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Innovative approaches
Practical results
Outstanding service



CITY OF FREDERICKSBURG
DRAINAGE MASTER PLAN

Prepared for:

City of Fredericksburg

August 26, 2016

Prepared by:

FREESE AND NICHOLS, INC.
10431 Morado Circle, Bldg. 5, Suite 300
Austin, Texas 78759
512-617-3100

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TEXAS REGISTERED
ENGINEERING FIRM
F-2144

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FRB15645

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EXECUTIVE SUMMARY

The Fredericksburg Drainage Master Plan was prepared to assist the City in evaluating the existing conditions of selected stormwater infrastructure and to develop prioritized capital improvement projects (CIPs) to address the problems. The CIPs and supporting information are organized within a customized and sustainable Microsoft Access database that can be used by the City to update project information or to add new projects. The Master Plan will ultimately serve to provide recommendations for updating the City's Capital Improvement Plan.

A total of 23 problem areas were identified and included in the Drainage Master Plan. Preliminary improvements were proposed to mitigate flooding in the problem areas and some are grouped into larger CIPs. A project cost was developed for each CIP based on 2016 dollars. It should be noted that the proposed improvements are not based on detailed engineering analysis or design. Rather they are based on field visits, review of existing data, and limited modeling and calculations. Each project cost includes engineering costs to perform field investigations and to develop the final design.

The projects were prioritized according to a ranking system developed through coordination with City staff. The ranking system is based on seven weighted criteria, which include street flooding hazard, infrastructure damage, at risk velocity, project cost, frequency of flooding, land acquisition needs, and availability of external funding. Criteria weighting was developed using a "pairwise" methodology that compares each criterion to all other criteria to determine what is most important to the City.

The projects were organized and ranked within a Microsoft Access database that is linked to a GIS location map. This database is intended as a "living" document, such that future projects can be added and prioritized and current projects can be updated or removed as they are completed. The Master Plan and database are intended to be planning tools to aid City staff in annual budgeting, possible future bond packages, and project implementation for their stormwater infrastructure. The city-wide ranking of the drainage CIPs and associated project costs is shown as Appendix A.

1.0 INTRODUCTION

In January of 2016, the City of Fredericksburg authorized Freese and Nichols, Inc. (FNI) to provide professional engineering services for developing the City of Fredericksburg's Drainage Master Plan. The authorized services included developing conceptual solutions for city identified drainage problems and associated cost estimates, developing a ranking system to prioritize the projects, and compiling the projects into a database which the City can later update with new projects and data into a standard form.

1.1 BACKGROUND

A flood protection planning study was prepared for the City in 1997. This Drainage Master Plan will build upon the previous study to incorporate past projects and new projects identified after the 1997 report.

1.2 PURPOSE OF STUDY AND APPROACH

The Fredericksburg Drainage Master Plan was prepared to assist the City in evaluating the existing conditions of selected stormwater infrastructure and to develop prioritized capital improvement projects (CIPs) to address problems identified by the City. The report uses a sustainable Microsoft Access database to allow for future project updates and additions. The Master Plan is comprised of 23 problem areas that were identified by the City for FNI to evaluate. All problem areas were picked by the City based on observations made by its staff, consultation by FNI, and reviewing previous flood studies.

The evaluation of existing conditions consisted of reviewing various sources of data (such as past studies, Geographical Information System (GIS) data, as-builts, models) and site visits to develop conceptual drainage Capital Improvement Projects (CIPs). Data from various drainage studies performed in the past were provided to FNI by the City.

Site visits were conducted at each of the problem areas to verify the problem, assess the scope of the potential CIP, and ensure that the solutions developed during desktop analysis were realistic. FNI was accompanied by City staff at many of the project areas to confirm the locations and provide first-hand knowledge of the problems.

For each problem area, at least one conceptual solution and cost estimate was developed to encompass the CIP. The results were used to develop an implementation plan for the City to prioritize improvements. FNI also developed ranking criteria and a scoring system to enable the City to prioritize these CIPs. The developed drainage CIPs were organized in a Microsoft Access database where they can be stored and

recalled, with an easy to use interface allowing the City to build upon the database in the future. The database is linked to an interactive GIS map, which shows the locations of projects and allows the City to easily query certain project attributes.

2.0 MASTER PLAN DEVELOPMENT

2.1 PROBLEM AREA IDENTIFICATION

Existing flooding, erosion, safety, and conveyance problem areas were identified based on the analyses of existing data and discussions with City staff. These areas included those identified in the Flood Protection Planning (FPP) Study for the Fredericksburg Area (1997) that had not been addressed yet, plus additional problem areas that had been identified by observations of City staff. After compiling the problem areas, FNI developed a preliminary problem area location map and CIP identification numbers. These location and project area maps were revised through coordination with the City and field visits. A total of 23 problem areas were identified within the City.

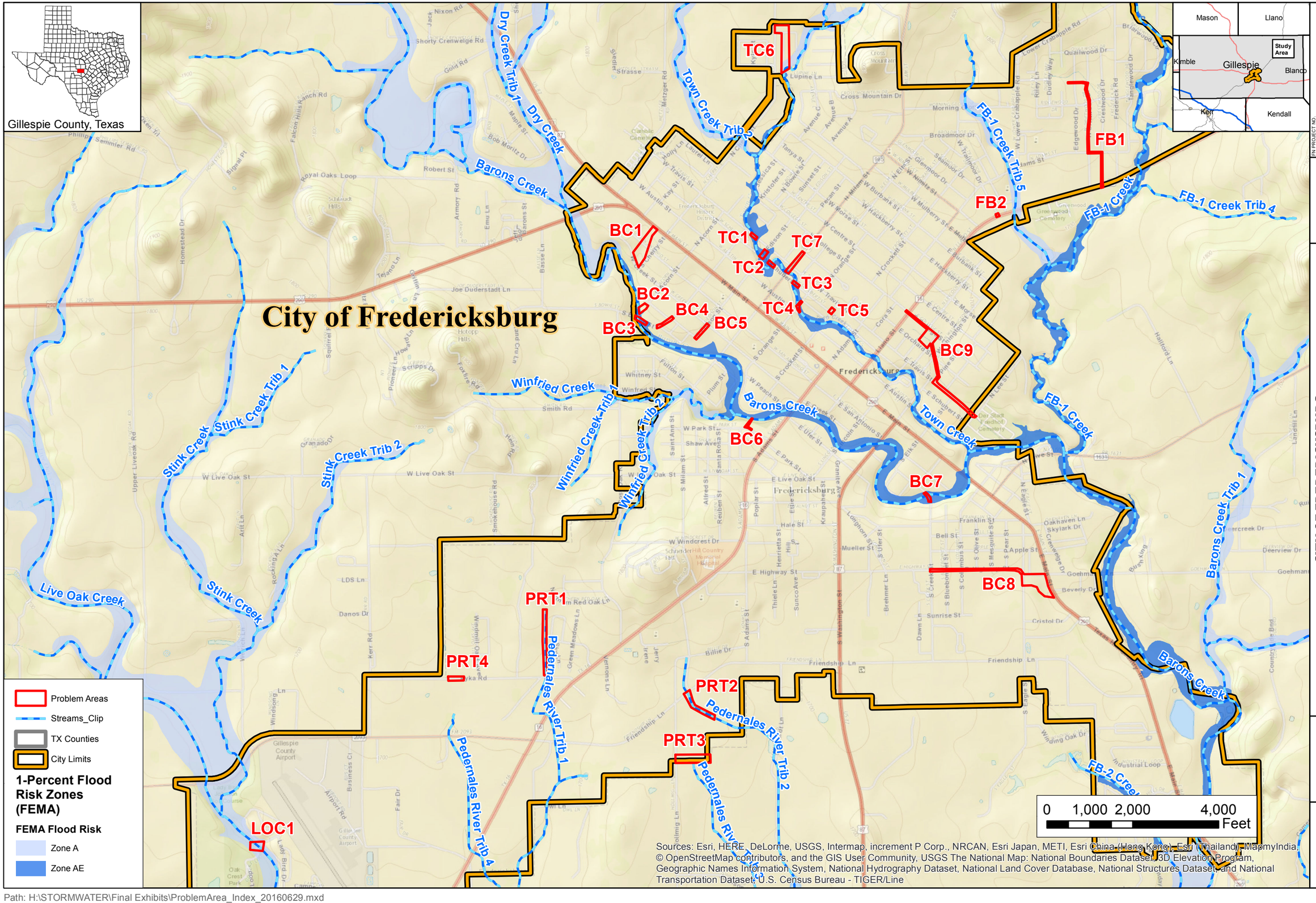
Each problem area was assigned an identification number that corresponds to the watershed in which the problem area is located. Figure 1 shows the general location of each of the problem areas.

2.2 CIP DEVELOPMENT

Preliminary improvements were proposed to mitigate these drainage problems and some small projects were grouped into larger projects to develop the Capital Improvement Projects (CIPs). The CIPs range from small projects that may be able to be implemented by City crews to large projects that will require a contractor. Ultimately, the City can break out or combine various elements of the different CIPs as needed to make the best use of City funds.

It should be noted that the proposed improvements are not based on detailed engineering analysis or design. Rather they are based on field visits, review of existing data, and limited modeling and calculations. A detailed hydrologic and hydraulic impact analysis should be performed during final design to ensure the recommended improvements will not cause adverse impact upstream or downstream of the project site.

Each project area is summarized as a one-page document developed using the Microsoft Access database. These reports are located in Appendix B.



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, USGS The National Map: National Boundaries Dataset, 3D Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line

PN PROJECT NO. OFF16041
DATE CREATED Date: 7/1/2016
DATUM & COORDINATE SYSTEM NAD83 State Plane (feet) Texas Central
FILE NAME Name: ProblemArea_Index_20160629.mxd
PREPARED BY BCK

CITY OF FREDERICKSBURG
DRAINAGE MASTER PLAN

PROBLEM AREAS

FREESE AND NICHOLS, INC
10814 JOLLYVILLE ROAD
BUILDING 4, SUITE 100
AUSTIN, TX 78759
PHONE: 512.617.3100

FIGURE
1

Path: H:\STORMWATER\Final Exhibits\ProblemArea_Index_20160629.mxd

2.3 OPINION OF PROBABLE PROJECT COSTS

An opinion of probable project cost was developed for each CIP based on field observations, FNI's professional opinion of probable root cause of the problem, and FNI's conceptual solution for the problem. The project cost includes items such as construction, final design, land acquisition, permitting, construction phase services, city management, and advertisement costs. It was assumed that each CIP would be completed as a standalone project, although some projects may ultimately be combined to reduce mobilization costs or lessen the amount of infrastructure required to implement a Flood Early Warning System.

All unit prices are in 2016 dollars, and are based on recent bid tabulations and FNI's experience with projects with similar design, construction, permitting, and maintenance elements. The cost for maintenance is not included. A 30% construction contingency was included in each estimate due to the preliminary nature of the design as no survey, detailed hydrologic/hydraulic modeling, geotechnical, or structural services were performed. Some of the projects warrant a detailed drainage study and/or alternatives analysis to be performed to vet whether the scope of project should change and/or whether another alternative, such as a regional stormwater facility, would be more cost effective to implement to address project clusters.

The construction duration for each CIP was estimated based on FNI's experience with projects of similar scope. City construction inspection and project management fees were included to span the construction duration and are based on daily rates received by the City.

Land acquisition unit costs and real estate negotiation fees are based on information provided by the City. Area of land to be acquired was assumed based on limits of project; however existing easements might exist that could reduce this cost.

Appendix C contains FNI's preliminary opinion of probable project cost for each CIP.

3.0 PROJECT PRIORITIZATION

The CIPs developed were prioritized through coordination with City staff. A ranking system was used to assess the relative severity of the identified drainage problems using weighted criteria that is used to assign a score to each project. The CIP ranking will assist the City in establishing annual funding priorities and needs. The ranking system is an integral component of the "living" master plan document with which existing projects can be modified and future projects can be added and prioritized.

3.1 IDENTIFICATION OF RANKING CRITERIA

The first step in the ranking process was to develop the criteria for scoring and ranking the projects. FNI coordinated with internal City stakeholders to develop the different ranking criteria which considers: street flooding hazard, infrastructure damage, at risk velocity, project cost, frequency of flooding, land acquisition needs, and availability of external funding. A brief explanation of each of the criteria is provided in Section 3.3.

3.2 CRITERIA WEIGHTING

The second step in the ranking process was to assign weighting factors to each criterion. This was accomplished through the "Pairwise" process. Pairwise comparison provides a simple, customizable, and rational framework to structure the ranking process. FNI created a Pairwise comparison table, which allowed the City's internal stakeholders to weigh each criterion against the other. A total of seven stakeholders performed the weighting process. The stakeholders were asked to determine which criterion was more important than another based on a scale of 1 to 3. A score of 3 means that one criterion is considered more important than another, a score of 2 means that the criteria are of the same importance, and a score of 1 means that the criterion is considered less important than another.

The results of the Pairwise exercise are shown as Table 1. For example, Staff was asked whether at risk velocity is more important, equally important to, or less important than frequency of flooding. According to Table 1, the City determined that at risk velocity is considered more important than frequency of flooding due to the potential of high velocities to sweep away cars, for example; therefore, at risk velocity received a score of 2.33 in that comparison.

Table 1. Pairwise Evaluation Criteria Ranking Results

Criteria	Street Flooding Hazard	Infrastructure Damage	Frequency of Flooding	At Risk Velocity	Project Cost	Availability of External Funding	Land Acquisition Needs	Sum	Rank
Street Flooding Hazard		1.67	2.22	1.67	2.11	2.33	2.44	12.4	3
Infrastructure Damage	2.33		2.78	2.22	2.78	2.56	2.78	15.4	1
Frequency of Flooding	1.78	1.22		1.67	2.22	2.11	2.00	11.0	4
At Risk Velocity	2.33	1.78	2.33		1.89	2.22	2.11	12.7	2
Project Cost	1.89	1.22	1.78	2.11		2.00	1.89	10.9	6
Availability of External Funding	1.67	1.44	1.89	1.78	2.00		1.78	10.6	7
Land Acquisition Needs	1.56	1.22	2.00	1.89	2.11	2.22		11.0	4

Based on the pairwise comparison above, Table 2 shows the evaluation criteria and the assigned weighting value in order from 1 to 7.

Table 2. Ranking Key

Rank	Criteria	Weight
1	Infrastructure Damage	15.4
2	At Risk Velocity	12.7
3	Street Flooding Hazard	12.4
4	Frequency of Flooding	11.0
4	Land Acquisition Needs	11.0
6	Project Cost	10.9
7	Availability of External Funding	10.6

3.3 PROJECT SCORING

After the criteria weighting was complete, FNI collaborated with the City to develop thorough descriptions and scoring systems for each category. The goal was to establish measures that provide consistent results and that would allow future projects to be added to the Master Plan if needed. It was determined that each criterion would have a 10-point scoring range, ranging from a minimum score of zero (0) and a maximum score of ten (10). FNI developed quantifiable measures and unique scoring guidelines for each criterion.

The following list provides descriptions of the ranking process and the scoring ranges developed for each criterion.

A. Street Flooding Hazard – During significant rainfall events, stormwater may overtop roadways or pedestrian routes creating a hazard for pedestrians, bicyclists, and motor vehicle operators. Also, the flooding of a roadway effectively removes that segment from the surface transportation system. Based on the location of such flooding, and the traffic loading of the street, serious problems may result by interrupting a driver's ability to move through the area, particularly to critical facilities (e.g. hospitals, police stations, etc).

   Project scoring is based on road classification (e.g. arterial, local, etc.) with points added to a project's score should a roadway be flooded and considered a primary route to a critical facility, or should a roadway segment that is subject to flooding leave some properties without an alternate route for ingress/egress.

   Roadway functional classifications were determined using the TxDOT Statewide Planning Map.

Highest Classification of Affected Roads	Points
Major Arterial	4
Minor Arterial	3
Collector	2
Local	0
+3 points if flooded and primary route to critical facility	
+3 points if flooded and sole route for ingress/egress for properties	

B. Infrastructure Damage – This category is used to account for the cost of damage that may be caused to public infrastructure as a result of the situation to continue unabated. Because it is best to prevent significant damage to the infrastructure before safety becomes an issue and costs escalate dramatically, areas with a higher cost potential for damage will receive a higher point value for this category. Project scoring is based on damage potential cost using engineering judgment.

Long Term Damage Potential	Points
> $100,000	10
$50,000 - $100,000	7
$10,000 - $50,000	4
$0 - $10,000	2
$0	0

C. Frequency of Flooding – Although larger, less frequent rainfall events can cause more damage during a single episode, the cumulative effect of repeated smaller events can be significant as well. Additionally, the more often flooding conditions are present, the greater the possibility of citizen complaint and personal injury. Therefore, situations which arise more frequently are given higher values. Project scoring is based on the first storm event that impacts the infrastructure, with the more frequent storms having the highest points.

Storm of Impact	Points
< 10-yr	10
10-yr	8
25-yr	6
100-yr	4
> 100-yr	0

D. At Risk Velocity – Even though roadways are commonly used to convey stormwater, the velocity of the water can pose a risk to the public. This criterion can help high risk areas rank higher on the list. Project scoring is based on applicable depth and velocity charts from the 1988 Bureau of Reclamation ACER Technical Memorandum No. 11 *Downstream Hazard Classification Guidelines*, where highest risk projects are assigned the highest points.

Flood Danger Zone	Points
High Danger Zone	10
Judgement Zone	5
Low Danger Zone	0

E. Project Cost – It is important to recognize that each stormwater capital project will vary in size of improvement, the type of project, and the overall cost. It is also important for the City to be able to provide funds for each identified project, and to develop a cost effective implementation schedule for the funding provided. This criterion can help some smaller projects rank higher on the list because lower cost projects can be accomplished with less impact to the City budget. Project scoring is based on estimate of total project cost, with lower-cost projects receiving the highest points. Two extra points are given to projects that have a construction cost less than $50K since the City can construct the project without a formal bid process.

Project Cost	Points
Less than $250,000	8
$250,000 - $499,999	7
$500,000 - $749,999	6
$750,000 - $999,999	5
$1,000,000 - $1,249,999	4
$1,250,000 - $1,499,999	3
$1,500,000 - $1,749,999	2
$1,750,000 - $1,999,999	1
More than $2,000,000	0
+2 points if OPCC is less than $50,000	

F. Availability of External Funding – Capital improvement projects can be partially/fully funded through other sources than City funds. Developer funding, TxDOT funding, grants through various agencies, and donations can all be sources of external funding for a project. Project scoring is based on the likelihood that a project could qualify for/have potential for external funding (Benefit Cost Ratio > 1, FEMA floodplain, in Hazard Mitigation Action Plan, Flood Early Warning System, Public Private Partnership). Projects with a higher level of external funding chance would be valued higher in this category to leverage use of City funds. This score could change over time if funding mechanisms change. For this master plan, if a project area impacted a state or county roadway, or was within a FEMA regulatory stream, five points was awarded to the project.

Likelihood of External Funding	Points
Very Likely	10
Somewhat Likely	5
Not Likely	0

G. Land Acquisition Needs – The timing of a project can be impacted by the availability to gain rights of way or easements needed for construction and future maintenance. In addition, the City is not allowed to spend public funds on private property issues. Project areas where the needed right-of-way or easements have already been obtained are therefore ranked higher in this category. Project scoring is based on whether land will need to be acquired in order to construct and/or maintain the improvements.

Need Land?	Points
no	10
yes	0

3.4 PROJECT RANKING

Each project was scored in each of the seven criteria and then multiplied by the corresponding criteria weights to develop a total score. The projects were ranked according to the total score, with 840 being the maximum possible score and 0 being the lowest possible score. The final scoring and ranking of each CIP is summarized in Appendix A. Documentation of how the project scores were derived can be found in the database.

This scoring process was programmed into the database that allows the user to input detailed information about each project, and ranks the CIPs to assess the benefit of the project with respect to the other projects.

4.0 DATABASE DEVELOPMENT

The final deliverable is the electronic database which includes the current prioritized CIPs. The database creates the report for the overall ranked list of projects, shown as Appendix A, as well as a one-page memo of each project, included as Appendix B. The database is linked to a GIS file. If a project is changed in the database, it will be changed in the GIS attribute table file as well.

The overall ranking list shown in Appendix A provides the City with a method for determining which projects receive priority. This ranking process is not intended to provide a prioritized list in which the City must complete in order without exception. However, it is a tool that can be used to help the City staff in annual budgeting and project implementation for their stormwater infrastructure improvements.

The database should be considered a "living document" that can be altered as needed in the future as new projects arise or as the City's needs change. It should be noted that some aspects of the database may need to be revisited by Staff annually. The scoring of a project may change over time as conditions on the ground change and the database can be revised when necessary to update project data and re-evaluate project priorities. These changes can be made within the current database. The master plan that is generated from the database will ultimately serve to provide recommendations for updating the City's Capital Improvement Plan.

It should be noted that there is also the ability for the City to include maintenance projects within the database. These projects will not be included in the ranked CIP reporting but this will provide a means for the City to track and document these smaller infrastructure improvements or repair.

APPENDIX A
CITY-WIDE RANKING OF DRAINAGE CIPS

Overall Ranking

Final Rank	Project ID	Project Name	Street Flooding Hazard	Infrastructure Damage	Frequency of Flooding	At Risk Velocity	Project Cost	Availability of External Funding	Land Aquisition Needs:	Total Weighted Score
1	BC7	Creek St. @ Barons CK	3	4	10	10	8	5	10	586
1	TC1	W. Travis LWC	3	4	10	10	8	5	10	586
3	TC4	200 Block N. Orange	0	4	10	10	8	5	10	548.8
4	LOC1	Lady Bird Golf Course LWC	0	2	10	10	8	5	10	518
5	BC3	S. Bowie LWC	2	0	10	10	8	5	10	512
6	TC2	N. Edison LWC	0	4	10	10	0	5	10	461.6
7	BC9	College/N. Llano, Sycamore/Travis	3	10	8	10	0	5	0	459.2
8	PRT4	Windmill Oaks Subdivision	2	2	10	0	8	5	10	415.8
9	BC5	Edison and Creek St.	0	7	10	0	7	0	10	404.1
10	TC3	LWC @ Schubert	0	4	10	10	4	5	0	395.2
11	TC5	Crockett St. south of Travis	3	2	10	10	5	0	0	359.5
12	PRT1	Post Oak Subdivision	2	4	8	10	4	0	0	345
13	BC4	Bowie and Peach St.	2	10	0	0	5	0	10	343.3
14	FB1	Carriage Hills	5	2	6	10	5	0	0	340.3
15	BC8	Hghway St. flooding	4	4	10	5	0	5	0	337.7
16	PRT2	Drainage Channel near EMS Building	0	7	0	0	7	0	10	294.1
17	PRT3	Bob White Trail	3	2	0	0	7	0	10	254.3
18	BC1	800 Block W. San Antonio	3	4	8	0	6	0	0	252.2
19	FB2	Trailmoor near Llano Hwy	4	2	10	0	0	5	0	243.4
20	BC6	112 W. Park	0	7	0	0	10	0	0	216.8
21	BC2	South End of Acorn	0	7	0	0	8	0	0	195
22	TC6	Cross Mountain West	3	0	8	0	5	0	0	179.7

Final Rank	Project ID	**Project Name**	Street Flooding Hazard	Infrastructure Damage	Frequency of Flooding	At Risk Velocity	Project Cost	Availability of External Funding	Land Aquisition Needs:	Total Weighted Score
23	TC7	N. Milam @ W. Travis	3	2	8	0	0	0	0	156

APPENDIX B
ONE PAGE SUMMARY REPORTS

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC1	Status:	Design Needed
Project Name:	800 Block W. San Antonio	Funding Mechanism:	N/A
Project Type:	Channel/Culvert	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	600,720	0	0	0	0	0	0	600,720

Funding Sources	
General Fund	600,720
Total	**600,720**

Problem Description:

Lack of conveyance from Main St. Flow runs through property yards, and San Antonio St floods, preventing access to homes at the end of the street.

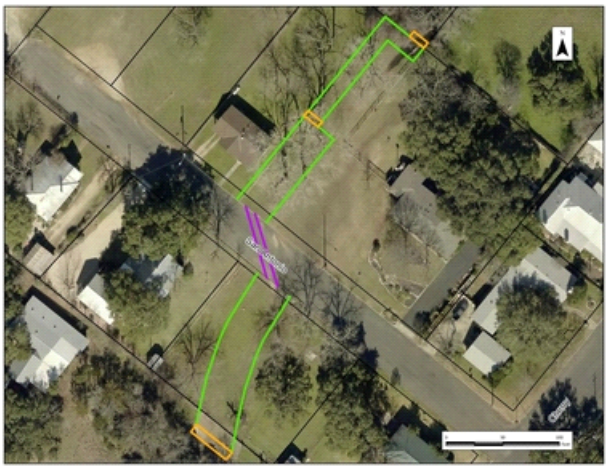
Proposed Improvements:

Series of channels and drop structures, along with two 7' x 4' RCBs underneath San Antonio St. This would require the removal/relocation of trees and drainage easements.

O & M Impact if Project is not Completed:

If left unaddressed, the asphalt pavement of San Antonio St can potentially erode due to roadway overtopping.

Section of San Antonio St where stormwater crosses.



Proposed series of channels and culvert crossing.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	3
15.4	Infrastructure Damage:	4
11	Frequency of Flooding:	8
12.7	At Risk Velocity:	0
10.9	Project Cost:	6
10.6	Availability of External Funding:	0
11	Land Acquisition Needs:	0
	Total Weighted Point Score:	252.2
	CIP Rank:	18

Notes:

Consider land owner coordination when choosing channel configuration.

Other options to consider: Install a storm sewer line on the north side of San Antonio St to bypass trees or leave the property on the north side of San Antonio St as-is and construct a berm to direct flow to culverts.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC2	Status:	Design Needed
Project Name:	South End of Acorn	Funding Mechanism:	N/A
Project Type:	Channel System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	226,320	0	0	0	0	0	0	226,320

Funding Sources	
General Fund	226,320
Total	**226,320**

Problem Description:

Lack of conveyance from Acorn St to Barons Creek. Flow runs through a property yard in an undefined channel until it reaches a steep outfall to the creek, which is experiencing erosion

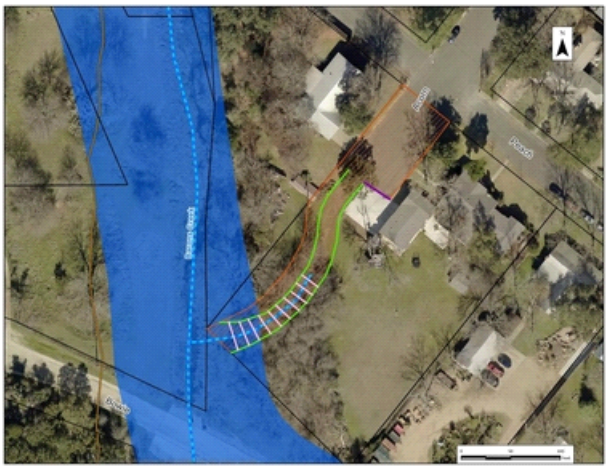
Proposed Improvements:

Add a rollup curb at the edge of the driveway to direct runoff to the vegetated channel, which would reduce the inundated area of the yard. A drop structure would be installed at the outfall to transition into Barons Creek.

O & M Impact if Project is not Completed:

If left unaddressed, the outfall could potentially headcut into the owner's yard and the channel would require repair

Yard which stormwater flows through to Barons Creek.



Proposed channel to Barons Creek.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	0
15.4	Infrastructure Damage:	7
11	Frequency of Flooding:	0
12.7	At Risk Velocity:	0
10.9	Project Cost:	8
10.6	Availability of External Funding:	0
11	Land Acquisition Needs:	0
	Total Weighted Point Score:	195
	CIP Rank:	21

Notes:

Other options to consider: Installing curb inlets and a storm sewer line at the end of Acorn St.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC3	Status:	Design Needed
Project Name:	S. Bowie LWC	Funding Mechanism:	Flood Protection Planning G
Project Type:	Flood Warning System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	142,045	0	0	0	0	0	0	142,045

Funding Sources	
General Fund	142,045
Total	**142,045**

Problem Description:

The Bowie LWC was recently upgraded to include concrete aprons to prevent erosion of asphalt, but the culverts are still undersized. The road overtops by approximately 9.5 ft during the 100-year storm.

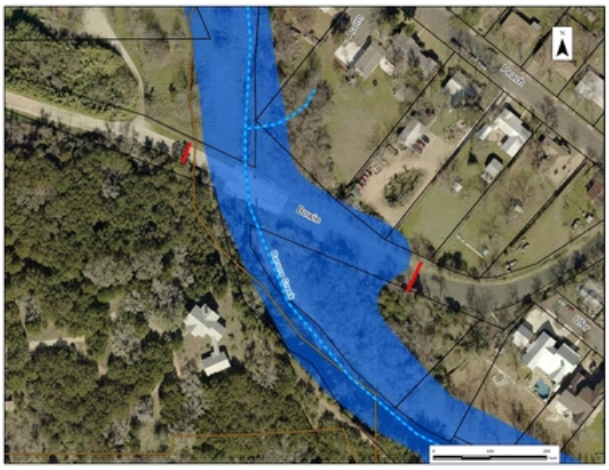
Proposed Improvements:

Install a FEWS, including automatic gates and warning flashers, at the LWC that will be able to communicate with the City's SCADA system.

O & M Impact if Project is not Completed:

If left unaddressed, there is no expected infrastructure damage costs since the crossing was upgraded to concrete with aprons.

Current LWC culverts.



Proposed FEWS gates and flashers locations.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	2	Other option to consider: Install manual gates for approximately $58,000 or upgrade the crossing to a bridge.
15.4	Infrastructure Damage:	0	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	8	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	512	
	CIP Rank:	5	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC4	Status:	Design Needed
Project Name:	Bowie and Peach St.	Funding Mechanism:	N/A
Project Type:	Storm Sewer System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	770,025	0	0	0	0	0	0	770,025

Funding Sources	
General Fund	770,025
Total	**770,025**

Eroding channel and side of road.

Problem Description:

The channel along Bowie St used to be protected by a guardrail, but the guardrail has fallen apart due to the erosion of the channel and asphalt. This along with a sight distance problem creates safety concern.

Proposed storm sewer system.

Proposed Improvements:

Install a storm sewer system with curb inlets that connect to two 36" RCPs where the current channel is. The Peach St culvert and guardrails would be eliminated.

O & M Impact if Project is not Completed:

If left unaddressed, the asphalt could potentially erode necessitating roadway repair and channel improvements.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	2	Previous design prepared by VEI Consulting Engineers, 2015
15.4	Infrastructure Damage:	10	
11	Frequency of Flooding:	0	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	5	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	343.3	
	CIP Rank:	13	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC5	Status:	Design Needed
Project Name:	Edison and Creek St.	Funding Mechanism:	N/A
Project Type:	Channel System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	469,915	0	0	0	0	0	0	469,915

Funding Sources	
General Fund	469,915
Total	**469,915**

Problem Description:

The two 24" RCP downstream driveway culverts are undersized and serve as a bottleneck in the channel along Edison St. The channel itself is also undersized, causing the channel sides to overtop.

Proposed Improvements:

Replace the two driveway culverts with 8' x 3' RCBs, construct a pilot channel and a concrete-lined channel in place of the vegetated channels.

O & M Impact if Project is not Completed:

If left unaddressed, channel improvements along the length of the channel could potentially be needed.

Current vegetated channel and Bed & Breakfast driveway.

Proposed channel and driveway culvert system.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	Previous design prepared by VEI Consulting Engineers, 2014
15.4	Infrastructure Damage:	7	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	7	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	404.1	
	CIP Rank:	9	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC6	Status:	Design Needed
Project Name:	112 W. Park	Funding Mechanism:	N/A
Project Type:	Channel System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	74,710	0	0	0	0	0	0	74,710

Funding Sources	
General Fund	81,460
Total	**81,460**

Problem Description:

Stormwater coming down Park St currently runs through private property due to a missing curb and no defined channel from Park St to Barons Creek.

Proposed Improvements:

Extend the curb eastward to direct water to a new vegetated channel on the west side of the driveway. The channel would outfall with a drop structure into Barons Creek.

O & M Impact if Project is not Completed:

If left unaddressed, channel improvements might be necessary along the length of the channel.

Housefront of affected property.

Proposed channel to Barons Creek.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	
15.4	Infrastructure Damage:	7	
11	Frequency of Flooding:	0	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	10	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	216.8	
	CIP Rank:	20	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC7	Status:	Design Needed
Project Name:	Creek St. @ Barons CK	Funding Mechanism:	Flood Protection Planning G
Project Type:	Flood Warning System	Street Grid Index:	1
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	142,045	0	0	0	0	0	0	142,045

Funding Sources	
General Fund	142,045
Total	**142,045**

Current LWC crossing bridge.

Problem Description:

Creek St low water crossing is a bridge with three 8' x 7' RCBs. The road overtops by approximately 11.5 ft during the 100-year storm.

Proposed Improvements:

Install a FEWS, including automatic gates and warning flashers, at the LWC that will be able to communicate with the City's SCADA system.

Proposed FEWS gates and flashers locations.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include repairing eroded asphalt on the top of the bridge and repairing scour under the bridge.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	3
15.4	Infrastructure Damage:	4
11	Frequency of Flooding:	10
12.7	At Risk Velocity:	10
10.9	Project Cost:	8
10.6	Availability of External Funding:	5
11	Land Acquisition Needs:	10
	Total Weighted Point Score:	586
	CIP Rank:	1

Notes:

Access to homes should be taken into account when locating gates. Manual gates could be installed for approximately $58,000.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC8	Status:	Study Needed
Project Name:	Hghway St. flooding	Funding Mechanism:	TXDOT
Project Type:	Channel System	Street Grid Index:	1
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	5,306,660	0	0	0	0	0	0	5,306,660

Funding Sources	
General Fund	5,306,660
Total	**5,306,660**

Problem Description:

Stormwater accumulates along Highway St and either ends up in the open space between Eagle St and Main St, where there is no defined channel, or continues to be conveyed on Highway St and onto Main. Runoff diverts from Highway Street in many locations along the south side of its length but there are no reported flooding complaints in the area south of Highway Street.

Proposed Improvements:

Construct a vegetated channel system in the open space area once the proper easements are obtained and to pick up the flow in two 10' x 4' RCBs in a storm sewer system that outfalls to Barons Creek.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at the southeast corner of the Hominick Subdivision and road repair where the flow might overtop onto Main Street.

Current naturally-forming channel through open land.

Proposed channel and storm sewer system.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	4	The open space area could possibly be used as a regional stormwater facility since it is already being used for stormwater conveyance. Infrastructure upgrades along Highway Street should be considered if flow diversion locations to the south are a concern.
15.4	Infrastructure Damage:	4	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	5	
10.9	Project Cost:	0	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	337.7	
	CIP Rank:	15	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	BC9	Status:	Study Needed
Project Name:	College/N. Llano, Sycamore/Travis	Funding Mechanism:	County
Project Type:	Storm Sewer System	Street Grid Index:	6
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	15,092,720	0	0	0	0	0	0	15,092,720

Funding Sources	
General Fund	15,092,720
Total	**15,092,720**

Problem Description:

The streets are used to convey stormwater through the neighborhood and the flow reaches dangerous depths and velocities in several places. Existing infrastructure is undersized and erosion occurs in the channel along Travis St.

Proposed Improvements:

Install an extensive storm sewer system throughout the project area that would outfall where Sycamore St intersects Town Creek or further downstream. The system would divert enough runoff from the watershed to not exceed capacity of existing channels.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include channel improvements for the channel along Travis St.

Channel from Travis St to cemetery.

Proposed storm sewer system to outfall into Town Creek.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	3	Hydrologic and hydraulic impact assessment is necessary to determine ultimate outfall location.
15.4	Infrastructure Damage:	10	
11	Frequency of Flooding:	8	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	0	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	459.2	
	CIP Rank:	7	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	FB1	Status:	Study Needed
Project Name:	Carriage Hills	Funding Mechanism:	N/A
Project Type:	Channel System	Street Grid Index:	5
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	927,430	0	0	0	0	0	0	927,430

Funding Sources	
General Fund	927,430
Total	**927,430**

Problem Description:

The streets are used to convey stormwater through the neighborhood, and the flow reaches dangerous depths and velocities at the outlet of the Crabapple pond and on Adams St.

Proposed Improvements:

Replace the curb on the south side of Adams St to allow stormwater to enter a new vegetated channel. Increase capacity at the Crabapple pond and replace outlet structure to reduce inflow to the concrete channels.

O & M Impact if Project is not Completed:

If left unaddressed, there are no foreseeable infrastructure damage costs associated with this problem area.

Current concrete channel at outlet of the Crabapple pond.

Proposed pond and channel improvements.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	5
15.4	Infrastructure Damage:	2
11	Frequency of Flooding:	6
12.7	At Risk Velocity:	10
10.9	Project Cost:	5
10.6	Availability of External Funding:	0
11	Land Acquisition Needs:	0
	Total Weighted Point Score:	340.3
	CIP Rank:	14

Notes:

Other options to consider: Installing a storm sewer system or converting alleyways into channels. However, runoff contained in ROW.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	FB2	Status:	Study Needed
Project Name:	Trailmoor near Llano Hwy	Funding Mechanism:	N/A
Project Type:	Storm Sewer System	Street Grid Index:	5
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	2,485,740	0	0	0	0	0	0	2,485,740

Funding Sources	
General Fund	2,485,740
Total	**2,485,740**

Problem Description:

Capacity of the existing 2-36" RCP on Trailmoor is exceeded during a 2-year storm event, leading to frequent flooding near the intersection with Llano Highway (State Highway 16). Debris build up at the upstream culvert entrance reduces the amount of flow entering the culverts, further contributing to flooding.

Proposed Improvements:

Install a stormsewer system throughout contributing watershed and capture overland and gutter flow for the 25-year storm event with curb and drop inlets along Trailmoor, Broadmoor, Westmoor, Seamoor, Glemoor, Crockett Street, and Adams Streets.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at the intersection of Trailmoor and Llano Highway (State Highway 16).

Culvert entrance on Trailmoor at Llano.

Proposed storm sewer system layout.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	4	
15.4	Infrastructure Damage:	2	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	0	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	243.4	
	CIP Rank:	19	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	LOC1	Status:	Design Needed
Project Name:	Lady Bird Golf Course LWC	Funding Mechanism:	N/A
Project Type:	Flood Warning System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	142,045	0	0	0	0	0	0	142,045

Funding Sources	
General Fund	164,930
Total	**164,930**

Problem Description:

The Lady Bird Johnson LWC crosses Live Oak Creek and acts as a dam. There is little freeboard even during sunny day conditions.

Proposed Improvements:

Install a FEWS, including automatic gates and warning flashers, at the LWC that will be able to communicate with the City's SCADA system.

O & M Impact if Project is not Completed:

If left unaddressed, there is no expected infrastructure damage costs.

Current LWC bridge.

Proposed FEWS gates and flashers locations.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	Other options to consider: Install manual gates for approximately $58,000 or structural improvements to the crossing for approximately $150,000.
15.4	Infrastructure Damage:	2	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	8	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	518	
	CIP Rank:	4	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	PRT1	Status:	Design Needed
Project Name:	Post Oak Subdivision	Funding Mechanism:	N/A
Project Type:	Channel/Culvert	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	1,039,130	0	0	0	0	0	0	1,039,130

Funding Sources	
General Fund	1,039,130
Total	**1,039,130**

Existing undefined earthen channel, facing South.

Problem Description:

Undefined earthen channel conveys runoff from a stormwater detention pond of a residential development towards four 24”x33” elliptical CMP pipes under Pyka RD. The capacity of the earthen channel and the culverts under Pyka Rd are exceeded above the 10-year storm event.

Proposed Improvements:

Improve existing undefined channel to a consistent and defined channel from the outlet of the detention pond down to Pyka Road. Raise Pyka RD by approximately 0.5 ft and construct 6-7’x3’ concrete box culverts.

Proposed defined channel route and culvert improvements.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at Pyka Road. Additionally, the asphalt pavement of Pyka Road can potentially erode due to roadway overtopping.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	2
15.4	Infrastructure Damage:	4
11	Frequency of Flooding:	8
12.7	At Risk Velocity:	10
10.9	Project Cost:	4
10.6	Availability of External Funding:	0
11	Land Acquisition Needs:	0
	Total Weighted Point Score:	345
	CIP Rank:	12

Notes:

Other options to consider: Install manual gates for approximately $58,000 or a FEWS with automatic gates for approximately $142,000.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	PRT2	Status:	Design Needed
Project Name:	Drainage Channel near EMS Building	Funding Mechanism:	N/A
Project Type:	Erosion Protection	Street Grid Index:	2
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	295,630	0	0	0	0	0	0	295,630

Funding Sources	
General Fund	295,630
Total	**295,630**

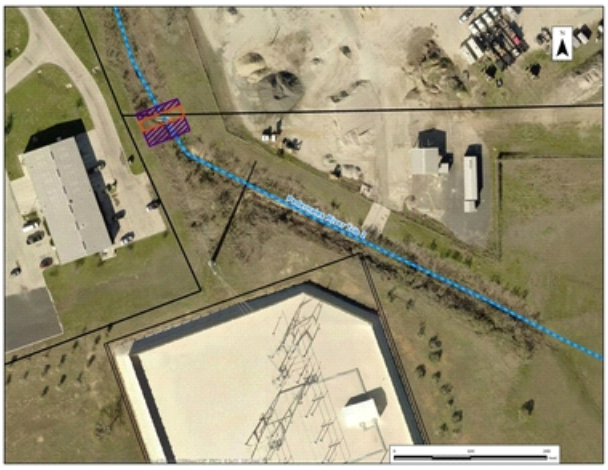
Problem Description:

The channel is experiencing erosion around a utility crossing causing the crossing to be exposed. Minor rilling is also evident along the downstream slopes.

Current channel with exposed utility.

Proposed Improvements:

Install a drop structure with utility encasement, which would protect the utility and prevent future downcutting. The downstream slopes would be cleaned and regraded.



Proposed drop structure location.

O & M Impact if Project is not Completed:

If left unaddressed, costs for infrastructure damage would include channel improvements and utility repair around the utlity if utility was to collapse.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	Reach appears stable upstream and downstream of utility crossing.
15.4	Infrastructure Damage:	7	
11	Frequency of Flooding:	0	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	7	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	294.1	
	CIP Rank:	16	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	PRT3	Status:	Design Needed
Project Name:	Bob White Trail	Funding Mechanism:	N/A
Project Type:	Culvert Improvements	Street Grid Index:	2
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	381,420	0	0	0	0	0	0	381,420

Funding Sources	
General Fund	381,420
Total	**381,420**

Problem Description:

The culverts that run underneath Bobwhite Trail are clogged and crushed, and the driveway culverts on both sides of Bobwhite Trail are either clogged or nonexistent. Stormwater overtops Bobwhite Trail and floods yards on the south side.

Proposed Improvements:

Replace the culverts under Bobwhite Trail with two 24" RCPs and regrade the easement channel to match up with the new crossing invert. The driveway culverts would be replaced and ditch along the south side of the road regraded.

O & M Impact if Project is not Completed:

If left unaddressed, costs for infrastructure damage would include road repair for eroded asphalt.

Current crushed/clogged culverts and easement channel.

Proposed new culverts and regraded channels.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	3	
15.4	Infrastructure Damage:	2	
11	Frequency of Flooding:	0	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	7	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	254.3	
	CIP Rank:	17	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	PRT4	Status:	Design Needed
Project Name:	Windmill Oaks Subdivision	Funding Mechanism:	Flood Protection Planning G
Project Type:	Flood Warning System	Street Grid Index:	3
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	142,045	0	0	0	0	0	0	142,045

Funding Sources	
General Fund	142,045
Total	**142,045**

Detention pond outlet onto Pyka Rd.

Problem Description:

The outflow for a development's detention pond on the north side of Pyka Rd, along with flows from other northern drainage areas, combine in one low point along Pyka Rd, where the road is overtopped.

Proposed Improvements:

FNI proposes to install a FEWS, including automatic gates and warning flashers, at the LWC that will be able to communicate with the City's SCADA system.

Proposed FEWS gates and flashers locations.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include repairing eroded asphalt where the water overtops the road.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	2
15.4	Infrastructure Damage:	2
11	Frequency of Flooding:	10
12.7	At Risk Velocity:	0
10.9	Project Cost:	8
10.6	Availability of External Funding:	5
11	Land Acquisition Needs:	10
	Total Weighted Point Score:	415.8
	CIP Rank:	8

Notes:

Other options to consider: Install manual gates for approximately $58,000. The City could also consider partnering with future developments to construct an upstream regional pond to reduce runoff at the road. Crossing improvements were also considered but 3 – 10'x5' MBC would be necessary to convey the 25-year storm and a new 8' deep channel from the crossing to an existing stream 600-feet downstream.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC1	Status:	Design Needed
Project Name:	W. Travis LWC	Funding Mechanism:	Flood Protection Planning G
Project Type:	Flood Warning System	Street Grid Index:	4
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	164,930	0	0	0	0	0	0	164,930

Funding Sources	
General Fund	164,930
Total	**164,930**

Problem Description:

Insufficient capacity of existing culvert crossing leads to frequent roadway overtopping. Erosion noted around edges of upstream concrete apron.

Proposed Improvements:

Install a FEWS, including automatic gates and warning flashers, at the LWC that will be able to communicate with the City's SCADA system.

O & M Impact if Project is not Completed:

If left unaddressed, the asphalt pavement of Travis St can potentially erode due to roadway overtopping. Additionally, erosion around edges of upstream concrete apron could undermine structural integrity of concrete apron.

Upstream culvert face and concrete apron.

Proposed FEWS gates and flashers locations.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	3
15.4	Infrastructure Damage:	4
11	Frequency of Flooding:	10
12.7	At Risk Velocity:	10
10.9	Project Cost:	8
10.6	Availability of External Funding:	5
11	Land Acquisition Needs:	10
	Total Weighted Point Score:	586
	CIP Rank:	1

Notes:

Other options to consider: Install manual gates for approximately $69,000 or increase size of culverts and raise the existing roadway at Schubert St.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC2	Status:	Design Needed
Project Name:	N. Edison LWC	Funding Mechanism:	Flood Protection Planning G
Project Type:	Flood Warning System / Crossing Improvements	Street Grid Index:	4
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	2,239,340	0	0	0	0	0	0	2,239,340

Funding Sources	
General Fund	2,239,340
Total	**2,239,340**

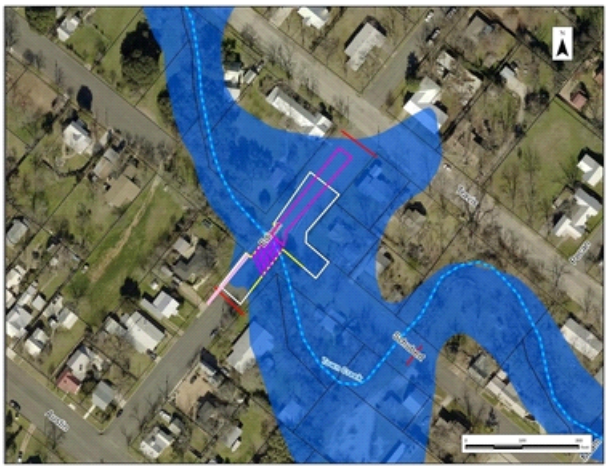
View of N Edison St LWC facing the raised Schubert St intersection.

Problem Description:

Capacity of the existing culverts at N Edison St and under Schubert are frequently exceeded, therefore conveyance occurs predominantly over the roadway. Existing intersection design at Schubert and Edison does not facilitate easy flow of traffic through the intersection.

Proposed Improvements:

Raise existing N Edison St. at the Schubert St. intersection to match grade with Schubert St. and redesign intersection into a T intersection. Install a FEWS, including automatic gates and warning flashers, at the LWC along Schubert St. that will be able to communicate with the City's SCADA system.



Footprint of proposed roadway and culvert improvements and locations of auto gates.

O & M Impact if Project is not Completed:

If left unaddressed, the asphalt pavement can potentially erode due to roadway overtopping.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	
15.4	Infrastructure Damage:	4	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	0	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	461.6	
	CIP Rank:	6	

City Of Fredericksburg

Capital Improvements Plan

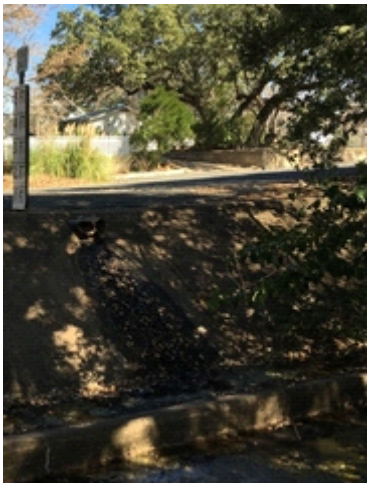
Project Summary Information	8/26/2016

Project ID:	TC3	Status:	Design Needed
Project Name:	LWC @ Schubert	Funding Mechanism:	Flood Protection Planning G
Project Type:	Channel/Culvert	Street Grid Index:	5
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	1,082,130	0	0	0	0	0	0	1,082,130

Funding Sources	
General Fund	1,082,130
Total	**1,082,130**



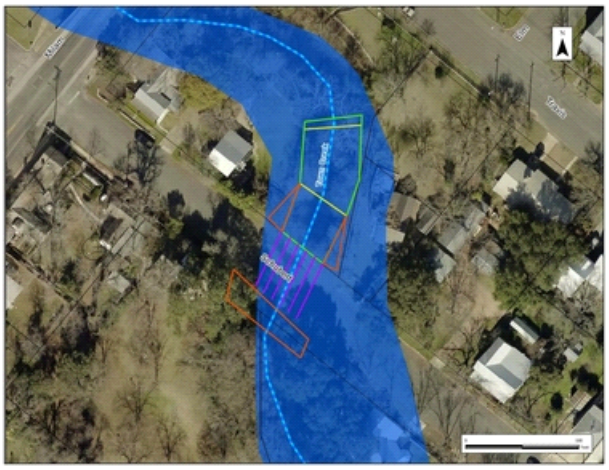
Downstream face of Schubert LWC facing north.

Problem Description:

Flow is completely blocked by debris in the existing 2-12" (approximate size) pipes under Schubert Street. Conveyance across Schubert Street occurs predominantly over the roadway.

Proposed Improvements:

Channel improvements upstream of Schubert St to lower channel by 4 to 5 ft through a series of drop structures. Install 5 - 9 ft x 5 ft box culverts under Schubert St.



Culvert and Channel Improvements

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at Schubert Street. Additionally, the asphalt pavement of Schubert St. can potentially erode due to roadway overtopping.

Weight	CIP Ranking Criteria	Score
12.4	Street Flooding Hazard:	0
15.4	Infrastructure Damage:	4
11	Frequency of Flooding:	10
12.7	At Risk Velocity:	10
10.9	Project Cost:	4
10.6	Availability of External Funding:	5
11	Land Acquisition Needs:	0
	Total Weighted Point Score:	395.2
	CIP Rank:	10

Notes:

Other options to consider: Install manual gates for approximately $58,000 or a FEWS with automatic gates for approximately $142,000.

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC4	Status:	Design Needed
Project Name:	200 Block N. Orange	Funding Mechanism:	Flood Protection Planning G
Project Type:	Erosion Protection	Street Grid Index:	5
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	153,620	0	0	0	0	0	0	153,620

Funding Sources	
General Fund	153,620
Total	**153,620**

Problem Description:

Due to a lack of erosion protection, erosion is present at the transition between the concrete apron and natural channel at the downstream side of the low water crossing on Orange Street. The channel on the upstream side of the crossing does not have any safety barriers or erosion protection, thus localized scour is occurring at the outfall and erosion along the length of the steeper sections of the channel.

Proposed Improvements:

Install concrete apron around upstream entrance of culvert and provide erosion protection at edges of concrete apron. Install pedestrian or guard rail along upstream face and relocate downstream concrete encased utility or deepen utility and extend downstream channel erosion protection to cover utility.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include rehabilitating erosion and regrading drainage ditches along roadway to provide positive drainage from the roadway to the creek

Upstream face of N Orange LWC facing northeast.

Footprint of proposed concrete apron and erosion protection.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	0	
15.4	Infrastructure Damage:	4	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	8	
10.6	Availability of External Funding:	5	
11	Land Acquisition Needs:	10	
	Total Weighted Point Score:	548.8	
	CIP Rank:	3	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC5	Status:	Design Needed
Project Name:	Crockett St. south of Travis	Funding Mechanism:	N/A
Project Type:	Storm Sewer System	Street Grid Index:	5
Date Identified:	2016		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	928,155	0	0	0	0	0	0	928,155

Funding Sources	
General Fund	928,155
Total	**928,155**

Problem Description:

Runoff from residential development concentrates in and is conveyed by Travis Street and Crockett toward an approximately 3 ft x 2 ft concrete box culvert located on the southeast side of Crockett St at Schubert intersection. Capacity of the roadway is exceeded at the 10-year storm event, leading to frequent flooding on Crockett Street near the intersection with Schubert.

Proposed Improvements:

Capturing overland and gutter flow with curb and drop inlets along Travis Street, Crockett Street and Austin Street.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at the intersection of Crockett St and Schubert.

Upstream face of culvert on southeast side of Crockett St at Schubert.

Proposed storm sewer system layout.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	3	
15.4	Infrastructure Damage:	2	
11	Frequency of Flooding:	10	
12.7	At Risk Velocity:	10	
10.9	Project Cost:	5	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	359.5	
	CIP Rank:	11	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC6	Status:	Design Needed
Project Name:	Cross Mountain West	Funding Mechanism:	N/A
Project Type:	Storm Sewer System	Street Grid Index:	4
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	893,350	0	0	0	0	0	0	893,350

Funding Sources	
General Fund	893,350
Total	**893,350**

Doe Run facing south.

Problem Description:

Approximately 23 acres of off-site drainage sheet flows across residential properties along Agave Court. Flow concentrates and flows down Doe Run Hollow; overtopping the curb and sheet flowing across residential properties during storm events.

Proposed Improvements:

Construct a drainage channel to divert the off-site water towards the west where a storm drain system beneath N Cherry St. would convey the off-site drainage away from the Cross Mountain West neighborhood down to Town Creek, downstream of Lupine Lane.

Proposed drainage ditch and storm sewer layout.

O & M Impact if Project is not Completed:

If left unaddressed, there is no expected infrastructure damage costs.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	3	
15.4	Infrastructure Damage:	0	
11	Frequency of Flooding:	8	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	5	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	179.7	
	CIP Rank:	22	

City Of Fredericksburg

Capital Improvements Plan

Project Summary Information	8/26/2016

Project ID:	TC7	Status:	Study Needed
Project Name:	N. Milam @ W. Travis	Funding Mechanism:	N/A
Project Type:	Storm Sewer System	Street Grid Index:	5
Date Identified:	1997		

Fiscal Year Plan

Prior Years	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	Future	Total
0	2,474,860	0	0	0	0	0	0	2,474,860

Funding Sources	
General Fund	2,474,860
Total	**2,474,860**

Northwest channel along Milam at Travis, facing south.

Problem Description:

Approximately 100 acres of predominantly residential areas drains toward Milam Street to two concrete channels and box culverts located near the intersection with Travis St. When the capacity of the culverts and channels is reached, flow will divert away from the channel and overflow onto Milam Street flowing towards the Travis Street intersection.

Proposed Improvements:

Capture overland and gutter flow for the 25-year storm event with curb inlets along Milam Street extending north along Milam street within the limits of the City's planned sidewalk and roadway improvements on the west side of Milam Street.

Proposed storm sewer system layout.

O & M Impact if Project is not Completed:

If left unaddressed, the infrastructure damage costs would include unclogging the undersized culverts at the northeast and northwest corners of the Milam St. and Travis St. intersection and road repair where the flow might overtop onto Milam Street.

Weight	CIP Ranking Criteria	Score	Notes:
12.4	Street Flooding Hazard:	3	
15.4	Infrastructure Damage:	2	
11	Frequency of Flooding:	8	
12.7	At Risk Velocity:	0	
10.9	Project Cost:	0	
10.6	Availability of External Funding:	0	
11	Land Acquisition Needs:	0	
	Total Weighted Point Score:	156	
	CIP Rank:	23	

APPENDIX C
OPINION OF PROBABLE PROJECT COSTS

City of Fredericksburg
Drainage Master Plan
BC1: 800 Block W. San Antonio
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
					$ -
	CONCRETE DROP STRUCTURE (3)	60	CY	$ 700	$ 42,000
	CONCRETE CHANNEL (6" THICK)	50	CY	$ 700	$ 35,000
	CHANNEL EXCAVATION	450	CY	$ 30	$ 13,500
	SOD	2,700	SY	$ 8	$ 21,600
	TOPSOIL	225	CY	$ 15	$ 3,375
	PRECAST CONCRETE BOX CULVERTS, 7 FT X 4 FT	150	LF	$ 600	$ 90,000
	CONCRETE HEADWALL	2	EA	$ 7,000	$ 14,000
	ROADWAY REPAIR	450	SY	$ 50	$ 22,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	2	MO	$ 2,500	$ 5,000
SUBTOTAL:					$ 247,000
EROSION AND SEDIMENT CONTROLS		3	%		$ 7,410
SUBTOTAL:					**$ 254,410**
Contingency		30	%		$ 76,300
SUBTOTAL:					$ 330,700
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 66,100
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 396,800**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 5,000	$ 5,000
	Engineering (Final Design Services)	1	LS	$ 63,500	$ 63,500
	Engineering (Construction Phase Services)	2	MON	$ 8,000	$ 16,000
	City Construction Inspection	44	days	$ 200	$ 8,800
	City G&A	44	days	$ 105	$ 4,620
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	2	EA	$ 3,000	$ 6,000
	Land Acquisition	17000	SF	$ 5	$ 85,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 600,720**

ASSUMPTIONS:

City of Fredericksburg
Drainage Master Plan
BC2: South End of Acorn
Preliminary Opinion of Probable Construction Costs

4/7/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
	SOD	680	SY	$ 8	$ 5,440
	TOPSOIL	55	CY	$ 15	$ 825
	CHANNEL EXCAVATION	40	CY	$ 30	$ 1,200
	CONCRETE CURB	55	LF	$ 25	$ 1,375
	DRY ROCK RIPRAP (D50 = 24 IN.)	225	CY	$ 175	$ 39,375
	ROADWAY REPAIR	50	SY	$ 50	$ 2,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	2	MO	$ 2,500	$ 5,000
					$ -
					$ -
					$ -
SUBTOTAL:					$ 55,700
EROSION AND SEDIMENT CONTROLS		3	%		$ 1,671
SUBTOTAL:					**$ 57,370**
Contingency		30	%		$ 17,200
SUBTOTAL:					$ 74,600
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 14,900
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 89,500**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	0	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 14,400	$ 14,400
	Engineering (Construction Phase Services)	2	MON	$ 8,000	$ 16,000
	City Construction Inspection	44	days	$ 200	$ 8,800
	City G&A	44	days	$ 105	$ 4,620
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Easement Acquisition	15000	SF	$ 5	$ 75,000
	Lawyer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 226,320**

ASSUMPTIONS:

(1) Assumed 34-ft top width for drainage easement along ditch alignment (channel top width and 15-ft access lane on one side of channel).
(2) Assumed 15-ft on either side of channel improvements needed to be sodded.
(3) Assumed 3" depth of topsoil throughout channel excavation area and 15-ft to each side of excavation area.
(4) Assumed dry rock riprap for 100' downstream of outfall, with thickness of 2ft

City of Fredericksburg
Drainage Master Plan
BC3: S. Bowie Low Water Crossing
Preliminary Opinion of Probable Construction Costs

6/23/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	2	EA	$ 7,925	$ 15,850
	AUTOMATIC BARRIER GATE	2	EA	$ 11,146	$ 22,292
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
				SUBTOTAL	**$ 94,079**
	Contingency	20	%		$ 18,816
				OPTION TOTAL:	**$ 112,895**
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 112,895**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation		LS	$ -	$ -
	Survey		LS	$ -	$ -
	Environmental Permitting		LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,000	$ 15,000
	Engineering (Construction Phase Services)		LS	$ -	$ -
	City Construction Inspection	30	days	$ 200	$ 6,000
	City G&A	30	days	$ 105	$ 3,150
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
				SUBTOTAL	**$ 29,150**
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ -	$ -
	Land Acquisition	0	SF	$ -	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 142,045**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumes the cost of Base Station & Software is one cost for all sites and is installed at the location receiving all the data
(3) Assumes one Master Gauging station per site
(4) Assumes the price of FEWS installation is per site

City of Fredericksburg
Drainage Master Plan
BC4: Bowie and Peach St.
Preliminary Opinion of Probable Construction Costs

4/7/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
	SITE PREPARATION	1	LS	$ 10,000	$ 10,000
	DEMOLITION	1	LS	$ 10,000	$ 10,000
	PIPE, 36" DIA. RCP CLASS III TYPE (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	1,350	LF	$ 150	$ 202,500
	20-FT CURB INLET	4	EA	$ 10,000	$ 40,000
	10-FT CURB INLET	1	EA	$ 7,500	$ 7,500
	REINFORCED CONCRETE HEADWALL	1	EA	$ 7,500	$ 7,500
	TOPSOIL	80	CY	$ 30	$ 2,400
	SOD	950	SY	$ 8	$ 7,600
	DRY ROCK RIPRAP (D50 = 24 IN.)	60	CY	$ 175	$ 10,500
	FILTER FABRIC	950	SY	$ 5	$ 4,750
	ROADWAY REPAIR	675	SY	$ 50	$ 33,750
	REMOVE EXISTING CONCRETE DRIVEWAYS AND CULVERTS	1	LS	$ 10,000	$ 10,000
	REMOVE AND REPLACE EXISTING METAL BEAM GUARD RAILING	220	LF	$ 105	$ 23,100
	P.C. CONCRETE CURB AND GUTTER	570	LF	$ 25	$ 14,250
	CONCRETE RIBBON CURB	50	LF	$ 20	$ 1,000
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MO	$ 2,500	$ 7,500
SUBTOTAL:					$ 382,400
EROSION AND SEDIMENT CONTROLS		3	%		$ 11,472
SUBTOTAL:					**$ 393,870**
Contingency		30	%		$ 118,200
SUBTOTAL:					$ 512,100
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 102,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 614,500**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 5,000	$ 5,000
	Survey	1	LS	$ 7,500	$ 7,500
	Environmental Permitting	0	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 49,200	$ 49,200
	Engineering (Construction Phase Services)	3	MON	$ 8,000	$ 24,000
	City Construction Inspection	65	days	$ 200	$ 13,000
	City G&A	65	days	$ 105	$ 6,825
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Easement Acquisition	9000	SF	$ 5	$ 45,000
	Lawyer and Real Estate Fees	1	EA	$ 3,000	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 770,025**

ASSUMPTIONS:

(1) Assumed dry rock riprap for 10' downstream of outfall, with thickness of 2 ft
(2) Assumed 15-ft width drainage easement along pipe alignment (each side).
(3) Assumed area of asphalt to be replaced from VEI plans
(4) Assumed 15-ft on one side of storm sewer improvements needed to be sodded. Assumed 3" depth of topsoil.

City of Fredericksburg
Drainage Master Plan
BC5: Edison and Creek St.
Preliminary Opinion of Probable Construction Costs

4/7/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
	CHANNEL GRADING	420	CY	$ 30	$ 12,600
	P.C. CONCRETE PILOT CHANNEL	10	CY	$ 700	$ 7,000
	P.C. CONCRETE HEADWALLS	4	EA	$ 10,000	$ 40,000
	REMOVE AND REPLACE EXISTING CONCRETE DRIVEWAYS AND CULVERTS	2	LS	$ 10,000	$ 20,000
	PRECAST CONCRETE BOX CULVERTS, 8 FT X 3 FT	85	LF	$ 720	$ 61,200
	REMOVE AND REPLACE METAL BEAM GUARD RAILING	180	LF	$ 105	$ 18,900
	TOPSOIL	150	CY	$ 30	$ 4,500
	SOD	1,600	SY	$ 8	$ 12,800
	DRY ROCK RIPRAP (D50 = 24 IN.)	30	CY	$ 175	$ 5,250
	CONCRETE FOR STRUCTURES (RECTANGULAR CHANNEL)	45	CY	$ 700	$ 31,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	2	MO	$ 2,500	$ 5,000
	P.C. CONCRETE RIPRAP	25	CY	$ 700	$ 17,500
					$ -
SUBTOTAL:					$ 236,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 7,089
SUBTOTAL:					**$ 243,390**
Contingency		30	%		$ 73,000
SUBTOTAL:					$ 316,400
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 63,300
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 379,700**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 7,500	$ 7,500
	Environmental Permitting	0	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 48,600	$ 48,600
	Engineering (Construction Phase Services)	2	MON	$ 8,000	$ 16,000
	City Construction Inspection	43	days	$ 200	$ 8,600
	City G&A	43	days	$ 105	$ 4,515
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Easement Acquisition		SF	$ 5	$ -
	Lawyer and Real Estate Fees		EA	$ 3,000	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 469,915**

ASSUMPTIONS:

(1) Assumed rock riprap for 10' downstream of outfall, at a thickness of 3 ft
(2) Assumed 15 ft to the south of the improvements will need to be reseeded
(3) Assumed 3" depth of topsoil for sod

City of Fredericksburg
Drainage Master Plan
BC6: Park Street Outfall to Barons Creek
Preliminary Opinion of Probable Construction Costs

4/7/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
	CONCRETE CURB	110	LF	$ 25	$ 2,750
	DRY ROCK RIPRAP (D50 = 24 IN.)	25	CY	$ 175	$ 4,375
	CHANNEL EXCAVATION	35	CY	$ 30	$ 1,050
	SOD	350	SY	$ 8	$ 2,800
	TOPSOIL	30	CY	$ 5	$ 150
	ROCK RIPRAP DROP STRUCTURE	25	CY	$ 175	$ 4,375
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
					$ -
					$ -
					$ -
					$ -
					$ -
SUBTOTAL:					$ 18,000
EROSION AND SEDIMENT CONTROLS		5	%		$ 900
SUBTOTAL:					**$ 18,900**
Contingency		30	%		$ 5,700
SUBTOTAL:					$ 24,600
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 4,900
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 29,500**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ -	$ -
	Survey	1	LS	$ 7,500	$ 7,500
	Environmental Permitting	1	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 10,000	$ 10,000
	Engineering (Construction Phase Services)	1	MON	$ 5,500	$ 5,500
	City Construction Inspection	22	days	$ 200	$ 4,400
	City G&A	22	days	$ 105	$ 2,310
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Easement Acquisition	2850	SF	$ 5	$ 14,250
	Lawyer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 81,460**

ASSUMPTIONS:

(1) Drainage easement along ditch alignment has assumed top width of 27-ft (channel top width and 15-ft access lane on one side of channel).
(2) Assumed 15-ft on either side of channel improvements needed to be sodded.
(3) Assumed 3" depth of topsoil throughout channel excavation area.
(4) Assumed 10 ft of dry rock riprap after outfall, with thickness of 2 ft

City of Fredericksburg
Drainage Master Plan
BC7: Creek St. at Barons
Preliminary Opinion of Probable Construction Costs

6/23/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	2	EA	$ 7,925	$ 15,850
	AUTOMATIC BARRIER GATE	2	EA	$ 11,146	$ 22,292
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
				SUBTOTAL	**$ 94,079**
	Contingency	20	%		$ 18,816
				OPTION TOTAL:	**$ 112,895**
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 112,895**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation		LS	$ -	$ -
	Survey		LS	$ -	$ -
	Environmental Permitting		LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,000	$ 15,000
	Engineering (Construction Phase Services)		LS	$ -	$ -
	City Construction Inspection	30	days	$ 200	$ 6,000
	City G&A	30	days	$ 105	$ 3,150
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
				SUBTOTAL	**$ 29,150**
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ -	$ -
	Land Acquisition	0	SF	$ -	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 142,045**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumes the cost of Base Station & Software is one cost for all sites and is installed at the location receiving all the data
(3) Assumes one Master Gauging station per site
(4) Assumes the price of FEWS installation is per site

City of Fredericksburg
Drainage Master Plan
BC8: Highway St. Flooding
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
					$ -
	CHANNEL EXCAVATION	1,450	CY	$ 30	$ 43,500
	DEMOLITION CONCRETE CURB	1	LS	$ 5,000	$ 5,000
	SAWTOOTH CONCRETE CURB	55	LF	$ 25	$ 1,375
	SOD	26,000	SY	$ 8	$ 208,000
	TOPSOIL	2,200	CY	$ 30	$ 66,000
	PRECAST CONCRETE BOX CULVERTS, 10 FT X 4 FT	2,700	LF	$ 800	$ 2,160,000
	FILL	4,100	CY	$ 15	$ 61,500
	PIPE, 36" DIA. RCP CLASS III TYPE (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	190	LF	$ 150	$ 28,500
	OUTFALL	40	CY	$ 700	$ 28,000
	ROADWAY REPAIR	1,500	SY	$ 50	$ 75,000
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	6	MO	$ 2,500	$ 15,000
SUBTOTAL:					$ 2,691,900
EROSION AND SEDIMENT CONTROLS		3	%		$ 80,757
SUBTOTAL:					**$ 2,772,660**
Contingency		30	%		$ 831,800
SUBTOTAL:					$ 3,604,500
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 720,900
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 4,325,400**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 10,000	$ 10,000
	Survey	1	LS	$ 25,000	$ 25,000
	Environmental Permitting	1	LS	$ 10,000	$ 10,000
	Engineering (Final Design Services)	1	LS	$ 415,200	$ 415,200
	Engineering (Construction Phase Services)	6	MON	$ 8,000	$ 48,000
	City Construction Inspection	132	days	$ 200	$ 26,400
	City G&A	132	days	$ 105	$ 13,860
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	6	EA	$ 3,000	$ 18,000
	Land Acquisition	81960	SF	$ 5	$ 409,800
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 5,306,660**

ASSUMPTIONS:

(1) Assume easement 15' to both sides of sewer through properties
(2) Assume 15' to each side of channels and sewer line to be resodded.
(3) Assume 2' deep for fill to shift channel.

City of Fredericksburg
Drainage Master Plan
BC9: College/N. Llano, Sycamore/Travis
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
	10-FT CURB INLETS	150	EA	$ 7,500	$ 1,125,000
	PIPE, 24" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	880	LF	$ 100	$ 88,000
	PIPE, 48" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	3,100	LF	$ 215	$ 666,500
	PRECAST CONCRETE BOX CULVERTS, 6 FT X 4 FT	1,350	LF	$ 400	$ 540,000
	PRECAST CONCRETE BOX CULVERTS, 12 FT X 6 FT	1,750	LF	$ 975	$ 1,706,250
	PRECAST CONCRETE BOX CULVERTS, 6 FT X 5 FT	1,900	LF	$ 400	$ 760,000
	PRECAST CONCRETE BOX CULVERTS, 12 FT X 5 FT	900	LF	$ 925	$ 832,500
	PRECAST CONCRETE BOX CULVERTS, 12 FT X 7 FT	270	LF	$ 1,000	$ 270,000
	PRECAST CONCRETE BOX CULVERTS, 12 FT X 8 FT	1,000	LF	$ 1,250	$ 1,250,000
	MANHOLE RISER (ACCESS)	40	EA	$ 2,000	$ 80,000
	JUNCTION BOX (AT EVERY JUNCTION)	2	EA	$ 15,000	$ 30,000
	OUTFALL TO TOWN CREEK	20	CY	$ 700	$ 14,000
	CHANNEL IMPROVEMENTS	200	LF	$ 500	$ 100,000
	ROADWAY REPAIR	18,500	SY	$ 50	$ 925,000
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	12	MO	$ 2,500	$ 30,000
SUBTOTAL:					$ 8,417,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 252,519
SUBTOTAL:					**$ 8,669,820**
Contingency		30	%		$ 2,600,900
SUBTOTAL:					$ 11,270,700
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 2,254,100
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 13,524,800**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 15,000	$ 15,000
	Survey	1	LS	$ 30,000	$ 30,000
	Environmental Permitting	1	LS	$ 10,000	$ 10,000
	Engineering (Final Design Services)	1	LS	$ 1,298,400	$ 1,298,400
	Engineering (Construction Phase Services)	12	MON	$ 8,000	$ 96,000
	City Construction Inspection	264	days	$ 200	$ 52,800
	City G&A	264	days	$ 105	$ 27,720
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
	Land Acquisition	6000	SF	$ 5	$ 30,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 15,092,720**

ASSUMPTIONS:

(1) Assumed 1 manhole per 250' for about 10,000' of pipe
(2) Assumed 30' easement along property line for outfall
(3) Assumed 10-ft curb inlets, but other sizes are possible.

City of Fredericksburg
Drainage Master Plan
FB1: Carriage Hills
Preliminary Opinion of Probable Construction Costs

6/27/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
					$ -
	CHANNEL EXCAVATION	460	CY	$ 30	$ 13,800
	POND EXCAVATION	7,000	CY	$ 30	$ 210,000
	DEMOLITION EXISTING POND OUTLET STRUCTURE	1	LS	$ 10,000	$ 10,000
	POND OUTLET STRUCTURE	35	CY	$ 700	$ 24,500
	DEMOLITION CONCRETE CURB	320	LF	$ 12	$ 3,840
	DEMOLITION AND REPAIR OF CHURCH DRIVEWAY	1	LS	$ 10,000	$ 10,000
	CONCRETE SAWTOOTH CURB	230	LF	$ 25	$ 5,750
	CONCRETE BRIDGE	55	CY	$ 700	$ 38,500
	CHANNEL GRADING	320	LF	$ 30	$ 9,600
	DRY ROCK RIPRAP (24 IN.)	460	CY	$ 175	$ 80,500
	SOD	2,600	SY	$ 8	$ 20,800
	TOPSOIL	225	CY	$ 30	$ 6,750
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MO	$ 2,500	$ 7,500
SUBTOTAL:					$ 441,500
EROSION AND SEDIMENT CONTROLS		3	%		$ 13,245
SUBTOTAL:					**$ 454,750**
Contingency		30	%		$ 136,400
SUBTOTAL:					$ 591,200
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 118,200
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 709,400**

PROJECT COST ESTIMATES

FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 10,000	$ 10,000
	Survey	1	LS	$ 15,000	$ 15,000
	Environmental Permitting	1	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 90,900	$ 90,900
	Engineering (Construction Phase Services)	3	MON	$ 8,000	$ 24,000
	City Construction Inspection	66	days	$ 200	$ 13,200
	City G&A	66	days	$ 105	$ 6,930
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
	Land Acquisition	10000	SF	$ 5	$ 50,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 927,430**

ASSUMPTIONS:

(1) Assume 3' depth for pond grading
(2) Assumed dry rock rip rap 2' thick for 300' downstream of bridge.
(3) Assumed bridge with 40' span, 30' width, 1' thick slab. 4 columns with 2' diameter and 4' tall.
(4) Assumed easement for area of new channel and bridge.
(5) Assumed 15' to each side of channel need to be sodded

City of Fredericksburg
Drainage Master Plan
FB2: Trailmoor near Llano Hwy
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
	PIPE, 24" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	330	LF	$ 100	$ 33,000
	PIPE, 36" DIA. RCP CLASS III TYPE (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	1,050	LF	$ 150	$ 157,500
	REINFORCED CONCRETE PIPE (CL III)(48 IN)	750	LF	$ 215	$ 161,250
	PIPE, 60" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	560	LF	$ 275	$ 154,000
	PRECAST CONCRETE BOX CULVERTS, 5 FT X 5 FT	1,200	LF	$ 375	$ 450,000
	DROP INLET	1	EA	$ 6,000	$ 6,000
	10FT CURB INLET	21	EA	$ 7,500	$ 157,500
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	1	EA	$ 10,000	$ 10,000
	TRENCH EXCAVATION PROTECTION	3,900	LF	$ 1	$ 3,900
	REMOVE CONCRETE CURB	225	LF	$ 12	$ 2,718
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	20	CY	$ 700	$ 14,000
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	4,000	SY	$ 25	$ 100,000
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	4	MO	$ 2,500	$ 10,000
SUBTOTAL:					$ 1,259,900
EROSION AND SEDIMENT CONTROLS		3	%		$ 37,797
SUBTOTAL:					**$ 1,297,700**
Contingency		30	%		$ 389,300
SUBTOTAL:					$ 1,687,000
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 337,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 2,024,400**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 10,000	$ 10,000
	Survey	1	LS	$ 20,000	$ 20,000
	Environmental Permitting	1	LS	$ 8,000	$ 8,000
	Engineering (Final Design Services)	1	LS	$ 324,000	$ 324,000
	Engineering (Construction Phase Services)	4	MO	$ 8,000	$ 32,000
	City Construction Inspection	88	days	$ 200	$ 17,600
	City G&A	88	days	$ 105	$ 9,240
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Laywer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
	Land Acquisition	6500	SF	$ 5	$ 32,500
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 2,485,740**

ASSUMPTIONS:

(1) Assumed existing headwall at downstream outfall would need to be replaced to accommodate additional flow.
(2) Assumed all RCP can be constructed within City ROW.
(3) Assumed a 10ft wide strip of asphalt along length of proposed pipe (only portions located in roadway) will be removed and replaced to install pipe.
(4) Assumed amount of concrete curb to be removed is equal to total length of proposed curb inlets.
(5) Assumed a drainage easement of 15ft from center of proposed pipe would be necessary for proposed pipe behind back of curb along Llano.

City of Fredericksburg
Drainage Master Plan
LOC1: Lady Bird Golf Course LWC
Preliminary Opinion of Probable Construction Costs

6/23/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	3	EA	$ 7,925	$ 23,775
	AUTOMATIC BARRIER GATE	3	EA	$ 11,146	$ 33,438
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
				SUBTOTAL	**$ 113,150**
	Contingency	20	%		$ 22,630
				OPTION TOTAL:	**$ 135,780**
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 135,780**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation		LS	$ -	$ -
	Survey		LS	$ -	$ -
	Environmental Permitting		LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,000	$ 15,000
	Engineering (Construction Phase Services)		LS	$ -	$ -
	City Construction Inspection	30	days	$ 200	$ 6,000
	City G&A	30	days	$ 105	$ 3,150
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
				SUBTOTAL	**$ 29,150**
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ -	$ -
	Land Acquisition	0	SF	$ -	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 164,930**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumes the cost of Base Station & Software is one cost for all sites and is installed at the location receiving all the data
(3) Assumes one Master Gauging station per site
(4) Assumes the price of FEWS installation is per site

City of Fredericksburg
Drainage Master Plan
PRT1: Post Oak Subdivision
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
	CONC BOX CULV (7 FT X 3 FT)	190	LF	$ 575	$ 109,250
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	2	EA	$ 10,000	$ 20,000
	TRENCH EXCAVATION PROTECTION	35	LF	$ 1	$ 35
	EMBANKMENT	60	CY	$ 5	$ 300
	CHANNEL EXCAVATION	1,900	CY	$ 30	$ 57,000
	DRY ROCK RIPRAP (D50 = 18 IN.)	260	CY	$ 150	$ 39,000
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	250	SY	$ 25	$ 6,250
	DEMOLITION	1	LS	$ 10,000	$ 10,000
	REMOVE AND REPLACE EXISTING METAL BEAM GUARD RAILING	150	LF	$ 105	$ 15,750
	SOD	8,000	SY	$ 8	$ 64,000
	TOPSOIL	150	CY	$ 15	$ 2,250
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MO	$ 2,500	$ 7,500
SUBTOTAL:					$ 331,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 9,939
SUBTOTAL:					**$ 341,240**
Contingency		30	%		$ 102,400
SUBTOTAL:					$ 443,600
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 88,700
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 532,300**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 7,500	$ 7,500
	Survey	1	LS	$ 15,000	$ 15,000
	Environmental Permitting	1	LS	$ 10,000	$ 10,000
	Engineering (Final Design Services)	1	LS	$ 68,200	$ 68,200
	Engineering (Construction Phase Services)	3	MON	$ 8,000	$ 24,000
	City Construction Inspection	66	days	$ 200	$ 13,200
	City G&A	66	days	$ 105	$ 6,930
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	4	EA	$ 3,000	$ 12,000
	Land Acquisition	69000	SF	$ 5	$ 345,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 1,039,130**

ASSUMPTIONS:

(1) Assumed area of asphalt to be removed as total area of road to be filled and raised (area between the two grade tie-in points).
(2) Assumed rock riprap extends 20 ft upstream (from headwall) and 15 ft downstream (from edge of concrete riprap).
(3) Assumed rock riprap extends 20 ft upstream (from headwall) and 15 ft downstream (from edge of concrete riprap).
(4) Assumed drainage easment width equal to width of channel plus 10ft maintenance access on either side of channel.
(5) Assumed 20'x55' rock riprap area w/ 3-ft thickness.
(6) Assumed topsoil and sod&seeding area equal to area of drainage easement. Depth of topsoil assumed to be 1ft.

City of Fredericksburg
Drainage Master Plan
PRT2: Drainage Channel near EMS Building
Preliminary Opinion of Probable Construction Costs

4/7/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
	CHANNEL GRADING	1,000	CY	$ 30	$ 30,000
	P.C. DROP STRUCTURE W/ UTILITY PROTECTION	55	CY	$ 700	$ 38,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MON	$ 500	$ 1,500
	SOD	5,000	SY	$ 8	$ 40,000
	TOPSOIL	425	CY	$ 30	$ 12,750
					$ -
SUBTOTAL:					$ 122,800
EROSION AND SEDIMENT CONTROLS		3	%		$ 3,684
SUBTOTAL:					**$ 126,480**
Contingency		30	%		$ 37,900
SUBTOTAL:					$ 164,400
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 32,900
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 197,300**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 7,500	$ 7,500
	Engineering (Final Design Services)	1	LS	$ 31,700	$ 31,700
	Engineering (Construction Phase Services)	3	MON	$ 8,000	$ 24,000
	City Construction Inspection	66	days	$ 200	$ 13,200
	City G&A	66	days	$ 105	$ 6,930
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Easement Acquisition		SF	$ 5	$ -
	Lawyer and Real Estate Fees		EA	$ 3,000	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 295,630**

ASSUMPTIONS:

(1) Assumed 10' of hard armor upstream of drop structure and 20' of hard armoring downstream.

(2) Assumed 15' to each side need to be sodded

City of Fredericksburg
Drainage Master Plan
PRT3: Bob White Trail
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
					$ -
	CHANNEL GRADING	540	CY	$ 30	$ 16,200
	SOD	3,550	SY	$ 8	$ 28,400
	TOPSOIL	300	CY	$ 30	$ 9,000
	PIPE, 48" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	85	LF	$ 215	$ 18,275
	CONCRETE HEADWALL	2	EA	$ 7,500	$ 15,000
	18" CMP DRIVEWAY CULVERTS	180	LF	$ 90	$ 16,200
	REMOVE AND REPLACE EXISTING ASPHALT DRIVEWAY	6	LS	$ 10,000	$ 60,000
	ROADWAY REPAIR	85	LF	$ 150	$ 12,750
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	2	MO	$ 2,500	$ 5,000
SUBTOTAL:					$ 180,800
EROSION AND SEDIMENT CONTROLS		3	%		$ 5,424
SUBTOTAL:					**$ 186,220**
Contingency		30	%		$ 55,900
SUBTOTAL:					$ 242,100
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 48,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 290,500**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 46,500	$ 46,500
	Engineering (Construction Phase Services)	2	MON	$ 8,000	$ 16,000
	City Construction Inspection	44	days	$ 200	$ 8,800
	City G&A	44	days	$ 105	$ 4,620
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ 3,000	$ -
	Land Acquisition	0	SF	$ 5	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 381,420**

ASSUMPTIONS:

(1) Assumed 15' to each side of easement channel resodded, 15' to one side of driveway ditches resodded.
(2) Assumed 15' to each side for roadway repair

City of Fredericksburg
Drainage Master Plan
PRT4: Windmill Oaks Subdivision
Preliminary Opinion of Probable Construction Costs

6/23/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	2	EA	$ 7,925	$ 15,850
	AUTOMATIC BARRIER GATE	2	EA	$ 11,146	$ 22,292
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
				SUBTOTAL	**$ 94,079**
	Contingency	20	%		$ 18,816
				OPTION TOTAL:	**$ 112,895**
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 112,895**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation		LS	$ -	$ -
	Survey		LS	$ -	$ -
	Environmental Permitting		LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,000	$ 15,000
	Engineering (Construction Phase Services)		LS	$ -	$ -
	City Construction Inspection	30	days	$ 200	$ 6,000
	City G&A	30	days	$ 105	$ 3,150
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
				SUBTOTAL	**$ 29,150**
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ -	$ -
	Land Acquisition	0	SF	$ -	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 142,045**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumes the cost of Base Station & Software is one cost for all sites and is installed at the location receiving all the data
(3) Assumes one Master Gauging station per site
(4) Assumes the price of FEWS installation is per site

City of Fredericksburg
Drainage Master Plan
TC1: W. Travis Low Water Crossing
Preliminary Opinion of Probable Construction Costs

6/23/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	3	EA	$ 7,925	$ 23,775
	AUTOMATIC BARRIER GATE	3	EA	$ 11,146	$ 33,438
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
				SUBTOTAL	**$ 113,150**
	Contingency	20	%		$ 22,630
				OPTION TOTAL:	**$ 135,780**
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 135,780**

PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation		LS	$ -	$ -
	Survey		LS	$ -	$ -
	Environmental Permitting		LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,000	$ 15,000
	Engineering (Construction Phase Services)		LS	$ -	$ -
	City Construction Inspection	30	days	$ 200	$ 6,000
	City G&A	30	days	$ 105	$ 3,150
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
				SUBTOTAL	**$ 29,150**
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ -	$ -
	Land Acquisition	0	SF	$ -	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 164,930**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumes the cost of Base Station & Software is one cost for all sites and is installed at the location receiving all the data
(3) Assumes one Master Gauging station per site
(4) Assumes the price of FEWS installation is per site

City of Fredericksburg
Drainage Master Plan
TC2: Town Creek at Edison and Schubert
Preliminary Opinion of Probable Construction Costs

6/16/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
	CONC BOX CULV (10 FT X 7 FT)	200	LF	$ 705	$ 141,000
	REINFORCED CONCRETE PIPE (CL III)(24 IN)	224	LF	$ 100	$ 22,400
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	4	EA	$ 10,000	$ 40,000
	TRENCH EXCAVATION PROTECTION	424	LF	$ 1	$ 424
	REMOVE CONCRETE CURB	763	LF	$ 12	$ 9,217
	REMOVE CONCRETE MEDIAN	63	SY	$ 14	$ 902
	P.C. CONCRETE CURB AND GUTTER	591	LF	$ 25	$ 14,775
	EMBANKMENT	69,190	CY	$ 10	$ 691,898
	CHANNEL EXCAVATION	311	CY	$ 30	$ 9,333
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	13	CY	$ 700	$ 9,074
	DRY ROCK RIPRAP (D50 = 18 IN.)	272	CY	$ 150	$ 40,833
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	2,072	SY	$ 25	$ 51,806
	REMOVE AND REPLACE EXISTING CONCRETE DRIVEWAYS AND CULVERTS	1	LS	$ 10,000	$ 10,000
	REMOVE AND REPLACE EXISTING METAL BEAM GUARD RAILING	266	LF	$ 105	$ 27,930
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	4	MO	$ 2,500	$ 10,000
FEWS WITH WARNING FLASHERS AND AUTOMATIC GATES					
	BASE STATION & SOFTWARE	1	EA	$ 10,568	$ 10,568
	MASTER GAUGING STATION	1	EA	$ 15,469	$ 15,469
	INSTALLATION	1	EA	$ 26,400	$ 26,400
	REMOTE WARNING STATION	3	EA	$ 7,925	$ 23,775
	AUTOMATIC BARRIER GATE	3	EA	$ 11,146	$ 33,438
SUBTOTAL:					$ 1,189,200
EROSION AND SEDIMENT CONTROLS		3	%		$ 35,676
SUBTOTAL:					**$ 1,224,880**
Contingency		30	%		$ 367,500
SUBTOTAL:					$ 1,592,400
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 318,500
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 1,910,900**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ 10,000	$ 10,000
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 244,600	$ 244,600
	Engineering (Construction Phase Services)	4	MON	$ 8,000	$ 32,000
	City Construction Inspection	88	days	$ 200	$ 17,600
	City G&A	88	days	$ 105	$ 9,240
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	0	EA	$ 3,000	$ -
	Land Acquisition	0	SF	$ 5	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 2,239,340**

ASSUMPTIONS:

(1) Assumed area of asphalt to be removed as total area of road to be filled and raised (area between the two grade tie-in points).
(2) Assumed excess pavement section on eastern side of Edison (north of Schubert) will be removed and curb will be shifted north.
(3) Assumed curb on low water crossing will be replaced with metal beam guard railing.
(4) Assumed only minor channel excavation required, mostly minor grading at culvert headwalls (assumed 20ft upstream and 20ft downstream, at a depth of 3 ft which is equal to riprap depth).
(5) Assumed a 5ft wide concrete apron with 1ft tall energy dissipation blocks.
(6) Assumed rock riprap extends 20 ft upstream (from headwall) and 15 ft downstream (from edge of concrete riprap).
(7) Assumed no topsoil or sod&seeding required since channel disturbance area will be limited to area with added rock riprap

City of Fredericksburg
Drainage Master Plan
TC3: Low Water Crossing at Schubert
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
	CONC BOX CULV (9 FT X 5 FT)	290	LF	$ 825	$ 239,250
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	2	EA	$ 15,000	$ 30,000
	EMBANKMENT	1,925	CY	$ 15	$ 28,875
	CHANNEL EXCAVATION	2,850	CY	$ 15	$ 42,750
	CONCRETE DROP STRUCTURE	45	CY	$ 700	$ 31,500
	DRY ROCK RIPRAP (D50 = 18 IN.)	250	CY	$ 150	$ 37,500
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	580	SY	$ 25	$ 14,500
	REMOVE AND REPLACE EXISTING METAL BEAM GUARD RAILING	490	LF	$ 105	$ 51,450
	SOD&SEEDING	1,650	SY	$ 8	$ 13,200
	TOPSOIL	60	CY	$ 30	$ 1,800
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MO	$ 2,500	$ 7,500
SUBTOTAL:					$ 498,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 14,949
SUBTOTAL:					**$ 513,250**
Contingency		30	%		$ 154,000
SUBTOTAL:					$ 667,300
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 133,500
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 800,800**

PROJECT COST ESTIMATES

FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	1	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 15,000	$ 15,000
	Engineering (Final Design Services)	1	LS	$ 128,200	$ 128,200
	Engineering (Construction Phase Services)	3	MON	$ 8,000	$ 24,000
	City Construction Inspection	66	days	$ 200	$ 13,200
	City G&A	66	days	$ 105	$ 6,930
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees	3	EA	$ 3,000	$ 9,000
	Land Acquisition	14000	SF	$ 5	$ 70,000
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 1,082,130**

ASSUMPTIONS:

(1) Assumed area of asphalt to be removed as area equal to width of existing roadway and a length of approximately 100ft.
(2) Assumed rock riprap extends 20 ft upstream and downstream (from edge of headwall).
(3) Assumed drainage easment width equal to width of channel plus 10ft maintenance access on either side of channel.
(4) Assumed 20'x100' rock riprap area w/ 3-ft thickness.
(5) Assumed topsoil and sod&seeding area equal to area of drainage easement. Depth of topsoil assumed to be 1ft.

City of Fredericksburg
Drainage Master Plan
TC4: 200 Block N. Orange
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	1	MO	$ 2,500	$ 2,500
	SITE REPAIR	1	LS	$ 1,000	$ 1,000
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	20	CY	$ 700	$ 14,000
	CHANNEL EXCAVATION	235	CY	$ 30	$ 7,050
	DRY ROCK RIPRAP (D50 = 18 IN.)	235	CY	$ 150	$ 35,250
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	2	MO	$ 2,500	$ 5,000
SUBTOTAL:					$ 61,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 1,839
SUBTOTAL:					**$ 63,140**
Contingency		30	%		$ 18,900
SUBTOTAL:					$ 82,000
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 16,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 98,400**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 5,000	$ 5,000
	Environmental Permitting	0	LS	$ -	$ -
	Engineering (Final Design Services)	1	LS	$ 15,800	$ 15,800
	Engineering (Construction Phase Services)	2	MON	$ 8,000	$ 16,000
	City Construction Inspection	44	days	$ 200	$ 8,800
	City G&A	44	days	$ 105	$ 4,620
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Lawyer and Real Estate Fees		EA	$ 3,000	$ -
	Land Acquisition		SF	$ 5	$ -
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 153,620**

ASSUMPTIONS:

(1) Assumes the cost of Manual Steel Gates includes materials and installation.
(2) Assumed concrete riprap extends approx. 30 ft upstream in channel and approx. 12 ft upstream from edge of asphalt.
(3) Assumed channel excavation equal to amount to be replace by concrete and rock rip rap
(4) Assumed drainage easment width equal to width of channel plus 10ft maintenance access on either side of channel.
(5) Assumed concrete riprap w/ 7-ft thickness.
(6) Assumed topsoil and sod&seeding area equal to area of drainage easement. Depth of topsoil assumed to be 1ft.

City of Fredericksburg
Drainage Master Plan
TC5: Crockett St. South of Travis
Preliminary Opinion of Probable Construction Costs

6/16/2016

Item	Description	Quantity	Unit	Unit Price	Total
CONSTRUCTION COSTS					
	REINFORCED CONCRETE PIPE (CL III)(24 IN)	535	LF	$ 100	$ 53,500
	REINFORCED CONCRETE PIPE (CL III)(36 IN)	95	LF	$ 150	$ 14,250
	REINFORCED CONCRETE PIPE (CL III)(48 IN)	300	LF	$ 215	$ 64,500
	5FT CURB INLET	1	EA	$ 6,000	$ 6,000
	10FT CURB INLET	6	EA	$ 7,500	$ 45,000
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	1	EA	$ 10,000	$ 10,000
	TRENCH EXCAVATION PROTECTION	975	LF	$ 1	$ 975
	REMOVE CONCRETE CURB	70	LF	$ 12	$ 846
	REMOVE AND REPLACE EXISTING CONCRETE DRIVEWAYS AND CULVERTS	1	LS	$ 10,000	$ 10,000
	EMBANKMENT	280	CY	$ 15	$ 4,200
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	20	CY	$ 700	$ 14,000
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	3,850	SY	$ 50	$ 192,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	3	MO	$ 2,500	$ 7,500
	PREPARE EXISTING ROW (DEMOLITION)	1	LS	$ 15,000	$ 15,000
SUBTOTAL:					$ 438,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 13,149
SUBTOTAL:					**$ 451,450**
Contingency		30	%		$ 135,400
SUBTOTAL:					$ 586,900
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 117,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 704,300**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 8,000	$ 8,000
	Engineering (Final Design Services)	1	LS	$ 112,800	$ 112,800
	Engineering (Construction Phase Services)	3	MO	$ 8,000	$ 24,000
	City Construction Inspection	66	days	$ 200	$ 13,200
	City G&A	66	days	$ 105	$ 6,930
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Laywer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
	Land Acquisition	8185	SF	$ 5	$ 40,925
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 928,155**

ASSUMPTIONS:

(1) Assumed entire existing roadway section would be removed and replaced in order to install pipe.
(2) Assumed existing headwall at downstream outfall would need to be replaced to accommodate additional flow.
(3) Assumed all RCP can be constructed within City ROW.
(4) Assumed 15ft wide drainage easement necessary for earthen berm and drop inlets located North of Travis.

City of Fredericksburg
Drainage Master Plan
TC6: Cross Mountian West
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Total**
	REINFORCED CONCRETE PIPE (CL III)(24 IN)	160	LF	$ 100	$ 16,000
	REINFORCED CONCRETE PIPE (CL III)(36 IN)	1,500	LF	$ 125	$ 187,500
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	2	EA	$ 5,000	$ 10,000
	TRENCH EXCAVATION PROTECTION	1,700	LF	$ 1	$ 1,700
	P.C. CONCRETE CURB AND GUTTER	55	LF	$ 25	$ 1,375
	CHANNEL EXCAVATION	725	CY	$ 20	$ 14,500
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	20	CY	$ 700	$ 14,000
	DRY ROCK RIPRAP (D50 = 18 IN.)	75	CY	$ 150	$ 11,250
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	190	SY	$ 50	$ 9,500
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	4	MO	$ 2,500	$ 8,750
	SOD&SEEDING	3,500	SY	$ 8	$ 28,000
	TOPSOIL	580	CY	$ 15	$ 8,700
SUBTOTAL:					$ 311,300
EROSION AND SEDIMENT CONTROLS		3	%		$ 9,339
SUBTOTAL:					**$ 320,640**
Contingency		30	%		$ 96,200
SUBTOTAL:					$ 416,800
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 83,400
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 500,200**
PROJECT COST ESTIMATES					
FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ 5,000	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 8,000	$ 8,000
	Engineering (Final Design Services)	1	LS	$ 64,000	$ 64,000
	Engineering (Construction Phase Services)	4	MON (MO?)	$ 8,000	$ 32,000
	City Construction Inspection	80	days	$ 200	$ 16,000
	City G&A	80	days	$ 105	$ 8,400
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Laywer and Real Estate Fees	2	EA	$ 3,000	$ 6,000
	Land Acquisition	48750	SF	$ 5	$ 243,750
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 893,350**

ASSUMPTIONS:

(1) Assumed 10'x20' rock riprap area w/ 3-ft thickness.
(2) Drainage easement along ditch alignment has assumed top width of 50ft (channel top width and 15-ft access lane on one side of channel).
(3) Assumed 15-ft width strip of asphalt at locations where pipe directly intersects existing roadway would need to be replaced. Assumed remainder of pipe to be constructed in grassy areas.
(4) Assumed 15-ft on either side of channel improvements needed to be seeded.
(5) Assumed 6-in depth of topsoil throughout channel excavation area.
(6) Assumed existing headwall and concrete apron at downstream outfall would need to be replaced to accommodate additional flow from 36" pipe.
(7) Assumed 1'x1'x2' concrete energy dissipation blocks.
(8) Assumed 36" RCP can be constructed within City ROW.

City of Fredericksburg
Drainage Master Plan
TC7: Channels and Culverts at Milam and Travis
Preliminary Opinion of Probable Construction Costs

6/16/2016

CONSTRUCTION COSTS

Item	Description	Quantity	Unit	Unit Price	Total
	PIPE, 24" DIA. RCP CLASS III TYPE, INCLUDING EXCAVATION AND BACKFILL	680	LF	$ 100	$ 68,000
	PIPE, 36" DIA. RCP CLASS III TYPE (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	75	LF	$ 150	$ 11,250
	REINFORCED CONCRETE PIPE (CL III)(48 IN)	1,100	LF	$ 215	$ 236,500
	PRECAST CONCRETE BOX CULVERTS, 5 FT X 4 FT	450	LF	$ 300	$ 135,000
	PRECAST CONCRETE BOX CULVERTS, 6 FT X 4 FT	850	LF	$ 400	$ 340,000
	PRECAST CONCRETE BOX CULVERTS, 7 FT X 4 FT	150	LF	$ 600	$ 90,000
	20FT CURB INLET	16	EA	$ 10,000	$ 160,000
	REINFORCED CONCRETE HEADWALLS, CLASS C CONCRETE, COMPLETE IN PLACE	1	EA	$ 10,000	$ 10,000
	TRENCH EXCAVATION PROTECTION	3,305	LF	$ 1	$ 3,305
	REMOVE CONCRETE CURB	350	LF	$ 12	$ 4,228
	CONCRETE RIPRAP WITH ENERGY DISSIPATION BLOCKS	20	CY	$ 700	$ 14,000
	REMOVE AND REPLACE EXISTING HOT MIX ASPHALTIC PAVEMENT	5,600	SY	$ 25	$ 140,000
	BARRICADES, SIGNS, AND TRAFFIC HANDLING	6	MO	$ 2,500	$ 15,000
	EMBANKMENT (IMPORTED MATERIAL)	518	CY	$ 15	$ 7,767
	HOT MIX ASPHALTIC CONCRETE PAVEMENT (major reconstruction)	388	SY	$ 50	$ 19,415
SUBTOTAL:					$ 1,254,500
EROSION AND SEDIMENT CONTROLS		3	%		$ 37,635
SUBTOTAL:					**$ 1,292,140**
Contingency		30	%		$ 387,600
SUBTOTAL:					$ 1,679,700
700S-TM	TOTAL MOBILIZATION PAYMENT (5%) and CONTRACTOR OH&P (15%)	20	%		$ 335,900
OPINION OF PROBABLE CONSTRUCTION COST:					**$ 2,015,600**

PROJECT COST ESTIMATES

FINAL DESIGN, BIDDING, CONSTRUCTION PHASE SERVICES					
	Geotechnical Investigation	0	LS	$ -	$ -
	Survey	1	LS	$ 10,000	$ 10,000
	Environmental Permitting	1	LS	$ 8,000	$ 8,000
	Engineering (Final Design Services)	1	LS	$ 322,500	$ 322,500
	Engineering (Construction Phase Services)	6	MON	$ 8,000	$ 48,000
	City Construction Inspection	132	days	$ 200	$ 26,400
	City G&A	132	days	$ 105	$ 13,860
	City Advertising (Newspaper, public notification)	1	LS	$ 2,500	$ 2,500
	Printing Construction Documents	1	LS	$ 2,500	$ 2,500
LAND ACQUISITION					
	Laywer and Real Estate Fees	1	EA	$ 3,000	$ 3,000
	Land Acquisition	4500	SF	$ 5	$ 22,500
OPINION OF PROBABLE TOTAL PROJECT COST:					**$ 2,474,860**

ASSUMPTIONS:

(1) Assumed existing headwall at downstream outfall would need to be replaced to accommodate additional flow.
(2) Assumed only system outfall will require drainage easement.
(3) Assumed a 15ft wide strip of asphalt along length of proposed pipe (only portions located in roadway) will be removed and replaced to install pipe.
(4) Asphalt will be placed over area where existing concrete channels will be filled in.
(5) Assumed amount of concrete curb to be removed is equal to total length of proposed curb inlets.