

OVERVIEW

The City of Fort Worth, Transportation and Public Works Department's Stormwater Management Program (SWMP): operates, maintains and improves the City's drainage system; regulates development in the FEMA floodplain; reviews private development for compliance with City drainage standards; and educates the public regarding flood protection and water quality practices. The City's drainage system includes over 900 miles of underground pipe, approximately 300 miles of engineered drainage channel, over 30,000 drainage inlets and numerous other drainage facilities such as detention ponds, bridge culverts, and bar ditches.

The SWMP is responsible for protecting people and property in the City of Fort Worth from harmful stormwater runoff. Fort Worth's SWMP is a very capital-intensive enterprise, which requires continuous investment in extensive above- and below-ground infrastructure. Continued investment in the drainage system is a prerequisite for the health and safety of the community it serves as well as economic growth and prosperity in the future. The 2016-2020 Capital Improvement Plan (CIP) totals \$83,337,333 and funds capital improvements required to mitigate floodrisk, ensure system reliability by replacing aging infrastructure and facilities, support the City's bond programs for street rehabilitation, meet corporate priorities, and facilitate economic revitalization in areas where development is hampered by chronic flooding.

CATEGORIES

The SWMP's 2016-2020 CIP funds investments in the following 7 categories:

1. Neighborhood Drainage Improvements

Projects to mitigate flooding problems in neighborhoods generally arising from local drainage systems with inadequate capacity for large rain events.

2. Roadway Crossing and Channel Improvements

Projects to protect motorists from the risk of dangerous road overtopping.

3. Major Drainage Rehabilitation Improvements

Projects to create or upgrade drainage facilities such as detention ponds and natural creeks to mitigate regional flooding risk and/or erosion problems that pose a public safety risk or threaten private property and/or public infrastructure.

4. Floodplain Management

Assessing the degree and limits of floodrisk in the FEMA mapped floodplain to protect and educate property owners and provide information for developing flood mitigation projects.

5. Drainage Engineering Analysis

Engineering efforts to assess, prioritize, and develop conceptual solutions for flooding problems throughout the City.

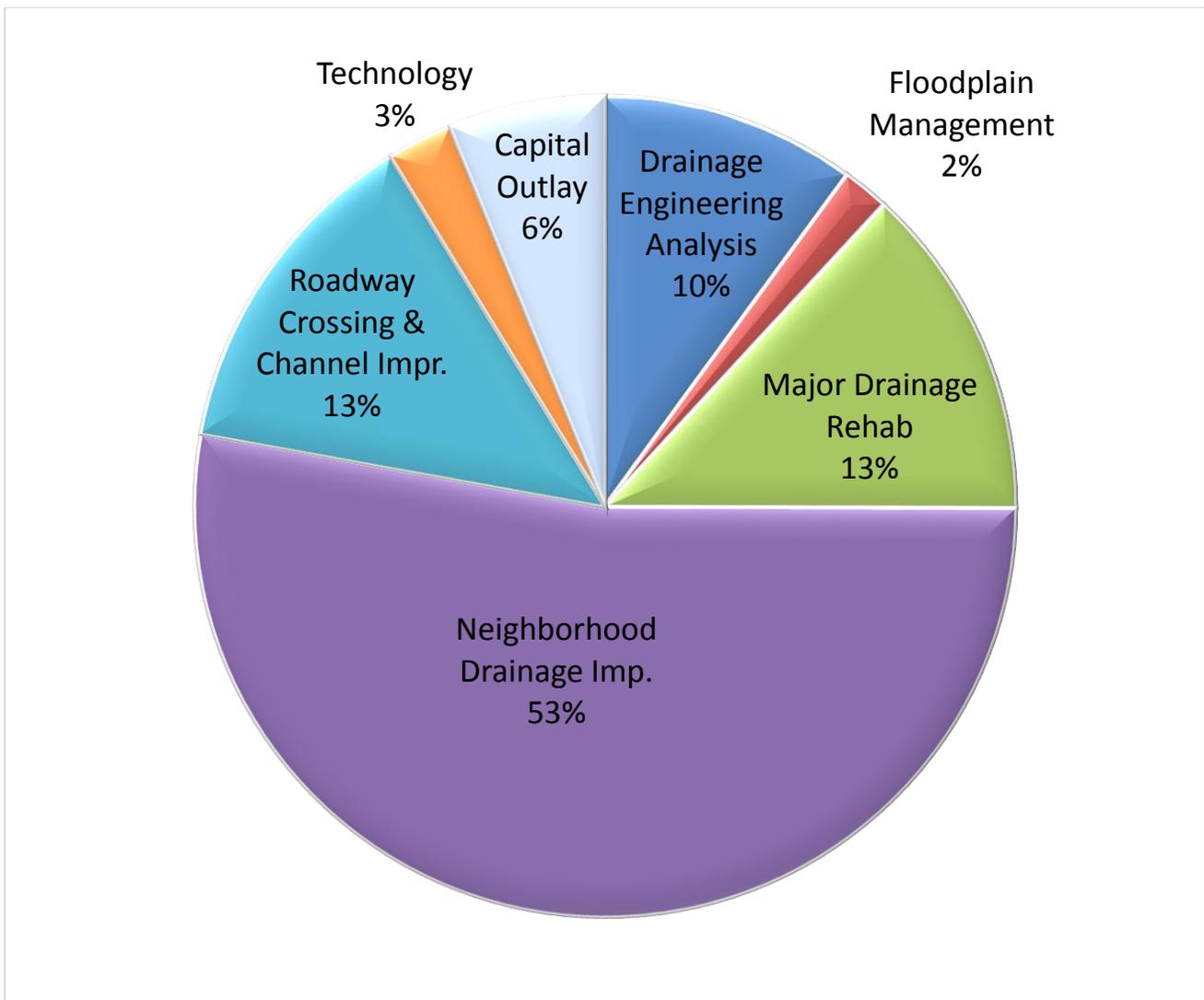
6. Technology

Included in this category are: initiatives to update the SWMP Geographic Information System (GIS) with data on the existing drainage system that is key to the assessment of floodprone areas and the development of flood mitigation projects, development of an early warning system for flooding, and periodic updates in the billing system software to keep the system from going obsolete.

7. Capital Outlay

Capital asset purchases to support operations and maintenance of the SWMP including routine replacement of heavy equipment & vehicles, minor tools & equipment and technology.

The FY2016-FY2020 CIP investment totaling \$83.3M by category is shown below.



Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

Summary of Projected Capital Investment by Category

The following table provides an overview of planned capital investment by Category for FY2016-2020 SWMP CIP.

Table 1

Categories:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Neighborhood Drainage Imp.	\$ 23,229,400	\$ 9,178,828	\$ 1,891,482	\$ 6,221,167	\$ 6,300,000	\$ 46,820,877
Roadway Crossing & Channel Impr.	\$ 4,718,200	\$ -	\$ 3,750,000	\$ -	\$ -	\$ 8,468,200
Major Drainage Rehab	\$ 1,251,500	\$ 2,017,204	\$ 2,700,000	\$ 2,500,000	\$ 2,551,270	\$ 11,019,974
Floodplain Management	\$ 1,510,000	\$ -	\$ -	\$ -	\$ -	\$ 1,510,000
Drainage Engineering Analysis	\$ 4,543,800	\$ 600,000	\$ 750,000	\$ 1,300,000	\$ 1,150,000	\$ 8,343,800
Technology	\$ 439,500	\$ 850,000	\$ 750,000	\$ -	\$ -	\$ 2,039,500
Capital Outlay	\$ 951,500	\$ 957,296	\$ 982,923	\$ 1,068,709	\$ 1,174,554	\$ 5,134,982
Total	\$ 36,643,900	\$ 13,603,328	\$ 10,824,405	\$ 11,089,876	\$ 11,175,824	\$ 83,337,333

CAPITAL IMPROVEMENT STRATEGY

The SWMP’s Capital Improvement Strategy is driven by its mission to protect people and property from harmful stormwater runoff. The CIP is informed by many sources from within the SWMP and the City as well as external entities. These sources include:



- **Planning effort/risk assessments:** The SWMP conducts engineering assessments to understand the degree and cause of flooding in various parts the City and develop conceptual alternatives to mitigate the risk. This information is used to prioritize the use of capital improvement funding and to develop tools for comparing and explaining the relative level of floodrisk throughout the City.
- **Historical flooding/customer reports:** The SWMP investigates customer reports of drainage problems. If the reported problem is something for which the SWMP is responsible, projects are initiated to correct problems that are within the existing resource capacity of the program. When current resources aren't sufficient to initiate corrective action, the problem is prioritized with other unfunded needs for project initiation as priorities and funding availability allows.
- **Corporate Priorities:** The SWMP provides drainage improvements or relocation projects in support of City Council-approved priority programs for the development of the city. Examples of these types of programs include the Trinity River Vision initiative and the Cultural District improvements.
- **Development Agreements/Community Facilities Agreements:** The Policy for the Installation of Community Facilities approved by the City Council provides for the SWMP's participation in upsizing

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

drainage facilities from the size required to accommodate a proposed development to the size required to mitigate floodrisk in the broader area. The SWMP's staff is in regular contact with the development community to identify opportunities for collaboration.

- **Collaboration with other public entities:** In developing flood mitigation alternatives, sometimes the property of other public entities is located in an area where a drainage improvement could be effective and/or the interests of another public entity could be served by drainage improvements. In such cases, SWMP staff engages with staff from the other entity to determine if there is an opportunity for a mutually beneficial project. Past efforts in this regard have resulted in partnerships with entities such as: the Fort Worth Independent School District and the Fort Worth Transportation Authority.
- **Legislative and Regulatory Mandates:** The Federal Government through the U.S. Environmental Protection Agency (USEPA) and the Texas Legislature through the Texas Commission on Environmental Quality (TCEQ) regulate the operation and maintenance of the City's drainage system through the Municipal Separate Storm Sewer System (MS4) permit program. Various aspects of the SWMP CIP are key to maintaining compliance with MS4 permit requirements. Similarly, the effective execution of the SWMP is a key part of the City's standing with the Federal Emergency Management Agencies National Flood Insurance Program.
- **Condition Assessment and Maintenance History:** A high priority for the SWMP is to optimize the performance and maintainability of the existing system. Toward that end investments are made in: rehabilitating degraded drainage channels to perform as designed and to facilitate ongoing maintenance; assessing the pipe system to develop a criticality ranking so that repair and rehabilitation funds can be directed to the most critical parts of the system; maintaining and expanding the GIS map for the system to make the assessment and response to drainage problems as efficient as possible; and technology and fleet upgrades that enhance efficiency in maintaining, repairing, and improving the system. SWMP staff routinely inspects various aspects of the City's drainage system, either visually or via Closed Circuit Television, to identify, prioritize, and program rehabilitation and maintenance projects. The SWMP's work order system is also invaluable in identifying recurring drainage problems so that in depth investigation can identify underlying causes and develop solutions.
- **Coordination with the CIP's of other City Departments/Divisions:** The SWMP coordinates with other departments and divisions such as TPW Capital Delivery, Water, Parks, and Planning and Development to identify areas where priorities and plans overlap so that collaborative projects can be developed that achieve multiple goals.

CIP Priority Criteria

The SWMP CIP is directly linked to the goals of: public safety, improving neighborhoods and communities, removing structures from floodplains, and encouraging economic growth. The SWMP's specific goals and project prioritization scores are aligned with City-wide strategic goals as reflected in the capital project prioritization system used for the City's Comprehensive Plan as follows:

Project Drivers

- Regulatory Risk
- Capacity
- Capital Replacement
- Efficiency/Sustainability

Tactical

- Citizen/Customer Satisfaction
- Prior CIP Approval
- Partnering Opportunity
- Healthy Environment

Strategic

- Safest City
- Improve Mobility
- Clean/Attractive City
- Strong Economy
- Development/Sustainability
- Improve Air Quality

Other Factors

- Inter-Organizational / Joint Infrastructure
- Leverage Funding
- Obligatory
- Time Sensitive

CAPITAL REVENUE SOURCES AND STRATEGY

The SWMP has identified funding for the \$83.3 million, five-year CIP from a variety of revenue sources, including Pay as You Go Cash (PayGo) from rate revenues, fund balance accumulation from prior year’s PayGo and funds remaining from the Drainage Revenue Bond program.

Pay as You Go - Fund Balance:

PayGo for capital is budgeted each year and recovered through the rates charged to the SWMP’s ratepayers. PayGo is accumulated as Fund Balance for planned investment in capital. For FY2016-2020, the SWMP will use \$9.9 million in PayGo held in fund balance from prior year’s cash accumulated for capital investment.

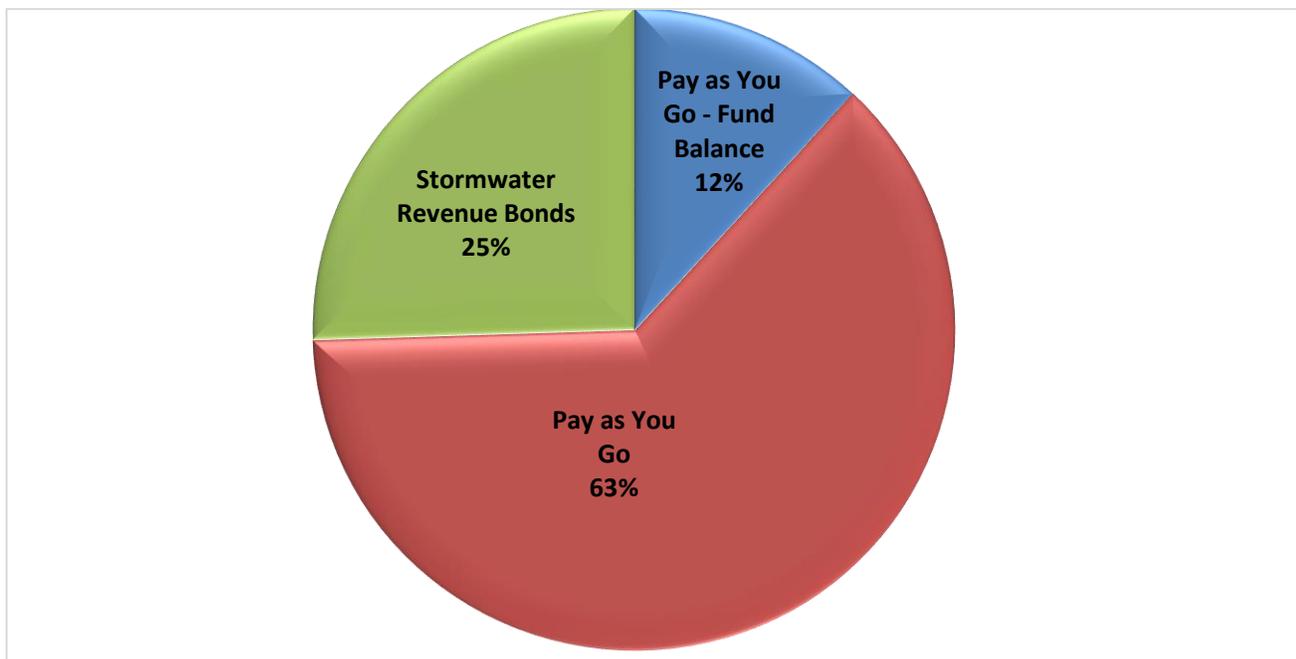
Pay as You Go:

PayGo for capital is budgeted each year and recovered through the rates charged to the SWMP’s ratepayers. Cash reserved for capital in 2016 totals \$8.5 million. Over the next five years the SWMP plans to increase its annual cash investment in the CIP each year to \$11.3 million in 2020. FY2016-2020 investment in annual Pay as You Go is \$52.2M.

Drainage Revenue Bond Program:

Since the establishment of the Stormwater Utility fee in 2006, the SWMP has sold a total of \$150 million in Revenue Bonds in 3 different issuances: 2007 (\$25 million), 2009 (\$45 million), and 2011 (\$80 million). The size and timing of future revenue bond sales will be determined by City leadership based on overall City priorities and within established financial and programmatic guidelines (e.g. debt to revenue ratios, reserve requirements, pay-go to debt proportions).

The FY2016-FY2020 CIP investment totaling \$83.3M by funding source is shown below.



Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

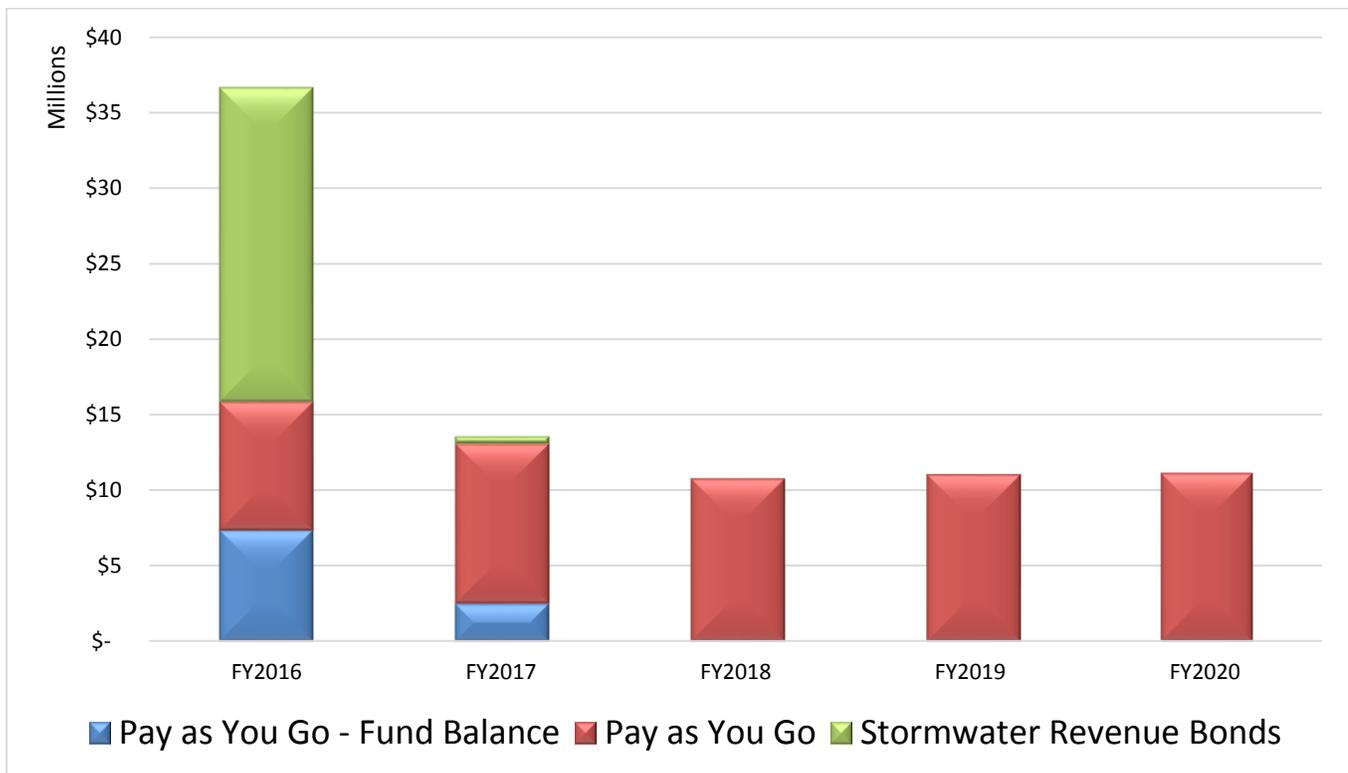
Summary of Projected Capital Investment by Revenue Source

The following table provides an overview of identified revenue sources to fund the anticipated appropriation schedule for FY2016-2020 SWMP CIP. The appropriation is scheduled to support planned projects.

Table 2

Funding Sources:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Pay as You Go - Fund Balance	\$ 7,370,600	\$ 2,504,888				\$ 9,875,488
Pay as You Go	\$ 8,511,800	\$ 10,613,567	\$ 10,824,405	\$ 11,089,876	\$ 11,175,824	\$ 52,215,472
Stormwater Revenue Bonds	\$ 20,761,500	\$ 484,873				\$ 21,246,373
Total	\$ 36,643,900	\$ 13,603,328	\$ 10,824,405	\$ 11,089,876	\$ 11,175,824	\$ 83,337,333

The following chart summarizes the Utility’s projected investment in the CIP by revenue source. Further details of the planned projects are provided in subsequent sections for each category.



OPERATIONS AND MAINTENANCE IMPACT

Most of the improvements in the 2016-2020 SWMP CIP will improve existing systems to function more effectively. New infrastructure that functions more effectively than the existing system translates into reduced maintenance and repair expenses. Some of the projects will create new detention facilities that will require periodic maintenance. These new expenses, though, are expected to be more than offset by reduced maintenance requirements resulting from the upgrades made via the overall program with no net increase to O&M costs.



Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

PROGRAM SUMMARY BY CATEGORY

1. NEIGHBORHOOD DRAINAGE IMPROVEMENTS

Projects to mitigate flooding problems in neighborhoods generally arising from local drainage systems with inadequate capacity for large rain events.

Program Summary: Neighborhood Drainage Improvements

Table 3

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Arundel Storm Drain Improvements	\$ 2,258,900					\$ 2,258,900
Bellaire Park Court Drainage Improvements	\$ 100,000					\$ 100,000
Cedar Breaks Drainage Improvements	\$ 275,000					\$ 275,000
Central Arlington Heights/Western Drainage	\$ 62,400					\$ 62,400
Dry Branch Creek Detention	\$ 2,364,100	\$ 600,000				\$ 2,964,100
Eastern Arlington Heights/Montgomery	\$ 200,000	\$ 3,000,000				\$ 3,200,000
Eastern Hills Drainage Improvements	\$ 982,500	\$ 1,917,500				\$ 2,900,000
Greenfield Acres Drainage Improvements	\$ 4,700,000					\$ 4,700,000
Hammond Street Drainage Improvements				\$ 2,850,000		\$ 2,850,000
Kimbo Court Drainage Improvements	\$ 125,000	\$ 700,000				\$ 825,000
Lower Sierra Vista Drainage Improvements	\$ 300,000					\$ 300,000
Minor Repair & Renovations - Easements	\$ 50,000	\$ 50,000	\$ 50,000	\$ 51,167	\$ 50,000	\$ 251,167
Minor Repair & Renovations - Paving & Concrete	\$ 230,000	\$ 480,000	\$ 500,000	\$ 520,000	\$ 550,000	\$ 2,280,000
Overton South Detention (Upper Willow Lake Channel)			\$ 300,000		\$ 3,000,000	\$ 3,300,000
Overton Woods Drainage Improvements	\$ 4,256,500	\$ 2,431,328				\$ 6,687,828
Precinct Line Arterial Contribution for Drainage	\$ 250,000					\$ 250,000
Sun Valley Drainage Improvements	\$ 2,625,000					\$ 2,625,000
Verna Trail-Paint Pony Trail	\$ 600,000					\$ 600,000
Westcliff Drainage	\$ 3,850,000		\$ 1,041,482			\$ 4,891,482
Washington Heights Drainage Improvements					\$ 2,700,000	\$ 2,700,000
Total	\$ 23,229,400	\$ 9,178,828	\$ 1,891,482	\$ 3,421,167	\$ 6,300,000	\$ 44,020,877

FY2016 Project Descriptions:

Arundel Storm Drain Improvements

The project is located approximately 1 mile northeast of the Loop 820 and Hulen Street intersection, and is bounded by Encanto Drive to the west and Somerset Lane to the east. Due to an undersized storm drain system, ponding occurs at the sump inlet locations, resulting in significant flooding of houses and property in the drainage basin. A new storm drain system, consisting of additional inlets and storm drain extension from sump areas to an existing channel will be installed, and sewer and water main replacement will be performed on Arundel Avenue between Encanto and Somerset.

Bellaire Park Court Drainage Improvements

The project site includes Bellaire Park Court, which intersects Bellaire Drive South east of S. Hulen Street, and Bellaire Drive South from Bellaire Park Court to an outfall in Howard's Branch, approximately 200 feet west of the intersection of Bellaire Drive South and Overton Park Drive East. Storm water runoff inundates an existing pond, Bellaire Park Court cul-de-sac just north of the pond, and lots along the northwest portion of Bellaire Park Court. Runoff crosses Bellaire Drive South and contributes to flooding in the Tanglewood Subdivision. A new overflow outfall structure for the pond and storm drain improvements in Bellaire Park Court and Bellaire Drive South to Howard's Branch are being installed.

Cedar Breaks Drainage Improvements

The project is located at Mesa Verde Trail and Basswood Boulevard. Residential streets experience flooding and significant erosion of residents' yards due to stormwater runoff. A storm drain from the intersection of Mesa Verde Ct and Mesa Verde Trail, up Mesa Verde Trail to Basswood, and along Basswood will be installed.

Central Arlington Heights/Western Drainage

The project is located on Western Avenue between El Campo and Bryce; Bryce Avenue between Western and Hulen, and the parcels located on the southeast corner of the Hulen/Bryce intersection. It is part of the multi-phase Central Arlington Heights program to reduce home and roadway flooding. The project includes underground detention on Western and Bryce, and a surface detention basin at the corner of Bryce and Western.

Dry Branch Creek Detention Improvements

The Dry Branch Creek study area west of Beach Street extends from E. Belknap Street northward to NE 28th Street. Dry Branch Creek, within the Riverside Neighborhood, routinely floods, and the existing stream, bridge and storm drain capacities are inadequate. One of two proposed detention basins will be constructed from Hollis Street to Blandin Street.

Eastern Arlington Heights/Montgomery

This project is located immediately west of Montgomery St and Harley Ave. It will extend expanded drainage infrastructure into the Eastern Arlington Heights neighborhood and connect it to the large system installed a few years ago running under Harley Ave to Trinity Park. This project will reduce the risk of road and structure flooding in the area.

Eastern Hills Drainage Improvements

The project is located in Eastern Hills subdivision generally bounded by Jacqueline Road, Meadowbrook Drive, Oakhill Road, and Weiler Blvd. The existing storm drain system is undersized, resulting in roadway overtopping. Phase 3 is part of a multi-phase program for the subdivision. New storm drains will be installed in the area to complete the program.

Greenfield Acres Drainage Improvements

The project is located near the intersection of IH-820 and Jacksboro Highway. Limits of project are: Boat Club Road on the west, Shadydell Drive on the south, Marine Creek Lake on the east, and Ten Mile Bridge Road on the north. When the neighborhood was incorporated into City of Fort Worth, the existing barrow ditch drainage system and an existing channel were inadequate. An underground storm drain system with custom drop inlets in the reduced barrow ditches will be installed. Two detention ponds which will reduce flooding of the neighborhoods south and southeast of Greenfield Acres will be installed. Greenfield Acres residents on Cindy Lane experience more frequent flooding than the rest of the neighborhood due to offsite drainage that overtops North Hill Lane and reaches their properties. A storm drain line and drop inlets will be constructed along North Hill Lane.

Hammond Street Drainage Improvements

The project is located on Hammond Street between Timothy and IH-35W. The downstream storm drain system is undersized, and during heavy storms, the roadway overtops at the intersection of Hammond and Burleson causing flooding of homes. A new storm drain system for the Hammond Street area upstream of IH-35W will be installed.

Kimbo Court Drainage Improvements

The project is located on Kimbo Court west of Bonnie Brae. The current drainage system is inadequate. A storm drain system will be installed in conjunction with the Kimbo Road Street project.

Lower Sierra Vista Drainage Improvements

This project would be accomplished via a Community Facilities Agreement with a private developer. The developer is required to install drainage infrastructure to convey additional runoff created by the planned project. The City will fund the upsizing of a culvert under S. Riverside Dr. just north of Berry St. to mitigate a severe road overtopping situation at that location. The developer will include that scope of work in the infrastructure portion of the private development project.

Minor Repair & Renovation – Easements

These funds are used to purchase easements associated with reactive projects that come up during the course of each year.

Minor Repair & Renovation – Paving & Concrete

This is a budget item to cover the cost of concrete and paving associated with Field Operations infrastructure and pipe repair projects. The concrete/paving work item extends the useful life of the infrastructure asset and is, therefore, a capital expenditure.

Overton South Detention (Upper Willow Lake Channel)

This project will develop a plan to address both stream flooding and overland flooding throughout the Overton South neighborhood. The project will develop a specific configuration to utilize the 4 acres of vacant flood prone property south of IH 20 that was acquired by the City for regional detention and to determine limits of channel improvements needed to accommodate any drainage improvements. This detention is going to be the first phase of improvements needed for future drainage improvements within the Overton South neighborhood to alleviate an undersized channel and undersized storm drains system. Until this detention is built, no improvements can be installed to alleviate home flooding along Westlake Drive.

Overton Woods Drainage Improvements

The project is located on Briarhaven Road between Bellaire Drive and the Trinity River. The roadway is overtopped by runoff, and numerous flood insurance policies in the area indicate widespread flooding. The solution has not been completely defined but will include a new drainage system with multi-barrel culverts. The project will be constructed in conjunction with the Bellaire Roundabout project.

Precinct Line Arterial Contribution for Drainage

The funding for this item is a SWMP contribution to an arterial improvement project to upgrade the drainage capacity along the Precinct Line Rd. just south of Trinity Blvd.

Sun Valley Drainage Improvements

This project will be accomplished via a Community Facilities Agreement with a private developer in the Sun Valley Industrial Park just west of IH 35W, east of Parker Henderson Rd., at Kaltenbrun Rd. There is serious and chronic road and structural flooding in this area. The primary property owner in the area is planning new development that will require detention of additional runoff created by the new development. The City funds will provide for an expanded detention area on the developer's property to mitigate flooding in the broader area. The City will provide funds associated with the expansion and the developer will include that work in the scope of the private construction project.

Verna Trail-Paint Pony Trail

The project is located in the Tejas Trails Addition, bounded by Verna Trail / Paint Pony Trail / Pack Saddle Drive. Because streets in this community are uncurbed and steep, large volumes of high velocity stormwater runoff occurs. Yard and street flooding is common, with the potential for home flooding and street and driveway washouts. A new storm drain system including pipe and box culverts will be installed.

Westcliff Drainage

The project is located on Surrey Street between Stadium Drive and Seminary Drive. It is part of the multi-phase Westcliff project which will address home flooding in the area. A new storm drain will be installed in conjunction with a water and sewer project.

Washington Heights Drainage Improvements

The project addresses the existing undersized storm drain system downstream of Meacham Airport from 38th and Houston Streets, down to 35th and Calhoun Streets. During heavy rain events, 38 residences and historic

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

businesses in the Washington Heights area are at risk of flooding and runoff overtops Commerce, Main, 35th and Calhoun Streets. New storm drains will be installed along Houston Street from 38th Street to 36th Street and along 36th Street from Houston to Main Street, outfalling into a proposed detention pond at Main and 36th Street.

2. ROADWAY CROSSING AND CHANNEL IMPROVEMENTS

Projects to protect motorists from the risk of dangerous road overtopping.

Program Summary: Roadway Crossing and Channel Improvements

Table 4

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Lebow Channel Roadway Crossing	\$ 31,200		\$ 3,750,000			\$ 3,781,200
Shore View Road Culvert Improvements				\$ 2,700,000		\$ 2,700,000
Burchill Channel Improvements	\$ 1,654,900					\$ 1,654,900
Victoria Emerywood/N Riverside	\$ 1,100,000					\$ 1,100,000
Comanche Creek Detention	\$ 1,050,000					\$ 1,050,000
Cooks Ederville Roadway Crossing	\$ 293,100					\$ 293,100
Butler-McClure Roadway Crossing	\$ 207,800					\$ 207,800
35th NW Cement Creek	\$ 125,000					\$ 125,000
Trinity Blvd (9700) Culvert Improvements	\$ 125,000					\$ 125,000
Mercado Channel Improvements	\$ 100,000					\$ 100,000
Lebow Channel Watershed Improvements	\$ 31,200					\$ 31,200
Total	\$ 4,718,200	\$ -	\$ 3,750,000	\$ 2,700,000	\$ -	\$ 11,168,200

FY 2016 Project Descriptions:

Lebow - Channel Roadway Crossing

The Brennan Crossing is part of the multi-phase Lebow Channel Roadway Crossing Project. The existing culverts are undersized, resulting in roadway overtopping. A multi-barrel culvert will be installed. Public Art will be included.

Shore View Road Culvert Improvements

The project is located at Shoreview Drive, west of Bomber Road. Shoreview Drive is the primary route of ingress and egress to neighborhoods west of the NAS JRB. Meandering Road Creek overtops Shore View Drive during major storm events, which blocks access for residents and emergency vehicles. Box culverts will be installed to increase conveyance capacity.

Burchill Channel Improvements

The project is located at the Burchill channel crossing at McKenzie. The existing culvert is undersized, resulting in roadway overtopping. A box culvert crossing will be installed which will incorporate access ramps on both the upstream and downstream sides.

Victoria Emerywood/North Riverside

This is a SWMP contribution to a project to widen N. Riverside Dr. between Basswood and N. Tarrant Parkway. SWMP funds will be used to dredge an adjacent channel that has experienced severe siltation and construct an access ramp for Field Operations equipment so that the channel can be maintained in the future.

Comanche Creek Detention

This is the City's cost share for a joint project with the City of Lake Worth to mitigate a hazardous low water crossing site. The hazardous site is in the Fort Worth city limits but the primary people affected are Lake Worth residents. Lake Worth is funding the design and will administer the construction project. SWMP funds will be used to construct the project.

Cooks - Ederville Roadway Crossing

This project will address severe sedimentation problems clogging two consecutive culverts on a small channel discharging into Cottonwood Creek, as well as severe erosion problems downstream of each culvert.

Butler-McClure Roadway Crossing

The project is located at the intersection of Butler Street and McClure Street. The existing culverts were severely undersized under Butler Street and washed out by previous flooding under McClure Street. Three deaths have occurred due to roadway overtopping. The improvements include a bypass channel along the south side of Butler Street and culvert improvements both under Butler Street and McClure Street and through the intersection of Butler and McClure Streets. Also the existing intersection was raised approx. 7', out of the 100-year floodplain to mitigate future roadway overtopping. Funding in FY 16 is to make upgrades to the erosion control system and close out the project.

35th NW-Cement Creek

This funding is for the purpose of installing street closure infrastructure at an intersection that is chronically overtopped by runoff during heavy rain events. The road only sees minimal traffic so the level of threat doesn't warrant a large capital improvement project but closing the road is an affordable way to further mitigate the risk to motorists.

Trinity Blvd (9700) Culvert Improvements

The project is located at the Valley View Branch crossing of Trinity Boulevard between Norwood Drive and Bell Spur. The existing culverts are undersized, resulting in flooding that caused two fatalities in 2000 and several other emergency rescues. On multiple occasions, vehicles have been swept off of the roadway and into the ditch. Improvements include a 4-lane bridge structure, raising the roadway surface approximately 3' and installing erosion control.

Mercado Channel Improvements

The project is located on Mercado Channel from its confluence with Marine Creek to the intersection of 20th Street and Commerce Street. Existing culverts are under sized causing flooding of the streets and commercial property adjacent to the channel. The channel also has streambank erosion concerns. Improvements include channel widening, bank stabilization, and the removal of the 22nd Street crossing which was replaced with creek access for City maintenance staff.

Lebow Channel Watershed Improvements

This project is part of the multi-phase Lebow Channel Watershed Improvement program. Ultimate improvements will consist of three bridges/crossings, 2.5 miles of channel improvements and detention basins. This portion of the program defines issues, acquires right of way and easements, and acquires permits from the U.S. Army Corps of Engineers.

3. MAJOR DRAINAGE REHABILITATION PROJECTS

Projects to create or upgrade drainage facilities such as detention ponds and natural creeks to mitigate regional flooding risk and/or erosion problems that threaten private property and/or public infrastructure.

Program Summary: Major Drainage Rehabilitation Improvements

Table 5

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Major Drainage Rehab - Reactive	\$ 275,000	\$ 2,017,204	\$ 2,500,000	\$ 2,500,000	\$ 2,051,270	\$ 9,343,474
Forty Oaks Drainage Improvements	\$ 150,000		\$ 200,000		\$ 500,000	\$ 850,000
Oakwood Trail Storm Drain Improvements	\$ 350,000					\$ 350,000
Lower Como Creek Erosion Control	\$ 301,500					\$ 301,500
Cottonwood Creek Drainage	\$ 175,000					\$ 175,000
Total	\$ 1,251,500	\$ 2,017,204	\$ 2,700,000	\$ 2,500,000	\$ 2,551,270	\$ 11,019,974

FY2016 Project Descriptions:

Major Drainage Rehabilitation - Reactive Drainage Improvements

This is funding set aside to respond to urgent issues that develop/are discovered in the drainage system during the course of the year that need immediate response. Such issues are typically corrected by an open-ended task order contract or, on some occasions, by SWMP field operations crews.

Forty Oaks Drainage Improvements

This project involves improvements to the performance of the Dallas and Wilson dry detention basins and to retrofit the existing detention basins to more effectively control runoff from small more frequent storms as well as to capture and contain sediment that currently requires periodic removal by Stormwater Field Ops. The project will also provide for enhancements to the community in the form of improved aesthetics and added green space. An additional goal for the project is to improve access for maintenance vehicles into the basins for mowing and sediment removal.

Oakwood Trail Storm Drain Improvements

The project is located on the east side of Fort Worth, north of IH 30, and north of the intersection of Boca Raton Blvd. and Oakland Hills Blvd. An existing earthen channel is in very poor condition with severe erosion. The channel will be replaced with piping and an outfall structure.

Lower Como Creek Erosion Control

The project is in Lower Como Creek between Collett Park and Bonnell Avenue, behind homes fronting on Driskell Blvd. Progressive creek erosion is causing property damage in the back of residential property along Driskell Blvd. Structural and gravity erosion control improvements to arrest damaging erosion and preserve property will be installed.

Cottonwood Creek Drainage

SWMP funding for this project is being contributed to the Parks Departments FY 14 CIP project to mitigate severe erosion to Cottonwood Creek as it flows through Sandy Lane Park.

4. FLOODPLAIN MANAGEMENT

Assessing the degree and limits of floodrisk in the FEMA mapped floodplain to protect and educate property owners and provide information for developing flood mitigation projects. It has been determined that these expenses are more appropriately categorized as operating expenditures. Beginning in 2017 expenses for these items will shifted from the CIP budget to the operating budget.

Program Summary: Floodplain Management

Table 6

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Drainage Design Review Services	\$ 800,000					\$ 800,000
Community Rating (CRS)	\$ 100,000					\$ 100,000
FEMA Mapping	\$ 75,000					\$ 75,000
Cooperating Technical Partner Program	\$ 200,000					\$ 200,000
Floodplain Management Plan Imp.	\$ 150,000					\$ 150,000
FEMA Grant	\$ 185,000					\$ 185,000
Total	\$ 1,510,000	\$ -	\$ -	\$ -	\$ -	\$ 1,510,000

FY2016 Project Descriptions:

Drainage Design Review Services

Consultant augment to staff for the review of private development projects for compliance with the City's drainage design standards.

Community Rating (CRS)

Fort Worth participates in the Community Rating System (CRS) as part of the implementation of the National Flood Insurance Program (NFIP) through FEMA. Lower CRS ratings recognize high performing programs and reduce flood insurance premiums. This effort is expected to reduce flood insurance premiums by another 10% for eligible policies.

FEMA Mapping

Consultant services for completing the process of correcting apparent errors in the 2009 FEMA floodplain maps.

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

Cooperating Technical Partner Program

Fort Worth participates in FEMA’s Cooperating Technical Partner (CTP) program in order to leverage FEMA flood hazard mapping grant funds. FEMA provides up to 75% of the costs to prioritize unstudied flood risk zones to update floodplain maps and provide better information about flood risks and potential solutions. Consultant’s will provide intensive technical support and assistance developing the strategy to optimize the opportunity to receive ongoing FEMA grant funding.

Floodplain Management Plan Implementation

This project builds upon the recommendations of the City of Fort Worth Floodplain Management Plan by developing enhanced flood risk awareness products and outreach materials. Products will include new on-line flood risk awareness tools to be integrated with existing City services, mobile application development, neighborhood-specific outreach products, and postage.

FEMA Grant

Funding to leverage or match FEMA flood hazard mitigation grant funding as described above.

5. DRAINAGE ENGINEERING ANALYSIS

Engineering efforts to assess, prioritize, and develop conceptual solutions for flooding problems throughout the City.

Program Summary: Drainage Engineering Analysis

Table 7

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Emergency Engineering Evaluations	\$ 944,086		\$ 150,000	\$ 150,000	\$ 150,000	\$ 1,394,086
Project Development & Prioritization	\$ 2,492,977	\$ 600,000	\$ 600,000	\$ 600,000	\$ 600,000	\$ 4,892,977
Project Development - Montgomery / E Arlington	\$ 73,680					\$ 73,680
Channel Flood Assessment	\$ 796,969					\$ 796,969
Drainage Infrastructure - Pipe Condition & Assessment	\$ 236,088			\$ 400,000	\$ 400,000	\$ 1,036,088
Channel Flood Assessment - Water Quality Geomorph				\$ 150,000		\$ 150,000
Total	\$ 4,543,800	\$ 600,000	\$ 750,000	\$ 1,300,000	\$ 1,150,000	\$ 8,343,800

FY2016 Project Descriptions:

Emergency Engineering Evaluations

These evaluations are performed by consultants on an as needed basis to identify drainage solutions that mitigate flood risk and increase the level of service of responses to citizen concerns regarding localized flooding.

Project Development & Prioritization

Consultant services to identify City-wide flood problems and prioritize areas for high level strategic planning and more detailed feasibility planning. Based on findings, projects are developed that are effective, acceptable to the community, and affordable. These projects are then programmed into the 5-year SWMP CIP for implementation as priorities and funding availability allows.

Project Development-Montgomery/E. Arlington

Consultant services to identify causes and potential solution for the risk of major structure and road flooding across Montgomery St. and into the site of the new Will Rogers Arena and just east of Montgomery St. into the Arlington Heights neighborhood. The flood mitigation work is planned for implementation in conjunction with the arterial improvement project slated for Montgomery St. in 2017/2018.

Channel Flood Assessment

This item is for the final step of consultant evaluations of flooding along specific channels conducted over the prior 3 years. Based on the flood hazard, alternatives for conceptual drainage solutions to reduce flood risk to protect people and property are identified.

Drainage Infrastructure- Pipe Condition and Assessment

The Pipe Condition Assessment Program provides a City-wide assessment of pipe conditions by rating pipe condition supported by video documentation. This information is used to determine maintenance and future project needs.

Channel Flood Assessment-Water Quality- Geomorph

This is for a consultant contract to develop engineered solutions for erosion control problems based on the nature of stream and bank instabilities determined by geo-morphology specialists.

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

6. TECHNOLOGY

Included in this category are: initiatives to update the SWMP Geographic Information System (GIS) with data on the existing drainage system that is key to the assessment of floodprone areas and the development of flood mitigation projects, development of an early warning system for flooding, and periodic updates in the billing system software to keep the system from going obsolete.

Program Summary: Technology

Table 8

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Infrastructure GIS Data Mgmt - Channel Infrastructure	\$ 300,000	\$ 500,000	\$ 500,000			\$ 1,300,000
Infrastructure GIS Data Mgmt	\$ 139,500					\$ 139,500
Advance Flood Warning System Upgrade		\$ 250,000				\$ 250,000
Advance Flood Warning Assessment		\$ 100,000	\$ 100,000	\$ 100,000		\$ 300,000
Stormwater Billing Tools Programming Update			\$ 150,000			\$ 150,000
Total	\$ 439,500	\$ 850,000	\$ 750,000	\$ 100,000	\$ -	\$ 2,139,500

FY2016 Project Descriptions:

Infrastructure GIS Data Management – Channel Infrastructure

This funding is to gather key data on drainage channels around the City and add the information to the SWMP GIS system. These data are key to understanding the performance of the drainage system and planning solutions to flooding problems.

Infrastructure GIS Data Management

This funding supports the SWMP's ability to optimize the value of the GIS for preventing flooding by increasing the effectiveness of the maintenance/repair of, and improvements to, the drainage system. Examples of some of the specific services provided include: quality control services to ensure the accuracy of mapped GIS data, inclusion of drainage easement data in the GIS, tools to make system data readily available to crews in the field, and conversion of key topographic data from paper to digital.

Advance Flood Warning System Upgrade

This funding will pay for periodic upgrades to the software system used in the High Water Warning System to send alerts to remote users of the system.

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

Advance Flood Warning Assessment

This funding will be used for consultant services to evaluate the feasibility of real time flood modelling for the purpose of providing advance warning of flooding so that cautionary measures can be taken and warnings issued in advance of the hazard developing.

Stormwater Billing Tools Programming Update

This funding is for updates to the software system used in the calculation for billing of Stormwater Utility fees.

7. Capital Outlay

Capital asset purchases to support operations and maintenance of the SWMP including routine replacement of heavy equipment & vehicles, minor tools & equipment and technology.

Program Summary: Capital Outlay

Table 9

Projects:	FY2016	FY2017	FY2018	FY2019	FY2020	Total 5 Yr. CIP
Maintenance Vehicles & Equipment Replacement	\$ 748,900	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 3,748,900
Minor Tools & Equipment	\$ 105,000	\$ 107,000	\$ 110,000	\$ 113,000	\$ 116,000	\$ 551,000
IT Hardware & Software	\$ 90,800	\$ 93,096	\$ 95,423	\$ 97,809	\$ 100,254	\$ 477,382
Rain and Stream Gauges				\$ 100,000	\$ 200,000	\$ 300,000
Minor Office Equipment & Furnishings	\$ 6,800	\$ 7,200	\$ 7,500	\$ 7,900	\$ 8,300	\$ 37,700
IT Data Storage			\$ 20,000			\$ 20,000
Total	\$ 951,500	\$ 957,296	\$ 982,923	\$ 1,068,709	\$ 1,174,554	\$ 5,134,982

FY2016 Project Descriptions:

Maintenance Vehicles & Equipment Replacement

Routine replacement of heavy equipment & vehicles supporting maintenance of existing infrastructure.

Minor Tools & Equipment

Routine replacement of capital tools and equipment used in the daily course of operations including construction and maintenance operations. Examples of tools and equipment include: weed eaters, chain saws, concrete vibrators, air compressors, commercial backpack blowers, electric dowling drills, handheld concrete saws, gas powered mixers, nozzles for vacuators, and d-hole for vacuators.

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

IT Hardware & Software

Scheduled replacement of Information Technology hardware and software including desktops and mobile data computers supporting daily operations for office and field maintenance personnel.

Rain and Stream Gauges

Rain and stream gauges for monitoring flooding, providing planning data and supporting the Advanced Warning System.

Minor Office Equipment & Furnishings

Routine replacement of capital tools and equipment used

Information Technology Data Storage

Hard drive data storage for servers and networks supporting GIS and drainage planning including video, LIDAR, pictures and engineering analysis.

PAST ACCOMPLISHMENTS

Over the last five years, the SWMP has expended an average of \$22 million/year for flood mitigation capital projects.

Some of the most significant projects for which funds were expended in FY2011-2015 include:

- Briarhaven Fieldcrest Drainage Improvements
- East Rosedale Culvert Improvements
- Butler-McClure Culvert Improvements
- Cromwell Marine Creek Culvert Improvements
- Forest Park-Parkview Storm Drain Rehabilitation
- Lebow Channel Crossing – 28th Street
- Lebow Channel Crossing – Dewey Street
- Eastern Hills Drainage Improvements Phase 1

LOOKING TO THE FUTURE

The SWMP 5-year CIP is based on the remaining revenue bond funds from previous debt sales plus about \$11 million/year on pay-as-you go funding from stormwater utility fee revenue. This level of funding only enables reduction of flooding through smaller, incremental projects. There are significantly more flooding problems than can be addressed at that funding level. SWMP staff estimate that it would cost roughly \$300 - \$400 million to substantively address the flood risks in the City that are considered to represent critical public safety risks. It would take decades to address all of these situations based on a gradual growth in the pay-as-you-go funding based on growth in the revenue base. Beyond the critical needs are nuisance drainage issues (some chronic and severe) that would take another several hundred million dollars to correct.

Stormwater Utility – 5-Year Capital Improvement Plan (FY2016-FY2020)

In FY2016-2017, the SWMP will be updating its master plan. A significant element of that will be refinement of policies and strategies regarding flood mitigation in the City of Fort Worth. The process to update the master plan will include a significant public input component to seek to ensure that flood mitigation policies and strategies reflect a consensus of the community. The updated master plan will refine and proportion the “tool bag” for mitigating flooding in Fort Worth, seeking to optimize program effectiveness by: ensuring that flood protection level of service goals are realistic and consistent with community desires; considering the appropriate use of property buy outs and flood warning in lieu of capital improvements; becoming increasingly opportunistic about public-public and public-private partnerships; and ensuring that the method for prioritizing needs is reflective of the community consensus.

Among the most significant flooding problems that are not addressed by the current Stormwater 5-year CIP are those in: Western Arlington Heights, the Forest Park Blvd/West Berry Street area, the Near West Side/Linwood area, the Near Southside area, and the Lebow Channel area on the north side of town.