CITY OF KYLE
DRAINAGE MASTER PLAN

JANUARY 12, 2019

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DRAINAGE MASTER PLAN

OUTLINE

- Master Plan Objective
- Drainage Problem Identification
- Drainage Solutions
- Ranking Criteria Matrix
- Prioritization of Drainage CIP projects
- Code of Ordinances and Drainage Criteria
  - Drainage Infrastructure Maintenance

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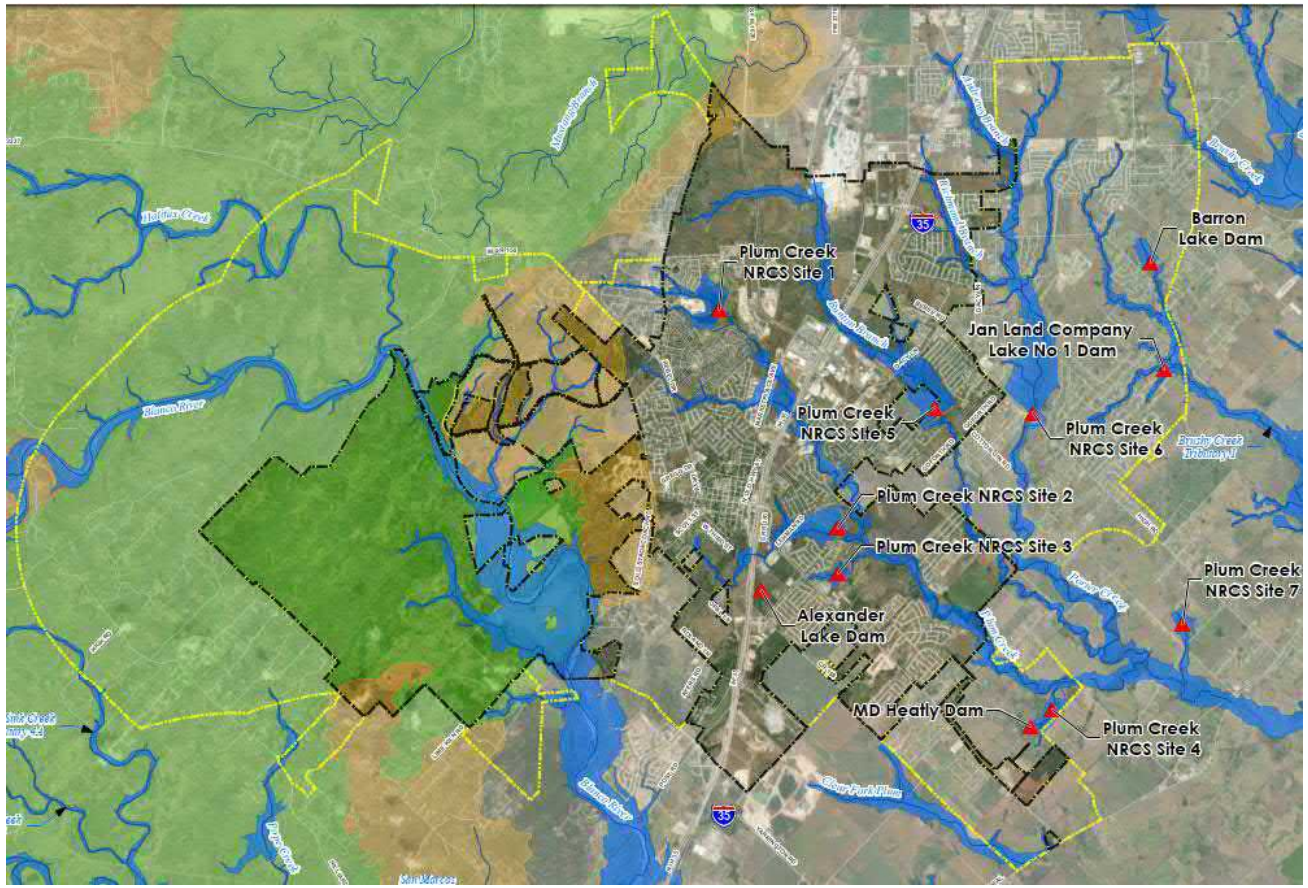

OBJECTIVES

- Gather the best available data
- Identify list of existing drainage issues
- Develop conceptual drainage solution projects
- Develop criteria scoring matrix
- Develop a prioritized list of drainage CIP projects
- Recommend drainage changes to:
  - Code of Ordinances
  - Drainage criteria
  - Development review
  - Maintenance policy
  - Stream Buffers/Setbacks

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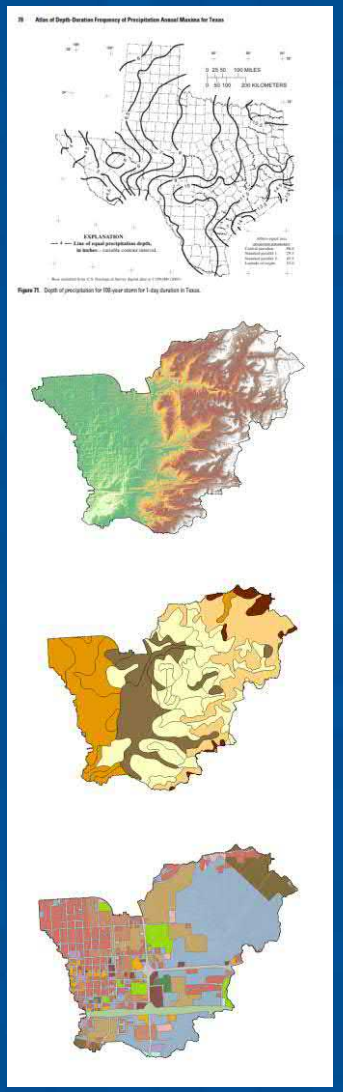
HYDROLOGY (HOW MUCH WATER)

1. HYDROLOGY CONSIDERS:

1. Rainfall intensity or depth
2. Topography (Ground Surface)
3. Soil Type and conditions
4. Land Use
   - Existing Conditions
   - Percent Urbanization
   - Percent Impervious

2. HYDROLOGY PROVIDES:

1. A Flow Rate of Water based on a particular Design Storm (or frequency)



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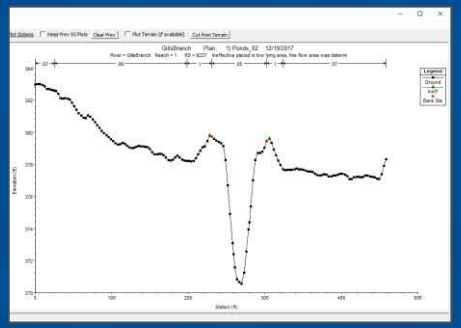
HYDRAULICS (WATER DEPTH IN CREEK)

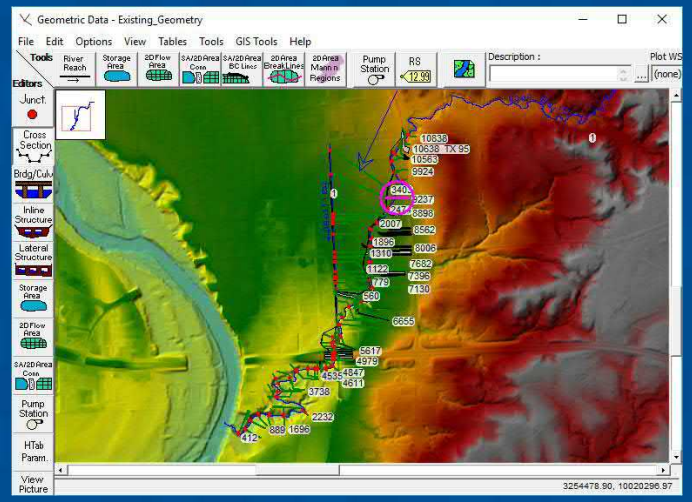
1. HYDRAULICS CONSIDERS:

- Peak Discharge
- Topography (Ground Surface)
- Cross-section
  - Location
  - Roughness Coefficients (N-values)
  - Ineffective/Blocked Areas
- Crossings/constrictions
  - Bridges
  - Culverts

2. HYDRAULICS PROVIDES:

- Depth of flow
- Velocity of flow
- Width of floodplain





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DRAINAGE PROBLEM IDENTIFICATION

- Within City limits and ETJ
- Based on GBRA Feasibility Flood Study
  - 11 major waterways
- Drainage problems consists of:
  - Riverine flooding
  - Local flooding
  - Overtopping of low water crossings
  - Channel erosion issues
- 32 local flooding problem areas
- 27 low water crossings

Table 3-2: City of Kyle Low Water Roadway Crossings

Road Name[2]	Near Intersection...	Watershed	Stream[1]	Source	AADT Traffic Count[4] (veh/day)	Minimum TOR Elevation[4] (ft)	Frequency Water Surface Elevation[3] (ft)						Annual Chance of Flooding[3]
							2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Year Event
Dacy Lane	~1000 ft north of Kelly Smith LN and Dacy LN int.	Plum Creek	Andrews Branch	ZONE A			669.07	669.99	670.37	670.77	671.09	671.38	2-yr
Dacy Lane	~ 800 ft south of Kelly Smith LN and Dacy LN int.	Plum Creek	Andre Trib 1										
Windy Hill	~2400 ft west of Windy Hill RD and Dacy LN int.	Plum Creek	Richm										
Kohler's Crossing	~1400 ft west of Kyle XING and Kohlers XING int.	Plum Creek	Bunto										
Old Stage Coach Rd	~800 ft before int. of FM 2770 and Rebel DR	Plum Creek	Plum										
Rebel Drive	~100 ft north of Autum Sage PKWY and Rebel DR int.	Plum Creek	Plum										
Bunton Ln	~2000 ft east of Twin Estates DR & Bunton Ln int.	Plum Creek	Bunto										
Bunton Ln	~2800 ft east of Twin Estates DR & Bunton Ln int.	Plum Creek	Bunto										
Goforth Rd	~400 ft west of GoForth & Creeks Landing DR int.	Plum Creek	Bunto										
Fountain Grove Dr	~250 ft west of Emerald Canyon & Fountain grove	Plum Creek	Bunto										
Sanders Rd	~1000 ft east of Fairway & Sanders int.	Plum Creek	Plum										
Spring Branch Dr	~200 ft east of Spring Branch DR & Jim Miller DR.	Plum Creek	Plum										
Hartson	~200 ft east of Mather & Hartson	Plum Creek	Spring										
IH 35 Frontage	between EXIT 212 and EXIT 213 South Bound IH35	Plum Creek	Bunto										
Arbor Knot Dr	~500 ft north of FM 150 & Arbor Knot	Plum Creek	Plum										
RM 150	~400 ft west of Lehman RD & RM 150 int.	Plum Creek	Plum										
Kelly Smith Ln	~500 ft east of IH35	Plum Creek	Richm										
Lime Kiln Rd	~9000 ft west of Old Stagecoach Rd & Center st.	Blanco River	Blanco										
Lime Kiln	~3000 ft east of Lime Kiln RD & S Gate RD int.	Blanco River	Blanco										
Dacy Ln	~1000 ft east of Dacy LN & Seton PKWY int.	Plum Creek	Bunto										
FM 1626	~4500 ft south of Int. with Jack C Hays	Plum Creek	Bunto										
Fairway	~120 ft north of Fairway & Echols Int.	Plum Creek	Plum										
Hellman	~60 ft east of Hellman & Nevarez Int.	Plum Creek	Plum										
Sledge St	~400 ft east of South Sledge ST & J Meyers LN int.	Plum Creek	Plum										
Indian Paintbrush Dr	~40 ft south of Windy Hill & Indian Paintbrush	Plum Creek	Richm										
Kyle Crossing	~600 ft north of Old Bridge TRL & Kyle XING int.	Plum Creek	Bunto										
Goforth Rd	~900 ft west of Brent BLVD & GoForth RD int.	Plum Creek	Plum										

TABLE 3-3: SUMMARY OF LOCALIZED DRAINAGE ISSUES

Problem Area	Stream	Problem Comment	Structures in 100-YR Floodplain
Lake Kyle	Plum Creek Trib 4	Riverine Flooding	
Steeplechase along Plum Creek	Plum Creek	Channel parallel to Plum Creek over-flowed during Oct. 30, 2015 the storm	
Meadows of Kyle Subd.	Local	Drainage from subd. draining east to Dacy Lane	
4540 Mather St.	Local	Water puddles before it reaches the storm drain	
Market Place	Plum Creek	Market Place Rd. overtops based on hydraulic modeling.	
Steeplechase Subd.	Local	Channel parallel to Plum Creek over-flowed during Oct. 30, 2015.	
Quail Ridge Dr.	Local	Runoff along street and through properties	
Violet Lane	Local	Flooding from adjacent property	
295 Carriage Way	Local	Erosion in drainage easement is threatening their privacy fence	
Center St.	Local	Near Wallace and the park experiencing drainage issues	
402 S. Burleson	Local	During heavy rain events, storm waters dam up and does not drain causing local flooding	
Saucedo St & Ramirez St.	Local	Tenorio Addition causing drainage to Blanton property	
Stagecoach Forest Subd.	Local	Adding detention pond.	
Middle School off FM 2770	Upper Plum Creek Trib. 2	Three culverts undersized and overtops during heavy rainfall	
Cotton Gin Rd.	Andrews Branch/Porter Creek	Riverine Flooding	2
Isabel Ln.	Plum Creek	Riverine Flooding	7
Railroad near Deleon St.	Local	Railroad creating dam and flooding neighborhood	
Homes off of Dove Ln.	Andrews Branch/Porter Creek	Riverine Flooding	4
Mobile Home off Dickerson Rd.	Unnamed Trib 84	Riverine Flooding	2
House off Summit Dr.	Brushy Creek Trib 2	Riverine Flooding	3
977 Sweet Gum Dr.	Plum Creek Trib 1	Concrete deflection wall and potential structure flooding	1
773-785 Sweet Gum	Plum Creek Trib 1	Eroded and scoured culvert channel	
Hometown Kyle Detention Pond	Local	Asking to turn pond over to City of Kyle	
Hometown Kyle Detention Pond	Local	Asking to turn pond over to City of Kyle	
172 Birch Dr	Local	Concrete outfall erosion and channel capacity	
376-436 Bottle Brush Dr.	Spring Branch Trib. 2	Backwater flooding from FM 150. Submerged car and flooded properties Oct. 2015.	
Park Place/Hitching Post	Local	Offsite runoff flowing over road and flooding properties	
W. Meyers St. & 800 W. 3rd	Local	Street flooding during heavy rainfall	
Hometown Subd & 328 Spruce Dr & 461 Sweet Gum	Local	Culvert directing flow into fencing causing rapid deterioration of fence due to channel capacity	
Goforth Rd., Dialysis Center on Goforth & Saddle Creek Apartments	Plum Creek	Riverine flooding based on GBRA analysis	8
Burleson Rd. Homes & Commercial Area off Brent Blvd.	Plum Creek	Riverine Flooding	2
310 & 350 Windy Hill Rd.	Local	Stormwater coming from gas station drains onto property causing erosion and flooding	
710 Live Oak & 801 N. Burleson	Local	Property flooded during 2013 and 2015 events & St. Anthony's Church Hall has flooded several times	

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DRAINAGE SOLUTIONS

- Solution alternatives consist of:
  - Storm drain system improvements
  - Road crossing improvements
  - Channel/ditch improvements
  - Buyouts
- Concepts designed for 25-year with a 100-yr option
- 29 recommended conceptual drainage projects
- **Update GBRA floodplain studies with newer NOAA Atlas 14 rainfall**

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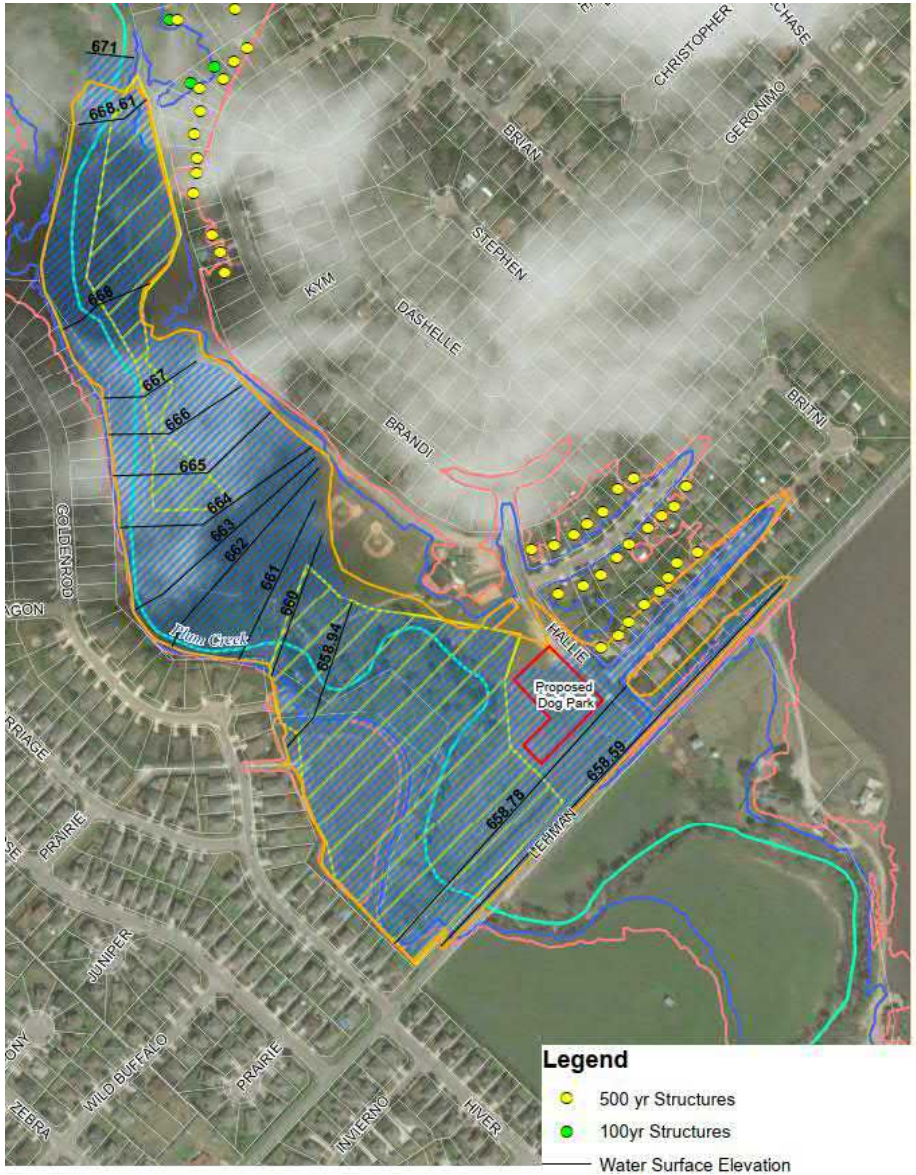

REGIONAL DETENTION ANALYSIS

- Identify and analyze park locations for detention
- Identify potential upgrade to existing NRCS reservoirs
- *Regional detention storage was not a feasible option for reducing existing flood damage as part of the Drainage Master Plan. It is more effective to manage flood risk by safely conveying stormwater runoff via existing stream and drainage channel improvements and by controlling development adjacent to floodplains.*

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City of Kyle - Drainage Project Ranking Criteria				
Category	Category Weight	Sub Category Weight	Sub Category	Scoring
Public Safety	30	7	Road Flooding and Mobility (Pre-Project Conditions)	1: Isolated Local Roadway Flooding 2: Collector Roadway Flooding 3: Moving water is likely to wash car off road (consider velocity and depth)
		5	Emergency Access for 25-year (4% ACE) storm event (Pre-Project Conditions)	1: Passable but response time increased 2: Impassable but alternative route available 3: Impassable/No alternative route.
		9	Number of occupied Structures (homes or businesses) within 100-year (1% ACE) footprint (Pre-Project Condition)	1: 0 flooded 2: 1-10 flooded 3: 10+ flooded or critical facility effected
		6	Level of Drainage Service (Post-Project Protection)	1: ≤ 25-year (4 % ACE) 2: 25-year (4% ACE) - 100-year (1% ACE) 3: ≥ 100-year (1% ACE)
		3	Mitigation required for downstream impacts	1: 15%+ of project costs 2: 1-15% of project cost 3: No mitigation need for downstream impacts
Economic	25	5	Project Cost (Note: add O&M cost)	1: ≥ 2 Million 2: $1 - 2 Million 3: ≤ $1 Million
		10	Funding Source	1: Full Funding required upfront 2: Phased Funding 3: Incremental Funding as available
		5	Degree of economic impact on development/redevelopment potential (post-project)	1: Negative Impact 2: No impact 3: Positive Impact
		5	Degree of Economic Impact on Local Businesses (post-project)	1: Negative Impact 2: No impact 3: Positive Impact
Environment	20	10	Water Quality Significance (MS4)	1: Negative Impact 2: No impact 3: Positive Impact
		10	Impact to Existing Environmental Features (i.e. Riparian Corridor, Habitat, etc.) (post-project)	1: Significant Negative Impact 2: Moderate Negative Impact 3: No Impact / Positive Impact
Project Timing	15	5	Ease of Permitting	1: Multi-jurisdiction more permits 2: Local permit with variances/Nationwide 3: Limited local permits
		3	Time for Implementation or Construction	1: ≥ 2 Years 2: 1 - 2 Years 3: 0 - 1 Years
		3	Dependency on other Projects	1: Dependent on other projects 3: No dependence on other projects
		4	Land and Easement Acquisition	1: Condemnation maybe required 2: Purchase necessary 3: No/minimal additional acquisition required
Social	10	5	Element of Comprehensive Plan (Parks, Transportation, Planning, Drainage, etc.)	1: No elements in other plans 2: Related to elements in other plans 3: Multiple elements other plan
		5	Beneficial Neighborhood Impacts	1: Negative Neighborhood Impact 2: No Neighborhood Impact 3: Positive Neighborhood Impact
	100	100		

	ABT-01 Darcy Ln		AND-01 Dove Ln Homes		BCT1-01 Bolbec Rd		BR-01 Roland Ln LWC (E)		BR-02 Roland Ln LWC (W)		BUN-01 Bunton Ln LWC (S)	
	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score
	3	7.0	0	0.0	3	7.0	2	4.7	2	4.7	3	7.0
	3	5.0	0	0.0	2	3.3	2	3.3	3	5.0	2	3.3
	1	3.0	2	6.0	1	3.0	1	3.0	1	3.0	1	3.0
	2	4.0	2	4.0	2	4.0	2	4.0	2	4.0	2	4.0
	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0
	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
	1	3.3	2	6.7	2	6.7	2	6.7	1	3.3	2	6.7
	2	3.3	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
	2	3.3	2	3.3	3	5.0	2	3.3	2	3.3	2	3.3
	2	6.7	3	10.0	2	6.7	2	6.7	2	6.7	2	6.7
	3	10.0	3	10.0	3	10.0	3	10.0	3	10.0	3	10.0
	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	2	3.3
	3	3.0	1	1.0	3	3.0	2	2.0	2	2.0	2	2.0
	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0	1	1.0
	3	4.0	1	1.3	3	4.0	1	1.3	1	1.3	2	2.7
	2	3.3	1	1.7	2	3.3	2	3.3	2	3.3	1	1.7
	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
		77.0		63.3		82.0		74.3		72.7		72.7

RANKING CRITERIA MATRIX

- PUBLIC SAFETY (30 points)
  - Road Flooding & Mobility
  - Emergency Access
  - Number of Structures in Floodplain
  - Level of Drainage Service
  - Downstream Mitigation Needs
- ECONOMIC (25 points)
  - Project Cost
  - Funding Source
  - Economic Impact on Development
  - Economic Impact on Local Business

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City of Kyle - Drainage Project Ranking Criteria					AST-01 Dacy Ln		AND-01 Dove Ln Homes		BCT1-01 Bolbec Rd		BR-01 Roland Ln LWC (E)		BR-02 Roland Ln LWC (W)		BUN-01 Bunton Ln LWC (S)	
Category	Category Weight	Sub Category Weight	Sub Category	Scoring	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score	Project Specific Score	Project Weighted Score
Public Safety	30	7	Road Flooding and Mobility (Pre-Project Conditions)	1: Isolated Local Roadway Flooding 2: Collector Roadway Flooding 3: Moving water is likely to wash car off road (consider velocity and depth)	3	7.0	0	0.0	3	7.0	2	4.7	2	4.7	3	7.0
		5	Emergency Access for 25-year (4% ACE) storm event (Pre-Project Conditions)	1: Passable but response time increased 2: Impassable but alternative route available 3: Impassable/No alternative route.	3	5.0	0	0.0	2	3.3	2	3.3	3	5.0	2	3.3
		9	Number of occupied Structures (homes or businesses) within 100-year (1% ACE) footprint (Pre-Project Condition)	1: 0 flooded 2: 1-10 flooded 3: 10+ flooded or critical facility effected	1	3.0	2	6.0	1	3.0	1	3.0	1	3.0	1	3.0
		6	Level of Drainage Service (Post-Project Protection)	1: ≤ 25-year (4 % ACE) 2: 25-year (4% ACE) - 100-year (1% ACE) 3: ≥ 100-year (1% ACE)	2	4.0	2	4.0	2	4.0	2	4.0	2	4.0	2	4.0
		3	Mitigation required for downstream impacts	1: 15%+ of project costs 2: 1-15% of project cost 3: No mitigation need for downstream impacts	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0
Economic	25	5	Project Cost (Note: add O&M cost)	1: ≥ 2 Million 2: $1 - 2 Million 3: ≤ $1 Million	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
		10	Funding Source	1: Full Funding required upfront 2: Phased Funding 3: Incremental Funding as available	1	3.3	2	6.7	2	6.7	2	6.7	1	3.3	2	6.7
		5	Degree of economic impact on development/redevelopment potential (post-project)	1: Negative Impact 2: No impact 3: Positive Impact	2	3.3	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
		5	Degree of Economic Impact on Local Businesses (post-project)	1: Negative Impact 2: No impact 3: Positive Impact	2	3.3	2	3.3	3	5.0	2	3.3	2	3.3	2	3.3
Environment	20	10	Water Quality Significance (MS4)	1: Negative Impact 2: No impact 3: Positive Impact	2	6.7	3	10.0	2	6.7	2	6.7	2	6.7	2	6.7
		10	Impact to Existing Environmental Features (i.e. Riparian Corridor, Habitat, etc.) (post-project)	1: Significant Negative Impact 2: Moderate Negative Impact 3: No Impact / Positive Impact	3	10.0	3	10.0	3	10.0	3	10.0	3	10.0	3	10.0
Project Timing	15	5	Ease of Permitting	1: Multi-jurisdiction more permits 2: Local permit with variances/Nationwide 3: Limited local permits	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	2	3.3
		3	Time for Implementation or Construction	1: ≥ 2 Years 2: 1 - 2 Years 3: 0 - 1 Years	3	3.0	1	1.0	3	3.0	2	2.0	2	2.0	2	2.0
		3	Dependency on other Projects	1: Dependent on other projects 3: No dependence on other projects	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0	1	1.0
		4	Land and Easement Acquisition	1: Condemnation maybe required 2: Purchase necessary 3: No/minimal additional acquisition required	3	4.0	1	1.3	3	4.0	1	1.3	1	1.3	2	2.7
Social	10	5	Element of Comprehensive Plan (Parks, Transportation, Planning, Drainage, etc.)	1: No elements in other plans 2: Related to elements in other plans 3: Multiple elements other plan	2	3.3	1	1.7	2	3.3	2	3.3	2	3.3	1	1.7
		5	Beneficial Neighborhood Impacts	1: Negative Neighborhood Impact 2: No Neighborhood Impact 3: Positive Neighborhood Impact	3	5.0	2	3.3	3	5.0	3	5.0	3	5.0	3	5.0
	100	100				77.0		63.3		82.0		74.3		72.7		72.7

RANKING CRITERIA MATRIX

- ENVIRONMENT (20 points)
  - Water Quality Significance
  - Impact to Environmental Features
- PROJECT TIMING (15 points)
  - Ease of Permitting
  - Time for Implementation
  - Dependency of other projects
  - Land/Easement Needs
- SOCIAL (10 points)
  - Element of Comprehensive Plan
  - Impact on Neighborhoods

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PRIORITIZATION OF PROJECTS

- 29 drainage CIP projects
  - 7 City Drainage Projects
  - 22 Drainage CIP Projects
- Projects scored for each ranking criteria
- Identifies drainage projects for City crews
- Significant drainage projects for contractors
- Potential combination of projects

Table 4.2: Prioritized Drainage CIP Project List

Ranking	Project ID	Project Name	Ranking Value	Estimated Project Cost
1	BCT1-01	BeBee Rd	82.0	$326,322
2	RIC-01	Windy Hill LWC	78.7	$595,600
3	ABT-01	Dacy Ln	77.0	$326,428
4	CTR-01	Center Street	74.7	$1,009,152
5	BR-01	Roland Rd LWC (E)	74.3	$841,754
6	PLU-02	Steeplechase Park US Det	74.0	$4,310,300
7	PLU-01	FM2770 nr Barton MS	73.7	$973,881
8	BUN-01	Bunton Ln LWC (S)	72.7	$617,908
9	BUN-03	Bunton Ln LWC (N)	72.7	$824,716
10	PCT4-06	Sledge Dr LWC	72.0	$566,128
11	BUN-02	Bunton Ln LWC (C)	71.0	$902,110
12	FPM-02	FEMA LOMR	71.0	$150,000
13	POR-01	Cotton Gin Rd Area	70.0	$780,000
14	FPM-01	US Floodplains	69.3	$90,000
15	BUN-04	Goforth Rd LWC	68.0	$287,870
16	PCT4-03			
17	PST-02			
18	PST-03			
19	AND-01			
20	PLU-04			
21	PCT1-01			
22	PCT1-02			

Table 4.1: City Maintenance Drainage Project List

Ranking	Project ID	Project Name	Ranking Value	Estimated Project Cost
1	RIC-02	Kelly Smith Ln	75.7	$368,400
2	PST-01	Live Oak St Drainage	73.3	$96,700
3	BR-02	Roland Ln LWC (W)	72.7	$852,800
4	CFP-01	Quail Ridge Area	71.7	$675,000
5	PCT4-05	Scott St LWC	69.3	$566,130
6	PCT4-04	S. Burleson St Drainage	67.3	$77,955
7	PCT4-01	Hitching Post	65.3	$257,523

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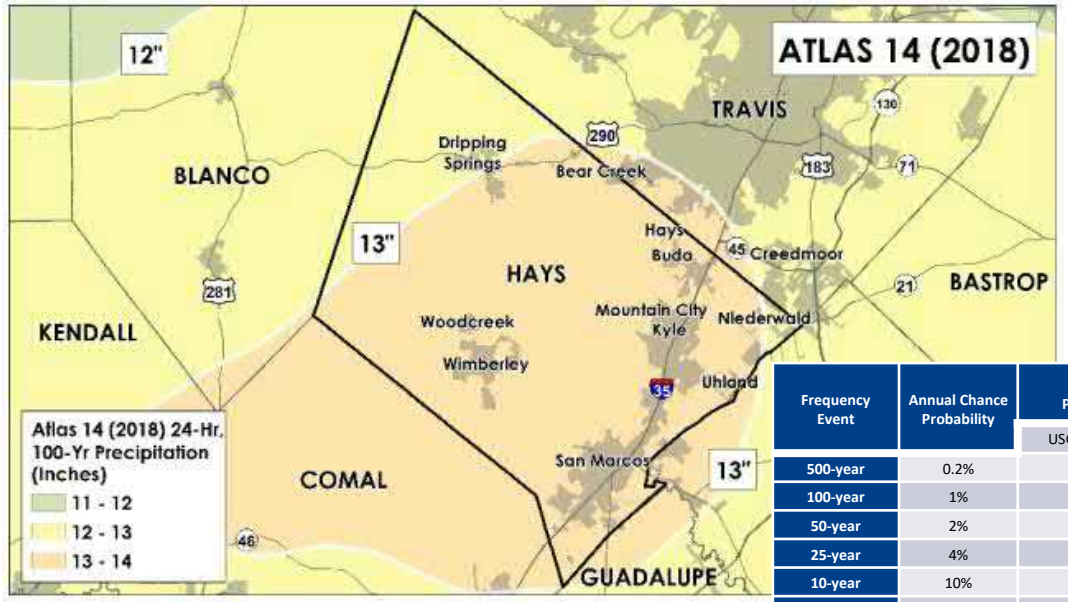

Frequency Event	Annual Chance Probability	Average 24-hour Precipitation Depths (inches)	
		USGS (1998)	ATLAS 14 (2018)
500-year	0.2%	13.9	19.8
100-year	1%	10.4	13.2
50-year	2%	9.0	11.0
25-year	4%	7.8	9.1
10-year	10%	6.3	6.9
5-year	20%	5.2	5.6
2-year	50%	3.7	4.2
1-year	100%	1.2	3.2

NOAA ATLAS 14

- The 100-yr, 24-hr rainfall
  - Increase from 10.4 in. to 13.2 in.
  - An increase of 2.8 in.

- Recommendation:
  - Adopt NOAA Atlas 14
  - Update GBRA watershed studies
  - Update Drainage CIP projects

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CODE OF ORDINANCES

- Chp. 32 - Site Development
  - ***FFE 2ft. above 100-yr or above the 500-yr which is higher***
  - Define 100-yr FP using fully developed land use
  - Adopt NOAA Atlas 14

- Chp. 41 - Subdivision
  - ***Require 100-yr detention***
  - Ensure no downstream impacts for flooding and erosion
  - Require grading plans to show proper drainage

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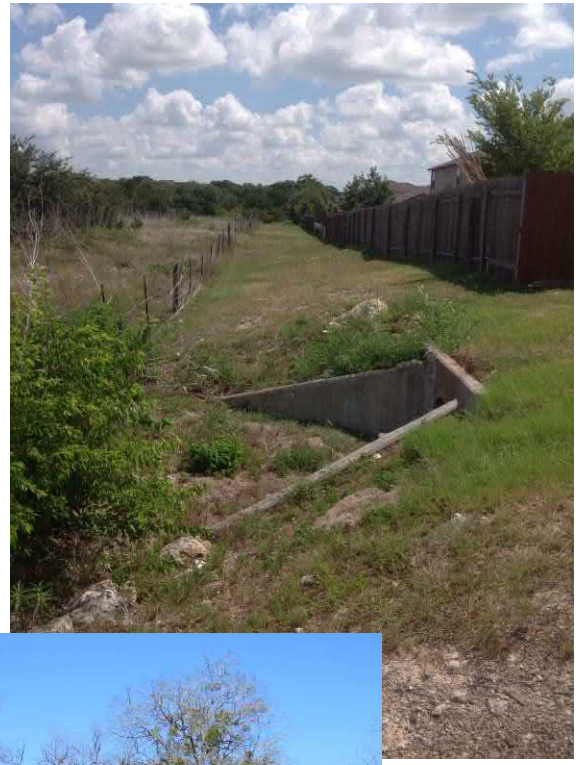

DRAINAGE CRITERIA/CHECKLIST

- Fully developed floodplains drainage area for more than 50 acres
- Peak runoff rates shall not be increased at any point downstream
- Hydrology methods:
  - Update design rainfall data
  - Specify Unit Hydrograph method
  - Specify Loss method
  - Specify channel routing method
- Require fully developed 100-yr peak discharges for new developments
- Discharge shall not cause downstream erosion
- Require grading plan ensure lots adequately drain

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INFRASTRUCTURE MAINTENANCE – Option 1

- Detention Ponds:
  - Property owners maintain ponds
  - City conducts annual inspect for compliance
  - Adopt Drainage Infrastructure Ordinance
  - City maintains large in-line ponds/recreational park
- Drainage Channels:
  - Commercial property owners maintain channels
  - City conducts annual inspect for compliance
  - Adopt Drainage Infrastructure Ordinance
  - City maintain HOA channels in drainage easement
  - HOA channels must provide proper access

- PROS:
  - Potentially no impact to Stormwater Utility Fee
  - Reduced City liability of failed infrastructure
  - No need for additional facilities for staff and equipment
- CONS:
  - HOA to maintain ponds annually

INFRASTRUCTURE MAINTENANCE – Option 2

- Detention Ponds:
  - City maintains HOA ponds
    - Certify proper operation and access
    - Pond in drainage easement
  - Mowed twice a year for maintenance

- Drainage Channels:
  - Commercial property owners maintain channels
  - City conducts annual inspect for compliance
  - Adopt Drainage Infrastructure Ordinance
  - City maintain HOA channels in drainage easement
  - HOA channels must provide proper access

- PROS:
  - City will properly maintain ponds
  - Drainage CIP projects completed

- CONS:
  - Additional crews and equipment
  - Increase to Stormwater Utility Fee
  - City liable for failed ponds
  - Additional facilities for staff and equipment
  - Clean out any trash dumping

INFRASTRUCTURE MAINTENANCE – Option 3

- Detention Ponds:
  - City maintains HOA ponds
    - Certify proper operation and access
    - Pond in drainage easement
  - Mowed twice a year for maintenance
  - No increase to Stormwater Utility Fee understanding
- Drainage Channels:
  - Commercial property owners maintain channels
  - City conducts annual inspect for compliance
  - Adopt Drainage Infrastructure Ordinance
  - City maintain HOA channels in drainage easement
  - HOA channels must provide proper access

- PROS:
  - City will properly maintain ponds
  - No increase to Stormwater Utility Fee
- CONS:
  - Drainage CIP projects completed as budget allows
  - Additional crews and equipment
  - City liable for failed ponds
  - Additional facilities for staff and equipment
  - Clean out any trash dumping

Table 5-1: Plum Creek 2016 Pollutants Concerns Listed by TCEQ	
Pollutant	**Level of Concern**
Depressed Dissolved Oxygen	CN - Concern for near-nonattainment of the TSWQS based on numeric criteria
Nitrate	CS - Concern for water quality based on screening levels
Total Phosphorus	CS - Concern for water quality based on screening levels

STREAM BUFFERS AND SETBACKS

- Require new residential and commercial development to prohibit development within the following stream buffer/setback:
  - FEMA Zone AE Streams – 100 feet setback extending on either side of the stream centerline or 25 feet measured from the floodway boundary, whichever is greater
  - FEMA Zone A and Non-FEMA Stream – 100 feet setback extending on either side of the stream centerline up to contributing drainage areas of 50 acres or larger
- For commercial sites, consider incentivizing the use low impact development stormwater techniques (i.e.; rain gardens, bio-retention, bio-swales, etc.) .
- Exceptions for specific activities could include a stream crossing for a driveway, transportation routes

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THANK YOU!