

PEER COMMUNITY REVIEW RESULTS

**STORMWATER MANAGEMENT PROGRAM MASTER PLAN
CITY OF FORT WORTH**



August 14, 2017

Point of Contact

Community	Name	Position/Title	Email
Arlington, TX	Mandy Clark	Assistant Director/Stormwater Watershed Protection Department, Watershed Engineering Division Floodplain Management	Mandy.Clark@arlingtontx.gov
Austin, TX	Karl McArthur	Assistant Manager, City of Charlotte, Storm Water Services Division	Karl.McArthur@austintexas.gov
Charlotte, NC	Daryl Hammock	Trinity Watershed Management	Daryl.Hammock-dhammock@ci.charlotte.nc.us
Dallas, TX	Steve Parker	Department Program Manager	stephen.parker@dallascityhall.com
Oklahoma City, OK	Raymond Melton	Environmental Protection Manager	raymond.melton@okc.gov
	Blaine Sheffield	Technical Review & Regulation Manager Senior Engineer/Strategic Planning, Engineering Services Dept. Stormwater Management	Blaine.sheffield@okc.gov
Raleigh, NC	Scott Bryant	Assistant Director of Stormwater	Scott.Bryant@raleighnc.gov
San Antonio, TX	Nefi Garza		Nefi.Garza@sanantonio.gov
	Jake Powell	Senior Engineer, Floodplain Administrator Transportation & Capital Improvements	Jacob.Powell@sanantonio.gov

Notes

1. Many communities had several staff members help fill out the questionnaire. However, the main point of contact(s) we coordinated with at each city is noted above.
2. Most of the communities we benchmarked were city stormwater programs with the exception of the Charlotte-Mecklenburg Storm Water Program. This is a joint municipal/county stormwater utility that includes Charlotte, the surrounding towns of Davidson, Cornelius, Huntersville, Matthews, Mint Hill and Pineville. and Mecklenburg County.

Benchmarking Results

Benchmarking responses were documented as received from the communities. Several of the communities participated in a follow-up call to discuss the results of the benchmarking survey and relevant notes from these conversations are included for reference following each section. Some questions were understandably interpreted in different ways by the respondents. The benchmarking results are best utilized in combination with the discussion notes.

How to Read the Results

The City of Fort Worth answers are shown in yellow. For each question, communities that answered the same way are colored green while answers that were different from Fort Worth are colored red. This helps visually show differences between the Fort Worth Stormwater Program and other communities. However, as noted above, some communities interpreted questions differently so the actual results are best utilized in combination with the discussion notes.

Flood Reduction Capital Projects	Community							
	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
1. Buyout Program								
Does your community have a voluntary buyout program?								
Yes								
No								
<i>FTW has participated in voluntary buyouts on a case-by-case basis for NFIP participants. There is not a voluntary buyout program with defined policy and criteria.</i>								
If so, is there a written policy or process for prioritizing buyouts?								
Yes								
No								
N/A								
<i>FTW policy is consistent with the FEMA or grant funding requirements.</i>								
How are acquired properties utilized? (Check all that apply)								
Parks								
Open Space								
Detention Ponds								
Other								
N/A								
Has there been neighborhood opposition to buyouts?								
Yes								
No								
N/A								
How are the buyouts budgeted?								
Budgeted amount consistent each year								
Budgeted amount varies each year								
Buyouts are typically in response to a major event								
N/A								
<i>FTW budgets \$100K annually for local grant share of voluntary buyouts.</i>								
Have you successfully utilized grants to fund property buyouts?								
Yes								
No								
N/A								
Who maintains the purchased property?								
Stormwater Dept.								
Parks Dept.								
HOA								
Other								
N/A								
Have you condemned property for stormwater purposes?								
Yes								
No								
I don't know								
<p>Arlington</p> <ul style="list-style-type: none"> • No formal policy for buyouts. • Currently event based – initiated after significant flood events. • Focus is on SL & SRL properties – 25% substantial damage threshold. • Buyout program is voluntary. • Approximately \$150k per year allocated to property buyouts – rolls forward in capital budget if not used. • Applied for HMGP grant in 2015. City received money in fall of 2016 and plans to purchase 6 homes through the grant program. • Most buyouts solely through City funds (All City funds for Rush Creek). • Have applied for RL grants through TWDB in the past. • Condemned 1 property in the past for stormwater purposes as last resort (easement acquisition). • City has more storm drain related flooding than riverine flooding. Much progress in the past 10-15 years for riverine flooding due to buyout program. <p>Austin</p> <ul style="list-style-type: none"> • City of Austin's buyouts are project based and are selected only when they're the most feasible flood mitigation solution; the City of Austin does not have a city-wide voluntary program. • Acquired properties are utilized by parks, open space, detention ponds, and community gardens. 								

Dallas

- Buyouts are for repetitive loss, via needs inventory and bond program.
- There is a criteria for all needs in regards to a process for prioritizing buyouts.
- Buyouts are typically budgeted in response to a major event such as capital bond program.
- City has condemned property for stormwater purposes as required for capital construction projects.

Oklahoma City

- Purchased properties after some of the major flood events in the 1990s.
- Larger voluntary buyout program has not been initiated under the current City management. Will buy properties when needed.
- No success with grants to buyout properties in the floodway. Many Severe Repetitive Loss properties. Tried for 3 years, no success. 5-6' of water in one property.
- Have not tried to pursue grants for structures in local floodplains.
- Bought out approximately 17 structures for City bond project; not really for flood relief. Neighborhood agreed to buyout.
- Buyouts only for special projects and case-by-case basis.

Raleigh

- 2004-2005 the Stormwater Utility was established.
- Pulling everything together now with technical, financial, etc.
- Initially focused on high level FEMA floodplains and level of service for riverine areas. In second phase, intend to take it down to a more granular level, looking at 50 acres.
- Several ongoing projects of buyout, specifically in gateways to downtown. Not typically pursued as stand alone City project. More through HMGP FEMA Grant. 100% funded from outside grants currently. However, City will set aside money for matching grant funds. Not saying that these buyouts would not occur in the future. At least one project identified that buyout was the best alternative.
- Success rate on grants has been pretty strong. Can be difficult to get all checks and balances to get application. But when it makes sense and meets criteria, it has been successful. Website includes sample projects.
- Flood Mitigation is \$200K for matching funds. Grant funds received recently have been around \$1M.
- Will not condemn for buyout alone. Will look at condemnation for easements. Rarely condemn structure completely. For example, property is not a rep loss but has flooding in crawl space and best option will be acquisition. Generally for properties established many years ago. Minimum 2 feet above 100-year WSEL is current standards.

San Antonio

- Generally no, but there are project specific buyouts.
- Example – Flood control receiving channel – Project management team approached those folks to see who would be on board for voluntary buyouts.
- Case-by-case basis – for projects.
- FEMA grant money in response to 1998 flood. One time thing.
- Have condemned for easements.
- No active plan to develop voluntary buyout program. It has been a part of the conversation.

Charlotte

- Risk Assessment / Risk Reduction Plan for FEMA floodplain
- Local Floodplains and Capital Needs are measured against benefits and costs of project. Capital will approach it more from the standpoint of a benefit to cost if the home owner is willing to sell their property.
- Some adjacent property owners have expressed concern, but these are minor. Have occasionally deeded property to adjacent owners for ownership and maintenance.
- County will purchase several homes next to each other that could result in a park.
- Sometimes property will be rebuilt to current standards.
- Commercial and Residential properties have been condemned for projects. Relocation costs, etc.

Flood Reduction Capital Projects	Community							
2. Multi-objective Flood Reduction Solutions	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your City acquire property for the purpose of natural area and floodplain preservation? For instance, would the City purchase a floodplain easement from a property owner that is not actively developing or platting?								
Yes								
No								
I don't know								
If so, how is property typically acquired?								
Consultant or private entity								
City staff								
Trust for Public Land or other non-profit								
Other								
N/A								
Does your community ever purchase flood-prone tax foreclosed property without a specifically planned project?								
Yes								
No								
I don't know								
<i>FTW has evaluated the purchase of property for floodplain acquisition and protection.</i>								
How are the maintenance responsibilities shared for multi-objective projects such as regional detention in a park?								
Parks Dept.								
Stormwater Dept.								
It depends								
I don't know								
Does your community have a written plan for natural areas and open space planning?								
Yes								
No								
<i>FTW plan includes the Comprehensive Plan and the 2015 Parks, Recreation, and Open Space Plan.</i>								
<u>Arlington</u>								
<ul style="list-style-type: none"> Multi-objective projects are considered part of the linear parks program and maintained through the parks department. 								
<u>Austin</u>								
<ul style="list-style-type: none"> City of Austin rarely purchases flood-prone tax foreclosed property with a specifically planned project. Stormwater components are typically maintained by Stormwater Department. 								
<u>Dallas</u>								
<ul style="list-style-type: none"> City would purchase a floodplain easement for Great Trinity Forest. City has a written plan for natural areas and open space planning for Great Trinity Forest. Major stream channelization, major storm drain trunk line improvements, major storm drain tunnels, wetland restoration/creation, and stream erosion mitigation are being implemented in the City. 								

Oklahoma City

- If parks agrees it is a park, even if regional detention, parks department agreeable to maintain.
- Several regional ponds in City.

Raleigh

- From time to time the opportunity will arise for City to purchase tax foreclosed properties and that will be pursued. At times, a resident will ask City if they are interested in purchasing property.
- Growing responsibility in stormwater maintenance. A detention pond on park would currently be maintained by parks. In coming year, the stormwater department will take more responsibilities for maintenance, inspections, and routine maintenance. Major repairs will be shared with "owning department". Ask each department to reimburse stormwater for maintenance. Value to overall City is a single group managing all stormwater controls. The initial intent with centralized SCM maintenance budget to determine how much the cost will be. In the future, the costs will be allocated to each owning department.
- SCMs may be placed on a park property when needs and goals of parks and partnering city departments are in alignment to best meet overall city needs. An example would include facilitating a street improvement project. Treating the water and providing some communication and educational opportunities would be multiple benefits.
- Always looking for an opportunity to daylight. Looking for it as possible options. Focused more on storm drains that are located under greenfields. Neighborhood improvement project example where one house was acquired and the culvert was daylighted (about 1,000 linear feet).
- Lake Preservation / Lake Management is administered as part of stormwater. Often small ponds that were developed with neighborhood or farm pond. There is a program for retrofitting these structures when there is an opportunity for stormwater quantity or quality improvements. These projects are on website and include dam retrofits. High Hazard Dam for instance will be scored 10 on safety. Might even include some wetland retrofits. Multi-objective projects. Not focused on projects that are just regional detention. 20 watershed plans and often an upstream regional detention pond is found to be the most beneficial. But it would have to weigh in against all the factors for prioritization. Mostly doesn't make sense for storage facilities greater than 300 acres. Too large of a detention facility. Have examples of retrofitting pond upstream that provides more attenuation that helps reduce size of storm drain upstream. New regional detention would be difficult to almost impossible due to permitting.

Charlotte

- City does not acquire floodplain easements. FEMA regulated floodplains are privately owned, but no easements on these properties unless part of greenway master plan.
- County will remove blockages, but residents have maintenance responsibilities as well.
- County will pursue stream restoration but they do not do capital projects to reduce flooding.

Flood Reduction Capital Projects	Community							
3. Regional Flood Mitigation	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Which of the following regional mitigation measures are currently being implemented or planned for implementation in your city? (Check all that apply)								
Regional detention								
Major stream channelization								
Major storm drain trunk line improvements								
Major storm drain tunnels								
Wetland restoration								
Stream erosion mitigation								
Channel daylighting								
Other								
Has your City banked wetland mitigation credits to meet USACE Section 404 requirements?								
Yes, credits have been banked and utilized								
Yes, credits have been banked but not been used								
No								
I don't know								
<i>FTW has purchased mitigation bank credits but the City has not banked credits on one project to be utilized on another project.</i>								
Is your community actively planning regional detention in advance of private development?								
Yes								
No								
Is your community active in constructing regional detention in advance of private development?								
Yes								
No								
<i>FTW is primarily focused on planning detention for flood reduction of existing development. However, the City has supported regional planning efforts for detention in developing watersheds.</i>								
If your community is active in planning or constructing regional detention, how are your costs reimbursed?								
Fee-in-lieu of detention								
Special drainage district								
Development of impact fees								
TIF or PID Funds								
Other								
N/A								
Arlington								
<ul style="list-style-type: none"> • Currently implementing a pilot program for stream erosion mitigation with emphasis on reach based solutions. • Reach based erosion mitigation projects for the pilot program were determined/ranked based on overlaying the erosion CIPs from watershed studies with the City's complaint database. • Total of 4 projects identified at approximately \$1M-\$3M each project. • The goal is for the pilot program to not interfere with flood mitigation projects. 								
Austin								
<ul style="list-style-type: none"> • Our accumulated Regional Stormwater Management Program fees have been used to perform planning studies and to design and construct regional detention facilities in several of our watersheds. We also encourage private development consider regional rather than site specific solutions when the development is large enough or groups of developers are willing to cooperate. 								
Dallas								
<ul style="list-style-type: none"> • Major stream channelization, major storm drain trunk line improvements, major storm drain tunnels, wetland restoration/creation, and stream erosion mitigation are being implemented in the City. 								
Oklahoma City								
<ul style="list-style-type: none"> • Most regional detention was constructed back in the '90s. • Currently expanding one of the existing ponds. • Bond issue coming up in September. Many projects proposed to replace major storm drains in downtown. Some of the bond projects put in are for detention. Roughly \$2M for each detention project. 								

San Antonio

- Some of the mandatory detention centers have very sensitive downstream natural features, or other areas that are high risk and subject to flooding. Not allowed to do fee-in-lieu of in mandatory areas, must detain (except for really small sites).

Charlotte

- Daylighting has been fairly limited in City. County has uncapped some larger systems. Will look at opportunities but those are relatively infrequent.

- Have used tunnels under state road, but these are limited to small runs.

- They have a mitigation bank and will sell those credits to other departments. The City manages the bank internally.

- Developers will drive the regional detention planning and construction to achieve fee credits. City is not planning or constructing detention. Maybe one example of planning for detention to help facilitate redevelopment of an area but not yet built.

- Filo for water quality improvements. Fees must be used in the same watershed for BMPs or SCMs. City likes regional 10, 50, or 100 acres of drainage. Wetponds, wetlands, open air sand filters, and some proprietary devices.

Flood Reduction Capital Projects	Community							
4. Project Prioritization	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have a project prioritization framework for selecting capital projects?								
Yes								
No								
If so, are qualitative or quantitative factors the primary basis for project prioritization?								
Qualitative								
Quantitative								
Qualitative and quantitative factors are both considered								
Does your community track flood reduction project successes in a quantitative manner?								
Yes								
No								
I don't know								
If so, what information is tracked? (Check all that apply)								
Structures removed from floodplain								
Erosion protection								
Customer satisfaction levels								
Average daily traffic trips affected (or other traffic measures)								
Return on investment								
Effect on property values								
Criticality (evaluating likelihood of failure and probability of failure)								
Flood warning abilities								
Level of service improvement								
Emergency accessibility								
Other								
N/A								
Arlington								
<ul style="list-style-type: none"> • Framework for prioritization – Neighborhood projects complaint driven; other projects identified through watershed studies. • Criteria includes structural flooding, flooding frequency, how long has the flooding occurred, and opportunity (other infrastructure also being built at the same location). 								
Dallas								
<ul style="list-style-type: none"> • Initially quantitative and then qualitative factors are the primary basis for project prioritization. • Drop in water surface elevation/in river are also tracked in a quantitative manner. 								
Oklahoma City								
<ul style="list-style-type: none"> • Came up with prioritization for drainage bond projects. Structural flooding, street flooding, yard flooding, known flooding complaints/areas, benefits of project. Number 1 weight is structural flooding. • Citizens were given opportunity to provide input. Online surveys, take home surveys. • No database to track flood reduction progress. • Huge flood in early '90s. Major creeks were improved back in the '90s. • Biggest hotspots that remain for flooding are in the downtown area. • Most flooding from local drainage system. Unimproved creeks in sprawling areas are becoming more of a flooding problem, but for the most part new development stays away from flood prone areas. 								
Charlotte								
<ul style="list-style-type: none"> • Severity and call in date are used in project prioritization. • Erosion is not ranked unless it is threatening public infrastructure. • Prioritization are similar across different projects/programs but they are not measured against each other. • Currently in a data collection process of asset management and hopeful that will create a more holistic approach. • About 350 purchased in County. About 15-20 purchased in City. Inspection team sends out customer satisfaction for during construction satisfaction. • Strive to meet roadway standards and meet 100-year level of service for structures. Want to improve situation 								

Flood Reduction Capital Projects	Community							
5. Level of Service	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community construct projects that provide less than 100-year level of protection?								
Yes								
No								
If so, what types of constraints could result in construction of a project with less than 100-year capacity? (Check all that apply)								
Budgetary constraints								
Construction feasibility								
Project would be too disruptive								
Property acquisition limitations								
Other								
N/A								
Does your community have a written process to determine level of service?								
Yes								
No								
I don't know								
<p><i>FTW level of service is based on drainage criteria manual. A minimum level of service for capital projects with constraints (such as those listed above) has not been established.</i></p>								
<p><u>Arlington</u></p> <ul style="list-style-type: none"> • No written policy for LOS less than 100-year. 								
<p><u>Oklahoma City</u></p> <ul style="list-style-type: none"> • Some roadway crossings are infeasible to construct to 100-year LOS, especially older structures that are being replaced. • Some storm drain rehab projects are on the list of bond projects. • No level of service criteria for storm drain rehab. Mostly just trying to fix the issue as quick as possible. Primarily reactive. • Protect for 100-year event but infrastructure not necessarily designed for it. Most level of service challenges are with roadway cross structure capacity. 								
<p><u>Raleigh</u></p> <ul style="list-style-type: none"> • Plan for 10-year level of service for storm drain. 25-year thoroughfares. 100-year for FEMA floodplains. • For a capital project, try to achieve the highest level of service as possible within the budget. • Plan for 10-year storm drains at a minimum. Might try for higher if we can get it. Can often get to 25-year level of protection. <p>Some flexibility with freeboard requirements. For retrofit projects can often look at a smaller level of service and relax freeboard requirements. Try to achieve maximum extent practicable. Must convey lower level of service to citizens at public meetings and understand that it can be better than it was before.</p>								
<p><u>Charlotte</u></p> <ul style="list-style-type: none"> • Most stormwater projects are within existing developed areas and due to constraints we can't always provide 100-year protection. • When inheriting Land Development subdivision infrastructure, houses are built after pipe is in the ground. When stormwater becomes involved, these buildings/houses are a constraint to work between and create hardships with equipment, shoring of the houses, etc. • Land Development Standards and Storm Water Design Standards as well as Subdivision Ordinance to set level of service. 								

Flood Reduction Capital Projects	Community							
	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
6. Financial Planning								
What is your approximate 2017 annual capital improvement project budget?	\$11.2M	\$15.74M	\$27.7M	\$30M	\$70M	\$10.7M	\$50M	\$44.5M
<i>FTW budget does not include debt service. It's possible that some of the respondents included debt service in this total.</i>								
What is your approximate 2017 stormwater debt service obligations?	\$9.4M	\$9.25M	\$3.62M					\$12.5M
What was your total capital budget for the last 10 years?	\$150M	\$63.65M	\$210.9M	\$630M	\$835M	\$57M		\$408M
What is your expected total capital budget for the next 10 years?	\$100M	\$150M	\$285M		\$1B	\$95M		\$960M
<i>FTW estimated budget does not include a fee increase or bond funds. Some respondents may have included estimated bond funds.</i>								
What percentage of your stormwater capital budget is typically dedicated to flood reduction projects that are less than \$1 million?								
Less than 25%								
25-50%								
50-75%								
Greater than 75%								
I don't know								
What percentage of your stormwater capital budget is typically dedicated to flood reduction projects that are between \$1 million and \$5 million?								
Less than 25%								
25-50%								
50-75%								
Greater than 75%								
I don't know								
What percentage of your stormwater capital budget is typically dedicated to flood reduction projects that are between \$5 million and \$10 million?								
Less than 25%								
25-50%								
50-75%								
Greater than 75%								
I don't know								
What percentage of your stormwater capital budget is typically dedicated to flood reduction projects that are greater than \$10 million?								
Less than 25%								
25-50%								
50-75%								
Greater than 75%								
I don't know								
What types of funding does your stormwater program receive? (check all that apply)								
Stormwater user fees (stormwater utility program)								
Permitting fees								
Special tax districts								
Grants								
General fund								
Does your community have a debt cap for the stormwater utility?								
Yes								
No								
I don't know								
Approximately what percentage of your annual stormwater utility budget is dedicated to debt service?								
Less than 10%								
Between 10 and 20%								
Between 20 and 30%								
Greater than 30%								
I don't know								

Flood Reduction Capital Projects	Community							
6. Financial Planning (cont.)	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your stormwater department set aside budget each year to pursue private or public partnership opportunities?								
Yes								
No								
I don't know								
What is the largest project that your stormwater utility will typically fund with pay-go capital?								
Less than \$1 million								
\$1-5 million								
\$5-10 million								
\$10-20 million								
Greater than \$20 million								
I don't know								
How does your community fund stormwater capital projects greater than the threshold selected in the previous question?								
General obligation bonds								
Stormwater utility revenue bonds								
We do not fund large capital stormwater projects								
Other								
N/A								
How often does your community increase SWU fees?								
Every year								
Every few years								
Five years or more								
Very infrequently								
Have you formed special drainage districts to be able to fund the construction of flood reduction projects in specific areas?								
Yes								
No								
I don't know								
Which activities are funded by your stormwater utility? (Check all that apply)								
Flood reduction capital projects								
Development review services								
Maintenance								
MS4 permit and activities								
Flood warning								
CRS activities								
Regional detention								
Development infrastructure needs								
FTW MS4 permit is managed by a separate department. However, FTW Stormwater Utility funds the operations and maintenance of the stormwater system.								
Has your community experienced a significant flooding event in the last 10 years that forced changes in funding structure or project planning schedule?								
Yes								
No								
I don't know								
<p>Arlington</p> <ul style="list-style-type: none"> • City has roughly \$300M in flood mitigation projects in backlog • Approximate \$15M 2017 annual CIP budget. • Approximate \$2M towards debt service (will increase next year). • \$15-\$16M for 2017 SWU revenue (current rate \$5.65 with \$0.50 increase per year until \$7.50) • \$9.2M in bonds for 2017. • Total capital budget last 6 years approximately \$63,650,000 (includes \$25M bond). City recommended no more than \$4M per year if extrapolated to determine last 10 years (extrapolated 10 year total capital budget approximately \$80M). • Stormwater department sets aside approximately \$150k per year for either private or public partnerships (almost entirely public partnerships). 								

Austin

- City's approximate 2017 annual capital improvement project budget is \$32.5 million for all CIP funding sources (\$27.7 million drainage utility fee funding source)
- City's approximate 2017 stormwater debt service obligations is \$3,625,548.
- Total capital budget for the last 10 years was \$210,967,000.
- Expected total capital budget for the next 10 years is \$285 million.
- Less than 25% for 2017, but 0% based on FY18 appropriation data will be dedicated to flood reduction projects that are less than \$1 million.
- Less than 25% for 2017, but 5% based on FY18 appropriation data will be dedicated to flood reduction projects that are between \$1 million and \$5 million.
- Less than 25% for 2017, but 14% based on FY18 appropriation data will be dedicated to flood reduction projects that are between \$5 million and \$10 million.
- Less than 25% for 2017, but 23% based on FY18 appropriation data will be dedicated to flood reduction projects that are greater than \$10 million.
- Austin does not have a debt cap for the stormwater utility. The debt cap is for the City based on Property and Sales Tax.
- Less than 10% of the city's annual stormwater utility budget is dedicated to debt service. Total budget is \$94.6 million, debt service is \$3.6 million, 3.8% of budget.

Dallas

- Approximately \$30M in annual CIP budget.
- There is no amount in debt service obligations.
- Total capital budget for the last 10 years is approximately \$630M (2006 and 2012 Bonds)
- Total CIP budget for the next 10 years is about \$450M if things go accordingly.
- Stormwater capital budget varies widely. However, it's normally between 25-50% for projects that are less than \$1M.
- Floodplain management projects have always been bond program funded.
- Bond funded projects with private investment are typically prioritized, amount varies.
- City may be transitioning to stormwater revenue bonds. This type of financing is typically more expensive.
- City used to form special drainage districts to be able to fund the construction of flood reduction projects in specific areas. But, the city stopped doing these in the late 1970's.
- 2006 flooding supported project implementation per needs inventory priorities (more than 10 years ago).

Oklahoma City

- Stormwater bond project competing against other bond projects. Roughly \$225M out of \$1B for stormwater.
- Stormwater projects not funded by stormwater fees. General revenue bonds fund stormwater capital projects.
- Roughly \$120M for downtown stormwater project needs. City attempts to split up into \$5-\$10M projects.
- \$17M per year in stormwater revenue. SWU \$5.75 per household on average. Based on meter size.
- Usually around \$100-\$150k from stormwater utility revenues used for small capital projects. These projects are the extent of pay go flood reduction projects which are mostly rehab or larger maintenance needs.
- Issue permits for stormwater discharge for industrial and new construction. Roughly 1000 permits going on at a time. \$65 each permit. Looking to increase permit fee.
- \$17M in stormwater fee revenue.
- Maintenance crew to maintain dams. Funded by drainage utility.
- City does not charge fee for drainage reviews.
- Very rare for private development to pitch in to fund projects. Not many public private partnerships
- Stormdrain improvements in conjunction with roadway improvements included in current bond package.
- Last storm water utility fee increase was in 2010. Graduated plan that ended in 2014. Started in 1995 to fund NPDS. Started at \$3.70 per household?
- SWU increases driven by need.

- Entire City not under mandatory detention.
- Fee-in-lieu only done in special cases. Site has to be under 0.5 acre for fee-in-lieu and show no downstream impacts.
- Have to meet historic runoff rate (pre-development not just existing conditions). Multi-frequency.
- Areas of known flooding identified in GIS based on complaint database. No defined polygon/area. Engineers notified of detention/site runoff requirements at pre-development meeting.
- Stormwater staff, maintenance crews and MS4 permit funded through SWU fee. Some bond money used for rehab projects.
- Private consultants will do design work on CIP projects. Preliminary sizing and estimates for CIP projects have been completed by staff in house.

Raleigh

- Have not issued stormwater revenue bonds. \$2M loan from state loan for debt.
- Net income must two times the debt service. Net income = revenue – expenses. Pay go capital to date.
- Clean Water Management Grant Funds and some other state funds. As they continue to build the program, revenue bonds may become part of the strategy as they complete more of the watershed studies.
- Not likely to fund a project greater than \$10M in current pay-go. Try to create phases. If not, then they would need to hold for revenue bond. Focus on revenue bonds first.
- Subject to tropical storms, but no recent storms that have changed the focus of the program. Hurricane Matthew brought 14-16 inches of rain in southeast part of state and washed out many structures and will need public funds to rebuild. Floyd in 1999 and others have brought major impacts. As part of master planning efforts they will research the complaint calls and try to identify the localized flooding issues. Going back to evaluate national agencies for rainfall to ensure the data is still accurate.
- Open to public private opportunities. If there is something that can be constructed that expands a project from public to private interests, they will consider that. For instance, green infrastructure paid for by developer but placed in a public right of way. Cannot pursue private opportunities alone. But can contribute public funds to private property improvements when there is a public benefit.

Charlotte

- \$67M total SWU revenue
- \$12.5M to debt
- \$11M to cover maintenance. Some fund balance, etc.
- \$44.5M to capital.
- \$960M from paygo and debt issuance expected in next 10 years.
- Had some general obligation bonds when stormwater utility first starter but not recently.
- Debt cap for the stormwater utility based on net operating revenues.
- Funding level to pursue either private or public partnership opportunities has dwindled recently. At one time is was close to \$500k
- The City has increased SWU fees approximately 22 times in 25 years; county increases every few years.
- The plan review fees are paid by developers for their plan. The Land Development Services reviews everything for stormwater, roads, utilities, subdivisions, zoning compliance, etc. It is a one stop shop. They are fully funded by plan review and inspection fees.

Maintenance	Community							
7. Channel Maintenance	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
How does the stormwater department and parks department share maintenance responsibilities for green infrastructure?								
On a case-by-case basis								
Parks department maintains								
Stormwater department maintains								
The community does not actively maintain any green infrastructure								
Other								
Does your community have a private property erosion policy?								
Yes								
No								
I don't know								
What actions will your community consider if a privately owned creek/channel begins to threaten private property, life, or safety and a private property owner is unable to fund a solution? (check all that apply)								
Participation in a voluntary buyout program								
Participation in a capital project								
Other means to address the problem								
The community will not participate in private erosion issues								
What types of channels does your community maintain?								
Engineered channels								
Natural channels								
Both								
Neither								
<i>FTW along with many of the other communities maintain natural channels but only to clear significant blockages. See questions below.</i>								
To what extent are natural channels maintained? (Check all that apply)								
Mowing								
Clearing significant blockages								
Erosion								
Other								
<i>The CHA program functions in coordination with Mecklenburg County. Since the County does have a streambank restoration program, the response for CHA was updated to include erosion.</i>								
Does your community have a regular schedule of maintenance for engineered channels?								
Yes								
No								
I don't know								
Arlington								
<ul style="list-style-type: none"> Maintenance responsibility for green infrastructure: In a park – parks responsibility; Not in a park – stormwater responsibility. City will not address private property erosion issues. Reach based erosion mitigation pilot program considered public. The project impacts many people and has a water quality improvement component. Engineered channel maintenance: concrete lined inspected annually; grass lined mowed 3-4 times per year. 								
Austin								
<ul style="list-style-type: none"> If the green infrastructure is within a park, the Parks Department would be responsible. Most of the City's GI facilities to date have not been in parks. City has a policy for prioritizing and repairing erosion within a drainage easement on private property. City funds erosion repair on private property based on priority only within a drainage easement dedicated to the City of Austin. The solution is usually a construction project (either in-house or capital), however buyouts are considered during alterative analysis. Maintenance trend is toward natural channel with no or limited mowing. Mowing is only maintained on certain channels. 								
Dallas								
<ul style="list-style-type: none"> Streets department maintains some responsibilities for green infrastructure. Channels are city-owned. 								

Oklahoma City

- Street department has drainage section that does repair and maintenance.
- Some pervious pavement and rain gardens have been constructed. Not much LID.
- Ordinance for erosion control for new development.
- If no public infrastructure involved, no involvement in private property erosion issues.
- Advised homeowners in the past to hire engineer for erosion protection. City would review and approve. Private property issues.
- Language on final plats states maintenance responsibilities.
- City requires to show floodplains as common areas or drainage easement on plats.
- City maintains certain natural channels if they are in public drainage easements on plats. These are limited to past agreements and these agreements are not included anymore for public maintenance of drainage easements.
- Mowing contracts for engineered or natural channels. Clear natural channels of blockages.
- Regular maintenance for engineered channels. No scheduled maintenance but they are regularly maintained.
- City has GIS file that shows inventory of engineered channels.

Raleigh

- Drainage assistance policy is a cost share program where City will review severe erosion or flooding when there is runoff from public street or land. Projects will be taken to a separate advisory board that will review and make a decision on whether to fund or not. Primarily for work upon private property where that property is receiving stormwater from public project. 2/3 of projects are erosion. 9,000 – 10,000 calls. Almost 60-70% of calls have to do with projects on private property. Need to continue to provide a level of service for erosion protection. Meant for smaller projects, not necessarily 40-50 lots. Some of the larger projects could become capital projects. Strict no rise requirement in Raleigh, so often have to go downstream to bench channel and stabilize velocity increases. Trying to optimize culvert improvements and erosion improvements at the same time if possible. Historically, there was a 50/50 cost share for capital project on private property but not many of these projects any more.
- City will maintain channels within the ROW or within any areas where they have permanent drainage easements. Not necessarily regular maintenance. Have more recently taken on a more major responsibility for maintenance and are still working on better defined maintenance schedule.
- Maintenance is focused on channels around ROW. Have a list of locations where they check. Not many engineered channels in town. There is some maintenance for pruning shrubbery around streams, but that is not maintenance that City will be involved with. City is focused on functional maintenance of the channel for the overall system, like major blockages, etc.

Charlotte

- Parks not involved in maintenance responsibilities. Combination of private and public maintenance, depending on project ownership.
- City has a private property erosion policy that's limited to focus on threats to homes and streets. City has an Erosion Control Ordinance that regulates.
- City no longer qualifies erosion problems as a Storm Water service, unless property (buildings, roads, etc.) are subject to loss.
- City will participate in a private erosion project but only after a structure is severely threatened. Yard and property erosion are not prioritized.
- City requires the property owner to maintain private channels (vegetation, cleaning, etc.) except for FEMA channels.

Maintenance	Community							
8. Level of Service	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have a targeted level of service for maintenance planning?								
Yes								
No								
I don't know								
<p><i>FTW does have a targeted frequency for mowing and inlet clearing. FTW does not have a targeted level of service that specifies channels must be functioning to convey the original design frequency.</i></p>								
<p><u>Arlington</u></p> <ul style="list-style-type: none"> • No targeted level of service for maintenance planning. 								
<p><u>Austin</u></p> <ul style="list-style-type: none"> • City is in the process of developing a comprehensive asset management plan that will include consideration of level of service, so the answer is really more that we will have this relatively soon. 								
<p><u>Oklahoma City</u></p> <ul style="list-style-type: none"> • Target is to maintain to design as best as possible. Many phone calls from citizens for channel maintenance. 								
<p><u>Charlotte</u></p> <ul style="list-style-type: none"> • City is primarily involved in maintenance planning when infrastructure fails or creates flooding to roads and structures. Refer to this practice more as repair than maintenance. • No longer inspecting inlets as it was an inefficient process. The City maintains based on observations of staff, street department, or citizens. 								

Maintenance	Community							
9. Nuisance Issues	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
How have mosquito threats impacted your maintenance program in recent years?								
Significantly								
Moderately								
Not significantly								
I don't know								
Has your community been successful utilizing sprays or non-construction techniques for mosquitos?								
Yes								
No								
No techniques to eliminate mosquitos have been attempted								
What types of nuisance issues will your community address? (Check all that apply)								
Groundwater seepage								
Ponding water in streets								
Mosquitos								
Natural channel maintenance								
Other								
Arlington								
• City does not address groundwater seepage (constant water flow in gutter line).								
Austin								
• Tend to use more natural techniques such as introducing gambusia to help control mosquito populations in wet ponds.								
• Typically encourage the establishment of natural channel vegetation and try to limit maintenance to clearance of significant debris especially near culvers and bridges.								
Dallas								
• Natural channel maintenance limited to blockages on City property are only nuisance issues our community will address.								
Oklahoma City								
• Mosquito plan to treat public property only. No spray.								
• Field phone calls on nuisance issues and perform site visits but street department performs any improvement work.								
Charlotte								
• Health department services mosquito threats.								
• Techniques to eliminate mosquitoes have been attempted.								
• City will perform stream stabilization or restoration on a large scale when the conditions are right. The City is currently conducting 5 miles of stream restoration at a cost of \$8M. The City recently stopped the practice of stabilizing creek banks on a single property in short distances.								

Maintenance	Community							
10. Storm Drain Rehabilitation	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have a storm drain rehabilitation program?								
Yes								
No								
<i>FTW has a storm drain rehabilitation program that is focused on addressing critical needs. The desire is to become more proactive.</i>								
How proactive is your community in addressing storm drain rehabilitation before a pipe fails?								
Very proactive								
Somewhat proactive								
Mostly reactive to failures								
How does your community prioritize storm drain rehabilitation locations?								
Age of pipe								
CCTV inspection								
Prioritization method using multiple factors								
Other								
N/A								
Which rehabilitation method is most preferred?								
Cured-in-place pipe lining								
Slip lining								
Open cut replacement								
N/A								
What percentage of the capital budget is dedicated to storm drain rehabilitation?								
Less than 5%								
5-15%								
15-25%								
25% or more								
Does your community have a systematic CCTV program with routine inspection?								
Yes								
No								
I don't know								
If so, who performs the CCTV inspections?								
City staff								
Subcontractor								
N/A								
What is the goal for frequency of CCTV inspections?								
1-5 years								
6-10 years								
Greater than 10 years								
N/A								
Does your community have an asset management program for stormwater?								
Yes								
No								
If so, what elements are included? (Check all that apply)								
Detailed inventory of assets								
Maintenance activities								
Work orders								
Resolutions								
Criticality assessment of assets								
Programmed replacement								
Service life depreciation								
Other								
N/A								

Arlington

- CCTV performed by City in advance of project or in response to a reported problem.
- Looking to create/use a more robust database for asset management. City has been using Cartegraph since 2006.

Austin

- Much of rehabilitation occurs in areas with severely undersized pipes. Typically prefer to upgrade such systems. Have used cured-in-place pipe lining in some situations.
- The program is fairly new, so City is playing catch-up. The focus to date has been a comprehensive evaluation of the central business district with inspections in other areas upon request.
- City's asset management program is in development.

Dallas

- City is working towards being more proactive. More than 1,800 miles of storm drainage in system.
- The goal for frequency of CCTV inspections are actually once per permit term which is five years; however, a 10 year time frame might be more ideal for this volume of storm drainage.

Oklahoma City

- Case-by-case on storm drain rehab. No plan for anticipating areas of needed rehab. Primarily reactive.
- City highlighted Programmed Replacement in reference to bond projects, not rehab.

Charlotte

- Assumed to mean proactive maintenance, the stormwater program is getting started now as a resolution to many system failures. We do consider rehabilitation first before deciding to replace or upsize.
- About 1.5% of the budget goes towards preventative maintenance currently. 40% goes to point repairs, 45% to capital flood control and condition based failures, 13% to stream restoration.
- Based on threat level (city street safety, house flooding, erosion). Most of our request for service are prioritized by severity or risk, public or private, and then date of call.
- Any and all rehabilitation methods are used, and the solution is case dependent. We use CIPP, Spin casting, sectional CIPP, exterior concrete collars.
- Our Asset Management Team is starting CCTV as part of collecting this data.
- City staff will perform CCTV inspections in the near future. The plan is to conduct systematic routine inspections. Subcontractor does CCTV on demand for project locations.
- The intent is to vary CCTV inspection frequency based on age, criticality, condition eventually to prioritize areas of need.
- The asset management program for stormwater has just started.

Development Services	Community							
11. Water Quality	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have water quality requirements for private development?								
Yes								
No								
I don't know								
<i>FTW has water quality requirements as part of the current MS4 program and SWMP requirements.</i>								
Does your community have water quality requirements for publicly funded projects?								
Yes								
No								
I don't know								
<i>FTW will consider water quality improvements as part of publicly funded projects.</i>								
If yes to either of the previous two questions, which of the following were contributing factors leading to these requirements? (Check all that apply)								
Protection of a community resource such as a lake or waterway								
MS4 permitting requirements								
Anticipation of future federal requirements								
Desire for greater quality of life								
Recreation								
Aesthetics								
N/A								
Which pollutants are you actively trying to reduce? (Check all that apply)								
Bacteria								
Hydrocarbons								
Nitrates								
Heavy metals								
Sediments								
Other								
N/A								
Does your community's stormwater program manage your MS4 permit?								
Yes, the permit is managed by the stormwater department								
No, the permit is managed by a separate department								
Arlington								
<ul style="list-style-type: none"> • Post-construction BMPs policy currently requires certain amount of points based on size of development. • No inspection during or after construction. 								
Austin								
<ul style="list-style-type: none"> • Contributing factors for amenities such as the Barton Creek swimming pool rather than activities in creeks. • Primarily Polycyclic Aromatic Hydrocarbons, bacteria like EC, heavy metals such as PB and ZN, sediments like TSS, and others such as COD, TP, and TN are 								
Dallas								
<ul style="list-style-type: none"> • City has water quality requirements for private development and publicly funded projects per MS4/construction General Permit. • City is also actively trying to reduce legacy pollutants/floatables. • MS4 permit is management by the stormwater division of TWM. 								
Oklahoma City								
<ul style="list-style-type: none"> • No specific requirements for private development on water quality. • No site specific TSS removal, but headed that way. Detention used for water quality. • TMDL is driving a greater focus on water quality and the City is considering detention ponds to help address TSS concerns in lakes. 								

Development Services	Community							
12. Floodplain Preservation	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have natural area preservation or buffer zones in floodplain areas?								
Yes								
No								
I don't know								
<p><u>Arlington</u></p> <ul style="list-style-type: none"> Erosion Clear Zone & Creek Buffer Zone. 								
<p><u>Oklahoma City</u></p> <ul style="list-style-type: none"> Buffer zone put into new comprehensive plan. 								

Development Services	Community							
13. Local Floodplains	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community regulate local floodplains outside of the FEMA floodplains?								
Yes								
No								
I don't know								
<i>FTW requirements include no adverse impacts for all development, but the City does not have specific criteria to regulate local floodplains outside of the FEMA floodplains.</i>								
If so, are the regulations the same as for FEMA floodplains?								
Yes								
No								
N/A								
<u>Arlington</u>								
<ul style="list-style-type: none"> • City uses the latest study along Fish & Cottonwood Creek as the best available data since the latest study is not effective yet. 								
<u>Austin</u>								
<ul style="list-style-type: none"> • City regulates on streams up to 64-acre drainage; City regulates to fully developed condition floodplains • City regulates to fully developed condition floodplains rather than FEMA existing condition and uses the 25-year fully developed condition floodplain in place of floodways. 								
<u>Oklahoma City</u>								
<ul style="list-style-type: none"> • Small creeks not mapped. Any development along these creeks require drainage study to establish minimum finished floor elevation. Any development within 200' of a flooding source would require a drainage study. Require developer to provide easement in these areas. City will provide completed drainage studies to other developers to use for adjacent properties. • Studies driven by development and performed by development. City uses the drainage studies to regulate subsequent developers along these small creeks. • No floodplains delineated in City GIS files outside of FEMA floodplains. 								
<u>Raleigh</u>								
<ul style="list-style-type: none"> • County soils map. FEMA floodplains and soils map used to identify floodplain areas, which are typically upstream of FEMA floodplains. Very specific on how BFEs are determined or required to build 2 feet from outer limit of floodprone soils layer. Developer can choose to perform flood study. Drainage around 35 acres will start to become evident based on the floodprone soils. Not sure whether future watershed plans will include mapping updates. 								
<u>Charlotte</u>								
<ul style="list-style-type: none"> • Local floodplains are based on a 20-year old mapping study of non-FEMA streams. The mapping has some limited value but it is not a detailed study and is not shared publicly. • The City will perform more detailed studies as part of CIP projects. The mapping developed for these studies is shared with developers but is not regulated. 								

Development Services		Community							
14. Impacts of Development and Infill		FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have specific strategies and policies to address the flooding impacts of infill and redevelopment?									
Yes									
No									
I don't know									
<i>Clarification: FTW requires no adverse impacts for all development but does not have specific strategies to address infill and redevelopment.</i>									
Does your stormwater department have the opportunity to review the flooding impacts of redevelopment when there is not platting or replatting associated with the project?									
Yes									
No									
I don't know									
What requirements are used to regulate cumulative impacts of development? (Check all that apply)									
Fully developed future conditions watershed analysis									
No increase in discharges									
Control impervious area increases									
Require applicants to reduce design discharges									
Watershed planning has identified specific mitigation requirements									
Other									
N/A									
Does your community have different criteria for greenfield and infill development?									
Yes									
No									
I don't know									
Are there specific areas of the City where increased discharges are specifically prohibited? (E.g. older areas of the community with known flooding or erosion issues)									
Yes									
No									
I don't know									
Are there policies and processes in place for your program to regulate impervious percentages of a single family residential lot redevelopment?									
Yes									
No									
I don't know									
Arlington									
<ul style="list-style-type: none"> • City reviews redevelopment at site plan level through building permit process. • Need floodplain easement on re-plats. Basically treated as new plat. 									
Austin									
<ul style="list-style-type: none"> • Policies to address the flooding impacts of infill and redevelopment are still under development. • Greenfield and infill development criteria is under development. • City regulates to no adverse impact, so any increases in flow must be contained within drainage system and drainage easement; detention required to detain to match pre-development conditions; both effectively limit increases in discharge. • Impervious cover limited by zoning maximums; Size limitations (setbacks and building envelopes) for redeveloped homes. 									
Dallas									
<ul style="list-style-type: none"> • Development services has the opportunity to review the flooding impacts of redevelopment when there is not platting or replatting associated with the project. • In certain conditions, detention is required to regulate cumulative impacts of development. • Regulation of impervious percentages of a single family residential lot redevelopment is done through economic incentives (fee is related to impervious cover) 									

Oklahoma City

- No different than any other development. Same standard as anyone else.
- Have to meet historic runoff rate (pre-development not just existing conditions).
- If they are not platting, stormwater permits will still trigger review. Building permit tied to stormwater permit.

Raleigh

- Most recent text change to ordinance that allows City to look at single family parcels. Reviewing every project of any significance for stormwater impacts. Historically had a threshold for disturbance of area. With new ordinance, requiring property owners to control volume of stormwater runoff. Website development/inspections has highlights.
- City currently performs all reviews in house. Team of reviewers, about 7 full time in next fiscal year. Turn-around time for plan reviews is very strict and published on the website for different submittal types. Have a team dedicated to expedited review times for an additional review fee.
- Each proposed development must evaluate their impacts downstream. But they evaluate existing conditions of watershed, not fully built out conditions.
- Reviewing any projects greater than 12,000 square feet. Based on disturbed area, not impervious. Changing ordinance so that it control contiguous and non-contiguous.
- Drainage fees are required and fee schedule is online.

Charlotte

- Department has the opportunity to review the flooding impacts of redevelopment for downstream analysis. But, not for single family, low density developments.
- Situation is dependent on specific areas of the city where increased discharges are specifically prohibited. Peak is regulated, volume is not. Downstream analysis, site specific. Increases are not specifically prohibited in specific geographic areas.
- Although there is not a hard cap for the program to regulate impervious percentages of a single family residential lot redevelopment, the stormwater department will review any project that exceeds 24% built upon area.

Development Services	Community							
15. Development Oversight	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Is downstream conveyance capacity considered in a "first-come, first-served" basis?								
Yes								
No								
I don't know								
Does your community utilize City funded watershed studies to inform future development requirements for mitigation/detention?								
Yes								
No								
I don't know								
Does your community require that infrastructure be designed for ultimate watershed development condition?								
Yes								
No								
I don't know								
If not, is there an expectation that future development will be mitigated on-site or through regional detention?								
Yes								
No								
N/A								
What is the threshold of lot size for development review?								
Less than 0.5 acres								
Between 0.5-1.0 acres								
1.0 acres or greater								
I don't know								
Are small lot and large lot developments reviewed differently?								
Yes								
No								
I don't know								
In your opinion, what level of development review does your community provide?								
Significant - equal level of significant review for all applicants								
Moderate - review effort is focused on critical applications in areas of known flooding								
Minimal - the primary responsibility is with the applicant								
N/A								
Does your community require fees for stormwater development reviews?								
Yes								
No								
I don't know								
Arlington								
<ul style="list-style-type: none"> • No specific threshold of lot size for development review. Required if permit or platting is required. • City has a flood study review fee, but no general stormwater review fee. • City staff of 4 people within the community development and planning department responsible for full construction plan review. 								
Austin								
<ul style="list-style-type: none"> • Drainage, water quality, and floodplain review are all part of the overall development review fee. 								

Oklahoma City

- Approximately 3-4 staff assigned to plan review, but they would like to add more. 5 people can review plans from stormwater but 1 main person from stormwater staff reviews.
- Review times are generally communicated at pre-development meeting. Typically, 4 weeks from the time they submit plans to the time they get reviews back.
- Typically more than 1 review cycle. Usually 2 reviews but can be more.
- Detention would require different level of review for small and large developments. No difference for anything else.
- Same level of review for all development.
- City reviews calculations in plans.
- New criteria manual coming out soon. Tying ordinance to criteria manual.

Charlotte

- Not considered a first come, first served basis in most cases. In specific instances, like small lots on redevelopment, yes.
- Our Post Construction Stormwater Ordinance requires detention on-site (based on specific criteria) and/or mitigation.
- Redevelopment is defined as any increase in impervious percentage. In certain areas, there are specific exemptions as part of the site betterments guidance for redevelopment incentives.
- Threshold of lot size for development review is 1.0 acres or greater for residential. 20,000sf of impervious is the commercial trigger, not lot size. Creating more than 24% built upon area will trigger stormwater review.
- The staff process is the same on small lot and large lot development reviews; the requirements can vary. For example, small commercial sites can pay a Fee-in-lieu for water quality requirements.

Flooding Preparedness and Response	Community							
16. Flood Warning	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Does your community have a flood warning program?								
Yes								
No								
If so, what are the primary objectives of the flood warning program? (Check all that apply)								
Protect low water crossings								
Warn for frequently flooded underpasses								
Install flood warning when a capital project solution is too expensive								
Install flood warning in response to a loss of life or high water rescue								
N/A								
What are your future goals for flood warning?								
Expand the program								
Shrink the program								
Stay the same								
N/A								
Are there new technologies that you expect to implement in your flood warning program in the next 5 years?								
Yes								
No								
I don't know								
Arlington								
• City currently has 5 stream gauges. Looking to revamp and increase to 16 gauges.								
Austin								
• Common Operating Picture for management of conditions during flood events, improved real-time flood inundation mapping.								
Oklahoma City								
• Headed in same direction as Fort Worth, but just now trying to get started.								
Raleigh								
• Looking to build strong GIS to help support flood warning.								
• USGS has an alert system that will alert you on stream gage that will send out alerts.								
• City has network of 12-14 stream gages across City.								
• Looking at Austin Flood Warning system								
Charlotte								
• Flood warning program operated by Mecklenburg County.								
• Primary objectives include notification of frequently flooded homes, businesses, streets, traffic and pedestrian safety, etc.								

Flooding Preparedness and Response	Community							
17. Flood Preparedness and Response	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Is your stormwater department involved in the flood response immediately following a storm event?								
Yes								
No								
Does your stormwater department have a written procedure for response to flooding events?								
Yes								
No								
<i>Clarification: FTW Operations and Maintenance has a specific response plan.</i>								
Is your department responsible for delivering data to emergency responders or citizens during a storm event that impact flooding response decisions?								
Yes								
No								
I don't know								
<i>Clarification: FTW stormwater staff are responsible for delivering data when the Emergency Operations Center is activated in large storm events. Flood gage data is provided to emergency responders for all storm events.</i>								
<u>Arlington</u>								
<ul style="list-style-type: none"> • City would like to establish standard operating procedure for major storm events. 								
<u>Dallas</u>								
<ul style="list-style-type: none"> • Stormwater department is involved in the flood responses immediately depending on impacts following a storm event. • Flood Control Division has a written procedure for responses to flooding events. • Department is responsible for delivering data to emergency responders or citizens during significant events, if the city suspects one is imminent. 								
<u>Oklahoma City</u>								
<ul style="list-style-type: none"> • Do the best they can during flood response. No formal response plan. • Sent out staff in roughly 5 sqmi. increments last flood event – assess damage, talk to residents, and retrieve high water marks. • Watch list from complaint database to monitor storm infrastructure prior to or during rain events. 								
<u>Charlotte</u>								
<ul style="list-style-type: none"> • City only gathers information after a flood event. • As per Essential Service Function ESF-3 we collaborate with the Charlotte-Mecklenburg Emergency Management Office to provide data. • Flood Information and Notification Systems (FINS) provides precipitation, flood stage, and flood depth to the public. 								

Flooding Preparedness and Response	Community							
18. Public Data	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
What information does your community make accessible to the public? (Check all that apply)								
Maintenance work orders								
Local floodplains and erosion hazards								
GIS data								
Pipe conditions assessment								
Downstream drainage constraints								
Watershed studies								
Hydrologic and hydraulic models								
None of the above								
<p><i>FTW GIS data is available on the website. Local floodplains and erosion hazards are available through "One Address" query online. Additional information such as watershed studies and H&H models are available upon request. Some communities may have responded to include data that is only available upon request.</i></p>								
<p><u>Arlington</u></p> <ul style="list-style-type: none"> Floodplains provided on City website. New website called "Open Arlington" intended to serve as central clearinghouse for accessing, visualizing, and interacting with public open data sets. 								
<p><u>Oklahoma City</u></p> <ul style="list-style-type: none"> Open records request for any public information if not provided on website. News crews will call to get information regarding storm events. 								
<p><u>Raleigh</u></p> <ul style="list-style-type: none"> Imaps site is web based GIS that shows floodplains, infrastructure, watersheds, etc. Alluvial flood layer needs to be checked to see local floodplains. In the middle of an open data initiative. Participated last year working with an entity to review open data. Already begun through the Raleigh Open Data Portal to provide more data to public. Historically may not have been provided unless requested. For instance, impervious area billing information is something that is now provided. Over 100,000 records are in database for customer to pursue if they would like. 								

Flooding Preparedness and Response	Community							
19. Communication	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
How does your community communicate flood related information to the public? (Check all that apply)								
Social media								
Text message								
National Weather Service feed								
Television								
Website								
Reverse 911								
Other								
N/A								
What data does your community communicate with the public? (Check all that apply)								
Precipitation								
Flood stage								
Flood depth								
Forecasting								
Road closures								
Highwater rescues								
Stranded vehicles								
Other								
N/A								
Does your community recommend actions to public along with the information that is communicated?								
Yes								
No								
N/A								
Arlington								
<ul style="list-style-type: none"> • No reverse 911 targeted for specific areas. 								
Dallas								
<ul style="list-style-type: none"> • City has National Weather Service feed on Flood Control website. City also has outreach program. • When available for river, flood depth is communicated with the public. • City recommends the actions of "Don't drive onto flooded roadways" to the public along with information. 								
Oklahoma City								
<ul style="list-style-type: none"> • Action center for public to call in. Receive calls every day. Can be anything, not just drainage related. Try to respond within a week. • High water rescues and stranded vehicles tracked in GIS. 								
Charlotte								
<ul style="list-style-type: none"> • Flood Information and Notification Systems (FINS) provides precipitation, flood stage, and flood depth to the public. Includes Charneckalerts.org • City uses media messages, "Turn Around, Don't Drown" 								

Flooding Preparedness and Response	Community							
20. Climate Change	FTW	ARL	AUS	DAL	OKC	RAL	SAN	CHA
Have changes been made to your program in recent years to address climate change?								
Yes								
No								
I don't know								
Arlington								
<ul style="list-style-type: none"> • No proposed changes. 								
Austin								
<ul style="list-style-type: none"> • Primarily on the operation side to reduce carbon footprint. We will likely consider the potential impacts of climate change in the ongoing development of our asset management plan and in some cases may consider more extreme design events for critical facilities. 								
Oklahoma City								
<ul style="list-style-type: none"> • After the 2013 flood, professor at OU analyzed rainfall and provided new data. City is planning to incorporate new rainfall data from the NOAA rainfall site. City does not anticipate 100yr event will increase by much. 								
Charlotte								
<ul style="list-style-type: none"> • Looked into making changes to our program to address climate change, but there's nothing thus far. 								