Appendix A –
Project Area Maps

Exhibit A.1 **Location Map**

Exhibit A.2 **Floodplain Maps**

Exhibit A.3 **Base Map**

Exhibit A.4 **Schematic Maps of Alternatives,
Evaluation Summary and HMS Summary Results**

Exhibit A.1

Location Map

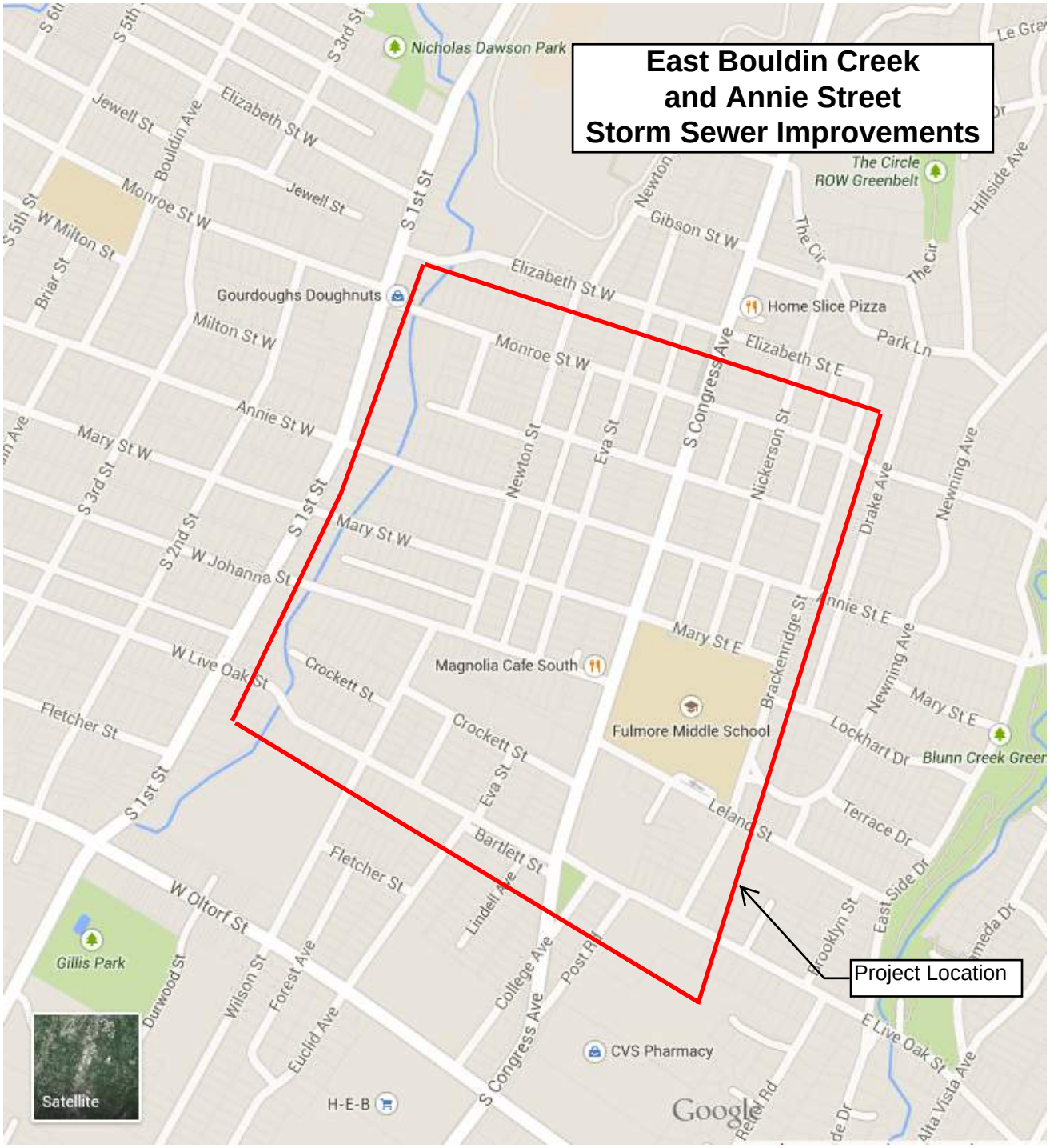
East Bouldin Creek
and Annie Street
Storm Sewer Improvements
Project Location
Nicholas Dawson Park
Gourdoughs Doughnuts
Home Slice Pizza
Magnolia Cafe South
Fulmore Middle School
CVS Pharmacy
H-E-B
Gillis Park
The Circle
ROW Greenbelt
Blunn Creek Greer
Satellite
Google
Jewell St
Elizabeth St W
Monroe St W
W Milton St
Milton St W
Annie St W
Mary St W
W Johanna St
W Live Oak St
Fletcher St
W Oltorf St
Gibson St W
Elizabeth St E
Monroe St E
Mary St E
Annie St E
Lockhart Dr
Terrace Dr
Leland St
Bartlett St
Crockett St
E Live Oak St
S 1st St
S 3rd St
S 2nd St
S 5th St
Bouldin Ave
Briar St
Newton St
Eva St
S Congress Ave
Nickerson St
Drake Ave
Newning Ave
Brackenridge St
Lindell Ave
College Ave
Post Rd
Durwood St
Wilson St
Forest Ave
Euclid Ave
Brooklyn St
East Side Dr
Hillside Ave
Park Ln
The Cir
Alta Vista Ave

Exhibit A.2

Floodplain Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the City of Austin and CAPCOG. This information was photogrammetrically compiled at a scale of at least 1:15,000 from aerial photography dated January 2003.

This map reflects more detailed and up- to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance *Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de- annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1- 877- 336- 2627) or visit the FEMA website at http://www.fema.gov/.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4475000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 14
- 6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 16, 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 5, 1997 January 19, 2000 April 15, 2002
September 26, 2008 - to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map format.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1- 800- 638- 6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0585H

FIRM
FLOOD INSURANCE RATE MAP
TRAVIS COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 585 OF 730
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TRAVIS COUNTY	481026	0585	H
AUSTIN, CITY OF	480624	0585	H
SUNSET VALLEY, CITY OF	481127	0585	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
48453C0585H

MAP REVISED
SEPTEMBER 26, 2008

Federal Emergency Management Agency

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NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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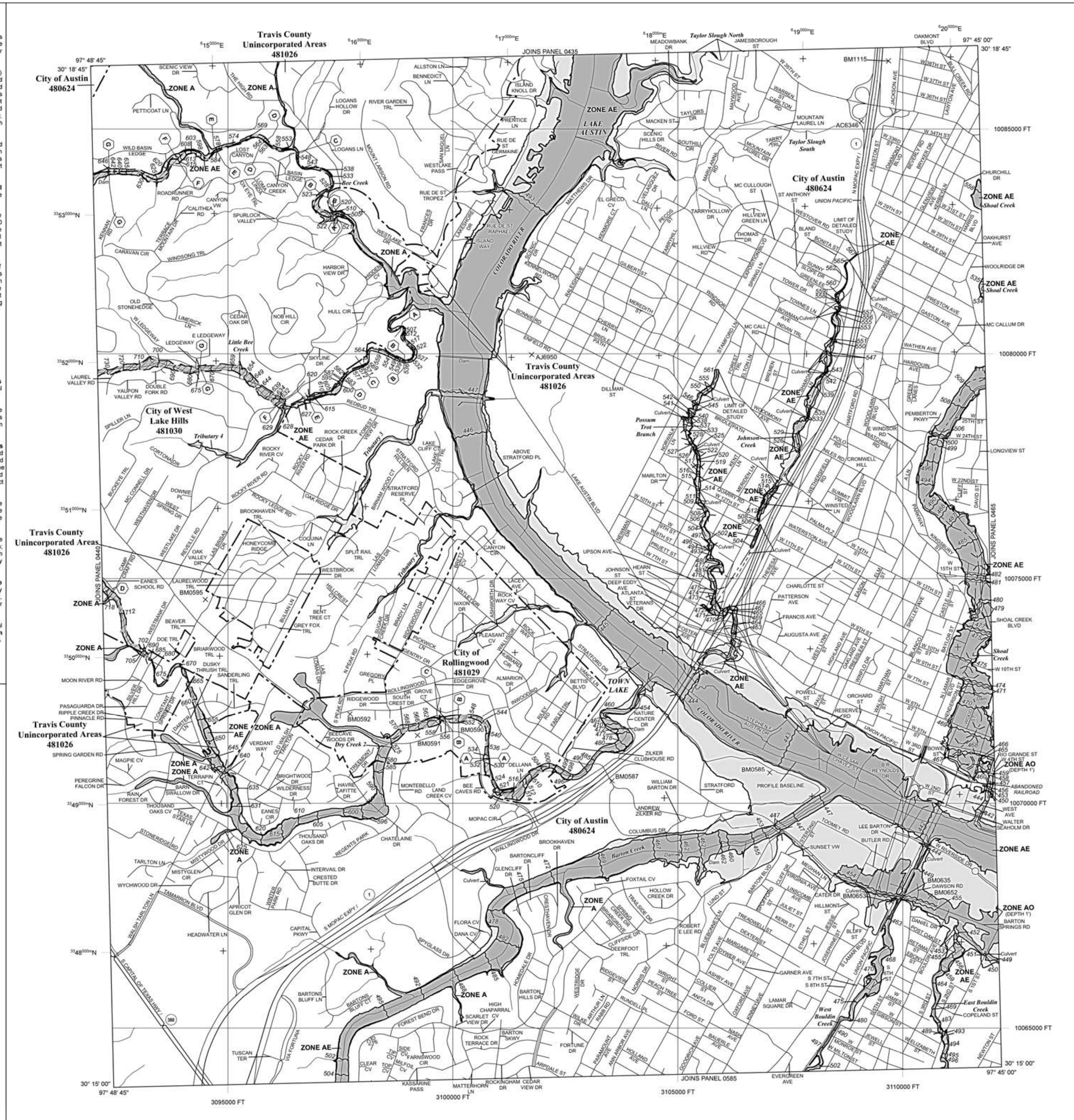

LEGEND

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OTHERWISE PROTECTED AREAS (OPAs)

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1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~ 513 ~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23) - - - - (23)	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Texas State Plane Central Zone (FIPS Zone 4203), Lambert Conformal Conic projection
4989000m N	1000-meter Universal Transverse Mercator grid values, zone 14
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• FT1,000	River Station

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 16, 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 5, 1997 January 19, 2000 April 15, 2002 September 26, 2008
January 6, 2016 - to update corporate limits, to change Special Flood Hazard Areas, to reflect updated topographic information, to incorporate previously issued Letters of Map Revision

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0445J

FIRM
FLOOD INSURANCE RATE MAP
TRAVIS COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 445 OF 730
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
AUSTIN, CITY OF	480624	0445	J
ROLLINGWOOD, CITY OF	481029	0445	J
TRAVIS COUNTY	481026	0445	J
WEST LAKE HILLS, CITY OF	481030	0445	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48453C0445J

MAP REVISED
JANUARY 6, 2016

Federal Emergency Management Agency

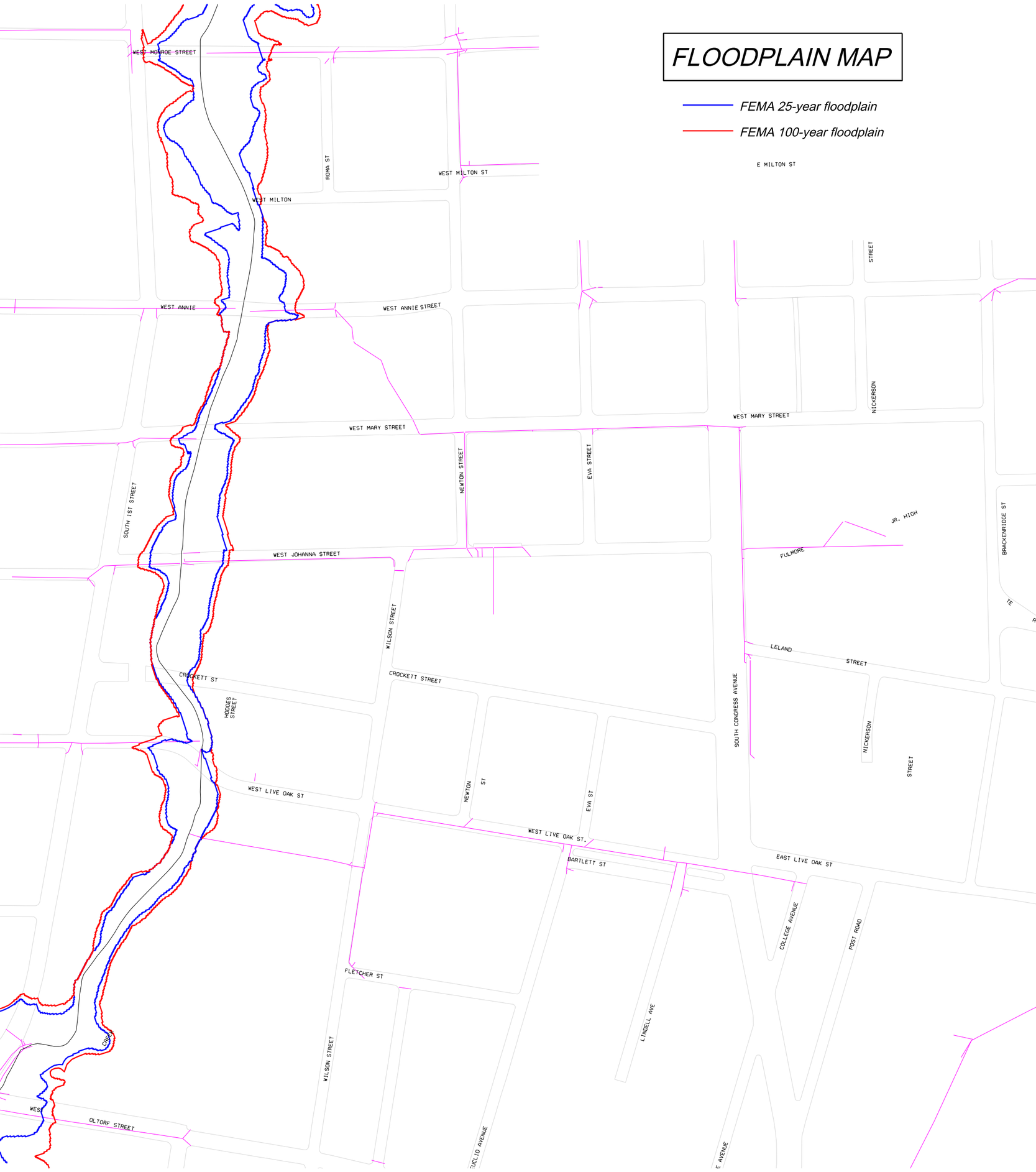
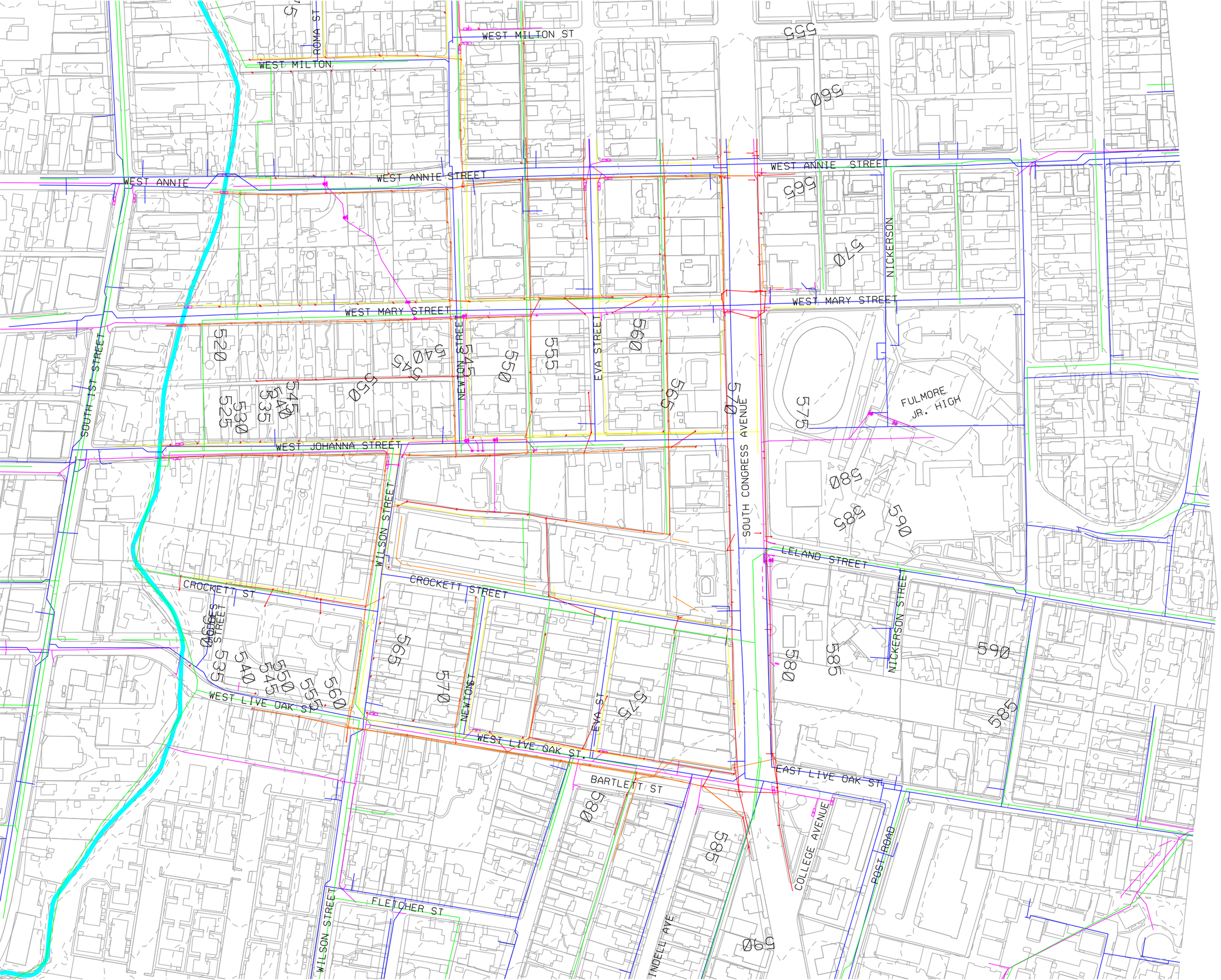

FLOODPLAIN MAP
FEMA 25-year floodplain
FEMA 100-year floodplain
WEST MONROE STREET
ROMA ST
WEST MILTON ST
E MILTON ST
WEST MILTON
WEST ANNIE
WEST ANNIE STREET
STREET
NICKERSON
WEST MARY STREET
WEST MARY STREET
NEWTON STREET
EVA STREET
SOUTH 1ST STREET
JR. HIGH
FULMORE
BRACKENRIDGE ST
WEST JOHANNA STREET
WILSON STREET
LELAND
STREET
CROCKETT ST
CROCKETT STREET
SOUTH CONGRESS AVENUE
MODGE STREET
NICKERSON
STREET
WEST LIVE OAK ST
NEWTON ST
EVA ST
WEST LIVE OAK ST.
EAST LIVE OAST ST
BARTLETT ST
COLLEGE AVENUE
POST ROAD
FLETCHER ST
LINDELL AVE
WILSON STREET
OLTORF STREET
EUCLID AVENUE

Exhibit A.3

Base Map



BASE MAP

- East Bouldin Creek
- Storm Drain Lines
- Abandoned Storm Drain Lines
- Water Lines
- Wastewater Lines
- Gas Lines
- Electric or Traffic Signal Lines
- Telecom Lines

Exhibit A.4

Schematic Maps of Alternatives,

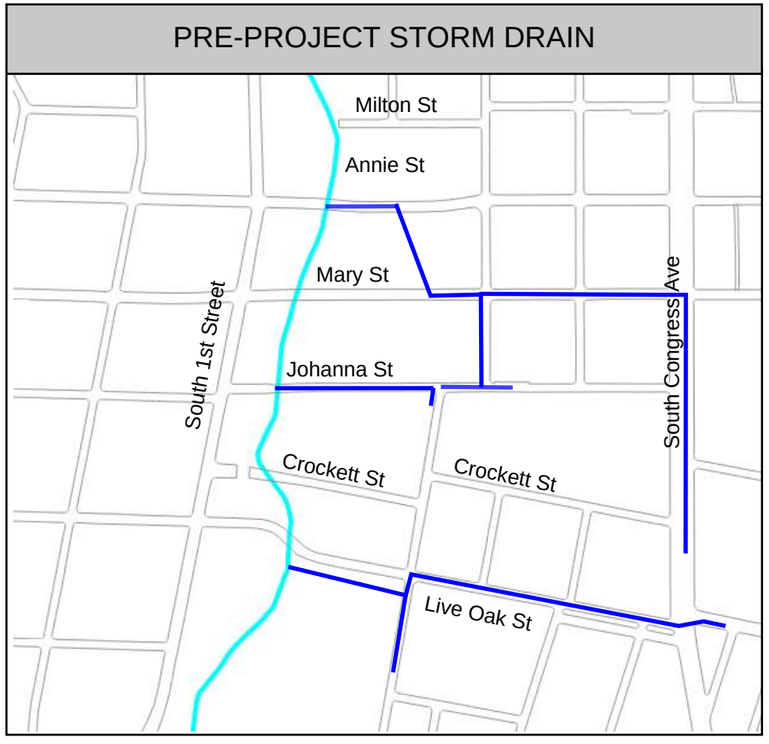
Evaluation Summary and HMS Summary Results

SCHEMATIC MAPS OF ALTERNATIVES AND DETNETION OPTIONS

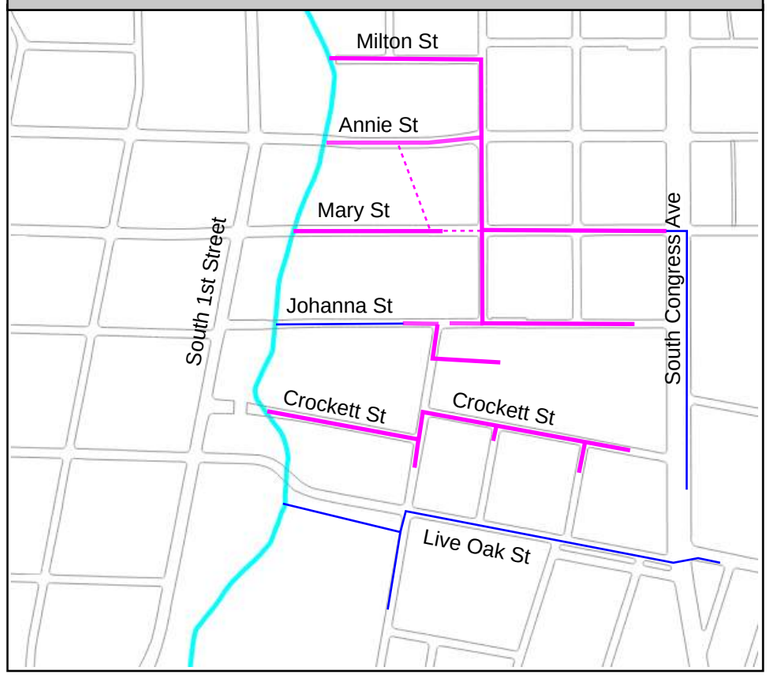
LEGEND

- Existing storm drain
- Proposed storm drain
- Storm drain to be abandoned
- East Bouldin Creek
- Detention
- Rain Garden

PRE-PROJECT STORM DRAIN



ALTERNATIVE 1



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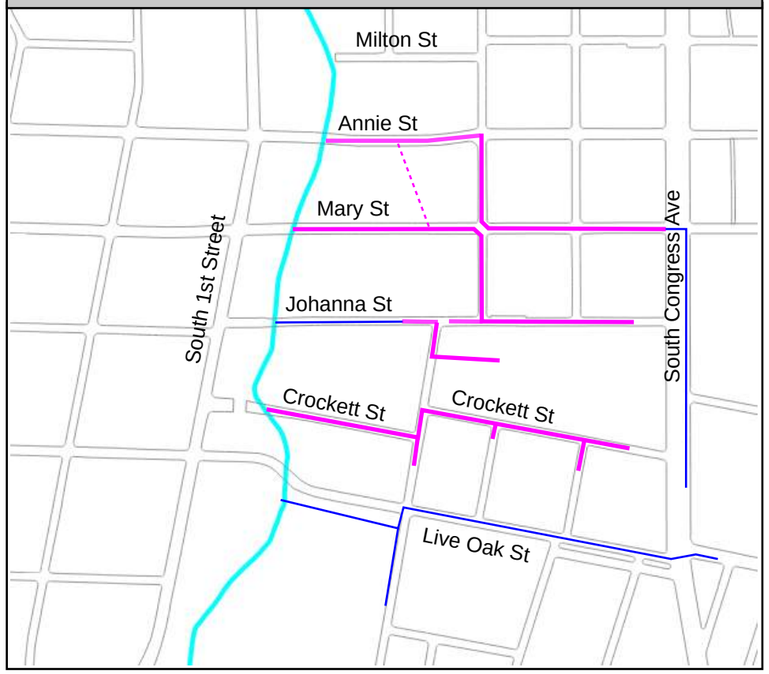

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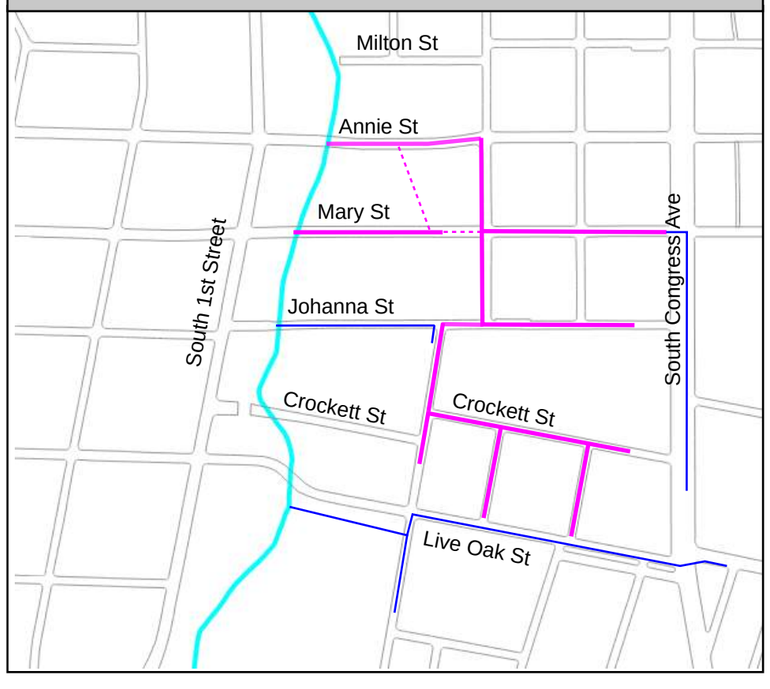
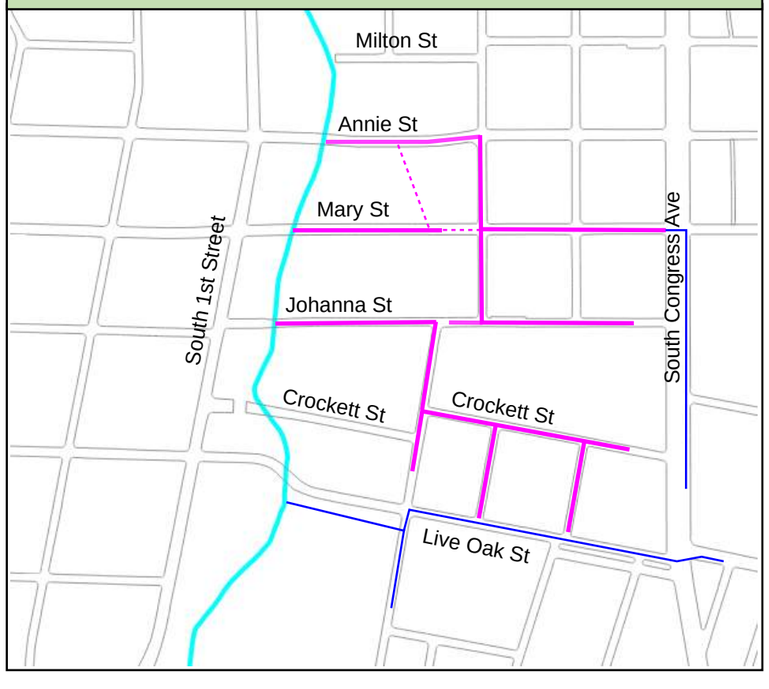
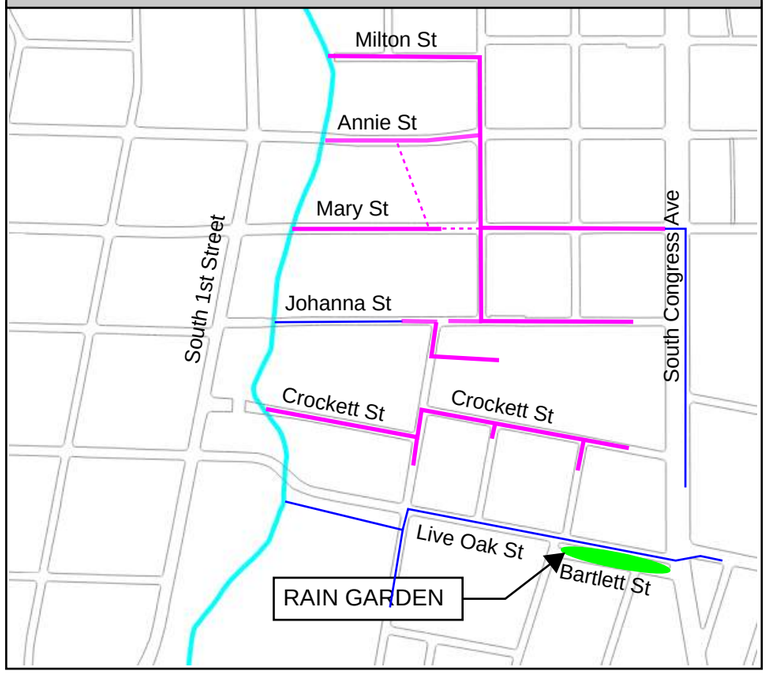


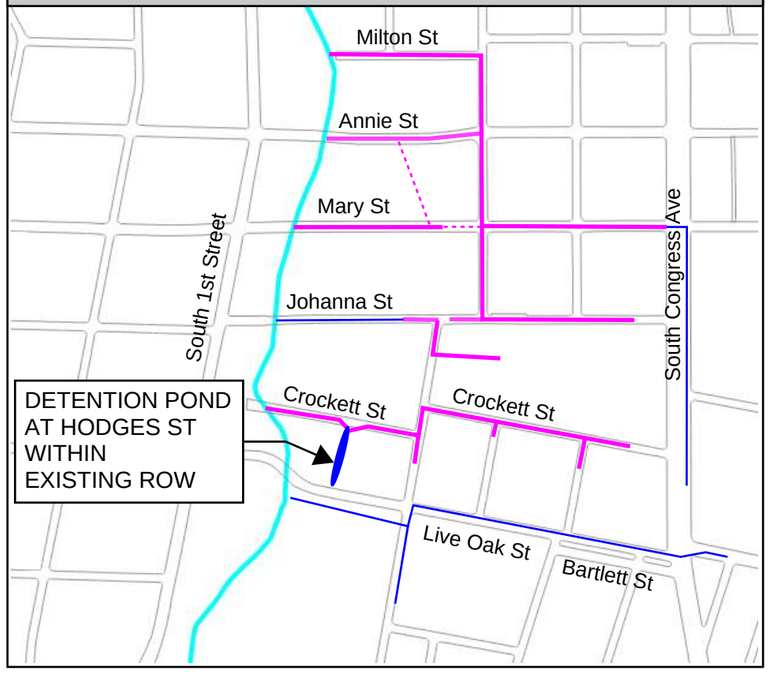
ALTERNATIVE 4



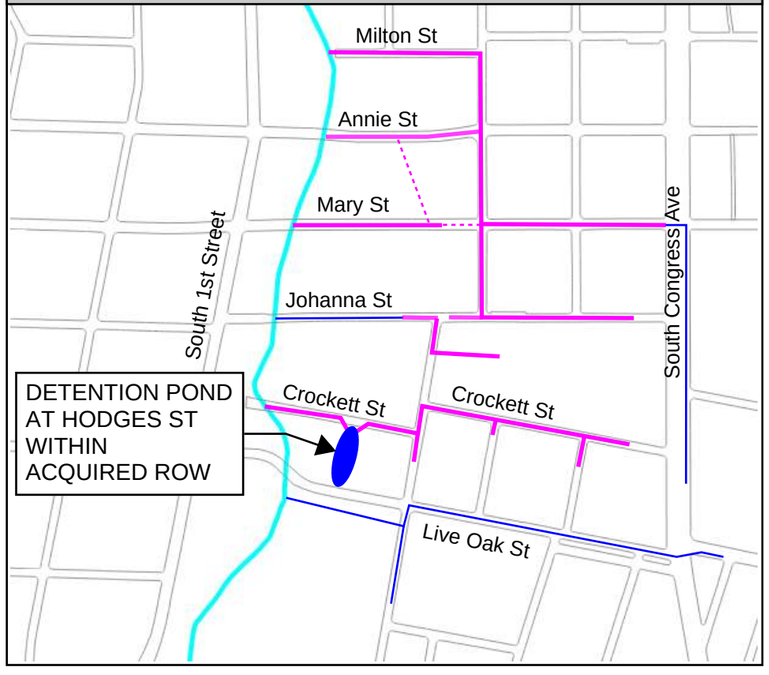
ALTERNATIVE 1, OPTION 1



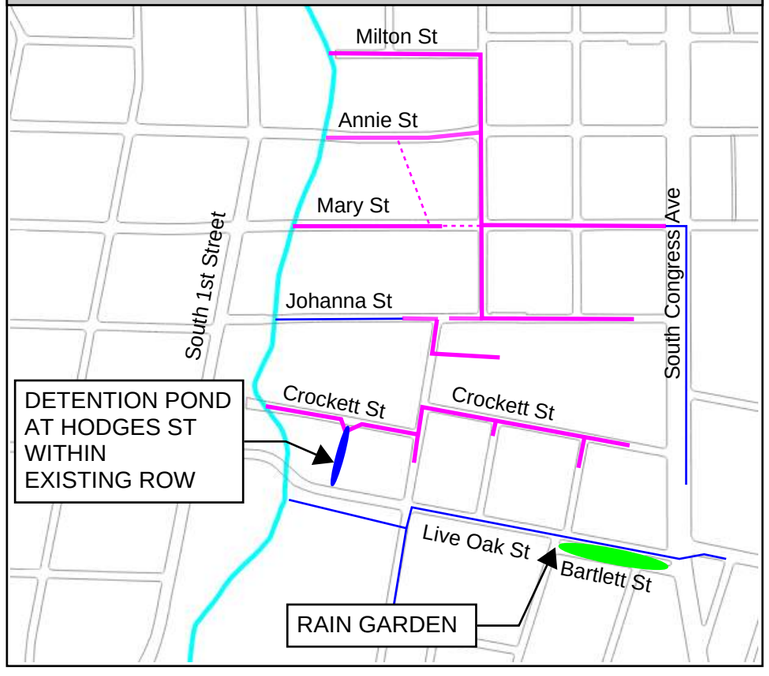
ALTERNATIVE 1, OPTION 2



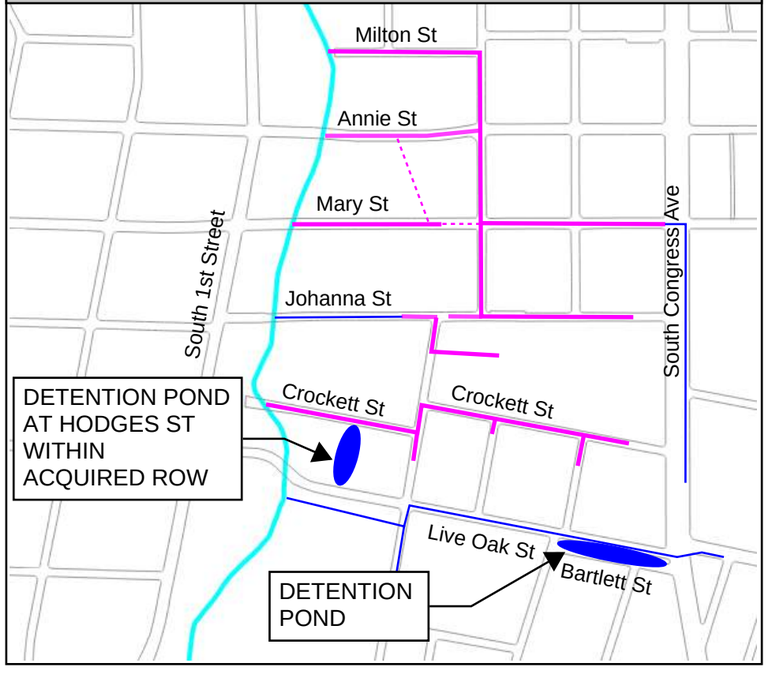
ALTERNATIVE 1, OPTION 2B



ALTERNATIVE 1&2



ALTERNATIVE 1&2B



Annie Street Storm Drain Improvements – Evaluation Summary

Review	PER	Meeting March 7, 2017					PER	Meeting June 29, 2017	PER
Storm Drain Configuration	**Alternative 1**	**Alternative 1**	**Alternative 1**	**Alternative 1**	**Alternative 1**	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4 PER Recommendation**
Creek improvements	3300 LF	None	None	None	None	None	N/A	None	None
Detention	None	**Option 1**	**Option 2**	**Option 2B**	**Option 1&2**	**Option 1&2B**	N/A	None	None
Storm Drain Cost	> $5.0 M[1]	> $5.0 M[1]	> $5.0 M[1]	> $5.0 M[1]	> $5.0 M[1]	> $5.0 M[1]	--	> $5.9 M[2]	$6.7
Creek work cost	$1.2 M	$0	$0	$0	$0	$0	--	$0	$0
Detention cost	$0	Not calculated	Not calculated	Not calculated	Not calculated	Not calculated	--	$0	$0
Total Cost	> $6.2 M[1]	Not calculated	Not calculated	Not calculated	Not calculated	Not calculated	Not calculated	> $5.9 M[2]	$6.7
Max pipe size	48” dia.[1]	48” dia.[1]	48” dia.[1]	48” dia.[1]	48” dia.[1]	48” dia.[1]	N/A	72” dia., 6’x10’ box[2]	66” dia., 5’x7’ box
Design Rainfall for pipe sizing	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Pre-Atlas 14	Atlas 14
Summary	-New outfalls to creek at Crockett, Mary, Milton Street -does not include detention in Mary Street Relief Line -creek x-sec revisions	-Bartlett St rain gardens	-Hodges St pond (existing ROW) -7 ft deep pond	-Hodges St pond (acquire ROW) -7 ft deep pond	-Hodges St pond (existing ROW) -7 ft deep pond -Bartlett St rain gardens	-Hodges St pond (existing ROW) -7 ft deep pond -Bartlett St Pond -12 ft deep pond	-New outfalls to creek at Crockett, Mary	-New outfall to creek only at Mary Street -Crockett St storm drain outfalls at Annie St -does not include detention in Mary St Relief line	-New outfall to creek only at Mary Street -Crockett St storm drain outfalls at Johanna St -upsize Johanna St storm drain -does not include detention in Mary St Relief line
Creek Flow Analysis	1.59% max flow increase is mitigated with channel improvements resulting in is 0.0’ rise in water surface elevation	- up to 2.09% flow increase	- up to 1.87% flow increase	-Less than 1% flow increase (max 0.40%)	-up to 1.98% flow increase	-up to 5.5% flow reduction	-Creek flow analysis of Alt 2 was removed from PER scope by WPD	-Less than 1% flow increase (max 0.10%)	-Less than 1% flow increase (max 0.87%)
Pros	-small pipes	-smaller pipes -No extensive creek work	-smaller pipes -No extensive creek work	-smaller pipes -No extensive creek work	-smaller pipes -No extensive creek work	-smaller pipes -No extensive creek work -Downstream flow reduction (~4%)	N/A	-No extensive creek work -storm drain sized to capture overflow from Live Oak St	-No extensive creek work -storm drain sized to capture overflow from Live Oak St -storm drain sized using Atlas 14 rainfall
Cons	-length of creek work -need USACE permit -pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	-pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	-pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	-need to acquire ROW -pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	-pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	-very deep pond at Bartlett St is not feasible -pipes will be larger when sized using Atlas 14 rainfall -Storm drain not sized for overflow from Live Oak St.	N/A	-larger pipes and box culverts -One phase construction -pipes will be larger when sized using Atlas 14 rainfall	-larger pipes and box culverts -utility relocations on Johanna St -Two phase construction

Notes:

1. Alternative 1 cost and pipe sizes will be higher after sizing pipes based on Atlas 14 rainfall and to accommodate Live Oak Street overflow. Utility relocations are not included in the cost estimate. Unit costs were updated in April 2021.
2. Alternative 3 cost and pipe sizes will be higher after sizing pipes based on Atlas 14 rainfall. Unit costs were updated in April 2021.

Comparison of ESD Revised Pre-Project Model and Proposed Alternative 1 Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 1 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 1 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised Pre-Project - Existing Conditions								Proposed Alternative 1 - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN070	571	01Jan2001, 12:18	1185	01Jan2001, 12:23	1670	01Jan2001, 12:22	2515	01Jan2001, 12:20	571	01Jan2001, 12:18	1185	01Jan2001, 12:23	1670	01Jan2001, 12:22	2515	01Jan2001, 12:20	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_Crockett	788	01Jan2001, 12:21	1620	01Jan2001, 12:28	2212	01Jan2001, 12:28	3234	01Jan2001, 12:26	798	01Jan2001, 12:21	1642	01Jan2001, 12:28	2241	01Jan2001, 12:28	3273	01Jan2001, 12:26	10	22	28	39	0.62%	1.36%	1.28%	1.19%	J_Crockett
J_Johanna	826	01Jan2001, 12:21	1677	01Jan2001, 12:27	2282	01Jan2001, 12:28	3337	01Jan2001, 12:26	830	01Jan2001, 12:22	1689	01Jan2001, 12:28	2298	01Jan2001, 12:28	3357	01Jan2001, 12:26	4	12	16	20	0.21%	0.73%	0.70%	0.60%	J_Johanna
J_Mary	851	01Jan2001, 12:22	1718	01Jan2001, 12:28	2334	01Jan2001, 12:29	3413	01Jan2001, 12:27	865	01Jan2001, 12:22	1744	01Jan2001, 12:28	2367	01Jan2001, 12:29	3459	01Jan2001, 12:27	14	26	33	47	0.83%	1.51%	1.41%	1.37%	J_Mary
J_Annie	923	01Jan2001, 12:22	1821	01Jan2001, 12:27	2454	01Jan2001, 12:29	3581	01Jan2001, 12:27	908	01Jan2001, 12:22	1807	01Jan2001, 12:28	2440	01Jan2001, 12:29	3561	01Jan2001, 12:27	-15	-14	-14	-20	-0.81%	-0.77%	-0.58%	-0.55%	J_Annie
J_Milton	927	01Jan2001, 12:22	1826	01Jan2001, 12:28	2460	01Jan2001, 12:29	3589	01Jan2001, 12:28	923	01Jan2001, 12:22	1827	01Jan2001, 12:28	2462	01Jan2001, 12:30	3591	01Jan2001, 12:28	-4	0	3	2	-0.24%	0.01%	0.12%	0.06%	J_Milton
J_Monroe	981	01Jan2001, 12:23	1907	01Jan2001, 12:28	2554	01Jan2001, 12:29	3715	01Jan2001, 12:29	976	01Jan2001, 12:23	1906	01Jan2001, 12:28	2556	01Jan2001, 12:30	3717	01Jan2001, 12:29	-5	-1	2	1	-0.26%	-0.06%	0.06%	0.03%	J_Monroe
JEBLDN080	985	01Jan2001, 12:23	1914	01Jan2001, 12:28	2562	01Jan2001, 12:30	3723	01Jan2001, 12:30	979	01Jan2001, 12:24	1912	01Jan2001, 12:28	2563	01Jan2001, 12:30	3724	01Jan2001, 12:30	-6	-2	1	1	-0.31%	-0.10%	0.04%	0.03%	JEBLDN080
JEBLDN090	1071	01Jan2001, 12:41	2147	01Jan2001, 12:40	2649	01Jan2001, 12:54	3759	01Jan2001, 12:55	1065	01Jan2001, 12:41	2140	01Jan2001, 12:41	2645	01Jan2001, 12:55	3754	01Jan2001, 12:55	-6	-7	-4	-5	-0.26%	-0.31%	-0.14%	-0.14%	JEBLDN090
JEBLDN090a	590	01Jan2001, 12:41	1201	01Jan2001, 12:40	1481	01Jan2001, 12:54	2081	01Jan2001, 12:55	587	01Jan2001, 12:41	1197	01Jan2001, 12:41	1479	01Jan2001, 12:55	2078	01Jan2001, 12:55	-3	-4	-2	-3	-0.26%	-0.32%	-0.13%	-0.14%	JEBLDN090a
JEBLDN100a	644	01Jan2001, 12:47	1294	01Jan2001, 12:47	1552	01Jan2001, 13:03	2096	01Jan2001, 13:11	640	01Jan2001, 12:47	1287	01Jan2001, 12:48	1549	01Jan2001, 13:04	2092	01Jan2001, 13:12	-4	-6	-3	-4	-0.28%	-0.49%	-0.22%	-0.18%	JEBLDN100a
JEBLDN100	708	01Jan2001, 12:45	1427	01Jan2001, 12:41	1765	01Jan2001, 12:34	2261	01Jan2001, 12:28	704	01Jan2001, 12:45	1417	01Jan2001, 12:42	1759	01Jan2001, 12:35	2257	01Jan2001, 12:28	-4	-10	-7	-4	-0.31%	-0.67%	-0.39%	-0.18%	JEBLDN100
Confluence w/ CR	712	01Jan2001, 12:50	1438	01Jan2001, 12:47	1781	01Jan2001, 12:41	2305	01Jan2001, 12:32	708	01Jan2001, 12:50	1429	01Jan2001, 12:47	1775	01Jan2001, 12:41	2301	01Jan2001, 12:32	-4	-9	-7	-4	-0.29%	-0.64%	-0.37%	-0.17%	Confluence w/ CR

Junction Name	ESD Revised Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 - Ultimate Development Conditions								Peak Flow Change from Pre-Project				Peak Flow Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN070	571	01Jan2001, 12:18	1185	01Jan2001, 12:23	1670	01Jan2001, 12:22	2515	01Jan2001, 12:20	571	01Jan2001, 12:18	1185	01Jan2001, 12:23	1670	01Jan2001, 12:22	2515	01Jan2001, 12:20	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_Crockett	820	01Jan2001, 12:21	1649	01Jan2001, 12:27	2239	01Jan2001, 12:28	3264	01Jan2001, 12:26	831	01Jan2001, 12:21	1672	01Jan2001, 12:27	2269	01Jan2001, 12:28	3304	01Jan2001, 12:26	11	23	30	40	0.69%	1.41%	1.34%	1.23%	J_Crockett
J_Johanna	862	01Jan2001, 12:21	1708	01Jan2001, 12:27	2312	01Jan2001, 12:28	3368	01Jan2001, 12:26	866	01Jan2001, 12:21	1721	01Jan2001, 12:27	2329	01Jan2001, 12:28	3390	01Jan2001, 12:26	4	13	17	21	0.23%	0.74%	0.74%	0.64%	J_Johanna
J_Mary	889	01Jan2001, 12:22	1752	01Jan2001, 12:28	2365	01Jan2001, 12:29	3445	01Jan2001, 12:27	905	01Jan2001, 12:22	1780	01Jan2001, 12:27	2399	01Jan2001, 12:29	3494	01Jan2001, 12:27	16	28	34	49	0.90%	1.59%	1.45%	1.41%	J_Mary
J_Annie	967	01Jan2001, 12:21	1859	01Jan2001, 12:27	2488	01Jan2001, 12:29	3618	01Jan2001, 12:27	951	01Jan2001, 12:22	1844	01Jan2001, 12:27	2474	01Jan2001, 12:29	3596	01Jan2001, 12:27	-16	-16	-14	-23	-0.87%	-0.83%	-0.56%	-0.62%	J_Annie
J_Milton	972	01Jan2001, 12:22	1865	01Jan2001, 12:27	2495	01Jan2001, 12:29	3626	01Jan2001, 12:28	967	01Jan2001, 12:22	1865	01Jan2001, 12:28	2497	01Jan2001, 12:29	3626	01Jan2001, 12:28	-5	0	2	1	-0.27%	0.02%	0.09%	0.02%	J_Milton
J_Monroe	1031	01Jan2001, 12:22	1950	01Jan2001, 12:27	2592	01Jan2001, 12:29	3753	01Jan2001, 12:29	1025	01Jan2001, 12:22	1948	01Jan2001, 12:28	2593	01Jan2001, 12:29	3754	01Jan2001, 12:29	-6	-2	1	1	-0.32%	-0.11%	0.03%	0.02%	J_Monroe
JEBLDN080	1036	01Jan2001, 12:23	1958	01Jan2001, 12:28	2600	01Jan2001, 12:30	3760	01Jan2001, 12:30	1030	01Jan2001, 12:23	1956	01Jan2001, 12:28	2601	01Jan2001, 12:30	3761	01Jan2001, 12:30	-6	-2	1	1	-0.29%	-0.09%	0.05%	0.03%	JEBLDN080
JEBLDN090	1137	01Jan2001, 12:40	2208	01Jan2001, 12:39	2695	01Jan2001, 12:54	3802	01Jan2001, 12:54	1130	01Jan2001, 12:40	2201	01Jan2001, 12:40	2690	01Jan2001, 12:54	3795	01Jan2001, 12:55	-7	-8	-5	-7	-0.31%	-0.35%	-0.19%	-0.19%	JEBLDN090
JEBLDN090a	628	01Jan2001, 12:40	1235	01Jan2001, 12:39	1506	01Jan2001, 12:54	2104	01Jan2001, 12:54	624	01Jan2001, 12:40	1231	01Jan2001, 12:40	1503	01Jan2001, 12:54	2101	01Jan2001, 12:55	-4	-4	-3	-4	-0.32%	-0.36%	-0.19%	-0.18%	JEBLDN090a
JEBLDN100a	683	01Jan2001, 12:46	1332	01Jan2001, 12:46	1578	01Jan2001, 13:03	2119	01Jan2001, 13:11	679	01Jan2001, 12:46	1325	01Jan2001, 12:47	1574	01Jan2001, 13:03	2114	01Jan2001, 13:12	-5	-7	-4	-5	-0.34%	-0.56%	-0.25%	-0.21%	JEBLDN100a
JEBLDN100	754	01Jan2001, 12:44	1472	01Jan2001, 12:40	1801	01Jan2001, 12:35	2297	01Jan2001, 12:27	748	01Jan2001, 12:44	1461	01Jan2001, 12:40	1795	01Jan2001, 12:33	2294	01Jan2001, 12:28	-6	-11	-5	-3	-0.37%	-0.71%	-0.29%	-0.14%	JEBLDN100
Confluence w/ CR	757	01Jan2001, 12:49	1483	01Jan2001, 12:46	1819	01Jan2001, 12:40	2343	01Jan2001, 12:31	752	01Jan2001, 12:49	1473	01Jan2001, 12:46	1813	01Jan2001, 12:40	2340	01Jan2001, 12:31	-5	-10	-6	-3	-0.36%	-0.67%	-0.31%	-0.15%	Confluence w/ CR

Comparison of ESD Revised Jan2017 Pre-Project Model and Proposed Alternative 1 OPTION 1 Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 1 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 1 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised Jan2017 Pre-Project - Existing Conditions								Proposed Alternative 1 OPTION 1 - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	255.6	01Jan2001, 12:52	616.9	01Jan2001, 12:26	842.0	01Jan2001, 12:17	1188.8	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	677.7	01Jan2001, 12:19	1410.9	01Jan2001, 12:24	1957.0	01Jan2001, 12:22	2899.9	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	736.0	01Jan2001, 12:19	1471.4	01Jan2001, 12:28	2031.6	01Jan2001, 12:27	2990.7	01Jan2001, 12:25	737	01Jan2001, 12:19	1472	01Jan2001, 12:28	2033	01Jan2001, 12:27	2992	01Jan2001, 12:25	1	1	1	1	0.12%	0.05%	0.04%	0.04%	J_LiveOak
J_Crockett	805.7	01Jan2001, 12:20	1582.8	01Jan2001, 12:27	2176.7	01Jan2001, 12:27	3206.1	01Jan2001, 12:25	818	01Jan2001, 12:19	1600	01Jan2001, 12:27	2198	01Jan2001, 12:27	3238	01Jan2001, 12:25	12	17	22	32	1.54%	1.07%	0.99%	1.01%	J_Crockett
J_Johanna	847.1	01Jan2001, 12:20	1641.4	01Jan2001, 12:27	2249.2	01Jan2001, 12:28	3314.3	01Jan2001, 12:26	853	01Jan2001, 12:20	1649	01Jan2001, 12:26	2258	01Jan2001, 12:28	3328	01Jan2001, 12:26	6	8	9	14	0.68%	0.48%	0.40%	0.41%	J_Johanna
J_Mary	871.6	01Jan2001, 12:20	1684.7	01Jan2001, 12:27	2301.5	01Jan2001, 12:28	3390.6	01Jan2001, 12:26	889	01Jan2001, 12:20	1709	01Jan2001, 12:26	2329	01Jan2001, 12:28	3433	01Jan2001, 12:26	18	24	28	43	2.04%	1.44%	1.19%	1.26%	J_Mary
J_Annie	949.9	01Jan2001, 12:20	1797.7	01Jan2001, 12:25	2424.5	01Jan2001, 12:28	3566.6	01Jan2001, 12:27	937	01Jan2001, 12:20	1779	01Jan2001, 12:25	2404	01Jan2001, 12:28	3540	01Jan2001, 12:27	-13	-19	-21	-27	-1.38%	-1.04%	-0.86%	-0.76%	J_Annie
J_Milton	954.0	01Jan2001, 12:20	1804.9	01Jan2001, 12:25	2431.4	01Jan2001, 12:29	3573.8	01Jan2001, 12:27	953	01Jan2001, 12:20	1803	01Jan2001, 12:25	2428	01Jan2001, 12:29	3570	01Jan2001, 12:27	-1	-2	-3	-4	-0.15%	-0.13%	-0.13%	-0.10%	J_Milton
J_Monroe	1012.8	01Jan2001, 12:21	1899.3	01Jan2001, 12:25	2529.0	01Jan2001, 12:29	3709.2	01Jan2001, 12:28	1011	01Jan2001, 12:21	1897	01Jan2001, 12:25	2526	01Jan2001, 12:29	3705	01Jan2001, 12:28	-2	-3	-4	-4	-0.15%	-0.13%	-0.14%	-0.12%	J_Monroe
JEBLDN080	1017.4	01Jan2001, 12:21	1907.1	01Jan2001, 12:25	2535.5	01Jan2001, 12:29	3718.2	01Jan2001, 12:29	1016	01Jan2001, 12:21	1905	01Jan2001, 12:25	2532	01Jan2001, 12:30	3714	01Jan2001, 12:29	-2	-3	-4	-5	-0.15%	-0.13%	-0.14%	-0.13%	JEBLDN080
JEBLDN090	1113.9	01Jan2001, 12:39	2165.5	01Jan2001, 12:37	2646.7	01Jan2001, 12:53	3788.9	01Jan2001, 12:53	1113	01Jan2001, 12:39	2164	01Jan2001, 12:37	2645	01Jan2001, 12:52	3785	01Jan2001, 12:53	-1	-2	-2	-4	-0.10%	-0.08%	-0.08%	-0.09%	JEBLDN090
JEBLDN090a	614.6	01Jan2001, 12:39	1211.1	01Jan2001, 12:37	1480.2	01Jan2001, 12:53	2097.2	01Jan2001, 12:53	614	01Jan2001, 12:39	1210	01Jan2001, 12:37	1479	01Jan2001, 12:52	2095	01Jan2001, 12:53	-1	-1	-1	-2	-0.10%	-0.08%	-0.07%	-0.09%	JEBLDN090a
JEBLDN100a	674.2	01Jan2001, 12:44	1319.4	01Jan2001, 12:44	1565.2	01Jan2001, 12:38	2116.4	01Jan2001, 13:10	674	01Jan2001, 12:44	1319	01Jan2001, 12:43	1566	01Jan2001, 12:38	2115	01Jan2001, 13:09	0	0	1	-1	-0.06%	-0.02%	0.04%	-0.05%	JEBLDN100a
JEBLDN100	745.1	01Jan2001, 12:43	1471.4	01Jan2001, 12:39	1801.7	01Jan2001, 12:33	2285.7	01Jan2001, 12:28	745	01Jan2001, 12:43	1472	01Jan2001, 12:39	1802	01Jan2001, 12:33	2286	01Jan2001, 12:28	0	0	1	0	-0.04%	0.03%	0.04%	0.02%	JEBLDN100
Confluence w/ CR	748.2	01Jan2001, 12:48	1482.0	01Jan2001, 12:44	1819.5	01Jan2001, 12:40	2331.1	01Jan2001, 12:32	748	01Jan2001, 12:47	1483	01Jan2001, 12:44	1820	01Jan2001, 12:40	2332	01Jan2001, 12:32	0	1	1	0	-0.03%	0.03%	0.04%	0.02%	Confluence w/ CR

Junction Name	ESD Revised Jan2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 OPTION 1 - Ultimate Development Conditions								Peak Flow Change from Pre-Project				Peak Flow Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	757	01Jan2001, 12:19	1491	01Jan2001, 12:28	2055	01Jan2001, 12:27	3014	01Jan2001, 12:25	1	1	1	1	0.11%	0.05%	0.04%	0.04%	J_LiveOak
J_Crockett	837	01Jan2001, 12:19	1608	01Jan2001, 12:27	2205	01Jan2001, 12:27	3233	01Jan2001, 12:25	851	01Jan2001, 12:19	1626	01Jan2001, 12:26	2227	01Jan2001, 12:27	3266	01Jan2001, 12:25	14	18	22	33	1.67%	1.09%	1.00%	1.02%	J_Crockett
J_Johanna	883	01Jan2001, 12:19	1669	01Jan2001, 12:26	2279	01Jan2001, 12:27	3341	01Jan2001, 12:26	890	01Jan2001, 12:19	1677	01Jan2001, 12:26	2289	01Jan2001, 12:27	3355	01Jan2001, 12:26	7	8	10	14	0.74%	0.49%	0.42%	0.42%	J_Johanna
J_Mary	911	01Jan2001, 12:20	1715	01Jan2001, 12:26	2334	01Jan2001, 12:28	3421	01Jan2001, 12:26	930	01Jan2001, 12:20	1740	01Jan2001, 12:26	2362	01Jan2001, 12:28	3464	01Jan2001, 12:26	19	26	28	43	2.09%	1.49%	1.21%	1.27%	J_Mary
J_Annie	995	01Jan2001, 12:20	1833	01Jan2001, 12:24	2460	01Jan2001, 12:28	3600	01Jan2001, 12:26	981	01Jan2001, 12:20	1813	01Jan2001, 12:24	2438	01Jan2001, 12:28	3571	01Jan2001, 12:26	-14	-20	-22	-29	-1.43%	-1.10%	-0.88%	-0.79%	J_Annie
J_Milton	1001	01Jan2001, 12:20	1841	01Jan2001, 12:24	2467	01Jan2001, 12:29	3609	01Jan2001, 12:27	999	01Jan2001, 12:20	1838	01Jan2001, 12:24	2463	01Jan2001, 12:29	3603	01Jan2001, 12:27	-2	-3	-4	-5	-0.18%	-0.16%	-0.16%	-0.15%	J_Milton
J_Monroe	1065	01Jan2001, 12:20	1941	01Jan2001, 12:24	2566	01Jan2001, 12:29	3745	01Jan2001, 12:28	1063	01Jan2001, 12:20	1938	01Jan2001, 12:24	2562	01Jan2001, 12:29	3740	01Jan2001, 12:28	-2	-3	-4	-5	-0.22%	-0.15%	-0.16%	-0.14%	J_Monroe
JEBLDN080	1070	01Jan2001, 12:21	1949	01Jan2001, 12:25	2574	01Jan2001, 12:29	3753	01Jan2001, 12:29	1068	01Jan2001, 12:21	1946	01Jan2001, 12:25	2570	01Jan2001, 12:29	3748	01Jan2001, 12:29	-2	-3	-4	-5	-0.21%	-0.15%	-0.16%	-0.14%	JEBLDN080
JEBLDN090	1196	01Jan2001, 12:37	2229	01Jan2001, 12:36	2693	01Jan2001, 12:52	3831	01Jan2001, 12:53	1194	01Jan2001, 12:37	2227	01Jan2001, 12:36	2690	01Jan2001, 12:52	3826	01Jan2001, 12:52	-2	-2	-3	-4	-0.15%	-0.10%	-0.10%	-0.11%	JEBLDN090
JEBLDN090a	661	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2120	01Jan2001, 12:53	660	01Jan2001, 12:37	1246	01Jan2001, 12:36	1504	01Jan2001, 12:52	2117	01Jan2001, 12:52	-1	-1	-2	-2	-0.17%	-0.10%	-0.10%	-0.11%	JEBLDN090a
JEBLDN100a	722	01Jan2001, 12:43	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	721	01Jan2001, 12:43	1359	01Jan2001, 12:43	1592	01Jan2001, 12:37	2137	01Jan2001, 13:09	-1	-1	1	-1	-0.11%	-0.05%	0.04%	-0.06%	JEBLDN100a
JEBLDN100	801	01Jan2001, 12:42	1519	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	800	01Jan2001, 12:42	1519	01Jan2001, 12:38	1838	01Jan2001, 12:34	2324	01Jan2001, 12:27	-1	0	1	1	-0.09%	0.01%	0.05%	0.04%	JEBLDN100
Confluence w/ CR	803	01Jan2001, 12:46	1529	01Jan2001, 12:44	1856	01Jan2001, 12:39	2370	01Jan2001, 12:31	802	01Jan2001, 12:46	1529	01Jan2001, 12:44	1857	01Jan2001, 12:39	2371	01Jan2001, 12:31	-1	0	1	1	-0.06%	0.01%	0.05%	0.04%	Confluence w/ CR

Comparison of ESD Revised Jan2017 Pre-Project Model and Proposed Alternative 1 OPTION 2 Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 1 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 1 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised Jan2017 Pre-Project - Existing Conditions								Proposed Alternative 1 OPTION 2 - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	255.6	01Jan2001, 12:52	616.9	01Jan2001, 12:26	842.0	01Jan2001, 12:17	1188.8	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	677.7	01Jan2001, 12:19	1410.9	01Jan2001, 12:24	1957.0	01Jan2001, 12:22	2899.9	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	736.0	01Jan2001, 12:19	1471.4	01Jan2001, 12:28	2031.6	01Jan2001, 12:27	2990.7	01Jan2001, 12:25	736	01Jan2001, 12:19	1471	01Jan2001, 12:28	2032	01Jan2001, 12:27	2991	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	805.7	01Jan2001, 12:20	1582.8	01Jan2001, 12:27	2176.7	01Jan2001, 12:27	3206.1	01Jan2001, 12:25	807	01Jan2001, 12:20	1600	01Jan2001, 12:27	2199	01Jan2001, 12:27	3239	01Jan2001, 12:25	1	18	22	33	0.15%	1.11%	1.02%	1.03%	J_Crockett
J_Johanna	847.1	01Jan2001, 12:20	1641.4	01Jan2001, 12:27	2249.2	01Jan2001, 12:28	3314.3	01Jan2001, 12:26	841	01Jan2001, 12:20	1650	01Jan2001, 12:26	2259	01Jan2001, 12:28	3329	01Jan2001, 12:26	-6	8	10	14	-0.68%	0.51%	0.43%	0.43%	J_Johanna
J_Mary	871.6	01Jan2001, 12:20	1684.7	01Jan2001, 12:27	2301.5	01Jan2001, 12:28	3390.6	01Jan2001, 12:26	877	01Jan2001, 12:20	1709	01Jan2001, 12:26	2330	01Jan2001, 12:28	3434	01Jan2001, 12:26	6	25	28	43	0.64%	1.47%	1.23%	1.27%	J_Mary
J_Annie	949.9	01Jan2001, 12:20	1797.7	01Jan2001, 12:25	2424.5	01Jan2001, 12:28	3566.6	01Jan2001, 12:27	924	01Jan2001, 12:20	1779	01Jan2001, 12:25	2404	01Jan2001, 12:28	3540	01Jan2001, 12:27	-26	-18	-20	-26	-2.75%	-1.02%	-0.83%	-0.74%	J_Annie
J_Milton	954.0	01Jan2001, 12:20	1804.9	01Jan2001, 12:25	2431.4	01Jan2001, 12:29	3573.8	01Jan2001, 12:27	940	01Jan2001, 12:21	1803	01Jan2001, 12:25	2429	01Jan2001, 12:29	3571	01Jan2001, 12:27	-14	-2	-3	-3	-1.49%	-0.11%	-0.11%	-0.09%	J_Milton
J_Monroe	1012.8	01Jan2001, 12:21	1899.3	01Jan2001, 12:25	2529.0	01Jan2001, 12:29	3709.2	01Jan2001, 12:28	998	01Jan2001, 12:21	1897	01Jan2001, 12:25	2526	01Jan2001, 12:29	3705	01Jan2001, 12:28	-15	-2	-3	-4	-1.48%	-0.11%	-0.11%	-0.10%	J_Monroe
JEBLDN080	1017.4	01Jan2001, 12:21	1907.1	01Jan2001, 12:25	2535.5	01Jan2001, 12:29	3718.2	01Jan2001, 12:29	1002	01Jan2001, 12:21	1905	01Jan2001, 12:25	2533	01Jan2001, 12:30	3714	01Jan2001, 12:29	-16	-2	-3	-4	-1.54%	-0.11%	-0.11%	-0.11%	JEBLDN080
JEBLDN090	1113.9	01Jan2001, 12:39	2165.5	01Jan2001, 12:37	2646.7	01Jan2001, 12:53	3788.9	01Jan2001, 12:53	1099	01Jan2001, 12:39	2164	01Jan2001, 12:37	2645	01Jan2001, 12:52	3786	01Jan2001, 12:53	-15	-1	-1	-3	-1.38%	-0.06%	-0.05%	-0.07%	JEBLDN090
JEBLDN090a	614.6	01Jan2001, 12:39	1211.1	01Jan2001, 12:37	1480.2	01Jan2001, 12:53	2097.2	01Jan2001, 12:53	606	01Jan2001, 12:39	1210	01Jan2001, 12:37	1479	01Jan2001, 12:52	2096	01Jan2001, 12:53	-9	-1	-1	-2	-1.43%	-0.06%	-0.05%	-0.07%	JEBLDN090a
JEBLDN100a	674.2	01Jan2001, 12:44	1319.4	01Jan2001, 12:44	1565.2	01Jan2001, 12:38	2116.4	01Jan2001, 13:10	665	01Jan2001, 12:45	1319	01Jan2001, 12:44	1565	01Jan2001, 12:38	2116	01Jan2001, 13:09	-9	-1	0	-1	-1.38%	-0.05%	0.01%	-0.03%	JEBLDN100a
JEBLDN100	745.1	01Jan2001, 12:43	1471.4	01Jan2001, 12:39	1801.7	01Jan2001, 12:33	2285.7	01Jan2001, 12:28	735	01Jan2001, 12:43	1470	01Jan2001, 12:39	1802	01Jan2001, 12:35	2286	01Jan2001, 12:28	-10	-1	0	0	-1.34%	-0.09%	-0.01%	0.01%	JEBLDN100
Confluence w/ CR	748.2	01Jan2001, 12:48	1482.0	01Jan2001, 12:44	1819.5	01Jan2001, 12:40	2331.1	01Jan2001, 12:32	739	01Jan2001, 12:48	1481	01Jan2001, 12:45	1819	01Jan2001, 12:40	2331	01Jan2001, 12:32	-10	-2	0	0	-1.30%	-0.10%	-0.02%	0.00%	Confluence w/ CR

Junction Name	ESD Revised Jan2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 OPTION 2 - Ultimate Development Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	837	01Jan2001, 12:19	1608	01Jan2001, 12:27	2205	01Jan2001, 12:27	3233	01Jan2001, 12:25	850	01Jan2001, 12:19	1626	01Jan2001, 12:26	2228	01Jan2001, 12:27	3266	01Jan2001, 12:25	13	18	23	34	1.53%	1.13%	1.03%	1.04%	J_Crockett
J_Johanna	883	01Jan2001, 12:19	1669	01Jan2001, 12:26	2279	01Jan2001, 12:27	3341	01Jan2001, 12:26	888	01Jan2001, 12:20	1678	01Jan2001, 12:26	2289	01Jan2001, 12:27	3356	01Jan2001, 12:26	5	9	10	15	0.51%	0.53%	0.45%	0.44%	J_Johanna
J_Mary	911	01Jan2001, 12:20	1715	01Jan2001, 12:26	2334	01Jan2001, 12:28	3421	01Jan2001, 12:26	928	01Jan2001, 12:20	1741	01Jan2001, 12:26	2363	01Jan2001, 12:28	3465	01Jan2001, 12:26	17	26	29	44	1.87%	1.52%	1.24%	1.29%	J_Mary
J_Annie	995	01Jan2001, 12:20	1833	01Jan2001, 12:24	2460	01Jan2001, 12:28	3600	01Jan2001, 12:26	977	01Jan2001, 12:21	1814	01Jan2001, 12:24	2439	01Jan2001, 12:28	3572	01Jan2001, 12:26	-19	-20	-21	-28	-1.86%	-1.07%	-0.85%	-0.78%	J_Annie
J_Milton	1001	01Jan2001, 12:20	1841	01Jan2001, 12:24	2467	01Jan2001, 12:29	3609	01Jan2001, 12:27	994	01Jan2001, 12:21	1838	01Jan2001, 12:24	2463	01Jan2001, 12:29	3604	01Jan2001, 12:27	-6	-3	-3	-5	-0.64%	-0.14%	-0.13%	-0.13%	J_Milton
J_Monroe	1065	01Jan2001, 12:20	1941	01Jan2001, 12:24	2566	01Jan2001, 12:29	3745	01Jan2001, 12:28	1055	01Jan2001, 12:21	1938	01Jan2001, 12:24	2563	01Jan2001, 12:29	3740	01Jan2001, 12:28	-10	-3	-3	-5	-0.93%	-0.13%	-0.13%	-0.12%	J_Monroe
JEBLDN080	1070	01Jan2001, 12:21	1949	01Jan2001, 12:25	2574	01Jan2001, 12:29	3753	01Jan2001, 12:29	1060	01Jan2001, 12:22	1947	01Jan2001, 12:25	2571	01Jan2001, 12:29	3748	01Jan2001, 12:29	-10	-3	-3	-5	-0.94%	-0.13%	-0.13%	-0.13%	JEBLDN080
JEBLDN090	1196	01Jan2001, 12:37	2229	01Jan2001, 12:36	2693	01Jan2001, 12:52	3831	01Jan2001, 12:53	1181	01Jan2001, 12:37	2228	01Jan2001, 12:36	2691	01Jan2001, 12:52	3827	01Jan2001, 12:52	-14	-2	-2	-4	-1.20%	-0.07%	-0.08%	-0.09%	JEBLDN090
JEBLDN090a	661	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2120	01Jan2001, 12:53	653	01Jan2001, 12:37	1246	01Jan2001, 12:36	1504	01Jan2001, 12:52	2118	01Jan2001, 12:52	-8	-1	-1	-2	-1.23%	-0.07%	-0.08%	-0.09%	JEBLDN090a
JEBLDN100a	722	01Jan2001, 12:43	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	713	01Jan2001, 12:44	1360	01Jan2001, 12:43	1592	01Jan2001, 12:37	2138	01Jan2001, 13:09	-10	-1	1	-1	-1.33%	-0.04%	0.03%	-0.04%	JEBLDN100a
JEBLDN100	801	01Jan2001, 12:42	1519	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	790	01Jan2001, 12:42	1518	01Jan2001, 12:38	1838	01Jan2001, 12:34	2324	01Jan2001, 12:27	-11	-1	0	1	-1.37%	-0.05%	0.02%	0.03%	JEBLDN100
Confluence w/ CR	803	01Jan2001, 12:46	1529	01Jan2001, 12:44	1856	01Jan2001, 12:39	2370	01Jan2001, 12:31	792	01Jan2001, 12:47	1528	01Jan2001, 12:44	1856	01Jan2001, 12:39	2371	01Jan2001, 12:31	-11	-1	0	1	-1.32%	-0.05%	0.02%	0.03%	Confluence w/ CR

Comparison of ESD Revised Jan2017 Pre-Project Model and Proposed Alternative 1 OPTION 2B Model

Required Hodges detention area = 0.77 acres

Junction Name	ESD Revised Jan2017 Pre-Project - Existing Conditions								Proposed Alternative 1 OPTION 2B - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	255.6	01Jan2001, 12:52	616.9	01Jan2001, 12:26	842.0	01Jan2001, 12:17	1188.8	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	677.7	01Jan2001, 12:19	1410.9	01Jan2001, 12:24	1957.0	01Jan2001, 12:22	2899.9	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	736.0	01Jan2001, 12:19	1471.4	01Jan2001, 12:28	2031.6	01Jan2001, 12:27	2990.7	01Jan2001, 12:25	736	01Jan2001, 12:19	1471	01Jan2001, 12:28	2032	01Jan2001, 12:27	2991	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	805.7	01Jan2001, 12:20	1582.8	01Jan2001, 12:27	2176.7	01Jan2001, 12:27	3206.1	01Jan2001, 12:25	805	01Jan2001, 12:20	1582	01Jan2001, 12:27	2175	01Jan2001, 12:27	3203	01Jan2001, 12:25	-1	-1	-2	-4	-0.11%	-0.06%	-0.07%	-0.11%	J_Crockett
J_Johanna	847.1	01Jan2001, 12:20	1641.4	01Jan2001, 12:27	2249.2	01Jan2001, 12:28	3314.3	01Jan2001, 12:26	839	01Jan2001, 12:20	1630	01Jan2001, 12:27	2236	01Jan2001, 12:28	3293	01Jan2001, 12:26	-8	-11	-14	-22	-0.93%	-0.68%	-0.61%	-0.65%	J_Johanna
J_Mary	871.6	01Jan2001, 12:20	1684.7	01Jan2001, 12:27	2301.5	01Jan2001, 12:28	3390.6	01Jan2001, 12:26	875	01Jan2001, 12:20	1688	01Jan2001, 12:27	2305	01Jan2001, 12:28	3397	01Jan2001, 12:26	4	4	4	6	0.40%	0.21%	0.15%	0.17%	J_Mary
J_Annie	949.9	01Jan2001, 12:20	1797.7	01Jan2001, 12:25	2424.5	01Jan2001, 12:28	3566.6	01Jan2001, 12:27	922	01Jan2001, 12:20	1756	01Jan2001, 12:26	2380	01Jan2001, 12:29	3503	01Jan2001, 12:27	-28	-42	-45	-64	-2.96%	-2.33%	-1.85%	-1.79%	J_Annie
J_Milton	954.0	01Jan2001, 12:20	1804.9	01Jan2001, 12:25	2431.4	01Jan2001, 12:29	3573.8	01Jan2001, 12:27	938	01Jan2001, 12:21	1779	01Jan2001, 12:26	2403	01Jan2001, 12:29	3531	01Jan2001, 12:28	-16	-26	-28	-43	-1.70%	-1.45%	-1.15%	-1.19%	J_Milton
J_Monroe	1012.8	01Jan2001, 12:21	1899.3	01Jan2001, 12:25	2529.0	01Jan2001, 12:29	3709.2	01Jan2001, 12:28	996	01Jan2001, 12:21	1871	01Jan2001, 12:25	2499	01Jan2001, 12:29	3665	01Jan2001, 12:28	-17	-28	-30	-44	-1.68%	-1.47%	-1.18%	-1.19%	J_Monroe
JEBLDN080	1017.4	01Jan2001, 12:21	1907.1	01Jan2001, 12:25	2535.5	01Jan2001, 12:29	3718.2	01Jan2001, 12:29	1000	01Jan2001, 12:22	1879	01Jan2001, 12:26	2506	01Jan2001, 12:30	3675	01Jan2001, 12:29	-18	-28	-29	-44	-1.75%	-1.48%	-1.16%	-1.17%	JEBLDN080
JEBLDN090	1113.9	01Jan2001, 12:39	2165.5	01Jan2001, 12:37	2646.7	01Jan2001, 12:53	3788.9	01Jan2001, 12:53	1096	01Jan2001, 12:39	2133	01Jan2001, 12:38	2612	01Jan2001, 12:53	3740	01Jan2001, 12:53	-18	-33	-35	-49	-1.59%	-1.52%	-1.31%	-1.29%	JEBLDN090
JEBLDN090a	614.6	01Jan2001, 12:39	1211.1	01Jan2001, 12:37	1480.2	01Jan2001, 12:53	2097.2	01Jan2001, 12:53	605	01Jan2001, 12:39	1193	01Jan2001, 12:38	1461	01Jan2001, 12:53	2071	01Jan2001, 12:53	-10	-19	-19	-26	-1.63%	-1.54%	-1.27%	-1.26%	JEBLDN090a
JEBLDN100a	674.2	01Jan2001, 12:44	1319.4	01Jan2001, 12:44	1565.2	01Jan2001, 12:38	2116.4	01Jan2001, 13:10	664	01Jan2001, 12:45	1299	01Jan2001, 12:44	1556	01Jan2001, 12:38	2092	01Jan2001, 13:10	-11	-20	-9	-24	-1.57%	-1.53%	-0.59%	-1.15%	JEBLDN100a
JEBLDN100	745.1	01Jan2001, 12:43	1471.4	01Jan2001, 12:39	1801.7	01Jan2001, 12:33	2285.7	01Jan2001, 12:28	734	01Jan2001, 12:43	1451	01Jan2001, 12:39	1790	01Jan2001, 12:33	2276	01Jan2001, 12:28	-11	-21	-11	-10	-1.50%	-1.40%	-0.63%	-0.43%	JEBLDN100
Confluence w/ CR	748.2	01Jan2001, 12:48	1482.0	01Jan2001, 12:44	1819.5	01Jan2001, 12:40	2331.1	01Jan2001, 12:32	737	01Jan2001, 12:48	1463	01Jan2001, 12:44	1808	01Jan2001, 12:40	2321	01Jan2001, 12:32	-11	-20	-12	-10	-1.46%	-1.32%	-0.66%	-0.44%	Confluence w/ CR

Junction Name	ESD Revised Jan2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 OPTION 2B - Ultimate Development Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	837	01Jan2001, 12:19	1608	01Jan2001, 12:27	2205	01Jan2001, 12:27	3232.8	01Jan2001, 12:25	836	01Jan2001, 12:19	1607	01Jan2001, 12:27	2204	01Jan2001, 12:27	3232	01Jan2001, 12:25	-1	-1	-2	-1	-0.14%	-0.06%	-0.07%	-0.03%	J_Crockett
J_Johanna	883	01Jan2001, 12:19	1669	01Jan2001, 12:26	2279	01Jan2001, 12:27	3341	01Jan2001, 12:26	874	01Jan2001, 12:19	1657	01Jan2001, 12:27	2264	01Jan2001, 12:27	3323	01Jan2001, 12:26	-9	-12	-15	-18	-1.05%	-0.72%	-0.66%	-0.54%	J_Johanna
J_Mary	911	01Jan2001, 12:20	1715	01Jan2001, 12:26	2334	01Jan2001, 12:28	3421	01Jan2001, 12:26	914	01Jan2001, 12:20	1719	01Jan2001, 12:26	2338	01Jan2001, 12:28	3429	01Jan2001, 12:26	3	4	4	8	0.37%	0.23%	0.15%	0.24%	J_Mary
J_Annie	995	01Jan2001, 12:20	1833	01Jan2001, 12:24	2460	01Jan2001, 12:28	3600	01Jan2001, 12:26	965	01Jan2001, 12:20	1789	01Jan2001, 12:25	2413	01Jan2001, 12:28	3536	01Jan2001, 12:27	-31	-45	-48	-63	-3.07%	-2.44%	-1.93%	-1.76%	J_Annie
J_Milton	1001	01Jan2001, 12:20	1841	01Jan2001, 12:24	2467	01Jan2001, 12:29	3609	01Jan2001, 12:27	982	01Jan2001, 12:20	1813	01Jan2001, 12:25	2438	01Jan2001, 12:29	3566	01Jan2001, 12:27	-19	-28	-29	-43	-1.89%	-1.53%	-1.18%	-1.19%	J_Milton
J_Monroe	1065	01Jan2001, 12:20	1941	01Jan2001, 12:24	2566	01Jan2001, 12:29	3745	01Jan2001, 12:28	1045	01Jan2001, 12:20	1910	01Jan2001, 12:25	2536	01Jan2001, 12:29	3701	01Jan2001, 12:28	-20	-31	-31	-44	-1.89%	-1.59%	-1.20%	-1.18%	J_Monroe
JEBLDN080	1070	01Jan2001, 12:21	1949	01Jan2001, 12:25	2574	01Jan2001, 12:29	3753	01Jan2001, 12:29	1051	01Jan2001, 12:21	1919	01Jan2001, 12:25	2543	01Jan2001, 12:30	3710	01Jan2001, 12:29	-20	-30	-32	-43	-1.83%	-1.56%	-1.23%	-1.15%	JEBLDN080
JEBLDN090	1196	01Jan2001, 12:37	2229	01Jan2001, 12:36	2693	01Jan2001, 12:52	3831	01Jan2001, 12:53	1170	01Jan2001, 12:38	2193	01Jan2001, 12:37	2655	01Jan2001, 12:52	3783	01Jan2001, 12:53	-26	-36	-38	-47	-2.14%	-1.62%	-1.41%	-1.23%	JEBLDN090
JEBLDN090a	661	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2120	01Jan2001, 12:53	646	01Jan2001, 12:38	1227	01Jan2001, 12:37	1485	01Jan2001, 12:52	2094	01Jan2001, 12:53	-15	-21	-21	-26	-2.21%	-1.64%	-1.37%	-1.21%	JEBLDN090a
JEBLDN100a	722	01Jan2001, 12:43	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	708	01Jan2001, 12:43	1338	01Jan2001, 12:43	1582	01Jan2001, 12:37	2115	01Jan2001, 13:10	-15	-22	-9	-24	-2.04%	-1.62%	-0.57%	-1.12%	JEBLDN100a
JEBLDN100	801	01Jan2001, 12:42	1519	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	785	01Jan2001, 12:42	1497	01Jan2001, 12:38	1825	01Jan2001, 12:34	2313	01Jan2001, 12:27	-16	-22	-12	-10	-1.96%	-1.45%	-0.65%	-0.41%	JEBLDN100
Confluence w/ CR	803	01Jan2001, 12:46	1529	01Jan2001, 12:44	1856	01Jan2001, 12:39	2370	01Jan2001, 12:31	788	01Jan2001, 12:47	1507	01Jan2001, 12:43	1844	01Jan2001, 12:39	2360	01Jan2001, 12:31	-15	-21	-12	-10	-1.87%	-1.39%	-0.62%	-0.42%	Confluence w/ CR

Comparison of ESD Revised Jan2017 Pre-Project Model and Proposed Alternative 1 OPTION 1&2 Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 1 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 1 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised Jan2017 Pre-Project - Existing Conditions								Proposed Alternative 1 OPTION 1&2 - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	255.6	01Jan2001, 12:52	616.9	01Jan2001, 12:26	842.0	01Jan2001, 12:17	1188.8	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	677.7	01Jan2001, 12:19	1410.9	01Jan2001, 12:24	1957.0	01Jan2001, 12:22	2899.9	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	736.0	01Jan2001, 12:19	1471.4	01Jan2001, 12:28	2031.6	01Jan2001, 12:27	2990.7	01Jan2001, 12:25	737	01Jan2001, 12:19	1472	01Jan2001, 12:28	2033	01Jan2001, 12:27	2992	01Jan2001, 12:25	1	1	1	1	0.12%	0.05%	0.04%	0.04%	J_LiveOak
J_Crockett	805.7	01Jan2001, 12:20	1582.8	01Jan2001, 12:27	2176.7	01Jan2001, 12:27	3206.1	01Jan2001, 12:25	808	01Jan2001, 12:20	1601	01Jan2001, 12:27	2200	01Jan2001, 12:27	3240	01Jan2001, 12:25	2	18	23	34	0.25%	1.15%	1.06%	1.06%	J_Crockett
J_Johanna	847.1	01Jan2001, 12:20	1641.4	01Jan2001, 12:27	2249.2	01Jan2001, 12:28	3314.3	01Jan2001, 12:26	840	01Jan2001, 12:20	1647	01Jan2001, 12:27	2256	01Jan2001, 12:28	3323	01Jan2001, 12:26	-8	5	6	9	-0.90%	0.33%	0.28%	0.27%	J_Johanna
J_Mary	871.6	01Jan2001, 12:20	1684.7	01Jan2001, 12:27	2301.5	01Jan2001, 12:28	3390.6	01Jan2001, 12:26	875	01Jan2001, 12:20	1706	01Jan2001, 12:26	2326	01Jan2001, 12:28	3428	01Jan2001, 12:26	4	22	25	38	0.44%	1.28%	1.07%	1.11%	J_Mary
J_Annie	949.9	01Jan2001, 12:20	1797.7	01Jan2001, 12:25	2424.5	01Jan2001, 12:28	3566.6	01Jan2001, 12:27	922	01Jan2001, 12:20	1776	01Jan2001, 12:25	2401	01Jan2001, 12:29	3535	01Jan2001, 12:27	-28	-22	-24	-32	-2.94%	-1.21%	-0.98%	-0.88%	J_Annie
J_Milton	954.0	01Jan2001, 12:20	1804.9	01Jan2001, 12:25	2431.4	01Jan2001, 12:29	3573.8	01Jan2001, 12:27	938	01Jan2001, 12:21	1799	01Jan2001, 12:25	2425	01Jan2001, 12:29	3565	01Jan2001, 12:27	-16	-6	-6	-9	-1.68%	-0.30%	-0.26%	-0.25%	J_Milton
J_Monroe	1012.8	01Jan2001, 12:21	1899.3	01Jan2001, 12:25	2529.0	01Jan2001, 12:29	3709.2	01Jan2001, 12:28	996	01Jan2001, 12:21	1894	01Jan2001, 12:25	2522	01Jan2001, 12:29	3700	01Jan2001, 12:28	-17	-6	-7	-10	-1.67%	-0.29%	-0.27%	-0.26%	J_Monroe
JEBLDN080	1017.4	01Jan2001, 12:21	1907.1	01Jan2001, 12:25	2535.5	01Jan2001, 12:29	3718.2	01Jan2001, 12:29	1000	01Jan2001, 12:22	1902	01Jan2001, 12:25	2529	01Jan2001, 12:30	3708	01Jan2001, 12:29	-18	-6	-7	-10	-1.74%	-0.29%	-0.26%	-0.26%	JEBLDN080
JEBLDN090	1113.9	01Jan2001, 12:39	2165.5	01Jan2001, 12:37	2646.7	01Jan2001, 12:53	3788.9	01Jan2001, 12:53	1096	01Jan2001, 12:39	2160	01Jan2001, 12:37	2640	01Jan2001, 12:53	3779	01Jan2001, 12:53	-18	-6	-6	-10	-1.64%	-0.26%	-0.24%	-0.26%	JEBLDN090
JEBLDN090a	614.6	01Jan2001, 12:39	1211.1	01Jan2001, 12:37	1480.2	01Jan2001, 12:53	2097.2	01Jan2001, 12:53	604	01Jan2001, 12:39	1208	01Jan2001, 12:37	1477	01Jan2001, 12:53	2092	01Jan2001, 12:53	-10	-3	-4	-5	-1.69%	-0.26%	-0.24%	-0.25%	JEBLDN090a
JEBLDN100a	674.2	01Jan2001, 12:44	1319.4	01Jan2001, 12:44	1565.2	01Jan2001, 12:38	2116.4	01Jan2001, 13:10	663	01Jan2001, 12:45	1315	01Jan2001, 12:44	1562	01Jan2001, 12:38	2112	01Jan2001, 13:10	-11	-4	-3	-5	-1.66%	-0.33%	-0.19%	-0.22%	JEBLDN100a
JEBLDN100	745.1	01Jan2001, 12:43	1471.4	01Jan2001, 12:39	1801.7	01Jan2001, 12:33	2285.7	01Jan2001, 12:28	733	01Jan2001, 12:43	1465	01Jan2001, 12:39	1797	01Jan2001, 12:33	2282	01Jan2001, 12:28	-12	-6	-4	-4	-1.65%	-0.43%	-0.24%	-0.15%	JEBLDN100
Confluence w/ CR	748.2	01Jan2001, 12:48	1482.0	01Jan2001, 12:44	1819.5	01Jan2001, 12:40	2331.1	01Jan2001, 12:32	736	01Jan2001, 12:48	1476	01Jan2001, 12:45	1815	01Jan2001, 12:40	2327	01Jan2001, 12:32	-12	-7	-5	-4	-1.60%	-0.44%	-0.26%	-0.16%	Confluence w/ CR

Junction Name	ESD Revised Jan2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 OPTION 1&2 - Ultimate Development Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	757	01Jan2001, 12:19	1491	01Jan2001, 12:28	2055	01Jan2001, 12:27	3014	01Jan2001, 12:25	1	1	1	1	0.11%	0.05%	0.04%	0.04%	J_LiveOak
J_Crockett	837	01Jan2001, 12:19	1608	01Jan2001, 12:27	2205	01Jan2001, 12:27	3233	01Jan2001, 12:25	851	01Jan2001, 12:19	1627	01Jan2001, 12:26	2229	01Jan2001, 12:27	3268	01Jan2001, 12:25	14	19	24	35	1.65%	1.18%	1.07%	1.07%	J_Crockett
J_Johanna	883	01Jan2001, 12:19	1669	01Jan2001, 12:26	2279	01Jan2001, 12:27	3341	01Jan2001, 12:26	888	01Jan2001, 12:20	1679	01Jan2001, 12:26	2290	01Jan2001, 12:27	3357	01Jan2001, 12:26	5	10	11	16	0.61%	0.57%	0.49%	0.47%	J_Johanna
J_Mary	911	01Jan2001, 12:20	1715	01Jan2001, 12:26	2334	01Jan2001, 12:28	3421	01Jan2001, 12:26	929	01Jan2001, 12:20	1742	01Jan2001, 12:25	2364	01Jan2001, 12:28	3466	01Jan2001, 12:26	18	27	30	45	1.98%	1.56%	1.27%	1.32%	J_Mary
J_Annie	995	01Jan2001, 12:20	1833	01Jan2001, 12:24	2460	01Jan2001, 12:28	3600	01Jan2001, 12:26	978	01Jan2001, 12:20	1815	01Jan2001, 12:24	2440	01Jan2001, 12:28	3573	01Jan2001, 12:26	-18	-19	-20	-27	-1.76%	-1.01%	-0.82%	-0.74%	J_Annie
J_Milton	1001	01Jan2001, 12:20	1841	01Jan2001, 12:24	2467	01Jan2001, 12:29	3609	01Jan2001, 12:27	995	01Jan2001, 12:21	1839	01Jan2001, 12:24	2464	01Jan2001, 12:29	3605	01Jan2001, 12:27	-5	-1	-2	-4	-0.54%	-0.08%	-0.10%	-0.10%	J_Milton
J_Monroe	1065	01Jan2001, 12:20	1941	01Jan2001, 12:24	2566	01Jan2001, 12:29	3745	01Jan2001, 12:28	1056	01Jan2001, 12:21	1940	01Jan2001, 12:24	2564	01Jan2001, 12:29	3742	01Jan2001, 12:28	-9	-1	-3	-3	-0.84%	-0.06%	-0.10%	-0.09%	J_Monroe
JEBLDN080	1070	01Jan2001, 12:21	1949	01Jan2001, 12:25	2574	01Jan2001, 12:29	3753	01Jan2001, 12:29	1061	01Jan2001, 12:22	1948	01Jan2001, 12:25	2572	01Jan2001, 12:29	3750	01Jan2001, 12:29	-9	-1	-3	-4	-0.85%	-0.06%	-0.10%	-0.10%	JEBLDN080
JEBLDN090	1196	01Jan2001, 12:37	2229	01Jan2001, 12:36	2693	01Jan2001, 12:52	3831	01Jan2001, 12:53	1182	01Jan2001, 12:37	2229	01Jan2001, 12:36	2692	01Jan2001, 12:52	3828	01Jan2001, 12:52	-14	0	-1	-2	-1.13%	-0.02%	-0.04%	-0.06%	JEBLDN090
JEBLDN090a	661	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2120	01Jan2001, 12:53	653	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2119	01Jan2001, 12:52	-8	0	-1	-1	-1.16%	-0.02%	-0.04%	-0.06%	JEBLDN090a
JEBLDN100a	722	01Jan2001, 12:43	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	713	01Jan2001, 12:44	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	-9	0	0	-1	-1.29%	-0.03%	0.01%	-0.02%	JEBLDN100a
JEBLDN100	801	01Jan2001, 12:42	1519	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	790	01Jan2001, 12:42	1518	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	-11	-1	0	0	-1.35%	-0.08%	-0.01%	0.01%	JEBLDN100
Confluence w/ CR	803	01Jan2001, 12:46	1529	01Jan2001, 12:44	1856	01Jan2001, 12:39	2370	01Jan2001, 12:31	792	01Jan2001, 12:47	1528	01Jan2001, 12:44	1856	01Jan2001, 12:39	2371	01Jan2001, 12:31	-10	-1	0	0	-1.30%	-0.08%	-0.01%	0.01%	Confluence w/ CR

Comparison of ESD Revised Jan2017 Pre-Project Model and Proposed Alternative 1 OPTION 1&2 B Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 1 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 1 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised Jan2017 Pre-Project - Existing Conditions								Proposed Alternative 1 OPTION 1&2 B - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	255.6	01Jan2001, 12:52	616.9	01Jan2001, 12:26	842.0	01Jan2001, 12:17	1188.8	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	677.7	01Jan2001, 12:19	1410.9	01Jan2001, 12:24	1957.0	01Jan2001, 12:22	2899.9	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	736.0	01Jan2001, 12:19	1471.4	01Jan2001, 12:28	2031.6	01Jan2001, 12:27	2990.7	01Jan2001, 12:25	715	01Jan2001, 12:20	1447	01Jan2001, 12:29	1998	01Jan2001, 12:28	2944	01Jan2001, 12:25	-21	-25	-34	-47	-2.81%	-1.69%	-1.67%	-1.59%	J_LiveOak
J_Crockett	805.7	01Jan2001, 12:20	1582.8	01Jan2001, 12:27	2176.7	01Jan2001, 12:27	3206.1	01Jan2001, 12:25	785	01Jan2001, 12:20	1572	01Jan2001, 12:27	2162	01Jan2001, 12:28	3190	01Jan2001, 12:25	-20	-11	-14	-16	-2.52%	-0.70%	-0.66%	-0.49%	J_Crockett
J_Johanna	847.1	01Jan2001, 12:20	1641.4	01Jan2001, 12:27	2249.2	01Jan2001, 12:28	3314.3	01Jan2001, 12:26	816	01Jan2001, 12:20	1616	01Jan2001, 12:27	2219	01Jan2001, 12:28	3275	01Jan2001, 12:26	-31	-25	-31	-39	-3.66%	-1.53%	-1.36%	-1.20%	J_Johanna
J_Mary	871.6	01Jan2001, 12:20	1684.7	01Jan2001, 12:27	2301.5	01Jan2001, 12:28	3390.6	01Jan2001, 12:26	852	01Jan2001, 12:21	1674	01Jan2001, 12:27	2287	01Jan2001, 12:28	3375	01Jan2001, 12:27	-20	-11	-14	-15	-2.25%	-0.66%	-0.61%	-0.45%	J_Mary
J_Annie	949.9	01Jan2001, 12:20	1797.7	01Jan2001, 12:25	2424.5	01Jan2001, 12:28	3566.6	01Jan2001, 12:27	898	01Jan2001, 12:21	1740	01Jan2001, 12:26	2362	01Jan2001, 12:29	3483	01Jan2001, 12:27	-52	-58	-62	-84	-5.51%	-3.23%	-2.57%	-2.41%	J_Annie
J_Milton	954.0	01Jan2001, 12:20	1804.9	01Jan2001, 12:25	2431.4	01Jan2001, 12:29	3573.8	01Jan2001, 12:27	912	01Jan2001, 12:22	1762	01Jan2001, 12:26	2385	01Jan2001, 12:29	3512	01Jan2001, 12:28	-42	-43	-46	-62	-4.38%	-2.39%	-1.90%	-1.77%	J_Milton
J_Monroe	1012.8	01Jan2001, 12:21	1899.3	01Jan2001, 12:25	2529.0	01Jan2001, 12:29	3709.2	01Jan2001, 12:28	968	01Jan2001, 12:22	1852	01Jan2001, 12:26	2480	01Jan2001, 12:29	3642	01Jan2001, 12:29	-45	-47	-49	-67	-4.42%	-2.49%	-1.95%	-1.84%	J_Monroe
JEBLDN080	1017.4	01Jan2001, 12:21	1907.1	01Jan2001, 12:25	2535.5	01Jan2001, 12:29	3718.2	01Jan2001, 12:29	971	01Jan2001, 12:23	1860	01Jan2001, 12:26	2487	01Jan2001, 12:30	3652	01Jan2001, 12:29	-46	-47	-48	-66	-4.52%	-2.47%	-1.91%	-1.82%	JEBLDN080
JEBLDN090	1113.9	01Jan2001, 12:39	2165.5	01Jan2001, 12:37	2646.7	01Jan2001, 12:53	3788.9	01Jan2001, 12:53	1068	01Jan2001, 12:40	2109	01Jan2001, 12:38	2588	01Jan2001, 12:53	3711	01Jan2001, 12:53	-46	-56	-59	-78	-4.11%	-2.60%	-2.23%	-2.10%	JEBLDN090
JEBLDN090a	614.6	01Jan2001, 12:39	1211.1	01Jan2001, 12:37	1480.2	01Jan2001, 12:53	2097.2	01Jan2001, 12:53	589	01Jan2001, 12:40	1179	01Jan2001, 12:38	1448	01Jan2001, 12:53	2055	01Jan2001, 12:53	-26	-32	-32	-42	-4.23%	-2.63%	-2.16%	-2.05%	JEBLDN090a
JEBLDN100a	674.2	01Jan2001, 12:44	1319.4	01Jan2001, 12:44	1565.2	01Jan2001, 12:38	2116.4	01Jan2001, 13:10	646	01Jan2001, 12:45	1283	01Jan2001, 12:44	1548	01Jan2001, 12:39	2077	01Jan2001, 13:10	-28	-36	-17	-39	-4.14%	-2.73%	-1.10%	-1.90%	JEBLDN100a
JEBLDN100	745.1	01Jan2001, 12:43	1471.4	01Jan2001, 12:39	1801.7	01Jan2001, 12:33	2285.7	01Jan2001, 12:28	715	01Jan2001, 12:43	1433	01Jan2001, 12:39	1780	01Jan2001, 12:34	2269	01Jan2001, 12:28	-30	-38	-22	-17	-4.07%	-2.60%	-1.22%	-0.76%	JEBLDN100
Confluence w/ CR	748.2	01Jan2001, 12:48	1482.0	01Jan2001, 12:44	1819.5	01Jan2001, 12:40	2331.1	01Jan2001, 12:32	719	01Jan2001, 12:48	1445	01Jan2001, 12:44	1797	01Jan2001, 12:40	2313	01Jan2001, 12:32	-30	-37	-23	-18	-3.96%	-2.48%	-1.26%	-0.78%	Confluence w/ CR

Junction Name	ESD Revised Jan2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 1 OPTION 1&2 B - Ultimate Development Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN060	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	256	01Jan2001, 12:52	617	01Jan2001, 12:26	842	01Jan2001, 12:17	1189	01Jan2001, 12:16	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN060
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	756	01Jan2001, 12:19	1490	01Jan2001, 12:28	2054	01Jan2001, 12:27	3013	01Jan2001, 12:25	734	01Jan2001, 12:20	1464	01Jan2001, 12:29	2018	01Jan2001, 12:27	2971	01Jan2001, 12:25	-22	-26	-36	-42	-2.91%	-1.73%	-1.76%	-1.40%	J_LiveOak
J_Crockett	837	01Jan2001, 12:19	1608	01Jan2001, 12:27	2205	01Jan2001, 12:27	3233	01Jan2001, 12:25	827	01Jan2001, 12:20	1597	01Jan2001, 12:27	2191	01Jan2001, 12:27	3223	01Jan2001, 12:25	-10	-11	-14	-10	-1.21%	-0.68%	-0.65%	-0.32%	J_Crockett
J_Johanna	883	01Jan2001, 12:19	1669	01Jan2001, 12:26	2279	01Jan2001, 12:27	3341	01Jan2001, 12:26	864	01Jan2001, 12:20	1647	01Jan2001, 12:27	2251	01Jan2001, 12:28	3314	01Jan2001, 12:26	-19	-23	-28	-28	-2.17%	-1.35%	-1.23%	-0.83%	J_Johanna
J_Mary	911	01Jan2001, 12:20	1715	01Jan2001, 12:26	2334	01Jan2001, 12:28	3421	01Jan2001, 12:26	903	01Jan2001, 12:21	1707	01Jan2001, 12:27	2324	01Jan2001, 12:28	3419	01Jan2001, 12:26	-8	-8	-10	-2	-0.82%	-0.44%	-0.41%	-0.07%	J_Mary
J_Annie	995	01Jan2001, 12:20	1833	01Jan2001, 12:24	2460	01Jan2001, 12:28	3600	01Jan2001, 12:26	952	01Jan2001, 12:21	1776	01Jan2001, 12:26	2399	01Jan2001, 12:29	3526	01Jan2001, 12:27	-43	-57	-61	-73	-4.32%	-3.13%	-2.48%	-2.08%	J_Annie
J_Milton	1001	01Jan2001, 12:20	1841	01Jan2001, 12:24	2467	01Jan2001, 12:29	3609	01Jan2001, 12:27	969	01Jan2001, 12:21	1799	01Jan2001, 12:26	2424	01Jan2001, 12:29	3554	01Jan2001, 12:28	-32	-41	-43	-54	-3.17%	-2.25%	-1.74%	-1.53%	J_Milton
J_Monroe	1065	01Jan2001, 12:20	1941	01Jan2001, 12:24	2566	01Jan2001, 12:29	3745	01Jan2001, 12:28	1029	01Jan2001, 12:22	1895	01Jan2001, 12:25	2521	01Jan2001, 12:29	3687	01Jan2001, 12:28	-36	-46	-45	-58	-3.40%	-2.35%	-1.77%	-1.56%	J_Monroe
JEBLDN080	1070	01Jan2001, 12:21	1949	01Jan2001, 12:25	2574	01Jan2001, 12:29	3753	01Jan2001, 12:29	1034	01Jan2001, 12:22	1903	01Jan2001, 12:25	2528	01Jan2001, 12:30	3697	01Jan2001, 12:29	-36	-46	-46	-56	-3.40%	-2.35%	-1.79%	-1.51%	JEBLDN080
JEBLDN090	1196	01Jan2001, 12:37	2229	01Jan2001, 12:36	2693	01Jan2001, 12:52	3831	01Jan2001, 12:53	1145	01Jan2001, 12:39	2174	01Jan2001, 12:37	2636	01Jan2001, 12:53	3762	01Jan2001, 12:53	-51	-55	-57	-69	-4.25%	-2.48%	-2.12%	-1.82%	JEBLDN090
JEBLDN090a	661	01Jan2001, 12:37	1247	01Jan2001, 12:36	1505	01Jan2001, 12:52	2120	01Jan2001, 12:53	632	01Jan2001, 12:39	1216	01Jan2001, 12:37	1475	01Jan2001, 12:53	2083	01Jan2001, 12:53	-29	-31	-31	-37	-4.37%	-2.52%	-2.05%	-1.78%	JEBLDN090a
JEBLDN100a	722	01Jan2001, 12:43	1360	01Jan2001, 12:43	1591	01Jan2001, 12:37	2138	01Jan2001, 13:09	692	01Jan2001, 12:44	1326	01Jan2001, 12:43	1578	01Jan2001, 12:38	2104	01Jan2001, 13:10	-30	-34	-13	-35	-4.20%	-2.49%	-0.80%	-1.66%	JEBLDN100a
JEBLDN100	801	01Jan2001, 12:42	1519	01Jan2001, 12:38	1837	01Jan2001, 12:34	2323	01Jan2001, 12:27	767	01Jan2001, 12:42	1485	01Jan2001, 12:38	1820	01Jan2001, 12:34	2309	01Jan2001, 12:27	-34	-34	-17	-14	-4.26%	-2.22%	-0.93%	-0.59%	JEBLDN100
Confluence w/ CR	803	01Jan2001, 12:46	1529	01Jan2001, 12:44	1856	01Jan2001, 12:39	2370	01Jan2001, 12:31	770	01Jan2001, 12:47	1496	01Jan2001, 12:43	1839	01Jan2001, 12:39	2356	01Jan2001, 12:31	-32	-33	-17	-14	-4.04%	-2.13%	-0.89%	-0.59%	Confluence w/ CR

Comparison of ESD Revised Pre-Project Model and Proposed Alternative 3 Model

Model Descriptions:

ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 3 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 3 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised JUNE 2017 Pre-Project - Existing Conditions								Proposed Alternative 3 - Existing Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN070	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	729	01Jan2001, 12:20	1462	01Jan2001, 12:28	2019	01Jan2001, 12:28	2967	01Jan2001, 12:25	729	01Jan2001, 12:20	1462	01Jan2001, 12:28	2019	01Jan2001, 12:28	2967	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	798	01Jan2001, 12:20	1573	01Jan2001, 12:27	2164	01Jan2001, 12:27	3181	01Jan2001, 12:25	798	01Jan2001, 12:20	1573	01Jan2001, 12:27	2164	01Jan2001, 12:27	3181	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_Crockett
J_Johanna	842	01Jan2001, 12:20	1635	01Jan2001, 12:27	2242	01Jan2001, 12:28	3303	01Jan2001, 12:26	839	01Jan2001, 12:20	1630	01Jan2001, 12:27	2236	01Jan2001, 12:28	3292	01Jan2001, 12:26	-4	-5	-6	-10	-0.45%	-0.32%	-0.28%	-0.31%	J_Johanna
J_Mary	867	01Jan2001, 12:20	1679	01Jan2001, 12:27	2294	01Jan2001, 12:28	3378	01Jan2001, 12:26	866	01Jan2001, 12:20	1677	01Jan2001, 12:27	2293	01Jan2001, 12:28	3375	01Jan2001, 12:26	-1	-1	-1	-3	-0.07%	-0.07%	-0.06%	-0.08%	J_Mary
J_Annie	946	01Jan2001, 12:20	1791	01Jan2001, 12:25	2417	01Jan2001, 12:28	3556	01Jan2001, 12:27	945	01Jan2001, 12:20	1791	01Jan2001, 12:25	2417	01Jan2001, 12:28	3556	01Jan2001, 12:27	0	0	0	0	-0.02%	0.00%	0.00%	-0.01%	J_Annie
J_Milton	950	01Jan2001, 12:21	1798	01Jan2001, 12:25	2424	01Jan2001, 12:29	3563	01Jan2001, 12:27	949	01Jan2001, 12:21	1798	01Jan2001, 12:25	2424	01Jan2001, 12:29	3562	01Jan2001, 12:27	0	0	0	0	-0.03%	-0.01%	0.00%	-0.01%	J_Milton
J_Monroe	1008	01Jan2001, 12:21	1892	01Jan2001, 12:25	2521	01Jan2001, 12:29	3698	01Jan2001, 12:28	1008	01Jan2001, 12:21	1892	01Jan2001, 12:25	2521	01Jan2001, 12:29	3698	01Jan2001, 12:28	0	0	0	0	-0.02%	-0.02%	0.00%	-0.01%	J_Monroe
JEBLDN080	1013	01Jan2001, 12:21	1900	01Jan2001, 12:25	2528	01Jan2001, 12:30	3707	01Jan2001, 12:29	1013	01Jan2001, 12:21	1899	01Jan2001, 12:25	2528	01Jan2001, 12:30	3707	01Jan2001, 12:29	0	-1	0	0	-0.02%	-0.03%	-0.01%	-0.01%	JEBLDN080
JEBLDN090	1110	01Jan2001, 12:39	2157	01Jan2001, 12:37	2638	01Jan2001, 12:53	3778	01Jan2001, 12:53	1110	01Jan2001, 12:39	2157	01Jan2001, 12:37	2638	01Jan2001, 12:53	3778	01Jan2001, 12:53	1	0	0	0	0.05%	-0.01%	0.00%	-0.01%	JEBLDN090
JEBLDN090a	612	01Jan2001, 12:39	1207	01Jan2001, 12:37	1476	01Jan2001, 12:53	2091	01Jan2001, 12:53	613	01Jan2001, 12:39	1206	01Jan2001, 12:37	1476	01Jan2001, 12:53	2091	01Jan2001, 12:53	0	0	0	0	0.05%	-0.01%	0.00%	0.00%	JEBLDN090a
JEBLDN100a	672	01Jan2001, 12:44	1316	01Jan2001, 12:43	1567	01Jan2001, 12:38	2112	01Jan2001, 13:10	673	01Jan2001, 12:44	1317	01Jan2001, 12:43	1568	01Jan2001, 12:38	2112	01Jan2001, 13:09	1	1	1	0	0.07%	0.06%	0.04%	0.01%	JEBLDN100a
JEBLDN100	743	01Jan2001, 12:43	1471	01Jan2001, 12:38	1806	01Jan2001, 12:35	2291	01Jan2001, 12:27	744	01Jan2001, 12:43	1472	01Jan2001, 12:38	1806	01Jan2001, 12:35	2290	01Jan2001, 12:27	1	2	1	-1	0.07%	0.10%	0.03%	-0.04%	JEBLDN100
Confluence w/ CR	747	01Jan2001, 12:47	1482	01Jan2001, 12:44	1824	01Jan2001, 12:39	2336	01Jan2001, 12:32	747	01Jan2001, 12:47	1483	01Jan2001, 12:44	1824	01Jan2001, 12:39	2335	01Jan2001, 12:32	1	1	0	-1	0.08%	0.09%	0.02%	-0.04%	Confluence w/ CR

Junction Name	ESD Revised JUNE 2017 Pre-Project - Ultimate Development Conditions								Proposed Alternative 3 - Ultimate Development Conditions								Peak Flow Change from Pre-Project				% Change from Pre-Project				
	Peak Flow (cfs) and Time to Peak (hour)								Peak Flow (cfs) and Time to Peak (hour)																
	2-year		10-year		25-year		100-year		2-year		10-year		25-year		100-year										
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	2-year	10-year	25-year	100-year	
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	0	0	0	0	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	748	01Jan2001, 12:19	1481	01Jan2001, 12:28	2041	01Jan2001, 12:27	2988	01Jan2001, 12:25	748	01Jan2001, 12:19	1481	01Jan2001, 12:28	2041	01Jan2001, 12:27	2988	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	829	01Jan2001, 12:20	1598	01Jan2001, 12:27	2192	01Jan2001, 12:27	3208	01Jan2001, 12:25	829	01Jan2001, 12:20	1598	01Jan2001, 12:27	2192	01Jan2001, 12:27	3208	01Jan2001, 12:25	0	0	0	0	0.00%	0.00%	0.00%	0.00%	J_Crockett
J_Johanna	878	01Jan2001, 12:19	1663	01Jan2001, 12:26	2272	01Jan2001, 12:27	3330	01Jan2001, 12:26	873	01Jan2001, 12:20	1657	01Jan2001, 12:26	2265	01Jan2001, 12:27	3319	01Jan2001, 12:26	-4	-6	-7	-11	-0.48%	-0.33%	-0.29%	-0.32%	J_Johanna
J_Mary	905	01Jan2001, 12:20	1708	01Jan2001, 12:27	2327	01Jan2001, 12:28	3409	01Jan2001, 12:26	905	01Jan2001, 12:20	1707	01Jan2001, 12:27	2325	01Jan2001, 12:28	3406	01Jan2001, 12:26	-1	-1	-1	-3	-0.08%	-0.06%	-0.06%	-0.08%	J_Mary
J_Annie	991	01Jan2001, 12:20	1826	01Jan2001, 12:24	2453	01Jan2001, 12:28	3589	01Jan2001, 12:27	991	01Jan2001, 12:20	1826	01Jan2001, 12:24	2453	01Jan2001, 12:28	3588	01Jan2001, 12:27	0	0	0	0	-0.01%	-0.01%	0.00%	-0.01%	J_Annie
J_Milton	996	01Jan2001, 12:20	1834	01Jan2001, 12:25	2459	01Jan2001, 12:29	3597	01Jan2001, 12:27	996	01Jan2001, 12:20	1833	01Jan2001, 12:25	2459	01Jan2001, 12:29	3597	01Jan2001, 12:27	0	0	0	0	-0.01%	-0.01%	0.00%	-0.01%	J_Milton
J_Monroe	1060	01Jan2001, 12:20	1933	01Jan2001, 12:24	2559	01Jan2001, 12:29	3734	01Jan2001, 12:28	1060	01Jan2001, 12:20	1932	01Jan2001, 12:24	2559	01Jan2001, 12:29	3733	01Jan2001, 12:28	0	-1	0	0	0.00%	-0.03%	0.00%	-0.01%	J_Monroe
JEBLDN080	1065	01Jan2001, 12:21	1942	01Jan2001, 12:25	2566	01Jan2001, 12:29	3742	01Jan2001, 12:29	1065	01Jan2001, 12:21	1941	01Jan2001, 12:25	2566	01Jan2001, 12:29	3742	01Jan2001, 12:29	0	-1	0	0	-0.01%	-0.03%	0.00%	-0.01%	JEBLDN080
JEBLDN090	1191	01Jan2001, 12:37	2221	01Jan2001, 12:36	2685	01Jan2001, 12:52	3820	01Jan2001, 12:53	1192	01Jan2001, 12:37	2221	01Jan2001, 12:36	2685	01Jan2001, 12:52	3820	01Jan2001, 12:53	1	0	0	0	0.05%	0.00%	0.00%	-0.01%	JEBLDN090
JEBLDN090a	658	01Jan2001, 12:37	1243	01Jan2001, 12:36	1501	01Jan2001, 12:52	2114	01Jan2001, 12:53	659	01Jan2001, 12:37	1243	01Jan2001, 12:36	1501	01Jan2001, 12:52	2114	01Jan2001, 12:53	0	0	0	0	0.05%	0.00%	0.01%	0.00%	JEBLDN090a
JEBLDN100a	720	01Jan2001, 12:43	1357	01Jan2001, 12:43	1594	01Jan2001, 12:37	2134	01Jan2001, 13:09	720	01Jan2001, 12:43	1358	01Jan2001, 12:42	1594	01Jan2001, 12:37	2135	01Jan2001, 13:09	1	1	1	0	0.07%	0.07%	0.03%	0.01%	JEBLDN100a
JEBLDN100	798	01Jan2001, 12:42	1518	01Jan2001, 12:38	1842	01Jan2001, 12:34	2328	01Jan2001, 12:27	799	01Jan2001, 12:41	1520	01Jan2001, 12:38	1842	01Jan2001, 12:34	2327	01Jan2001, 12:27	1	1	0	-1	0.09%	0.09%	0.01%	-0.04%	JEBLDN100
Confluence w/ CR	801	01Jan2001, 12:46	1529	01Jan2001, 12:43	1860	01Jan2001, 12:38	2375	01Jan2001, 12:31	801	01Jan2001, 12:46	1530	01Jan2001, 12:43	1860	01Jan2001, 12:38	2374	01Jan2001, 12:31	1	1	0	-1	0.07%	0.08%	0.00%	-0.04%	Confluence w/ CR

Comparison of ESD Revised Pre-Project Model and Proposed Alternative 4 Model

Model Descriptions:
ESD Revisded Pre-Project - Existing Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on existing land use conditions.
ESD Revisded Pre-Project - Ultimate Development Conditions is the effective COA HEC-HMS model that has been revised by ESD and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Proposed Alternative 4 - Existing Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on existing land use conditions.
Proposed Alternative 4 - Ultimate Development Conditions is the proposed conditions that has been modified from the ESD Revised Pre-Project model and is based on future land use conditions.
ESD Revised Pre-Project time interval: 1 min

Rainfall: SCS Unit Storm with pre-Atlas 14 24-hour depths

Simulation start time: 01Jan2001, 00:00

Junction Name	ESD Revised OCT 2020 Pre-Project - Existing Conditions										Prop Alternative 4 (Prop Crockett storm drain system to Johanna/EBC, Prop Mary, no detention) - Existing Conditions										Peak Flow Change from Pre-Project					% Change from Pre-Project					
	Peak Flow (cfs) and Time to Peak (hour)										Peak Flow (cfs) and Time to Peak (hour)																				
	2-year		10-year		25-year		100-year		500-year		2-year		10-year		25-year		100-year		500-year												
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	500-year	2-year	10-year	25-year	100-year	500-year	
JEBLDN070	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	3973	01Jan2001, 12:19	678	01Jan2001, 12:19	1411	01Jan2001, 12:24	1957	01Jan2001, 12:22	2900	01Jan2001, 12:21	3973	01Jan2001, 12:19	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	729	01Jan2001, 12:20	1462	01Jan2001, 12:28	2019	01Jan2001, 12:28	2946	01Jan2001, 12:26	4069	01Jan2001, 12:24	729	01Jan2001, 12:20	1462	01Jan2001, 12:28	2019	01Jan2001, 12:28	2946	01Jan2001, 12:26	4069	01Jan2001, 12:24	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	798	01Jan2001, 12:20	1573	01Jan2001, 12:27	2164	01Jan2001, 12:27	3160	01Jan2001, 12:26	4377	01Jan2001, 12:24	798	01Jan2001, 12:20	1573	01Jan2001, 12:27	2164	01Jan2001, 12:27	3160	01Jan2001, 12:26	4377	01Jan2001, 12:24	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	J_Crockett
J_Johanna	842	01Jan2001, 12:20	1634	01Jan2001, 12:27	2240	01Jan2001, 12:28	3295	01Jan2001, 12:26	4577	01Jan2001, 12:24	846	01Jan2001, 12:20	1640	01Jan2001, 12:26	2247	01Jan2001, 12:28	3309	01Jan2001, 12:26	4605	01Jan2001, 12:24	4	6	6	14	27	0.49%	0.34%	0.29%	0.42%	0.59%	J_Johanna
J_Mary	866	01Jan2001, 12:20	1677	01Jan2001, 12:27	2293	01Jan2001, 12:28	3369	01Jan2001, 12:27	4686	01Jan2001, 12:24	873	01Jan2001, 12:20	1688	01Jan2001, 12:27	2304	01Jan2001, 12:28	3394	01Jan2001, 12:26	4727	01Jan2001, 12:24	7	10	11	25	41	0.85%	0.61%	0.48%	0.75%	0.87%	J_Mary
J_Annie	943	01Jan2001, 12:20	1788	01Jan2001, 12:25	2414	01Jan2001, 12:28	3553	01Jan2001, 12:27	4946	01Jan2001, 12:25	940	01Jan2001, 12:20	1785	01Jan2001, 12:25	2408	01Jan2001, 12:29	3543	01Jan2001, 12:27	4936	01Jan2001, 12:25	-3	-4	-6	-10	-10	-0.32%	-0.20%	-0.26%	-0.27%	-0.21%	J_Annie
J_Milton	947	01Jan2001, 12:21	1795	01Jan2001, 12:25	2421	01Jan2001, 12:29	3559	01Jan2001, 12:28	4958	01Jan2001, 12:25	945	01Jan2001, 12:21	1791	01Jan2001, 12:26	2415	01Jan2001, 12:29	3550	01Jan2001, 12:27	4947	01Jan2001, 12:25	-3	-4	-6	-9	-11	-0.31%	-0.22%	-0.26%	-0.24%	-0.22%	J_Milton
J_Monroe	1006	01Jan2001, 12:21	1889	01Jan2001, 12:25	2519	01Jan2001, 12:29	3694	01Jan2001, 12:28	5148	01Jan2001, 12:27	1003	01Jan2001, 12:21	1883	01Jan2001, 12:25	2511	01Jan2001, 12:29	3686	01Jan2001, 12:28	5137	01Jan2001, 12:27	-3	-6	-8	-9	-11	-0.32%	-0.33%	-0.31%	-0.23%	-0.21%	J_Monroe
JEBLDN080	1011	01Jan2001, 12:21	1896	01Jan2001, 12:25	2525	01Jan2001, 12:30	3703	01Jan2001, 12:29	5155	01Jan2001, 12:28	1007	01Jan2001, 12:21	1890	01Jan2001, 12:26	2518	01Jan2001, 12:30	3695	01Jan2001, 12:29	5144	01Jan2001, 12:28	-3	-6	-7	-9	-11	-0.33%	-0.30%	-0.29%	-0.24%	-0.22%	JEBLDN080
JEBLDN090	1108	01Jan2001, 12:39	2154	01Jan2001, 12:37	2635	01Jan2001, 12:53	3774	01Jan2001, 12:53	5219	01Jan2001, 12:53	1106	01Jan2001, 12:39	2146	01Jan2001, 12:37	2628	01Jan2001, 12:53	3765	01Jan2001, 12:53	5207	01Jan2001, 12:53	-3	-9	-7	-9	-12	-0.23%	-0.39%	-0.27%	-0.24%	-0.22%	JEBLDN090
JEBLDN090a	611	01Jan2001, 12:39	1205	01Jan2001, 12:37	1474	01Jan2001, 12:53	2089	01Jan2001, 12:53	2811	01Jan2001, 12:53	610	01Jan2001, 12:39	1200	01Jan2001, 12:37	1470	01Jan2001, 12:53	2084	01Jan2001, 12:53	2808	01Jan2001, 12:53	-1	-5	-4	-5	-3	-0.23%	-0.40%	-0.26%	-0.23%	-0.11%	JEBLDN090a
JEBLDN100a	671	01Jan2001, 12:44	1316	01Jan2001, 12:43	1568	01Jan2001, 12:38	2110	01Jan2001, 13:09	2394	01Jan2001, 13:31	670	01Jan2001, 12:44	1313	01Jan2001, 12:43	1570	01Jan2001, 12:38	2107	01Jan2001, 13:09	2394	01Jan2001, 13:31	-1	-3	2	-4	0	-0.16%	-0.23%	0.11%	-0.17%	0.00%	JEBLDN100a
JEBLDN100	743	01Jan2001, 12:43	1471	01Jan2001, 12:38	1807	01Jan2001, 12:35	2292	01Jan2001, 12:27	2918	01Jan2001, 12:23	742	01Jan2001, 12:42	1471	01Jan2001, 12:38	1810	01Jan2001, 12:32	2295	01Jan2001, 12:27	2921	01Jan2001, 12:23	-1	0	3	3	2	-0.12%	0.00%	0.18%	0.14%	0.08%	JEBLDN100
Confluence w/ CR	746	01Jan2001, 12:47	1482	01Jan2001, 12:44	1826	01Jan2001, 12:39	2337	01Jan2001, 12:31	2992	01Jan2001, 12:27	745	01Jan2001, 12:47	1483	01Jan2001, 12:43	1829	01Jan2001, 12:39	2341	01Jan2001, 12:31	2995	01Jan2001, 12:27	-1	0	4	3	3	-0.11%	0.01%	0.19%	0.14%	0.09%	Confluence w/ CR

Junction Name	ESD Revised OCT 2020 Pre-Project - Ultimate Development Conditions										Prop Alternative 4 (Prop Crockett storm drain system to Johanna/EBC, Prop Mary, no detention) - Ultimate Conditions										Peak Flow Change from Pre-Project					% Change from Pre-Project					
	Peak Flow (cfs) and Time to Peak (hour)										Peak Flow (cfs) and Time to Peak (hour)																				
	2-year		10-year		25-year		100-year		500-year		2-year		10-year		25-year		100-year		500-year												
	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	Peak Flow	Time	2-year	10-year	25-year	100-year	500-year	2-year	10-year	25-year	100-year	500-year	
JEBLDN070	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	3996	01Jan2001, 12:19	693	01Jan2001, 12:19	1427	01Jan2001, 12:24	1975	01Jan2001, 12:22	2920	01Jan2001, 12:21	3996	01Jan2001, 12:19	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	JEBLDN070
J_LiveOak	748	01Jan2001, 12:19	1481	01Jan2001, 12:28	2041	01Jan2001, 12:27	2966	01Jan2001, 12:26	4090	01Jan2001, 12:24	748	01Jan2001, 12:19	1481	01Jan2001, 12:28	2041	01Jan2001, 12:27	2966	01Jan2001, 12:26	4090	01Jan2001, 12:24	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	J_LiveOak
J_Crockett	829	01Jan2001, 12:20	1598	01Jan2001, 12:27	2192	01Jan2001, 12:27	3184	01Jan2001, 12:25	4401	01Jan2001, 12:24	829	01Jan2001, 12:20	1598	01Jan2001, 12:27	2192	01Jan2001, 12:27	3184	01Jan2001, 12:25	4401	01Jan2001, 12:24	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	J_Crockett
J_Johanna	877	01Jan2001, 12:19	1662	01Jan2001, 12:26	2271	01Jan2001, 12:27	3322	01Jan2001, 12:26	4602	01Jan2001, 12:24	881	01Jan2001, 12:19	1668	01Jan2001, 12:26	2276	01Jan2001, 12:27	3338	01Jan2001, 12:25	4630	01Jan2001, 12:24	4	6	5	16	27	0.50%	0.36%	0.24%	0.49%	0.60%	J_Johanna
J_Mary	904	01Jan2001, 12:20	1707	01Jan2001, 12:27	2325	01Jan2001, 12:28	3399	01Jan2001, 12:26	4715	01Jan2001, 12:24	912	01Jan2001, 12:20	1718	01Jan2001, 12:26	2336	01Jan2001, 12:28	3426	01Jan2001, 12:26	4756	01Jan2001, 12:24	8	11	11	27	41	0.86%	0.64%	0.46%	0.78%	0.87%	J_Mary
J_Annie	989	01Jan2001, 12:20	1823	01Jan2001, 12:24	2450	01Jan2001, 12:28	3585	01Jan2001, 12:27	4979	01Jan2001, 12:24	985	01Jan2001, 12:20	1819	01Jan2001, 12:25	2443	01Jan2001, 12:28	3577	01Jan2001, 12:26	4968	01Jan2001, 12:24	-4	-5	-8	-8	-11	-0.35%	-0.26%	-0.31%	-0.22%	-0.22%	J_Annie
J_Milton	994	01Jan2001, 12:20	1831	01Jan2001, 12:25	2457	01Jan2001, 12:29	3593	01Jan2001, 12:27	4991	01Jan2001, 12:25	990	01Jan2001, 12:20	1826	01Jan2001, 12:25	2450	01Jan2001, 12:29	3586	01Jan2001, 12:27	4980	01Jan2001, 12:25	-4	-5	-7	-7	-11	-0.38%	-0.27%	-0.28%	-0.19%	-0.22%	J_Milton
J_Monroe	1058	01Jan2001, 12:20	1930	01Jan2001, 12:24	2556	01Jan2001, 12:29	3729	01Jan2001, 12:28	5181	01Jan2001, 12:27	1054	01Jan2001, 12:20	1922	01Jan2001, 12:25	2548	01Jan2001, 12:29	3722	01Jan2001, 12:28	5170	01Jan2001, 12:27	-4	-8	-8	-8	-11	-0.37%	-0.40%	-0.32%	-0.20%	-0.21%	J_Monroe
JEBLDN080	1063	01Jan2001, 12:21	1938	01Jan2001, 12:25	2564	01Jan2001, 12:29	3738	01Jan2001, 12:29	5188	01Jan2001, 12:28	1059	01Jan2001, 12:21	1930	01Jan2001, 12:25	2555	01Jan2001, 12:29	3730	01Jan2001, 12:29	5176	01Jan2001, 12:28	-4	-8	-9	-8	-11	-0.36%	-0.42%	-0.35%	-0.22%	-0.22%	JEBLDN080
JEBLDN090	1189	01Jan2001, 12:37	2218	01Jan2001, 12:36	2682	01Jan2001, 12:52	3816	01Jan2001, 12:53	5254	01Jan2001, 12:53	1186	01Jan2001, 12:37	2209	01Jan2001, 12:36	2674	01Jan2001, 12:52	3807	01Jan2001, 12:53	5243	01Jan2001, 12:53	-3	-9	-8	-9	-12	-0.27%	-0.40%	-0.28%	-0.24%	-0.22%	JEBLDN090
JEBLDN090a	657	01Jan2001, 12:37	1241	01Jan2001, 12:36	1499	01Jan2001, 12:52	2112	01Jan2001, 12:53	2820	01Jan2001, 12:53	655	01Jan2001, 12:37	1236	01Jan2001, 12:36	1495	01Jan2001, 12:52	2107	01Jan2001, 12:53	2817	01Jan2001, 12:53	-2	-5	-4	-5	-3	-0.29%	-0.41%	-0.27%	-0.24%	-0.11%	JEBLDN090a
JEBLDN100a	719	01Jan2001, 12:43	1357	01Jan2001, 12:42	1595	01Jan2001, 12:37	2133	01Jan2001, 13:09	2395	01Jan2001, 13:30	717	01Jan2001, 12:43	1354	01Jan2001, 12:42	1596	01Jan2001, 12:37	2129	01Jan2001, 13:09	2395	01Jan2001, 13:30	-2	-3	2	-3	0	-0.21%	-0.20%	0.12%	-0.15%	0.00%	JEBLDN100a
JEBLDN100	798	01Jan2001, 12:41	1519	01Jan2001, 12:38	1843	01Jan2001, 12:34	2329	01Jan2001, 12:27	2959	01Jan2001, 12:22	796	01Jan2001, 12:41	1519	01Jan2001, 12:37	1846	01Jan2001, 12:34	2332	01Jan2001, 12:27	2962	01Jan2001, 12:22	-1	0	3	3	3	-0.15%	0.01%	0.17%	0.12%	0.08%	JEBLDN100
Confluence w/ CR	800	01Jan2001, 12:46	1529	01Jan2001, 12:43	1862	01Jan2001, 12:38	2376	01Jan2001, 12:31	3034	01Jan2001, 12:27	799	01Jan2001, 12:46	1530	01Jan2001, 12:43	1865	01Jan2001, 12:38	2379	01Jan2001, 12:31	3036	01Jan2001, 12:27	-1	1	4	3	3	-0.12%	0.03%	0.19%	0.13%	0.09%	Confluence w/ CR

Appendix B –
Flooding History

Exhibit B.1	**Map of Flooding Complaints**
Exhibit B.2	**Watershed Protection Department Flooding Complaint Records**
Exhibit B.3	**304 West Mary Street Homeowner Report**
Exhibit B.4	**Flooding Reports and Pictures from 300 Crockett Street**

Exhibit B.1

Map of Flooding Complaints

Local Flood complaints to include in report are circled. Scope defined by Jorge Morales and Megan Banse in a meeting on 1/21/2015

Red : Building flooding
Green : Yard flooding
Yellow : Street flooding
Pink : Standing Water

FLOODING COMPLAINTS

- FEMA 25-year floodplain
- FEMA 100-year floodplain
- Building Flooding
- Yard Flooding
- Street Flooding

WEST MONROE STREET
ROMA ST
WEST MILTON ST
WEST MILTON
WEST ANNIE
WEST ANNIE STREET
311 W. Annie Street
1804 Newton Street
304 W. Mary Street
WEST MARY STREET
300 W. Mary Street
NEWTON STREET
EVA STREET
SOUTH 1ST STREET
420 W. Johanna Street
WEST JOHANNA STREET
WILSON STREET
300/301 Crockett Street
CROCKETT ST
CROCKETT STREET
HODGES STREET
Crockett and Newton Streets
WEST LIVE OAK ST
NEWTON ST
ST
WEST MARY STREET
NICKERSON
JR. HIGH
FULMORE
LELAND STREET
SOUTH CONGRESS AVENUE
NICKERSON STREET

Exhibit B.2

Watershed Protection Department

Flooding Complaint Records

Watershed Protection Department's Local Flood Complaint Database

Note: Database file received from Andrew Rudin on August 27, 2014

Date	Address	ESD Notes on Flooding Source Described in Complaint	ESD Designated Flooding Area	ESD Evaluation of Complaint	Flooding Type	WPD Documentation 1	WPD Documentation 2	WPD Documentation 3	WPD Documentation 4	WPD Documentation 5
2002-05-23	1804 Newton St	street flow	Annie/Mary/Newton	previous evaluation by COA concluded this is a private property issue	Yard	The property slopes from front to back. Water comes from the street across my property and washes away top soil every time it rains. Please call citizen before going out to investigate because he wants to meet with you on site.	Water coming off street is entering through non-standard driveway approach in neighbor's lot. Citizen's lot is at grade break of Newton Street (water flows both north and south from this location). On site erosion is property owner responsibility. No work required by City.			
2008-04-30	311 W ANNIE ST	Annie System storm drain	Annie/Mary/Newton	Annie storm drain system undersized	Yard				Please clean the inlets adjacent to 306 W. Mary St and flush the pipe. Please contact John Beachy and let him no if there were any blockages or not.	BACKYARD AND SIDE YARD. CITIZEN SAYS THAT THIS ALSO EFFECTS HIS NEIGHBORS PROPERTY NEXT DOOR 307 W ANNIE ST . CITIZEN IS VERY CONCERNED, WASHED AWAY A GOOD CHUCKED OF HIS BACKYARD AREA (FENCE INCLUDED). SR# 74472 WAS REPORTED TO CODE ENFORCEMENT
1991-04-15	311 W Annie St	Annie System storm drain	Annie/Mary/Newton	Annie storm drain system undersized	Yard	Drain pipe under house broke, water is coming out and broke skirt out from under house. Citizen contacted the City Managers Office (RFA). See file (4/29/91).				
2009-09-12	300 W MARY ST	unclear	Annie/Mary/Newton	issue resloved	Street				Road open and clear. T.V. 702	No
2013-04-04	304 W MARY ST	Annie System storm drain	Annie/Mary/Newton	Annie storm drain system undersized	Building					CITIZEN WANTS SOMEONE TO TAKE A LOOK AND SEE IF DRANINS ARE EFFECTIVE FOR THE AREA
2013-04-04	300 CROCKETT ST	unclear	Crockett/Wilson	Annie storm drain system undersized and/or private property drainage issues	Building	Rob Kellogg who is on the board of the condo association is reporting that 7 units were flooding during the storm on 4/2.				
2011-01-14	300 CROCKETT ST	Annie System storm drain and private property drainage issues	Crockett/Wilson	Annie storm drain system undersized and/or private property drainage issues	Building	The condos at this location are seeing drainage problems. Water is leaving the street and flowing into the condo property.			Met Citizen on site. Builidng Flooding. Citizen stated that during the Hermine Floods and rains over the summer several units in the condo flooded due to runoff from the street as well as onsite drainage issues. Citizen was going to provide dates and photos, but he never contacted me again.	
2004-09-15	300 CROCKETT ST	Annie System storm drain and private property drainage issues	Crockett/Wilson	Annie storm drain system undersized and/or private property drainage issues	Building	The flooding has disapeared,but when it rains like it did yesterday it tends to develope the flooding there in the area discribed. Water gets into the laundry room when it rains.				
2004-07-21	301 Crockett St	unclear	Crockett/Wilson	Annie storm drain system undersized and/or private property drainage issues	Building	Mike Newman and I just met with the owner, the engineer and the manager of an apartment complex located at 301 Crockett Street. There were 9 apartment units that had water inside the building during the June storm event. They observed that there could be some blockage in nearby inlets along Live Oak St. between Wilson St. and S. Congress. They requested these inlets be inspected and cleaned to remove any blockage.		Cleaned grates at 2000 Wilson. Opened and cleared.		
2012-10-06	CROCKETT ST & NEWTON ST	Annie System storm drain and private property drainage issues	Crockett/Wilson	Annie storm drain system undersized and/or private property drainage issues	Building	this request was sent via email				THIS MESSAGE IS FROM MATTHEW COMERFORD. I AM ONE OF THE BOARD MEMBERS FOR THE COURTYARD CONDOS AT 300 CROCKETT STREET. THERE IS NO DRAINAGE OR ADEQUATE DRAINAGE WHICH CAUSES ISSUES WHEN IT RAINS
2003-10-09	420 W Johanna St	obstruction in East Bouldin Creek	Johanna/East Bouldin Creek	maintenance issue and property located in 25-year floodplain	Yard	Mr. Barton reported to David Walker that he owns a house on the northeast corner of East Bouldin Creek at W. Johanna St. He claims the neighbors across the creek at 1919 S. 1st St. have caused an obstruction of the waterway of East Bouldin Creek. He has requested the neighbors to remove the obstruction but no response. Is requesting an investigation, a citation, or other appropriate action. Please return his call.	On 10/15/2003, Mike Newman and Jonathan met at the site with Mr. Brett Barton who owns the 420 W. Johanna property. While discussing many drainage issues, we noticed a wire and rock basket on the west bank of E. Bouldin Creek (behind the church at 1919	The South Crew removed old rock berm and debris on side of channel bank.		
2001-12-05	420 W Johanna St	Annie System, clogged inlet, debris in East Bouldin Creek	Johanna/East Bouldin Creek	maintenance issue and property located in 25-year floodplain	Building	Flood damage. There is carpet, couch and debris scattered on the bridge. A bush 25 ft. from the bridge down stream is hung on the retaining wall. The inlet is clogged with debris. The inlet is not adequate for the amount of rain. Sent to Olivia and		Crew removed the carpet and the debris from the creek. Olivia = 12-11-01 Inlet open and clear. Pete Reyes. 12-05-01		

Exhibit B.3

304 West Mary Street Homeowner Report

A RIVER RUNS THROUGH IT

A Desperate Plea from South Austin Homeowners that experienced <u>Three Flash Floods</u> enter their home in <u>2013</u>!!!

304 W. Mary Street

-KEEP AUSTIN SAFE-

Keith and Iris Mahon
304 West Mary Street
Austin, TX 78704

December 5, 2013

The Honorable Lee Leffingwell
Mayor of the City of Austin
301 West Second Street
Austin, TX 78701

Dear Mayor Leffingwell,

The extraordinary flood event on October 31st led to extensive property damage and the tragic loss of life in Austin and surrounding communities. Our Austin home at 304 West Mary Street is not located in one of the areas associated with the massive devastation caused by the Halloween flood nor is it within a low lying floodplain or next to a creek. Based on the original topographic maps of the area, it is hard to imagine that our house would flood in a 25 or 100 year event, which according to the City of Austin's "Drainage Criteria Manual" is the standard used to design storm drain systems. In spite of this, the Halloween flood marked the THIRD time since April of this year that a flash flood rapidly rose from the street and entered the first floor living areas of our house in South Austin, resulting in extensive property damage both inside and outside our home.

Why did our Austin home flood on April 2, 2013? Why did it flood again on May 10, 2013? And why was the flood so severe during the early morning hours of October 31, 2013 that our daughter feared for her safety and called 911? Engineers with Austin's Local Flood Mitigation Program evaluated the problem after the spring floods and determined that storm drains near the corner of West Mary and Newton streets are failing. It appears that this storm drain is dedicated to rainwater runoff from over 70 acres of South Austin. The bottom line is that the storm drain on our street is both undersized and in extremely poor condition.

We love Austin and we love our Austin house, but the inescapable fact is that the drainage infrastructure near our Austin home does not meet the needs of current land use along the South Congress corridor from Oltorf to West Mary streets. The city discussed the results of their evaluation with us during the six months prior to the Halloween flood. Everyone we dealt with was courteous, professional, and honest, but the only tangible changes made were from the thousands of dollars and countless hours WE spent to improve the drainage around our house. NOTHING was fixed by the City of Austin. We fear that nothing will change in the near future unless we show you indisputable evidence and plead for immediate action. IT IS TIME FOR THE CITY TO UPGRADE THE DRAINAGE INFRASTRUCTURE IN SOUTH AUSTIN – STARTING WITH WEST MARY STREET!

Here are the facts:

(1) The city's evaluation concluded that the underground storm drain located near the corner of West Mary and Newton streets is undersized and outdated. The three flash floods this year prove that it is ineffective at safely removing rainwater runoff during heavy rainfalls. This drainage infrastructure was installed over a half century ago

and is in very poor condition. A severely damaged segment of the storm drain is located under a large elm tree behind our property on West Annie Street, but it is outside of easements making repairs difficult without the property owner's permission.

(2) The natural flow of water has been substantially altered by development throughout the drainage basin. This includes impervious cover from streets, sidewalks, driveways, and buildings as well as fences, block walls, and landfill used to divert water from its natural drainage. As a result of these manmade "improvements" and the severely diminished capacity of the storm drain system, rainwater runoff is focused to the front portion of our home placing us in the direct path of flash floods. The power of these flash floods is evidenced by a 600 lb. block of concrete that was discovered behind a damaged portion of our fence following the April flood. This concrete block is nearly identical in size and shape to the ones used by the City of Austin to anchor traffic signals. It was either moved there by a massive flash flood or placed there as part of landfill to divert runoff towards our property.

(3) There is only one feasible solution – install a modern storm drain along West Mary Street that enters directly into East Bouldin Creek. We were informed that this type of capital improvement is 3 to 7 years away, which to us may be in 10 to 20 catastrophic flash floods based on this year's experiences.

According to people who have witnessed these floods, the water rises rapidly and moves over the ground at a remarkably high velocity. The water comes like an ocean wave from South Congress that enlarges at each intersection and driveway along its path to an already overwhelmed storm drain at West Mary and Newton streets. The concentration of one inch of rainwater runoff from 70 acres of land is equivalent to almost 2 million gallons of water or nearly 3 Olympic-sized swimming pools! In this region of Texas, there is a 50% chance in any given year that 1 inch of rain will fall in a 15 minute period (USGS Water Resources Investigations Report 98-4044). We were flooded by less intense rainfall on April 2nd and May 10th that overwhelmed the undersized and diminished capacity of the storm drain causing it to overflow onto our neighbor's yard where a natural dip in the street is located. The water and debris quickly built momentum and surrounded our house forming two tributaries that merged in our backyard. Due to the alteration of the natural landscape to divert the flow of water, our house is in the immediate path of these destructive floods.

The April and May floods gouged and began undercutting the concrete foundation on the northeast corner of our house. The April flood knocked down fences on both sides of the property and carried complete fence segments with attached metal poles and concrete footings into the middle of our backyard. We made costly repairs to the foundation and built a concrete flume to efficiently move the water away from the house. We also replaced the fence with a hog panel design that allows water to flow through without knocking it down. We discovered that once the tributaries flowing around our house recombine in the backyard, the rapidly advancing river has more than enough force to knock down a hog panel fence.

The Halloween flood did far more extensive damaged to the interior of the house; rising up to two feet high near our front door. As with the two earlier floods, water and silt entered our

home before escaping along the west side of the house. The majority of the first floor received water in the first two floods, but the Halloween flood covered every inch of the downstairs living residence. Wood floors, baseboards, sheetrock, and insulation had to be removed. The most remarkable damage was to a majestic oak tree that is now in the path of these floods. The last flood eroded enough material from the base of this gigantic tree to expose its roots for the first time since it sprouted in the mid-19th century. Unless we experienced three 500-year flood events this year alone, these flash floods are not natural phenomena. It is our opinion that most of the problem is manmade and that the only solution is to install infrastructure that can handle a 25 or 100-year event as described in the City of Austin's "Drainage Criteria Manual."

It is clear to everyone that continued evaluation of the problem will not stop these floods; approving more development within the drainage basin will not stop these floods; sympathy and excuses will not stop these floods. The only solution is to install drainage infrastructure that is consistent with existing or planned development within the drainage basin.

Please review the attached figures and documentation to better understand the flood problem we face at 304 West Mary Street. There are only a few pictures taken during the actual floods because witnesses are far more concerned about saving property and personal safety. We will follow-up with your office in January to see how we can work together to accelerate the necessary infrastructure improvements. Please call us if you have any questions. No further evaluation is needed - now is the time to upgrade the infrastructure while we prepare for the next flash flood.

Thank you for your time.

With kind regards,

Keith I. Mahon
mobile: 713-301-5420
email: kmahon77@gmail.com

Iris Mahon
mobile: 936-718-6999
email: blue.sky.7@comcast.net

Cc: *Council Member* Sheryl Cole
Council Member Chris Riley
Council Member Mike Martinez
Council Member Kathie Tovo
Council Member Laura Morrison
Council Member Bill Spelman
City Manager Marc Ott
Jorge L. Morales, PE, CFM, *Supervising Engineer: Watershed Engineering Division*
Dale Jennings, *Austin Drainage & Landscape Development*
Arielle Mahon, *Resident of 304 W. Mary St.*
Allison Trosclair, *Resident of 306 W. Mary St.*

A RIVER RUNS THROUGH IT

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Flash Flood: April 2, 2013

After 5:00 pm on Tuesday April 2nd, a heavy rainfall in the area resulted in our first flash flood. Water began entering the house through the front door (*Fig. 1*) and the force of the flood knocked down the fence on the east side of the property (*Fig. 2*) as well as the newly constructed hog panel fence on the west side (*Fig. 3*). Ground erosion was significant on both the west (*Fig. 4*) and east (*Fig. 5*) sides of house.


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5

Improvements after April Flood

We began installation of "hog panel" fence on the east side of the property (*Fig. 6*) following the April flash flood. This modification was made in order to prevent the fence from breaking loose in the future and to help mitigate the problem of water backing up on the street. Much of this construction was incomplete at the time of the May flood, but water rose far too rapidly for these unfenced areas to act as efficient flow conduits. Water still entered our house in May. We temporarily suspended construction after the May flood to allow the city to evaluate the storm drain running under our property. The fence was eventually completed prior to the October flood.

Fig. 6

Flash Flood: May 10, 2013

During the evening of Friday May 10th, a heavy rain in the area resulted in a second flash flood of 2013 as water began entering the house through the front door and continued into one of the downstairs bedrooms (*Fig. 7*). The floods continued to erode material from the sides of the house and deposited mud and debris outside the front entry (*Fig. 8*) and garage (*Fig. 9*).

Fig. 7

Fig. 8

Fig. 9

Improvements after May Flood

It was clear after the May flash flood that we needed to do more to stop massive amounts of water from backing up on the street and flooding the interior of our house. The April and May floods damaged the northeast corner of the concrete foundation and exposed the large footings supporting the back deck. Several contractors came out and evaluated the problem. After considerable research, we chose to install a concrete flume (*Fig. 10*), low level deflection wall, and broader drain grate to efficiently move water along the east side of the house and mitigate future erosion. In addition, the surface drainage on the west side of the house was repaired.

Fig. 10

Flash Flood: October 31, 2013

Water began entering the house through the front door shortly after midnight on October 31st (*Fig. 11*). A photo taken within seconds after the flood started illustrates the initial velocity and force of the water through the recently constructed flume (*Fig. 12*). The peak depth was about almost midway up the fence prompting our daughter to call 911. There was a genuine concern that the structures on the east side could come loose and slam into the house, trapping the residents inside. The AFD simply recommended that she leave the house in spite of the fact that rapidly moving flood waters were more than a foot deep on three sides.

Fig. 11

Fig. 12

Flash Flood: October 31, 2013

A definitive water line was measured a few days after the floods. It reached a level of 13 inches to the right of the front door (*Fig. 13*). The force of the water was pushed into the corner of the entry and got as much as 2 feet deep to the left of the entry (*Fig. 14*). This water forced its way in between the siding and badly damaged the interior sheetrock and insulation.

Fig. 13

Fig. 14

Flash Flood: October 31, 2013

The recently constructed flume and reinforced deck posts may have saved the back deck from breaking away during the October flood, but it could not stop the erosive power of these flood waters outside of the flume. A large amount of rock and debris were deposited in the back yard (*Fig. 15*). The end of the flume had nearly 2 feet of material gouged out (*Fig. 16*). The roots of a majestic oak tree, which has been estimated by an arborist to be 150 to 175 years old, were exposed and damaged by this powerful flood (*Fig. 17*).

Fig. 15

Fig. 16

Fig. 17

Flash Flood: October 31, 2013

Sheetrock and insulation throughout the first floor were badly damaged by the October flood. Material was removed (*Fig. 18*) and disposed in weekly garbage pickups over the course of a month(*Fig. 19*). The baseboards were also removed (*Fig. 20*) and will be disposed of over time.

Fig. 18

Fig. 19

Fig. 20

Flash Flood: October 31, 2013

The water found its way under the bamboo wood floors that were present throughout the house when we bought the property. The flood resulted in massive warping of the wood on the first floor (*Fig. 21*). The wood floors were removed (*Fig. 22*) and disposed (*Fig. 23*).

Fig. 21


Fig. 22


Fig. 23

The Cause: Large Drainage Area

The storm drains at W. Mary and Newton streets are part of the East Bouldin Creek drainage basin (*Fig. 24*). An *estimate* of the "street enhanced" drainage area found that it is approximately 70 acres in size – an extraordinarily large area for a 30 inch drain pipe. This area may be as much as 60% larger than the *estimated* natural drainage area (*Fig. 25*) due to surface street flow from S. Congress and other areas diverted towards W. Mary and Newton streets. It is well known that urban development increases the rate of runoff (*Fig. 26*). A larger drainage area and increased rate of runoff leads to flash floods.

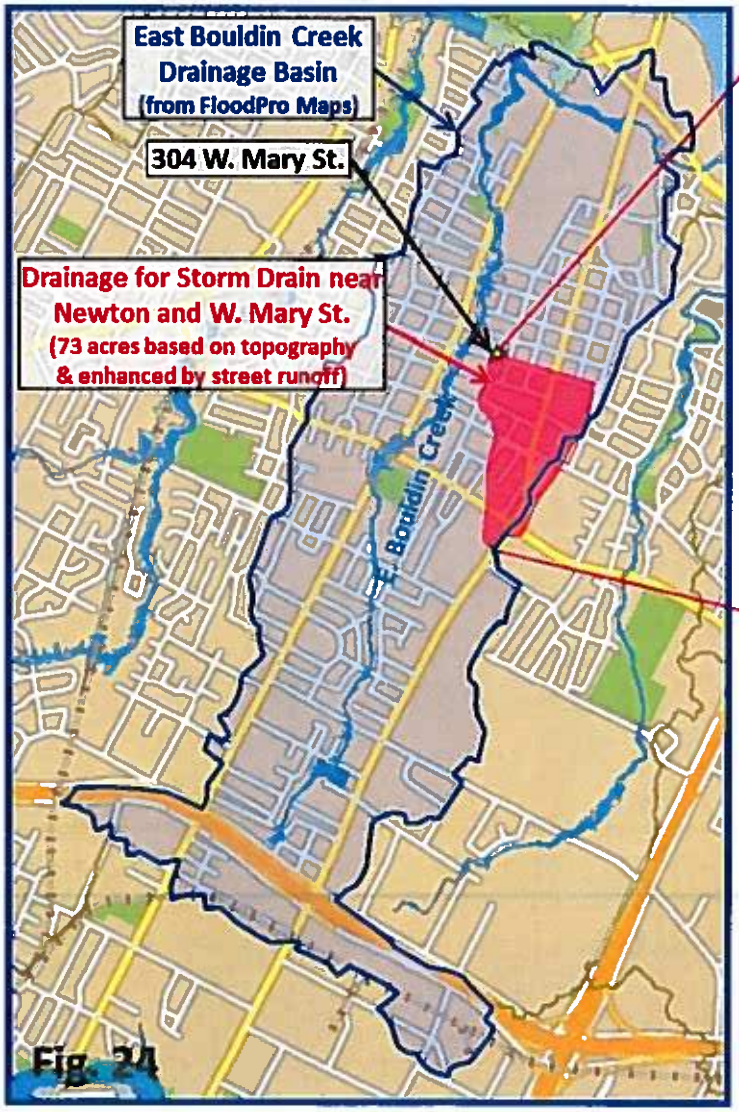

Fig. 24

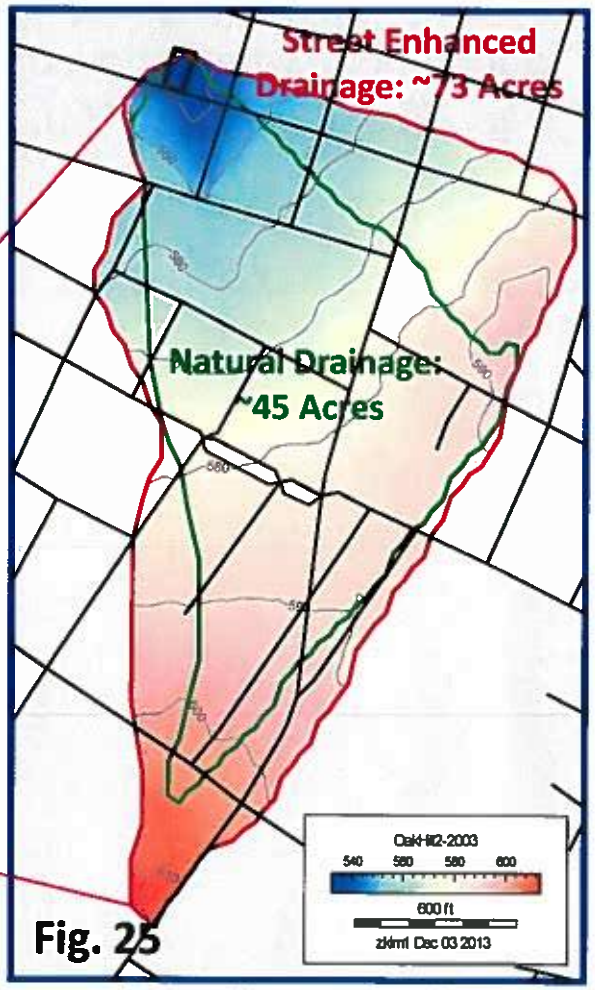

Fig. 25

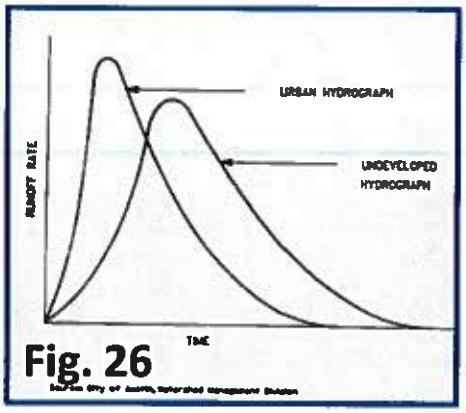

Fig. 26

The Cause: Large Drainage Area

The corner of Oltorf and S. Congress is "driving distance" from the corner of W. Mary and Newton streets. However, a straight line gradient (*Fig. 27*) shows that some of the flood waters that entered our home may have originated from that intersection. *Figure 28* is a 3-dimensional representation of the drainage area (enhanced by street runoff). This is a clear illustration of how much area is available to fill the bowl at W. Mary and Newton streets.

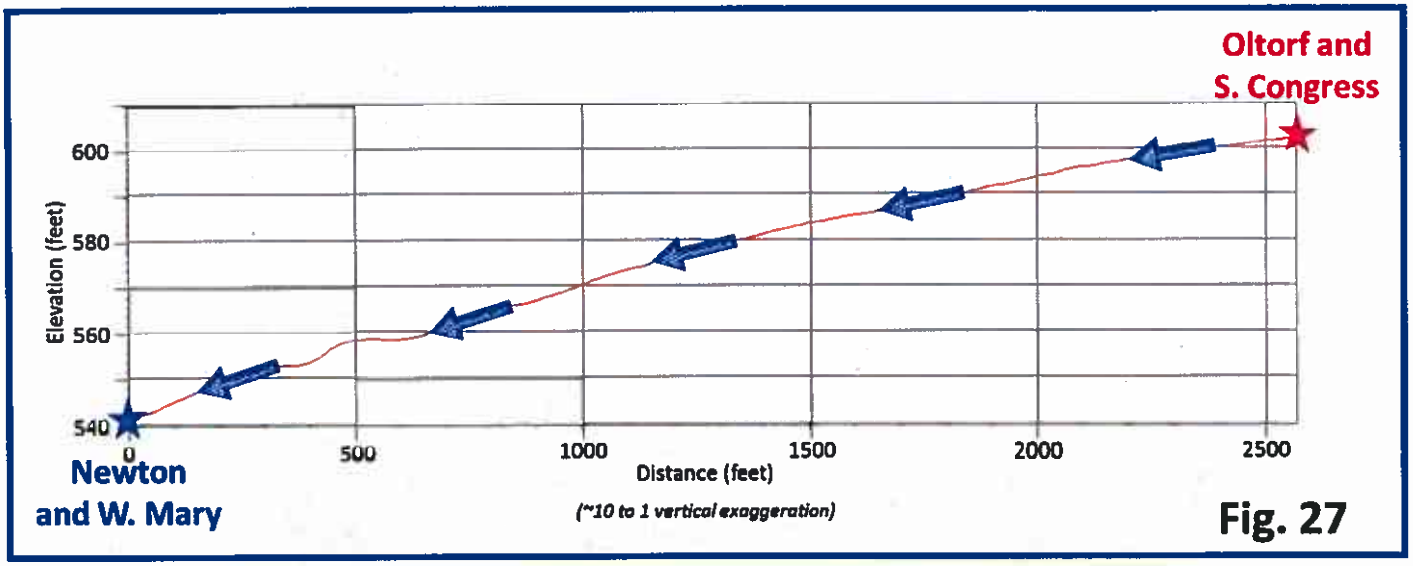

Fig. 27

Fig. 28

The Cause: Undersized and Damaged Infrastructure

The storm drain pipe under 307 W. Annie St. is damaged, but is not located in an easement (*Fig. 29*). The city did not get the owners permission to make repairs due to potential harm to the overlying elm tree. Even a 30 inch pipe in perfect condition is dramatically undersized for the drainage area it is expected to handle (*Table 1*).

(Note that W. Mary is the only street without a direct outlet to East Bouldin Creek.)

Fig. 29

Summary:

- 30" diameter pipe under Newton St.
- 24" pipe from South Congress connects with a 30" pipe at Newton and W. Mary corner.
- 30" pipe badly damaged under 307 W. Annie.
- Drain pipe expands to 36" under W. Annie St.

Diameter (inches)	Volume/foot (cubic feet)
18	17.7
24	31.4
30	49.1
36	70.7
A 36 inch pipe is 20% wider than a 30 inch pipe, but has 44% greater volume.	

Table 1

The Cause: Development

Within a block of 304 W. Mary St. several houses have been built in the past 5 years leading to more and higher velocity runoff into an already undersized drainage system (*Fig. 30 a-d*). More construction is underway (*Fig. 31*) with no improvements in flood control. Commercial development continues unabated along S. Congress (*Fig. 32*). Rainwater runoff is being handled by the same storm drains that existed when many streets were unpaved and bungalows dotted the landscape. We are not completely opposed to new development, but we are opposed to the resulting increase in rainwater runoff.


Fig. 30a


Fig. 30b


Fig. 30c


Fig. 30d


Fig. 31


Fig. 32

The Cause: Landfill (?)

When we began repairs to the fence on the east side of our backyard after the April flash flood, a large block of concrete was discovered against the old fence (area circled in Fig. 33). This block measure ~20 inches on each side (*Fig. 34*) and is nearly identical to the signal light anchors in South Austin, including the four iron bolts on top (*Fig. 35*). This 600 lb. concrete block was moved here by a flood or was placed here as landfill to protect other houses (not ours) from flash floods.

Fig. 33

Fig. 34

Fig. 35

Correspondence with JOHN BEACHY Watershed Protection Department: Field Operations Division

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from: Beachy, John <John.Beachy@austintexas.gov>
to: "kmahon77@gmail.com" <kmahon77@gmail.com>
date: Mon, Apr 8, 2013 at 9:34 AM
subject: 304 W Mary St

Mr. Mahon,

Thanks for contacting the City with your issues. I visited the site last Friday and saw the evidence of the flooding. If you have any photos taken during the storm those would be good to pass along to staff to show the magnitude of the problem.

Thanks,
John Beachy
Environmental Compliance Spec. Sr
Field Operations Division
Watershed Protection Department
(512) 974-3516

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from: Keith Mahon <kmahon77@gmail.com>
to: "Beachy, John" <John.Beachy@austintexas.gov>
date: Wed, Apr 10, 2013 at 8:30 AM
subject: Re: 304 W Mary St

John,

Attached are the 3 photos taken that day. Only one was taken during the flash flood because the girls in the house were very busy trying to save as much as they could. The water entered the house through the front door and the garage. Based on the mud line outside, it was as much as a foot deep in front of the garage. The debris from the flood clogged the drainage that was recently upgraded and caused substantial erosion, particularly on the east side of the house. The fence was completely dislodged on the east side, taking two large panels out, including the metal post and cement. The fence on the west side was installed last year and was also badly damaged.

It is obvious that the street drainage is not capable of handling the amount of rainfall received that day. Unless something is done to remedy the situation, I fear that the large deck on the back of the house could be taken out if this event is repeated. Please advise on what we can do on our property to prevent water from entering the home again while we await the necessary street drainage upgrades.

Regards,
Keith I. Mahon
713-301-5420

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from: Keith Mahon <kmahon77@gmail.com>
to: "Beachy, John" <John.Beachy@austintexas.gov>
cc: Arielle Mahon <arielle.mahon@gmail.com>
date: Fri, May 10, 2013 at 9:21 PM
subject: Re: 304 W Mary St

John,

My daughter informed me that the street flooded again this evening and water entered our house at 304 W Mary St. for the second time in two months.

When this occurred in April, I thought it was a freak storm that might occur once in twenty years. Clearly, this is not the case.

We've got a serious flood problem that is coming off the street and focusing towards our property. What is the city going to do to mitigate this problem? I await your response.

Regards,
Keith Mahon
713-301-5420

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from: Beachy, John <John.Beachy@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
date: Mon, May 13, 2013 at 1:13 PM
subject: RE: 304 W Mary St

Keith,

I have forwarded this concern to management. I will be in touch when I hear back from them.

Thanks,
John Beachy
Environmental Compliance Spec. Sr
Field Operations Division
Watershed Protection Department
(512) 974-3516

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from: Keith Mahon <kmahon77@gmail.com>
to: "Beachy, John" <John.Beachy@austintexas.gov>
date: Thu, May 16, 2013 at 5:29 PM
subject: Re: 304 W Mary St

Hi John,

Any word from management on the cause of flooding or possible storm drain enhancement in the near future?

Thanks,
Keith

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from: Beachy, John <John.Beachy@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>

date: Tue, May 21, 2013 at 4:05 PM
subject: RE: 304 W Mary St

Keith,

WPD Staff had a meeting about this location this afternoon. The first step to address the problems will be to have the existing system inspected to ensure that it is working properly. We hope to have the pipe inspection completed by the end of the week, but this depends on how fast crews can complete current assignments. WPD staff is still evaluating other alternatives and we will provide you a more detailed response in the near future. We will keep you posted on the results from the inspection.

Thanks,
John Beachy
Environmental Compliance Spec. Sr
Field Operations Division
Watershed Protection Department
(512) 974-3516

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from: Keith Mahon <kmahon77@gmail.com>
to: "Beachy, John" <John.Beachy@austintexas.gov>
date: Tue, May 21, 2013 at 5:12 PM
subject: Re: 304 W Mary St

Thanks John.

Correspondence with JORGE MORALES
Watershed Protection Department
Watershed Engineering Division

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from: Morales, Jorge <Jorge.Morales@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
cc: "Vigil, Mapi" <Mapi.Vigil@austintexas.gov>, "Beachy, John" <John.Beachy@austintexas.gov>, "Jackson, Roxanne" <Roxanne.Jackson@austintexas.gov>
subject: Flooding in home at 304 W. Mary Street
date: Fri, May 24, 2013 at 3:52 PM

Dear Mr. Mahone,

After the storm event of April 2, 2013, our department was notified of the flooding that occurred at your property. John Beachy, Environmental Compliance Specialist, Sr., Field Operation Division (FOD), Watershed Protection Department (WPD) investigated the location on April 5, 2013. From the field visit it was evident that water overtopped the roadway and affected several properties. These issues were brought to the attention of the Field Engineering group and our group the Localized Flood Hazard Mitigation (LFHM) Program to find the best course of action to address the drainage issues at this location. FOD will take initial steps to ensure that the existing storm drain system is operating properly. FOD anticipates completing an inspection of the system by May 27, 2013. The first half of the system has been TV inspected already and some issues with the system have been identified. FOD staff will develop a work plan to address the issues found during the inspection.

The solution will require multiple steps. We will be looking for short term solutions to address the drainage issue recently identified with the TV inspection and long term solutions that will address the aged infrastructure for that entire drainage area. The first step after concluding the TV inspection will be for FOD crews to go in and make repairs to the system to make sure it functions properly. We will also need assistance from you and your adjacent neighbors to allow access to the properties among other possible activities.

Our department will be in contact with you and your neighbors to discuss our repair plan and how it could affect you. The next step will be for Field Engineering and LFHM to complete the evaluation of the full system and identify repairs and improvements to the entire system. This step will take longer as it has to follow the Capital Improvements Program (CIP) process, which can take from three to seven years depending on the available funding. We will also see if any of the work can be done by the FOD crews. If that is the case, then there could possibly be some stormwater infrastructure improvements constructed within the next two years.

WPD staff will continue to update you and your neighbors of the progress and the identified potential solutions in this area.

If you have additional questions, please contact me or John Beachy, Environmental Compliance Specialist Sr., FOD, WPD, 974-3516.

Sincerely,
Jorge L. Morales, PE, CFM, Supervising Engineer
Local Flood Hazard Mitigation Program
Watershed Engineering Division

512.974.3345 o | 512.507.1648 c | 512.974.3390 f

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from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
cc: "Vigil, Mapi" <Mapi.Vigil@austintexas.gov>, "Beachy, John" <John.Beachy@austintexas.gov>, "Jackson, Roxanne" <Roxanne.Jackson@austintexas.gov>
date: Fri, Jun 7, 2013 at 12:49 PM
subject: Re: Flooding in home at 304 W. Mary Street

Dear Mr. Morales,

What are the conclusions of FOD's inspection of the storm drains near my house on 304 W. Mary St. in Austin? The April 2nd storm was the first to flood the house, but another storm on May 10th also flooded the house and damaged more of the fence on the east side of the property.

I invited multiple contractors and their associated engineers and architects to evaluate what I need to do in order the stop flood waters from entering the house. I think we all can agree that without proper street drainage, there is little that can be done on my property alone that will stop the next flood.

This is the first time I am aware that the house flooded, which coincides with the completion of two townhome projects on the corner of Newton and W. Mary. There is a new foundation about to be poured for another project on the same corner. These and other upstream projects have increased storm runoff to a level that cannot be managed with the current infrastructure. The city should put a moratorium on all new projects within this drainage basin until the infrastructure can be updated and improved.

Please keep me informed as to the status of the inspections and repairs.

Regards,
Keith Mahon
713-301-5420

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from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
cc: "Vigil, Mapi" <Mapi.Vigil@austintexas.gov>, "Beachy, John" <John.Beachy@austintexas.gov>, "Jackson, Roxanne" <Roxanne.Jackson@austintexas.gov>, Allison Troclair <atrosclair@austin.rr.com>
date: Thu, Jun 13, 2013 at 10:25 AM
subject: Re: Flooding in home at 304 W. Mary Street

Dear Mr. Morales,

I had 5 drainage contractors visit our house on 304 W. Mary St. over the past 10 days. Three of the contractors were clearly overwhelmed and unqualified to be of any assistance. One contractor made a costly proposal to divert water towards one of my neighbors that I found to be ethically unacceptable. The last contractor made multiple visits with engineers and architects over the past seven days. This contractor is in the process of making another very costly proposal to help divert a majority of the water

on either side of the house. But even this costly set of improvements will be no match for a flash flood event on par with the April 2nd flood and possibly the May 10th event as well. In his words, "The amount of water and the force of the water is pretty astounding for the urban environment." The intensity, velocity, and force of the runoff pattern is dramatic and undermined the deck post, blew the fence away, and is threatening the house foundation. This is clearly an unnatural phenomena caused by development in the area. There is a 150 year-old oak tree that would be in the direct path of the recent flash floods had our house's foundation not diverted it to the side. This tree clearly survived the 1921 and earlier floods that should have easily destroyed a much smaller oak tree in the path of a similar-sized flash flood.

Water from a wide area is entering our street and is much too large for the current infrastructure on our street. Capital improvement projects that take three to seven years to complete is not acceptable me and should not be acceptable to anyone with knowledge of the problem. To make matters worse, a new hotel is about to break ground a few blocks away on South Congress and another new foundation is being poured near the corner of Newton and W. Mary. These projects are moving forward without any improvement in our drainage. It is obvious that the drainage infrastructure cannot handle the existing development during a moderate to large rain event. Will it take the loss of multiple structures in our area during the next flood for the city to consider our street a priority?

Please send me the conclusions of FOD's inspection report. My hope is that this report will be enough for the city to recognize that the infrastructure needs to be put in place now, not in three to seven years, in order to prevent a disaster in South Austin.

Regards,
Keith I. Mahon
304 W. Mary St.
Austin, TX 78704

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from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
cc: "Vigil, Mapi" <Mapi.Vigil@austintexas.gov>, "Beachy, John" <John.Beachy@austintexas.gov>, "Jackson, Roxanne" <Roxanne.Jackson@austintexas.gov>, Allison Troclair <atrosclair@austin.rr.com>
date: Thu, Jun 13, 2013 at 12:40 PM
subject: Re: Flooding in home at 304 W. Mary Street

Mr. Morales,

Thank you for talking to me this morning. I think that everyone in the Bouldin Creek neighborhood would love to see improvements in the street drainage take place sooner rather than later. The more I hear about the April 2nd flash flood and see the damage it caused in and around my house, the more I understand the remakable destructive force of flash flooding. I'm glad that you understand the magnitude of the problem that we face, and hope that capital improvements to our neighborhood's infrastructure moves to the top of the list without having to suffer through a third flash flood this year.

Regards,
Keith

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from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
date: Fri, Jun 14, 2013 at 10:00 AM
subject: Re: Flooding in home at 304 W. Mary Street

Jorge,

Would you be able send me a digital copy of the map show where the drainage pipe lies under my property at 304 W. Mary St.? I have a guy on site replacing the fence today, and I would like him to avoid fencing that area to give you easy access to the drain.

Thank you,
Keith
713-301-5420

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from: Morales, Jorge <Jorge.Morales@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
date: Thu, Jun 20, 2013 at 10:47 AM
subject: RE: Flooding in home at 304 W. Mary Street

Mr. Mahon,

I'll get you an updated map, but for now here is we put together during the TV inspection. The letter hasn't gone out, because we need to include another form for all residents affected to fill out and return. It is a Right of Entry (ROE). We need permission to get on the private property to make the repairs. You should see the letter by early next week.

Thanks,
Jorge

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from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
date: Thu, Jun 20, 2013 at 3:56 PM
subject: Re: Flooding in home at 304 W. Mary Street

Thanks Jorge.

I noticed on the map that the wrong street number is listed for my house on W. Mary. It says 306, but it should be 304. The workers were in my backyard because the pipe was dug up near the back fence.

I am going to be out of town and out of the country for much of the summer, but you have my permission to enter the property at any time to make repairs. The tenants are aware that you will be doing work.

If you need to send me the letter, it is best to send it to both the 304 Mary St. address as well as to my main residence at: 38 Silver Maple Place, The Woodlands, TX 77382.

Thanks,
Keith

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
date: Sat, Jun 29, 2013 at 4:10 PM
subject: Flooding in home at 304 W. Mary Street

Mr. Morales,

I received a $28,450 estimate to repair the exterior structural damages and improve drainage to avoid future floods into the house. This was the only contractor out of several I contacted that was willing to do the whole job and guarantee the work. They would divert water via surface drains, not retaining walls. This obviously is way out of my price range.

When will the street drainage infrastructure be improved to handle the capacity of the the April and May floods?

Thanks,
Keith

---

from: Morales, Jorge (WPD) <Jorge.Morales@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
date: Wed, Jul 3, 2013 at 8:34 AM
subject: RE: Flooding in home at 304 W. Mary Street

Mr. Mahon,

The immediate repairs behind the property will be started on July 15TH. It would be best to hold off on any repairs you may be planning until we finish repairing the line. The relocation of the storm system to be in the street will take a little longer. It requires evaluating the entire system which goes east of Congress Ave. I am working on hiring someone to help out since this was not projected in our 5yr forecast, but definitely needs to be evaluated sooner. I will communicate with you and the other residents once we start the overall evaluation. In general a design has to be done first followed by a permit and then construction. We will hold public meetings once we have alternatives, so that we can get feedback from all residents impacted.

I've attached the letters that finally went out. We were having some internal delays.

Please sign and return by mail or email the right of entry form that is included. I have your email with permission, but it for consistency we would like you to sign the entry form.

Please let me know if you have any questions.

Thanks,

Jorge

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge (WPD)" <Jorge.Morales@austintexas.gov>
date: Tue, Jul 9, 2013 at 10:52 AM
subject: Re: Flooding in home at 304 W. Mary Street

Mr. Morales,

Thank you for sending me the notice of repair. You have my permission to do this work. I am out of the country for another week and will be unable to mail you a signed copy by the time you start repairs. If it is necessary, I can fax you a copy from my London office.

Again, thank you for your prompt attention.

Regards,
Keith

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge (WPD)" <Jorge.Morales@austintexas.gov>
date: Fri, Jul 19, 2013 at 3:59 PM
subject: Re: Flooding in home at 304 W. Mary Street

Mr. Morales,

I just got to Austin and will be here all weekend. There doesn't appear to be any work done in my backyard, but I noticed that stakes were placed in my neighbors yard. Remember that the street numbers were wrong on your map. 304 W Mary is the second house west of Newton. I want to get the surface drainage work started on my house and planned to give the contractor the down payment tomorrow morning. When will your team be done with the work in my backyard so that my contractor can start?

Regards,
Keith Mahon
713-301-5420

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge (WPD)" <Jorge.Morales@austintexas.gov>
date: Mon, Jul 29, 2013 at 1:25 PM
subject: Re: Flooding in home at 304 W. Mary Street

Mr. Morales,

How is the work going on the storm drains on West Mary St.?

Regards,

Keith Mahon
713-301-5420

---

from: Morales, Jorge (WPD) <Jorge.Morales@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
date: Tue, Jul 30, 2013 at 4:37 PM
subject: RE: Flooding in home at 304 W. Mary Street

Mr. Mahon,

I think we spoke on the phone last week, but I may be confusing you with another neighbor.

The area of the pipe that needs to be repaired is actually behind your neighbor on Annie Street. The voids that need repair are right under his large tree in the center of his backyard and he has concerns with us damaging the tree. We are trying to see what repair alternatives are out there that will limit the digging and potential damage to his tree.

If you have any questions please do not hesitate to call me.

Thank you,
Jorge

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge (WPD)" <Jorge.Morales@austintexas.gov>
date: Thu, Aug 29, 2013 at 12:18 PM
subject: Re: Flooding in home at 304 W. Mary Street

Hello Mr. Morales,

Were you able to resolve the drainage problem below my back neighbor's property on Annie St.? A crew is coming to my house in a few weeks to repair the foundation damage from the spring floods and improve drainage around the house. I am hopeful that the street drainage will be fixed so that my new system doesn't get tested by a powerful flood like we experienced in April and May.

Thanks,
Keith

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge (WPD)" <Jorge.Morales@austintexas.gov>
date: Mon, Sep 23, 2013 at 12:10 PM
subject: Re: Flooding in home at 304 W. Mary Street

Mr. Morales,

Could you give me an update on the draiange repairs on W. Mary St.? I live at 304 W. Mary St. and the last time we spoke you were still waiting on the arborist for the house behind me on Annie St.

Thanks,
Keith Mahon
713-301-5420

---

from: Morales, Jorge (WPD) <Jorge.Morales@austintexas.gov>
to: Keith Mahon <kmahon77@gmail.com>
date: Tue, Sep 24, 2013 at 12:04 PM
subject: RE: Flooding in home at 304 W. Mary Street

Mr. Mahon,

The property owner didn't authorize us to dig under his tree to make the repairs due to the large elm tree directly over the repair area. Our tree arborist also thought the tree would be damaged with the needed excavation. We have contacted a company that specializes in repairs and trenchless technologies to see if the repair can be done from within the pipe. They will assist in making the interim repairs as we plan to relocate the line or replace with new systems in the rights of way. We are working on finalizing the scope for the engineering services that will evaluate all the drainage area and identify CIP or in-house system upgrades. As soon as the scope is completed and we kick off the project we will communicate to all the affected residents.

Thanks,
Jorge

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
date: Wed, Oct 9, 2013 at 10:37 AM
subject: 304 W. Mary St.

Dear Mr. Morales,

I want to thank you for the attention you have given to the damaged storm drain that goes under my property at 304 W. Mary St. Following the two flash floods on April 2nd and May 10th of this year, you identified that the undersized drain pipe is broken and blocked under my neighbor's property. You also recognized that the current system is incapable of preventing future flash floods due to the enormous drainage basin that is focused towards this old, undersized pipe. Obviously, we need a new east to west storm system installed sooner rather than later.

The status quo leaves me in a difficult position. While the city is trying to come up with a solution to repair or replace the undersized storm drain, I have spent nearly $14,000 to replace and repair damages to my house's foundation, exterior drainage, and fence following this year's two flash floods. These repairs do not include the damage to the interior of the house and garage or the work that needs to be done to repair and upgrade the drainage on the west side of my house that was also severely eroded during these flood events. None of these repairs are covered by my homeowners insurance.

My hope is that you will be able to repair the old narrow gauge storm drain that underlies mine and my neighbors' properties before the next large rain event. The precipitation amounts in April and May were significant, but were not statistical aberrations based on historical monthly rain gauge data. Yet these two events this spring resulted in neighborhood flash flooding that long term residents have never witnessed, even in previous wet months. These floods are the result of the failure of the drainage infrastructure to handle the ever increasing runoff from development that is taking place in and along the South Congress corridor. I am not against all development, but I firmly believe it is the city's responsibility to insure that the infrastructure exists in order to handle the expected increases in runoff.

Again, thank you for the attention you have given this issue that is impacting me and my neighbors in the vicinity of West Mary and Newton streets in south Austin. Please continue to keep me informed as to the status of the repairs taking place with the old drain pipe as well as updates regarding a planned east to west storm drain system along West Mary Street to East Bouldin Creek.

Regards,
Keith I. Mahon
304 West Mary St.
Austin, TX
78704
Mobile: 713-301-5420

---

from: Keith Mahon <kmahon77@gmail.com>
to: "Morales, Jorge" <Jorge.Morales@austintexas.gov>
date: Sun, Nov 3, 2013 at 11:38 PM
subject: 304 W. Mary St.

Mr. Morales,

When I texted you last week, I was on the edge of a wilderness area in the Ozark's of northwest Arkansas. My car was located on the other side of a 20 mile trail that took 3 days to cross through mountainous terrain with no cell phone coverage or electricity. After backpacking for 3 days and driving for 10 hours, I finally arrived at 304 W. Mary St. this morning to survey the flood damage.

The damage is extensive as the water entered every room on the first floor and to a much higher height than ever before. I am tearing out base boards and dry wall as I write this. The wood floors are beyond repair and will also be removed. I spent some of the day repairing fences damaged by the flood and will remain in Austin through Monday to hire more contractors to do more repairs and upgrades to the outside to accommodate the river that has run along and through my house three times this year. I feel as though I am a total fool. Wouldn't you agree?

Here's what needs to be done: 1) stop evaluating the problem - we all know the problem and the solution; 2) fix the existing pipe ASAP even if it requires that the tree be removed - it sucks, but my house is more valuable than that tree; 3) start the process of getting an up to date drainage system along the street; 4) place an immediate moratorium on all further development in the drainage basin that is pointed directly towards my house until no. 2 and 3 are complete.

As you may have guessed - I'm fed up and I want infrastructure repairs and necessary upgrades done now. This isn't a bankrupt city - it's Austin!

(Keith Mahon)

City of Austin
Founded by Congress, Republic of Texas, 1839
Watershed Protection Department
P.O. Box 1088, Austin, Texas 78767

Keith Mahon
304 W. Mary St.
Austin, TX 78704

July 2, 2013

Dear Mr. Mahon,

The City of Austin's Watershed Protection Department will be making emergency repairs to the stormdrain system in your neighborhood in the coming weeks. In order to complete this essential maintenance, we will need your permission to enter your backyard to excavate and repair the stormdrain line. Excavation is expected to begin in mid-July and will take approximately two weeks.

The stormdrain system consists of pipes that are buried underground. They collect runoff when it rains and carry the rain water safely to creeks. The system helps prevent flooding of streets, houses and yards.

The stormdrain system in your neighborhood is outdated, and video inspection of the pipes has revealed that portions have collapsed or are in imminent danger of failing. To ensure proper stormdrain functionality, City crews must repair the stormdrain running through your property. The enclosed map shows the approximate location of the pipe (yellow lines) in relation to your property. The work will be performed in the area where the map shows a gap between the two lines and there is a red cloud. Please be assured that once the work is completed, your yard and property will be returned to its previous condition.

The City must obtain permission to enter your property before repairs can begin. Please complete the enclosed Right of Entry form and return it in the pre-addressed, stamped envelope we have provided. If you have any questions or concerns regarding this project, or would like more information, please contact me at (512) 974-3345 or jorge.morales@austintexas.gov.

Thank you,

JJ Morales

Jorge L. Morales, P.E., CFM
Supervising Engineer
City of Austin
Watershed Protection Department
Watershed Engineering Division
505 Barton Springs Rd., 12th Floor
Austin, TX 78704

The State of Texas

County of Travis

RIGHT OF ENTRY

This is an agreement made in the City of Austin, Travis County, Texas on _____, between _____, hereinafter referred to as the Grantor, and the City of Austin, Watershed Protection Department, Watershed Engineering and Field Operations.

The Grantor hereby agrees to allow the City and its contractors to enter the property below, which is under the control of the Grantor and is legally know as _____ to perform necessary construction and maintenance activities as determined by the City, between the dates of July 15, 2013 and August 15, 2013.

By signing this agreement, the Parties hereto expressly represent that they have authority to enter into this agreement.

EXECUTED in duplicate on _____.

_____

For the **CITY OF AUSTIN**

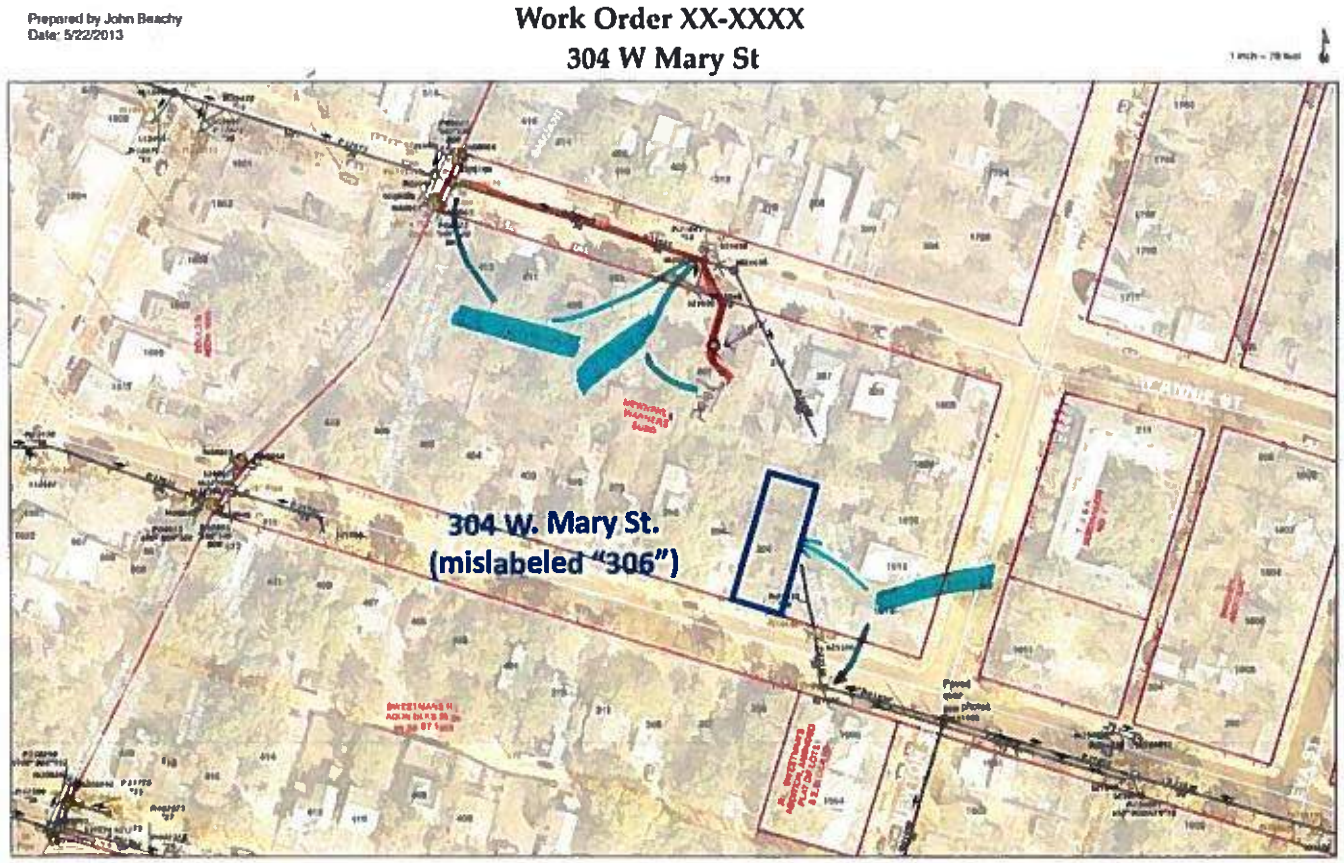
_____

PROPERTY OWNER OR DESIGNATED REPRESENTATIVE

Permission granted via email on July 9th.

Location Map for Annie Street/Mary Street Storm Drain Repairs

Location and Size of Storm Drains



Map provided by Jorge Morales
Watershed Engineering Division

Exhibit B.4

Flooding Reports and Pictures

from 300 Crockett Street


WILSON STREET
CROCKETT STREET
Rock Wall
Photo 2
Photos 3 and 4
Photo 1
NEWTON ST
WEST LIVE OAK ST.
EVA ST

300 Crockett Street – Courtyard Condominiums

Photo 1

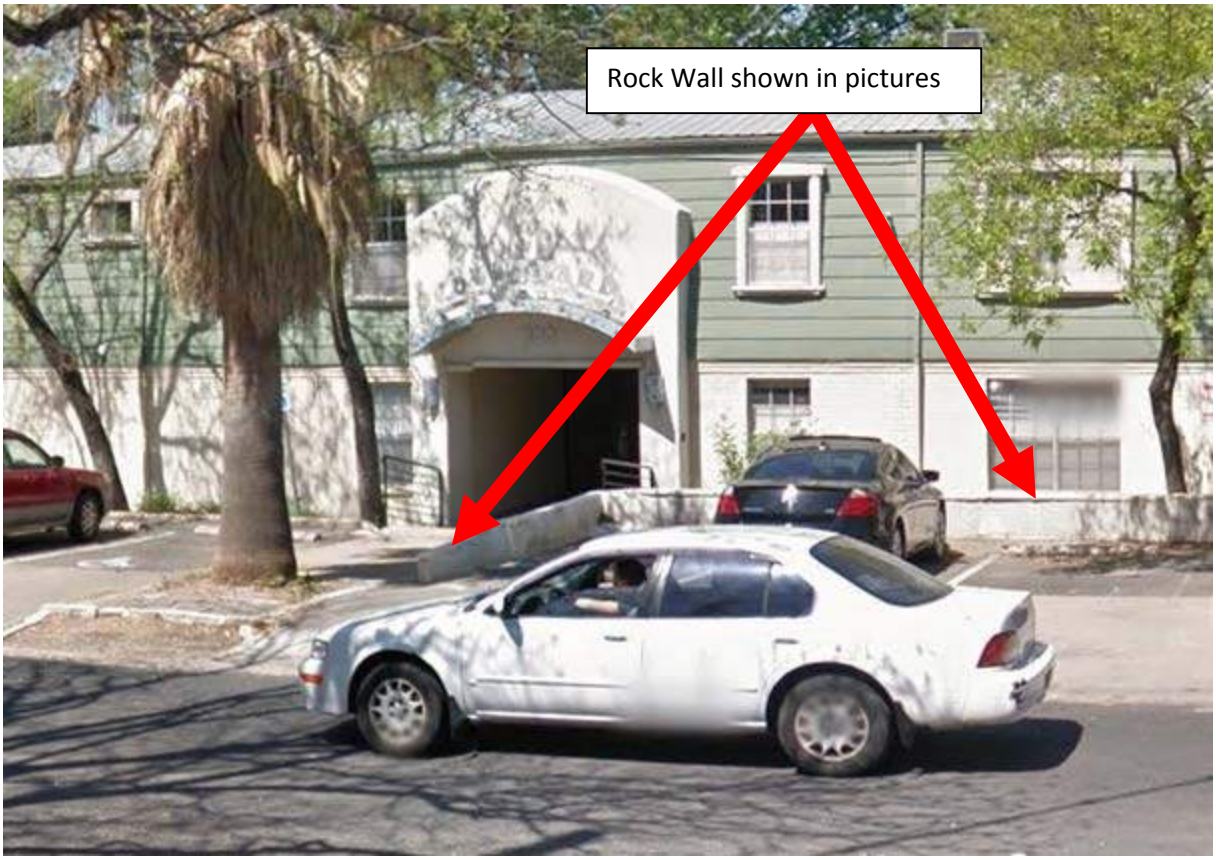


Photo 2

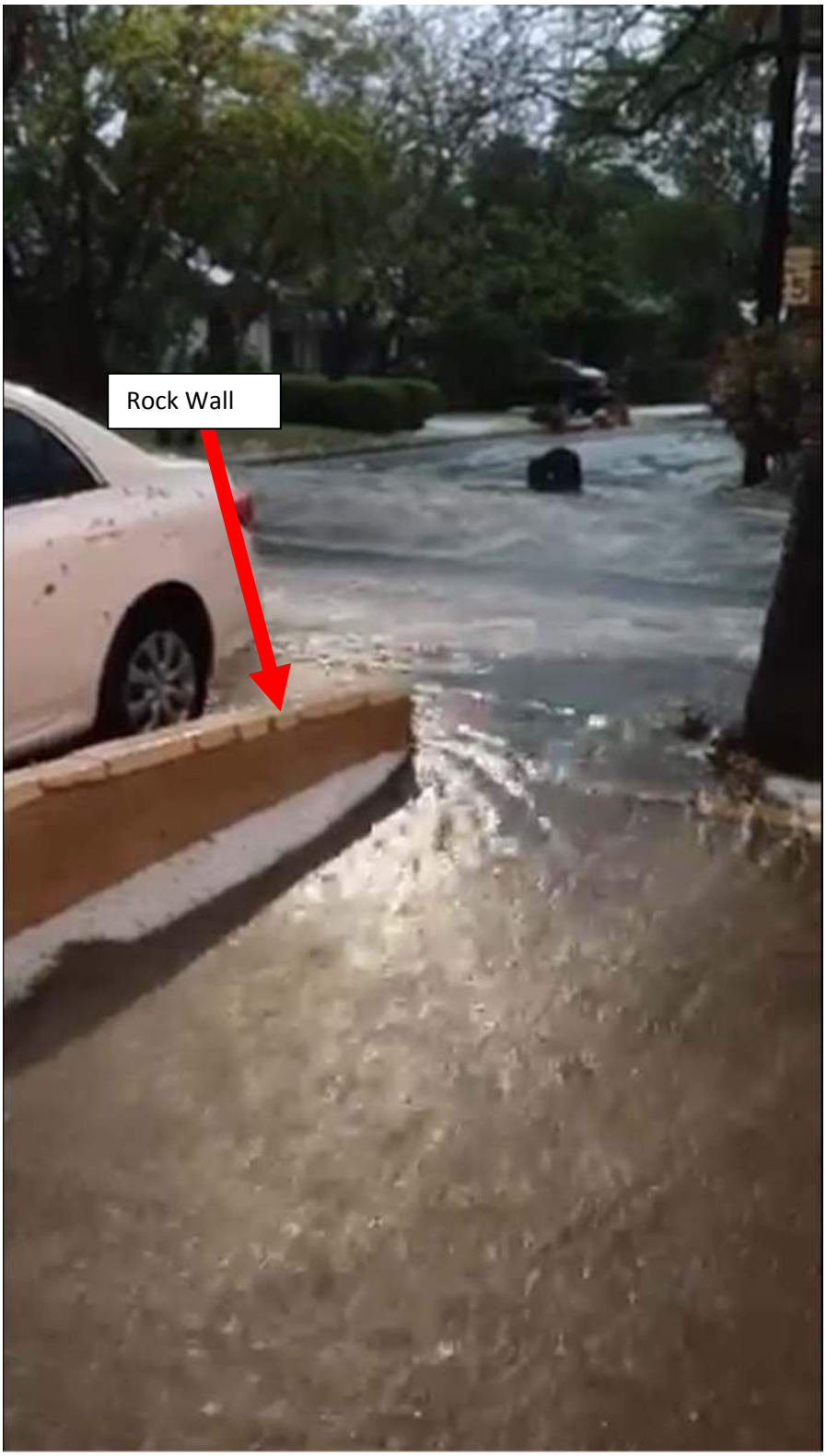
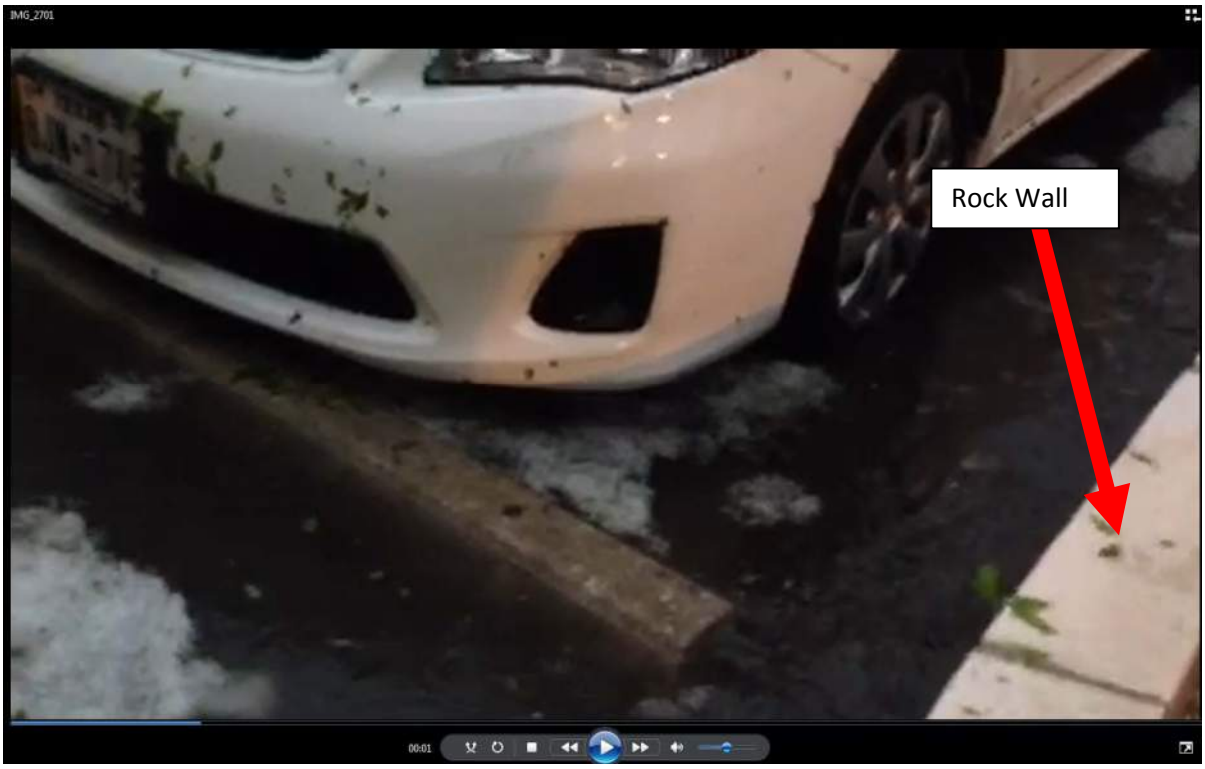


Photo 3 – rock wall constructed by Courtyard Condominiums to keep water out of complex

Photo 4 – water depth approaching top of parking curb stop



From: Halley, Shannon
Sent: Monday, February 09, 2015 4:48 PM
To: Morales, Jorge (WPD); Jackson, Roxanne
Cc: Sandoval, Marie
Subject: FW: Consistent, repeated flooding of 300 Crockett St. due to insufficient drainage

Dear Roxanne and Jorge,

As in the past, could we get an update on whether or not this property is identified in upcoming CIP work and/or scheduled for any routine FOD operations?

Many thanks!
Shannon

Shannon Halley
Policy Aide
Office of Mayor Pro Tem Kathie Tovo, District 9
512-978-2199 / Shannon.Halley@austintexas.gov
http://www.austintexas.gov/department/district-9

From: Kurt Ahlhorn [mailto:kurtahlhorn@gmail.com]
Sent: Sunday, February 08, 2015 4:24 PM
To: Harden, Joi
Cc: Perkins, Karen; Tovo, Kathie
Subject: Consistent, repeated flooding of 300 Crockett St. due to insufficient drainage

Dear Joi,

My name is Kurt Ahlhorn and I am a member of the HOA board for the Courtyard Condominiums located at 300 Crockett Street in Councilmember Tovo's district. I am writing to you to express our community's frustration at the city's seeming unwillingness to address a flooding issue which has plagued our community for some time.

The Courtyard is a community comprised of 67 units of non-student housing located immediately behind the Boy's and Girl's Club at the intersection of Wilson Street and Crockett Street. The southern side of our community looks down Newton Street. It is this arrangement which has caused us much frustration. Due to the lack of adequate storm-drainage in our area, any significant rainfall causes water to rush down Newton Street, cross Crockett Street, and flood many of our first-floor units.

We have taken as many steps as we can to mitigate the issue -- including digging drainage trenches around the entire property and building a retaining wall (that impedes access to the property itself). Even with these measures, the water has begun running under our foundation and seeping into units through the foundation. We recently had an owner remove 60 gallons of rainwater from her unit with a shop-vac.

Previously, a former member of our HOA board has attempted to inspire the city to take action to preserve our property and mitigate any future damages to owners' units, but has been met excuses and inaction. When I asked him to describe his interactions with me, he sent me the following:

> Good afternoon Kurt,
>
> Thanks for putting this in motion. Attached is a letter I received from a City Attorney acknowledging the claim for our loss during one of the flood events. I was directed to her about filing a claim by John Beachy with the City Watershed Department. When I spoke with him and met with him on site to show him the improper drainage on Crocket at Newton which caused water to pour into our complex, He was able to see in his system that the flooding issue had been present for a long time and was noted in his system going back more than 15 years.
>
> I left a message for the City Attorney to inquire about the status of the claim last year, but did not hear anything back.
>
> Flood events since I've lived here have occurred at the Courtyard in 2006, 2007, April 2013, and October 2013, We have been told by more than one person at the Watershed control that we are not a high enough priority for the City. More focus has been on the Onion Creek area and buyout programs.
>
> Is this enough detail to keep this moving?
>
> Thanks,
>
> Rob

I have attached a copy of a letter sent to the HOA by the city acknowledging our claim along with 3 videos recorded by our owners documenting the flooding. We hope that with our new single-member-district representation, that our issue will finally be heard and that the city will help its voters preserve their property.

I have CCd Karen Perkins -- with whom I've spoken regarding the issue -- as well as Councilmember Tovo. I can be reached at KurtAhlhorn@gmail.com, or at (512) 393-1755. Thank you for your time and attention.

Sincerely,

Kurt Ahlhorn

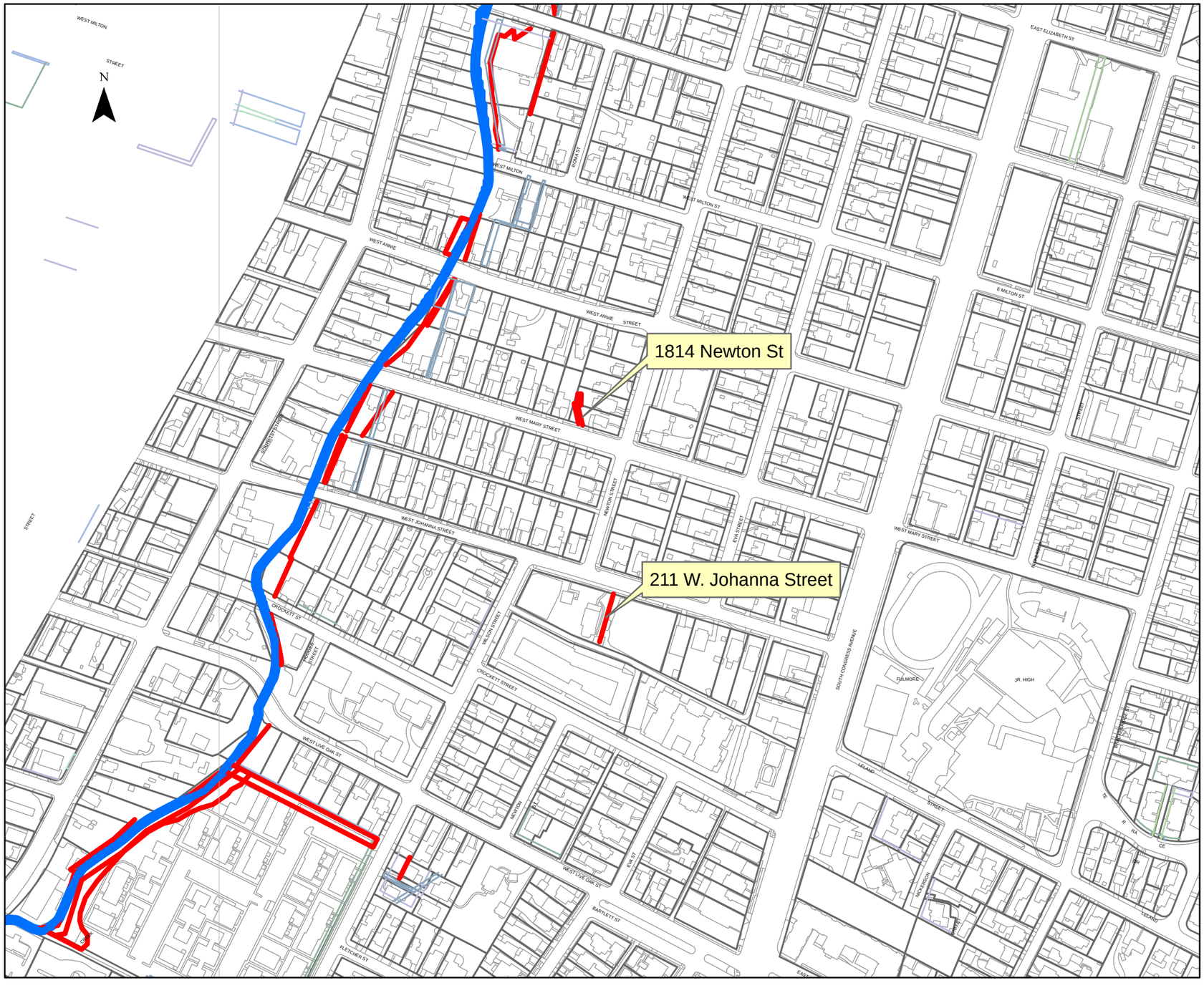
https://www.youtube.com/watch?v=9AVBgP2DJVQ

Appendix C –
Existing Infrastructure Records

Exhibit C.1	**Drainage Easement Map and Documentation**
Exhibit C.2	**Austin Utility Location and Coordination Committee Responses**
Exhibit C.3	**Storm Drain Video Inspection and Grading System Description**

Exhibit C.1

Drainage Easement Map and Documentation



Legend

East Bouldin Creek Centerline

Easements

<all other values>

EASEMENT_TYPE

- <Null>
- ACCESS
- Access
- Access Easement
- COMMUNICATION
- DRAINAGE
- Drainage
- Drainage Easement
- ELECTRIC
- ETE
- Electric
- GAS
- Gas
- MULTIPLE USE
- Multiple Use
- OPEN SPACE
- OTHER
- Other
- PUE
- Public Utility Easement
- SLOPE EASEMENT
- WWW

City of Austin.
Form-ODD-ESS-E-7-12-60

650406.22

OPEN DRAINAGE DITCH OR ENCLOSED STORM SEWER EASEMENT

THE STATE OF TEXAS |
| KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF TRAVIS |

That I, Josephine Bell

of the County of Travis and State of Texas, hereinafter referred to as Grantors, whether one or more, for and in consideration of the sum of One Dollar ($1.00) to Grantors in hand paid, and the further consideration of the benefits accruing to Grantors by reason of the drainage to be provided on the easement herein granted, have this day Granted and Conveyed and by these presents do Grant and Convey unto the City of Austin, a municipal corporation situated in the County of Travis and State of Texas, an easement and right of way for the construction and maintenance of a storm water drainageway to consist of an open drainage ditch or an enclosed storm sewer in, upon and across the following described property, to wit:

> All that certain tract, piece or parcel of land, lying and being situated in the County of Travis, State of Texas described in EXHIBIT "A" attached hereto and made a part hereof for all purposes, to which reference is here made for a more particular description of said property.

TO HAVE AND TO HOLD the same perpetually to the City of Austin, and its successors and assigns, together with the right and privilege at any and all times to enter said premises, or any part thereof, for the purpose of constructing and maintaining said storm water drainageway, and for making connections therewith.

IN WITNESS WHEREOF, Grantors have caused this instrument to be executed on this 15th day of April, 1965.

Josephine Bell

Sent to County Clerk 4-16-65
Recorded in Vol. 2942 Page 1161-1163
Sent to City Clerk 5-4-65

MAY 5 - 1965

123

City of Aust.
Form-SA-7-5-60

SINGLE ACKNOWLEDGMENT

THE STATE OF TEXAS |
|
COUNTY OF TRAVIS |

BEFORE ME, the undersigned authority, a Notary Public in and for said County and State, on this day personally appeared

Ella Moore,

known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the

_____ day of _____, 19 65.

_____
Notary Public in and for Travis County, Texas.

06APR65
DFtec

EXHIBIT "A"

Ella Moore, a widow
Drainageway
(Open or Enclosed)

FIELD NOTES

FIELD NOTES FOR A STRIP OF LAND TEN (10.00) FEET IN WIDTH, SAME BEING OUT OF AND A PART OF LOT 6, BLOCK 4B, SWISHER ADDITION, A SUBDIVISION OF A PORTION OF THE ISAAC DECKER LEAGUE IN THE CITY OF AUSTIN, TRAVIS COUNTY, TEXAS, ACCORDING TO A MAP OR PLAT OF SAID SWISHER ADDITION OF RECORD IN BOOK 1 AT PAGE 2 OF THE PLAT RECORDS OF TRAVIS COUNTY, TEXAS, WHICH LOT 6 WAS CONVEYED TO ELLA MOORE, A WIDOW, BY WARRANTY DEED DATED JANUARY 29, 1946 OF RECORD IN VOLUME 773 AT PAGE 96 OF THE DEED RECORDS OF TRAVIS COUNTY, TEXAS; THE CENTER LINE OF SAID STRIP OF LAND TEN (10.00) FEET IN WIDTH BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING at a point in the south line of said Lot 6, Block 4B, Swisher Addition, same being the north line of West Mary Street, and from which point of beginning the southwest corner of said Lot 6 bears N 71° 01' W 30.43 feet;

THENCE, N 03° 20' W 55.46 feet to point of termination in the north line of said Lot 6, same being the south line of Lot 5, and from which point of termination the northwest corner of said Lot 6 bears N 71° 01' W 4.93 feet.

FIELD NOTES: William O. Schroeder
3-30-65

FIELD WORK: E. J. Wilson
FB 2691, Pg. 59-60

APPROVED:

S. Reuben Rountree, Jr.
Director of Public Works

References:
FP 563
2-G-52
Section Map 123

ct

City of Austin
Form-ESSE-7-10-60

650406.21

ENCLOSED STORM SEWER EASEMENT

THE STATE OF TEXAS |
KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF TRAVIS |

That, I, Ella Moore, a widow

of Travis County, State of Texas, for and in consideration of the sum of One Dollar ($1.00) to Grantors in hand paid, and the further consideration of the benefits accruing to Grantors by reason of the drainage to be provided on the easement herein granted, the sufficiency of which consideration is hereby acknowledged and confessed, have this day Granted and Conveyed, and by these presents do Grant and Convey, unto the City of Austin, a municipal corporation situated in the County of Travis and State of Texas, an easement and right of way for the construction and maintenance of an enclosed storm sewer in, upon and across the following described property, to-wit:

> All that certain tract, piece or parcel of land, lying and being situated in the County of Travis, State of Texas described in EXHIBIT "A" attached hereto and made a part hereof for all purposes, to which reference is here made for a more particular description of said property.

TO HAVE AND TO HOLD the same perpetually to the City of Austin, and its successors and assigns, together with the right and privilege at any and all times to enter said premises, or any part thereof, for the purpose of constructing and maintaining said sewer, and for making connections therewith; all upon the condition that the City of Austin will at all times after doing any work in connection with the construction or repair of said sewer restore the surface of said premises to the condition in which the same was found before such work was undertaken.

IN WITNESS WHEREOF, Grantors have caused this instrument to be executed on this 6th day of April, 19 65.

Ella Moore

Sent to County Clerk 4-16-65
Recorded in Vol. 3982 page 1164-1166
Sent to City Clerk 5-4-65

MAY 5-1965

123

City of [illegible]in
Form-JA-7-6-60

JOINT ACKNOWLEDGMENT

THE STATE OF TEXAS |
|
COUNTY OF TRAVIS |

BEFORE ME, the undersigned authority, a Notary Public in and for said County and State, on this day personally appeared

Paul Gentry

and Bessie R. Gentry, his wife, both known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they each executed the same for the purposes and consideration therein expressed, and the said Bessie R. Gentry, wife of the said Paul Gentry, having been examined by me privily and apart from her husband, and having the same fully explained to her, she, the said Bessie R. Gentry acknowledged such instrument to be her act and deed, and she declared that she had willingly signed the same for the purposes and consideration therein expressed, and that she did not wish to retract it.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the _____ day of _____, 19 65.

_____

Notary Public in and for Travis County, Texas.

14APR65
DF:sc

The easement and rights hereby granted include the continuing right to clear and keep clear the above land of any and all obstructions extending above a distance of 36.00 feet from the surface of said land.

TO HAVE AND TO HOLD all and singular the above described easements and rights thereto in anywise belonging unto the City of Austin, its successors and assigns forever.

EXECUTED, this the 4th day of April, 19 65.

Paul Gentry

Bessie R. Gentry

R E S O L U T I O N

WHEREAS, the City Council of the City of Austin deems it advisable to acquire for the purpose of opening for public use as an alley that certain property lying east of and intersecting with Wilson Street, and being immediately south of Block B-6 of the R. L. Sweetman Addition of the City of Austin, said property being a portion of the Swisher Addition out of the Isaac Decker League within the City of Austin, Travis County, Texas, and also being a portion of that certain 6 acre tract or parcel of land conveyed to Simon Gillis by Mary R. James, by deed dated November 21, 1903, and recorded in Volume 183 at page 514 of the Deed Records of Travis County, Texas; and

WHEREAS, title to the property required for such alley is now in Simon Gillis, of Austin, Travis County, Texas; and

WHEREAS, the City Council deems it advisable to close and to vacate and abandon the use of all the alley lying between Blocks B-6 and B-7 of the R. L. Sweetman Addition and a portion of the alley lying south of said Block B-7 of the R. L. Sweetman homestead, a subdivision of a portion of the Isaac Decker League within the City of Austin, Travis County, Texas, according to a map or plat of said Sweetman Homestead appearing in Book 1 at page 52 of the Plat Records of Travis County, Texas, with the reservation, however, of an easement for all city utilities, said alley to become a part of Lot 1 of said Block B-6; and

THE STATE OF TEXAS)

COUNTY OF TRAVIS)

Before me, the undersigned authority, in and for Travis County, Texas, on this day personally appeared D.V. Pickle (an unmarried man), known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office, at Austin, Texas, this 2nd. day of November, A.D. 1925.

S. O. Philquist

Clerk District Courts, Travis County, Texas

Filed for Record December 1, 1925, at 12:10 o'clock P. M

Recorded December 1, 1925, at 1:50 o'clock P M

in Volume 381, Pages 319 to 320, of the
Deed Records of Travis County, Texas.

Exhibit C.2

Austin Utility Location and Coordination Committee Responses

Project Name:	**East Bouldin Creek and Annie Street Storm Sewer System Improvements**	Date:	**August 7, 2014**
UC Tracking #:	**UCC-140807-02-01**	CIP ID #:	**5789.106**
Type of Review:	**0%**	#:	**0**
Project Manager:	**Jorge Morales, 512-974-3345**		
Engineer:	**Ella (Xiaoqin) Zhang 512-974-3562**		
Project Contact:	**Kiersten Dube 512-974-7134**		
Others? (See attendance sheet)	on Date:	**August 7, 2014**	

Project Notes:

Utility	**Austin Energy**	
Rep.	David Henning (North) Tony Ferdinando (South) John Biehn _x___	
E-mail?	**yes**	mtg 08/07/14: David H. - New contact person will be provided (may be Mr. Nylec) Cc. Allen Small
Data Sh?	**yes**	email 09/02/14: AE has lines on AE and ATT poles and some underground; typical cover for UG lines is 30-36"; contact AE
Clear?	**no**	if excavating within 5' of a pole; AE must have truck access to all facilities
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict_____	
Utility	**Austin Energy -CW (Chilled Water)**	
Rep.	James Matlock Carol Stewart	
E-mail?	**yes**	email 08/12/2014: clear
Data Sh?	**no**	
Clear?	**yes**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict_____	
Utility	**Austin Water Utility**	
Rep.	Vasu Gadhia Other_____	
E-mail?	**yes**	mtg 08/07/2014: waiting for 30% preliminary sketch email
Data Sh?	**yes**	08/07/2014: see system maps H-20 and J-20
Clear?	**no**	
Docs?	System Maps ____ As-built Plans ____ Marked-up Plans ____ Other _____ No Apparent Conflict_____	
Utility	**Texas Gas Service**	
Rep.	Karla Merino Lea Crenshaw Chelseigh Simmons _x___	
E-mail?	**yes**	mtg 08/07/14 Karla M.: New Contact: Joanna, System Maps will be provided. email
Data Sh?	**yes**	8/06/2014: underground facilities throughout project area
Clear?	**no**	
Docs?	System Maps __x_____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts _____	
Utility	**GAATN**	
Rep.	Bryan Jones	
E-mail?	**yes**	email 08/06/2014: Aerial facilities on Austin Energy poles mtg 08/07/14:
Data Sh?	**yes**	Aerial- Austin Energy, no underground utility. Contact Person: Chirs.Gonzales@titus-systems.com
Clear?	**no**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict ___x___	
Utility	**Grande**	
Rep.	Luis Mata Other_____	
E-mail?	**yes**	email 08/13/2014: aerial facilities
Data Sh?	**yes**	
Clear?	**yes**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	
Utility	**ATT Texas**	
Rep.	Denise McCollum Other_____ Anthony Michetich _x_	
E-mail?	**yes**	mtg 08/07/14 Anthony Michetich (512.870-5287): will send email. email 08/07/2014:
Data Sh?	**yes**	Aerial facilities on Austin Energy and ATT poles. Also underground facilities.
Clear?	**no**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Project Name:	**East Bouldin Creek and Annie Street Storm Sewer**	Date:	**August 7, 2014**

Utility	**Level 3**	
Rep.	Andrew Trevino	Other_____
E-mail?		
Data Sh?		
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	**Tel Pacific Network Services**	
Rep.	Robert Cuevas	Other_____
E-mail?		
Data Sh?		
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	**Time Warner Cable**	
Rep.	Scott Wratten	Other_____
E-mail?	**yes**	mtg 08/07/14: TWC has aerial facilities on AE poles in the area. No underground utilities. email
Data Sh?	**yes**	08/06/2014: Aerial facilities on Austin Energy poles
Clear?	**no**	
Docs?	System Maps ___x_____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts _____	

Utility	**Verizon Business (MCI)**	
Rep.	Doug Kougl	Other_____
E-mail?	**yes**	mtg 08/07/14: Verizon (MCI) is clear in this project area.
Data Sh?	**no**	
Clear?	**yes**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts _____	

Utility	**Signals**	
Rep.	Chris Dixon	Other_____
E-mail?	**yes**	mtg 08/07/14 Chris D.: Will send plans. email 08/07/2014:
Data Sh?	**yes**	Underground facilities and aerial on Austin Energy poles.
Clear?	**no**	
Docs?	System Maps ___x_____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	**Street & Bridge Division**	
Rep.	Daren Duncan	Other_____
E-mail?		mtg 08/07/14 Daren D: please send 30% plans for review.
Data Sh?		
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	**Watershed Engineering Division**	
Rep.	Reyes Camacho	Arthur Romero
E-mail?	**yes**	
Data Sh?	**yes**	email 08/05/2014: system maps mtg 08/07/14: Aaron
Clear?	**no**	Pruitt send an email re. COA Storm Water GIS Data Cc: Arthur Romero and Reyes Camacho
Docs?	System Maps ____x____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts_____	

Utility	**TW Telecom**		Utility	**Alpheus**	
Rep.	Jared Spataro		Rep.	Morris Bankhead	
E-mail?	yes	email 08/07/2014: Aerial facilities on Austin Energy poles mtg 08/07/2014: TWT has aerial facilities on AE poles in this area.	E-mail?		
Data Sh?	**yes**		Data Sh?		
Clear?	**no**		Clear?		
Docs?	**no**		Docs?		

Utility			Utility	**XO Communications**	
Rep.	Greg Willis		Rep.	Chistopher Jones	
E-mail?			E-mail?		mtg 08/07/2014: clear
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		

Project Name:	East Bouldin Creek and Annie Street Storm Sewer		Date:	August 7, 2014	
Utility	AT&T Metro		Utility	AT&T Legacy	
Rep.	Chris Walker		Rep.	Ricky Howard	
E-mail?		mtg 08/07/14: Aerial	E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	Atmos		Utility	Bluebonnet Elec.	
Rep.	Brad Crosswhite		Rep.	Carl Miller	
E-mail?			E-mail?	yes	
Data Sh?			Data Sh?	yes	
Clear?			Clear?	yes	
Docs?			Docs?	NA	
Utility	Cap Metro RxR		Utility	Chevron Pipeline	
Rep.	Vincent Sandoval		Rep.	Miriam Scoulios	
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	CITGO Pipeline		Utility	Enterprise Pipeline	
Rep.	Sam Bentley		Rep.	Charlie Rogers	
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	Kinder Morgan Pipeline		Utility	Koch Pipeline	
Rep.	Jim Ephraim		Rep.		
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	LCRA		Utility	PEC	
Rep.			Rep.	Kay Jeanes	
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	Zayo		Utility	ONCOR Elec. Delivery	
Rep.	Bob Howard		Rep.		
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	PAETEC		Utility	APOGEE	
Rep.			Rep.	Sean Eaton	
E-mail?			E-mail?		
Data Sh?			Data Sh?		
Clear?			Clear?		
Docs?			Docs?		
Utility	FIBERLIGHT		Utility	GFT	
Rep.	Jonathan Meshell		Rep.	Ken Brock	
E-mail?			E-mail?	yes	email 08/06/2014: proposed aerial facilities in the area
Data Sh?			Data Sh?	no	
Clear?			Clear?	yes	
Docs?			Docs?	NA	
Utility	Fibernet		Utility	Austin Center for Events (ATD)	
Rep.	Noel Rice		Rep.	Cara Fischer (cara.fischer@austintexas.gov)	
E-mail?	yes		E-mail?		Depending on major events (Office: OTC 10th Floor). Pay attention to S.Congress and Live Oak
Data Sh?	no		Data Sh?		
Clear?	yes		Clear?		
Docs?	NA		Docs?		

Project Name:	**East Bouldin Creek Storm Drain Improvements**	Date:	**June 18, 2015**
UC Tracking #:	**UCC-140807-02-01**	CIP ID #:	**5789.106**
Type of Review:	**0%**	License Agreement	**0**
Project Manager:	**Jorge Morales, P.E. (512) 974-3345**		
Engineer:	**Jennifer Massie-Gore, P.E. (512) 974-7774**		
Project Contact:	**Kiersten Dube (512) 974-7134; Aaron Hanna, P.E. (512) 974-7001**		
Others? (See attendance sheet)		Constructi	**June 18, 2015**

Project Notes:

Utility	**Austin Energy**	
Rep.	David Henning (North)____ Tony Ferdinando (South)_____ John Biehn _X_	
E-mail?	**yes**	mtg 08/07/14: David H. - New contact person will be provided (may be Mr. Nylec) Cc. Allen Small
Data Sh?	**yes**	email 09/02/14: AE has lines on AE and ATT poles and some underground; typical cover for UG lines is 30-36"; contact AE
Clear?	**no**	if excavating within 5' of a pole; AE must have truck access to all facilities
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict_____	
Utility	**Austin Energy -CW (Chilled Water)**	
Rep.	James Matlock_____ Carol Stewart __X__	
E-mail?	**06/08/15**	
Data Sh?	**n/a**	
Clear?	**06/08/15**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict_____	
Utility	**Austin Water Utility**	
Rep.	Vasu Gadhia _____ Angela Baez	
E-mail?	**yes**	mtg 08/07/2014: waiting for 30% preliminary sketch email
Data Sh?	**yes**	08/07/2014: see system maps H-20 and J-20
Clear?	**no**	
Docs?	System Maps ____ As-built Plans ____ Marked-up Plans ____ Other _____ No Apparent Conflict_____	
Utility	**Texas Gas Service**	
Rep.	Larissa Prince Chelseigh Simmons __X__ Other_____	
E-mail?	**06/18/15**	Underground. Depth 18"-36" typical. Show existing gas system in future submittals. Provide revised plans for review. Use
Data Sh?	**06/18/15**	caution. Contact ONE call for locates. Keep 2' vertical and 5' (or 2' minimum) horizontal clearance from all gas lines.
Clear?	**no**	
Docs?	System Maps __06/18/15__ As-built Plans ____ Marked-up Plans ____ No Apparent Conflicts ____	
Utility	**GAATN**	
Rep.	Bryan Jones Chris Gonzales X	
E-mail?	**06/11/15**	Aerial facilities on Austin Energy poles. Contact Chris Gonzales (Email: chris.gonzales@titus-systems.com, Office: 512-
Data Sh?	**06/11/15**	252-7171, Fax: 512-252-7278, Mobile: 512-486-9417)
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict __6/11/15__	
Utility	**Grande**	
Rep.	Luis Mata_____ Other_____	
E-mail?	**06/17/15**	Aerial facilities.
Data Sh?	**06/17/15**	
Clear?		
Docs?	System Maps ____ As-built Plans ____ Marked-up Plans ____ No Apparent Conflict __06/17/15__	
Utility	**ATT Texas**	
Rep.	Karen Benton Anthony Michetich _X_	
E-mail?	**yes**	mtg 08/07/14 Anthony Michetich (512.870-5287): will send email. email 08/07/2014:
Data Sh?	**yes**	Aerial facilities on Austin Energy and ATT poles. Also underground facilities.
Clear?	**no**	
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Project Name:	East Bouldin Creek Storm Drain Improvements	Date:	June 18, 2015

Utility	Level 3	
Rep.	Mike Appleby	Jared Spataro __X__
E-mail?	06/19/15	Aerial and underground facilities. See data sheet for system map and more detailed facility list based on location.
Data Sh?	06/19/15	
Clear?		
Docs?	System Maps _6/19/15_ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	Tel Pacific Network Services	
Rep.	Rober Cuevas	Other_____
E-mail?	06/16/15	
Data Sh?		
Clear?		
Docs?	System Maps ____ As-built Plans ____ Marked-up Plans ____ No Apparent Conflict __06/16/15__	

Utility	Time Warner Cable	
Rep.	Scott Wratten __X__	Other_____
E-mail?	06/17/15	TWC has aerial facilities on AE poles in the area, and a slab mounted cabinet behind the curb on the West side of Wilson St,
Data Sh?	06/17/15	South of Crockett St.
Clear?		
Docs?	System Maps __6/17/15__ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts _____	

Utility	Verizon Business (MCI)	
Rep.	Doug Kougl	
E-mail?	06/15/15	Aerial fiber along S. 1st Street near the project area. No conflicts expected.
Data Sh?	n/a	
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts __6/15/15__	

Utility	Signals	
Rep.	Chris Dixon _____	Other_____
E-mail?	yes	mtg 08/07/14 Chris D.: Will send plans. email 08/07/2014:
Data Sh?	yes	Underground facilities and aerial on Austin Energy poles.
Clear?	no	
Docs?	System Maps _X_____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	Street & Bridge Division	
Rep.	Daren Duncan	Other_____
E-mail?	06/16/15	Please coordinate with S&B Operations regarding pavement trench repair and restoration.
Data Sh?	06/16/15	
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflict _____	

Utility	Watershed Engineering Division	
Rep.	Reyes Camacho __X__	Arthur Romero
E-mail?	06/16/15	In-house project. No conflicts.
Data Sh?	n/a	
Clear?		
Docs?	System Maps _____ As-built Plans _____ Marked-up Plans _____ No Apparent Conflicts _____	

Utility	TW Telecom	
Rep.	Jared Spataro	
E-mail?	06/19/15	See Level 3.
Data Sh?		
Clear?		
Docs?		

Utility	Alpheus	
Rep.	Morris Bankhead	
E-mail?		
Data Sh?		
Clear?		
Docs?		

Utility	CenturyLink	
Rep.	Greg Willis _____	
E-mail?		
Data Sh?		
Clear?		
Docs?		

Utility	XO Communications	
Rep.	Chistopher Jones _____	
E-mail?		mtg 08/07/2014: clear
Data Sh?		
Clear?		
Docs?		

Project Name:	East Bouldin Creek Storm Drain Improvements	Date:	June 18, 2015

Utility	AT&T Metro	Utility	AT&T Legacy
Rep.	Chris Walker_____	Rep.	Ricky Howard_____
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	Atmos	Utility	Bluebonnet Elec.
Rep.	Brad Crosswhite_____	Rep.	Carl Miller_____
E-mail?		E-mail?	yes
Data Sh?		Data Sh?	yes
Clear?		Clear?	yes
Docs?		Docs?	n/a

Utility	Cap Metro RxR	Utility	Chevron Pipeline
Rep.	Vincent Sandoval_____	Rep.	Miriam Scoulios_____
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	CITGO Pipeline	Utility	Enterprise Pipeline
Rep.	Sam Bentley_____	Rep.	Charlie Rogers_____
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	Kinder Morgan Pipeline	Utility	Koch Pipeline
Rep.	Jim Ephraim_____	Rep.	
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	LCRA	Utility	PEC
Rep.	Bob Beckmann	Rep.	Kay Jeanes_____
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	Zayo	Utility	ONCOR Elec. Delivery
Rep.	Freddie Kight	Rep.	Robert Fajkus
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	PAETEC	Utility	APOGEE
Rep.		Rep.	Sean Eaton
E-mail?		E-mail?	
Data Sh?		Data Sh?	
Clear?		Clear?	
Docs?		Docs?	

Utility	FIBERLIGHT	Utility	FIBERNET
Rep.	Jonathan Meshell	Rep.	Noel Rice __X__
E-mail?		E-mail?	06/05/15 Leased fiber in the XO duct package along S. 1st Street.
Data Sh?		Data Sh?	n/a Obtain additional information of alignment from XO.
Clear?		Clear?	
Docs?		Docs?	n/a

Utility	GOOGLE FIBER	Utility	Project Connect

Rep.	John Schultz		Rep.	Rustin Roussell	
E-mail?	yes	email 08/06/2014: proposed aerial facilities in the area	E-mail?		
Data Sh?	no		Data Sh?		
Clear?	yes		Clear?		
Docs?	n/a		Docs?		

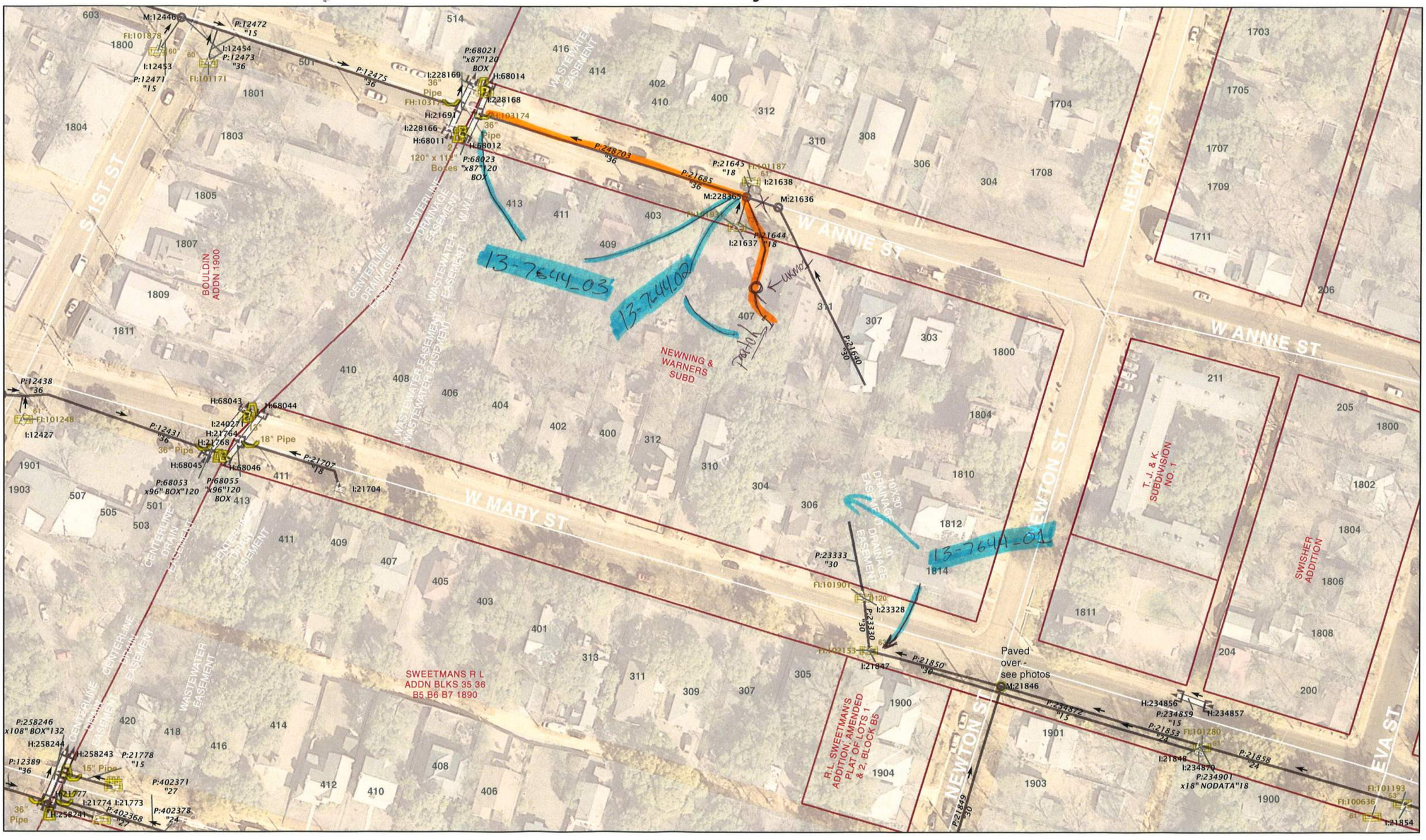
Exhibit C.3

Storm Drain Video Inspection and Grading System Description

Prepared by John Beachy
Date: 5/22/2013

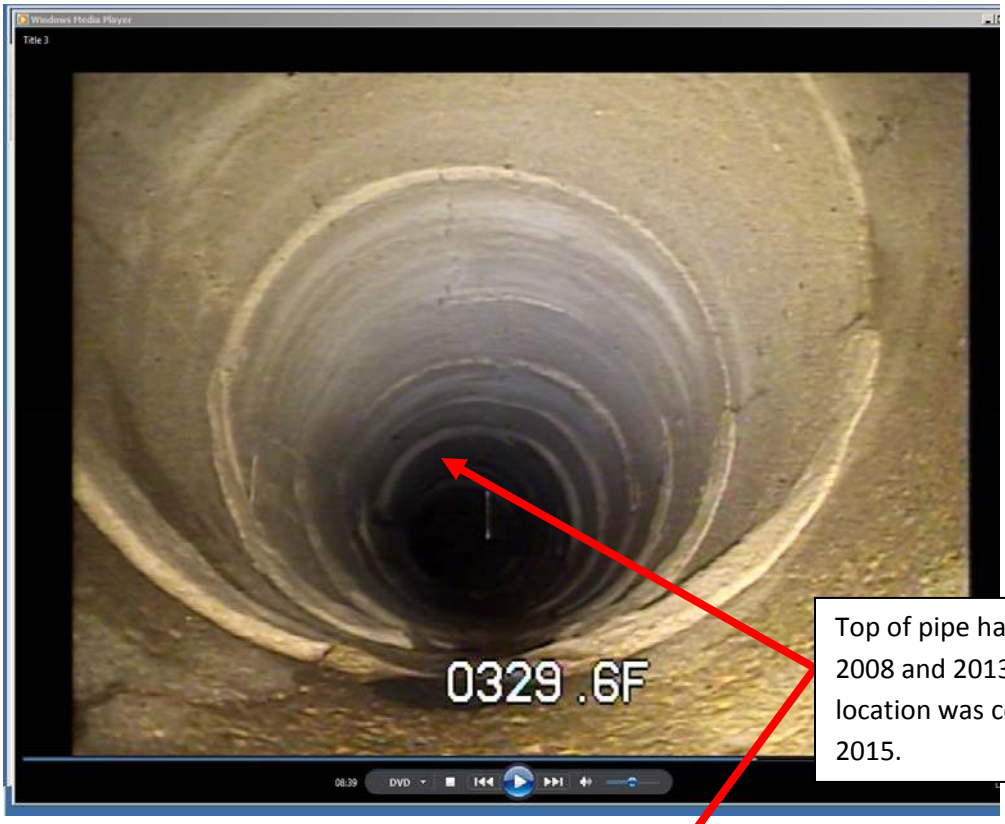
Work Order XX-XXXX
304 W Mary St

1 inch = 78 feet



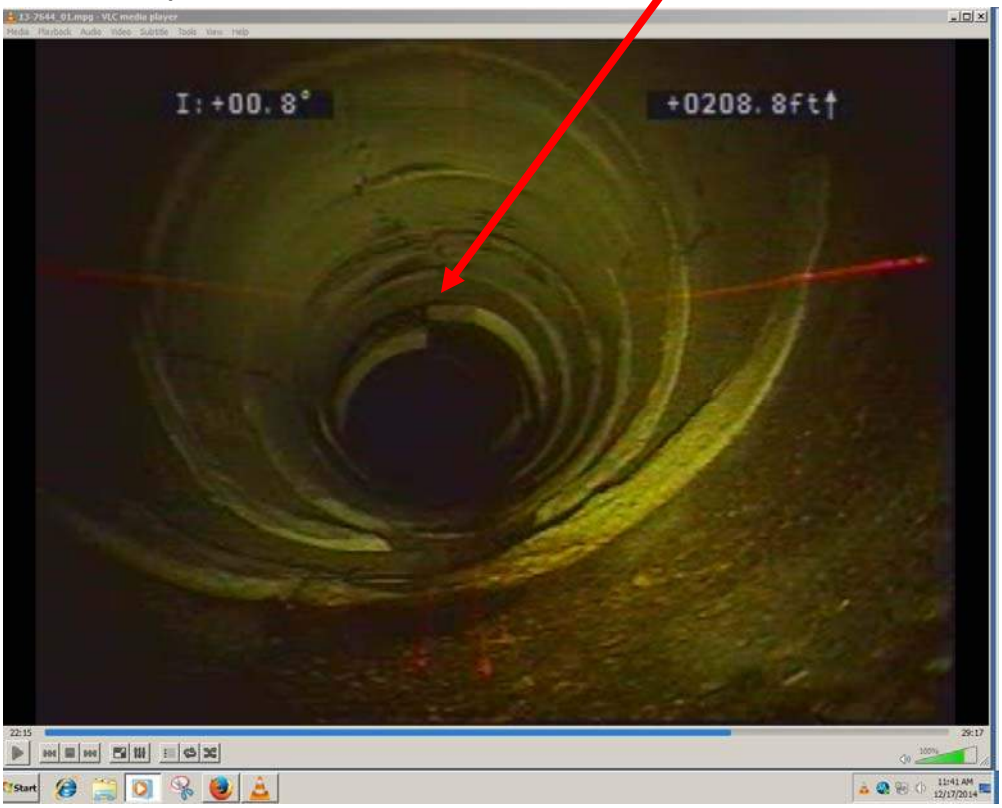
Comparison #1 – Segment 13-7644_01

2008 Video Inspection



Top of pipe has collapsed between 2008 and 2013. Spot repair at this location was completed in spring of 2015.

213 Video Inspection



Comparison #2 – Segment 13-7644_01

2008 Video Inspection

Continued erosion and deterioration between 2008 and 2013. Spot repair at this location was completed in spring of 2015.

2013 Video Inspection

Surveyors name	Certificate Number	System Owner	Survey Customer	Drainage Area	Sheet
Brian Crooks	U-710-11067				1

P/O No.	Pipeline Segment Reference	Date	Time	Location (Street Name and number)	Locality
	23330	20130522	10:26	304 W Mary St	AUSTIN

Further Location details	Upstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade
on W Mary Beside 1900 Newton St	102153			

Downstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade	Use of Sewer	Direction	Flow Control	Height
21636					Downstream		30

Width	Shape	Material	Ln. Method	Pipe Joint Length	Total Length	Length Surveyed	Year Laid	Year Rehabilitated	Tape / Media Number
	Circular								13-7644_01

Purpose	Sewer Category	Pre-Cleaning	Cleaned	Weather	Additional Information
		No Pre-Cleaning		Dry	Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

Distance (Feet)	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Struct. Grade	O&M Grade	Remarks
	Group/ Descriptor	Modifier/ severity		S/M/L	Inches 1st	Inches 2nd	%		At / From	To				
0.0	ACB													Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.
0.0	MWL						0							
0.0	H	VV							7			5		there is a void visible at the tie in for the pipe.
7.0	MGO													Continuing inspection from 7' preset.
15.8	D		S01				25							The pipe is egg shape do to to brake in pipe
16.0	B								12	12		5		the pipe is broken in mutilple stops
17.6	H	SV							9			5		
41.9	D		F01				0					4×5		
41.9	RPP								11	1				this is a patch with a steel plate
47.6	TB	A			18				1					this is the tap for inlet 101901
129.0	RPP								11	1				this is a patch
177.7	LL						15						2	pipe making a slow bend to the left
192.4	B							J	11	1		5		roots hanging down and what looks like a meatl pipe sticking out
196.1	B							J	11	1		5		there is what looks like rope hanging into the pipe.
221.0	SMW								3	9		5		the whole bottom of the pipe is broken and some pieces of the pipe are missing.
221.0	B	VV							3	9		5		there is a very large void at this location
221.0	MSA													Ending inspection of pipe 23330 here due to the broken pipe we where unable to locat4e this spot.

Surveyors name	Certificate Number	System Owner	Survey Customer	Drainage Area	Sheet
Brian Crooks	U-710-11067				2

P/O No.	Pipeline Segment Reference	Date	Time	Location (Street Name and number)	Locality
	23330	20130522	10:26	304 W Mary St	AUSTIN

Further Location details	Upstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade
on W Mary Beside 1900 Newton St	102153			

Downstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade	Use of Sewer	Direction	Flow Control	Height
21636					Downstream		30

Width	Shape	Material	Ln. Method	Pipe Joint Length	Total Length	Length Surveyed	Year Laid	Year Rehabilitated	Tape / Media Number
	Circular								13-7644_01

Purpose	Sewer Category	Pre-Cleaning	Cleaned	Weather	Additional Information
		No Pre-Cleaning		Dry	Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

Distance (Feet)	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Struct. Grade	O&M Grade	Remarks
	Group/ Descriptor	Modifier/ severity		S/M/L	Inches 1st	Inches 2nd	%		At / From	To				

	Structural								O & M								Overall							
Segment	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
13-7644_01	0	0	0	20	35	55	5745	4.6	0	2	0	0	0	2	2100	2.0	0	2	0	20	35	57	5745	4.4

PACP Inspection Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

Ftg.	Code	Description	Position	Comment
0.0	ACB	Access Point - Catch Basin		Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.
0.0	MWL	Water Level		
0.0	HVV	Hole in Pipe: Void Visible	7	there is a void visible at the tie in for the pipe.
7.0	MGO	General Observation		Continuing inspection from 7' preset.
15.8	D	Pipe Deformed		The pipe is egg shape do to to brake in pipe
16.0	B	Pipe Broken	12 to 12	the pipe is broken in mutilple stops
17.6	HSV	Hole in Pipe: Soil Visible	9	
41.9	D	Pipe Deformed		
41.9	RPP	Point Repair - Patch Repair	11 to 1	this is a patch with a steel plate
47.6	TBA	Tap, Break-in / Hammer: Active	1	this is the tap for inlet 101901
129.0	RPP	Point Repair - Patch Repair	11 to 1	this is a patch
177.7	LL	Line - Left		pipe making a slow bend to the left
192.4	B	Pipe Broken	11 to 1	roots hanging down and what looks like a meatl pipe sticking out
196.1	B	Pipe Broken	11 to 1	there is what looks like rope hanging into the pipe.
221.0	SMW	Surface: Missing Wall	3 to 9	the whole bottom of the pipe is broken and some pieces of the pipe are missing.
221.0	BVV	Pipe Broken: Void Visible	3 to 9	there is a very large void at this location
221.0	MSA	Survey Abandoned		Ending inspection of pipe 23330 here due to the broken pipe we where unable to locat4e this spot.

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

ACB - Access Point - Catch Basin @ 0.0 ft. Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

MWL - Water Level @ 0.0 ft.

HVV - Hole in Pipe: Void Visible @ 0.0 ft. there is a void visible at the tie in for the pipe.

MGO - General Observation @ 7.0 ft. Continuing inspection from 7' preset.

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

D - Pipe Deformed @ 15.8 ft. The pipe is egg shape do to to brake in pipe

B - Pipe Broken @ 16.0 ft. the pipe is broken in mutilple stops

HSV - Hole in Pipe: Soil Visible @ 17.6 ft.

D - Pipe Deformed @ 41.9 ft.

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

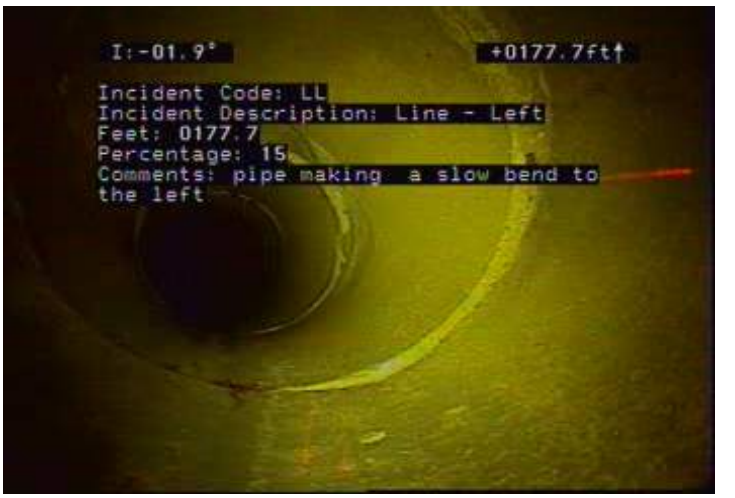
Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

RPP - Point Repair - Patch Repair @ 41.9 ft. this is a patch with a steel plate

TBA - Tap, Break-in / Hammer: Active @ 47.6 ft. this is the tap for inlet 101901

RPP - Point Repair - Patch Repair @ 129.0 ft. this is a patch



LL - Line - Left @ 177.7 ft. pipe making a slow bend to the left

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

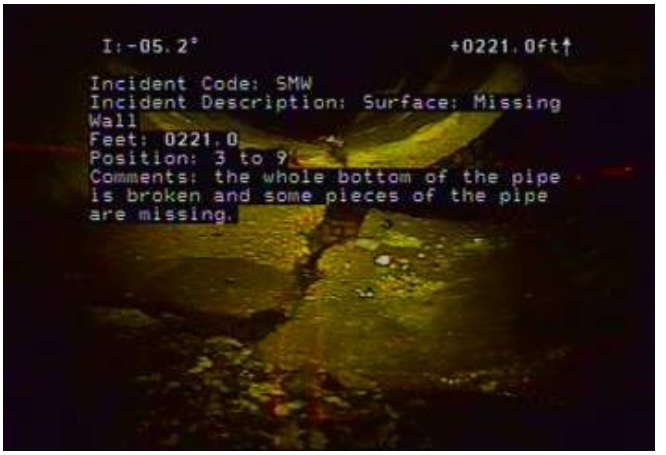
Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.

B - Pipe Broken @ 192.4 ft. roots hanging down and what looks like a meatl pipe sticking out

B - Pipe Broken @ 196.1 ft. there is what looks like rope hanging into the pipe.



SMW - Surface: Missing Wall @ 221.0 ft. the whole bottom of the pipe is broken and some pieces of the pipe are missing.

BVV - Pipe Broken: Void Visible @ 221.0 ft. there is a very large void at this location

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
228365	103174	36			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	10:40	

Additional Information

Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

AEP - Access Point - End of Pipe @ 247.4 ft. Ending inspection of pipe 21685 here at outfall 103174

Incident Snapshot Report

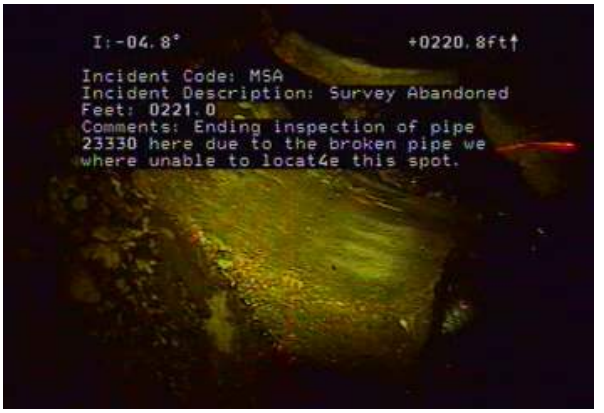
Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	21636	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	on W Mary Beside 1900 Newton St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream		Dry	20130522	10:26	

Additional Information

Starting inspection of pipe 23330 from inlet 102153 heading downstream to manhole 21636.



MSA - Survey Abandoned @ 221.0 ft. Ending inspection of pipe 23330 here due to the broken pipe we where unable to locat4e this spot.

PACP Inspection Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

Ftg.	Code	Description	Position	Comment
7.0	AMH	Access Point - Manhole		Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153. Starting inspection from 7' preset due to access into the pipe.
7.0	MWL	Water Level		
7.0	FL	Fracture Longitudinal	6	
37.1	FL	Fracture Longitudinal	6	
47.1	VC	Vermin - Cockroach		
54.5	BVV	Pipe Broken: Void Visible	7	
56.4	B	Pipe Broken	10 to 12	this may be a patch in the pipe
60.1	LR	Line - Right		
60.1	MGO	General Observation		this is a juction box at the turn the bottom of the wall in the box is not connected to the bottom of the box
107.1	MGO	General Observation		This is an unknown manhole (UKM01) we located this location at 407 W Annie St
107.1	LL	Line - Left		
110.5	LL	Line - Left		the pipe keeps making a slow bend to the left
163.2	RPP	Point Repair - Patch Repair	12 to 12	this looks to be a patch of a whole joint of pipe. looks like they use concrete for the bottom and the wall and steel plate for the top.
167.1	B	Pipe Broken	5 to 7	the bottom of the patch is broken
169.5	MSA	Survey Abandoned		Ending inspection here due to the bottom of the patch being broken and may get stuck on the way back out of the pipe.

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

AMH - Access Point - Manhole @ 7.0 ft. Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153. Starting inspection from 7' preset due to access into the pipe.

MWL - Water Level @ 7.0 ft.

FL - Fracture Longitudinal @ 7.0 ft.

FL - Fracture Longitudinal @ 37.1 ft.

Incident Snapshot Report

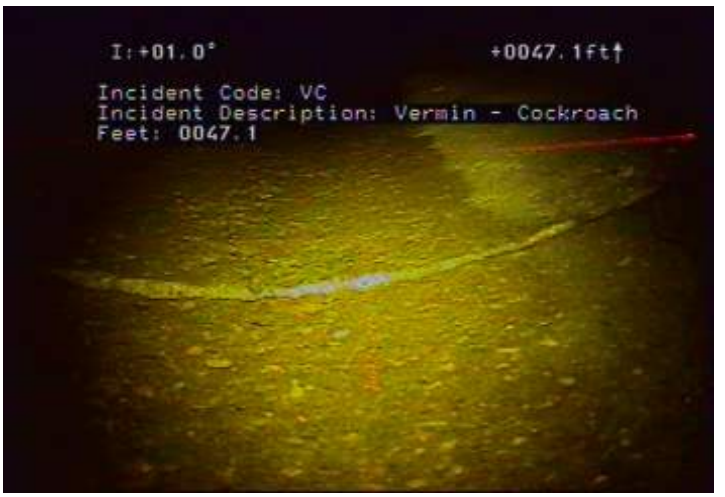
Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.



VC - Vermin - Cockroach @ 47.1 ft.

BVV - Pipe Broken: Void Visible @ 54.5 ft.

B - Pipe Broken @ 56.4 ft. this may be a patch in the pipe

LR - Line - Right @ 60.1 ft.

Incident Snapshot Report

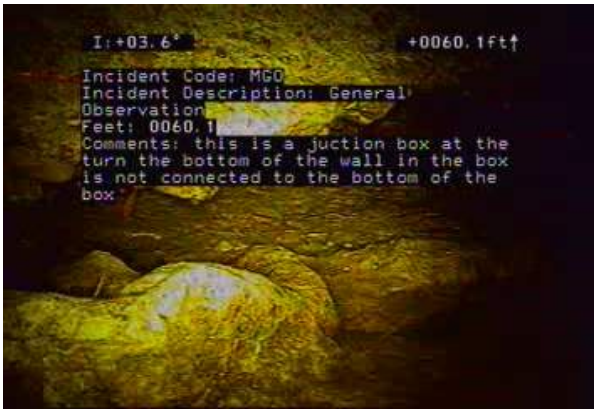
Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.



MGO - General Observation @ 60.1 ft. this is a juction box at the turn the bottom of the wall in the box is not connected to the bottom of the box

MGO - General Observation @ 107.1 ft. This is an unknown manhole (UKM01) we located this location at 407 W Annie St

LL - Line - Left @ 107.1 ft.

LL - Line - Left @ 110.5 ft. the pipe keeps making a slow bend to the left

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

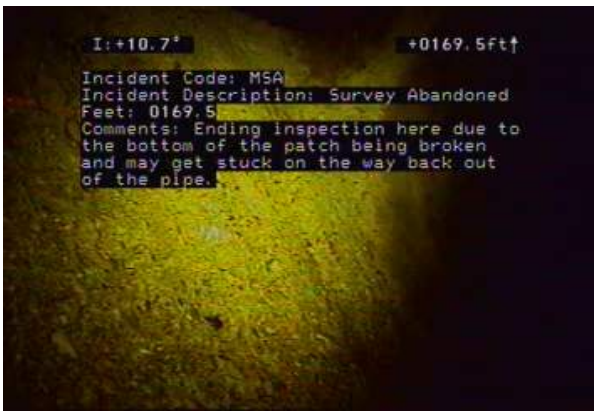
Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

RPP - Point Repair - Patch Repair @ 163.2 ft. this looks to be a patch of a whole joint of pipe. looks like they use concrete for the bottom and the wall and steel plate for the top.

B - Pipe Broken @ 167.1 ft. the bottom of the patch is broken



MSA - Survey Abandoned @ 169.5 ft. Ending inspection here due to the bottom of the patch being broken and may get stuck on the way back out of the pipe.

Surveyors name	Certificate Number	System Owner	Survey Customer	Drainage Area	Sheet
Brian Crooks	U-710-11067				1

P/O No.	Pipeline Segment Reference	Date	Time	Location (Street Name and number)	Locality
	21640	20130523	09:03	304 W Mary St	AUSTIN

Further Location details	Upstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade
312 W Anne St	102153			

Downstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade	Use of Sewer	Direction	Flow Control	Height
228365					Upstream		30

Width	Shape	Material	Ln. Method	Pipe Joint Length	Total Length	Length Surveyed	Year Laid	Year Rehabilitated	Tape / Media Number
	Circular								13-7644_02

Purpose	Sewer Category	Pre-Cleaning	Cleaned	Weather	Additional Information
		No Pre-Cleaning			Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

Distance (Feet)	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Struct. Grade	O&M Grade	Remarks
	Group/ Descriptor	Modifier/ severity		S/M/L	Inches 1st	Inches 2nd	%		At / From	To				
7.0	AMH													Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153. Starting inspection from 7' preset due to access into the pipe.
7.0	MWL						0							
7.0	FL		S01					J	6					
37.1	FL		F01						6			3×6		
47.1	VC												1	
54.5	B	VV						J	7			5		
56.4	B							J	10	12		5		this may be a patch in the pipe
60.1	LR						45						4	
60.1	MGO													this is a juction box at the turn the bottom of the wall in the box is not connected to the bottom of the box
107.1	MGO													This is an unknown manhole (UKM01) we located this location at 407 W Annie St
107.1	LL						45						4	
110.5	LL						10						1	the pipe keeps making a slow bend to the left
163.2	RPP								12	12				this looks to be a patch of a whole joint of pipe. looks like they use concrete for the bottom and the wall and steel plate for the top.
167.1	B								5	7		5		the bottom of the patch is broken
169.5	MSA													Ending inspection here due to the bottom of the patch being broken and may get stuck on the way back out of the pipe.

Surveyors name	Certificate Number	System Owner	Survey Customer	Drainage Area	Sheet
Brian Crooks	U-710-11067				2

P/O No.	Pipeline Segment Reference	Date	Time	Location (Street Name and number)	Locality
	21640	20130523	09:03	304 W Mary St	AUSTIN

Further Location details	Upstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade
312 W Anne St	102153			

Downstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade	Use of Sewer	Direction	Flow Control	Height
228365					Upstream		30

Width	Shape	Material	Ln. Method	Pipe Joint Length	Total Length	Length Surveyed	Year Laid	Year Rehabilitated	Tape / Media Number
	Circular								13-7644_02

Purpose	Sewer Category	Pre-Cleaning	Cleaned	Weather	Additional Information
		No Pre-Cleaning			Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

Distance (Feet)	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Struct. Grade	O&M Grade	Remarks
	Group/ Descriptor	Modifier/ severity		S/M/L	Inches 1st	Inches 2nd	%		At / From	To				

	Structural								O & M								Overall							
Segment	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
13-7644_02	0	0	18	0	15	33	5336	3.7	2	0	0	8	0	10	4212	2.5	2	0	18	8	15	43	5342	3.3

PACP Inspection Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

Ftg.	Code	Description	Position	Comment
7.0	AMH	Access Point - Manhole		Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153. Starting inspection from 7' preset due to access into the pipe.
7.0	MWL	Water Level		
7.0	FL	Fracture Longitudinal	6	
37.1	FL	Fracture Longitudinal	6	
47.1	VC	Vermin - Cockroach		
54.5	BVV	Pipe Broken: Void Visible	7	
56.4	B	Pipe Broken	10 to 12	this may be a patch in the pipe
60.1	LR	Line - Right		
60.1	MGO	General Observation		this is a juction box at the turn the bottom of the wall in the box is not connected to the bottom of the box
107.1	MGO	General Observation		This is an unknown manhole (UKM01) we located this location at 407 W Annie St
107.1	LL	Line - Left		
110.5	LL	Line - Left		the pipe keeps making a slow bend to the left
163.2	RPP	Point Repair - Patch Repair	12 to 12	this looks to be a patch of a whole joint of pipe. looks like they use concrete for the bottom and the wall and steel plate for the top.
167.1	B	Pipe Broken	5 to 7	the bottom of the patch is broken
169.5	MSA	Survey Abandoned		Ending inspection here due to the bottom of the patch being broken and may get stuck on the way back out of the pipe.

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

AMH - Access Point - Manhole @ 7.0 ft. Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153. Starting inspection from 7' preset due to access into the pipe.

MWL - Water Level @ 7.0 ft.

FL - Fracture Longitudinal @ 7.0 ft.

FL - Fracture Longitudinal @ 37.1 ft.

Incident Snapshot Report

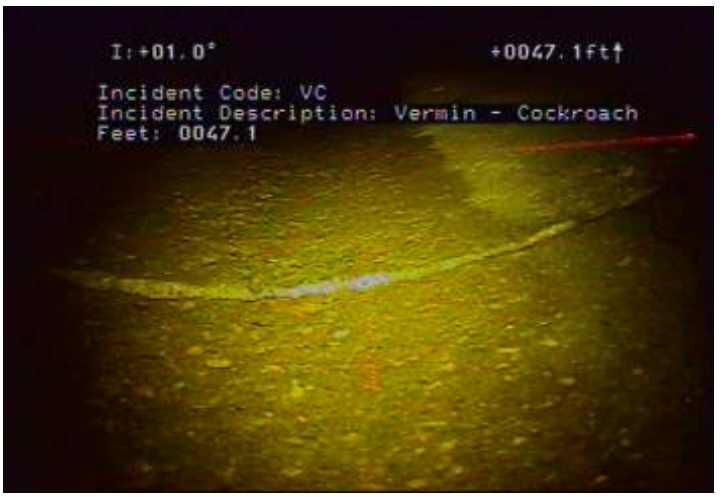
Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.



VC - Vermin - Cockroach @ 47.1 ft.

BVV - Pipe Broken: Void Visible @ 54.5 ft.

B - Pipe Broken @ 56.4 ft. this may be a patch in the pipe

LR - Line - Right @ 60.1 ft.

Incident Snapshot Report

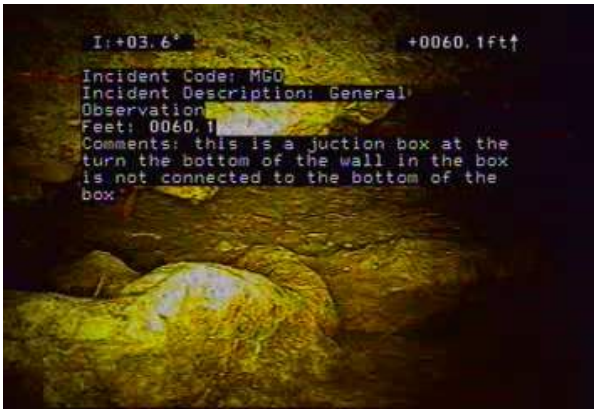
Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.



MGO - General Observation @ 60.1 ft. this is a juction box at the turn the bottom of the wall in the box is not connected to the bottom of the box

MGO - General Observation @ 107.1 ft. This is an unknown manhole (UKM01) we located this location at 407 W Annie St

LL - Line - Left @ 107.1 ft.

LL - Line - Left @ 110.5 ft. the pipe keeps making a slow bend to the left

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
102153	228365	30			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

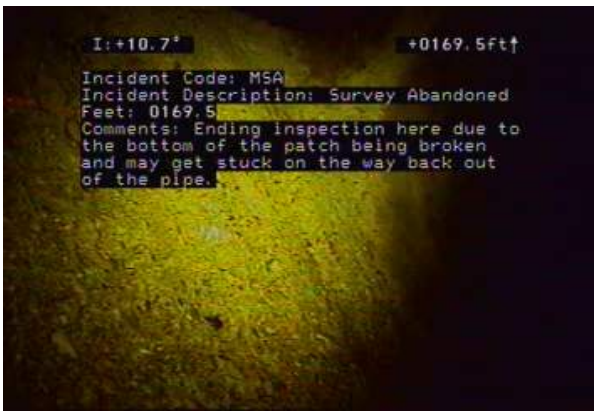
Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	09:03	

Additional Information

Starting inspection of pipe 21640 from manhole 228365 heading upstream to inlet 102153.

RPP - Point Repair - Patch Repair @ 163.2 ft. this looks to be a patch of a whole joint of pipe. looks like they use concrete for the bottom and the wall and steel plate for the top.

B - Pipe Broken @ 167.1 ft. the bottom of the patch is broken



MSA - Survey Abandoned @ 169.5 ft. Ending inspection here due to the bottom of the patch being broken and may get stuck on the way back out of the pipe.

Surveyors name	Certificate Number	System Owner	Survey Customer	Drainage Area	Sheet
Brian Crooks	U-710-11067				1

P/O No.	Pipeline Segment Reference	Date	Time	Location (Street Name and number)	Locality
	21685	20130523	10:40	304 W Mary St	AUSTIN

Further Location details	Upstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade
312 W Anne St	228365			

Downstream Manhole Number	Rim to Invert	Grade to Invert	Rim to Grade	Use of Sewer	Direction	Flow Control	Height
103174					Upstream		36

Width	Shape	Material	Ln. Method	Pipe Joint Length	Total Length	Length Surveyed	Year Laid	Year Rehabilitated	Tape / Media Number
	Circular								13-7644_03

Purpose	Sewer Category	Pre-Cleaning	Cleaned	Weather	Additional Information
		No Pre-Cleaning			Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

Distance (Feet)	Code		Continuous defect	Value				Joint	Circumferential Location		Image Ref.	Struct. Grade	O&M Grade	Remarks
	Group/ Descriptor	Modifier/ severity		S/M/L	Inches 1st	Inches 2nd	%		At / From	To				
0.0	AMH													Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.
0.0	MWL						0							
7.0	MGO													Continuing inspection from 7' preset.
21.9	OBI						50		9	3			5	there is a utility board though the pipe
21.9	B								3			5		pipe is broken due to utility board though the pipe
21.9	B								9			5		pipe is broken due to utility board though the pipe
90.7	FL		S01						6					
128.9	VC												1	alot of roaches
141.0	B	SV						J	5	6		5		pipe broken at joint soil and reinforcement visible
233.6	B	SV						J	7			5		PIPE IS BROKEN AT JOINT SOIL VISIBLE
237.0	JS			M								1		You can see sedament though the joint
237.0	JO			M								1		
247.4	AEP													Ending inspection of pipe 21685 here at outfall 103174

	Structural								O & M								Overall							
Segment	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
13-7644_03	2	0	0	0	20	22	5412	3.7	1	0	0	0	5	6	5111	3.0	3	0	0	0	25	28	5513	3.5

PACP Inspection Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
228365	103174	36			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	10:40	

Additional Information

Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

Ftg.	Code	Description	Position	Comment
0.0	AMH	Access Point - Manhole		Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.
0.0	MWL	Water Level		
7.0	MGO	General Observation		Continuing inspection from 7' preset.
21.9	OBI	Obstacle - Object Protruding Thru Wall	9 to 3	there is a utility board though the pipe
21.9	B	Pipe Broken	3	pipe is broken due to utility board though the pipe
21.9	B	Pipe Broken	9	pipe is broken due to utility board though the pipe
90.7	FL	Fracture Longitudinal	6	
128.9	VC	Vermin - Cockroach		alot of roaches
141.0	BSV	Pipe Broken: Soil Visible	5 to 6	pipe broken at joint soil and reinforcement visible
233.6	BSV	Pipe Broken: Soil Visible	7	PIPE IS BROKEN AT JOINT SOIL VISIBLE
237.0	JSM	Joint Separated (open): Medium		You can see sedament though the joint
237.0	JOM	Joint Offset (displaced): Medium		
247.4	AEP	Access Point - End of Pipe		Ending inspection of pipe 21685 here at outfall 103174

Incident Snapshot Report

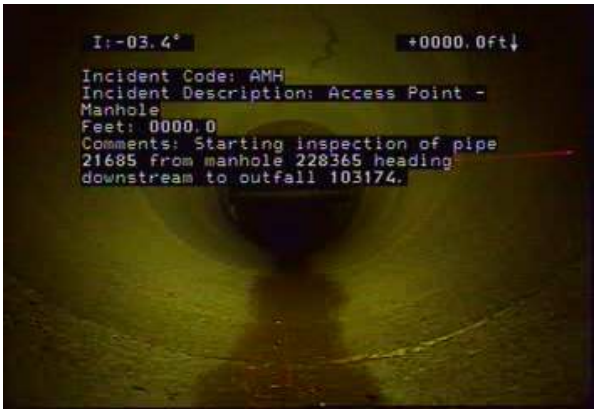
Upstream MH	Downstream MH	Size	Material	Total Length	City
228365	103174	36			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	10:40	

Additional Information

Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.



AMH - Access Point - Manhole @ 0.0 ft. Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

MWL - Water Level @ 0.0 ft.

MGO - General Observation @ 7.0 ft. Continuing inspection from 7' preset.

OBI - Obstacle - Object Protruding Thru Wall @ 21.9 ft. there is a utility board though the pipe

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
228365	103174	36			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	10:40	

Additional Information

Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

B - Pipe Broken @ 21.9 ft. pipe is broken due to utility board though the pipe

B - Pipe Broken @ 21.9 ft. pipe is broken due to utility board though the pipe

FL - Fracture Longitudinal @ 90.7 ft.

VC - Vermin - Cockroach @ 128.9 ft. alot of roaches

Incident Snapshot Report

Upstream MH	Downstream MH	Size	Material	Total Length	City
228365	103174	36			AUSTIN

Surveyor's Name	Certificate Number	Street Address	Location Details
Brian Crooks	U-710-11067	304 W Mary St	312 W Anne St

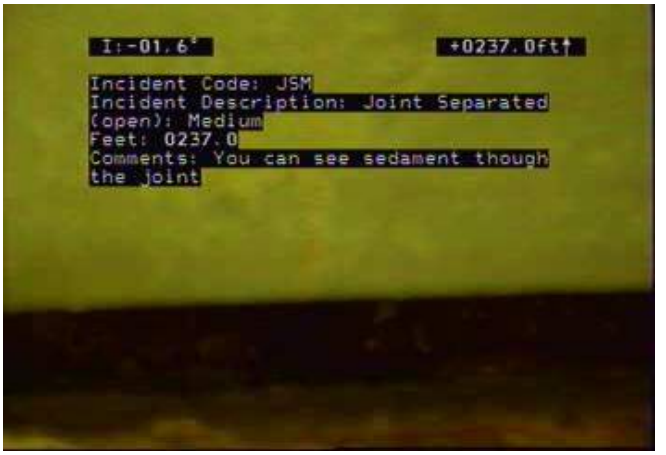
Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream			20130523	10:40	

Additional Information

Starting inspection of pipe 21685 from manhole 228365 heading downstream to outfall 103174.

BSV - Pipe Broken: Soil Visible @ 141.0 ft. pipe broken at joint soil and reinforcement visible

BSV - Pipe Broken: Soil Visible @ 233.6 ft. PIPE IS BROKEN AT JOINT SOIL VISIBLE



JSM - Joint Separated (open): Medium @ 237.0 ft. You can see sedament though the joint

JOM - Joint Offset (displaced): Medium @ 237.0 ft.

PACP© Condition Grading System

The Pipeline Assessment and Certification Program (PACP) developed by NASSCO provides a mechanism for creating reliable descriptions of pipe conditions. NASSCO has also developed a system based on the PACP codes to assign a condition rating to pipelines. Requirements of the grading system were as follows:

1. Like the PACP, the grading system should be direct and objective.

2. Provide the ability to qualitatively identify differences in pipe condition between one inspection and subsequent inspections, and to prioritize based on the significance of the defects different pipe segments.

Many other approaches to sewer pipe grading have been used in the United States as well as in other parts of the World. These approaches generally use some type of defect grading that is then used to calculate an overall pipe rating.

It is problematic to develop a single pipe segment rating that fully describes all of the important aspects of a pipe. Therefore the PACP Condition Grading System uses more than one method of rating pipe segment condition including a rating that considers the number of total defects within the pipe segment and a rating that considers the most severe defects within the pipe segment.

The PACP Condition Grading System only considers internal pipe conditions obtained from TV inspection. While other factors such as pipe material, depth, soils, and surface conditions also affect pipe survivability, those factors have not been included in the PACP Condition Grading System. The PACP Condition Grading System should be used only as a tool for screening pipe segment inspections, allowing the User to quickly determine which pipe segments have significant defects. It is expected that as the PACP further develops the PACP Condition Grading System will expand to include other factors.

The PACP Condition Grading System provides condition ratings for Structural Defects and Operation and Maintenance Defects.

Approach

Using the PACP Code Matrix, Each PACP defect code is assigned a condition grade of from 1 to 5. Grades are assigned based on the significance of the defect, extent of

damage, percentage of flow capacity restriction, or the amount of wall loss due to deterioration.

The PACP Condition Grading System alone is inadequate for determining if a pipe segment should be rehabilitated or replaced. Many other factors in addition to the internal condition of the segment should be considered. The fact that a segment has significant Grade 4 or Grade 5 defects does not necessarily mean the pipe segment should be immediately rehabilitated. Recent experience by PACP Users has shown that pipe segments with serious defects such as hinge failures may remain largely unchanged for many decades if no deterioration factors such as surcharging, roots, or groundwater are present.

What is needed is improved estimates of remaining life or mean time before failure that are based on close monitoring of pipe segments over time. Once we know how much change occurs in pipe segments we can better understand the relationship between defects, deterioration factors, and pipe segment life expectancy. PACP continues to be an excellent tool for benchmarking pipe condition between one inspection and subsequent inspections of the same pipe.

Grades are assigned for two categories, Structural, and O&M defects.
Grades are as follows;
5 - Most significant defect grade
4 – Significant
3 – Moderate defect grade
2 – Minor to Moderate
1 –Minor defect grade

The PACP Condition Grading System results are entirely dependent on the quality of the PACP defect coding. Errors in the coding will directly result in errors in the Grading. All utilities, engineers, and contractors should make sure the data they are using was coded by experienced technicians who have successfully demonstrated their competence through a formal or informal apprenticeship program. PACP data from inexperienced technicians should be checked and corrected as needed. Errors found in coding should be corrected and the errors brought to the attention of the technician.

Grading of Continuous Defects

The PACP continuous defect feature is used to denote where long portions of a sewer pipe are affected by the same defect, without the User having to repetitively enter point defects. However to develop a grade for the pipe segment, a mechanism is needed to translate a continuous defect into an equivalent number of point defects.

The equivalent number (quantity) of "uninterrupted" and "joint repeating" continuous defects is calculated by dividing the length of the continuous defect by 5. Example, a 6-meter long continuous defect, grade 3, should equate to four Grade 3 defects. Fractions are rounded to the nearest whole number.

Pipe Ratings

The pipe rating is based on the number of occurrences for each condition grade. Ratings are calculated separately for **Structural Defects** and **O&M Defects**. Several ways of expressing pipe segment condition are used by the PACP Condition Grading System as follows.

Segment Grade Scores - Each pipe segment will have a Segment Grade Score for each of the five grades. The number of occurrences of each pipe grade is multiplied by the pipe grade to calculate the segment grade score. Example, six Grade 5 defects would be 6 times 5 and equates to a Segment Grade 5 Score of 30. If a pipe segment had no defects of a particular grade, then the Segment Grade Score for that grade would be 0.

Overall Pipe Rating –The five Segment Grade Scores are added together to calculate the **Overall Pipe Rating. Structural Pipe Ratings** are calculated using only Structural Defect grades, while **O&M Pipe Ratings** are calculated using only O&M Defect grades.

PACP Quick Rating – The PACP Quick Rating is a shorthand way of expressing the number of occurrences for the two highest severity grades. The PACP Quick Rating is a four character score as follows:

1. The first character is the highest severity grade occurring along the pipe length.
2. The second character is the total number of occurrences of the highest severity grade. If the total number exceeds 9, then alphabetic characters are used as follows- 10 to 14 – A; 15 to 19 – B; 20 to 24 – C; etc.
3. The third character is the next highest severity grade occurring along the pipe length.
4. The fourth character is the total number of the second highest severity grade occurrences, derived as in item 2 above.

For Example

4B27

This immediately shows that no grade 5 defects or grade 3 defects, however 15 to 19 grade 4 defects and seven grade 2 defects were found.

Another Example

3224

Two grade 3 defects and four grade 2 defects, however no grade 5 or grade 4 defects were found.

If a pipe segment only has defects of one grade, the first two characters are the grade and the quantity of defects, and the last two characters are 00 (denoting no other defect grades). A pipe segment with no defects would have a Quick Score of 0000 (all zeros).

The PACP Quick Rating provides the ability to summarize the number and severity of defects found within a pipe segment. As with the Pipe Rating, Quick Structural Ratings

are calculated using only Structural Defect Grades, and Quick O&M Ratings are calculated using only O&M Defect Grades.

The Quick Rating is an excellent screening tool to determine which pipe segments require closer scrutiny. If a pipe has not defects greater than Grade 1 or 2, then the pipe segment probably does not need any further investigation.

Pipe Ratings Index – This is an indicator of the distribution of defect severity. The Pipe Ratings Index is calculated by dividing the Pipe Rating by the number of defects. For example, the Structural Pipe Ratings Index would be the Structural Pipe Rating divided by the number of structural defects. Pipe Ratings Indexes are calculated for Structural, O&M, and Overall. A pipe segment with a Pipe Rating of zero (0) would have a Pipe Rating Index of zero (0).

Summary

The following procedures are used to calculate pipe segment ratings using the PACP Condition Grading System:

1. Determine the number of occurrences for each condition grade within the pipe segment. Calculate separately for Structural Defect Grades and O&M Defect Grades.
2. Calculate the Segment Grade Score by multiplying the number of occurrences by the respective grade 1 through 5. Calculate the Structural Segment Grade Score and the O&M Segment Grade Score separately, and then add together for the Overall Segment Grade Score.
3. Calculate the Pipe Rating for the pipe segment by adding the Segment Grade Scores. Add all five Structural Segment Grade Scores for the Structural Pipe Rating, and add all five O&M Segment Grade Scores for the O&M Pipe Rating. Add all five Overall Segment Grade Scores for the Overall Pipe Rating.
4. Determine the PACP Quick Rating by calculating the number of occurrences of the two highest severity grades.

5. Calculate the Pipe Ratings Index by dividing the Pipe Rating by the number of defects. If the pipe has no defects, the Pipe Ratings Index is zero.
6. Verify the PACP defect data used in accurate. The grading is a direct calculation from the defect data, and coding errors will be reflected in grading errors.

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
Structural	Crack (C)	Circumferential (C)		CC	1	
		Longitudinal (L)		CL	2	
		Multiple (M)		CM	3	
		Hinge (CH2)		CH2	4	
		Hinge (CH3)		CH3	5	
		Hinge (CH4)		CH4	5	
		Spiral (S)		CS	2	
Structural	Fracture (F)	Circumferential (C)		FC	2	
		Longitudinal (L)		FL	3	
		Multiple (M)		FM	4	
		Hinge (H2)		FH2	4	
		Hinge (H3)		FH3	5	
		Hinge (H4)		FH4	5	
		Spiral (S)		FS	3	
Structural	Pipe Failures (Silent)	Broken (B)		B	1 clock pos - 3, 2 clock pos - 4, >=3 clock pos - 5	
		Broken (B)	Soil Visible (SV)	BSV	5	
		Broken (B)	Void Visible (V V)	BVV	5	
		Hole (H)		H	1 clock pos - 3, 2 clock pos - 4, >= 3 clock pos - 5	
		Hole (H)	Soil Visible (SV)	HSV	5	
		Hole (H)	Void Visible (V V)	HVV	5	
Structural	Collapse (X)	Pipe (P)		XP	5	
		Brick (B)		XB	5	
Structural	Deformed (D)	(Pipe)		D	<=10% - 4,>10% - 5	
		(Brick)	Horizontally (H)	DH	5	
		(Brick)	Vertically (V)	DV	5	
Structural	Joint (J)	Offset (displaced) (O)	Med (M)	JOM	1	
			Large (L)	JOL	2	
		Separated (open) (S)	Med (M)	JSM	1	
			Large (L)	JSL	2	
		Angular (A)	Med (M)	JAM	1	
			Large (L)	JAL	2	
Structural	Surface Damage Chemical (S)	Roughness Increased (RI)	C	SRIC	1	
		Surface Spalling (SS)	C	SSSC	2	
		Aggregate Visible (AV)	C	SAVC	3	
		Aggregate Projecting (AP)	C	SAPC	3	
		Aggregate Missing (AM)	C	SAMC	4	

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor		Modifier	Code	Structural Grade	O&M Grade
		Reinforcement Visible (RV)	C		SRVC	5	
		Reinforcement Projecting (RP)	C		SRPC	3	
		Reinforcement Corroded (RC)	C		SRCC	5	
		Missing Wall (MW)	C		SMWC	5	
		Other (Z)	C		SZC		
Structural	Surface Damage Mechanical (M)	Roughness Increased (RI)	M		SRIM	1	
		Surface Spalling (SS)	M		SSSM	2	
		Aggregate Visible (AV)	M		SAVM	3	
		Aggregate Projecting (AP)	M		SAPM	3	
		Aggregate Missing (AM)	M		SAMM	4	
		Reinforcement Visible (RV)	M		SRVM	5	
		Reinforcement Projecting (RP)	M		SRPM	3	
		Reinforcement Corroded (RC)	M		SRCM	5	
		Missing Wall (MW)	M		SMWM	5	
		Other (Z)	M		SZM	N/A	
Structural	Surface Damage Not Evident (Z)	Roughness Increased (RI)	Z		SRIZ	1	
		Surface Spalling (SS)	Z		SSSZ	2	
		Aggregate Visible (AV)	Z		SAVZ	3	
		Aggregate Projecting (AP)	Z		SAPZ	3	
		Aggregate Missing (AM)	Z		SAMZ	4	
		Reinforcement Visible (RV)	Z		SRVZ	5	
		Reinforcement Projecting (RP)	Z		SRPZ	3	
		Reinforcement Corroded (RC)	Z		SRCZ	5	
		Missing Wall (MW)	Z		SMWZ	5	
		Other (Z)	Z		SZZ	N/A	
Structural	Surface Damage (Metal Pipes)	Corrosion (CP)			SCP	3	
Structural	Lining Features (LF)	Detached (D)			LFD	3	
		Defective End (DE)			LFDE	3	
		Blistered (B)			LFB	3	
		Service Cut Shifted (CS)			LFCS	3	
		Abandoned Connection (AC)			LFAC		
		Overcut Service (OC)			LFOC	3	
		Undercut Service (UC)			LFUC	3	
		Buckled (BK)			LFBK	3	
		Annular Space (AS)			LFAS	3	
		Bulges (BU)			LFBU	3	
		Discoloration (DC)			LFDC	3	
		Delamination (DL)			LFDL	3	
		Pinholes (PH)			LFPH	3	
		Resin Slug (RS)			LFRS	3	
		Wrinkled (W)			LFW	3	
		Other (Z)			LFZ	N/A	
Structural	Weld Failure (WF)	Circumfrential (C)			WFC	2	
		Longitudinal (L)			WFL	2	

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Multiple (M)		WFM	3	
		Spiral (S)		WFS	2	
Structural	Point Repair (RP)	Localized Pipeliner (L)		RPL		
		Localized Pipeliner (L)	Defective (D)	RPLD	4	
		Patch Repair (P)		RPP		
		Patch Repair (P)	Defective (D)	RPPD	4	
		Pipe Replaced (R)		RPR		
		Pipe Replaced (R)	Defective (D)	RPRD	4	
		Other (Z)		RPZ		
		Other (Z)	Defective (D)	RPZD		
Structural	Brickwork (Silent)	Displaced (DB)		DB	3	
		Missing (MB)		MB	4	
		Dropped Invert (DI)		DI	5	
		Missing Mortar	Small	MMS	2	
			Medium	MMM	3	
			Large	MML	3	
O&M	Deposits (D)	Deposits Attached (DA)	Encrustation (E)	DAE		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Grease (G)	DAGS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Ragging (R)	DAR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Other (Z)	DAZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Deposits Settled (DS)	Hard/Compacted (C)	DSC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Fine silt/sand (F)	DSF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Gravel (G)	DSGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Other (Z)	DSZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Deposits Ingress (DN)	Fine silt/sand (F)	DNF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Gravel (GV)	DNGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
			Other (Z)	DNZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Roots (R)	Fine (F)	Barrel (B)	RFB		2
			Lateral (L)	RFL		1
			Connecfion (C)	RFC		1
	Roots (R) at a Joint		N/A	RFJ	in software with a J	1
		Tap (T)	Barrel (B)	RTB		3
			Lateral (L)	RTL		2
			Connecfion (C)	RTC		2
	Roots (R) at a Joint		N/A	RTJ		2
		Medium (M)	Barrel (B)	RMB		4
			Lateral (L)	RML		3
			Connecfion (C)	RMC		3
	Roots (R) at a Joint		N/A	RMJ		3
		Ball (B)	Barrel (B)	RBB		5
			Lateral (L)	RBL		4
			Connecfion (C)	RBC		4
	Roots (R) at a Joint		N/A	RBJ		4
O&M	Infiltration (I)	Weeper (W)		IW		2
		Dripper (D)		ID		3
		Runner (R)		IR		4
		Gusher (G)		IG		5
		Stain (S)		IS		
O&M	Obstacles/Obstructions (OB)	Brick or Masonry (B)		OBB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Pipe Material in Invert (M)		OBM		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Intruding Thru Wall (I)		OBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Wedged in Joint (J)		OBJ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Thru Connection (C)		OBC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		External Pipe or Cable In Sewer (P)		OBP		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Built Into Structure (S)		OBS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Construction Debris (N)		OBN		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Rocks (R)		OBR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other Objects (Z)		OBZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Vermin (V)	Rat (R)		VR		2
		Cockroach (C)		VC		1
		Other (Z)		VZ		1
O&M	Grout Test and Seal (G)	Grout Test Pass (GTP)				
			Joint (J)	GTPJ		
			Lateral (L)	GTPL		
		Grout Test Fail (GTF)				
			Joint (J)	GTFJ		
			Lateral (L)	GTFL		
		Grout Test Unable to Test (GTU)				
			Joint (J)	GTUJ		
			Lateral (L)	GTUL		
		Grout at a Location (not a joint) (GRT)		GRT		
Construction Features	Tap (T)	Factory Made (F)		TF		
			Capped (C)	TFC		
			Abandoned (B)	TFB		
			Defective (D)	TFD		2
			Intruding (I)	TFI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Activity (A)	TFA		
		Break-In/Hammer (B)		TB		
			Capped (C)	TBC		2
			Abandoned (B)	TBB		
			Defective (D)	TBD		3
			Intruding (I)	TBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Activity (A)	TBA		
		Saddle (S)		TS		
			Capped (C)	TSC		
			Abandoned (B)	TSB		

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
			Defective (D)	TSD		2
			Intruding (I)	TSI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Activity (A)	TSA		
		Rehabilitated (R)		TR		
			Defective (D)	TRD		2
			Intruding (I)	TRI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
Construction Features	Intruding Seal Material (IS)			IS		
		Sealing Ring (SR)		ISSR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Hanging (H)	ISSRH		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Broken (B)	ISSRB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Loose, Poorly Fitting (SRL)		ISSRL		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Grout (GT)		ISGT		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		ISZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
Construction Features	Line (L)	Left (L)		LL		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/Up (LU)		LLU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/Down (LD)		LLD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right (R)		LR		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4

NASSCO PACP Condition Grading System
Code Matrix

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Right/Up (RU)		LRU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right/Down (RD)		LRD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Up (U)		LU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Down (D)		LD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
Construction	Access Points (A)					
		Cleanout (CO)		ACO		
			Mainline (M)	ACOM		
			Property (P)	ACOP		
			House (H)	ACOH		
		Discharge Point (DP)		ADP		
		Junction Box (JB)		AJB		
		Meter (M)		AM		
		Manhole (MH)		AMH		
		Other Special Chamber (OC)		AOC		
		Tee Connection (TC)		ATC		
		WW Access Device (WA)		AWA		
		Wet Well (WW)		AWW		
		Catch Basin (CB)		ACB		
		End of Pipe (EP)		AEP		
Other	Miscellaneous (M)	Camera Underwater (CU)		MCU		4
		Dimension/Diam/Shape Change (SC)		MSC		
		General Observation (GO)		MGO		
		General Photograph (GP)		MGP		
		Material Change (MC)		MMC		
		Lining Change (LC)		MLC		
		Pipe Joint Length Change (JL)		MJL		
		Survey Abandoned (SA)		MSA		
		Water Level (WL)		MWL		
			Sag (S)	MWLS	<=30% - 2, <=50% - 3, >50% - 4	
		Water Mark (WM)		MWM		>=50% 4, >=75% 5
		Dye Test (Y)		MY		
			Visible (V)	MYV		5
			Not Visible (N)	MYN		3