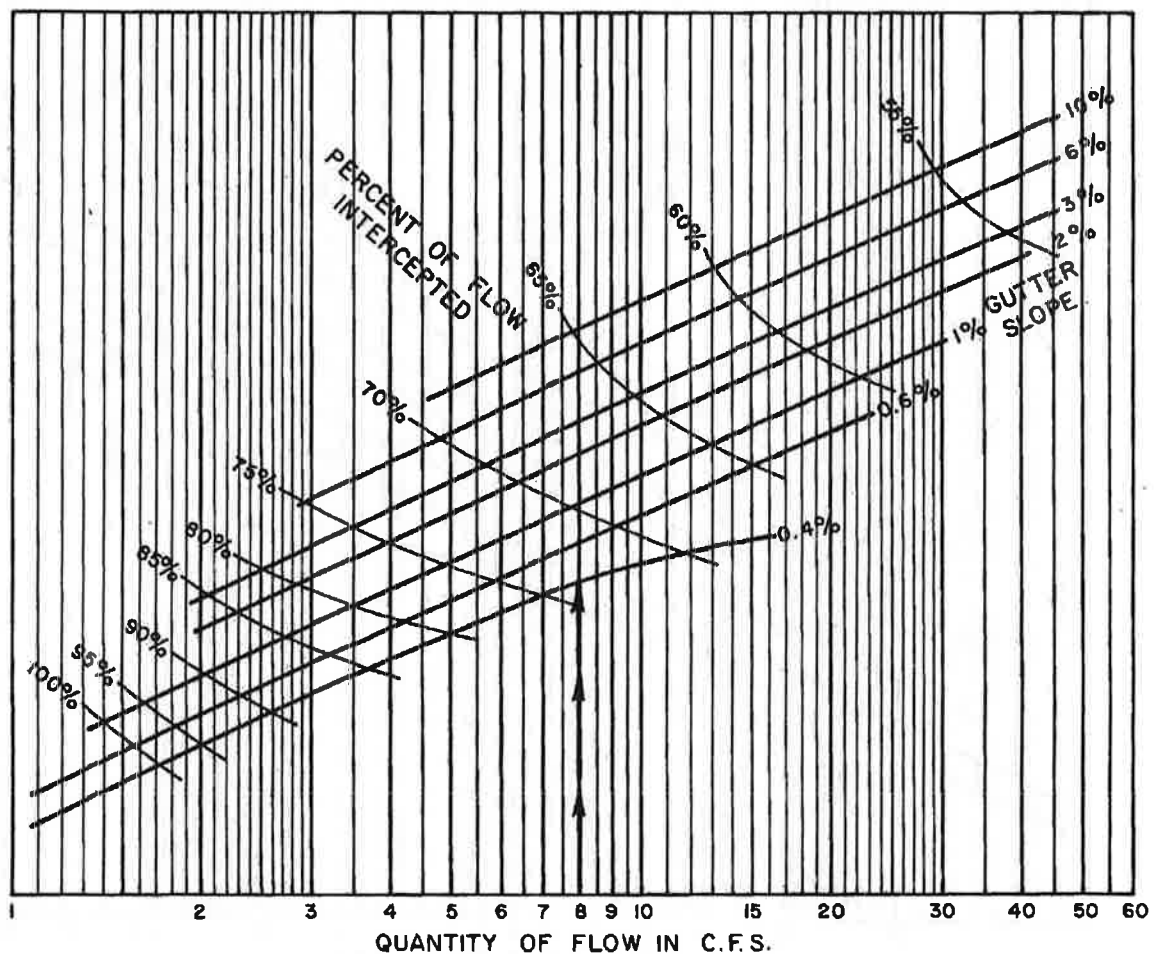
Intercepted = 74 %

74% of 8.0 c.f.s. = 5.9 c.f.s.

as Capacity of Three Grate Inlet

Remaining Gutter Flow =

8.0 c.f.s. - 5.9 c.f.s. = 2.1 c.f.s.



THREE GRATE INLET AND
THREE GRATE COMBINATION INLET
CAPACITY CURVES
ON GRADE

FIGURE 14

EXAMPLE

Known:

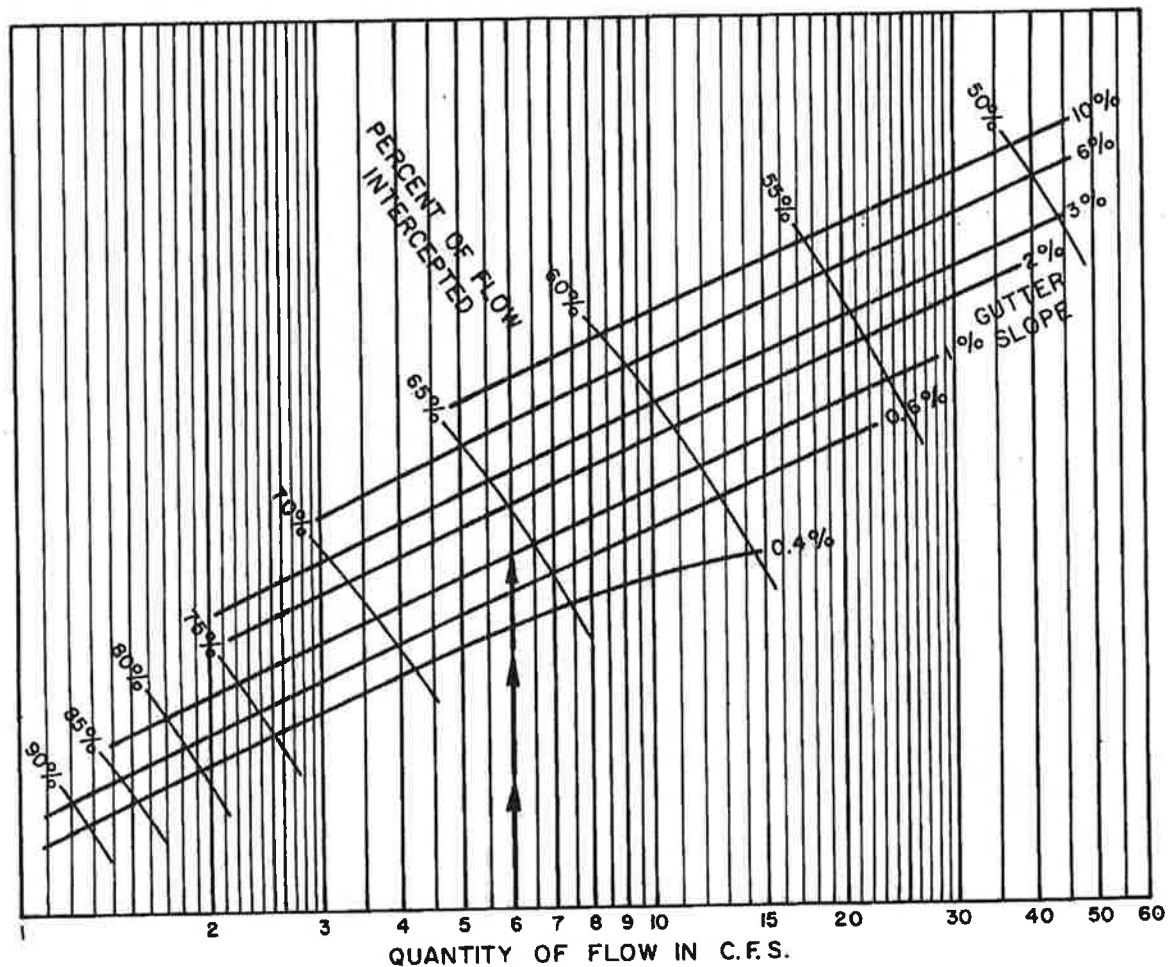
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

Find:

Capacity of Two Grate Inlet

Solution:

Enter Graph at 6.0 c.f.s.
Intersect Slope = 1.0%
Read Percent of Flow Intercepted = 66%
66% of 6.0 c.f.s. = 4.0 c.f.s.
as Capacity of Two Grate Inlet
Remaining Gutter Flow =
6.0 c.f.s. - 4.0 c.f.s. = 2.0 c.f.s.



TWO GRATE INLET
CAPACITY CURVES
ON GRADE

FIGURE 15

EXAMPLE

Known:

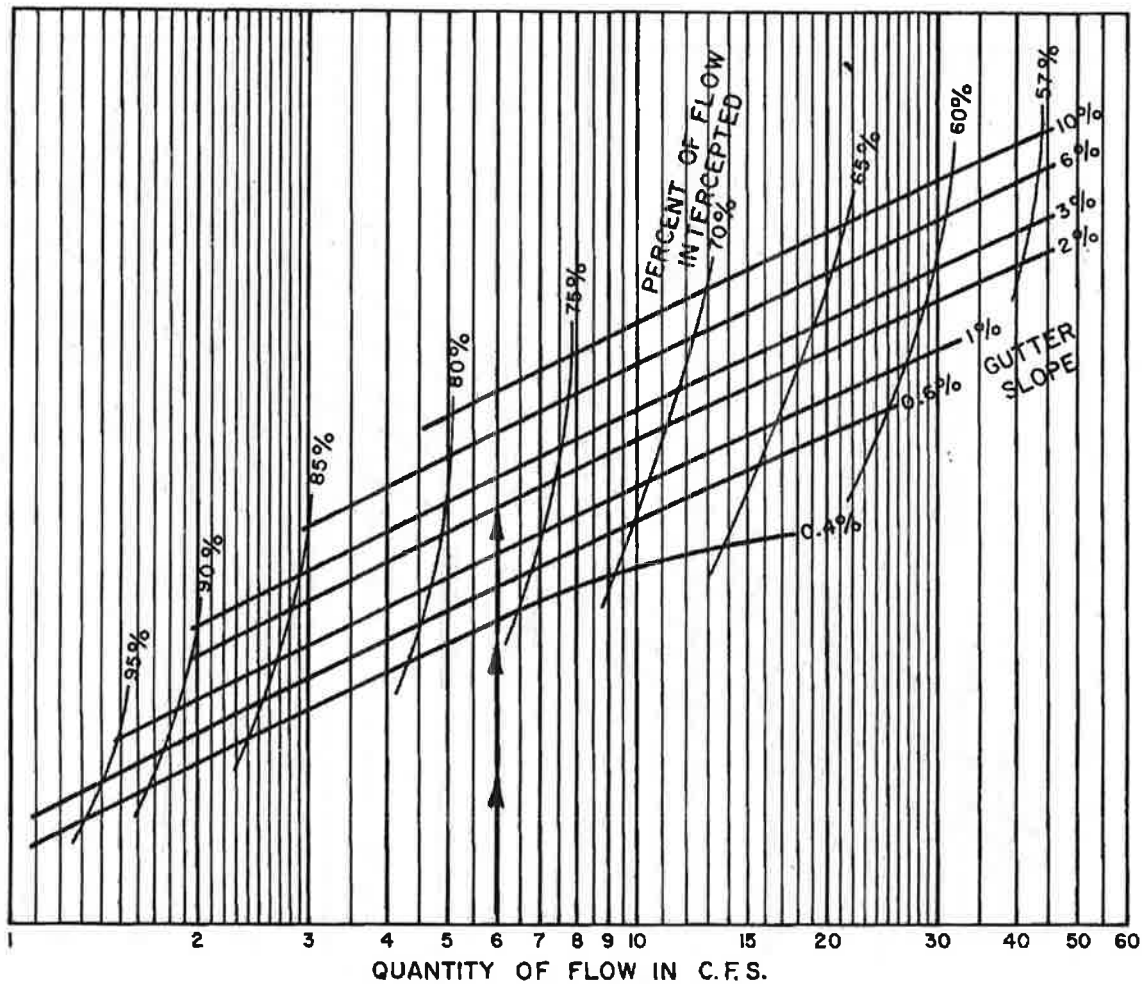
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

Find:

Capacity of Four Grate Inlet

Solution:

Enter Graph at 6.0 c.f.s.
Intersect Slope = 1.0%
Read Percent of Flow Intercepted = 77 %
77% of 6.0 c.f.s. = 4.6 c.f.s.
as Capacity of Four Grate Inlet
Remaining Gutter Flow =
6.0 c.f.s. - 4.6 c.f.s. = 1.4 c.f.s.



FOUR GRATE INLET
CAPACITY CURVES
ON GRADE

FIGURE 16

EXAMPLE

Known:

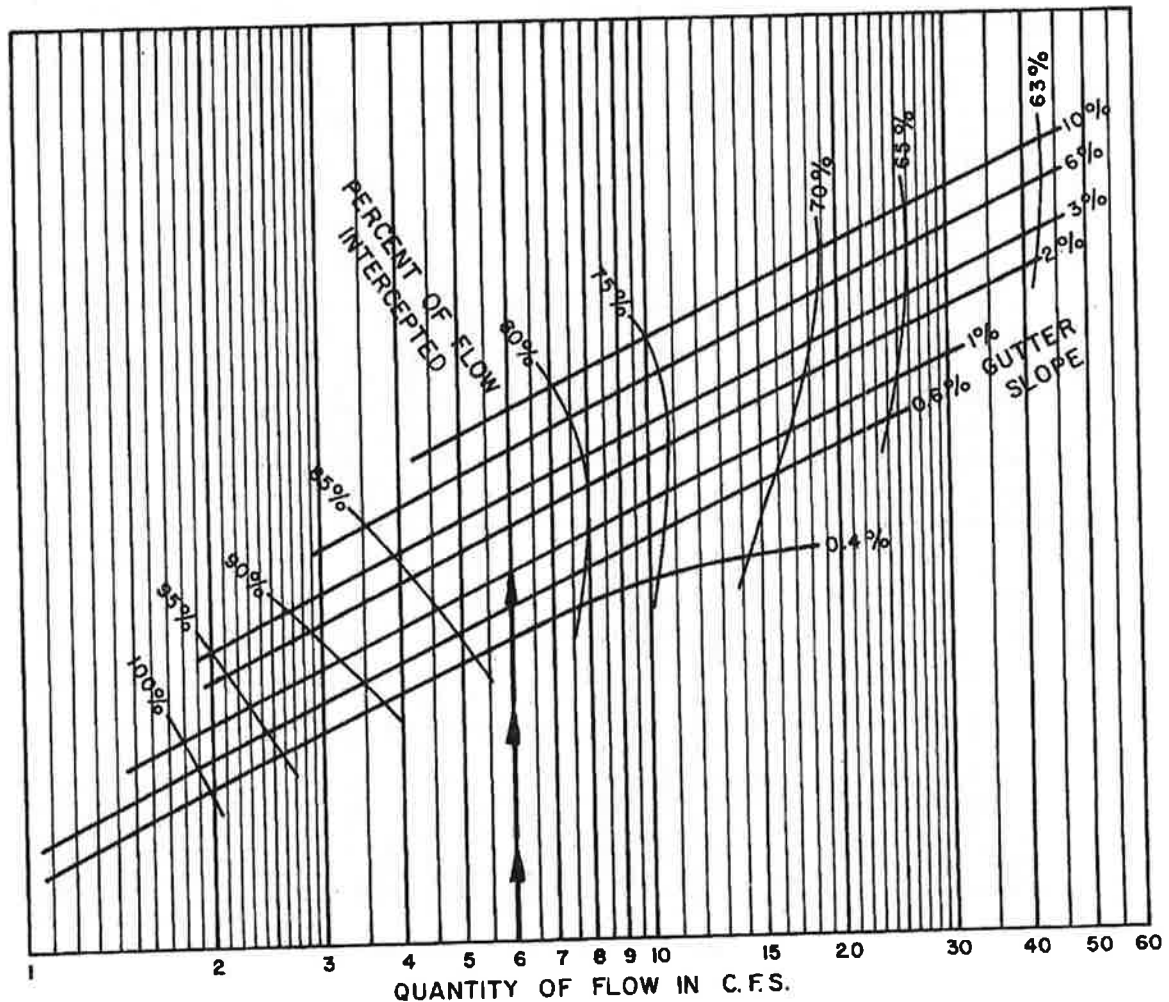
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

Find:

Capacity of Six Grate Inlet

Solution:

Enter Graph at 6.0 c.f.s.
Intersect Slope = 1.0%
Read Percent of Flow Intercepted = 82 %
82 % of 6.0 c.f.s. = 4.9 c.f.s.
as Capacity of Six Grate Inlet
Remaining Gutter Flow =
6.0 c.f.s. - 4.9 c.f.s. = 1.1 c.f.s.



SIX GRATE INLET
CAPACITY CURVES
ON GRADE

FIGURE 17

EXAMPLE

Known:

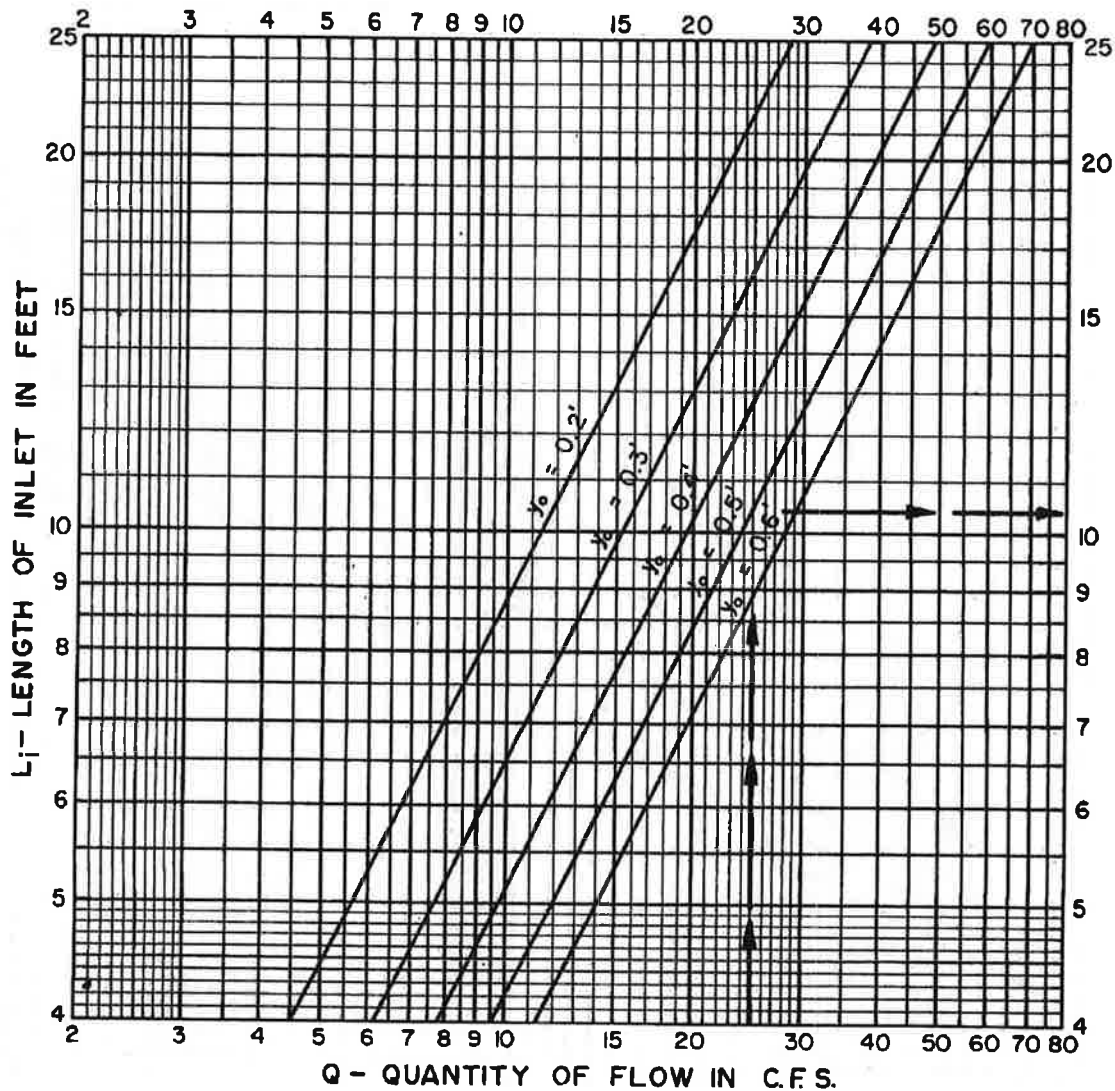
Quantity of Flow = 25.0 c.f.s.
Maximum Depth of Flow Desired
At Low Point (y_o) = 0.5'

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 25.0 c.f.s.
Intersect $y_o = 0.5'$
Read $L_i = 10.4'$
Use 12' Inlet



ROUGHNESS COEFFICIENT $n = .0175$	
STREET WIDTH	CROWN TYPE
ALL	Straight and Parabolic

COMBINATION INLET
CAPACITY CURVES
AT LOW POINT

FIGURE 18

EXAMPLE

Known:

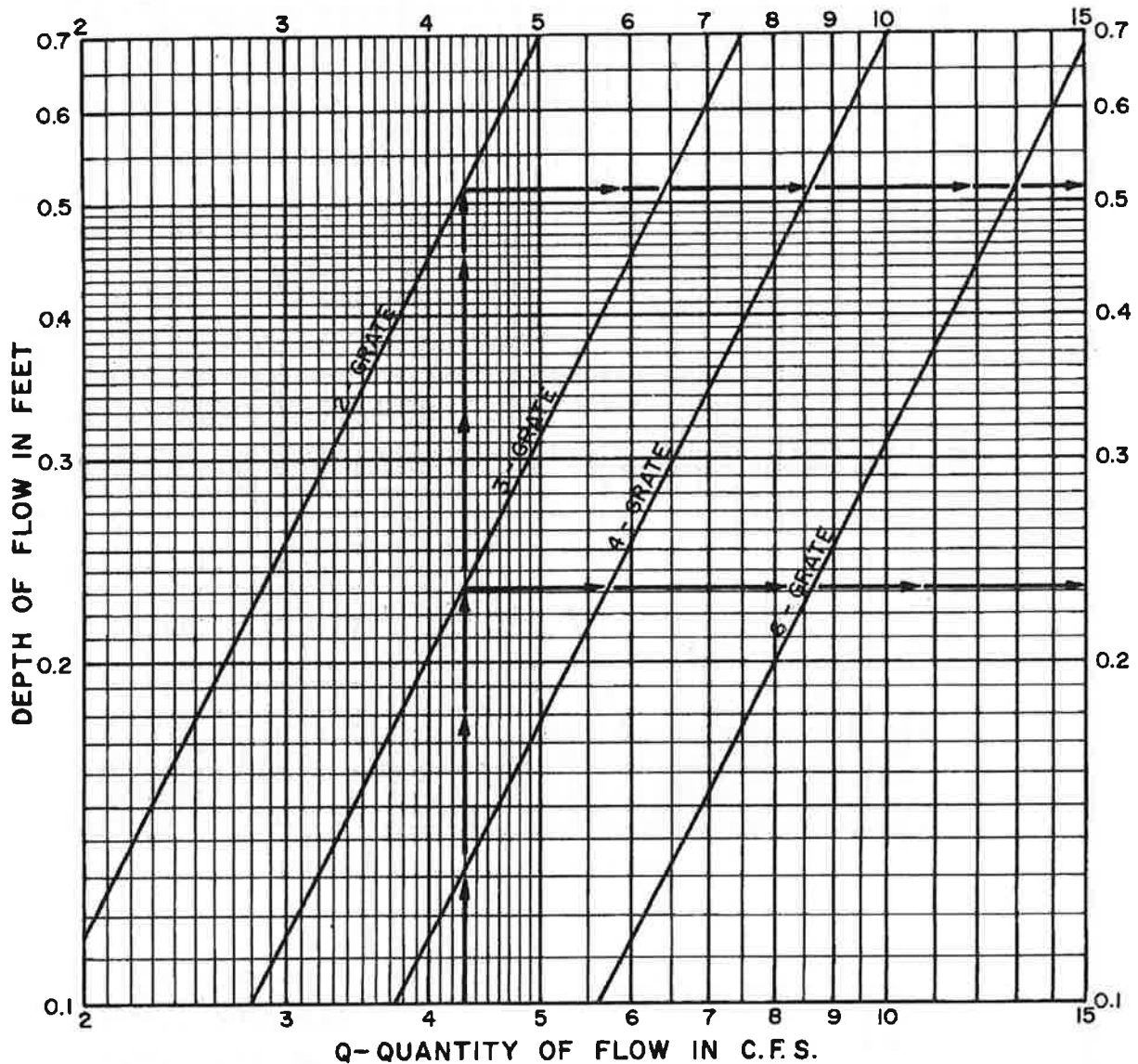
- Quantity of Flow = 4.3 c.f.s.
- Maximum Depth of Flow Desired at Low Point = 0.3'

Find:

Inlet Required

Solution:

- Enter Graph at 4.3 c.f.s.
- Intersect 3 - Grate at 0.23'
- Intersect 2 - Grate at 0.51'
- Use 3 - Grate



GRATE INLET
CAPACITY CURVES
AT LOW POINT

FIGURE 19

EXAMPLE

Known:

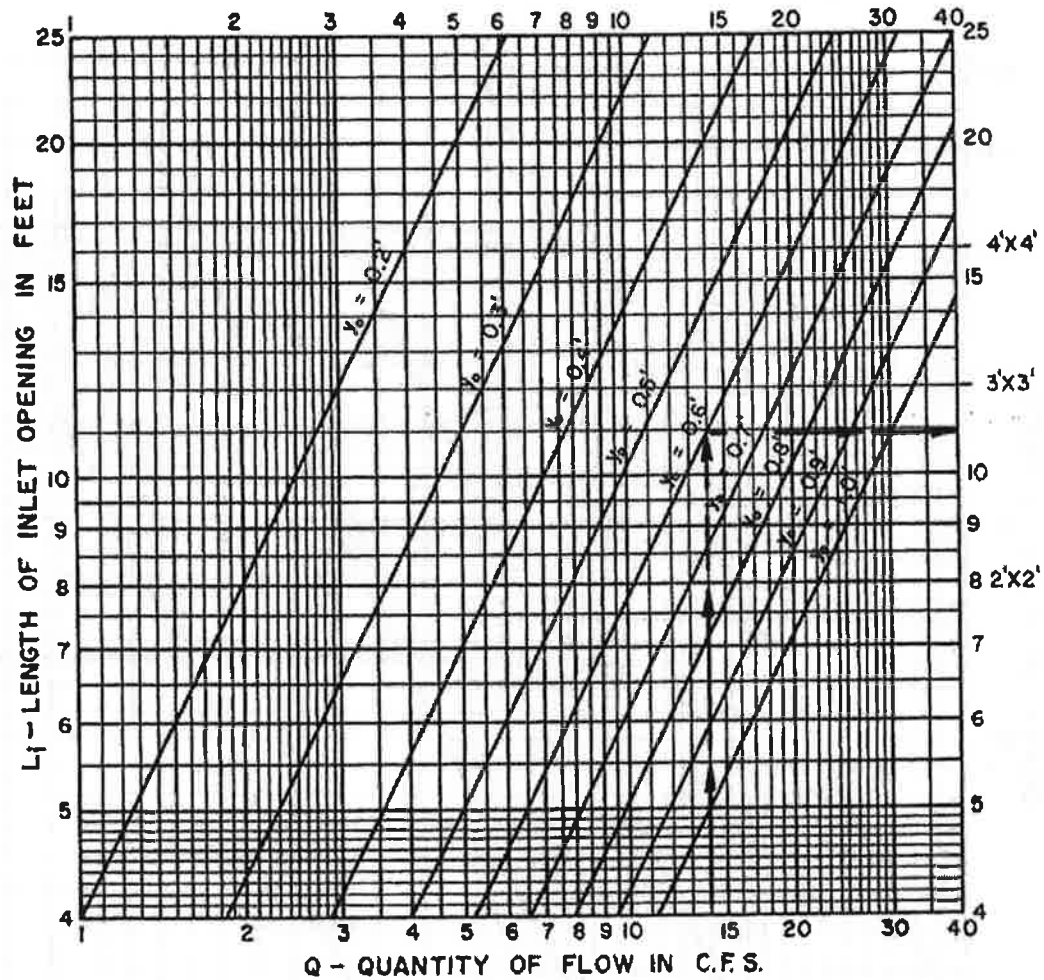
Quantity of Flow = 14.0 c.f.s.
Maximum Depth of Flow Desired
(y_0) = 0.6'

Find:

Length of Inlet Opening Required (L_i)

Solution:

Enter Graph at 14.0 c.f.s.
Intersect $y_0 = 0.6'$
Read $L_i = 10.9'$
Use 12' of Inlet; 3'x3'



Standard Drop Inlet Sizes:

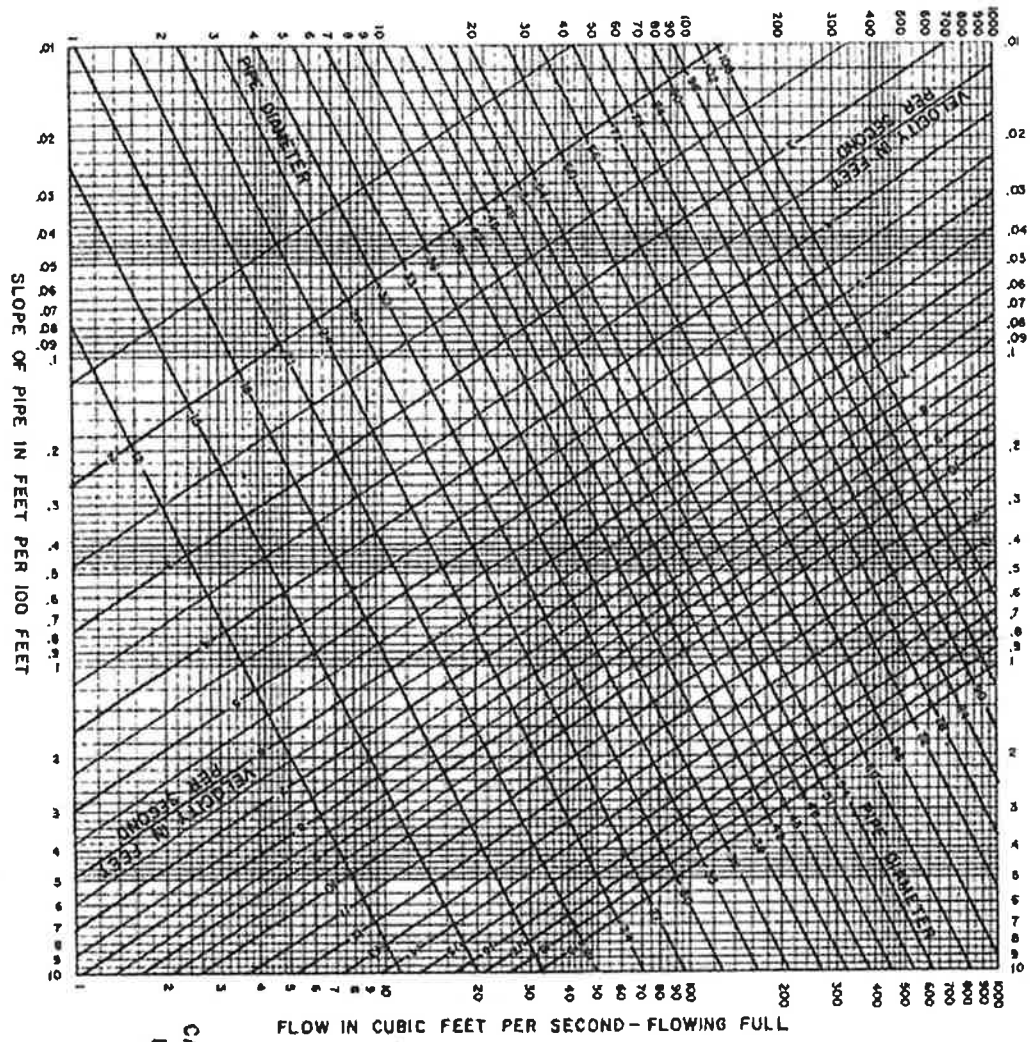
2'x2'; $L_i = 8'$

3'x3'; $L_i = 12'$

4'x4'; $L_i = 16'$

DROP INLET
CAPACITY CURVES
AT LOW POINT

FIGURE 20



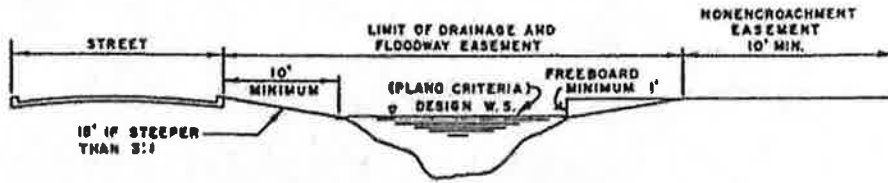
CAPACITY OF CIRCULAR
PIPES FLOWING FULL

A GRAPHICAL SOLUTION
OF
MANNING'S EQUATION
 $V = \frac{1.486}{n} R^{2/3} S^{1/2}$
 $n = 0.013$

FIGURE 21

CREEKS MAY REMAIN IN OPEN NATURAL CONDITION IF:

- (1) THEY COMPLY WITH THE SUBDIVISION ORDINANCE;
- (2) TREE COVERAGE IS ADEQUATE TO BE ACCEPTABLE TO THE CITY
- (3) UNSANITARY OR UNACCEPTABLE DRAINAGE CONDITIONS DO NOT EXIST IN THE CREEK;
- (4) APPROVED BY THE CITY

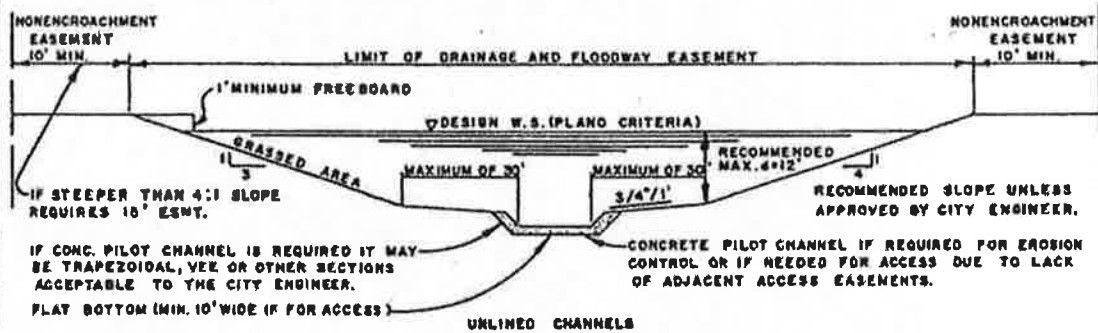


UNIMPROVED CHANNEL
TYPE I - NATURAL

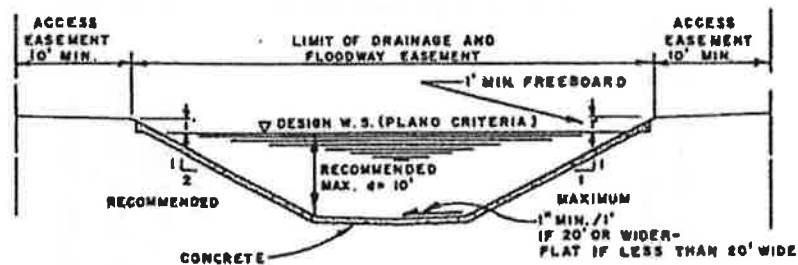
NOTE: TYPE I OR II - IF STEEPER THAN 3:1 SLOPE ABOVE DESIGN W.S., THE NON-ENCROACHMENT ESMT. SHALL BE 15 FEET WIDE TO PROVIDE A STABLE ACCESS ESMT., IF ACCESS HAS NOT OTHERWISE BEEN PROVIDED.

NOTE: A PARALLEL STREET IS RECOMMENDED ON AT LEAST ONE SIDE OF TYPE I CHANNELS IF THE DRAINAGE AND FLOODWAY IS DEDICATED TO PUBLIC USE.

NOTE: NO ENCROACHMENTS SHALL BE PERMITTED IN ACCESS EASEMENTS.



UNLINED CHANNELS
TYPE II - UNLINED WITH MAINTENANCE SECTION
TYPICAL

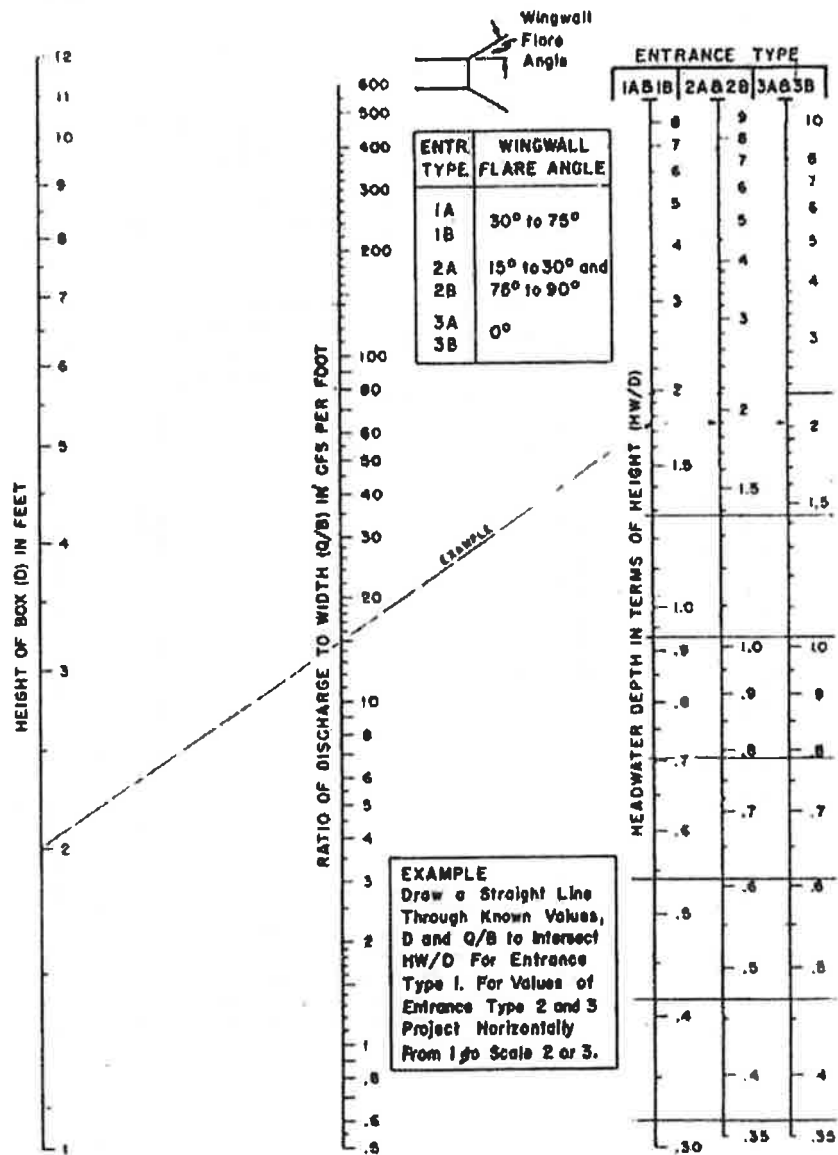


TYPE III - LINED

NOTE: WHEN CHANNEL IS DESIGNED USING PEAK DISCHARGE FLOWS FROM THE FLOOD INSURANCE STUDY, FREEBOARD MAY BE DELETED.

OPEN CHANNEL TYPES

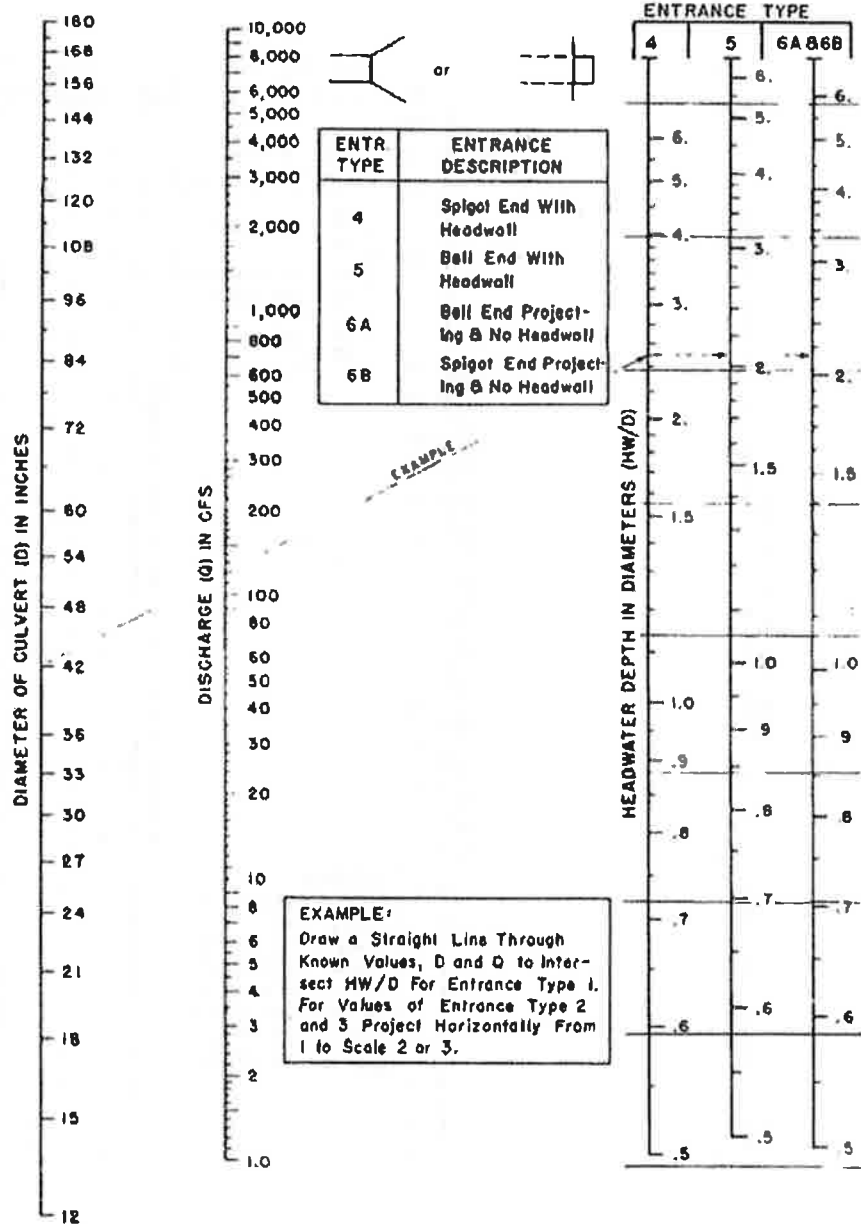
FIGURE 22



BUREAU OF PUBLIC ROADS JAN 1963

HEADWATER DEPTH FOR CONCRETE BOX CULVERT WITH INLET CONTROL

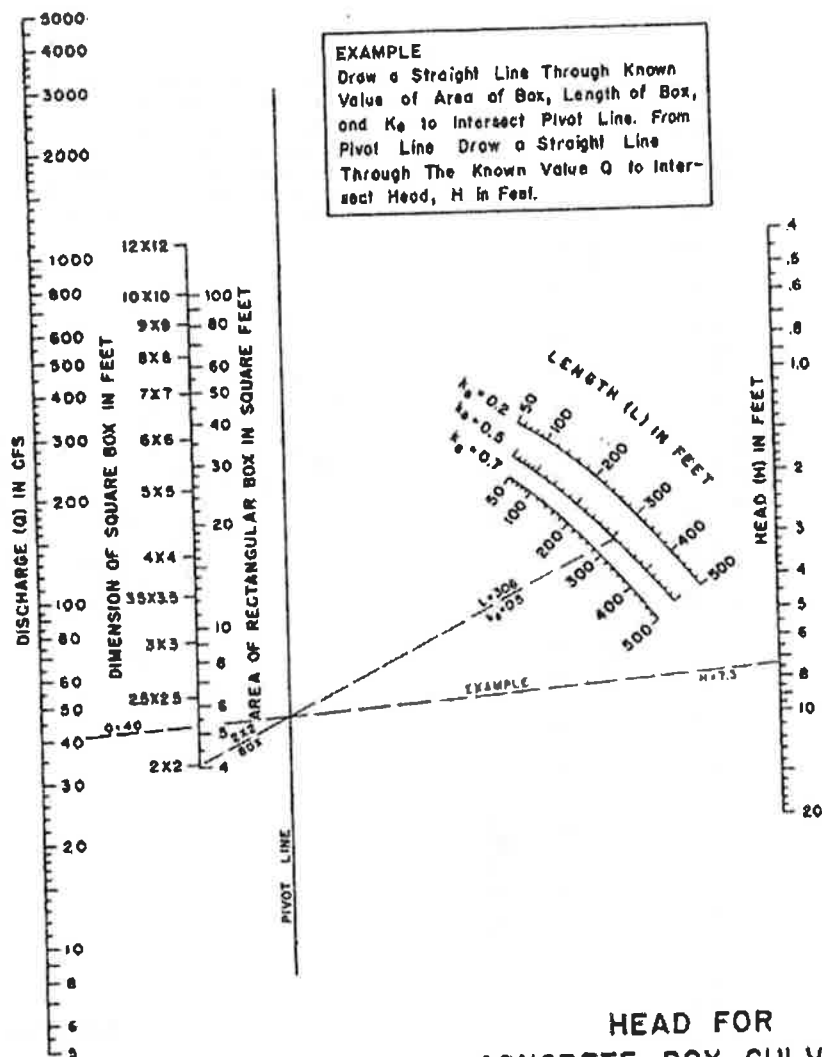
FIGURE 23



HEADWATER DEPTH FOR
CONCRETE PIPE CULVERTS
WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN 1965

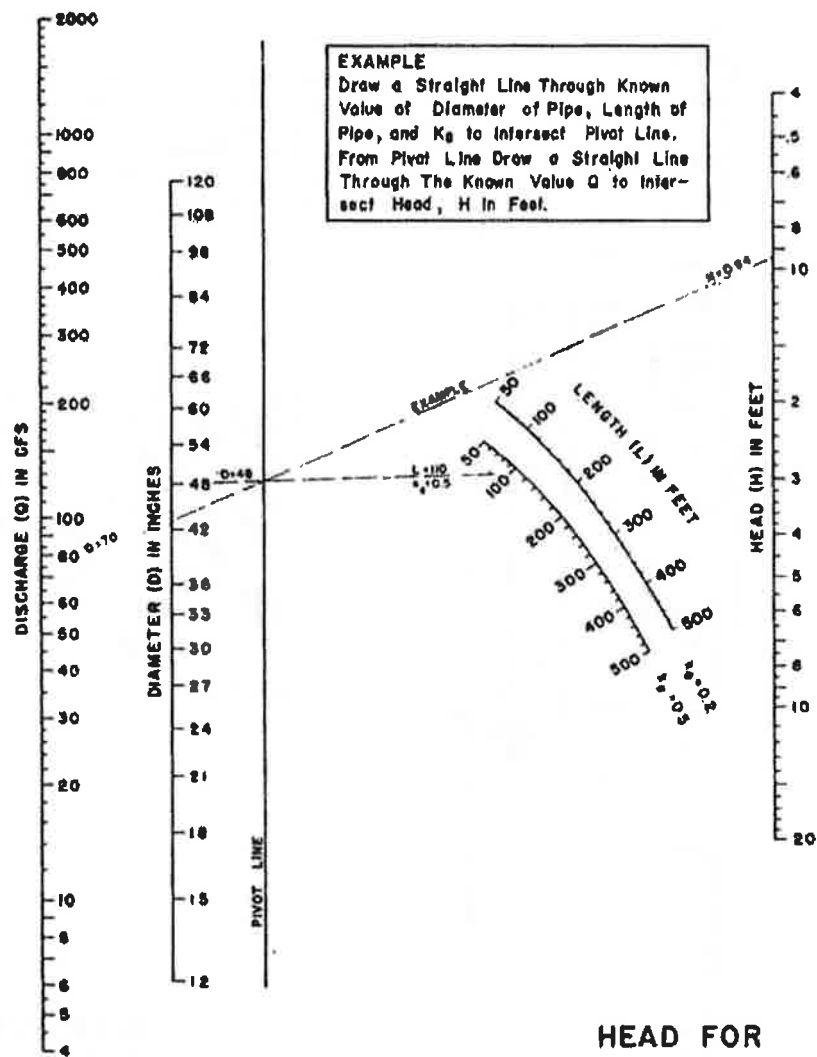
FIGURE 24



HEAD FOR
 CONCRETE BOX CULVERTS
 FLOWING FULL
 $n = 0.012$

BUREAU OF PUBLIC ROADS JAN 1963

FIGURE 25



HEAD FOR
 CONCRETE PIPE CULVERTS
 FLOWING FULL
 $n = 0.012$

BUREAU OF PUBLIC ROADS JAN 1963

FIGURE 26

EXAMPLE

Known:

Discharge = 200 c.f.s.

Width of Conduit = 5'

$Q/B = 40$

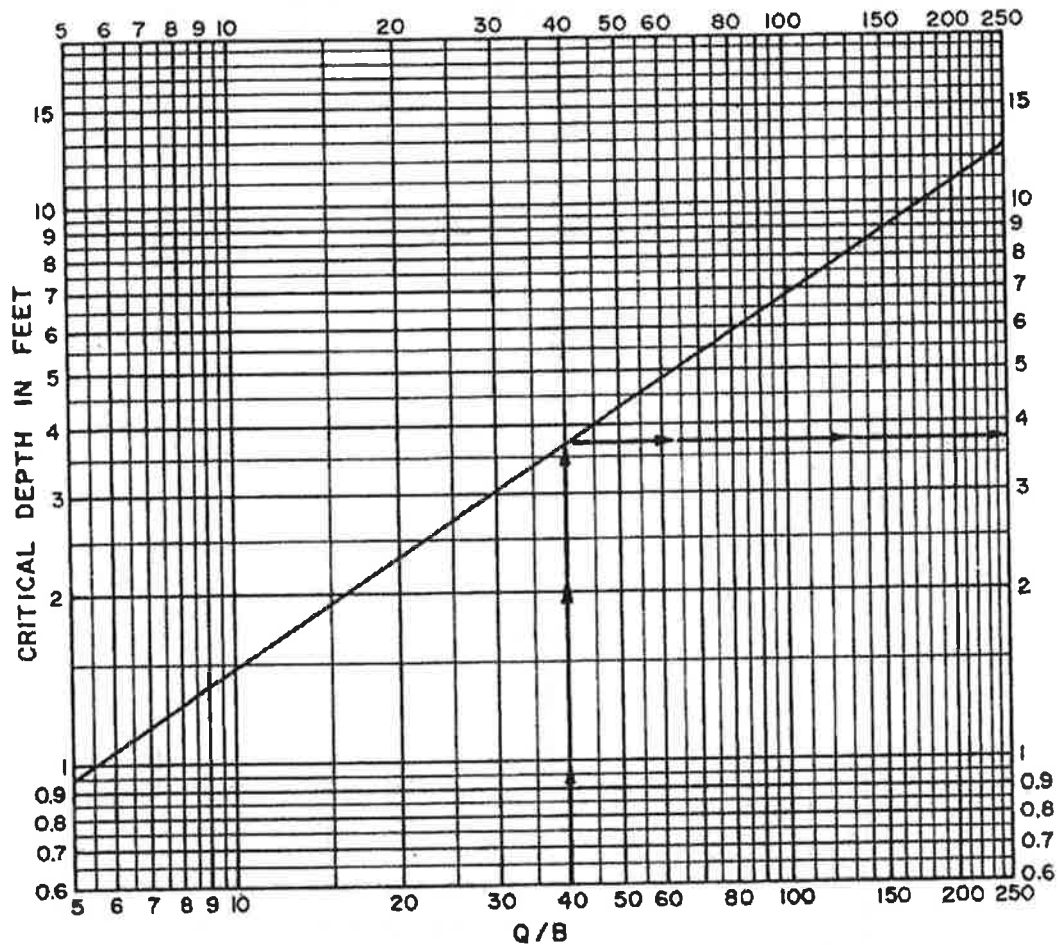
Find:

Critical Depth

Solution:

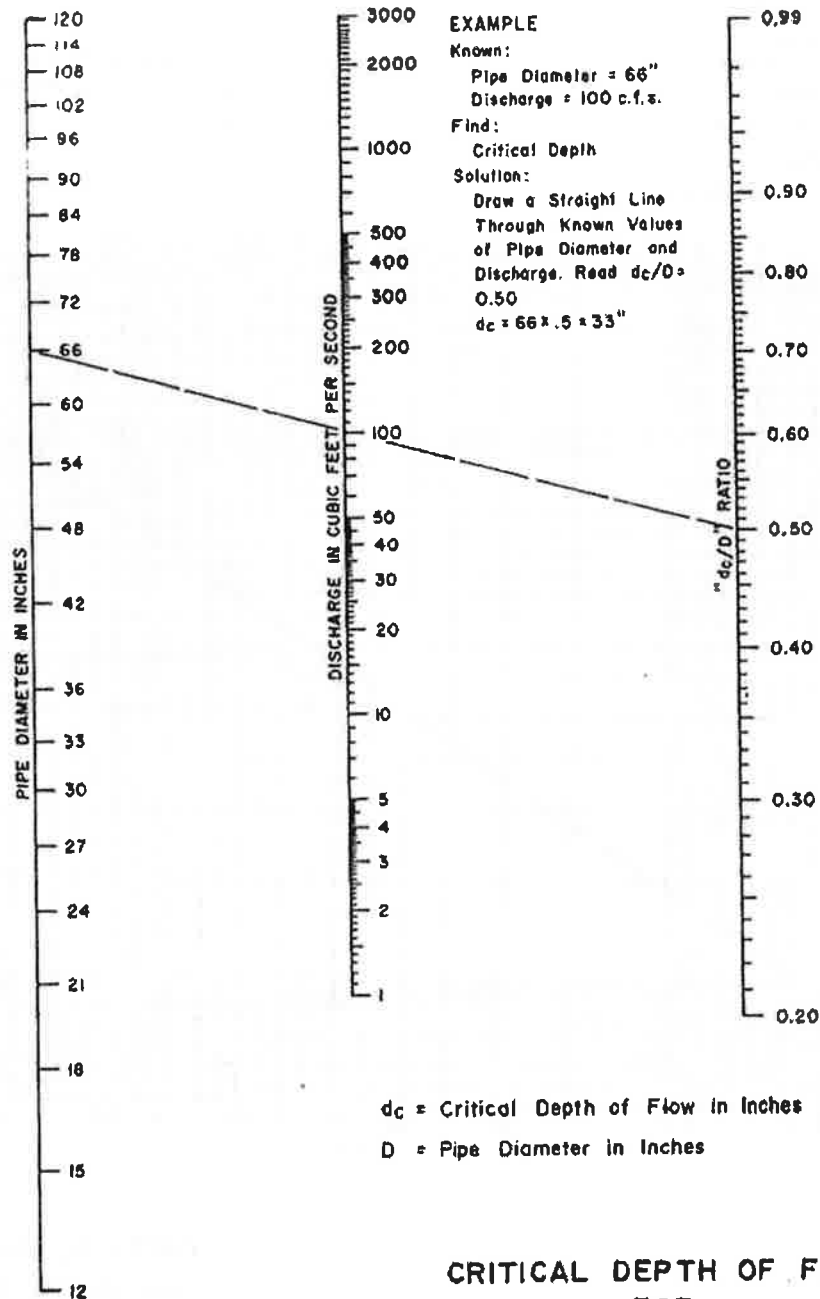
Enter Graph at $Q/B = 40$

Intersect Critical Depth
at 3.7



CRITICAL DEPTH
OF FLOW FOR
RECTANGULAR CONDUITS

FIGURE 27



d_c = Critical Depth of Flow in Inches
 D = Pipe Diameter in Inches

CRITICAL DEPTH OF FLOW FOR CIRCULAR CONDUITS

TEXAS HIGHWAY DEPARTMENT

FIGURE 28.

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- 45) Technical Memorandum National Weather Service, Hydro 35, Dated June 1977.
- 46) Hydraulics of Bridge Waterways, Hydraulic Design Service No. 1, U. S. Department of Transportation, Bureau of Public Roads, 1970

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	5. Discuss policy goals pertaining to traffic signalization needs and intersection improvements within city limits.
Access	Public
Type	Discussion
Goals	Provide a high quality of life environment for families, individuals, businesses, and other organizations in Sachse. Strategically invest in the City's existing and future infrastructure.

Public Content**BACKGROUND**

The City of Sachse is a growing community which is strategically located between growing population centers to the northeast and employment centers to the south and west.

OVERVIEW

The City of Sachse and its neighbors have seen significant growth in population over the past decade. Due to Sachse's location, a majority of the new traffic in the region must pass through Sachse to get from home to work. This phenomenon results in a great deal of "pass-through" traffic, which impacts the quality of life for Sachse residents. While there is no way to force traffic outside of the community, there are steps by which the City can improve transportation, minimize congestion and limit the impact this traffic has on Sachse residents.

This item is for staff to present the City Council with an overview of:

- Key locations of traffic congestion
- Intersection improvement needs and options
- Budgetary impacts of Capital Improvement Projects (CIP) at street intersections

POLICY CONSIDERATIONS

Traffic congestion impacts both City infrastructure and quality of life for Sachse residents.

RECOMMENDATION

There are no recommendations at this time. Staff is seeking feedback on policy goals pertaining to traffic signalization needs and intersection improvements.

[Intersection Improvement Needs Presentation.pdf \(3,683 KB\)](#)

Intersection Improvement Needs

CITY COUNCIL MEETING

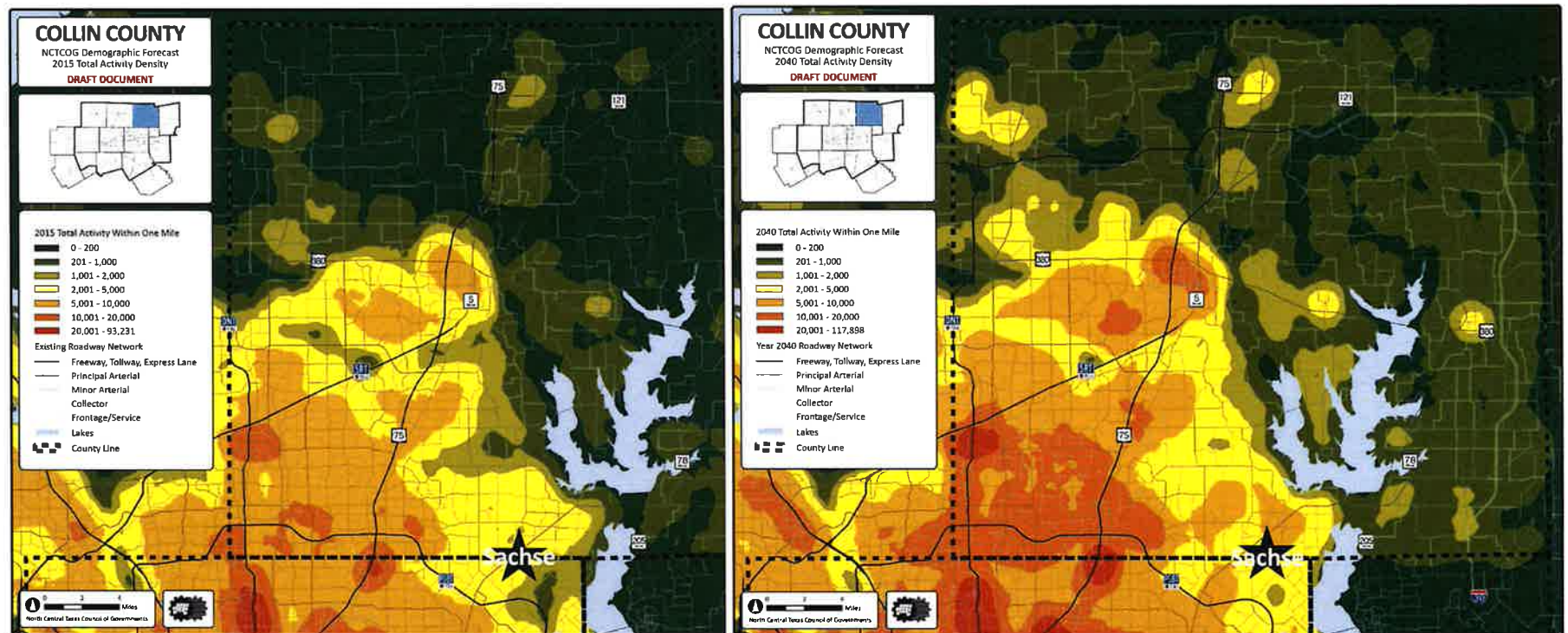
MAY 6, 2019



Overview

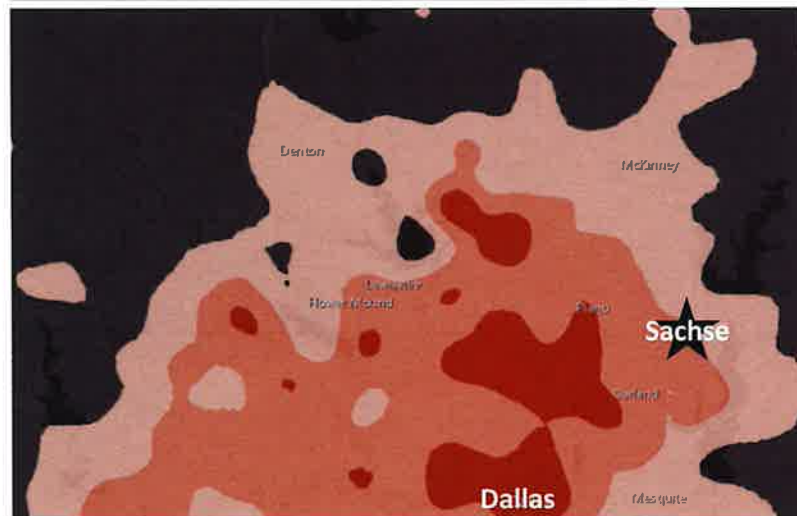
- Activity Growth Estimates
- Traffic Congestion Estimates
- Impacts in Sachse
- City Options & Improvement Needs
- Budgetary Impacts
- Collin County 2018 Bond Program
- Funding Options
- Staff Recommendations & Next Steps

Activity Growth Estimates

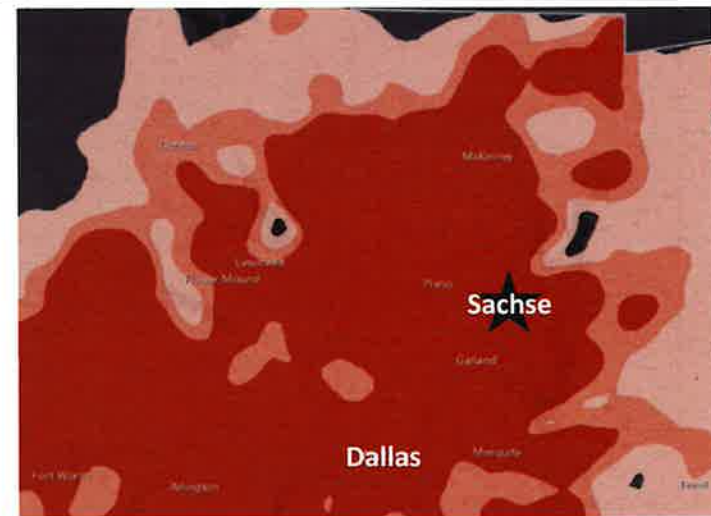


(data from NCTCOG's Collin County Strategic Roadway Plan)

Traffic Congestion Estimates



2020 Anticipated Congestion
(data from NCTCOG Mobility 2045 Plan)

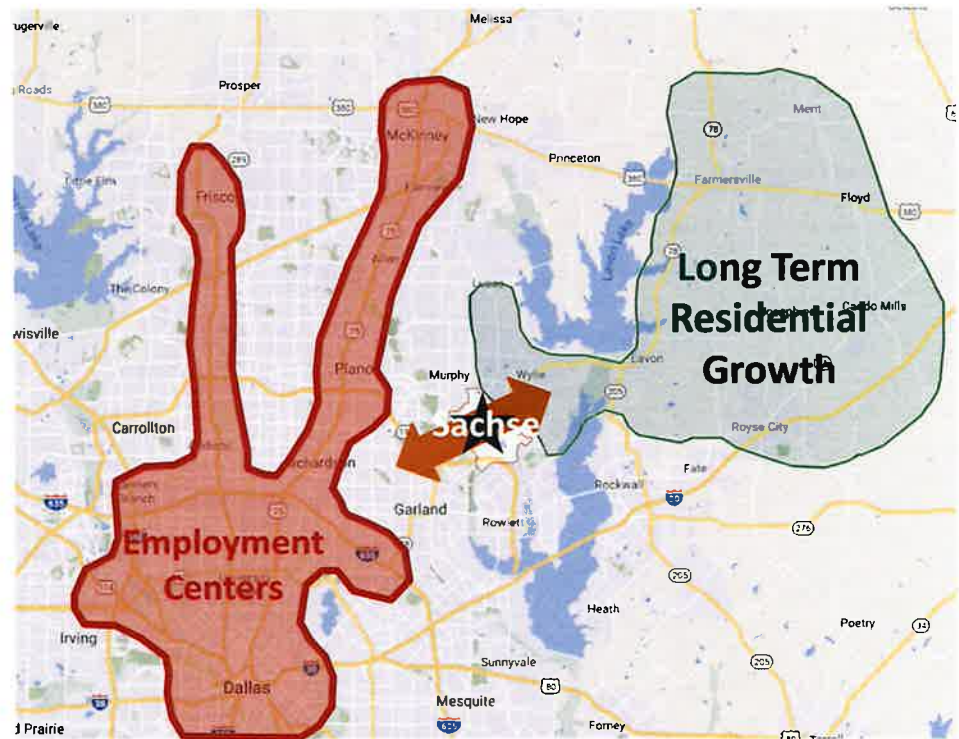


2040 Anticipated Congestion
if no transportation improvements are made
(data from NCTCOG Mobility 2045 Plan)

 Severe Congestion  Moderate Congestion  Light Congestion

What Does it Mean?

- Sachse is uniquely positioned between growth to the northeast and employment centers to the south and west.
- As population growth and activity levels in eastern Collin County increase, Sachse will see more traffic.
- Sachse's location relative to the PGBT ensures that many new neighbors will be utilizing our road network each and every day.



What Can Be Done?

- NCTCOG, Dallas County, and Collin County continue to develop plans and funding options for roadway network improvements.
 - The Merritt Road project is being made possible by this work.
 - The projects which will come from these efforts are long-term solutions with high price tags.
- Traffic has been and will continue to come in larger volumes.
- Sachse cannot control the growth of its neighbors. However, the City can control how it deals with the resulting traffic.

Collin County Growth Impacts in Sachse

Legend

Primary Impacts

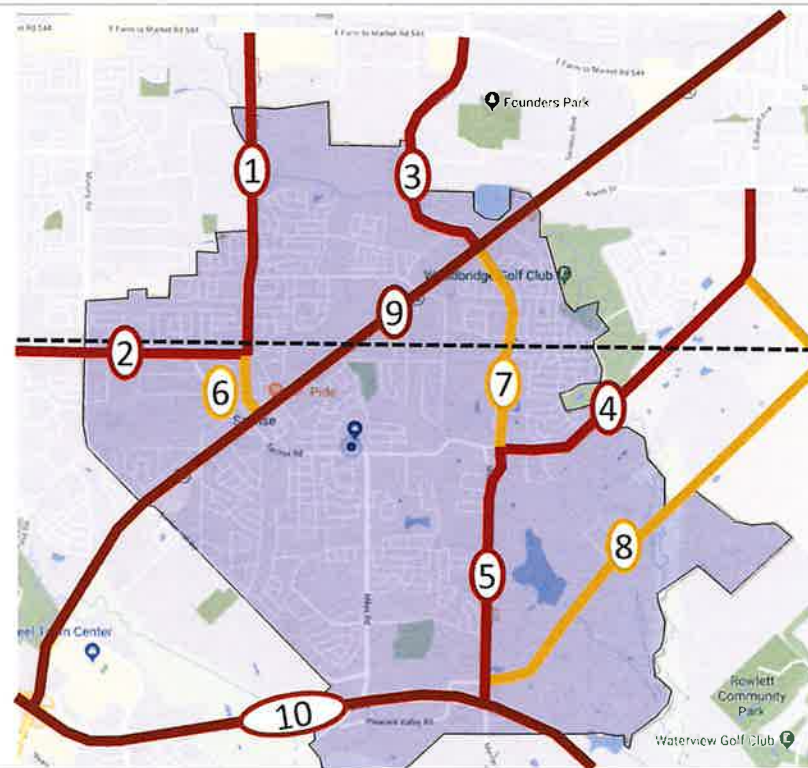
1. Dewitt Road
2. Blackburn Road
3. Woodbridge Parkway North
4. Sachse Road East
5. Merritt Road

Secondary Impacts

6. 5th Street
7. Woodbridge Parkway South
8. Pleasant Valley Road

Non-City Thoroughfare Impacts

9. State Highway 78
10. President George Bush Turnpike



Options

1. Hope traffic improves on its own
 - a. Highly unlikely scenario. As Wylie, Lavon, Farmersville and other communities to the north continue to grow, we will see traffic increase.
2. Focus on major NCTCOG Improvement Projects
 - a. The NCTCOG is continuing to work on long-term major transportation solutions.
 - b. These projects will be done over the next 5-25 years. Most of these projects exist outside of the City limits, but they will help to move traffic.
 - c. Sachse will see a benefit from these projects over the long-term.
3. Complete small scale projects to improve efficiency
 - a. Intersections are where the majority of congestion originates. The inefficient movement of traffic onto/off of a road, turning movements, etc. cause delays and backups.
 - b. Sachse has multiple locations where smaller scale projects could improve efficiency. These projects are feasible to fund and construct over a shorter period of time when compared to major arterial improvements.

Intersection Improvement Needs

- Based on existing conditions and the continued increase in growth, Sachse has determined that traffic signals are, or will soon be required in the following locations along major Collin County transportation corridors:
 - Corridor 1
 - Dewitt Road/Ingram Road (Funded, design underway)
 - Ranch Road/Dewitt Road
 - Maxwell Creek Road/Canyon Crest/Keith Lane
 - Corridor 2
 - Woodbridge Parkway/Cody Lane
 - Woodbridge Parkway/Creek Crossing
 - Sachse Road/Merritt Road/Woodbridge Parkway (Funded with Merritt Road Project)
- Sachse also anticipates the need for a signal at Country Club/SH 78. Staff has requested TxDOT to review this need during their signal re-timing project for SH 78 and FM 544.



Budgetary Impacts

- The cost to signalize an intersection is currently estimated at:
 - \$50,000 for engineering design and land surveying
 - \$450,000 for construction
 - Additional funds if easements/right-of-way is needed
- Therefore, in total the City would need approximately \$2,000,000 to design & construct the 4 unfunded traffic signal projects needed along the Woodbridge Parkway and Dewitt/Maxwell Creek corridors:
 - Ranch Road/Dewitt Road
 - Maxwell Creek Road/Canyon Crest/Keith Lane
 - Woodbridge Parkway/Cody Lane
 - Woodbridge Parkway/Creek Crossing

Collin County 2018 Bond Program

- In 2018 Collin County received approval from taxpayers for a \$750M bond, including:
 - \$600 million for high-speed roadways;
 - \$140 million for arterial roadways that feed into the highway system; and,
 - \$10 million for open space and parks projects.
- In Sachse, there are not currently any proposed high-speed roadways.
- However, both the Dewitt/Maxwell Creek corridor and the Woodbridge Parkway/Merritt Road corridor meet the intent of the \$140M identified for “arterial roadways that feed into the highway system.”
- Per County staff, Collin County will be conducting a call for projects later this year, and will begin awarding projects in early 2020.

Funding Options

- The City currently has \$500,000 allocated toward the Dewitt/Ingram traffic signal project. The other 4 traffic signal projects are not yet funded.
- Per the 2018 Collin County Bond, a City Sachse's size is eligible for a 70/30 match with the County (30% City, 70% County).
- The County is seeking projects which are eminent and close to being shovel ready. Their expectation is that if a project is awarded, it needs to start very soon.
- Therefore, if Sachse received approval for a signalization project of all 5 intersections, then:
 - The City share would be approximately \$750,000 to complete all 5 signals (including Dewitt/Ingram)
 - The project would need to begin in the spring of 2020 (per current County schedule)

Staff Recommendations

- Staff recommends the following path forward:
 - Continue design work for the Ingram/Dewitt Signal Improvement Project
 - Re-allocate \$200,000 from the Dewitt/Ingram construction budget toward the design of the following signal projects:
 - Dewitt/Ingram
 - Ranch Road/Dewitt Road
 - Maxwell Creek Road/Canyon Crest/Keith Lane
 - Woodbridge Parkway/Cody Lane
 - Woodbridge Parkway/Creek Crossing
 - In the 2019-2020 Capital Improvement Plan, allocate an additional \$250,000 in Roadway Impact Fees toward the Sachse Traffic Signal Improvement Project.
 - Submit all 5 projects for Collin County Bond Funding this summer/fall, with construction anticipated for 2020.
 - If projects do not receive Collin County funding, move forward with construction of Ingram/Dewitt Signal (utilizing the \$250,000 of funds from Roadway Impact Fees to cover the construction funding gap).

Next Steps

- Staff is seeking feedback on the potential re-allocation of funding for the Dewitt/Ingram signal construction toward a larger city-wide traffic signal project in conjunction with Collin County.
- If the City Council agrees with staff's recommendation, staff will return with a resolution to authorize the proposed funding re-allocation and design project at the May 20 City Council meeting.

**Agenda Item Details**

Meeting	May 06, 2019 - Regular Combined City Council Meeting
Category	F. Regular Agenda Items
Subject	6. Discuss the 2019-2020 Capital Improvement Plan (CIP).
Access	Public
Type	Discussion
Goals	Be a model of financial stewardship through growth management, responsible investment, and financial transparency. Strategically invest in the City's existing and future infrastructure.

Public Content**BACKGROUND**

The City of Sachse updates the Capital Improvement Plan on an annual basis as a part of the annual budget process. This item is to discuss the initial staff findings pertaining to capital improvement utility projects to be considered for inclusion in the Fiscal Year 2019-2020 budget.

OVERVIEW

The City of Sachse Capital Improvement Plan (CIP) includes major City projects in the following categories:

- Street Expansion & Maintenance
- Water System Expansion & Maintenance
- Sewer System Expansion & Maintenance
- Drainage System Expansion & Maintenance
- Parks Expansion & Maintenance
- City Facilities

The Capital Improvement Plan is updated on an annual basis as part of the annual budget process.

Below is a proposed calendar of presentations to the City Council for the proposed Capital Improvement Plan Updates:

- May 6 – Utilities
- May 20 – Facilities & Drainage
- June 3 - Streets
- June 17 – Parks & Trails
- July 15 – Full Revised CIP
- August 19 – Final CIP

Schedule may change as needed to address comments received.

This item will provide the City Council with an overview of staff's initial findings regarding potential Fiscal Year 2019-2020 utility projects, with initial project scopes and order of magnitude cost estimates.

Utility project needs are classified into two categories:

Maintenance

- Replace existing water and sewer mains in poor condition
- Replace valves, manholes, and hydrants in poor condition
- Construct replacement mains in areas with high call volume (sewer backups)

Expansion

- Construct new mains to serve undeveloped properties
- Increase size of existing mains to improve capacity of water and sewer system

Staff is seeking feedback on the overall policy goals of the City Council pertaining to CIP projects, along with feedback on individual utility projects which the City Council finds to be of the greatest importance to the community.

POLICY CONSIDERATIONS

The City of Sachse is responsible for maintaining and expanding public infrastructure and public facilities in the city. Specific policy considerations pertaining to individual projects will be presented in greater detail as the CIP process moves forward.

RECOMMENDATION

There are no recommendations affiliated with this item at this time. Staff is seeking feedback on the initial CIP utility recommendations.

CIP Presentation - Utilities.pdf (466 KB)

2019-2020 Capital Improvement Plan - Utilities

CITY COUNCIL MEETING

MAY 6, 2019



Overview

- 2019-2020 CIP Calendar
 - Key Active & Completed Projects
 - Capital Project Needs
 - Fund Balances
 - Project Recommendations by Classification
 - Next Steps
- 

CIP Calendar

- May 6 – Utilities
- May 20 – Facilities & Drainage
- June 3 - Streets
- June 17 – Parks & Trails
- July 15 – Full Revised CIP
- August 19 – Final CIP

Schedule may change as needed to address comments received.

Key Active & Completed Projects

Utilities

- Southeast Water Tower
 - *Project 80% complete – opening early June 2019*
- PGBT Phase 1 Sewer
 - *Project 75% complete – construction top finish this summer*
- Sachse Street/Dewitt Street Water Service Relocation
 - *Contractor coordinating work schedule with homeowners*
- PGBT Sewer Phase 2
 - *Contractor mobilized and is beginning site work*
- PGBT Sewer Phase 3
 - *Project to be bid upon completion of Phase 1*
- Maxwell Creek Pump Station Rehabilitation
 - *Consultant analyzing system requirements for preliminary design*

Capital Utility Project Needs

- Maintenance
 - Replace existing water and sewer mains in poor condition
 - Replace valves, manholes, and hydrants in poor condition
 - Construct replacement mains in areas with high call volume (sewer backups)

- Expansion
 - Construct new mains to serve undeveloped properties
 - Increase size of existing mains to improve capacity of water and sewer system

Fund Balances

- Maintenance Funding
 - Utility Fund allocates \$250,000/year for maintenance projects
 - In recent years, strong fund balance is allowing additional funding for both maintenance and expansion needs
- Expansion Funding
 - Water Impact Fees - \$709,802.69
 - Sewer Impact Fees - \$2,032,495.27

Utility Maintenance Recommendations

- All utility rehabilitation projects are funded through the Utility Fund, paid for through water and sewer rates.
- Anthony Lane Sewer Rehabilitation
 - Design (FY 18-19 Budget)
 - Construction: \$250,000 (FY 19-20)
- Natchez Sewer Main Rehabilitation
 - In-House Design
 - Construction: \$220,000 (FY 19-20)
- 3rd Street Water Main Rehabilitation
 - In-House Design
 - Construction: \$275,000 (FY 19-20)
- Cartwright Water Main Rehabilitation
 - In-House Design
 - Construction: \$160,000 (FY 19-20)

Utility Expansion Recommendations

- **Pleasant Valley Road 12" Water Main**
 - The project will help to establish a loop between the new water tower near Merritt/Pleasant Valley and the existing water tower at the Public Works facility on Sachse Road.
 - Project cost increased significantly based on staff findings of conditions during our Pleasant Valley Place/Longbranch Court water main replacement project completed last year. Significant boring will be required in order to minimize impact upon adjacent properties, creek/bridge, and franchise utility conflicts.
 - Design: \$100,000 (FY 18-19)
 - Construction: \$600,000 (FY 19-20)
 - Fund Source: Water Impact Fees

- **Southeast Sewer Expansion – Phase 3**
 - This project is not required for PGBT sewer, but is a long-term need to remove the Sachse Road Lift Station and lessen the strain on the Merritt Road lift station.
 - Project design is substantially complete. Staff working to obtain remaining easements needed. Project will go to bid upon completion of PGBT Sewer Phase 1 and all easements being acquired.
 - Original Cost Estimate: \$2,500,000
 - Fund Source: Sewer Impact Fees, Utility Fund (from prior years CIP)

Next Steps

- Staff is seeking feedback on overall policy pertaining to the Capital Improvement Plan (CIP), and feedback on any individual utility projects which the Council would like staff to provide more detail on, further analysis, or move up/down the priority list.
- These projects will be incorporated into the FY 2019-2020 Capital Improvement Plan.

CIP Calendar

- The CIP is updated as a part of the annual budget process. Below is a timeline for finalizing the CIP:
 - May 6 – Utilities
 - May 20 – Facilities & Drainage
 - June 3 - Streets
 - June 17 – Parks & Trails
 - July 15 – Full Revised CIP
 - August 19 – Final CIP

Schedule may change as needed to address comments received.