A) GENERAL: PURPOSE AND OVERVIEW OF THE PLAN

This Stormwater Master Plan is designed to provide the City a clear road map to address current and future stormwater management needs for flood control, stream stability, water quality and water resource protection. The plan will:

- ❑ Help the City prioritize, budget and address immediate and long-term stormwater problems and maintenance issues in a systematic manner.
- ❑ Allow the City to proactively forecast, evaluate, and manage the stormwater-related impacts that result from future development or other changes in the city's watersheds.
- ❑ Help the City achieve financial savings through comprehensive watershed-based planning and coordination with other City projects and infrastructure master planning.
- ❑ Support the City's compliance with EPA water quality mandates.

The plan is organized into the following Parts:

Part A: General Information
Part B: Recommended Action Plan
Part C: Additional Management Tools and Case Studies
Part D: Data Sources, Methodology and Standards

An overview map of the City of Belton and its primary watersheds is provided in Figure A-1.

B) RECOMMENDED ACTION PLAN

The Recommended Action Plan is the heart of the Master Plan, designed to provide the City a clear and concise prioritized plan of recommended actions to achieve the stormwater management goals stated above. The recommended actions are grouped into: 1) capital improvement projects; 2) maintenance actions; 3) funding mechanisms; and 4) future planning and prevention measures.

1. *Capital Improvement Projects*

Through the public outreach, investigations and analyses efforts, a recommended prioritized capital improvement plan was developed that includes 30 projects throughout Belton (see attached Figure A-2) at a total estimated cost of approximately $15 million (see "Capital Improvement Project List" on the following page). The projects are aimed at addressing historical flooding and erosion problems caused by insufficient or absent public drainage systems. The projects were organized into three Priority Groups where: Group 1 projects are characterized by the most severe and widespread stormwater problems; Group 2 projects are moderately severe; and Group 3 projects are generally isolated problems and the least severe. The projects were then prioritized within each of the three Groups using a cost-benefit scoring system that quantifies a project's benefit potential relative to cost. The benefit score is based on meeting key criteria related to frequency and severity of home flooding, street flooding, synergy with other City projects, and regional benefit. The "Priority Score" shown in the following Capital Improvement Project List is the project's benefit score divided by the estimated cost. Included in this Project List is a cumulative capital project costs column along with estimated <u>additional</u> 25-year maintenance costs of <u>new</u> storm drainage system that would be added by the project only.

Capital Improvement Project List - Prioritization by Grouping and Scoring
Belton, MO

Project	Project Location	100-yr Flood Impacts Homes (Factors 1-3)	Street Flooding (Factors 4-7)	Erosion Threatens Infrastructure (Factors 8-12)	System Condition (Factors 13-14)	Water Quality Benefits (Factors 15-16)	(A) Benefit Score	(B) Project Costs	Cummulative Project Costs	(C) Added 25-Yr. Maint. Costs	(D) Project + Maint. Costs	Priority Score (1000xA/D)	Other Considerations: Benefits other public infrastructure	High probability of outside cost sharing/support	Regional, long-term benefits	High aesthetic value
PRIORITY 1 PROJECTS																
WF-3	Pacific Dr. and Sunrise Dr.	180	90				270.0	$259,001	$259,001	$11,850	$270,851	1.00				
WF-4	Westside Dr. and Lacy Ln.	900	90		10		1000.0	$2,677,989	$2,936,990	$85,425	$2,763,414	0.36	Y			
OC-1	Hight Ave. and Bryan Way	300	112.5	60			472.5	$1,502,384	$4,439,374	$0	$1,502,384	0.31				
WF-1	Sunset Ln. and N Hillcrest Dr.	540	90	30			660.0	$2,243,225	$6,682,599	$18,825	$2,262,050	0.29	Y			
WF-2	Sunrise Dr. and Buena Vista Dr.	120	45				165.0	$646,815	$7,329,414	$2,150	$648,965	0.25	Y			
OC-2	Valentine Ave. and 162nd St.	360	75				435.0	$1,945,563	$9,274,977	$0	$1,945,563	0.22	Y			Y
Markey Lake*	South of US 71 and Hwy. Y	24	7	2		20	53.0	$1,117,749	$10,392,726	$450,000	$1,567,749	0.03	Y	Y	Y	Y
Total Project Costs - Priority 1 Group								**$10,392,726**								
PRIORITY 2 PROJECTS																
OC-6	162nd St. and Slater Ave.	120					120.0	$41,990	$41,990	$2,175	$44,165	2.72				
OC-3	Richmond Ave. and E 160th St.	120	60				180.0	$70,843	$112,833	$1,125	$71,968	2.50	Y			
OC-2 ALT	Valentine Ave. and 162nd St.	120					120.0	$53,811	$166,644	$0	$53,811	2.23				
WF-12	Baldwon St. and Lynn St.	180	90				270.0	$676,927	$843,571	$6,225	$683,152	0.40				
WF-14	Walnut St. and Scott Ave.	60					60.0	$28,191	$871,762	$500	$28,691	2.09				
OC-9	South of Bel-Ray Blvd. and Middleton	60	150				210.0	$361,559	$1,233,321	$3,575	$365,134	0.58				
WF-11	South of Margaret Ln. and South Ave	40	90				130.0	$239,844	$1,473,165	$5,475	$245,319	0.53	Y			
WF-6	Cherry Hill Rd. and Orchard Dr.	60				40	100.0	$142,281	$1,615,446	$52,550	$194,831	0.51	Y			
OC-5	North of Slater Ave. and E 160th Ter.	40					40.0	$141,748	$1,757,194	$9,500	$151,248	0.26				
OC-4	Terry Ave. and Valentine St.	60					60.0	$242,543	$1,999,737	$0	$242,543	0.25	Y			
WF-5	N Cleveland Ave. and Tervis Ave.		90	30			120.0	$794,493	$2,794,230	$38,275	$832,768	0.14	Y			
Total Project Costs - Priority 2 Group								**$2,794,230**								
PRIORITY 3 PROJECTS																
WF-20	East of Brian Ave. and S Scott Ave.		72	30			102.0	$28,650	$28,650	$0	$28,650	3.56				
OC-8	Kay Ave. and 158th Ter.	60					60.0	$21,468	$50,118	$0	$21,468	2.79				
WF-19	Black Cherry Ct.	60					60.0	$27,000	$77,118	$0	$27,000	2.22				
OC-7	Terry Ave. and 161st Ter.	180					180.0	$84,553	$161,671	$9,800	$94,353	1.91				
WF-17	Plaza Acres Ct.	40					40.0	$37,291	$198,962	$2,200	$39,491	1.01				
WF-7	South of Pawnee Ln. and W Cambridge Rd.			90			90.0	$135,000	$333,962	$0	$135,000	0.67				
WF-13	Kent Dr. and Brentwood Dr.	120					120.0	$257,330	$591,292	$8,750	$266,080	0.45				
WF-15	East of S Cedar St. and E Cambridge Rd.			30			30.0	$85,000	$676,292	$0	$85,000	0.35	Y			
WF-10	Prairie Ln. and Park Ave.				5		5.0	$15,000	$691,292	$0	$15,000	0.33				
WF-16	West of S Cedar St. and W Cambridge Rd.			60			60.0	$193,750	$885,042	$0	$193,750	0.31	Y			
WF-9	North end of Kendi Ln.			30	25		55.0	$217,500	$1,102,542	$0	$217,500	0.25	Y			
WF-21	Hollywood Blvd. and S Scott Ave.		90				90.0	$429,750	$1,532,292	$500	$430,250	0.21	Y			
WF-8	South of Cherry Hill Dr. and E 171st St.			55	40		95.0	$475,500	$2,007,792	$0	$475,500	0.20	Y			
WF-18	181st Ter. and Mary Way	40					40.0	$376,394	$2,384,186	$0	$376,394	0.11				
Total Project Costs - Priority 3 Group								**$2,384,186**								

** Project to move forward only if majority of project is funded through private-public benefit district*

A brief overview description of each of the Priority Group 1 projects is provided below:

WF-3 | Pacific Drive and Sunrise Drive. Residential flooding along East Pacific Drive and street flooding on East Pacific Drive are caused by excess stormwater flowing from the north of 206 East Pacific Drive. The conceptual improvement for this area involves berming and new storm sewer. The berm will be placed on the north side of East Pacific Drive to direct water into the new stormwater system that will be placed north of East Pacific Drive and outlet to the open channel south of East Pacific Drive.

WF-4 | Westside Drive and Lacy Lane. The flooding problem in this area consists of numerous flooding complaints throughout the Lacy Estates subdivision. The stormwater system in this area is undersized and not capable of handling the runoff generated. Analysis of the problem area revealed that the solution for this problem involves the extension of the stormwater system and upsizing the current system. Several inlets will also need to be added to capture the stormwater and convey it into the system.

OC-1 | Hight Avenue and McKinley Street. Residential and street flooding exists throughout this area. The existing stormwater main trunk line is undersized for the stormwater generated in the neighborhood. The undersized line causes flooding residences and street flooding. The solution for this area involves replacing the main trunk line from McKinley Street to the system outlet at Somerset Park.

WF-1 | Sunset Lane and North Hillcrest Drive. Numerous residential flooding and street flooding locations exist in this area. The flooding in this area is a result of an undersized system and bypass flow from the upper portion of the watershed. The excess water causes frequent flooding and is also partially responsible for surcharging sanitary sewer in the area. A detailed analysis of the area was performed and a replacement stormwater system was determined to be the most cost effective solution. The stormwater system will extend from Westover Road and following the existing storm sewer alignment outlet into Hargis Lake. Portions of the system will also extend onto Hargis Lane, North Hillcrest Road, and Hillcrest Court.

WF-2 | Sunrise Drive and Buena Vista Drive. Numerous residential and street flooding complaints along with flash flooding contribute to the flooding in this area. Undersized culverts and undersized storm sewer system cause the flooding in this area. The undersized system causes street flooding at West Sunrise Drive, Buena Vista Drive and Park Avenue. The undersized system also causes home flooding on West Sunrise Drive and Buena Vista Drive. After analysis of the system the most cost effective solution was determined to be the replacement of the culverts on West Sunrise Drive and Park Avenue. The storm inlet will also need replacement along a portion of Buena Vista Drive.

OC-2 | Valentine Avenue and 162nd Street. Street and residential flooding in this area is caused by an undersized culvert and insufficient open channel capacity in Oil Creek. The culvert restricts the water flowing in Oil Creek and causes a backup to occur that ponds up water and causes flooding in homes upstream of the culvert. The homes north of 162nd Street flood due to limited channel capacity along Oil Creek. The solution to the flooding problems in this area involve the replacement of the culvert with a bridge and widening Oil Creek to provide greater conveyance to prevent flooding of the homes north of 162nd Street.

2. *Maintenance Actions*

The City's storm drainage system was surveyed and inventoried, and it was determined the public system includes 48 miles of pipes and culverts with over 2,000 inlets and manholes. Long-term maintenance of this system is necessary to prevent future flooding problems, roadway failures, sewer back-ups and other impacts to property and infrastructure. The entire drainage system was visually inspected at inlets, pipe outfalls, junction boxes and manholes to assess the condition of the system. Each structure was rated as either "new", "good", "fair" or "poor" based on visual criteria such as debris accumulation, cracking, settlement, and current or potential structure failure. All "poor" and "fair" condition structures were identified in the project GIS base map for use by the City. Pipe video inspections were not performed, but are recommended in locations where poor structure conditions were identified in order to determine potential pipe repair or replacement extents. From this field inventory, recommendations for maintenance actions were developed. On a site by site basis the actions are relatively minor, but across the entire 48 miles of pipe the required resources to maintain the system annually will be significant and is estimated at $500,000/year for staff salaries, equipment and occasional contracting costs for minor reconstruction work. The recommended actions are outlined and organized by:

- *Immediate Repairs.* These repairs are focused on structures in poor condition where failures have occurred or are imminent.
- *Long-term Maintenance Actions.* These repairs are characterized by frequent sediment and debris removals, minor inlet repairs (grate replacements, etc.) and monitoring.

3. *Funding Mechanisms*

The City of Belton does not currently have a dedicated source of revenue necessary to maintain the existing system or make improvements to address critical flooding and erosion issues. Stormwater maintenance and improvement costs are likely to increase due to inflation, infrastructure degradation that increases with age, and expanding state and federal stormwater program requirements. The present value estimated costs of needed improvements and ongoing maintenance outlined above are summarized below:

- ❑ Priority 1 capital improvements: $10.4M
- ❑ Priority 2 and 3 capital improvements: $5.2M
- ❑ Ongoing annual maintenance costs: $500,000

Due to the variety of needed stormwater management expenditures, a variety of funding mechanisms should be explored to maintain and improve the level of stormwater management service to the citizens, primarily:

- General Obligation (GO) Bonds
- Stormwater Utility
- Sales Tax

Each mechanism has been used by numerous municipalities both locally and across the country in order to fund stormwater improvements and maintenance. There is no one-size-fits-all approach, as each option carries its share of advantages and disadvantages, and proper application depends ultimately on the community's goals, needs and financial position. The table below briefly

summarizes each option. Please note the estimated citizen impact costs below are approximate and would need to be calculated in full detail when a funding method is chosen for implementation.

Funding Option	Basic Structure	Recommended Application	Fund Generation, City & Citizen Impact	Advantages	Disadvantages or Limitations
GO Bonds	Low interest debt instrument typically used by cities to fund public infrastructure (same as Belton's 2006 bond issue)	Funding of initial Priority 1 capital projects estimated at $10.4M.	Funding amount limited by City's bonding capacity. City obligated to repay bond holders at specified rate.	+ Large amount of funds available up front to address most severe problems quickly + Low interest + Belton is familiar with the bonding process	- City pays interest - Not practical for multiple small cost repairs
Utility	Property owners are charged a fixed monthly fee to fund the stormwater program, typically based on an Equivalent Residential Unit (ERU) (1)	1. Fund annual maintenance of the existing system at $500k/yr. 2. Fund smaller Priority 2 and 3 capital projects, $5.2M over 10 years.	1. Cost per ERU estimated at $4.00/mo. to cover annual maintenance. 2. Cost per ERU estimated at approximately $8.00/mo. to fund annual maintenance and Priority Group 2 and 3 capital projects	+ Steady, predictable annual funding stream + Fee structure to citizens is equitable, based on runoff generation + Provides built-in incentive to reduce impervious area on properties	- Takes time to build funds; not ideal for completing urgent capital projects
Sales Tax	A dedicated amount of local sales tax is authorized for public improvements and maintenance.	1. Fund annual maintenance of the existing system at $500k/yr. 2. Fund smaller Priority 2 and 3 capital projects, $5.2M over 10 years.	1/4-cent sales tax would be needed to generate $500,000/yr covering annual maintenance. Additional 1/4cent could be added for 10 years to fund Priority 2 & 3 projects.	+ Part of the revenue is generated by out-of-town visitors + Stormwater can be combined with Parks program, which has been successful and voter-supported in many other cities	- Revenue can fluctuate greatly from year to year - Takes time to build funds; not ideal for completing urgent capital projects

(1) Equivalent Residential Unit is a common stormwater utility measuring unit that is calculated based on the average impervious area (rooftop, driveway, etc.) on a typical single family lot. The ERU can be applied to commercial, industrial, school, church and other non-residential properties, which are then charged a fee for multiple ERUs as determined by the impervious area on the property.

A property tax is another revenue generation option, but is less common and not recommended over the above options due to the fact the rate charged is based upon property value and not runoff generation or watershed impact. The average rate per parcel that would need to be charged across all parcels in Belton – residential, commercial, industrial and undeveloped areas – is approximately $5-$6/month for annual maintenance, and an additional $5/month to cover Priority 2 and 3 project costs, if desired. This is an approximation based on the total number of parcels currently in Belton.

Actual rates will vary widely depending on land use and value, and would need to be calculated using specific property values for more exact revenue forecasting.

Based on Olsson's initial analysis and research, it is recommended the City explore utilizing a combination of general obligation bonds for initial Priority 1 Group Project implementation and a Stormwater Utility to fund annual ongoing maintenance.

4. *Planning and Prevention Measures*

The Master Plan outlines key recommended planning measures that should be undertaken in order to proactively manage current and future growth and development impacts on the natural and constructed drainage system. These measures include:

A. Immediate Actions

Water Quality Ordinance and Criteria. New ordinances and criteria are outlined that provide for post-construction water quality management and are required to meet EPA and Missouri Department of Natural Resources regulations.

Stream Buffer Modifications. A stream buffer ordinance is recommended that provides a minimum width based on typical stream meander, and then provides incentives to developers to dedicate more buffer area in select locations. This would tie to recommendations provided in the Conservation Overlay Zoning District section.

Private Development Detention Strategies by Watershed. Recommendations are provided that define four stormwater detention strategies for new development that is dependent upon downstream conditions in the watershed. The strategies aim to address flooding (extreme flood events), stream erosion (frequent flood events), combination of both (comprehensive) and special detention areas where regional management controls are planned. The criteria is based upon the most recent American Public Work Association, Kansas City Metropolitan Chapter Design Criteria. Figure A-3 illustrates where each of the four recommended on-site detention strategies are to be applied.

Floodplain Management Policies. The City should continue to apply the floodplain regulations throughout the City while adding two enhancements to reduce and manage future flood risk:

- Requiring all construction adjacent to an open channel to have a finish floor or low opening a minimum of 1 foot above the ultimate conditions 1% chance flood elevation.
- Complete Letter of Map Revision (LOMR) in a timely manner for all changes in the FEMA floodplain, including fill, roadway structures, and other enhancements.

Public Education and Outreach. Recommended regular practices include informing the public of flood risk and water quality protection practices through website postings, educational flyers and signage, public open house events, newsletters and radio.

B. Mid- to Long-Term Actions

Conservation Overlay Zoning Districts. This section recommends the creation of a new Conservation Overlay District (COD) zone to apply to areas mapped the attached Figure A-4. The COD applies as an overlay, regardless of the underlying zoning, designed to

protect the water quality of key water resources without hampering development by offering density trade-offs and incentives built into the policy.

The COD would apply to all new projects in the mapped areas. It would have four categories of Standards for review: Site Planning, Landscape Design, Erosion Control and "Green" Stormwater Management. The design criteria is set up with incentive levels to encourage applicants to go above and beyond the base requirements.

Benefit District Policy for Regional Detention and BMPs. Opportunities will continue to present themselves in Belton in the future for the placement of regional Best Management Practices (BMPs) and detention facilities for regional flood control and water quality protection. Regional facilities allow planned development to occur in upland areas and the treatment or detention to occur further downstream in the watershed, freeing up valuable land on development sites. To fund these regional BMPs, the watershed development that contributes to them would be asked to contribute towards the facility and in return would be able to forgo detention on the development site. To determine a fair "fee in lieu of on-site detention" for any development that might pay into a regional facility, a case study was completed to compare the cost of detention of several type of development. The following table provides a breakdown of typical per-acre on-site detention costs for new development sites:

On-Site Detention Costs per Site Acre

Development Size	*Site Percent Impervious*		
	<40%	40-70%	>70%
Less than 25 ac	$1,004	$1,287	$1,717
Greater than 25 ac	$501	$785	$1,215

C) ADDITIONAL MANAGEMENT TOOLS & CASE STUDIES

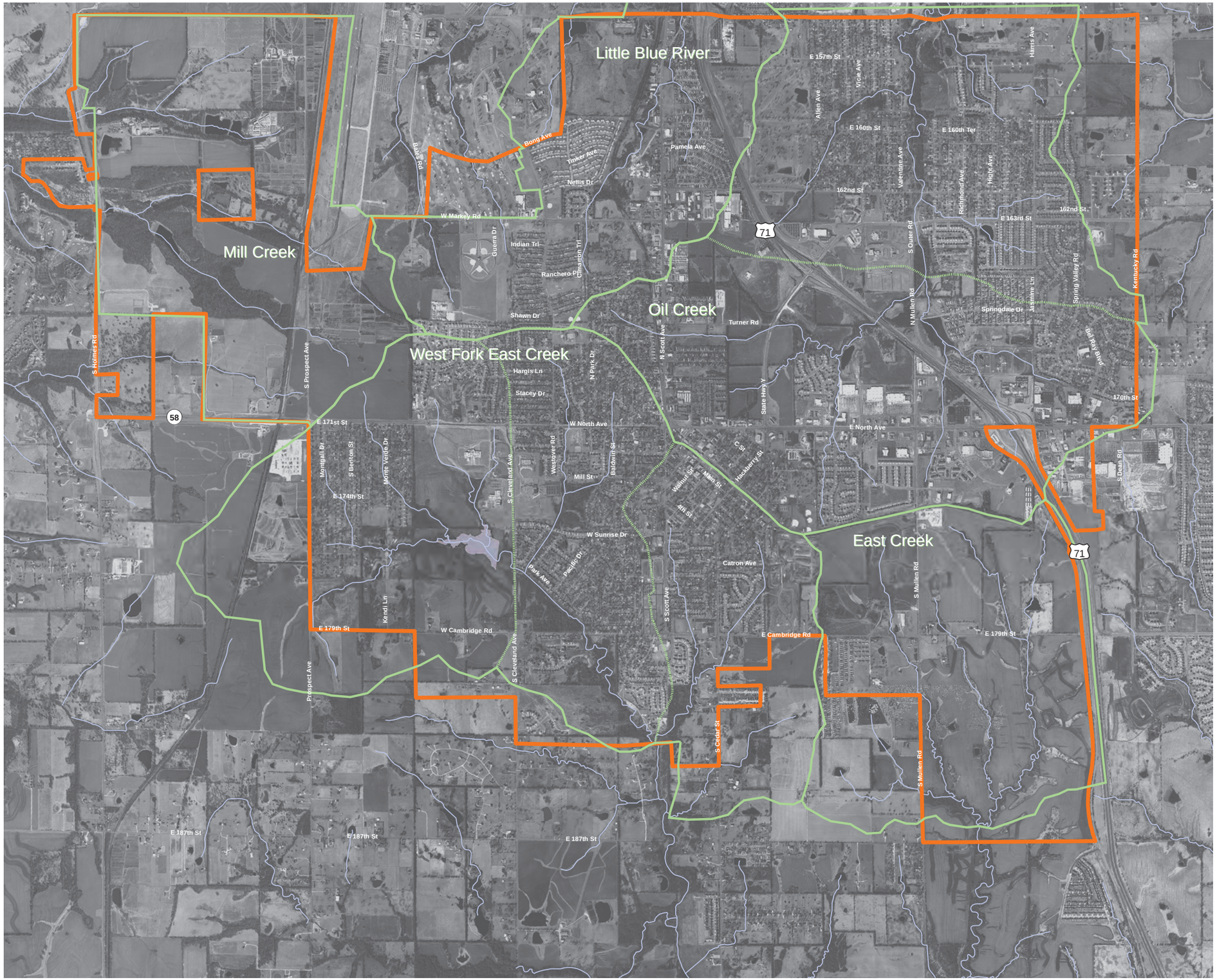
Additional information and alternative management methods were analyzed and recommendations made for potential application and use in the City of Belton, including:

1. Ultimate development conditions floodplain delineations
2. "Green" Neighborhood Improvement Project recommendations
3. Off-line detention concepts in flood zones
4. Floodplain fill impact analyses
5. Stream geomorphic review and recommendations
6. Functional GIS database mapping system for use by City staff in the future

UPDATING THE PLAN

The Belton Stormwater Master Plan will provide guidance for the City as it maintains and improves the stormwater system. As the City grows, accomplishes recommended actions, and new issues arise, the Plan should continue to be updated in order to best serve the City long term.

Figure A-1
City of Belton, Missouri
Watershed Map



Legend

- Watersheds
- Sub Watersheds
- Stream Centerline
- City Limits

1 inch = 2,500 feet

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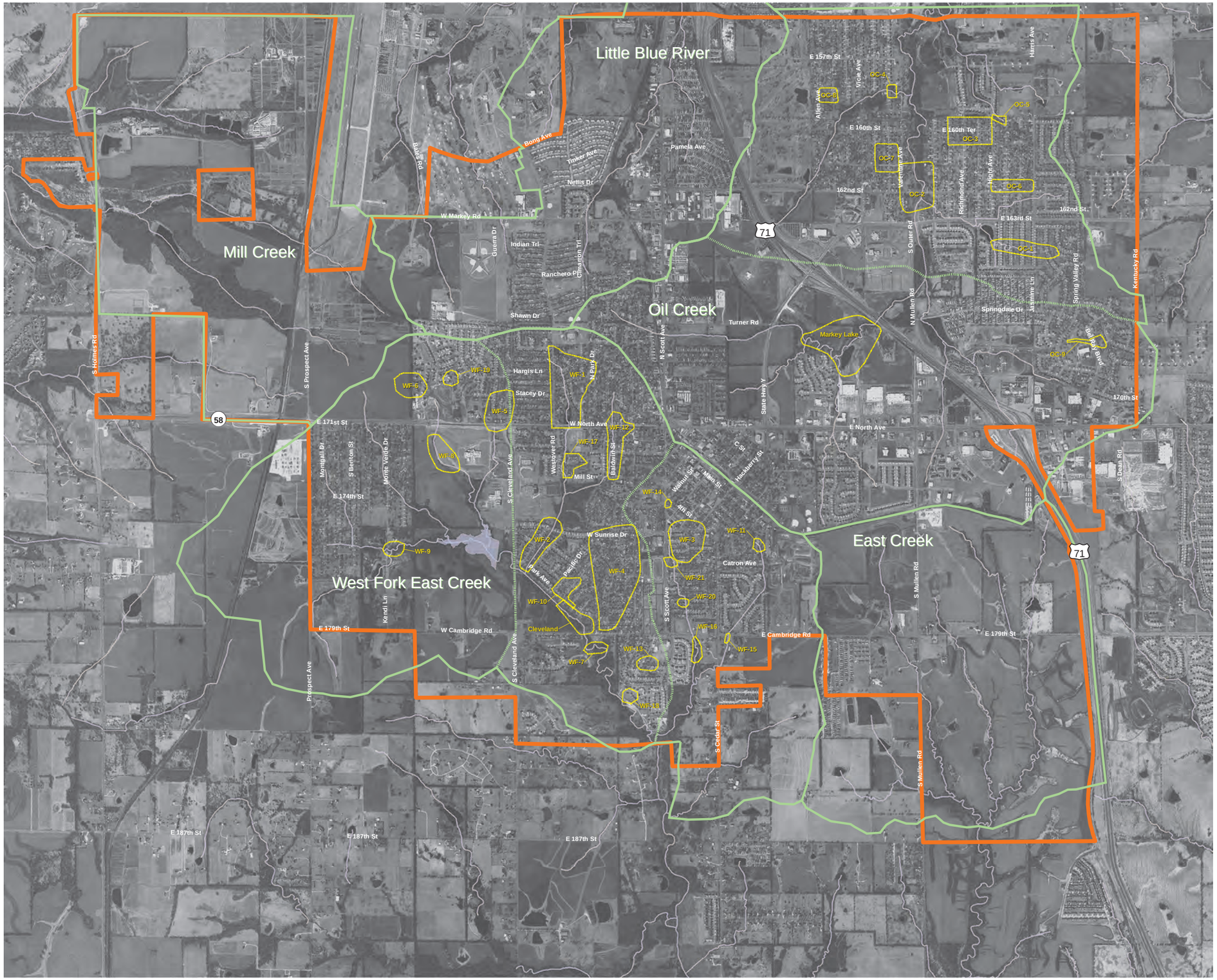
09/04/2012

Figure A-2
City of Belton, Missouri
Project Area Locations



Legend

- Watersheds
- Sub Watersheds
- Stream Centerline
- Project Areas
- City Limits

1 inch = 2,500 feet

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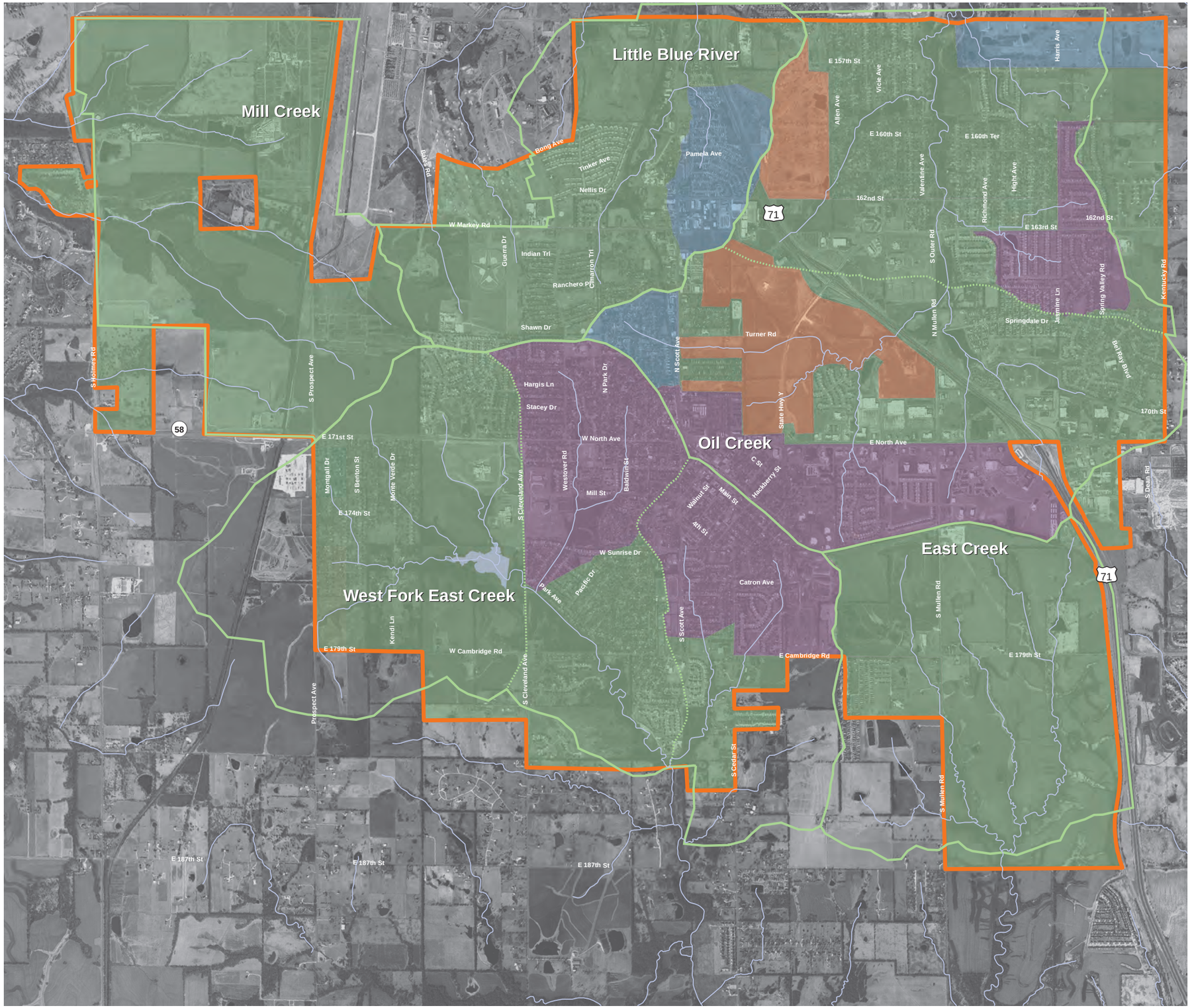
Figure A-3
City of Belton, Missouri
Private Development Detention Strategies by Watershed



Legend

Det Zone Strategy

- Comprehensive
- Extreme
- Frequent
- Special

- Stream Centerline
- Watersheds
- Sub Watersheds
- City Limits

1 inch = 2,500 feet

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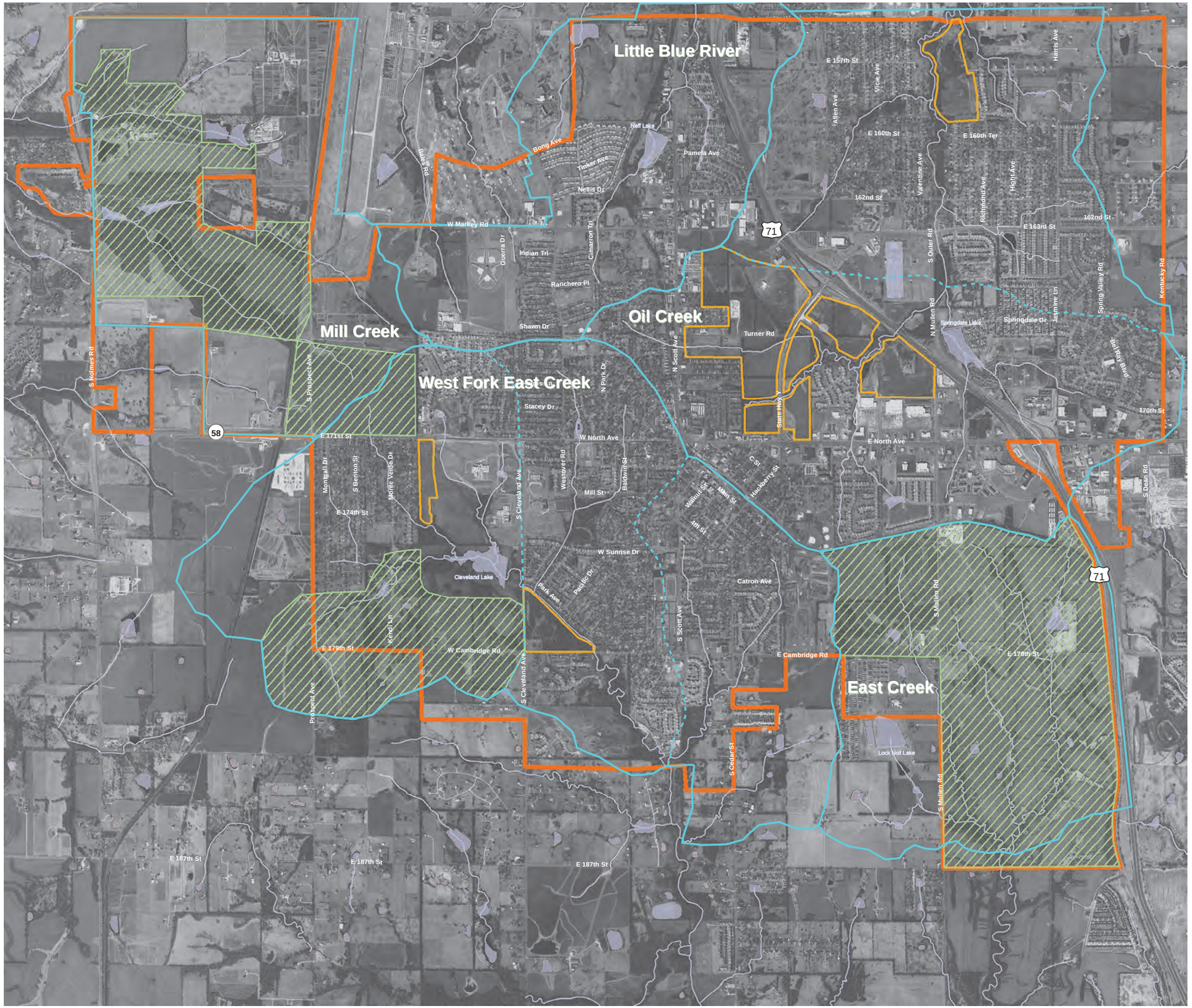
Figure A-4
City of Belton, Missouri
Conservation Overlay Zoning and Future Development



Legend

- Watersheds
- Sub Watersheds
- Stream Centerline
- Lakes
- City Limits

Projected Development Areas

- Future Development Areas
- Recommended Conservation Overlay Zoning

1 inch = 2,500 feet

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