

Stormwater Infrastructure Asset Management Program Development

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City of Austin - Watershed Protection Department

Environmental Commission

Development and Water Quality Regulations Joint Committee Meeting

November 16, 2016

What is Asset Management (AM)?

- Asset management - A strategic life-cycle approach to cost-effectively maintain levels of service provided by an organization's assets.
- AM includes activities that guide the procurement , maintenance, rehabilitation, restoration, replacement and removal of assets. This requires continual assessment of condition, performance, risks and expenditures over the asset life cycles.

Major Questions & Components of AM Plan

5 Core Questions	10 Step Process
1. What is the current state of assets?	1. Inventory Assets 2. Asses Conditions 3. Determine Residual Life 4. Determine Replacement Costs
2. What is our required level of service ?	5. Define target <u>Levels of Service</u>
3. What are the assets are <u>critical</u> to sustain performance?	6. Assign Business Risk Exposure (BRE)
4. What are my best Operational and CIP strategies?	7. Determine Appropriate Maintenance 8. Determine Appropriate CIP
5. What is my best long-term funding strategy?	9. Funding and Operational Strategy 10. Build the Asset Management Plan (AMP)

Statement of Need

- Asset Management is needed to strategically plan resources for the ongoing repair, replacement, rehabilitation of infrastructure.



- Stormwater Control Measures (Ponds)



- Storm Drains



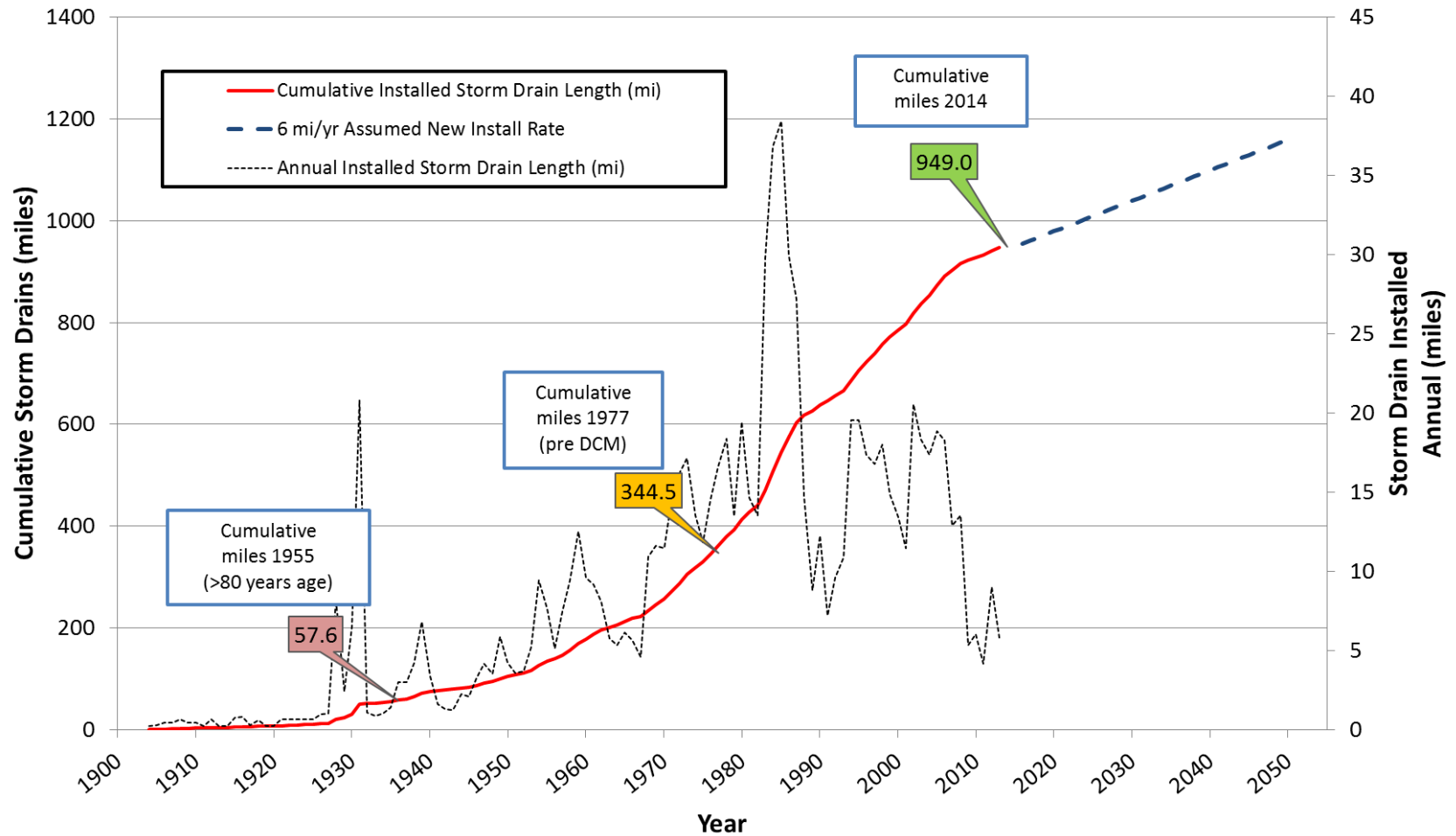
- Open Drainage Channels

WPD Asset Registry Information (as of 06/21/2016 DIG)	
Storm Drain System	
Storm Drains Total (all types, miles)	949
Inlets (all types, count)	29,655
Inlet Based Stormwater Controls	81
Manholes	5,074
Outfalls	6,373
Stormwater Control Measures	
SCMs (WPD Maintained)	894
Water Quality	648
Flood Control Detention	246
Private SCMs w/WPD Inspection Only	6,796
Water Quality	2,989
Flood Control Detention	3,807
Unknown	47
Dams	247
Flood Walls (# projects)	3

WPD Asset Registry Information (as of 06/21/2016 DIG)	
Open Channel System	
Creeks Network (miles)	897
Constructed Channel (miles)	225
WPD Stabilization Projects (miles)	20
COA Flood Channel Projects	Compiling data
By-pass Channels (#projects)	3
Lakes (linear miles)	46
Shared Assets	
Creek Crossings (includes FEMA)	1,087
Creek Crossings FEMA Inspections	658
Land Assets	
Land (maintained lots)	754
Riparian Zones (# areas)	49
Karst Features	1124

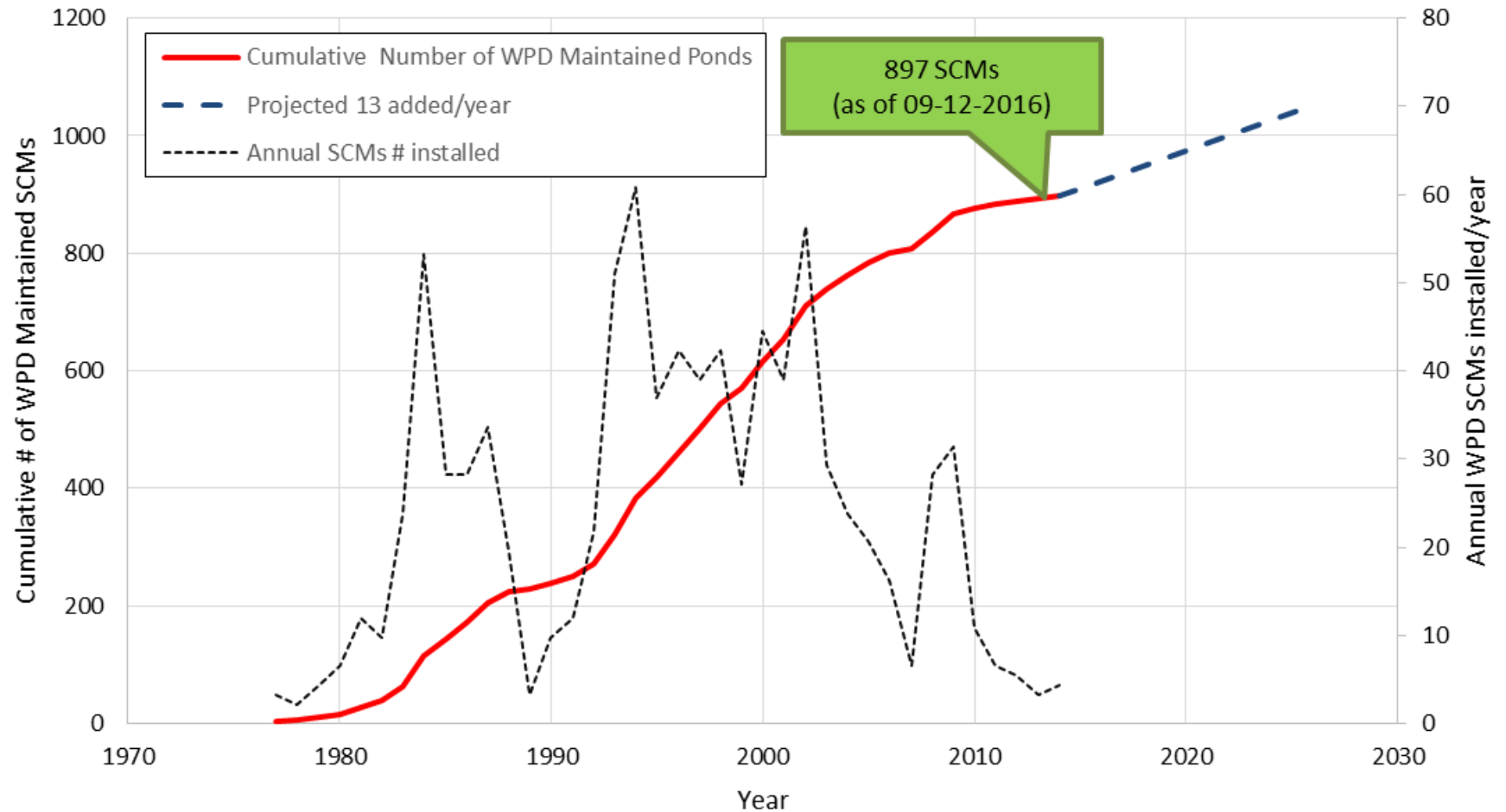
Asset Inventory

Storm Drains in City of Austin



Asset Inventory

WPD Maintained Stormwater Control Measures (ponds)



Asset Condition Assessments

(Physical Condition & Capacity/Performance)

- **Storm Drains**

- Physical Condition - TV inspection program, age information (surrogate)
- Capacity – Storm Drain system modeling



- **Stormwater Controls (Ponds)**

- Physical Condition - Publically maintained pond inspection program (revisions in progress)
- Capacity – Design plans/volume:drainage area ratio

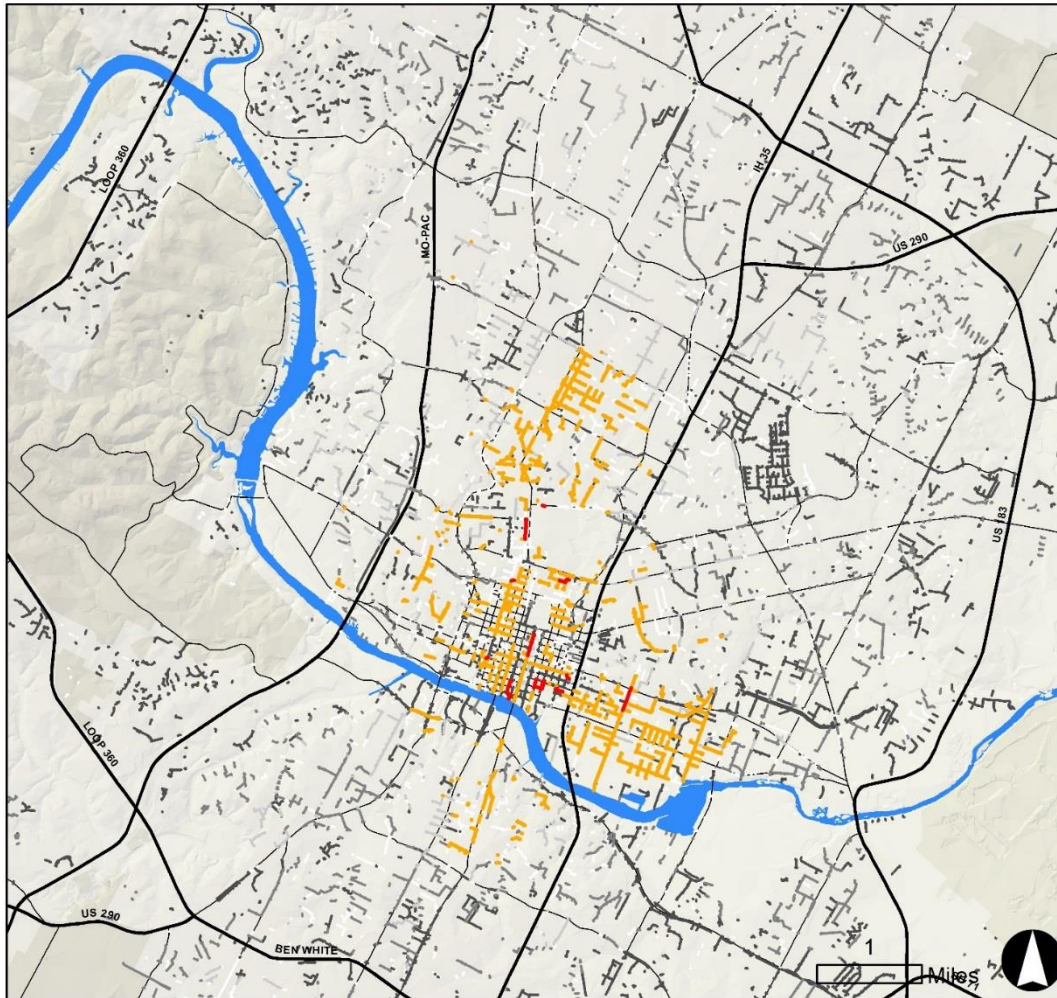
- **Open Channels**

- Physical Condition - Erosion assessments (1-time), Environmental Integrity Index (EII), FEMA LWXing inspections
- Capacity – Floodplain models

Asset Condition Ratings

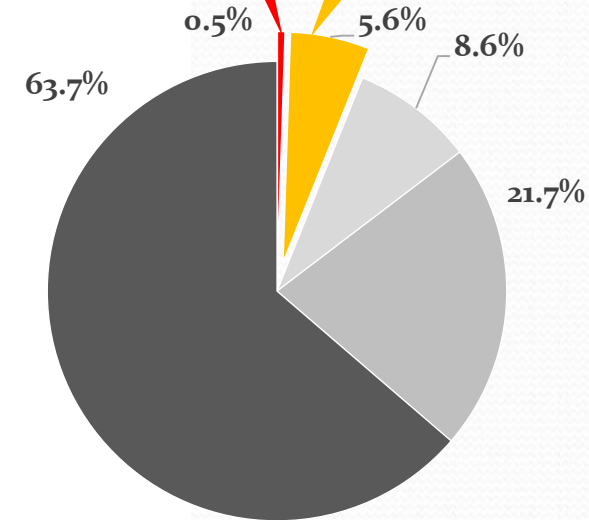
Rating	Age/Design Life	Physical Condition	Capacity		
			Storm Drains	Engineered Channels	Flood Detention Ponds
1	0 - 0.25	No defects or signs of structural fatigue	25-year HGL is < 6" below the gutter line (meets DCM)	>= 100-year in channel banks or easement	Matches predevelopment peak flow rates up to 100-year runoff event.
2	0.25 - 0.5	Minor defects	25-year HGL > 6" above gutter line (meets DCM)	25 to 100 -year in channel banks or easement	<u>...up to the 25-year event</u>
3	0.5 - 0.75	Substantial defects, yet functional	10-year HGL > 6" below gutter line.	10 to 25-year in channel banks or easement	<u>... 10-year runoff event</u>
4	0.75 - 1.0	Significant defects and unable to provide unacceptable level of service	2-year HGL > 6" below gutter line	2 to 10-year in channel banks or easement	...2-year runoff event
5	>1.0	Not functional, collapsed	2-year HGL exceeds ground elevation	2-year flow exceeds the banks or easement	Does not match the predevelopment peak flow rates for the 2-year

Storm Drain Age



4.9 miles

52.7 miles



*pipes with no date information distributed by population growth 1904 – 1977

Note: Age is not a reliable surrogate for condition for storm drain infrastructure, but is used for needs based planning purposes

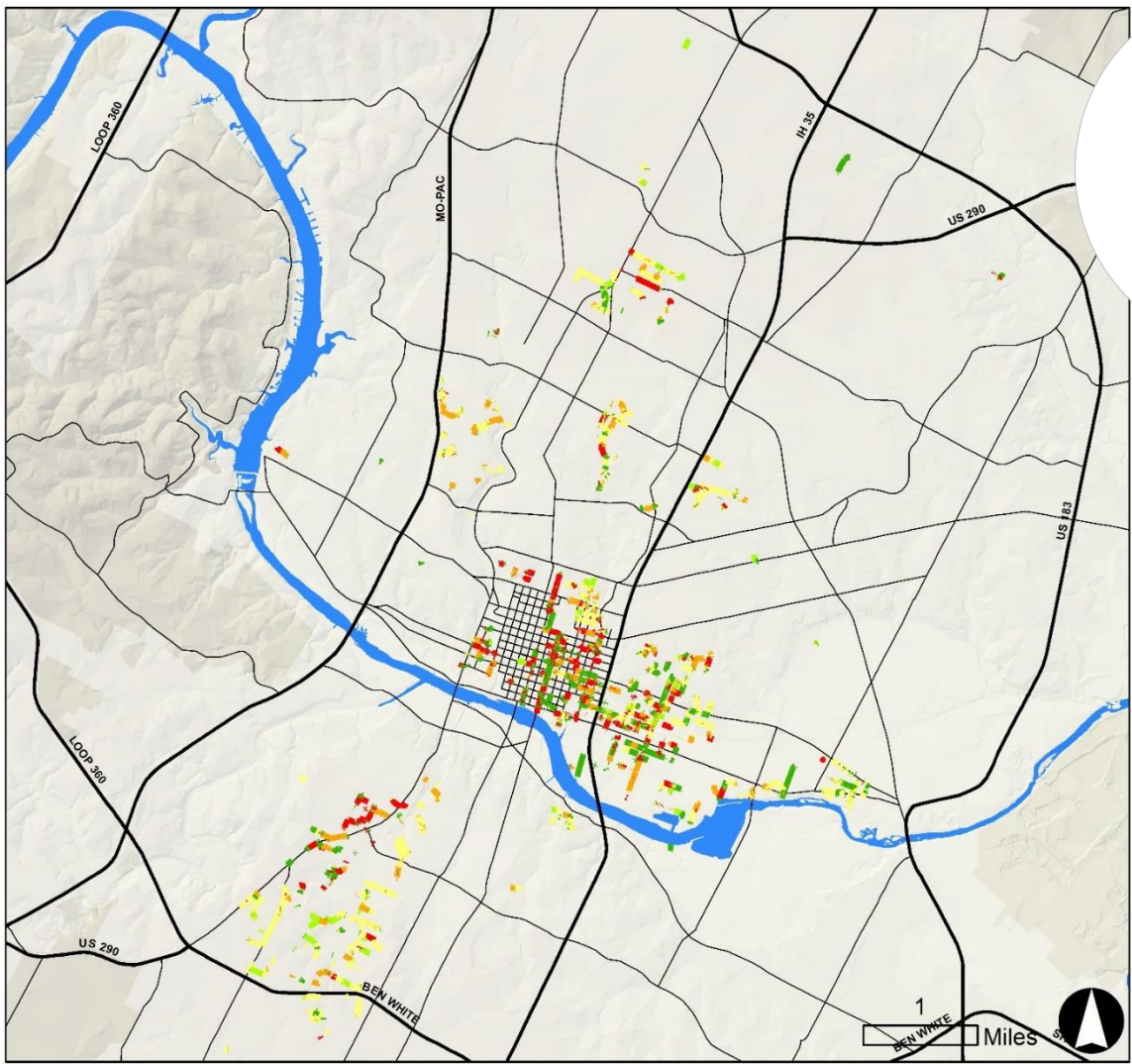
- > 100 years
- 80 - 100 years
- 60 - 79 years
- 40 - 59 years
- 0 - 39 years

Pipes with no date information

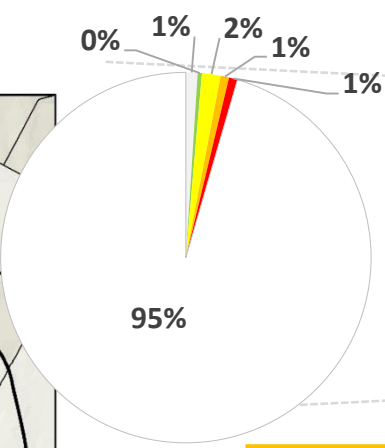
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- ~1/3 of the storm drain system (~350 miles) was built before regulations (1977)
- ~ 6% (~60 miles) older than 80 years, ~5 miles older than 100-years

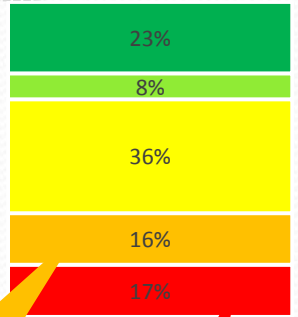
Pipe Inspection Scores



Total System



Inspected System



6.9 miles

7.1 miles

Condition Problem Index**

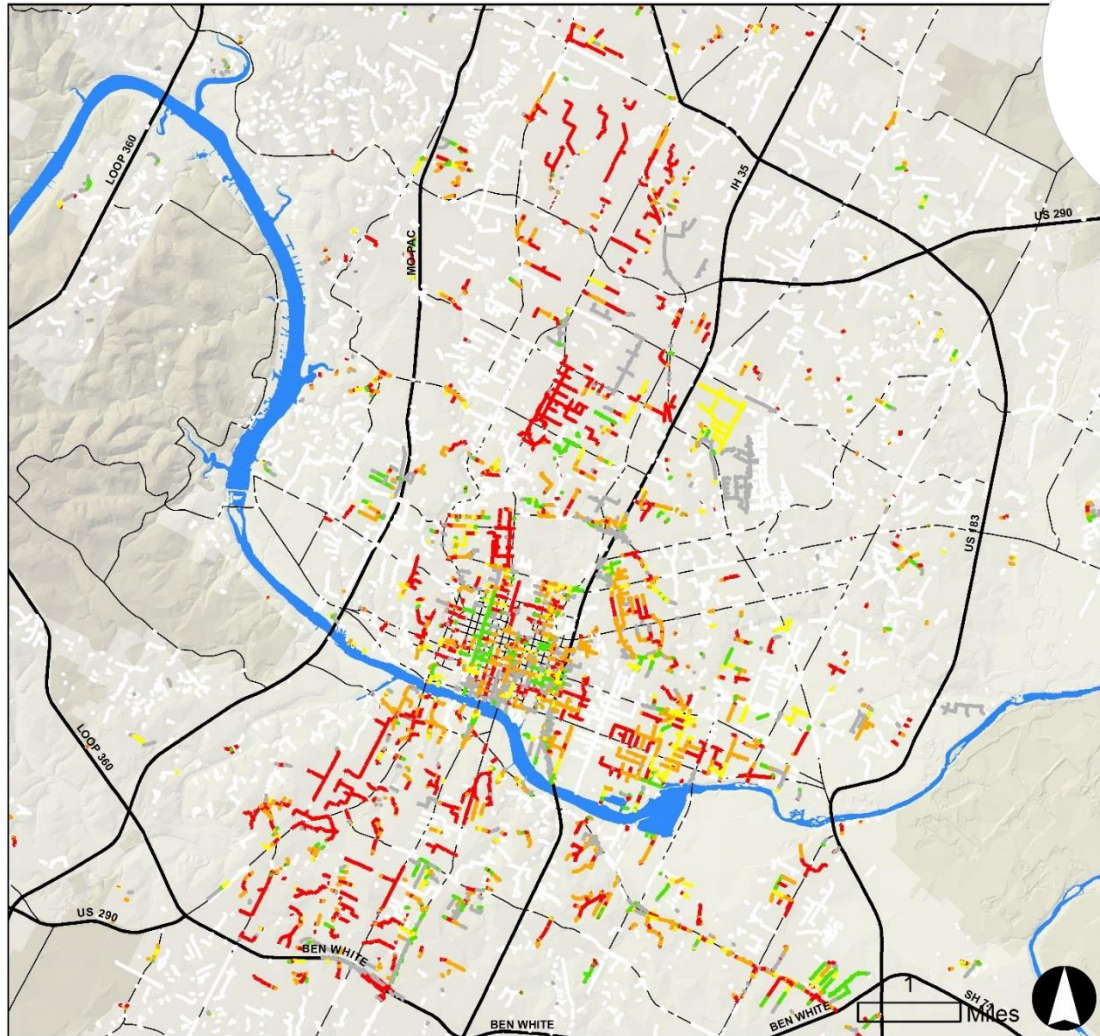
- 1 Excellent
- 2 Good
- 3 Fair
- 4 Poor
- 5 Attention Needed

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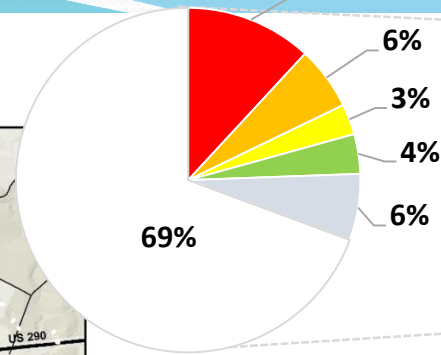
- WPD has inspected ~ 10 % of system (~100 miles)
- Mostly in CBD and local flood problem areas
- ~ 5% represented here (mapped)

**Note Condition grading alone is inadequate for determining if a pipe is in need of rehabilitation or replacement.

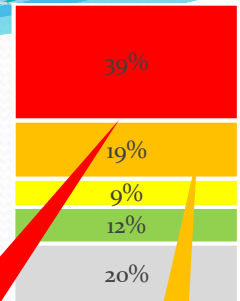
Storm Drain Capacity



Total System



Modeled System



113 miles

56 miles

Level of Service

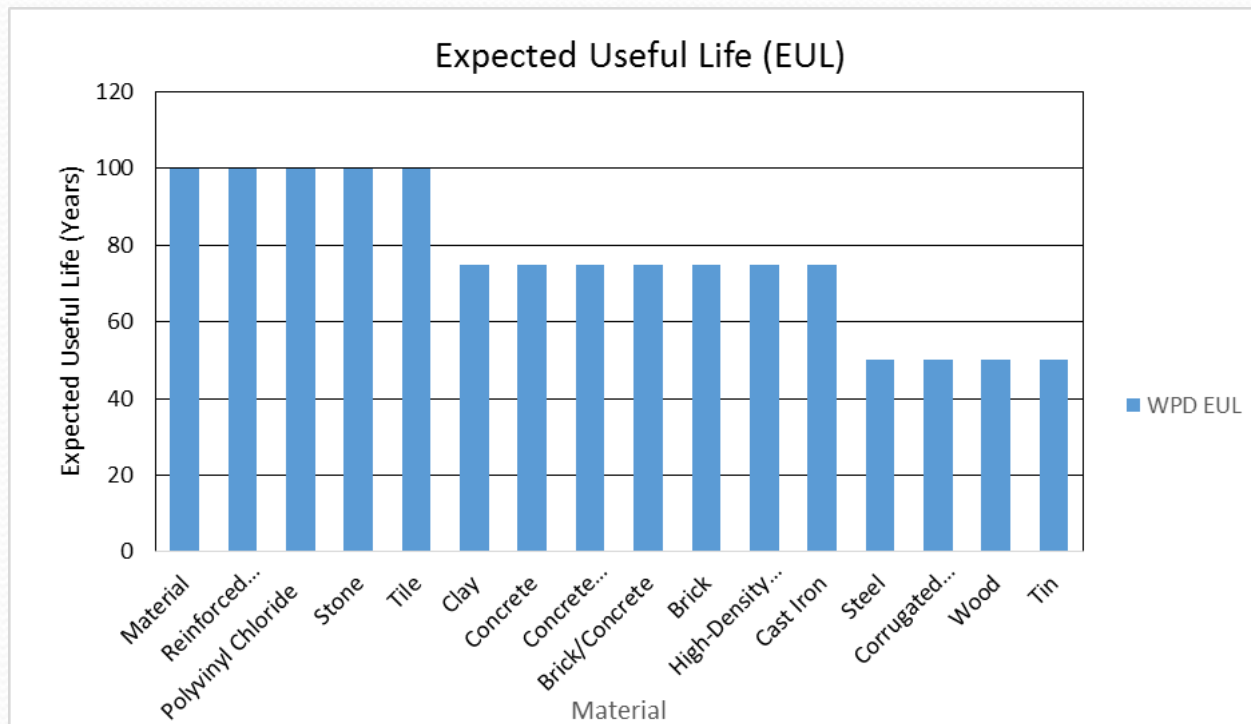
- > 100 yr storm event
- < 100 yr storm event
- < 25 yr storm event
- < 10 yr storm event
- < 2 yr storm event
- Unmodeled areas

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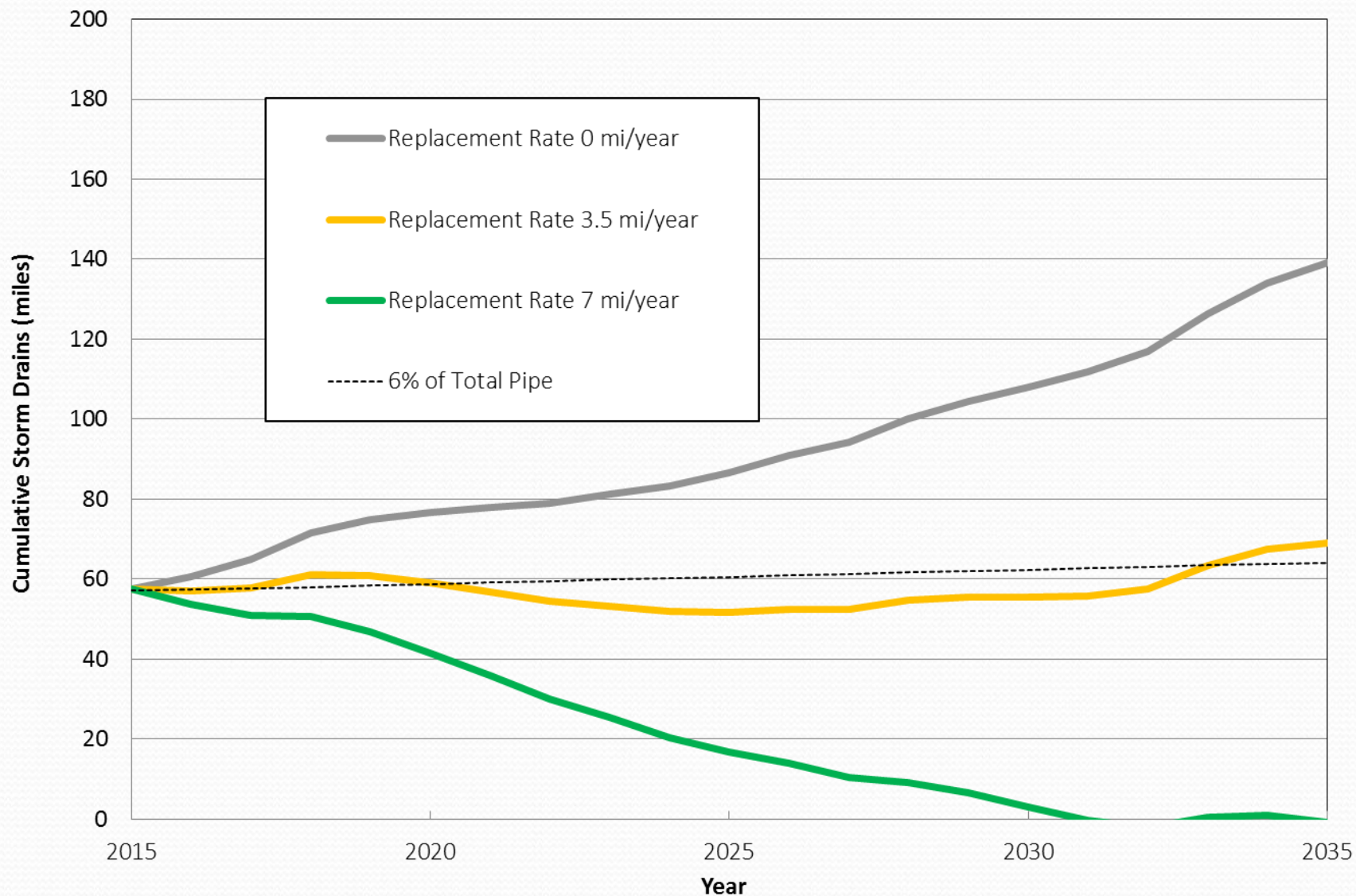
- Models indicate ~40% of sampled area have less than 2-year capacity
- Analysis is conservative, but aligns with age of pipe built before 1977
- May not indicate structural flooding (i.e. roadway has capacity)

Residual Life

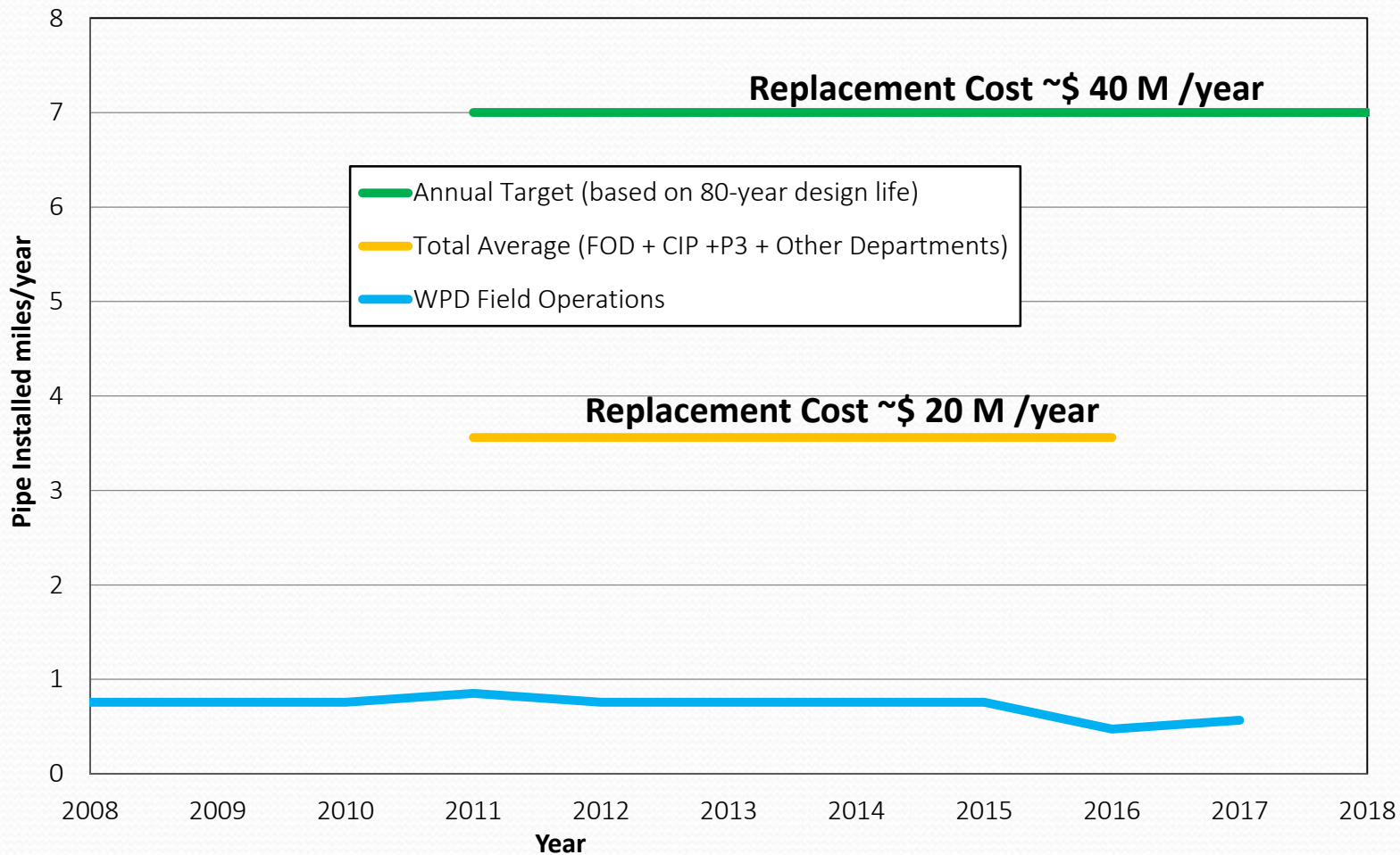
- Storm Drains – Based on material type (50 – 100-years)
- Engineered Channels - Based on material (soft = N/A)
- Natural Channels – N/A
- Ponds – Major rehab ~ 50-years



Aging Infrastructure - Storm Drains in City of Austin Pipe > 80 Years of Age

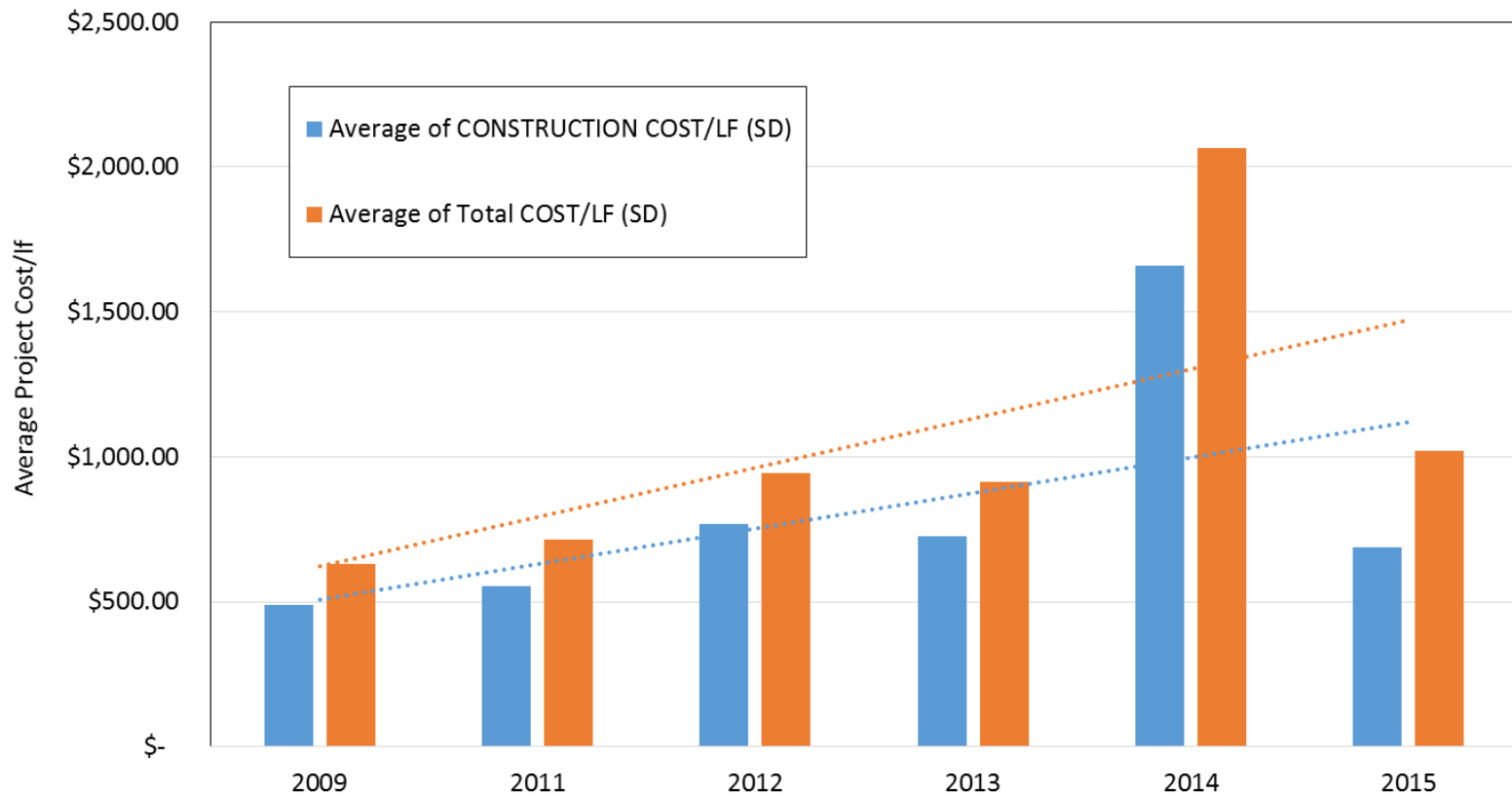


Storm Drain Replacement Performance History and Projection



Replacement Costs

WPD CIP Storm Drain System Project Construction and Total Project Costs
(includes all ancillary items and project costs)



Levels of Service

- **Asset Level of Service**
 - Capacity LOS
 - Design storm
 - Condition LOS
 - Physical Condition
 - O&M Condition (temporal)
- **Organization/Operational LOS**
 - Inspection (frequency)
 - O&M (responsiveness)
 - Rehabilitation/Replacement
 - System Upgrade

Business Risk Exposure (BRE) Model

$$\text{BRE} = \text{LoF} * \text{CoF}$$

LoF = Likelihood of Failure

CoF = Consequence of Failure

<u>Likelihood</u> Condition & Capacity	Consequences				
	1 Very low	2 Low	3 Moderate	4 High	5 Very high
Very low (1)	VL	VL	L	M	M
Low (2)	VL	VL	M	M	H
Moderate (3)	L	L	H	H	E
High (4)	L	M	H	E	E
Very high (5)	L	M	H	E	E

Key

E = extreme

H = high

M = medium

L = low

VL = very low

Pending Evaluations

- Asset Criticality
- Determine Appropriate Maintenance
- Determine Appropriate CIP
- Funding and Operational Strategy
- Build the Asset Management Plan (AMP)

WPD AM Program Progress

- FY16
 - Program Initiation
 - AM framework identification
 - Verify asset inventory
 - Review condition & capacity, assessments
 - Define of levels of service
 - In-house staff assignments in Support of AM program
 - Define program priority needs

WPD AM Program Progress

- FY17
 - AMP for Detention Ponds (pilot)
 - TV Inspection Sampling Program
 - Storm Drain TV Defect Evaluation and Repair Program
 - PWD/WPD MOU on Asset Responsibility
 - Related: In-house Small Project Delivery Process Implementation
- FY18 – FY21 Develop other AM plans
 - WQ ponds, storm drains, channels
 - Hire consultant/AM software implementation

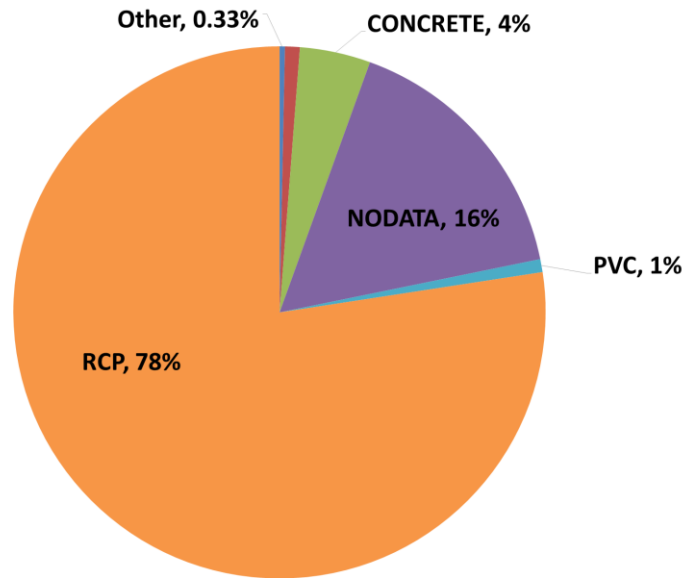
Thank you!



City of Austin

**WATERSHED
PROTECTION**

Austin Storm Drain System Material Types



STORMWATER CONTROL MEASURE
CONTROL TYPE (WPD MAINTAINED)

