

AGENDA FOR THE KERRVILLE CITY COUNCIL MEETING

TUESDAY, JANUARY 14, 2020, 6:00 P.M.

KERRVILLE CITY HALL, COUNCIL CHAMBERS

701 MAIN STREET, KERRVILLE, TEXAS

The Community Vision

Kerrville will be a vibrant, welcoming and inclusive community that:

- *Respects and protects the natural environment that surrounds it;*
- *Seeks to attract economic growth and development;*
- *Provides opportunities for prosperity, personal enrichment and intellectual growth for people of all ages; and*
- *Does so while preserving the small-town charm, heritage, arts and culture of the community.*



Kerrville2050



KERRVILLE CITY COUNCIL MEETING AGENDA
JANUARY 14, 2020, 6:00 PM
701 MAIN STREET, KERRVILLE, TEXAS
CITY HALL, COUNCIL CHAMBERS



The facility is wheelchair accessible and accessible parking spaces are available. Requests for accommodations or interpretive services must be made 48 hours prior to this event. Please contact the City Secretary's Office at 830-257-8000 for further information.

Citizens may speak to the City Council on posted agenda items. Prior to speaking, each speaker must fill out the speaker request form and submit it to the City Secretary. The speaker request form must be submitted before the item is called or read into record. Each speaker is limited to four minutes.

CALL TO ORDER:

Mayor Bill Blackburn

INVOCATION, AND PLEDGE OF ALLEGIANCE TO THE FLAG:

Led by Councilmember Kim Clarkson

1 ANNOUNCEMENTS OF COMMUNITY INTEREST:

Announcement of items of community interest, including expressions of thanks, congratulations, or condolences; information regarding holiday schedules; honorary recognitions of city officials, employees, or other citizens; reminders about upcoming events sponsored by the city or other entity that is scheduled to be attended by city officials or employees; and announcements involving imminent threats to the public health and safety of the city. No action will be taken.

2 VISITORS/CITIZENS FORUM:

Any citizen with business not scheduled on the agenda may speak to the City Council. Prior to speaking, each speaker must fill out the speaker request form and give it to the City Secretary. The speaker request form must be submitted to the City Secretary before the item is called or read into record. City Council may not discuss or take any action on an item but may place the issue on a future agenda. Each speaker is limited to four minutes.

3 PRESENTATIONS:

3.A. Kerrville Fire Department Firefighter of the Year Recognition.

Attachments:

[20200114_Recognition_2019 FireFighter of the Year.pdf](#)

4 CONSENT AGENDA:

These items are considered routine and can be approved in one motion unless a Councilmember asks for separate consideration of an item. It is recommended that the City Council approve the following items which will grant the Mayor or City Manager the authority to take all actions necessary for each approval:

4.A. Resolution No. 01-2020. A Resolution ordering that a General Election be held on May 2, 2020, for the election of Mayor, Councilmember Place 3, and Councilmember Place 4; establishing the dates and times for early voting for such election; appointing election judges; and providing other matters related to subject.

Attachments:

[20200114_Resolution 01-2020 Ordering that a General Election be held on May 2, 2020 for the Election of a Mayor, Councilmember Place 3 and 4.pdf](#)

- 4.B. Resolution No. 02-2020. A Resolution authorizing the City Manager to enter into an agreement for a local on-system improvement project with the Texas Department of Transportation; said agreement to provide City funding to TXDOT for its construction of the extension of Olympic Drive to State Loop 534.

Attachments:

[20200114_Resolution_02-2020 TXDOT Agreement - Local On-System Improvement Project - Olympic Drive to State Loop 534.pdf](#)
[20200114_Agreement_TXDOT Olympic Drive_LOSA.pdf](#)

- 4.C. City of Kerrville Stormwater Master Plan.

Attachments:

[20200114_Plan_Kerrville Storm Water Master Plan January 2020.pdf](#)

- 4.D. Purchase of Bobcat Skid Steer T870 in the amount of \$68,807.90.

Attachments:

[20200114_Quote_Bobcat Skid Loader T870 - Street Division.pdf](#)

- 4.E. Minutes for the City Council Workshop held December 10, 2019.

Attachments:

[20200114_Minutes_Workshop 4pm on 12-10-19.pdf](#)

- 4.F. Minutes for the City Council regular meeting on December 10, 2019 at 6pm.

Attachments:

[20200114_Minutes_Regular meeting 6pm on 12-10-19.pdf](#)

END OF CONSENT AGENDA

5 CONSIDERATION AND POSSIBLE ACTION:

- 5.A. Vintage Heights Development Deal Points.

Attachments:

[20200114_Powerpoint_Vintage Heights DEAL POINTS presentation.pdf](#)
[20200114_Housing Study Executive Summary.pdf](#)
[20200114_Agreement_Vintage Heights deal points.pdf](#)

6 PUBLIC HEARING AND ORDINANCES, FIRST READING:

- 6.A. Ordinance No. 2020-03. An Ordinance amending Chapter 60 of the Code of Ordinances, City of Kerrville, Texas, which adopted zoning regulations, use districts, and a zoning map in accordance with the City's Comprehensive Plan, such chapter more commonly known as the City's Zoning Code; by changing the zoning and classification of a property generally located east of and adjacent to State Highway 16 South, south of Riverhill Boulevard, and comprising approximately 225.69 acres; from a single-family residential zoning district (R-1) to a medium density residential zoning district (R-2); amending the Comprehensive Plan (Kerrville 2050) to make it consistent with such amendment; providing a cumulative clause; providing for severability; providing an effective date; ordering publication; and providing other matters relating to the subject.

Attachments:

[20200114_PowerPoint_Vintage Heights ZONING presentation.pdf](#)
[20200114_Ordinance 2020-03 Vintage Heights Zoning.pdf](#)
[20200114_METES BOUNDS_Vintage Heights.pdf](#)
[20200114_Map_Vintage Heights.pdf](#)
[20200114_Appeal_Letter_Vintage Heights 2019_12_05_1130am.pdf](#)

7 PUBLIC HEARINGS AND RESOLUTIONS:

- 7.A. Resolution No. 03-2020. A Resolution allowing a Conditional Use Permit for Automobile Dealership, Used Auto Sales on approximately 0.45 acres, part of Lots 5-8, Block 15, Westland Addition; and more commonly known as 404 Junction Highway.

Attachments:

[20200114_Resolution 03-2020 Resolution granting a conditional use permit to authorize automobile dealership CUP.pdf](#)

8 ORDINANCES, FIRST READING:

- 8.A. Ordinance No. 2020-04. An Ordinance amending Ordinance No. 2018-19 which created Tax Increment Reinvestment Zone Number One, City of Kerrville, Texas, by amending the composition of the Board of Directors for the Zone; containing a cumulative clause; containing a savings and severability clause; and providing other matters relating to this subject.

Attachments:

[20200114_Ordinance 2020-04 Amending Ordinance No. 2018-19 which created TIRZ.pdf](#)

9 ORDINANCES, SECOND READING:

- 9.A. Ordinance No. 2020-01. Second Reading. An Ordinance declaring the adoption of amendments to the City of Kerrville, Texas, Charter in accordance with the adoption of propositions A through O and Q at the Special Election held on November 05, 2019; adopting the Charter, as amended; providing a cumulative clause; containing a savings and severability clause; providing an effective date; and providing other matters related to the subject.

Attachments:

[20200114_Ordinance_2020-01 Adoption of Amendments to City Charter.pdf](#)

[20200114_Charter.pdf](#)

- 9.B. Ordinance No. 2020-02. Second Reading. An Ordinance amending Chapter 2, "Administration", Article IV "Boards and Commissions", Section 2-91 "Senior Services Advisory Committee" of the Code of Ordinances of the City of Kerrville, Texas; by amending subsections (A)(1) and (A)(2) to decrease the membership of this committee to 14 members; containing a cumulative clause; containing a savings and severability clause; and providing other matters relating to this subject.

Attachments:

[20200114_Ordinance_2020-02 Amending Senior Services Advisory Committee to 14 members.pdf](#)

10 ITEMS FOR FUTURE AGENDAS:

City Council may suggest items or topics for future agendas.

11 BOARD APPOINTMENTS:

- 11.A. Appointment to the Kerr Emergency 9-1-1 Network Board of Directors.

Attachments:

[20200114_Board Appointment_911 Board of Directors.pdf](#)

- 11.B. Appointment to the Library Advisory Board.

Attachments:

[20200114_Board Appointment_Library Board.pdf](#)

- 11.C. Appoint members to the Recovery Community Coalition.

Attachments:

[20200114_Board Appointment_Recovery Community Coalition.pdf](#)

- 11.D. Appointment to the Senior Services Advisory Board.

Attachments:

[20200114_Board Appointment_Senior Services Advisory Board.pdf](#)

- 11.E. Appointments to the Planning and Zoning Commission. (This item is eligible for discussion in executive session).

Attachments:

[20191210_Board Appointment_Planning and Zoning Commission roster.pdf](#)

12 EXECUTIVE SESSION:

City Council may, as permitted by law, adjourn into executive session at any time to discuss any matter listed above including if they meet the qualifications in Sections 551.071 (consultation with attorney), 551.072 (deliberation regarding real property), 551.073 (deliberation regarding gifts), 551.074 (personnel/officers), 551.076 (deliberation regarding security devices), and 551.087 (deliberation regarding economic development negotiations) of Chapter 551 of the Texas Government Code.

12.A. Section 551.074: Personnel Matters: Appointments to the Planning and Zoning Commission.

13 ACTION ON ITEMS DISCUSSED IN EXECUTIVE SESSION, IF ANY:

ADJOURN



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Kerrville Fire Department Firefighter of the Year Recognition.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Dec 19, 2019

SUBMITTED BY: Dannie Smith

EXHIBITS: [20200114_Recognition_2019 FireFighter of the Year.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Recognize the Kerrville Fire Department 2019 Firefighter of the Year.

RECOMMENDED ACTION:

Present award.

The City and Fire Department of Kerrville

Presents this

Certificate of Commendation

to

Lane Rhea

*For your dedication & commitment to
Setting the Public Safety Standard
and achieving the honor of*

Firefighter of the Year 2020

December 19, 2019

Mark McDaniel, City Manager

Dannie Smith, Fire Chief



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Resolution No. 01-2020. A Resolution ordering that a General Election be held on May 2, 2020, for the election of Mayor, Councilmember Place 3, and Councilmember Place 4; establishing the dates and times for early voting for such election; appointing election judges; and providing other matters related to subject.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 22, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Resolution 01-2020 Ordering that a General Election be held on May 2, 2020 for the Election of a Mayor, Councilmember Place 3 and 4.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Resolution to order a General Election to be held Saturday, May 2, 2020. Electing Mayor, Councilmember Place 3 and Councilmember Place 4.

The period for filing an application for place on the ballot is January 15, 2020 through February 14, 2020.

The City Secretary recommends the following:

1. Early voting be held at the Cailloux City Center, 910 Main Street as follows:

April 20, 2020 and April 21, 2020: 7:00 a.m. to 7:00 p.m.

April 22, 2020 through April 24, 2020: 8:00 a.m. to 5:00 p.m.

April 27, 2020 and April 28, 2020: 8:00 a.m. to 5:00 p.m.

2. Election Day is Saturday, May 2, 2020: 7:00 a.m. to 7:00 p.m. at the Cailloux City Center, 910 Main Street.

3. Bob Reeves, Kerr County Tax Assessor/Collector is appointed Early Voting Clerk; and applications for ballot by mail be addressed to Bob Reeves, Attn Early Voting Clerk, Kerr County Courthouse, 700 Main Street. Applications for ballot by mail must be received no later than April 21, 2020 at 4:30 p.m.

4. Appoint Early Voting Clerks: Paul Zohlen, Bill Fitch, Suzanne Harston. Appoint Early Voting Ballot Board: Bill Fitch as Judge, and Beverly Avery and Sandra Lane. Appoint Election Day: Paul Zohlen as Judge, Helen Herget as Alternate Judge, Suzanne Hartson as Clerk.

5. Establish the location of the central counting station as the Kerr County Juvenile Facility, 3499 Legion Drive, and appoint the central counting station workers as follows: Nadene Alford as Central Counting Station Manager, Jane Trolinger as Central Counting Station Judge, and Eva Washburn as Tabulation Supervisor.

6. Official canvass of the election be held Tuesday, May 12, 2020.

RECOMMENDED ACTION:

Approve Resolution No. 01-2020.

**CITY OF KERRVILLE, TEXAS
RESOLUTION NO. 01-2020**

A RESOLUTION ORDERING THAT A GENERAL ELECTION BE HELD ON MAY 2, 2020, FOR THE ELECTION OF MAYOR, COUNCILMEMBER PLACE 3, AND COUNCILMEMBER PLACE 4; ESTABLISHING THE DATES AND TIMES FOR EARLY VOTING FOR SUCH ELECTION; APPOINTING ELECTION JUDGES; AND PROVIDING OTHER MATTERS RELATED TO THE SUBJECT

WHEREAS, Section 2.03 of the City Charter establishes a two-year term of office for each Councilmember, including the Mayor, and until a successor is elected; and

WHEREAS, the term of office for Mayor, Councilmember Place Three, and Councilmember Place Four will expire in May 2020; and

WHEREAS, City Council finds it to be in the public interest to call a general election to be held on May 2, 2020, for the election of persons to the offices of Mayor, Councilmember Place Three, and Councilmember Place Four; and

WHEREAS, the City shall conduct the election pursuant to the provisions of the Texas Election Code, and as established in a joint election agreement for election services with the Kerr County Elections Officer;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. The findings above are hereby found to be true and correct.

SECTION TWO. City Council orders that a general election be held within the City of Kerrville, Texas, on Saturday, the 2nd day of May 2020, for the purpose of electing persons to the offices of Mayor, Councilmember Place Three, and Councilmember Place Four for the City of Kerrville, Texas.

SECTION THREE. City Council orders that the municipal polling place for such election will be the Kathleen C. Cailloux City Center of the Performing Arts, 910 Main Street, Kerrville, Texas, 78028.

SECTION FOUR. On Election Day, May 2, 2020, the polls shall be open from 7:00 AM to 7:00 PM. Early voting by personal appearance shall be conducted at the Kathleen C. Cailloux City Center of the Performing Arts, 910 Main Street, Kerrville, Texas, 78028, April 22 through April 30 as follows:

- **Monday, April 20, 2020:** 7:00 AM to 7:00 PM
- **Tuesday, April 21, 2020:** 7:00 AM to 7:00 PM

- **Wednesday, April 22, 2020, through Friday, 24, 2020:** 8:00 AM to 5:00 PM
- **Monday, April 27, 2020:** 8:00 AM to 5:00 PM; and
- **and Tuesday, April 28, 2020:** 8:00 AM to 5:00 PM

For purposes of processing ballots cast in early voting, the election officers for the early voting ballot board shall be appointed and designated in accordance with the provisions of the joint election agreement between the City and the Kerr County Elections Officer.

SECTION FIVE. Qualified persons may file for a place on the ballot by filing an application in the Office of the City Secretary during regular business hours from 8:00 AM to 5:00 PM each weekday, beginning Wednesday, January 15, 2020, and continuing until 5:00 PM on Friday, February 14, 2020.

SECTION SIX. The Kerr County Elections Officer, Bob Reeves, 700 Main Street, Kerrville, Texas, 78028 is hereby appointed as Early Voting Clerk; and Shelley McElhannon, City of Kerrville City Secretary, 701 Main Street, Kerrville, Texas, 78028, shall serve as the Deputy Early Voting Clerk. Applications for ballot by mail must be received by mail no later than the close of business on Tuesday, April 21, 2020, at the following Mailing Address: Bob Reeves, 700 Main Street, Kerrville, Texas, 78028; *Attn:* Early Voting Clerk.

SECTION SEVEN. All resident qualified electors of the City shall be permitted to vote at said election. This election shall be held and conducted in accordance with the aforesaid joint election agreement, election laws of the Texas Election Code, the Federal Voting Rights Act of 1965, as amended, the Charter of the City of Kerrville, and as may be required by law. All election materials and proceedings shall be printed in both English and Spanish. Kerr County will utilize its voting equipment for this election.

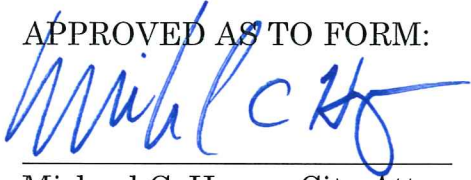
SECTION EIGHT. The Election Judge and officers for the polling place and the Early Voting Ballot Board shall be appointed in accordance with the provisions of the joint election agreement for the conducting of the election on the aforesaid election date with Kerr County.

SECTION NINE. City Council will conduct the official canvass of the election at a special meeting on Tuesday, May 12, 2020, in the Council Chambers, City Hall, 701 Main Street, Kerrville, Texas.

PASSED AND APPROVED ON this the _____ day of _____ A.D., 2020.

Bill Blackburn, Mayor

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

ATTEST:

Shelley McElhannon, City Secretary



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Resolution No. 02-2020. A Resolution authorizing the City Manager to enter into an agreement for a local on-system improvement project with the Texas Department of Transportation; said agreement to provide City funding to TXDOT for its construction of the extension of Olympic Drive to State Loop 534.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Dec 20, 2019

SUBMITTED BY: Kyle Burow

EXHIBITS: [20200114_Resolution_02-2020 TXDOT Agreement - Local On-System Improvement Project - Olympic Drive to State Loop 534.pdf](#)
[20200114_Agreement_TXDOT Olympic Drive_LOSA.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
\$0	\$0	\$0	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	E - Economic Development
Guiding Principle	E6. Support access to the infrastructure necessary to accommodate the future growth of housing and business (water, wastewater, power, communications, roads)

Action Item

SUMMARY STATEMENT:

The resolution supports authorizing the City Manager, the designated representative of the City of Kerrville, Texas, to execute an agreement for a local on-system improvement project with the Texas Department of Transportation for construction of the Olympic Drive Extension Project. The City of Kerrville Economic Improvement Corporation, Kerrville Independent School District, and City of Kerrville entered into project funding agreements for the development and construction of the extension of Olympic Drive to connect to State Loop 534. The project will consist of the extension of Olympic Drive to State Loop 534 including the widening of State Loop 534, drainage improvements, removal of existing

marking and striping, installation of new markers, restriping, and installation and completion of mast arm signal pole and signal heads. As a result of the connection to State Loop 534, a portion of the project enter into the Texas Department of Transportation (TxDOT) right-of-way for State Loop 534 requiring an agreement between the City and State of Texas for the construction, maintenance, and operation of Olympic Drive.

RECOMMENDED ACTION:

Authorize City Manager and Mayor to finalize and execute the Resolution No. 02-2020 to satisfy any necessary TxDOT Agreement requirements.

**CITY OF KERRVILLE, TEXAS
RESOLUTION NO. 02-2020**

A RESOLUTION AUTHORIZING THE CITY MANAGER TO ENTER INTO AN AGREEMENT FOR A LOCAL ON-SYSTEM IMPROVEMENT PROJECT WITH THE TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT); SAID AGREEMENT TO PROVIDE CITY FUNDING TO TXDOT FOR ITS CONSTRUCTION OF A PORTION OF THE OLYMPIC DRIVE EXTENSION PROJECT

WHEREAS, the City of Kerrville Economic Improvement Corporation ("EIC"), the City of Kerrville ("City"), and the Kerrville Independent School District ("KISD") previously entered into agreements with each other for the construction of an extension of Olympic Drive so that it connects to State Highway Loop 534 ("Loop 534"); and

WHEREAS, the ongoing project consists of the extension of Olympic Drive and includes the widening of Loop 534, drainage improvements, and the installation of signals at this new intersection, all of which occurs on property controlled by the Texas Department of Transportation (the "State"); and

WHEREAS, as a result of this connection to Loop 534 and use of State property, the City must enter into an agreement with the State; and

WHEREAS, City Council finds it to be in the public interest to authorize the City Manager to enter into an *Agreement for a Local On-System Improvement Project* between the City and State, as specified above;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. City Council authorizes the City Manager to enter into an *Agreement for a Local On-System Improvement Project* (the "Agreement") with the State regarding the extension of Olympic Drive, said agreement which is attached hereto as **Exhibit A**.

SECTION TWO. The City Manager, or designee, is hereby authorized and directed to act on the City's behalf in all matters pertaining to the Agreement.

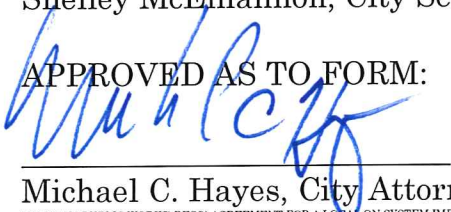
PASSED AND APPROVED ON this the ____ day of _____, A.D., 2020.

Bill Blackburn, Mayor

ATTEST:

Shelley McElhannon, City Secretary

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

CSJ #	
District #	
Code Chart 64 #	
Project Name	

ATTACHMENT A
RESOLUTION, ORDINANCE, OR COMMISSIONERS COURT ORDER

{Insert Local Government Resolution, Ordinance, or Commissioners Court Order}

CSJ #	
District #	
Code Chart 64 #	
Project Name	

STATE OF TEXAS §

COUNTY OF TRAVIS §

AGREEMENT **For A** **LOCAL ON-SYSTEM IMPROVEMENT PROJECT**

THIS AGREEMENT (Agreement) is made by and between the State of Texas, acting by and through the Texas Department of Transportation called the "State", and the **City of Kerrville**, acting by and through its duly authorized officials, called the "Local Government." The State and Local Government shall be collectively referred to as "the parties" hereinafter.

WITNESSETH

WHEREAS, the Texas Transportation Code, Section 201.103 establishes that the State shall design, construct and operate a system of highways in cooperation with local governments and Section 222.052 authorizes the Texas Transportation Commission to accept contributions from political subdivisions for development and construction of public roads and the state highway system within the political subdivision; and

WHEREAS, the Texas Transportation Commission passed Minute Order Number _____, authorizing the State to accept Local Government funded projects performed on the state highway system. The project covered by this Agreement includes only work within the state right of way as described in the Agreement, Article 2, Scope of Work (Project); and,

WHEREAS, the Governing Body of the Local Government has approved entering into this Agreement by resolution, ordinance, or commissioners court order dated **01/14/2020**, which is attached to and made a part of this Agreement as Attachment A, Resolution, Ordinance, or Commissioners Court Order (Attachment A) for the improvement covered by this Agreement. A map showing the Project location appears in Attachment B, Project Location Map (Attachment B), which is attached to and made a part of this Agreement.

NOW, THEREFORE, in consideration of the premises and of the mutual covenants and agreements of the parties, to be by them respectively kept and performed as set forth in this Agreement, it is agreed as follows:

AGREEMENT

1. Period of the Agreement

This Agreement becomes effective when signed by the last party whose signing makes the Agreement fully executed. This Agreement shall remain in effect until the completed Project is accepted by the State or unless terminated as provided below.

CSJ #	
District #	
Code Chart 64 #	
Project Name	

2. Scope of Work

The Project consists of **the extension of Olympic Drive to State Loop 534 including the widening of State Loop 534, drainage improvements, removal of existing marking and striping, installation of new markers, restriping, and installation and completion of mast arm signal pole and signal heads in Kerrville, TX as shown on Attachment B.**

3. Local Project Sources and Uses of Funds

- A. The total estimated cost of the Project is shown in Attachment C, Local On-System Improvement Project Budget (Attachment C), which is attached to and made a part of this Agreement. The estimated funds from the Local Government are shown in Attachment C. The State will pay for no Project costs performed by or managed by Local Government under this Agreement.
- B. Attachment C shows how necessary resources for completing the Project will be provided by major cost categories. These categories may include but are not limited to: (1) costs of real property (right of way); (2) costs of utility work; (3) costs of environmental assessment and remediation; (4) cost of preliminary engineering and design; (5) cost of construction and construction management; and (6) any other Project costs.
- C. The Local Government shall be solely responsible for all of its costs associated with the Project provided for in this Agreement. The Local Government shall be responsible for cost overruns for the Project in excess of the estimated amount to be paid by the Local Government on Attachment C. The Local Government shall also be responsible for direct and indirect costs incurred by the State related to performance of this project if so indicated on Attachment C. If the State determines that the on-system improvements are of significant operational benefit to the State, the State may waive its direct or indirect costs. The State's waiver of its direct or indirect costs shall be indicated on Attachment C by showing the State as responsible for these costs. When the Local Government is responsible for the State's direct or indirect costs, the amount indicated on Attachment C is a fixed fee and not subject to adjustment except through the execution of an amendment to this Agreement.
- D. Prior to the performance of any engineering review work by the State, the Local Government shall pay to the State the amount of direct and indirect State costs specified in Attachment C.
- E. Whenever funds are paid by the Local Government to the State under this Agreement, the Local Government shall remit a check or warrant made payable to the "Texas Department of Transportation" or may use the State's Automated Clearing House (ACH) system for electronic transfer of funds in accordance with instructions provided by TxDOT's Financial Management Division. The funds shall be deposited and managed by the State and are not refundable.
- F. The Local Government will begin construction on the Project within 6 months after execution of the Agreement.
- G. The Local Government will complete construction and receive the State's acceptance of the project within 18 months after the date the State authorizes in writing for the Local Government to commence construction of the Project.
- H. If the Local Government chooses not to or fails to complete the work once construction on the Project commences, the State may terminate this Agreement in accordance with paragraph 4.C. below. The State may address unfinished construction work as it

CSJ #	
District #	
Code Chart 64 #	
Project Name	

determines necessary to protect the interests of the State, which includes returning the Project area to its original condition or completing the work using State forces or contractors. The Local Government shall pay all costs incurred by the State under this provision.

4. Termination of this Agreement

This Agreement shall remain in effect until the Project is completed and accepted by the State, unless:

- A. The Agreement is terminated in writing with the mutual consent of the parties;
- B. The State terminates the Agreement in writing due to the Local Government's failure to comply with paragraphs 3.F or 3.G; or
- C. The Agreement is terminated by one party because of a breach, in which case any cost incurred because of the breach shall be paid by the breaching party.

5. Amendments

Amendments to this Agreement due to changes in the character of the work, terms of the Agreement, or responsibilities of the parties relating to the Project may be enacted through a mutually agreed upon, written amendment. Amendments may not include the addition of State or Federal funds. If any funds other than Local Government funds are proposed, this Agreement must be terminated and a new agreement with appropriate terms and clauses executed in its place.

6. Remedies

This Agreement shall not be considered as specifying the exclusive remedy for any Agreement default, but all remedies existing at law and in equity may be availed of by either party to this Agreement and shall be cumulative.

7. Architectural and Engineering Services

The Local Government has responsibility for the performance of architectural and engineering services. The engineering plans shall be developed in accordance with the applicable *State's Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges* and the special specifications and special provisions related to it. The Project design shall, at a minimum conform to applicable State manuals.

The State shall review the plans, specifications, and estimates provided by the Local Government upon completion or at any time deemed necessary by the State. Should the State determine that the complete plans, specifications, and estimates for the Project are not acceptable, the Local Government shall correct the design documents to the State's satisfaction. Should additional specifications or data be required by the State, the Local Government shall redesign the plans and specifications to the State's satisfaction. The costs for additional work on the plans, specifications, and estimates shall be borne by the Local Government.

8. Environmental Assessment and Mitigation

Development of a transportation project must comply with applicable environmental laws. The Local Government is responsible for:

CSJ #	
District #	
Code Chart 64 #	
Project Name	

- A. The identification and assessment of any environmental problems associated with the development of the Project governed by this Agreement.
- B. The cost of any environmental problem's mitigation and remediation.
- C. Providing any public meetings or public hearings required for development of all required environmental documents and obtaining all required permits and approvals.
- D. The preparation of documents required for the environmental clearance of the Project.

Before the advertisement for bids, the Local Government shall provide to the State written documentation from the appropriate regulatory agency or agencies that all environmental clearances and approvals have been obtained.

9. Right of Way and Real Property

The Local Government shall acquire all required right of way and necessary right of entry for performance of the Project in accordance with applicable requirements of the Texas Department of Transportation Right of Way Manual, State law, and Federal law governing the acquisition of real property including but not limited to Title II and Title III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 Title 42 U.S.C.A. Section 4601 et seq. Right of way acquired for improvements to the state highway system shall be acquired in the name of the State. Local Government shall provide right of entry to State personnel and its authorized representatives to areas off the state highway system throughout the duration of the Project for the State to perform inspection and oversight of the Project.

10. Utilities

The Local Government shall be responsible for the adjustment, removal, or relocation of utility facilities for the Project in accordance with applicable State and Federal laws, regulations, rules, policies, and procedures, including any cost to the State of a delay resulting from the Local Government's failure to ensure that utility facilities are adjusted, removed, or relocated before the scheduled beginning of construction. The Local Government will not be reimbursed for the cost of required utility work. The Local Government must obtain advance approval for any variance from established procedures.

11. Compliance with Texas Accessibility Standards and ADA

Local Government shall ensure that the plans for and the construction of the Project are in compliance with standards issued or approved by the Texas Department of Licensing and Regulation (TDLR) as meeting or consistent with minimum accessibility requirements of the Americans with Disabilities Act (P.L. 101-336) (ADA).

12. Construction Responsibilities

- A. The Local Government shall advertise for construction bids, issue bid proposals, receive and tabulate the bids, and award and administer the contract for construction of the Project. Administration of the contract includes the responsibility for construction engineering and for issuance of any change orders, supplemental agreements, amendments, or additional work orders that may become necessary subsequent to the award of the construction contract. Project plans and specifications for improvements on the state highway system must be approved by the State prior to advertising for construction. Upon selection of a contractor and prior to commencing construction

CSJ #	
District #	
Code Chart 64 #	
Project Name	

within the state highway system right of way, the Local Government shall request and obtain written authorization to commence construction of the Project from the State. The Local Government will supervise and inspect all work performed hereunder and provide such engineering inspection and testing services as may be required to ensure that the construction is accomplished in accordance with the approved plans and specifications. All construction change orders impacting the proposed improvements, traffic control, environmental mitigation, or drainage on the state highway system require written pre-approval by the State prior to execution by the Local Government.

- B. Upon completion of the Project, the Local Government will issue and sign a "Notification of Completion" acknowledging the Project's construction completion. A copy will be provided to the State prior to State's final acceptance of the improvements.
- C. Prior to the State's acceptance of the improvements on the state highway system, Local Government shall furnish to the State written certification from a Texas Registered Professional Engineer that the Project was constructed in substantial compliance with the Project's plans, specifications, and quality assurance requirements.

13. Project Maintenance

After Local Government completion of the work and acceptance by the State, the State will be responsible for maintenance of the improvements within the state highway system right of way outside the boundaries of an incorporated city. This obligation may be fulfilled through other agreements signed by the State.

14. Notices

All notices to either party shall be delivered personally or sent by certified or U.S. mail, postage prepaid, addressed to that party at the following address:

Local Government	State
Director of Engineering City of Kerrville 200 Sidney Baker Street Kerrville, TX 78028	Director of Contract Services Texas Department of Transportation 125 E. 11th Street Austin, Texas 78701

All notices shall be deemed given on the date delivered in person or deposited in the mail, unless otherwise provided by this Agreement. Either party may change the above address by sending written notice of the change to the other party. Either party may request in writing that notices shall be delivered personally or by certified U.S. mail, and that request shall be carried out by the other party.

15. Legal Construction

If one or more of the provisions contained in this Agreement shall for any reason be held invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provisions and this Agreement shall be construed as if it did not contain the invalid, illegal, or unenforceable provision.

CSJ #	
District #	
Code Chart 64 #	
Project Name	

16. Responsibilities of the Parties

The State and the Local Government agree that neither party is an agent, servant, or employee of the other party, and each party agrees it is responsible for its individual acts and deeds as well as the acts and deeds of its contractors, employees, representatives, and agents.

17. Ownership of Documents

Upon completion or termination of this Agreement, copies of all documents and data prepared under this Agreement by the Local Government for improvements within the state highway system right of way shall be provided to the State prior to State acceptance of the Project without restriction or limitation on their further use. The originals shall remain the property of the Local Government. At the request of the State, the Local Government shall submit any Project information required by the State in the format directed by the State.

18. Compliance with Laws

The parties shall comply with all federal, state, and local laws, statutes, ordinances, rules and regulations, and the orders and decrees of any courts or administrative bodies or tribunals in any manner affecting the performance of this Agreement. When required, the Local Government shall furnish the State with satisfactory proof of this compliance.

19. Sole Agreement

This Agreement constitutes the sole and only agreement between the parties and supersedes any prior understandings or written or oral agreements respecting the Agreement's subject matter.

20. Inspection of Books and Records

The parties to this Agreement shall maintain all books, documents, papers, accounting records, and other documentation relating to costs incurred and engineering inspection and testing services performed under this Agreement and shall make such materials available to the State and the Local Government or their duly authorized representatives for review and inspection at its office during the Agreement period and for seven (7) years from the date of completion of work defined under this Agreement or until any impending litigation or claims are resolved. Additionally, the State and the Local Government and their duly authorized representatives shall have access to all the governmental records that are directly applicable to this Agreement for the purpose of making audits, examinations, excerpts, and transcriptions.

21. Insurance

Before beginning work on the state highway system, the Local Government and its contractor performing the work shall provide the State with a fully executed copy of the State's Form 1560 Certificate of Insurance verifying the existence of coverage in the amounts and types specified on the Certificate of Insurance for all persons and entities working on state right of way. Self-insurance documentation acceptable to the State may be substituted for all or part of the coverage's required for the Local Government. This coverage shall be maintained until all work on the state right of way is complete. If coverage is not maintained, all work on state right of way shall cease immediately, and the State may recover damages and all costs of completing the work.

CSJ #	
District #	
Code Chart 64 #	
Project Name	

22. Pertinent Non-Discrimination Authorities

During the performance of this Agreement, the Local Government, for itself, its assignees, and successors in interest agree to comply with all applicable Federal and State nondiscrimination statutes and authorities.

23. Signatory Warranty

Each signatory warrants that the signatory has necessary authority to execute this Agreement on behalf of the entity represented.

Each party is signing this agreement on the date stated under that party's signature.

THE STATE OF TEXAS

THE LOCAL GOVERNMENT

Signature

Signature

Kenneth Stewart

Mark McDaniel

Typed or Printed Name

Typed or Printed Name

Director of Contract Services

City Manager

Typed or Printed Title

Typed or Printed Title

Date

Date

CSJ #	
District #	
Code Chart 64 #	
Project Name	

ATTACHMENT B
PROJECT LOCATION MAP

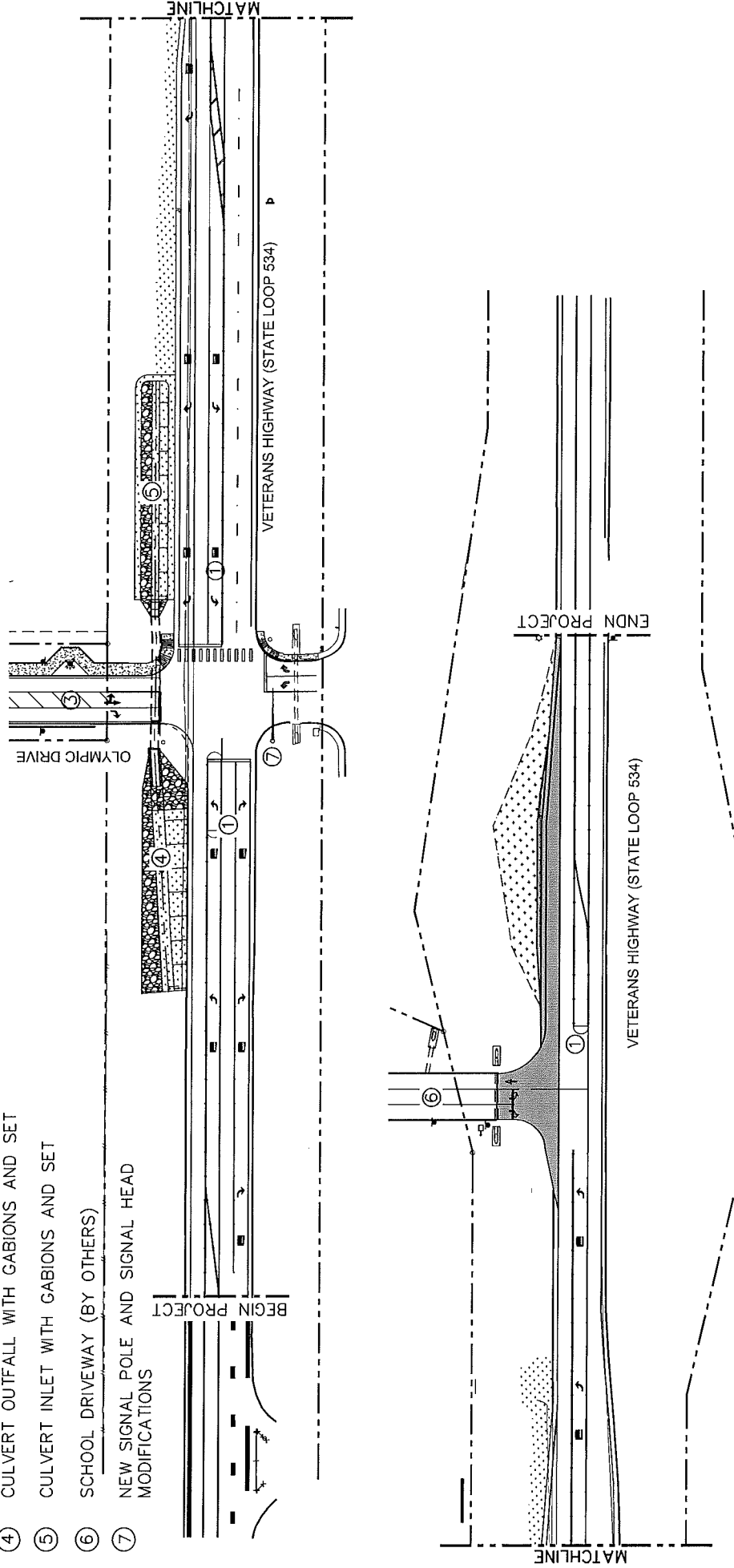
{Insert Map}

KEY NOTES:

- ① RESTRIPIING AND PAVEMENT MARKERS
- ② SIDEWALK RAMP AND CROSSWALK
- ③ OLYMPIC DRIVE EXTENSION
- ④ CULVERT OUTFALL WITH GABIONS AND SET
- ⑤ CULVERT INLET WITH GABIONS AND SET
- ⑥ SCHOOL DRIVEWAY (BY OTHERS)
- ⑦ NEW SIGNAL POLE AND SIGNAL HEAD MODIFICATIONS



SCALE: 1" = 80'



CIVIL
DON DURDEN, INC.
11550 I.R. 10 WEST, SUITE 395
SAN ANTONIO, TEXAS 78230
P) 210.641.3999 F) 210.641.0440
TEAS ENGINEERING: F-2214
SURVEYING: 100410-00
Email: cec@cecetexas.com

CITY OF KERRVILLE
OLYMPIC DRIVE IMPROVEMENTS

JOB NO. E0618801

CSJ #	
District #	
Code Chart 64 #	
Project Name	

ATTACHMENT C
LOCAL ON-SYSTEM IMPROVEMENT PROJECT BUDGET
(Locally Funded and Performed Project)

The Local Government is responsible for 100% of the costs allocated to it as described below, including overruns.

Description	Estimated Costs	Subtotals
PROJECT PHASES: Work performed by the Local Government or its Consultant or Contractor		
Environmental	\$	
Right of Way	\$	
Engineering	\$	
Utility Work	\$	
Construction	\$	
Subtotal for Project Phases		\$
DIRECT STATE COSTS:	Paid By: ☐ Local Government ☐ State	
Environmental	\$	
Right of Way	\$	
Engineering	\$	
Utility Work	\$	
Construction	\$	
Subtotal for Direct State Costs		\$
INDIRECT STATE COSTS:	Paid By: ☐ Local Government ☐ State	
Subtotal for Indirect State Costs		\$
TOTAL ESTIMATED COST OF PROJECT		\$

\$	Fixed price amount of payment by the Local Government to the State for the State's direct and indirect costs as stated in Article 3, C and D of the Agreement.
----	--



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: City of Kerrville Stormwater Master Plan.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 07, 2020

SUBMITTED BY: Stuart Barron

EXHIBITS: [20200114_Plan_Kerrville Storm Water Master Plan January 2020.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	W - Water / Waste-Water / Drainage
Guiding Principle	W7. Develop and maintain a long-range plan for stormwater/drainage management, addressing and prioritizing infrastructure needs and identifying funding sources
Action Item	N/A

SUMMARY STATEMENT:

In 2018 the City engaged with engineering consulting firm LNV to initiate the City's first Stormwater Management Plan. The plan helped identify 13 areas across the community that have problematic drainage issues when storm events occur. The plan evaluated these areas, and identified possible solutions, as well as high-level cost estimates. The Stormwater Master Plan will allow the City to better plan for future mitigation of these problem drainage locations in the future. A copy of the 312 page document will be available at Kerrville City Hall for viewing. In addition, once adopted, the plan will be available for download on the City of Kerrville webpage.

RECOMMENDED ACTION:

Adopt the City of Kerrville Stormwater Master Plan.

STORMWATER MASTER PLAN

City of Kerrville

January 9, 2020

LNV



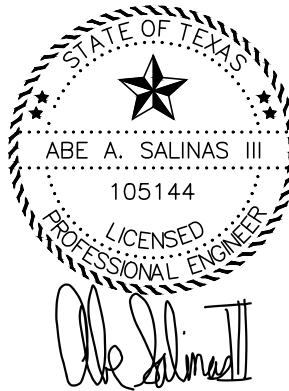
City of Kerrville

Stormwater Master Plan

Submitted to:

City of Kerrville

January 9, 2020



Prepared by:

LNV, Inc.

TBPE Firm No. F-366

8918 Tesoro Drive, Suite 401

San Antonio, Texas 78217

P: 210-822-2232

Project: 170271



Solutions Today with a
Vision for Tomorrow

engineers | architects | surveyors

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EXECUTIVE SUMMARY

This Stormwater Master Plan serves to evaluate the current state of stormwater management practices and the condition of storm drains, streams, and watersheds for the City of Kerrville. This document is intended to provide a roadmap for implementing stormwater planning and infrastructure projects that support a more sustainable community by providing a framework for managing stormwater, streams, and watersheds for the next 15 to 20 years and identifying opportunities to provide sustained funding sources to complete the identified projects.

The contents of this plan provide the following:

An overview of the city's storm drainage network, associated dams, streams and other stormwater facilities to provide information on how to best manage the system in the coming years. Key results from this assessment including identifying the city's:

- 10 major watersheds, the total drainage areas, and estimated peak flows;
- 10 major streams and providing an overview of known flood risks and documented historical floods;
- Major storm drain network of pipes, culverts, and creeks;
- Low water crossings subject to frequent overtopping and hazardous conditions;
- Dam and detention pond inventory with known hazard classifications, and identification of city-owned dams;
- Land use development patterns and anticipated future growth;
- Existing storm drainage system needs and providing recommendations for improvements.

An evaluation of fourteen problem areas experiencing frequent flooding, erosion or other stormwater related issues and providing proposed solutions, probable project costs, and a priority list for project implementation.

- Probable cost to implement the 14 identified Capital Improvement Projects is estimated to be \$21M.
- The top five project priority locations were identified as follows: Take it Easy Drainage Channel Improvements, Lois Street Drainage Improvements, Hill Country Drive Drainage Improvements, Kroc Center Outfall and Clay Street Storm Drain System Improvements, and East Main to Pinto Trail Drainage Channel Improvements.

Recommendations for updating the city's drainage criteria and land development codes to comply with new and evolving stormwater regulations, pollution reduction goals and best management practices. Evaluations and recommendations include:

- Adoption of the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation data, guidelines for development, and remapping of the FEMA regulatory floodplains;
- Updates to the City's Code of Ordinances and Land Development Codes;
- Updates to the City's Drainage Criteria Manual;
- Identification for opportunities to protect and enhance water quality;
- Consideration of future stormwater management programming and planning projects.

Locating funding resources to generate a consistent stream of revenue, identify opportunities for partnerships, and identify grants that will support the implementation of selected planning and capital improvement projects.

Provide the city with an implementation strategy and plan for completing the identified planning and capital improvement projects.

Summary of Project Total Costs and Rankings

Ranking	ID	Project Name	Project Score	Estimated Project Cost
1	I	Take It Easy Drainage Channel	771	\$ 2,291,913
2	J	Lois St. (Woodlawn to Ox Dr.)	718	\$ 189,899
3	F	Hill Country at SH16	677	\$ 2,429,607
4	G & H	Kroc Center Detention Pond Clay St. (Schreiner to SH27)	644	\$ 8,967,501
5	A	East Main to Pinto Trail	588	\$ 979,520
6	K2	Circle Avenue	587	\$ 188,800
7	L	Jack Drive	552	\$ 2,373,793
7	M	Coronado at Junction Highway	552	\$ 494,195
9	E	Spring St. - Erosion at Outfall	528	\$ 744,073
10	K1	Harper Street	524	\$ 1,808,431
11	B	Park St. Low Water Crossing	413	\$ 200,000
11	C	First St. Low Water Crossing	413	\$ 200,000
13	D	Fourth St. Low Water Crossing	368	\$ 200,000
Total Project Costs				\$ 21,067,733

Stormwater Project Planning List

Project Name	Type	Description	Priority Level	Estimated Cost Range
Dam Inspection and Maintenance Program	Program	Develop a standard dam inspection and maintenance program to be completed by staff.	High	\$15,000 / year
Kerrville Flood Protection Plan Study (Hydrologic and Hydraulic Studies - FEMA Streams)	Study	Restudy all significant streams within the city and reassess community flood risk using NOAA Atlas 14 precipitation data, updated hydrologic modeling, updated terrain information, and detailed hydraulic modeling. Identify potential future projects to be completed to mitigate flooding and general management of the basin.	High	\$400,000-\$800,000
Louise Hays Dam Repairs	Design & Construction	Repair of concrete buttress dam structure due to seepage and spalling of concrete.	High	\$1,000,000
Stormwater Drainage Design Manual Update	Manual	Update the city's drainage design and criteria manual to reflect current industry best practices and projected city growth.	High	\$50,000

Project Name	Type	Description	Priority Level	Estimated Cost Range
Storm Drain System Inventory and Assessment	Data Collection	Update the city's current storm drain system inventory in GIS and assess the condition of existing infrastructure including storm drains, culverts, detention ponds, and other drainage facilities to identify storm drains needing replacement.	Medium	\$10,000 / year
Regional Detention Pond Study and Fee-in-Lieu of Program	Study	Perform a study of the city's watersheds and anticipated growth for each basin to identify detention needs, where regional detention may be provided and where mandatory detention should be required to mitigate adverse impacts.	Medium	\$60,000
Design Review Checklist	Manual	Develop a detailed stormwater design review checklist to verify proposed developments meet city criteria and ordinance requirements.	Medium	\$5,000 - \$10,000
Stormwater Utility Fee Study	Study	Study the potential for implementing a city-wide stormwater utility fee program to generate revenue responsible for maintaining the city's existing storm drainage system and to assist with the funding of capital projects. The fee is roughly estimated to generate \$500,000 to \$1,000,000 per year.	Medium	\$70,000
Flood Warning System	Design & Construction	Install automatic gate flood warning systems at Quinlan Creek, Town Creek, and other known low water crossings.	Medium	\$200,000 per location
Water Quality Protection Plan	Study	Study to implement water quality protection measures within the watersheds and protect natural riparian areas.	Medium	\$80,000
Flood Complaint Database	Data Collection	Maintain a city complaint database to document flooding incidents, identified issues, and photographs to assist with identifying priority projects and hot spot areas.	Low	\$5,000 / year

INTRODUCTION

PURPOSE OF STUDY

On February 13, 2019, the City of Kerrville authorized LNV, Inc. to perform a master planning study for the city's storm drainage system including:

1. Review of available drainage studies, construction plans, topography, GIS inventory and other available data pertinent to the project.
2. Evaluation of fourteen identified problem drainage areas, as identified by City staff and approved by City Council.
3. Development of proposed solutions for each problem area (including estimations of probable project costs) and ranking of the projects into a priority list for consideration and addition into the city's Capital Improvement Plan project list.
4. Review current drainage policy and criteria to identify where improvements may be needed and recommend changes as appropriate.
5. Present a recommendations list of capital projects, planning studies and policy updates to be completed by the City.
6. Provide an implementation and funding strategy for completion of the identified projects.

This Stormwater Master Plan document will serve to update the previously adopted *Storm Drainage System Study* completed in 1983 by Hogan & Rasor, Inc.

The planning area is generally limited to within the city limits, as represented in **Figure 1**.

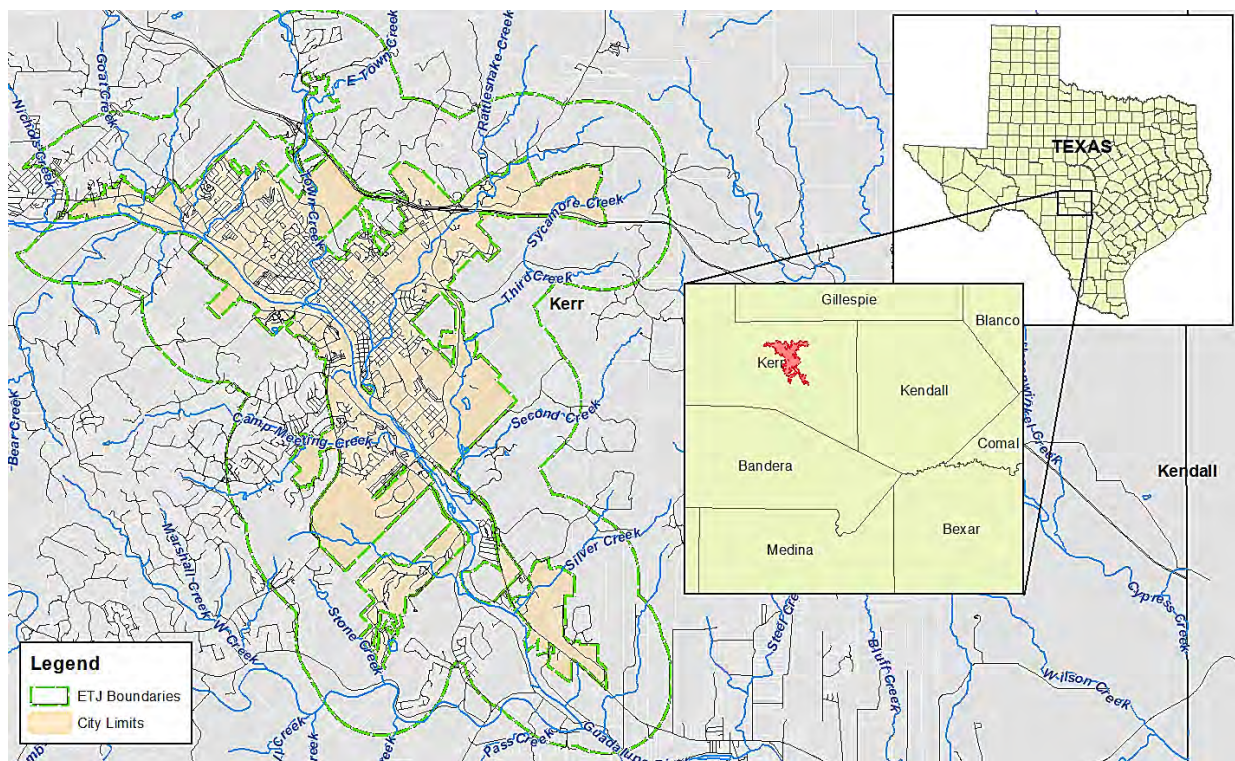


Figure 1 - Study Location Map

PROJECT APPROACH

For the city-wide stormwater master plan update, this study intends to evaluate the multiple components of the city's drainage system to identify areas of needed improvement through infrastructure planning, design, construction, and maintenance.

The study approach begins by providing an overview and considerations to the city's watersheds, drainage system infrastructure, and known creek flooding issues. The report then investigates the city's fourteen identified problem areas to develop conceptual solutions and probable costs associated with reducing flood damage risks, improving public safety, enhancing economic commerce and protecting the environment. Finally, this plan evaluates the city's current drainage policy and criteria to identify areas for potential updates.

This plan will then provide a roadmap for implementation which includes adopting best practices for managing future development, prioritizing and implementing identified city projects, providing a list of potential funding sources and identifying other additional stormwater planning considerations.

Lastly, this plan is intended to serve as a living document which should include minor yearly updates to the drainage capital improvement project list and major master plan updates every 5 to 10 years.

STUDY PRIMARY OBJECTIVES:

- Provide a plan and strategy for implementing the identified priority projects as related to capital improvements, existing storm drainage systems, city-owned dams, floodplain management, and land development.
- Promote cost-efficient solutions that enhance the effectiveness of allocated funds to ensure quality services are provided to the community.
- Promote the continued maintenance and rehabilitation of city-owned drainage infrastructure.
- Protect water quality for both surface and groundwater sources.
- Preservation of riparian habitat and natural streams, creeks and river areas.

2050 COMPREHENSIVE PLAN GUIDING PRINCIPLES

The following guiding principles provided by the *2050 Comprehensive Plan* have been utilized in the development of this study.

- **W1: Develop and maintain long-range water plans that prioritize infrastructure needs and identify funding sources and take a regional approach to planning.**
- **W3: Address water quality challenges with proven solutions**
 - **W3.1:** Examine all potential solutions to improving water quality that could be applicable to Kerrville.
 - **W3.4:** Examine the possibility of adopting maximum impervious cover limits and enhanced drainage design standards around/adjacent to the river to ensure water quality.
 - **W3.6:** Collaborate with UGRA and others in their efforts to reduce surface water pollutants and debris in the river.
- **W4: Preserve natural riparian areas**
 - **W4.1:** Map current riparian areas and determine potential future impacts associated with the potential loss of these areas and establish minimum and optimum sizes for riparian zones.
 - **W4.2:** Pursue zoning ordinance amendments to support riparian area protection.
 - **W4.4:** Encourage the establishment of a riparian protection zone in the floodplain permitting process to address water quality considerations.
 - **W4.5:** Consider adding water quality review to the floodplain permitting process.
 - **W4.6:** Develop standard maintenance protocols for riparian areas, including the option of leaving the areas in a natural condition
 - **W4.7:** Restore damaged riparian areas in riverside parks.
- **W7: Develop and maintain a long-range plan for stormwater/drainage management, addressing and prioritizing infrastructure needs and identify funding sources.**
 - **W7.1:** Take a holistic approach to stormwater and drainage management based on the level of growth anticipated in the Kerrville 2050 Comprehensive Plan.
 - **W7.2:** Update the City's floodplain ordinance to be consistent with Kerrville 2050 Comprehensive Plan.
 - **W7.3:** Explore a variety of options, including bond funding or city-wide drainage fees, to address drainage infrastructure concerns.
 - **W7.4:** As a part of the drainage plan, focus on regional versus single-site detention.
 - **W7.5:** Consider allowing a fee-in-lieu of improvements for development of regional detention versus onsite detention.

- **W8: Focus more on on-site green/bio stormwater infrastructure to support water quality and quantity goals.**
 - o **W8.1:** Establish reasonable guidelines or standards to encourage more green infrastructure.
 - o **W8.2:** Develop drainage design standards (including “green” design options), on-site retention requirements, and water quality standards.

- **W9: Enhance efforts aimed at water conservation, better stormwater management on private property and measures such as rainwater harvesting and other innovative approaches to help manage water usage.**
 - o **W9.1:** Provide financial or other incentives for rainwater harvesting.
 - o **W9.3:** Maximize the use of surface water in the city and surrounding areas to help maintain groundwater levels.
 - o **W9.4:** Label storm drains citywide to reduce/eliminate dumping of grass clippings and other waste.
 - o **W9.5:** Implement a strong water conservation plan to include additional conservation measures and programs.

EXISTING DRAINAGE SYSTEM

OVERVIEW

The City of Kerrville lies within Kerr County and in the Edwards Plateau geologic formation. The city is located within the Upper Guadalupe River watershed and is directly affected by flood waters from the Guadalupe River and the sub-watersheds associated with Town Creek, Quinlan Creek, Camp Meeting Creek, Elm Creek, Third Creek, Second Creek, Bear Creek, Goat Creek, and an unnamed Tributary (Lime Creek).

The geography of the region for the city is characteristic of the Texas Hill Country which includes rugged and stony hills, steep terrain, followed by relatively flat areas. Stormwater runoff is collected in the various creeks and ultimately discharged into the Guadalupe River. Existing topographic elevation values within the city limits, range anywhere between 1,527 to 2,035 feet above the Mean Sea Level (MSL). In addition, a number of small and large springs feed into surrounding creeks and function as a recognized quality of life contributor and attraction to visitors of the area.

The City of Kerrville is within the Edwards Aquifer Contributing Zone and is contained by the Edwards-Trinity Aquifer which serves as a primary source of drinking water for the region. Therefore, the city is responsible for restricting development or discharges that could adversely affect the quality of water that contributes to groundwater recharge.

The city's drainage system includes closed-system storm drains, open channels, detention ponds, flood control dam structures, and existing natural creeks and tributaries that drain to the Guadalupe River. Many of the streams, creeks, and river areas in and around the city are privately owned and without maintenance requirements. This limits the city's ability to manage development adjacent to these areas and makes it difficult to manage stormwater volume and quantity.

The city's continued growth will place new strains on the existing stormwater drainage system. To deal with this growth, this stormwater plan provides guidance for updating development criteria and ordinances for enforcement. Additional information may be found in the **Evaluation of Drainage Policy and Criteria** section of this report.

The following subsections provide a detailed summary of the city's major watersheds, streams, storm drain networks, dam and detention pond inventory, land use development patterns and recommended considerations for maintaining and improving the city's current system.

MAJOR WATERSHEDS

The City of Kerrville is located within the Upper Guadalupe River Basin and has a total contributing drainage area of approximately 510 square miles at the Guadalupe River. Within the city limits, there are nine major sub-watersheds with a total contributing drainage area of 90.1 square miles. These watersheds are known to contribute to groundwater recharge and to spring flows along the various tributaries of the Guadalupe. Among those springs are Colbath Springs of Bear Creek, Goat Springs of Goat Creek, Rapid Springs of Town Creek, Cypress Springs, and Indian Springs. Each of these springs are part of the Glen Rose Limestone of the Edwards Aquifer.

The city's contributing watersheds are further identified and illustrated in **Figure 2**. According to FEMA's Flood Insurance Study (FIS) report, the hydrologic analysis utilized to derive peak flow runoff rates for Town Creek, Quinlan Creek, Elm Creek, and Camp Meeting Creek was last studied by detailed methodologies in 1997. In addition, Goat Creek, Third Creek, Second Creek, Bear Creek, and Unnamed Tributary (Lime Creek) have not had any detailed analysis performed and are presently utilizing FEMA approximate methodologies to determine peak flow.

The city's watersheds are within the Upper Guadalupe River Authority (UGRA) which is responsible for managing the watersheds and water resources of the Upper Guadalupe River through the protection and management of water quantity, quality and sustainability in the Guadalupe River watershed within Kerr County.

Identified Major Watersheds within the study area include:

Table 1 - Major Watersheds Summary for Kerrville, TX

Watershed Name	Study Date	FEMA Method of Analysis	Drainage Area (sq. mi.)	100-Year Peak Flow (cfs)	500-Year Peak Flow (cfs)
Goat Creek Basin	1997	FEMA Approx. Methodologies	19.03	N/A	N/A
Town Creek Basin	1997	HEC-1	23.32	18,210	23,730
Quinlan Creek Basin	1997	HEC-1	12.45	11,070	14,470
Third Creek Basin	1997	FEMA Approx. Methodologies	7.90	N/A	N/A
Second Creek Basin	1997	FEMA Approx. Methodologies	5.37	N/A	N/A
Unnamed Tributary (Lime Creek)	1997	Unknown	2.90	N/A	N/A
Elm Creek Basin	1997	HEC-1	1.27	1,996	2,560
Bear Creek Basin	1997	FEMA Approx. Methodologies	7.61	N/A	N/A
Camp Meeting Creek Basin	1997	HEC-1	10.24	10,120	12,900
Guadalupe River Basin at UGRA Dam	1997	USGS Flood Flow Frequency Analysis	510	215,000	360,000

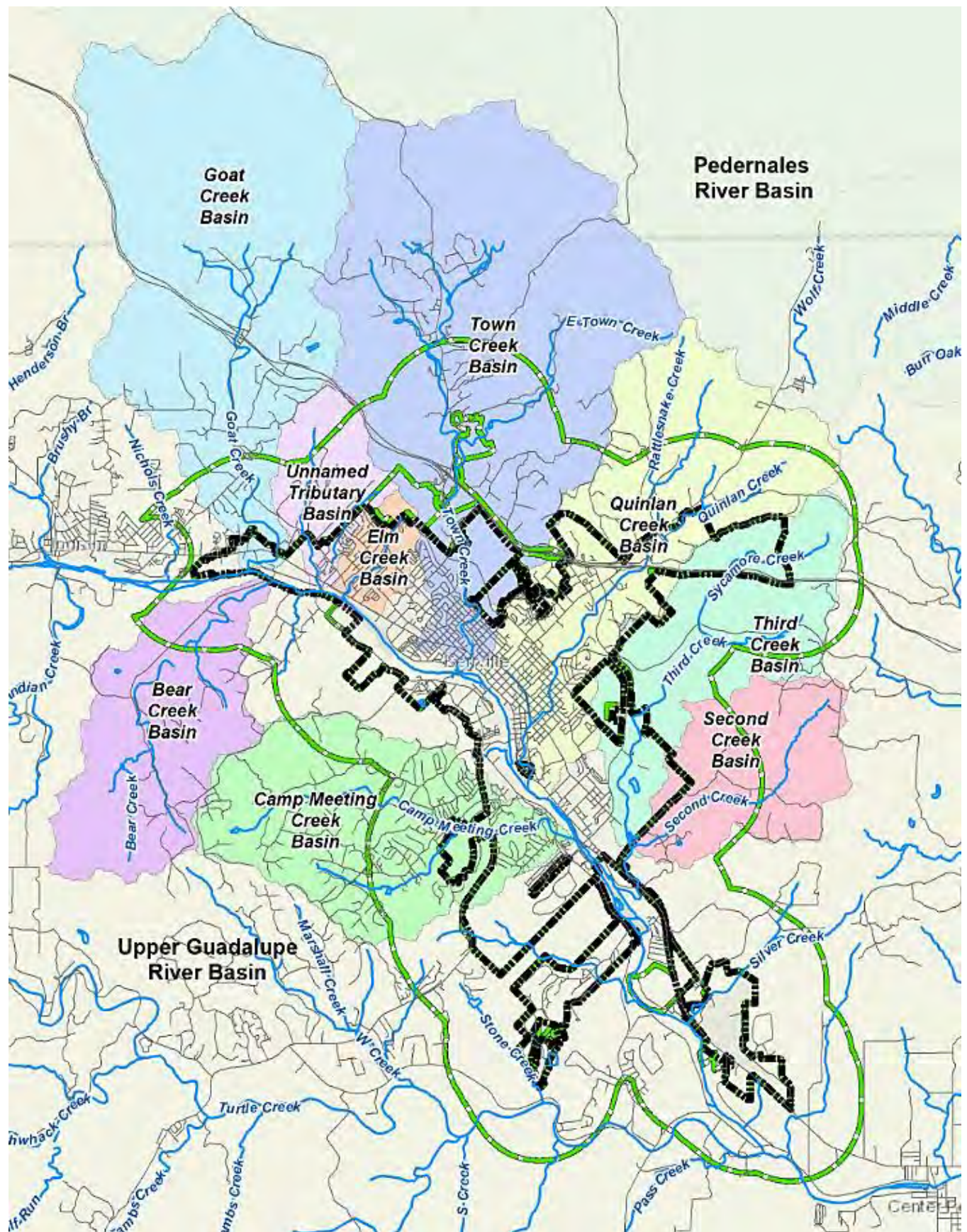


Figure 2 - Major Watersheds of Kerrville

GOAT CREEK

Goat Creek Basin has a total drainage area of 19.03 square miles with only a small portion of the watershed, 0.23 square miles, within the city limits. The watershed consists of medium intensity development at the downstream end with impervious surfaces accounting for 50% to 79% of the total cover. North of the city limits within Kerr County, which represents the majority of the basin area, consists of low-intensity development, developed open space and shrubland with an estimated impervious cover of less than 20%.

TOWN CREEK

Town Creek Basin has a total drainage area of 23.32 square miles with 1.85 square miles within the city limits, which generally consists of the area south of IH-10. The watershed consists of medium intensity and undeveloped shrubland north of IH-10. Town Creek and East Town Creek merge together at a fork just north of IH-10 and runs south/southeast through the city of Kerrville and into the Guadalupe River. South of IH-10, the watershed consists of medium to high-intensity development which include established, high populated residential areas with an estimated impervious cover of 60% to 85%. Town Creek, within the city limits, is known to be susceptible to flooding and is therefore sensitive to increases in impervious cover. A series of regulating weirs / small dams and low water crossings are located along Town Creek and East Town Creek.

QUINLAN CREEK

Quinlan Creek Basin has an overall drainage area of 12.45 square miles with 4.85 square miles within the city limits. It is one of the largest contributing creeks in the City of Kerrville and consists of several low water crossings susceptible to frequent overtopping. Its upstream watershed resides mostly north of IH-10 and consists of low-intensity development with an estimated impervious cover of less than 20%. The downstream watershed, south of IH-10, is medium intensity development with an estimated impervious area of 40% to 60%.

THIRD CREEK

Third Creek Basin contributes 7.9 square miles of catchment at the confluence with Second Creek with 2.2 square miles of basin area within the city limits which outflows into the Guadalupe River, downstream of Kerrville. Third Creek can generally be described as a low impact watershed with the majority of the basin being open space shrubland with an impervious area estimated to be less than 20%. The impervious area for the lower portion of the basin is estimated to be up to 30% to 40%, some areas consisting mostly of residential and recreational areas.

SECOND CREEK

Second Creek Basin contributes 5.37 square miles of catchment at the confluence with Third Creek, with 4% of the drainage area within the city limits. Second Creek, located further southeast of Kerrville than Third Creek, can be described as having very similar upstream and downstream characteristics as Third Creek. Upstream impervious cover is estimated to be less than 20% with a downstream impervious cover estimated to be up to 35% to 40%. Both Second Creek and Third Creek converge and discharge into the Guadalupe River.

UNNAMED TRIBUTARY (LIME CREEK)

Unnamed Tributary Basin, also known as Lime Creek, has a total drainage area of 2.9 square miles with 0.44 square miles within the city limits. Located in the northwestern reach of Kerrville, the Unnamed Tributary is one of the smaller watersheds that extends south of IH-10 between Goat Creek Basin and Town Creek Basin. Consisting mostly of sparse development and open spaced shrubland, Unnamed Tributary watershed can be described as a low-intensity development area and is estimated to have less than 20% impervious cover.

ELM CREEK

Elm Creek Basin has a total drainage area of 1.27 square miles with 1.0 square mile being within the city limits. Land use in this basin consists mostly of moderate density residential development with more heavily developed commercial land use to the south along SH27. Future land use scenarios identified in the 2050 Comprehensive Plan indicate continued residential growth in the far north end of the basin, which will add to the amount of impervious cover and runoff for this drainage basin.

BEAR CREEK

Bear Creek Basin has an overall drainage area of 7.61 square miles and is located outside of the city limits. 1.08 square miles of the Bear Creek Basin is within the existing Kerrville Extra Territorial Jurisdiction (ETJ) Limits. The basin consists of large tracts of land primarily used for agricultural use or rural residential homes. Based on the 2050 Comprehensive Plan, future land uses are projected to be similar to existing land use conditions.

CAMP MEETING CREEK

Camp Meeting Creek Basin has an overall drainage area of 10.23 square miles, with 1.42 square miles within the Kerrville city limits. The basin within the city limits contain the River Hills Country Club & Subdivision. The western area of the basin is comprised mostly of large lot single family homes and agricultural land uses. Towards the eastern parts of the basin, a denser residential pattern begins to take shape with developed opens spaces (Riverhills Golf Course). Impervious cover for this basin is relatively low, estimated at 20%, and is concentrated on the eastern edge of the basin. Future development along SH16 south of Riverhills Country Club & Subdivision is anticipated.

MAJOR STREAMS

The City of Kerrville contains 10 major creeks and tributaries as identified in **Table 2** and as identified by the FEMA Flood Insurance Study (FIS) report dated March 3, 2011 (**Figure 3 thru Figure 7**). The principal flood problems include overflows, flooding and overtopping of low water crossings along Quinlan Creek, Town Creek and the Guadalupe River.

Detailed hydraulic modeling and mapping of the major streams within the city were last performed in 1997 using the U.S. Army Corps of Engineers (USACE) HEC-2 modeling software for Town Creek, Quinlan Creek, Camp Meeting Creek, Elm Creek, and the Guadalupe River. No detailed modeling or mapping has been conducted for Goat Creek, Third Creek, Second Creek, Unnamed Tributary Creek, and Bear Creek. Minor revisions to the floodplain mapping were performed and issued in 2011.

Additionally, new precipitation data has been released by NOAA, as discussed in further detail in section **NOAA Atlas 14 Considerations**, which is anticipated to increase the limits of the floodplain inundation boundary for all FEMA mapped streams. To address these changes in the associated flood damages risk, it is recommended that remapping efforts be considered and planned for in coordination with FEMA, the TWDB, Kerr County and community stakeholders.

Table 2 - FEMA Studied Streams Summary for Kerrville, TX¹

Stream Name	Study Date	FEMA Map Effective Date	Method of Analysis	Stream Length (mi.)	Parcels Count 100-Year Floodplain	Structures Count 100-Year Floodplain
Goat Creek	1997	2011	FEMA Approx. Methodologies	6.1	29	6
Town Creek	1997	2011	HEC-2	8.7	184	44
Quinlan Creek	1997	2011	HEC-2	7.6	282	127
Third Creek	1997	2011	FEMA Approx. Methodologies	6.2	39	15
Second Creek	1997	2011	FEMA Approx. Methodologies	4.2	4	0
Unnamed Tributary (Lime Creek)	1997	2011	FEMA Approx. Methodologies	2.7	85	72
Elm Creek	1997	2011	HEC-2	1.7	164	119
Bear Creek	1997	2011	FEMA Approx. Methodologies	6.0	0	0
Camp Meeting Creek	1997	2011	HEC-2	4.0	80	10
Guadalupe River Basin at UGRA Dam	1997	2011	HEC-2	-	299	197

¹ Parcel and structure count only includes properties within the city limits. Calculation is estimated by using the effective FEMA Floodplain, Kerr County Appraisal District Parcel Data, and City of Kerrville GIS building footprints.

FEMA PREVIOUS STUDIES TIMELINE AND SUMMARY

- 1977:** The original Federal Insurance Administration (FIA) study was completed in July/August 1977, which covered all significant flooding sources for the City of Kerrville and the unincorporated areas of Kerr County respectively. Hydrologic and hydraulic analysis was performed by Turner Collie & Braden under Contract No. H-3937.
- 1997:** A restudy of the original 1977 FIA study was completed in September 1997. Hydrologic and hydraulic analysis was performed by the United States Army Corps of Engineers (USACE), Fort Worth District, for the Federal Management Agency (FEMA) under Interagency Agreement No. EMW-93-E-4115, Project Order No. 1.
- o Letter of Map Revision (LOMR) was incorporated in the restudy.
- 2008:** A second countywide revision was completed in August 2008. Work, completed by MAPVI, compiled existing data to convert the previous Kerr County Federal Insurance Study (FIS) into digital format. Contract No. EMT-2002-CO-0052.
- 2011:** The countywide Flood Insurance Study was revised March 3, 2011, to reflect updates to the vertical datum to North American Vertical Datum of 1988 (NAVD88).
- 2011:** A Letter of Map Revision (LOMR) was issued on May 12, 2011 to remap an unnamed tributary of Town Creek, approximately 1,600 feet downstream of FM 783 (Harper Road) to approximately 830 ft upstream of FM 783 (Harper Road).

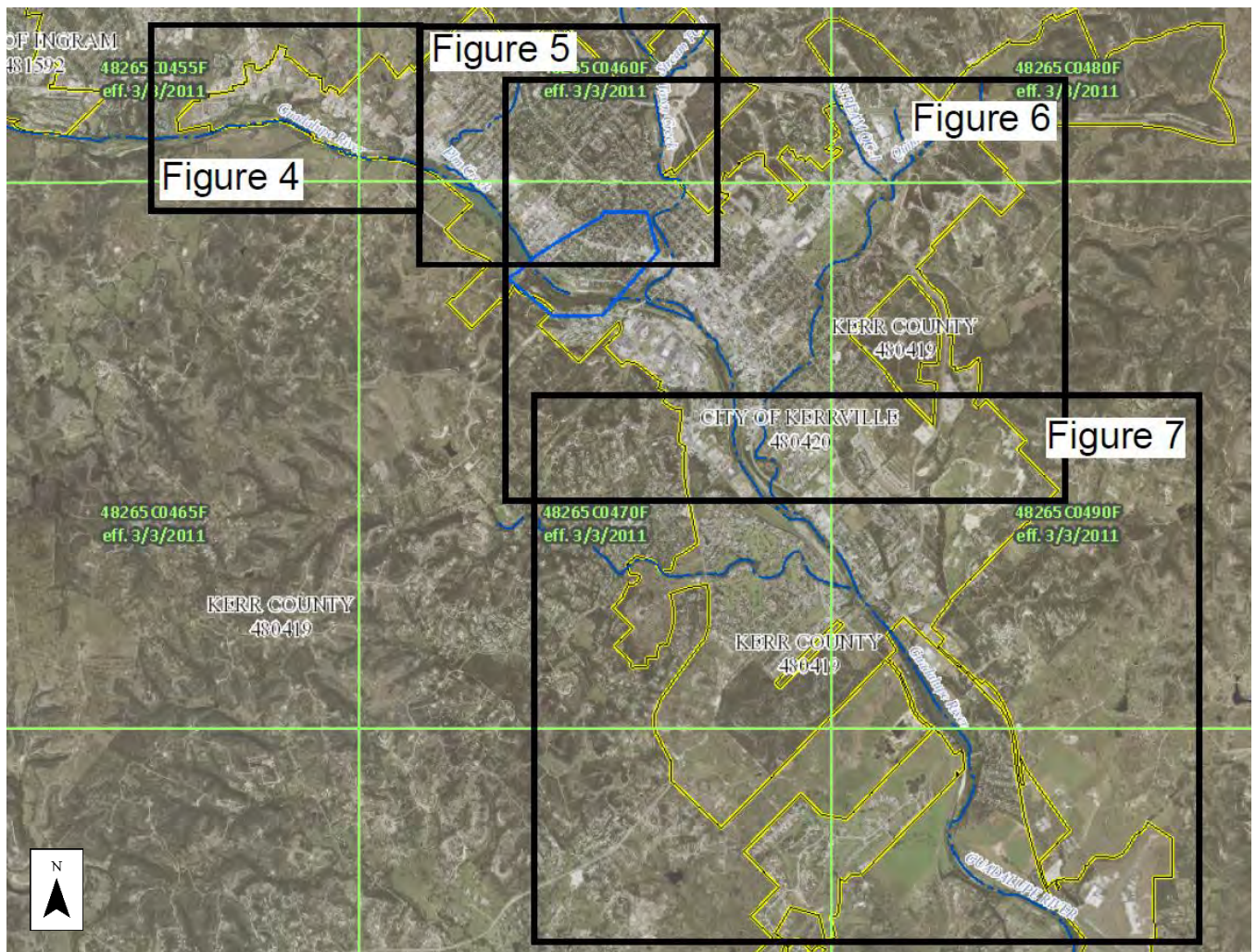


Figure 3 - FEMA National Flood Hazard Key Map

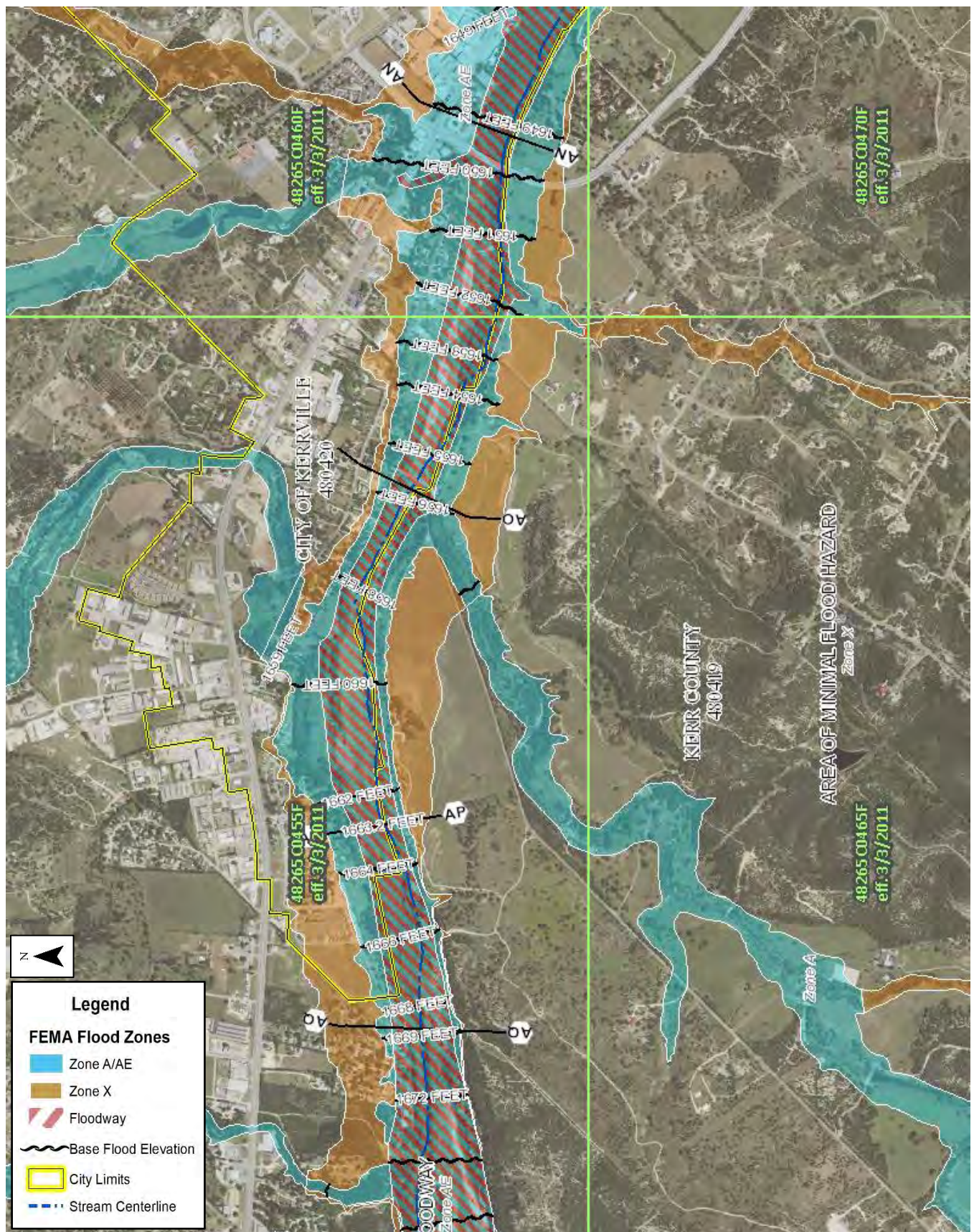
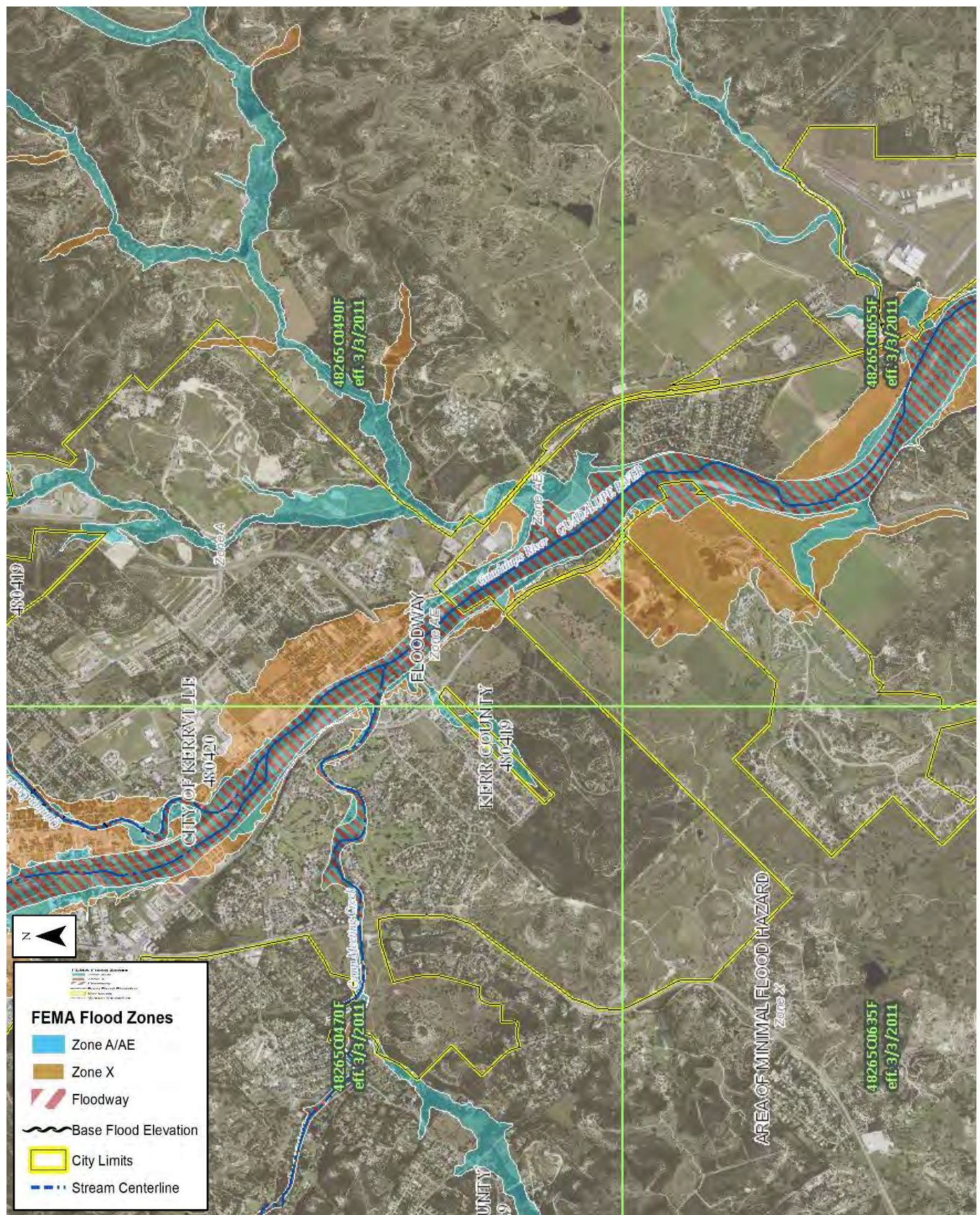


Figure 4 - FEMA National Flood Hazard Layer







HISTORICAL FLOODS

Table 3 shows the top 21 recorded historical flood events that occurred along the Guadalupe River near Kerrville, TX as measured by USGS Gage 08166200 for a period of record from 1932 to 2016. Major flood events are shown to typically occur during the warmer summer months from May thru September. Many of the storms that develop during this time of year start with moist air that will move in from the Gulf of Mexico. These centers of low pressure ascend the Balcones escarpment as they move north, where cool drier air mixes with the rich atmospheric moisture and can lead to potentially heavy rainfall. Slow moving storms are of concern due to the potential for heavy sustained flooding on local and regional levels over a period of several days. This was the situation on August 1st thru the 4th in 1978 when the remnants of tropical storm Amelia moved into the South-Central Texas region and brought widespread property damage and loss of life.

The historical flood of record for the upper Guadalupe River Basin, west of Kerrville, occurred from a rainfall event that lasted from June 30 to July 2, 1932 which amounted to over 35 inches of rain in about 36 hours, as observed at the State Fish Hatchery above Ingram (Major Texas Floods of 1932) which resulted in peak discharges estimated at 196,000 cfs. The rainfall event documented record-breaking stages for all streams above Kerrville and on the Guadalupe River to a point below Spring Branch. Along the streams, many homes, resorts, camps, and other facilities were destroyed (**Figures 9 thru 10**).

The largest flood of record for Quinlan Creek occurred on July 5, 2002, where an accumulated rainfall of approximately 25.0 inches to 30.0 inches was observed between July 1st through the 22nd at the headwaters of Quinlan Creek resulting in a peak discharge estimated at 36,000 cfs. Flooding resulted in heavy damage of property, instability of critical facilities and required a federal assessment and funding assistance (**Figures 11 thru 12**). Over 23 homes were reportedly purchased and demolished, citywide infrastructure was damaged or compromised, and emergency contracts were permitted; fiscal recovery of this storm took over five years.

These historical flood events serve as a stark reminder of the stream power of the Guadalupe River and its associated tributaries and highlights the importance of managing flood risk, development within the floodplain and the need for effective early flood warning systems that serve to protect life and public safety.

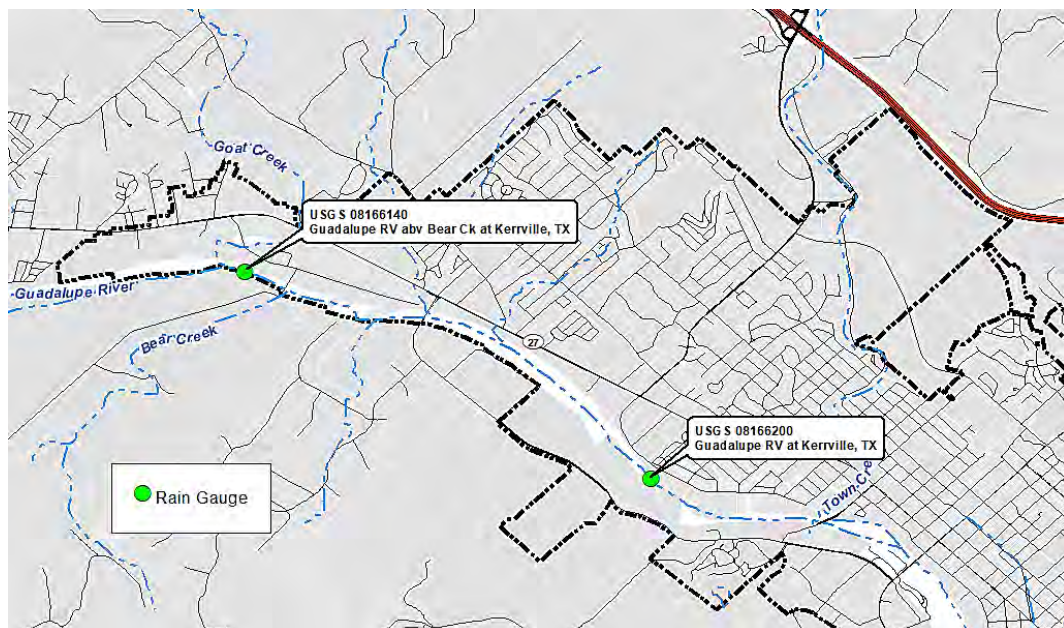


Figure 8 – City of Kerrville Rain Gauge Locations

Table 3 - Peak Recorded Flood Events on Guadalupe River at Kerrville, TX (Guadalupe Park) (Source: USGS NWIS)

Rank	Water Year	Month	Date	Peak Flow (cfs)	Gage Height ¹ (ft.)
1*	1978	August	08/01/1978	240,000	40.90
2	1932	July	07/02/1932	196,000	39.00
3	1987	July	07/17/1987	141,000	37.72
4	2004	June	06/09/2004	72,700	20.53
5	2000	October	10/23/2000	55,700	17.94
6	1996	October	10/28/1996	54,400	17.73
7	1988	July	07/11/1988	45,900	28.81
8	1986	September	09/26/1986	45,800	28.80
9	2007	May	05/25/2007	39,400	15.21
10	2002	July	07/05/2002	35,900	14.56
11	2010	April	04/16/2010	30,700	13.51
12	1998	August	08/23/1998	15,700	9.81
13	1994	May	05/13/1994	14,100	9.35
14	2016	May	05/29/2016	11,100	8.38
15	1990	August	08/03/1990	10,700	8.22
16	1991	December	12/21/1991	8,710	7.49
17	2012	May	05/11/2012	4,670	5.69
18	1999	June	06/20/1999	3,320	4.87
19	1995	June	06/29/1995	3,240	4.88
20	2015	May	05/24/2015	2,810	4.61
21	1996	September	09/15/1996	2,400	4.33
*Note 1978 flood not recorded at USGS 08166200 gauge at Kerrville. Peak flows at Spring Branch of 158,000 cfs and 240,000 cfs at Comfort, TX.					

Flood Stage Impacts

35 ft.	Major flooding inundates many lowest homes and businesses in Kerrville. Lowest homes and mobile homes flood above Center Point to near Comfort. Secondary and primary roads and bridges in the flood plain are extremely dangerous. Near the USGS 1:100 year flood level.
32 ft.	Disastrous flooding of lowest homes and businesses in Kerrville. Numerous homes and mobile homes flood downstream above Center Point to near Comfort. Above the USGS 1:50 year flood level.
28 ft.	Flow is near the level of the July 17, 1987 "Bus Tragedy" flood. Major flooding inundates lowest homes and businesses in Kerrville. Numerous homes and mobile home parks flood above Center Point to near Comfort. Near the USGS 1:50 year flood level.
26 ft.	Flow reaches the parking lot of a park just below the UGRA Dam on the left bank. Several lowest homes and buildings in Kerrville begin flooding. Flow exceeds the USGS 1:25 year flood level.
24 ft.	Flow is near the USGS 1:25 year flood level. Flooding is life-threatening from the headwaters to below Comfort. Lowest homes above Center Point to below Comfort flood.
20 ft.	Major flooding threatens structures near the river in Kerrville and evacuations are probable below Kerrville.
17 ft.	Flow reaches the first floor of a resort and restaurant upstream left bank. Near the USGS 1:10 year flood.
13 ft.	Flow is over the left bank. Secondary and primary roads and bridges are flooded. The swimming pool and tennis court in a resort and restaurant upstream left bank flood. Flow is near the USGS 1:5 year flood level.
9 ft.	Flow is over the right bank with no significant damage.
7 ft.	Flow is over the right bank.

¹ See "Flood Stage Impacts" for a definition of flood stage risk relationship with historical gage height data.



Figure 9 – Guadalupe River, July 1, 1932 (Source: Kerr County Historical Commission)
Figure 10 - Guadalupe River, July 1, 1932 (Source: Kerr County Historical Commission)



Figure 11 – Property and Home Damage in Kerrville, TX after flood July 2002. Largest Flood of Record for Quinlan Creek. (Source: City of Kerrville)

Figure 12 – Nancy Beth Drive, Kerrville TX after flood July 2002. Largest Flood of Record for Quinlan Creek. (Source: City of Kerrville)

MAJOR STORM DRAIN NETWORK INVENTORY

The City of Kerrville's public storm drain network consists of approximately 7,790 LF of open channels, 26,400 LF of pipes and 430 inlets maintained by the city. In addition, TxDOT owns and maintains another 3,835 LF of open channels and 16,600 LF of storm drain pipes that are within the city limits.

City staff dedicates approximately 3,000 hours yearly to drainage and rehabilitation work with responsibilities including cleaning, grading, and erosion control for the city's storm drainage system. In addition, the city recently adopted a Drainage Maintenance and Rehabilitation Program to maintain and enhance the city's existing infrastructure.

Figure 13 illustrates the existing major storm drain network within the city as provided by the City of Kerrville's GIS Department and subsequently updated by LNV with any observed missing components to the storm drainage network inventory. The inventoried drainage structures include roadside ditches, detention ponds, storm drains, inlets, culverts, and bridges. Storm drain material consists mostly of reinforced concrete pipe, followed by a number of corrugated metal pipes. Major storm drains generally discharge into Town Creek, Quinlan Creek, Camp Meeting Creek and/or the Guadalupe River.

A storm drainage system capacity study was not performed as part of this plan and is recommended to be completed as a subsequent evaluation.

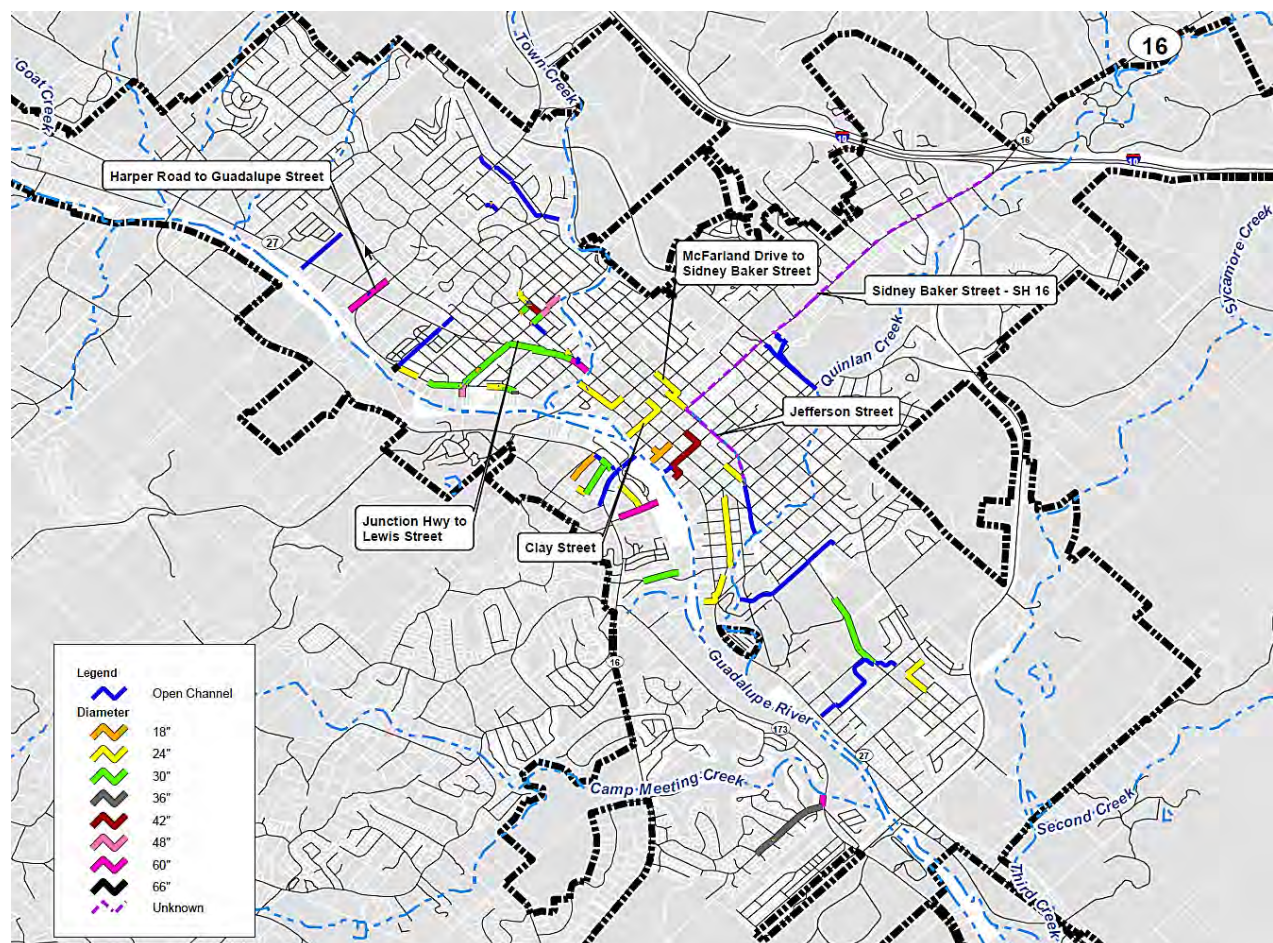


Figure 13 - Kerrville Major Storm Drain Network

LOW WATER CROSSINGS

The City of Kerrville has an estimated nineteen low water crossings within the city limits (**Figure 14**). These numerous crossings were intended as a low-cost solution to provide roadway connectivity across streams such as Quinlan Creek and Town Creek. Overtopping is a consistent occurrence caused by frequent storm events, additionally, large storm events generate excessive overtopping restricting low water crossing usage up to thirty minutes. Crossings are often a public safety hazard during large storm events where flood depths can create dangerous conditions capable of sweeping away vehicles and impairing the ability for emergency responders to access areas of the city.

The low water crossings were identified using the TNRIS Low Water Crossing inventory with additional points added by LNV for hazardous crossings not included in the database. The duration of roadway overtopping is brief, typically lasting less than a half hour.

Several of the problem areas identified by the city for consideration as part of this plan are located along Quinlan Creek including First Street, Fourth Street, and Park Street. Preliminary hydraulic models were developed utilizing FEMA effective hydrologic flows to assess the overtopping of the roadways and the potential for roadway improvements to elevate the roadway above the 25-year or 50-year storm event. During this iterative process, it was determined that each crossing would require a substantial bridge-class structure and significant upstream and downstream channel improvements to mitigate the rise in the floodway elevation. Therefore, it was determined that elevating the roadway was not practical without evaluating the stream and watershed holistically and providing a comprehensive channel and roadway improvement project for the length of the stream.

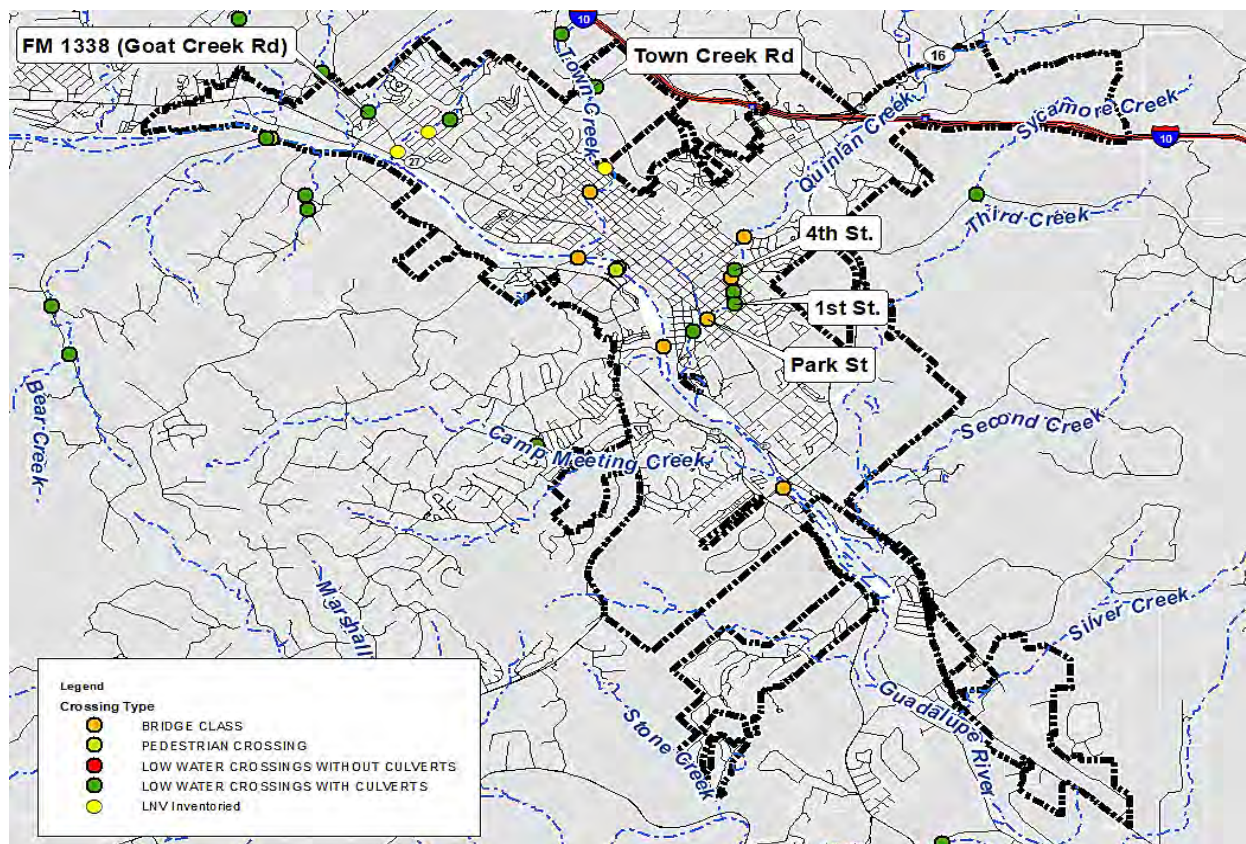


Figure 14 - Low Water Crossing Inventory (Source: TNRIS)

DAM AND DETENTION POND INVENTORY

Ten dams were identified within the City of Kerrville, as illustrated in **Figure 15** and **Table 4**, including Nimitz Lake Dam (Kerrville Ponding Dam), Louise Hays Dam (Kerrville Lake Dam), Kroc Center Detention Dam, Reuse Pond Dam, Lake Happy Dam, and Riverhill Lake Dam. Additional low hazard dams with unidentified names were located on Town Creek near the City of Kerrville Sports Complex (Town Creek Private Dam #1), Town Creek near Silver Saddle Drive (Town Creek Private Dam #2) and Quinlan Creek at Texas Lions League (Quinlan Creek Private Dam #1). These dams serve various purposes such as flood control, recreation, municipal and irrigation uses. A summary of identified city-owned dams is provided in the subsequent sections.

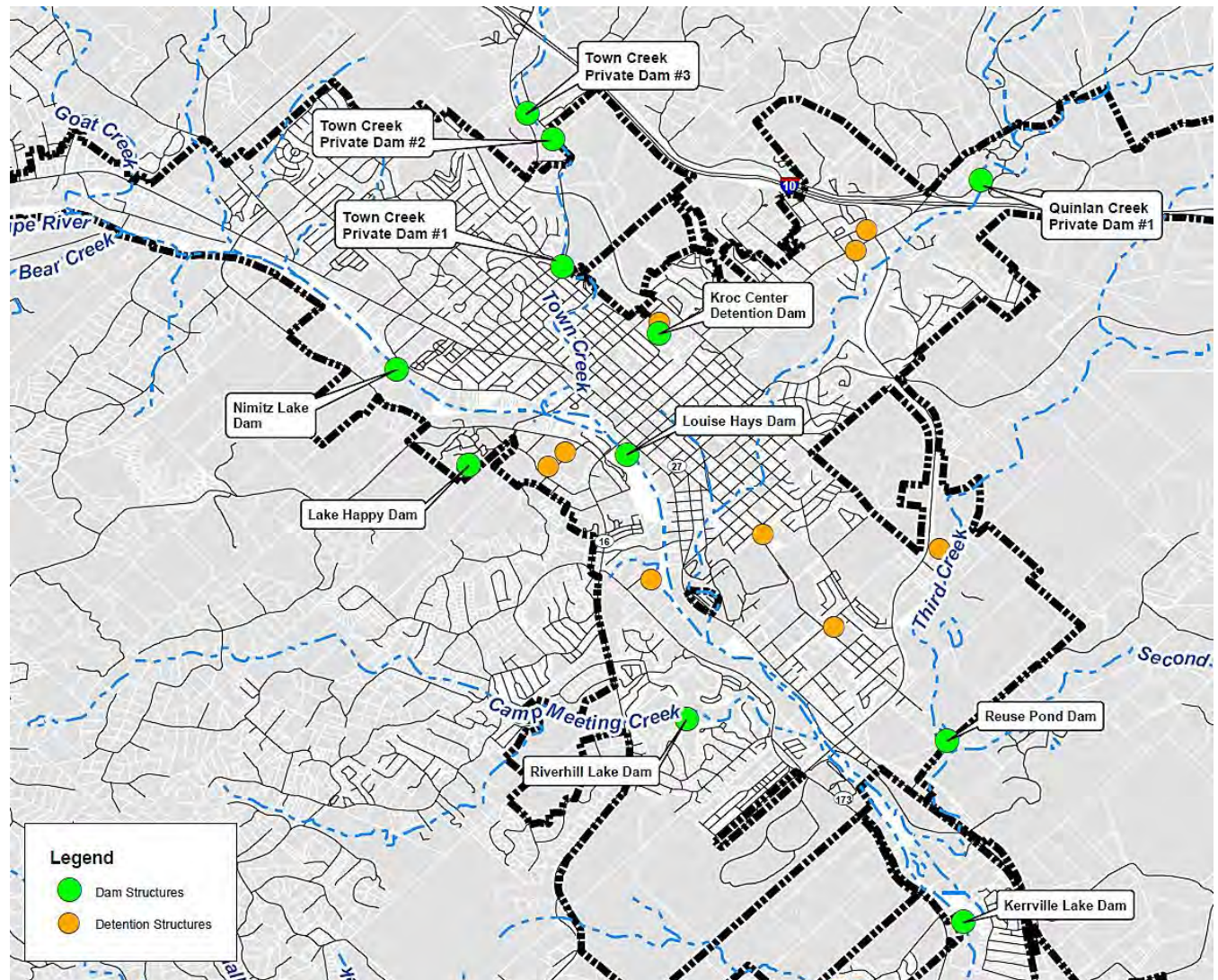


Figure 15 - Dam and Detention Pond Inventory

Table 4 - Dam Inventory within Kerrville, TX

Name	NID	River	Purpose	Owner	Dam Type	Hazard Classification	Dam Height (ft.)	Storage Volume (ac-ft)	Year Built
Nimitz Lake Dam (Kerrville Ponding Dam)	TX04650	Guadalupe River	Irrigation/Municipal	City of Kerrville	Concrete Embankment	Significant Hazard	35	840	1980
Flat Rock Dam	TX02457	Guadalupe River	Recreation	Kerr County	Concrete Embankment	TBD	20	820	1956
Louise Hays Dam	N/A	Guadalupe River	Recreation	City of Kerrville	Concrete Buttress	TBD	-	-	1950
Kroc Center Detention Dam	TX09581	Town Creek	Flood Control	City of Kerrville	Earth Embankment	High Hazard	8	36	2009
Reuse Pond Dam	TX07488	Third Creek	Other	City of Kerrville	Earth Embankment	High Hazard	31	291	2018
Lake Happy Dam	TX05884	Guadalupe River	Recreation	Kerrville State Hospital	Earth Embankment	TBD	30	84	1974
Riverhill Lake Dam	TX04408	Camp Meeting Creek	Irrigation	Riverhill Country Club	Earth Embankment	High Hazard	23	250	1967
Quinlan Creek Private Dam #1	N/A	Quinlan Creek	-	Private	Concrete	TBD	-	-	-
Town Creek Private Dam #1	N/A	Town Creek	-	Private	Concrete	TBD	-	-	-
Town Creek Private Dam #2	N/A	Town Creek	-	Private	Concrete	TBD	-	-	-

NIMITZ LAKE DAM (KERRVILLE PONDING DAM)

Nimitz Lake and Dam (Kerrville Ponding Dam) is the city's most significant dam structure which is a relatively small channel dam on the Guadalupe River that serves as a water supply for the City of Kerrville. The dam was constructed in 1980 and major repairs were completed in January 1985 due to seepage problems in the abutments and overtopping damages that resulted in the loss of a portion of the concrete cap and significant erosion of the clay core over approximately one-third of the length of the dam. The subsequent structural repairs and choice of roller compacted concrete have proven to hold up during overtopping flood flows.

The dam was originally owned by the Upper Guadalupe River Authority and purchased by the City of Kerrville in April 1998. In 2011, the city renamed the reservoir Nimitz Lake in honor of World War II Navy Fleet Admiral Chester W. Nimitz.

In 2015, a Volumetric Survey was performed by the TWDB for Nimitz Lake and a storage capacity of 735 acre-feet of water and a maximum allowable impoundment capacity of 840 acre-feet was determined. Sedimentation continues to be a major concern for the upper reaches of the lake near the dam. The conclusions of the study recommended resurveying the lake in 10 years or after a major flood event.

LOUISE HAYS DAM

Louise Hays Dam (**Figure 16**) is not an identified dam in the USACE National Inventory of Dams (NID) list. The dam is estimated to have been completed in the 1950s. The dam type is a concrete buttress dam structure that has experienced issues of seepage and concrete spalling over the years.



Figure 16 - Kerrville Flooding at Louise Hays Dam May 29, 2016 (Source: Kerrville Photo.com)

KROC CENTER DETENTION DAM

The Kroc Center Detention Dam was constructed in 2009 as a small sized earthen flood control dam and is classified by TCEQ as a high hazard dam due to the risk of public safety in the event of a breach. The dam's outlet structure (service spillway) and emergency spillway discharge into a drainage channel before being released onto the adjacent, residential George Street. Outflow through the service spillway was designed to discharge a maximum of 35 cfs onto the street to minimize existing downstream drainage problems. The resulting drawdown time for the pond is estimated at 7.2 hours for the 100-year storm event.

The pond and its associated discharge of water onto George Street has remained a problem for the city and is included as one of the city's identified problem areas for analysis as part of this study.

REUSE POND DAM

The City of Kerrville's Reuse Pond Dam, a 95-million-gallon pond constructed in 2018, is an earthen embankment dam with the purpose of impounding water for consumptive use by the city. The Reuse Dam is located at the confluence of Third Creek and Second Creek. The Reuse Pond receives flow from the nearby City of Kerrville Waste Water Treatment Plant (WWTP) via a 24" gravity-fed reuse line and a 12" reuse force main distributes water from the pond into the reuse distribution network.

According to the Kerrville Water Reuse Pond Design Report, a dam breach event for the reuse pond would result in a discharge rate of 50,700 cfs. A breach of the dam during a storm event could result in inundation to properties downstream of the dam, along Spur 100 and SH-27.

LAND USE DEVELOPMENT PATTERNS

The City of Kerrville is projected to have steady growth over the next 30 years which will create new strains on the city's drainage system by impacting the volume of runoff received by local streets, storm drains, and waterways, as well as the water quality that enters the city's natural riparian areas and rivers.

City development has primarily occurred along the northern side of the Guadalupe River within the Elm Creek, Quinlan Creek, and Town Creek Basins. The highest impervious cover is concentrated along Junction Highway and Sidney Baker Street, with the majority of all basins remain generally undeveloped as natural shrubland (**Figure 17**).

According to the *2050 Comprehensive Plan*, the city's growth as identified by the targeted strategic catalyst areas is primarily located along the banks of the Guadalupe River along Town Creek near IH-10 and up the length of Sidney Baker Street (SH-16) (Quinlan Creek Basin) (**Figure 18**).

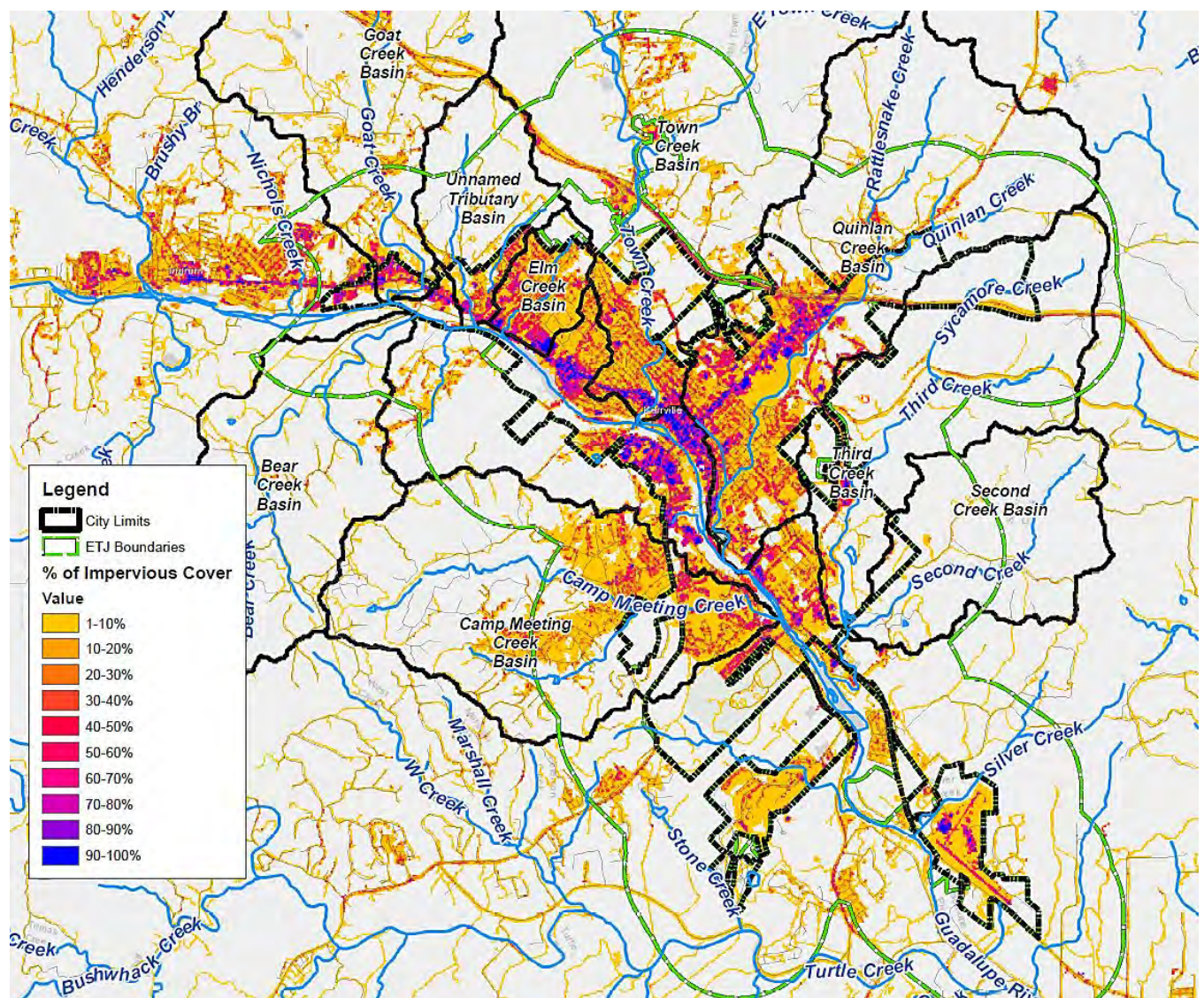


Figure 17 - NLCD 2011 Percent Developed Imperviousness (CONUS)

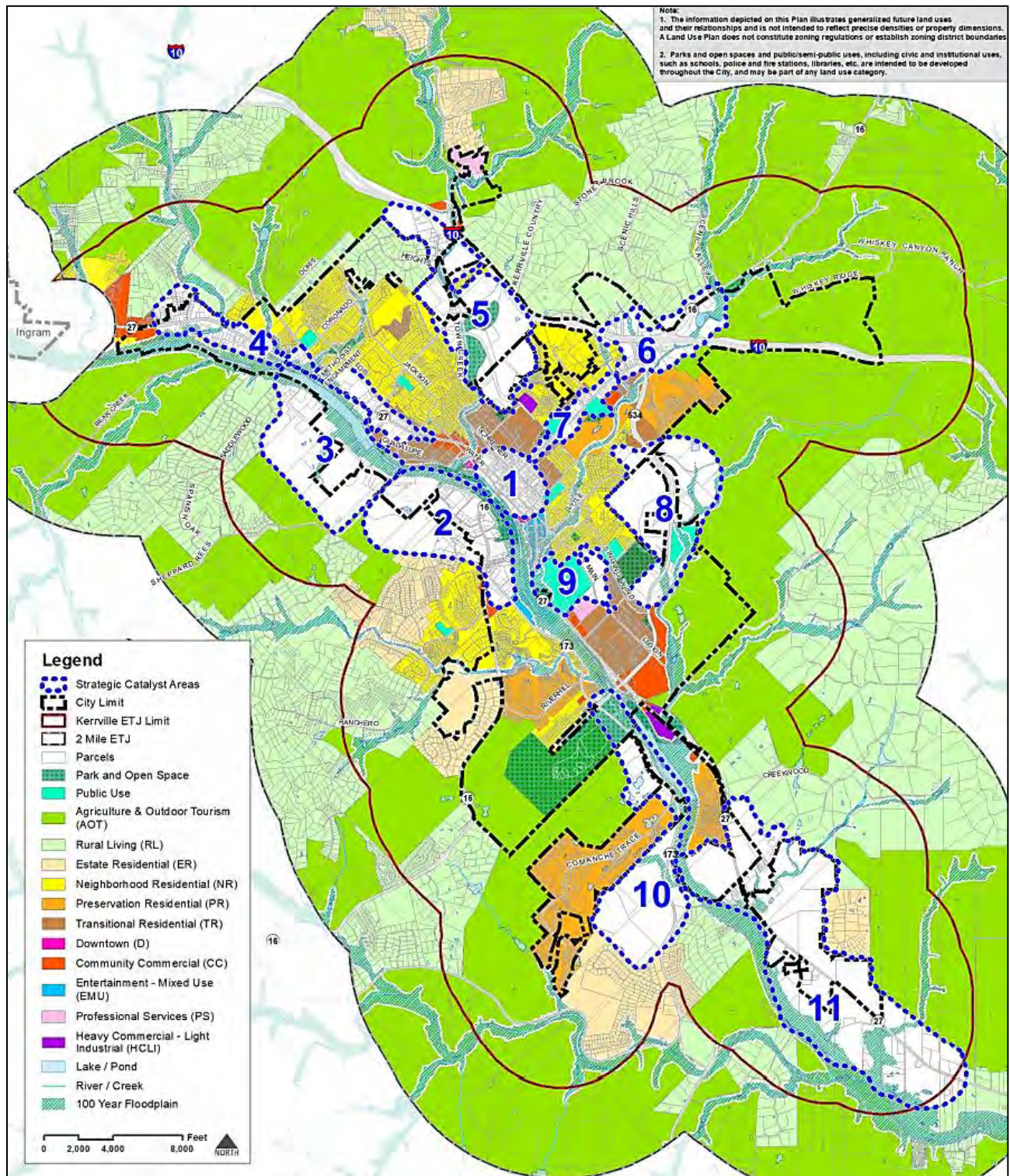


Figure 18 - City of Kerrville Future Land Use Map (Source: 2050 Comprehensive Plan)

FUTURE LAND USE

The *2050 Comprehensive Plan* identifies several Special Catalyst Areas (SCAs) throughout the city. These SCAs contain various levels of mixed land use patterns that are appropriate for each individual area, yet flexible enough to accommodate residential, commercial, and industrial all within the same relative location. The SCAs with the most potential for new buildings and growth are SCA-5 (Town Creek Road/ Holdsworth Drive.), SCA-6 (IH-10 & SH16), SCA-8 (Loop 534), SCA-10 (Hwy 173), and SCA-11 (Hwy 27).

The SCA-6 (IH-10 & SH16 Intersection) and SCA-9 (Schreiner University area) present significant opportunity for development based on the 2050 Comprehensive Plan. This potential development will likely increase the amount of runoff that drains to Quinlan Creek due to impervious cover needed for development. Three of the identified problem areas (First St, Fourth St, and Park St) in this report could be impacted by any significant residential or commercial development in SCA-6 or SCA-9.

The city can expect to see residential development within the existing city limits as well as the Extra Territorial Jurisdiction (ETJ) in the future. Residential development is anticipated along existing road corridors of State Highway 16 (north and south), State Highway 173 (south), and State Ranch Road 783. The potential for residential development also exists on the land south of Spur 98 and Goat Creek Road (north from State Highway 27 towards Interstate Highway 10). **Figure 20 and Figure 21** depict an example of changing land use and increased development in the city.

POPULATION GROWTH

The Kerrville 2050 Comprehensive Plan projects steady growth for the study area (City proper and 2-mile ETJ) with a population estimated of 33,000 in 2015 and projected to grow to 37,866 to 45,637 people by 2050 (**Figure 19**). According to U.S. Census records, the average household size is 2.19 which represents to correspondent increase in households over the next 30 years of approximately 2,222 to 5,851 households.

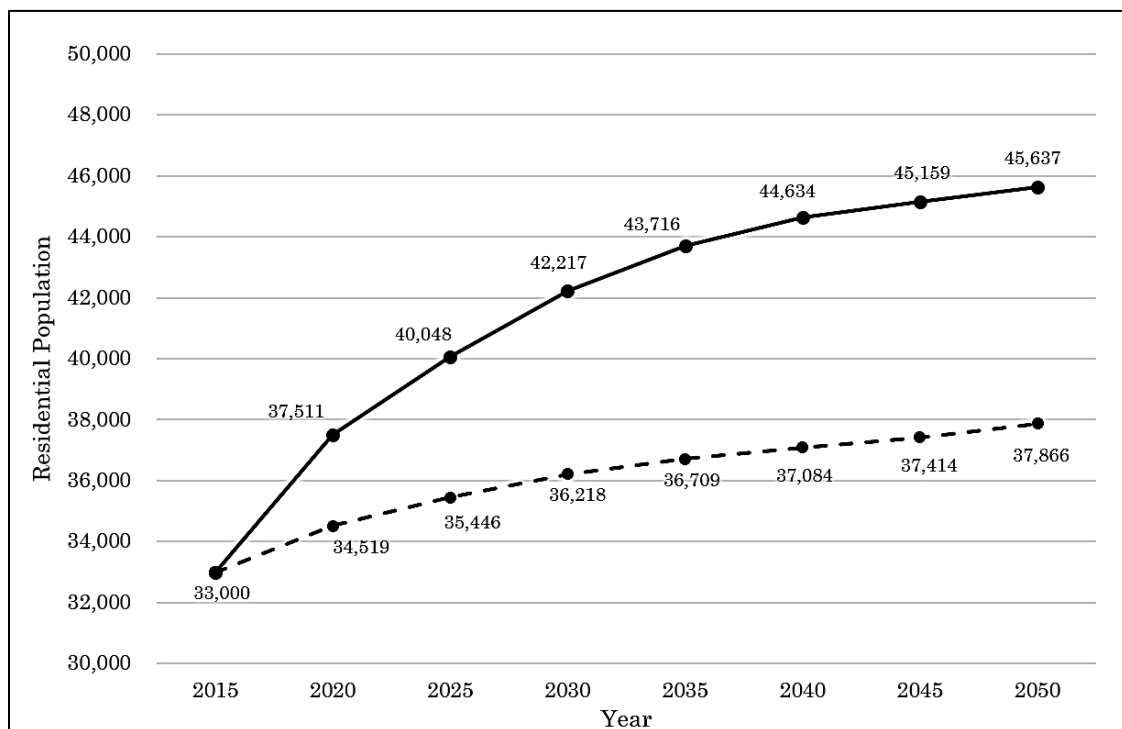


Figure 19 - Kerrville 2050 Comprehensive Plan Projected Population growth



Figure 20 - 1995 Land Use



Figure 21 - 2018 Land Development

PROBLEM AREA IDENTIFICATION

OVERVIEW

The City of Kerrville identified fourteen project areas for further investigation and development of proposed solutions as part of this Stormwater Master Plan Report (**Figure 22**). Additional problem areas exist within the city and are anticipated to be addressed in subsequent updates to this Stormwater Master Plan.

Each project area was evaluated using approximate methodologies to assess a probable improvement option to address the stormwater concern. Detailed information regarding hydrologic and hydraulic methodologies may be found in **Appendix D – Technical Support Data**. Project costs were estimated with considerations to the costs associated with planning and design, construction, permitting, land acquisition and utility adjustment needs and are located in **Appendix B – City-Wide Drainage CIPs**. The solutions and costs presented in this report are conceptual-level and additional detailed analysis will be required for all projects presented prior to implementation. Additionally, each of the projects was evaluated and scored based on criteria for public safety, economics, project timing, and environmental considerations (See **PRIORITIZATION OF DRAINAGE CIP PROJECTS** section for additional information.)

The fourteen problem areas evaluated by this plan consist of six in the Quinlan Creek Basin, four in the Town Creek Basin, one in the Elm Creek Basin, one in the Unnamed Tributary (Lime Creek) Basin, and two in the Upper Guadalupe River Basin.

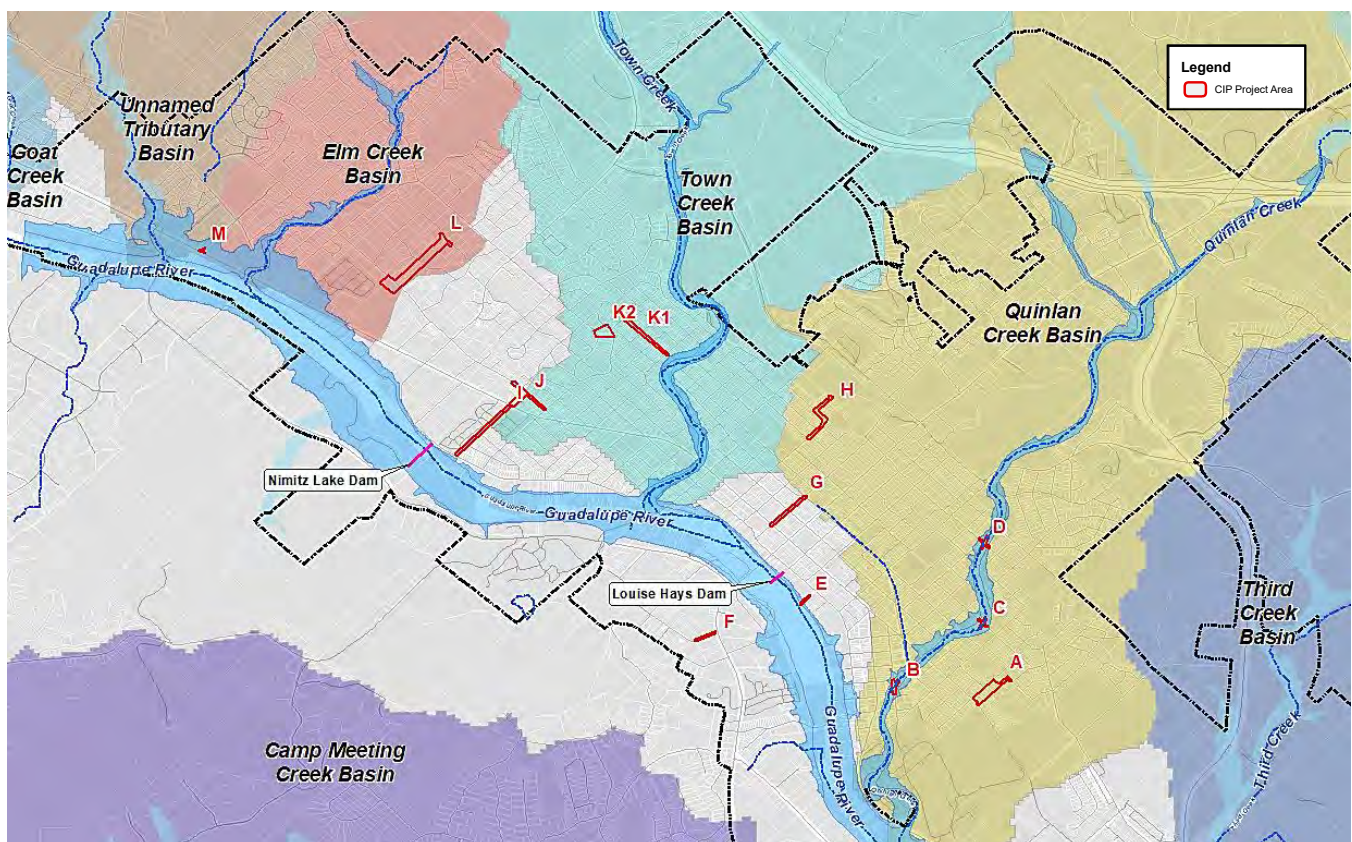


Figure 22 - Problem Areas Map

PROJECT AREA LIST AND DESCRIPTIONS

A. EAST MAIN TO PINTO TRAIL EARTHEN CHANNEL

Primary Concerns: Structural flooding, erosion/channel stability

Project Description: Undersized drainage channel, bank overtopping, property flooding, and erosion stability are the main concerns in this area. The drainage pattern generally flows in a southwesterly direction. Runoff makes its way along Tomahawk Trail and continues across Singing Wind Road towards Pinto Trail. Runoff is then captured by a concrete trapezoidal channel that transitions into an earthen channel at a relatively steep slope resulting in erosion and channel stability issues. During significant storm events, flow overtops the channel at the 90-degree bend or bypasses the channel. Further downstream towards East Main Street, flow is known to overtop the western bank towards Westminster Street.

Peak Flow Summary: Drainage Area = 83.6 acres at Pinto Trail and Tomahawk Trail (**Appendix B Exhibit A01**).

Peak Flows – Ultimate Conditions $Q_{25} = 430$ cfs, $Q_{50} = 491$ cfs, $Q_{100} = 555$ cfs.
(**Appendix B Exhibit A02**)



Figure 23 - Pinto Trail Project Area Map



Figure 24 - Earthen Drainage Channel Facing Upstream



Figure 25 - Pinto Trail Channel Facing Downstream

B. PARK STREET - LOW WATER CROSSING

- Primary Concerns:** Frequent roadway overtopping, flooding, public safety, limited emergency access
- Project Description:** Flooding, dangerous roadway conditions and frequent roadway closures during most rain events have been reported. Quinlan Creek at Park Street drains approximately 7,400 acres and ultimately discharges into the Guadalupe River. Quinlan Creek is mapped as a FEMA Regulatory Zone AE Floodplain with a floodway. Park Street Low Water Crossing consists of one - 3' x 10' box culvert with an estimated full flow capacity of 282 cfs, which is less than 5% of the 5-year frequency storm event.
- Peak Flow Summary:** Drainage Area = 7,450 acres at Park Street low water crossing (**Appendix B Exhibit B01**)
FEMA Peak Flows – Existing Conditions $Q_{10} = 5,750$ cfs, $Q_{50} = 9,350$ cfs, $Q_{100} = 10,830$ cfs (**Appendix B Exhibit B02**)



Figure 26 - Park Street Project Area Map



Figure 27 – Park Street Facing Downstream



Figure 28 - Flooding at the Park Street Low Water Crossing – April 2019 (Source - City of Kerrville)

C. FIRST STREET - LOW WATER CROSSING

Primary Concerns: Frequent roadway overtopping, flooding, public safety, limited emergency access

Project Description: Flooding, dangerous roadway conditions and frequent roadway closures during most rain events have been reported. The First Street Low Water Crossing consists of five – 24" RCPs providing a combined full flow capacity of approximately 141 cfs which is roughly 2.5% of the 5-year frequency storm event.

Peak Flow Summary: Drainage Area = 6,930 acres at First Street Low Water Crossing (**Appendix B Exhibit C01**)

FEMA Peak Flows – Existing Conditions $Q_{10} = 5,560$ cfs, $Q_{50} = 8,980$ cfs, $Q_{100} = 10,400$ cfs (**Appendix B Exhibit C02**)



Figure 29 - First Street Project Area Map



Figure 30 – First Street Low Water Crossing



Figure 31 - Flooding at the First Street Low Water Crossing – April 2019 (Source - City of Kerrville)

D. FOURTH STREET – LOW WATER CROSSING

Primary Concerns: Frequent roadway overtopping, flooding, public safety, limited emergency access

Project Description: Flooding, dangerous roadway conditions and frequent roadway closures during most rain events have been reported. Fourth Street Low Water Crossing consists of two – 24" RCPs providing a combined capacity of approximately 32 cfs which is roughly 1% of the 5-year frequency storm event.

Peak Flow Summary: Drainage Area = 6,740 acres at Fourth Street Low Water Crossing (**Appendix B Exhibit D01**)
FEMA Peak Flows – Existing Conditions $Q_{10} = 5,110$ cfs, $Q_{50} = 8,080$ cfs, $Q_{100} = 9,350$ cfs (**Appendix B Exhibit D02**)

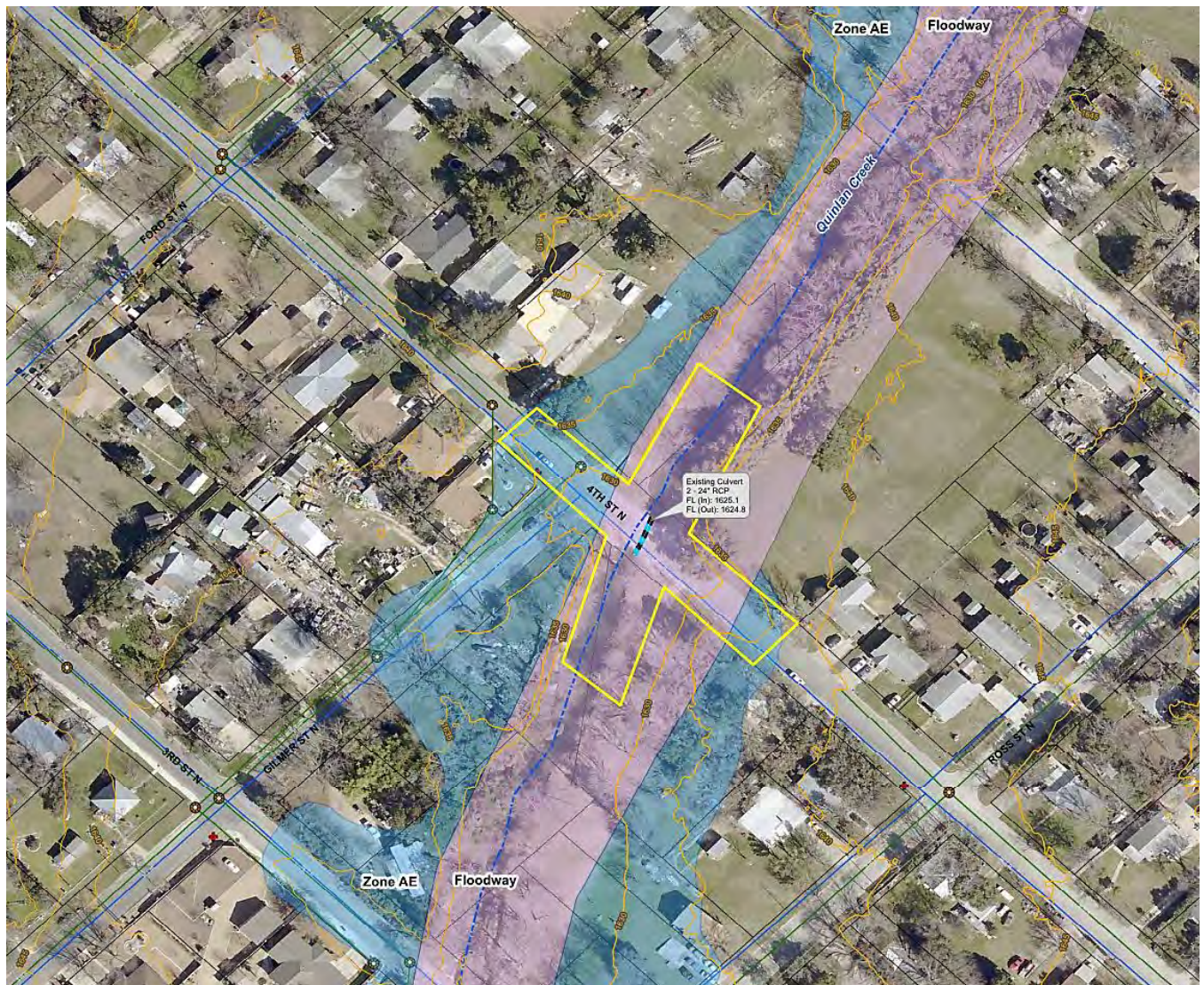


Figure 32 - Fourth Street Project Area Map



Figure 33 – Fourth Street Culvert Facing Downstream



Figure 34 - Flooding at the Fourth Street Low Water Crossing – April 2019 (Source - City of Kerrville)

E. SPRING STREET – EROSION AT OUTFALL

Primary Concerns: Erosion/channel stability, loss of property

Project Description: Excessive erosion at the Spring Street outfall is the main concern in this area. Discharge from a 54" RCP is collected within a gabion mattress channel and discharged down a steep embankment into the Guadalupe River. Soil instability has resulted in head cutting, undermining of the soils beneath the gabion structure and mass wasting of the stream bank. Left unprotected, the erosion is at risk of further incising upstream.

Peak Flow Summary: Drainage Area = 34.8 acres (**Appendix B Exhibit E01**)
Peak Flows – Ultimate Conditions $Q_{25} = 228$ cfs, $Q_{50} = 260$ cfs, $Q_{100} = 294$ cfs
(**Appendix B Exhibit E02**)



Figure 35 - Spring Street Project Area Map



Figure 36 – Channel Erosion at Spring Street



Figure 37 – Channel Failure at Guadalupe River Bank

F. HILL COUNTRY DRIVE AT SH 16

Primary Concerns: Roadway flooding, property damage to vehicles

Project Description: Street and property flooding are the main issues in this area. The roadway profile is in a sag with two - 36" CMPs located at the flowline of the roadway sag. The storm drain is at grade resulting in frequent roadway overtopping, street closures, and stalling of vehicles.

Peak Flow Summary: Drainage Area = 23 acres at Hill Country Drive and Sidney Baker Street (SH 16).
(Appendix B Exhibit F01)
Peak Flows – Ultimate Conditions $Q_{25} = 184$ cfs, $Q_{50} = 211$ cfs, $Q_{100} = 238$ cfs
(Appendix B Exhibit F02)



Figure 38 - Hill Country Drive Project Area Map



Figure 39 – Hill Country Culvert at Sidney Baker Street Intersection (Upstream Side)



Figure 40 - Hill Country Drive Flooding (Source: Kerrville Daily Times)

G. CLAY STREET (SCHREINER TO SH27):

Primary Concerns: Roadway flooding, structural flooding

Project Description: A relatively large area of runoff drains toward Clay Street, including contributing discharge from the Kroc Center Detention Pond outfall. The runoff received exceeds the capacity of the undersized storm drainage system which includes generally 24" or 30" CMPs. Additional flooding is experienced on Jefferson Street, Schreiner Street and other adjacent streets with flow discharged to the south towards the Guadalupe River or east towards Quinlan Creek.

Peak Flow Summary: Drainage Area = 188 acres (**Appendix B Exhibit G01**)
Peak Flows – Ultimate Conditions $Q_{25} = 656$ cfs, $Q_{50} = 735$ cfs, $Q_{100} = 819$ cfs.
(**Appendix B Exhibit G02**)



Figure 41 - Clay Street Project Area Map



Figure 42 – Stormwater Inlet at Clay Street



Figure 43 – Roadside Ditch at Clay Street

H. KROC CENTER DETENTION POND AND SPILLWAY OUTFALL

Primary Concerns: Structural damages, extended duration of roadway flooding, accelerated deterioration of roadway pavement.

Project Description: Widespread street and property flooding are the main concerns in this area. Kroc Center Detention Pond, classified by TCEQ as a High Hazard Dam, is designed to hold runoff from a watershed area consisting of approximately 120 acres. During large storm events, the detention pond fills up to near full capacity, resulting in a steady extended release from the pond outfall, discharging onto George, Miller and Hays Streets with no subsurface drainage system resulting in accelerated pavement deterioration.

Peak Flow Summary: Drainage Area = 120 acres (**Appendix B Exhibit H01**)
Peak Flows – Ultimate Conditions $Q_{25} = 814$ cfs, $Q_{50} = 930$ cfs, $Q_{100} = 1,052$ cfs.
(**Appendix B Exhibit H02**)



Figure 44 - Kroc Center Project Area Map



Figure 45 – Outflow Structure for Kroc Center Detention Pond



Figure 46 - Kroc Center Draining onto George Street - Looking Downstream – April 2019 (Source - City of Kerrville)

I. TAKE IT EASY CHANNEL (SH27 TO GUADALUPE ST.)

Primary Concerns: Erosion/channel stability, loss of property, channel capacity

Project Description: Steep channel banks have resulted in instabilities and slope failures due to the erosive velocities in the channel. Take It Easy Channel is generally bounded from Guadalupe Street at the downstream and extends to Junction Highway. Approximately 320 acres of stormwater runoff drains into an open channel and into the Take It Easy drainage channel is then captured by a 66" storm pipe that outfalls into the Guadalupe River.

Peak Flow Summary: Drainage Area = 320 acres (**Appendix B Exhibit I01**)
Peak Flows – Ultimate Conditions $Q_{25} = 920$ cfs, $Q_{50} = 1,050$ cfs, $Q_{100} = 1,180$ cfs.
(**Appendix B Exhibit I02**)



Figure 47 - Take It Easy Channel Project Area Map



Figure 48 – Unstable Side Slope for Take It Easy Channel



Figure 49 – Channel Profile for Take It Easy Channel Facing Downstream

J. LOIS STREET (BETWEEN WOODLAWN AND OX)

Primary Concerns: Structural flooding, roadway flooding, emergency access

Project Description: Street flooding, roadway closures, property flooding, and structural flooding are the main concerns in this area. Runoff generally drains to the south/southeast and is captured by a shallow drainage channel with a concrete bottom and discharges across five – 3.5' x 5' oval CMPs into Take It Easy Channel. Due to the insufficient capacity of the Junction Highway culverts, the shallow and relatively flat drainage channel backs up water in the system that then spills over onto adjacent properties.

Peak Flow Summary: Drainage Area = 135 acres (**Appendix B Exhibit J01**)
Peak Flows – Ultimate Conditions $Q_{25} = 613$ cfs, $Q_{50} = 698$ cfs, $Q_{100} = 787$ cfs.
(**Appendix B Exhibit J02**)



Figure 50 - Lois Street Project Area Map



Figure 51 – Undersized Concrete Ditch at Lois Street



Figure 52 - Flooding at Lois Street – April 24, 2019 (Source - Residents)

K. HARPER ST. BETWEEN CULBERSON AVE. (K1) & LEWIS AVE AND CIRCLE AVE (K2)

Primary Concerns: Roadway flooding, slope stability erosion, sediment accumulation in roadway.

Project Description: Problem Area K has been separated into two sub-areas referred to as K1 for Harper Street which is associated with roadway flooding due to a relatively flat terrain with insufficient slope to drain runoff. Problem Area K2 is associated with the runoff received from Jackson Road draining down a steep earthen embankment towards Circle Avenue which has resulted in excessive erosion, gully formations and sediment washout into the roadway.

Peak Flow Summary: K1 Drainage Area = 13 acres; K2 = 23 acres (**Appendix B Exhibit K01**)

Peak Flows – K1 Ultimate Conditions $Q_{25} = 66$ cfs, $Q_{50} = 75$ cfs, $Q_{100} = 85$ cfs;

K2 Ultimate Conditions $Q_{25} = 170$ cfs, $Q_{50} = 194$ cfs, $Q_{100} = 219$ cfs
(**Appendix B Exhibit K02**)



Figure 53 - Harper Street Project Area Map



Figure 54 – Culberson Avenue Facing Downstream



Figure 55 – Circle Avenue Earthen Channel Erosion

L. JACK DRIVE - UNDERSIZED INLET

Primary Concerns: Street flooding, property flooding

Project Description: Street flooding and ponding are the main issues in this area. Approximately 27 acres drain to Jack Drive. Overland flow generally travels in a southwesterly direction across Jackson Road and flows towards an undersized inlet on Jack Drive with unknown downstream connectivity. Overtopping of Jackson Road is known to frequently occur with overland runoff travelling across multiple lots in a southwesterly direction towards Virginia Drive and Lois Street.

Peak Flow Summary: Drainage Area = 27 acres at Jack Drive (**Appendix B Exhibit L01**)
Peak Flows – Ultimate Conditions $Q_{25} = 127$ cfs, $Q_{50} = 145$ cfs, $Q_{100} = 163$ cfs.
(**Appendix B Exhibit L02**)



Figure 56 - Jack Drive Project Area Map



Figure 57 – Outflow of Undersized Storm Drain at Jack Drive Facing Upstream



Figure 58 - Inadequate Inlet Capacity at Jack Drive - April 24, 2019 (Source - Residents)

M. INTERSECTION OF CORONADO DR. AND JUNCTION HWY

Primary Concerns: Roadway flooding

Project Description: Street flooding and ponding at the intersection is the main drainage concern in this area. Approximately 8 acres of contributing drainage area collects at the low lying area at the northern side of the intersection of Coronado Drive and Junction highway, where runoff ponds due to lack of positive drainage.

Peak Flow Summary: Drainage Area = 8 acres at Coronado Drive and Junction Highway
(Appendix B Exhibit M01)
Peak Flows – Ultimate Conditions $Q_{25} = 79$ cfs, $Q_{50} = 90$ cfs, $Q_{100} = 102$ cfs. (Appendix B Exhibit M02)

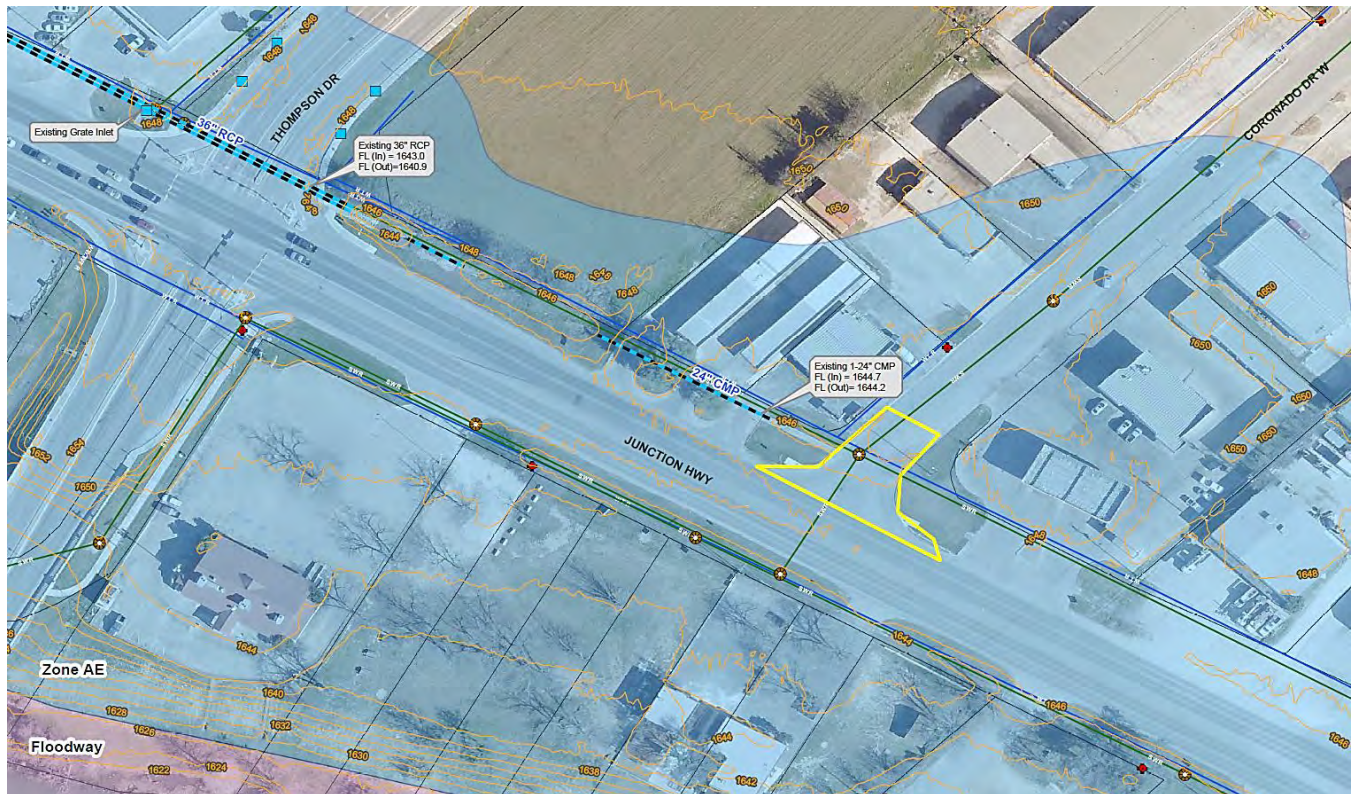




Figure 60 – Intersection of Coronado Drive and Junction Highway (Facing South)



Figure 61 – Ponding at Coronado Drive at Junction Highway Intersection (Facing Southeast)

PROJECT POTENTIAL SOLUTIONS

Each of the fourteen selected project areas, as identified by the City of Kerrville, was evaluated using approximate methodologies for analysis and determination of conceptual solutions. Each problem area was then scored based on the relative severity of problem as further described by the **Prioritization of Drainage Projects** section of this report. Detailed information regarding hydrologic and hydraulic methodologies may be found in **Appendix D – Technical Support Data**. Project costs were estimated in 2019 dollars with considerations to the costs associated with planning and design, construction, permitting, land acquisition and utility adjustment needs and are located in **Appendix B – City-Wide Drainage CIPs**. The solutions and costs presented in this report are at a conceptual-level and additional detailed analysis will be required for all projects prior to implementation.

Refer to **Appendix B** for project summary sheets and detailed conceptual solutions exhibits.

Projects implemented in future years should consider a 6%-7% increase, per year, to the total project cost.

A. PINTO TRAIL

The Pinto Trail conceptual design solution intends to provide flood relief to the properties adjacent to the channel at risk of flooding and removing them from the localized 100-year floodplain for ultimate conditions. To minimize the potential for adverse impacts downstream, it is recommended that channel improvements extend further downstream from Main Street to Acorn Boulevard by increasing the capacity of the existing earthen channel. Further investigations and detailed hydraulic analysis is required to further assess channel sizing and culvert capacity.

Project assumes that Parcel 534019, at the upstream end of the project, is owned by the City of Kerrville and will therefore not require any land acquisition.

The project scope of work is summarized as follows:

1. Widen the existing channel between Acorn Boulevard and East Main Street for a length of approximately 1,320 LF of grass-lined trapezoidal channel with an 8-foot bottom width, 3.5-foot depth and 6:1 side slope.
2. Widen the existing channel between East Main Street to Pinto Trail for a length of approximately 690 LF and replace with a mechanically stabilized earth (MSE) rectangular concrete segmental block wall system with a 15-foot bottom width, 3-foot depth and vertical side slopes (**Figure 62**).
3. Construct a grass-lined trapezoidal channel from Tomahawk Drive and transition to the proposed MSE rectangular channel.
4. Hydro-mulch or grass seed the proposed earthen channels.

Refer to **Appendix B Exhibit A03** for the proposed improvements exhibit.

The total opinion of probable engineering and construction costs for this project is estimated to be \$0.8 to \$1 million. See **Appendix B** for an itemized breakdown of quantities and costs.



Figure 62 – Project Area Conceptual Layout

B. PARK STREET LOW WATER CROSSING

The conceptual design solutions evaluated in this study explored opportunities to replace the low water crossing at Park Street at Quinlan Creek with a structure that provides minimum flood protection from the 50-year storm event. Multiple iterations were considered in varying combinations that included replacement of the existing culverts, channel widening, and capacity improvements and reprofiling the roadway. Efforts were made in the conceptual modeling process to identify opportunities to mitigate adverse impacts associated with the proposed improvements with respect to the FEMA Floodway and Floodplain. Each option provided minimal benefits, were very high in cost, and at best provide conveyance capacity for up to the 5-year storm event before overtopping. Therefore, it was determined that individual roadway culvert replacements did not provide an adequate cost-benefit to recommend implementation. Therefore, as an alternate to mitigate and improve public safety, it is recommended that automated flood gates be installed at each low water crossing.

Refer to **Appendix B Exhibit B03** for the proposed improvements exhibit showing extent of anticipated channel and culvert improvements required for 5-year frequency storm event flood protection.

The total opinion of probable engineering and construction costs for this solution is estimated at approximately \$3.2 Million for channel and culvert capacity improvements. The recommended mitigating solution of an Automated Flood Gate System is estimated to cost approximately \$200,000. See **Appendix B** for the itemized breakdown of quantities and costs.

The project scope of work for culvert and channel improvements are summarized as follows:

1. Perform a detailed hydrologic and hydraulic study of Quinlan Creek to better quantify the flood risk conditions and evaluate alternatives to address Park Street, First Street, and Fourth Street.
2. Construct channel widening and capacity improvement through the length of the channel and replace the culvert crossings at Park, First and Fourth Streets with bridge-class culverts that mitigate adverse impacts to the FEMA Floodway and Floodplain.

Recommended Mitigating Solutions of work is summarized as follows:

Install a High-Water Alert Lifesaving Technology (HALT) flashing light and automated flood gate to alert drivers of dangerous waters and encourage alternative routes.



Figure 63. Flood Detection System Automated Gate Example

C. FIRST STREET LOW WATER CROSSING

Conceptual design was evaluated for Quinlan Creek at First Street low water crossing to alleviate existing flooding situation and road blockage. Iterative design calculations were performed to increase the flow carrying capacity of the culvert. Various options for improvements such as channel modification, roadway regrading, and culvert replacement were considered. Efforts were made in the conceptual modeling process to identify opportunities to mitigate adverse impacts associated with the proposed improvements with respect to the FEMA Floodway and Floodplain. Each option provided minimal benefits, were very high in cost, and at best provide conveyance capacity for up to the 5-year storm event before overtopping. Therefore, it was determined that individual roadway culvert replacements did not provide an adequate cost-benefit to recommend implementation. Therefore, as an alternate to mitigate and improve public safety, it is recommended that automated flood gates be installed at each low water crossing.

The total opinion of probable engineering and construction costs for this solution is estimated at approximately \$4.9 Million for channel and culvert capacity improvements. The recommended mitigating solution of an Automated Flood Gate System is estimated to cost approximately \$200,000. See **Appendix B** for the itemized breakdown of quantities and costs.

The project scope of work is summarized as follows:

1. Perform a detailed hydrologic and hydraulic study of Quinlan Creek to better quantify the flood risk conditions and evaluate alternatives to address Park Street, First Street, and Fourth Street.
2. Construct channel widening and capacity improvement through the length of the channel and replace the culvert crossings at Park, First and Fourth Streets with bridge-class culverts that mitigate adverse impacts to the FEMA Floodway and Floodplain.

Recommended Mitigating Solutions of work is summarized as follows:

Install a High-Water Alert Lifesaving Technology (HALT) flashing light and automated flood gate to alert drivers of dangerous waters and encourage alternative routes.



Figure 64 - Flood Detection System Automated Gate Example

D. FOURTH STREET LOW WATER CROSSING

As discussed earlier, conceptual solutions for low water crossing were analyzed and cost-effective solution of automated flood gates are recommended for optimum utilization of resources. Undersized culverts at Fourth Street are only capable to convey 20 cfs with a roadway flooding depth of 9.38 ft for a 100-year storm. According to the FEMA FIS study, drainage area contributes approximately 9,350 cfs at this low water crossing and most of the flow overtops the existing roadway elevation set at 1628.5 ft. Iterative drainage design calculations were performed to provide optimum design. Each option provided minimal benefits, were very high in cost, and at best provide conveyance capacity for up to the 2-year storm event before overtopping. Therefore, it was determined that individual roadway culvert replacements did not provide an adequate cost-benefit to recommend implementation. Therefore, as an alternate to mitigate and improve public safety, it is recommended that automated flood gates be installed at each low water crossing.

Appendix D shows the hydraulic models results.

The total opinion of probable engineering and construction costs for this solution is estimated at approximately \$1.6 Million for channel and culvert capacity improvements. The recommended mitigating solution of an Automated Flood Gate System is estimated to cost approximately \$200,000 . See **Appendix B** for the itemized breakdown of quantities and costs.

The project scope of work is summarized as follows:

1. Perform a detailed hydrologic and hydraulic study of Quinlan Creek to better delineate the flood risk conditions and evaluate alternatives to address Park Street, First Street, and Fourth Street.
2. Construct channel widening and capacity improvement through the length of the channel and replace the culvert crossings at Park, First and Fourth Streets with bridge-class culverts that mitigate adverse impacts to the FEMA Floodway and Floodplain.

Recommended Mitigating Solutions of work is summarized as follows:

Install a High-Water Alert Lifesaving Technology (HALT) flashing light and automated flood gate to alert drivers of dangerous waters and encourage alternative routes.



Figure 65 - Flood Detection System Automated Gate Example

E. SPRING STREET – EROSION AT OUTFALL

An existing 54" RCP storm drain discharges into an existing rock-filled gabion channel that then flows down a steep drop off plunging into the Guadalupe River. The existing gabion mattress has failed and the earthen channel bank is at risk of further incising upstream if left in its current condition. Solutions for this problem involve extending the existing 54" storm drain, regrading and compacting the earthen channel to stabilize the erosion that has taken place, and constructing a concrete baffled chute to convey flow down the steep channel embankment with a stilling basin to dissipate energy before discharging into the Guadalupe River. No downstream adverse impacts have been identified with this project. Further geotechnical investigations and detailed analysis are required.

The project scope is summarized as follows:

1. Remove existing concrete headwall and extend the existing 54" RCP approximately 100 LF.
2. Construct new concrete headwall.
3. Construct a 20' wide by 70' long concrete baffled chute with 5' high side walls, maximum longitudinal slope of 2:1.
4. Regrade and compact significant slope failures at a 3:1 maximum slope.
5. Construct stilling basin and transition to rock rip-rap at the outfall.

The total opinion of probable engineering and construction costs for this project is estimated to be \$600,000 to \$750,000. See **Appendix B** for an itemized breakdown of quantities and costs.



Figure 66 - Baffled Chute Energy Dissipater (Source: USBR EM-25)



Figure 67 - Conceptual Drainage Chute at Spring Street

F. HILL COUNTRY DRIVE AT SH 16

The intersection of Hill Country Drive and Sidney Baker Street (State Highway 16) experiences frequent property and street flooding due to Hill Country Drive's low lying roadway condition and two – 36" corrugated metal pipes (CMP) with inverts set at the low point in the roadway. The proposed solutions for this project are divided into two phases. Phase 1 consists of raising the roadway profile and regrading Hill Country Drive by approximately 11 inches while adding positive slope toward the existing two 36" CMP pipes. Because of the limited capacity of the two existing 36" CMPs at the intersection, Phase 2 consists of increasing the downstream pipe capacity at Hill Country Drive by replacing the two – 36" CMPs with a trench box connected into two 6' wide by 3' tall box culverts from Hill Country Dr to the existing TxDOT maintained trapezoidal channel near the intersection of Park Lane and Sidney Baker Street. The Phase 2 box culvert would increase capacity from 42 cfs to 185 cfs and will provide capacity for approximately the 25-year frequency storm event for ultimate conditions. Phase 2 capacity improvements equal to approximately 87% of the total 50-year storm event under ultimate conditions.

Increasing the capacity of the storm drains and discharging into the channel downstream has the potential to result in adverse impacts. Although the existing TxDOT drainage channel is believed to have adequate capacity, further study downstream to the outfall at the Guadalupe River is recommended prior to project final decision and construction.

The project scope is summarized as follows:

1. Raise Hill Country Drive by approximately 11 inches and regrade to establish positive drainage toward existing storm drain system. (Phase 1)
2. Replace the existing two 36" CMP with two 6' x 3' box culvert from intersection to existing TxDOT channel. (Phase 2)
3. Construct trench drain box at Hill Country Drive, just west of SH 16. (Phase 2)

The total opinion of probable engineering and construction costs for this project is estimated to be \$0.25 million for Phase 1 and \$2.2 million for Phase 2, for a total of approximately \$2.4 million. See **Appendix B** for an itemized breakdown of quantities and costs.

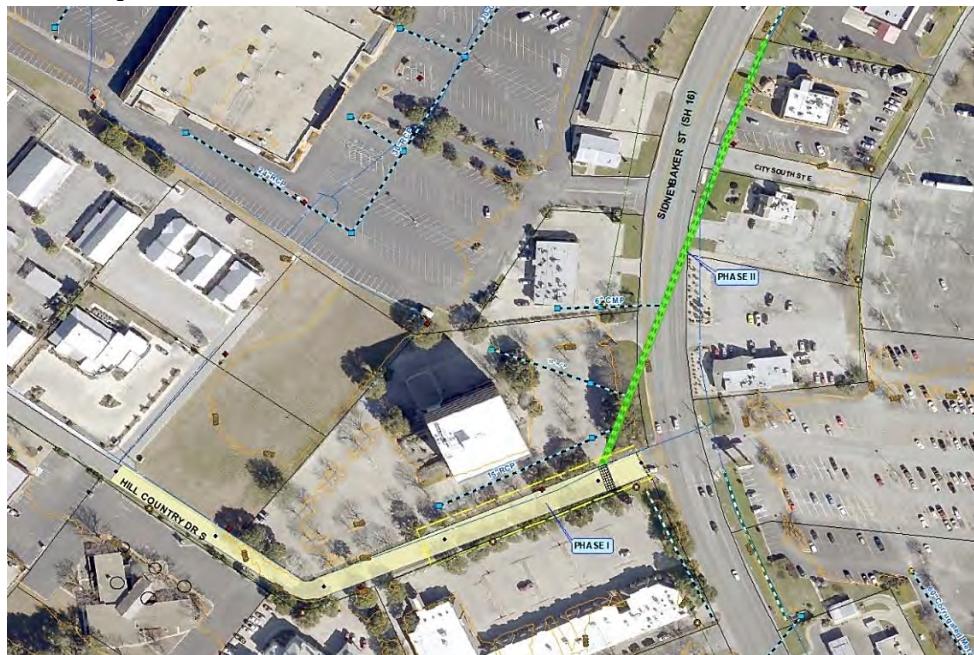


Figure 68 – Hill Country Drive Conceptual Drainage Improvements (Phase 1 and 2)

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G. CLAY STREET (SCHREINER TO SH27) &

H. KROC CENTER DETENTION POND AND SPILLWAY OUTFALL

The proposed design for Clay Street and the Kroc Center Detention Pond are intended to provide flood relief downstream of the Kroc Center along George Street, Hays Street and south of McFarland Street. Proposed improvements consist of reconfiguring and reconstructing the existing Kroc Center outlet structure to directly discharge into a proposed storm drain system to prevent the pond from directly releasing into the street. Clay Street drainage improvements include connecting to the Kroc Center Pond outlet and upsizing, connecting, and extending the stormwater network with a series of storm drain inlets and reinforced concrete box pipes extending down to the Guadalupe River. The proposed drainage improvements are intended to provide 100-year detention at the Kroc Center with the downstream storm drain system sized to contain 25-year flows in the pipes and 100-year within the road right-of-way. No adverse impacts have been identified downstream. A more detailed conceptual layout is provided in **Appendix B**.

The project scope or work is summarized as follows:

1. Construct an outlet riser structure within the Kroc Center Detention Pond and connect outfall directly into the proposed storm drain pipe.
2. Construct approximately 460 LF of 6' x 4' reinforced concrete box pipe from the Kroc Center to George Street.
3. Construct approximately 284 LF of 6' x 4' reinforced concrete box pipe from Miller Street to Hays Street.
4. Construct approximately 1,273 LF of 6' x 4' reinforced concrete box pipe from Hays Street to McFarland Street.
5. Construct approximately 920 LF of 9' x 4' reinforced concrete box pipe from McFarland Street to Clay Street.
6. Construct approximately 750 LF of 9' x 4' reinforced concrete box pipe on Clay Street between McFarland Street and Jefferson Street.
7. Construct approximately 940 LF of 9' x 5' reinforced concrete box pipe from on Clay Street between Jefferson Street and Water Street.
8. Construct approximately 220 LF of 10' x 5' reinforced concrete box pipe along Clay Street to outfall at the Guadalupe River.
9. Provide a stilling basin with baffle box at the outlet structure.
10. Construct four - 20 foot on grade curb inlets along George Street.
11. Construct eight - 20 foot on grade curb inlets along Hays Street.
12. Construct one - 20 foot on grade curb inlets along McFarland Street.
13. Construct eight - 20 foot on grade curb inlets along Clay Street.
14. Reconstruct / Regrade roads along proposed storm drainage alignment to establish positive drainage toward storm drain system.

The total opinion of probable engineering and construction costs for this project is estimated to be \$7 million to \$9 million. See **Appendix B** for an itemized breakdown of quantities and costs.

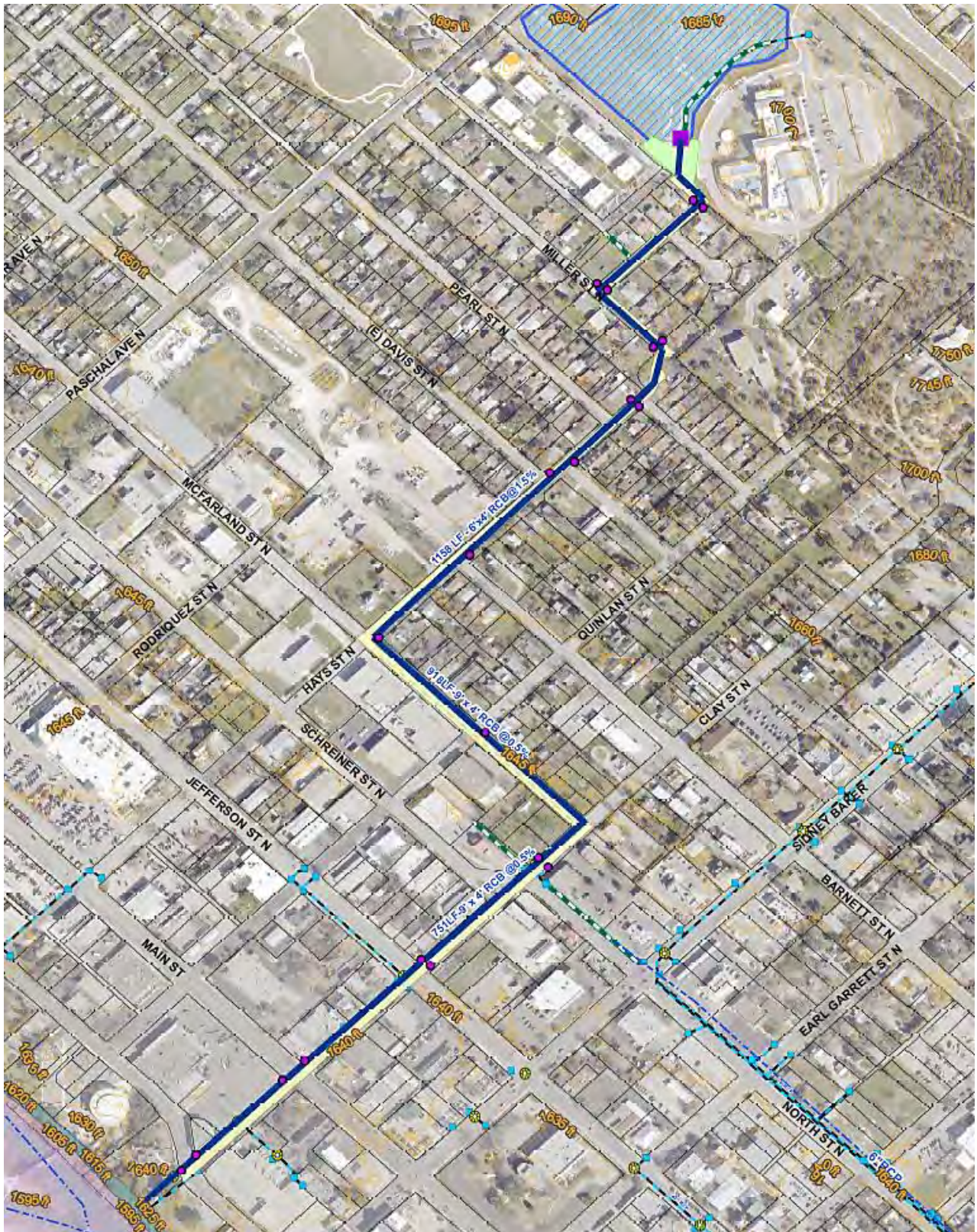


Figure 69 – Conceptual Storm Drainage System for Kroc Center and Clay Street.

I. TAKE IT EASY CHANNEL (SH27 TO GUADALUPE STREET.)

Take It Easy Channel proposed improvements are intended to primarily stabilize the nearly vertical channel bank side slopes from further erosion placing the adjacent RV park and residential neighborhood at risk and to provide improved conveyance for the upstream drainage system from Junction Highway to Lois Street. Implementation of the proposed design is intended to provide at a minimum, protection for the 25-year storm event under ultimate conditions. No adverse downstream impacts have been identified.

The project scope of work is summarized as follows:

1. Tie into existing 66" CMP at Guadalupe Street and extend one 12' x 6' RCB approximately 800 LF upstream within Take It Easy Channel.
2. Backfill Take it Easy Channel above 12' x 6' RCB and reconstruct a trapezoidal overflow channel and stabilize channel with erosion control blankets.
3. Reconstruct remaining 700 LF of channel with a 3' tall rectangular channel with 2:1 side slopes tied to existing grade. Proposed channel geometry includes a rectangular channel constructed of a concrete segmental mechanically stabilized earth (MSE) wall system with a 12' bottom width, 3' depth and 2:1 side slopes reinforced with turf reinforced matting tied into existing grade.

The total opinion of probable engineering and construction costs for this project is estimated to be \$1.8 to \$2.3 million. See **Appendix B** for an itemized breakdown of quantities and costs.

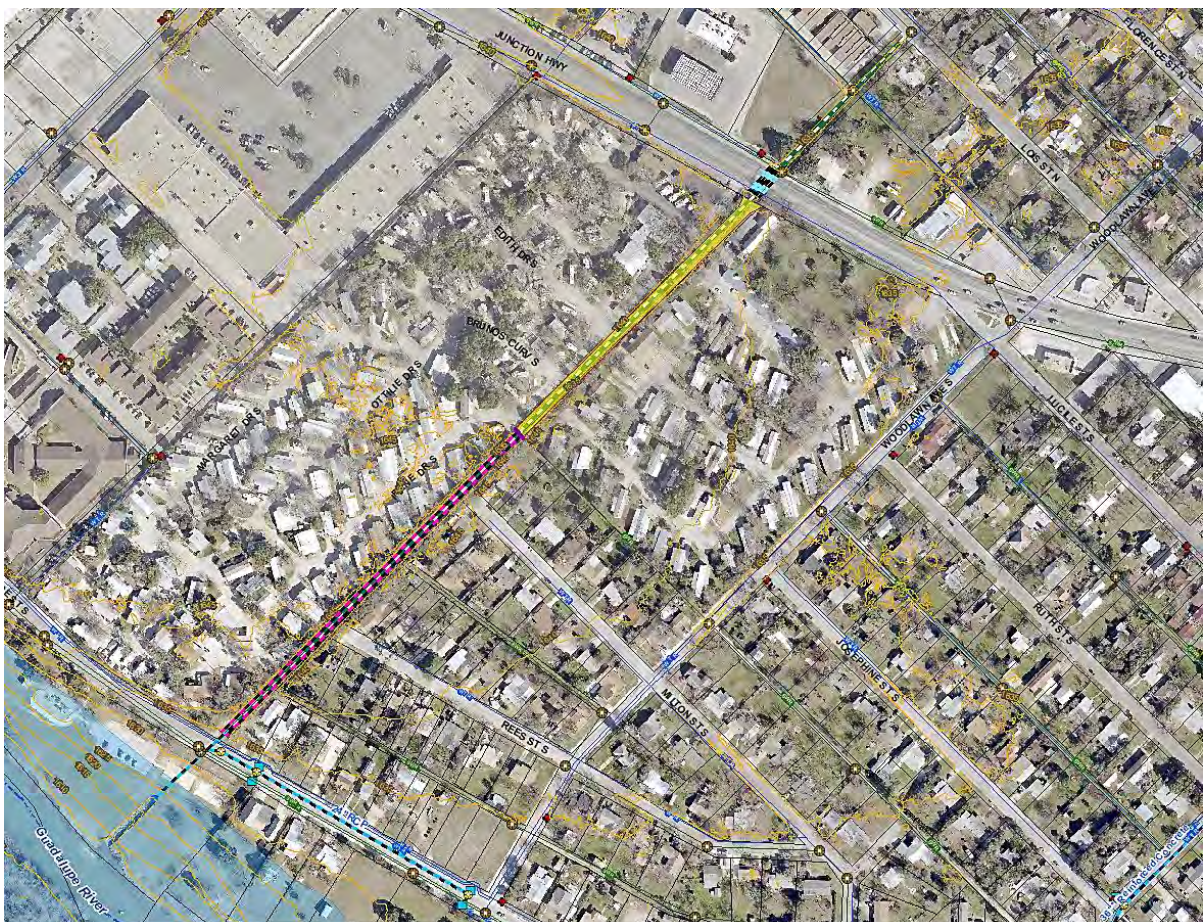


Figure 70 – Conceptual Channel Improvements at Take It Easy Channel

J. LOIS STREET (BETWEEN WOODLAWN AND OX)

The proposed conceptual solution evaluated is intended to address the frequent street flooding on Lois Street and the slow draining channel between Junction Highway and Lois Street. Proposed channel improvements are intended to effectively pass a 25-year frequency storm event under ultimate conditions. This project is dependent on Take It Easy Channel downstream improvements occurring first, which include lowering the channel bottom to accommodate larger box culverts at Junction Highway and increasing the channel depth from Junction Highway to Lois Street.

The project scope of work is summarized as follows:

1. Coordinate with TxDOT to determine replacement of existing five 3.5' x 5' Oval CMP pipes with approximately three 6' x 6' RCBs. In addition, lower the culvert to match the proposed flowline of Take It Easy Channel.
2. Upsize the existing concrete channel by constructing a trapezoidal channel with an 11-foot bottom width, 3-foot depth, and 20-foot top width, construct retaining walls along portions of limited easement or to protect significant trees.
3. Regrade a portion of Lois Street to increase positive flow towards the improved drainage channel.

The total opinion of probable engineering and construction costs for this project is estimated to be \$170,000 to \$200,000. See **Appendix B** for an itemized breakdown of quantities and costs. Replacement of TxDOT culverts at Junction Highway are to be coordinated and determined and are not included in the estimate.



Figure 71 – Conceptual Channel Improvements at Lois Street

K. HARPER STREET BETWEEN CULBERSON AVENUE AND LEWIS AVENUE (K1)

Proposed design at Harper Street is intended to relieve localized flooding and excessive ponding that occurs throughout Harper Street. A proposed storm drain system is intended to capture up to the 25-year storm event under ultimate conditions with discharge into Town Creek. No adverse downstream effects were identified in this conceptual analysis; however, a detailed analysis should be completed prior to final design and construction.

The project scope of work is summarized as follows:

1. Regrade existing roadway to remove low spots on the road near Pershing Avenue intersection.
2. Construct four 20-foot curb inlets (on grade) along Harper Street between Culberson Avenue and Pershing Avenue.
3. Construct two 10-foot curb inlets (in sag) at the intersection of Harper Street and Pershing Avenue.
4. Construct four 10-foot curb inlets (on grade) at the intersection of Patton Avenue and Harper Street.
5. Construct four 10-foot curb inlets (on grade) at the intersection of Lewis Street and Harper Street.
6. Construct four stormwater manholes along Harper Street at an intersection of Culberson Avenue, Pershing Avenue, Patton Avenue, and Lewis Avenue.
7. Construct baffle blocks at the storm drain outfall to reduce flow velocities and dissipate energy discharging into Town Creek.
8. Perform roadway asphalt mill and overlay resurfacing after installation of proposed storm drain system.
9. Construct full length curb and gutter on both sides along Harper Street.

The total opinion of probable engineering and construction costs for this project is estimated to be \$1.5 million to \$1.8 million. See **Appendix B** for an itemized breakdown of quantities and costs.



Figure 72 – Conceptual Street Drainage Improvements at Harper Street

K. CIRCLE AVENUE DRAINAGE CHANNEL (K2)

Proposed conceptual solution is recommended to alleviate sedimentation and erosion issues at the intersection of Culberson Ave and Circle Avenue. Vertical elevation drops 40 feet over 300 foot channel length which results in high-velocity flow along the natural grass channel. The proposed solution will adequately pass 25-year storm peak flow under ultimate conditions. The runoff will flow to its current downstream flow path which has no reports of flooding issues.

The project scope of work is summarized as follows:

1. Regrade 410 SY of Jackson Road to provide gradual transition to the proposed channel.
2. Remove 242 LF of existing concrete curb along Jackson Road.
3. Construct 242 LF of concrete curb and gutter section.
4. Construct 330 LF hard armored slope drain chute with stilling basin and baffle blocks.
5. Provide curb cuts along Circle Avenue for gradual transition of channel flow.

The total opinion of probable engineering and construction costs for this project is estimated to be \$190,000. See **Appendix B** for an itemized breakdown of quantities and costs.



Figure 73 – Conceptual Drainage Chute at Circle Avenue

L. JACK DRIVE – UNDERSIZED INLET

The conceptual solution is intended to relieve road and property flooding from occurring directly downstream of Jack Drive's existing undersized inlet. The proposed storm drain pipe system has been designed to collect runoff for up to the 25-year storm event with excess flow conveyed by surface drainage. The proposed system will capture runoff at Jack Drive via a 42" RCP storm drain with jack and bore construction methods for areas where significant structures, trees and other features would be highly impacted. Additional investigations are required prior to final design and construction. The alignment presented for the proposed storm drain is conceptual and is subject to change during final design.

The project scope of work is summarized as follows:

1. Regrade 8,065 SF of Jack Drive and construct roadway curbs to increase inlet interception within the roadway. Provide 35 SY of full depth roadway repair at Virginia Drive.
2. Regrade 6,200 SF and provide 90 SY of full depth repair of Lois Street for improved drainage conditions to proposed channel alignment.
3. Install one – 5' X 5' grate inlet in sag at lowest elevation at Lois Street.
4. Construct 1,230 LF of 42" storm pipe within the existing city owned drainage easement.
5. Construct 426 LF of 48" storm pipe by jack and bore between the residence of 1228 and 1230 Lois Street within a proposed drainage easement or within existing easements. Alignment presented is illustrated for estimating purposes only.
6. Regrade and construct 220 LF of earthen trapezoidal channel between Lois Street and Sunset Drive with a 5-foot bottom width and a 4-foot depth.

The total opinion of probable engineering and construction costs for this project is estimated to be \$2.4 million. See **Appendix B** for an itemized breakdown of quantities and costs.

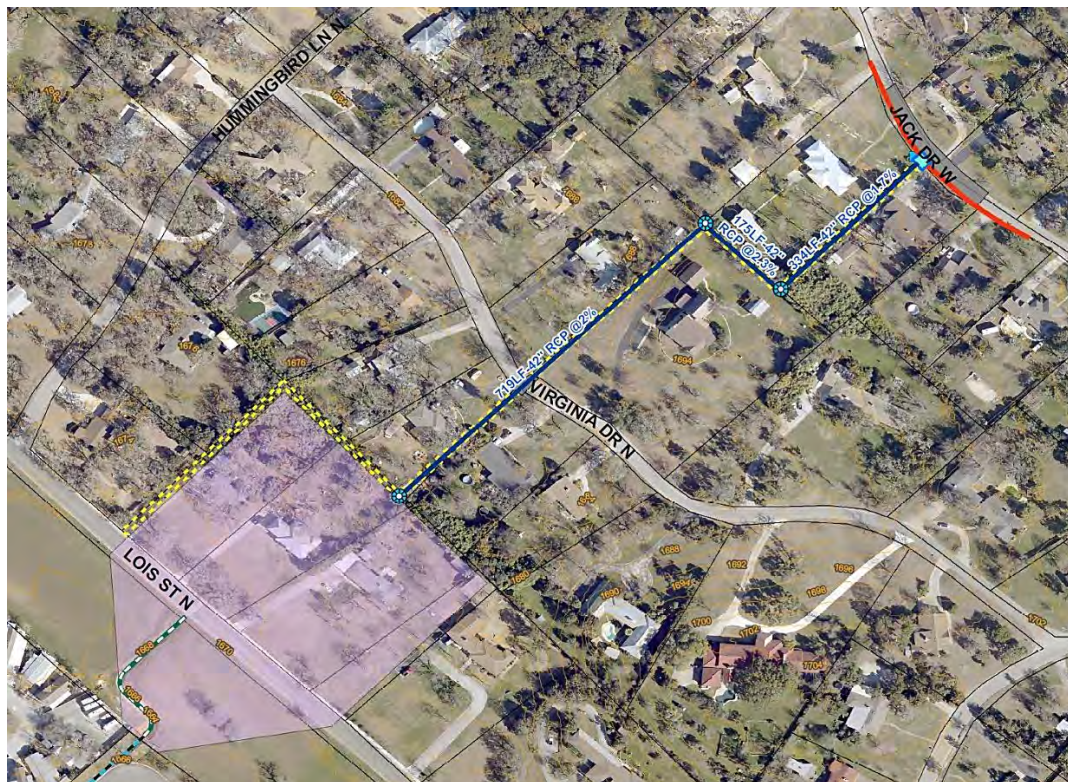


Figure 74 – Conceptual Drainage Improvements at Jack Drive

M. INTERSECTION OF CORONADO DR. AND JUNCTION HWY

Conceptual solution is intended to alleviate street ponding and nuisance flooding at Coronado Drive north of Junction Highway. The proposed solution has been sized to convey the 25-year storm event under ultimate conditions by constructing a trench drain and storm pipe system to capture runoff and discharge into the Guadalupe River. No downstream adverse effects were identified in this study.

The project scope of work is summarized as follows:

1. Regrade approximately 565 SY of Coronado Drive to increase inlet interception.
2. Construct 210 LF of concrete curb near the intersection at Coronado St and Junction Highway.
3. Regrade/relocate existing ditch located at the intersection to the low point on the road.
4. Install one – 3.5' x 30' trench drain at the intersection.
5. Install approximately 420 LF of 36" storm pipe along city own property by open cut and approximately 110 LF by jack and bore under TxDOT roadway.
6. Construct headwall with energy dissipation such as a stilling basin with baffle block at the outlet.
7. Provide rock riprap to provide erosion protection at the Guadalupe River.

The total opinion of probable engineering and construction costs for this project is estimated to be \$495,000. See **Appendix B** for an itemized breakdown of quantities and costs.



Figure 75 – Conceptual Drainage/Street Improvements at Coronado Drive

OPINION OF PROBABLE PROJECT COSTS

An opinion of the probable project costs were developed for each study location based on the conceptual improvements presented by this plan. **Table 5** provides the summarized costs for each problem area separated out by the following major categories: general, roadway, utilities, and drainage improvements. Estimations are provided in 2019 dollars and a cost index adjustment should be applied for improvements occurring into the future. Refer to **Appendix B – CITY-WIDE DRAINAGE CIPs** for the itemized cost breakdowns and exhibits for the proposed conceptual solutions.

Each project total construction cost subtotal is divided into five categories: General costs include Mobilization (11%), Insurances and Bonds (3%), Preparation of Right-of-Way (4%), Traffic Control Plan (3%), and Storm Water Pollution Prevention Plan (SW3P) (1%). Roadway construction costs are directly related to street maintenance and roadway construction improvements. Drainage costs are related to stormwater structures such as pipes, culverts, and channels. Design, permitting and land acquisition costs are related to all other elements required for the project completion. Land acquisition costs were estimated by multiplying the current total land value by 170%. The preliminary engineering study, design, engineering and surveying costs are based on percent construction fee curves and overall project complexity.

Project unit prices are based on 2019 average low bid prices obtained from TxDOT, Bexar County / City of San Antonio, and recent bid tabs for similar projects. All project total costs include a 25% contingency for unforeseen expenses. All project solutions are based on approximate methodologies and limited data and therefore are conceptual and subject to change. Probable construction costs should be adjusted for inflation and changing market conditions when projecting into the future.

Table 5 - Summary of Probable Project Costs

ID	Project Priority Rank	Project Name	General	Roadway	Utilities	Drainage	Design, Permitting, Land Acquisition Costs	Total Project Costs ¹
A	5	East Main to Pinto Trail	\$ 111,710	\$ 210	\$ 22,500	\$ 565,237	\$ 104,949	\$ 979,520
B	11	Park St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
C	11	First St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
D	13	Fourth St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
E	9	Spring St. - Erosion at Outfall	\$ 83,370	\$ -	\$ -	\$ 438,787	\$ 91,377	\$ 744,073
F1 & F2	3	Hill Country at SH16 Ph I	\$ 32,001	\$ 123,336	\$ 7,500	\$ 14,625	\$ 27,729	\$ 249,557
		Hill Country at SH16 Ph II	\$ 280,803	\$ 363,424	\$ 16,800	\$ 896,151	\$ 233,577	\$ 2,180,050
G & H	4	Kroc Center Detention Pond Clay St. (Schreiner to SH27)	\$ 1,183,734	\$ 1,121,475	\$ 547,000	\$ 3,712,132	\$ 861,570	\$ 8,967,501
I	1	Take It Easy Drainage Channel	\$ 297,871	\$ 118,320	\$ -	\$ 1,235,639	\$ 227,127	\$ 2,291,913
J	2	Lois St. (Woodlawn to Ox Dr.)	\$ 34,404	\$ 59,721	\$ 59,040	\$ 37,620	\$ 28,618	\$ 189,899
K1	10	Harper Street	\$ 232,936	\$ 332,090	\$ 179,800	\$ 505,310	\$ 193,760	\$ 1,808,431
K2	6	Circle Avenue	\$ 23,684	\$ 40,702	\$ 3,900	\$ 63,053	\$ 24,626	\$ 188,800
L	7	Jack Drive	\$ 293,948	\$ 128,901	\$ 68,500	\$ 1,138,724	\$ 336,202	\$ 2,373,793
M	7	Coronado at Junction Highway	\$ 63,372	\$ 53,485	\$ 24,800	\$ 209,770	\$ 54,911	\$ 494,195
Summary of Probable Cost			\$ 3,767,096	\$ 2,768,357	\$ 1,100,540	\$ 13,352,677	\$ 4,166,502	\$ 21,067,733

¹ Total project costs include all projected expenditures thru project completion

Notes: 2019 Dollars, assume 6% to 7% cost increase each year

PRIORITIZATION OF DRAINAGE CIP PROJECTS

A Stormwater Capital Improvement Plan (CIP) project priority list was developed for the City of Kerrville to assist with the development of a multi-year program that aims to address the goals and objectives for city-owned public facilities. This project list is intended to create and/or replace physical infrastructure assets with facilities that provide improvements that reduce the risks to public safety, improve economic development potential and enhance environmental features.

The goal of the provided project list and costs are to assist the city in the planning and budgeting process. The project list summarizes the improvements, provides estimated costs, schedule, and identified potential sources of funding.

The project scoring method applied has been developed to objectively assess and rank projects into a priority list. This priority list should not be considered as the final absolute ranking nor does it represent the expected order for implementation but instead should be utilized to assign relative priority.

Additional detailed information on the methodology and ranking system may be found in **Appendix D**.

PROJECT RANKING & PRIORITIZATION SUMMARY

Each proposed project has been prioritized by a scoring and ranking system to assess the city's relative infrastructure improvement priorities based on the identified principal categories of public safety, economic effect, project timing and environmental impacts.

The method applied consists of first weighting each primary category against the other primary category to develop a pairwise comparison. The pairwise comparison matrix developed is provided in **Table 6** which compares the principal categories in pairs to judge the higher priority or importance versus another principal category. Each pairwise comparison scores importance as 3 for more important, 2 equally important or 1 as less important.

Table 6 - Pairwise Principal Category Ranking

Criteria	Public Safety	Economic	Project Timing	Environment	CATEGORY WEIGHT
Public Safety		3	3	3	9
Economic	1		3	2	6
Project Timing	1	1		2	4
Environment	1	2	3		6

Each problem area is then scored based on sub-categories within the primary category as presented in **Table 7**. As an example, public safety includes scoring for risk associated with property and structural flooding, roadway flooding, roadway emergency services access, frequency of flood damages and erosion potential. A total weighted score can then be developed using the following formulas:

$$\text{Principal Category} \times \text{Sub Category Points} = \text{Total Category Score}$$

$$\text{Public Safety Total} + \text{Economic Total} + \text{Project Timing Total} + \text{Environment Total} = \text{Total Final Score}$$

Table 7 – Subcategory Ranking Descriptions

Category / Weight	Sub Category	Point Value Range Description	Point Value	Example Project	
				Project Score	Weighted Score
Public Safety (Weight 9)	Structural Flooding for 100-year (1% AEP), estimated (Pre-Project Conditions)	Low Risk (0 structures flooded) Moderate Risk (1-10 structures flooded) High Risk (10+ structures flooded or critical facility effected)	0 5 10	5	45
	Roadway Flooding for 100-Year (1% AEP) (Pre-Project Conditions)	No road overtopping Local road overtopping Collector road overtopping Arterial road overtopping	0 4 7 10	7	63
	Roadway Emergency Services Access for 25-year (4% AEP) storm-event (Pre-Project Conditions)	Access not impacted Access minimally impacted Alternative route required / limited access (duration $0 \leq x \leq 1$ hour) No access or alternative route available (duration $x \geq 1$ hour)	0 2 6 10	2	18
	Frequency of Flood Damages (Pre-Project Conditions)	Minimal (100-year < X) Moderate (25-year < X ≤ 100-year) High (1-year < X ≤ 25-year) Very High (X ≤ 1-year)	1 4 7 10	4	36
	Erosion / Channel Stability	No erosion Stable (minimal erosion) Unstable (risk of property loss) Highly unstable (risk of structure damage or accelerated property loss)	0 2 6 10	10	90
	Drainage Service (Post-Project Protection)	≤10 Year (10% AEP) 10 Year (10% AEP) - 25-Year (4% AEP) 25 Year (4% AEP) - 100-Year (1% AEP) ≥100-Year (1% AEP)	1 4 6 10	10	90
Economic (Weight 6)	Project Cost	High Cost (\$2 million < X) Moderate Cost (\$1 million < X ≤ \$2 million) Low Cost (≥ \$1 million)	2 6 10	6	36
	Funding Source / Availability	Unidentified funding sources General Fund Future Municipal Bonds (2020-? Bond Program) Cost-Share Potential (Federal or State grants, Inter-local agreements)	0 4 7 10	4	24
	Development/Redevelopment Post-Project (residential and commercial)	Negative impact (reduced development and/or business potential) No significant impact (no change to development and/or business potential) Positive impact (development potential, improved land value, sales, etc.)	0 5 10	10	60
Project Timing (Weight 4)	Permitting	Significant Permitting & Mitigation Federal permitting (Section 404 IP, other) Limited permitting local/state/federal (Nationwide, TCEQ WPAP) Local permitting only	0 2 6 10	10	40
	Land/Easement Acquisition	Condemnation/buy-outs may be required Limited easement/land acquisition needs (no impact to structures) No additional easements or acquisition anticipated	1 3 5	3	12
	Project Readiness (est. time until completion)	Long Range (X > 2 years) Mid-Range (1-year < X ≤ 2 year) Short-Range (X ≤ 1 year)	1 3 5	3	12
	Project Dependency	Project is dependent on other upstream/downstream improvements occurring before this project to mitigate flooding issues Project is independent of any upstream/downstream improvements to mitigate flooding issues Project must be constructed before other related projects to solve flooding issues in basin	0 5 10	5	20
Environment (Weight 6)	Water Quality Impacts Post-Project	Negative impact (WQ reduced due to increased impervious cover, etc.) No significant impact Positive impact (WQ enhanced with LID/BMP features)	0 7 15	7	42
	Riparian Impacts Post-Project (habitat, natural waterways, trees, wetlands, etc.)	Negative impacts (loss of natural riparian areas) No impacts (no significant change to natural riparian areas) Positive impacts (preserves or creates natural riparian areas)	0 7 15	0	0
Project Ranking Score					588

*AEP = Annual Exceedance Probability

Total ranking scores are determined by accumulating each subcategory rank augmented by appropriate category weight. Full ranking project scores and overall ranking values may be seen in **Appendix D**.

The intention of the weighting system method selected was to provide a customized quantitative and impartial process for ranking project priorities based on specific needs and considerations. The resulting process provides the relative project priority list as represented in **Table 8**

Table 8 - Prioritized Drainage CIP Project List

Ranking	ID	Project Name	Project Score	Estimated Project Cost
1	I	Take It Easy Drainage Channel	771	\$ 2,291,913
2	J	Lois St. (Woodlawn to Ox Dr.)	718	\$ 189,899
3	F	Hill Country at SH16	677	\$ 2,429,607
4 ²	G & H	Kroc Center Detention Pond Clay St. (Schreiner to SH27)	644	\$ 8,967,501
5	A	East Main to Pinto Trail	588	\$ 979,520
6	K2	Circle Avenue	587	\$ 188,800
7	L	Jack Drive	552	\$ 2,373,793
7	M	Coronado at Junction Highway	552	\$ 494,195
9	E	Spring St. - Erosion at Outfall	528	\$ 744,073
10	K1	Harper Street	524	\$ 1,808,431
11	B	Park St. Low Water Crossing	413	\$ 200,000 ¹
11	C	First St. Low Water Crossing	413	\$ 200,000 ¹
13	D	Fourth St. Low Water Crossing	368	\$ 200,000 ¹
Total Project Costs				\$ 21,067,733

¹ Alternative solution: High-Water Alert Lifesaving Technology (HALT) \$200,000

² Capital Improvement Projects G & H have been combined into one project.

EVALUATION OF DRAINAGE POLICY AND CRITERIA

NOAA ATLAS 14 CONSIDERATIONS

On September 27, 2018, the National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Design Studies Center released an update to Texas's rainfall frequency values, which redefines the amount of rainfall it takes to qualify as a 100-, 500-, and 1,000-year storm event. The newly updated data is intended to supersede the *USGS Water Resources Investigations Report 98-4044* (USGS 1998) and *NOAA Technical Paper No. 40 for Rainfall Frequency Atlas of the United States* (TP-40 1963) and represents the best available data for stormwater and floodplain design and analysis.

The study, published as *NOAA Atlas 14, Volume 11 Precipitation-Frequency Atlas of the United States* (Atlas 14), has found that previously identified 50-year rainfall values in the City of Kerrville drainage manual were equivalent to the 25-year rainfall estimates for Atlas 14 for the City. 24-hour precipitation depth for the 100-year storm has increased from 9.36 inches to 12.1 inches, which shows a rise of 2.74 inches as shown in **Figure 76**. Previously designed drainage structure may show hydraulic inadequacy when compared to the new rainfall estimates.

Comparison of rainfall intensities are provided in **Table 9**.

Table 9 - Comparison of Rainfall Intensities (inches per hour)

Duration	25 Yr			50 Yr			100 Yr		
	Atlas 14	City of Kerrville	Difference	Atlas 14	City of Kerrville	Difference	Atlas 14	City of Kerrville	Difference
5-min	10.90	11.3	-0.40	12.40	12.76	-0.36	14.00	14.17	-0.17
10-min	8.73	8.82	-0.09	9.98	9.94	0.04	11.30	11.11	0.19
15-min	7.21	7.31	-0.10	8.22	8.24	-0.02	9.28	9.24	0.04
30-min	5.00	4.99	0.01	5.68	5.61	0.07	6.40	6.31	0.09
60-min	3.31	3.20	0.11	3.78	3.59	0.19	4.27	4.05	0.22
2-hr	2.16	1.97	0.19	2.51	2.21	0.30	2.89	2.5	0.39
3-hr	1.67	1.47	0.20	1.95	1.65	0.30	2.27	1.86	0.41
6-hr	1.03	0.88	0.15	1.22	0.99	0.23	1.44	1.11	0.33
12-hr	0.60	0.52	0.08	0.72	0.58	0.14	0.86	0.66	0.20
24-hr	0.35	0.31	0.04	0.42	0.35	0.07	0.50	0.39	0.11

Comparison of precipitation depth are provided in **Table 10**.

Table 10 - Comparison of Precipitation Depths (inches)

Duration	25 Yr			50 Yr			100 Yr		
	Atlas 14	City of Kerrville	Difference	Atlas 14	City of Kerrville	Difference	Atlas 14	City of Kerrville	Difference
5-min	0.907	1.83	-0.92	1.04	2.40	-1.36	1.17	3.01	-1.84
10-min	1.46	1.11	0.35	1.66	1.46	0.20	1.88	1.84	0.04
15-min	1.8	0.77	1.03	2.06	1.00	1.06	2.32	1.27	1.05
30-min	2.5	0.36	2.14	2.84	0.47	2.37	3.2	0.59	2.61
60-min	3.31	0.15	3.16	3.78	0.19	3.59	4.27	0.24	4.03
2-hr	4.33	3.94	0.39	5.02	4.42	0.60	5.77	5.00	0.77
3-hr	5	4.41	0.59	5.87	4.95	0.92	6.82	5.58	1.24
6-hr	6.16	5.28	0.88	7.32	5.94	1.38	8.63	6.66	1.97
12-hr	7.27	6.24	1.03	8.69	6.96	1.73	10.3	7.92	2.38
24-hr	8.44	7.44	1.00	10.1	8.40	1.70	12.1	9.36	2.74

Table 11 shows the 24-hour rainfall data comparison for the City of Kerrville and 2018 Atlas 14 precipitation estimates and **Figure 76** provides a graphical comparison of rainfall frequency rain events for TP-40 versus Atlas 14 precipitation data.

Table 11 - Comparison of 24-Hr Rainfall Data

Frequency Event	Annual Chance of Probability	Average 24-Hour Precipitation Depth (Inches)	
		City of Kerrville	Atlas 14 (2018)
500 Yr	0.2%	13.5*	17.6
100 Yr	1%	9.36	12.1
50 Yr	2%	8.40	10.1
25 Yr	4%	7.44	8.44
10 Yr	10%	6.48	6.49
5 Yr	20%	5.28	5.23
2 Yr	50%	3.84	3.92
* USGS Precipitation			

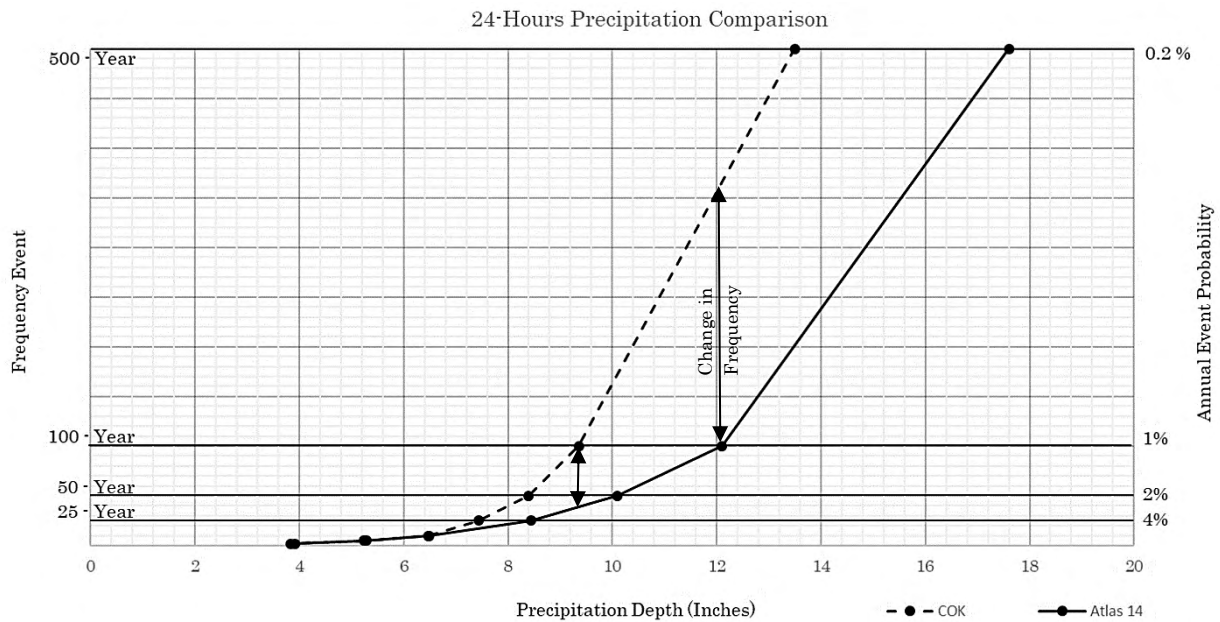


Figure 76 - Comparison of 24-Hr Precipitation with Atlas 14 Estimates

RECOMMENDATION:

- Adoption of Atlas 14 and updating city ordinances and drainage criteria manual to reflect best available data.
- All plats submitted prior to amending city code with Atlas 14 values may use the rainfall data effective at the time of submittal. However, a design check should be required to check for adverse impacts utilizing the Atlas 14 data. If an adverse impact is determined, appropriate mitigation should be considered as appropriate.
- Phased developments, such as residential subdivisions, should be required to bring the drainage system into compliance based on a city determined timeline.
- Single-phased developments previously approved and currently under construction that has been deemed out of compliance will be handled on a case by case basis to determine mitigation steps or if an Administrative Exception will be granted.
- Floodplain remapping utilizing Atlas 14 rainfall data should occur to update the Digital Flood Insurance Rate Maps (DFIRM) for the City of Kerrville and Kerr County. This effort to remap the floodplains is anticipated to take approximately one year once the process is started. Therefore, a lag period where the effective floodplain maps are not reflecting the flood risk using best available rainfall data. During this period where Atlas 14 is adopted but remapping has not occurred, it is recommended that plats, permits, and adverse impact analyses utilize Atlas 14 data while FEMA CLOMR/LOMR submittals utilize previously adopted city rainfall data.
- Finished floor elevations (FFE) for residential and commercial buildings:
 - o Prior to Atlas 14 adoption, FFE should be based on ultimate conditions base flood elevations (BFE) using current rainfall data, plus 1 foot of freeboard.
 - o After Atlas 14 adoption, FFE should be based on ultimate conditions BFE using Atlas 14 rainfall data, plus 1 foot of freeboard.

CODE OF ORDINANCES AND DESIGN CRITERIA

The currently effective city stormwater drainage policy and criteria were reviewed to identify where improvements may be needed and recommend changes as appropriate. This review of the municipal codes, subdivision ordinances, and drainage design criteria is intended to provide a general list of recommendations and the intentions of this review are not to prepare changes ready for adoption. Instead, these are to be used as guidance and for planning future policy and criteria updates.

The detailed and itemized comments are provided in **Appendix C**.

MUNICIPAL CODES

The City's Municipal Codes *Section 54 Floods*, and *Chapter 118 Waterways* were reviewed to identify potential improvements to the codes.

The recommended changes, additions and modifications to Article II Floodplain Management Sections 31 Purpose and Methods, 32 Definitions, 33 General Provisions, 34 Administration, 35 Provisions for flood hazard reduction, and Chapter 118 Article II City water impoundment regulations Sections 32 Definitions with added sections for provisions for enforcement, provisions for defining allowable development within the regulatory floodplain, and provisions for prohibited development within the regulatory floodplain.

SUBDIVISION ORDINANCES

The City's Subdivision Ordinance was last updated in October 2008. Articles for plat approval procedure, minimum design standards, minimum development procedures, and recommended additional sections were reviewed for potential updates to the city ordinances.

The recommended changes provide considerations for additions and modifications to the development of drainage facilities to protect properties from adverse impacts, additions to flood control requirements, detention/retention, impervious cover, drainage considerations during construction, drainage improvement responsibilities, maintenance responsibilities, and water quality improvements.

DRAINAGE DESIGN CRITERIA

The City's *Drainage Design Criteria Manual* was last updated in 2013. The design criteria was reviewed for potential updates and improvements.

The recommend changes include additions, modifications and deletions to the determination of design discharge, time of concentration methodology and calculations, rainfall intensity updates to NOAA Atlas 14 data, unit hydrograph loss methods, street drainage requirements, channel flow, access easements, interceptor channel requirements, maintenance considerations, bridge/culvert design frequency, freeboard and roadway overtopping requirements, velocity protection and control devices, and detention pond requirements.

WATER QUALITY CONSIDERATIONS

The City of Kerrville is situated along the banks of the Guadalupe River which is fed by natural springs emanating from the Edwards Aquifer. Groundwater from the Edwards Group is estimated to provide the Guadalupe River watershed an average annual flow of 78,921 acre-feet or about 7 million gallons per day. In addition, Kerr County historically has been recorded to be one of the most abundant areas with natural springs resulting from the Edwards-Trinity Aquifers. These springs produce sparkling clean water that feeds into the city's creeks as it meanders through the rugged terrain and rolling hills towards the Guadalupe River (**Figure 77**). As such, the importance of the water quality, groundwater recharge, and the recreational and scenic amenities of the Guadalupe River are among the most important priorities of the city as identified in the *2050 Comprehensive Plan*.

To protect and enhance water quality, the city is challenged with determining methods for preserving natural stream areas, reducing the impacts of impervious cover, and the associated non-point source pollution.

The City of Kerrville is located within the Upper Guadalupe River Authority jurisdictional area which presently provides initiatives for improving water quality in Kerr County including the construction of water and sediment control basins designed to slow down overland flow and control the release of floodwater downstream.

Table 12 presents the list of impaired streams as classified by the EPA and **Figure 78** illustrates the U.S. Fish and Wildlife Service Wetlands Inventory of potential riparian and wetland areas within the city.

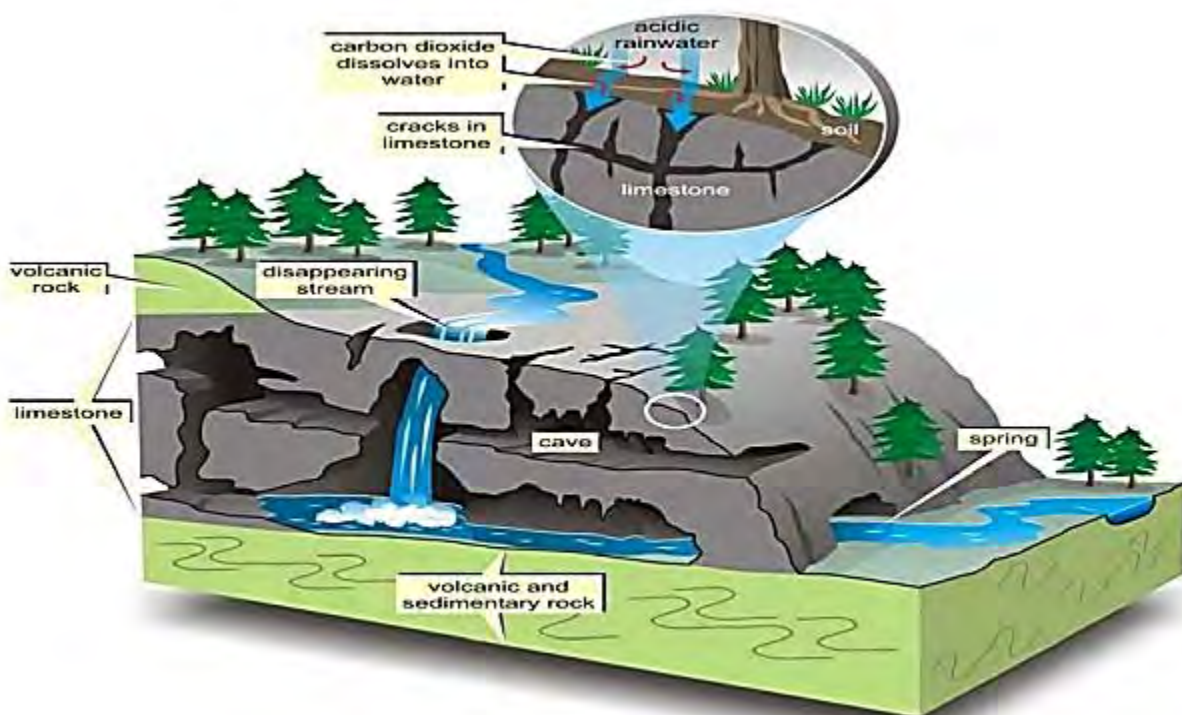


Figure 77 - Karsted Terrain and Subsurface Aquifer Characteristics (Source: Kerr County Hydrogeology Report, 2008)

Table 12 - Waterbody Impairment Report (Source: EPA)

Stream Name	Date Assessed	Reported Condition	Pollution Categories	What's Being Done
Goat Creek	N/A	Unknown	Unknown	No TMDL Cleanup Plans; dischargers regulated by permits; no polluted runoff control projects
Town Creek	2010	Impaired for primary recreation/ swimming	Bacteria and other microbes	No TMDL Cleanup Plans; no dischargers regulated by permits; no polluted runoff control projects
Quinlan Creek	2010	Impaired for primary recreation/ swimming	Bacteria and other microbes	No TMDL Cleanup Plans; dischargers regulated by permits; polluted runoff control projects exist
Third Creek	N/A	Unknown	Unknown	No TMDL Cleanup Plans; no dischargers regulated by permits; polluted runoff control projects exist
Second Creek	N/A	Unknown	Unknown	No TMDL Cleanup Plans; no dischargers regulated by permits; polluted runoff control projects exist
Unnamed Tributary (Lime Creek)	N/A	Unknown	Unknown	N/A
Elm Creek	N/A	Unknown	Unknown	N/A
Bear Creek	N/A	Unknown	Unknown	No TMDL Cleanup Plans; no dischargers regulated by permits; no polluted runoff control projects
Camp Meeting Creek	2010	Impaired for aquatic life use; primary recreation/ swimming use good	Low oxygen	No TMDL Cleanup Plans; no dischargers regulated by permits; polluted runoff control projects exist
Guadalupe River Basin at UGRA Dam	2010	General use good; other categories not assessed	No impairment data reported	2007 TMDL Cleanup Plan for Bacteria and Other Microbes; no dischargers regulated by permits; polluted runoff control projects exist.
Kerrville Lake	2007	Unknown		2007 TMDL Cleanup Plan for Bacteria and Other Microbes; no dischargers regulated by permits; polluted runoff control projects exist

TMDL – Total Max Daily Load

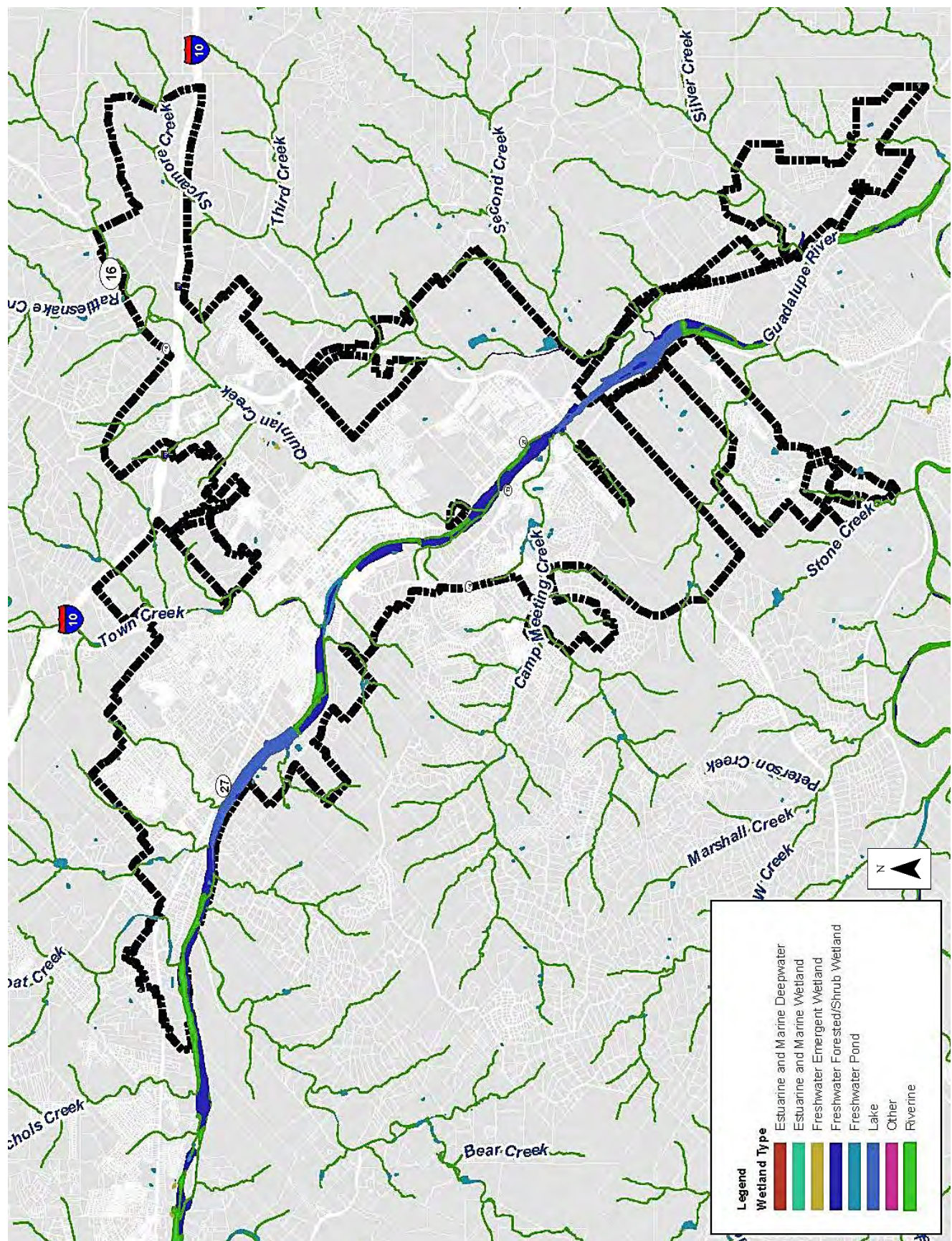


Figure 78 - USFWS Wetlands Inventory

RECOMMENDATIONS:

- Develop a Water Quality Protection Plan to identify recommended areas for protection, identify potential strategic retrofit solutions, water quality measures integrated into identified capital improvement projects, and updates to the city's land development code.
- Evaluate opportunities for each multi-purpose and stormwater project at the preliminary design phase to assess the viability of providing water quality best management practices (BMPs) and give priority to implementing water quality improvements within identified protection zones as developed in the Water Quality Protection Plan.
- Provide municipal code requirements for protecting existing natural riparian areas with natural channel design solutions, stream buffer requirements, and stream protection volume.
- Identify areas in the city for regional detention facilities that will mitigate increases in runoff volume and reduce the need to impact natural riparian areas downstream.
- Continued monitoring and enforcement of the city's municipal separate storm drain system (MS4) program which is intended to provide public outreach and education, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management in new development and redevelopment, and pollution prevention and good housekeeping measures for municipal operations.
- Study and update land development codes to provide watershed specific water quality regulations including such additions as fee-in-lieu of water quality, fee-in-lieu of detention, stream buffer protection, water quality protection zones, and stream protection volume.
- Implement a Water Conservation Plan and Erosion Control Plan.

IMPLEMENTATION STRATEGY

This Stormwater Master Plan is the first city-wide planning update in more than 35 years. As such, there is a significant amount of stormwater management policy updates, planning and capital project requirements to address over the coming years. The Implementation Strategy presented by this plan is intended to provide recommendations for the phasing of programs and projects to address and prioritize stormwater management needs over the short-term and long-term up to 20 years.

STORMWATER PROGRAMS AND PLANNING

The Stormwater Master Plan serves to identify overall goals, priorities and a strategy for addressing the city's stormwater management needs which extends beyond identifying and completing capital improvement projects. In addition, there are a number of identified stormwater programs and planning studies needed to effectively address flood control, water quality, erosion, and future development that are not covered by this plan. These program and planning items have been identified in **Table 13**. The projects are identified in relative priority levels and should be addressed as resources and potential funding becomes available. Refer to the next section, **Potential Funding Sources**, for funding guidance.

Table 13 - Stormwater Project Planning List

Project Name	Type	Description	Priority Level	Estimated Cost Range
Dam Inspection and Maintenance Program	Program	Develop a standard dam inspection and maintenance program to be completed by staff.	High	\$15,000 / year
Kerrville Flood Protection Plan Study (Hydrologic and Hydraulic Studies - FEMA Streams)	Study	Restudy all significant streams within the city and reassess community flood risk using NOAA Atlas 14 precipitation data, updated hydrologic modeling, updated terrain information, and detailed hydraulic modeling. Identify potential future projects to be completed to mitigate flooding and general management of the basin.	High	\$400,000-\$800,000
Louise Hays Dam Repairs	Design & Construction	Repair of concrete buttress dam structure due to seepage and spalling of concrete.	High	\$1,000,000
Stormwater Drainage Design Manual Update	Manual	Update the city's drainage design and criteria manual to reflect current industry best practices and projected city growth.	High	\$50,000
Storm Drain System Inventory and Assessment	Data Collection	Update the city's current storm drain system inventory in GIS and assess the condition of existing infrastructure including storm drains, culverts, detention ponds, and other drainage facilities to identify storm drains needing replacement.	Medium	\$10,000 / year

Project Name	Type	Description	Priority Level	Estimated Cost Range
Regional Detention Pond Study and Fee-in-Lieu of Program	Study	Perform a study of the city's watersheds and anticipated growth for each basin to identify detention needs, where regional detention may be provided and where mandatory detention should be required to mitigate adverse impacts.	Medium	\$60,000
Design Review Checklist	Manual	Develop a detailed stormwater design review checklist to verify proposed developments meet city criteria and ordinance requirements.	Medium	\$5,000 to \$10,000
Stormwater Utility Fee Study	Study	Study the potential for implementing a city-wide stormwater utility fee program to generate revenue responsible for maintaining the city's existing storm drainage system and to assist with the funding of capital projects. The fee is roughly estimated to generate \$500,000 to \$1,000,000 per year.	Medium	\$70,000
Flood Warning System	Design & Construction	Install automatic flood gate warning systems at Quinlan Creek, Town Creek, and other known low water crossings.	Medium	\$200,000 per location
Water Quality Protection Plan	Study	Study to implement water quality protection measures within the watersheds and protect natural riparian areas.	Medium	\$80,000
Flood Complaint Database	Data Collection	Maintain a city complaint database to document flooding incidents, identified issues, and photographs to assist with identifying priority projects and hot spot areas.	Low	\$5,000 / year

CAPITAL IMPROVEMENT PROJECTS

The stormwater capital improvement projects presented in this report will require additional effort to plan, design, and permit before they may be constructed. These identified priority projects and identified conceptual-level costs are intended to be incorporated into the City's CIP for further project development.

The management and implementation of capital projects is the responsibility of the City's Public Works and Engineering Departments. An outcome of this master planning process will be to provide the city with a repeatable methodology for rating, ranking, and prioritizing stormwater capital projects.

The rating and ranking method applied to projects identified for consideration have been used to develop a project priority list. The priority list presented in this report is not necessarily the final ranking nor does it represent the expected order for implementation but indicates a relative priority.

The final Stormwater CIP includes the top 14 project recommendations summarized in **Table 8**. The top five projects are regarded as having the highest priority.

Additionally, several factors can influence the actual implementation sequence. For example, a financial constraint or a partnership opportunity could emerge and influence project sequencing or flood control projects should be addressed by beginning with improving conveyance at the downstream end of a system to reduce the backwater in the upstream reaches. The priority rankings are thus a relative guide.

Finally, because the city's goals, resources, and issues are constantly changing, this plan is designed to be re-evaluated each year to reaffirm or reprioritize the stormwater capital improvement project list. Additional projects may be added and existing projects may be revised utilizing the Project Worksheet template located in **Appendix E**.

POTENTIAL FUNDING SOURCES

As part of this report’s planning effort, potential funding sources have been identified for consideration by the City. The list presented is intended for informational purposes only and is intended to provide guidance on where funding may be acquired through local municipal tax and user-fee funding, general obligation bonds, revolving state and federal grants, disaster recovery grants, and inter-agency public partnerships. **Table 14** provides a storm water utility fee comparison of revenue generated per capita for comparable cities and **Table 15** summarizes the available stormwater potential funding sources by program, agency, and annual ceiling limits.

To address the city’s stormwater management needs it is important to identify a consistent source of funding to ensure that short-term and long-term plans can be implemented. Additionally, stormwater infrastructure should be treated as a large-scale community asset that should be evaluated at the watershed level to effectively manage flood control, erosion, and water quality issues.

Each of the projects identified for consideration and future funding will need to be evaluated on an annual basis to reassess projects for implementation based upon city available funding, external funding sources, various agencies and donations, and cost-share opportunities through interlocal agreements with the county.

Methods for implementing a steady fund for addressing the highest priority and basic maintenance needs may be accomplished by the following:

- **Stormwater Utility Fee** – A fee assessed, similar to water or sewer enterprise funds, based on the amount of stormwater a property generates which is directly related to impervious cover from such things as buildings and parking lots. This sustainable funding mechanism is dedicated to recovering the costs of stormwater infrastructure regulatory compliance, planning, maintenance, capital improvements, repair, and replacement. Based on cities of similar size and revenues generated, it is estimated that the City of Kerrville would raise approximately \$800,000 per year based on revenue per capita which would include revenue from both residential and commercial properties (**Table 14**).

Table 14 - Stormwater Utility Fee City Comparison

	Population Estimate	Revenue*	Revenue / Capita
Georgetown	58,723	\$ 3,377,480	\$ 57.52
Keller	44,940	\$ 1,474,997	\$ 32.82
Lancaster	59,708	\$ 1,576,407	\$ 26.40
San Marcos	54,076	\$ 5,800,000	\$ 107.26
University Park	25,201	\$ 453,052	\$ 17.98
Colleyville	26,674	\$ 972,082	\$ 36.44
Schertz	37,938	\$ 1,141,000	\$ 30.08
Fredericksburg	14,014	\$ 477,607	\$ 34.08
Median	41,239	\$ 1,307,999	\$ 33.45
Kerrville (Estimated)	24,292	\$ 812,594	\$ 33.45

**2016-17 actual revenues or projected 2019 revenues*

- **Property Taxes/General Fund** – A portion of property taxes can be transferred into the stormwater management fund. These funds are generally subject to great competition from other worthy municipal programs. It is common for stormwater management to take a lower priority and thus

creates a less reliable source of funding. In addition, stormwater services typically bear no relationship to the assessed value of the property and therefore might not be equitable.

- **Bond Programs** – General Obligation Bonds (GO), Revenue Bonds (RB), Certificates of Obligation (CO) are various types of debt the city may elect to incur to fund major capital expenditures. A voter-approved general obligation bond program such as a Capital Improvements Bond may be chosen to meet the demand for growth and services as appropriate.
- **Grants and Low-Interest Loans** – Various revolving stormwater management grants are available through the Texas Water Development Board (TWDB), Department of Housing and Urban Development (HUD), the General Land Office (GLO), U.S. Army Corps of Engineers (USACE), and other agencies. The potential for grant funding should be examined annually to identify matching requirements, application due dates, and which projects should seek grant aid.
- **Disaster Recovery Grant Funding** – FEMA and the Texas Department of Emergency Management (TDEM) administer grant funding as related to Disaster Declaration Proclamations which are often declared by Governor's or Presidential orders to provide community assistance. Inevitably, disasters will occur, and when they do, the City should seek to apply for state and federal assistance.
- **Interlocal Cooperation Agreements** – The City and Kerr County are able to enter into interlocal agreements for the purposes of cost sharing planning and construction projects that affect both jurisdictional areas. An example of a cost-share agreement may be related to flood protection planning for major rivers and streams that are shared by both political subdivisions.

Table 15 - Stormwater Potential Funding Sources

Source Type	Program Name	Agency	Annual Ceiling (\$)	Schedule	Suggested Use of Funds / Notes
Local	City issued bond financing	COK	TBD	TBD	Issue general obligation bonds issued with the approval of the electorate for capital improvement and general public improvements for use to fund the design and construction of the project including Stormwater Revenue Bonds and General Obligation Bonds.
Local	General Fund	COK	TBD	Annual	A portion of property taxes can be transferred into the stormwater management fund. These funds are generally subject to great competition from other worthy municipal programs.
Local	Stormwater Utility Fee	COK	Est. \$500k to \$1M	Annual	A fee assessed, similar to water or sewer enterprise funds, based on the amount of stormwater a property generates which is directly related to impervious cover from such things as buildings and parking lots.
Local	Sales Tax for Drainage and Water Quality Projects	COK	Est. \$300,000 / year	TBD	Propose to transfer sales tax revenue to a special tax/drainage district.
Gov. Fed	Hazard Mitigation Grant Program (HMGP)	TDEM / FEMA	Varies	Disaster Declaration Required	FEMA provides funding to support cost-effective post-disaster projects provided on a 75/25 match in funding for mitigation projects. Benefit-Cost Ratio must be greater than 1.0.
Gov. State	Flood Protection Grant	TWDB	TBD	Annual	Flood protection grants for flood protection planning, flood early warning systems, flood response (during or after a flood event)
Gov. Fed	Flood Mitigation Assistance Grant Program (FMA)	TWDB/ FEMA	Varies	Annual	Community Flood Mitigation: Advance Assistance \$100,000; Projects a cost share up to \$10,000,000; Technical Assistance up to \$50,000; Flood Mitigation Planning up to \$100,000.
Gov. Fed	Pre-Disaster Mitigation Program (PDM)	FEMA	Varies	Annual	Assists with implementing a sustained pre-disaster natural hazard mitigation program. Funding maximum \$4 million for mitigation projects; \$150,00 for mitigation plan updates.
Gov. Fed	Community Development Block Grant	TDA/ HUD	\$350,000	Annual	Assists with housing, economic development, and measures to reduce damages in future storms.
Gov. Fed	Continuing Authorities Program (CAP)	USACE	\$10M	Annual	The Corps' CAP program provides a plan, design, and implementation for certain types of water resources projects for such things as flood control, dredging, streambank and erosion protection, and environment. Feasibility phase is limited to \$100,000 and then a 50/50 cost-share.
Gov- State	Inter-local Agreement (Kerrville-Kerr County)	TBD	TBD	TBD	Contractual relationship entered into between two or more local units of government and/or between a local unit of government and a non-profit organization for the joint usage and/or development of sports fields, regional parks, or other facilities
Gov- State	Inter-local Agreement (Kerrville-Kerr County)	TBD	TBD	TBD	Contractual relationship entered into between two or more local units of government and/or between a local unit of government and a non-profit organization for the joint usage and/or development of sports fields, regional parks, or other facilities

PROPOSED STORMWATER PROJECT IMPLEMENTATION PLAN

Provided below is a generalized overview of the project development and implementation process. The phases supported by this Stormwater Master Plan are related to Phase 1 Strategic Planning solutions.

Project Development Process

- **PHASE 2 / 3: Preliminary Engineering Analysis and Report (9-18 months)**
 - o Identify detailed modeling and quantification of problems
 - o Identify environmental permitting, land acquisition and utility adjustment needs.
 - o Begin environmental assessment / environmental impact statement and other permits, as necessary.
 - o Evaluate feasible design alternatives and select the option for implementation.
 - o Develop a construction phasing plan if the project needs to be done at different times.
 - o Begin negotiation process, if required, for land acquisition, easements, and right-of-way.
 - o Secure land acquisition and easement needs.
- **PHASE 3 / 4: Design Phase (6-12 months)**
 - o Develop construction documents including plans, specifications, bid documents, and detailed cost estimates.
 - o Receive environmental and permitting clearances, as required.
 - o Coordinate with utility providers on required utility adjustments.
- **PHASE 4: Construction Phase (6-24 months per phase)**
 - o Begin construction activities.
 - o Monitor and inspect the progress of construction.
 - o Future Maintenance Procedure Establishment

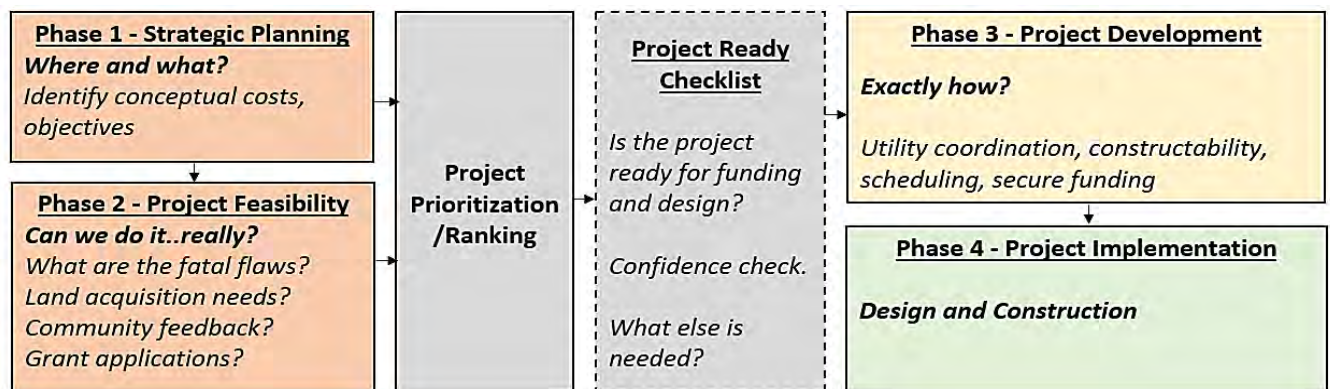


Figure 79 - Capital Improvement Program Lifecycle Process

Table 16 - Proposed Project Implementation Plan

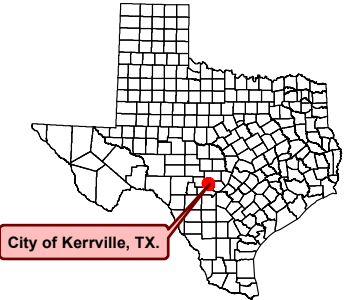
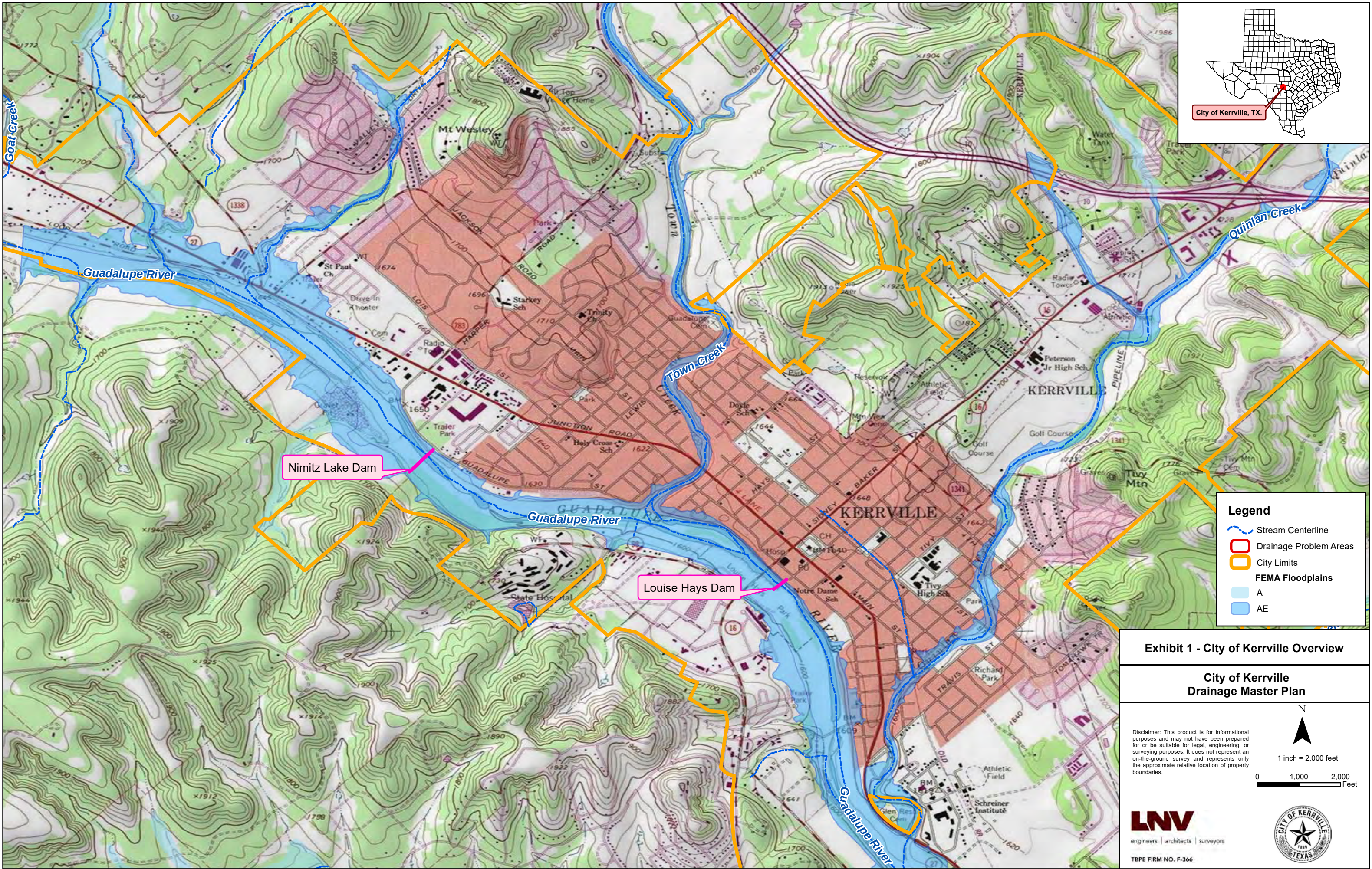
	Project Name	Estimated Total Project Cost
Stormwater Programs and Planning Studies	Dam Inspection and Maintenance Program	\$15,000/YR
	Flood Protection Plan Study (H&H, remapping) ¹	\$400,000 to \$800,000
	Storm Drain System Inventory and Assessment	\$10,000/YR
	Regional Detention Pond Study and Fee-in-Lieu of Program	\$60,000
	Stormwater Drainage Criteria Manual Update	\$50,000
	Design Review Checklist	\$5,000 to \$10,000
	Stormwater Utility Fee Study	\$70,000
	Flood Complaint Database	\$5,000/YR
	Water Quality and Erosion Control Program Study	\$80,000
	Flood Warning System (4 Locations)	\$200,000
Stormwater Capital Improvement Projects	Louise Hays Dam Structural Repairs Phase 1 - Planning/Design	\$1,000,000
	Phase 2 - Construction	
	Take it Easy Channel Improvements	\$2,291,900
	Lois Street Drainage Improvements ²	\$189,900
	Hill Country Drive Phase 1 – Drainage Improvements	\$249,600
	Hill Country Drive Phase 2 - Downstream Improvements ²	\$2,180,100
	Kroc Center Detention Pond	\$8,967,500
	Clay Street Drainage Improvements	\$979,500
	Pinto Trail Channel Improvements	\$188,800
	Circle Avenue	\$2,373,800
	Jack Drive Drainage Improvements	\$494,200
	Coronado Drive Drainage Improvements ²	\$744,100
	Spring Street Erosion Control	\$1,808,400
	Harper Street Drainage Improvements	\$200,000
	Park Street Low Water Crossing	\$200,000
	First Street Low Water Crossing	\$200,000
	Fourth Street Low Water Crossing	\$200,000
	TOTALS (ROUNDED)	\$23,400,000

* 2019 dollars; Assume 6% to 7% increase each additional year

¹ Partnership opportunities with Kerr County

² Partnership opportunities with TxDOT

APPENDIX A - EXHIBITS



Legend

- Stream Centerline
- Drainage Problem Areas
- City Limits
- FEMA Floodplains**
 - A
 - AE

Exhibit 1 - City of Kerrville Overview

**City of Kerrville
Drainage Master Plan**

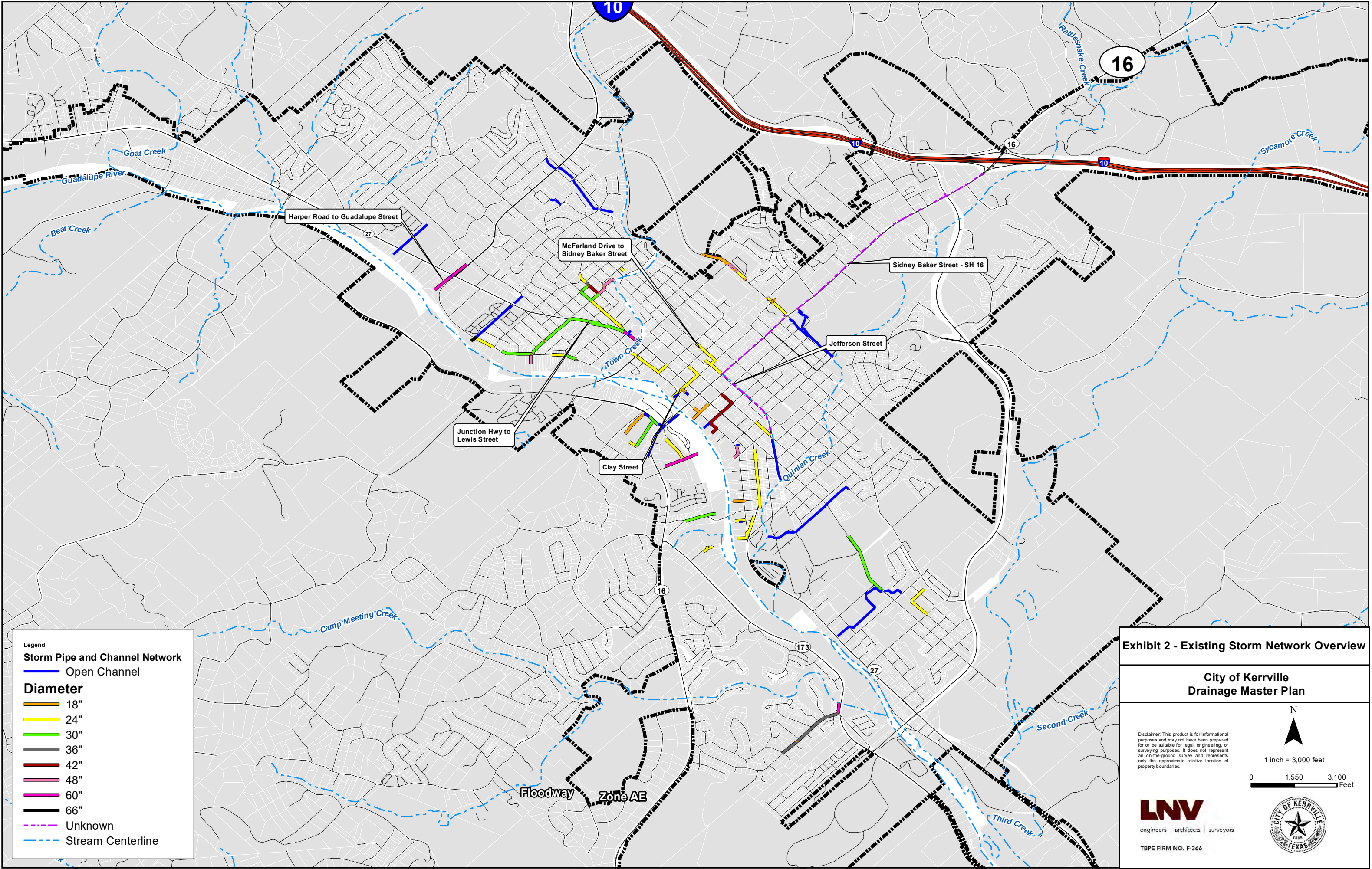
Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

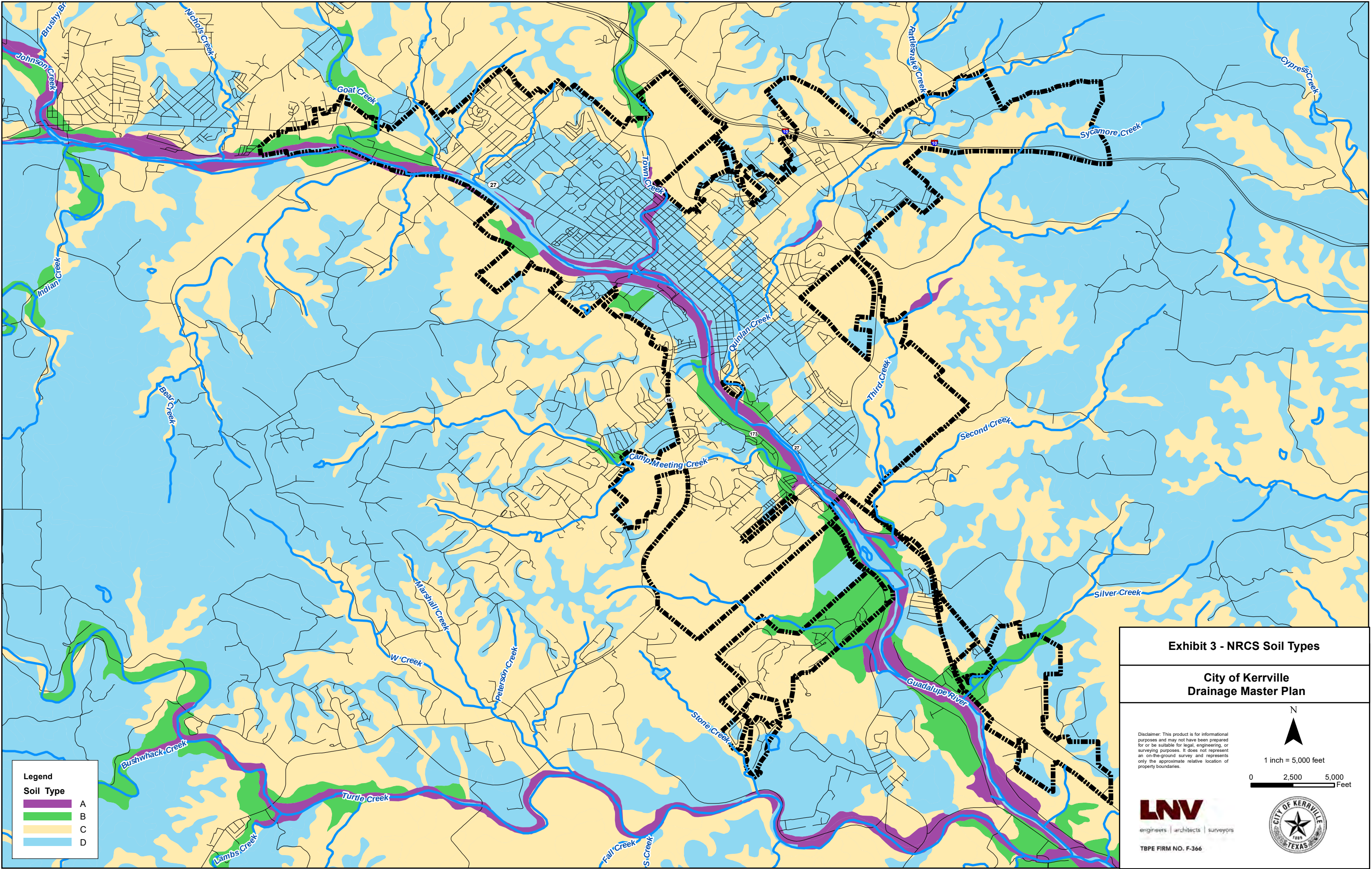
N
1 inch = 2,000 feet
0 1,000 2,000 Feet

LNv
engineers | architects | surveyors

CITY OF KERRVILLE
TEXAS

TBPE FIRM NO. F-366





NOTES TO USERS

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NGS Information Services
NOAA, NNGS12
National Geodetic Survey, SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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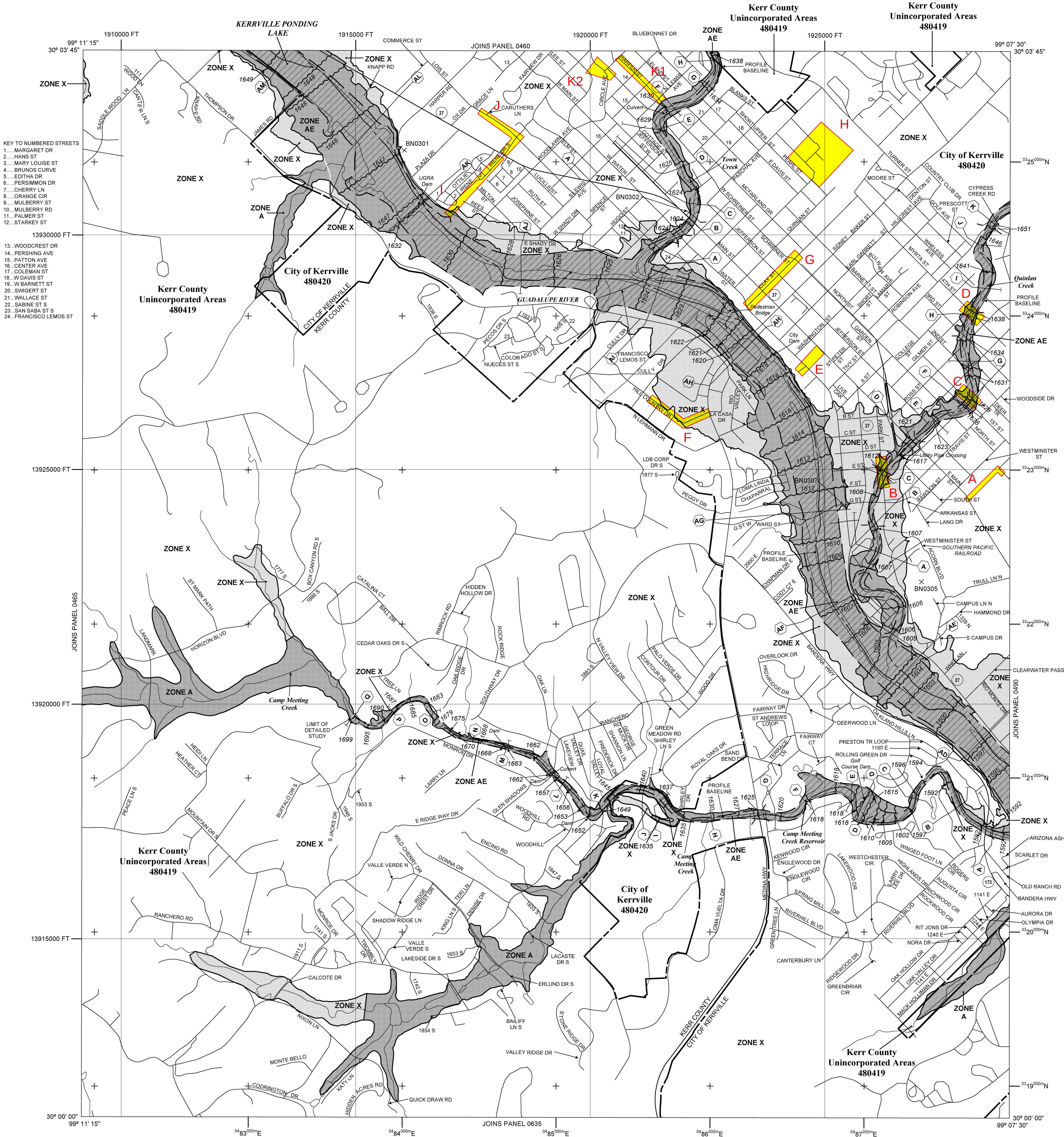
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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA Boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet

*Referenced to the North American Vertical Datum of 1988

(A) (A) Cross section line

(23) (23) Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

1000-meter Universal Transverse Mercator grid values; zone 14

5000-foot grid ticks; Texas State Plane coordinate system, zone South Central (FIPSZONE 4204), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

DXSS10 X

M1.5 River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP PANEL

JULY 19, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

March 3, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to update roads and road names, and to reflect updated topographic information

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0470F

FIRM
FLOOD INSURANCE RATE MAP
KERR COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 470 OF 775
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KERR COUNTY	480419	0470	F
CITY OF KERRVILLE	480420	0470	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48265C0470F

MAP REVISED
MARCH 03, 2011

Federal Emergency Management Agency

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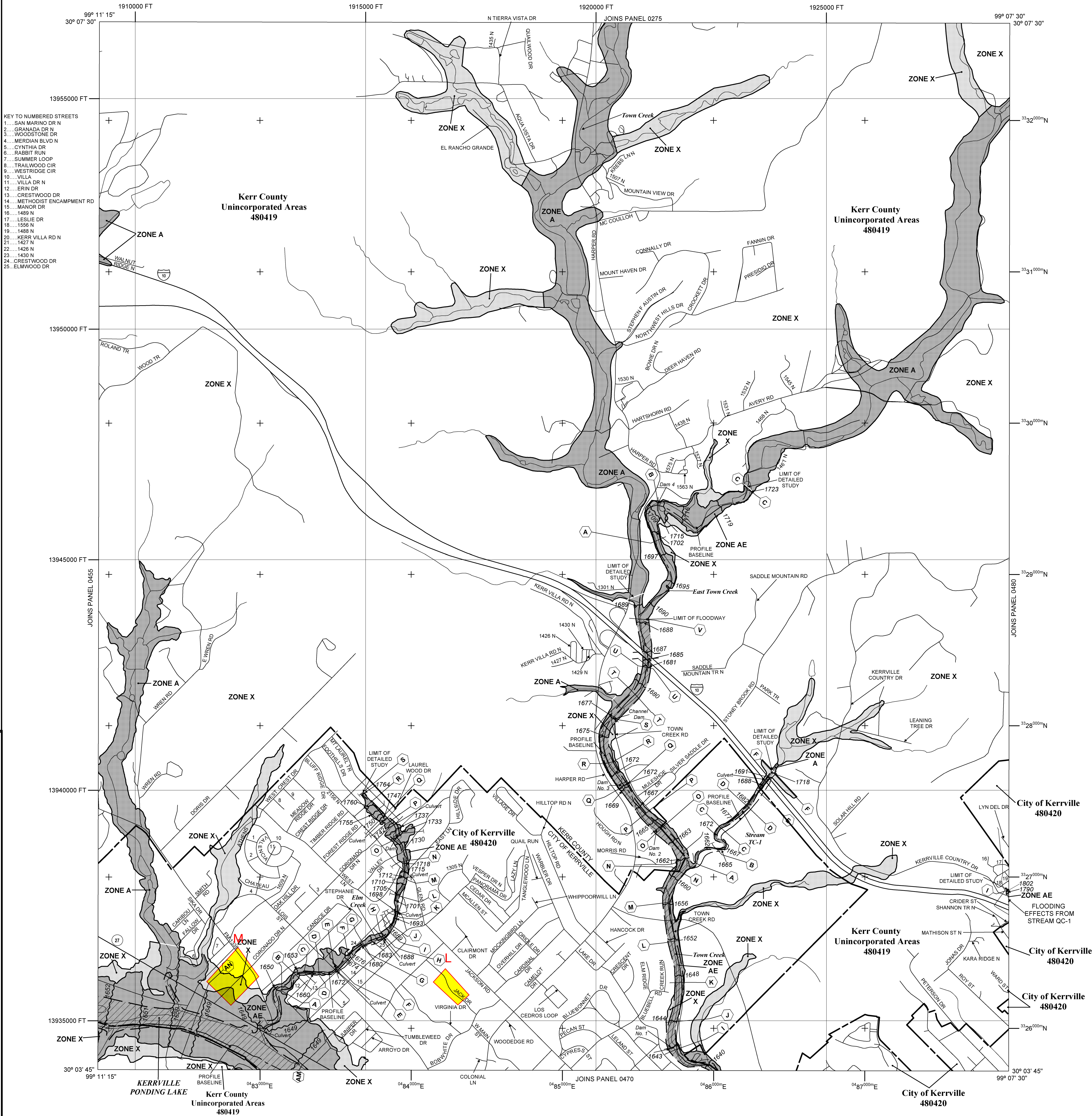
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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA Boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

Cross section line
Transsect line
97° 07' 30", 32° 22' 30"
97° 07' 30", 32° 22' 30"
600000 FT
DXSS10
M1.5
River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index.
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP PANEL
JULY 19, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

March 3, 2011 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to update roads and road names, and to reflect updated topographic information

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 1000'
500 0 1000 2000
300 0 300 600
FEET
METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0460F

FIRM
FLOOD INSURANCE RATE MAP
KERR COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 460 OF 775
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KERR COUNTY	480419	460	F
KERRVILLE, CITY OF	480420	460	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48265C0460F

MAP REVISED
MARCH 03, 2011

Federal Emergency Management Agency

APPENDIX B - CITYWIDE DRAINAGE CIPS

APPENDIX B
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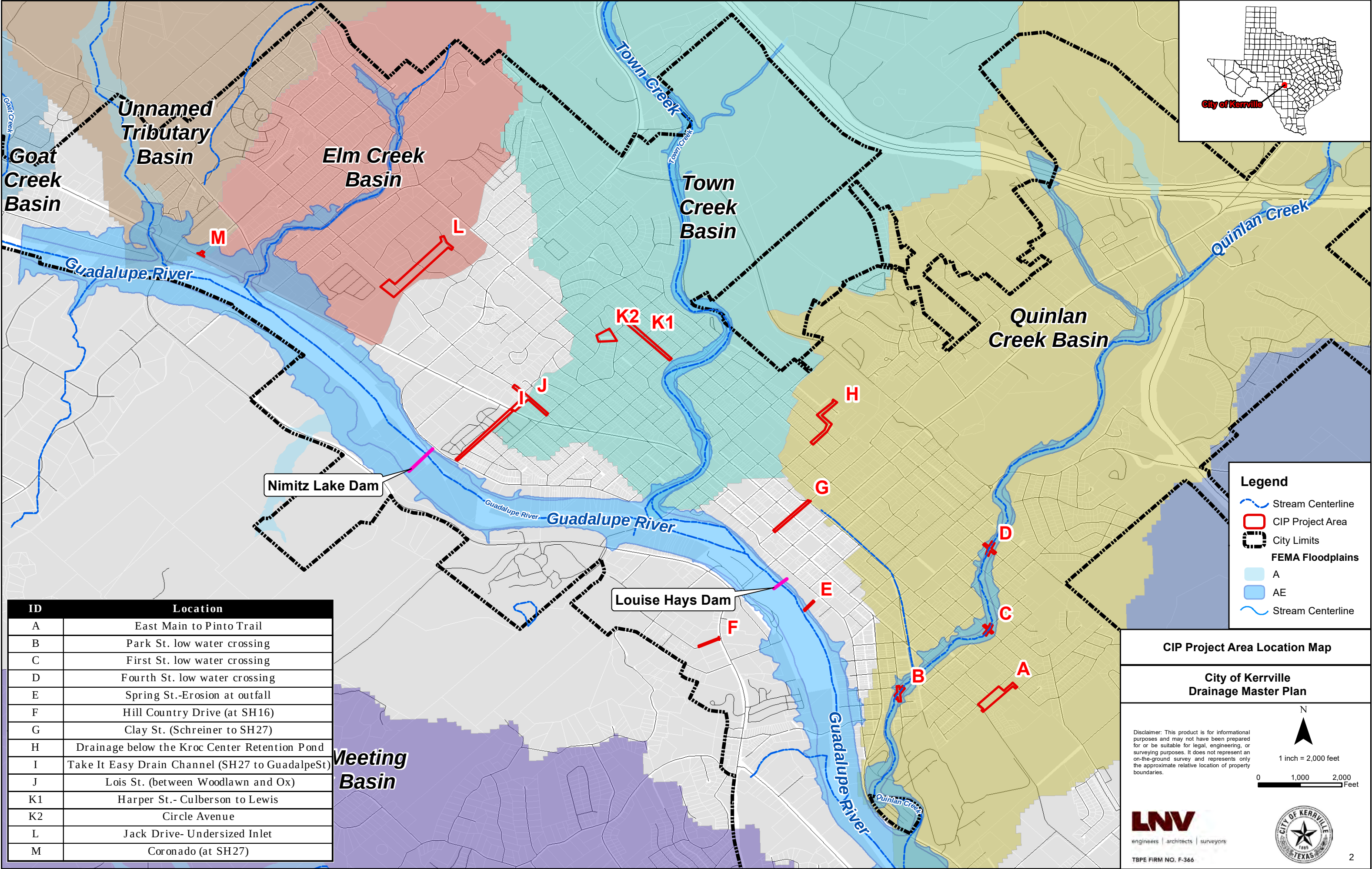
SUMMARY OF PROBABLE CONSTRUCTION COST
Stormwater Master Plan
City of Kerrville

Date: 12/19/2019

ID	Project Priority Rank	Project Name	General	Roadway	Utilities	Drainage	Design, Permitting, Land Acquisition Costs	Total Project Cost ¹
A	5	East Main to Pinto Trail	\$ 111,710	\$ 210	\$ 22,500	\$ 565,237	\$ 104,949	\$ 979,520
B	11	Park St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
C	11	First St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
D	13	Fourth St. Low Water Crossing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 200,000
E	9	Spring St. - Erosion at Outfall	\$ 83,370	\$ -	\$ -	\$ 438,787	\$ 91,377	\$ 744,073
F1 & F2	3	Hill Country at SH16 Ph I	\$ 32,001	\$ 123,336	\$ 7,500	\$ 14,625	\$ 27,729	\$ 249,557
		Hill Country at SH16 Ph II	\$ 280,803	\$ 363,424	\$ 16,800	\$ 896,151	\$ 233,577	\$ 2,180,050
G & H	4	Kroc Center Detention Pond Clay St. (Schreiner to SH27)	\$ 1,170,744	\$ 1,093,620	\$ 547,000	\$ 3,680,945	\$ 852,115	\$ 8,967,501
I	1	Take It Easy Drainage Channel	\$ 297,871	\$ 118,320	\$ -	\$ 1,235,639	\$ 227,127	\$ 2,291,913
J	2	Lois St. (Woodlawn to Ox Dr.)	\$ 24,460	\$ 27,162	\$ 46,940	\$ 37,080	\$ 20,346	\$ 189,899
K1	10	Harper Street	\$ 232,936	\$ 332,090	\$ 179,800	\$ 505,310	\$ 193,760	\$ 1,808,431
K2	6	Circle Avenue	\$ 23,684	\$ 40,702	\$ 3,900	\$ 63,053	\$ 24,626	\$ 188,800
L	7	Jack Drive	\$ 293,948	\$ 128,901	\$ 68,500	\$ 1,138,724	\$ 336,202	\$ 2,373,793
M	7	Coronado at Junction Highway	\$ 63,372	\$ 53,485	\$ 24,800	\$ 209,770	\$ 54,911	\$ 494,195
Summary of Probable Cost			\$ 3,744,163	\$ 2,707,943	\$ 1,088,440	\$ 13,320,951	\$ 4,148,777	\$ 21,067,733

¹ Total project costs include all projected expenditures thru project completion

Notes: 2019 Dollars, assume 6% to 7% cost increase each year



ID	Location
A	East Main to Pinto Trail
B	Park St. low water crossing
C	First St. low water crossing
D	Fourth St. low water crossing
E	Spring St.-Erosion at outfall
F	Hill Country Drive (at SH16)
G	Clay St. (Schreiner to SH27)
H	Drainage below the Kroc Center Retention Pond
I	Take It Easy Drain Channel (SH27 to GuadalupeSt)
J	Lois St. (between Woodlawn and Ox)
K1	Harper St.- Culberson to Lewis
K2	Circle Avenue
L	Jack Drive- Undersized Inlet
M	Coronado (at SH27)

Legend

- Stream Centerline
- CIP Project Area
- City Limits
- FEMA Floodplains
 - A
 - AE
- Stream Centerline

CIP Project Area Location Map

**City of Kerrville
Drainage Master Plan**

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

N
1 inch = 2,000 feet
0 1,000 2,000 Feet

LNV
engineers | architects | surveyors

CITY OF KERRVILLE
TEXAS

TBPE FIRM NO. F-366

2

LOCATION A - PINTO TRAIL CHANNEL

City of Kerrville

Capital Improvements Project

Project Summary								
Project ID:	A							
Project Name:	East Main to Pinto Trail Channel							
Fiscal Year Plan								Total
								\$979,520

Funding Source		
General Fund	0	
Total	0	
Problem Description:		
Existing earthen Pinto Trail drainage channel is subject to high velocities resulting in erosion, destabilization of channel and overtopping flows. During large storm events, the channel is known to overtop and spill westward towards Westminster Street.		
Proposed Improvement:		
Construct a rectangular MSE channel with a concrete bottom from East Main Street to Pinto Trail.		
Regrade existing downstream channel from Acorn Boulevard to East Main Street.		
O & M Impact:		
O & M will require periodic mowing and clean out of channel and culverts.		
CIP Ranking Criteria		Score
Structural Flooding		45
Roadway Flooding		63
Roadway Emergency Service Access		18
Frequency of Flooding Damages		36
Erosion / Channel Stability		90
Level of Protection Benefit		90
Project Cost		36
Funding Source / Availability		24
Developmental Impacts		60
Permitting		40
Land / Easement Acquisition		12
Project Readiness		12
Project Dependency		20
Water Quality Impacts		42
Riparian Impacts		0
Total Weighted Point Score:		588
CIP Ranking:		5

Existing Conditions	
	
Existing Earthen Drainage Channel (Facing D/S)	
Proposed Improvements	
	
Conceptual Drainage Improvement Layout	
Notes:	

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: A - East Main To Pinto Trail

Date: 12/19/2019



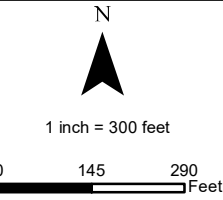
	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 64,674.22
	2	INSURANCE & BOND	LS	3%	1	\$ 17,638.42
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 23,517.90
	4	SW3P	LS	1%	1	\$ 5,879.47
Roadway	5	REMOVE CONCRETE CURB	LF	\$ 6.00	35	\$ 210.00
Utility	6	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	3	\$ 6,000.00
	7	ADJUST EXISTING WASTEWATER LATERAL	EA	\$ 1,500.00	11	\$ 16,500.00
Drainage	8	REMOVING CONC (RIPRAP)	SY	\$ 18.00	319	\$ 5,743.42
	9	CHANNEL EXCAVATION (150 CY < X < 5,000 CY)	CY	\$ 25.00	3,010	\$ 75,250.00
	10	CONCRETE RIPRAP (5")	SY	\$ 90.00	2,150	\$ 193,464.00
	11	CONCRETE STRUCTURE (BAFFLE BLOCKS / RETAINING WALL)	CY	\$ 1,000.00	22	\$ 22,000.00
	12	MSE RETAINING WALL, 3 FT	SF	\$ 27.00	4,140	\$ 111,780.00
	13	TOPSOIL (4")	SY	\$ 9.00	8,000	\$ 72,000.00
	14	BERMUDA SODDING	SY	\$ 7.00	8,000	\$ 56,000.00
	15	CHAIN LINK FENCE (REMOVE)	LF	\$ 18.00	500	\$ 9,000.00
	16	CHAIN LINK FENCE (4' HIGH)	LF	\$ 40.00	500	\$ 20,000.00
Subtotal						\$ 699,657.43
Contingency 25%						\$ 174,914.36
Total Construction Cost						\$ 874,571.78
Engineering 12%						\$ 104,948.61
Total Project Cost						\$ 979,520.40



**A01 - Drainage Area Map
Pinto Trail**

**City of Kerrville
Drainage Master Plan**

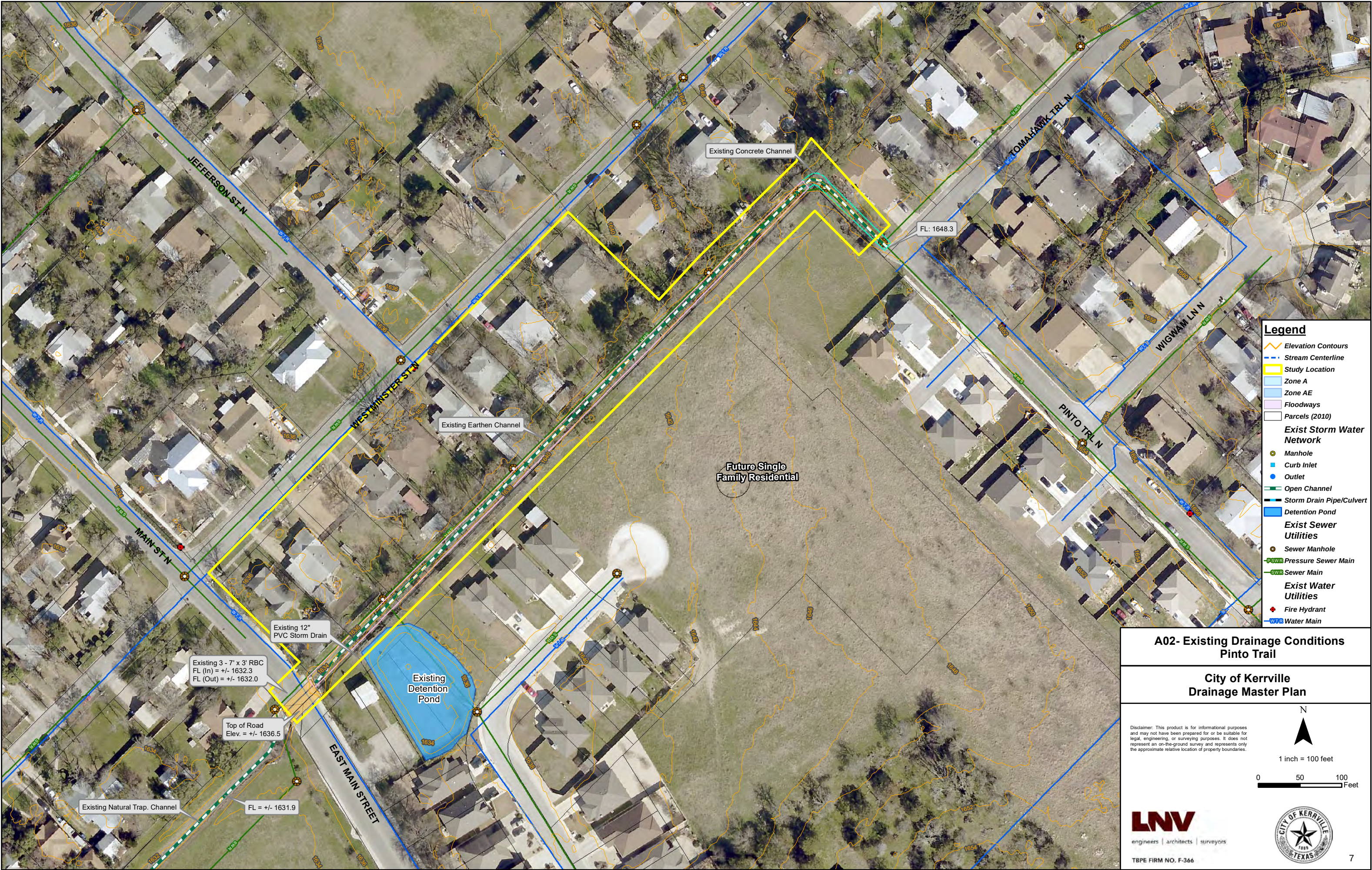
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LNV
engineers | architects | surveyors



TBPE FIRM NO. F-366



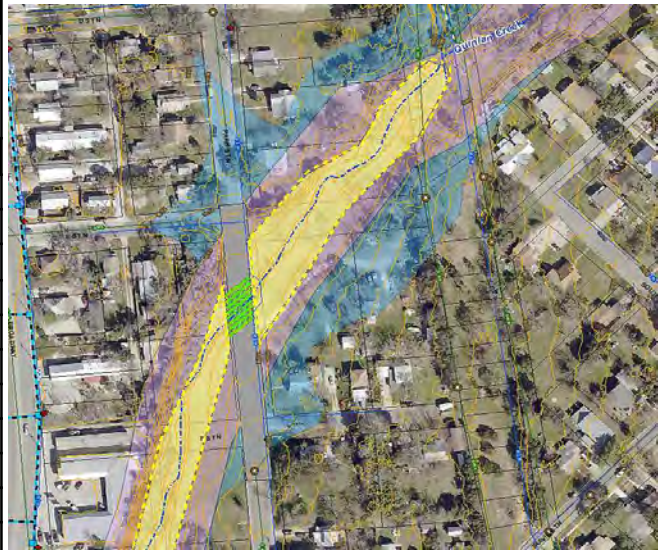


LOCATION B, C, D – LOW WATER CROSSINGS

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	B						
Project Name:	Park Street Low Water Crossing						
Fiscal Year Plan							Total
							\$200,000

Funding Source		Existing Conditions	
General Fund		0	
Total		0	
Problem Description:			
Quinlan Creek at the Park Street low water crossing experiences overtopping flows resulting in frequent roadway closures due to insufficient capacity, hazardous flood flow conditions, erosion, and risk of property flooding.			
Proposed Improvement:			
Option 2: Provide Automatic Flood Gates and warning signs to improve public safety.			
O & M Impact:			
Periodic maintenance of flood gate system.			
CIP Ranking Criteria		Score	
Structural Flooding		90	
Roadway Flooding		36	
Roadway Emergency Service Access		54	
Frequency of Flooding Damages		90	
Erosion / Channel Stability		18	
Level of Protection Benefit		9	
Project Cost		12	
Funding Source / Availability		0	
Developmental Impacts		30	
Permitting		24	
Land / Easement Acquisition		4	
Project Readiness		4	
Project Dependency		0	
Water Quality Impacts		42	
Riparian Impacts		0	
Total Weighted Point Score:		413	Conceptual Drainage Improvement Layout
CIP Ranking:		11	
Notes:			
Option 1 consists of major roadway and channel improvements that provide protection for up to the 5-year storm event.			

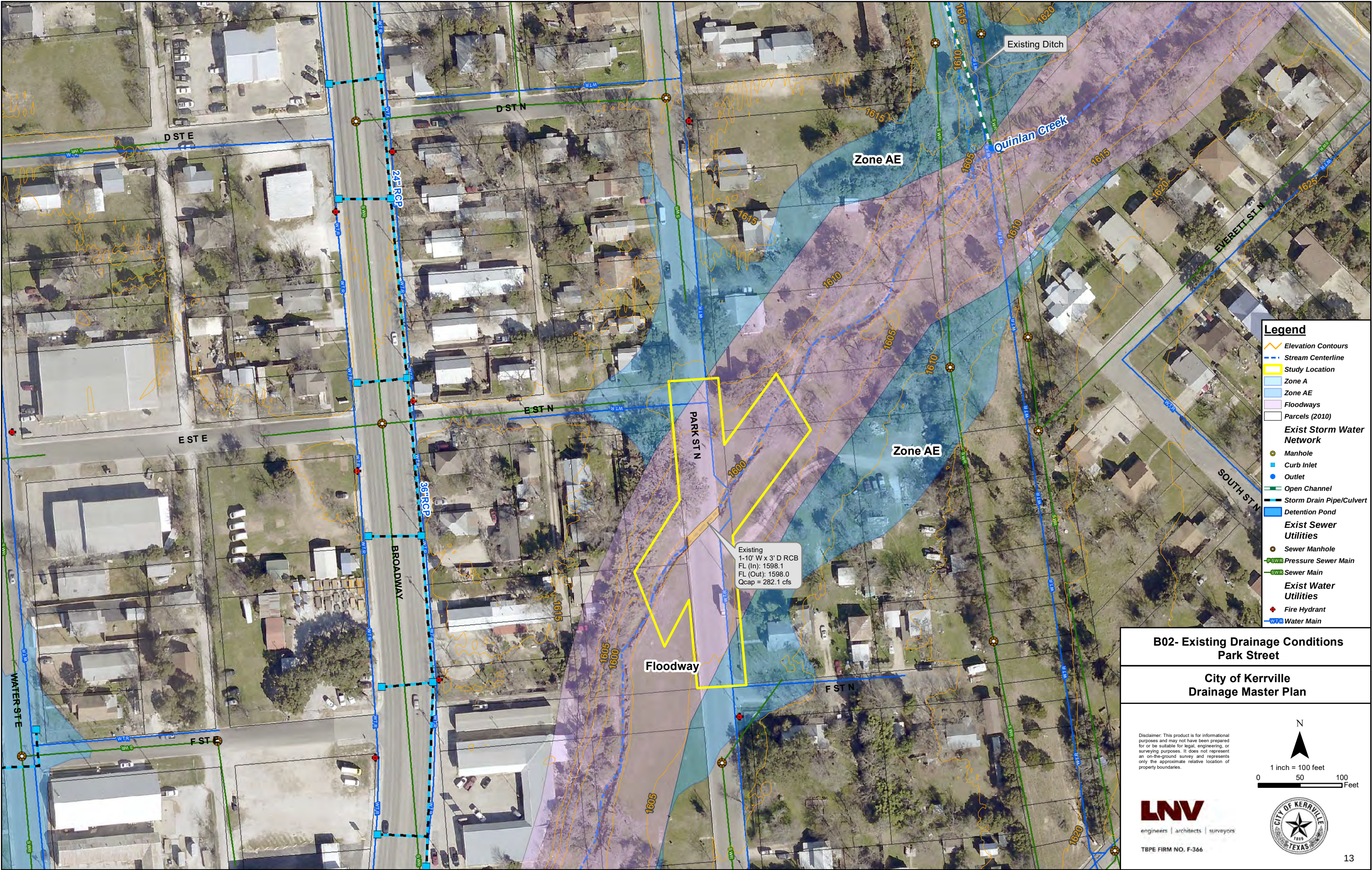
OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: B - Park Street Low Water Crossing

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
	OPTION 1 (HIGH WATER DETECTION SYSTEM)					
	1	HIGH-WATER ALERT LIFESAVING TECHNOLOGY (HALT)	EA	100,000.00	2.00	\$ 200,000.00
	OPTION 2 (BRIDGE REPLACEMENT AND CHANNEL IMPROVEMENT)					
General	1	MOBILIZATION	LS	11%	1	\$ 188,749.82
	2	INSURANCE & BOND	LS	3%	1	\$ 51,477.22
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 68,636.30
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 51,477.22
	5	SW3P	LS	1%	1	\$ 17,159.07
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	940	\$ 5,640.00
	7	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 18.00	2,637	\$ 47,470.00
	8	TACK COAT	GAL	\$ 5.00	181	\$ 904.44
	9	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	2,022	\$ 70,777.78
	10	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	1,809	\$ 27,133.33
	11	CONCRETE CURB & GUTTER	LF	\$ 20.00	940	\$ 18,800.00
	12	CURB RAMP	EA	\$ 1,500.00	4	\$ 6,000.00
Utility	13	6" PVC WATER MAIN	LF	\$ 50.00	550	\$ 27,500.00
Drainage	14	CHANNEL EXCAVATION (5,000 CY < X < 70,000 CY)	CY	\$ 20.00	35,670	\$ 713,400.00
	15	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	2,315	\$ 34,722.22
	16	CONCRETE STRUCTURE (HEADWALL, WINGWALL, AND TOEWALL)	CY	\$ 1,000.00	150	\$ 150,000.00
	17	PRECAST REINFORCED CONCRETE BOX CULVERT (12'X8')	CY	\$ 800.00	480	\$ 384,000.00
	18	GRAVEL SUBGRADE FILLER	CY	\$ 42.00	167	\$ 7,000.00
	19	CONCRETE RIPRAP (5" THICK)	SY	\$ 90.00	420	\$ 37,800.00
	20	TOPSOIL (4")	SY	\$ 9.00	10,000	\$ 90,000.00
	21	BERMUDA SODDING	SY	\$ 7.00	10,000	\$ 70,000.00
	22	TREE PLANTING AND PLACEMENT	EA	\$ 500.00	20	\$ 10,000.00
	23	MSE RETAINING WALL, (3 - 5 FT)	SF	\$ 27.00	300	\$ 8,100.00
	24	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	1,331	\$ 3,993.00
	25	REMOVE CONC (HEADWALL)	CY	\$ 480.00	6	\$ 2,666.67
				Subtotal		\$ 2,093,407.08
				Contingency	25%	\$ 523,351.77
				Total Construction Cost		\$ 2,616,758.85
				Land Acquisition	10%	\$ 261,675.89
				Environmental Permitting	2%	\$ 52,335.18
				Engineering	12%	\$ 300,927.27
				Total Project Cost		\$ 3,231,697.18







City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	C						
Project Name:	First Street Low Water Crossing						
Fiscal Year Plan							Total
							\$200,000

Funding Source	
General Fund	0
Total	0

Problem Description:

Quinlan Creek at the First Street low water crossing experiences overtopping flows resulting in frequent roadway closures due to insufficient capacity, hazardous flood flow conditions, erosion, and risk of property flooding.

Proposed Improvement:

Option 2:
Provide Automatic Flood Gates and warning signs to improve public safety.

O & M Impact:

Periodic maintenance of flood gate system.

CIP Ranking Criteria	Score
Structural Flooding	90
Roadway Flooding	36
Roadway Emergency Service Access	54
Frequency of Flooding Damages	90
Erosion / Channel Stability	18
Level of Protection Benefit	9
Project Cost	12
Funding Source / Availability	0
Developmental Impacts	30
Permitting	24
Land / Easement Acquisition	4
Project Readiness	4
Project Dependency	0
Water Quality Impacts	42
Riparian Impacts	0
Total Weighted Point Score:	413
CIP Ranking:	11

Existing Conditions



Existing 5 - 24" RCP Culvert (Facing U/S)

Proposed Improvements



Conceptual Drainage Improvement Layout

Notes:

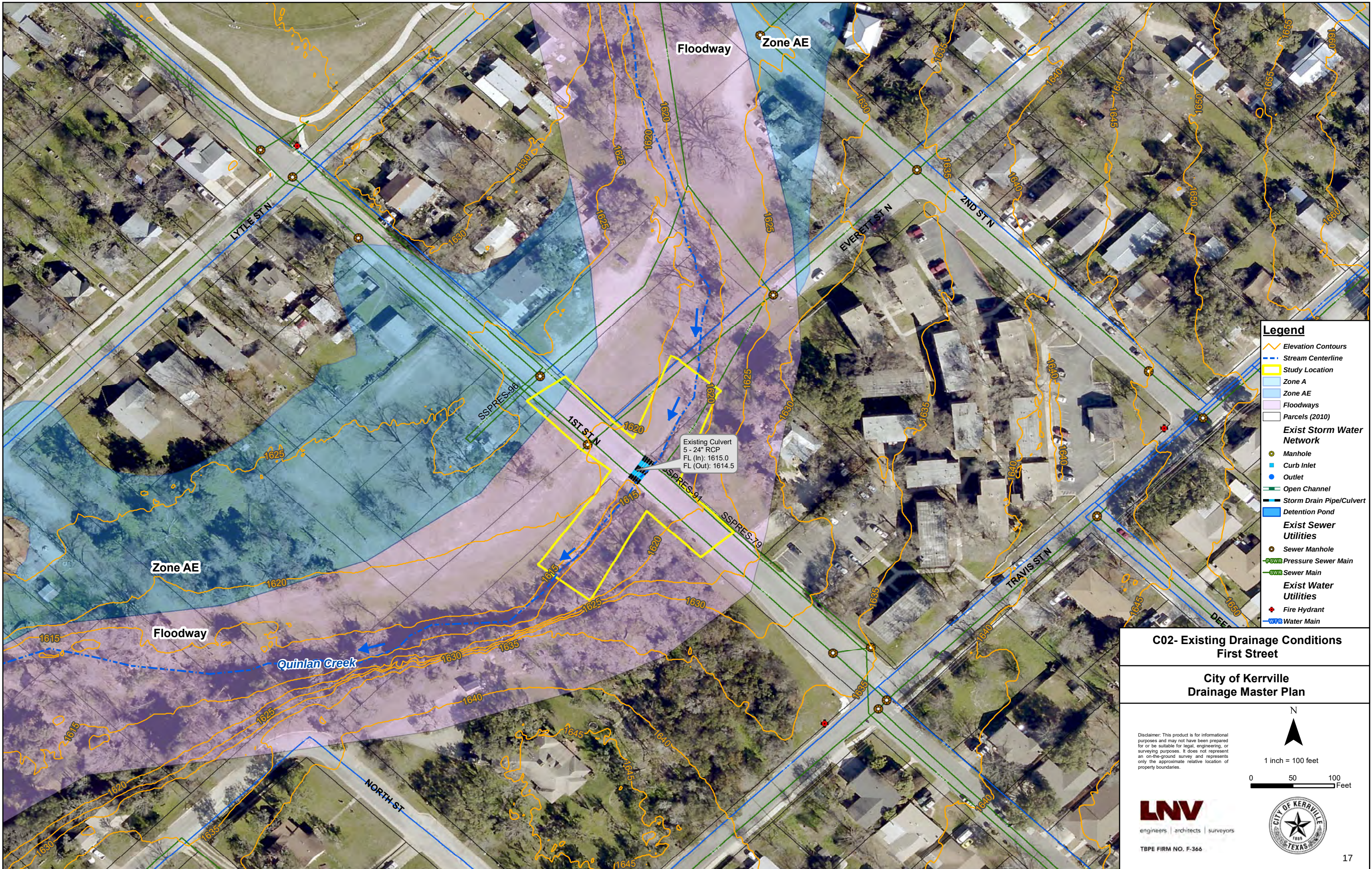
Option 1 consists of major roadway and channel improvements that provide protection for up to the 5-year storm event.

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: C - First Street Low Water Crossing

Date: 12/19/2019



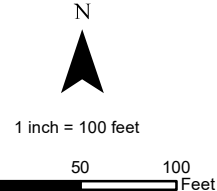
ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
OPTION 1 (HIGH WATER DETECTION SYSTEM)					
1	HIGH-WATER ALERT LIFESAVING TECHNOLOGY (HALT)	EA	\$ 100,000.00	2.00	\$ 200,000.00
OPTION 2 (BRIDGE REPLACEMENT AND CHANNEL IMPROVEMENT)					
1	MOBILIZATION	LS	11%	1	\$ 280,002.74
2	INSURANCE & BOND	LS	3%	1	\$ 76,364.38
3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 101,819.18
4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 76,364.38
5	SW3P	LS	1%	1	\$ 25,454.79
6	REMOVE CONCRETE CURB	LF	\$ 6.00	900	\$ 5,400.00
7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	1,077	\$ 5,385.00
8	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 18.00	942	\$ 16,960.00
9	TACK COAT	GAL	\$ 5.00	120	\$ 601.11
10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	1,400	\$ 49,000.00
11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	1,202	\$ 18,033.33
12	CONCRETE CURB & GUTTER	LF	\$ 20.00	900	\$ 18,000.00
13	CONCRETE SIDEWALKS	SY	\$ 50.00	433	\$ 21,666.67
14	PORTLAND CEMENT CONCRETE DRIVEWAY	SY	\$ 74.00	36	\$ 2,631.11
15	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	2	\$ 4,000.00
16	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	2	\$ 13,000.00
17	SANITARY SEWER (6IN) (PVC) (SDR 26)	LF	\$ 70.00	1,500	\$ 105,000.00
18	CHANNEL EXCAVATION (> 70,000 CY)	CY	\$ 20.00	70,550	\$ 1,411,000.00
19	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	1,620	\$ 24,305.56
20	CONCRETE STRUCTURE (HEADWALL, WINGWALL, AND TOEWALL)	CY	\$ 1,000.00	150	\$ 150,000.00
21	MSE RETAINING WALL, (3 - 5 FT)	SF	\$ 27.00	800	\$ 21,600.00
22	PRECAST REINFORCED CONCRETE BOX CULVERT (12'X8')	CY	\$ 800.00	512	\$ 409,600.00
23	GRAVEL SUBGRADE FILLER	CY	\$ 42.00	117	\$ 4,900.00
24	CONCRETE RIPRAP (5" THICK)	SY	\$ 90.00	420	\$ 37,800.00
25	TOPSOIL (4")	SY	\$ 9.00	13,650	\$ 122,850.00
26	BERMUDA SODDING	SY	\$ 7.00	13,650	\$ 95,550.00
27	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	60	\$ 180.00
28	REMOVE CONC (HEADWALL)	CY	\$ 480.00	9	\$ 4,266.67
29	REMOVE STRUCTURE (PIPE) (24") (PIPE)	LF	\$ 25.00	150	\$ 3,750.00
Subtotal					\$ 3,105,484.92
Contingency 25%					\$ 776,371.23
Total Construction Cost					\$ 3,881,856.15
Land Acquisition 14%					\$ 543,459.86
Environmental Permitting 2%					\$ 77,637.12
Engineering 11%					\$ 427,004.18
Total Project Cost					\$ 4,929,957.31

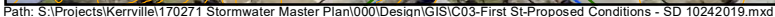


**C02- Existing Drainage Conditions
First Street**

**City of Kerrville
Drainage Master Plan**

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.





City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	D						
Project Name:	Fourth Street Low Water Crossing						
Fiscal Year Plan							Total
							\$200,000

Funding Source	
General Fund	0
Total	0

Problem Description:

Quinlan Creek at the Fourth Street low water crossing experiences overtopping flows resulting in frequent roadway closures due to insufficient capacity, hazardous flood flow conditions, erosion, and risk of property flooding.

Proposed Improvement:

Option 2:
Provide Automatic Flood Gates and warning signs to improve public safety.

O & M Impact:

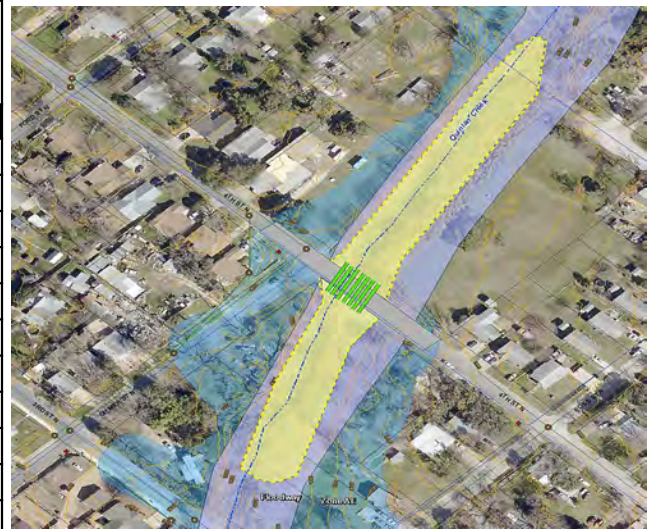
Periodic maintenance of flood gate system.

Existing Conditions



Existing 2 - 24" RCP Culvert (Facing D/S)

Proposed Improvements



Conceptual Drainage Improvement Layout

Notes:

Option 1 consists of major roadway and channel improvements that provide protection for up to the 2-year storm event.

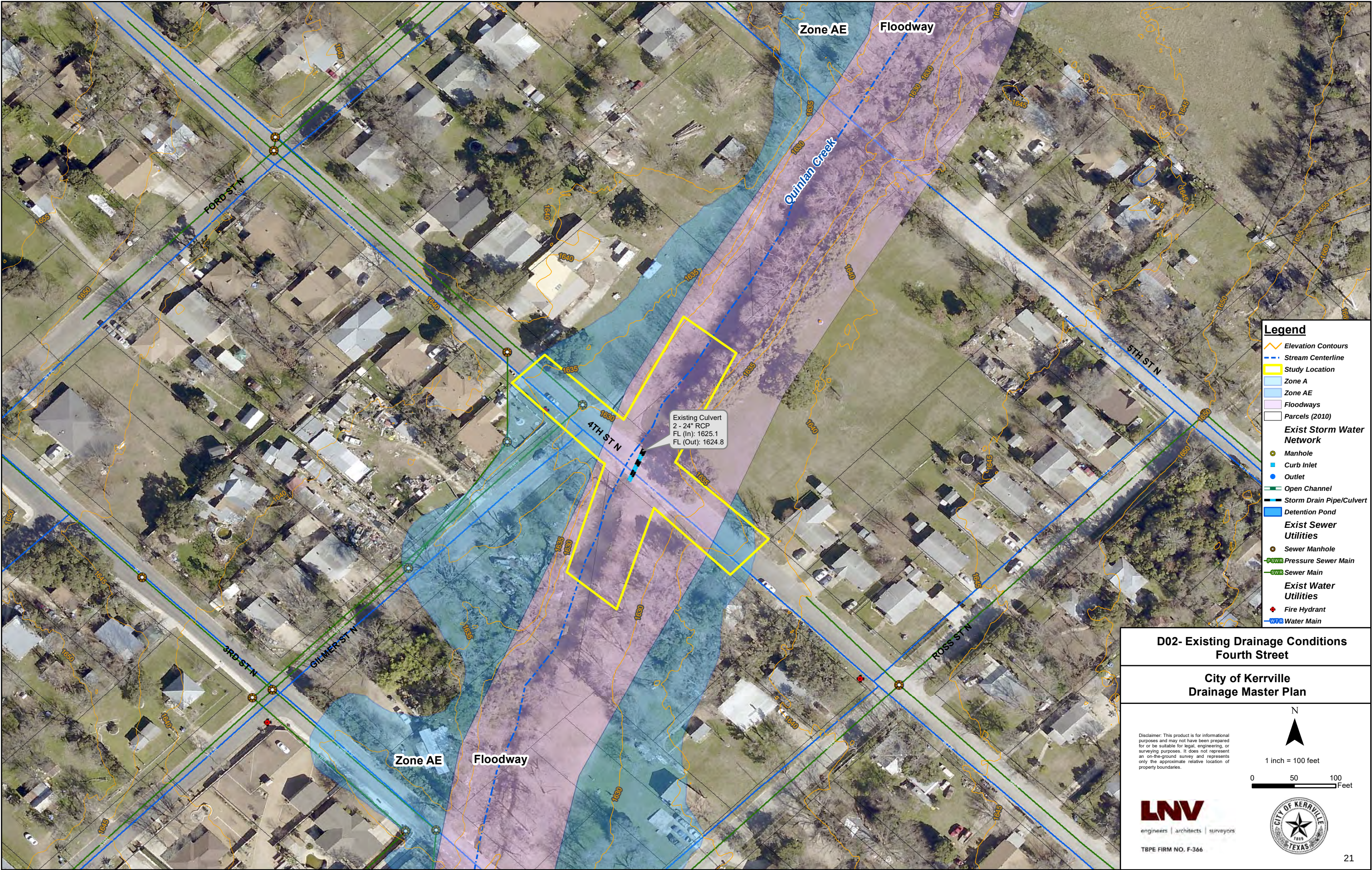
CIP Ranking Criteria	Score
Structural Flooding	45
Roadway Flooding	36
Roadway Emergency Service Access	54
Frequency of Flooding Damages	90
Erosion / Channel Stability	18
Level of Protection Benefit	9
Project Cost	12
Funding Source / Availability	0
Developmental Impacts	30
Permitting	24
Land / Easement Acquisition	4
Project Readiness	4
Project Dependency	0
Water Quality Impacts	42
Riparian Impacts	0
Total Weighted Point Score:	368
CIP Ranking:	13

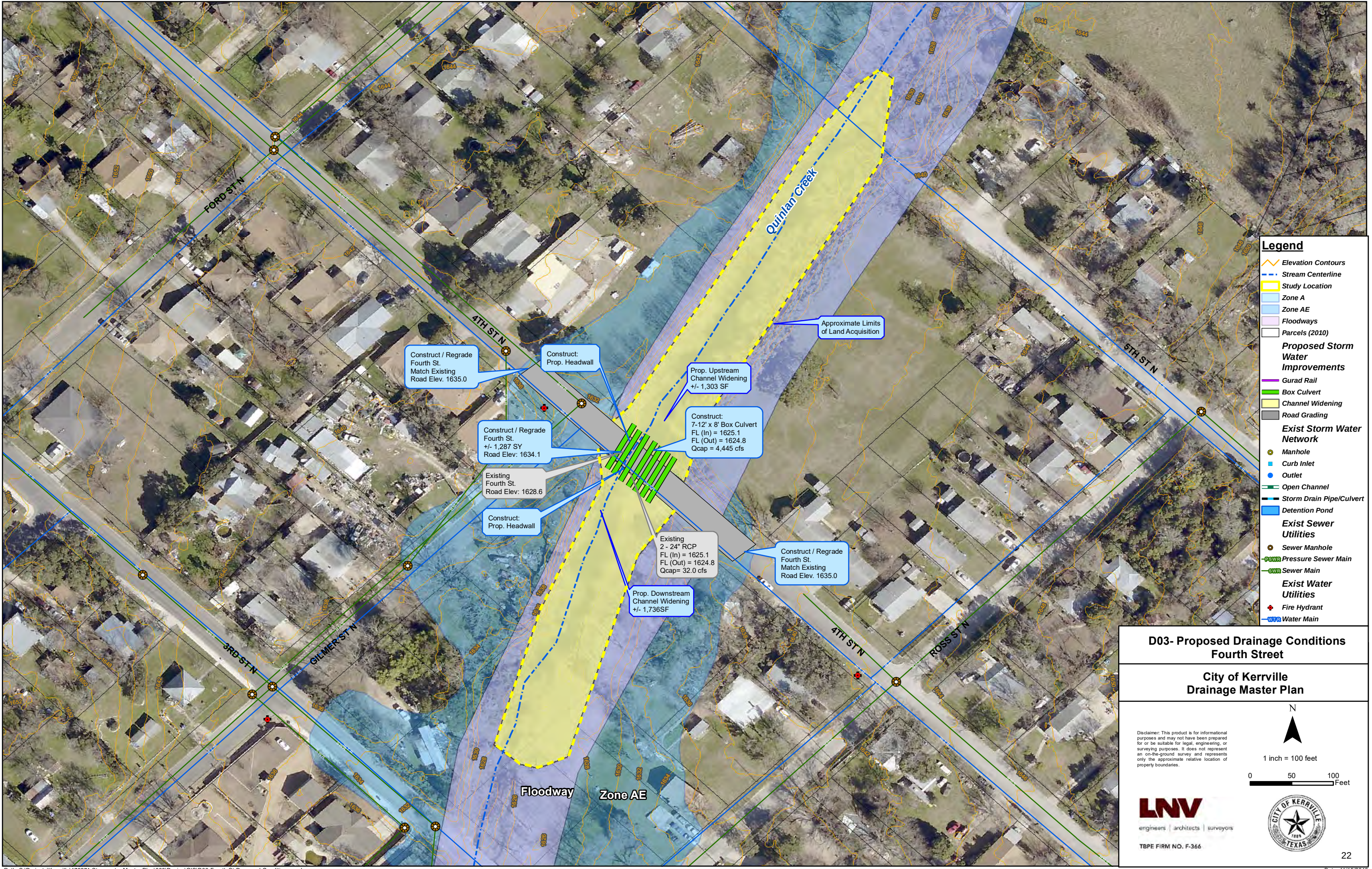
OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: D - Fourth Street Low Water Crossing

Date: 12/19/2019



ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
OPTION 1 (HIGH WATER DETECTION SYSTEM)					
1	HIGH-WATER ALERT LIFESAVING TECHNOLOGY (HALT)	EA	\$ 100,000.00	2.00	\$ 200,000.00
OPTION 2 (BRIDGE REPLACEMENT AND CHANNEL IMPROVEMENT)					
1	MOBILIZATION	LS	11%	1	\$ 95,879.75
2	INSURANCE & BOND	LS	3%	1	\$ 26,149.02
3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 34,865.36
4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 26,149.02
5	SW3P	LS	1%	1	\$ 8,716.34
6	REMOVE CONCRETE CURB	LF	\$ 6.00	830	\$ 4,980.00
7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	70	\$ 350.00
8	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 18.00	1,077	\$ 19,379.33
9	TACK COAT	GAL	\$ 5.00	115	\$ 572.50
10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	1,287	\$ 45,052.78
11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	1,145	\$ 17,175.00
12	CURB RAMPS	EA	\$ 1,500.00	2	\$ 3,000.00
13	CONCRETE CURB & GUTTER	LF	\$ 20.00	830	\$ 16,600.00
14	PORTLAND CEMENT CONCRETE DRIVEWAY	SY	\$ 74.00	70	\$ 5,180.00
15	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	1	\$ 2,000.00
16	8" PVC WATER MAIN	LF	\$ 60.00	320	\$ 19,200.00
17	CHANNEL EXCAVATION(5,000 CY < X < 70,000 CY)	CY	\$ 20.00	7,130	\$ 142,600.00
18	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	1,348	\$ 20,222.22
19	CONCRETE STRUCTURE (HEADWALL, WINGWALL, AND TOEWALL)	CY	\$ 1,000.00	117	\$ 117,000.00
20	PRECAST REINFORCED CONCRETE BOX CULVERT (12'X8')	CY	\$ 800.00	390	\$ 312,000.00
21	GRAVEL SUBGRADE FILLER	CY	\$ 42.00	148	\$ 6,222.22
22	CONCRETE RIPRAP (5" THICK)	SY	\$ 90.00	340	\$ 30,600.00
23	TOPSOIL (4")	SY	\$ 9.00	3,600	\$ 32,400.00
24	BERMUDA SODDING	SY	\$ 7.00	3,600	\$ 25,200.00
25	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	100	\$ 300.00
26	MSE RETAINING WALL, (3 - 5 FT)	SF	\$ 27.00	1,600	\$ 43,200.00
27	REMOVE CONC (HEADWALL)	CY	\$ 480.00	13	\$ 6,400.00
28	REMOVE STRUCTURE (PIPE) (24") (PIPE)	LF	\$ 25.00	80	\$ 2,000.00
Subtotal					\$ 1,063,393.55
Contingency				25%	\$ 265,848.39
Total Construction Cost					\$ 1,329,241.93
Land Acquisition				10%	\$ 132,924.19
Environmental Permitting				2%	\$ 26,584.84
Engineering				12%	\$ 159,509.03
Total Project Cost					\$ 1,648,260.00





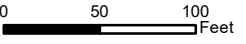
D03- Proposed Drainage Conditions
Fourth Street

City of Kerrville
Drainage Master Plan

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.



1 inch = 100 feet



TBPE FIRM NO. F-366



LOCATION E – SPRING STREET CHANNEL

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	E						
Project Name:	Spring Street						
Fiscal Year Plan							Total
							\$744,073

Funding Source		Existing Conditions
General Fund		
Total		
Problem Description:		
The existing gabion mattress has failed and the earthen channel bank extending into the Guadalupe River is at risk of further incising upstream if left in its present condition.		
Proposed Improvement:		
Extend the existing 54" storm drain further downstream and construct a concrete baffled chute to convey flow down the steep embankment. Provide a stilling basin at the end of the chute to dissipate energy. Regrade the channel embankment as necessary.		
O & M Impact:		
CIP Ranking Criteria		Score
Structural Flooding		0
Roadway Flooding		0
Roadway Emergency Service Access		0
Frequency of Flooding Damages		90
Erosion / Channel Stability		90
Level of Protection Benefit		90
Project Cost		36
Funding Source / Availability		24
Developmental Impacts		30
Permitting		24
Land / Easement Acquisition		20
Project Readiness		20
Project Dependency		20
Water Quality Impacts		42
Riparian Impacts		42
	Total Weighted Point Score:	528
	CIP Ranking:	9
Proposed Improvements		
		
Existing Conditions of Gabion Lined Drainage Channel		
Conceptual Drainage Improvement Layout		
Notes:		

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: E - Spring Street

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 48,266.57
	2	INSURANCE & BOND	LS	3%	1	\$ 13,163.61
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 17,551.48
	4	SW3P	LS	1%	1	\$ 4,387.87
Drainage	5	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 60.00	3,320	\$ 199,200.00
	6	REMOVE CONC (HEADWALL)	CY	\$ 480.00	5	\$ 2,400.00
	7	CONCRETE STRUCTURE RETAINING WALL, 5 FT HEIGHT	CY	\$ 1,000.00	35	\$ 35,000.00
	8	CONCRETE STRUCTURE (HEADWALLS OR OUTFALL STRUCTURES)	CY	\$ 1,000.00	13	\$ 13,000.00
	9	REINFORCED CONCRETE PIPE (CLASS III)(54" DIA)	LF	\$ 400.00	100	\$ 40,000.00
	10	CONCRETE STRUCTURE (CHUTE BOTTOM, AND BAFFLE BLOCKS)	CY	\$ 1,000.00	117	\$ 117,037.04
	11	TOPSOIL (4")	SY	\$ 9.00	250	\$ 2,250.00
	12	BERMUDA SODDING	SY	\$ 7.00	250	\$ 1,750.00
	13	ROCK RIPRAP (STONE PROTECTION)(18 IN)	CY	\$ 170.00	120	\$ 20,400.00
	14	GEOGRID REINFORCEMENT OF EMBANKMENT SLOPE	SY	\$ 5.00	600	\$ 3,000.00
	15	CL A CONC (COLLAR)	EA	\$ 1,450.00	1	\$ 1,450.00
	16	REMOVE STR (GABION)	LF	\$ 22.00	150	\$ 3,300.00
Subtotal						\$ 522,156.57
Contingency 25%						\$ 130,539.14
Total Construction Cost						\$ 652,695.72
Environmental Permitting 2%						\$ 13,053.91
Engineering 12%						\$ 78,323.49
Total Project Cost						\$ 744,073.12







LOCATION F – HILL COUNTRY DRIVE

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	F						
Project Name:	Hill Country Drive						
Fiscal Year Plan							Total
							\$2,429,607

Funding Source	
General Fund	0
Total	0

Existing Conditions



Existing 2 - 36" CMP Culvert (Facing D/S)

Problem Description:

The intersection experiences frequently property and street flooding due to Hill Country Drive's low lying roadway condition and due to two 36" CMP pipes with inverts set at the low point in the roadway resulting in the backup of water in the system.

Proposed Improvement:

- Phase I - Reconstruct / reprofile Hill Country Drive to improve the capture of runoff flowing towards the existing storm drain system.
- Phase II - replace existing 2 - 36" CMP with two 6' x 3' Reinforced Concrete Box Culverts from Hill Country Drive to the Downstream Channel

O & M Impact:

Proposed Improvements



Conceptual Drainage Improvement Layout

CIP Ranking Criteria	Score
Structural Flooding	90
Roadway Flooding	63
Roadway Emergency Service Access	90
Frequency of Flooding Damages	90
Erosion / Channel Stability	18
Level of Protection Benefit	54
Project Cost	12
Funding Source / Availability	24
Developmental Impacts	60
Permitting	40
Land / Easement Acquisition	20
Project Readiness	12
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	677
CIP Ranking:	3

Notes:

Phase II is located within TxDOT right-of-way and will require coordination and approval.

OPINION OF PROBABLE CONSTRUCTION COST

City of Kerrville Stormwater Master Plan
Project ID: F.1 - Hill Country Dr. Phase - I

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 16,000.71
	2	INSURANCE & BOND	LS	3%	1	\$ 4,363.83
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 5,818.44
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 4,363.83
	5	SW3P	LS	1%	1	\$ 1,454.61
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	600	\$ 3,600.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	1,420	\$ 7,100.00
	8	STREET EXCAVATION	CY	\$ 31.00	144	\$ 4,477.78
	9	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 18.00	72	\$ 1,300.00
	10	LIME TREATED SUBGRADE (6" COMPACTED DEPTH)	SY	\$ 6.00	867	\$ 5,200.00
	11	FLEXIBLE BASE (6" COMPACTED DEPTH)	SY	\$ 9.00	867	\$ 7,800.00
	12	LIME	TON	\$ 200.00	2	\$ 416.00
	13	PRIME COAT	GAL	\$ 5.00	87	\$ 433.33
	14	REINFORCED CONCRETE PAVEMENT	SY	\$ 80.00	867	\$ 69,333.33
	15	CONCRETE CURB & GUTTER	LF	\$ 20.00	600	\$ 12,000.00
Utility	16	PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL	SY	\$ 74.00	158	\$ 11,675.56
	17	8" PVC WATER MAIN	LF	\$ 60.00	100	\$ 6,000.00
	18	ADJUST EXISTING WASTEWATER LATERAL	EA	\$ 1,500.00	1	\$ 1,500.00
Drainage	19	REMOVE MISCELLANEOUS CONCRETE	SF	\$ 5.00	175	\$ 875.00
	20	CONCRETE RIPRAP (5" THICK)	SY	\$ 250.00	19	\$ 4,861.11
	21	TOPSOIL (4")	SY	\$ 9.00	556	\$ 5,000.00
	22	BERMUDA SODDING	SY	\$ 7.00	556	\$ 3,888.89
Subtotal						\$ 177,462.42
Contingency 25%						\$ 44,365.61
Total Construction Cost						\$ 221,828.03
Engineering 13%						\$ 27,728.50
Total Project Cost						\$ 249,556.53

OPINION OF PROBABLE CONSTRUCTION COST

City of Kerrville Stormwater Master Plan

Project ID: F.2 - Hill Country Phase II

Date: 12/19/2019



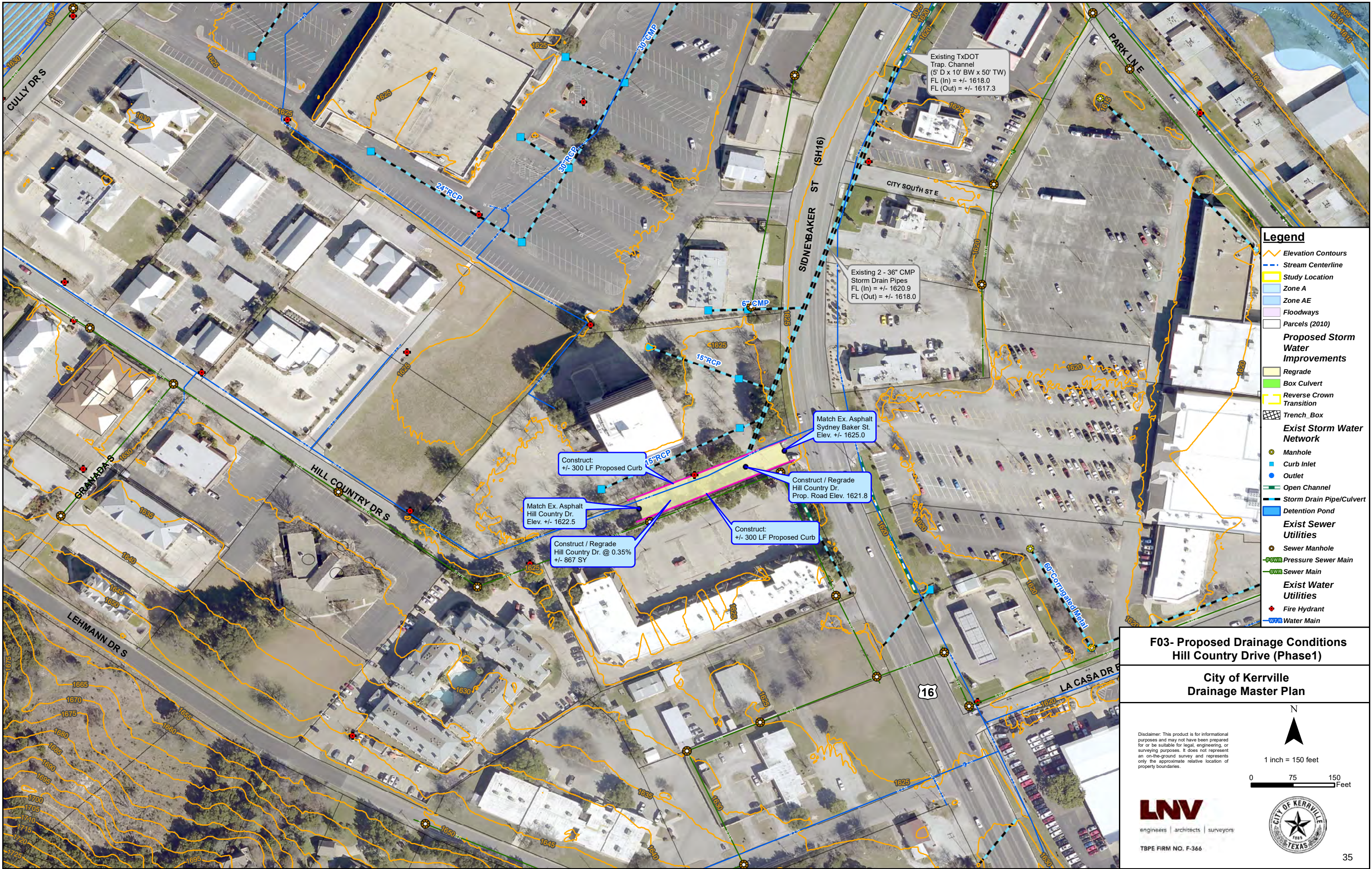
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	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 140,401.33
	2	INSURANCE & BOND	LS	3%	1	\$ 38,291.27
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 51,055.03
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 38,291.27
	5	SW3P	LS	1%	1	\$ 12,763.76
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	2,300	\$ 13,800.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	4,750	\$ 23,750.00
	8	STREET EXCAVATION	CY	\$ 31.00	192	\$ 5,952.00
	9	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	\$ 20.00	301	\$ 6,027.78
	10	TACK COAT	GAL	\$ 5.00	386	\$ 1,927.78
	11	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	3,856	\$ 134,944.44
	12	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	3,856	\$ 57,833.33
	13	CONCRETE CURB & GUTTER	LF	\$ 20.00	2,300	\$ 46,000.00
	14	CONCRETE SIDEWALKS	SY	\$ 50.00	222	\$ 11,111.11
Utility	15	PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL	SY	\$ 74.00	839	\$ 62,077.78
	16	8" PVC WATER MAIN	LF	\$ 60.00	280	\$ 16,800.00
Drainage	17	REMOVE MISCELLANEOUS CONCRETE	SF	\$ 5.00	4,760	\$ 23,800.00
	18	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	2,596	\$ 38,933.33
	19	STRUCTURAL EXCAVATION (100 < X < 500 CY)	CY	\$ 85.00	117	\$ 9,916.67
	20	CONCRETE STRUCTURE (RETAINING WALLS) (10 CY < X < 100 CY)	CY	\$ 1,000.00	32	\$ 32,222.22
	21	CONCRETE STRUCTURE (HEADWALLS OR OUTFALL STRUCTURES)	CY	\$ 1,000.00	10	\$ 10,370.37
	22	PRECAST REINFORCED CONCRETE BOX CULVERT (6'X3')	CY	\$ 800.00	670	\$ 536,000.00
	23	SPECIAL JUNCTION BOXES (COMPLETE) - 15'W X 15'L X 6'D	EA	\$ 35,000.00	2	\$ 70,000.00
	24	CONCRETE RIPRAP	SY	\$ 90.00	511	\$ 46,000.00
	25	TOPSOIL (4")	SY	\$ 9.00	3,156	\$ 28,400.00
	26	BERMUDA SODDING	SY	\$ 10.00	3,156	\$ 31,555.56
	27	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 7.00	760	\$ 5,320.00
	28	TRENCH DRAIN (10'W X 30'L X 3'D)	EA	\$ 25,000.00	1	\$ 25,000.00
	29	REMOVE CONC (HEADWALL, WINGWALL)	CY	\$ 480.00	4	\$ 2,133.33
	30	REMOVE STRUCTURE (PIPE) (36") (PIPE)	LF	\$ 25.00	1,460	\$ 36,500.00
Subtotal						\$ 1,557,178.36
Contingency						25% \$ 389,294.59
Total Construction Cost						\$ 1,946,472.95
Engineering						12% \$ 233,576.75
Total Project Cost						\$ 2,180,049.70







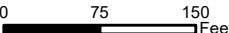
F03- Proposed Drainage Conditions
Hill Country Drive (Phase1)

City of Kerrville
Drainage Master Plan

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1 inch = 150 feet



TBPE FIRM NO. F-366





LOCATION G & H – KROC CENTER & CLAY STREET

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	G & H						
Project Name:	Kroc Center & Clay Street (Combined)						
Fiscal Year Plan							Total
							\$8,967,501

Funding Source	
General Fund	0
Total	0

Problem Description:

Prolonged discharge from existing 24" and 18" detention pond outfall structure results in excessive roadway flooding along George, Hays, McFarland and Clay Streets. In addition, the downstream system for Clay Street is undersized, resulting in localized flooding.

Proposed Improvement:

Reconfigure and reconstruct the existing Kroc Center detention pond outlet with a riser structure that connects directly to a new storm drain system beneath George Street and extending downstream along Miller, Quinlan, McFarland, and Clay Streets.

O & M Impact:

O & M will require periodic removal of debris that may block outflow of Kroc Center Detention Pond and proposed storm drain system.

CIP Ranking Criteria	Score
Structural Flooding	90
Roadway Flooding	90
Roadway Emergency Service Access	54
Frequency of Flooding Damages	90
Erosion / Channel Stability	0
Level of Protection Benefit	54
Project Cost	12
Funding Source / Availability	42
Developmental Impacts	60
Permitting	24
Land / Easement Acquisition	20
Project Readiness	4
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	644
CIP Ranking:	4

Existing Conditions



Existing Drainage Spillway - Facing Towards Kroc Center Pond

Proposed Improvements



Conceptual Drainage Improvement Layout

Notes:

OPINION OF PROBABLE CONSTRUCTION COST

City of Kerrville Stormwater Master Plan

Project ID: G&H - Clay St. & Kroc Center



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Date: 12/19/2019

	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 585,372.08
	2	INSURANCE & BOND	LS	3%	1	\$ 159,646.93
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 212,862.58
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 159,646.93
	5	SW3P	LS	1%	1	\$ 53,215.64
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	5,100	\$ 30,600.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	11,600	\$ 58,000.00
	8	STREET EXCAVATION	CY	\$ 31.00	3,623	\$ 112,309.56
	9	EMBANKMENT (FINAL)(DENS CONT)(TY A) @ Kroc Weir	CY	\$ 18.00	107	\$ 1,925.00
	10	TACK COAT	GAL	\$ 5.00	1,700	\$ 8,500.00
	11	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	7,933	\$ 277,666.67
	12	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	17,000	\$ 255,000.00
	13	CONCRETE STRUCTURE (MISCELLANEOUS)	CY	\$ 1,000.00	29	\$ 28,518.52
	14	CONCRETE CURB RAMPS	EA	\$ 1,500.00	21	\$ 31,500.00
	15	CONCRETE CURB & GUTTER	LF	\$ 20.00	5,100	\$ 102,000.00
	16	CONCRETE SIDEWALKS (One Side)	SY	\$ 50.00	2,833	\$ 141,666.67
	17	PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL	SY	\$ 74.00	567	\$ 41,933.33
	18	RELOCATE TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)	EA	\$ 2,000.00	2	\$ 4,000.00
Utility	19	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	10	\$ 20,000.00
	20	SANITARY SEWER (6IN) (PVC) (SDR 26)	LF	\$ 70.00	1,300	\$ 91,000.00
	21	SANITARY SEWER (12IN) (PVC) (SDR 26)	LF	\$ 100.00	1,000	\$ 100,000.00
	22	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	21	\$ 136,500.00
	23	WATER SERVICE RPL AND RECONNECT	EA	\$ 3,000.00	44	\$ 132,000.00
	24	ADJUST EXISTING WASTEWATER LATERAL	EA	\$ 1,500.00	45	\$ 67,500.00
Drainage	25	REMOVE MISCELLANEOUS CONCRETE	SF	\$ 5.00	1,430	\$ 7,150.00
	26	POND OUTLET RISER	EA	\$ 35,000.00	1	\$ 35,000.00
	27	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	18,667	\$ 280,000.00
	28	STRUCTURAL EXCAVATION (100 < X < 500 CY)	CY	\$ 85.00	107	\$ 9,090.28
	29	CONCRETE STRUCTURE (HEADWALL AND WINGWALL)	CY	\$ 1,000.00	10	\$ 10,370.37
	30	PRECAST REINFORCED CONCRETE BOX CULVERT (6'X4')	CY	\$ 800.00	1,312	\$ 1,049,920.00
	31	PRECAST REINFORCED CONCRETE BOX CULVERT (9'X4')	CY	\$ 800.00	1,181	\$ 944,480.00
	32	PRECAST REINFORCED CONCRETE BOX CULVERT (9'X5')	CY	\$ 800.00	710	\$ 568,160.00
	33	PRECAST REINFORCED CONCRETE BOX CULVERT (10'X5')	CY	\$ 800.00	175	\$ 140,024.00
	34	GRAVEL SUBGRADE FILLER	CY	\$ 42.00	944	\$ 39,666.67
	35	SPECIAL JUNCTION BOXES (COMPLETE) - 14W X 10L X 10D	EA	\$ 21,200.00	1	\$ 21,200.00
	36	SPECIAL JUNCTION BOXES (COMPLETE) - 12W X 12L X 8D	EA	\$ 19,000.00	3	\$ 57,000.00
	37	SPECIAL JUNCTION BOXES (COMPLETE) - 10W X 10L X 8D	EA	\$ 15,000.00	5	\$ 75,000.00
	38	INLET TYPE I (COMPLETE) (10 FT) (5' DEPTH)	EA	\$ 6,000.00	10	\$ 60,000.00
	39	INLET TYPE I (COMPLETE) (10 FT) (6' DEPTH)	EA	\$ 6,500.00	7	\$ 45,500.00
	40	INLET TYPE I (COMPLETE) (10 FT) (8' DEPTH)	EA	\$ 7,000.00	5	\$ 35,000.00
	41	INLET TYPE I (COMPLETE) (10 FT) (10' DEPTH)	EA	\$ 7,500.00	2	\$ 15,000.00
	42	MANHOLE VERTICAL STACK (SPECIAL MANHOLE RISER)	EA	\$ 5,000.00	9	\$ 45,000.00
	43	CONCRETE RIPRAP (5")	SY	\$ 90.00	22	\$ 2,000.00
	44	TOPSOIL (4")	SY	\$ 9.00	2,833	\$ 25,500.00
	45	BERMUDA SODDING	SY	\$ 7.00	2,833	\$ 19,833.33
	46	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	5,100	\$ 15,300.00
	47	RELOCATE POWER POLE	EA	\$ 5,000.00	26	\$ 130,000.00
	48	REMOVE STRUCTURE (PIPE) (24") (PIPE)	LF	\$ 25.00	900	\$ 22,500.00
	49	REMOVE STRUCTURE (PIPE) (36") (PIPE)	LF	\$ 25.00	1,130	\$ 28,250.00
Subtotal						\$ 6,492,308.55
Contingency 25%						\$ 1,623,077.14
Total Construction Cost						\$ 8,115,385.69
Engineering 11%						\$ 852,115.50
Total Project Cost						\$ 8,967,501.19





**H01 - Drainage Area Map
Kroc Center**

**City of Kerrville
Drainage Master Plan**

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1 inch = 400 feet

0 200 400 Feet



TBPE FIRM NO. F-366



Legend

- Elevation Contours
- Stream Centerline
- Study Location
- Zone A
- Zone AE
- Floodways
- Parcels (2010)
- Exist Storm Water Network
 - Manhole
 - Curb Inlet
 - Outlet
 - Open Channel
 - Storm Drain Pipe/Culvert
 - Detention Pond
- Exist Sewer Utilities
 - Sewer Manhole
 - PSWR Pressure Sewer Main
 - SWR Sewer Main
- Exist Water Utilities
 - Fire Hydrant
 - Water Main

G&H02- Existing Drainage Conditions
Kroc Center and Clay Street

City of Kerrville
Drainage Master Plan

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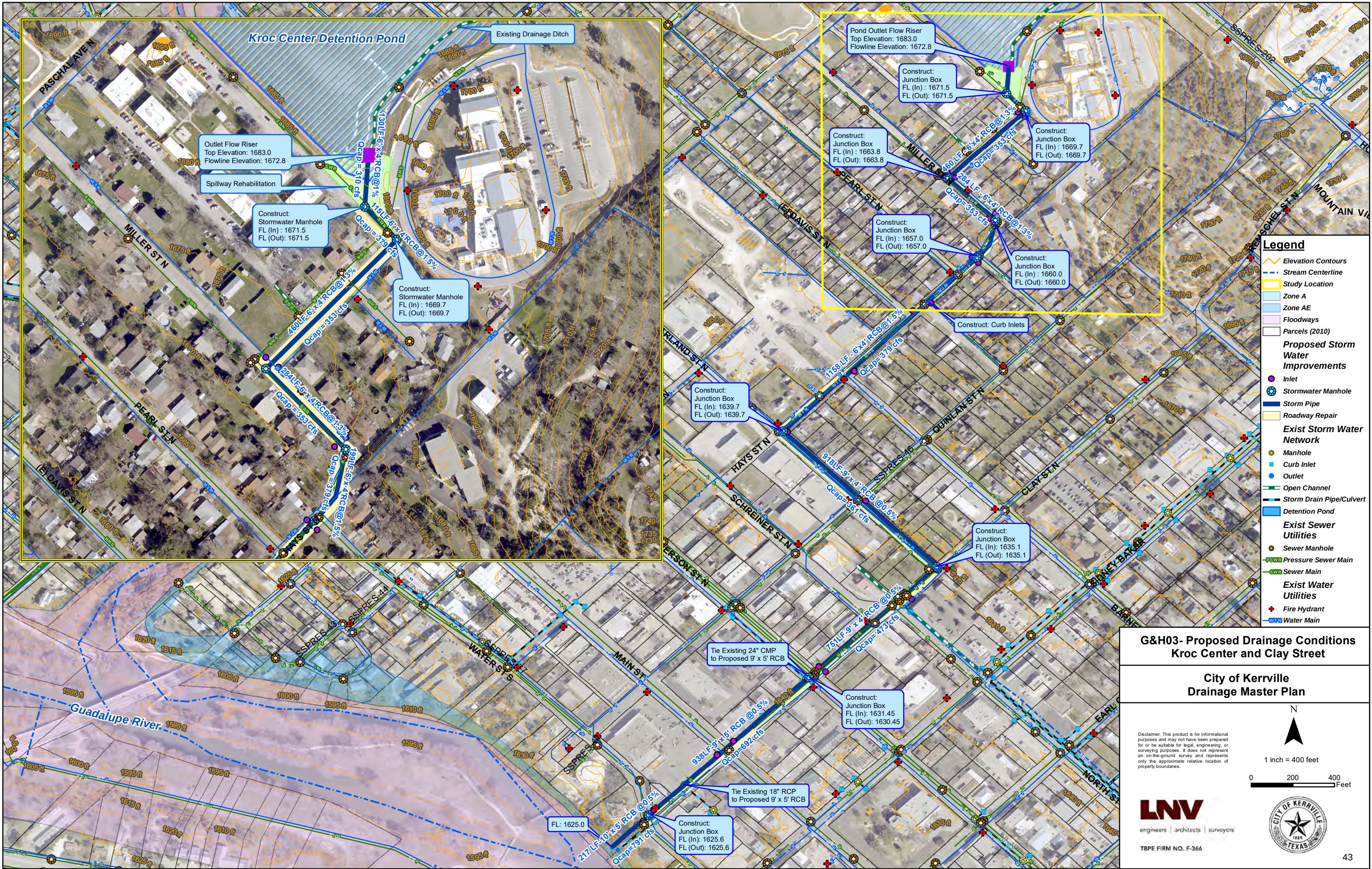


1 inch = 300 feet
0 150 300 Feet



TBPE FIRM NO. F-366





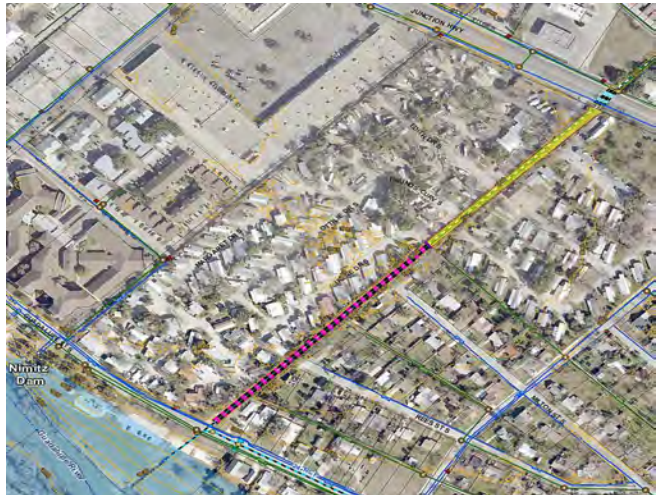
LOCATION I – TAKE IT EASY CHANNEL

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	I						
Project Name:	Take It Easy Drainage Channel						
Fiscal Year Plan							Total
							\$2,291,913

Funding Source		Existing Conditions
General Fund		
Total		
Problem Description:		
Steep channel banks have resulted in instabilities and slope failures due to the erosive velocity's in the channel.		
Proposed Improvement:		
Construct a 12' x 6' box culvert from the 66" CMP at Guadalupe Street for approximately 800 LF. Lower the profile of the channel to accommodate upsizing of the roadway culvert at Junction Highway. Reconstruct the remaining channel from the box culvert to Junction Highway with a rectangular section with 2:1 side slopes to existing grade.		
O & M Impact:		
Periodic cleaning of culverts and channel after major storm events.		
CIP Ranking Criteria		Score
Structural Flooding		90
Roadway Flooding		90
Roadway Emergency Service Access		54
Frequency of Flooding Damages		63
Erosion / Channel Stability		90
Level of Protection Benefit		90
Project Cost		12
Funding Source / Availability		42
Developmental Impacts		60
Permitting		24
Land / Easement Acquisition		20
Project Readiness		12
Project Dependency		40
Water Quality Impacts		42
Riparian Impacts		42
Total Weighted Point Score:		771
CIP Ranking:		1

Proposed Improvements	
	
Conceptual Drainage Improvement Layout	
Notes:	
Take It Easy Channel Improvements should be constructed prior to improving Lois Street drainage conditions.	

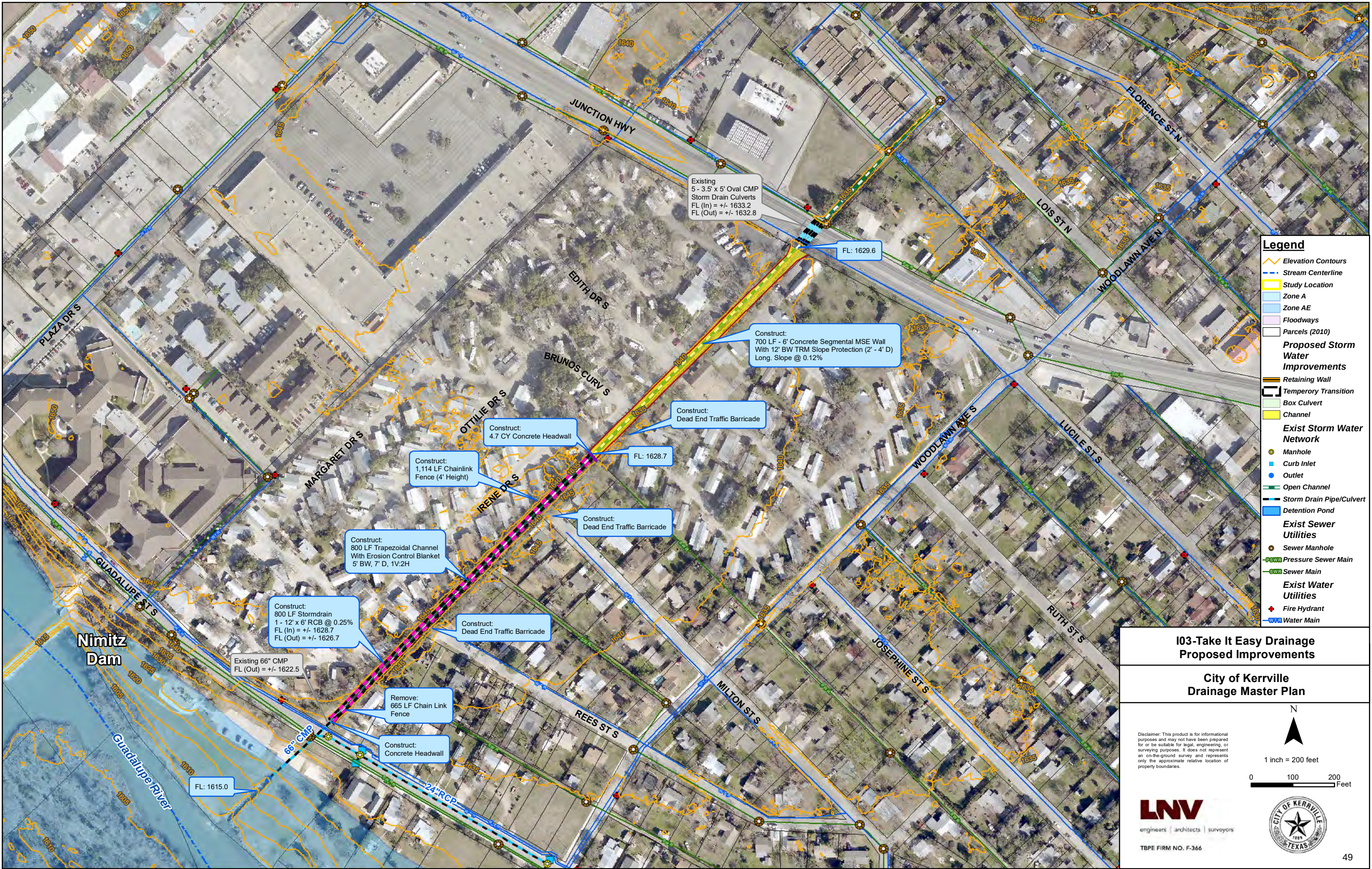
OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: I - Take It Easy Drainage Channel

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 148,935.44
	2	INSURANCE & BOND	LS	3%	1	\$ 40,618.76
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 54,158.34
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 40,618.76
	5	SW3P	LS	1%	1	\$ 13,539.59
Roadway	6	CHAIN LINK FENCE (REMOVE)	LF	\$ 18.00	665	\$ 11,970.00
	7	CHAIN LINK FENCE (4' HIGH)	LF	\$ 25.00	1,114	\$ 27,850.00
	8	SIDEWALK PIPE RAILING (GALVANIZED)	LF	\$ 100.00	700	\$ 70,000.00
	9	MTL W-BEAM GD FEN (TIM POST)	LF	\$ 85.00	100	\$ 8,500.00
Drainage	10	REMOVE MISCELLANEOUS CONCRETE	SF	\$ 7.00	1,060	\$ 7,420.00
	11	REMOVE CONC (HEADWALL)	CY	\$ 480.00	29	\$ 14,155.62
	12	STRUCTURAL EXCAVATION (< 100 CY)	CY	\$ 480.00	30	\$ 14,222.22
	13	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	\$ 18.00	2,000	\$ 36,000.00
	14	CHANNEL EXCAVATION(5,000 CY < X < 70,000 CY)	CY	\$ 25.00	100	\$ 2,500.00
	15	BOX CULVERT EXCAVATION AND BACKFILL	CY	\$ 15.00	100	\$ 1,500.00
	16	CONCRETE STRUCTURE (HEADWALLS OR OUTFALL STRUCTURES)	CY	\$ 1,000.00	24	\$ 24,296.30
	17	MULTI CONC BOX CULV (12 FT X 6 FT)	CY	\$ 800.00	1,100	\$ 880,000.00
	18	GRAVEL SUBGRADE FILLER	CY	\$ 42.00	346	\$ 14,544.44
	19	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	1,400	\$ 4,200.00
	20	MSE RETAINING WALL, 6 FT	SF	\$ 27.00	4,200	\$ 113,400.00
	21	EROSION CONTROL BLANKET	SY	\$ 13.00	1,800	\$ 23,400.00
	22	TURF REINFORCED MATTING	SY	\$ 20.00	5,000	\$ 100,000.00
Subtotal						\$ 1,651,829.47
Contingency 25%						\$ 412,957.37
Total Construction Cost						\$ 2,064,786.84
Engineering 11%						\$ 227,126.55
Total Project Cost						\$ 2,291,913.40





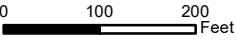
**I03-Take It Easy Drainage
Proposed Improvements**

**City of Kerrville
Drainage Master Plan**

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.



1 inch = 200 feet



TBPE FIRM NO. F-366



LOCATION J – LOIS STREET CHANNEL

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	J						
Project Name:	Lois Street						
Fiscal Year Plan							Total
							\$189,899

Funding Source	
General Fund	0
Total	0

Existing Conditions



Existing Concrete Drainage Channel (Facing D/S)

Problem Description:

Frequent flooding occurs due to the backing up of water at the roadway culvert at Junction Highway and the shallow drainage channel which does not have sufficient capacity. The result is street, property and structural flooding.

Proposed Improvement:

Coordinate with TxDOT for Junction Highway culvert improvements.

Upsize the drainage channel from Lois Street to Junction Highway to improve flow conveyance.

O & M Impact:

Proposed Improvements



Conceptual Drainage Improvement Layout

CIP Ranking Criteria	Score
Structural Flooding	90
Roadway Flooding	90
Roadway Emergency Service Access	54
Frequency of Flooding Damages	90
Erosion / Channel Stability	18
Level of Protection Benefit	90
Project Cost	36
Funding Source / Availability	42
Developmental Impacts	60
Permitting	24
Land / Easement Acquisition	20
Project Readiness	20
Project Dependency	0
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	718
CIP Ranking:	2

Notes:

This project is dependent on Take It Easy Channel downstream improvements occurring first, which include lowering the channel bottom to accommodate larger box culverts at Junction Highway.

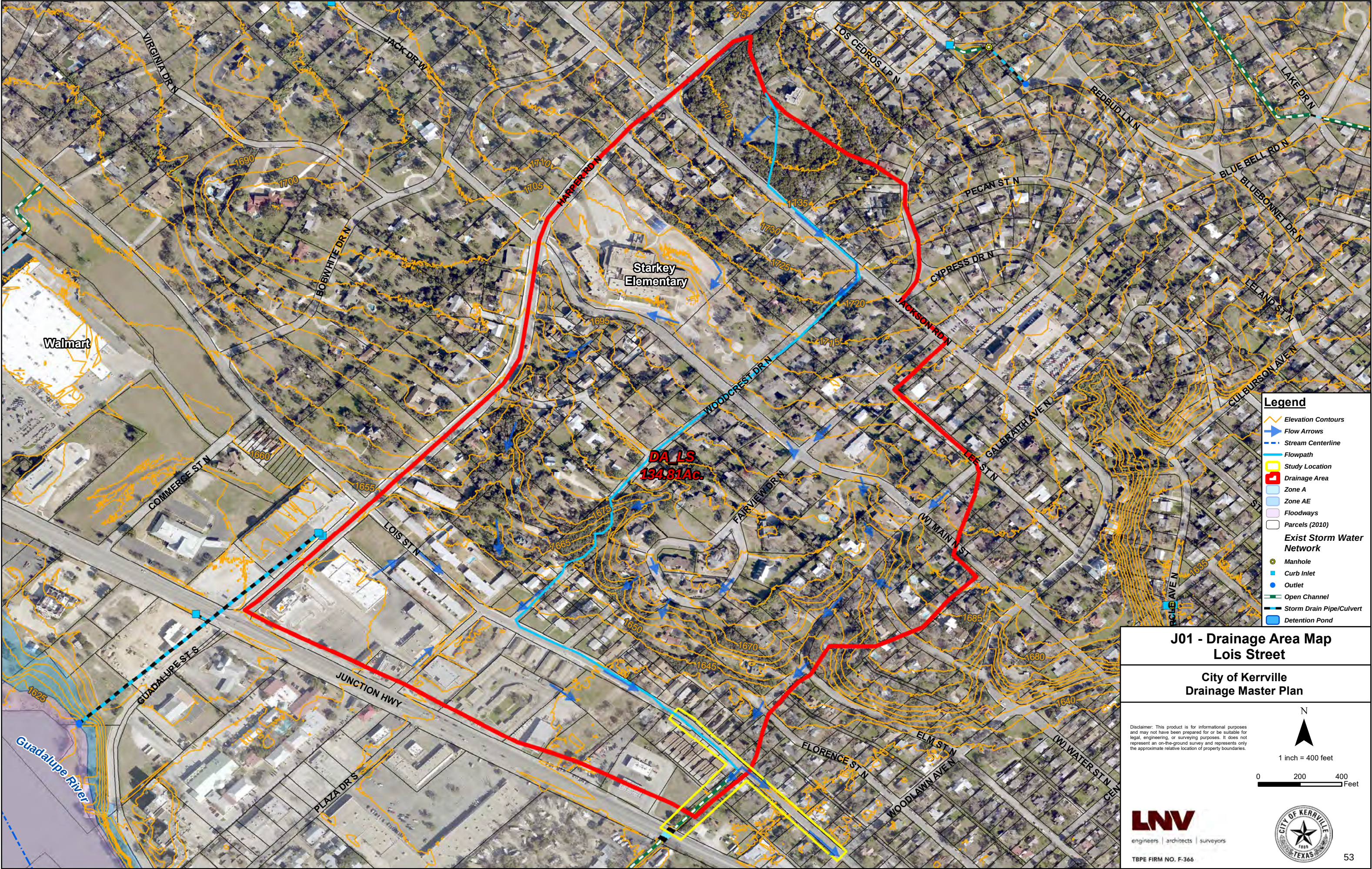
OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: J - Lois Street

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 12,230.03
	2	INSURANCE & BOND	LS	3%	1	\$ 3,335.46
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 4,447.28
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 3,335.46
	5	SW3P	LS	1%	1	\$ 1,111.82
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	160	\$ 960.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	400	\$ 2,000.00
	8	STREET EXCAVATION	CY	\$ 31.00	60	\$ 1,846.22
	9	TACK COAT	GAL	\$ 5.00	27	\$ 133.33
	10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	302	\$ 10,577.78
	11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	267	\$ 4,000.00
	12	CONCRETE CURB & GUTTER	LF	\$ 20.00	160	\$ 3,200.00
Utility	13	CONCRETE SIDEWALKS	SY	\$ 50.00	89	\$ 4,444.44
	14	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	2	\$ 13,000.00
	15	8" PVC WATER MAIN	LF	\$ 60.00	134	\$ 8,040.00
Drainage	16	8" PVC SANITARY SEWER LINE (SDR-26) (ALL DEPTHS)	LF	\$ 70.00	370	\$ 25,900.00
	17	CHANNEL EXCAVATION (150 CY < X < 5,000 CY)	CY	\$ 25.00	654	\$ 16,361.11
	18	CONCRETE STRUCTURE (3' RETAINING WALL)	CY	\$ 1,000.00	3	\$ 2,592.59
	19	SIDEWALK DRAIN	EA	\$ 3,000.00	1	\$ 3,000.00
	20	CONCRETE RIPRAP (5" THICK)	SY	\$ 90.00	168	\$ 15,126.62
Subtotal						\$ 135,642.17
Contingency 25%						\$ 33,910.54
Total Construction Cost						\$ 169,552.71
Engineering 12%						\$ 20,346.32
Total Project Cost						\$ 189,899.03

* Replacement of TxDOT culverts at Junction Highway are to be coordinated and determined, not included in estimate

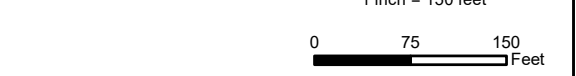




**J02- Existing Drainage Conditions
Lois Street**

**City of Kerrville
Drainage Master Plan**

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TBPE FIRM NO. F-366



Legend

Elevation Contours

Stream Centerline

Study Location

Zone A

Zone AE

Floodways

Parcels (2010)

Proposed Storm Water Improvements

Curb

Railing

Box Culvert

Proposed Ditch

Road Grading

Temporary Transition

Exist Storm Water Network

Manhole

Curb Inlet

Outlet

Open Channel

Storm Drain Pipe/Culvert

Detention Pond

Exist Sewer Utilities

Sewer Manhole

PSWR Pressure Sewer Main

SWR Sewer Main

Exist Water Utilities

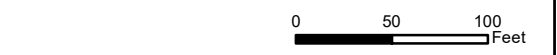
Fire Hydrant

WTR Water Main

J03-Proposed Drainage Improvements
Lois Street

City of Kerrville
Drainage Master Plan

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LOCATION K1 AND K2 – HARPER STREET & CIRCLE AVENUE

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	K1						
Project Name:	Harper Street						
Fiscal Year Plan							Total
							\$1,808,431

Funding Source	
General Fund	0
Total	0

Existing Conditions



Existing Conditions at Harper Street (Facing U/S)

Problem Description:

Minor roadway flooding due to the relatively flat terrain and low-lying spots in the roadway resulting in frequent ponding and nuisance flooding

Proposed Improvement:

Construct a storm drain system from Town Creek to Culberson Avenue.

Perform minor roadway reconstruction by mill and overlay to eliminate low spots in the roadway and improve positive drainage.

O & M Impact:

Proposed Improvements



Conceptual Drainage Improvement Layout

CIP Ranking Criteria	Score
Structural Flooding	45
Roadway Flooding	36
Roadway Emergency Service Access	54
Frequency of Flooding Damages	63
Erosion / Channel Stability	0
Level of Protection Benefit	54
Project Cost	12
Funding Source / Availability	24
Developmental Impacts	60
Permitting	40
Land / Easement Acquisition	20
Project Readiness	12
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	524
CIP Ranking:	10

Notes:

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: K1 - Harper Street

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 116,468.04
	2	INSURANCE & BOND	LS	3%	1	\$ 31,764.01
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 42,352.02
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 31,764.01
	5	SW3P	LS	1%	1	\$ 10,588.00
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	1,680	\$ 10,080.00
	7	STREET EXCAVATION	CY	\$ 31.00	263	\$ 8,161.84
	8	SALVAGING, HAULING & STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT(2" DEPTH)	SY	\$ 9.00	4,167	\$ 37,500.00
	9	LIME TREATED SUBGRADE (6" COMPACTED DEPTH)	SY	\$ 6.00	658	\$ 3,949.28
	10	LIME	TON	\$ 200.00	2	\$ 315.94
	11	PRIME COAT	GAL	\$ 5.00	450	\$ 2,250.00
	12	TACK COAT	GAL	\$ 5.00	417	\$ 2,083.33
	13	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	4,500	\$ 157,500.00
	14	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	4,167	\$ 62,500.00
	15	CONCRETE CURB & GUTTER	LF	\$ 20.00	1,680	\$ 33,600.00
	16	CURB RAMP	EA	\$ 1,500.00	8	\$ 12,000.00
	17	CHAIN LINK FENCE (REMOVE)	LF	\$ 18.00	50	\$ 900.00
	18	CHAIN LINK FENCE (4' HIGH)	LF	\$ 25.00	50	\$ 1,250.00
Utility	19	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	11	\$ 22,000.00
	20	6" PVC WATER MAIN	LF	\$ 50.00	40	\$ 2,000.00
	21	ADJUST EXISTING WATER LATERAL	EA	\$ 3,000.00	21	\$ 63,000.00
	22	SANITARY SEWER (6IN) (PVC) (SDR 26)	LF	\$ 70.00	190	\$ 13,300.00
	23	SANITARY SEWER (12IN) (PVC) (SDR 26)	LF	\$ 100.00	90	\$ 9,000.00
	24	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	6	\$ 39,000.00
	25	ADJUST EXISTING WASTEWATER LATERAL	EA	\$ 1,500.00	21	\$ 31,500.00
Drainage	26	REINFORCED CONCRETE PIPE (CLASS III)(24" DIA)	LF	\$ 130.00	320	\$ 41,600.00
	27	REINFORCED CONCRETE PIPE (CLASS III)(36" DIA)	LF	\$ 150.00	460	\$ 69,000.00
	28	REINFORCED CONCRETE PIPE (CLASS III)(42" DIA)	LF	\$ 228.00	1,000	\$ 228,000.00
	29	CONCRETE STRUCTURE (HEADWALLS OR OUTFALL STRUCTURES)	CY	\$ 1,000.00	8	\$ 8,000.00
	30	CL A CONC (COLLAR)	EA	\$ 1,450.00	1	\$ 1,450.00
	31	RIPRAP (STONE PROTECTION)(18 IN)	CY	\$ 170.00	8	\$ 1,360.00
	32	JUNCTION BOX (COMPLETE) 6'X6'X6'	EA	\$ 7,500.00	4	\$ 30,000.00
	33	INLET TYPE I (COMPLETE) (10 FT) (10' DEPTH)	EA	\$ 7,500.00	16	\$ 120,000.00
	34	INLET EXTENSIONS (10 FT.)	EA	\$ 4,000.00	4	\$ 16,000.00
	35	CONCRETE RETAINING WALLS-(SIDEWALK/ DRIVEWAYS)	CY	\$ 1,000.00	27	\$ 27,000.00
	36	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	1,500	\$ 4,500.00
				Subtotal		\$ 1,291,736.48
				Contingency	25%	\$ 322,934.12
				Total Construction Cost		\$ 1,614,670.60
				Engineering	12%	\$ 193,760.47
				Total Project Cost		\$ 1,808,431.07

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	K2						
Project Name:	Circle Avenue						
Fiscal Year Plan							Total
							\$188,800

Funding Source	
General Fund	0
Total	0

Problem Description:

Runoff received from Jackson Drive travels down a steep earthen slope towards Circle Drive resulting in erosion and the accumulation of sediment within the roadway.

Proposed Improvements:

Construct a concrete lined channel with energy dissipation controls from Jackson Drive to Circle Avenue.

Direct runoff at the downstream outlet parallel with Circle Avenue to prevent flows from discharging across the roadway and into private property.

O & M Impact:

Periodic cleaning of the concrete channel and outlet.

CIP Ranking Criteria	Score
Structural Flooding	0
Roadway Flooding	36
Roadway Emergency Service Access	18
Frequency of Flooding Damages	63
Erosion / Channel Stability	90
Level of Protection Benefit	90
Project Cost	60
Funding Source / Availability	24
Developmental Impacts	30
Permitting	40
Land / Easement Acquisition	12
Project Readiness	20
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	587
CIP Ranking:	6

Existing Conditions



Existing Earthen Channel Outfall Location (Facing U/S)

Proposed Improvements



Conceptual Drainage Improvement Layout

Notes:

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: K2 - Circle Avenue

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 11,842.05
	2	INSURANCE & BOND	LS	3%	1	\$ 3,229.65
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 4,306.20
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 3,229.65
	5	SW3P	LS	1%	1	\$ 1,076.55
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	242	\$ 1,452.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	560	\$ 2,800.00
	8	STREET EXCAVATION	CY	\$ 31.00	231	\$ 7,147.41
	9	TACK COAT	GAL	\$ 5.00	36	\$ 181.21
	10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	407	\$ 14,240.57
	11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	362	\$ 5,436.43
	12	CONCRETE CURB & GUTTER	LF	\$ 20.00	242	\$ 4,840.00
Utility	13	PORTLAND CEMENT CONCRETE DRIVEWAY	SY	\$ 74.00	62	\$ 4,604.44
	14	8" PVC WATER MAIN	LF	\$ 60.00	65	\$ 3,900.00
Drainage	15	CHANNEL EXCAVATION (< 150 CY)	CY	\$ 20.00	147	\$ 2,940.74
	16	CONCRETE STRUCTURE (BAFFLE BLOCKS)	CY	\$ 1,000.00	1	\$ 888.89
	17	CONCRETE RIPRAP (5" THICK) (100 SY < X < 4000 SY)	SY	\$ 90.00	406	\$ 36,500.00
	18	TOPSOIL (4")	SY	\$ 9.00	733	\$ 6,600.00
	19	BERMUDA SODDING	SY	\$ 7.00	733	\$ 5,133.33
	20	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	330	\$ 990.00
	21	CONCRETE BOLLARDS	EA	\$ 5,000.00	2	\$ 10,000.00
Subtotal						\$ 131,339.14
Contingency					25%	\$ 32,834.78
Total Construction Cost						\$ 164,173.92
Engineering					15%	\$ 24,626.09
Total Project Cost						\$ 188,800.01





K1-02, K2-02 - Existing Drainage Conditions
Harper Street & Circle A Ave

City of Kerrville
Drainage Master Plan

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1 inch = 200 feet

0 100 200 Feet



TBPE FIRM NO. F-366



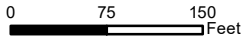
K1-03 - Proposed Drainage Improvements
Harper Street

City of Kerrville
Drainage Master Plan

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1 inch = 150 feet

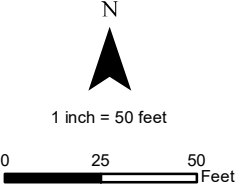




**K2-03 - Proposed Drainage Improvements
Circle Avenue**

**City of Kerrville
Drainage Master Plan**

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TBPE FIRM NO. F-366

LOCATION L – JACK DRIVE

City of Kerrville

Capital Improvements Project

Project Summary							
Project ID:	L						
Project Name:	Jack Drive						
Fiscal Year Plan							Total
							\$2,373,793

Funding Source	
General Fund	0
Total	0

Existing Conditions



Existing Undersized Drainage Network at Jack Drive

Proposed Improvements



Conceptual Drainage Improvement Layout

Problem Description:
Significant runoff that accumulates at Jack Drive has no storm drain system to be collected into which results in flood flows traveling across residential properties and places structures at risk of damage.

Proposed Improvement:
Construct a storm drain pipe system from Jack Drive to Lois Street intended to capture runoff and convey it within available easements and within proposed easements, as needed. Jack and bore storm drain pipe in areas where there are significant structures, trees or high risk of property damage due to construction.

O & M Impact:

CIP Ranking Criteria	Score
Structural Flooding	90
Roadway Flooding	36
Roadway Emergency Service Access	18
Frequency of Flooding Damages	90
Erosion / Channel Stability	0
Level of Protection Benefit	54
Project Cost	12
Funding Source / Availability	24
Developmental Impacts	60
Permitting	40
Land / Easement Acquisition	12
Project Readiness	12
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42

Total Weighted Point Score:	552
CIP Ranking:	7

Notes:

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: L - Jack Drive

Date: 12/19/2019



	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 146,973.77
	2	INSURANCE & BOND	LS	3%	1	\$ 40,083.75
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 53,445.01
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 40,083.75
	5	SW3P	LS	1%	1	\$ 13,361.25
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	260	\$ 1,560.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	1,070	\$ 5,350.00
	8	STREET EXCAVATION	CY	\$ 31.00	669	\$ 20,741.87
	9	TACK COAT	GAL	\$ 5.00	143	\$ 712.50
	10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	1,618	\$ 56,641.67
	11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	1,425	\$ 21,375.00
	12	CONCRETE CURB & GUTTER	LF	\$ 20.00	670	\$ 13,400.00
	13	CONCRETE SIDEWALKS	SY	\$ 50.00	72	\$ 3,611.11
Utility	14	PORTLAND CEMENT CONCRETE DRIVEWAY	SY	\$ 74.00	74	\$ 5,508.89
	15	ADJUST EXISTING MANHOLES AND VALVE BOXES	EA	\$ 2,000.00	1	\$ 2,000.00
	16	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	6	\$ 39,000.00
	17	8" PVC WATER MAIN	LF	\$ 60.00	60	\$ 3,600.00
	18	SANITARY SEWER (6IN) (PVC) (SDR 26)	LF	\$ 70.00	270	\$ 18,900.00
Drainage	19	SANITARY SEWER (12IN) (PVC) (SDR 26)	LF	\$ 100.00	50	\$ 5,000.00
	20	CHANNEL EXCAVATION (150 CY < X < 5,000 CY)	CY	\$ 25.00	554	\$ 13,851.85
	21	STRUCTURAL EXCAVATION DRVY RET WALLS	CY	\$ 85.00	2	\$ 204.63
	22	CONCRETE STRUCTURE(RETAINING WALLS) (< 10 CY)	CY	\$ 1,000.00	2	\$ 2,407.41
	23	CONCRETE STRUCTURE (HEADWALLS OR OUTFALL STRUCTURES)	CY	\$ 1,000.00	3	\$ 2,888.89
	24	REINFORCED CONCRETE PIPE (CLASS III)(42" DIA)	LF	\$ 228.00	1,230	\$ 280,440.00
	25	REINFORCED CONCRETE PIPE (CLASS III)(48" DIA)	LF	\$ 390.00	426	\$ 166,140.00
	26	JUNCTION BOX (COMPLETE) 6'X6'X6'	EA	\$ 7,500.00	4	\$ 30,000.00
	27	INLET TYPE I (COMPLETE) (10 FT) (5' DEPTH)	EA	\$ 6,000.00	6	\$ 36,000.00
	28	MANHOLE VERTICAL STACK (SPECIAL MANHOLE RISER)	EA	\$ 3,000.00	4	\$ 12,000.00
	29	CHAIN LINK WIRE FENCE (6' HIGH)	LF	\$ 40.00	520	\$ 20,800.00
	30	TOPSOIL (4")	SY	\$ 9.00	1,222	\$ 11,000.00
	31	BERMUDA SODDING	SY	\$ 7.00	1,222	\$ 8,555.56
	32	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	1,886	\$ 5,658.00
	33	RIPRAP (STONE PROTECTION)(18 IN)	CY	\$ 170.00	2	\$ 377.78
	34	GRATE INLET (COMPL) (TY W-3)	EA	\$ 6,000.00	1	\$ 6,000.00
	35	REMOVE STRUCTURE (INLET)	EA	\$ 1,200.00	2	\$ 2,400.00
	36	JACK BORE (48" RCP)	LF	\$ 900.00	600	\$ 540,000.00
Subtotal						\$ 1,630,072.68
Contingency						25% \$ 407,518.17
Total Construction Cost						\$ 2,037,590.85
Land Acquisition						5% \$ 101,879.54
Engineering						12% \$ 234,322.95
Total Project Cost						\$ 2,373,793.34



**L01 - Drainage Area Map
Jack Drive**

**City of Kerrville
Drainage Master Plan**

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.



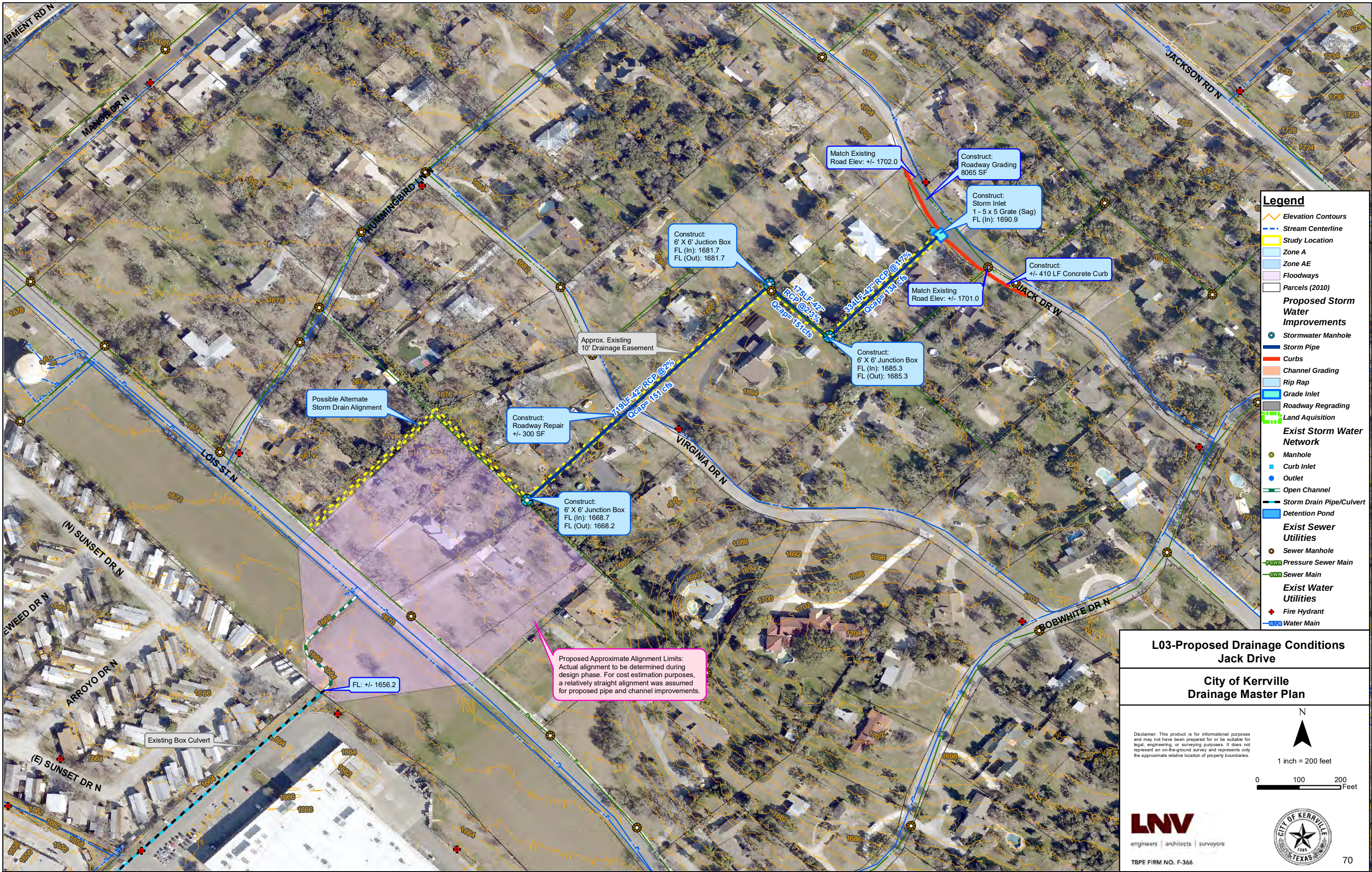
1 inch = 300 feet

0 150 300 Feet



TBPE FIRM NO. F-366





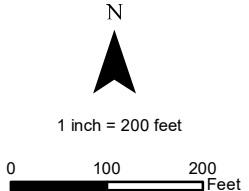
Legend

- Elevation Contours
- Stream Centerline
- Study Location
- Zone A
- Zone AE
- Floodways
- Parcels (2010)
- Proposed Storm Water Improvements**
- Stormwater Manhole
- Storm Pipe
- Curbs
- Channel Grading
- Rip Rap
- Grade Inlet
- Roadway Regrading
- Land Aquisition
- Exist Storm Water Network**
- Manhole
- Curb Inlet
- Outlet
- Open Channel
- Storm Drain Pipe/Culvert
- Detention Pond
- Exist Sewer Utilities**
- Sewer Manhole
- Pressure Sewer Main
- Sewer Main
- Exist Water Utilities**
- Fire Hydrant
- Water Main

**L03-Proposed Drainage Conditions
Jack Drive**

**City of Kerrville
Drainage Master Plan**

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TBPE FIRM NO. F-366

LOCATION M – CORONADO DRIVE

City of Kerrville

Capital Improvements Project

Project Summary								
Project ID:	M							
Project Name:	Coronado Drive North at SH27 (Junction Highway)							
Fiscal Year Plan								Total
								\$494,195

Funding Source	
General Fund	0
Total	0

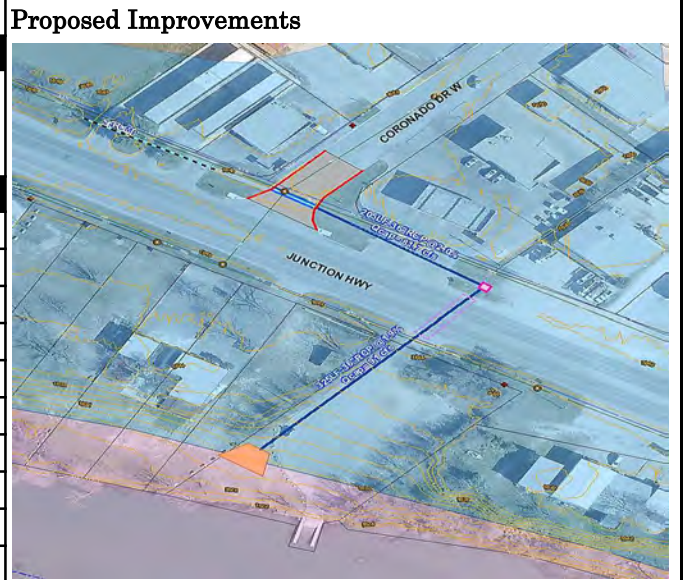


Existing Drainage Conditions at Coronado St.

Problem Description:
Junction Highway is higher than Coronado Drive resulting in runoff traveling from Coronado to backup and pond in the system due to lack of positive drainage which results in street flooding and roadway closures during storm events.

Proposed Improvements:
Construct a trench drain or inlet system at Coronado Drive and convey runoff thru a storm pipe across Junction Highway that discharges into the Guadalupe River.

O & M Impact:



Conceptual Drainage Improvement Layout

CIP Ranking Criteria	Score
Structural Flooding	0
Roadway Flooding	63
Roadway Emergency Service Access	54
Frequency of Flooding Damages	63
Erosion / Channel Stability	0
Level of Protection Benefit	54
Project Cost	60
Funding Source / Availability	60
Developmental Impacts	30
Permitting	24
Land / Easement Acquisition	20
Project Readiness	20
Project Dependency	20
Water Quality Impacts	42
Riparian Impacts	42
Total Weighted Point Score:	552
CIP Ranking:	7

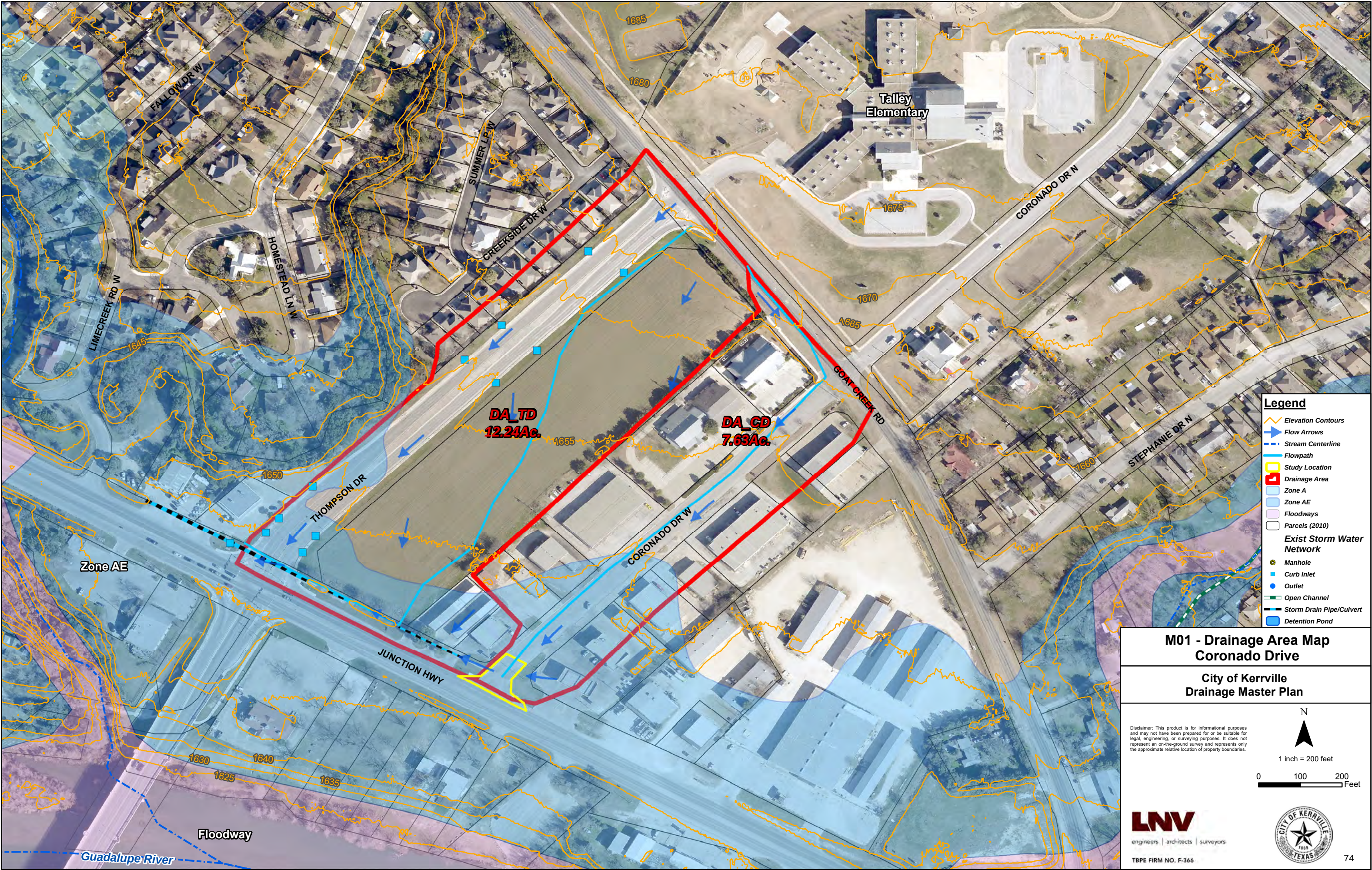
Notes:

OPINION OF PROBABLE CONSTRUCTION COST
City of Kerrville Stormwater Master Plan
Project ID: M - Coronado Drive

Date: 12/19/2019



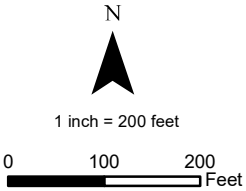
	ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
General	1	MOBILIZATION	LS	11%	1	\$ 31,686.10
	2	INSURANCE & BOND	LS	3%	1	\$ 8,641.66
	3	PREPARING RIGHT OF WAY	LS	4%	1	\$ 11,522.22
	4	TRAFFIC CONTROL PLAN	LS	3%	1	\$ 8,641.66
	5	SW3P	LS	1%	1	\$ 2,880.55
Roadway	6	REMOVE CONCRETE CURB	LF	\$ 6.00	210	\$ 1,260.00
	7	REMOVE CONCRETE SIDEWALKS & DRIVEWAYS	SF	\$ 5.00	1,025	\$ 5,125.00
	8	STREET EXCAVATION	CY	\$ 31.00	227	\$ 7,026.67
	9	TACK COAT	GAL	\$ 5.00	49	\$ 245.56
	10	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	\$ 35.00	567	\$ 19,833.33
	11	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	\$ 15.00	491	\$ 7,366.67
	12	CONCRETE CURB & GUTTER	LF	\$ 20.00	210	\$ 4,200.00
Utility	13	PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL	SY	\$ 74.00	114	\$ 8,427.78
	14	SANITARY SEWER MANHOLE (0' - 6')	EA	\$ 6,500.00	3	\$ 19,500.00
	15	8" PVC WATER MAIN	LF	\$ 60.00	30	\$ 1,800.00
Drainage	16	8" PVC SANITARY SEWER LINE (SDR-26) (ALL DEPTHS)	LF	\$ 70.00	50	\$ 3,500.00
	17	GRATE INLET (COMPL) (TRAFFIC) (TY X-1) (5' X 5')	EA	\$ 5,000.00	1	\$ 5,000.00
	18	REMOVE MISCELLANEOUS CONCRETE	SF	\$ 5.00	880	\$ 4,400.00
	19	STRUCTURAL EXCAVATION (100 < X < 500 CY)	CY	\$ 85.00	61	\$ 5,194.44
	20	REINFORCED CONCRETE PIPE (CLASS III)(36" DIA)	LF	\$ 155.00	530	\$ 82,150.00
	21	SAFETY END TREATMENT (TYPE 1) (36" DIA)	EA	\$ 3,000.00	1	\$ 3,000.00
	22	JUNCTION BOX (COMPLETE) 5'X5'X5'	EA	\$ 5,820.00	1	\$ 5,820.00
	23	CONCRETE RIPRAP (5" THICK)	SY	\$ 90.00	102	\$ 9,175.00
	24	TRENCH EXCAVATION SAFETY PROTECTION	LF	\$ 3.00	677	\$ 2,031.00
	25	JACK BORE (36" RCP)	LF	\$ 900.00	85	\$ 76,500.00
	26	TRENCH DRAIN (3.5'W X 30'L X 5'D)	EA	\$ 16,500.00	1	\$ 16,500.00
Subtotal						\$ 351,427.64
Contingency					25%	\$ 87,856.91
Total Construction Cost						\$ 439,284.55
Engineering					13%	\$ 54,910.57
Total Project Cost						\$ 494,195.12



M01 - Drainage Area Map
Coronado Drive

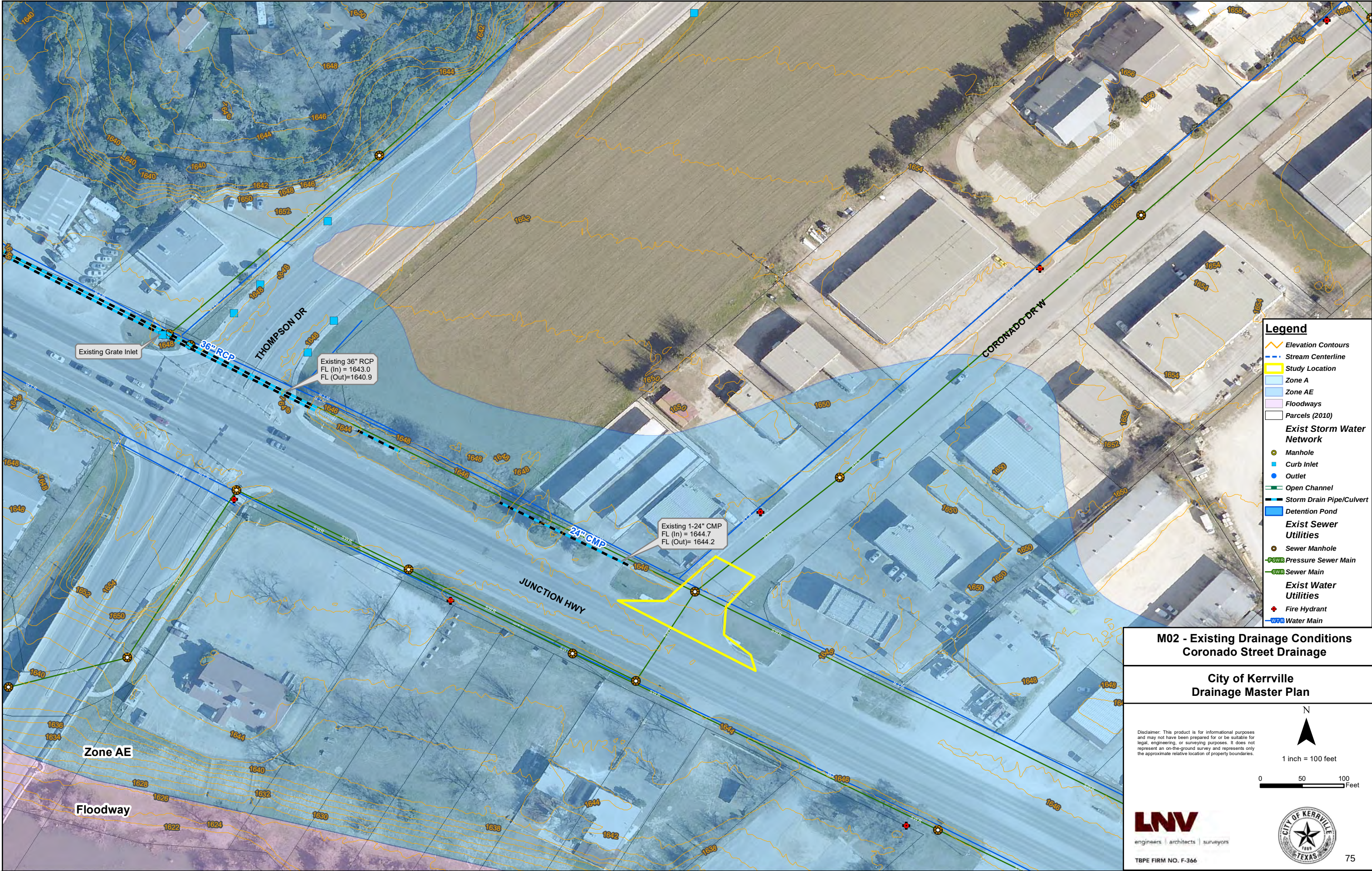
City of Kerrville
Drainage Master Plan

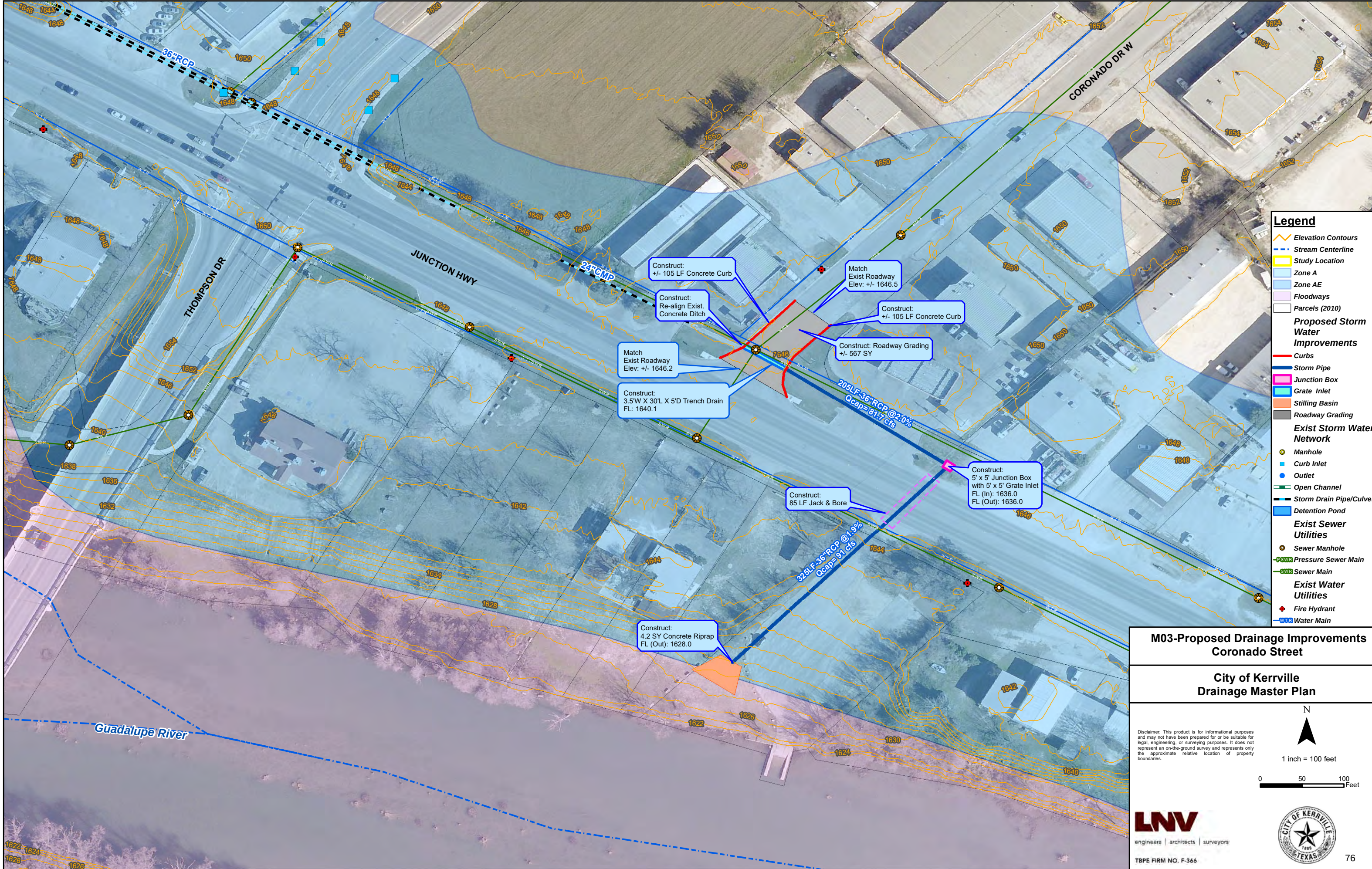
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LNV
engineers | architects | surveyors
TBPE FIRM NO. F-366







Legend

Elevation Contours

Stream Centerline

Study Location

Zone A

Zone AE

Floodways

Parcels (2010)

Proposed Storm Water Improvements

Curbs

Storm Pipe

Junction Box

Grate Inlet

Stilling Basin

Roadway Grading

Exist Storm Water Network

Manhole

Curb Inlet

Outlet

Open Channel

Storm Drain Pipe/Culvert

Detention Pond

Exist Sewer Utilities

Sewer Manhole

PSW Pressure Sewer Main

SWR Sewer Main

Exist Water Utilities

Fire Hydrant

WVR Water Main

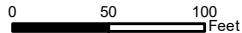
M03-Proposed Drainage Improvements
Coronado Street

City of Kerrville
Drainage Master Plan

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1 inch = 100 feet



TBPE FIRM NO. F-366



APPENDIX C – DRAINAGE POLICY AND CRITERIA REVIEW

SECTION 54 FLOODS

ARTICLE	ORDINANCE	RECOMMENDATION
I	IN GENERAL	No change.
II	FLOODPLAIN MANAGEMENT	
31 – Purpose and Methods	(a) <i>Purpose.</i> This article is adopted for the purpose of promoting the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to: (1) Protect human life and health; (2) Minimize expenditure of public money for costly flood control projects; (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public; (4) Minimize prolonged business interruptions; (5) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains; (6) Help maintain a stable tax base by providing for the sound use and development of floodprone areas in such a manner as to minimize future flood blight areas; and (7) Ensure that potential buyers are notified that property is in a flood area. (b) <i>Methods of reducing flood losses.</i> In order to accomplish the purposes set forth in subsection (a) of this section, this article uses the following methods: (1) Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, or which cause excessive increases in flood heights or velocities; (2) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction; (3) Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters; (4) Control filling, grading, dredging and other development which may increase flood damage; (5) Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.	ADD PROVISIONS: (a) <i>Purpose.</i> (8) To minimize public and private property losses due to flooding; (9) To preserve the natural floodplains where at all possible; (6) Controlling development which would cause greater erosion or potential flood damage such as grading, dredging, excavation, and filling. (7) Imposing a regulatory 1% annual chance floodplain that requires using the ultimate development of the watershed to determine the 1% annual chance water surface elevations. New developments must be constructed above this elevation.

ARTICLE	ORDINANCE	RECOMMENDATION
32 – Definition and Interpretation	<i>Definitions.</i> Unless specifically defined in this section, words or phrases used in this article shall be interpreted to give them the meaning they have in common usage and to give this article its most reasonable application: <i>Actual start</i> for purposes of determining the "start of construction" as defined in this section, means: (1) The first placement of permanent construction of a structure on a site; (2) The placement of a manufactured home on a foundation; or (3) In the case of a substantial improvement, the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building. <i>Alluvial fan flooding</i> means flooding occurring on the surface of an alluvial fan or similar land form which originates at the apex and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and, unpredictable flow paths. <i>Alluvial stream</i> means a stream that has formed its channel by the process of aggradation. The sediment in the stream is similar to the material in the bed and banks. <i>Apex</i> means a point on an alluvial fan or similar land form below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur. <i>Appeal</i> means a request for a review of the floodplain administrator's interpretation of any provision of this article or a request for a variance. <i>Area of shallow flooding</i> means a designated AO, AH, AR/AO, AR/AH, or VO zone on a community's flood insurance rate map (FIRM) with a one percent or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow. <i>Area of special flood hazard</i> means the land in the floodplain within the city subject to a one percent or greater chance of flooding in any given year. Prior to completion of detailed ratemaking in preparation of publication of a FIRM, such area may be designated as zone A on the flood hazard boundary map. After the completion of detailed ratemaking in preparation for publication of a FIRM, such area may be designated as zones A, AE, AH, AO, A1-99, VO, V1-30, VE or V. <i>Base flood</i> means the flood having a one percent chance of being equaled or exceeded in any given year. <i>Base flood elevation (BFE)</i> means the water surface elevation associated with the base flood as defined in the flood insurance study approved by FEMA dated March	ADD PROVISIONS: <i>Definitions.</i> <i>1% annual chance floodplain</i> (formerly 100-year floodplain) is the land within a community subject to a one (1) percent or greater chance of flooding in any given year. These areas are typically designated as a Federal Emergency Management Agency (FEMA) Zone A, AE, AH, or AO on FEMA Flood Insurance Rate Maps (FIRM Panels). <i>Appurtenant structure</i> means a structure which is on the same parcel of property as the principal structure to be insured and the use of which is incidental to the use of the principal structure. <i>Area of flood inundation</i> refers to sites that are subject to flooding as a result of water ponding in the controlled storage areas of dams, detention and retention ponds. <i>Area of future flood conditions</i> means the land area that would be inundated by the 1% annual chance (100-year) flood based on future conditions hydrology.

ARTICLE	ORDINANCE	RECOMMENDATION
	3, 2011, any amendments approved by FEMA to such flood insurance study, or such other flood insurance study as may be later adopted and/or amended by FEMA. <i>Basement</i> means any area of the building having its floor subgrade (below ground level) on all sides. <i>CFR</i> means the Code of Federal Regulations. <i>Competent engineering study</i> means hydrologic and/or hydraulic analysis performed in accordance with standard engineering practices required by FEMA. <i>Critical feature</i> means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised. <i>Cross section</i> means a vertical profile of the ground surface taken perpendicular to the direction of flood flow. The profile is defined by coordinates of ground elevation and horizontal distance (station). <i>Development</i> means any manmade change in improved and unimproved real estate, including but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. <i>Development permit</i> means any authorization required by the city prior to development in the floodplain. The term "development permit" includes, but is not limited to, a subdivision plat, site plan, building permit, grading permit or construction permit. <i>Director</i> means the director of engineering of the city. <i>Elevated building</i> means a nonbasement building which, for insurance purposes, has its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns. <i>Existing construction</i> and <i>existing structures</i> mean for the purpose of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRM's effective before that date. <i>Existing manufactured home park or subdivision</i> means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before October 1, 1998. <i>Expansion to an existing manufactured home park or subdivision</i> means the preparation of additional sites by the construction of facilities for servicing the lots on which manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).	<i>CLOMR</i> means a Conditional Letter of Map Revision. A CLOMR will be submitted for FEMA approval for all proposed physical changes to the floodplain that will result in a change to the floodplain boundary. MODIFY PROVISIONS: Definitions - Elevated Building Definition. <i>Elevated building</i> means a non-basement building (i) built, in the case of a building in Zones AE, A, A99, AO, AH, X, and D, to have the top of the elevated floor, elevated above the ground level by means of pilings, columns (posts and piers), or shear walls parallel to the floor of the water and (ii) adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood. In the case of Zones AE, A, A99, AO, AH, X, D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of floodwaters.

ARTICLE	ORDINANCE	RECOMMENDATION
	<i>FEMA</i> means the Federal Emergency Management Agency. <i>First placement of permanent construction</i> means the initial step of constructing a permanent structure in a site including, but not limited to: (1) The pouring of slab or footings; (2) The installation of piles; (3) The construction of columns; or (4) Any work beyond the stage of excavation. For purpose of this definition the term "permanent construction" does not include land preparation, such as clearing, grading and filling, installation of streets and/or walkways, excavation for basement, footings, piers or foundations or the erection of temporary forms, or the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. <i>Flood and flooding</i> mean: (1) A general and temporary condition of partial or complete inundation of normally dry land areas from: a. The overflow of inland or tidal waters; b. The unusual and rapid accumulation or runoff of surface waters from any source; or c. Mudslides which are proximately caused by flooding as defined in subsection (1)b of this definition and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current; and (2) The collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding as defined in subsection (1)a of this definition. <i>Flood elevation determination</i> means a determination by the administrator of FEMA of the water surface elevation of the base flood. <i>Flood elevation study</i> and <i>flood insurance study</i> mean an examination, evaluation, and determination of (i) flood hazards and, if appropriate, corresponding water surface elevations; or (ii) mudslides (i.e. mudflow) and/or flood-related erosion hazards.	

ARTICLE	ORDINANCE	RECOMMENDATION ADD PROVISIONS:
	<i>Flood insurance rate map (FIRM)</i> means an official map of the areas of the incorporated limits of the city on which FEMA has delineated both the areas of special flood hazards and the risk premium zones applicable to property located within the city. <i>Flood protection system</i> means those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed in conformance with sound engineering standards specifically to modify flooding in order to reduce the extent of the areas within the city subject to a "special flood hazard" and the extent of the depths of associated flooding, including, but not limited to, dams, reservoirs, levees or dikes. <i>Floodplain</i> and <i>floodprone area</i> mean the land lying between the channel of the Guadalupe River and/or its tributaries and the outer boundary of the 100-year flood, as delineated on the FIRM. The term "floodplain" includes land within the regulatory floodways and land within the flood fringe. <i>Floodplain development permit</i> means the city authorization required by this article to allow a property owner to obtain preliminary or final approval of an application for development of land within the floodplain issued alone or concurrently with a building permit pursuant to chapter 26, article II, of this Code. <i>Floodproofing</i> means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents. <i>Floodway</i> and <i>regulatory floodway</i> mean the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. <i>Floodway fringe</i> means the area between the floodway boundary and the 100-year floodplain boundary. <i>Functionally dependent use</i> means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term "functionally dependent use" includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and shipbuilding and ship repair facilities, but does not include longterm storage or related manufacturing facilities. <i>Habitable floor</i> means any floor, other than a floor used for storage purposes only, which is usable for one or more of the following purposes: (1) Working; (2) Sleeping; (3) Eating; (4) Cooking; or	<i>Flood Insurance Study (FIS)</i> is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, water surface elevation or the base flood, as well as the flood boundary map. Also see Flood Elevation Study. <i>Flood-prone area</i> means any land area susceptible to being inundated by water from any source (see definition of flooding). <i>Floodplain management</i> means the operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations. <i>Floodplain management regulations</i> means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. <i>Habitable structure</i> means a structure that has facilities to accommodate people for an overnight stay. These include, but are not limited to, residential homes, apartments, condominiums, hotels, motels, and manufactured homes. Recreational vehicles are not included in this definition.

ARTICLE	ORDINANCE	RECOMMENDATION
	(5) Recreation.	ADD PROVISIONS:
	<i>Highest adjacent grade</i> means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. <i>Historic structure</i> means any structure that is: (1) Listed individually in the National Register of Historic Places (a listing maintained by the United States Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; (2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (3) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or (4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: a. By an approved state program as determined by the Secretary of the Interior; or b. Directly by the Secretary of the Interior in states without approved programs. <i>Levee</i> means a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. <i>Levee system</i> means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. <i>Lowest floor</i> means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirement of Section 60.3 of the National Flood Insurance Program regulations (44 CFR 60.3). <i>Manufactured home</i> means a structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For floodplain management purposes, the term "manufactured home" also includes park trailers, travel trailers, and other similar recreational vehicles or trailers placed on a site for greater than 30 consecutive days. For insurance purposes, the term "manufactured home" does	<i>LOMR</i> means a letter of map revision. A LOMR will be submitted for FEMA approval for all changes to the floodplain boundary that are delineated on the current Flood Insurance Rate Maps.

ARTICLE	ORDINANCE	RECOMMENDATION
	not include park trailers, travel trailers, and other similar recreational vehicles or trailers. <i>Manufactured home park or subdivision</i> means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale. <i>Mean sea level</i> means for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on the FIRM are referenced. <i>New construction</i> means, for floodplain management purposes, structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by the city and includes any subsequent improvements to such structures. <i>New manufactured home park or subdivision</i> means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of the ordinance from which this article is derived or any amendment to this article. <i>100-year flood</i> means the flood that has a one percent chance of being equaled or exceeded once every year; equivalent to the one percent annual chance flood. <i>Recreational vehicle</i> means a vehicle which is: (1) Built on a single chassis; (2) Four hundred square feet or less when measured at the largest horizontal projection; (3) Designed to be self-propelled or permanently towable by a light duty truck; and (4) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use. <i>Standard Fire Prevention Code</i> means the Standard Fire Prevention Code of 1994, promulgated by the Southern Building Code Congress International, Inc., as incorporated and amended by section 50-6. <i>Start of construction</i> means other than new construction or substantial improvements performed under the Coastal Barrier Resources Act (PL 97-348), the date the building permit was issued for new construction or substantial improvements to an existing structure, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement was within 180 days of the permit date. <i>Structure</i> means a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, or a manufactured home.	ADD PROVISIONS: <i>Natural state</i> means the topography that exists at the time information is gathered for flood insurance rate maps or any subsequent approved revisions to those maps. <i>Regulatory floodplain</i> is the land within the community subject to a one (1) percent or greater chance of flooding in any given year assuming all future development has occurred throughout the watershed. The regulatory floodplain is delineated on the currently effective FEMA Flood Insurance Rate Maps (FIRM Panels). NOTE: As the city's floodplain ordinance (this Appendix F of the Unified Development Code) is approved by FEMA as a condition of participation in the National Flood Insurance Program (NFIP), the city's regulatory floodplain is considered FEMA's future base flood. <i>Regulatory floodway</i> means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The floodway is congruent with the regulatory 1% annual chance floodplain in the City of Kerrville and its Extra Territorial Jurisdiction. <i>Repetitive loss</i> means flood-related damages sustained by a structure on two (2) separate occasions during a ten-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds twenty-five (25) percent of the market value of the structure before the damage occurred. <i>Riverine</i> means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc. <i>Special flood hazard area</i> see Area of Special Flood Hazard.

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	<i>Substantial damage</i> means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. <i>Substantial improvement</i> means any reconstruction, rehabilitation, addition, or other improvement of a structure, including structures which have incurred substantial damage regardless of the actual repair work performed, the cost of which alone or in combination with the cost of all other reconstruction, rehabilitation, or improvements performed on the structure within the five years prior to the start of construction equals or exceeds 50 percent of the market value of the structure either before the start of construction, or, in the case where the structure has received substantial damage, the market value before the damage occurred. The term "substantial improvement" does not include: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which haven't been identified by city officials and which are solely necessary to assure safe living conditions; or (2) Any alteration of a historic structure listed on the National Register of Historic Places or a state inventory of historic places. <i>Variance</i> means a grant of relief by the city from the provisions of this article in accordance with Section 60.6 of the National Flood Insurance Program regulations (44 CFR 60.6) when specific enforcement would result in unnecessary hardship, which relief would allow construction or development in a manner otherwise prohibited by this article. <i>Violation</i> means the failure of a structure or other development to be fully compliant with this article and other floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in 44 CFR 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided. <i>Water surface elevation</i> means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of the Guadalupe River and its tributaries.	

**33 General
Provisions**

- (a) *Lands to which this article applies.* This article applies to all areas of special flood hazard within the incorporated limits of the city.
- (b) *Basis for establishing the areas of special flood hazard.* The areas of special flood hazard identified and defined in the following documents prepared by FEMA are hereby adopted by reference and incorporated as part of this article:
 - (1) A scientific and engineering report entitled, *The Flood Insurance Study for Kerr County, Texas and Incorporated Areas*, effective March 3, 2011;
 - (2) Flood Insurance Rate Map Nos. 48265C0455F, 48265C0460F, 48265C0480F, 48265C0470F, 48265C0490F, 48265C0635F, effective on March 3, [2011].
- (c) *Compliance.* No structure or land shall hereafter be located, altered, or have its use changed without full compliance with this article and other applicable regulations.
- (d) *Abrogation and greater restrictions.* This article is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions; however, to the extent that this article and other ordinances conflict or overlap, whichever imposes the more stringent restrictions shall prevail.
- (e) *Interpretation.* In the interpretation and application of this article, all provisions shall be:
 - (1) Considered as minimum requirements;
 - (2) Liberally construed in favor of the city in light of the purposes set forth in section 54-31; and
 - (3) Deemed neither to limit nor repeal any other powers granted under state law.
- (f) *Warning and disclaimer of liability.* The degree of flood protection required by this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods can and will occur and flood heights may be increased by manmade or natural causes. This article does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This article shall not create liability on the part of the city or any official or employee thereof for any flood damages that result from reliance on this article or any administrative decision lawfully made under this article.

MODIFY PROVISION:

- (a) Lands to which this article applies. This article applies to all areas of special flood hazard within the incorporated limits of the city and where applicable in its area of extraterritorial jurisdiction.

ADD PROVISION:

- (b)(3) *{Include latest FEMA Letter of Map Revisions}*

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34 Administration	(a) <i>Designation of the floodplain administrator.</i> The director of engineering or designee is hereby appointed the floodplain administrator to administer and implement the provisions of this article and other appropriate sections of Part 44 of the Code of Federal Regulations (National Flood Insurance Program Regulations) pertaining to floodplain management. (b) <i>Duties and responsibilities of the floodplain administrator.</i> Duties and responsibilities of the floodplain administrator shall include, but not be limited to, the following: (1) Maintain and hold open for public inspection all records pertaining to the provisions of this article, including records related to floodplain development permits issued or denied pursuant to section 54-35; (2) Review permit applications to determine whether proposed building sites will be reasonably safe from flooding; (3) Review, approve or deny all applications for floodplain development permits required by this article; (4) Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by federal or state law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 USC 1334; (5) Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the floodplain administrator shall make the necessary interpretation; (6) Notify, in riverine situations, adjacent communities and the state natural resource conservation commission, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency; (7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained; (8) When base flood elevation data has not been provided in accordance with section 54-33(b), the floodplain administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a federal, state or other source pending receipt of data from the FEMA administrator in order to administer the provisions of section 54-35; provided, however, the floodplain administrator may require that such information be provided by an applicant with respect to property which is the subject of a floodplain development permit application; (9) If a regulatory floodway has not been designated for a particular waterway, the floodplain administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the city's FIRM,	MODIFY PROVISION: (6) Notify <u>(as applicable) in riverine situations adjacent communities, the Texas Water Development Board (TWDB) and the Texas Commission on Environmental Quality (TCEQ), prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency;</u>

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	unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the city; (10) Maintain a record of all variance actions, including justification for their issuance, and report such variances to FEMA upon request or as otherwise required by law or regulation. (c) <i>Floodplain development permits.</i> In order to ensure compliance with this article, a floodplain development permit is required for all development in the areas of special flood hazard, the issuance of which shall be in accordance with the following procedures: (1) <i>Application.</i> An application for a floodplain development permit shall be made in writing, alone or in conjunction with the issuance of a building permit pursuant to chapter 26, article II, of this Code, on forms provided by the public works department and filed with the floodplain administrator, which application must contain at least the following information and documentation: a. The name, address, and phone number of the applicant; b. If different than the applicant, the name, address, and phone number of the record owner of the property according to the real property records of the county; c. If the applicant and/or owner are not individuals, the name, address, and phone number of the person or people authorized to act on behalf of the applicant and/or owner in all matters relating to the application; d. The complete lot and block or metes and bounds description of the property for which the application is made and, if available, the street address of the property; e. If the applicant is not the owner of the property described in the application, a sworn statement from the owner or legal representative of the owner that the applicant has been authorized to make an application for a floodplain development permit with respect to the property; f. A detailed description of the existing and/or proposed use of the property; g. Plans, in duplicate, drawn to scale and sealed and signed by a licensed professional engineer or licensed professional surveyor showing: 1. The location, dimensions, and elevation of: i. Proposed landscape alterations;	

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	ii. Existing and proposed structures; iii. Floodplain and floodway boundaries;	
	2. The location of the items listed in subsection (c)(1)g.1 of this section in relation to areas of special flood hazard;	
	3. Elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures; and	
	4. Elevation in relation to mean sea level to which any nonresidential structure shall be floodproofed;	
	h. If the development includes the placement of fill in the floodplain, a grading plan certified by a professional engineer predevelopment and post-development grades and elevations, which plan shows the location of the floodplain and/or floodway boundaries with dimensions and proposed structures;	
	i. A certificate from a registered professional engineer that any nonresidential floodproofed structure shall meet the floodproofing criteria of section 54-35(b)(2);	
	j. A description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development;	
	k. The nonrefundable application fee established by the city council for floodplain development permit application.	
(2)	<i>Only completed applications considered.</i> No application for a floodplain development permit shall be deemed to be completed until all information and documentation set forth in subsection (c)(1) of this section have been delivered to the floodplain administrator and the required application fee paid. If upon review of a floodplain development permit application the floodplain administrator determines that the application is not complete, the floodplain administrator shall notify the applicant of that fact and indicate which information and/or documents are required in order for the application to be considered complete. The floodplain administrator shall have no duty to consider an incomplete application.	
(3)	<i>Review criteria of application.</i> Upon receipt of a completed floodplain development application, the floodplain administrator shall review the application based on all of the provisions of this article and the following relevant factors: a. The danger to life and property due to flooding or erosion damage; b. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner; c. The danger that materials may be swept onto other lands to the injury of others;	

ARTICLE	ORDINANCE	RECOMMENDATION
	d. The compatibility of the proposed use with existing and anticipated development; e. The safety of access to the property in times of flood for ordinary and emergency vehicles; f. The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems; g. The expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; h. The necessity to the facility of a waterfront location, where applicable; i. The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use; j. The relationship of the proposed use to the comprehensive plan for that area.	
	(4) <i>Approval or denial of application.</i> Not later than 60 days after an application for a floodplain development permit is received and deemed complete by the floodplain administrator, the floodplain administrator shall grant or deny the issuance of a floodplain development permit based on the requirements of this article and the factors set forth in subsection (c)(3) of this section. If the floodplain administrator denies the issuance of a floodplain development permit, the floodplain administrator must provide to the applicant written notice of the denial setting forth in detail the basis for the denial.	
	(5) <i>Application which also requires variance.</i> Notwithstanding subsection (c)(4) of this section, if an applicant for a floodplain development permit is also requesting a variance to the provisions of this article with respect to the development of the same property, the floodplain administrator shall not be required to take action on the floodplain development permit application until 15 days following the city council decision regarding the application for the variance.	
	(6) <i>Appeal from decision of floodplain administrator.</i> The city council shall hear and decide appeals that allege an error in any requirement, decision, or interpretation made by the floodplain administrator in the interpretation or enforcement of this article with respect to the denial of a floodplain development permit, which appeal shall be in accordance with the following procedures:	

ARTICLE	ORDINANCE	RECOMMENDATION
	a. <i>Who may appeal.</i> Any person aggrieved by the decision of the floodplain administrator may appeal the decision to the city council. b. <i>Form of appeal.</i> To be effective, the appeal must be made in writing and must contain at least the following: 1. A citation to the specific statute and/or ordinance which is the subject of the appeal; 2. The date on which the floodplain administrator rendered the denial which is the subject of the appeal to the appellant; 3. A copy of the denial notice prepared by the floodplain administrator which is the basis for the appeal; 4. The specific grounds upon which the appeal is based; 5. A description of the property affected by the floodplain administrator's decision sufficient to identify the location and the boundaries of the property; 6. The reason the person filing the appeal should be considered a person aggrieved by the decision; 7. The signature of the person filing the appeal; and 8. Eight copies of the site plan drawing submitted with the floodplain development permit application. c. <i>Perfection of appeal.</i> An appeal pursuant to this subsection (c)(6) shall be deemed timely filed and perfected only if the notice of appeal: 1. Is filed not later than 30 calendar days after the date on which the decision of the floodplain administrator was received by the appellant with: i. The city clerk; ii. The floodplain administrator; 2. Is accompanied by the filing fee established by the city council; and 3. Contains all the information set forth in subsection (c)(6)b of this section. d. <i>Preparation of record.</i> Upon receiving the notice of appeal, the floodplain administrator must immediately forward to the city clerk all of the papers constituting the record of the action that is appealed. e. <i>Date of public hearing.</i> Unless a later date is set upon written request of the appellant, the city council shall hold a public hearing on an appeal under this subsection (c)(6) not later than 30 days after the filing and perfection of the notice of appeal. f. <i>Decision of the city council.</i> After receiving all evidence and hearing all argument, the city council shall: 1. Affirm the decision of the floodplain administrator; or 2. Upon a finding that the floodplain administrator made an error in any requirement, decision, or determination in denying the application:	

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	i. Reverse the decision of the floodplain administrator and issue the floodplain development permit; or ii. Remand the matter application to the floodplain administrator for reconsideration with specific directions of matters to be reconsidered. g. <i>Required vote.</i> The concurring vote of 75 percent of the membership of the city council is required to modify or reverse the decision or determination of the floodplain administrator.	
	(7) <i>Termination of permits.</i> A floodplain development permit shall terminate and become null and void if actual start of construction of the new construction or substantial improvements described in the application does not commence within six months after issuance of the permit.	
	(d) <i>Variances.</i> The city council may grant a variance to the regulations of this article in accordance with the following procedures:	
	(1) <i>Application.</i> An application for a variance shall be made in writing on forms provided by the public works department and filed with the floodplain administrator. An application for a variance shall be deemed complete when all information on the application form is provided and the application is accompanied by the following: a. All fees established by the city council for such matters; b. A description of the property to which the variance would apply sufficient to identify the location and the boundaries of the property; c. The reason the person is requesting the variance; d. The signature, acknowledged by a notary public of: 1. The owner of the property; and 2. If different than the owner, the signature of the person requesting the variance; and e. Eight copies of a site plan drawn to scale showing existing and proposed development of the property in question. (2) <i>When application to be considered.</i> Upon filing of an application for a variance, the floodplain administrator shall request the city manager place the application for request for variance on the next regular city council agenda following 20 days after the filing of a completed application for variance with the floodplain administrator. An application for variance shall not be deemed complete unless and until all items and fees required by subsection (d)(1) of this section have been delivered. (3) <i>Grounds applicable to grant of any variance.</i> Except as authorized by subsection (d)(8) of this section, no variance shall be granted by the city council until it makes the following findings:	

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	a. Considering the flood hazard, the requested variance is the minimum necessary to afford relief; b. The applicant has shown good and sufficient cause for the granting of the variance; c. Failure to grant the variance would result in exceptional hardship to the applicant; and d. Granting of a variance will not result in: 1. Increased flood heights; 2. Additional threats to public safety, 3. Extraordinary public expense; 4. The creation of nuisances; 5. Causing a fraud on or victimization of the public; or 6. A conflict with other existing local laws or ordinances.	
	(4) <i>Form of variance granted.</i> Upon consideration of the factors noted in subsection (d)(3) of this section, and the purpose of this article as set forth in section 54-31(a), the city council may grant or deny a request for a variance. If granted, all variances shall be approved by ordinance of the city council. In adopting an ordinance granting a variance, the city council may include such conditions to the grant as it deems necessary to further the purpose and objectives of this article.	
	(5) <i>Variances issued for certain new construction or substantial improvements.</i> Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in subsection (c)(3) of this section have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.	
	(6) <i>Variances for functionally dependent use.</i> Variances may be issued by the city council for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that: a. The city council makes the findings required by subsection (d)(3) of this section; and b. The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.	
	(7) <i>Variances in floodway generally prohibited.</i> Notwithstanding anything to the contrary in this section, variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.	

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	(8) <i>Exception for variances regarding historic places.</i> Variances may be issued for the repair or rehabilitation of structures listed on the National Register of Historic Places or the state inventory of historic places, without regard to the procedures set forth in this article, provided: - The proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure; and - The variance is the minimum necessary to preserve the historic character and design of the structure. (9) <i>Notice issued with grant of variance.</i> Any applicant to whom a variance is granted shall be given written notice by the floodplain administrator that: - The issuance of a variance to construct a structure below the base flood elevation will result in increased premium rates for flood insurance up to amounts as high as \$25.00 for each \$100.00 of insurance coverage; and - Such construction below the base flood elevation increases risks to life and property. Such notice shall be maintained with the record of all variances granted by the city council. (e) <i>False information or statements.</i> It shall be unlawful for a person to intentionally, knowingly, or recklessly make a false statement or provide false information in an application for a floodplain development permit or a variance from this article.	
35 Provisions for flood hazard reduction.	(a) <i>General standards.</i> In all areas of special flood hazards, the following provisions are required for all new construction and substantial improvements: (1) <i>Anchoring.</i> All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. (2) <i>Methods and practices of construction.</i> All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage. (3) <i>Use of flood resistant materials.</i> All new construction or substantial improvements shall be constructed with materials resistant to flood damage. (4) <i>Floodproofing of mechanical systems.</i> All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.	MODIFY PROVISION: (1) <i>Anchoring.</i> All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy (<u>see U.S. Corps of Engineers Flood Proofing Regulations</u>). (2) <i>Methods and practices of construction.</i> All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage (<u>see U.S. Corps of Engineers Flood Proofing Regulations</u>).

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	(5) <i>Water supply systems.</i> All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system. (6) <i>Sanitary sewer systems.</i> New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from the systems into floodwaters. (7) <i>On-site waste disposal systems.</i> Installation of on-site waste disposal systems shall be prohibited within areas of special flood hazard. (b) <i>Specific standards.</i> In all areas of the floodplain where base flood elevation data has been provided as set forth in sections 54-33(b), 54-34(b)(8) or subsection (c)(4) of this section, the following additional construction standards apply to new construction or substantial improvements within the floodplain: (1) <i>Residential construction.</i> New construction and substantial improvement of any residential structure must be constructed with the lowest floor (including basement) elevated to at least one foot above the base flood elevation. In addition to such other requirements as may be set forth in chapter 26, article II, of this Code, construction of a residential structure to which this subsection (b) applies shall not proceed beyond completion of the finished slab until a registered public land surveyor has certified on a form approved by and filed with the floodplain administrator that the lowest floor (including basement) is in fact elevated to or above the base flood elevation for the property. (2) <i>Nonresidential construction.</i> New construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either: a. Have the lowest floor (including basement) elevated to at least one foot above the base flood elevation; or b. Be designed so that the portion of the structure below the base flood elevation, together with attendant utility and sanitary sewer facilities, is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer shall develop and/or review structural design, specifications, and plans for the construction, and shall certify to the floodplain administrator that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification, which includes the specific elevation in relation to mean sea level to which such structures are floodproofed, shall be provided to and maintained by the floodplain administrator on forms prescribed by the floodplain administrator.	(1) <i>Residential construction.</i> New construction and substantial improvement of any residential structure must be constructed with the lowest floor (including basement) elevated to at least <u>two feet</u> above the base flood elevation and <u>two feet above the adjacent street or curb</u>. In addition to such other requirements as may be set forth in chapter 26, article II, of this Code, construction of a residential structure to which this subsection (b) applies shall not proceed beyond completion of the finished slab until a registered public land surveyor has certified on a form approved by and filed with the floodplain administrator that the lowest floor (including basement) is in fact elevated to or above the base flood elevation for the property. <i>{NOAA Atlas 14: New precipitation data is anticipated to impact the regulatory floodplain. Until the floodplain maps are restudied and remapped, the City of Kerrville should require new developments to be 2 feet above the existing and ultimate conditions base flood elevation.}</i>

ARTICLE	ORDINANCE	RECOMMENDATION
	(3) <i>Enclosures.</i> New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for the parking of vehicles, building access, or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement shall be certified by either a registered professional engineer or architect or meet or exceed the following minimum criteria: a. A minimum of two openings on separate walls having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. b. The bottom of all openings shall be no higher than one foot above grade. c. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters. (4) <i>Manufactured homes located in zone A.</i> All manufactured homes to be placed within zone A on the city's FIRM shall be installed in accordance with the following regulations: a. Generally, the manufactured home must be installed using methods and practices which minimize flood damage; b. The manufactured home must be elevated to resist flotation, collapse, or lateral movement, which elevation must, as a minimum, be in accordance with section 54-35(b)(1); c. In addition to applicable state and local anchoring requirements for resisting wind forces, the manufactured home must be anchored using methods which resist flotation, collapse, or lateral movement, including, but not limited to, use of over-the-top or frame ties to ground anchors. (5) <i>Manufactured homes located in zones A1-30, AE or AH.</i> All manufactured homes to be placed or substantially improved within zones A1-30, AH, or AE on the city's FIRM must be constructed in accordance with the following regulations: a. The manufactured home must be elevated on a permanent foundation such that the lowest floor of the manufactured home is at or above the base flood elevation and otherwise securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement if the manufactured home is located: 1. Outside of a manufactured home park; 2. In a new manufactured home park or subdivision; 3. In an expansion to a new manufactured home park or subdivision; or	MODIFY PROVISION: (5) <i>Manufactured homes located in zones A1-30, aE, or AH.</i> a. The manufactured home must be elevated on a permanent foundation such that the lowest floor of the manufactured home is <u>two feet above</u> the base flood elevation and otherwise securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement if the manufactured home is located: OR a. <u>Construction/Installation of manufactured homes within the regulatory floodplain (base flood) is not allowed.</u>

ARTICLE	ORDINANCE	RECOMMENDATION
	4. In an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage as a result of a flood. b. If the manufactured homes are being placed or substantially improved on sites within an existing manufactured home park or subdivision and are not otherwise subject to the provisions of subsection (b)(5)a of this section, the manufactured home must be elevated so that either: - The lowest floor of the manufactured home is at or above the base flood elevation; or - The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.	MODIFY PROVISION: The lowest floor of the manufactured home is <u>two feet</u> above the base flood elevation; or
	(6) <i>Compliance with zoning code.</i> To the extent of any conflict between the development standards for manufactured housing set forth in this article and the development standards set forth in title 11, chapter I, of the former Code of Ordinances: - The most restrictive standards shall apply; and - Whenever title 11, chapter I of the former Code of Ordinances requires that a manufactured home be attached to the real property by a permanent foundation, such requirement shall apply, notwithstanding a lesser anchoring regulation allowed by this article.	ADD PROVISION: (7) <i>Recreational Vehicles.</i> Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either (i) be on the site for fewer than one hundred eighty (180) consecutive days, or (ii) be fully licensed and ready for highway use, or (iii) meet the permit requirements of Article 4, Section C(1), and the elevation and anchoring requirements for "manufactured homes" in paragraph (4) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.
	(c) <i>Standards for placement of fill in floodplain.</i> The placement of fill in the floodplain pursuant to a floodplain development permit shall be in accordance with the following minimum specifications: - The fill must be placed in a manner to obtain a minimum of 90 percent of the maximum soil compaction as determined by the standard proctor test in order to reduce settlement. - Fill material must be soil or rock, and must be free of wood or construction debris. - Fill material shall not contain organic material which may result in decomposition and settlement. - Side slopes which are not stabilized in accordance with standard engineering practices shall not exceed a grade of three feet horizontal to one foot vertical. - No portion of the fill material shall be placed in the regulatory floodway.	

ARTICLE	ORDINANCE	RECOMMENDATION
	(6) Provisions must be made to prevent fill from eroding or moving laterally into the regulatory floodway. (d) <i>Standards for proposed subdivisions.</i> In addition to the regulations set forth in chapter IV of title 10 of the former Code of Ordinances regarding the subdivision of land within the city, the following regulations shall apply to the subdivision of land which is regulated by this article: (1) <i>Consideration of purposes of this article.</i> In addition to the intent and purposes set forth in Article 10-IV-1(A) of the former Code of Ordinances, the approval by the planning and zoning commission of a plat for the subdivision of land (including, but not limited to, a manufactured home subdivision), and, as required by Article 11-I-10(d)(3) of the former Code of Ordinances, the approval of a development site plan for a manufactured home rental community by the city council shall be consistent with section 54-31 if part of the land being subdivided and/or developed is located within a special flood hazard zone. (2) <i>Location of floodplain and floodway.</i> No preliminary plat and/or final plat indicating a proposed subdivision of property which is in whole or in part located within a floodplain and/or floodway may be approved in accordance with title 10, chapter IV of the former Code of Ordinances until the preliminary plat and/or final plat drawing contains: a. The horizontal location of the floodplain with sufficient detail to determine the area of the proposed subdivision, including, but not limited to, any proposed lot, which is located in whole or in part within the floodplain; and b. The horizontal location of the floodway with sufficient dimensions to locate the floodway on all platted lots. (3) <i>Base flood elevation indicated on plat.</i> In addition to the requirements set forth in chapter IV of title 10 of the former Code of Ordinances, before the planning and zoning commission may approve a final plat of property, all or part of which is located in a special flood hazard zone, the base flood elevation for each lot of the proposed subdivision or each manufactured home site located in a manufactured home rental community which is located in a special flood hazard zone must be determined and indicated on the final plat or development site plan, whichever is required. If the BFE for the property has not been established in accordance with section 54-33(b), the owner or developer of the proposed subdivision or manufactured home rental community shall generate sufficient data for the floodplain administrator to determine the BFE for such property in accordance with section 54-34(b)(8). (4) <i>Drainage requirements.</i> All proposed subdivisions and manufactured home rental communities shall have adequate drainage provided to reduce exposure to flood hazards.	ADD PROVISION: (7) Filling or the disposal of any materials which will diminish the water flow capacity of any waterway or floodplain defined by this ordinance must be compensated with remedial action. An equal amount of storage volume must be created in another location of the same SFHA to compensate for the storage capacity lost. {See Allowable Development Within the Regulatory Floodplain section below} (8) All proposed subdivisions must be contiguous to high ground that is not subject to flooding (the base flood, ultimate development 100-year or the twenty-five-year ultimate development flood, whichever is higher) that is in excess of one (1) foot flow depth, i.e., no "island" will be considered for platting; unless adequate connecting structures capable of passing the base flood, ultimate development 100-year or twenty-five-year ultimate development flood (whichever is higher) are provided to high ground (not subject to the controlling flood of the same floodplain), and an additional one (1) foot of free board is provided to all minimum floor slab elevations. (9) All proposed subdivisions traversed by an area of special flood hazard where the "buildable" portion of the subdivision is severed by the floodplain shall be provided with adequate access. Adequate access shall be a structure that will pass the control flood (ultimate development 100-year) without overtopping the structure. Upstream property must not be affected by backwater, and velocities in the vicinity of the structure must be controlled to prevent scour, erosion or structural damage. Proposed subdivisions that involve the platting of streets shall have at least one (1) access to an unflooded portion of existing dedicated street or roadway.

ARTICLE	ORDINANCE	RECOMMENDATION
	(5) <i>Location of public utilities.</i> All proposed subdivisions and manufactured home rental communities must locate all public utilities and facilities such as sanitary sewer, natural gas, electrical and water systems in such a manner as to minimize or eliminate flood damage. (e) <i>Standards for areas in the 100-year floodplain with no base flood elevation determined (zone A).</i> No building permit shall be issued for construction of property located within a special flood hazard zone until the proper detailed methods have been applied by a professional engineer to determine the BFE for the property and a letter of map revision or letter of map amendment has been obtained from FEMA. (f) <i>Floodways.</i> Encroachment into a regulatory floodway with fill, new construction, substantial improvements or other development is prohibited unless: (1) A registered professional engineer, based on a competent engineering study certified by the engineer, demonstrates through hydrologic and hydraulic analysis performed in accordance with standard engineering practice to the satisfaction of the floodplain administrator that the proposed encroachment will not result in any increase in flood levels within the city during the occurrence of the base flood discharge; or (2) The city or the person wishing to place the encroachment in the floodway has applied for a conditional FIRM and floodway revision from FEMA and has received consent from FEMA to allow encroachments within the floodway. If an encroachment into a regulatory floodway is permitted in accordance with subsection (f)(1) of this section, the new construction or substantial improvements placed within the floodway shall comply with all applicable flood hazard reduction provisions of this article.	(10) Proposed subdivisions that do not involve the platting of streets shall have access to an existing dedicated street that is not subject to flood depths of over one (1) foot. (11) Existing channels shall not be increased or decreased from their natural state until engineering data meeting the requirements of section 54-XX, Stormwater Management, has been approved by the city engineer. Floodplain engineering and procedures requirements for subdivision within FEMA or United States Corps of Engineers official flood prone areas shall conform to the engineering criteria as set out in section 54-XX, Stormwater Management.
36 Nuisances within a special flood hazard area	(a) <i>Certain nuisances defined.</i> Notwithstanding anything to the contrary set forth in this Code, the following activities occurring within a special flood hazard area constitute a danger to the health, safety, and welfare of the residents of the city, are hereby defined as public nuisances, and are prohibited within any special flood hazard area: (1) The manufacture, processing, blending, mixing, refining, or distribution of the following products as defined in the Standard Fire Prevention Code: a. Explosives; b. Blasting agents; c. Flammable or combustible gases, solids or liquids, hazardous chemicals, liquified petroleum gases, and petroleum products such as gasoline and diesel; and d. Road construction materials containing petroleum products;	

ARTICLE	ORDINANCE	RECOMMENDATION
	(2) Storage of the products listed in subsection (a)(1) of this section; except that the indoor storage of incidental cleaning products, or the retail sale of packaged products off-the-shelf at normal retail sales outlets, is allowed; (3) The construction and operation of on-site sewage disposal systems.	
	(b) <i>Defense; prior use of property.</i> It shall be a defense to prosecution pursuant to subsection (a) of this section if: (1) Property located within a special flood hazard zone was being used for a purpose defined as a nuisance in subsection (a) of this section, before January 26, 1996, has been continuously used for such purpose thereafter, and such use was: a. A permitted use pursuant to the city Code as January 26, 1996; or b. Constituted a lawful nonconforming use under the city's zoning code on January 26, 1996; and (2) Property which becomes located within a special flood hazard area as the result of an amendment to the city's FIRM was being used for a purpose defined as a nuisance in subsection (a) of this section, before the effective date of the amended FIRM, has been continuously used for such purpose thereafter, and such use was: a. A permitted use pursuant to the city's zoning code as of the effective date of the FIRM; or b. Constituted a lawful nonconforming use under the city's zoning code on the effective date of the FIRM.	
37 Penalties	(a) <i>Criminal penalties.</i> The penalty for violation of this article shall be in accordance with the general penalty provisions contained in section 1-7. (b) <i>Civil remedies.</i> In addition to any other criminal or civil remedies that may be available to the city, the city may seek and obtain an injunction against the owner or owner's representative with control over the property in accordance with V.T.C.A., Local Government Code ch. 54.	

CHAPTER 118 WATERWAYS

ARTICLE	ORDINANCE	RECOMMENDATION
I	IN GENERAL	
II	CITY WATER IMPOUNDMENT REGULATIONS	
31 Scope	This article shall apply to: (1) The waters of the Guadalupe River impounded behind the city impoundment dam and for a distance of 1.8 miles upstream of the dam; and (2) The lands and easements owned by the city adjacent to and beneath the waters impounded by the dam.	
32 Definitions	The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning: <i>City impoundment dam</i> and <i>dam</i> mean the dam constructed within the Guadalupe River and located adjacent to the west line of the Walter Fosgate Survey No. 138, Kerr County, Texas, the centerline of such dam being south 40° east 2470 feet, more or less, from the southwest corner of such survey, within the incorporated limits of the city. <i>Habitable structure</i> means a structure designed primarily for human occupancy and are potential locations for shelter from storms. Typically included within this category are residences, hotels and restaurants. Additionally, a habitable structure includes improvements, attached or otherwise, including but not limited to porches and gazebos, and excludes sidewalks, swimming pools, and other surface level improvements. <i>Impounded waters</i> means the waters of the Guadalupe River impounded by the city behind the dam pursuant to the authority of TCEQ up to the level of 1622 feet above mean sea level. <i>Jugline</i> means a free-floating main fishing line tied to a free-floating device. <i>Lake</i> means that body of water impounded behind the dam for a distance of 1.8 miles upstream of the centerline of the dam. <i>Lakebed</i> means those lands outside of the main Guadalupe River channel covered by the impounded waters when the water elevation at the dam is 1622 feet above mean sea level. <i>TCEO</i> means the Texas Commission on Environmental Quality or its successor agency. <i>Throwline</i> means a main fishing line with one end attached to a fixed anchor. <i>Trotline</i> means a main fishing line with both ends free-floating and anchored in any manner.	MODIFY PROVISION: <i>City impoundment dam definition</i> - {Reference dam by name and National Inventory Dam identification number} <i>Habitable Structure</i> – Refer to Section 54 32- Definitions Habitable Structures <i>TCEQ</i> means the Texas Commission on Environmental Quality or its successor agency.

Water treatment plant means the water treatment plant owned by the city and located on the south shore of the Guadalupe River adjacent to the dam.

Watercraft means any vessel, other than a seaplane, used or capable of being used for transportation on water regardless of the means of propulsion.

**33
Prohibited
Activities.**

No person shall:

- (1) Operate an internal combustion engine of a watercraft on the lake;
- (2) Construct or maintain a dock, wharf, or habitable structure fixed into, resting upon, or located over the lakebed or fixed into, resting upon, or located over any other property owned by the city;
- (3) Construct or maintain a dock, wharf, or habitable structure fixed into, resting upon, or located over any flood easement owned by the city that is upstream of the dam;
- (4) Place, operate, or maintain a houseboat on the lake;
- (5) Place, use, or maintain a trotline, throwline, or jugline at any location within the lake; or
- (6) Swim, fish, or operate a watercraft within a distance of 200 feet from the raw water intake of the water treatment plant.

**34
Defenses.**

It shall be a defense to section 118-33(1) if the person who is operating a watercraft equipped with an internal combustion engine is engaged in:

- (1) A law enforcement activity;
- (2) An effort to prevent the personal injury or death of a person in eminent danger of injury or death;
- (3) Operation, maintenance, and/or monitoring of the water treatment plant, dam, or impoundment and the person is an employee, agent, or contractor of the city; or
- (4) Is engaged in an activity that has been authorized by resolution of the city council.

**35
Penalties**

Conviction of a violation of this article shall constitute a misdemeanor punishable in accordance section 1-8.

RECOMMENDED SECTIONS FOR ADDITION TO SECTION 54

**38
Enforcement**

ADD PROVISIONS FOR ENFORCEMENT:

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violation of the provisions of this court order by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions) shall constitute a misdemeanor. Any person who violates this court order or fails to comply with any of its requirements shall upon conviction thereof be fined not more than five hundred dollars (\$500.00) for each violation, and in addition shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent City of Kerrville from taking such other lawful action as is necessary to prevent or remedy any violation.

- (a) Notice of Violation
- (b) Remediation
- (c) Options
- (d) Reporting Violations, Other Remedies

**39 Allowable
Development
Within the
Regulatory
Floodplain.**

ADD PROVISIONS FOR DEFINING ALLOWABLE DEVELOPMENT WITHIN THE REGULATORY FLOODPLAIN

This ordinance shall only apply to areas of special flood hazard within the jurisdiction of the city and where applicable in its area of extraterritorial jurisdiction.

- (a) Reserved.
- (b) Reserved.
- (c) An increase in water surface elevation is permitted solely when all the following conditions are met:
 - 1. Property owner owns both sides of the floodplain.
 - 2. The increase in the regulatory floodplain is contained in a dedicated drainage easement or right-of-way as required per subsection XXX.
 - 3. Increase in water surface elevation for the 1% annual chance floodplain does not exceed six (6) inches.
 - 4. No increase in water surface elevations or velocities upstream and downstream outside of the owner's property limits.
- (d) Account for increase in discharge due to loss of storage in all reclamation analyses.
- (e) Demonstrate that the development will not increase the regulatory 1% annual chance floodplain velocities above six (6) fps. No increase in velocity will be permitted if predevelopment velocities in the floodplain exceed six (6) fps unless proven that the existing channel/creek is stable (i.e., rocky bottom channel/creek) and no signs of erosion or scour are occurring in predevelopment conditions.
- (f) The following development may be allowed in the regulatory 1% annual chance and will require a floodplain development permit (see section 54 34-C for permit requirements):
 - (1) All-weather street crossings that meet the requirements of subsection XX-XX.
 - (2) Utility construction.
 - (3) Parks.
 - (4) Greenways.
 - (5) Recreational facilities and golf courses.
 - (6) Hike and bike trails.

- (7) Drainage improvements that mitigate existing or anticipated flood hazards.
- (8) Publicly funded capital improvement projects that reduce flooding to protect the public safety.
- (9) Maintenance activities necessary to maintain the stormwater conveyance of the floodplain.
- (10) Drainage infrastructure repair.
- (11) Floodplain restoration.
- (12) Wetland reestablishment, mitigation, or environmentally friendly design criteria (i.e. Natural channel design, Low-Impact Development, etc., set forth by the City of Kerrville, Upper Guadalupe Blanco River Authority and/or U.S. Army Corps of Engineers).
- (13) Habitat re-establishment.
- (14) Installation of flood monitoring controls - rain gages, early flood warning systems, high water detection systems, etc.
- (15) Installations of emergency devices necessary to warn alarm and protect citizens at flood hazards.
- (16) Improvements to a structure that do not fall under the definition of substantial improvement.
- (17) Elevating and/or floodproofing structures in the floodplain.
- (18) 1% annual chance floodplain reclamation where the watershed drainage area is less than three hundred twenty (320) acres when the floodplain storage volume lost due to fill is offset by comparable excavation within the same floodplain (see subsections 54-39(d) and 54-39(f)(27). In addition, all federal, state, or local permits shall be obtained, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334 (see subsections 54-XX).
- (19) Parking lot construction where water depths do not exceed six (6) inches during a future 1% annual chance storm event.
- (20) 1% annual chance floodplain reclamation in areas of ineffective flow where floodplain storage volume lost to reclamation is offset by comparable excavation within the same creek floodplain. (See subsections 54-39(d) and 54-39(f)(27).)
- (21) 1% annual chance floodplain reclamation in overbank areas subject to extensive shallow (0'—3') flooding where velocities in the overbank area are less than three (3) fps and where floodplain storage volume lost to reclamation is offset by comparable excavation within the same creek floodplain (see subsections 54-39(d) and 54-39(f)(27).) Where a maximum amount of fill allowed in the overbank areas is no more than three (3) feet with engineered slope stability calculations.
- (22) Historic structure reconstruction, rehabilitation or restoration.
- (23) Development in the low risk flood area, as defined by appendix A or subject to the requirements of section 54-XX.
- (24) Reclamation between the 1% annual chance floodplain and the regulatory 1% annual chance floodplain.
- (25) Reserved.
- (26) Nonresidential construction. The following restrictions will be placed on nonresidential construction in the floodplain:
 - A. Demonstrate that no alternative sites are available for development within the property that is out of the floodplain.
 - B. Meet all the requirements of subsection 54-39(b), Nonresidential construction.
 - C. Ensure the lowest finished floor elevation and/or the height to which the building must be floodproofed is no lower than the higher elevation of the energy grade line or the water surface elevation plus one (1) foot of the regulatory 1% annual chance floodplain.
 - D. An increase in water surface elevation may be permitted on the developer's property if the floodplain is contained in a dedicated drainage easement or right-of-way. If all the requirements of 54-39(c) are met.
 - E. Reserved.

- F. Demonstrate that the development will not increase the 1% annual chance floodplain post-development velocities above six (6) fps. No increase in velocity will be permitted if predevelopment velocities exceed six (6) fps.
- G. Demonstrate that the development will not be subject to damage from hydrostatic or hydrodynamic forces, debris impact, soaking, sediments and contaminants.
- H. Provide, operate and maintain an early flood warning system for the development. Warning systems will be subject to periodic inspection by the City of Kerrville to ensure they are maintained and operated as intended as per floodplain administrator's direction.
- I. Complete the Letter of Map Revision process for the development.
- J. The owner shall indemnify the City of Kerrville against damages resulting from flooding on the owner's site.
- K. Other site-specific restrictions and/or requirements deemed appropriate by the floodplain administrator.

- (27) Construction in areas of flood inundation must meet the requirements of section 54-XX, General Standards. Structures associated with park and recreation development (fences, open construction type bleachers, concession stands etc.) may be permitted in areas of flood inundation. Keep this construction out of the flood conveyance section of the floodplain. Compensate for loss of storage. Secure structures to minimize damage from hydrostatic or hydrodynamic forces (including buoyancy) and debris impact.

**40
Prohibited
Development
Within the
Regulatory
Floodplain.**

ADD PROVISION FOR PROHIBITED DEVELOPMENT WITHIN THE REGULATORY FLOODPLAIN.

- (a) The following development will not be allowed in the regulatory floodplain:
- (1) Development without first obtaining a floodplain development permit.
 - (2) Habitable structures.
 - (3) Street or access construction that does not meet the requirements of subsection XX.
 - (4) Activity prohibited by Chapter XX, Article XX of the City Code "Aquifer Recharge Zone and Watershed Protection."
 - (5) 1% annual chance floodplain reclamation where the watershed drainage area exceeds three hundred twenty (320) acres except as provided in section A.
 - (6) 1% annual chance floodplain reclamation in over bank areas that are subject to flood depths greater than three (3) feet.
 - (7) 1% annual chance floodplain reclamation in over bank areas where flood velocities are greater than three (3) fps.
 - (8) No development will be permitted that has a significant adverse impact to other properties - refer to subsection XX-XX.

ART. 10-IV-1 PROCEDURE FOR PLAT APPROVAL

SECTION (B)	PLATS	RECOMMENDATION
2. d.	(4) Storm drainage facilities as currently required by this or other applicable ordinances, and; (5) Easements or rights-of-way as may be currently required by this or other applicable ordinance for the installation of any of the above stated improvements;	No change.

ART. 10-IV-2 PROCEDURE FOR PLAT APPROVAL

SECTION (A)	PRELIMINARY PLAT	RECOMMENDATION
1.	General The applicant shall present to City staff a concept plan prior to the submission of the preliminary plat. The staff shall present the concept plan to the Commission for review and comment. The objective of the concept plan presentation is a clarify city regulations and the comprehensive plan-land use strategy guidelines, as they apply to the parcel of land in question and its proposed subdivision. The concept plan shall include the following information: a. The property’s legal description, zoning, and location identifying the site in relation to natural water courses, public rights-of-way, and significant landmarks which are located within five hundred feet (500.0’) of the boundary of the proposed subdivision; b. Proposed uses, lot layouts, and general land features, to include significant trees or tree stands, major grade changes, flood plains, ridge lines, and drainage courses; c. Existing and proposed utilities, streets and drainage facilities or courses.	No change.
		When the proposed subdivision constitutes a unit of a large tract owned by the developer or in which the developer has interest, the Commission may require that the concept plan identify and include the entire area which is intended to be subsequently subdivided. The presentation, including portions of the larger tract, shall be required to include, at a minimum, the same information as required for the concept plan, except that individual lots need not be shown so long as the anticipated land uses and development density is presented. The latter shall be used to determine compatibility with zoning, street layout, and utility and drainage facility capacities.
		The preliminary plat as approved will be the basis for the preparation of construction plans for improvements. The preliminary plat may be given final approval in phases, but if so, each phase given final approval shall conform to the approved preliminary plat.

		RECOMMENDATION
3.	Form and Content	No change.
a.	Natural Features	
(1)	The location of existing water courses, dry creek beds, caves, springs, wells, sinkholes and other similar drainage features including existing drainage structures;	
(2)	The limit of the “100-year” flood hazard area boundary and the floodway, as determined by the most current map published by the Federal Emergency Management Agency (FEMA). If neither encroaches upon the subject property, a note to that effect must be placed upon the drawing.	
(3)	Topographic data drawn according to “The Manual of Practice for Land Surveying in the State of Texas,” Category 6, except that where each tract or lot created is equal to or greater than 25 acres in size, data compiled from United States Geologic Survey (USGS) map or an aerial photograph may be substituted.	
	Contour intervals shall be:	
(a)	Where the slope is less than five percent ; 2 feet.	
(b)	Where the slope is five percent or greater but less than ten percent; 5 feet.	
(c)	Where the slope is ten percent or greater but less than fifteen percent; 10 feet.	
(d)	Where the slope is fifteen percent or greater; 20 feet	
	The contoured area shall extend outward in all directions along the entire length of the subdivision boundary line for a distance equal to 25% of the distance across the tract, but not less than 50 feet nor more than 200 feet in any one direction; provided, however, in the event the developer, his contractors or agents, are unable to gain access to property adjacent to the proposed subdivision for the purpose of obtaining the above-required topographical data as the result of an inability to obtain the consent of the property owner or a the likelihood of injury to persons or property who might go on to such adjacent property, the inability to obtain such data, and the reason for such inability shall be certified to in writing by the developer and delivered to the Planning Director. The Planning Director or his designee shall provide reasonable assistance to the developer in gaining access to the adjacent property; provided however, such assistance shall not require the City to obtain any easements or commit the expenditures of any City funds. If access to the adjacent property cannot be obtained with ten (10) working days after receipt by the Planning Director of the certified statement, the requirement to extend the contoured area beyond the perimeter of the proposed subdivision shall be waived.	

RECOMMENDATION

SECTION (B) FINAL PLAT

3. **A. Natural Features**

- (1) The location of center lines of all waterways intended to convey water from or to adjacent private land owners;
- (2) The boundaries of all drainage easements and the one hundred (100) year flood plain and designated flood way. If the subdivision or a portion thereof is in a flood-prone area, the developer will be required to comply with provisions of the City's floodplain management ordinances. This information must be certified by a Registered Professional Engineer with the following statement:

“The fully developed, concentrated storm water runoff resulting from the one hundred (100) year frequency storm is contained within the drainage easements shown and/or public rights-of-way dedicated by this plat”

On each buildable lot in said flood plain the required base flood elevation (BFE) shall be indicated. Vertical bench marks tied to USGS Vertical datum of 1929 or the City of Kerrville's Coordinate System, shall be shown on the plat with a maximum horizontal separation of 1,000 feet between benchmarks.

5. **Minor Subdivision Approval**

- (5) all water, sanitary sewer, and drainage facilities that are otherwise required to be constructed pursuant to this chapter are already in place and meet the regulations then in effect for construction of such improvements; however, the subdivision may be considered and approved as a minor subdivision if no storm water drainage study has been submitted or the required storm drainage facilities constructed, provided the plat contains the following note:

A drainage study conforming to the applicable drainage specifications shall be submitted to, and approved by, the city engineer before a building permit is issued for any lot in the subdivision. Drainage improvements which adequately address the findings of the study shall be made part of the building permit application, and shall be constructed concurrently with the development of the site.

ART. 10-IV-3 MINIMUM DESIGN STANDARDS

SECTION (C)	PARKS, OPEN SPACES, PUBLIC EASEMENTS AND PRESERVATION OF NATURAL FEATURES	RECOMMENDATION
1.	<u>Parkland Dedication</u> All subdivision plat which are to be approved by the Planning and Zoning Commission shall note the method of Parkland Dedication, which has been chosen by the developer and approved by the City as provided in Ordinance No. 91-10.	
2.	<u>Easements for Public Utilities</u> The City Planning Commission may require easements for poles, wires, conduits, storm and sanitary sewers, gas, water or other utility lines, along any necessary lot lines. Easements shall be a minimum of fourteen (14) feet in width. Easements of the same or greater width may be required along the lines of or across lots, where necessary for the extension of existing or planned utilities.	
3.	<u>Preservation of Natural Features</u> Natural features such as large trees, water courses, historic spots, and similar community assets which, if preserved, will add attractiveness and value to the property. Nature features shall be identified on a site plan prior to plat approval. If considered to be of significant value to the property, or the neighborhood, or the community, the Commission may require the preservation of some or all of these natural features.	
SECTION (D)	DEVELOPMENT OF SENSITIVE LANDS: FLOOD HAZARDS	
Land subject to flooding as identified in the Federal Insurance Administration's report entitled "The Flood Insurance Study for the City of Kerrville, dated January 19, 1982, with accompanying flood hazard maps shall serve as the basis for identifying those lands susceptible to flood conditions. The developer and/or his agent at the pre-application conference stage of preparing the preliminary plat shall establish floodway elevations. Lands that are to be platted for development which are susceptible to flooding shall be in accordance with current city code requirements in which finished flood elevations shall be established a minimum of one (1) foot above the established flood criteria and/or in accordance with alternatives identified by the Federal Insurance Administration.		
The City Planning Commission shall not approve the subdivision of land if from adequate investigations conducted by all public agencies concerned, it has been determined that in the best interest of the public, the site is not suitable for platting and development purposes of the kind proposed.		

ART. 10-IV-4 DEVELOPMENT PROCEDURES

SECTION (A) MINIMUM DEVELOPMENT IMPROVEMENTS	RECOMMENDATION
1. <u>General</u> h. <u>Drainage Facilities</u> Drainage facilities shall be designed and provided to meet the approval of the City Engineer and shall be designed and constructed in accordance with the City's <i>Design Manual for Storm Drainage Facilities</i> and City construction standards and specifications	REVISE PROVISION: <u>Drainage Facilities</u> Drainage facilities shall be designed and provided to meet the approval of the City Engineer and shall be designed and constructed in accordance with the City's <i>Design Manual for Storm Drainage Facilities</i> and City construction standards and specifications. h. The minimum configuration of any stormwater facility shall accommodate potential runoff from the entire upstream drainage area under developed conditions and shall be designed to prevent overloading the capacity of the downstream drainage system as determined by the City Engineer and in accordance with Flood Control Requirements and the City's adopted Design Manual for Storm Drainage Facilities and City construction standards and specifications. i. The City may require the phasing of development, the use of control methods such as retention or detention, the construction of off-site drainage improvements, and/or payment of stormwater connection fees in order to mitigate the impacts of the proposed development.

ADDED SECTION	STORMWATER COLLECTION AND DRAINAGE SYSTEMS	RECOMMENDATION
	FLOOD CONTROL REQUIREMENTS	
	A. Flood Damage Prevention Ordinance. Developments and improvements in or near a FEMA floodplain shall meet the requirements of the Chapter 39 of the City's Code of Ordinances.	
	B. Site Stormwater Management. The following two items should be considered during the design process: 1. Diversion of storm water away from the natural watercourse will not be allowed, except within the property boundaries controlled by the developer under the following conditions: a. The storm water is returned to its natural flowing watercourse prior to leaving the developer's property, b. For watersheds greater than twenty (20) acres, a timing analysis of the existing and diverted hydrograph must be performed to confirm that the peak flow rate has not been increased at the point that it reenters the watercourse, as a result of the diversion. 2. All developments shall provide adequate drainage outfall at the lower end of the site into an existing street, alley, drainage, easements or right-of-way, or to the centerline of an existing natural drain. Where a proposed street, storm drain, or open channel does not discharge into a natural low or into an existing adequate drainage easement, then facilities and drainage easements of adequate width — to contain the design discharge — shall be constructed and dedicated. 3. Developments cannot increase the water surface elevation off-site unless contained within a dedicated drainage easement or right-of-way.	
	C. Responsibility to Accept Storm Water. The owner or developer of property to be developed shall be responsible for the conveyance of all storm water flowing through the property. This responsibility includes the storm water flowing onto the property by any other developed property as well as the drainage naturally flowing through the property by reason of topography.	
	D. Design Based on Maximum Build-Out Configuration. Drainage improvements shall accommodate runoff from the upstream drainage area in its anticipated maximum "build-out" condition, and shall be designed to prevent overloading the capacity of the downstream drainage system. The City may require the phasing of development, the use of control methods such as retention or detention, or the construction of off-site drainage improvements in order to mitigate the impact of the proposed development.	
	E. Design Storm Event. All drainage facilities (including streets, curbs, gutters, storm drains, ditches, creeks, detention ponds, etc.) shall be designed to intercept and transport runoff from a twenty five (25) year frequency storm. The drainage system shall be designed to convey those flows greater than a twenty five (25) year frequency, up to and including a one hundred (100) year frequency storm within defined rights-of-way or drainage easements.	
	F. Detention or Retention Required. Drainage facilities shall be designed and constructed so that the rate of runoff from a site after construction shall be equal to or less than the runoff prior to construction for the two (2), ten (10), twenty five (25), and one hundred (100) year storm frequencies. 1. The timing of the hydrograph released from the detention facility must be checked against the timing of the flow rate in the first open watercourse to prevent any increase in the peak flow rate in the receiving watercourse. For detention basins constructed in-line on an existing watercourse, the creation of the basin shall not increase flood elevations in the channel upstream of the new development boundaries. 2. Computation of the rate of runoff shall be based on an assumption of a contributing drainage area or watershed fully developed in accordance with the Stormwater Technical Manual. 3. Low impact development practices can be used to reduce peak flow rates to reduce or eliminate detention requirements when designed in accordance with the Stormwater Technical Manual criteria.	

RECOMMENDATION

4. Detention pond bottoms must be vegetated.

G. Waiver of Detention/Retention.

1. Detention/retention may be waived for non-residential small site permits if no adverse impacts are demonstrated through drainage analysis and a payment-in-lieu is made into the stormwater management fund in accordance with Section 6.1.1.3.
2. Detention/Retention may be waived in High Intensity Zones if no adverse impacts are demonstrated through drainage analysis and a payment-in-lieu is made into the stormwater management fund in accordance with Section 6.1.1.3.

H. Street Drainage. Except for inverted crown thoroughfares, no lowering of the standard height of street crown shall be allowed for the purposes of obtaining additional hydraulic capacity. Bridges and culverts in residential streets, shall be designed for the runoff from the one hundred (100) year frequency flow based on a fully developed watershed. shall not produce a headwater depth at the roadway greater than either twelve (12) inches above the roadway crown or any top of upstream curb elevation, whichever is lower. For bridges and culverts in streets other than residential areas, the one hundred (100) year headwater depth is limited to six (6) inches. Storm drain system shall be designed to meet the criteria listed in the Stormwater Technical Manual.

I. Minimize Cut and Fill. The layout of the street network, lots and building sites shall minimize the amount of cut and fill on slopes in accordance with the standards for cut and fill set forth in Section 6.1.2.2.

J. Permit Required. No person, individual, partnership, firm or corporation shall deepen, widen, fill, reclaim, reroute or change the course or location of any existing ditch, channel, stream or drainage without first obtaining a site plan permit and permits from applicable agencies (such as FEMA or the U.S. Army Corps of Engineers) having jurisdiction. The Responsible Official may, at his or her discretion, require preparation and submission of a FEMA or flood study for a proposed development if there are concerns regarding storm drainage on the subject property or upstream or downstream from the subject property. The costs of such study, if required, shall be borne by the developer.

K. Conformance with the City's Stormwater Technical Manual. All stormwater facilities, including those for low impact development, detention, retention or water quality, shall be designed by a licensed professional engineer in accordance with the City's Stormwater Technical Manual, including requirements for location, screening and fencing not inconsistent with this Chapter and applicable ordinances. All plans submitted to the Responsible Official for approval shall include a layout of the stormwater management system together with supporting calculations for the design of the system.

ADDED SECTION Impervious Cover Calculation and Limitations

Paved roads, sidewalks, parking areas, parking lots, buildings and other impermeable construction covering the natural land surface shall be considered impervious cover. The methods to be used to calculate the percent of impervious cover created by the development of a parcel or tract of land are described in the City Stormwater Technical Manual. Note that the area of impervious cover for a surface may be reduced based on data acceptable to the Responsible Official showing that the surface has a significant degree of permeability.

ADDED SECTION Drainage Requirements During Construction

During construction, on-site drainage shall be maintained so that water surfaces are not increased upstream or downstream of the site when compared to pre-project conditions unless fully contained within a drainage easement or designated right-of-way.

ADDED SECTION Drainage Improvement Responsibility

- A. Drainage improvements required by this Article shall be provided at the sole expense of the owner of the property to be developed, unless otherwise expressly provided to the contrary in a subdivision improvements agreement.
- B. Drainage easements shall be provided to the public by the owner of property to be developed for the purposes of drainage master planning of all drainage improvements, open or enclosed, and all storm water flows to the limits of the one hundred (100) year

RECOMMENDATION

floodplain as determined in accordance with anticipated fully-developed contributing area land use conditions and allowing continuous access for inspection, operation, maintenance and rehabilitation of all drainage improvements.

- C. At the discretion of the Responsible Official, the owner of the property to be developed shall dedicate drainage improvements to the public in a right-of-way rather than a drainage easement.
- D. In determining whether drainage improvements should be dedicated to the public, the Responsible Official shall take the following factors into consideration:
 - 1. Drainage improvements associated with a single development shall remain private; and
 - 2. Drainage improvements that serve streets or other public property or may serve multiple developments or provide regional detention/treatment shall be dedicated to the public.
- E. Drainage easement and right-of-way widths shall be specified by the City as necessary for inspection and maintenance of facilities as well as to accommodate areas anticipated to be inundated by stormwater.
- F. Full detention basin design may be deferred until the site development permit stage if the property owner submits a “request for detention deferral” demonstrating an understanding of the implications of such design deferral AND the following notes are placed on the subdivision plat AND supporting documentation is provided.
 - 1. “Stormwater detention is required for this property. The engineer of record for this subdivision plat has estimated that an area of approximately _____ acres and a volume of approximately _____ acre feet will be required for this use. This is an estimate only and detailed analysis may reveal different requirements.”
 - 2. “No building permit shall be issued for this platted property until a stormwater detention system design has been approved by the City of Kerrville or applicable county if in the ETJ.”

Drainage Improvements Maintenance Responsibility

- A. Drainage improvements constructed or installed under this Article shall be maintained in accordance with the following:
 - 1. Drainage improvements located in public rights-of-way that have been accepted by the City shall be maintained by the appropriate jurisdiction.
 - 2. Drainage improvements located on private property with publicly dedicated easements shall be maintained by the property owner.

ART. 10-IV-5 CONSTRUCTION PLANS

RECOMMENDATION

SECTION (A) MINIMUM DEVELOPMENT IMPROVEMENTS

3. Form and Content

g. Plan of Storm Drainage System

- (1) Developer shall present a topographic map showing existing drainage conditions and submit a drainage plan which meets approval of the City Engineer prior to approval of submission. An adequate drainage system, including necessary open ditches, pipes, culverts, intersection drains, drop inlets, bridges, etc., shall be provided for the proper drainage of all surface water. The 100-year flood plain shall be delineated based upon condition of the projected ultimate development of the subdivision.

RECOMMENDATION

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| (2) Where a subdivision is traversed by a water course, drainage way, natural channel or stream, there shall be provided an “easement” or “right-of-way” conforming substantially to the limit of such water course, plus additional width to accommodate future needs. Drainage easements shall be approved by the City Engineer both as to location and width. |
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2013

**CITY OF KERRVILLE
KERR COUNTY
TEXAS**





DRAINAGE DESIGN MANUAL

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1.0 **GENERAL**

This manual contains the minimum storm drainage design criteria to be followed in the design of storm drainage facilities in the City of Kerrville (City). If an item is not covered in this manual other criteria as approved by the City Engineer may be applied.

2.0 **DESIGN STORM FREQUENCY**

The 1% storm frequency (100–year storm) for fully developed watershed conditions shall be used in all storm sewer designs in the City, unless specified otherwise in this manual. Alternative approaches are only permitted with the approval of the City Engineer or designee.

3.0 **DETERMINATION OF DESIGN DISCHARGE**

The Rational Method for computing storm water runoff is to be used for hydraulic design of facilities serving a drainage area of less than 150 acres with no significant flood storage. For drainage areas greater than 150 acres, a Unit Hydrograph method shall be utilized to compute the storm water runoff (i.e., Snyder's Unit Hydrograph, Soil Conservation Service Unit Hydrograph (SCS), or Clark's Unit Hydrograph). If a hydrologic modeling system computer program is utilized to compute the storm water runoff, the model must be compatible with the Army Corps of Engineers HEC-HMS software. A copy of the digital model must be submitted to the Engineering Department with the plan review submittal. In all cases, the detailed calculations utilized to determine the storm water design discharges and a summary of the results must be included within the civil construction plans.

3.1 **RATIONAL METHOD**

The Rational Method can be used to estimate storm water runoff peak flows for the design of gutter flows, drainage inlets, storm sewer pipe, culverts and small ditches. It is most applicable to small, highly impervious areas. The maximum drainage area that is allowed to be used with the Rational Method is 150-acres.

The Rational Formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and the mean rainfall intensity (I) for a duration equal to the time of concentration (T_c).

The Rational Formula is expressed as follows:

$$Q = C \times I \times A \quad (3.1)$$

where: Q = maximum rate of runoff (cfs)
 C = runoff coefficient representing a ratio of runoff to rainfall (unitless)
 I = average rainfall intensity for a duration equal to the T_c (in/hr)
 A = drainage area contributing to the design location (acres)

3.1.1 **Time of Concentration**

The time of concentration (T_c) can be defined as the time required for water to flow from the most hydraulically remote point in a drainage basin to the point being analyzed. The most hydraulically remote drainage point refers to the route requiring the longest drainage travel time and not necessarily the greatest linear distance. Use of the Rational Formula requires the time of



concentration for each design point within the drainage basin. The duration of rainfall is then set equal to the time of concentration and is used to estimate the design average rainfall

intensity (I). Overland (sheet) flow, shallow concentrated flow and channel flows are components that need to be considered in the calculation of time of concentration. ~~The following NRCS TR-55 methods are is recommended preferred method for calculating for time of concentration calculation. The minimum time of concentration for any drainage area shall be 5 minutes. Additionally, the minimum slope used for calculation of sheet and shallow flow travel time components should be 0.005 feet per foot (0.5%).~~

3.1.1.1 Overland flow – ~~flow over plane surfaces: For each drainage area, the distance is determined from the design point to the most hydraulically remote point in the tributary area. From a topographic map, the average slope is determined for the same distance. The runoff coefficient (C) is determined by the procedure described in a subsequent section of this chapter. Overland flow distance should not exceed 300 feet. The overland flow time can be determined by the following formula (Equation 3.2) or by the Seelye Chart for Overland Flow Time (Figure A, Appendix A). Note that for overland sheet flow the minimum time is 5 minutes and the maximum overland flow time shall be 20 minutes.~~

$$T_{\text{overland}} = \frac{1.8(1.1 - C)L^{1/2}}{S^{1/4}} \quad (3.2)$$

where: ~~C = runoff coefficient determined from Table 3.2
L = over land flow length in feet (ft)
S = average overland slope in percent (%)~~

Commented [AS1]: Formula used here is the FAA Method for calculating time of concentration which is mixing up methodologies between FAA and NRCS TR-55. Recommend using TR-55 Method. Revised formulate provided below.

Sheet flow is shallow flow over land surfaces, which usually occurs in the headwaters of streams. The engineer should realize that sheet flow occurs for only very short distances, especially in urbanized conditions. Sheet flow for both natural (undeveloped) and developed conditions should be limited to a maximum of 100 feet. Sheet flow for developed conditions should be based on the actual pavement or grass conditions for areas that are already developed and should be representative of the anticipated land use within the headwater area in the case of currently undeveloped areas. In a typical residential subdivision, sheet flow may be the distance from one end of the lot to the other or from the house to the edge of the lot. In some heavily urbanized drainage areas, sheet flow may not exist in the headwater area. The NRCS method employs equation 5.4.1, which is a modified form kinematic wave equation, for the calculation of the sheet flow travel time.

- TR-55 "Urban Hydrology for Small Watersheds," SCS 1986 may be used, please consider the maximum (20 min.) and minimum (5 min.) when defining the flow length (L).

(Equation 5.4.1)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

T_t = travel time (hr.)
 n = Manning's roughness coefficient
 L = flow length (ft.)
 P_2 = 2-year, 24-hour rainfall*
 s = slope of hydraulic grade line (land slope, ft/ft)

3.1.1.2. Shallow concentrated flow – overland flow usually becomes shallow concentrated flow after a maximum of ~~300~~ 100 feet, and before the flow enters a defined channel or drainage system, the flow is considered shallow concentrated flow. Travel time for shallow concentrated flow is calculated as follows:

$$T_{\text{shallow}} = \frac{L}{V_{\text{shallow}}} (60) \quad (3.3)$$

where: T = time (minutes)

L = shallow concentrated flow length in feet (ft)

V_{shallow} = shallow concentrated flow velocity in feet per second (fps)

S_{decimal} = average water course slope in decimal

$$V_{\text{shallow}} = 16.1345 \sqrt{S_{\text{decimal}}} \quad [\text{for unpaved areas}] \quad (3.4)$$

$$V_{\text{shallow}} = 20.3282 \sqrt{S_{\text{decimal}}} \quad [\text{for paved areas}] \quad (3.5)$$

3.1.1.3 Channel Flow – Velocity in channels should be calculated from the Manning's equation. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity for travel time calculations is usually determined for bank-full elevation assuming low vegetation winter conditions. When actual cross section information is not available, non-floodplain channel velocities for ultimate watershed development should not be less than 6 fps for estimating time of concentration.

$$T_{\text{channel}} = \frac{L}{V_{\text{channel}}} (60) \quad (3.6)$$

where: T = time (minutes)

V_{channel} = channel flow average velocity (fps)

L = Length of reach along the flow path (ft)

The Channel Velocity is calculated using Manning's Formula as follows:

$$V_{channel} = \frac{1.486(R^{2/3})(S^{1/2})}{n} \quad (3.7)$$

$$R = \frac{A}{P_w} \quad (3.8)$$

To obtain the total time of concentration, the overland, shallow concentrated, and channel flow times must be added together. For example, if the flow time in a channel is 15 minutes and the overland flow time from a ridge line to the channel is 10 minutes, then the total time of concentration is 25 minutes.

3.1.2 Rainfall Intensity (I)

The rainfall intensity (I) is the average rainfall rate in in/hr for a duration equal to the time of concentration for a selected return period. Once a particular return period has been selected for design and a time of concentration calculated for the drainage area, the rainfall intensity can be determined from Rainfall-Intensity-Duration data given in Table 3.1. Note that the data represented in this table were derived from the NOAA Atlas 14 ~~Dodson Method~~ as follows:

$$I = \frac{b}{(T + d)^c} \quad (3.9)$$

where: I = rainfall intensity (in/hr)
 T = rainfall duration (minutes)

b, d, c = coefficients based upon precipitation data

3.1.3 Runoff Coefficient (C)

The runoff coefficient (C) is the variable of the Rational Method least susceptible to precise determination and requires judgment and understanding on the part of the design engineer. While engineering judgment will always be required in the selection of runoff coefficients, typical coefficients represent the integrated effects of many drainage basin parameters. Table 3.2 gives the recommended runoff coefficients for the Rational Method.

It should be remembered that the Rational Method assumes that all land uses within a drainage area are uniformly distributed throughout the area. If it is important to locate a specific land use within the drainage area, then another hydrologic method may be used where hydrographs can be generated and routed through the drainage system. If a hydrograph is used, the results should be compared to the Rational Method and the more conservative results utilized in the design.

It may be that using only the impervious area from a highly impervious site (and the corresponding high C factor and shorter time of concentration) will yield a higher peak runoff value than by using the whole site. **This should be checked** particularly in areas where the overland portion is grassy (yielding a long T_c) to avoid underestimating peak runoff.



Table 3.1 Rain-Intensity-Duration-Data for Kerr County						
		Return-Period (Years)				
Coefficients		2	5	10	25	50
e		0.789	0.765	0.764	0.763	0.766
b		49	58	69	80	94
d		8.4	8	8	8	8
Hours — Minutes		Rainfall Intensity (inches per hour)				
0.083	5	6.32	8.15	9.72	11.30	12.76
	6	5.97	7.70	9.19	10.68	12.05
	7	5.67	7.31	8.72	10.13	11.43
	8	5.39	6.95	8.30	9.65	10.88
	9	5.15	6.64	7.92	9.21	10.39
	10	4.92	6.36	7.58	8.82	9.94
	11	4.72	6.10	7.28	8.46	9.54
	12	4.54	5.86	7.00	8.14	9.17
	13	4.37	5.65	6.74	7.84	8.84
	14	4.22	5.45	6.50	7.57	8.53
0.25	15	4.07	5.27	6.29	7.31	8.24
	16	3.94	5.10	6.09	7.08	7.98
	17	3.82	4.94	5.90	6.86	7.73
	18	3.70	4.80	5.73	6.66	7.50
	19	3.60	4.66	5.56	6.47	7.29
	20	3.50	4.53	5.41	6.29	7.09
	21	3.40	4.41	5.27	6.13	6.90
	22	3.31	4.30	5.13	5.97	6.72
	23	3.23	4.19	5.01	5.82	6.56
	24	3.15	4.09	4.89	5.68	6.40
	25	3.08	4.00	4.77	5.55	6.25
	26	3.01	3.91	4.66	5.43	6.11
	27	2.94	3.82	4.56	5.31	5.97
	28	2.87	3.74	4.47	5.20	5.85
0.5	29	2.81	3.66	4.37	5.09	5.73
	30	2.76	3.59	4.28	4.99	5.61
	31	2.70	3.52	4.20	4.89	5.50
	32	2.65	3.45	4.12	4.79	5.39
	33	2.60	3.39	4.04	4.70	5.29
	34	2.55	3.32	3.97	4.62	5.20
	35	2.50	3.26	3.90	4.54	5.10
	36	2.46	3.21	3.83	4.46	5.01
	37	2.41	3.15	3.77	4.38	4.93
	38	2.37	3.10	3.70	4.31	4.85
	39	2.33	3.05	3.64	4.24	4.77
	40	2.30	3.00	3.58	4.17	4.69
	41	2.26	2.95	3.53	4.11	4.62
	42	2.22	2.91	3.47	4.04	4.55
0.75	43	2.19	2.87	3.42	3.98	4.48
	44	2.16	2.82	3.37	3.92	4.41
	45	2.12	2.78	3.32	3.87	4.35
	46	2.09	2.74	3.28	3.81	4.29
	47	2.06	2.70	3.23	3.76	4.23
	48	2.03	2.67	3.19	3.71	4.17
	49	2.01	2.63	3.14	3.66	4.11
	50	1.98	2.60	3.10	3.61	4.06
	51	1.95	2.56	3.06	3.56	4.00
	52	1.93	2.53	3.02	3.52	3.95
	53	1.90	2.50	2.98	3.47	3.90
	54	1.88	2.47	2.95	3.43	3.86
	55	1.86	2.44	2.91	3.39	3.81
	56	1.83	2.41	2.88	3.35	3.76
1	57	1.81	2.38	2.84	3.31	3.72
	58	1.79	2.35	2.81	3.27	3.68
	59	1.77	2.33	2.78	3.23	3.63
	60	1.75	2.30	2.75	3.20	3.59
	120	1.06	1.42	1.69	1.97	2.21
	180	0.79	1.06	1.26	1.47	1.65
	360	0.46	0.63	0.76	0.88	0.99
	720	0.27	0.37	0.45	0.52	0.58
	1440	0.16	0.22	0.27	0.34	0.39

Commented [AS2]: Revise table to adopt NOAA Atlas 14, Volume 11 precipitation frequency estimates. Convert Atlas 14 precipitation estimates to Intensity-Duration-Frequency (IDF) and Depth-Duration-Frequency (DDF) tables.

Commented [AS2]: Revise table to adopt NOAA Atlas 14, Volume 11 precipitation frequency estimates. Convert Atlas 14 precipitation estimates to Intensity-Duration-Frequency (IDF) and Depth-Duration-Frequency (DDF) tables.

Table 3.2 Rational Method Runoff Coefficients	
Description of Area	Runoff Coefficient (C)
Developed:	
Asphalt	0.95
Concrete	0.97
Grass Areas (Lawns, Parks, etc.):	
<u>Poor Condition (Grass Cover < 50% of Area)</u>	
Flat, 0-2%	0.47
Average, 2-7%	0.53
Steep, over 7%	0.55
<u>Fair Condition (Grass Cover between 50% & 75% of Area)</u>	
Flat, 0-2%	0.41
Average, 2-7%	0.49
Steep, over 7%	0.53
<u>Good Condition (Grass Cover > 75% of Area)</u>	
Flat, 0-2%	0.36
Average, 2-7%	0.46
Steep, over 7%	0.51
Undeveloped:	
<u>Cultivated</u>	
Flat, 0-2%	0.47
Average, 2-7%	0.51
Steep, over 7%	0.54
<u>Pasture/Range</u>	
Flat, 0-2%	0.41
Average, 2-7%	0.49
Steep, over 7%	0.53
<u>Forest/Woodlands</u>	
Flat, 0-2%	0.39
Average, 2-7%	0.47
Steep, over 7%	0.52
Land Use	
<u>Single Family Residential (40% Impervious Cover)</u>	
Flat, 0-2%	0.60
Average, 2-7%	0.66
Steep, over 7%	0.69
<u>Multifamily Residential (65% Impervious Cover)</u>	
Flat, 0-2%	0.76
Average, 2-7%	0.79
Steep, over 7%	0.81
<u>Retail/Office/Light Commercial (80% Impervious Cover)</u>	
Flat, 0-2%	0.85
Average, 2-7%	0.87
Steep, over 7%	0.88
<u>Regional Commercial/Industrial (95% Impervious Cover)</u>	
Flat, 0-2%	0.94
Average, 2-7%	0.95
Steep, over 7%	0.96

Adapted from: 1. ISWM Design Manual for Development/Redevelopment, 2006
2. City of Austin, Drainage Criteria Manual, 2007

3.2 UNIT HYDROGRAPHS

For drainage areas greater than 150 acres, a Unit Hydrograph method shall be utilized to compute the storm water runoff (i.e., Snyder's Unit Hydrograph, Soil Conservation Service Unit Hydrograph (SCS), or Clark's Unit Hydrograph). If the Army Corps of Engineers HEC-HMS software is utilized to compute the storm water runoff, a copy of the digital model must be submitted to the Engineering Department with the plan review submittal. Additionally, the detailed calculations utilized to determine the storm water design discharges must be included in the civil construction plans.

The methodologies specified and approved by the US Army Corps of Engineers manual for the Snyder's Unit Hydrograph, Soil Conservation Service Unit Hydrograph (SCS) and the Clark's Unit Hydrograph are hereby adopted by this manual and included by reference. The recommended methodology is the SCS Method.

3.2.1 LOSS METHOD

3.2.1.1 SCS CURVE NUMBER LOSS

3.2.1.2

{INSERT SCS CURVE NUMBER BY SOIL TYPE TABLE}

{INSERT TABLE FOR PERCENT IMPERVIOUS COVER BY LAND USE}

3.2.2 TRANSFORM METHOD

3.2.2.1 SCS UNIT HYDROGRAPH

3.2.2.2 SNYDER UNIT HYDROGRAPH METHOD

3.2.2.3 CLARK UNITY HYDROGRAPH METHOD

3.2.3 REACH ROUTING

Commented [AS3]: Provide description summary for methods, acceptable values and reference to formulas.

Commented [AS4]: Provide explanation of acceptable reach routing methods including Muskingum, Muskingum-Cunge 8-Point, Modified Puls, Kinematic Wave

4.0 STREET DRAINAGE

The design flow of water in a street is related to its interference with traffic, public safety, parking, ADA requirements & pedestrian access and the chance of flood damage to surrounding properties. Interference with traffic is regulated by design limits of the spread of water into or through traffic lanes. Flooding of surrounding properties is regulated by limiting the depth of flow at the curb and by containment of the 100-year design storm flow within the street right of way. The following subsections specify the capacity limitations allowed in the City of Kerrville streets.

4.1 PERFORMANCE STANDARDS & LIMITATIONS

4.1.1 Flow Velocity

The maximum velocity of street flow shall not exceed 10 feet/second. At street "T" intersections, the flow velocity must be checked on the stem of the "T" to ensure that flow will not traverse the crown and opposing curb of the crossing street and enter onto private property.

4.1.2 Flow Depth

The flow depth shall be limited to the top of curb for the 4% chance (25-year) storm event.

The 1% (100-year) storm event shall be confined to be within the limits of the street rights-of-

ways.

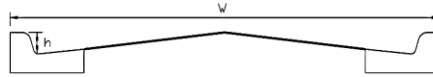
Streets draining a watershed greater than one hundred (100) acres must be designed for the 100-year ultimate design frequency storm. Street width shall not be widened beyond the width as determined by the street classification for drainage purposes.

For 100-year storm event flow depth shall not exceed 10 inches. In street right-of-way the product of water depth (ft.) x velocity (fps) should not be more than 6.5.

Once capacity has been reached, flows shall be conveyed via a public drainage system. In general, the flows listed in Table 4.1 shall not be exceeded without substantiating computations satisfactorily demonstrating that adverse impacts will be eliminated.

Table 4.1 – Street Capacity Table for Standard Parabolic Curb & Gutter Asphalt Streets

Manning's n = 0.018
h=0.54



Street Slope (%)	City Standard Curbed & Guttered Street Width (feet)					
	30		36		42	
	Q (cfs)	V (fps)	Q (cfs)	V (fps)	Q (cfs)	V (fps)
0.40	17.2	2.1	20.8	2.1	24.3	2.1
0.45	18.3	2.3	22.0	2.3	25.8	2.3
0.50	19.3	2.4	23.2	2.4	27.2	2.4
0.55	20.2	2.5	24.4	2.5	28.5	2.5
0.60	21.1	2.6	25.5	2.6	29.8	2.6
0.65	22.0	2.7	26.5	2.7	31.0	2.7
0.70	22.8	2.8	27.5	2.8	32.2	2.8
0.75	23.6	2.9	28.5	2.9	33.3	2.9
0.80	24.4	3.0	29.4	3.0	34.4	3.0
0.85	25.1	3.1	30.3	3.1	35.4	3.1
0.90	25.9	3.2	31.2	3.2	36.5	3.2
0.95	26.6	3.3	32.0	3.3	37.5	3.3
1.00	27.3	3.4	32.9	3.4	38.4	3.4
1.50	33.4	4.1	40.2	4.1	47.1	4.2
2.00	38.6	4.8	46.5	4.8	54.4	4.8
2.50	43.1	5.3	52.0	5.3	60.8	5.4
3.00	47.2	5.8	56.9	5.9	66.6	5.9
3.50	51.0	6.3	61.5	6.3	71.9	6.3
4.00	54.5	6.7	65.7	6.8	76.9	6.8
4.50	57.9	7.1	69.7	7.2	81.6	7.2
5.00	61.0	7.5	73.5	7.6	86.0	7.6
5.50	64.0	7.9	77.1	7.9	90.2	8.0
6.00	66.8	8.2	80.5	8.3	94.2	8.3
6.50	69.5	8.6	83.8	8.6	98.0	8.6
7.00	72.2	8.9	86.9	8.9	101.7	9.0
7.50	74.7	9.2	90.0	9.3	105.3	9.3
8.00	77.1	9.5	92.9	9.6	108.7	9.6
8.50	79.5	9.8	95.8	9.9	112.1	9.9
9.00	79.7	10.0	95.1	10.0	110.5	10.0
9.50	76.5	10.0	91.2	10.0	106.0	10.0
10.00	73.5	10.0	87.7	10.0	101.9	10.0
10.50	70.8	10.0	84.5	10.0	98.2	10.0
11.00	68.3	10.0	81.5	10.0	94.7	10.0
11.50	66.0	10.0	78.7	10.0	91.6	10.0
12.00	63.8	10.0	76.2	10.0	88.6	10.0

Commented [A55]: Revise table calculations to reflect adopted street classifications per the Kerrville 2050 Comprehensive Plan.

Check Q and V values.

4.2 ALLOWABLE FLOW SPREAD

4.2.1 Residential Streets

Runoff in a residential street from the 4% design frequency flows shall not exceed a depth of the lowest top of curb. Stormwater shall be removed from the streets by inlets or openings into

adjacent public drainage systems. They shall generally be placed at low points and as frequently as necessary to avoid exceeding water spread & depth criteria.

4.2.2 Collector Streets

Based upon the 4% storm event, Flow Spread shall be designed to provide at least one (1) open 12-foot traffic lane at the center of the street. For divided collectors, the flow spread shall be designed to provide one (1) open travel lane in each direction. Wherever possible, a collector street shall not be crossed with surface drainage unless approved by the City Engineer.

4.2.3 Major and Minor Arterials

Based upon the 1% design frequency flows, Flow Spread shall be designed to not exceed one (1) travel lane in each direction. Bypass from upstream inlets in excess of 5-cfs is not allowed into major or minor arterial intersections.

4.2.4 Alleys

The 1% design frequency flows shall not exceed the capacity of the paved alley section. Alley capacities must be checked at all alley turns and intersections to determine if curbing is needed or if grades should be flattened. Curbing must be required for at least 10-feet on either side of an inlet in an alley and on the other side of the alley so that the top of the inlet is even with the high edge of the alley pavement.

In residential areas where the standard 10-foot wide alley section capacity is exceeded, a wider alley may be used to provide more drainage capacity. Curbs shall not be added to alleys to increase the capacity. Where a particular width alley is required, such as a 12-foot width, a wider alley, such as a 16-foot width, may be required for greater capacity. Approximate increases in right-of-way widths will be necessary.

4.3 INTERSECTIONS

Inlet placement and storm sewer size shall ensure that design storm flows are intercepted along street legs entering the intersection in advance of the curb returns connecting the streets based on the criteria provided in this manual. In no case shall inlets be placed in the curved portion of curbs connecting intersecting streets. Where storm flow is allowed to pass through an intersection, valley gutter design must provide for smooth, uninterrupted traffic flow.

<u>Intersection Pair</u>	<u>Intercept</u>	<u>Valley Gutter Criteria</u>
Arterial - Arterial	All legs	No valley gutters
Arterial - Collector	All legs	No valley gutters
Arterial - Residential	All legs	No valley gutters
Collector - Collector	All legs	No valley gutters
Collector - Residential	Residential legs	Valley gutters can parallel Collector
Residential - Residential	Two legs preferred	Valley gutters acceptable

5.0 ROADWAY DITCH REQUIREMENTS

When roadway ditches are used in-lieu of city standard curb & gutter, the following standards shall apply. If any of the below requirements cannot be achieved, an alternative to mitigate the

deficiency shall be submitted for review and approval by the City.

1. The ditch shall not be less than 24 inches in depth.
2. The side slopes shall not be steeper than ~~3H4H~~3H:1V.
3. Provisions for armoring and/or vegetation for erosion control on the side slopes and bottom shall be shown on the plans.
4. The ditch shall convey the flows generated by the 1% storm event.
5. The flow velocity in an unarmored ditch shall generally not exceed 6 feet per second. Reference Table 6.1a for further velocity control information.

6.0 OPEN CHANNELS, CULVERTS, AND BRIDGES

6.1 GENERAL DESIGN CONSIDERATIONS

- Stormwater systems should be planned and designed so as to generally conform to natural drainage patterns and discharge to natural drainage pathways within a drainage basin. These natural drainage pathways should only be modified as a last resort to contain and safely convey the peak flows generated by the development.
- Runoff must be discharged in a manner that will not cause adverse impacts on downstream properties or stormwater systems. In general, runoff from development sites within a drainage basin should be discharged at the existing natural drainage outlet or outlets. If the developer wishes to change discharge points he or she must demonstrate that the change will not have any adverse impacts on downstream properties or stormwater (minor) systems.
- It is important to ensure that the combined on-site flood control system and major stormwater system can handle blockages and flows in excess of the design capacity to minimize the likelihood of nuisance flooding or damage to private properties. If failure of minor stormwater systems and/or major stormwater structures occurs during these periods, the risk to life and property could be significantly increased.
- In establishing the layout of stormwater systems, it is essential to ensure that flows are not diverted onto private property during flows up to the major stormwater system design capacity.

6.2 OPEN CHANNELS

Natural or lined open channels shall be designed to convey the flood peak flows while at the same time be designed in such a way to minimize erosion and maintain the stability of the stream banks. Concrete lined channels are generally discouraged by the City. **Bioengineering** techniques may be used in natural channels with side slopes no steeper than 3H:1V. Construction of a low-flow channel, where possible, is another recommended option. Low-flow channels should be sized using the channel forming discharge or the 2-year storm. The design engineer is reminded that it may be extremely difficult to obtain the proper permits from the State and Federal authorities for concrete channel designs. In addition, developers are responsible for acquisition of all regulatory agency permits.

- Open channels provide opportunities for reduction of flow peaks and pollution loads. They may be designed as wet or dry enhanced swales or grass channels.
- Channels can be designed with natural meanders improving both aesthetics and pollution removal through increased contact time.

- Grass channels generally provide better habitat than hardened channel sections, though studies have shown that riprap interstices provide significant habitat as well. Velocities should be carefully checked at design flows and the outer banks at bends should be specifically designed for increased shear stress and superelevation.
- Compound sections can be developed to carry the annual flow in the lower section and higher flows above them. Figure 6.1 illustrates a compound section that carries the 50% design frequency flows (2-year storm event) and 1% design frequency flows within banks. This reduces channel erosion at lower flows, and meandering, self-forming low flow channels that attack banks. The shelf in the compound section should have a minimum 1V:12H slope to ensure drainage.

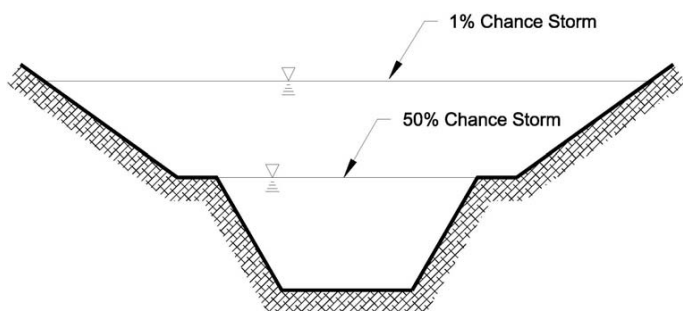


Figure 6.1 Compound Channel Section

6.2.1 Open Channel Lining Types

The three main classifications of open channel linings are vegetated, flexible, and rigid. Vegetated linings include grass with mulch, sod, and bioengineering techniques. Stone riprap and some forms of flexible man-made linings or gabions are examples of flexible linings, while rigid linings are generally concrete or rigid block.

Vegetative Linings – Vegetation, where practical, is the most desirable lining for an artificial channel. It stabilizes the channel body, consolidates the soil mass of the bed, checks erosion on the channel surface, provides habitat, and provides water quality benefits (see Appendix B-References, *iSWM Technical Manual* for more details on using enhanced swales and grass channels for water quality purposes).

Conditions under which vegetation only linings may not be acceptable include but are not limited to:

- High velocities
- Standing or continuously flowing water
- Lack of regular maintenance necessary to prevent growth of taller or woody vegetation
- Lack of nutrients and inadequate topsoil
- Excessive shade

Proper seeding, mulching, and soil preparation are required during construction to assure establishment of healthy vegetation.

If low flows are prevalent, a hard lined pilot channel may be needed, and it should be wide enough to accommodate maintenance equipment.

Flexible Linings – Rock riprap, including rubble and gabion baskets, is the most common type of flexible lining for channels. It presents a rough surface that can dissipate energy and mitigate increases in erosive velocity. These linings are usually less expensive than rigid linings and have self-healing qualities that reduce maintenance. However, they may require the use of a filter fabric depending on the underlying soils, and the growth of grass, weeds, and trees may present maintenance problems.

Rigid Linings – Rigid linings are generally constructed of concrete and used where high flow capacity is required. Higher velocities, however, create the potential for scour at channel lining transitions and channel headcutting.

6.2.2 Uniform Flow Calculations

Manning's Equation

Manning's Equation, presented in three forms below, is recommended for evaluating uniform flow conditions in open channels:

$$v = \frac{1.486}{n} R^{\frac{2}{3}} \sqrt{s} \quad (6.1)$$

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} \sqrt{s} \quad (6.2)$$

$$s = \left(\frac{Qn}{1.486 A R^{\frac{2}{3}}} \right)^2 \quad (6.3)$$

where: v = average channel velocity (ft/s)
 Q = discharge rate for design conditions (cfs)
 n = Manning's roughness coefficient
 A = wetted cross sectional area or cross sectional area of flow (ft²)
 R = hydraulic radius A/P (ft) [see equation 3.8]
 s = slope of the channel or channel bed (ft/ft)

Note that when solving for S in Equation 6.3, S represents the energy gradient, which is the head loss per length of flow path. When S is less than 0.1%, the energy gradient is approximately the bed slope.

Manning's n Values

The Manning's n value is an important variable in open channel flow computations. Variation in this variable can significantly affect discharge, depth, and velocity estimates. Since Manning's n values depend on many different physical characteristics of natural and man-made channels, care and good engineering judgment must be exercised in the selection process.

Recommended Manning's n values for natural channels are given in Table 6.1 For natural channels, Manning's n values should be estimated using experienced judgment and information presented in publications such as the *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains*, FHWA-TS-84-204, 1984, FHWA HEC-15, 1988, or Chow, 1959. Recommended Manning's n values for various artificial channels are provided in Table 6.2.

Table 6.1 Roughness Coefficients (Manning's n) and Allowable Velocities for Natural Channels		
Channel Description	Manning's n	Maximum Permissible Channel Velocity (ft/s)
MINOR NATURAL STREAMS		
Fairly regular section		
1. Some grass and weeds; little or no brush	0.030 – 0.035	*6
2. Dense growth of weeds, depth of flow materially greater than weed height	0.035	*6
3. Some weeds, light brush on banks	0.035	*6
4. Some weeds, heavy brush on banks	0.050	*6
5. Some weeds, dense willows on banks	0.060	*6
• For trees within channels with branches submerged at high stage, increase above values by	+0.010	*6
• Irregular section with pools, slight channel meander, increase above values by	+0.010	*6
Floodplain – Pasture		*6
1. Short grass	0.030	*6
2. Tall grass	0.035	*6
Floodplain – Cultivated Areas		*6
1. No crop	0.030	*6
2. Mature row crops	0.035	*6
3. Mature field crops	0.040	*6
Floodplain – Uncleared		*6
1. Heavy weeds scattered brush	0.050	*6
2. Wooded	0.120	*6
MAJOR NATURAL STREAMS		*6
Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of “n” for larger streams of mostly regular sections, with no boulders or brush	Range from 0.028 to 0.060	*6
UNLINED VEGETATED CHANNELS		*6
Clays (Bermuda Grass)	0.030	*6
Sandy and Silty Soils (Bermuda Grass)	0.030	*6
UNLINED NON-VEGETATED CHANNELS		
Sandy Soils	0.030	2.5
Silts	0.030	1.5
Sandy Silts	0.030	3
Clays	0.030	5
Coarse Gravels	0.030	6
Shale	0.030	8
Rock	0.025	15

(Adapted from: iSWM Technical Manual, 2010)

***Reference Table 6.1a Velocity Control**

Table 6.1a Velocity Control

Velocity (fps)	Type of Facility Required	Hydraulic Radius	Correction Factor	Maximum Permissible Velocity (fps)
1 to 6 (maximum average velocity = 6 fps)	Vegetated Earthen Channel	0-1	0.83	5
		1-3	0.92	5.5
		3-5	1.05	6.3
		5-8	1.15	6.9
		8-10	1.225	7.35
		Over 10	1.25	7.5
6 to 8	Concrete Retards	NA	NA	NA
>8	Concrete Lining or Drop Structures	NA	NA	NA

Table 6.2 Manning's Roughness Coefficients (n) for Artificial Channels

		Depth Range		
Category	Lining Type	0-0.5 ft	0.5-2.0 ft	>2.0 ft
Rigid	Concrete	0.015	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Unlined	Bare Soil	0.023	0.020	0.020
	Rock Cut	0.045	0.035	0.025
Temporary*	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.022	0.019
	Straw with Net	0.065	0.033	0.025
	Curled Wood Mat	0.066	0.035	0.028
	Synthetic Mat	0.036	0.025	0.021
Gravel Riprap	1-inch D50	0.044	0.033	0.030
	2-inch D50	0.066	0.041	0.034
Rock Riprap	6-inch D50	0.104	0.069	0.035
	12-inch D50	–	0.078	0.040

Note: Values listed are representative values for the respective depth ranges. Manning's roughness coefficients, n, vary with the flow depth.
*Some "temporary" linings become permanent when buried.

(Source: HEC-15, 1988; ISWM TM, 2010)

6.2.3 Critical Flow Calculations

In the design of open channels, it is important to calculate the critical depth in order to determine if the flow in the channel will be subcritical or supercritical. If the flow is subcritical it is relatively easy to handle the flow through channel transitions because the flows are tranquil and wave action is minimal. In subcritical flow, the depth at any point is influenced by a downstream control, which may be either the critical depth or the water surface elevation in a pond or larger downstream channel. In supercritical flow, the depth of flow at any point is influenced by a

control upstream, usually critical depth. In addition, the flows have relatively shallow depths and high velocities. Hydraulic jumps are possible under these conditions and consideration should be given to stabilizing the channel.

Critical depth depends only on the discharge rate and channel geometry. The general equation for determining critical depth is expressed as:

$$\frac{Q^2}{g} = \frac{A_c^3}{T} \quad (6.4)$$

where: Q = discharge rate for design conditions (cfs)
 g = acceleration due to gravity (32.2 ft/sec²)
 A_c = critical depth cross-sectional area (ft²)
 T = top width of water surface (ft)

Note: A trial and error procedure is needed to solve Equation 6.4. The cross-sectional area is a function of the critical depth and can be factored out depending upon the geometry of the channel section. For a rectangular channel:

$$d_c = \frac{A_c}{T} \quad [\text{rectangular}] \quad (6.5)$$

where: d_c = critical depth

Therefore, Equation 6.4 can be rewritten as:

$$d_c^3 = \frac{Q^2}{g} [\text{rectangular}] \quad (6.6)$$

6.2.4 Semi-Empirical Calculations

Semi-empirical equations (as presented in Table 6.3) or section factors (as presented in Figure 6.2) can be used to simplify trial and error critical depth calculations. The following equation is used to determine critical depth with the critical flow section factor, Z :

$$Z = \frac{Q}{\sqrt{g}} \quad (6.7)$$

where: Z = critical flow section factor

Q = discharge rate for design conditions (cfs)
 g = acceleration due to gravity (32.2 ft/sec²)

The following guidelines are given for evaluating critical flow conditions of open channel flow:

- A normal depth of uniform flow within about 10% of critical depth is unstable and should be avoided in design, if possible.
- If the velocity head is less than one-half the mean depth of flow, the flow is subcritical.
- If the velocity head is equal to one-half the mean depth of flow, the flow is critical.
- If the velocity head is greater than one-half the mean depth of flow, the flow is supercritical.



Note: The head is the height of water above any point, plane, or datum of reference. The velocity head in flowing water is calculated as the velocity squared divided by 2 times the gravitational constant ($V^2/2g$).

The Froude number, Fr , calculated by the following equation, is useful for evaluating the type of flow conditions in an open channel:

$$Fr = \frac{v}{\sqrt{gT}} \quad (6.8)$$

where: Fr = Froude number (dimensionless)
 v = velocity of flow (ft/s)

g = acceleration of gravity (32.2 ft/sec²)
 A = cross-sectional area of flow (ft²)
 T = top width of flow (ft)
 Q = discharge rate for design conditions (cfs)
 d = depth corresponding to velocity v (ft)

If Fr is greater than 1.0, flow is supercritical; if it is under 1.0, flow is subcritical. Fr is 1.0 for critical flow conditions.

Table 6.3 Critical Depth Equations for Uniform Flow in Selected Channel Cross Sections

Channel Type ¹	Semi-Empirical Equations ² for Estimating Critical Depth	Range of Applicability
1. Rectangular ³	$d_c = [Q^2/(gb^2)]^{1/3}$	N/A
2. Trapezoidal ³	$d_c = 0.81[Q^2/(gz^{0.75}b^{1.25})]^{0.27} - b/30z$	$0.1 < 0.5522 Q/b^{2.5} < 0.4$ For $0.5522 Q/b^{2.5} < 0.1$, use rectangular channel equation
3. Triangular ³	$d_c = [(2Q^2)/(gz^2)]^{1/5}$	N/A
4. Circular ⁴	$d_c = 0.325(Q/D)^{2/3} + 0.083D$	$0.3 < d_c/D < 0.9$
5. General ⁵	$(A^3/T) = (Q^2/g)$	N/A
where: d_c = critical depth (ft) Q = design discharge (cfs) g = acceleration due to gravity (32.2 ft/s ²) b = bottom width of channel (ft) z = side slopes of a channel (horizontal to vertical) D = diameter of circular conduit (ft) A = cross-sectional area of flow (ft ²) T = top width of water surface (ft)		
¹ See Figure 6.2 for channel sketches ² Assumes uniform flow with the kinetic energy coefficient equal to 1.0 ³ Reference: French (1985) ⁴ Reference: USDOT, FHWA, HDS-4 (1965) ⁵ Reference: Brater and King (1976)		

(Source: iSWM TM, 2010)

If the water surface profile in a channel transitions from supercritical flow to subcritical flow, a hydraulic jump must occur. The location of the hydraulic jump and its sequent depth are critical to proper design of free flow conveyances. To determine the location of a hydraulic jump, the standard step method is used to compute the water surface profile and specific force



(momentum principle) and specific energy relationships are used. For computational methods



refer to Chow, 1959, TxDOT, 2002, and Mays, 1999. The HEC-RAS computer program can be used to compute water surface profiles for both subcritical and supercritical flow regimes.



Section	Area A	Wetted Perimeter p	Hydraulic Radius R	Top Width T	Critical Depth Factor, Z
 Trapezoid	$bd + zd^2$	$b + 2d\sqrt{z^2 + 1}$	$\frac{bd + zd^2}{b + 2d\sqrt{z^2 + 1}}$	$b + 2zd$	$\frac{[(b + zd)d]^{1.5}}{\sqrt{b + 2zd}}$
 Rectangle	bd	$b + 2d$	$\frac{bd}{b + 2d}$	b	$bd^{1.5}$
 Triangle	zd^2	$2d\sqrt{z^2 + 1}$	$\frac{zd}{2\sqrt{z^2 + 1}}$	$2zd$	$\frac{\sqrt{2}}{2} zd^{2.5}$
 Parabola	$\frac{2}{3} dT$	$T + \frac{8d^2}{3T}$ ¹	$\frac{2dT^2}{3T^2 + 8d^2}$ ¹	$\frac{3a}{2d}$	$\frac{2}{9}\sqrt{6} Td^{1.5}$
 Circle - $< 1/2$ full ²	$\frac{D^2}{8} (\frac{\pi\theta}{180} - \sin\theta)$	$\frac{\pi D\theta}{360}$	$\frac{45D(\frac{\pi\theta}{180} - \sin\theta)}{\pi\theta}$	$D \sin \frac{\theta}{2}$ or $2\sqrt{d(D-d)}$	$a\sqrt{\frac{a}{D \sin \frac{\theta}{2}}}$
 Circle - $> 1/2$ full ³	$\frac{D^2}{8} (2\pi - \frac{\pi\theta}{180} + \sin\theta)$	$\frac{\pi D(360 - \theta)}{360}$	$\frac{45D}{\pi(360 - \theta)} (\frac{\pi\theta}{180} + \sin\theta)$	$D \sin \frac{\theta}{2}$ or $2\sqrt{d(D-d)}$	$a\sqrt{\frac{a}{D \sin \frac{\theta}{2}}}$

Note: Small z = Side Slope Horizontal Distance
 Large Z = Critical Depth Section Factor

Figure 6.2 Open Channel Geometric Relationships for Various Cross Sections
 (Source: USDA, SCS, NEH-5 1956; ISWM TM, 2010)

6.2.5 Flow Considerations

- Channel capacity shall be determined to accommodate the discharge from a 4% design storm event (25-year) assuming ultimate build-out conditions for all of the contributing drainage area. In addition, the channel shall be designed to convey the 1% storm event flows generated from the developed on-site conditions and the existing off-site conditions.
- Where supercritical flow is encountered, allowances shall be made in the design for the proper handling of the water.
- Velocity of flow shall not be less than 2.5 fps for the 4% storm event.
- Maximum velocities for the design flow shall be less than the values given in Table 6.1 for the type of surface treatment(s) specified.
- Where the minimum velocities cannot be maintained or when low flows are expected on a regular basis, a concrete pilot channel or approved equal shall be constructed to convey the 50% (2-year) storm event.
- Channels shall be designed to convey the 1% storm without overtopping the channel and shall be designed with a minimum freeboard equal to one foot above the 4% chance storm design depth or 20% of the design depth, whichever is less.
- A driveable access way shall be provided in floodplain easements for the length of the easement when regular maintenance of the floodplain is required.

6.2.6 Physical Considerations

- The maximum side slope for a non-armored or reinforced open channel shall be 3H:1V unless proposed erosion control data and slope stability calculations are submitted and approved by the City Engineer.
- The minimum velocity for earthen or vegetative lined channels shall be 2.5 fps ~~longitudinal slope shall be 1% (100H:1V) for earthen or vegetative lined channels~~ to prevent formation of standing water. The slope may be reduced to less than 0.5% if a concrete pilot channel or city approved alternative is provided to convey the 5-year storm event.
- Special channel linings and energy dissipation features must be used to compensate for high velocities and hydraulic jumps associated with supercritical flow. The channel must contain the hydraulic jump throughout the extent of the supercritical profile.
- The maximum allowable deflection angle for bends in designed channels shall be 30 degrees. The outside of horizontal curves shall provide additional channel bank height and surface treatment as necessary to fully contain the design flow and prevent erosion and overtopping. Allowance for extra freeboard shall be made when the centerline radius of the channel is less than three (3) times the bottom width. Where sharp bends or high velocities are involved, the designer shall account for extra freeboard requirements using the following formula as a minimum:

$$d_2 - d_1 = \frac{V^2(T + b)}{2gR} \quad (6.9)$$

where: d_1 = depth of flow
at the inside of
the bend (ft) d_2 =
depth of flow at
the outside of the
bend (ft) b =
bottom width of

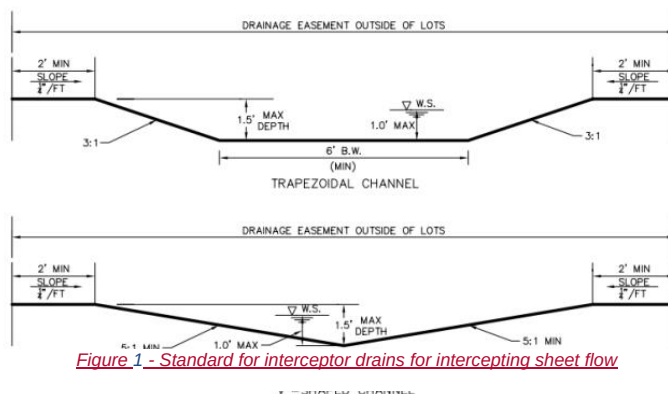
channel (ft)
 V = average approach velocity in the channel (ft/sec)
 T = width of flow at the water surface (ft)
 g = acceleration of gravity (32.2 ft/sec²)
 R = center line radius of the turn or bend (ft)

- A fifteen (15) foot access road on one side of the extreme limits of the channels is required when channels do not parallel and adjoin an alley or roadway. Where utilities are installed in the access road of the channel, the access road will be widen to seventeen (17) feet. "Extreme Limits" of the channel shall mean the side slope intercept with the natural ground or proposed finished ground elevation. Where designed channel bottoms exceed one hundred (100) feet in width, the fifteen-foot access road shall be provided on both sides of the channel. The access road will slope toward the channel with a maximum cross slope of one (1) inch per foot. Additionally, the top of utility manholes within the access road to match the finish ground surface.
- Earthen channels shall be vegetated.
- Fencing will be required adjacent to the channel where channel vertical wall heights exceed two (2) feet. Fencing will also be required adjacent to the channel where channel side slopes exceed two to one (2:1) and the channel depth is greater than two (2) feet. The fencing must not cause sight distance problems for motorists.

Interceptor Channel

Interceptor channels for proper conveyance of upstream storm water sheet flow shall be required on all subdivision plats where upstream contributing area exceeds the criteria indicated below. Interceptor channels shall be constructed prior to the issuing of building permits on any lot that would intercept natural drainage.

- Interceptor channels shall be provided for residential subdivisions where the drainage area to the back of platted lots exceeds the depth of two (2) average residential lots with equivalent zoning.
- Interceptor channels shall be required on nonresidential subdivision plats where the off-site drainage area contributing to the proposed development exceeds three (3) acres.



Freeboard

Drainage Freeboard for Concrete Lined and Earth Channels for Twenty-Five-Year

Design Depth of Flow	Required Freeboard
0 to 5 feet	0.5 foot
5 to 10 feet	10% of design depth
10 feet and over	1.0 foot

Maintenance Considerations

- A. Access - A drivable access way shall be provided in drainage easements for the length of the easement when regular maintenance of the floodplain is required.

Maintenance Access Right-of-Way. An unobstructed access right-of-way connecting the drainage easement with an alley or roadway parallel to or near the easement shall be provided at a minimum spacing of one (1) access right-of-way at approximately one thousand-foot intervals. The access right-of-way shall be a minimum of fifteen (15) feet in width and shall be maintained clear of obstructions that would limit maintenance vehicular access. If the flow line of the designed channel incorporates grade control structures or vehicular bridges that would prevent maintenance equipment from accessing that portion of the channel, additional access points may be required. Channel design, earthen or concrete, shall have ramps in the side slopes near the access points that would allow maintenance equipment to descend to the floor level of the channel. The maximum allowable ramp slope for vehicular access is seven to one (H7:V1). Access points adjacent to roadways or alleys shall be provided with a post and cable feature with padlock to prevent unauthorized use.

B. Schedule

Design of new channels or alterations to existing channels shall consider future maintenance requirements. A maintenance schedule for any private channel shall be submitted to and approved by the City Engineer prior to approval of construction plans. Maintenance requirements of concrete channels consist of de-silting activities, prevention of vegetation establishment in construction joints, and repair of concrete as necessary. Maintenance of earthen channels includes regular observation and repair, as necessary, of erosion, scouring, and removal of silt deposits, as necessary to maintain design parameters. Developers shall be responsible for maintaining newly planted channels until coverage is established throughout eighty-five (85) percent of the area.

This area shall include slopes, floor, and any attendant maintenance easement. New earthen channels shall be planted with grass species. Mowing frequencies vary with the vegetation growth rates, but is required when the grass exceeds the design roughness coefficient of the channel.

6.3 CULVERTS & BRIDGES

6.3.1 General Overview

A culvert is a hydraulically short conduit, open on both ends, generally used to convey stormwater runoff through a roadway or an embankment and typically constructed without manholes, inlets, or catch basins. For economy and hydraulic efficiency, culverts are typically designed to operate with the inlet submerged during the design storm event. Bridges, on the other hand, are not covered with embankment or designed to take advantage of submergence to increase hydraulic capacity, even though some are designed to be inundated under flood conditions. According to FHWA standards, a culvert with a clear opening of more than 20-feet, measured along the center of the roadway between inside of end walls, is considered a bridge.

6.3.2 Design Considerations

The design engineer shall keep head losses and velocities within the guidelines specified in this manual and where not included shall be within generally acceptable engineering practices. This normally requires selecting a structure which creates a slight headwater (1.2 times the culvert height) and has a flow velocity at or below the allowed maximum. Velocities in culverts are normally limited to the maximum allowed in the downstream channel unless there is some form of energy dissipation at the outfall.

6.3.3 Flow Control

In the hydraulic design of culverts, an investigation must be made into the type of flow condition through the culvert. The flow will be controlled, or limited, either at the culvert entrance or the outlet, and is designated either inlet or outlet control, respectively.

Inlet Control – Inlet control occurs when the barrel capacity exceeds the culvert inlet capacity and the tailwater elevations is too low to control. In other words, the headwater depth entrance geometry at the inlet will control the amount of water entering the barrel. The roughness, length of culvert barrel, and outlet conditions do not affect capacity for culverts with inlet control.

Outlet Control – Outlet control occurs when the culvert inlet capacity exceeds the barrel capacity or the tailwater elevation causes backwater effect through the culvert. In this case, the tailwater elevation, slope, length and roughness of the culvert barrel will determine the hydraulic capacity of the culvert even though the entrance conditions are such that a larger flow could be conveyed.

Proper culvert design should include an analysis to determine whether the inlet is outlet or inlet controlled. For more information on inlet and outlet control, see TxDOT's Hydraulic Design Manual, 2011 or latest edition.

6.3.4 Design Frequency & Freeboard

The culvert(s) should be designed for the ultimate twenty-five (25) year storm if the drainage area to the culvert crossing is less than one hundred (100) acres. If the drainage area to the culvert(s) is more than one hundred (100) acres, the system should be designed for the ultimate one hundred (100) year storm. Channels upstream and downstream of culverts must contain the design storm and freeboard.

~~Freeboard, the vertical clearance between the design water surface and the lowest point of the roadway at the culvert, is included as a safety factor in the event of clogging of the culvert. One-~~

~~foot (1') of freeboard above the 1%-chance water surface elevation is required. Bridges shall be designed to pass the 1% storm event, fully developed watershed conditions, peak flow with two feet (2') of clearance below the lowest part of the open span of the bridge, commonly called the low chord.~~

~~Freeboard at a bridge is the vertical distance between the design water surface elevation and the low-chord of the bridge. The bridge low-chord is the lowest portion of the bridge deck superstructure. The purpose of freeboard is to provide room for the passage of floating debris, extra area for conveyance in the event that debris build-up on the piers reduces hydraulic capacity of the bridge, and a factor of safety against the occurrence of waves or floods larger than the design flood. The minimum freeboard is one (1) foot for the ultimate one hundred (100) year storm. For drainage areas less than one hundred (100) acres, the ultimate twenty-five (25) year storm freeboard will range from 6" to 1 ft depending on channel depth~~

Roadway Overtopping

~~Avoid overtopping of the bridge deck from a design storm. If overtopping of the bridge is possible, the design engineer should check the bridge for floatation and provide proper anchorage of the deck and super structure components.~~

Bridge Railing

~~The bridge railing should be traffic rated.~~

~~If overtopping of the bridge from a design storm is possible, the bridge railing should be design to minimize obstruction to the storm overtopping.~~

~~Should a bridge railing be on the exterior of the bridge with a sidewalk adjacent to the railing, a hand rail may be needed on top of the bridge railing.~~

6.3.5 Headwalls & Entrance Conditions

1. Headwalls are structural appurtenances located at the ends of a culvert that are typically formed of cast-in-place concrete. The purpose of these structures are:
 - a. To retain the fill material and reduce erosion of embankment slopes.
 - b. To improve hydraulic efficiency.
 - c. To provide structural stability to the culvert ends and serve as a counterweight to offset buoyant or uplift forces.
2. Headwalls shall be designed to fit the conditions of the site, and constructed according to the City of Kerrville Standard Details, or the Texas Department of Highways and Public Transportation Details, unless approved otherwise by the City Engineer.

6.3.6 Outlet Velocity

The velocity in the culvert is likely to be higher than that in the channel because the culvert usually constricts the available channel area. This increased velocity can cause streambed scour and bank erosion in the vicinity of the culvert outlet. There may also be eddies resulting from flow expansion. It is important to control the amount of scour at the culvert outlet because of the possibility of undermining of the headwall and loss of support of the culvert itself. Bank erosion may threaten nearby structures and may also disrupt the stability of the channel itself.

At many locations, use of a simple outlet treatment (e.g., cutoff walls, concrete aprons, rock rubble rip-rap, other) may provide adequate protection against scour. At other locations, adjustment of the barrel slope may be sufficient to prevent damage from scour.

When the outlet velocity exceeds the erosive velocity in the downstream channel, considerations should be given to energy dissipation devices (e.g., dissipation blocks, stilling basins, rip-rap basins, etc).

7.0 INLET DESIGN

All storm sewer inlets shall be designed to capture the fully developed flows and located to comply with Section 4.0 of this manual. Figures A through O may be used to determine the capacity of specific inlets under various conditions.

The following is a list of guidelines for inlet placement:

1. The maximum length of inlets at one location along a street shall not exceed 20 feet.
2. Placing several inlets at a single location is permitted in areas with steep grades in order to reduce bypass and avoid exceeding street capacities in flatter reaches downstream.
3. To minimize water draining through an intersection, inlets should be placed upgrade from an intersection.
4. Inlets should also be located in alleys upgrade of intersections and where necessary to prevent water from entering intersections in amounts exceeding the allowed street capacity.
5. Inlets should be placed upstream from right angle turns.
6. Any discharge of concentrated flow into streets and alleys requires a hydraulic analysis of street and alley capacities.
7. Inlet boxes designed more than 4.5' deep require a special design.
8. All "Y" inlets and inlets 10-feet or greater shall have a minimum 21-inch lateral. All smaller inlets shall have a minimum lateral of 18-inches.
9. Inlets at a sag point require a minimum of 10-feet of opening, unless approved otherwise by

the City Engineer.

10. The end of recessed inlet boxes shall be at least 10-feet from a curb return for an intersection or driveway. The inlet shall be located to minimize interference with the use of adjacent property. Inlets shall not be located across from median openings where a future drive approach may be added.
11. Data shown at each inlet shall include storm drain stationing, size of inlet, type of inlet, top of curb elevation, throat of inlet opening, and flowline of inlet.
12. Inlet box depth shall not be less than 4-feet.
13. Interconnecting inlets on lateral shall be avoided.
14. Grate type inlets, except for combination inlets, shall be avoided.

7.1 POSITIVE OVERFLOW

The approved storm sewer system shall provide positive overflow at all Low Points. The term "Positive Overflow" means that when inlets do not function properly due to clogging or when the design capacity of the conduit is exceeded, the excess flow can be conveyed overland along an improved/armored course.

8.0 CLOSED CONDUIT SYSTEMS

All enclosed drainage systems shall be hydraulically designed using Manning's Equation:

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} \sqrt{s} \quad (8.1)$$

where: Q = discharge rate for design conditions (cfs)
n = Manning's roughness coefficient
A = inside cross-sectional area of conduit (ft²)
R = hydraulic radius A/P (ft) [see equation 3.8]
s = slope of the energy grade line (ft/ft)

Table 8.1 provides recommended Manning's n values for different types of closed conduit materials.

Alignments of proposed storm sewer systems shall utilize existing easements and rights-of-ways where possible. No other utility parallel with the storm sewer system shall be located within 5-feet horizontally. Storm drainage systems shall be designed so that the necessary trenching will not undermine existing surface structures, utilities or trees. The minimum bury depth for storm drain systems shall be three feet (3'). Storm sewer junction structures with manhole access shall be provided as follows:

- For underground systems consisting of pipe diameters less than 48-inches shall be spaced a maximum of 500-feet apart.
- For underground systems consisting of pipe diameters 48-inches and larger shall be spaced a maximum of 1000-feet apart.

Horizontal and vertical curve design for storm sewer systems shall take into account joint closure. Half tongue exposure is the maximum opening permitted with tongue and groove pipe. Where vertical and/or horizontal alignment require greater deflection, radius pipe on curved alignment shall be used.

The minimum pipe size allowed in the City of Kerrville is 18-inches in diameter.

Table 8.1 Manning's n Values for Closed Conduits

Type of Conduit	Wall & Joint Description	Manning's n
Concrete Pipe	Good joints, smooth walls	0.012
	Good joints, rough walls	0.016
	Poor joints, rough walls	0.017
Concrete Box	Good joints, smooth finished walls	0.012
	Poor joints, rough, unfinished walls	0.018
Corrugated Metal Pipes and Boxes Annular Corrugations	2 2/3- by 1/2-inch corrugations	0.024
	6- by 1-inch corrugations	0.025
	5- by 1-inch corrugations	0.026
	3- by 1-inch corrugations	0.028
	6-by 2-inch structural plate	0.035
	9-by 2-1/2 inch structural plate	0.035
Corrugated Metal Pipes, Helical Corrugations, Full Circular Flow	2 2/3-by 1/2-inch corrugated 24-inch plate width	0.012
Spiral Rib Metal Pipe	3/4 by 3/4 in recesses at 12 inch spacing, good joints	0.013
High Density Polyethylene (HDPE)	Corrugated Smooth Liner	0.015
	Corrugated	0.020
Polyvinyl Chloride (PVC)		0.011

Source: HDS No. 5, 2001; iSWMM TM, 2010

Note: For further information concerning Manning n values for selected conduits consult Hydraulic Design of Highway Culverts, Federal Highway Administration, 2001, HDS No. 5, pages 201 - 208.

8.1 HYDRAULIC GRADIENT OF CONDUITS

After computing the runoff rate to each inlet, the size and gradient of pipe required to carry the design storm must be determined. The City of Kerrville requires that all hydraulic gradient calculations begin at the outfall of the system. The following are criteria for the starting elevation of the hydraulic gradient:

1. Starting hydraulic grade at an outfall into a creek, channel or pond shall be the 1% chance storm event water surface elevation.
2. In lieu of a known or calculated 1% chance storm event water surface elevation, the starting hydraulic gradient shall not be below the top of pipe.

Calculations of the 1% storm event hydraulic grade line shall be provided on all storm sewer profiles and begin from the downstream starting hydraulic grade line elevation and progress upstream using Manning's formula. Adjustments are made in the hydraulic grade line whenever

the velocity in the line changes due to conduit size changes or discharge changes.

Hydraulic grade line “losses” or “gains” for connections, pipe size changes, and other velocity changes must be accounted for and can be calculated by the following formulas:

VELOCITY DIFFERENCE	
$V_1 < V_2$	$V_1 > V_2$
$h_j = \frac{V_1^2}{2g} - \frac{V_2^2}{2g} \quad (8.2)$	$h_j = \frac{V_1^2}{4g} - \frac{V_2^2}{4g} \quad (8.3)$

where: h_j = Head loss (Hydraulic Jump) in feet
 V_1 = Upstream Velocity in fps
 V_2 = Downstream Velocity in fps
 g = the acceleration of gravity (32.2 ft/sec²)

In determining the hydraulic gradient for a lateral, begin with the hydraulic grade of the trunk line at the junction plus the h_j due to the velocity change. Where the lateral is in full flow, the hydraulic grade is projected along the friction slope calculated using Manning’s equation (see Equation 6.3).

Head losses at structures, such as manholes, wye branches, bends, junction boxes and inlets, shall be calculated as shown in Figures 8.1 & 8.2. The minimum head loss used at any structure shall be 0.1 feet.

The basic equation takes the form as set forth below with the various conditions of the coefficient “ K_j ” shown in Table 8.2.

$$h_j = K_j \frac{V_1^2}{2g} - K_j \frac{V_2^2}{2g} \quad (8.4)$$

where: h_j = Junction or structure head loss in feet
 v_1 = Velocity in upstream pipe in fps
 v_2 = Velocity in downstream pipe in fps
 K_j = Junction or structure coefficient of loss.

In the case where the manhole is at the very beginning of a line or the line is laid with bends or on a curve, the equation becomes the following without any velocity of approach.

$$h_j = K_j \frac{V_1^2}{2g} \quad (8.5)$$

TABLE 8.2 Junction or Structure Coefficient of Loss			
Case No.	Reference Figure	Description of Condition	Coefficient K_j
I	13-1	Inlet on Main Line	0.50
II	13-1	Inlet on Main Line with Branch Lateral	0.25
III	13-1	Manhole on Main Line with 45° Branch Lateral	0.50
IV	13-1	Manhole on Main Line with 90° Branch Lateral	0.25



V	13-2	45° Wye Connection or cut-in	0.75
VI	13-2	Inlet or Manhole at Beginning of Line	1.25



VII	13-2	Conduit on Curves for 90° *	
		Curve radius = diameter	0.50
		Curve radius = 2 to 8 x diameter	0.25
		Curve radius = 8 to 20 x diameter	0.10
VIII	13-2	Bends where radius is equal to diameter	
		90° Bend	0.50
		60° Bend	0.43
		45° Bend	0.35
		22.5° Bend	0.20
		Manhole on line with 60° Lateral	0.35
		Manhole on line with 22.5° Lateral	0.75
		* Where bends or other than 90° bend coefficient can be used with the following percentage factor applied: 60° Bend = 85%, 45° Bend = 70%, 22.5° Bend = 40%	

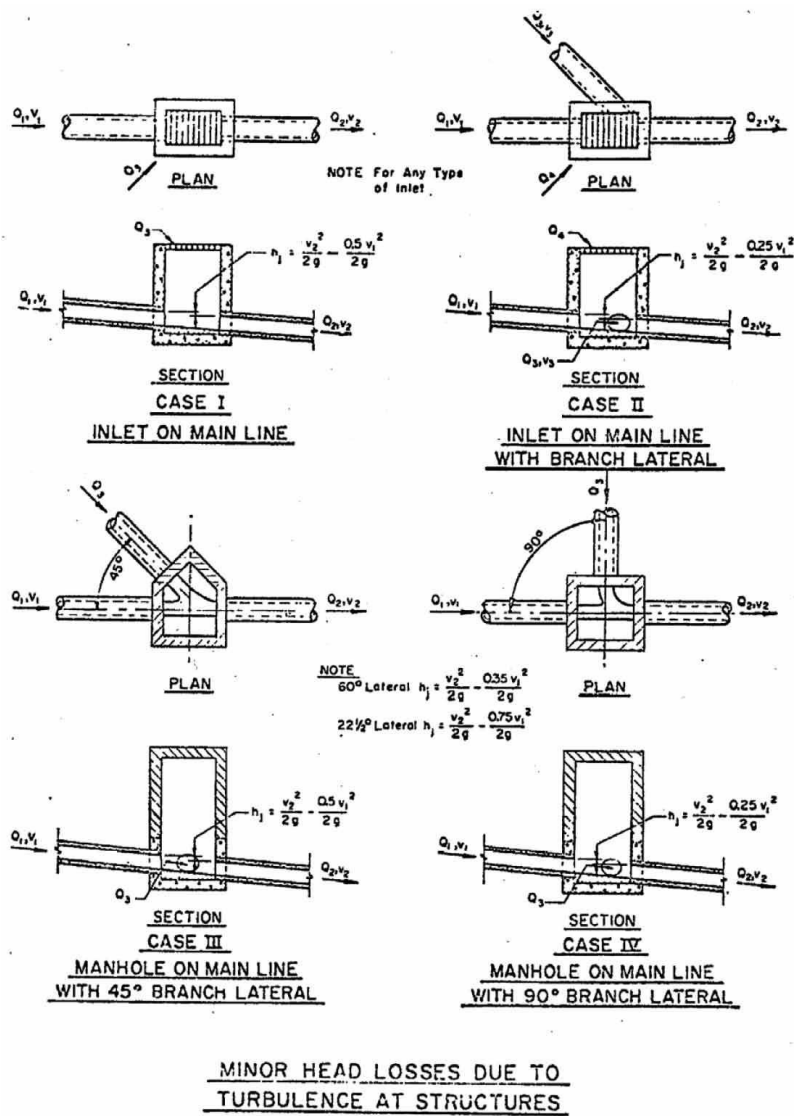


FIGURE 8.1

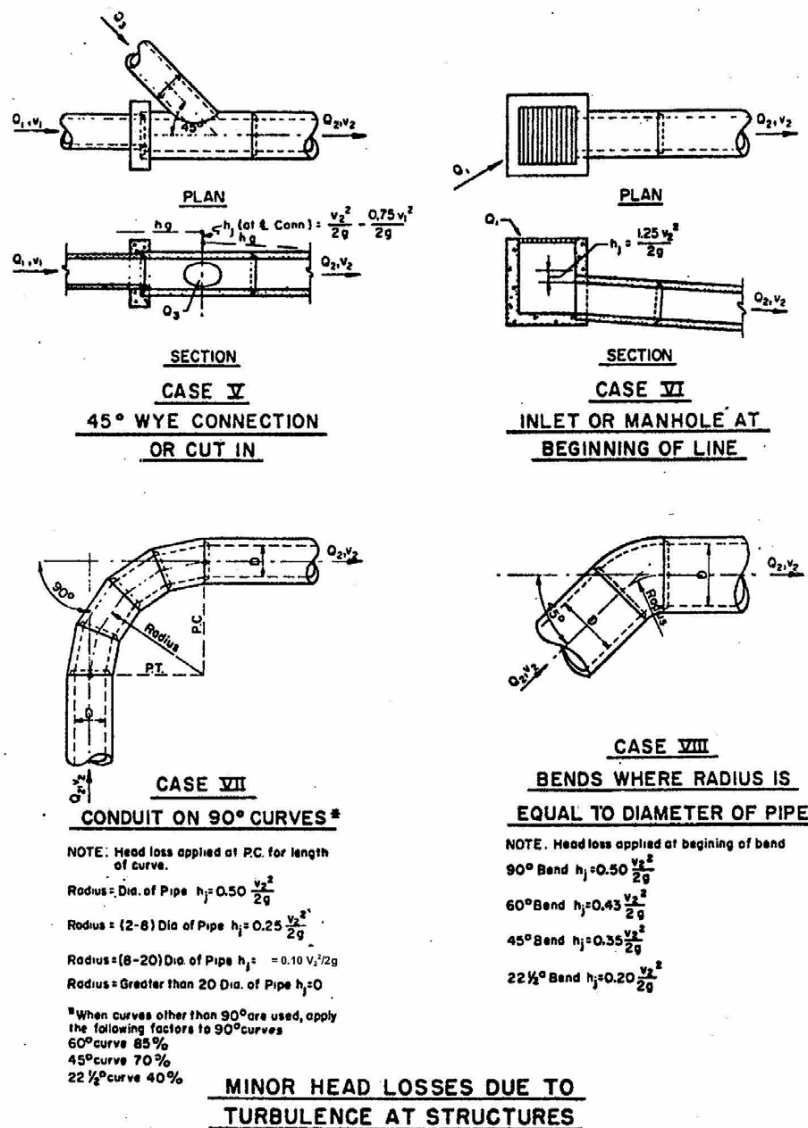


FIGURE 8.2

8.2 VELOCITIES AND GRADES

Storm sewer systems should operate with velocities of flow sufficient to prevent clogging. The controlling velocity is near the bottom of the conduit and considerably less than the mean velocity of the sewer. Storm drains shall be designed to have a minimum mean velocity flowing full of 2.5 fps.

The maximum velocities in storm sewer systems are important mainly due to the possibility of excessive erosion on the pipe material. To reduce this erosive potential, the City of Kerrville requires that the maximum velocity in a storm sewer system be 15 fps.

Storm sewer system discharging into an open channel or ditch shall not exceed a velocity of 6 fps without armoring and/or dissipation devices installed at the outfall.

8.X VELOCITY PROTECTION AND CONTROL DEVICES

8.3 MATERIALS

Reinforced concrete pipe is the preferred pipe material for public storm sewer systems in the City of Kerrville; however, alternatives may be acceptable on a case-by case basis if approved by the City Engineer.

9.0 STORM WATER DETENTION

Storm water detention shall be provided to mitigate increased peak flows in the City of Kerrville. The purpose of the mitigation is to minimize downstream flooding impacts from upstream development. Storm water detention basins shall be categorized as (On-Site" or "Regional", where On-Site basins are those which are located off-channel and provide stormwater management for a particular project or development, and Regional basins are designed to provide stormwater management in conjunction with other improvements on a watershed-wide basis. These categories are further subdivided into "Small" and "Large", depending on tributary area impounded volume. Small On-Site basins have drainage areas less than 25 acres, and Large On-Site basins have drainage areas between 25 and 64 acres. Small Regional basins impound up to 150 ac-ft, and Large Regional basins impound more than 150 ac-ft, with any Regional basin having an embankment over 15' categorized as large. The following criteria shall be applied in the design of storm water detention facilities:

1. A fee may be assessed by the City of Kerrville in-lieu of constructing on-site detention if there are existing facilities in place or that are proposed in the near future that would account for the increase runoff from the proposed development improvements.
2. On-site storm water detention shall be provided to control post-development runoff down to pre-development conditions. The proposed cumulative storm water discharges from a development site shall not exceed the calculated discharges under existing conditions.
3. An existing conditions drainage area map shall be provided with the civil construction plans and include the detailed calculations used to determine the existing conditions flow rate. In calculating the existing conditions flow rate, the designer shall also calculate the existing conditions travel time and plot the drainage path on the map. Reference Section 3.1 in this manual for information on calculating time of concentration.
4. Storm water detention facilities for watersheds of up to 150 acres in size shall be designed using the "Modified Rational Method" (see example below).
5. Storm water detention facilities for watersheds over 150 acres shall be designed using a detailed Unit Hydrograph method (i.e., Snyder's or SCS).
6. A summary of the detailed detention calculations shall be provided on the construction plans. If a unit hydrograph is used to size the detention for watersheds over 150 acres, a separate report summarizing the detailed calculations shall be provided to the City for review and referenced on the construction plans. Additionally, if a HEC-HMS unit

Commented [AS6]: Recommend adding a section on velocity control devices and methods for preventing scour with energy dissipators. Reference FHWA HEC-14.

hydrograph computer model is utilized, a digital copy in HEC-HMS format shall also be provided.

- ~~6.~~
~~8-7.~~ Stage-storage-discharge values shall be tabulated and flow calculations for discharge structures shall also be shown on the construction plans. The stage-storage-discharge values shall be provided in a table format and include stages at a maximum of 1 foot increments.
- ~~9-8.~~ Storm water detention facilities shall be designed for the 50% (2-year), 20% (5-year), 4% (25-year), and 1% (100-year) storm events ultimate conditions.
- ~~10-9.~~ Off-site areas draining through the proposed development site shall not be allowed to pass through the proposed on-site storm water detention facility unless the off-site area is released through the proposed detention facility at pre-development conditions and the actual travel time is considered. Otherwise, the off-site flows shall be conveyed via a separate drainage system and bypass the proposed detention facility.
- ~~10.~~ Large On-Site and Regional Storm water detention basins shall be designed with a maintenance access wide enough for a 10' wide tracked backhoe to maneuver. This generally requires a minimum of a 12' wide maintenance access be provided in all detention basins. The maximum cross slope shall not exceed 2.0% and the longitudinal slope shall not exceed 6H:1V. Basins with permanent storage (retention basins) must include dewatering facilities to provide for maintenance. An unobstructed fifteen (15)-foot access easement around the periphery of the flooded area shall be dedicated as a drainage easement for facilities that require regular mowing or other ongoing maintenance, at the discretion of the Director of TCI. An unobstructed fifteen (15)-foot access right-of-way shall be established; this will connect the drainage easement adjacent to the storage facility to a road or alley.
- Access ramps with a maximum slope of seven to one (7:1), with a maximum cross slope of 2%, will be provided for access to the flow line of all storage facilities.
11. When an earthen embankment is proposed for detention, a typical embankment section and specifications for fill shall be included in the construction plans. No earthen embankment shall exceed a slope greater than 3H:1V.
12. An armored emergency spillway shall be provided above the 1% storm water surface elevation and have sufficient capacity to convey the 1% storm with the following minimum freeboard to top of embankment. The spillway design calculations shall be included in the construction plans.

<u>DETENTION BASIN CLASS</u>	<u>MINIMUM FREEBOARD</u>
On-Site Small	0.5'
On-Site Large	1.0'
Regional: Small	2.0'
Regional: Large	*

*Design storm event and required freeboard for Large Regional ponds shall be determined by a dam breach analysis based on the principles outlined in Chapter 299 of the Texas Administrative Code. The dam breach analysis shall be submitted to the City Engineer for approval.

13. Minimum crest widths for earthen embankments shall be as follows:

<u>EMBANKMENT HEIGHT</u>	<u>MINIMUM CREST WIDTH</u>
Up to 4'	3'
>4' to 6'	4'

>6'

As recommended by geotechnical engineer

14. Storm runoff may be detained within parking lots. However, the engineer should be aware of the inconvenience to both pedestrians and traffic. The location of ponding areas in a parking lot should be planned so that this condition is minimized. Stormwater ponding depths (for the 100-year storm) in parking lots are limited to an average height of ~~eight-four~~ **(84)** inches with a maximum of ~~twelve-six~~ **(126)** inches.
15. All detention basins shall be stabilized to prevent erosion. For earthen detention basins, stabilization shall be defined as the uniform establishment of perennial vegetative cover with a density of at least 70% of the native background for all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions or geotextiles) have been employed.

16. State rules and regulations regarding impoundments and dams shall be observed in the design and maintenance of storm water detention facilities.
17. Outflow structures for storm water detention facilities shall be designed so that discharge flows at a non-erosive rate.
18. An outlet control structure such as an orifice or 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. Emergency overflow structures and paved positive overflow channels shall be included with the design of detention systems.
19. Whenever possible, detention basins shall fit in the natural contour of the land, be aesthetically pleasing and be free draining. A grading plan with 1-foot intervals shall be placed on the construction plans. Maintenance access shall be provided for each basin. 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.
20. A detention basin maintenance plan must be submitted to the City Engineer prior to final acceptance. A sample detention basin maintenance plan is included on the following page of this manual.
21. Detention basins shall be enclosed within a detention easement and the filed easement document shall be provided to the City Engineer prior to final acceptance

DETENTION BASIN MAINTENANCE PLAN
City of Kerrville Project No.
(Project Name)

The following are guidelines for the overall maintenance of the detention basin.

- *Inspections.* The detention system should be inspected to assure proper operation at least 4 times annually. One of these inspections should occur during or immediately following wet weather.
- *Sediment Removal.* Remove sediment from outlet weir structure, and downstream of the outlet at least 2 times annually, or when depth reaches 3 inches. When sediment accumulation in other areas of the basin, fills the basin by 10% of the basin volume, all sediment should be removed and disposed of properly.
- *Mowing.* The side slopes, and embankment of a detention basin must be mowed regularly to discourage woody growth and control weeds. Grass areas in and around basins must be mowed at least four times annually to limit vegetation height to 12 inches. More frequent mowing to maintain aesthetic appeal may be necessary in landscaped areas. When mowing is performed, a mulching mower should be used, or grass clippings should be caught and removed.
- *Debris and Litter Removal.* Debris and litter will accumulate near the outfall weir and should be removed during regular mowing operations and inspections. Particular attention should be paid to floating debris that can eventually clog the outfall weir.
- *Erosion Control.* The pond side slopes and embankment may periodically suffer from slumping and erosion, although this should not occur often if the soils are properly compacted during construction. Regrading and revegetation may be required to correct the problems.
- *Nuisance Control.* Standing water or soggy conditions in the detention basin can create nuisance conditions for nearby residents. Odors, mosquitoes, weeds, and litter are all occasionally perceived to be problems. Most of these problems are generally a sign that regular inspections and maintenance are not being performed (e.g., mowing and debris removal).

I agree to perform the above maintenance items on the Detention Basin.

OWNER (Please print name)

DATE

SIGNATURE

MODIFIED RATIONAL METHOD DETENTION BASIN DESIGN (EXAMPLE)

Given: A 10-acre site, currently pasture land with on an average slope of 5% percent, is to be developed into a single family residential subdivision (typical lot will have 60-70% impervious cover). The entire area is proposed to drain into a proposed detention basin. The existing time of concentration (T_c) has been determined to be 21 minutes and the proposed 15 minutes.

Determine: Maximum release rate and required detention storage for the 1% storm event.

Solution:

1. Determine 1% storm event's peak runoff rate prior to site development. This is the maximum allowable release rate from the site after development.
2. Determine the inflow hydrograph for storms of various durations in order to determine maximum volume required with the release rate determined in Step 1 below.

Note: Incrementally increase durations (1-minute normally & 5-minutes maximum) to determine maximum required storage volume. The duration with a peak inflow less than maximum release rate, or where required storage is less than storage for the prior duration, is the last increment.

Step 1:

Present Conditions

$$Q = C \times I \times A$$

$$\begin{aligned} C &= 0.51 \\ T_c &= 21 \text{ min} \\ I &= 7.75 \text{ in/hr} \\ Q &= (0.51) (7.75) (10.0) = 39.5 \text{ cfs (Max allowable release rate)} \end{aligned}$$

Step 2:

Future Conditions (Single family Residential 65% Impervious Cover)

$$\begin{aligned} C &= 0.79 \\ T_c &= 15 \text{ min} \\ I &= 9.24 \text{ in/hr} \\ Q &= (0.79) (9.24) (10.0) = 73.0 \text{ cfs} \end{aligned}$$

Step 3:

Check various duration storms

10 min	$I = 11.11$	$Q = 0.79 \times 11.11 \times 10 = 87.8$
15 min	$I = 9.24$	$Q = 0.79 \times 9.24 \times 10 = 73.0$
20 min	$I = 7.96$	$Q = 0.79 \times 7.96 \times 10 = 62.9$
25 min	$I = 7.03$	$Q = 0.79 \times 7.03 \times 10 = 55.5$
30 min	$I = 6.31$	$Q = 0.79 \times 6.31 \times 10 = 49.9$
35 min	$I = 5.57$	$Q = 0.79 \times 5.57 \times 10 = 45.4$
40 min	$I = 5.29$	$Q = 0.79 \times 5.29 \times 10 = 41.8$

Maximum Storage Volume is determined by deducting the volume of runoff released during the time of inflow from the total inflow for each duration.

Inflow = (Storm Duration) X (Respective Peak Discharge) X (60 sec/min)

Outflow = (Half of the respective inflow duration) X (control release discharge) X (60 sec/min)

10 min. Storm	Inflow 10 x 87.8 x 60 sec/min	= 52,654 cf
	Outflow 0.5 x 25 x 39.5 x 60 sec. /min	= 29,644 cf
	Storage	= <u>23,010 cf</u>
15 min. Storm	Inflow 15 x 73.0 x 60 sec /min.	= 65,667 cf
	Outflow 0.5 x 30 x 39.5 x 60 sec. /min	= 35,573 cf
	Storage	= <u>30,094 cf</u>
20 min. Storm	Inflow 20 x 62.9 x 60 sec /min.	= 75,456 cf
	Outflow 0.5 x 35 x 39.5 x 60 sec. /min	= 41,501 cf
	Storage	= <u>33,955 cf</u>
25 min. Storm	Inflow 25 x 55.5 x 60 sec /min.	= 83,275 cf
	Outflow 0.5 x 40 x 39.5 x 60 sec. /min	= 47,430 cf
	Storage	= <u>35,845 cf</u>
30 min. Storm	Inflow 30 x 49.9 x 60 sec /min.	= 89,777 cf
	Outflow 0.5 x 45 x 39.5 x 60 sec. /min	= 53,359 cf
	Storage	= <u>36,419 cf</u>
35 min. Storm	Inflow 35 x 45.4 x 60 sec /min.	= 95,343 cf
	Outflow 0.5 x 50 x 39.5 x 60 sec. /min	= 59,288 cf
	Storage	= <u>36,055 cf</u>
40 min. Storm	Inflow 40 x 41.8 x 60 sec /min.	= 100,210 cf
	Outflow 0.5 x 55 x 39.5 x 60 sec. /min	= 65,216 cf
	Storage	= <u>34,994 cf</u>

Maximum Volume required is 36,419 cf at 30 min. storm duration.

10.0 MINIMUM LOT AND FLOOR ELEVATIONS

Minimum lot and floor elevations shall be established as follows:

- (1) Lots abutting a natural or excavated channel shall have a minimum elevation for the buildable area of the lot at least one-foot higher than the top of channel bank or 1% storm event water surface elevation, whichever is higher.
- (2) Any habitable structure on property in or abutting a floodplain shall conform to the City's Floodplain Management Ordinance. All structures must be located at least one (1) foot above the 1% storm floodplain.
- (3) Where lots do not join a natural or excavated channel, minimum floor elevations shall be a minimum of one (1) foot above the street curb or edge of alley, whichever is higher. Where the intent of the development is to preserve the natural condition of the site (Tree Preservation), the finished floor elevation may be lower if approved by the City Engineer. Such approval will require special design parameters to ensure runoff from the street or alley does not flow into or across the lot.

11.0 DRAINAGE EASEMENTS

Drainage Easements shall be provided for all storm sewer systems conveying runoff from one property to another. Drainage Easements for storm sewer pipe shall not be less than 15 feet, and easement widths for open channels shall be at least 20 feet wider than the top of the

Commented [A57]: Revisit these requirements and verify that any replatting or plats require the dedication of public drainage easements for significant waterways.



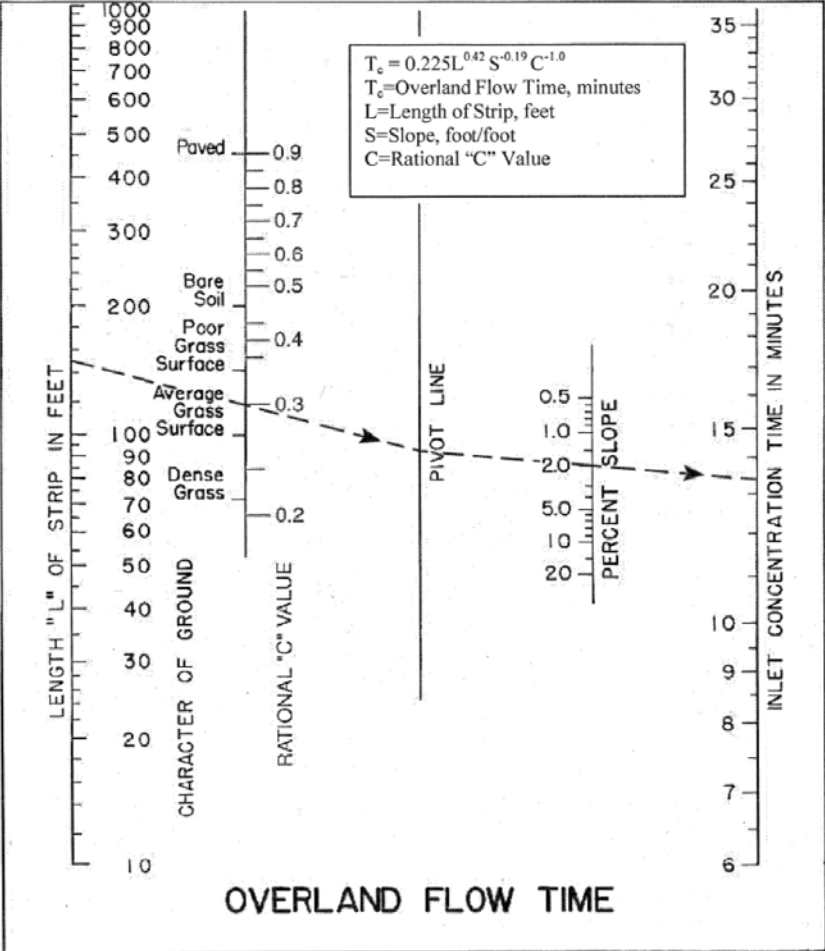
channel, 15 feet of which shall be on one side to serve as an access for maintenance purposes. Where easements are proposed parallel with property lot lines, the easements shall not be allowed to straddle lot lines; instead, the easement must be located on one side of each lot.



APPENDIX A - FIGURES

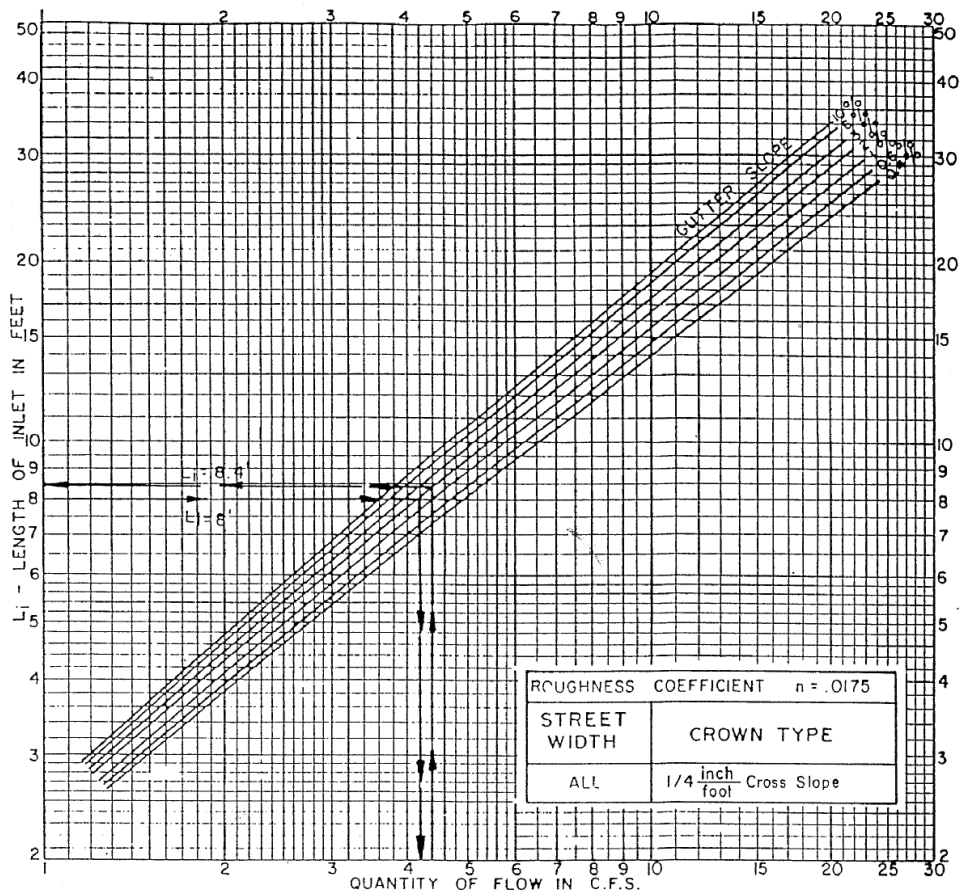
DRAINAGE DESIGN MANUAL

**CITY OF KERRVILLE
KERR COUNTY
TEXAS**



(Source: Data Book for Civil Engineers, Vol. I – Design, 1951)

Figure A



EXAMPLE

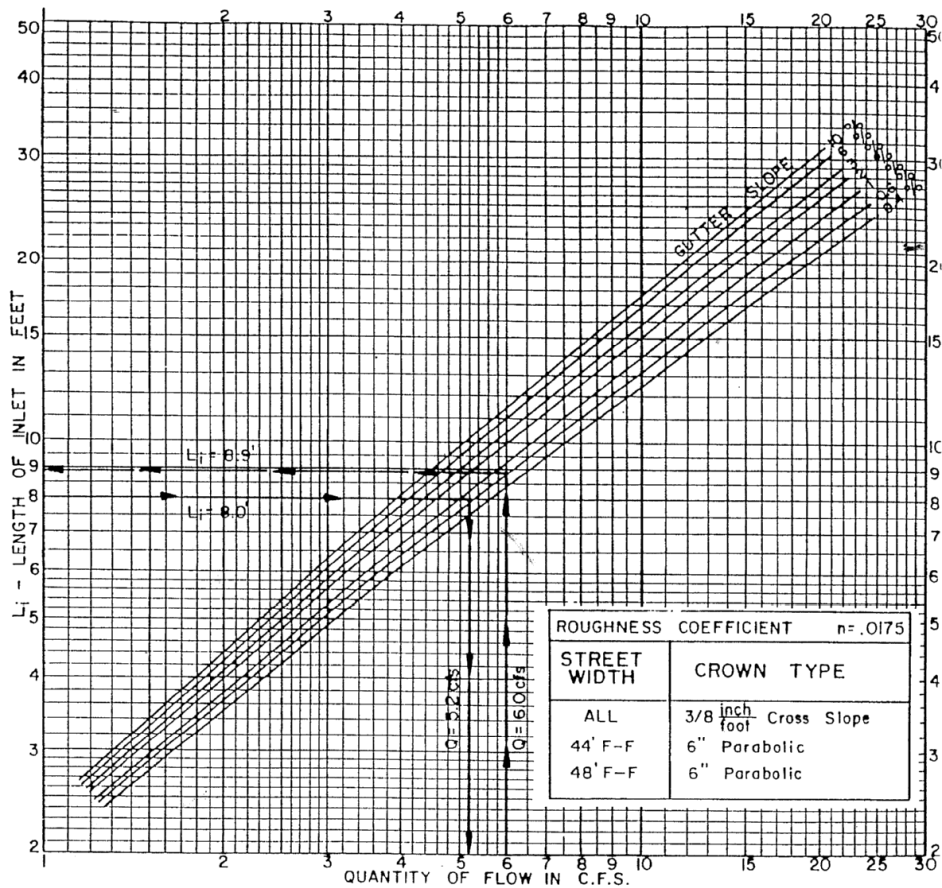
Known:
Pavement Width = 24'
Gutter Slope = 2.0 %
Pavement Cross Slope = 1/4" / 1'
Gutter Flow = 4.4 cfs

Find:
Length of Inlet Required (L_i)

Solution:
Enter Graph at 4.4 cfs
Intersect Slope = 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 cfs - 4.2 cfs = 0.2 cfs

Figure B



EXAMPLE

Known:
Pavement Width = 44'
Gutter Slope = 0.6 %
6" Parabolic Crown
Gutter Flow = 6.0 cfs

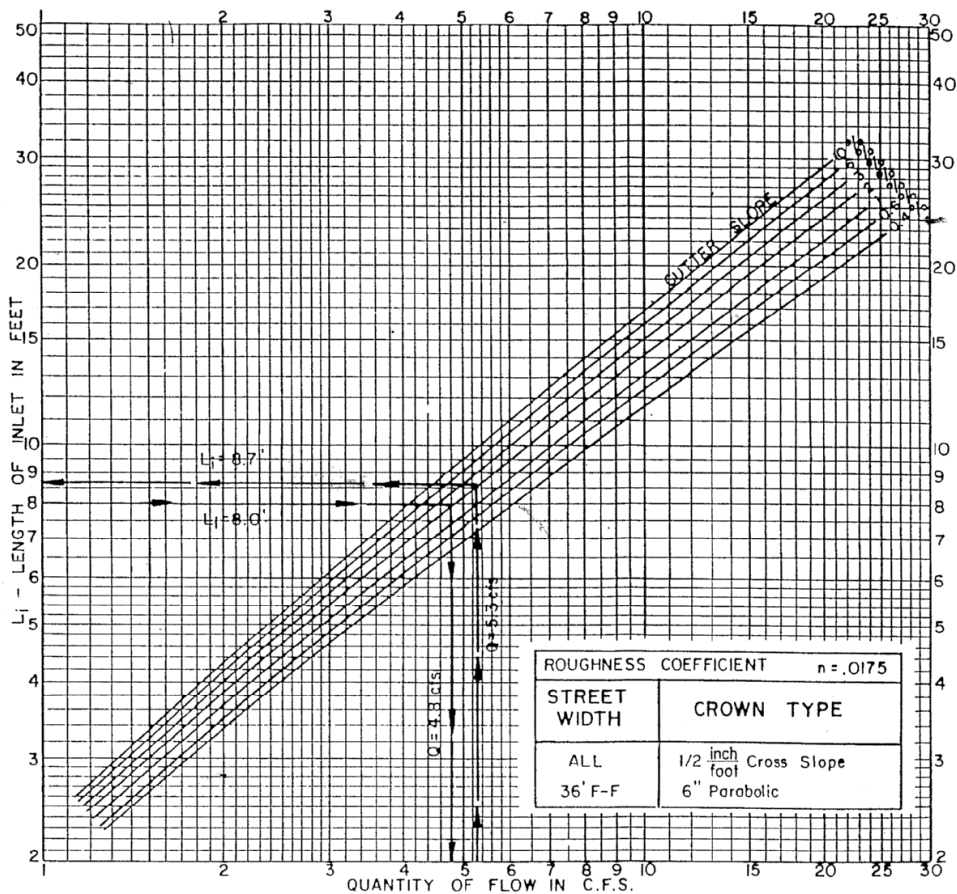
Find:
Length of Inlet Required (L_i)

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 cfs - 5.2 cfs = 0.8 cfs

**RECESSED AND STANDARD
CURB OPENING INLET
CAPACITY CURVES
ON GRADE**

Figure C



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 $L_i = 8'$

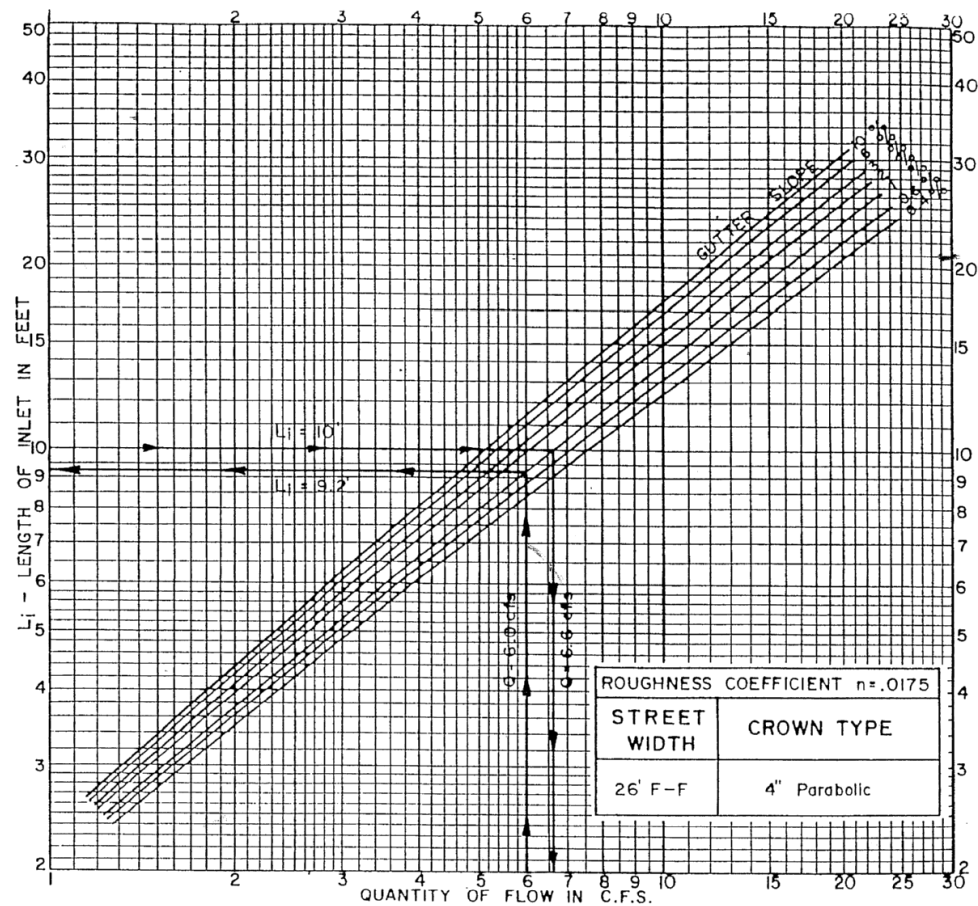
Intersect Slope = 2%

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 D



EXAMPLE

Known:

Pavement Width = 26'
Gutter Slope = 1%
4" Parabolic Crown
Gutter Flow = 6.0 cfs

Find:

Length of Inlet Required (L_i)

Solution:

Enter Graph at 6.0 cfs
Intersect Slope = 1%
Read $L_i = 9.2'$

Decision:

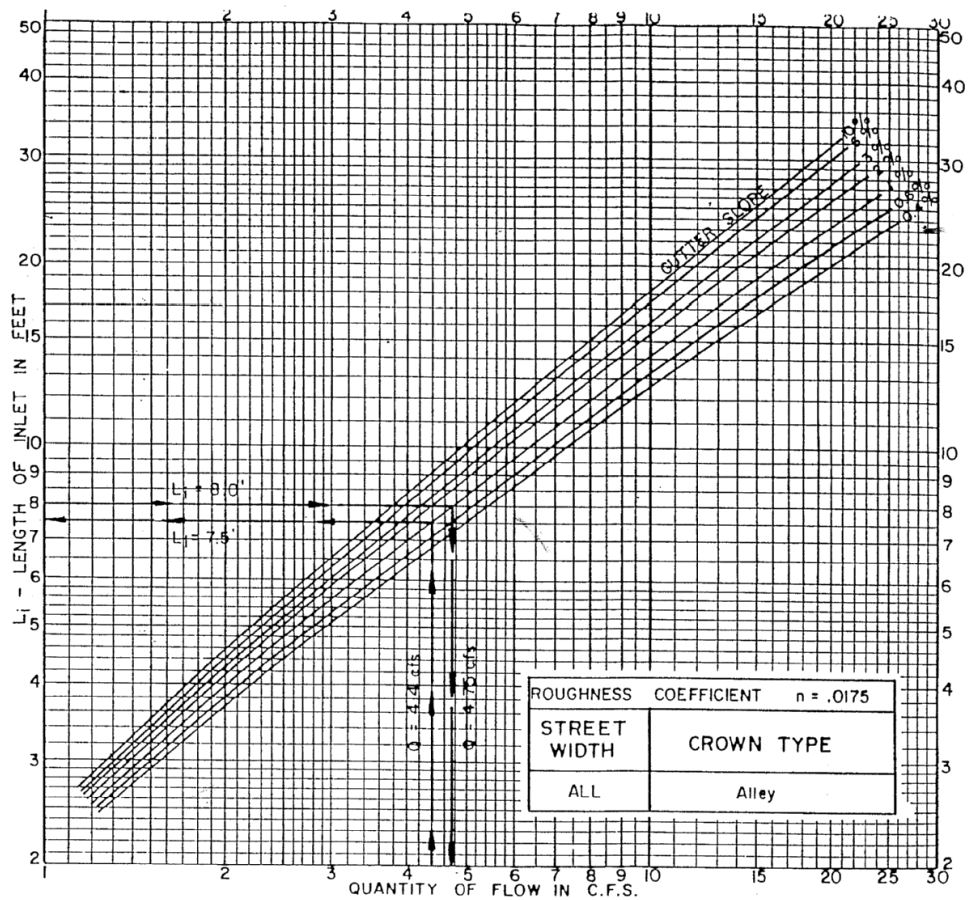
1. Use 10' Inlet
No Flow Remains in Gutter
2. Use 8' Inlet
Intercept Only Part of Flow

Use 10' Inlet

Enter Graph at $L_i = 10'$
Intersect Slope = 1%
Read $Q = 6.6$ cfs
No Flow Remains in Gutter

**RECESSED AND STANDARD
CURB OPENING INLET
CAPACITY CURVES
ON GRADE**

Figure E



EXAMPLE

Known:
Pavement Width = 16'
Gutter Slope = 1%
Pavement Cross Slope = 1/4"/1'
Gutter Flow = 4.4 cfs
Find:
Length of Inlet Required (Li)
Solution:
Enter Graph at 4.4 cfs
Intersect Slope = 1%
Read Li = 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 Li = 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 F



EXAMPLE

Known:

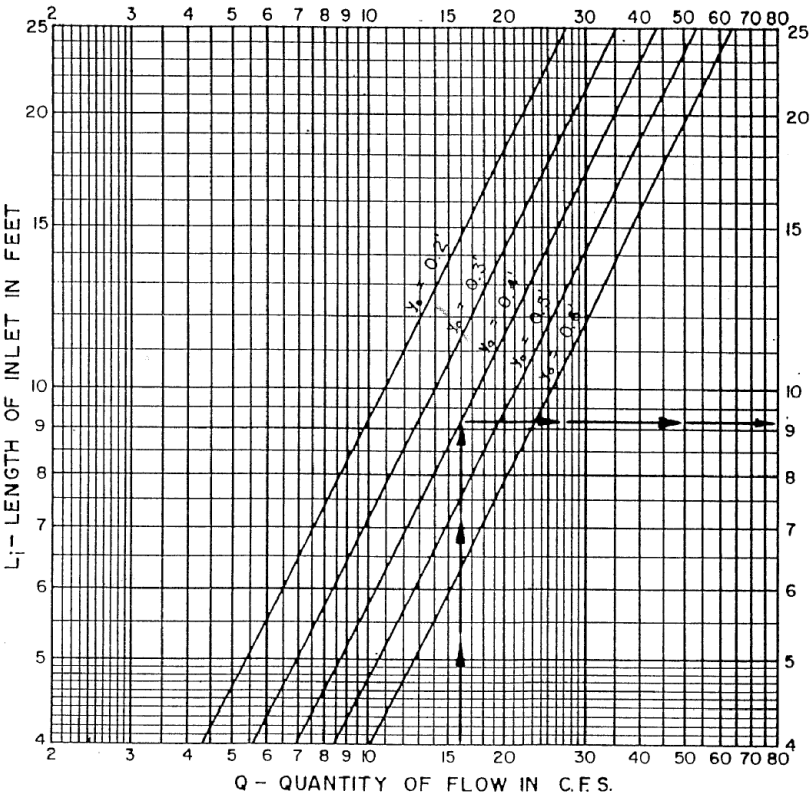
- Quantity of Flow = 16.0 c.f.s.
- Maximum Depth of Flow Desired in Gutter At Low Point ($y_o = 0.4'$)

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 G

EXAMPLE

Known:

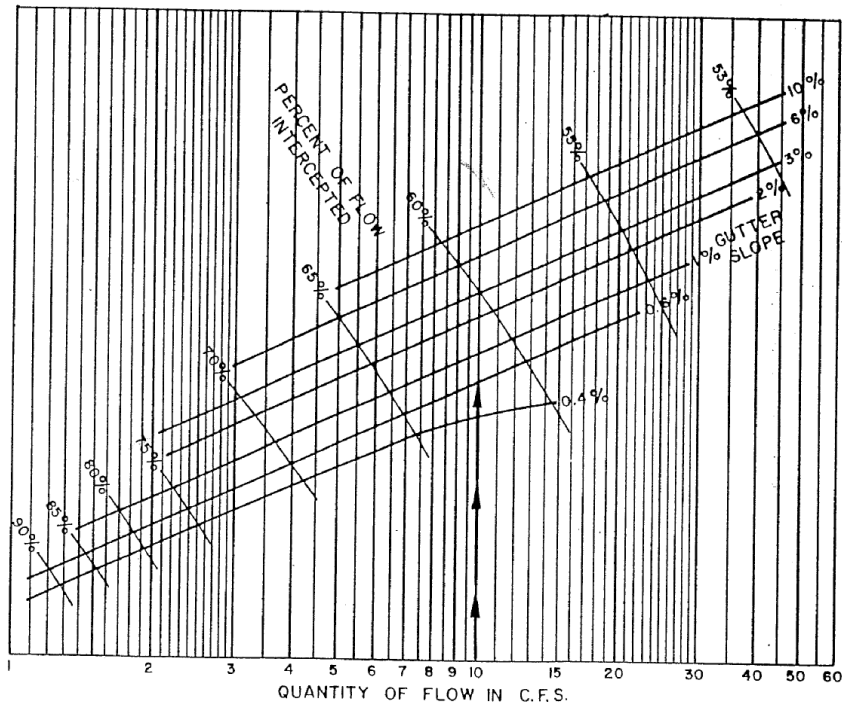
Quantity of Flow = 10.0 c.f.s.
Gutter Slope = 0.6 %

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 c.f.s - 6.2 c.f.s. = 3.8 c.f.s.



TWO GRATE COMBINATION INLET
CAPACITY CURVES
ON GRADE
FIGURE H



EXAMPLE

Known:

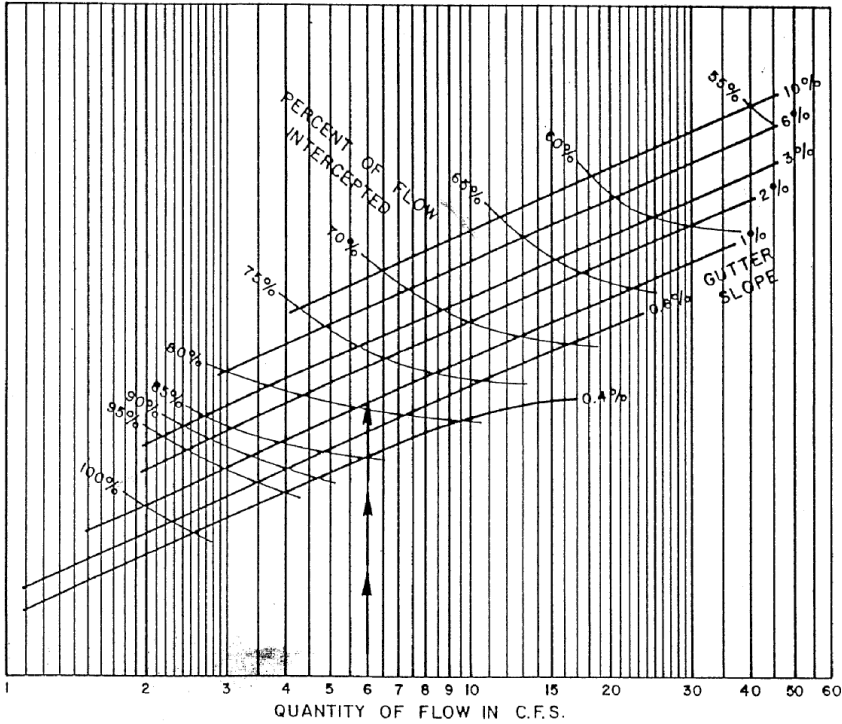
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0 %

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 1

EXAMPLE

Known:

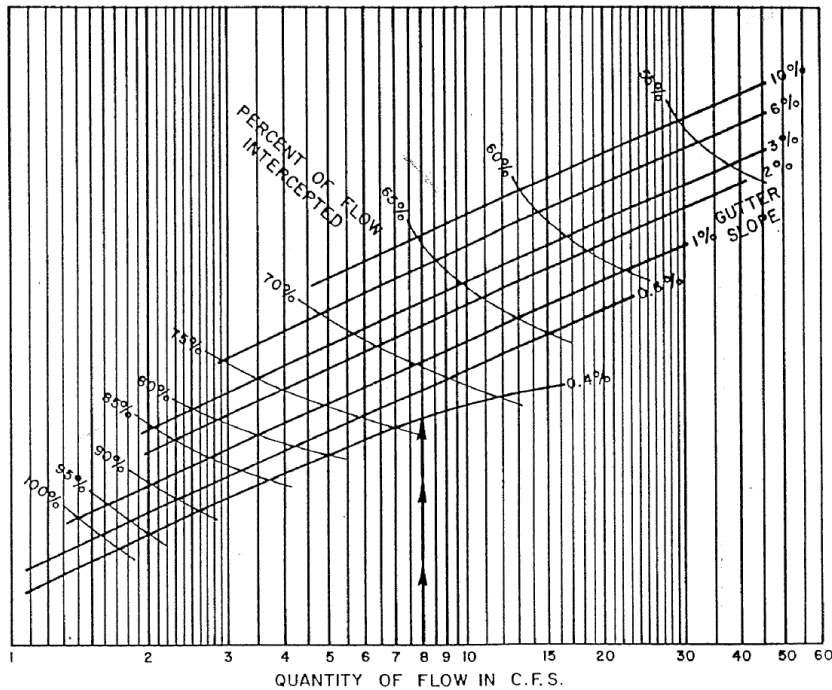
Quantity of Flow = 8.0 c.f.s.
Gutter Slope = 0.4%

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 J

EXAMPLE

Known:

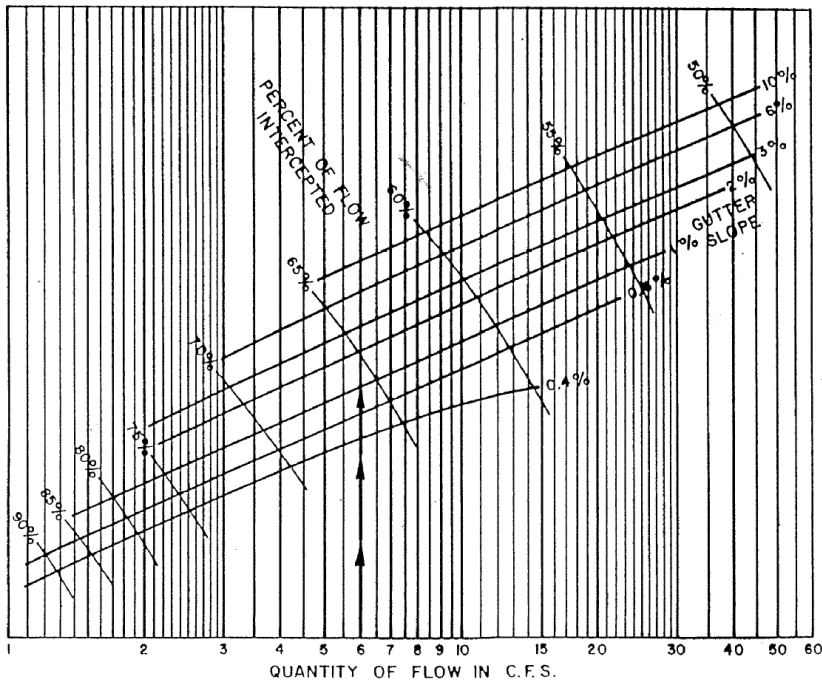
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

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 K



EXAMPLE

Known:

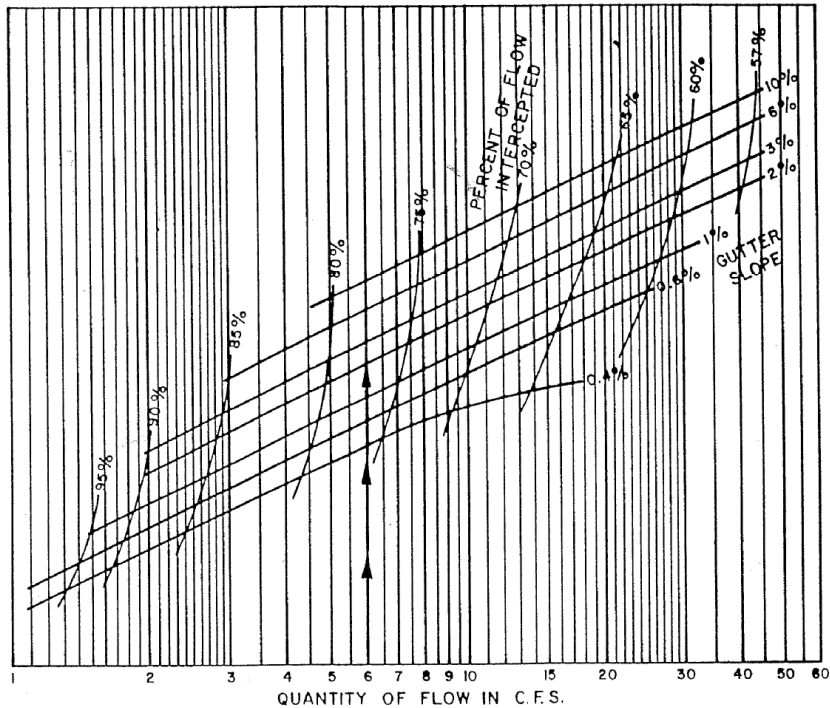
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

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 L

EXAMPLE

Known:

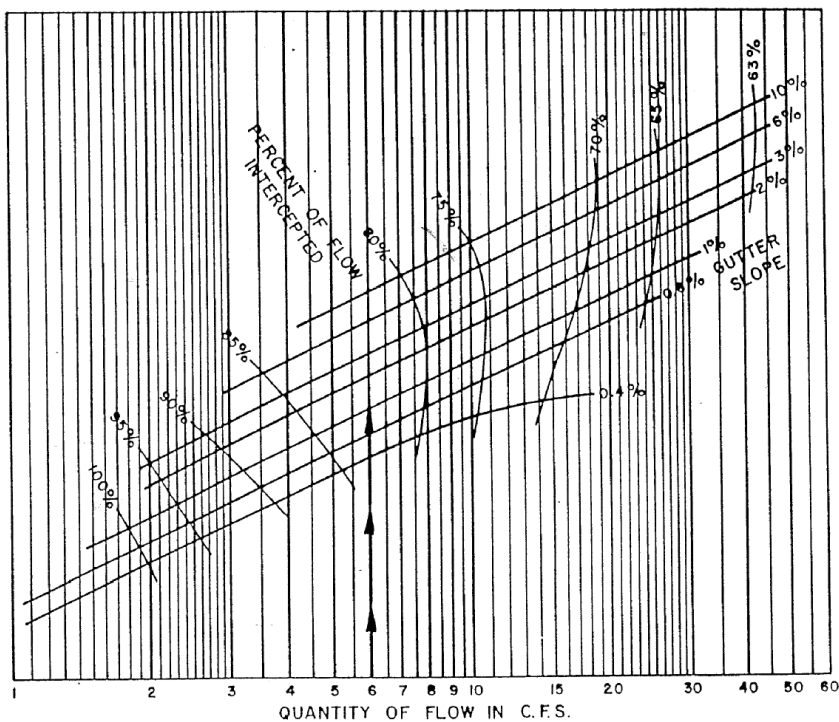
Quantity of Flow = 6.0 c.f.s.
Gutter Slope = 1.0%

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 M



EXAMPLE

Known:

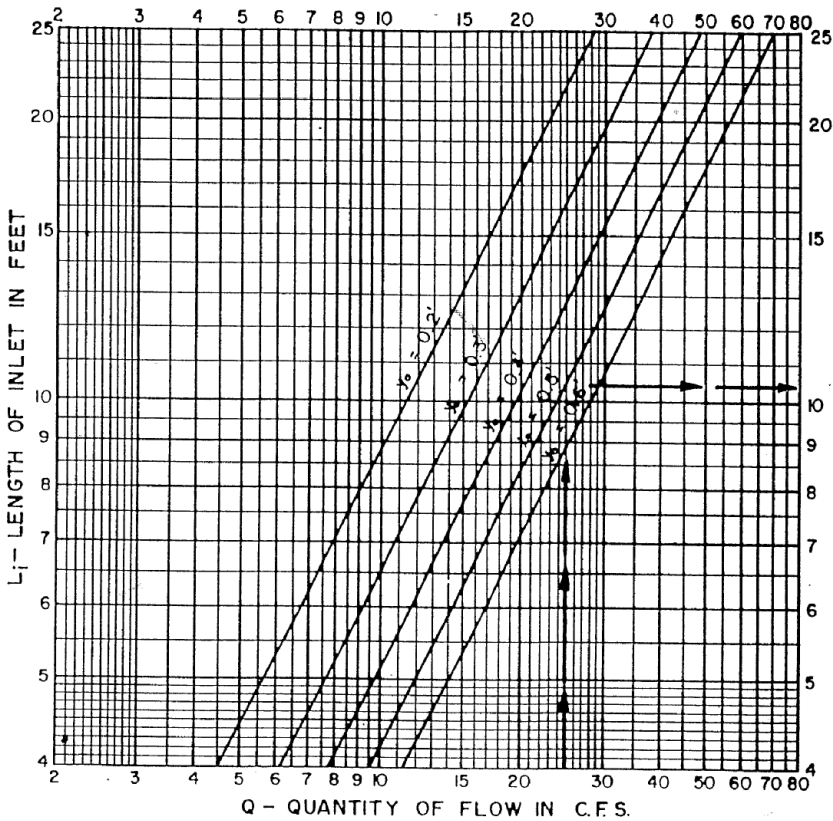
Quantity of Flow = 25.0 c.f.s.
Maximum Depth of Flow Desired
At Low Point (y_o) = 0.5'

Solution:

Enter Graph at 25.0 c.f.s.
Intersect $y_o = 0.5'$
Read $L_i = 10.4'$
Use 12' Inlet

Find:

Length of Inlet Required (L_i)



ROUGHNESS COEFFICIENT $n = .0175$	
STREET WIDTH	CROWN TYPE
ALL	Straight and Parabolic

COMBINATION INLET
CAPACITY CURVES
AT LOW POINT

FIGURE N
A-14



EXAMPLE

Known:

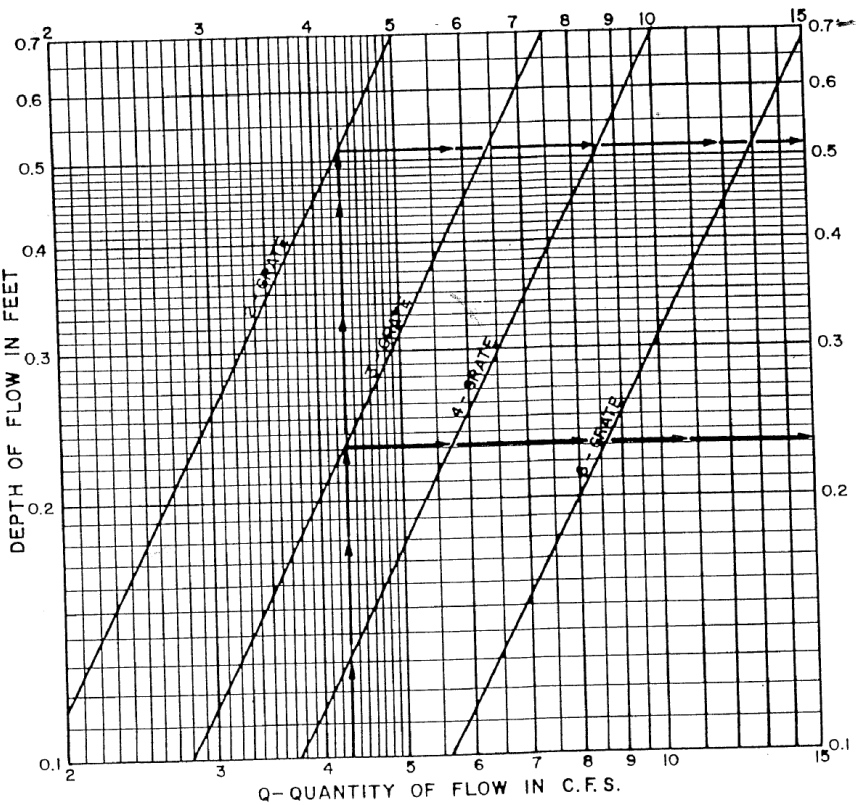
Quantity of Flow = 4.3 c.f.s.
Maximum Depth of Flow Desired
at Low Point = 0.3'

Solution:

Enter Graph at 4.3 c.f.s.
Intersect 3 - Grate at 0.23'
Intersect 2 - Grate at 0.51'
Use 3 - Grate

Find:

Inlet Required



GRATE INLET
CAPACITY CURVES
AT LOW POINT

FIGURE O



EXAMPLE

Known:

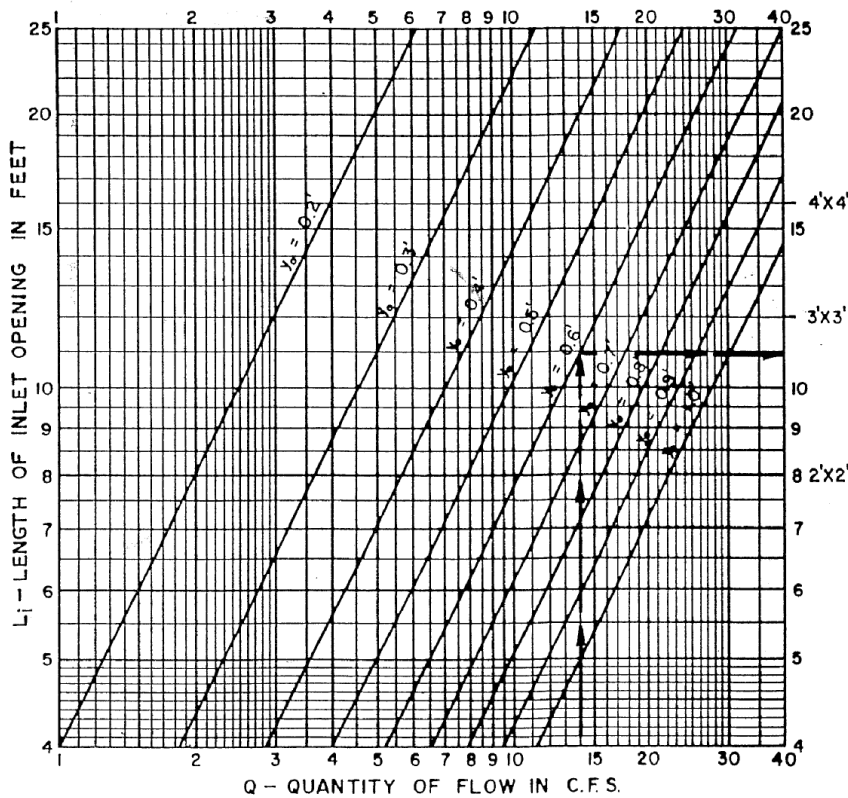
- Quantity of Flow = 14.0 c.f.s.
- Maximum Depth of Flow Desired (y_o) = 0.6'

Find:

Length of Inlet Opening Required (L_i)

Solution:

- Enter Graph at 14.0 c.f.s.
- Intersect $y_o = 0.6'$
- 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 P



APPENDIX B - REFERENCES

DRAINAGE DESIGN MANUAL

**CITY OF KERRVILLE
KERR COUNTY
TEXAS**

APPENDIX B – REFERENCES

Commented [AS8]: Update references.

The following sources were references were consulted directly or indirectly by reference in the development of this manual:

North Central Texas Council of Governments (NCTCOG), Draft integrated Storm Water Management (iSWM) Design Manual for Development/Redevelopment, 2004.

North Central Texas Council of Governments (NCTCOG), integrated Storm Water Management (iSWM) Technical Manual, 2010.

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City of Bryan, City of College Station, Texas, Unified Stormwater Design Guidelines, 2009.

City of Kerrville, Texas, Draft Drainage Design Manual, 2011.

Federal Highway Administration (FHWA), Hydraulic Design of Highway Culverts, Hydraulic Design Series Number 5, 2005.

APPENDIX D - TECHNICAL SUPPORT DATA – PART 1

Methodology for Drainage Analysis for City of Kerrville Stormwater Masterplan

1) Hydrologic Analysis

The hydrologic analysis performed in this study is approximate and intended for planning purposes only to determine peak flows at problem areas and determining the feasible design alternatives to mitigate the flooding occurring, occasional street ponding, and to upgrade existing storm drain network in the City of Kerrville, Tx.

The hydrologic analysis was primarily performed using rational peak flow analysis except for Kroc Center and Clay Street drainage calculation. In the drainage analysis, contributing drainage basin areas range from 6.36 acres to 6734 acres. Considering terrain diversity at problem locations, drainage design approaches vary according to the contributing drainage area at study location, and existing drainage structures located within the drainage basin. Preferably, for drainage areas less than 150 acres, rational method is used to determine peak flow contributed by the basin at the outlet. Rational method focuses on runoff coefficient, rainfall intensities, and drainage areas.

$$Q = C \times I \times A$$

Where,

Q: Peak Discharge (cfs)

C: Runoff Coefficient

I: Rainfall Intensity (inch/hour)

A: Drainage Area (Acres)

Travel time was calculated for each basin considering sheet, shallow and channel flows types. Manning roughness values and terrain slope is considered to determine Time of Concentration (TC) as depicted in TR-55 manual. Basin Lag Times were derived based on 0.6 multiplied by the calculated Time of Concentration. Time of concentration calculations were performed for both existing and proposed situations. Considering future developments in the study region, drainage calculations use TC values for ultimate conditions.

No previous existing conditions hydrologic models were available for the Quinlan Creek, Town Creek, and Guadalupe River. Therefore, a cursory hydrologic analysis was performed using the United States Army Corps of Engineers (USACE) HEC-HMS and XpStorm software for Kroc Center and Clay Street. Hydrologic model parameters were developed using the best available data obtained from previous studies, aerial imagery, various topographic mapping sources such as Texas Natural Resources Information System (TNRIS).

Stormwater discharges for Kroc Center and Clay Street were computed using the Soil Conservation Services (SCS) Unit Hydrograph method. The SCS Runoff Curve Numbers (CN) were calculated using the National Resource Conservation Services (NRCS) soil type data in conjunction with the CN values outlined in Table 2-2a of the U.S. Department of Agriculture Technical Release No. 55, Urban Hydrology for Small Watersheds (TR-55) and the City of Cibolo's Stormwater Design Guidelines Manual Table C-7. See the following section for the table of values utilized by this study. Composite Curve Numbers for each

sub-basin were computed using hydrologic soil types and existing land use conditions for the watershed under AMC II conditions. The existing land use was determined using the aerial imagery. Primarily, the study area consists of hydrologic soil types C and D. Hydrologic soil types were delineated based on the USDA-NRCS Soil Survey Division's Soil Map for Kerr County.

SCS runoff method considers the initial abstraction for each basin to determine excess runoff. The initial abstraction defines the amount of precipitation that must fall before surface excess results and is only applied to the previous portion of the basin if the percent impervious is specified. The initial abstraction was calculated as 0.2 times the potential retention, which is based on the Curve Number value. The methodology is outlined in the U.S. Department of Agriculture, Technical Release No. 55, Urban Hydrology for Small Watersheds.

Preliminary XpStorm model was created to analyze the Kroc Center detention pond and evaluate the downstream drainage conditions due to continuous discharge from the pond outlet. Surface runoff from 18" and 24" outlet structure was modeled for 25- and 100-year storm event. XpStorm model was further extended to determine adverse effects on Clay Street drainage conditions.

No hydrologic analysis was performed for low water crossing, instead, the hydraulic model was developed using HEC-RAS software and FEMA FIS flows to analysis flooding situations at First Street, Fourth Street, and Park Street low water crossings. See Hydraulic Analysis section for more information.

Runoff Coefficient (C) Calculations									
Drainage ID	Street Name	Existing Conditions				Ultimate Conditions			
		Landuse (Existing)	Area (Acres)	Runoff Coe.	Weighted Runoff (Existing)	Landuse (Ultimate)	Area (Acres)	Runoff Coe.	Weighted Runoff (Ultimate)
DA_CS	Coronado St.	Poor Condition Grass Area	0.4	0.53	0.93	Average Regional Commercial	0.4	0.95	0.95
		Average Regional Commercial	7.23	0.95		Average Regional Commercial	7.5	0.95	
DA_TD	Thompson Dr. (Coronado)	Flat Single Family Residential	0.9	0.6	0.64	Flat Single Family Residential	0.9	0.6	0.92
		Flat Cultivated	7.2	0.47		Flat Regional Commercial	7.2	0.94	
		Flat Regional Commercial	4.24	0.94		Flat Regional Commercial	4.24	0.94	
DA_HS	Harper St.	Average Single Family Residential	13.11	0.66	0.66	Average Single Family Residential	13.11	0.66	0.66
DA_CA	Harper St. - Circle Ave.	Average Single Family Residential	14.33	0.66	0.66	Average Single Family Residential	14.33	0.66	0.69
		Average Retail/Office/Light Commercial	3.47	0.87		Average Retail/Office/Light Commercial	3.47	0.87	
		Average Fair Condition Grass	4.78	0.49		Average Single Family Residential	4.78	0.66	
DA_HC	Hill Country	Steep Single Family Residential	0	0.69	0.84	Steep Single Family Residential	0	0.69	0.89
		Steep Good Condition Grass	5.61	0.51		Steep Single Family Residential	5.61	0.69	
		Average Regional Commercial	17.66	0.95		Average Regional Commercial	17.66	0.95	
DA_HC1	Hill Country	Steep Single Family Residential	0	0.69	0.95	Steep Single Family Residential	0	0.69	0.95
		Steep Good Condition Grass	0	0.51		Steep Single Family Residential	0	0.69	
		Average Regional Commercial	4.56	0.95		Average Regional Commercial	4.56	0.95	
DA_TE	Easy Drain Channel	Flat Regional Commercial	16.43	0.94	0.83	Flat Regional Commercial	16.43	0.94	0.83
		Average Multifamily Residential	40.6	0.79		Average Multifamily Residential	40.6	0.79	
	Easy Drain Channel Bypass	Average Single Family Residential	95.4	0.66	0.69	Average Single Family Residential	95.4	0.66	0.73
		Average Good Condition Grass	10.85	0.46		Average Regional Commercial	10.85	0.95	
		Average Regional Commercial	21.1	0.95		Average Regional Commercial	21.1	0.95	
DA_LS	Lois St.	Average Single Family Residential	100.55	0.66	0.69	Average Single Family Residential	100.55	0.66	0.73
		Average Good Condition Grass	10.91	0.46		Average Regional Commercial	10.91	0.95	
		Average Regional Commercial	23.35	0.95		Average Regional Commercial	23.35	0.95	
DA_LS1	Lois St.	Average Single Family Residential	6.36	0.66	0.66	Average Single Family Residential	6.36	0.66	0.66

Runoff Coefficient (C) Calculations									
Drainage ID	Street Name	Existing Conditions				Ultimate Conditions			
		Landuse (Existing)	Area (Acres)	Runoff Coe.	Weighted Runoff (Existing)	Landuse (Ultimate)	Area (Acres)	Runoff Coe.	Weighted Runoff (Ultimate)
DA_JD	Jack Drive	Average Single Family Residential	16.52	0.66	0.59	Average Single Family Residential	16.52	0.66	0.66
		Average Fair Condition Grass	10.76	0.49		Average Single Family Residential	10.76	0.66	
DA_KC	Kroc Center	Average Single Family Residential	33.62	0.66	0.62	Average Single Family Residential	62.39	0.66	0.76
		Flat Good Condition Grass	9.28	0.36		Flat Good Condition Grass	9.28	0.36	
		Average Good Condition Grass	43.71	0.46		Average Retail/Office/Light Commercial	51.49	0.87	
		Average Retail/Office/Light Commercial	32.84	0.87		Average Retail/Office/Light Commercial	32.84	0.87	
DA_HY	Kroc Center	Average Single Family Residential	28.77	0.66	0.62	Average Single Family Residential	28.77	0.66	0.66
		Average Good Condition Grass	7.78	0.46		Average Single Family Residential	7.78	0.66	
DA_PT	East Main to Pinto Trail (Channel Begin)	Average Single Family Residential	51.98	0.66	0.61	Average Single Family Residential	51.98	0.66	0.66
		Average Good Condition Grass	15.43	0.46		Average Single Family Residential	15.43	0.66	
	East Main to Pinto Trail (Channel End)	Flat Single Family Residential	11.8	0.6	0.53	Flat Single Family Residential	11.8	0.6	0.60
		Flat Pasture/Range	6.62	0.41		Flat Single Family Residential	6.62	0.6	
DA_FO	Fourth St. Low Water Crossing	Flat Forest Woodlands	5596	0.39	0.43	Flat Single Family Residential	5596	0.6	0.60
		Flat Single Family Residential	1137.51	0.6		Flat Single Family Residential	1137.51	0.6	
DA_FI	First St. Low Water Crossing	Average Forest Woodlands	73.75	0.47	0.59	Average Single Family Residential	73.75	0.66	0.66
		Average Single Family Residential	122.49	0.66		Average Single Family Residential	122.49	0.66	
DA_PS	Park St. Low Water Crossing	Flat Single Family Residential	218.5	0.6	0.64	Flat Single Family Residential	218.5	0.6	0.70
		Flat Retail/Office/Light Commercial	93.43	0.85		Flat Retail/Office/Light Commercial	93.43	0.85	
		Flat Fair Condition Grass	42.14	0.41		Flat Retail/Office/Light Commercial	42.14	0.85	
DA_SS	Spring St. Erosion Outfall	Flat Regional Commercial	34.78	0.94	0.94	Flat Regional Commercial	34.78	0.94	0.94
DA_CS	Clay St.	Flat Regional Commercial	24.04	0.94	0.94	Flat Regional Commercial	24.04	0.94	0.94
	Clay St. (Bypass)	Flat Regional Commercial	10.03	0.94	0.94	Flat Regional Commercial	10.03	0.94	0.94

Curve Number (CN) Value Calculation									
Drainage ID	Street Name	Existing Conditions				Ultimate Conditions			
		Landuse (Existing)	Area (Acres)	CN	Weighted CN (Existing)	Landuse (Ultimate)	Area (Acres)	CN	Weighted CN (Ultimate)
DA_CS	Coronado St.	Fair Condition Open Space	0.4	79	93.2	Commercial and Business	0.4	94	94.0
		Commercial and Business	7.23	94		Commercial and Business	7.5	94	
DA_TD	Thompson Dr. (Coronado)	1/4 Acre Residential District	0.9	83	81.5	1/4 Acre Residential District	0.9	83	93.2
		Good Condition Open Space	7.2	74		Commercial and Business	7.2	94	
		Commercial and Business	4.24	94		Commercial and Business	4.24	94	
DA_HS	Harper St.	1/4 Acre Residential District	13.11	87	87.0	1/4 Acre Residential District	13.11	87	87.0
DA_CA	Harper St. - Circle Ave.	1/4 Acre Residential District	14.33	87	87.6	1/4 Acre Residential District	14.33	87	88.2
		Commercial and Business	3.47	95		Commercial and Business	3.47	95	
		Fair Condition Open Space	4.78	84		1/4 Acre Residential District	4.78	87	
DA_HC	Hill Country	1/4 Acre Residential District	0	83	89.9	1/4 Acre Residential District	0	83	92.1
		Good Condition Open Space	5.61	74		1/4 Acre Residential District	5.61	83	
		Commercial and Business	17.66	95		Commercial and Business	17.66	95	
DA_HC1	Hill Country	1/4 Acre Residential District	0	83	95.0	1/4 Acre Residential District	0	83	95.0
		Good Condition Open Space	0	74		1/4 Acre Residential District	0	83	
		Commercial and Business	4.56	95		Commercial and Business	4.56	95	
DA_TE	Easy Drain Channel	Commercial and Business	16.43	95	85.7	Commercial and Business	16.43	95	85.7
		2 Acre Residential Destrict	40.6	82		2 Acre Residential Destrict	40.6	82	
	Easy Drain Channel Bypass	1/4 Acre Residential District	95.4	87	87.7	1/4 Acre Residential District	95.4	87	89.0
		Good Condition Open Space	10.85	80		Commercial and Business	10.85	95	
		Commercial and Business	21.1	95		Commercial and Business	21.1	95	

Curve Number (CN) Value Calculation									
Drainage ID	Street Name	Existing Conditions				Ultimate Conditions			
		Landuse (Existing)	Area (Acres)	CN	Weighted CN (Existing)	Landuse (Ultimate)	Area (Acres)	CN	Weighted CN (Ultimate)
DA_LS	Lois St.	1/4 Acre Residential District	100.55	87	87.8	1/4 Acre Residential District	100.55	87	89.0
		Good Condition Open Space	10.91	80		Commercial and Business	10.91	95	
		Commercial and Business	23.35	95		Commercial and Business	23.35	95	
DA_LS1	Lois St.	1/4 Acre Residential District	6.36	87	87.0	1/4 Acre Residential District	6.36	87	87.0
DA_JD	Jack Drive	1/4 Acre Residential District	16.52	87	85.8	1/4 Acre Residential District	16.52	87	87.0
		Fair Condition Open Space	10.76	84		1/4 Acre Residential District	10.76	87	
DA_KC	Kroc Center	1/4 Acre Residential District	33.62	83	83.9	1/4 Acre Residential District	62.39	83	88.4
		Good Condition Open Space	9.28	74		Good Condition Open Space	9.28	74	
		Fair Condition Open Space	43.71	79		Commercial and Business	51.49	94	
		Commercial and Business	32.84	94		Commercial and Business	32.84	94	
DA_HY	Kroc Center	1/4 Acre Residential District	28.77	83	81.1	1/4 Acre Residential District	28.77	83	83.0
		Good Condition Open Space	7.78	74		1/4 Acre Residential District	7.78	83	
DA_PT	East Main to Pinto Trail (Channel Begin)	1/4 Acre Residential District	51.98	87	85.4	1/4 Acre Residential District	51.98	87	87.0
		Good Condition Open Space	15.43	80		1/4 Acre Residential District	15.43	87	
	East Main to Pinto Trail (Channel End)	1/4 Acre Residential District	11.8	87	84.5	1/4 Acre Residential District	11.8	87	87.0
		Good Condition Open Space	6.62	80		1/4 Acre Residential District	6.62	87	

Curve Number (CN) Value Calculation									
Drainage ID	Street Name	Existing Conditions				Ultimate Conditions			
		Landuse (Existing)	Area (Acres)	CN	Weighted CN (Existing)	Landuse (Ultimate)	Area (Acres)	CN	Weighted CN (Ultimate)
DA_FO	Fourth St. Low Water Crossing	Woods Grass Combination (Good)	5596	79	80.4	1/4 Acre Residential District	5596	87	87.0
		1/4 Acre Residential District	1137.51	87		1/4 Acre Residential District	1137.51	87	
DA_FI	First St. Low Water Crossing	Woods Grass Combination (Good)	73.75	72	78.9	1/4 Acre Residential District	73.75	83	83.0
		1/4 Acre Residential District	122.49	83		1/4 Acre Residential District	122.49	83	
DA_PS	Park St. Low Water Crossing	1/4 Acre Residential District	218.5	87	88.3	1/4 Acre Residential District	218.5	87	90.1
		Commercial and Business	93.43	95		Commercial and Business	93.43	95	
		Good Condition Open Space	42.14	80		Commercial and Business	42.14	95	
DA_SS	Spring St. Erosion Outfall	Commercial and Business	34.78	95	95.0	Commercial and Business	34.78	95	95.0
DA_CS	Clay St.	Commercial and Business	24.04	95	95.0	Commercial and Business	24.04	95	95.0
	Clay St. (Bypass)	Commercial and Business	10.03	95	95.0	Commercial and Business	10.03	95	95.0

Time of Concentration Calculations (Existing Conditions)																										
Location	Basin ID	Basin Area (Ac)	Basin Area (sq.mi.)	Overland/ Sheet Flow:								Shallow Concentrated Flow:					Channelized Flow:				Time of Concentration:		Lag Time:			
				$T_o = 0.42 \cdot \frac{(n_o \cdot L_o)^{0.8}}{P_2^{0.5} \cdot S_o^{0.4}}$								$V_s = Fig .3.1$ $T_s = \frac{L_s}{60 \cdot V_s}$					$T_h = \frac{L_h}{60 \cdot V_h}$				$T_c = T_o + T_s + T_h$		$T_L = 0.6 \cdot T_c$			
				Lo	So	So	C	P2	Mannings N	To	To	1=Paved	Ls	Ss	Vs	Ts	Flow Type	Vh	Lh	Th	Tc		TL			
				ft	%	ft/ft	N/A	Inches	NA	minutes	(15 min max)	2=Unpaved	ft	ft/ft	fps	minutes		fps	ft	minutes	minutes	hours	minutes	hours		
Coronado Dr.	DA_CD	7.63	0.012	100	2.000	0.020	0.930	3.920	0.011	1.09	1.09	1	100.00	0.016	2.56	0.65	Pipe				4.59	0.08	2.75	0.05		
																	Channel	5.00								
																	Gutter	6.43	1096.54	2.84						
Thompson Drive - Downstream of Coronado Dr.	DA_TD	12.24	0.019	100	5.000	0.050	0.640	3.920	0.240	8.94	8.94	2	1059.10	0.016	2.04	8.67	Pipe	7.81	180.00	0.38	18.64	0.31	11.18	0.19		
																	Channel	5.00	195.65	0.65						
																	Gutter	5.00								
Harper Street	DA_HS	13.11	0.020	100	5.000	0.050	0.660	3.920	0.150	6.14	6.14	2	884.00	0.031	2.84	5.19	Pipe				13.77	0.23	8.26	0.14		
																	Channel	5.00								
																	Gutter	5.19	759.56	2.44						
Harper Street (Bypass) Culberson to Circle Ave	DA_CA	22.58	0.035	100	2.000	0.020	0.660	3.920	0.011	1.09	1.09	1	100.00	0.035	3.80	0.44	Pipe				4.35	0.07	2.61	0.04		
																	Channel	10.60	371.84	0.58						
																	Gutter	8.43	1126.45	2.23						
Jack Drive	DA_JD	27.28	0.043	100	2.000	0.020	0.590	3.920	0.150	8.85	8.85	2	1495.79	0.043	3.34	7.45	Pipe				17.67	0.29	10.60	0.18		
																	Channel	5.00								
																	Gutter	5.00	410.00	1.37						
Hill Country Drive	DA_HC	23.27	0.036	100	19.320	0.193	0.840	3.920	0.240	5.20	5.20	2	965.00	0.214	7.48	2.15	Pipe				9.58	0.16	5.75	0.10		
																	Channel	5.00								
																	Gutter	9.00	1198.83	2.22						
Hill Country Drive	DA_HC1	4.56	0.007	100	1.000	0.010	0.950	3.920	0.240	17.01	15.00	1	899.99	0.003	1.10	13.67	Pipe				28.67	0.48	17.20	0.29		
																	Channel	5.00								
																	Gutter	6.43								
Clay St	DA_CS	21.93	0.034	100	0.500	0.005	0.940	3.920	0.011	1.91	1.91	1	106.00	0.010	2.02	0.88	Pipe				7.25	0.12	4.35	0.07		
																	Channel	5.00								
																	Gutter	4.70	1259.21	4.47						
Clay St Bypass	DA_CS_BYPASS	10.03	0.016	100	0.600	0.006	0.940	3.920	0.011	1.77	1.77	1	100.00	0.003	1.10	1.52	Pipe				9.06	0.15	5.44	0.09		
																	Channel	5.00								
																	Gutter	2.68	927.50	5.77						
Lois Street	DA_LS	134.81	0.211	100	1.000	0.010	0.690	3.920	0.240	17.01	15.00	2	362.92	0.020	2.28	2.66	Pipe				25.20	0.42	15.12	0.25		
																	Channel	5.00								
																	Gutter	8.88	4017.89	7.54						
Lois Street	DA_LS1	6.36	0.010	100	0.400	0.004	0.660	3.920	0.240	24.54	15.00	2	478.00	0.005	1.14	7.01	Pipe				22.69	0.38	13.61	0.23		
																	Channel	5.00								
																	Gutter	4.50	183.15	0.68						
Fourth St. Low Water Crossing	DA_FO	6733.51	10.521	100	2.000	0.020	0.390	3.920	0.240	12.89	12.89	2	1792.00	0.040	3.23	9.26	Pipe				130.22	2.17	78.13	1.30		
																	Channel	5.00	32421.00	108.07						
																	Gutter									
First St. Low Water Crossing	DA_FI	196.24	0.307	100	4.000	0.040	0.500	3.920	0.240	9.77	9.77	2	1128.00	0.130	5.82	3.23	Pipe				27.09	0.45	16.25	0.27		
																	Channel	4.50	3805.00	14.09						
																	Gutter									
Park St. Low Water Crossing	DA_PS	354.07	0.553	100	8.000	0.080	0.600	3.920	0.011	0.63	0.63						Pipe				32.93	0.55	19.76	0.33		
																	Channel	5.00	9689.06	32.30						
																	Gutter									
Spring St. - Erosion at Outfall	DA_SS	34.78	0.054	100	4.000	0.040	0.940	3.920	0.011	0.83	0.83	1	100.00	0.001	0.63	2.65	Pipe				16.56	0.28	9.94	0.17		
																	Channel	5.00								
																	Gutter	3.75	2943.91	13.08						

Time of Concentration Calculations (Existing Conditions)																											
Location	Basin ID	Basin Area (Ac)	Basin Area (sq.mi.)	Overland/ Sheet Flow:								Shallow Concentrated Flow:					Channelized Flow:				Time of Concentration:		Lag Time:				
				$T_o = 0.42 \cdot \frac{(n_o \cdot L_o)^{0.8}}{P_2^{0.5} \cdot S_o^{0.4}}$								$V_s = Fig .3.1$ $T_s = \frac{L_s}{60 \cdot V_s}$					$T_h = \frac{L_h}{60 \cdot V_h}$				$T_c = T_o + T_s + T_h$		$T_L = 0.6 \cdot T_c$				
				Lo	So	So	C	P2	Mannings N	To	To	1=Paved	Ls	Ss	Vs	Ts	Flow Type	Vh fps	Lh ft	Th minutes	Tc		TL				
				ft	%	ft/ft	N/A	Inches	NA	minutes	(15 min max)	2=Unpaved	ft	ft/ft	fps	minutes					minutes	hours	minutes	hours			
Kroc Center Detention Pond	DA_KC	119.46	0.187	100	1.000	0.010	0.620	3.920	0.011	1.44	1.44	2	375.00	0.200	7.23	0.86	Pipe				9.34	0.16	5.60	0.09			
																	Channel	8.00	3374.86	7.03							
																	Gutter										
Kroc Center Detention Pond - Hays Street	DA_HY	36.55	0.057	100	3.000	0.030	0.620	3.920	0.240	10.96	10.96	2	1466.86	0.070	4.27	5.73	Pipe				17.77	0.30	10.66	0.18			
																	Channel	5.00									
																	Gutter	8.20	530.73	1.08							
East Main to Pinto Trail (Channel Begin)	DA_PT_BEGIN	65.21	0.102	100	4.000	0.040	0.610	3.920	0.240	9.77	9.77	2	872.28	0.180	6.86	2.12	Pipe				14.61	0.24	8.77	0.15			
																	Channel										
																	Gutter	12.02	1960.38	2.72							
East Main to Pinto Trail (Channel End)	DA_PT_END	18.42	0.029	100	2.000	0.020	0.530	3.920	0.240	12.89	12.89	2	942.00	0.017	2.10	7.48	Pipe				22.48	0.37	13.49	0.22			
																	Channel	5.00									
																	Gutter	4.14	523.00	2.11							
Easy Drain Channel	DA_TE	57.03	0.089	100	3.000	0.030	0.830	3.920	0.011	0.93	0.93	1	690.00	0.004	1.27	9.06	Pipe				20.09	0.33	12.05	0.20			
																	Channel	5.26	2701.42	8.56							
																	Gutter	6.12	564.00	1.54							
Easy Drain Channel - Bypass	DA_TE_BYPASS	127.35	0.199	103.29	6.000	0.060	0.690	3.920	0.150	5.85	5.85	2	746.00	0.118	5.55	2.24	Pipe				19.50	0.33	11.70	0.20			
																	Channel										
																	Gutter	9.12	6243.33	11.41							

Time of Concentration Calculations (Ultimate Conditions)																								
Location	Basin ID	Basin Area (Ac)	Basin Area (sq.mi.)	Overland/ Sheet Flow:								Shallow Concentrated Flow:					Channelized Flow:				Time of Concentration:		Lag Time:	
				$T_o = 0.42 \cdot \frac{(n_o \cdot L_o)^{0.8}}{P_2^{0.5} \cdot S_o^{0.4}}$								$V_s = Fig .3.1 \qquad T_s = \frac{L_s}{60 \cdot V_s}$					$T_h = \frac{L_h}{60 \cdot V_h}$				$T_c = T_o + T_s + T_h$		$T_L = 0.6 \cdot T_c$	
				Lo ft	So %	So ft/ft	C N/A	P2 in	No	To minutes	To (15 min max)	1=Paved 2=Unpaved	Ls ft	Ss ft/ft	Vs fps	Ts minutes	Flow Type	Vh fps	Lh ft	Th minutes	Tc		TL	
																				minutes	hours	minutes	hours	
Coronado Dr.	DA_CD	7.63	0.012	100	2.000	0.020	0.950	3.920	0.011	1.09	1.09	1	100.00	0.016	2.56	0.65	Pipe				4.59	0.08	2.75	0.05
																	Channel	5.00						
																	Gutter	6.43	1096.54	2.84				
Thompson Drive - Downstream of Coronado Dr.	DA_TD	12.24	0.019	100	5.000	0.050	0.920	3.920	0.011	0.76	0.76	1	1059.10	0.016	2.56	6.90	Pipe	7.81	180.00	0.38	8.69	0.14	5.22	0.09
																	Channel	5.00	195.65	0.65				
																	Gutter	5.00						
Harper Street	DA_HS	13.11	0.020	100	5.000	0.050	0.660	3.920	0.150	6.14	6.14	2	884.00	0.031	2.84	5.19	Pipe				13.77	0.23	8.26	0.14
																	Channel	5.00						
																	Gutter	5.19	759.56	2.44				
Harper Street (Bypass) Culberson to Circle Ave	DA_CA	22.58	0.035	100	2.000	0.020	0.690	3.920	0.011	1.09	1.09	1	100.00	0.035	3.80	0.44	Pipe				4.35	0.07	2.61	0.04
																	Channel	10.60	371.84	0.58				
																	Gutter	8.43	1126.45	2.23				
Jack Drive	DA_JD	27.28	0.043	100	2.000	0.020	0.660	3.920	0.150	8.85	8.85	1	1495.79	0.043	4.22	5.91	Pipe				16.13	0.27	9.68	0.16
																	Channel	5.00						
																	Gutter	5.00	410.00	1.37				
Hill Country Drive	DA_HC	23.27	0.036	100	19.320	0.193	0.890	3.920	0.240	5.20	5.20	2	965.00	0.214	7.48	2.15	Pipe				9.58	0.16	5.75	0.10
																	Channel	5.00						
																	Gutter	9.00	1198.83	2.22				
Hill Country Drive	DA_HC1	4.56	0.007	100	1.000	0.010	0.950	3.920	0.240	17.01	15.00	1	899.99	0.003	1.10	13.67	Pipe				28.67	0.48	17.20	0.29
																	Channel	5.00						
																	Gutter	6.43						
Clay St	DA_CS	21.93	0.034	100	0.500	0.005	0.940	3.920	0.011	1.91	1.91	1	106.00	0.010	2.02	0.88	Pipe				7.25	0.12	4.35	0.07
																	Channel	5.00						
																	Gutter	4.70	1259.21	4.47				
Clay St Bypass	DA_CS_BYPASS	10.03	0.016	100	0.600	0.006	0.940	3.920	0.011	1.77	1.77	1	100.00	0.003	1.10	1.52	Pipe				9.06	0.15	5.44	0.09
																	Channel	5.00						
																	Gutter	2.68	927.50	5.77				
Lois Street	DA_LS	134.81	0.211	100	1.000	0.010	0.730	3.920	0.150	11.68	11.68	2	362.92	0.020	2.28	2.66	Pipe				21.88	0.36	13.13	0.22
																	Channel	5.00						
																	Gutter	8.88	4017.89	7.54				
Lois Street	DA_LS1	6.36	0.010	100	0.400	0.004	0.660	3.920	0.150	16.85	15.00	2	478.00	0.005	1.14	7.01	Pipe				22.69	0.38	13.61	0.23
																	Channel	5.00						
																	Gutter	4.50	183.15	0.68				
Fourth St. Low Water Crossing	DA_FO	6733.51	10.521	100	2.000	0.020	0.390	3.920	0.150	8.85	8.85	2	1792.00	0.040	3.23	9.26	Pipe				126.18	2.10	75.71	1.26
																	Channel	5.00	32421.00	108.07				
																	Gutter							
First St. Low Water Crossing	DA_FI	196.24	0.307	100	4.000	0.040	0.500	3.920	0.150	6.71	6.71	2	1128.00	0.130	5.82	3.23	Pipe				24.03	0.40	14.42	0.24
																	Channel	4.50	3805.00	14.09				
																	Gutter							
Park St. Low Water Crossing	DA_PS	354.07	0.553	100	8.000	0.080	0.600	3.920	0.011	0.63	0.63						Pipe				32.93	0.55	19.76	0.33
												Channel	5.00	9689.06	32.30									
												Gutter												
Spring St. - Erosion at Outfall	DA_SS	34.78	0.054	100	4.000	0.040	0.940	3.920	0.011	0.83	0.83	1	100.00	0.001	0.63	2.65	Pipe				16.56	0.28	9.94	0.17
																	Channel	5.00						
																	Gutter	3.75	2943.91	13.08				

Time of Concentration Calculations (Ultimate Conditions)																								
Location	Basin ID	Basin Area (Ac)	Basin Area (sq.mi.)	Overland/ Sheet Flow:								Shallow Concentrated Flow:					Channelized Flow:				Time of Concentration:		Lag Time:	
				$T_o = 0.42 \cdot \frac{(n_o \cdot L_o)^{0.8}}{P_2^{0.5} \cdot S_o^{0.4}}$								$V_s = Fig .3.1$ $T_s = \frac{L_s}{60 \cdot V_s}$					$T_h = \frac{L_h}{60 \cdot V_h}$				$T_c = T_o + T_s + T_h$		$T_L = 0.6 \cdot T_c$	
				Lo	So	So	C	P2	No	To	To	1=Paved	Ls	Ss	Vs	Ts	Flow Type	Vh	Lh	Th	Tc		TL	
				ft	%	ft/ft	N/A	in		minutes	(15 min max)	2=Unpaved	ft	ft/ft	fps	minutes		fps	ft	minutes	minutes	hours	minutes	hours
Kroc Center Detention Pond	DA_KC	119.46	0.187	100	1.000	0.010	0.760	3.920	0.011	1.44	1.44	2	375.00	0.200	7.23	0.86	Pipe				9.34	0.16	5.60	0.09
																	Channel	8.00	3374.86	7.03				
																	Gutter							
Kroc Center Detention Pond - Hays Street	DA_HY	36.55	0.057	100	3.000	0.030	0.660	3.920	0.150	7.53	7.53	2	1466.86	0.070	4.27	5.73	Pipe				14.33	0.24	8.60	0.14
																	Channel	5.00						
																	Gutter	8.20	530.73	1.08				
East Main to Pinto Trail (Channel Begin)	DA_PT_BEGIN	65.21	0.102	100	4.000	0.040	0.660	3.920	0.150	6.71	6.71	2	872.28	0.180	6.86	2.12	Pipe				11.55	0.19	6.93	0.12
																	Channel							
																	Gutter	12.02	1960.38	2.72				
East Main to Pinto Trail (Channel End)	DA_PT_END	18.42	0.029	100	2.000	0.020	0.600	3.920	0.150	8.85	8.85	2	942.00	0.017	2.10	7.48	Pipe				18.43	0.31	11.06	0.18
																	Channel	5.00						
																	Gutter	4.14	523.00	2.11				
Easy Drain Channel	DA_TE	57.03	0.089	100	3.000	0.030	0.830	3.920	0.011	0.93	0.93	1	690.00	0.004	1.27	9.06	Pipe				20.09	0.33	12.05	0.20
																	Channel	5.26	2701.42	8.56				
																	Gutter	6.12	564.00	1.54				
Easy Drain Channel - Bypass	DA_TE_BYPASS	127.35	0.199	103.29	6.000	0.060	0.730	3.920	0.150	5.85	5.85	2	746.00	0.118	5.55	2.24	Pipe				19.50	0.33	11.70	0.20
																	Channel							
																	Gutter	9.12	6243.33	11.41				

2) Hydraulic Analysis

The project's hydraulic analysis consisted of calculating capacity, velocity and depths for existing roadways, drainage structures, and channels to evaluate the water surface elevations and resulting localized flooding issues experienced at First, Fourth and Park Street low water crossings. Floodplain hydraulics were analyzed using the USACE HEC-RAS software version 5.0.5. All modeling simulations are one-dimensional steady-state runs.

A HEC-RAS hydraulic model was generated for Quinlan Creek using 2011 TNRS 1/16 USGS Quad DEM bare earth terrain data at a 1-meter resolution, and field investigations. A field survey was conducted as part of this analysis for approximate invert elevations and road profiles. However, a detailed field survey will be required during the drainage design phase.

The hydraulic analysis was performed for the 1-, 2-, 5-, 10-, 25-, 50- and 100-year effective conditions storm events. Cross-sections along the streamlines were placed to capture the geometry of the channel and stream characteristics and to capture data for hydraulically significant structures such as bridges, culverts, and roads. The maps of the cross-sections modeled as part of this study are included in the sections below. All cross-sections are modeled from left to right looking downstream. Further refinement of the model with field survey data is required to enhance the accuracy and to further define the extent of the flooding and the corresponding benefits of the proposed improvements.

Hydraulic model parameter estimations include Manning's roughness coefficient (n) values, contraction and expansion coefficients, and ineffective flow limits. For Quinlan Creek, the drainage channel typically has an irregular channel geometry with heavy brush vegetation and trees within the channel banks and pasture and brushland within the overbank areas.

Overbank manning's values were typically defined as having n values of 0.04 to 0.06 for pasture and brush areas. Each of the values follows the recommendations provided by the HEC-RAS Reference Manual and by Table 5-7 of the Floodplain Modeling Using HEC-RAS (Haestad 147).

Contraction and expansion coefficients are applied upstream and downstream, respectively, of culverts and bridges to represent the contraction of flow as water enters the drainage structure and expands outward as it exits the structure. In this study, contraction and expansion coefficients of cross-sections bounding bridges are 0.1 and 0.3, respectively.

Ineffective flow limits are added to cross-sections to accurately model any given section's inability to convey flow, such as cross-sections that bound bridges and culverts. Ineffective limits were also set at the top of channel banks to account for storage in over banks that do not contribute to channel conveyance. Blocked obstructions are placed in areas where the conveyance is not expected to occur or in areas that should not be included as storage.

No hydrologic peak flow calculations were performed for low water crossings. Instead, effective FEMA FIS flows are considered for the following scenarios:

- 1) Existing Conditions
- 2) Proposed Conditions with Channel Modification
- 3) Proposed Conditions with Channel Modification and Culvert Replacement
- 4) Proposed Conditions with Channel Modification, Culvert Replacement, and 3 Feet Railing.

Iterative approximate hydraulic calculations were performed using various parameters such as channel modification slope, channel bottom width, culvert height, and span. Considering the large volume of surface runoff in Quinlan Creek and existing structural restrains, drainage structures were designed barely for 10 years for Park Street and First Street. 2-year storm capacity was able to achieve for Fourth Street low water crossing.

Following table shows the effective flows used for hydraulic analysis. FIS FEMA study report is used to extract discharge values for 10-, 50-, 100- and 500-years at low water crossings. A linear relationship between surface runoff from ATLAS 14 precipitation and FIS discharge is used to estimate flows for 1-, 2-, 5-, 25-years.

Atlas 14 Peak Flows (Rational Method) - Ultimate									
Name	Area	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	500 YR
Park Street LWC	7,450.00	3,463.04	4,213.63	5,325.64	6,323.17	7,781.47	9,008.88	10,339.18	N/A
First Street LWC	6,929.75	2,995.30	3,655.57	4,627.90	5,504.91	6,788.70	7,875.16	9,056.55	N/A
Fourth Street LWC	6,733.51	2,668.80	3,268.91	4,145.91	4,941.71	6,107.95	7,100.47	8,182.83	N/A
FIS FEMA Effective Flows									
Name	Area	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	500 YR
Type		Estimated	Estimated	Estimated	FIS FEMA	Estimated	FIS FEMA	FIS FEMA	FIS FEMA
Park Street LWC	7,494.40	3,149.13	3,831.68	4,842.90	5,750.00	8,076.11	9,350.00	10,830.00	14,140.00
First Street LWC	7,232.00	3,025.27	3,692.15	4,674.21	5,560.00	7,741.12	8,980.00	10,400.00	13,660.00
Fourth Street LWC	6,643.20	2,759.69	3,380.23	4,287.10	5,110.00	6,950.56	8,080.00	9,350.00	12,520.00

Hydraulic summary of low water crossings is given below:

1) Fourth Street Low Water Crossing Analysis

Proposed Improvements:

- **Channel Modification**
Limits: RS 130 to RS 1055 (Approx. 925 ft)
Bottom Width: 80 feet
Bottom Width Near Culvert: 100 feet
Side Slope: 3H:1V
- **Culvert Replacement**
7 – 12' X 8'
FL (In): 1625.1 ft
FL (Out): 1624.8 ft
- **Roadway Regrading**
Existing Road Elevation: 1628.5 ft
Proposed Roadway Elevation Over Culvert: 1634.1 ft
Proposed Roadway Elevation at Tie End: 1635.0 ft
Max. Road Raise: 5.6 ft

Hydraulic Analysis Result for Fourth Street:

Existing Conditions

Existing Conditions (With No Improvements) at Fourth Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,639.41	1,628.59	25.63	12,609.57	4.08	4.08	10.82
100 YR	1,637.97	1,628.59	25.27	9,525.54	4.02	4.02	9.38
50 YR	1,637.29	1,628.59	24.87	8,289.40	3.96	3.96	8.70
25 YR	1,636.60	1,628.59	24.00	7,076.67	3.82	3.82	8.01
10 YR	1,635.35	1,628.59	22.20	4,975.94	3.53	3.53	6.76
5 YR	1,634.63	1,628.59	21.03	4,158.44	3.35	3.35	6.04
2 YR	1,633.73	1,628.59	22.71	3,397.13	3.61	3.61	5.14
1 YR	1,633.05	1,628.59	21.99	2,692.35	3.50	3.50	4.46

Proposed Channel Modification with Existing Culvert

Proposed Conditions With Channel Modification Only at Fourth Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,638.97	1,628.59	25.63	12,282.01	4.08	4.08	10.38
100 YR	1,637.54	1,628.59	25.27	9,333.31	4.02	4.02	8.95
50 YR	1,636.86	1,628.59	24.87	7,951.32	3.96	3.96	8.27
25 YR	1,636.17	1,628.59	24.00	6,711.35	3.82	3.82	7.58
10 YR	1,634.90	1,628.59	24.11	4,992.89	3.84	3.84	6.31
5 YR	1,634.19	1,628.59	25.12	4,375.27	4.00	4.00	5.60
2 YR	1,633.27	1,628.59	24.82	3,444.01	3.95	3.95	4.68
1 YR	1,632.61	1,628.59	24.58	2,747.74	3.91	3.91	4.02

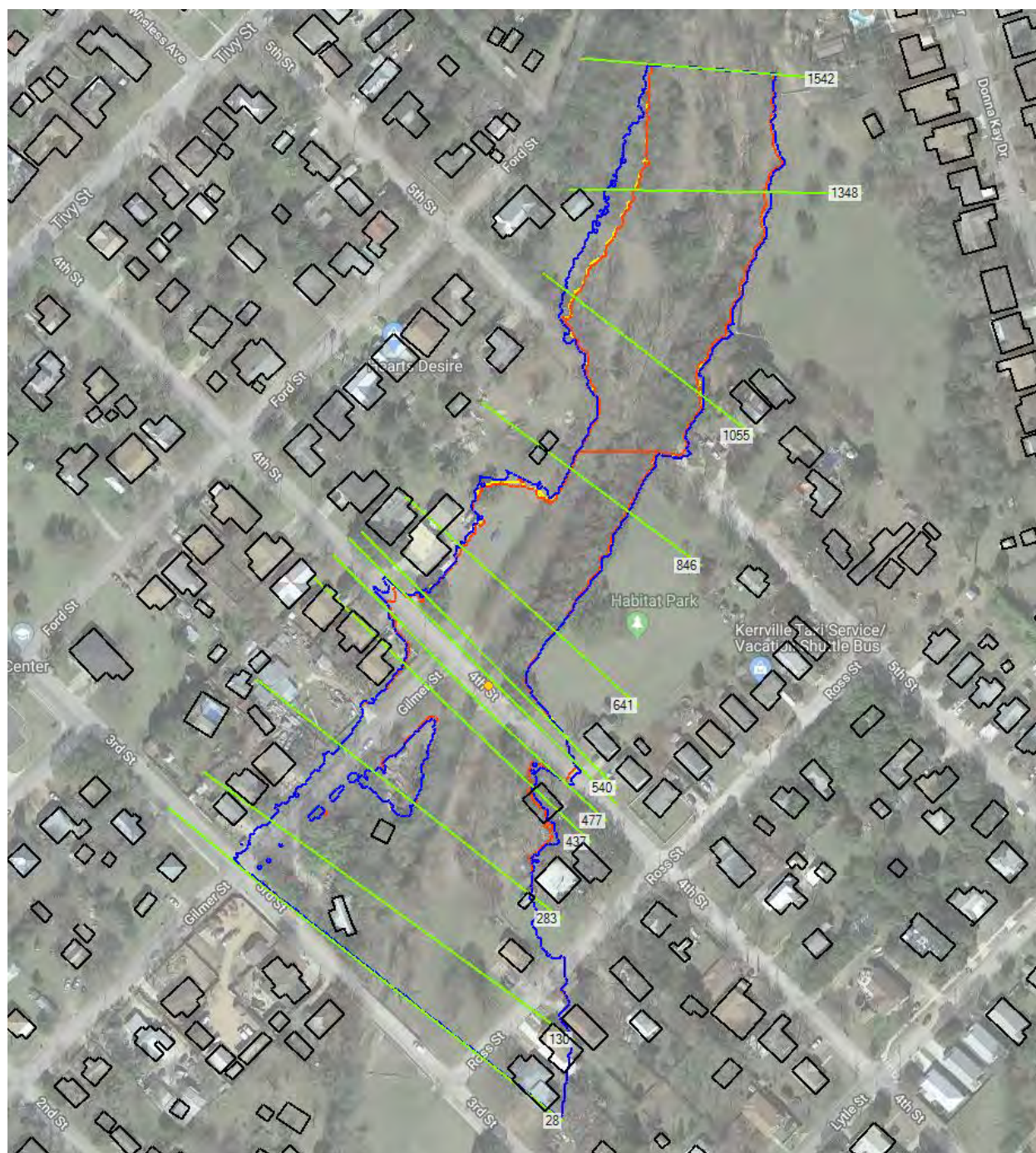
Proposed Channel Modification with Proposed Culvert

Proposed Channel Modification and Culvert Replacement at Fourth Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,639.02	1,634.01	2,931.27	9,588.73	4.36	4.36	5.01
100 YR	1,637.67	1,634.01	3,547.33	5,802.67	5.28	5.28	3.66
50 YR	1,637.08	1,634.01	3,747.22	4,332.78	5.58	5.58	3.07
25 YR	1,636.50	1,634.01	3,870.71	3,079.29	5.76	5.76	2.49
10 YR	1,635.37	1,634.01	3,986.71	1,123.30	5.93	5.93	1.36
5 YR	1,634.52	1,634.01	4,033.72	253.38	6.00	6.00	0.51
2 YR	1,633.35	1,634.01	3,380.23		5.06	5.03	0.00
1 YR	1,632.60	1,634.01	2,759.69		4.50	4.31	0.00

Proposed Channel Modification with Proposed Culvert and 3ft Railing

Proposed Channel Modification + Culvert Replacement + 3 ft Rail							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,639.17	1,634.01	3,955.07	8,564.94	5.89	5.89	5.16
100 YR	1,638.04	1,634.01	4,445.85	4,904.15	6.62	6.62	4.03
50 YR	1,637.47	1,634.01	4,542.39	3,537.61	6.76	6.76	3.46
25 YR	1,636.85	1,634.01	4,576.02	2,373.98	6.81	6.81	2.84
10 YR	1,635.54	1,634.01	4,340.02	769.98	6.46	6.46	1.53
5 YR	1,634.58	1,634.01	4,171.33	115.77	6.21	6.21	0.57
2 YR	1,633.35	1,634.01	3,380.23		5.06	5.03	0.00
1 YR	1,632.60	1,634.01	2,759.69		4.50	4.31	0.00

Inundation Map for Fourth Street Low Water Crossing



Blue – Existing Conditions

Orange – Proposed Conditions with Channel Modification Only

Yellow – Proposed Conditions with Channel Modification and Culvert Replacement

2) First Street Low Water Crossing Analysis

Proposed Improvements:

- **Channel Modification**
Limits: RS 476 to RS 2070 (Approx. 1594 ft)
Bottom Width: 100 feet
Bottom Width Near Culvert: 110 feet
Side Slope: 3H:1V
- **Culvert Replacement**
8 – 12' X 8'
FL (In): 1615 ft
FL (Out): 1614.5 ft
- **Roadway Regrading**
Existing Road Elevation: 1618.025 ft
Proposed Roadway Elevation Over Culvert: 1624 ft
Proposed Roadway Elevation at Tie End: 1625 ft
Max. Road Raise: 6 ft

Hydraulic Analysis Result for First Street:

Existing Conditions

Existing Conditions (With No Improvements) at First Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,629.44	1,618.21	47.17	13,595.47	3.00	3.00	11.23
100 YR	1,627.73	1,618.21	49.08	10,278.71	3.12	3.12	9.52
50 YR	1,627.09	1,618.21	49.81	9,170.05	3.17	3.17	8.88
25 YR	1,626.09	1,618.21	49.59	7,686.73	3.16	3.16	7.88
10 YR	1,624.59	1,618.21	49.52	5,567.44	3.15	3.15	6.38
5 YR	1,623.73	1,618.21	44.66	4,629.34	2.84	2.84	5.52
2 YR	1,622.90	1,618.21	49.18	3,642.82	3.13	3.13	4.69
1 YR	1,622.38	1,618.21	54.35	2,970.65	3.46	3.46	4.17

Proposed Channel Modification with Existing Culvert

Proposed Conditions With Channel Modification Only							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,625.37	1,618.28	170.18	13,498.35	10.83	10.83	7.09
100 YR	1624.8	1618.28	172.78	10229.9	11	11	6.52
50 YR	1,624.48	1,618.28	174.56	8,803.25	11.11	11.11	6.20
10 YR	1,623.45	1,618.28	195.95	5,366.99	12.47	12.47	5.17
25 YR	1,624.16	1,618.28	180.63	7,565.63	11.50	11.50	5.88
5 YR	1,623.09	1,618.28	206.21	4,470.04	13.13	13.13	4.81
2 YR	1,622.63	1,618.28	199.73	3,493.89	12.72	12.72	4.35
1 YR	1,622.31	1,618.28	202.27	2,822.73	12.88	12.88	4.03

Proposed Channel Modification with Proposed Culvert

Proposed Conditions With Channel Modification and Culvert Replacement							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,625.89	1,624.01	9,048.18	4,611.82	11.78	11.78	1.88
100 YR	1,624.99	1,624.01	8,523.23	1,876.77	14.19	11.36	0.98
50 YR	1,624.48	1,624.01	8,137.30	842.70	13.97	11.46	0.47
25 YR	1,624.29	1,624.01	7,310.43	430.57	13.48	16.56	0.28
10 YR	1,622.57	1,624.01	5,560.00		12.31	15.40	0
5 YR	1,621.71	1,624.01	4,674.00		11.61	14.72	0
2 YR	1,620.69	1,624.01	3,692.00		10.74	13.85	0
1 YR	1,619.97	1,624.01	3,025.00		10.05	13.17	0

Proposed Channel Modification with Proposed Culvert and 3 ft Railing

Proposed Conditions With Channel Mod + Culvert Replacement + Railing							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,626.20	1,624.01	9,885.72	3,774.28	12.87	12.87	2.19
100 YR	1,625.42	1,624.01	8,714.38	1,685.63	14.29	11.62	1.41
50 YR	1,624.76	1,624.01	8,275.04	704.97	14.05	11.65	0.75
25 YR	1,624.45	1,624.01	7,450.47	290.54	13.57	16.64	0.44
10 YR	1,622.57	1,624.01	5,560.00		12.31	15.40	0
5 YR	1,621.71	1,624.01	4,674.00		11.61	14.72	0
2 YR	1,620.69	1,624.01	3,692.00		10.74	13.85	0
1 YR	1,619.97	1,624.01	3,025.00		10.05	13.17	0

Inundation Map for First Street Low Water Crossing



Blue – Existing Conditions

Orange – Proposed Conditions with Channel Modification Only

Yellow – Proposed Conditions with Channel Modification and Culvert Replacement

3) Park Street Low Water Crossing Analysis

Proposed Improvements:

- **Channel Modification**

Limits: RS 388 to RS 1801

Bottom Width: 50 feet

Bottom Width Near Culvert: 120 feet

Side Slope: 3H:1V

Channel alignment is provided to the River Station (RS) 388, 488 and 795.

Channel is aligned approximately 60' – 70' to the left to avoid structural impacts.

- **Culvert Replacement**

8 – 12' X 8'

FL (In): 1598.5 ft

FL (Out): 1598.1 ft

- **Roadway Regrading**

Existing Road Elevation: 1601.8 ft

Proposed Roadway Elevation Over Culvert: 1607.5 ft

Proposed Roadway Elevation at Tie End: 1608.5 ft

Max. Road Raise: 5.7 ft

Hydraulic Analysis Result for Park Street:

Existing Conditions

Existing Conditions (With No Improvements) at Park Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,613.66	1,601.84	69.37	13,353.89	2.31	2.31	11.82
100 YR	1,611.94	1,601.84	72.76	10,742.14	2.43	2.43	10.10
50 YR	1,611.06	1,601.84	70.13	8,997.62	2.34	2.34	9.22
25 YR	1,610.22	1,601.84	74.45	8,131.01	2.48	2.48	8.38
10 YR	1,608.21	1,601.84	39.39	5,710.61	1.31	1.31	6.37
5 YR	1,607.45	1,601.84	81.71	4,761.29	2.72	2.72	5.61
2 YR	1,606.43	1,601.84	81.39	3,802.39	2.71	2.71	4.59
1 YR	1,605.64	1,601.84	71.46	3,077.54	2.38	2.38	3.80

Proposed Channel Modification with Existing Culvert

Proposed Channel Modification at Park Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,611.76	1,601.84	95.00	14,450.22	3.17	3.17	9.92
100 YR	1,610.31	1,601.84	96.45	10,971.92	3.22	3.22	8.47
50 YR	1,609.49	1,601.84	98.75	9,285.09	3.29	3.29	7.65
25 YR	1,608.75	1,601.84	111.14	7,964.86	3.70	3.70	6.91
10 YR	1,606.71	1,601.84	133.52	5,616.48	4.45	4.45	4.87
5 YR	1,606.31	1,601.84	166.19	4,676.81	5.54	5.54	4.47
2 YR	1,605.87	1,601.84	201.17	3,630.83	6.71	6.71	4.03
1 YR	1,605.48	1,601.84	255.15	2,893.86	8.50	8.50	3.64

Proposed Channel Modification with Proposed Culvert

Proposed Channel Modification and Culvert Replacement at Park Street							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,611.82	1,607.51	3,149.14	10,990.86	4.1	4.1	4.31
100 YR	1,610.55	1,607.51	3,799.29	7,030.72	4.95	4.95	3.04
50 YR	1,609.98	1,607.51	4,399.25	4,950.75	5.73	5.73	2.47
25 YR	1,609.42	1,607.51	4,836.99	3,239.01	6.3	6.3	1.91
10 YR	1,607.56	1,607.51	5,644.34	105.66	7.35	7.35	0.05
5 YR	1,606.43	1,607.51	4,843.00		6.91	6.49	0
2 YR	1,605.34	1,607.51	3,832.00		6.2	5.78	0
1 YR	1,604.59	1,607.51	3,149.00		5.6	5.19	0

Proposed Channel Modification with Proposed Culvert and 3ft Railing

Proposed Channel Modification + Culvert Replacement + 3 ft Rail							
Profile	W.S. US.	Min El Weir Flow	Q Culv Group	Q Weir	Culv Vel US	Culv Vel DS	Depth of Water Over Culvert (ft)
	(ft)	(ft)	(cfs)	(cfs)	(ft/s)	(ft/s)	
500 YR	1,611.91	1,607.51	3,638.19	10,501.81	4.74	4.74	4.40
100 YR	1,610.85	1,607.51	4,581.90	6,248.10	5.97	5.97	3.34
50 YR	1,610.26	1,607.51	5,058.81	4,291.19	6.59	6.59	2.75
25 YR	1,609.66	1,607.51	5,351.21	2,724.80	6.97	6.97	2.15
10 YR	1,607.59	1,607.51	5,714.35	35.65	7.44	7.44	0.08
5 YR	1,606.43	1,607.51	4,843.00		6.91	6.49	0
2 YR	1,605.34	1,607.51	3,832.00		6.2	5.78	0
1 YR	1,604.59	1,607.51	3,149.00		5.6	5.19	0

Inundation Map for Park Street Low Water Crossing



Blue – Existing Conditions

Orange – Proposed Conditions with Channel Modification Only

Yellow – Proposed Conditions with Channel Modification and Culvert Replacement

Methodology for Ranking Criteria and Scoring for City of Kerrville Stormwater Masterplan

Prioritization ranking performed in this study was intended to be modified to fit the City of Kerrville’s needs and considerations. The goal was to effectively rank projects by a system which would produce consistent results based on project-specific characteristics such as potential hazards, project cost, and economic factors. Project rankings will support city officials in recommending potential project implementation. Ranking for future projects will also be able to follow this process as the City of Kerrville continues to develop.

1) Project Prioritization

Each proposed project has been prioritized by a ranking system identifying four major Categories: Public Safety, Economic Effect(s), Project Timing and Environmental. Each category contains subcategories that relate to each project individually and can be graded based on severity. Each project is intended to be graded individually producing a score and effectively ranking each project. After each project was graded on each subcategory, the next step was to weigh each category based on relative importance to one another.

2) Category Ranking Criteria

Categories are given a weighted value based on importance over another using a “Pairwise” process. This process is operated through a simple, customizable table which can be restructured and utilized in different ranking conditions. The goal was to create a ranking process in which will yield consistent results considering the different aspects of the projects. A scale of 1 to 3 is used to score each categories importance, and by scoring each category against another, we can determine which category is considered most to least important. A score of 1 being of least importance and a score of 3 being most important, a higher weighted value is assigned to the most important category and a lower weighted value to the least important.

LNV’s intent was to tailor the method of rankings based on the city of Kerrville’s specific needs and considerations; by allowing the city officials to prioritize each category, this ranking process will ultimately be utilized directly for and directly based by the city of Kerrville representatives.

Criteria	Public Safety	Economic	Project Timing	Environment	CATEGORY WEIGHT	RANK
Public Safety		3	3	3	9	1
Economic	1		3	2	6	2
Project Timing	1	1		2	4	4
Environment	1	2	3		6	2

3) Criteria Identification

After LNV's and city of Kerrville's cooperative efforts, project ranking and prioritizations were evaluated by the following principles:

- **Public Safety (53%)** – This principal considers overall public safety during major rainfall events. Risk of structural flooding, roadway flooding, emergency services access, frequency of flood damages and erosion/channel stability concerns are measured by individual severity to the general public's safety. Post-project level of protection is also weighted in this category. Infrastructure damage, at risk velocity and emergency access during large rain events, is highly weighed in this category.

Category	Category Weight	Sub Category	Point Value Range Description	Point Value
Public Safety	9	Structural Flooding for 100-year (1% AEP), estimated (Pre-Project Conditions)	Low Risk (0 structures flooded)	0
			Moderate Risk (1-10 structures flooded)	5
			High Risk (10+ structures flooded or critical facility effected)	10
		Roadway Flooding for 100-Year (1% AEP) (Pre-Project Conditions)	No road overtopping	0
			Local road overtopping	4
			Collector road overtopping	7
			Arterial road overtopping	10
		Roadway Emergency Services Access for 25-year (4% AEP) storm-event (Pre-Project Conditions)	Access not impacted	0
			Access minimally impacted	2
			Alternative route required / limited access (duration $0 \leq x \leq 1$ hour)	6
			No access or alternative route available (duration $x \geq 1$ hour)	10
		Frequency of Flood Damages (Pre-Project Conditions)	Minimal (100-year < X)	1
			Moderate (25-year < X ≤ 100-year)	4
			High (1-year < X ≤ 25-year)	7
			Very High (X ≤ 1-year)	10
		Erosion / Channel Stability	No Erosion	0
			Stable (minimal erosion)	2
			Unstable (risk of property loss)	6
			Highly unstable (risk of structure damage or accelerated property loss)	10
		Drainage Service (Post-Project Protection)	≤10 Year (10% AEP)	1
			10 Year (10% AEP) - 25-Year (4% AEP)	4
			25 Year (4% AEP) - 100-Year (1% AEP)	6
			≥100-Year (1% AEP)	10

- **Economic (18%)** – This principal considers the cost-effectiveness of each proposed project. It is important for the city to acknowledge that each project will vary in scale and in price. Project cost, funding sources/availability, and the potential for development/redevelopment are considered to account for the overall economic stability of the city and potential growth the city may encounter when improvements are complete.

Category	Category Weight	Sub Category	Point Value Range Description	Point Value
Economic	6	Project Cost	High Cost (\$2 million < X)	2
			Moderate Cost (\$1 million < X ≤ \$2 million)	6
			Low Cost (≥ \$1 million)	10
		Funding Source / Availability	Unidentified funding sources	0
			General Fund	4
			Future Municipal Bonds (2020-? Bond Program)	7
			Cost-Share Potential (Federal or State grants, Inter-local agreements)	10
		Development/Redevelopment Post-Project (residential and commercial)	Negative impact (reduced development and/or business potential)	0
			No significant impact (no change to development and/or business potential)	5
			Positive impact (development potential, improved land value, sales, etc.)	10

- **Project Timing (11%)** – Permitting, land/easement acquisition needs, project readiness, and project dependency for implementation are accounted for to understand the overall difficulty for the project to effectively be ready for groundbreaking. State and Federal permitting may prove to have lengthy application scenarios and, in some cases, can add substantial costs and fees to a project.

Category	Category Weight	Sub Category	Point Value Range Description	Point Value
Project Timing	4	Permitting	Significant Permitting & Mitigation	0
			Federal permitting (Section 404 IP, other)	2
			Limited permitting local/state/federal (Nationwide, TCEQ WPAP)	6
			Local permitting only	10
		Land/Easement Acquisition	Condemnation/buy-outs may be required	1
			Limited easement/land acquisition needs (no impact to structures)	3
			No additional easements or property acquisition anticipated	5
		Project Readiness (est. time until completion)	Long Range ($X > 2$ years)	1
			Mid-Range ($1\text{-year} < X \leq 2\text{ year}$)	3
			Short-Range ($X \leq 1\text{ year}$)	5
		Project Dependency	Project is dependent on other upstream/downstream improvements occurring before this project to mitigate flooding issues	0
			Project is independent of any upstream/downstream improvements to mitigate flooding issues	5
			Project must be constructed before other related projects to solve flooding issues in basin	10

- **Environment (18%)** – Environmental properties such as water quality impacts and riparian habitat impacts are also considered to weigh each project’s potential for significantly changing natural habitat and/or ability to create or change water quality characteristics in the future.

Category	Category Weight	Sub Category	Point Value Range Description	Point Value
Environment	6	Water Quality Impacts Post-Project	Negative impact (WQ reduced due to increased impervious cover, etc.)	0
			No significant impact	7
			Positive impact (WQ enhanced with LID/BMP features)	15
		Riparian Impacts Post-Project (habitat, natural waterways, trees, wetlands, etc.)	Negative impacts (loss of natural riparian areas)	0
			No impacts (no significant change to natural riparian areas)	7
			Positive impacts (preserves or creates natural riparian areas)	15

Ranking order should not be relied upon to determine the exact order of project implementation but rather be utilized as a useful guide with a system that ensures consistent results. Point values, ranges and subcategories are also interchangeable and can be substituted for qualities or quantities city officials see fit. It is important to note if modifications are made, they are made with similar considerations described in this methodology.

Full CIP ranking criteria and project scoring are available in this appendix.

City of Kerrville Stormwater Master Plan - CIP Ranking Criteria					1		2		3		4		5	
Category	Category Weight	Sub Category	Point Value Range Description	Point Value	A. Pinto Trail Project Score	Weighted Score	B. Park Street Project Score	Weighted Score	C. First Street Project Score	Weighted Score	D. Fourth Street Project Score	Weighted Score	E. Spring Drive Project Score	Weighted Score
Public Safety	9	Structural Flooding/Losses for 100-year (1% AEP), estimated (Pre-Project Conditions)	Low Risk (0 structures damaged) Moderate Risk (1-10 structures damaged) High Risk (10+ structures damaged or critical facility effected)	0 5 10	5	45	10	90	10	90	5	45	0	0
		Roadway Flooding for 100-Year (1% AEP) (Pre-Project Conditions)	No road overtopping Local road overtopping Collector road overtopping Arterial road overtopping	0 4 7 10	7	63	4	36	4	36	4	36	0	0
		Roadway Emergency Services Access for 25-year (4% AEP) storm-event (Pre-Project Conditions)	Access not impacted Access minimally impacted Alternative route required / limited access (duration 0 ≤ x ≤ 1 hour) No access or alternative route available (duration x ≥ 1 hour)	0 2 6 10	2	18	6	54	6	54	6	54	0	0
		Frequency of Flood Damages (Pre-Project Conditions)	Minimal (100-year < X) Moderate (25-year < X ≤ 100-year) High (1-year < X ≤ 25-year) Very High (X ≤ 1-year)	1 4 7 10	4	36	10	90	10	90	10	90	10	90
		Erosion / Channel Stability	No Erosion Stable (minimal erosion) Unstable (risk of property loss) Highly unstable (risk of structure damage or accelerated property loss)	0 2 6 10	10	90	2	18	2	18	2	18	10	90
		Level of Protection Benefit (Post-Project Protection)	≤10 Year (10% AEP) 10 Year (10% AEP) - 25-Year (4% AEP) 25 Year (4% AEP) - 100-Year (1% AEP) ≥100-Year (1% AEP)	1 4 6 10	10	90	1	9	1	9	1	9	10	90
		Economic	6	Project Cost	High Cost (\$2 million < X) Moderate Cost (\$1 million < X ≤ \$2 million) Low Cost (\$1 million ≥ X)	2 6 10	6	36	2	12	2	12	2	12
Funding Source / Availability	Unidentified funding sources General Fund Future Municipal Bonds (2020-? Bond Program) Cost-Share Potential (Federal or State grants, Inter-local agreements)			0 4 7 10	4	24	0	0	0	0	0	0	4	24
Development/Redevelopment Post-Project (residential and commercial)	Negative impact (reduced development and/or business potential) No significant impact (no change to development and/or business potential) Positive impact (development potential, improved land value, sales, etc.)			0 5 10	10	60	5	30	5	30	5	30	5	30
Project Timing	4	Permitting	Significant Permitting & Mitigation Federal permitting (Section 404 IP, other) Limited permitting local/state/federal (Nationwide, TCEQ WPAP, FEMA) Local permitting only	0 2 6 10	10	40	6	24	6	24	6	24	6	24
		Land/Easement Acquisition	Condemnation/buy-outs may be required Limited easement/land acquisition needs (no impact to structures) No additional easements or property acquisition anticipated	1 3 5	3	12	1	4	1	4	1	4	5	20
		Project Readiness (est. time until completion)	Long Range (X > 2 years) Mid-Range (1-year < X ≤ 2 year) Short-Range (X ≤ 1 year)	1 3 5	3	12	1	4	1	4	1	4	5	20
		Project Dependency	Project is dependent on other upstream/downstream improvements occurring before this project to mitigate flooding issues Project is independent of any upstream/downstream improvements to mitigate flooding issues Project must be constructed before other related projects to solve flooding issues in basin	0 5 10	5	20	0	0	0	0	0	0	5	20
Environment	6	Water Quality Impacts Post-Project	Negative impact (WQ reduced due to increased impervious cover, etc.) No significant impact Positive impact (WQ enhanced with LID/BMP features)	0 7 15	7	42	7	42	7	42	7	42	7	42
		Riparian Impacts Post-Project (habitat, natural waterways, trees, wetlands, etc.)	Negative impacts (loss of natural riparian areas) No impacts (no significant change to natural riparian areas) Positive impacts (preserves or creates natural riparian areas)	0 7 15	0	0	0	0	0	0	0	0	7	42
* AEP = Annual Exceedance Probability				Public Safety Score (Max = 540)		342		297		297		252		270
				Economic Score (Max = 180)		120		42		42		42		90
				Project Timing Score (Max = 120)		84		32		32		32		84
				Environment Score (Max = 180)		42		42		42		42		84
				Total Score (Max = 1020)		588		413		413		368		528
				Rank		5		11		11		13		9

City of Kerrville Stormwater Master Plan - CIP Ranking Criteria					6	7 & 8		9	10				
Category	Category Weight	Sub Category	Point Value Range Description	Point Value	F. Hill Project Score	Country Drive Weighted Score	G.H. Kroc & Clay Project Score	Weighted Score	I. Take It Easy Project Score	Weighted Score	J. Lois Street Project Score	Weighted Score	
Public Safety	9	Structural Flooding/Losses for 100-year (1% AEP), estimated (Pre-Project Conditions)	Low Risk (0 structures damaged)	0	10	90	10	90	10	90	10	90	
			Moderate Risk (1-10 structures damaged)	5									
			High Risk (10+ structures damaged or critical facility effected)	10									
		Roadway Flooding for 100-Year (1% AEP) (Pre-Project Conditions)	No road overtopping	0	7	63	10	90	10	90	10	90	
			Local road overtopping	4									
			Collector road overtopping	7									
			Arterial road overtopping	10									
Roadway Emergency Services Access for 25-year (4% AEP) storm-event (Pre-Project Conditions)	Access not impacted	0	10	90	6	54	6	54	6	54			
	Access minimally impacted	2											
	Alternative route required / limited access (duration 0 ≤ x ≤ 1 hour)	6											
	No access or alternative route available (duration x ≥ 1 hour)	10											
Frequency of Flood Damages (Pre-Project Conditions)	Minimal (100-year < X)	1	10	90	10	90	7	63	10	90			
	Moderate (25-year < X ≤ 100-year)	4											
	High (1-year < X ≤ 25-year)	7											
	Very High (X ≤ 1-year)	10											
Erosion / Channel Stability	No Erosion	0	2	18	0	0	10	90	2	18			
	Stable (minimal erosion)	2											
	Unstable (risk of property loss)	6											
	Highly unstable (risk of structure damage or accelerated property loss)	10											
Level of Protection Benefit (Post-Project Protection)	≤10 Year (10% AEP)	1	6	54	6	54	10	90	10	90			
	10 Year (10% AEP) - 25-Year (4% AEP)	4											
	25 Year (4% AEP) - 100-Year (1% AEP)	6											
	≥100-Year (1% AEP)	10											
Economic	6	Project Cost	High Cost (\$2 million < X)	2	2	12	2	12	2	12	6	36	
			Moderate Cost (\$1 million < X ≤ \$2 million)	6									
			Low Cost (\$1 million ≥ X)	10									
		Funding Source / Availability	Unidentified funding sources	0	4	24	7	42	7	42	7	42	
			General Fund	4									
Development/Redevelopment Post-Project (residential and commercial)	Future Municipal Bonds (2020-? Bond Program)	7	10	60	10	60	10	60	10	60			
	Cost-Share Potential (Federal or State grants, Inter-local agreements)	10											
Project Timing	4	Permitting	Negative impact (reduced development and/or business potential)	0	10	60	10	60	10	60	10	60	
			No significant impact (no change to development and/or business potential)	5									
			Positive impact (development potential, improved land value, sales, etc.)	10									
			Significant Permitting & Mitigation	0									
		Land/Easement Acquisition	Federal permitting (Section 404 IP, other)	2	5	20	5	20	5	20	5	20	
			Limited permitting local/state/federal (Nationwide, TCEQ WPAP, FEMA)	6									
			Local permitting only	10									
Project Readiness (est. time until completion)	Condemnation/buy-outs may be required	1	3	12	1	4	3	12	5	20			
	Limited easement/land acquisition needs (no impact to structures)	3											
	No additional easements or property acquisition anticipated	5											
Project Dependency	Long Range (X > 2 years)	1	5	20	5	20	10	40	0	0			
	Mid-Range (1-year < X ≤ 2 year)	3											
	Short-Range (X ≤ 1 year)	5											
Environment	6	Water Quality Impacts Post-Project	Project is dependent on other upstream/downstream improvements occurring before this project to mitigate flooding issues	0	7	42	7	42	7	42	7	42	
			Project is independent of any upstream/downstream improvements to mitigate flooding issues	5									
			Project must be constructed before other related projects to solve flooding issues in basin	10									
		Negative impact (WQ reduced due to increased impervious cover, etc.)	0										
		No significant impact	7										
Riparian Impacts Post-Project (habitat, natural waterways, trees, wetlands, etc.)	Positive impact (WQ enhanced with LID/BMP features)	15	7	42	7	42	7	42	7	42			
	Negative impacts (loss of natural riparian areas)	0											
	No impacts (no significant change to natural riparian areas)	7											
* AEP = Annual Exceedance Probability					Positive impacts (preserves or creates natural riparian areas)	15							
					Public Safety Score (Max = 540)	405		378		477		432	
					Economic Score (Max = 180)	96		114		114		138	
					Project Timing Score (Max = 120)	92		68		96		64	
					Environment Score (Max = 180)	84		84		84		84	
					Total Score (Max = 1020)	677		644		771		718	
					Rank	3		4		1		2	

City of Kerrville Stormwater Master Plan - CIP Ranking Criteria					11		11a		12		13			
Category	Category Weight	Sub Category	Point Value Range Description	Point Value	K1. Harper Street Project Score	Weighted Score	K2. Circle Avenue Project Score	Weighted Score	L. Jack Drive Project Score	Weighted Score	M. Coronado Drive Project Score	Weighted Score		
Public Safety	9	Structural Flooding/Losses for 100-year (1% AEP), estimated (Pre-Project Conditions)	Low Risk (0 structures damaged) Moderate Risk (1-10 structures damaged) High Risk (10+ structures damaged or critical facility effected)	0 5 10	5	45	0	0	10	90	0	0		
		Roadway Flooding for 100-Year (1% AEP) (Pre-Project Conditions)	No road overtopping Local road overtopping Collector road overtopping Arterial road overtopping	0 4 7 10	4	36	4	36	4	36	7	63		
		Roadway Emergency Services Access for 25-year (4% AEP) storm-event (Pre-Project Conditions)	Access not impacted Access minimally impacted Alternative route required / limited access (duration 0 ≤ x ≤ 1 hour) No access or alternative route available (duration x ≥ 1 hour)	0 2 6 10	6	54	2	18	2	18	6	54		
		Frequency of Flood Damages (Pre-Project Conditions)	Minimal (100-year < X) Moderate (25-year < X ≤ 100-year) High (1-year < X ≤ 25-year) Very High (X ≤ 1-year)	1 4 7 10	7	63	7	63	10	90	7	63		
		Erosion / Channel Stability	No Erosion Stable (minimal erosion) Unstable (risk of property loss) Highly unstable (risk of structure damage or accelerated property loss)	0 2 6 10	0	0	10	90	0	0	0	0		
		Level of Protection Benefit (Post-Project Protection)	≤10 Year (10% AEP) 10 Year (10% AEP) - 25-Year (4% AEP) 25 Year (4% AEP) - 100-Year (1% AEP) ≥100-Year (1% AEP)	1 4 6 10	6	54	10	90	6	54	6	54		
		Economic	6	Project Cost	High Cost (\$2 million < X) Moderate Cost (\$1 million < X ≤ \$2 million) Low Cost (\$1 million ≥ X)	2 6 10	2	12	10	60	2	12	10	60
Funding Source / Availability	Unidentified funding sources General Fund Future Municipal Bonds (2020-? Bond Program) Cost-Share Potential (Federal or State grants, Inter-local agreements)			0 4 7 10	4	24	4	24	4	24	10	60		
Development/Redevelopment Post-Project (residential and commercial)	Negative impact (reduced development and/or business potential) No significant impact (no change to development and/or business potential) Positive impact (development potential, improved land value, sales, etc.)			0 5 10	10	60	5	30	10	60	5	30		
Project Timing	4	Permitting	Significant Permitting & Mitigation Federal permitting (Section 404 IP, other) Limited permitting local/state/federal (Nationwide, TCEQ WPAP, FEMA) Local permitting only	0 2 6 10	10	40	10	40	10	40	6	24		
		Land/Easement Acquisition	Condemnation/buy-outs may be required Limited easement/land acquisition needs (no impact to structures) No additional easements or property acquisition anticipated	1 3 5	5	20	3	12	3	12	5	20		
		Project Readiness (est. time until completion)	Long Range (X > 2 years) Mid-Range (1-year < X ≤ 2 year) Short-Range (X ≤ 1 year)	1 3 5	3	12	5	20	3	12	5	20		
		Project Dependency	Project is dependent on other upstream/downstream improvements occurring before this project to mitigate flooding issues Project is independent of any upstream/downstream improvements to mitigate flooding issues Project must be constructed before other related projects to solve flooding issues in basin	0 5 10	5	20	5	20	5	20	5	20		
Environment	6	Water Quality Impacts Post-Project	Negative impact (WQ reduced due to increased impervious cover, etc.) No significant impact Positive impact (WQ enhanced with LID/BMP features)	0 7 15	7	42	7	42	7	42	7	42		
		Riparian Impacts Post-Project (habitat, natural waterways, trees, wetlands, etc.)	Negative impacts (loss of natural riparian areas) No impacts (no significant change to natural riparian areas) Positive impacts (preserves or creates natural riparian areas)	0 7 15	7	42	7	42	7	42	7	42		
* AEP = Annual Exceedance Probability					Public Safety Score (Max = 540)		252		297		234			
					Economic Score (Max = 180)		96		114		96		150	
					Project Timing Score (Max = 120)		92		92		84		84	
					Environment Score (Max = 180)		84		84		84		84	
					Total Score (Max = 1020)		524		587		552		552	
					Rank		10		6		7		7	





**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Purchase of Bobcat Skid Steer T870 in the amount of \$68,807.90.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 09, 2020

SUBMITTED BY: Stuart Barron

EXHIBITS: [20200114_Quote_Bobcat Skid Loader T870 - Street Division.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
\$68,807.90	\$70,000	\$70,000	18-1800-5300

PAYMENT TO BE MADE TO: Bobcat or authorized dealer, via Buyboard Contract # 597-19

Kerrville 2050 Item?	Yes
Key Priority Area	M - Mobility / Transportation
Guiding Principle	M4. Place a high priority on the maintenance of existing streets
Action Item	M4.2 - Continue implementing the plan for street repairs, including a timeline and funding, based on the road conditions data collection and evaluation completed in 2016

SUMMARY STATEMENT:

It is necessary to replace the Street Division existing skid loader with a new, larger, upgraded model. The current skid loader is a 2001 Bobcat 863 with 3005 service hours and not capable of running many attachments including the asphalt milling attachment, which is a critical component of the Street Division milling and overlay operations. The budgeted Bobcat Skid Loader T870 will allow for faster and more reliable milling operations and will be a valuable asset in many aspects of Street Division operations to include paving, drainage and general maintenance.

RECOMMENDED ACTION:

Approve purchase of Bobcat T870 from BuyBoard Purchasing Co-Op.



Bobcat

Product Quotation

Quotation Number: HMM-18937v1

Date: 2019-12-10 21:26:21

Customer Name/Address:

CITY OF KERRVILLE
Attn: BRANDON
800 JUNCTION HWY
KERRVILLE, TX 78028

Bobcat Delivering Dealer

Ranchers ATV and Tractor,
Kerrville, TX
2330 JUNCTION HWY
KERRVILLE TX 78028
Phone: 830-315-2330
Fax:

ORDERS TO BE PLACED WITH:
Contract Holder/Manufacturer

Clark Equipment Company dba
Bobcat Company
PO Box 6000
West Fargo, ND 58078
Phone: 701-241-8719
Fax: 701-280-7860
Contact: Heather Messmer
Heather.Messmer@doosan.com

Description

T870 T4 Bobcat Compact Track Loader

100 HP Turbo Tier 4 Diesel Engine
2 Speed Travel
Air Intake Heater (Automatically Activated)
Auxiliary Hydraulics: Variable Flow
Backup Alarm
Bob-Tach
Bobcat Interlock Control System (BICS)
Controls: Bobcat Standard Controls with Power Assist
Enclosed Cab with Air Conditioning & Heat
Engine/Hydraulic Systems Shutdown
Horn
Instrumentation: Engine Temperature & Fuel
Gauges, Hourmeter, RPM and Warning Lights
Lift Arm Support

Part No

M0293

Qty

1

Price Ea.

\$63,666.40

Total

\$63,666.40

Lift Path: Vertical
Lights, Front & Rear
Operator Cab

- Includes: Adjustable Suspension Seat, Top & Rear Windows, Seat Bar and 3-Point Seat Belt
- Roll Over Protective Structure (ROPS) meets SAE-J1040 & ISO 3471
- Falling Object Protective Structure (FOPS) meets SAE-J1043 & ISO 3449, Level I; (Level II is available through Bobcat Parts)

Parking Brake: Spring Applied, Pressure Released (SAPR)

Power Bob-Tach

Torsion Suspension with 5 Rollers

Tracks: Rubber, 17.7" wide

Warranty: 2 years, or 2000 hours whichever occurs first

A91 Option Package

High Flow Hydraulics
Sound Reduction
Hydraulic Bucket Positioning

M0293-P01-A91

1

\$2,849.00

\$2,849.00

Deluxe Instrument Panel

Keyless Start

Attachment Control Kit

Cab Accessories Package

Selectable Joystick Controls (SJC)
Heated Air Ride Suspension Seat - Cloth
Radio
Reversing Fan
Automatic Ride Control
Telematics US

M0293-R01-C04

1

\$661.50

\$661.50

M0293-R05-C12

1

\$332.50

\$332.50

M0293-R26-C02

1

\$348.60

\$348.60

M0293-R32-C02

1

\$431.20

\$431.20

M0293-R33-C02

1

\$518.70

\$518.70

M0293-R51-C02

1

\$0.00

\$0.00

Total of Items Quoted

\$68,807.90

Dealer Assembly Charges

\$0.00

Quote Total - US dollars

\$68,807.90

Notes:

***Prices per the TX - Buyboard Contract# 597-19**

***Must be a Coop Member to purchase off contract**

***Terms Net 30 Days. Credit cards accepted.**

***FOB Destination within the 48 Contiguous States.**

***Delivery: 60 to 90 days from ARO.**

***State Sales Taxes apply.**

***ORDERS TO BE PLACED WITH: Clark Equipment Company dba Bobcat Company, 250 E. Beaton Drive, PO Box 6000, West Fargo, ND 58078**

Prices & Specifications are subject to change. Please call before placing an order. Applies to factory ordered units only.

ORDER ACCEPTED BY:

SIGNATURE

DATED

PRINT NAME AND TITLE

PURCHASE ORDER #

SHIP TO ADDRESS: _____

BILL TO ADDRESS (if different than Ship To): _____





**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Minutes for the City Council Workshop held December 10, 2019.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 07, 2019

SUBMITTED BY: Kayla McInturff

EXHIBITS: [20200114_Minutes_Workshop 4pm on 12-10-19.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Minutes for the City Council Workshop held on December 10, 2019 at 4:00 p.m.

RECOMMENDED ACTION:

Approve minutes as presented.

CALL TO ORDER

On December 10, 2019, at 4:00 p.m., the Kerrville City Council Workshop was called to order by Mayor Bill Blackburn in Council Chambers at 701 Main Street.

COUNCILMEMBERS PRESENT:

Bill Blackburn	Mayor
Kim Clarkson	Councilmember Place 2
Judy Eychner	Councilmember Place 3
Delayne Sigerman	Councilmember Place 4

COUNCILMEMBER ABSENT:

Gary Cochrane	Councilmember Place 1
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CITY STAFF PRESENT:

Mark McDaniel	City Manager
E.A. Hoppe	Deputy City Manager
Mike Hayes	City Attorney
Shelley McElhannon	City Secretary
Ashlea Boyle	Director of Parks and Recreation
Stuart Cunyus	Public Information Officer
Amy Dozier	Chief Financial Officer
Kim Meisner	Executive Director of General Operations
Sherry Mosier	Manager of Strategic Initiatives
Dannie Smith	Fire Chief

VISITORS PRESENT: On file in City Secretary's Office for required retention period.

1. INFORMATION AND DISCUSSION

1.A. Boating Center Presentation

Mark McDaniel summarized the item, Sherry Mosier introduced the item, and Kimley-Horn Consultant, Austin Powers, provided a presentation on a prospective Nimitz Lake Boating Center. Mark McDaniel and Austin Powers responded to questions by City Council. At the request of Mayor Blackburn, citizen John Anderson offered his perspective on a Boating Center and responded to Council questions.

2. RECESS

The workshop was recessed by Mayor Blackburn at 4:41 p.m.

3. RECONVENE

The workshop was reconvened by Mayor Blackburn in the upstairs large conference room at 5:04 p.m.

4. EXECUTIVE SESSION

Councilmember Delayne Sigerman made a motion the City Council adjourn into closed executive session under 551.072 (deliberation regarding real property) and 551.087 (business prospect /economic development) of Chapter 551, Texas Government Code, and Councilmember Judy Eychner seconded. The motion passed 4-0.

Mayor Blackburn recessed the open session at 5:04 p.m., and Council adjourned into closed executive session.

4.A. Hotel/conference center project (551.087)

4.B. Sky Master business development project (551.072, 551.087)

4.C. A.C. Schreiner House public-private partnership project (551.072, 551.087)

The closed executive session recessed, and Council returned to open session at 5:48 p.m.

5. ACTION ON ITEMS DISCUSSED IN EXECUTIVE SESSION IF ANY

No action was taken in executive session.

ADJOURNMENT

The meeting was adjourned at 5:49 p.m.

APPROVED: _____

APPROVED:

ATTEST:

Bill Blackburn, Mayor

Shelley McElhannon, City Secretary



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Minutes for the City Council regular meeting on December 10, 2019 at 6pm.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 22, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Minutes_Regular meeting 6pm on 12-10-19.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Minutes from the December 10, 2019 regular meeting at 6:00 p.m.

RECOMMENDED ACTION:

Approve minutes as presented.

CITY COUNCIL MINUTES
REGULAR MEETING

KERRVILLE, TEXAS
DECEMBER 10, 2019

On December 10, 2019, at 6:00 p.m. the meeting was called to order by Mayor Bill Blackburn in the City Hall Council Chambers at 701 Main Street. The invocation was offered by Mayor Blackburn, followed by the Pledge of Allegiance led by the TallyBots Robotics Team.

COUNCILMEMBERS PRESENT:

Bill Blackburn	Mayor
Kim Clarkson	Councilmember
Judy Eychner	Councilmember
Delayne Sigerman	Councilmember

COUNCILMEMBER ABSENT:

Gary Cochrane	Councilmember
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CITY EXECUTIVE STAFF PRESENT:

Mark McDaniel	City Manager
E.A. Hoppe	Deputy City Manager
Mike Hayes	City Attorney
Shelley McElhannon	City Secretary
Stuart Barron	Director of Public Works
Kyle Burow	Director of Engineering
Stuart Cunyus	Public Information Officer
David Knight	Chief of Police
Kim Meisner	Executive Director of General Operations
Sherry Mosier	Manager of Strategic Initiatives
Dannie Smith	Fire Chief

VISITORS PRESENT: On file in City Secretary's Office for required retention period.

1. ANNOUNCEMENTS OF COMMUNITY INTEREST:

Items of Interest to the Community were presented by Stuart Cunyus, Councilmember Delayne Sigerman, and Councilmember Judy Eychner.

2. VISITORS FORUM:

The following persons spoke:

- The Tallybots Robotics 5th Grade Team from Tally Elementary
- Peggy McKay
- John Brown
- Jack Pratt

3. CONSENT AGENDA:

Mayor Blackburn requested to pull item 3H from the Consent Agenda. Councilmember Eychner moved to approve items 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3I, and 3J as presented. Councilmember Sigerman seconded, and the motion passed 4-0.

3A. Resolution No. 51-2019. A Resolution authorizing a banking services agreement with Wells Fargo Bank, N.A.

3B. Resolution No. 53-2019. A Resolution adopting the City of Kerrville Investment Policy and Strategy regarding the investment of city funds, in accordance with the Public Funds Investment Act.

3C. Resolution No. 54-2019. A Resolution requesting financial assistance from the Texas Water Development Board (Clean Water State Revolving Fund) to finance certain improvements to the City's water system; authorizing the filing of an application for financial assistance; and making certain findings in connection therewith.

3D. Resolution No. 55-2019. A Resolution amending Resolution No. 28-2019, which recreated the Kerrville Main Street Advisory Board, by allowing for non-voting Ex Officio Members.

3E. Resolution No. 56-2019. A Resolution authorizing the filing of an application with the Alamo Area Council of Governments for a 2020/2021 Solid Waste Pass through Grant.

3F. Joint Election Agreement between the City of Kerrville and Kerr County for the May 2, 2020 City General Election.

3G. Purchase new Case Backhoe 590 Super N 4WD Extendahoe.

3I. Minutes for the City Council meeting held November 12, 2019.

3J. Minutes for the City Council Official Canvass of Election Results and City Council workshop held November 18, 2019.

END OF CONSENT AGENDA

3H. Minutes for the City Council workshop held November 12, 2019.

Mayor Blackburn pointed out the hotel named on page 2 item 4.B. reflects "Springfield" and should be corrected to "Springhill". Councilmember Eychner moved to approve the minutes with an amendment to the name of the hotel to "Springhill". Councilmember Sigerman seconded, and the motion passed 4-0.

4. ORDINANCES, FIRST READING:

4A. Ordinance No. 2020-01. An Ordinance declaring the adoption of amendments to the City of Kerrville, Texas, Charter in accordance with the adoption of propositions A through O and Q at the Special Election held on November 05, 2019; adopting the Charter, as amended; providing a cumulative clause; containing a savings and severability clause; providing an effective date; and providing other matters related to the subject.

The Ordinance caption was read into record by Shelley McElhannon.
Mike Hayes presented information and responded to questions.

Councilmember Eychner moved to approve Ordinance No. 2020-01, and Councilmember Sigerman seconded. The motion passed 4-0.

4B. Ordinance No. 2020-02. An Ordinance amending Chapter 2, "Administration", article IV "Boards and Commissions", section 2-91 "Senior Services Advisory Committee" of the Code of Ordinances of the City of Kerrville, Texas; by amending subsections (A)(1) and (A)(2) to decrease the membership of this committee to 14 members; containing a cumulative clause; containing a savings and severability clause; and providing other matters relating to this subject.

The Ordinance caption was read into record by Shelley McElhannon. Kim Meisner presented information and responded to questions.

Councilmember Sigerman moved to approve Ordinance No. 2020-02, and Councilmember Kim Clarkson seconded. The motion passed 4-0.

5. CONSIDERATION AND POSSIBLE ACTION:

5A. Fourth Amendment to Development Agreement by and between Comanche Trace Ranch and Golf Club, LLLP, a Colorado Limited Liability Limited Partnership; and the City of Kerrville, Texas, for Comanche Trace Ranch and Golf Club.

The Agreement caption was read into record by Shelley McElhannon. E.A. Hoppe presented information and responded to questions.

Councilmember Sigerman moved to authorize the execution of the development agreement fourth amendment, and Councilmember Eychner seconded. The motion passed 4-0.

5B. Professional Services Agreement with Hewitt Engineering, Inc. for the Lois Street and Take-It-Easy RV drainage project in the amount of \$176,800.00.

The Agreement caption was read into record by Shelley McElhannon. Kyle Burow presented information and responded to questions.

Councilmember Eychner moved to accept the professional services agreement with Hewitt Engineering, and Councilmember Sigerman seconded. The motion passed 4-0.

6. INFORMATION AND DISCUSSION:

6A. Financial update for the month ended October 31, 2019.

Amy Dozier presented information and responded to questions.

7. BOARD APPOINTMENTS:

7A. Appointment to the Planning and Zoning Commission.

This item was taken into executive session

8. ITEMS FOR FUTURE AGENDAS:

- Sidewalks for Olympic Drive extension – Councilmember Clarkson

9. EXECUTIVE SESSION:

Councilmember Eychner moved to go into executive session under Section 551.074 (personnel matters) of the Texas Government Code. Councilmember Clarkson seconded, and the motion passed 4-0.

Mayor Blackburn recessed the open session at 6:51 p.m., and Council convened in closed executive session.

9A. Section 551.074, Personnel Matters: Appointments to the Planning and Zoning Commission.

At 7:07 p.m. the Council reconvened in open session.

10. ACTION ON ITEMS DISCUSSED IN EXECUTIVE SESSION, IF ANY:

Councilmember Eychner made a motion that Council make no Planning and Zoning Commission appointments during this meeting, due to a Councilmember's absence. The Planning and Zoning Commission appointments will be deferred, until all Councilmembers are present. Councilmember Sigerman seconded, and the motion passed 4-0.

ADJOURNMENT

The meeting was adjourned at 7:09 p.m.

APPROVED:

ATTEST:

Bill Blackburn, Mayor

Shelley McElhannon, City Secretary

APPROVED BY COUNCIL: _____



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Vintage Heights Development Deal Points.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 07, 2020

SUBMITTED BY: Sherry Mosier

EXHIBITS: [20200114_Powerpoint_Vintage Heights DEAL POINTS presentation.pdf](#)
[20200114_Housing Study Executive Summary.pdf](#)
[20200114_Agreement_Vintage Heights deal points.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	H - Housing
Guiding Principle	H1. Provide a diverse range of housing options to meet the needs and desires of all age groups, income levels, and lifestyles
Action Item	H1.2 - Research potential funding mechanisms for the development of workforce housing, defined as 80% to 120% of area median household income

SUMMARY STATEMENT:

Developer and City representatives heard the comments of the citizens presented at the December 5, 2019 Planning and Zoning Commission public meeting and through various correspondence received regarding this proposed housing development but continues to recognize the need for more attainable quality workforce housing to serve its citizens and local workforce. As a result, City staff has since spent a considerable amount of time negotiating with the Developer to address these concerns and bring forth the following deals points for consideration to be memorialized within a potential future Development Agreement to ensure that we address and mitigate the concerns of the adjacent Riverhills Subdivision while also providing the much needed housing. The deal points are detailed

in the attached deal sheet and summarized below:

The Developer will:

Deal Pt 1 - Fence off the three stub-out streets known as Green Tree Lane, Hickory Hills Lane, and Ridgewood Drive which feed into Riverhill Blvd. requiring the Vintage Heights streets adjacent to Riverhill to be redesigned as cul-de-sacs with no public access through to Riverhill Blvd.

Deal Pt 2 - Install an 8' wooden privacy fence on metal poles along the common boundary with the existing Riverhill neighborhood, subject to modification by mutual agreement of the individual adjacent property owners.

Deal Pts 3, 13 - Leave 40% of the Property as open space (inclusive of parks and storm water detention areas) and develop a trail system, to be deeded to the homeowner's association, with at least two designated parks, inclusive of two (2) playgrounds, which will total approximately 12± acres (or 1 acre per every 42 dwellings) as required by the City's Subdivision Ordinance.

Deal Pt 4 - No lot in Phase I or II will be utilized for townhomes, patio homes, or duplexes.

Deal Pt 5 - Provide secondary/emergency access through future arterial and collector streets with an all-weather surface capable of supporting a 75,000 pound vehicle as necessary to meet the current Fire Code, inclusive of a dedicated temporary fire access easement gated with Knox locks, which will be maintained by the developer until permanent road/remote access is built.

Deal Pts 6, 7 - Comply with City's Subdivision Code, with exception to the waivers as indicated below, and move existing water line to align with future lots within the development as required and identified on the preliminary plat submittal.

Deal Pts 8, 9, 10, 11 - Contract with D.R. Horton (the "Homebuilder") as follows:

- Only single story homes will be built on lots where any portion of the lot is within 100' of the adjacent Riverhill Subdivision.

- All lots abutting Riverhill Subdivision will be at least 50' in width.

- A quality home product that is equal to or better than the "DR Horton" brand of home products comparable with those homes constructed within the Valley Ranch and Redbird Ranch subdivisions located within Bexar County, Texas.

- Landscaping and irrigation packages which encompass both front and back yards.

- 75% Masonry on all homes to include brick, stone, stucco or fiber cement on the first floor.

- 3 tab weathered wood color roof shingles with 25 year warranty.

- 10 year Limited Home Builder's Warranty, Warranty Manual with contact information and

24-hour emergency service numbers, New Home orientation to understand home's features and care.

Deal Pt 12 - A mandatory property owners' association will be formed to maintain all common areas to a standard equal to or better than the maintenance of the City's park system.

In exchange for the redesign and the additional improvements that will be required of Developer, the City will:

Deal Pt 1 - Provide a 45% property tax rebate for 20 years from date initial home is placed on the tax roll.

- To be eligible for rebate, homes must meet the locally applicable definition of workforce housing, which is currently priced at or under \$227K as determined annually by the Texas Department of Housing and Community Affairs in regard to its HOME Funds Program.

- Total rebate will be capped at \$5 million.

Deal Pt 2 - Waive Subdivision Code requirements regarding:

- Length of any streets exceeding 600 feet.

- Extension of stub outs from adjacent Riverhill subdivision.

Deal Pt 3 - Terminate prior development agreement.

Deal Pt 4 - Accept street configurations as consistent with design guidelines.

KERRVILLE 2050 AND WORKFORCE HOUSING

As noted in the Economic Development section of the Kerrville 2050 Comprehensive Plan ("Kerrville 2050"), one of the top challenges facing cities engaged in fostering a favorable climate for growth and development is providing a diversity of attainable housing options for a range of employers and employees in varying income segments.

Workforce housing is defined as 80% to 120% of area median household income and typically represents the housing products which all too often are not addressed by the public sector (low-income housing) or by the private sector (market-rate housing). Development challenges unique to Kerrville make this an even more difficult product to deliver. Housing is a critical element of Kerrville's economic development infrastructure and was identified as a top priority by the community during the strategic planning process for Kerrville 2050 thus, warranting an entire chapter dedicated to Housing.

The Housing section of the 2050 Plan provided that in 2017, the median home price in Kerrville was approximately \$215,000, an increase of nearly 23% over the 2016 price, and

that over the past several years, home price increases have not necessarily been accompanied by increases in household income, negatively affecting housing affordability in Kerrville.

It also presented a history of home sales in the Kerrville market which revealed that the number of home sales over the past 6 years increased at a 10.4% annual rate and the value of total home sales increased at a 17.4% annual rate. Average and median home sale prices increased at annual rates of 6.4% and 6.8%, respectively. During the same time period, total listings declined at a 17.2% annual rate, bringing the months of inventory down to 2.7. It was further stated that these indicators typically reflect a robust housing market; however, the relative lack of supply in Kerrville, particularly in the middle market price points, resulted in an imbalance between supply and demand.

It further provided that the strongest sales have been in the \$150,000 to \$250,000 price range, reflecting the “middle market” as previously described. New homes being constructed in the Kerrville market area start at approximately \$300,000 and increase from there. This gap creates a missing middle market niche of for-sale housing. Demand for housing products is the highest in the \$50,000 to \$75,000 household income group, which supports housing prices ranging from \$200,000 to \$250,000. This is the “missing middle” price range that the current market is having difficulty delivering.

These facts are further supported by the Housing Study and Strategic Plan 2019 that was undertaken and adopted by Council in October 2019 as a result of Kerrville 2050. This Housing Plan digs deeper into the specifics of the housing demand and supply situation here in Kerrville as well as recommends strategies to address the issue, one of which suggests incentivizing or financially assisting developers with public infrastructure costs in return for housing developments priced to local workers earning 120% of median income and below. Please see the Executive Summary of the Housing Study and Strategic Plan 2019 attached for reference.

RECOMMENDED ACTION:

Deliberation and possible action.



Vintage Heights

Development Agreement Deal Points

City Council Mtg. January 14, 2020





Kerrville 2050

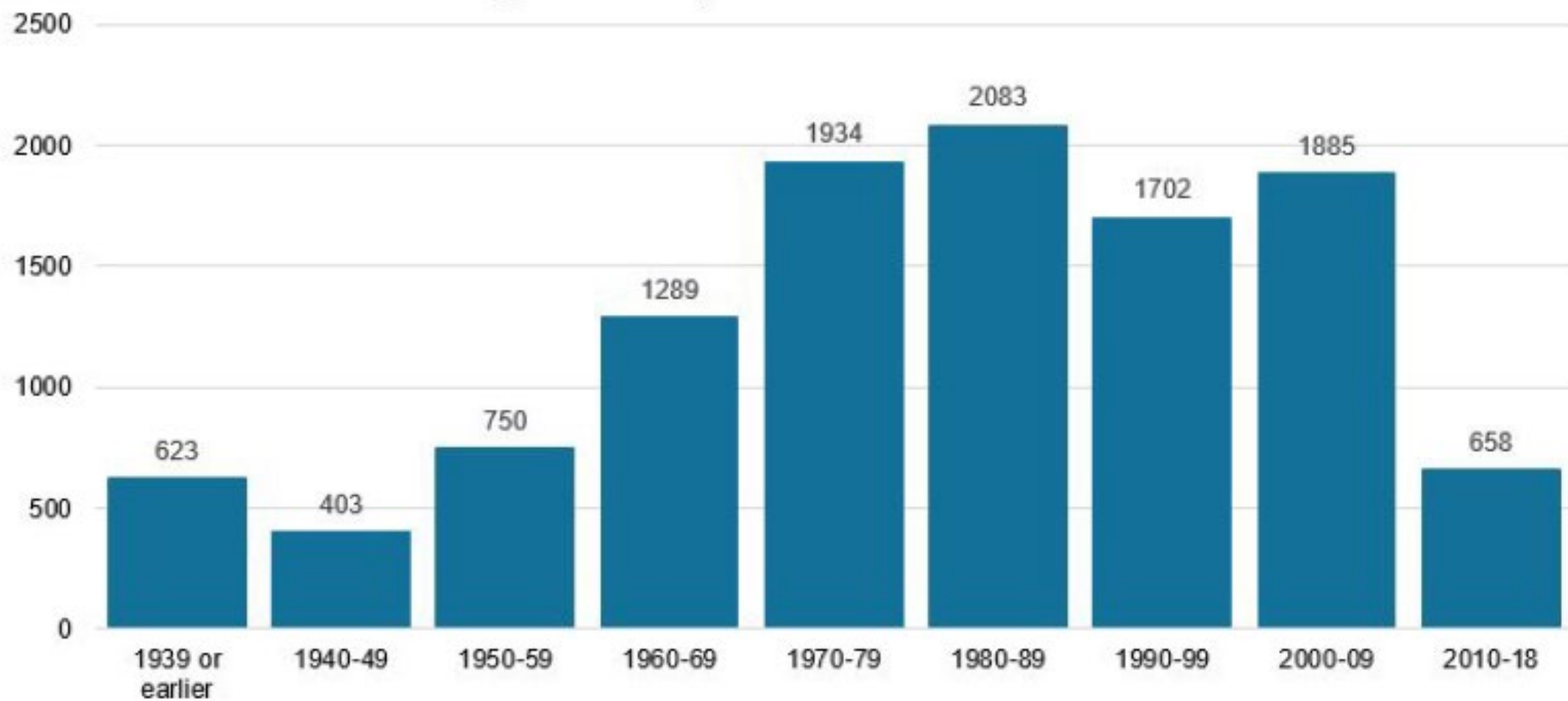
H1

GUIDING PRINCIPLE: Provide a diverse range of housing options to meet the needs and desires of all age groups, income levels, and lifestyles.

Just as a community serves a wide range of resident types, its housing options must serve a wide range of lifestyles. Most communities strive to allow their citizens to “age in place”, that is, they try to provide a range of housing options to accommodate every stage of a person’s life.

- Develop a City-wide strategic housing plan (market supply and demand, “delivery system” capacity, development economics, incentives and tools) with an emphasis on affordable/ workforce housing. A strategic document that effectively articulates the community’s housing vision and provides a roadmap for implementing that vision is another element of marketing Kerrville to the private sector.
- Research potential funding mechanisms for the development of workforce housing, defined as 80% to 120% of area median household income. This general definition of workforce housing represents the housing products which typically aren’t addressed by the public sector (low-income housing) or by the private sector (market-rate housing). Development challenges unique to Kerrville make this an even more difficult product to deliver.

Housing Units by Year Structure Built



FY2019 Home Sales by Price Range

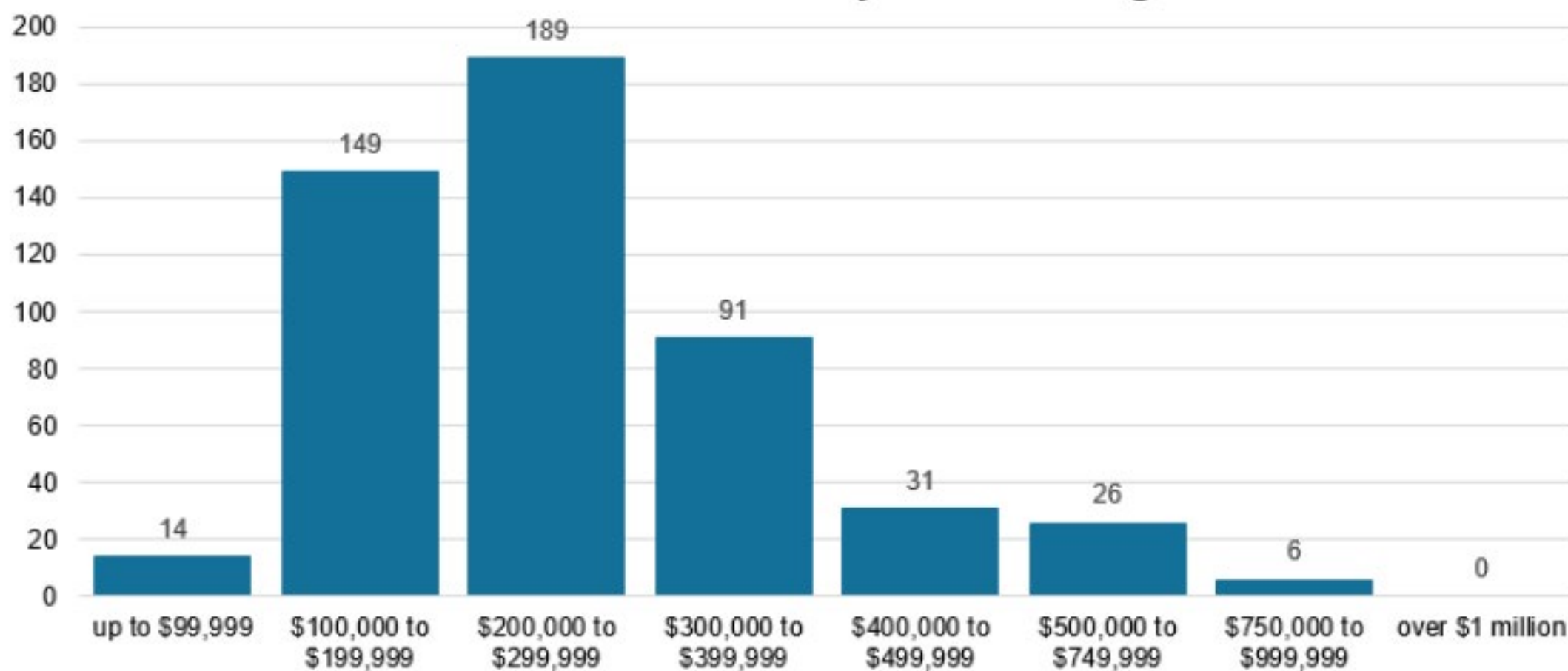
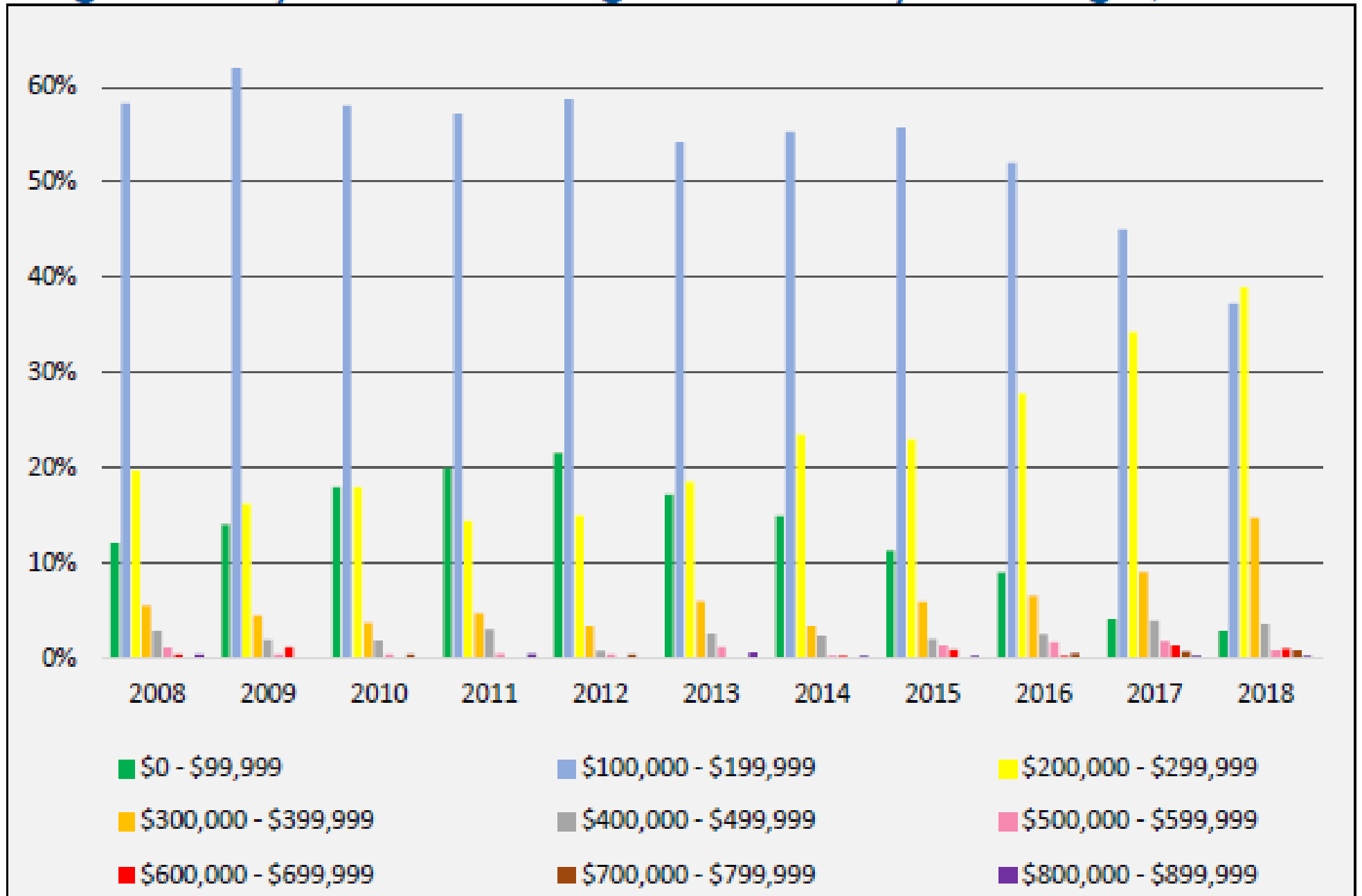


Figure 69: City of Kerrville Existing Homes Sales by Price Ranges, 2008 – 2018



Source: Kerrville Association of Realtors



WELLBORN
 ENGINEERS & SURVEYING

631 Water Street
 Karville, TX 78028
 Phone 830-317-7105
 Texas Registration No. F-7715

wellbornengineering.com

This document is released for interim purposes only. It is incomplete and may not be used for regulatory approval, permit, or construction.

Michael Wellborn, P.E.
 License # 89685

Site Plan Exhibit - Overall

for

Vintage Heights Residential Subdivision

2801 Medina Highway
 Karville, Texas

Revisions		Drawn	Checked	Appr'd	By	Date
1		1.9.2020	Overall	Site	Plan	Entire

Scale 1"=200' for 22"x34" sheets

WES Project No. WEI-19-005

Sheet No.

• • • • •



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Michael Wellborn, P.E.
License # 88885

Site Plan Exhibit - Overall
for
Vintage Heights Residential Subdivision
2601 Medina Highway
Kerrville, Texas

Revisions	No.	Date	Description
	1	1-2-2020	Overall Spec by EHR

Scale
1"=200' for 22"x34" sheets

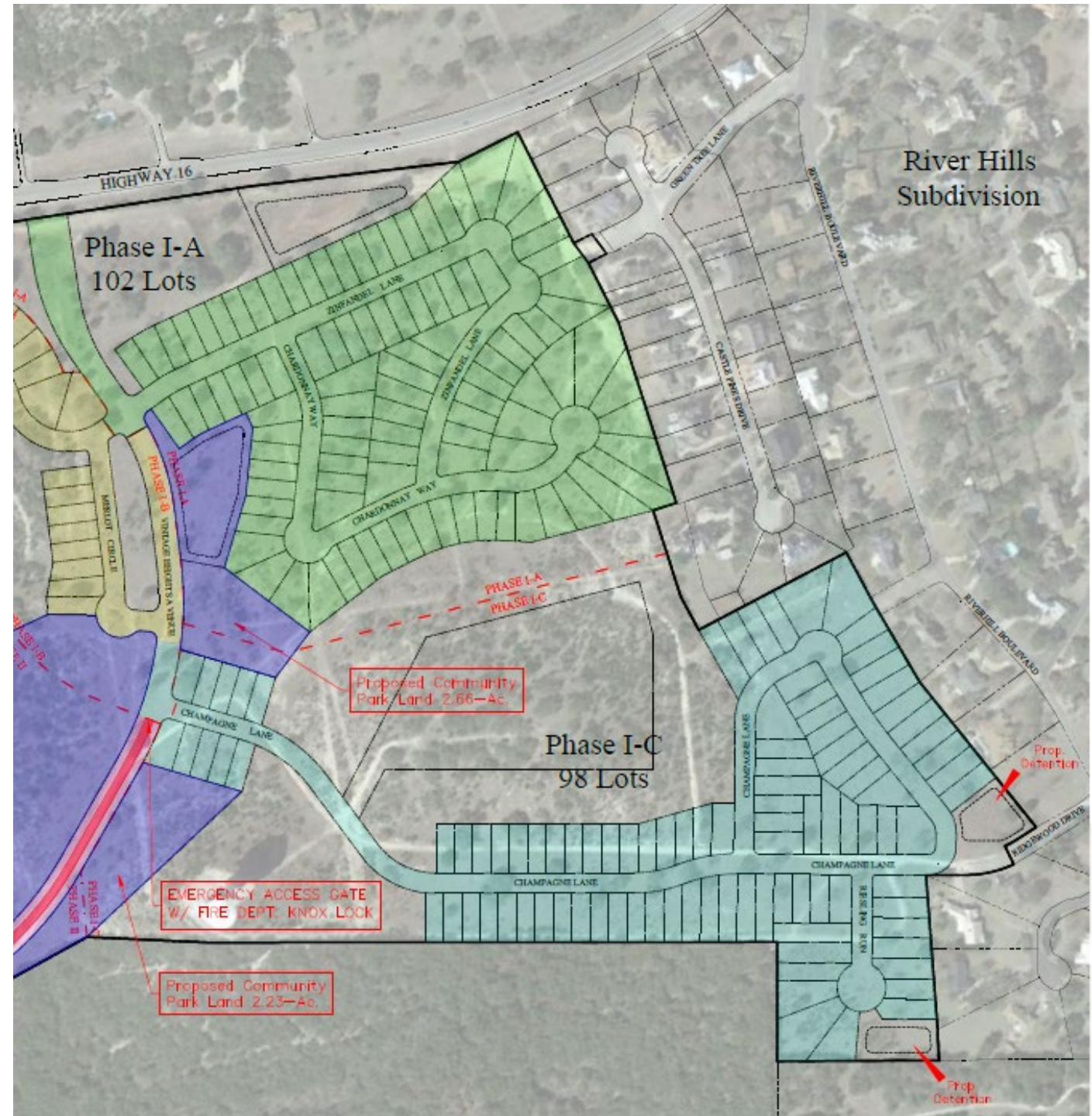
WES Project No.
WE-19-005

Sheet No.

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No Connections into Riverhill

- **No through connection to Riverhill, leaving existing street stub outs on:**
 - Green Tree Lane
 - Hickory Hills Lane
 - Ridgewood Drive
- **Requires City Council waiver of subdivision code requirements**





Additional Requirements

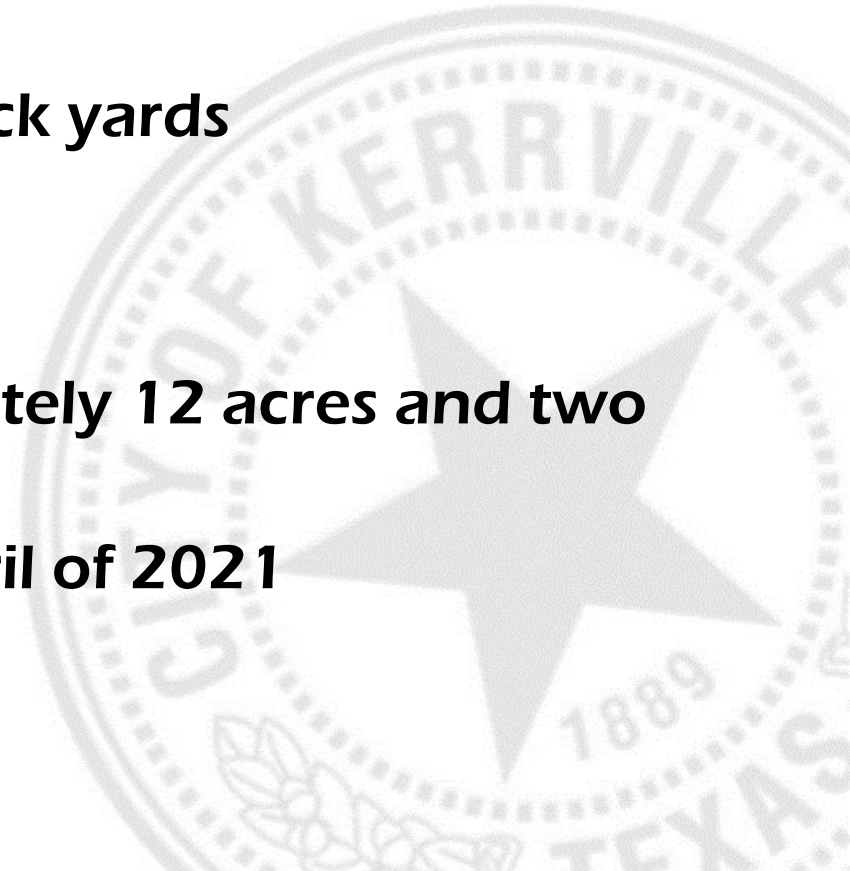
- **Per Fire Code, provide secondary fire/emergency access through future arterial and collector streets with an all-weather surface capable of supporting a 75,000 pound vehicle:**
 - Dedicated temporary fire access easement
 - Gated with Knox locks
 - Maintained by the developer until permanent road/remote access is built
- **Require fencing along boundary with adjacent Riverhill property owners**
- **Amended to require larger lots adjacent to Riverhill, minimum of 50' width, same as current R-1 zoning**
- **Limited to single story homes on any lot within 100 feet of Riverhill subdivision**





Builder/Neighborhood requirements

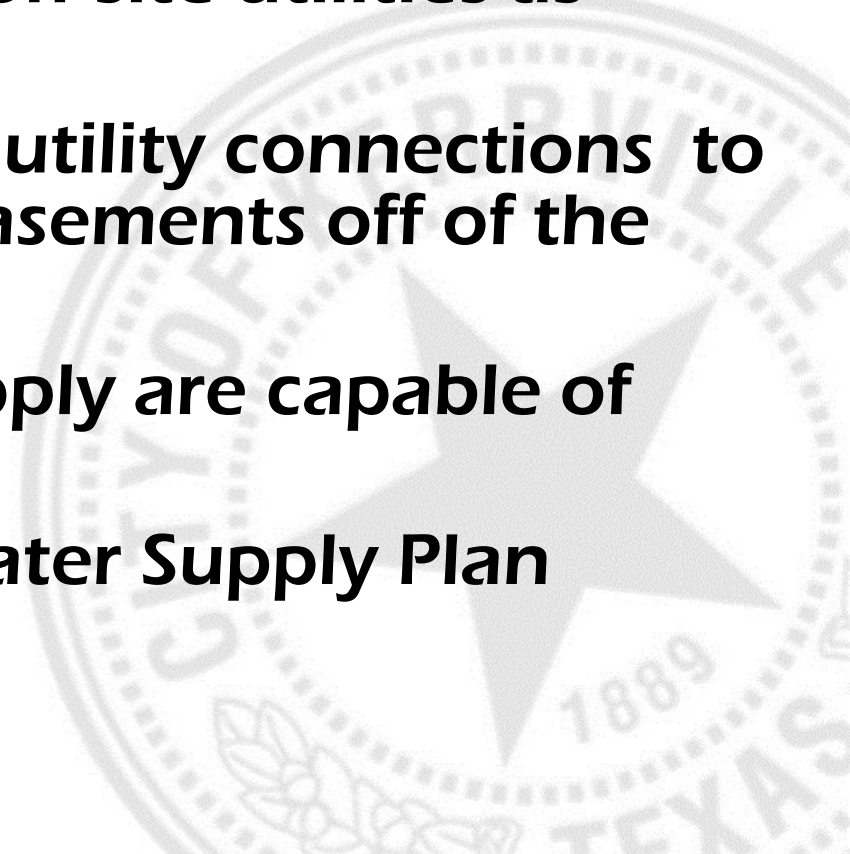
- **Homes will be from the “Horton” product line**
- **Lots in Phases I and II are restricted to single family homes**
- **75% masonry on three of four sides**
- **Landscaping and irrigation in front and back yards**
- **10 year warranty on new homes**
- **Leave 40% of the property as open space**
- **Privately maintained parks with approximately 12 acres and two playgrounds**
- **Home construction shall commence by April of 2021**
- **Property owners association required**





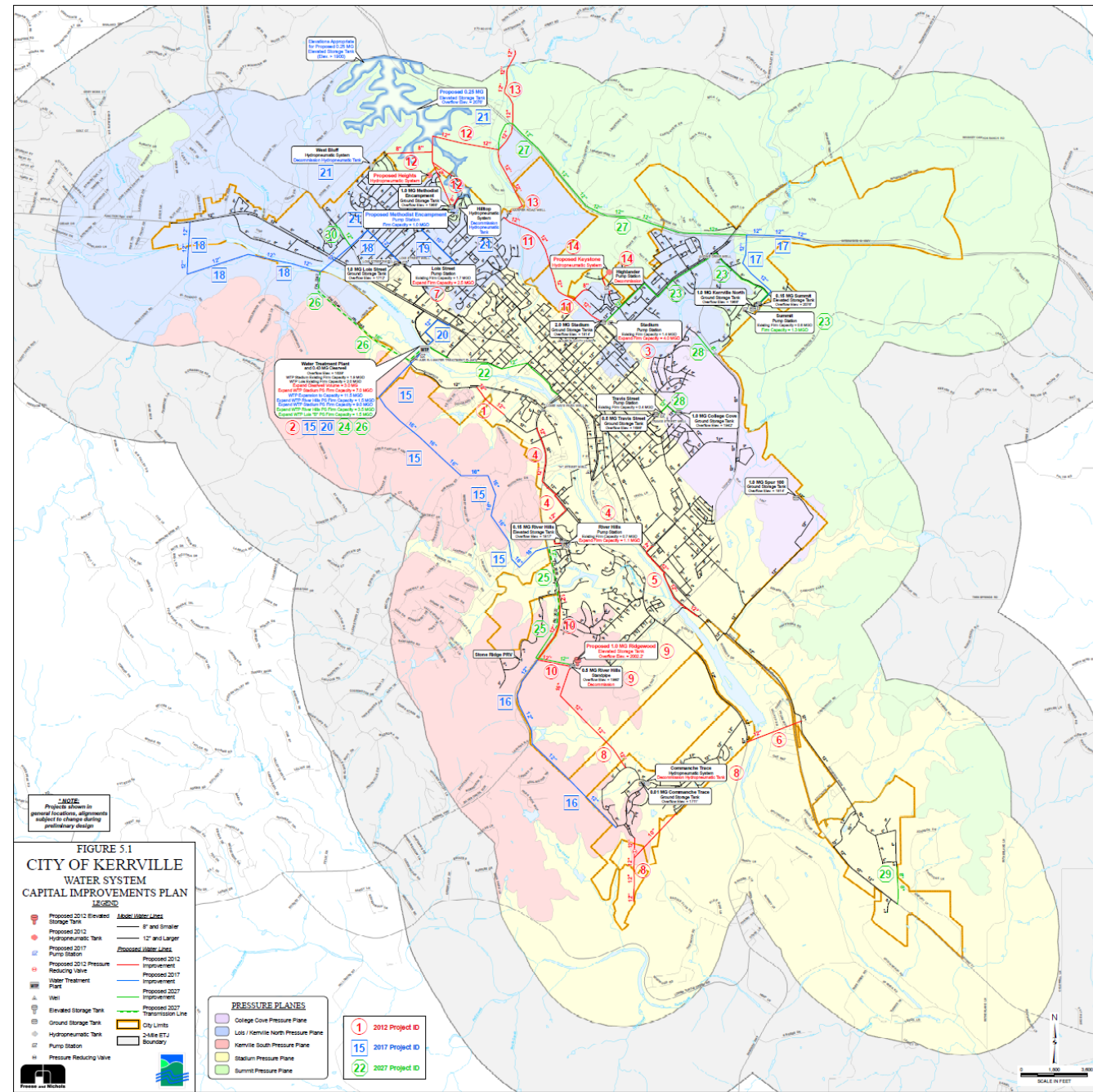
Utility Requirements

- **Developer has already built some perimeter utilities (water main lines)**
- **Construct and/or realign all on- and off-site utilities as required per City codes**
- **Developer will be permitted to make utility connections to existing utility lines through utility easements off of the three existing street stub-outs**
- **Existing water infrastructure and supply are capable of serving the proposed neighborhood**
- **2019 City of Kerrville Long Range Water Supply Plan**

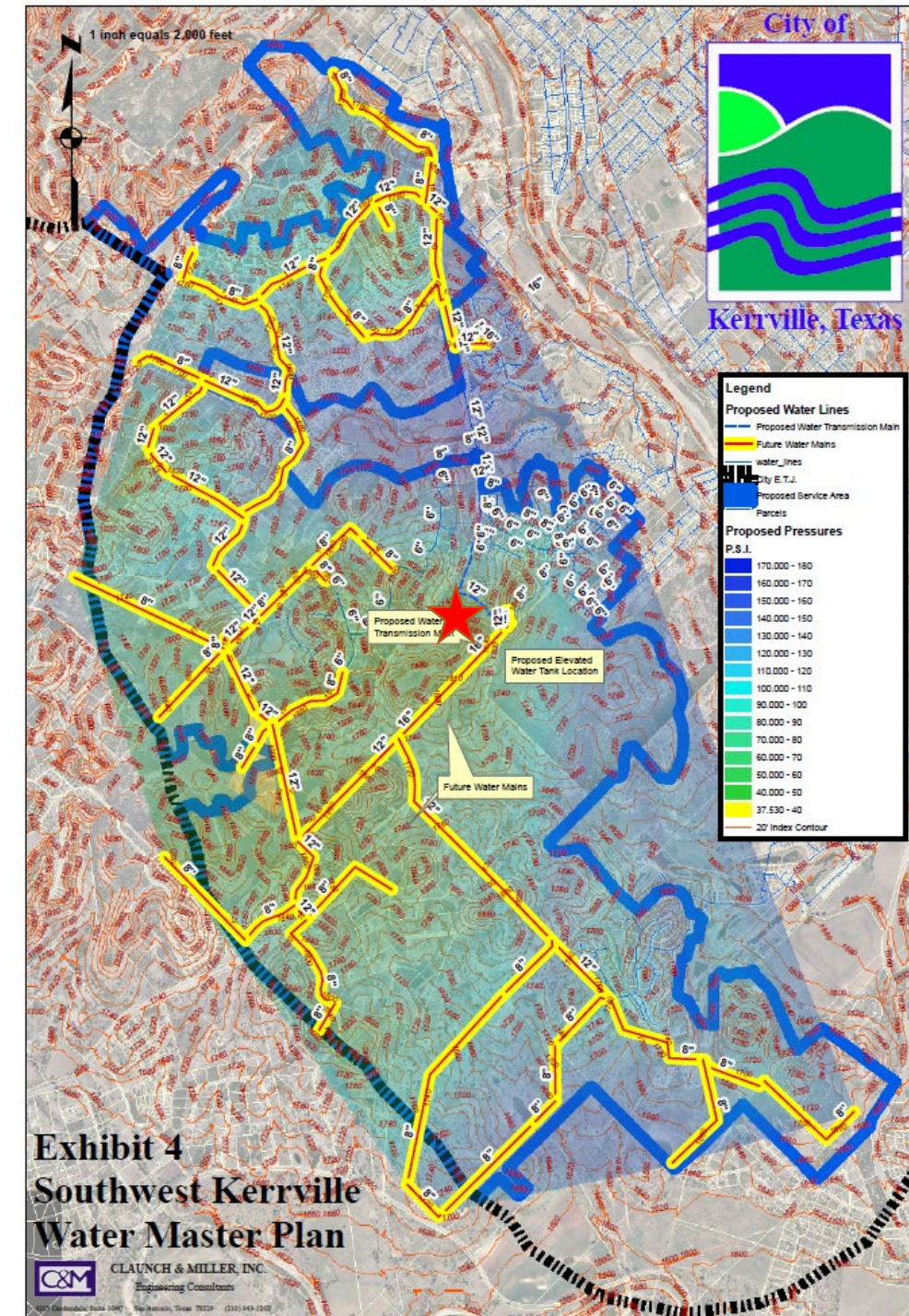


2008 Water & Wastewater Master Plan

- The proposed Vintage Heights subdivision was included in the study area
- Identified 5 new water projects to build and serve the Ridgewood elevated water tank
- All identified projects were completed – full water capacity is available



Topographic map of Kerrville, Texas, showing proposed water infrastructure. The map features contour lines indicating elevation, with major peaks around 1800-1900 feet. A red line outlines the 'Proposed Water Transmission Main' route, starting near Riverhill Blvd and heading south. A yellow line indicates the 'Proposed Elevated Water Tank Location' area. Blue lines represent 'Future Water Mains'. The map also shows 'Kerrville Schreiner Park' and various street names like Riverhill Blvd. Elevation markers are provided in feet throughout the terrain.





In consideration of the developer concessions, the City will:

- **Provide 45% rebate of City property taxes for 20 years from date initial home is placed on the tax roll:**
 - To be eligible for rebate, homes must meet definition of workforce housing, which is currently priced at or under \$227K
 - Total rebate will be capped at \$5 million
- **Terminate prior development agreement (2018), including the abandoning of applicable easements that will not be utilized as part of the development of Vintage Heights (such abandonment and vacation to require separate legal process and approval by City Council)**
- **Accept street configurations as consistent with design guidelines**



Subdivision waivers

- **Not continuing the existing streets from Riverhill into the development:**
 - **Waiver of 10-IV-3(A)2**
- **Not providing a turn-around for the existing street since the streets are not continuing:**
 - **Waiver of 10-IV-3(A)5. "...They shall be provided at the closed end with a turn-around having an outside roadway pavement diameter of at least eighty feet and street right-of-way diameter of at least one hundred feet"**
- **Over length cup-de-sacs:**
 - **Waiver of 10-IV-3(A)5. "Turn-around (Cul-de-sacs) Minor terminal streets or courts designed to have one end permanently closed (cul-de-sac) shall be no more than six hundred (600) feet long unless necessitated by topography"...**



City Council questions about Deal Points?

Public Comment



EXECUTIVE SUMMARY

Since 2010 Kerrville population grew by an estimated 1,690 net new residents. Households grew by 801 net new households. Population estimates for 2019 show 25,012 current residents. Employment estimates from 2018 showed 18,383 employed in Kerr County. Nearly 400 net new jobs were added in the County from 2017 to 2018 and a total of 1,411 net new jobs were created in the County since 2011.

A 2015 estimate showed that nearly 66% of Kerrville workers resided outside of the City limits.

Overall the Kerrville housing market has a housing shortage that coupled with job and population growth have created appreciation of housing prices, especially existing single family homes.

This high demand due largely to supply shortage and in part to job and population growth was identified in all housing markets in Kerrville – multifamily, single family rentals and single family for-sale homes – which has increased prices (especially existing for-sale homes) and competition for housing (especially in the single family and multifamily rental market) that has begun to weigh on local businesses and prospective worker households.

Multifamily rents require monthly incomes to be three times the rent and Kerrville is a low to moderate wage employment hub meaning multifamily rents can only be raised by a small amount (\$25-\$50 a month), on average every year to two years.

Estimates from 2017 showed there were 60% (5,894) owner-occupied households and 40% (3,919) renter-occupied households in Kerrville.

Data from 2017 ACS shows housing cost burdened renters across all household income cohorts accounted for 28% (1,627) of all households in Kerrville.

The 2017 median household income for Kerrville was \$44,113, meaning that half of households in the City earn less and 55% of households earn less than \$50,000 annually.

Approximately 42% (1,627) of all renter occupied households were paying 30% or more on housing costs and 22% (1,343) of all owner-occupied units in the City were paying 30% or more on housing costs.

Estimates showed that only 6% or 304 out of all owner-occupied householders, 3% of all households in the City are under 35. This represents a large opportunity to increase share of younger owner-households. There were 1,254 renter-occupied households, 13% of all households and 21% of owner-households.

Residents age 65 and over account for nearly 30% (6,938) of the 2019 Kerrville estimated population of 24,037. The largest age cohort in Kerrville in 2019 was the 65 to 74 cohort with 14% (3,434) of the population followed by age 55 to 64 representing an estimated 13% (3,055) of total population.

The household estimates from 2017 ACS data for Kerrville showed 65 years and older households accounted for 42% (4,122) of all households in the City. Also, 2017 estimates revealed that 65 years and over householders accounted for 55% (3,245) of all owner-occupied households and 22% (877) of all renter-occupied households in the City.

This data shows that 65 and older residents play a significant role in the Kerrville housing market accounting for an estimated 55% share of single family home ownership

Total current housing demand estimates of current pent up demand from the Kerrville workforce could be up to 3,046 units.

The mix of household types (renter or owner) for those living greater than 50 miles cannot be ascertained but a conservative estimate applying 50% would mean 519 renter households and 519 owner households for a total demand of 1,271 rental units and 1,775 for-sale units.

Based on 315 new jobs planned in Kerrville over the next 24 months and a ratio from the past 4 years of regional household growth as a percent of jobs added in the three MSA's, future housing for Kerrville could range from 151, 134 or 91 net new worker households.

A separate 1:1 new worker household to new jobs ratio would create local worker household demand for 315 local worker households.

There are several local active single family builders and housing developments in Kerrville with a grand total of nearly 720 single family lots in varying points in the development pipeline.

There are a total of 240 total multifamily rental units currently underway in two separate developments and are estimated to command rents in the \$1,000 and greater price range.

As of August 2019, the median list price in Kerrville was \$297,500 and the average list price is \$338,856, well greater than the maximum affordable price of \$200,000 to \$180,000 and below affordable for the 2018 County average weekly wage of \$942 (\$48,984 annually) and the 2017 median household income for the City of \$44,113.

The City's economy is largely based on health care and social assistance, retail trade, accommodation and food services and educational services. However, as of 2015 an estimated 66% of local workers lived outside the City. Many employers have faced difficulty hiring new workers across all industries and pay grades. Employers and newly hired employees shared in interviews that if they had not known a local resident with knowledge and connections, they would probably not have found housing (rental or for-sale) in Kerrville. Some employers, especially healthcare, are worried that retiree households that have been moving increasingly to Kerrville of the past several years may not view the City as desirable if housing shortages for local workers creates even more difficulty for them to hire and retain works sufficient to satisfy the growing demand.

Certain future job growth will exacerbate the gap between supply and demand for rental and for-sale housing at all price ranges but will impact those in the lowest and moderate pay jobs the greatest as they will be forced to seek housing outside of the City if new supply attainable to their incomes is not created.

Economic Analysis

As of July 2019, there were an estimated 5,380 employees working at the largest 15 businesses in the City. These 15 employers alone represent 29.3% of Kerr County's 2018 employment of 18,383 workers.

Unemployment for Kerr County was 3.2% in 2018 while the U.S. and Texas was 3.5%. This means that additional job growth will likely require either new worker households living in the City or new workers commuting into the City for work.

The five largest industry sectors by employment in Kerr County are Health Care and Social Assistance (4,169), Retail Trade (2,907), Accommodation and Food Services (2,282), Educational Services (1,730) and Construction (1,504). Combined, these five industries employ 12,592 workers which account for 68% of all jobs in the County.

In the last three years 779 employees were added in the five largest numbers of employees in Manufacturing (250), Construction (168), Real Estate and Rental and Leasing (128), Educational Services (120) and Administrative and Support and Waste Management and Remediation Services (113).

Health Care and Social Assist, Retail Trade and Accommodation and Food Services are the only industries with 10% or more share of employment in 2018.

Ten of the twenty-one industries in Kerr County pay an average weekly wage more than \$1,000 per week and the average weekly wage for all industries combined is \$942. Five of the largest employment industry sectors that pay below the average weekly wage employ 8,184 workers, 45% of all workers in the County.

Overall 49% (8,919) of Kerr County workers make less than the average weekly wage.

According to LEHD 2015 data out of 12,140 Kerrville workers 66% (8,065) lived outside the city limits with 3,463 greater than 50 miles. As of 2015 employment data shows Kerrville employs about 70% of workers in Kerr County.

The County added 235 net new jobs in 2017 and 398 net new jobs in 2018 for a total job growth in the previous 2 years in the County of 633 net new jobs. Given the same growth in the next two years this would create a net new job growth of 633 new jobs by 2021. In addition, CDS field research and interviews with the City and several of the largest employers in Kerrville revealed that definitive job creation over the next 24 months will be in the range of 315 net new jobs.

The employers and anticipated job growth are presumed to originate from the expansion of 200 to 215 net new positions at Kerrville State Hospital over the next 24 months, an estimated 50 net new jobs from a new business, Hobby Lobby and finally an estimated 50 net new jobs from the expansion of the existing H.E.B. grocery store.

Demographic Analysis

Current estimated population in Kerrville is 25,012 and increased by 7.6% (1,690 new residents) from 2010 to 2019 and is estimated to increase by another 4.1% (975 new residents) from 2019 to 2024.

Kerrville captured a 60% share of the estimated total population growth in Kerr County since 2010.

Currently the median age of Kerrville is 46.51.

These are the main age groups for Kerrville in order of share of total City population: under age 21 – 24% (5,670), age 55 and over – 42% (9,993) and age 65 and over – 29% (6,938)

Hispanic or Latino make up nearly 30% of the population in Kerrville.

The estimated average household size for Kerrville is 2.2.

Family households account for 62% and non-family households account for 38% of all households in the City with 2-person (3,840) and 1-person (3,453) making up the most prevalent household sizes.

According to 2019 estimates 75% of households in both study areas have no children younger than 18 years old in their household while 25% did. Female householders make up about a third of households with no children.

Kerrville has an estimated 8% (839) of total households below poverty with 6% (570) below poverty with children.

Educational attainment of the population age 25 and older is highly concentrated with High School Graduate (or GED) and Some College, no degree.

Kerrville ISD enrollment in the 2017-2018 school year was 5,019 and only grew by 93 students from 2016-2017 enrollment.

Kerr County experienced a 7% reduction in average household income and an 8% reduction in median household income from 2010 to 2019. Kerrville experienced a 5% reduction in average household income and a 0.1% reduction in median household income.

The number of households in upper middle class and affluent income ranges from \$75,000 to \$499,999 increased substantially from 2010 to 2019.

Estimated 2019 median household income for Kerrville was \$46,215 and average household income was \$64,012. The greatest household income cohort for Kerrville in 2019 was the \$35,000 to \$49,999 bracket with 1,843 households, 18% of all households in the City.

The 2017 estimated median household income for Kerrville was \$44,113.

Estimated projections for 2024 show the City adding 455 net new households as well as increase of median household income to \$47,457 and average household income to 66,256, a positive sign for the community.

Kerrville has about 9,730 residents age 16+ working with just more than 30% working in Office Administration and Support (1,341), Management (935), and Sales/Related (924) occupations.

Housing Market Trends

In Kerrville 66% of housing units are estimated to be owner-occupied with the remaining 34% renters.

The largest share by year built of the existing housing was constructed in the 1980's (21%). An estimated 1,892 (28%) owner-occupied homes in Kerrville are valued below \$100,000. This stock of homes represents in some cases blighted or perhaps unlivable structures that could be the focus of continued blight abatement and neighborhood revitalization efforts.

Household analysis was derived from 2017 ACS data, the most recent U.S. Census Bureau data available.

There were 9,813 households in Kerrville as of 2017 and about 48% of Kerr County households were located within Kerrville.

There were 60% (5,894) owner-occupied households and 40% (3,919) renter-occupied households in Kerrville.

Only 877 (22%) of renter households were householders 65 years and over. Householders 65 years and younger have much higher levels of renter householders and cost burdened renter households.

Estimates showed that only 6% or 304 out of all owner-occupied householders are under 35. This represents a large opportunity to increase share of younger owner-households.

The 2017 median household income for Kerrville was \$44,113, meaning that half of households in the City earn less and 55% of households earn less than \$50,000 annually.

In Kerrville 27% (2,653) of households earning less than \$50,000 per year are considered cost-burdened with housing expenses exceeding 30% of gross income.

Approximately 42% (1,627) of all renter occupied households were paying 30% or more on housing costs and 22% (1,343) of all owner-occupied units in the City were paying 30% or more on housing costs. This shows that renters are the most housing cost burdened group in the City. About 18% of Kerrville renter households spent 50% or more of their income on housing, something only 9% of home owners did.

Housing Market Trends – Multifamily Rentals

Multifamily units account for 22% of the housing stock in Kerrville. This equates to an estimated 2,323 multifamily rental units out of a 2019 estimated 11,403 total housing units in Kerrville. About 67% (1,546) of all units are conventional, 22% (484) age restricted and 12% (293) income restricted. Occupancy in market rate units was very high at an overall average of 96% with almost all current vacancies due to tenant move out upgrades and maintenance. Many property managers at almost every property during field interviews cited some of the longest tenured apartment residents as being 5, 10 and even 20 years in the same rental unit.

CDS estimates the current average multifamily rent is \$742.

There were 183 multifamily units built in the past two years which were luxury units (which have an average of \$1,000 rent minimum per month). This makes preservation of older existing market rate units extremely crucial.

There have been 1,546 multifamily units built in Kerrville since 1980. The lack of new supply and the fact that much of the recent supply are either income restricted such as Paseo de Paz or highly amenitized luxury units such as Sidney Baker and Country Club Apartments, which rent 1-bedroom units for \$1,050 and \$865, respectively.

Although there appears to be a significant stock of attached single family (townhomes, patio homes, duplexes and some triplexes and fourplexes) product, serving the for-sale and rental market there seems to have not been any new supply of these housing types in the last decade or more.

Data from 2017 ACS shows housing cost burdened renters across all household income cohorts accounted for 28% (1,627) of all households in Kerrville. Also, 752 renter-occupied households in Kerrville with household incomes of \$50,000 and less were paying 30% or more of household income to housing. These estimates are now several years old and are likely higher at the release of this report.

There are currently two separate multifamily projects underway in Kerrville.

One new project is the 120-unit luxury apartment complex located on Thompson Drive which will likely command rents in the \$885 to \$1,500 per month.

The second project which is currently under construction at 2601 Singing Winds Dr. this will also be a luxury style apartment complex with 120 units that will likely also command rents in the \$885 to \$1,500 per month range.

Rental demand is currently very high, the 240 total multifamily rental units currently underway will provide needed rental units however they will only be affordable to the highest paid workers and household income in the City and are not very likely to satisfy the bulk of moderate pay current and future local worker demand.

Many Kerrville employers interviewed for this study mentioned that the lack of housing choices, rental and for-sale, made retention and hiring of workers very difficult.

Housing Market Trends – Single family Rentals

Landlords receive multiple calls per day for listed and unlisted properties. They also receive heavy internet, craigslist and Facebook traffic for rental inquiries indicating that demand is very strong. Occupancy of single family rentals was near 100% in interviews with landlords and property managers. Demand for single family rentals has been very strong over the last 18-24 months.

Currently the maximum time a unit stays vacant is around 2 weeks and that is usually due to unit maintenance and upgrades. The inventory of single family rentals has not increased, and demand has risen. Single family home investment has picked up significantly in the last several years and most are professional investors, not reluctant owner renters.

The smallest and oldest units tend to be smaller 2 bed 1 bath homes in the 900-sf. range and rent for \$900 to \$1,050 per month. Renovated single family units and duplexes are renting for around \$1,050 to \$1,200 per month. Due to a large shortage of desirable for-sale homes priced \$180,000 and below, this too has increased single family renter demand, especially those with children or family members. Units with 3 bedrooms are in very low supply and are priced \$1,200-\$1,250 with some higher end units renting in the \$1,500 to \$2,000 range with the median price around \$1,400. Three-bedroom two bath units get the greatest demand.

This market did indicate that some level of accountability between landlords and the City would be helpful as some owners and landlords have tenants living in very unsafe and unacceptable conditions and refuse to repair or upgrade. The flip side is that typically this means increasing rates which could displace residents. Very few of the rental houses are listed on the MLS and most are only advertised on specific internet sites. This makes it difficult for landlords to determine rental rates in a conventional manner of comparison.

An interesting aspect unique to Kerrville's housing market is the presence and demand for rental units by those recently graduating into sober living. There are many local and regional businesses oriented to rehabilitation and recovery patients. Many of them are younger or with past credit history, job and perhaps criminal history preventing them from attaining housing in multifamily properties due to requirements. Therefore, they turn to the less formal single family housing rental market for housing. However, the no more than 3 unrelated residents ordinance has caused many challenges along with the shortage of housing overall that has made single family rentals a very desired and lucrative housing product for tenants and landlords/property owners. In addition, this population has a strong drive and, in many cases, a mandatory requirement for employment. This benefits local businesses, especially those in the recreation and entertainment, retail and accommodation and food services sectors by providing an eager workforce. But, the housing shortage and in particular the tight single family rental market, are beginning to make it very difficult for this population to secure housing in Kerrville. This also provides an opportunity for the City to add younger households and perhaps encourage a new generation of Kerrville residents to put down roots and create new families and households.

Housing Market Trends – Single family For-Sale Homes

Two years ago, in 2017 more homes were sold in Kerrville than in any year from 2008 to 2018. Home sales began to pick up following the Great Recession in 2012 and increased each year, with a slight dip in 2016, a peak in 2017 and another slight dip in 2018. Overall home sales volumes have increased by 36% since 2008.

In 2018 the overall average was 85 days on the market with a total of 395 sales, an average of 33 sold per month. According to the data 135 homes are currently listed for sale putting months of inventory as of August 2019 at 6.1 months of supply based on 266 home sales in the last 6 months, an average of 22 sales per month.

The single family residential housing market in the Kerrville area currently appears to be a buyers' market, however, the findings of this study reveal that many Kerrville home buyers, especially those employed within the City, face some difficulty finding housing that fits their household budget and needs.

The majority of home sales in Kerrville have shifted greatly in price from 58% (169) of sales in 2008 in the \$100,000 - \$199,999 price range to just 37% (147) of all sales in 2018, a decrease of 13% since 2008.

The increase in higher priced home sales can be seen to start in 2012 and 2013 with the beginning of the growth in the share of homes sold in the \$200,000 - \$299,999 and \$300,000 to \$399,999.

Since 2011 home sales volume in the \$200,000 - \$299,999 price range increased from 34 to 154 in 2018, an increase of 354%.

Additionally, home sales volume in the \$300,000 - \$399,999 price range increased from 11 to 58 in 2018, an increase of 427%.

This indicates decreasing supply of homes priced below \$200,000. These lower price categories represent "entry level" prices for first-time buyers at or below Kerrville's median household income (\$44,113 as of the 2017 American Community Survey).

Real estate agents mentioned that many of these homes in this price range are unlivable or require more desired or necessary upgrades than first time home buyers can afford and are being purchased (many times in all cash transactions) by investors as flips or rentals.

The share of homes \$200,000 - \$299,999 price ranges has shifted from barely 20% of all sales in 2008 to almost 40% of all sales in 2018 while the share of homes \$300,000 - \$399,999 increased from 6% of sales in 2008 to 15% in 2018.

Although the total volume of existing home sales grew last year to the highest point in the past decade (an increase of 36%), the total volume of homes sold less than \$200,000 has decreased from 204 (70% of all sales in 2008) to 158 (40% of all sales in 2018). At the same time population has grown by 1,690 since 2010 and jobs have increased by 1,107 since 2009.

As of the 2017 American Community Survey the median household income for the City was \$44,113. The correlated affordable price for that annual income is \$180,000 and less. This price point is found in the consistently shrinking \$100,000 - \$199,999 price band, however, \$180,000 represents the absolute most someone making the 2017 median income can afford.

The median sold price in Kerrville has increased each year since 2013, an increase of 42% in the past 6 years.

In 2018 the median sold price was \$219,150. Homes prices of \$180,000 was the maximum affordable home price for the median household income in Kerrville and half of all households made less than the 2017 median of \$44,113.

Home prices greater than \$180,000 are not attainable to about half of the households in Kerrville as of 2017 and many local workers making the 2018 average weekly wage for the County of \$942, which translates to an annual income of \$48,984, which then translates to a maximum affordable home price of \$200,000.

As of August 2019, the median list price in Kerrville was \$297,500 and the average list price is \$338,856, well greater than the maximum affordable price of \$200,000 to \$180,000 and below affordable for the 2018 County average weekly wage of \$942 (\$48,984 annually) and the 2017 median household income for the City of \$44,113.

Only 10% (13) of current sale listings are in the \$100,000 to \$199,000 price band. This means that if the 13 available homes for sale in this price band do not fit a households needs or budget (many existing homes in Kerrville require anywhere from \$5,000 to \$60,000 in upgrades) then the potential buyer will likely seek housing elsewhere or seek rental housing in the very full (in the upper 90% occupancy citywide) multifamily or single family rental market. This scenario provides a glimpse of perhaps part of the reason 66% of Kerrville workers reside outside of the City.

MLS data shows that 701 homes in Kerrville were sold in the past two years in the three most affordable price bands. There were an estimated 555 owner-occupied households in Kerrville that were housing cost burdened (30% or more household income spent on housing) in incomes \$74,999 and below.

Since 2008 there were 572 single family permits issued, an average of 52 per year in that span.

Previous MLS sales data shows that since 2008 Kerrville had a total of 3,884 sales, an average of 353 single family detached home sales per years and about 30 home sales per month.

There are several local active single family builders and housing developments in Kerrville with a grand total of nearly 720 single family lots in varying points in the development pipeline.

Lot costs and infrastructure are the top two cost related barriers in Kerrville facing home builders seeking to serve the \$150,000 to \$200,000 price range.

Lot costs have steadily risen over the past five years as the average lot price has gone up from \$10,000 to in some cases no \$40,000 and up for one infill lot.

Average infrastructure costs quoted from several different local builders in Kerrville was in the \$500 to \$600 dollars per foot range.

Builders with a focus on trying to create new infill single family development appear to require financial assistance on infrastructure and lot costs in order to feasibly price new infill single family homes for sale in the \$150,000 to \$200,000 range.

Housing Demand Analysis

Residents age 65 and over account for nearly 30% (6,938) of the 2019 Kerrville estimated population of 24,037. The largest age cohort in Kerrville in 2019 was the 65 to 74 cohort with 14% (3,434) of the population followed by age 55 to 64 representing an estimated 13% (3,055) of total population.

The household estimates from 2017 ACS data for Kerrville showed 65 years and older households accounted for 42% (4,122) of all households in the City. Also, 2017 estimates revealed that 65 years and over householders accounted for 55% (3,245) of all owner-occupied households and 22% (877) of all renter-occupied households in the City. Of renter-occupied householders 65 and over 11% (430) were housing cost burdened and 12% (733) of owner-occupied householders 65 and over were housing cost burdened.

This data shows that 65 and older residents play a significant role in the Kerrville housing market accounting for an estimated 55% share of single family home ownership. Furthermore, the data shows that 65 and over householders have low levels of housing cost burden with a total of 1,163 65 and over householders, an estimated 12% of total households in 2017.

The amount and share of homes this constitutes could not be ascertained given the scope of this report. Nevertheless, local real estate agents as well as single family rental property managers and landlords all cited that the presence of vacation / second home purchasers do exist and seems to be growing. Also, the presence of professional single family rental investors has been increasing rapidly over the past three years in Kerrville.

With the evident existing and growing popularity of Kerrville and nearby Fredericksburg as a vacation and tourist hot spot, single family whole or partial homes used for vacation rentals likely will only increase unless there are short-term rental ordinances to permit, track and regulate the presence and share that whole home and partial home rentals play in the market.

Total current housing demand estimates of current pent up demand from the Kerrville workforce could be up to 3,046 units. This derives from past data but provides the best look at existing demand from the local workforce.

The data points used to derive this figure was based on a conservative one third (1,038) of the 2015 estimate of Kerrville workers living greater than 50 miles from the City, 2017 ACS estimates in Table 60, Table 75 and Table 76 of 752 cost burdened renter households, 555 cost burdened owner households and 701 homes sold in Kerrville in the past two years in the two most affordable price ranges (\$0 - \$99,999 and \$100,000 - \$199,999).

This equates to 3,046 total units. The mix of household types (renter or owner) for those living greater than 50 miles cannot be ascertained but a conservative estimate applying 50% would mean 519 renter households and 519 owner households for a total demand of 1,271 rental units and 1,775 for-sale units.

Data estimates showed that 3,463 Kerrville workers as of 2015 lived greater than 50 miles from the City. If only one third of those workers living greater than 50 miles was due to housing supply and/or price challenges that would be a total of 1,038 local worker housing demand.

Based on 315 new jobs planned in Kerrville over the next 24 months and a ratio from the past 4 years of regional household growth as a percent of jobs added in the three MSA's, future housing for Kerrville could range from 151, 134 or 91 net new worker households.

A separate 1:1 ratio would create local worker household demand for 315 local worker households.

According to CDS estimates based on a conservative assumed 50% capture rate of 519 workers 2015 LEHD worker commute distance of 50 miles or greater, plus 2017 ACS estimates of 752 cost burdened renter households equates to current worker household demand of 1,271 rental units.

According to CDS estimates based on a conservative assumed 50% capture rate of 519 workers 2015 LEHD worker commute distance of 50 miles or greater, plus 2017 ACS estimates of 555 cost burdened owner households, plus 701 homes sold in the past two years \$200,000 and below equates to current worker household demand of 1,775 rental units.

New, conventional market rate multifamily construction cannot be built cheaply enough in any market to serve maximum affordable rental prices of \$450. CDS research in various smaller markets in Texas in addition to interviews with local Kerrville multifamily developers the lowest cost for new market rate multifamily rental units hovers in the range of \$1.15 to \$1.26 per square foot.

This means that demand from net new jobs paying the lowest wages must be satisfied with non-market-based supply. This could take the form of new LIHTC rental unit supply, increased supply of new Accessory Dwelling Units (ADUs).

Next 24 months net new worker household creation demand and maximum rent/for-sale prices:

- 73 rental units at maximum affordable rent of \$450 per month
- 171 rental units at maximum affordable rent of \$750 per month
- 29 single family homes or rental units at maximum affordable price of \$175,000 or \$1,050 per month
- 26 single family homes at maximum affordable price of \$225,000 or \$1,350 per month
- 7 single family homes at maximum affordable price of \$285,000
- 10 single family homes at maximum affordable price of \$350,000+

Housing Strategic Plan

Based upon review of the Kerrville housing market, analysis of additional housing needs, and the development environment that enables or discourages housing supply creation, CDS recommends the following Housing Strategic Plan actions.

1. Increase Stock of Moderately Priced Rental Units with Moderate-Density Infill Development

Allow and encourage moderate-density “missing middle” housing and accessory units that can be constructed more quickly and cheaply than larger apartment complexes.

2. Increase the supply of single family for-sale homes on infill lots

Encourage the construction of entry-level for-sale homes on infill lots in already-developed areas with existing infrastructure; generally prioritize areas with immediate access to existing infrastructure over sites requiring new extensions or added capacities.

3. Preserve Existing Low-Income and Moderately-Priced Rental Housing through Rehab Programs and Opportunity Investment

Develop a rehab incentive program for multifamily and single family rental housing that includes a long term affordability component. Work with local and regional philanthropic organizations and community-minded investors to form partnership entities for strategic investments in rental housing preservation.

4. Support Additional Low-Income Rental Housing Development through the Federal LIHTC Program and a Public Facilities Corporation

- Issue a clear statement from City government and respected organizations that quality LIHTC projects are welcomed.
- Create a PFC to acquire sites and partner with multifamily developers to create tax-exempt mixed-income housing

5. Create an Official Incentive Policy for Workforce Housing Development

Create a defined City policy for financially assisting developers with public infrastructure costs in return for housing developments that priced to local workers earning 120% of median income and below and meet reasonable quality design standards.

6. Utilize Land Owned by Public Agencies, Institutions, and Philanthropic Organizations for Workforce Housing Development and Preservation

- Work with the public agencies and nonprofit organizations (including educational institutions and philanthropic organizations) who own the properties to devote them to housing development for low to middle income workforce households.
- Put measures in place to assure long term affordability of the new housing created on these sites.

7. Initiate an effort to accommodate specialized renter populations

- Examine development and land use regulations to ensure rehab / recovery graduates can be provided safe and livable “sober houses”

- Enlist the participation of philanthropic and nonprofit groups to assist in provision and servicing of “sober houses” and transitioning of graduates to standard rental housing

8. Examine other regulatory elements that affect development costs

Examine proposed development code to see if restrictive, cost-raising requirements can be changed to lower costs or otherwise mitigated as part of an incentive policy for attainable workforce housing.

9. Create a Cooperative Housing Navigation and Financial Education Program

Through a set of broad-based community partnerships, create a nonprofit Housing Navigation and Financial Education Program to help workers find appropriate and attainable housing and to prepare first-time buyers for home purchase and ownership

**Vintage Heights
Development Agreement Deal Points**

Developer will:

1. Leave and fence off three stub-outs off of Riverhill Blvd. and redesign Vintage Heights streets adjacent to Riverhill with no public access through to Riverhill Blvd. Developer will have the right to make utility connections to existing utility lines on the three stub-outs.
2. Provide an 8' wooden privacy fence on metal poles along the boundary with existing Riverhill neighborhood, such fence to be on average 8' based upon topography and other features and subject to modification by possible agreement between the owner of the lot and the owner of an adjacent lot.
3. Leave 40% of the Property as open space, to include all parks and storm water detention areas.
4. No lot in Phase I or II will be utilized for townhomes, patio homes or duplexes.
5. Per Fire Code, provide secondary fire/emergency access through future arterial and collector streets with an all-weather surface capable of supporting a 75,000 pound vehicle.
 - a. Dedicated temporary fire access easement.
 - b. Gated with Knox locks.
 - c. Maintained by the developer until permanent road/remote access is built.
6. Developer shall comply with City's Subdivision Code, to include the dedication and/or construction of public improvements both onsite and offsite, such as water and wastewater lines, public streets, and ancillary improvements to any of those. The parties acknowledge and agree that Developer is currently in the middle of the plat approval process pursuant to the City's Subdivision Code, which included the approval of a preliminary plat, subject to the vote of the Planning and Zoning Commission held on December 5, 2019.
7. If necessary, move existing water line on Vintage Heights property to align with future lots as required as identified on the preliminary plat submittal.
8. Contract with D.R. Horton to purchase lots and build homes within the Vintage Heights subdivision, as follows:
 - a. Build homes equivalent to the "D.R. Horton" home product that is constructed within Valley Ranch or Redbird Ranch subdivisions in Bexar County, Texas.
 - b. Ensure that at least 35% of homes within entire property will be two story.
 - c. Commence construction of first home by April, 2021.
9. Ensure that only single story homes will be built on any portion of any lot within 100 feet of adjacent Riverhill subdivision property line.
10. Ensure that lots abutting to Riverhill subdivision are at least 50 feet in width or are fan lots, which consist of an average width of 50 feet.
11. Ensure that homes are built of a quality that includes the following specifications and is equal to or better than the "DR Horton" home product that is constructed within Valley Ranch or Redbird Ranch subdivisions in Bexar County, Texas:
 - a. Landscaping and irrigation in both front and back yards
 - b. 75% Masonry to include brick, stone, stucco or fiber cement on the first floor.
 - c. 3 tab weathered wood color roof shingles with 25 year warranty
 - d. Warranties – 10 year Limited Home Builder's Warranty, Warranty Manual with contact information and 24-hour emergency service numbers, New Home orientation to understand home's features and care

12. Form a mandatory property owners' association to maintain all common areas to a standard equal to or better than the maintenance of the City's park system.
13. Specify location and ensure installation of at least two parks within subdivision, to be deeded to the homeowner's association.
 - a. Approximately, but not less than, 12+ total acres, or 1 acre/42 dwellings, as required by Subdivision Ordinance.
 - b. To include two playgrounds, with equipment as further defined.

City will:

1. Provide 45% tax rebate for 20 years from date initial home is placed on the tax roll.
 - a. To be eligible for rebate, homes must meet definition of workforce housing, which is currently priced at or under \$227K.
 - b. Total rebate will be capped at \$5 million.
2. Waive Subdivision Code requirements regarding:
 - a. Length of any streets exceeding 600 feet.
 - b. The extension of stub outs from adjacent Riverhill subdivision.
 - c. The construction of a turn-around for any existing street since the streets are not being extended.
3. Terminate prior development agreement, including the abandoning of applicable easements that will not be utilized as part of the development of Vintage Heights, such abandonment and vacation to require separate legal process and approval by City Council.
4. Accept street configurations as consistent with design guidelines.

Developer and City acknowledge, understand, and agree that each party has agreed to the terms specified above, with the intent that following City Council's review and possible approval of these Deal Points, the terms will then be adapted into a more formal document to be drafted by and approved by the parties, which for the City means City Council. The parties do not intend to vary the substantive content of the terms. In addition, some of the terms expressed above are contingent upon the City Council's approval of a zoning amendment to the property. The parties acknowledge, understand, and agree that such approval is not automatic, but instead, is subject to a separate, independent review that entails the legislative function and decision of City Council.

I hereby agree to the terms expressed above:

I hereby agree to the terms expressed above:

Medina River Estates, LLC


By: Chuck Cammack, Manager
Developer

1/15/2027 (DATE)

Mark McDaniel, City Manager

(DATE)



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Ordinance No. 2020-03. An Ordinance amending Chapter 60 of the Code of Ordinances, City of Kerrville, Texas, which adopted zoning regulations, use districts, and a zoning map in accordance with the City's Comprehensive Plan, such chapter more commonly known as the City's Zoning Code; by changing the zoning and classification of a property generally located east of and adjacent to State Highway 16 South, south of Riverhill Boulevard, and comprising approximately 225.69 acres; from a single-family residential zoning district (R-1) to a medium density residential zoning district (R-2); amending the Comprehensive Plan (Kerrville 2050) to make it consistent with such amendment; providing a cumulative clause; providing for severability; providing an effective date; ordering publication; and providing other matters relating to the subject.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 03, 2020

SUBMITTED BY: Drew Paxton

EXHIBITS: [20200114_PowerPoint_Vintage Heights ZONING presentation.pdf](#)
[20200114_Ordinance 2020-03 Vintage Heights Zoning.pdf](#)
[20200114_METES BOUNDS_Vintage Heights.pdf](#)
[20200114_Map_Vintage Heights.pdf](#)
[20200114_Appeal_Letter_Vintage Heights 2019_12_05_1130am.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	\$0	\$0	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	L - Land Use
Guiding Principle	H1. Provide a diverse range of housing options to meet the needs and desires of all age groups, income levels, and lifestyles
Action Item	H1.2 - Research potential funding mechanisms for the development of workforce housing, defined as 80% to 120% of area median household income

SUMMARY STATEMENT:

This is a request to change the zoning from R-1 Single Family District to R-2 Medium Density Residential, which includes a proposed amendment to the Future Land Use Plan of the City's comprehensive Plan, on approximately 225.69 acres, proposed Vintage Heights Subdivision; and generally located east of Medina Highway and south of Riverhill Boulevard.

The Planning and Zoning Commission heard this case on December 5th and did not approve the case; the resulting vote was 3 in favor, 3 against. The applicant has requested an appeal to the P&Z Commission's decision. In order to overturn the P&Z Decision, the Council must approve the case with at least a 3/4ths vote.

Procedural Requirements

54 letters were mailed November 18th, to adjacent property owners. The public notice was published in the Kerrville Daily Times on November 14th.

Staff Analysis and Recommendation

Consistency with the Kerrville 2050 Comprehensive Plan: The property and is designated Agriculture and Outdoor Tourism within the Future Land Use Plan. Agriculture and Outdoor Tourism areas are characterized by very large tracts of undeveloped land primarily utilized for the production of agricultural products, ranch and wildlife management, camping, and hunting. These tracts provide much of the environmental and open space character in the community and its border regions. AOT includes opportunities for additional uses and low-intensity developments that support the character and economic viability of the broader, primary land use.

Primary Land Use: Agriculture, outdoor tourism such as camping, hunting and other nature-based recreational activities, Single-family detached homes.

Secondary Land Use: Agricultural land, civic and institutional uses, parks, open space, local food production.

The existing surrounding area includes: single family homes (in and outside the city limits), Kerrville Schreiner Park and vacant land.

This request also includes an amendment to the Future Land Use Plan. This zoning request is consistent with both the Preservation Residential and Neighborhood Residential. Based on the proposed subdivision layout, Preservation Residential is best suited for the development as it consists of single family detached homes and open space throughout the development. Preservation Residential areas support a variety of housing types in a compact network of complete, walkable streets that are easy to navigate by car, bike, and foot. Housing types can include small-lot, single-family detached homes, patio homes, townhomes, duplexes, condominiums, or apartments. Limited amounts of local retail and services may be appropriate in certain locations as needed to support the primary land use.

Primary Land Use: Single-family detached homes, patio homes, townhomes, other single-family attached dwellings.

Secondary Land Use: Civic and institutional uses, parks, open space, small amounts of neighborhood serving retail and office in carefully chosen locations.

The Kerrville 2050 Plan is considered to be a living document and thus is intended to be reviewed and updated from time to time. This includes both “regular reviews in the coming years to see that the plan maintains its relevance and to sustain the commitment of the community that participated so enthusiastically in its creation”, as well as review on a case by case level, triggered by rezoning cases such as this.

As per the Zoning Code, when considering an application for rezoning of a specific tract that is inconsistent with the Comprehensive Plan, the request may be considered if it is determined that:

1. The application represents a new and important opportunity for the community that deserves due consideration and was not known or anticipated at the time of adoption of the plan;
2. Decisions were made in developing the Comprehensive Plan that were based on incorrect information;
3. New information not available during preparation of the Comprehensive Plan has arisen or been developed; or
4. Conditions upon which the Comprehensive Plan was based have changed so as to warrant consideration of the application.

In this case, this application represents a new and important opportunity for the community that deserves due consideration and was not known or anticipated at the time of adoption of the plan. At the time of adoption of the Kerrville 2050 Plan Future Land Use Plan and the updated Zoning Code, this property was proposed to be developed as large, 10+ acre tracts for single family estates. This proposal brings opportunity for more future housing to the Kerrville market, which has been identified in the Kerrville 2050 Plan and the Kerrville Housing Study and Strategic Plan as having significant gaps in housing inventory.

Adjacent Zoning and Land Uses

Subject Property

Current Zoning: R-1 Single Family Residential

Existing Land Uses: vacant land

Direction: North

Current Zoning: R-1 Single Family District

Existing Land Uses: Single family homes (Riverhill subdivision)

Direction: East and South

Current Zoning: PI Public and Institutional and R-1 Single Family District

Existing Land Uses: Single family homes and Kerrville Schreiner Park

Direction: West

Current Zoning: outside the city limits

Existing Land Uses: single family county subdivision

Thoroughfare Plan: The development has proposed access to Medina Highway (TX 16) through a new Collector street, as well as integrated access to the existing street connections near Riverhill Boulevard. The Riverhill Subdivision was designed with three connecting street into the remainder of the original tract of land, the subject property of this case. The three connections, Green Tree Lane, Hickory Hills Drive, and Ridgewood Lane, provide access for future development to the Riverhill Boulevard collector street.

Collectors balance access and mobility in the City's thoroughfare network by collecting and distributing traffic to and from local streets and the arterials. Collectors provide the necessary connectivity through and between residential neighborhoods and support circulation in nonresidential activity centers.

Some concern has been brought up by neighboring property owners regarding the level of traffic on Riverhill Boulevard. The City Council has recently passed an ordinance to help mitigate through traffic, particularly through truck traffic to help mitigate pass-through traffic, better enabling Riverhill Boulevard to act as a neighborhood collector as it was designed. This includes the future connections to this development.

Traffic Impact: The applicant has submitted a Traffic Impact Study for review with their zoning and plat application. The initial report did not include data for all impacted intersections. The data that had been received at the time of this staff report indicated that "All study intersections including the State Highway 16 and Riverhill Boulevard intersection and proposed driveways are expected to operate at acceptable LOS (level of service) values during the morning and evening peak periods for all scenarios analyzed." Additional data for the remaining intersections has been requested.

Parking: Based on the parking requirements within the zoning code, there should be no negative impact on parking.

Recommendation: As stated above, this request also includes an amendment to the Future Land Use Plan, and should be considered since the application represents a new and important opportunity for the community.

Based on the policies within the Kerrville 2050 Plan and in support of the Kerrville Housing Study and Strategic Plan, staff recommends the Future Land Use Plan amendment and the zoning request.

RECOMMENDED ACTION:

Approve Ordinance No. 2020-03. Zone Change Vintage Heights, Appeal P&Z Decision - Public hearing and First Reading.



Vintage Heights

Zone Change Request

City Council Mtg. January 14, 2020



Ordinance No. 2020-03. An Ordinance amending Chapter 60 of the Code of Ordinances, City of Kerrville, Texas, which adopted zoning regulations, use districts, and a zoning map in accordance with the City's Comprehensive Plan, such chapter more commonly known as the City's Zoning Code; by changing the zoning and classification of a property generally located east of and adjacent to State Highway 16 South, south of Riverhill Boulevard, and comprising approximately 225.69 acres; from a single-family residential zoning district (R-1) to a medium density residential zoning district (R-2); amending the Comprehensive Plan (Kerrville 2050) to make it consistent with such amendment; providing a cumulative clause; providing for severability; providing an effective date; ordering publication; and providing other matters relating to the subject.



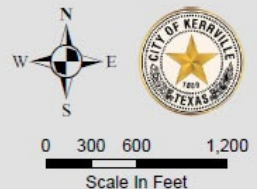
Location Map

Case # 2019-079

Location:
Vintage Heights Subdivision

Legend

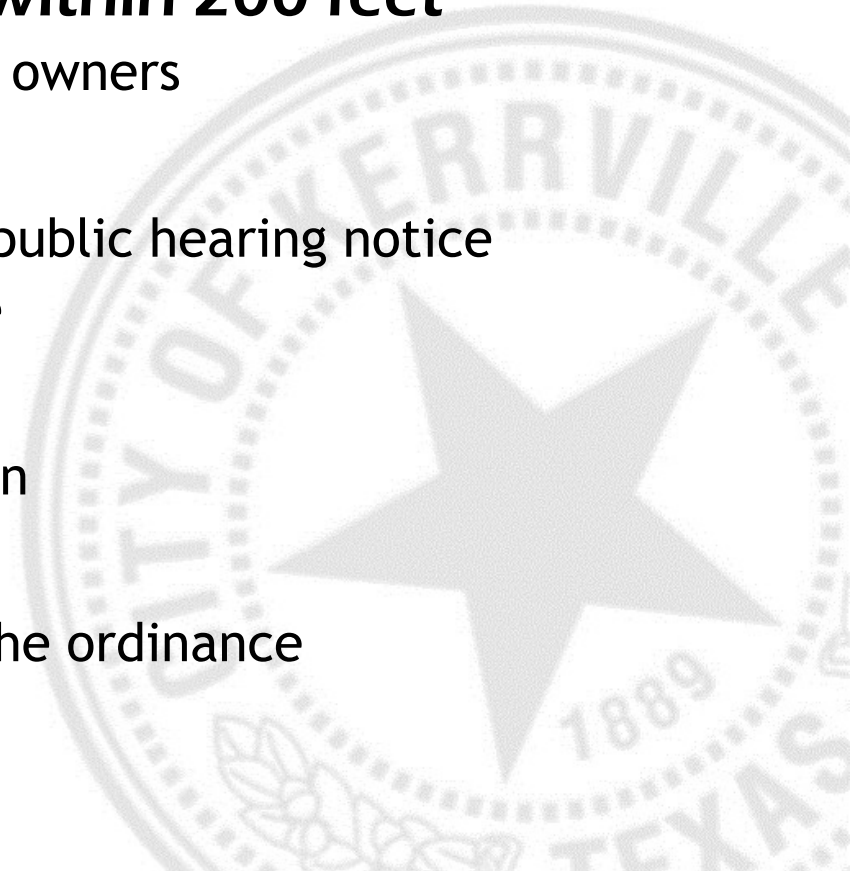
200' Notification Area
Subject Properties



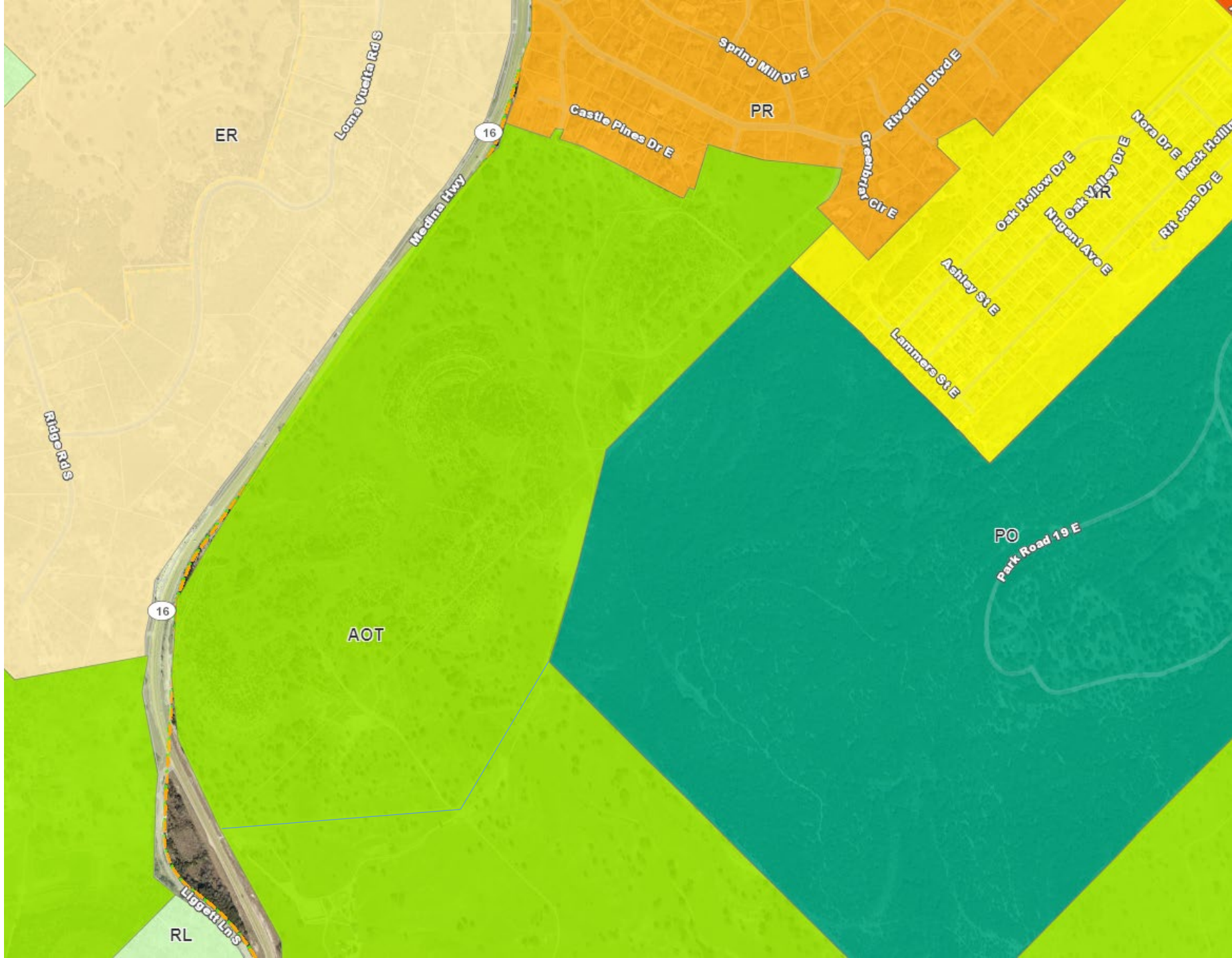


Zoning Process

- **Application for zone change**
 - November 1st - Applicant submitted application
- **Notifications to adjacent property owners within 200 feet**
 - November 18th - Letters sent to adjacent property owners
- **Publications for notice of a public hearing**
 - November 14th - Planning and Zoning Commission public hearing notice
 - December 20th - City Council public hearing notice
- **P&Z Meetings**
 - December 5th - Public hearing and recommendation
- **City Council 2 readings**
 - January 14th - Public hearing and first reading of the ordinance
 - January 28th - Second reading of the ordinance



Future Land Use Plan



Agriculture and Outdoor Tourism (AOT)



Agriculture and Outdoor Tourism areas are characterized by very large tracts of undeveloped land primarily utilized for the production of agricultural products, ranch and wildlife management, camping, and hunting. These tracts provide much of the environmental and open space character in the community and its border regions. AOT includes opportunities for additional uses and low-intensity developments that support the character and economic viability of the broader, primary land use.

Primary Land Use: Agriculture, outdoor tourism such as camping, hunting and other nature-based recreational activities, Single-family detached homes.

Secondary Land Use: Agricultural land, civic and institutional uses, parks, open space, local food production.

Indicators & Assumptions: These place types typically utilize private well water and septic systems. Lots vary, but are typically two to ten acres in size.

Preservation Residential (PR)



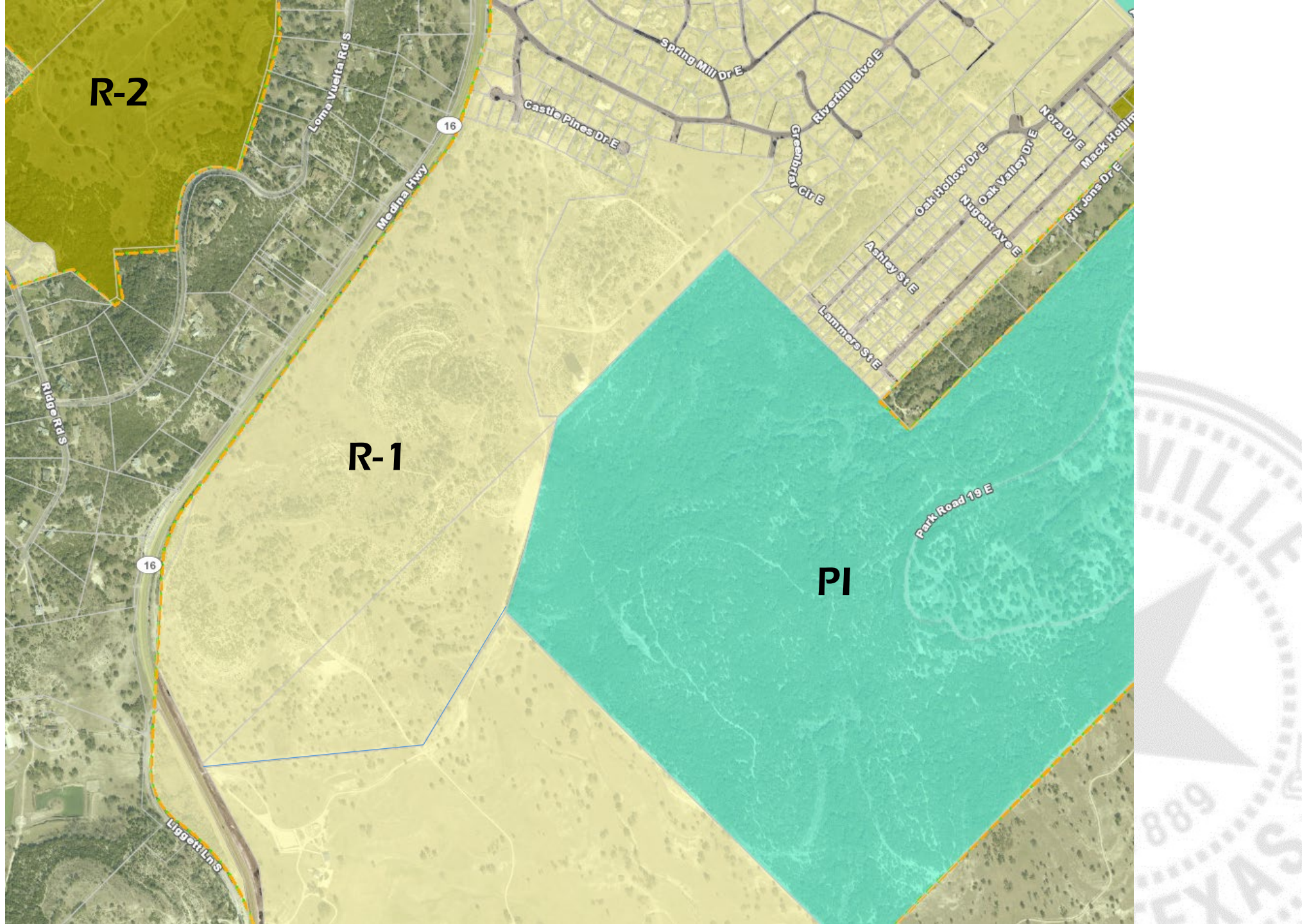
Preservation Residential areas support a variety of housing types in a compact network of complete, walkable streets that are easy to navigate by car, bike, and foot. Housing types can include small-lot, single-family detached homes, patio homes, townhomes, duplexes, condominiums, or apartments. Limited amounts of local retail and services may be appropriate in certain locations as needed to support the primary land use.

Primary Land Use: Single-family detached homes, patio homes, townhomes, other single-family attached dwellings.

Secondary Land Use: Civic and institutional uses, parks, open space, small amounts of neighborhood-serving retail and office in carefully chosen locations.

Indicators & Assumptions: These place types typically utilize public water and wastewater services. Lot sizes range but are often less than one acre in size. However, when one factors in open space, population densities are often comparable to Estate Residential or Rural Living.

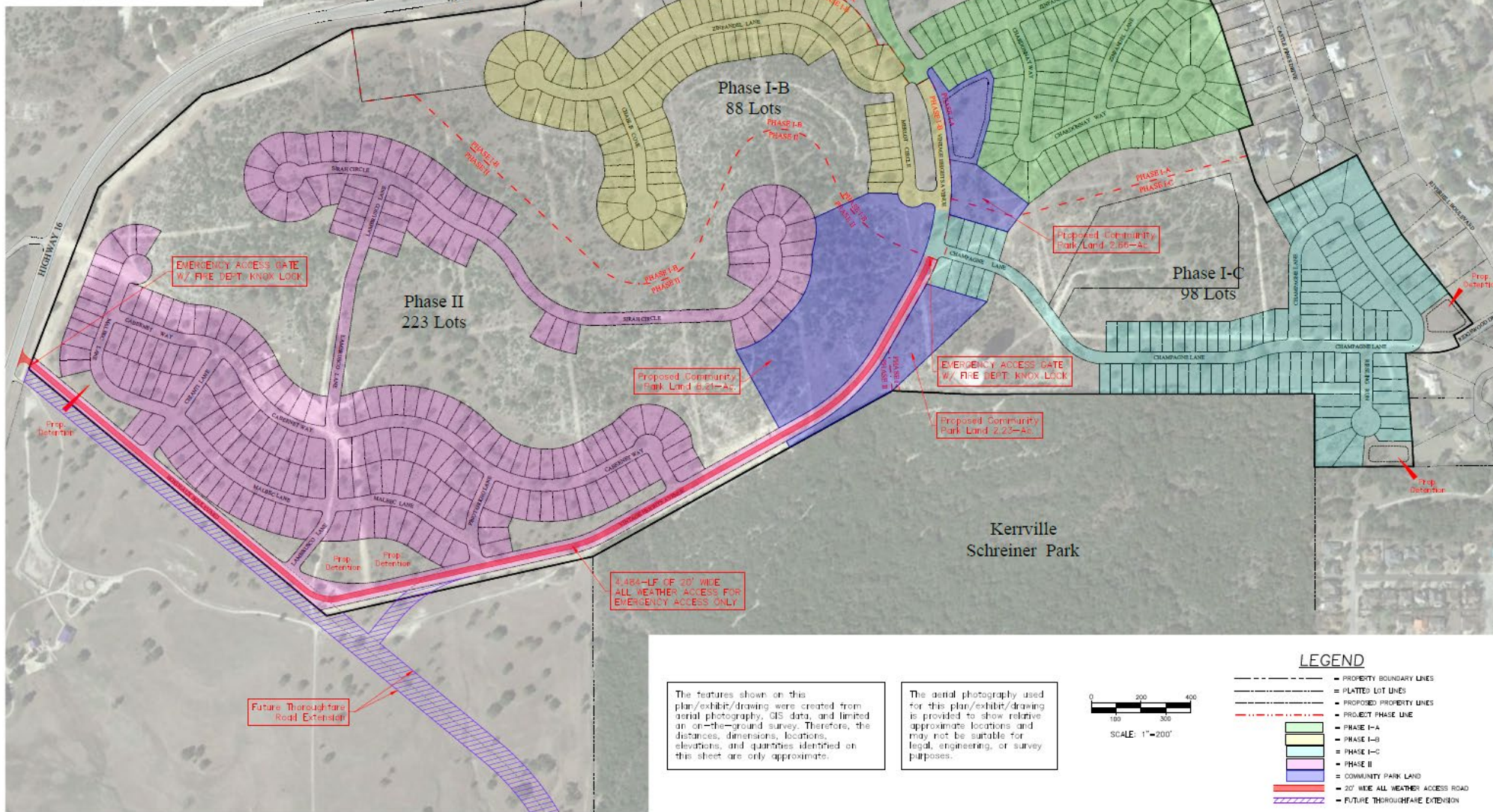
Current Zoning





Vicinity Map

1" = 1000'



The features shown on this plan/exhibit/drawing were created from aerial photography, GIS data, and limited on-the-ground survey. Therefore, the distances, dimensions, locations, elevations, and quantities identified on this sheet are only approximate.

The aerial photography used for this plan/exhibit/drawing is provided to show relative approximate locations and may not be suitable for legal, engineering, or survey purposes.

WELLBORN
ENGINEERING & SURVEYING

631 Water Street
Kerrville, TX 78028
Phone: 830-217-7100
Texas Registration No. P-7761
wellbornengineering.com

This document is released for interim purposes only. It is incomplete and may not be used for regulatory approval, permit, or construction. Michael Wellborn, P.E. License # 88685

Site Plan Exhibit - Overall
for
Vintage Heights Residential Subdivision
2601 Medina Highway
Kerrville, Texas

Revision	Drawn	Checked	Overall	Per	By	Date
No.	1	1	1	1	1	1
1	1	1	1	1	1	1

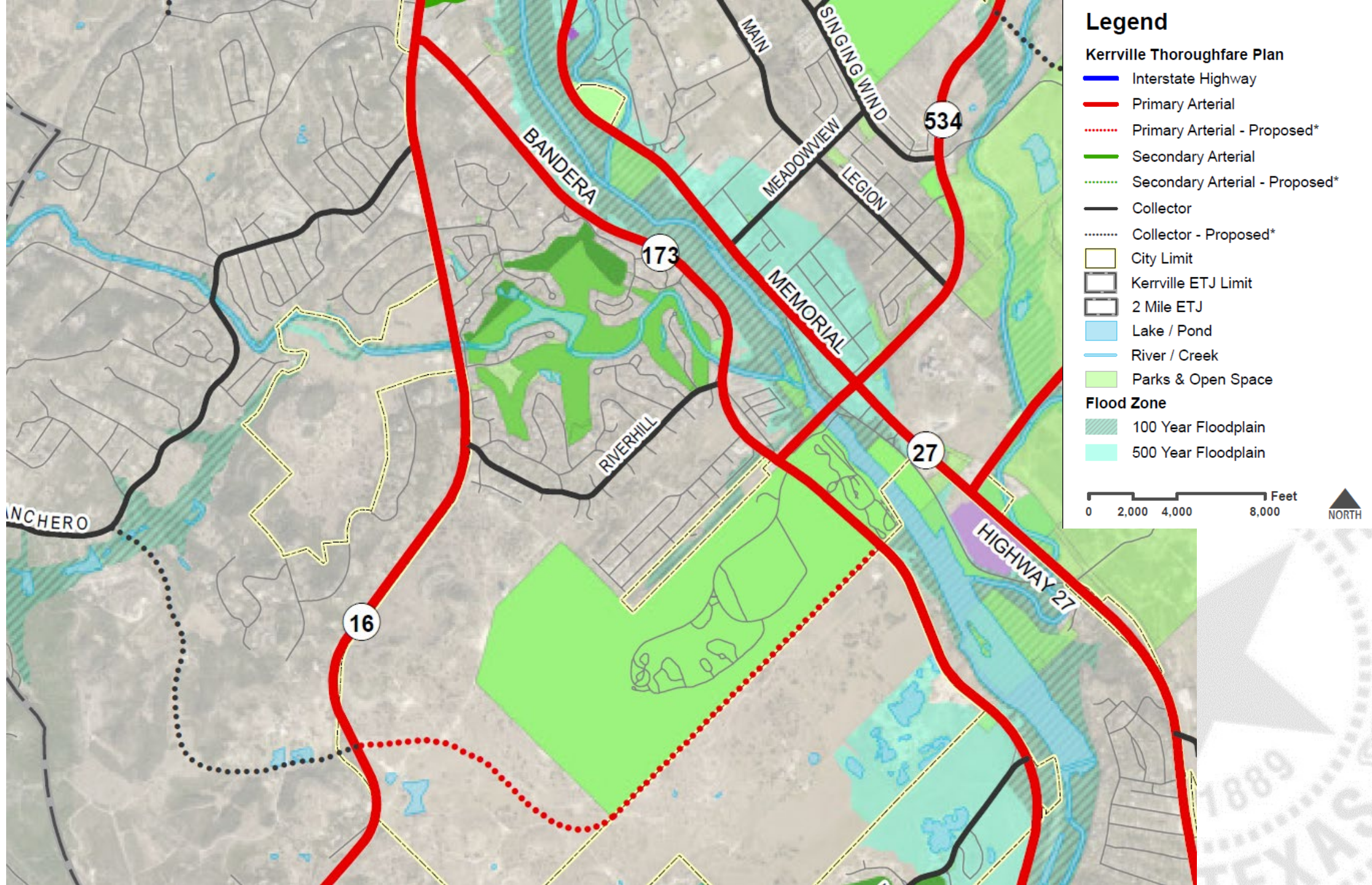
Scale: 1"=200' for 22"x34" sheets

WES Project No.

WES-19-005

Sheet No.

Thoroughfare Plan



City Council Questions?

Public Hearing



Location Map

Case # 2019-079

Location:
Vintage Heights Subdivision

Legend

200' Notification Area
Subject Properties



0 300 600 1,200
Scale In Feet

**CITY OF KERRVILLE, TEXAS
ORDINANCE NO. 2020-03**

AN ORDINANCE AMENDING CHAPTER 60 OF THE CODE OF ORDINANCES, CITY OF KERRVILLE, TEXAS, WHICH ADOPTED ZONING REGULATIONS, USE DISTRICTS, AND A ZONING MAP IN ACCORDANCE WITH THE CITY'S COMPREHENSIVE PLAN, SUCH CHAPTER MORE COMMONLY KNOWN AS THE CITY'S ZONING CODE; BY CHANGING THE ZONING AND CLASSIFICATION OF A PROPERTY GENERALLY LOCATED EAST OF AND ADJACENT TO STATE HIGHWAY 16 SOUTH, SOUTH OF RIVERHILL BOULEVARD, AND COMPRISING APPROXIMATELY 225.69 ACRES; FROM A SINGLE-FAMILY RESIDENTIAL ZONING DISTRICT (R-1) TO A MEDIUM DENSITY RESIDENTIAL ZONING DISTRICT (R-2); AMENDING THE COMPREHENSIVE PLAN (KERRVILLE 2050) TO MAKE IT CONSISTENT WITH SUCH AMENDMENT; PROVIDING A CUMULATIVE CLAUSE; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE; ORDERING PUBLICATION; AND PROVIDING OTHER MATTERS RELATING TO THE SUBJECT

WHEREAS, pursuant to Texas Local Government Code Sections 211.006 and 211.007, notice has been given to all parties in interest and citizens by publication in the official newspaper for the City of Kerrville, Texas ("City"), and otherwise, of a hearing held before the City Council on January 14, 2020, which considered a report of the City's Planning and Zoning Commission regarding its recommendations on an ordinance, the adoption of which will result in the change of a zoning district for a property generally located east of and adjacent to State Highway 16 South and south of Riverhill Boulevard; such change to result in the removal of the property from a Single-Family Residential Zoning District (R-1) to placement within a Medium Density Residential Zoning District (R-2); and

WHEREAS, on January 14, 2020, City Council held a public hearing on the zoning change referenced above pursuant to the published notice and has considered the application, comments, reports, and recommendations of the Planning and Zoning Commission and staff, public testimony, and other relevant support materials;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. The Zoning Code for the City of Kerrville, Texas, as enacted by City Council and effective October 1, 2019 and included within Chapter 60 of the Code of Ordinances of the City of Kerrville, Texas, and the *Official Zoning Map* be and the same are hereby amended to designate the following described property zoned as a Medium Density Residential Zoning District (R-2):

Being all of a certain tract or parcel of land comprising, approximately, 184.68 acres out of Nathaniel Hoyt Survey No. 147, Abstract No. 178, and 41.01 acres out of John A. Southmayd Survey No. 148, Abstract No. 288, within the City of Kerrville, Kerr County, Texas; said tract being more particularly described and depicted at Exhibit A, attached hereto and made a part hereof for all purposes, and hereafter referred to as the "Property."

SECTION TWO. The City Manager or designee is authorized and directed to amend the City's *Official Zoning Map* to reflect the change in districts adopted herein and to take other actions contemplated by and in accordance with the City's Zoning Code.

SECTION THREE. The City Manager or designee is authorized and directed to amend the City's Comprehensive Plan (*Kerrville 2050*), together with its *Future Land Use Map*, as necessary to make it consistent with the amendment(s) to the Zoning Code authorized by this Ordinance, to include changing the designation of the Property on said map to "Preservation Residential."

SECTION FOUR. The provisions of this Ordinance are cumulative of all other ordinances or parts of ordinances governing or regulating the same subject matter as that covered herein; provided, however, that all prior ordinances or parts of ordinances inconsistent with or in conflict with any of the provisions of this Ordinance are expressly repealed to the extent of any such inconsistency or conflict.

SECTION FIVE. The terms and provisions of this Ordinance shall be deemed to be severable in that if any portion of this Ordinance is declared to be invalid, the same shall not affect the validity of the other provisions of this Ordinance.

SECTION SIX. Pursuant to Texas Local Government Code §52.013(a) and Section 3.07 of the City's Charter, the City Secretary is hereby authorized and directed to publish the descriptive caption of this Ordinance in the manner and for the length of time prescribed by the law as an alternative method of publication.

SECTION SEVEN. This Ordinance shall become effective immediately upon the expiration of ten days following publication, as provided for by Section 3.07 of the City Charter.

PASSED AND APPROVED ON FIRST READING, this the ____ day of _____, A.D., 2020.

PASSED AND APPROVED ON SECOND AND FINAL READING, this the ____ of _____, A.D., 2020.

Bill Blackburn, Mayor

ATTEST:

Shelley McElhannon, City Secretary

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

FIELD NOTES DESCRIPTION FOR 225.69 ACRES OF THE
TUSCANY LAND, LTD. PROPERTY ON STATE HIGHWAY
NO. 16 IN THE CITY OF KERRVILLE, KERR COUNTY, TEXAS

Being all of a certain tract or parcel of land comprising, approximately, 184.68 acres out of Nathaniel Hoyt Survey No. 147, Abstract No. 178, and 41.01 acres out of John A. Southmayd Survey No. 148, Abstract No. 288, in the City of Kerrville, Kerr County, Texas; parts of 669.14 acres conveyed as Tract I and 40.52 acres conveyed as Tract II to Tuscany Land, Ltd. from Robert Keeble, et al, by a General Warranty Deed executed the 6th day of September, 2002 and recorded in Volume 1219 at Page 173 of the Real Property Records of Kerr County, Texas; and being more particularly described by metes and bounds as follows (record calls shown in parentheses):

Beginning at a ½" iron stake found in the southeast right-of-way line of State Highway No. 16 for the northwest corner of the herein described tract and said 669.14 acres, the southwest corner of Block No. 1 of Riverhill No. 11, the replat of which is recorded in Volume 6 at Page 350 of the Plat Records of Kerr County, Texas; which point bears 8791.6 ft. N.21°37'07"W. from a ½" iron stake found in a stone mound at the east corner of Mrs. Alliweses Clark Survey No. 395, Abstract No. 101;

THENCE, with the northeast line of said 669.14 acres, each point marked with a found ½" iron stake unless stated otherwise: with the south line of said Block 1, S.71°49'28"E. 305.07 ft. (S.71°50'28"E. 305.00 ft.) to the southeast corner of said Block 1; with the east line of said Block 1, N.18°03'56"E. 50.00 ft. (N.18°09'32"E. 50.00 ft.) to the southerly terminus of the west right-of-way line of Green Tree Lane, a sixty (60) ft. wide public street; with the south right-of-way line of said Green Tree Lane, S.81°49'40"E. 60.91 ft. (S.81°45'48"E. 60.91 ft.) to a ½" iron stake set at the southerly terminus of the east right-of-way line of said Green Tree Lane, in the west line of Block 2; with the west line of said Block 2, S.18°03'56"W. 50.00 ft. (S.18°09'32"W. 50.00 ft.) to the southwest corner of said Block 2; with the south line of said Block 2, S.71°50'19"E. 162.65 ft. (S.71°50'28"E. 162.75 ft.) and S.62°50'45"E., at 221.5 ft. passing a fence cornerpost, then along a fence for a total distance of 466.07 ft. (S.62°51'17"E. 466.07 ft.) to a ½" iron stake found at a cornerpost at the south corner of Lot No. 14 in the northwest line of Lot No. 13R, the replat of which is recorded in Volume 6 at Page 384 of the Plat Records of Kerr County, Texas;

THENCE, along a fence with the common line between said 669.14 acres and said Lot No. 13R: S.27°01'06"W. 59.85 ft. (S.27°08'43"W. 60.00 ft.) to a ½" iron stake found at a cornerpost for a reentrant corner of the herein described tract, the west corner of said Lot No. 13R; S.62°51'53"E. 221.79 ft. (S.62°51'17"E. 221.85 ft.) to a ½" iron stake found at an anglepost; and S.73°09'48"E. 30.48 ft. (S.73°12'01"E. 30.58 ft.) to a ½" iron stake found at a cornerpost at the south corner of said Lot No. 13R, the easterly common corner of said 669.14 acres and said 40.52 acres, the west corner of 0.08 acre conveyed to F. O'Neil Griffin Issue GST for Richard Griffin from Robert Keeble, et al, by a General Warranty Deed executed the 13th day of March, 2000 and recorded in Volume 1063 at Page 736 of the Real Property Records of Kerr County, Texas;

THENCE, along a fence upon, over and across said 40.52 acres: with the southwest line of said 0.08 acre, S.73°09'12"E. 63.26 ft. (S.73°12'01"E. 63.15 ft.) to a ½" iron stake found at a cornerpost for a reentrant corner of the herein described tract, the south corner of said 0.08 acre; and with the southeast line of said 0.08 acre, N.16°59'24"E. 59.28 ft. (N.17°08'54"E. 59.02 ft.) to a ½" iron stake found at a cornerpost at the east corner of said 0.08 acre, the south corner of Lot No. 12, Block No. 2, a reentrant corner of said 40.52 acres;

THENCE, with the common line between said 40.52 acres and said Block No. 2, N.17°11'54"E., along a fence, at 167.2 ft. passing an anglepost, then not along a fence, at 186.6 ft. passing a cornerpost, then again along a fence, at 309.1 ft. passing an anglepost, then not along a fence for a total distance of 349.78 ft. (N.17°08'54"E. 350.00 ft.) to a ½" iron stake found near a fence at the northerly common corner of said 40.52 acres and said Block No. 2, in the southwest line of Lot No. 8 in Block "D" of Riverhill Estates No. One, the plat of which is recorded in Volume 4 at Pages 22 and 23 of the Plat Records of Kerr County, Texas;

THENCE, with the common line between said 40.52 acres and said Riverhill Estates No. One, each point marked with a found ½" iron stake: with the south line of said Lot No. 8 in Block "D", S.73°12'44"E. 124.81 ft. (S.73°12'01"E. 125.00 ft.) to the southeast corner of said Lot No. 8 at the southerly terminus of the west right-of-way line of Hickory Hills Drive, a fifty (50) ft. wide public street; with the south right-of-way line of said Hickory Hills Drive, S.74°38'21"E. 50.07 ft. (S.74°37'02"E. 50.02 ft.) to the southwest corner of Lot No. 1 in Block "H" at the southerly terminus of the east right-of-way line of said Hickory Hills Drive; with the south line of said Lot No. 1, S.75°24'35"E. 190.65 ft. (S.75°22'07"E. 190.74 ft.) to the southerly common corner of Lots No. 1 and No. 2; and with the south line of Lots No. 2, No. 3 and No. 4 in said Block "H", S.83°46'15"E. 457.08 ft. (S.83°46'05"E. 457.09 ft.) to a ½" iron stake found for the northeast corner of the herein described tract and said 40.52 acres, the southeast corner of said Lot No. 4 in Block "H", in the west right-of-way line of Ridgewood Lane, a fifty (50) ft. wide public road easement as dedicated by said subdivision plat;

THENCE, with the northeast line of said 40.52 acres: with the west right-of-way line of said Ridgewood Lane, S.12°29'46"W. 60.06 ft. (S.12°30'28"W. 60.08 ft.) to a ½" iron stake found at the beginning of a 25°13'32" curve concave to the west having a radius of 227.15 ft. (227.15 ft.), and 27.95 ft. (28.05 ft.) with an arc of said 25°13'32" curve subtended by a central angle of 07°03'02" (07°04'31") [long chord = S.16°16'26"W. 27.93 ft. (S.16°16'25"W. 28.03 ft.)] to a ½" iron stake set at its end at the southerly terminus of the west right-of-way line of said Ridgewood Lane; and with the southerly end of said Ridgewood Lane, S.70°12'03"E. 50.00 ft. (S.70°11'20"E. 50.00 ft.) to a ½" iron stake set in the east right-of-way line of said Ridgewood Lane, the northwest line of Lot No. 2 in Block "M" of Riverhill Estates No. Three, the replat of which is recorded in Volume 4 at Page 114 of the Plat Records of Kerr County, Texas;

THENCE, with the common line between said 40.52 acres and said Lot No. 2: 121.66 ft. (121.66 ft.) with an arc of a 20°40'29" curve concave to the west having a radius of 277.15 ft. (277.15 ft.) [long chord = S.32°22'29"W. 120.69 ft. (S.32°23'12"W. 120.69 ft.)] to a ½" iron stake found at its end; and S.44°57'01"W. 98.46 ft. (S.44°57'44"W. 98.43 ft.) to a ½" iron stake found at the westerly common corner of Lots No. 2 and No. 3 for a reentrant corner of the herein described tract and said 40.52 acres;

THENCE, with the common line between said 40.52 acres and said Block "M", each point marked with a found ½" iron stake: with the southwest line of said Lot No. 3, S.49°22'53"E. 180.02 ft. (S.49°21'57"E. 179.91 ft.) to the southwesterly common corner of Lots No. 3 and No. 4; with the southwest line of said Lot No. 4, S.49°23'27"E. 199.67 ft. (S.49°26'00"E. 199.73 ft.) to the southwesterly common corner of Lots No. 4 and No. 5; and with the southwest line of said Lot No. 5, S.49°12'32"E. 78.20 ft. (S.49°08'29"E. 78.04 ft.) to the south corner of said Lot No. 5 for the most easterly corner of the herein described tract and said 40.52 acres, in a fence along the northwest line of 8.57 acres conveyed to David R. Wilson from Kenneth L. Creal

Page 3 – 225.69 acres of the Tuscany Land, Ltd. land
on State Highway No. 16 in the City of
Kerrville, Kerr County, Texas

by a Cash Warranty Deed executed the 12th day of October, 2001 and recorded in Volume 1149 at Page 121 of the Real Property Records of Kerr County, Texas;

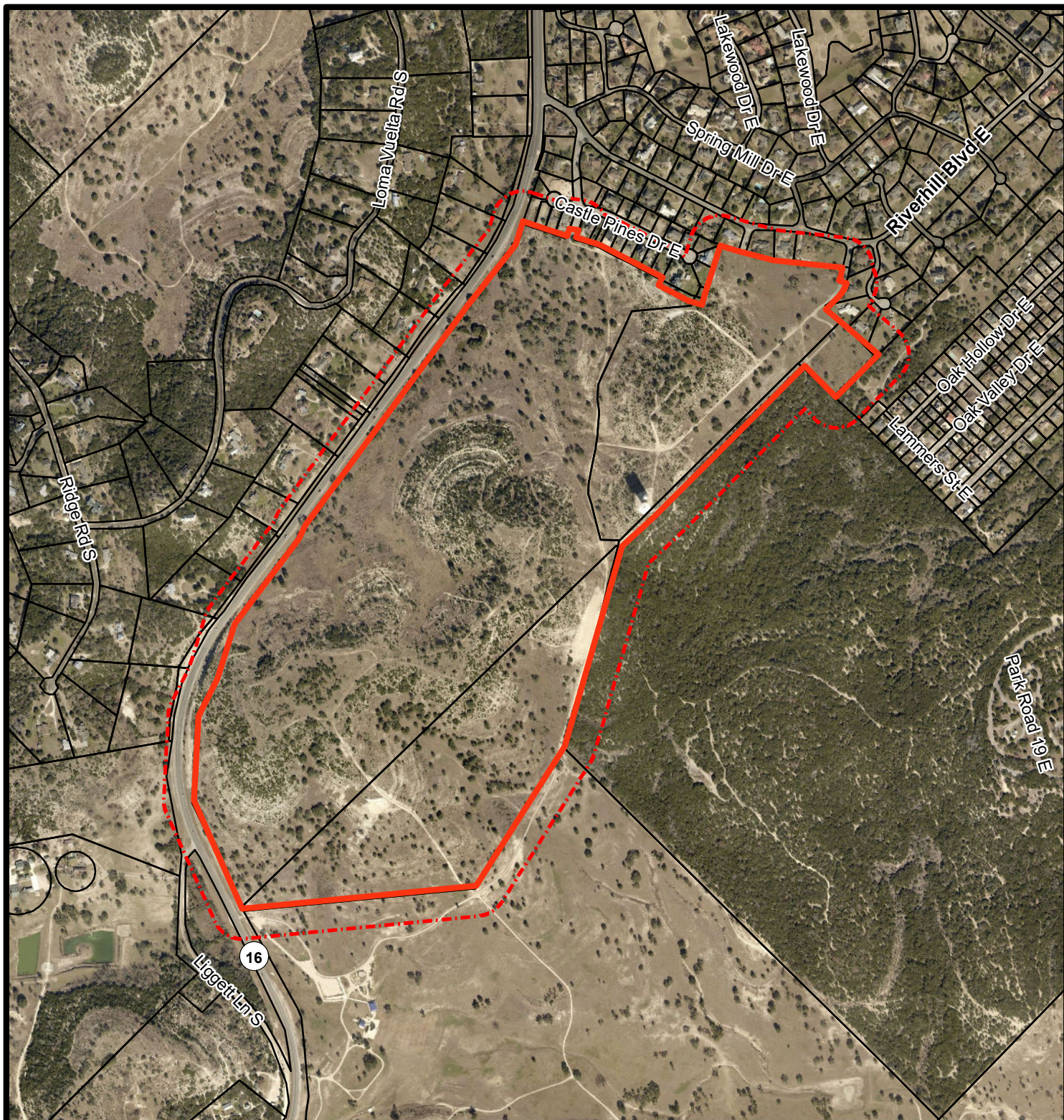
THENCE, along a fence with the common line between said 40.52 acres and said 8.57 acres, S.44°51'12"W. 398.59 ft. (S.44°51'33"W. 399.05 ft.) to a ½" iron stake found at a three-way cornerpost at the west corner of said 8.57 acres in the northeast line of 500 acres conveyed to the City of Kerrville from the Texas Parks and Wildlife Department by a Deed executed the 29th day of January, 2004 and recorded in Volume 1334 at Page 43 of the Real Property Records of Kerr County, Texas;

THENCE, along a fence with the common line between said 40.52 acres and said 500 acres: N.45°04'10"W. 292.50 ft. (N.44°57'23"W. 292.51 ft.) to a ½" iron stake found at a three-way cornerpost for a northerly corner of said 500 acres, a reentrant corner of the herein described tract and said 40.52 acres; S.44°53'05"W. 1397.12 ft. (S.44°54'41"W. 1397.10 ft.) to an anglepost; and S.47°39'40"W. 297.03 ft. (S.47°28'34"W. 296.94 ft.) to an anglepost at the easterly common corner of said 40.52 acres and said 669.14 acres;

THENCE, along a fence with the common line between said 669.14 acres and said 500 acres, S.15°56'25"W. 1371.27 ft. (S.15°59'54"W. 1371.21 ft.) to an anglepost at the most westerly corner of said 500 acres;

THENCE, upon, over and across said 669.14 acres: S.32°25'57"W. 1092.88 ft. to a ½" iron stake set for the southeast corner of the herein described tract; and S.84°28'14"W., at 1371.87 ft. passing a ½" iron stake set for reference, then continuing for a total distance of 1550.53 ft. to a brass disc right-of-way marker found for the southwest corner of the herein described tract in a fence along the southwest line of said 669.14 acres, the northeast right-of-way line of said State Highway No. 16;

THENCE, along a fence with the west line of said 669.14 acres, the east right-of-way line of said State Highway No. 16, each point marked with a found concrete right-of-way marker unless stated otherwise: N.24°03'48"W., at 452.79 ft. passing a found concrete right-of-way marker, then continuing for a total distance of 780.76 ft. (N.24°02'55"W. 780.77 ft.); N.03°08'27"E. 559.23 ft. (N.03°09'29"E. 559.23 ft.); N.26°54'50"E. 275.58 ft. (N.26°55'32"E. 275.41 ft.); N.17°13'42"E., at 314.97 ft. passing a found concrete right-of-way marker, then continuing for a total distance of 380.54 ft. (N.17°14'05"E. 380.65 ft.); N.37°15'25"E. 700.04 ft. (N.37°16'02"E. 700.17 ft.); N.26°09'13"E. 101.86 ft. (N.26°14'28"E. 101.69 ft.); N.36°24'01"E. 1799.95 ft. (N.36°24'42"E. 1800.04 ft.); N.38°12'35"E., at 241.27 ft. passing a found concrete right-of-way marker, then continuing for a total distance of 512.33 ft. (N.38°12'59"E. 512.29 ft.) to a found brass disc right-of-way marker; and N.18°07'08"E., at approximately 137 ft. passing a cornerpost, then not along a fence for a total distance of 161.05 ft. (N.18°09'32"E. 160.79 ft.) to the PLACE OF BEGINNING containing 225.69 acres of land, more or less, within these metes and bounds.



Location Map

Case # 2019-079

Location:
Vintage Heights Subdivision

Legend

200' Notification Area - - - - -
Subject Properties —————



0 300 600 1,200

Scale In Feet

December 10, 2019

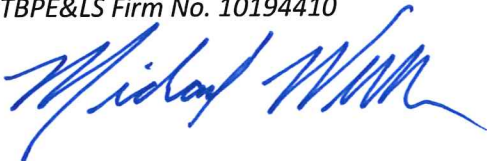
City of Kerrville
Attention: Drew Paxton, Planning Director
701 Main Street
Kerrville, Texas 78028

**RE: Vintage Heights – Zoning Change
Appeal Letter
City Case No. 2019-079
WEL Project No.: WEL-19-005**

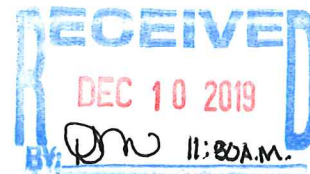
Mr. Paxton:

Pursuant to Section 60-65 (7) of the City of Kerrville's Zoning Code, Medina River Estates, LLC hereby appeals the Planning and Zoning Commission's denial of our zoning change request to the City of Kerrville's City Council. It is our understanding that this appeal will be presented and discussed during the January 14, 2020 City Council meeting.

Thank you,
Wellborn Engineering & Surveying
TBPE Firm No. F7761
TBPE&LS Firm No. 10194410



Michael Wellborn, P.E., C.F.M.
President
Phone # 830.928.9889
E-mail: mikew@wellbornengineering.com





**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Resolution No. 03-2020. A Resolution allowing a Conditional Use Permit for Automobile Dealership, Used Auto Sales on approximately 0.45 acres, part of Lots 5-8, Block 15, Westland Addition; and more commonly known as 404 Junction Highway.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 03, 2020

SUBMITTED BY: Drew Paxton

EXHIBITS: [20200114_Resolution 03-2020 Resolution granting a conditional use permit to authorize automobile dealership CUP.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

This is a request to allow a Conditional Use Permit for Automobile Dealership, Used Auto Sales on approximately 0.45 acres, part of Lots 5-8, Block 15, Westland Addition; and more commonly known as 404 Junction Highway.

The Planning and Zoning Commission heard this case on December 5th and voted to approve the Conditional Use Permit.

Procedural Requirements

31 letters were mailed November 18th, to adjacent property owners. The public notice was published in the Kerrville Daily Times on November 14th.

Staff Analysis and Recommendation

Consistency with the Kerrville 2050 Comprehensive Plan: The property and is designated as part of Strategic Catalyst Area #4. Strategic Catalyst Area 4 is the northwestern-most area, a narrow band of commercial and industrial land uses that nearly touches the City's border with Ingram. SCA 4 along State Highway 27 will be a commercial area that maintains the distinctive character of the surrounding neighborhoods.

Defining Characteristics: SH 27 is the city's northwest gateway. Major intersections are at Goat Creek and Harper roads.

Allowable Place Types: Community Commercial, Regional Commercial, Heavy Commercial - Light Industrial

Place Type Distinctions: Community Commercial should be present throughout SCA 4, while Regional Commercial would more appropriate on the eastern side closer to the Harper Road/SH 27 intersection. The Heavy Commercial - Light Industrial place type will be more appropriate along the existing cluster near the SH 27/Mill intersection on the far west side.

The zoning is not changing through this request and is therefore consistent with the Future Land Use Plan of the Kerrville 2050 Plan. The proposed use for Used Automobile Dealership is a Conditional Use within the C-2 District.

Adjacent Zoning and Land Uses

Subject Property

Current Zoning: C-2 Light Commercial

Existing Land Uses: print shop

Direction: North

Current Zoning: R-1 Single Family Residential and R-1A Single Family Residential with Accessory Dwelling Unit

Existing Land Uses: single family dwellings

Direction: East

Current Zoning: C-2 Light Commercial

Existing Land Uses: convenience store with fuel sales

Direction: South

Current Zoning: C-2 Light Commercial and C-3 General Commercial

Existing Land Uses: retail and offices

Direction: West

Current Zoning: C-2 Light Commercial

Existing Land Uses: retail

Thoroughfare Plan: The proposed use is on an existing commercial development along a major arterial, Junction Highway, so there should be no significant impact on the Thoroughfare network as a result of this proposed use.

Traffic Impact: As the proposed use is on an existing arterial, there should be no significant impact on traffic in the area.

Parking: Based on the requirements within the zoning code, adequate parking will be required for customers and employees for both the print shop and vehicle display area.

Recommendation: Based on the consistency with the Kerrville 2050 Comprehensive Plan, staff recommends approval.

RECOMMENDED ACTION:

Approve Resolution No. 03-2020.

**CITY OF KERRVILLE, TEXAS
RESOLUTION NO. 03-2020**

A RESOLUTION GRANTING A CONDITIONAL USE PERMIT TO AUTHORIZE AUTOMOBILE DEALERSHIP, USED AUTO SALES ON THE PROPERTY CONSISTING OF PART OF LOTS 5 THROUGH 8, BLOCK 15, OF THE WESTLAND ADDITION, A SUBDIVISION OF RECORD WITHIN THE CITY OF KERRVILLE, KERR COUNTY, TEXAS; AND LOCATED AT 404 JUNCTION HIGHWAY (STATE HIGHWAY 27); SAID PROPERTY IS LOCATED WITHIN THE C-2 ZONING DISTRICT; AND MAKING SAID PERMIT SUBJECT TO CERTAIN CONDITIONS AND RESTRICTIONS CONTAINED HEREIN

WHEREAS, the owner of the property graphically depicted in the vicinity map in **Exhibit A** (the "Property"), both exhibits being attached hereto and made a part hereof for all purposes, is requesting approval of a Conditional Use Permit (CUP) to allow an approximate .45-acre tract of land located within the C-2 Zoning District to be used for automobile dealership, used auto sales; and

WHEREAS, the City Planning and Zoning Commission and the City Council of the City of Kerrville, Texas, in compliance with state law and the Zoning Code of the City of Kerrville, Texas (Chapter 60, Code of Ordinances), and in particular, the approval of Conditional Use Permits, and the official zoning map; having given the requisite notices by United States mail, publication, and otherwise; and after holding due public hearings and affording a full and fair hearing to all of property owners generally and particularly to those interested persons situated in the affected area and in the vicinity thereof, City Council, finds that the health, safety, and general welfare will be best served by the granting of a Conditional Use Permit, subject to the special conditions and restrictions set out hereinafter on the Property;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. A Conditional Use Permit is granted to permit the property described below, and located within the C-2 Zoning District, to be developed and used for an Automobile Dealership, Used Auto Sales as that term is defined in and pursuant to the City's Zoning Code (Chapter 60, Article XI), and such use is subject to the provisions of this Resolution and other City ordinances and regulations:

Legal Description: Being an approximate 0.45 acre tract of land lying and being situated within the City of Kerrville, Kerr County, Texas, and being parts of Lots 5-8, Westland Addition, a subdivision of record in Kerr County, Texas; said lot being graphically depicted on the vicinity map in **Exhibit A**, attached hereto and made a part hereof for all purposes.

General Location: 404 Junction Highway (State Highway 27),
Kerrville, Texas

SECTION TWO. In addition to the development and use regulations currently applicable to the Property, development and use of the Property is subject to the following additional conditions:

- A. **Concept Plan:** The development and use of the Property shall conform to the concept plan, attached as **Exhibit A**.
- B. **Inventory:** No more than twelve (12) vehicles may be displayed on the Property for sales at any time.
- C. **Protection from Encroachment onto Right-of-way:** Concrete parking blocks (stops) shall be installed on the Property, adjacent to State Highway 27, and set back at least two feet (2.0') from the Property line.
- D. **Other Zoning Regulations:** The regulations set forth in this Resolution are in addition to those set forth in the Zoning Code, as may be amended or superseded. In the event of any irreconcilable conflict between this Resolution and the regulations set forth in the Zoning Code, the provisions of this Resolution will prevail.

SECTION THREE. This Resolution and the Conditional Use Permit granted herein is subject to termination in accordance with the Zoning Code.

SECTION FOUR. City Council finds and determines that its adoption of this Resolution promotes the health, safety, and general welfare of the public and is a proper valid exercise of the City's police powers.

SECTION FIVE. If any section, subsection, sentence, clause, phrase, or portion of this Resolution is for any reason held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions thereof.

SECTION SIX. This Resolution is effective upon adoption.

PASSED AND APPROVED ON this the ____ day of _____, A.D.,
2020.

Bill Blackburn, Mayor

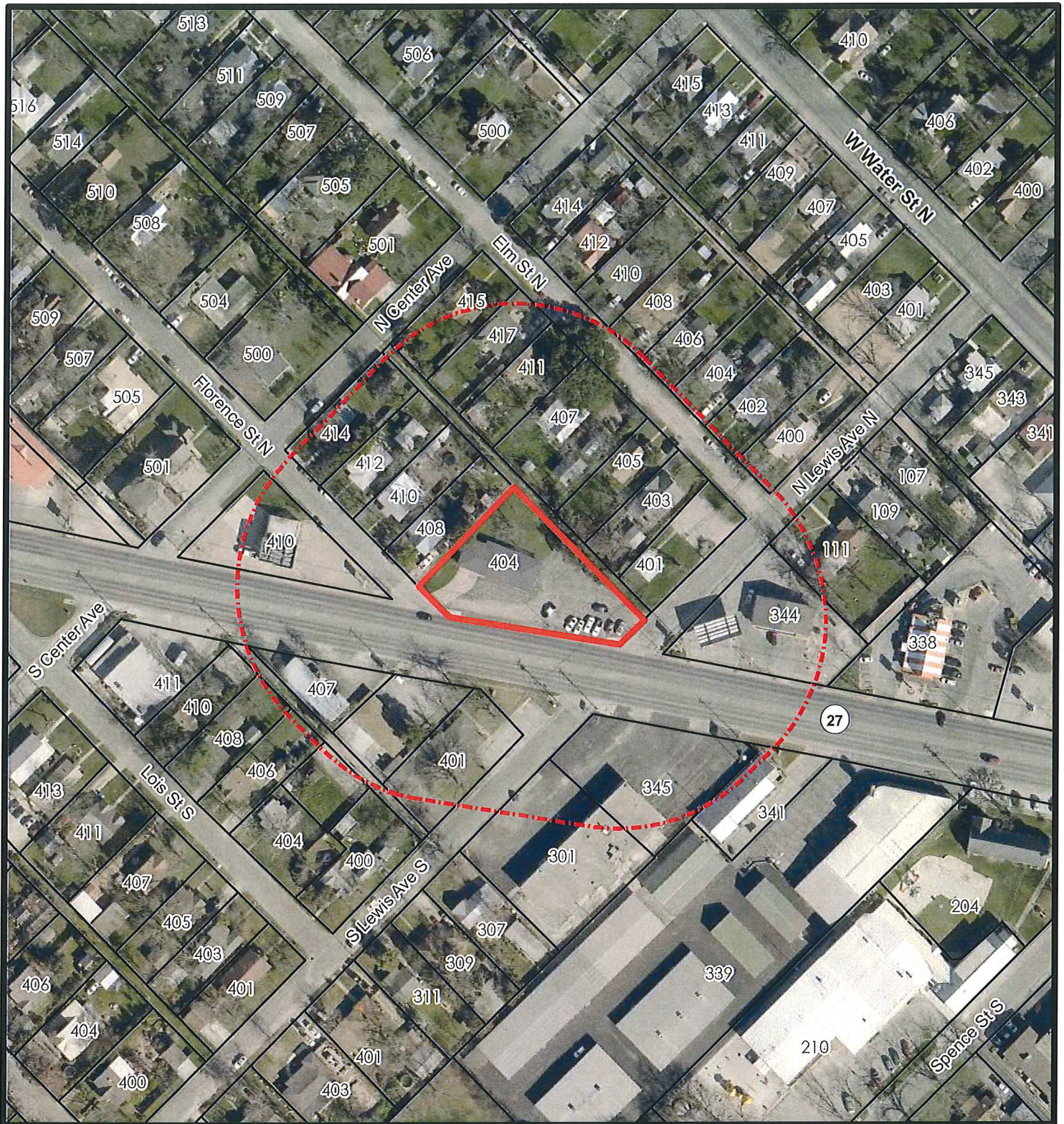
APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

ATTEST:

Shelley McElhannon, City Secretary



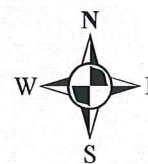
Location Map

Case # 2019-080

Location:
404 Junction Hwy

Legend

200' Notification Area
Subject Properties



0 50 100 200
Scale In Feet



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Ordinance No. 2020-04. An Ordinance amending Ordinance No. 2018-19 which created Tax Increment Reinvestment Zone Number One, City of Kerrville, Texas, by amending the composition of the Board of Directors for the Zone; containing a cumulative clause; containing a savings and severability clause; and providing other matters relating to this subject.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 08, 2020

SUBMITTED BY: Sherry Mosier

EXHIBITS: [20200114_Ordinance 2020-04 Amending Ordinance No. 2018-19 which created TIRZ.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	D - Downtown Revitalization
Guiding Principle	D8. Encourage reinvestment in Downtown in the form of vertical mixed-use development including residential uses.
Action Item	D8.3 - Offer incentives for Downtown housing and business development

SUMMARY STATEMENT:

Tax Increment Reinvestment Zone Number One, City of Kerrville (the "Zone") was created on September 25, 2018 by Ordinance No. 2018-19 to encourage reinvestment in Downtown. At that time the legislatively required five (5) member board of directors (the "Board") for the Zone was created which is currently comprised of the Mayor and Councilmembers Place 1 through 4. In lieu of City Council serving as the Board, it would be beneficial to change the membership of the Board and have the City Council appoint the Board as they do with other City boards and commissions. At the time of appointment, the City Council should also designate the Chair and Vice Chair of the Board from among its appointments.

RECOMMENDED ACTION:

Approve Ordinance No. 2020-04 to amend the Board of Directors for Tax Increment Reinvestment Zone Number One, City of Kerrville, Texas, to allow appointment of Board Members by City Council in lieu of City Council serving as the Board and at time of appointment, designate the Chair and Vice Chair from among its appointments.

**CITY OF KERRVILLE, TEXAS
ORDINANCE NO. 2020-04**

AN ORDINANCE AMENDING ORDINANCE NO. 2018-19 WHICH CREATED TAX INCREMENT REINVESTMENT ZONE NUMBER ONE, CITY OF KERRVILLE, TEXAS, BY AMENDING THE COMPOSITION OF THE BOARD OF DIRECTORS FOR THE ZONE; CONTAINING A CUMULATIVE CLAUSE; CONTAINING A SAVINGS AND SEVERABILITY CLAUSE; AND PROVIDING OTHER MATTERS RELATING TO THIS SUBJECT

WHEREAS, City Council, pursuant to Chapter 311 of the Texas Tax Code as amended (known as the Tax Increment Financing Act and herein referred to as the “Act”) and its adoption of Ordinance No. 2018-19, previously designated a geographic area within the City as a tax increment reinvestment zone (“TIRZ”); and

WHEREAS, Ordinance No. 2018-19 designated the TIRZ as “Reinvestment Zone Number One, City of Kerrville, Texas” hereinafter referred to as the “Zone”; and

WHEREAS, Ordinance No. 2018-19 also created a board of directors (“Board”) for the Zone, the Board generally consisting of five (5) members comprised of Councilmembers from Places 1 through 4 and the Mayor, with the Mayor designated as the Chair of the Board; and

WHEREAS, City Council now believes it beneficial to amend Ordinance No. 2018-19 to change the possible composition of the Board; and

WHEREAS, City Council finds it to be in the public interest to amend Ordinance No. 2018-19 as provided herein;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. Section Four of Ordinance No. 2018-19 is amended by adding the language that is underlined (added) and deleting the language that is bracketed and stricken (~~[deleted]~~) as follows:

“SECTION FOUR. BOARD OF DIRECTORS. A board of directors for the Zone (“Board”) is hereby created. The Board shall consist of five (5) members ~~[comprised of Councilmembers from Places 1 through 4 and the Mayor]~~ appointed by City Council, where such members may include one or more Councilmembers. ~~[The Mayor~~

~~shall serve as chair of the Board and the Board may elect a vice chair and such other officers as the Board sees fit]~~ At the time of its appointments and at any other time, City Council shall designate the Chair and Vice Chair of the Board from among its appointments. The terms of the members are staggered, such that Council will appoint 3 members to terms expiring September 30 of one year. Council will then appoint the remaining 2 members to terms expiring September 30 of the following year. During the early history of the Board and where an appointment is made to fill unexpired term and, based upon a goal of maintaining staggered terms, Council may appoint a person to a term that is less than two years. However, no appointee shall serve a term longer than two years. All members shall serve until their successors are appointed and qualified, but regardless, each term will exist as a two-year term beginning October 1 and terminating September 30, two years thereafter. Additionally, each taxing unit that levies taxes within the Zone and chooses to contribute all or part of the tax increment produced by the unit into the tax increment fund may appoint one member of the Board. The number of directors on the Board shall be increased by one for each taxing unit that appoints a director to the Board; provided, that the maximum number of directors shall not exceed fifteen (15). The Board shall make recommendations to City Council concerning the administration, management, and operation of the Zone. The Board shall prepare and adopt a project plan and a reinvestment zone financing plan for the Zone and submit such plans to City Council for its approval. The Board shall perform all duties imposed upon it by Chapter 311 of the Texas Tax Code and all other applicable laws. Notwithstanding anything to the contrary herein, the Board, pursuant to Section 311.010 of the Act, is not authorized to (i) issue bonds; (ii) impose taxes or fees; (iii) exercise the power of eminent domain, or (iv) give final approval to the Zone's project plan and financing plan. (For purposes of clarification, City Council is not authorizing the Board to initiate any zoning changes, authorize any changes in land use or modify the procedure to obtain the same, all of which must continue to comply with the ordinances, codes and procedures of the City of Kerrville.)"

SECTION TWO. The provisions of this Ordinance are to be cumulative of all other ordinances or parts of ordinances governing or regulating the same subject matter as that covered herein; provided, however, that all prior ordinances or parts

of ordinances inconsistent with or in conflict with any of the provisions of this Ordinance are hereby expressly repealed to the extent of any such inconsistency or conflict.

SECTION THREE. If any section, subsection, sentence, clause, or phrase of this Ordinance is, for any reason, held to be unconstitutional or invalid, such holding shall not affect the validity of the remaining portions of this Ordinance. The Council of the City of Kerrville, Texas hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause, or phrase hereof irrespective of the fact that one or more sections, subsections, sentences, clauses, or phrases be declared unconstitutional or invalid.

PASSED AND APPROVED ON FIRST READING, this the ____ day of _____, A.D., 2020.

PASSED AND APPROVED ON SECOND AND FINAL READING, this the ____ day of _____, A.D., 2020.

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

Bill Blackburn, Mayor

ATTEST:

Shelley McElhannon, City Secretary



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Ordinance No. 2020-01. Second Reading. An Ordinance declaring the adoption of amendments to the City of Kerrville, Texas, Charter in accordance with the adoption of propositions A through O and Q at the Special Election held on November 05, 2019; adopting the Charter, as amended; providing a cumulative clause; containing a savings and severability clause; providing an effective date; and providing other matters related to the subject.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 20, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Ordinance_2020-01 Adoption of Amendments to City Charter.pdf](#)
[20200114_Charter.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Pursuant to Section 14.07 of the City Charter, the City's Charter must undergo a review every five years. To conduct that review, the Council must appoint a Charter Review Commission ("CRC"), which it did in January 2019. The CRC completed its review of the Charter and submitted its 'Report of the 2019 Kerrville Charter Review Commission' at a Council meeting on July 16, 2019. After the CRC's presentation, Council voted to accept the Report. Council also considered the CRC's recommended amendments and voted to hold a Special Election. Prior to said election, Council voted to send all of the CRC's proposed amendments, except one, to the voters as propositions.

At the November 5, 2019 election, voters approved Propositions A through O and Q, which contained the amendments. At a special meeting held on November 18, 2019, Council canvassed the results of this election and the adoption of the amendments, and voted to accept the results via Resolution No. 52-2019. Under state law, Council must now officially adopt the newly amended Charter. Following adoption, City staff will ensure that the new Charter is published online and maintained within the City Secretary's Office.

Ordinance No. 2020-01 first reading was approved by Council on December 10, 2019.

RECOMMENDED ACTION:

Adoption of Ordinance No. 2020-01 on 2nd Reading to declare the adoption of various amendments to the City Charter and to adopt a newly revised Charter.

**CITY OF KERRVILLE, TEXAS
ORDINANCE NO. 2020-01**

AN ORDINANCE DECLARING THE ADOPTION OF AMENDMENTS TO THE CITY OF KERRVILLE, TEXAS, CHARTER IN ACCORDANCE WITH THE ADOPTION OF PROPOSITIONS A THROUGH O AND Q AT THE SPECIAL ELECTION HELD ON NOVEMBER 5, 2019; ADOPTING THE CHARTER, AS AMENDED; PROVIDING A CUMULATIVE CLAUSE; CONTAINING A SAVINGS AND SEVERABILITY CLAUSE; PROVIDING AN EFFECTIVE DATE; AND PROVIDING OTHER MATTERS RELATED TO THIS SUBJECT

WHEREAS, on February 25, 1942, a home-rule Charter was adopted for the City of Kerrville, Texas; and

WHEREAS, the City Charter is a document prepared by the citizens of the City providing direction to the City government on how to operate; and

WHEREAS, since this time, the Charter has been amended nine times, with the last comprehensive review occurring in 2013-14; and

WHEREAS, Section 14.07 of the Charter requires a periodic review to help ensure that the document is current and that it properly reflects the overall directions of this community; and

WHEREAS, in January 2019, City Council appointed persons to a Charter Review Commission ("CRC") and charged it with reviewing and proposing amendments to the Kerrville City Charter; and

WHEREAS, following a series of meetings, the CRC presented its *Report of Proposed Charter Amendments* to City Council in July 2019 at a public meeting; and

WHEREAS, the Council reviewed the Report and after considering the CRC's proposed amendments, the Council called a Special Election for November 5, 2019, for a vote of the electors to consider the approval or rejection of various amendments to the Charter, the amendments being in the form of Propositions A through R; and

WHEREAS, at the Special Election on November 5, 2019, voters approved by majority vote Propositions A through O and Q, and failed to approve Propositions P and R, thereby amending the Charter in this manner; and

WHEREAS, at a special meeting held on November 18, 2019, which was open to the public, City Council canvassed the results of this Special Election and adopted Resolution No. 52-2019, which approved and declared the results of this election; and

WHEREAS, City Council finds it to be in the public interest to declare the adoption of the amendments to the City's Charter, and to adopt the amended Charter, in accordance with Chapter 9, Texas Local Government Code, and Section 14.06 of the Charter;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. Propositions A through O and Q, as passed during the Special Election held on November 5, 2019, and which contained amendments to the City's Charter, are declared adopted. This declaration serves as an order, which the City Secretary shall record in the City's official records, in accordance with Section 9.005(b) of the Texas Local Government Code.

SECTION TWO. In accordance with Section 14.08 of the Charter, and based upon the amendments, the Charter has been renumbered and rearranged as appropriate, and the City Council authorizes such changes.

SECTION THREE. The newly revised Charter, including the amendments resulting from the passage of Propositions A through O and Q, is attached as **Exhibit A** and made a part hereof for all purposes, and is adopted in this form by City Council.

SECTION FOUR. In accordance with Section 9.007(a) of the Texas Local Government Code and following adoption of this Ordinance, the Mayor shall certify to the Texas Secretary of State an authenticated copy of the Charter, as amended, under the City's seal and showing the approval by the voters of the City.

SECTION FIVE. The City Secretary shall record in the City Secretary's records the Charter, as amended, as adopted by the voters of the City pursuant to Section 9.008(a) of the Texas Local Government Code.

SECTION SIX. The provisions of this Ordinance are to be cumulative of all other ordinances or parts of ordinances governing or regulating the same subject matter as that covered therein and does not repeal any of the provision of said ordinances.

SECTION SEVEN. If any section, subsection, sentence, clause or phrase of this Ordinance or any appendix thereof, is, for any reason, held to be unconstitutional

or invalid, such holding does not affect the validity of the remaining portions. The City Council of the City of Kerrville, Texas, declares that it would have passed this Ordinance and its exhibit and each section, subsection, sentence, clause, or phrase thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases be declared unconstitutional or invalid.

SECTION EIGHT. Following adoption of this Ordinance upon second reading, the amendments, and the newly revised Charter shall become effective immediately.

PASSED AND APPROVED ON FIRST READING, this the 10 day of December, A.D., 2019.

PASSED AND APPROVED ON SECOND AND FINAL READING, this the ____ day of _____, 2020.

Bill Blackburn, Mayor

ATTEST:

Shelley McElhannon, City Secretary

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney



CHARTER OF THE CITY OF KERRVILLE, TEXAS

CITY OF KERRVILLE CHARTER

MEMBERS OF THE CITY COUNCIL

**BILL BLACKBURN
MAYOR**

**GARY COCHRANE
COUNCILMEMBER, PLACE 1**

**KIM CLARKSON
COUNCILMEMBER, PLACE 2**

**JUDY EYCHNER
COUNCILMEMBER, PLACE 3**

**DELAYNE SIGERMAN
COUNCILMEMBER, PLACE 4**

SHELLEY McELHANNON, CITY SECRETARY

JANUARY 14, 2020

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ARTICLE I. INCORPORATION, POWERS, AND TERRITORY

Section 1.01. Establishment and Purpose of the Charter.

We the people of the City of Kerrville, Texas, under the constitution and laws of the State of Texas, in order to secure the benefits of local self-government and to provide for an honest and accountable council-manager government do hereby adopt this Charter and confer upon the City the following powers, subject to the following limitations, and prescribed by the following procedures and government structure. By this action, we secure the benefits of home-rule and affirm the values of representative democracy, professional management, strong leadership, citizen participation, and regional cooperation.

Section 1.02. Enumerated Powers not Exclusive.

The enumeration of particular powers by this Charter shall not be held or deemed to be exclusive, but, in addition, to the powers enumerated therein or implied thereby, or appropriate to the exercise of such powers, it is intended that the City of Kerrville shall have, and may exercise, all powers of local self-government, provided by the Constitution and laws of the State of Texas, as it is competent for this Charter to specifically enumerate. All powers of the City, whether expressed or implied, shall be exercised in the manner prescribed by this Charter, or if not prescribed therein, then in the manner provided by ordinance or resolution of the Council.

Section 1.03. Provisions Relating to Assignment, Execution, and Garnishment.

The property, real and personal, belonging to the City shall not be liable to be sold or appropriated under any writ of execution or cost bill. The funds belonging to the City, in the hands of any person, firm or corporation, shall not be liable to garnishment; nor shall the City be liable to garnishment on account of any debt it may owe or funds or property it may have on hand or owing to any person. Neither the City nor any of its officers or agents shall be required to answer any such writ of garnishment on any account whatever. The City shall not be obligated to recognize any assignment of wages or funds by its employees, agents, or contractors.

Section 1.04. Boundaries.

The boundaries of the City of Kerrville are hereby established by the official map which is on file in the City Secretary's Office at City Hall.

Section 1.05. Annexation of Territory.

The City Council may by ordinance annex territory lying adjacent to the City, with or without the consent of the inhabitants in such territory, or owners thereof, not inconsistent with the Constitution and Statutes of the State of Texas or the United States of America.

Section 1.06. Deannexation.

Whenever there exists within the corporate limits of the City of Kerrville any territory not suitable or necessary for City purposes, the Council may, upon a petition signed by a majority of the qualified voters residing in such territory, if the same be inhabited, or without any such petition if the same be uninhabited, by ordinance duly passed by a majority vote of all the Councilmembers, discontinue said territory as a part of said City; said petition and ordinance shall specify accurately the metes and bounds of the territory sought to be eliminated from the City and shall contain a plat designating such territory so that the same can be definitely ascertained; and when said ordinance has been duly passed, the same shall be entered upon the minutes and records of said City, and from and after the entry of such ordinance, said territory shall cease to be a part of said City, but said territory shall still be liable for its pro rata share of any debts incurred while said area was a part of said City.

Section 1.07. - Sale of Liquor Prohibited.

The City may regulate or otherwise prohibit the sale of liquor in all or part of the residential areas of the City as authorized by this charter provision and State law.

ARTICLE II. GOVERNING BODY

Section 2.01. The City Council.

Except as otherwise provided in this Charter, all powers of the City shall be vested in a Council of five (5) members, to be known as the Kerrville City Council. The members of the Council shall be elected from the City of Kerrville at large in a manner prescribed elsewhere in this Charter without party or partisan mark or designation. The Mayor is a member of the Council and may be referred to in this Charter as a "Councilmember."

Section 2.02. Qualifications for Councilmembers.

Each member of the City Council, in addition to having other qualifications required by law:

- a. Shall be a qualified voter of the State of Texas;
- b. Shall be at least eighteen (18) years of age;
- c. Shall be a resident of the City for at least twelve (12) consecutive months preceding the election day; provided, however, that any person who shall have been a resident for a period of not less than twelve (12) consecutive months immediately preceding the election of any territory not formerly within the corporate limits of the City, but which is annexed under the provision of this charter, shall be eligible for said office;
- d. Shall not hold any other elected office or employment under the City government while a member of the Council, except a member of the City Council may be appointed by the City Council to represent the Council on any board, commission, committee, organization or entity in the Council's sole discretion so long as that person's service does not extend beyond the person's term of office.
- e. At the time that a candidate's application for a place on the ballot is submitted, or thereafter, such candidate shall not be related within the second degree of affinity or third degree of consanguinity to anyone employed by the City and who holds an executive position with the City, which is defined as the head of any department or division within the City. The City Manager shall indicate such positions within his or her budget.

Section 2.03. Term of Office.

- a. The members of the City Council shall hold their offices for a term of two years and until their successors have been elected and duly qualified in accordance with this Charter. Five Councilmembers will be elected at large, two in one year for Places One and Two, and the following year, three will be elected for Places Three; Four and Mayor, respectively.
- b. No Councilmember may serve more than three (3) full terms in succession.
- c. Any Councilmember, upon filing an application to run for mayor, shall have automatically resigned his or her office effective on the day following the canvass for such election.

Section 2.04. Vacancies.

Vacancies in the City Council, including a vacancy resulting from a recall election, shall be filled by the Council for the remainder of the unexpired term. The Council

shall appoint a qualified elector to fill a vacancy within forty-five (45) days after such vacancy occurs, as determined by state law. For purposes of this section and the Charter, a “qualified elector” or “qualified voter” means a “registered voter” in accordance with state law.

Section 2.05. Compensation for Councilmembers.

Councilmembers shall serve without an established salary; however, they will be authorized to receive the sum of \$25.00 for each Council meeting in which they attend to off set the “out-of-pocket” expenses incurred. The expense fees are not to be construed as being a salary, but an authorized allowance for each regular meeting. Councilmembers may be reimbursed for other reasonable expenses directly associated with their service to the City, subject to controls established by the Council.

ARTICLE III. PROCEDURES OF THE COUNCIL; LEGISLATION

Section 3.01. Canvass of Election; Meetings of the Council, Boards, and Commissions; Compliance with Open Meetings Act.

Following each municipal election, the Council shall meet at the usual place for holding its meetings, canvass the election in accordance with state law, and the newly elected members shall assume the duties of office without party or partisan mark or designation. Council shall meet at such times as may be prescribed by ordinance or resolution, but not less frequently than once each month. Special meetings shall be called by the City Secretary upon request of the Mayor, the City Manager, or a majority of the members of the Council. Any such notice shall state the subject or subjects that shall be considered. All meetings of the Council shall be open to the public, and the rules of the Council shall provide that the citizens of the City shall have a reasonable opportunity to be heard at any such meetings in regard to any matter considered; but the Council may by a majority vote of all the members authorize a closed meeting. Council and its boards, commissions, and committees shall comply fully with the provisions of the Texas Open Meeting Act as amended.

Section 3.02. Mayor and Mayor Pro Tem.

Following the canvass of a regular election, the Council shall choose one of its members (other than the Mayor) as Mayor Pro Tem. The Mayor shall preside at meetings of the Council and shall exercise such other powers and perform such other duties as are or may be conferred and imposed upon him or her by this Charter and the ordinances of the City. He or she shall be recognized as the head of the City government for all ceremonial purposes, by the courts for serving civil processes, and by the Governor for purposes of military law. In time of public

danger or emergency, the Mayor is authorized to act in accordance with federal and state law and City policy. If a vacancy occurs in the Office of Mayor, the Council shall appoint a successor Mayor for the remaining term, in accordance with Section 2.04. If the Mayor is absent or incapacitated such that he or she is unable to perform the duties of office, the Mayor Pro Tem shall act as Mayor for the duration of the period of such absence or disability. If the Mayor Pro Tem is also absent or disabled, then the Council shall elect a Presiding Officer to act in the place of the Mayor Pro Tem.

Section 3.03. City Secretary.

The City Manager shall appoint a City Secretary who shall perform such administrative duties as may be delegated by the City Manager.

Section 3.04. Council Rules.

The Council shall be the judge of the election and qualifications of its members, and in such cases, shall have the power to subpoena witnesses and compel the production of all pertinent books, records, and papers; but the decision of the Council in any such case shall be subject to review by the courts. The Council shall determine its own rules and order of business and keep a journal of its proceedings. It shall have power to compel the attendance of absent members, may punish its members for disorderly behavior, and by vote of not less than a majority of all its members, expel from a meeting a member for disorderly conduct for the violation of its rules; but no member shall be expelled from a meeting unless notified of the charge against him and given an opportunity to be heard in his own defense.

Section 3.05. Quorum.

Except as otherwise allowed by state law, a majority of all the members of the Council shall constitute a quorum to do business, but a less number may adjourn from time to time and compel the attendance of absent members in such manner and under such penalties as may be prescribed by ordinance. The affirmative vote of a majority of all the members of the Council shall be necessary to adopt any ordinance, resolution, or order; except that a vote to adjourn, or an action regarding the attendance of absent members, may be adopted by a majority of the members present. No member may be excused from voting except when such member has a conflict of interest as defined by law.

Section 3.06. Introduction and Passage of Ordinances and Resolutions.

- a. Ordinances and resolutions shall be introduced only in written form. All ordinances, except ordinances making appropriations and ordinances codifying or rearranging existing ordinances or enacting a code of ordinances, shall be

confined to one subject, and the subject of all ordinances shall be clearly expressed in the title. Ordinances making appropriations shall be confined to the subject of appropriations. No ordinance shall be passed until it has been read and voted upon in at least two regular meetings, except an emergency measure. The final reading of each ordinance shall be in full unless a written or printed copy thereof shall have been furnished to each member of the Council prior to such reading. The “yeas” and “nays” shall be taken upon the passage of all ordinances and resolutions and entered upon the journal of the proceedings of the Council. The enacting clause of all ordinances shall be, “Be it ordained by the City Council of the City of Kerrville, Kerr County, Texas.”

- b. An ordinance shall take effect upon final passage unless indicated otherwise in the ordinance.
- c. Upon its final passage, each ordinance and resolution shall be authenticated by the signatures of the Mayor or Presiding Officer and of the City Secretary, and shall be systematically recorded as provided by Ordinance.
- d. An “emergency measure” is an ordinance or resolution to provide for the immediate preservation of the public peace, property, health, or safety, in which the emergency claimed is set forth and defined in the preamble thereto. The affirmative vote of at least a majority of all members of the Council shall be required to pass any ordinance or resolution as an emergency measure. No measure making or amending a grant, renewal or extension of a franchise or other special privilege, shall ever be passed as an “emergency measure.”

Section 3.07. Publication of Penal Ordinances.

Each adopted penal ordinance, or its caption and penalty, shall be published one time in a newspaper of general circulation which is published in the City. The City shall also provide notice of the adoption of the ordinance at the City’s website. Such ordinance so published in the newspaper shall take effect and be in force, from and after ten (10) days after publication thereof, unless a later time is expressly provided.

Section 3.08. Creation of Boards, Commissions, and Committees.

The City Council may create and provide for such Boards, Commissions, and/or Committees as the City Council may deem appropriate or necessary.

ARTICLE IV. NOMINATIONS AND ELECTIONS

Section 4.01. - Municipal Elections.

All City elections shall be governed, except as otherwise provided by the Charter, by the laws of the State of Texas.

Section 4.02. - Election of Councilmembers by Plurality, places.

There will be five places: One, Two, Three, Four, and Mayor. At the regular municipal election, the voters may vote for one candidate for each place listed on the ballot. The candidate for each place listed on the ballot who receives the greatest number of votes for that place cast in such election shall be declared elected; and in case of a tie vote, by lot.

Section 4.03. - Application for Candidacy.

Any person, who lawfully qualifies and is a registered voter, may file an application for election for a Place on the City Council. The name of such candidate and Place for which he is filing will be affixed by the City Secretary at the time of issuance of an application form. Such application must include a petition signed by not less than 100 qualified and registered voters of the City. The application and the signatures thereon as well as the affidavits of the circulators must meet the requirements of state law. All papers comprising an application must be assembled and filed with the City Secretary in accordance with state law. Signatures are not required where the application includes a filing fee of \$100.00. The City Secretary shall review the petition as required by state law and if the petition is found to be insufficient, the City Secretary shall immediately notify the person who filed it, with a written statement certifying why the petition is found to be "insufficient." Within the time authorized by state law such a petition may be amended and filed again as a new petition, or a different petition may be filed for the same candidate. If the application complies with this section and state law, the City Secretary shall place such name on the ballot. Application and petition forms must be obtained from the City Secretary, as they are promulgated by the Texas Secretary of State.

ARTICLE V. RECALL, INITIATIVE, AND REFERENDUM

Section 5.01. General Authority.

- a. **Recall.** The qualified voters of the City shall have the power to petition for recall of the Mayor or any member of the City Council

- b. **Initiative.** The qualified voters of the City shall have power to propose ordinances to the City Council. Such power shall not extend to the budget, capital program, or appropriation of money, issuance of bonds, setting of utility rates, levy of taxes, annexations, salaries of City officers or employees, or any other ordinance not subject to initiative as provided by state law.
- c. **Referendum.** The qualified voters of the City shall have power to require reconsideration by the City Council of any adopted ordinance. Such power shall not extend to the budget, capital program, relate to the appropriation of money, issuance of bonds, setting of utility rates, levy of taxes, annexations, salaries of City officers or employees, or any other ordinance not subject to referendum as provided by state law.

Section 5.02. Commencement of Petition; Petitioners' Committee; Affidavit.

Any three (3) qualified voters of the City may commence recall, initiative, or referendum proceedings by filing with the City Secretary an affidavit stating they will constitute the petitioners committee and be responsible for preparing and circulating the petition and filing it in proper form, stating their names and addresses and specifying the address to which all notices to the committee are to be sent and naming the Councilmember(s) to be recalled or setting out in full the proposed initiative ordinance or citing the ordinances sought to be reconsidered.

Section 5.03. Scope of Recall.

Each Councilmember shall be subject to recall and removal from office by the qualified voters of the City.

Section 5.04. Petitions for Recall.

Before the question of recall of a Councilmember shall be submitted to the qualified voters of the City, a petition demanding such question to be so submitted shall first be filed with the City Secretary. The petition must contain the number of valid signatures of qualified voters totaling the greater of (a) five percent (5%) of the registered voters entitled to vote at the last City election or (b) thirty-five percent (35%) of the number of persons who voted in the most recent City election. Each signer of such recall petition shall personally sign their name thereto and shall write after their name their place of residence, giving the name of the street and the number, and shall also write thereon the day, the month, and the year their signature was affixed.

Section 5.05. Form and Content of Recall Petition.

All papers of a petition shall be uniform in size and style and shall be assembled as one instrument for filing. Each signature shall comply with Chapter 277 of the Texas Election Code as it may be amended. The petition shall be addressed to the City Council and the content shall distinctly and specifically point to the ground(s) upon which such petition for removal is predicated. Further, said petition shall state distinctly and specifically the alleged action(s) and the factual circumstance(s) surrounding such action(s) taken by the Councilmember that warrant the charge as to give the Councilmember sought to be removed notice of the matter(s) and thing(s) with which the officer is charged. The signatures shall be verified by oath in the following form:

STATE OF TEXAS
COUNTY OF KERR

I, _____, being first duly sworn, on oath depose and say that I am one of the signers of the above petition, and that the statements made therein are true, and that each signature appearing thereto was made in my presence on the day and date it purports to have been made, and I solemnly swear that the same is the genuine signature of the person it purports to be.

Signature_____

Sworn and subscribed before me this ____ day of _____ 20__.
NOTARY PUBLIC, STATE OF TEXAS

My commission expires: _____

Section 5.06. Recall; Petition; Procedure.

- a. **Certificate of City Secretary.** Within thirty (30) days after the petition is filed, the City Secretary shall complete a certificate as to its sufficiency or insufficiency as mandated herein, specifying, if it is insufficient, the particulars wherein it is defective and shall within that thirty (30) day period send a copy of the certificate to the petitioners committee by certified mail or by hand delivery to a committee member.
- b. **Amendment.** If the City Secretary finds a petition insufficient for lack of the required number of valid signatures, the petitioner may file one supplementary petition by the deadline in accordance with state law and Sections 5.04 and 5.05. The City Secretary shall notify the petitioner as to the sufficiency of the

petition not later than the fifth regular business day after the date of its receipt.

- c. **Presentation to Council.** When a recall petition has been fully determined sufficient, the City Secretary shall present the petition to City Council at its next regular meeting. If a petition or amended petition is certified insufficient and the petitioners committee does not elect to amend within the time required, the City Secretary shall at the next regular Council meeting present such certificate to the Council who shall then make the final determination as to whether or not the petition is insufficient.

Section 5.07. Public Hearing for Recall.

The Councilmember whose removal is sought may, within five (5) days after such recall petition has been presented to the City Council, request that a public hearing be held to permit the Councilmember to present the facts pertinent to the charges specified in the recall petition. In this event, the City Council shall order such public hearing to be held, not less than five (5) days nor more than fifteen (15) days after receiving such request for a public hearing.

Section 5.08. Calling of Recall Election.

If the Councilmember whose removal is sought does not resign, then the City Council shall for the next available election date, order an election for holding such recall election. If, after the recall election date is established, the Councilmember vacates the office, the election shall be cancelled, in accordance with state law.

Section 5.09. Ballots in Recall Election.

Ballots used at recall elections shall conform to the following requirements:

- a. With respect to the Councilmember whose removal is sought, the question shall be submitted:

“Shall _____ be removed from the office of _____ by recall?”

- b. Immediately below each such question, there shall be printed the following words, one above the other, in the order indicated:

“Yes”
“No”

Section 5.10. Result of Recall Election.

- a. If a majority of the votes cast at a recall election shall be “No”, that is against the recall of the Councilmember named on the ballot, the Councilmember shall continue in office for the remainder of his/her unexpired term, subject to recall as provided herein. If a majority of the votes cast at such election be “Yes”, that is for the recall of the Councilmember named on the ballot, the Councilmember shall, regardless of any technical defects in the recall petition, be deemed removed from office upon passing of the resolution canvassing the election, and the vacancy shall be filled in accordance with Section 2.04 above.
- b. Where a vacancy(s) occurs due to a recall election, the remaining Councilmembers, including where the remaining Councilmembers number two or less, shall appoint a qualified elector(s) for the recalled place(s), which such person(s) may serve only through the remainder of the unexpired term.
- c. A Councilmember who is recalled is not eligible for appointment to Council in the period between the recall vote and the next election or, qualified for placement on the ballot for the immediately ensuing election.

Section 5.11. Initiative; Petition; Procedure.

- a. Qualified voters of the City may initiate legislation by ordinance by submitting a petition addressed to the City Council, which requests the submission of the proposed ordinance to a vote of the qualified voters of the City. The City Attorney shall review the petition for enforceability and legality. Said petition must contain the number of valid signatures totaling the greater of (a) five percent (5%) of the registered voters entitled to vote at the last City election or (b) thirty-five percent (35%) of the number of persons who voted in the most recent City election. Each copy of the petition shall have attached to it a copy of the full text of the proposed ordinance. The petition, its form and content, shall be the same as for recalls as provided in Section 5.05 above. The certification of the City Secretary, and any amendment to the petition and its presentation to City Council shall be the same as for recalls as provided in Section 5.06 above.
- b. When an initiative petition has been fully determined sufficient, City Council shall at its next regular meeting consider the proposed initiative ordinance. Upon presentation to the Council, Council shall, within sixty (60) days after the date the petition was finally determined sufficient and in accordance with the procedure required in Section 5.06 above, either pass and adopt such ordinance without alteration as to meaning or effect, or call for an election, to be held on a date allowed under the Texas Election Code, at which the qualified

voters of the City shall vote on the question of adopting or rejecting the proposed ordinance. Unless otherwise provided by law, any election for an initiative under this Charter shall be held on the first authorized uniform election date that occurs after the seventieth (70th) calendar day after the City Council's decision to submit the ordinance to the voters.

- c. If a majority of the qualified electors voting on a proposed initiative ordinance vote in its favor, it shall be considered adopted upon certification of the election results and shall be treated in all respects in the same manner as ordinances of the same kind adopted by the Council. If conflicting ordinances are approved at the same election, the one receiving the greatest number of affirmative votes shall prevail to the extent of such conflict.

Section 5.12. Referendum; Petition; Procedure; Effect Prior to Election.

- a. Qualified voters of the City may require that any ordinance, with the exception of ordinances dealing with any budget or any capital program, or relating to appropriation of money, issuing of bonds, setting of utility rates and levy of taxes or salaries of City officers or employees, or any other ordinance not subject to referendum as provided by state statute or case law, passed by the City Council be submitted to the voters of the City for approval or disapproval, by submitting a petition for this purpose within thirty (30) days after the date the ordinance sought to be reconsidered was adopted. Said petition must contain the number of valid signatures totaling the greater of (a) five percent (5%) of the registered voters entitled to vote at the last City election, (b) thirty-five percent (35%) of the number of persons who voted in the most recent City election. The petition, its form and content, shall be the same as for recalls as provided in Section 5.05 above. The certification of the City Secretary, any amendment to the petition and its presentation to City Council shall be the same as for recalls as provided in Section 5.06 above. Council shall either repeal the referred ordinance or submit the referred ordinance to the qualified voters of the City at the next uniform election date as authorized by law.
- b. Pending the holding of such election, the ordinance shall be suspended from taking effect and shall not later take effect unless a majority of the qualified voters voting thereon at such election shall vote in favor thereof. Any election for a referendum under this Charter shall be held in accordance with state law on the first authorized uniform election date after the decision by the City Council.
- c. If a majority of the qualified electors voting on a referred ordinance vote against it, it shall be considered repealed upon certification of the election results.

Section 5.13. Form of Ballots.

The ballots used when voting upon initiative or referendum shall set forth their nature sufficiently to identify them and shall also set forth, upon separate lines, the words:

“For the Ordinance”

“Against the Ordinance”

Section 5.14. Ordinances Passed by Popular Vote, Repeal or Amendment.

No ordinance which may have been passed by the City Council upon a petition or adopted by popular vote under the provisions of this Article may be repealed or amended by the City Council for a period of six (6) months from the date said ordinance became effective. An ordinance which may have been passed by the City Council upon a petition or adopted by popular vote under the provisions of this Article may be repealed or amended at any time in response to a referendum petition or by submission as provided by Section 5.16 below.

Section 5.15. Voluntary Submission of Legislation by the City Council.

The City Council, upon its own motion and by the affirmative vote of a majority of the full membership of the Council, may submit to popular vote at an election for adoption or rejection any proposed ordinance or resolution or measure, or may submit for repeal any existing ordinance, or resolution, or measure, in the same manner and with the same force and effect as provided in this Article for submission of initiative and referendum petitions, and may, at its discretion, call for an election for this purpose on an authorized uniform election date as provided by state law.

Section 5.16. Publicity for Ordinances Submitted to Voters.

The City Secretary, at least fifteen (15) days before any election at which any ordinance is to be submitted to the voters, shall have printed in a newspaper of general circulation published in the City the caption of all ordinances submitted. The full text of all ordinances shall be made available for public review in the office of the City Secretary, at the City’s library, and linked on the City’s website. The text of every ordinance shall also be displayed at the polling place in such election; but the validity of an ordinance approved by the electors shall not be questioned because of errors or irregularities in publication or display.

ARTICLE VI. ADMINISTRATIVE SERVICE

Section 6.01. City Manager.

The Council shall appoint an officer whose title shall be City Manager and who shall be chief executive and the head of the administrative branch of the City government. By written notice to City Council, the City Manager shall designate, a qualified City executive to exercise the powers and perform the duties of city manager during periods of his or her temporary absence or disability. The Council may annul such designation at any time and appoint another City executive to serve until the City Manager returns to perform his or her duties. The City Council shall annually review the performance of the City Manager, and the City Manager shall receive such compensation as may be fixed by the City Council.

Section 6.02. Qualifications.

The City Manager shall be chosen by the Council solely on the basis of his executive and administrative qualifications with special reference to his actual experience in, or his knowledge of, accepted practice in respect to the duties of his office as hereinafter outlined. At the time of his appointment, he need not be a resident of the City or state, but during his tenure of office he shall reside within the City. No person elected to membership on the Council shall, subsequent to such election, be eligible for appointment as City Manager until one year has elapsed following the expiration of the term for which he was elected.

Section 6.03. Term and Removal.

The City Manager shall hold his office subject to the provisions set forth below, at the will and pleasure of the City Council. A majority of the members of the City Council may remove the City Manager, except that no City Manager who has been in the service of the City for more than one year prior to a regular City election shall be removed within sixty (60) days subsequent to such election except by a four-fifths vote of the members of the City Council. If removed at any time after he has served six months, the City Manager may demand a hearing at a public meeting of the City Council prior to the date on which his final removal shall take effect, but pending and during such hearing the City Council may suspend him from office. The action of the City Council in suspending or removing the City Manager shall be final, since it is the intention of this Charter to vest all authority and fix all responsibility for any such suspension or removal wholly in the City Council.

Section 6.04. General Powers and Duties of the Manager.

The City Manager shall be the chief executive officer of the City, responsible to the Council for the management of all City affairs placed in the manager's charge by or under this Charter. The City Manager shall:

- a. Appoint and suspend or remove all City employees and appointive administrative officers provided for by or under this Charter, except as otherwise provided by law or this Charter. The City Manager may authorize any administrative officer subject to the manager's direction and supervision to exercise these powers with respect to subordinates in that officer's department, office, or agency;
- b. Direct and supervise the administration of all departments, offices and agencies of the City, except as otherwise provided by this Charter or by law;
- c. Attend all City Council meetings. The City Manager shall have the right to take part in discussion but shall not vote;
- d. See that all laws, provisions of this Charter and acts of the City Council, subject to enforcement by the City Manager or by officers subject to the manager's direction and supervision, are faithfully executed;
- e. Prepare and submit the annual budget and capital program to the City Council, and implement the final budget approved by Council to achieve the goals of the City;
- f. Submit to the City Council and make available to the public a complete report on the finances and administrative activities of the City as of the end of each fiscal year;
- g. Make such other reports as the City Council may require concerning operations;
- h. Keep the City Council fully advised as to the financial condition and future needs of the City;
- i. Make recommendations to the City Council concerning the affairs of the City and facilitate the work of the City Council in developing policy;
- j. Provide staff support services for the Mayor and Councilmembers;

- k. Assist the Council to develop long-term goals for the City and strategies to implement these goals;
- l. Encourage and provide staff support for regional and intergovernmental cooperation;
- m. Promote partnerships among Council, staff, and citizens in developing public policy and building a sense of community; and
- n. Perform such other duties as are specified in this Charter or may be required by the City Council.

Section 6.05. Council not to Interfere in Appointments or Removals.

Neither the Council nor any of its committees or members shall direct or request the appointment of any person to, or his removal from, office by the City Manager or any of his subordinates; or, except as is or may be otherwise provided under the terms of this Charter, in any manner take part in the appointment or removal of officers and employees in the administrative service of the City. Except for the purpose of inquiry, the Council and its members shall deal with the administrative service solely through the Manager, and neither the Council nor any member thereof shall give orders to any subordinate of the City Manager either publicly or privately. Any violation of the provisions of this section by a member of the Council shall subject him to whatever discipline the remaining members of the Council may under the terms of Section 3.04 see fit to impose upon him.

Section 6.06. Right of Manager and Other Officers in Council.

The City Manager, and such department heads and other officers of the City may be designated by vote of the Council, shall be entitled to seats in the Council except at executive meetings, but shall have no vote therein. The Manager shall have the right to take part in the discussion of all matters coming before the Council, and such department heads and other officers who by designation of the Council are entitled to seats in the Council, shall be entitled to take part in all discussions of the Council relating to their respective departments and offices.

Section 6.07. Administrative Departments.

The City Manager shall have the responsibility to organize the various departments within the City as may be needed to fulfill the requirements and needs of the City, subject to the approval of the City Council.

Section 6.08. Investigations by Council or Manager.

The Council or the Manager shall have power to inquire into the conduct of any department, office or officer of the City, and to make investigations as to municipal affairs, and for that purpose only, the Council or the Manager may subpoena witnesses, administer oaths, and compel the production of books, papers, and other evidence, and it shall be the duty of the City Manager to designate a police officer to serve such subpoena.

ARTICLE VII. CITY ATTORNEY

Section 7.01. City Attorney-Qualifications.

- a. The City Council shall appoint a licensed attorney of the State of Texas to be the City Attorney. The City Attorney shall review all contracts and other instruments in writing in which City Council is concerned, endorse approval of the form and correctness of such, and perform other duties of a legal nature as may be determined by City Council. The City Attorney shall receive for services such compensation as may be fixed by City Council for regular and special duties and shall hold office at the pleasure of Council. The City Attorney, or such other assistant attorneys selected by the City Attorney with the approval of City Council, shall represent the City in all legal matters, to include prosecution within municipal court.
- b. The City Council or the City Attorney, following written notice to Council, may engage legal counsel at any time it deems necessary and appropriate.
- c. At least annually, City Council shall review the performance of the City Attorney.
- d. City Council may not remove a City Attorney who has been in the service of the City for more than one year prior to a regular City election within sixty (60) days subsequent to such election except by a four-fifths vote of the members of City Council.

ARTICLE VIII. FINANCIAL MANAGEMENT

Section 8.01. Development and Submission of City Budget and Budget Message.

- a. *Development.* The City Manager shall prepare each year a budget to cover all proposed expenditures of the government of the City for the succeeding year. Such budget shall be carefully itemized so as to make as clear a comparison as

practicable between expenditures included in the proposed budget and actual expenditures for the same or similar purposes for the preceding year. The budget shall also show as definitely as possible each of the various projects for which appropriations are set up in the budget, and the estimated amount of money carried in the budget for each of these projects. The budget shall also contain funds received from all sources during the previous year, the funds available from all sources during the ensuing year, the estimated revenue available to cover the proposed budget, and the estimated rate of tax which will be required.

- b. *Accounting Practices.* The City Manager shall prepare and present the budget according to budget award guidelines currently established by the Government Finance Officers Association, or its successor organization.
- c. *Submission.* On or before the 31st day of July of each year, the City Manager shall submit to the City Council and City Secretary a budget for the ensuing fiscal year and an accompanying budget message. The full text of the proposed budget and message shall be made available for public review in the office of the City Secretary, at the City's library, and prominently linked on the City's website.

Section 8.02. Fiscal Year.

The fiscal year of the City government shall begin on the first day of October each year and shall end on the last day of September the following year. Such year shall constitute the budget year of the City government.

Section 8.03. City Council Action on Budget.

- a. **Notice and Hearing.** The City Council shall publish the general summary of the budget and a notice stating:
 - 1. The times and places where copies of the message and budget are available for inspection by the public, and
 - 2. The time and place, not less than two weeks after such publication, for a public hearing(s) on the budget.
- b. **Amendment Before Adoption.** After the public hearing, the City Council may adopt the budget with or without amendment. In amending the budget, it may add or increase programs or amounts and may delete or decrease any programs or amounts, except expenditures required by law or for debt service or for an estimated cash deficit.

- c. **Adoption.** The City Council shall adopt the budget on or before the 30th day of September of the fiscal year currently ending. If it fails to adopt the budget by this date, the budget proposed by the City Manager shall go into effect.
- d. **“Publish” defined.** As used in this section and this article, the term “publish” refers to making the information available on the City’s website and otherwise complying with state law. In addition, the budget shall be made available in the office of the City Secretary and in the City’s library.

Section 8.04. Budget.

The budget shall provide a complete financial plan of all City funds and activities for the ensuing fiscal year and, except as required by law or this Charter, shall be in such form as the City Manager deems desirable for effective management and an understanding of the relationship between the budget and the City’s strategic goals. The budget shall begin with a clear general summary of its contents; shall show in detail all estimated income, indicating the proposed property tax levy; all proposed expenditures, and debt service for the ensuing fiscal year; and shall be so arranged as to show comparative figures for income and expenditures of the current and preceding fiscal year. It shall indicate in separate sections:

- a. Proposed revenues and expenditures for current operations during the ensuing fiscal year for each City fund;
- b. Proposed goals and performance measures for each operational department; and
- c. Proposed long term financial planning in the form of a five year forecast of revenues and expenditures for the General and Water Funds and at least five years of capital project expenditures and associated financing sources;

Section 8.05. Appropriation and Revenue Ordinances.

To implement the adopted budget, the City Council shall adopt, prior to the beginning of the fiscal year.

- a. an appropriation ordinance making appropriations by department, fund, or other organizational unit and authorizing an allocation for each program or activity; and
- b. a tax levy ordinance authorizing the property tax levy or levies and setting the tax rate or rates.

Section 8.06. Amendments after Adoption.

- a. **Supplemental Appropriations.** If during or before the fiscal year the City Manager certifies that there are available for appropriation revenues in excess of those estimated in the budget, the City Council by ordinance may make supplemental appropriations for the year up to the amount of such excess.
- b. **Emergency Appropriations.** To address a public emergency affecting life, health, property, or the public peace, the City Council may make emergency appropriations. Such appropriations may be made by emergency ordinance in accordance with the provisions of Section 3.06 above. To the extent that there are no available unappropriated revenues or a sufficient fund balance to meet such appropriations, the Council may by such emergency ordinance authorize the issuance of emergency notes, which may be renewed from time to time, but the emergency notes and renewals of any fiscal year shall be paid or refinanced as long-term debt not later than the last day of the fiscal year next succeeding that in which the emergency appropriation was made.
- c. **Reduction of Appropriations.** If at any time during the fiscal year it appears probable to the City Manager that the revenues or fund balances available will be insufficient to finance the expenditures for which appropriations have been authorized, the manager shall report to the City Council without delay, indicating the estimated amount of the deficit, any remedial action taken by the manager and recommendations as to any other steps to be taken. The Council shall then take such further action as it deems necessary to prevent or reduce any deficit and for that purpose it may by ordinance reduce or eliminate one or more appropriations.
- d. **Transfer of Appropriations.** The City Manager may transfer appropriated funds among line items within a fund as long as the transfer results in a \$0.00 net impact to the fund.
- e. **Limitation; Effective Date.** No appropriation for debt service may be reduced or transferred, except to the extent that the debt is refinanced and less debt service is required, and no appropriation may be reduced below any amount required by law to be appropriated or by more than the amount of the unencumbered balance thereof. The supplemental and emergency appropriations and reduction or transfer of appropriations authorized by this section may be made effective immediately upon adoption.

Section 8.07. Independent Audit.

As soon as practicable after the close of each fiscal year, an independent audit shall be made of all accounts of the City government by certified public accountants, to be selected by the Council, who have no personal interest directly or indirectly in the financial affairs of the City government. The results of this audit shall be published immediately upon its completion.

ARTICLE IX. MUNICIPAL COURT

Section 9.01. Creation and Jurisdiction.

There is hereby established a Municipal Court of the City of Kerrville, Texas, which shall have such jurisdiction and powers as are given and prescribed by the laws of Texas.

Section 9.02. Municipal Court Judge.

The Municipal Judge, whether one or more, shall preside over the Municipal Court. He or she shall be appointed by the City Council and must be a qualified attorney who is duly licensed to practice law within the State of Texas. The Judge shall be appointed for a term not to exceed two (2) years, and shall hold office at the pleasure of the City Council. If for any reason the Judge shall temporarily fail to act, the Mayor or Mayor Pro Tem of the City is hereby authorized to appoint a replacement who shall act in the place of the Judge and who shall have all of the powers and discharge all of the duties of said office. During either twelve (12) month period beginning at the date of appointment, more than two (2) consecutive or six (6) total absences over and above prior approved vacation and sick leave, shall be cause for automatic removal from office by the City Council. The Judge, or anyone acting in his place, shall receive such compensation as may be determined by the City Council.

ARTICLE X. CONDEMNATION AND SPECIAL ASSESSMENTS

Section 10.01. Power of Condemnation and Special Assessments.

The City Council shall have the power, not inconsistent with state laws, as amended from time to time, to acquire property by condemnation and to provide payment of all or part of the costs of public improvements by levying and collecting of special assessments upon properties specially benefited.

Section 10.02. Procedures for Condemnation and Assessing.

The City Council, through the passing of ordinances as may be required, shall formulate the procedures for condemnation and for assessing and collecting special assessments.

ARTICLE XI. PUBLIC UTILITIES

Section 11.01. Franchises-Powers of the City Council.

The City Council shall have power by ordinance to grant, amend, renew, and extend all franchises, and to regulate all public utilities of every character within the City of Kerrville, and for such purposes is granted full power. No public utility franchise shall be transferred except upon the approval of the City Council expressed by ordinance; and copies of all transfers and mortgages or other documents affecting the title or use of public utilities shall be filed with the City Manager within ten (10) days after the execution thereof. Such franchise shall not be transferred indirectly through the acquisition of the capital stock of the grantee company by another corporation, except through the approval by City Council and the filing of all documents relating to the purchase of such stock, including the corporation affiliations of the purchasing company.

Section 11.02. Term and Plan of Purchase.

Any public utility franchise may be terminated by ordinance at specified intervals of not more than five (5) years after the beginning of operation, whenever the City shall determine to acquire by condemnation or otherwise the property of such utility necessarily used in or conveniently useful for the operation thereof within the City limits. The method of determining the price to be paid for the public utility property shall be fixed in the ordinance granting the franchise.

Section 11.03. Right of Regulation.

All grants, renewals, extensions, or amendments of public utility franchises, whether it be so provided in the ordinance or not, shall be subject to the right of the City:

- a. To repeal the same by ordinance at any time for misuse or nonuse, or for failure to begin construction within the time prescribed or otherwise to comply with the terms prescribed.
- b. To require proper and adequate extension of plan and service, and the maintenance of the plant and fixtures at the highest practicable standard of efficiency.

- c. To establish reasonable standards of service and quality of service and quality of products and prevent unjust discrimination in service or rates.
- d. To prescribe the form of accounts and at any time to examine and audit the accounts and other records of any such utility and to require annual and other reports by each such public utility provided, that if a public service commission or any other authority shall be given the power by law to prescribe the forms of accounts for public utilities throughout the state or throughout any district of which the City is a part, the forms so prescribed shall be controlling so far as they go, but the Council may prescribe other and more detailed forms for the utilities within its jurisdiction.
- e. To impose such other regulations as may be conducive to the safety, welfare, and accommodation of the public.

Section 11.04. Consent of Property Owners.

The consent of abutting and adjacent property owners shall not be required for the construction, extension, maintenance or operation of any public utility, but any property owner shall be entitled to recover from the owner of such public utility the actual amount of damages to such property on account thereof less any benefits received therefrom, provided suit is commenced within two (2) years after the project is completed.

Section 11.05. Revocable Permits.

Permits revocable at the will of the Council for such minor or temporary public utility privileges as may be specified by general ordinance may be granted and revoked by the Council from time to time in accordance with the terms and conditions to be prescribed thereby; and such permits shall not be deemed to be franchises as the term is used in this Charter. Such general ordinance, however, shall be subject to the same procedure as an ordinance granting a franchise and shall not be passed as an emergency measure.

Section 11.06. Extensions.

All extensions of public utilities within the City limits shall become a part of the aggregate property of the public utility, shall be operated as such, and shall be subject to all obligations and reserved rights contained in this Charter and in any original grant hereafter made. The right to use and maintain any extension shall terminate with the original grant and shall be terminable as provided in Section 13.03. In case of an extension of a public utility operated under a franchise hereafter granted, such

right shall be terminable at the same time and under the same conditions as the original grant.

Section 11.07. Other Conditions.

Every public utility franchise hereafter granted shall be held subject to all the terms and conditions contained in the various sections of this article, whether or not such terms are specifically mentioned in the franchise. Nothing in this Charter shall operate to limit in any way, except as specifically stated, the discretion of the Council or the electors of the City in imposing terms and conditions in connection with any franchise grant.

Section 11.08. Franchise Records.

Every public utility and every owner of a public utility franchise shall file with the City, as maybe prescribed by ordinance, certified copies of all franchises owned or claimed, or under which such utility is operated. The City shall compile and maintain a public record of utility franchises and of all public utility fixtures in the streets of the City.

Section 11.09. Accounts of Municipally Owned Utilities.

Accounts shall be kept for each public utility owned or operated by the City and the City Council shall publish annually notice of the availability of reports and independent audits concerning such accounts, and shall display the entirety of such reports and audits on the City's website, at its library, and in the office of the City Secretary.

ARTICLE XII. MISCELLANEOUS PROVISIONS

Section 12.01. Publicity of Records.

All records of the City, except those protected by executive sessions, or state and federal statutes, shall be open to inspection by any person during the regular posted office hours of the City Hall and in accordance with the Texas Public Information Act.

Section 12.02. Personal Financial Interest.

The City Council as well as officers and employees of the City, shall comply with state law regarding personal, financial, or conflicting interests, including Chapter 171 of the Texas Local Government Code.

Section 12.03. Official Bonds.

The Director of Finance, and such other officers or employees as the Council may by general ordinance require so to do, shall give bond in such amount and with such surety as may be approved by the Council. The premiums on such bonds may be paid by the City.

Section 12.04. Oath of Office.

Every officer of the City shall, before entering upon the duties of his office, take and subscribe to an oath or affirmation, as provided by state law, to be filed and kept in the office of the City Secretary.

Section 12.05. Power of the City to Enforce Ordinances.

The City may enforce its ordinances by fines not exceeding limits established by state statutes, and may also provide by ordinance for the commutation of such fines by labor in a work house or on any public work or place in the City, but no ordinance shall provide a lesser penalty than is prescribed for a like offense by the laws of the state. Provisions may also be made by ordinance for the collections of fines imposed and executions issued in civil cases.

Section 12.06. Review of Charter; Charter Review Commission.

- a. The Charter shall be reviewed at five (5) year intervals, or sooner where the City Council believes it necessary. For each five-year review, the City Council shall appoint a Charter Review Commission of seven (7) residents of the City. The Commission shall have the following duties:
 1. Consider the operation of the City government under the Charter and determine whether any Charter sections require revision. To this end, at least one public hearing shall be held and the Commission shall have the power to compel the attendance of any officer or employee of the City and to require the submission of any of the City records which it may deem necessary to the conduct of such hearing.
 2. Propose recommendations, if any, it deems desirable to ensure compliance with the Charter by the City government.
 3. Propose amendments, if any, to the Charter to improve the effective application of the Charter to current conditions and operations.
 4. Report its finding and present its proposed amendments, if any, to the City Council.

- b. The term of office of the Charter Review Commission shall be six months but may be extended as necessary by City Council.

Section 12.07. Rearrangement and Renumbering.

The City Council shall have the power, by ordinance, to renumber and rearrange all articles, sections and paragraphs of this Charter or any amendments thereto, as it deems appropriate, and upon the passage of such ordinance, a copy thereof certified by the City Secretary shall be forwarded to the Secretary of State for filing.

Section 12.08. Meaning of Words and Designations.

All words and designations used in this Charter are to be taken and construed in the sense in which they are understood in common language, taking into consideration the context and subject matter relative to which they are employed. The gender of the wording throughout this Charter shall always be interpreted to mean either sex. All singular words shall include the plural and all plural words shall include the singular. All references to the state law or laws of the State of Texas, however expressed in this Charter, shall mean “as presently enacted or as may be amended or superseded”. The use of the word “City” in this Charter shall mean the City of Kerrville, Texas, and the use of the word “Charter” shall mean this Home Rule Charter.

Section 12.09. Savings Clause.

If any part of this Charter shall be declared invalid by a court of competent jurisdiction, such judgment shall not invalidate the remainder of the Charter. The provisions of this Charter shall supersede all laws and ordinances not consistent herewith, insofar as the City of Kerrville is affected thereby.

ADOPTED: February 25, 1942

AMENDED: January 10, 1973

AMENDED: April 3, 1975

AMENDED: April 10, 1984

AMENDED: April 7, 1987

AMENDED: May 9, 1989

AMENDED: May 5, 1992

AMENDED: May 4, 1999

AMENDED: May 20, 2008

AMENDED: June 10, 2014

AMENDED: January 14, 2020

CERTIFICATE OF SECRETARY OF STATE DATED:

March 3, 1942

April 25, 1973

February 13, 1976

May 14, 1984

April 28, 1987

January 10, 1990

October 16, 1992

May 27, 1999

June 17, 2008

June 10, 2014

January _____, 2020



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Ordinance No. 2020-02. Second Reading. An Ordinance amending Chapter 2, "Administration", Article IV "Boards and Commissions", Section 2-91 "Senior Services Advisory Committee" of the Code of Ordinances of the City of Kerrville, Texas; by amending subsections (A)(1) and (A)(2) to decrease the membership of this committee to 14 members; containing a cumulative clause; containing a savings and severability clause; and providing other matters relating to this subject.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 20, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Ordinance_2020-02 Amending Senior Services Advisory Committee to 14 members.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	C - Community / Neighborhood Character and Place Making
Guiding Principle	C1. Promote "aging in place" or full life-cycle amenities to address the needs and desires of children, teens, young families and single professional adults.
Action Item	C1.6 - Provide service options for elderly persons who want to stay in their homes

SUMMARY STATEMENT:

City Council believes it is beneficial to decrease the membership of the City's Senior Advisory Committee from 16 to 14 members.

Ordinance No. 2020-02 first reading was approved by Council on December 10, 2019.

RECOMMENDED ACTION:

Approve Ordinance No. 2020-02. Second Reading.

**CITY OF KERRVILLE, TEXAS
ORDINANCE NO. 2020-02**

AN ORDINANCE AMENDING CHAPTER 2, "ADMINISTRATION," ARTICLE IV "BOARDS AND COMMISSIONS", SECTION 2-91 "SENIOR SERVICES ADVISORY COMMITTEE" OF THE CODE OF ORDINANCES OF THE CITY OF KERRVILLE, TEXAS; BY AMENDING SUBSECTIONS (A)(1) AND (A)(2) TO DECREASE THE MEMBERSHIP OF THIS COMMITTEE TO 14 MEMBERS; CONTAINING A CUMULATIVE CLAUSE; CONTAINING A SAVINGS AND SEVERABILITY CLAUSE; AND PROVIDING OTHER MATTERS RELATING TO THIS SUBJECT

WHEREAS, City Council believes it beneficial to decrease the membership of the City's Senior Services Advisory Committee from 16 to 14 members; and

WHEREAS, City Council finds it to be in the public interest to amend Chapter 2, Article IV, Section 2-91 of the Code of Ordinances of the City of Kerrville as provided herein;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF KERRVILLE, KERR COUNTY, TEXAS:

SECTION ONE. Chapter 2 "Administration," Article IV "Boards and Commissions" of the Code of Ordinance of the City of Kerrville, Texas, is amended by revising Section 2-91, subsection (a)(1), to add the language that is underlined (added) and deleting the language that is bracketed and stricken (~~deleted~~) as follows:

"Sec. 2-91. – Senior Services Advisory Committee.

(a) Creation of Senior Services Advisory Committee; terms; membership; meetings.

- (1) There is hereby created the Senior Services Advisory Committee of the City ("Committee"), which shall be an advisory body of 14 ~~16~~ members appointed by City Council. The mayor shall appoint the chair and vice-chair from among the appointments made by Council, but only following the appointment of the initial Committee. Thereafter, each Committee shall select the chair and vice-chair from among its members.
- (2) During the initial appointment of Committee members, Council will appoint ~~8~~ 7 of the Committee members to terms expiring September 30, 2019. Council will then appoint each of the remaining ~~8~~ 7 members to

terms expiring September 30, 2020. Subsequent appointments shall serve a full two-year term. All members shall serve until their successors are appointed and qualified, but regardless, each term will exist as a two-year term beginning October 1 through September 30 two years hence."

SECTION TWO. The City Secretary is authorized and directed to submit this amendment to the publisher of the City's Code of Ordinances and the publisher is authorized to amend said Code to reflect the amendment adopted herein and to correct typographical errors and to index, format, and number and letter paragraphs to the existing Code as appropriate.

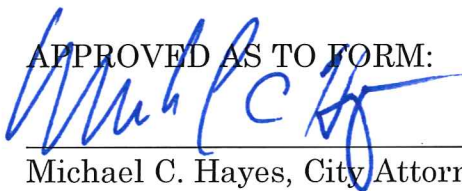
SECTION THREE. The provisions of this Ordinance are to be cumulative of all other ordinances or parts of ordinances governing or regulating the same subject matter as that covered herein; provided, however, that all prior ordinances or parts of ordinances inconsistent with or in conflict with any of the provisions of this Ordinance are hereby expressly repealed to the extent of any such inconsistency or conflict.

SECTION FOUR. If any section, subsection, sentence, clause, or phrase of this Ordinance is, for any reason, held to be unconstitutional or invalid, such holding shall not affect the validity of the remaining portions of this Ordinance. The Council of the City of Kerrville, Texas hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause, or phrase hereof irrespective of the fact that one or more sections, subsections, sentences, clauses, or phrases be declared unconstitutional or invalid.

PASSED AND APPROVED ON FIRST READING, this the 10 day of December, A.D., 2020.

PASSED AND APPROVED ON SECOND AND FINAL READING, this the ____ day of _____, A.D., 2020.

APPROVED AS TO FORM:



Michael C. Hayes, City Attorney

Bill Blackburn, Mayor

ATTEST:

Shelley McElhannon, City Secretary



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Appointment to the Kerr Emergency 9-1-1 Network Board of Directors.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Jan 03, 2020

SUBMITTED BY: David Knight

EXHIBITS: [20200114_Board Appointment_911 Board of Directors.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
\$0	\$0	\$0	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Consider appointment to the following board:

Kerr Emergency 9-1-1 Network Board: One regular member position that expired March 31, 2019: Lieutenant Mary Krebs.

Mr. Francisco Galvan is the public safety communications manager for the Kerrville Police Department. Police Chief David Knight recommends that Mr. Francisco Galvan be appointed as the City of Kerrville board representative.

RECOMMENDED ACTION:

Approve appointment of Kerrville Police Department's Communications Manager Francisco Galvan as the City of Kerrville representative to the 911 Board of Directors.



City of Kerrville
701 Main Street
Kerrville, Texas 78028
(830) 257-8000

**KERR EMERGENCY 911 NETWORK BOARD OF MANAGERS
AND STAFF AS OF MAY 2017**

2nd Tuesday of the month at 2:00PM

NAME	APPT	EXP
Lt. Mary Krebs, Kerrville Police Department <i>Member Representing the City of Kerrville</i>	7/1/17	8/1/19
Robert Neuman, Vice Chair <i>Member Representing the Kerr County</i>	9/1/14	12/1/20
Byron Griffin <i>Member Representing City of Ingram, Chief of Police</i>	3/1/17	3/1/19
Ronald Vick <i>Member Representing the Kerr County</i>	10/1/04	5/1/19
Gerald "Jerry" Vincent <i>Member Representing Kerr Area Rural Fire Assoc</i>	7/1/08	9/1/18
William "Rusty" Henderson, Non-Voting Member <i>Windstream Communications</i>		
Mark Del Toro, Executive Director <i>Board Ex-Officio Secretary</i>		
Nick LaMontia <i>GIS/Address Coordinator</i>		

City Staff: Lt. Mary Krebs, Kerrville Police Department



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Appointment to the Library Advisory Board.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Dec 04, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Board Appointment_Library Board.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

Due to one resignation and one expiration of term, two vacancies exist for the Library Advisory Board.

Two applications have been received: Megan Bean, and Erin Sullivan.

RECOMMENDED ACTION:

Appoint two members.



City of Kerrville
701 Main Street
Kerrville, Texas 78028
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LIBRARY ADVISORY BOARD			
Quarterly, third Tuesday of the month @ 3:00pm			
NAME	APPT	EXP	TERM#
Astrid Box	01/26/16 *01/09/18	11/22/19	0
**Joseph Conklin	10/09/19	11/22/20	0
***Tom Moser	1/9/18	11/22/20	0
Carol Wichman	01/09/18 *12/11/18	11/22/20	0
Vacant		11/22/19	0

City Staff: Laura Bechtel, Library Director
Kim Meisner, Executive Director for General Operations

Qualifications: Members must maintain a library card in good standing.

Powers and Duties: The Board is an advisory board to the city council; shall have the authority to hold meetings within the city and to consider and make recommendations to the Council from time to time on any and all matters pertaining to the Library. Upon a majority vote of the total membership.

Term of Office: All Board appointments shall serve two (2) year terms. No Board member shall serve more than two (2) consecutive two (2) year term on the Board without having at least one (1) full year off of the Board between terms. A majority of the members' terms shall expire in even-number years with the remaining members' terms expiring in odd-numbered years.

Number of Members: Five **Quorum:** Three

Meeting Time and Place: Quarterly, on the Third Tuesday of the Month; 3:00 pm; Butt-Holdsworth Memorial Library

Established by: Ordinance No. 1967-17; amended by Ordinance Nos. 80-5, 84-14, 84-58, 85-01, 87-24, 87-60, 87-61, and 2005-19 (in its entirety); Resolution Nos. 045-2006, 107-2006, 076-2007, and 122-2007 did not change this board. Code of Ordinances: Chapter 66 - Article II – Sections 66-31 through 66-34; Amended by Ordinance No. 2010-05; Amended by Ordinance No. 2011-16; amended by Ordinance 2017-11.

*Reappointed Date

**Appointed by Friends of the Butt-Holdsworth Memorial Library

***Appointed by Kerr County



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Appoint members to the Recovery Community Coalition.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Dec 04, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Board Appointment_Recovery Community Coalition.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	No
Key Priority Area	N/A
Guiding Principle	N/A
Action Item	N/A

SUMMARY STATEMENT:

There are eight vacancies currently on the Recovery Community Coalition Board.

Eight applications have been received: Brittany Andry, Michael Brooks, Christa Lovett, Lesley Marek, Steve Pautler, Claudia Richner, Richard Stolpman, and Dr Kendall Young.

The interview team for this board is Councilmember Place 1 Gary Cochrane, and Councilmember Place 3 Judy Eychner.

Staff liaison for this board is Chief Dannie Smith.

RECOMMENDED ACTION:

Appoint members.



City of Kerrville
701 Main Street
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RECOVERY COMMUNITY COALITON			
Fourth Monday every month at 4:00 p.m.			
NAME	APPT		TERM#
Dale Trees, Chairperson (8)	1/10/17	1/08/19*	12/31/20 1
Randie Benno (7)		1/22/19	12/31/20 1
Brian Brannon (8)		4/9/19	12/31/19 1
Shawn Driggers (4)		1/10/17	12/31/19 1
Dawn Elder (8)		2/13/18	12/31/19 1
LeighAnn Fitzpatrick (5)		03/13/18 01/08/19*	12/31/20 1
Blair Geisler (3)		1/10/17	12/31/19 1
Laura Godwin (2)		1/10/17 1/8/19*	12/31/20 1
Kara Grant (3)		12/11/18	12/31/20 1
Sabine Kuenzel (3)		8/28/18 1/8/19*	12/31/20 1
Steve Pautler (6)		1/10/17	12/31/19 1
Claudia Richner (4)		1/10/17	12/31/19 1
Richard Stolpman (3)		1/10/17	12/31/19 1
Kendall Young (4)		2/13/18	12/31/19 1
Vacant (1)			

City Staff: Dannie Smith, Fire Chief

Qualifications: At least one member from each of the following, but any of which may include more than one member:

- (1) owner of a male boarding home facility with a valid permit issued by the City;
- (2) owner of a female boarding home facility with a valid permit issued by the City;
- (3) member of the recovering community;
- (4) citizen of Kerrville with interest in these issues;
- (5) representative of mental health support organizations such as Kerrville State Hospital;
- (6) representative of Peterson Health;
- (7) representative of Hill Country MHDD Centers;
- (8) representative from a residential addiction treatment facility located within Kerr County.

Functions: The purpose of the Coalition is to enhance the opportunities for the recovery community to become fully integrated into the fabric of Kerrville. The Coalition shall work toward considering and identifying strategies and techniques for reducing barriers for the recovery community to be fully integrated into the local community as well as to identify and advocate goals and ideas for enhancing positive relationships by and amongst the recovery community.

Number of Members: Fifteen **Quorum:** Seven

Established By: RESO 26-2016 **Term Limit:** N/A **Term Date:** Exp December 31 **Term:** 2 YRS

*Reappointed Date



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Appointment to the Senior Services Advisory Board.

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 01, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20200114_Board Appointment_Senior Services Advisory Board.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	C - Community / Neighborhood Character and Place Making
Guiding Principle	C1. Promote “aging in place” or full life-cycle amenities to address the needs and desires of children, teens, young families and single professional adults.
Action Item	C1.6 - Provide service options for elderly persons who want to stay in their homes

SUMMARY STATEMENT:

Two vacancies exist for this board, due to resignations.

Members must be at least 55 years of age or have relative experience in providing services to seniors, should be persons who are concerned about senior affairs in the community, and must reside within the City.

Two applications have been received: Marilyn Cizmich, and Dwight McDonald.

The Council interview team are Councilmember Place 2 Kim Clarkson, and Councilmember Place 3 Judy Eychner. The staff liaison for this board is Kim Meismer.

RECOMMENDED ACTION:

Appoint member to the Senior Services Advisory Board.



City of Kerrville
701 Main Street
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(830) 257-8000

SENIOR SERVICES ADVISORY COMMITTEE				
2nd Tuesday of the month at 2:00PM				
NAME	APPT	EXP	TERM#	
Waverly Jones Chair	1/8/2019 *10/22/19	9/30/21	1st FULL TERM	
Janice Andersen	11/12/19	9/30/21	1	
Misty Blevins	1/8/19	9/30/20	1	
Karen Burkett	1/8/19	9/30/20	1	
Susan Eklund	1/8/2019 *10/22/19	9/30/21	1st FULL TERM	
Margie Jetton	1/8/19	9/30/20	1	
Christine Klima	1/8/19	9/30/20	1	
Melba Maring	11/12/19	9/30/21	1	
Rebecca Piszczor	1/8/2019 *10/22/19	9/30/21	1st FULL TERM	
Theresa Standage	2/12/19	9/30/20	1	
Mike Wilson	2/12/19	9/30/20	1	
Sandra Yarbrough	3/12/2019 *10/22/19	9/30/21	1st FULL TERM	
Vacant				
Vacant				

City Staff: Kim Meismer, Executive Director for General Operations

Qualifications: Members must be at least 55 years of age, or have relative experience in providing services to seniors, should be persons who are concerned about senior affairs in the community, and must reside within the City.

Functions: 1. The Senior Services Advisory Committee shall act as an advisory body to the City Manager and City Council and shall:

- recommend the role of the City and the Committee in ensuring the provision of services to the elderly;
- advise City Council as requested on elderly issues;
- assist the City in identifying programs for the elderly that are needed in the community; and
- perform other duties assigned by City Council;

2. The City Manager shall designate staff liaison responsibilities to the Committee

Number of Members: Sixteen **Quorum:** Nine

Established By: ORD 2018-32 **Term Limit:** N/A **Term Date:** Oct 1- September 30 2 YR TERMS

*Reappointed Date



**TO BE CONSIDERED BY THE CITY COUNCIL
CITY OF KERRVILLE, TEXAS**

SUBJECT: Appointments to the Planning and Zoning Commission. (This item is eligible for discussion in executive session).

AGENDA DATE OF: January 14, 2020 **DATE SUBMITTED:** Nov 01, 2019

SUBMITTED BY: Shelley McElhannon

EXHIBITS: [20191210_Board Appointment_Planning and Zoning Commission roster.pdf](#)

Expenditure Required:	Remaining Budget Balance in Account:	Amount Budgeted:	Account Number:
N/A	N/A	N/A	N/A

PAYMENT TO BE MADE TO: N/A

Kerrville 2050 Item?	Yes
Key Priority Area	E - Economic Development
Guiding Principle	D9. Other (Plug in where appropriate)
Action Item	E1.4 - Improve the processes for business recruitment, expansion and retention among stakeholders, EIC and KEDC

SUMMARY STATEMENT:

Due to one resignation and two expiration of terms, three regular member positions are vacant. The two members who's terms expire January 1, 2020 are both eligible for reappointment.

Eight applications have been received: Shane Bourgeois, Tricia Byrom (reappointment), Ronny Carroll, David Jones (reappointment), Bill Morgan, Hunter Patterson, Ed Perry, and Linda Stilwell.

Due to a Councilmember's absence 12/10/19, this item will be presented upon full Council attendance.

The interview team for this board is Councilmember Place 2 Kim Clarkson, and Councilmember Place 4 Delayne Sigerman.

RECOMMENDED ACTION:

Appoint members to the Planning and Zoning Commission.



City of Kerrville
701 Main Street
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(830)257-8000

PLANNING & ZONING			
First & Third Thursday of each month @ 4:30pm			
NAME	APPT	EXPIRES	TERM #
Garrett Harmon, Co-Chair	Alternate appt 6/25/2013 Member appt 12/13/2016 – 12/31/2018 Member re-appt 1/8/2019	1/1/2021	2
Tricia Byrom	Member appt 6/12/2018	1/1/2020	1
T David Jones	Alternate appt 12/13/2016 Alternate re-appt 1/09/2018 Member appt 6/12/2018	1/1/2020	0
David Lipscomb	Member appt 10/22/2019	1/1/2021	0
Cliff Tuttle	Member appt 10/22/2019	1/1/2021	0
Rustin Zuber	Alternate appt 12/10/2013 Member appt 12/13/2016 – 12/31/2018 Member re-appt 1/9/2019	1/1/2021	2
Vacant		1/1/2022	0

City Staff: Drew Paxton, Planning Director

Qualifications: At least five members shall be residents and eligible voters of the city; two members may reside in the city's extraterritorial jurisdiction (ETJ) and must be an eligible voter of Kerr County.

Functions: 1. Shall formulate and recommend to the City Council for adoption a Comprehensive Plan for the orderly growth and development of the city's and its environs. The commission may review and recommend such changes in the plan as it finds will facilitate the movement of people and goods, and the health, recreation, safety and general welfare of the citizens of the city.

2. Shall formulate a zoning ordinance as may be deemed best to carry out the goals of the Comprehensive Plan; hold public hearings; make recommendations to city council relating to the creation, amendment, and implementation of zoning regulations and districts as provided in state law.

3. Review Subdivision Plans and Plats, and shall exercise all powers of a commission as to approval or disapproval of plans, plats, or replats as set out by state law and the city's subdivision regulations.

4. Shall consider and make recommendations on applications for changes in zoning and may initiate for consideration at public hearings proposals for the original zoning of annexed areas or for the change of zoning district boundaries.

5. Shall consider and take appropriate action on variances to the City's subdivision regulations and any other ordinances as prescribed by City Council. Variances to the terms of the Zoning Code, excluding the list of permitted land uses, shall be reviewed by the Board of Adjustment as authorized by Chapter 211, Texas Local Government Code, as amended.

6. Shall from time to time recommend such changes to the Zoning Code, subdivision regulations, development standards, and any other ordinance city council assigns to its review, that will facilitate the general health, safety and welfare of the citizens of the city.

Membership: 7 Regular Members **Quorum:** 4 **Established by:** Zoning Code, Ordinance No. 2019-17

Term: 2 years. **Term Limit:** 3 consecutive full terms. **Revised:** October 01, 2019