HICKORY SOUTH DRAINAGE BASIN

SAPULPA CITYWIDE MASTER DRAINAGE PLAN

JUNE 2010

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CIVIL & WATER RESOURCE ENGINEERING
GEOGRAPHIC INFORMATION SYSTEMS

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SECTION 9. HICKORY SOUTH DRAINAGE BASIN

9.1. EXISTING CONDITIONS HYDROLOGY

The Hickory South Drainage Basin stretches from W. Mike Avenue on the north, W. Teel Road on the west, W. Norma Street on the south and S. Ridgeway Street to the east to drain into Polecat Creek. The basin and its location are depicted in **FIGURE 9-1**.

The hydrologic soil groups and existing land use for this basin are shown in **FIGURE 9-2** and **FIGURE 9-3** respectively. More information on the hydrologic soil groups can be found in **SECTION 2.1 HYDROLOGIC ANALYSIS**.

The hydrologic coefficients used for input in the HEC-HMS model include the drainage area, the lag time and the soil complex curve number (CN). A summary of hydrologic coefficients is tabulated in **TABLE 9-1** with more detailed data in **APPENDIX 9-A**.

The drainage basin was modeled using HEC-HMS. The HEC-HMS schematic used to develop the flow rates for the Hickory South Drainage Basin is located in **APPENDIX 9-B** with a complete list of the flow rates for the existing conditions in **APPENDIX 9-C**. **TABLE 9-2** on the following pages shows the resulting flow rates at major junctions for this basin.

9.2. EXISTING CONDITIONS HYDRAULICS

FIGURE 9-4 shows the storm sewer systems studied and their capacities for the Hickory South Drainage Basin. A StormCAD model was used to analyze the flow through the storm sewer system. The pipe capacities from the StormCAD model were compared with the 1 – 500-year HMS flow rates to determine the existing capacities of each pipe in the system.

The Hickory South Drainage Basin has a number of storm sewer systems which drain into the upper reaches of Polecat Creek. The major storm sewers run north-south along Hickory Street although there are several smaller storm sewer systems serving residential neighborhoods east of S. Hickory Street. Tables with flow rates and capacities are included in **APPENDIX 9-C.**

The floodplains in this drainage system were mapped for the 100- and 500-year frequency events and in some cases more frequent events. The general location of the studied floodplains is shown in **FIGURE 9-4** with detailed floodplain maps found in **APPENDIX 9-D**. Buildings located within the floodplain are also shown. The resulting water surface profiles for each frequency are presented in **APPENDIX 9-E**.

Finally, bridges and culverts were studied to determine the likelihood of being overtopped during certain storm frequencies and are depicted in **FIGURE 9-5**. Four structure overtoppings occur in this drainage basin and are located in the southeastern part of the basin. The structures are capable of passing a storm with a frequency of 10% or greater annual chance.

STORMWATER
UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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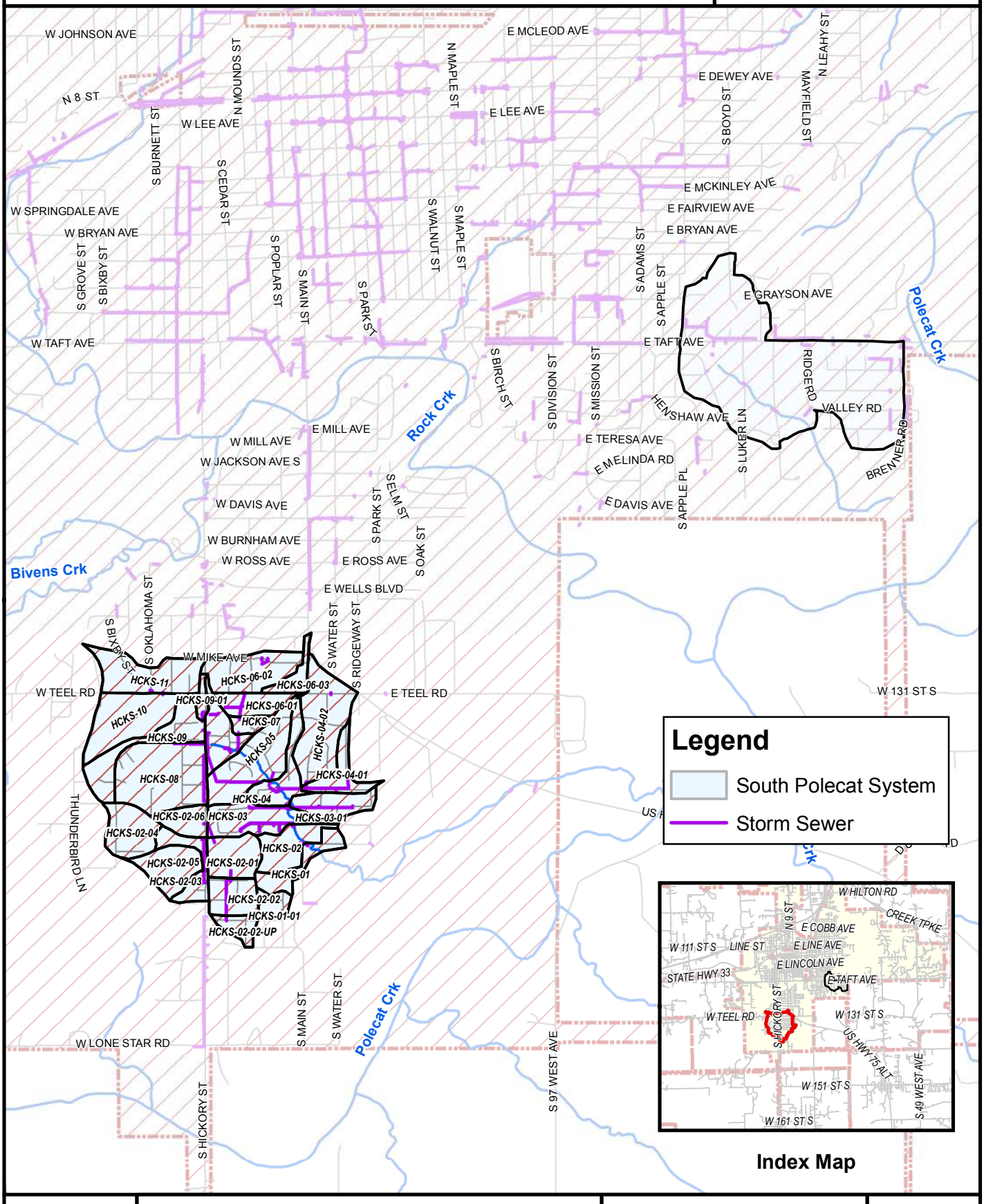

Legend

- South Polecat System
- Storm Sewer

Index Map

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South Polecat Systems
Hickory South Drainage Basin

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Figure 9-1

City of Sapulpa Master Drainage Plan

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

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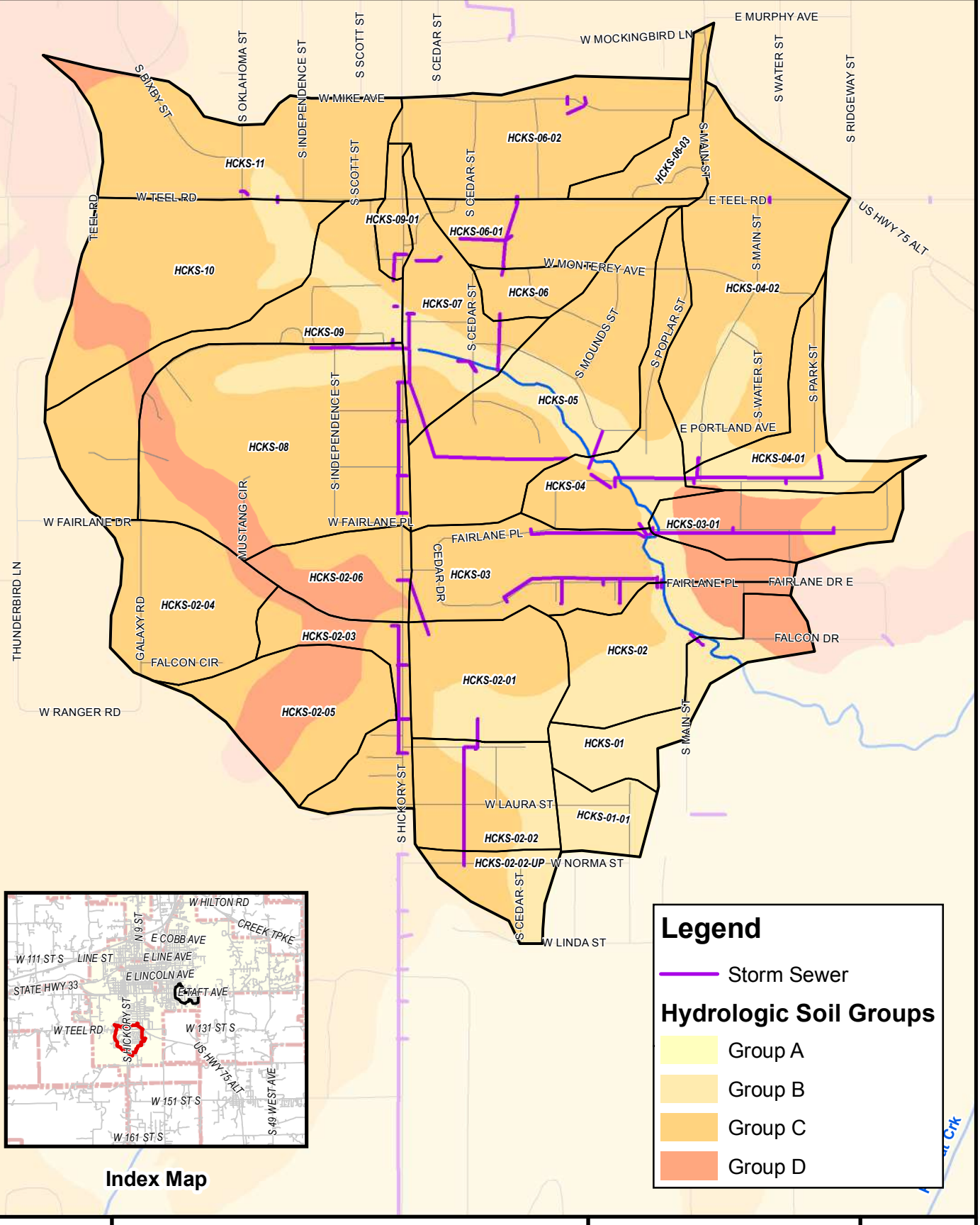

Index Map

Legend

- Storm Sewer

Hydrologic Soil Groups

- Group A
- Group B
- Group C
- Group D

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Hickory South Drainage Basin Hydrologic Soil Groups

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Figure 9-2

City of Sapulpa Master Drainage Plan

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

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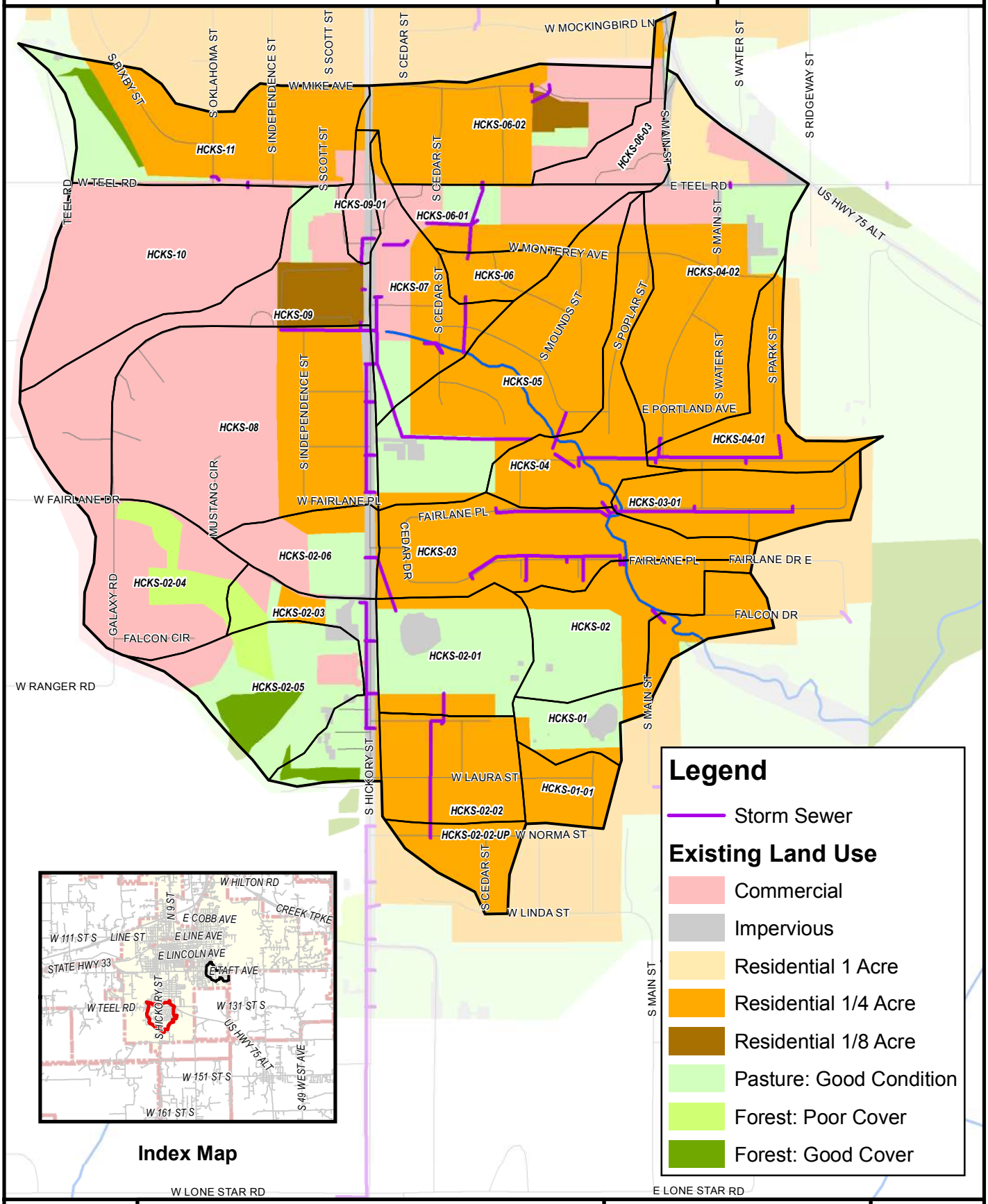

Index Map

Legend

- Storm Sewer

Existing Land Use

- Commercial
- Impervious
- Residential 1 Acre
- Residential 1/4 Acre
- Residential 1/8 Acre
- Pasture: Good Condition
- Forest: Poor Cover
- Forest: Good Cover

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Hickory South Drainage Basin Existing Land Use

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Figure 9-3

TABLE 9-1. SOUTH POLECAT SYSTEMS – HICKORY SOUTH DRAINAGE BASIN SUMMARY OF HYDROLOGIC COEFFICIENTS FOR EXISTING CONDITIONS

Sub-Area	Drainage Area, Acres	Lag Time, Minutes	Composite CN
HCKS-01	8.6	6.5	75
HCKS-01-01	4.0	4.0	75
HCKS-02	11.3	6.2	73
HCKS-02-01	11.3	3.5	74
HCKS-02-02	9.4	5.9	79
HCKS-02-02-UP	4.5	6.1	79
HCKS-02-03	8.1	3.6	83
HCKS-02-04	12.4	4.3	90
HCKS-02-05	12.0	3.8	81
HCKS-02-06	6.8	3.5	88
HCKS-03	15.5	6.5	83
HCKS-03-01	9.1	8.1	84
HCKS-04	10.6	10.4	81
HCKS-04-01	7.9	8.2	80
HCKS-04-02	24.3	11.6	83
HCKS-05	22.3	6.5	80
HCKS-06	3.1	4.0	83
HCKS-06-01	8.0	8.0	87
HCKS-06-02	16.5	7.7	86
HCKS-06-03	4.5	12.7	93
HCKS-07	10.1	6.1	84
HCKS-08	30.5	7.8	90
HCKS-09	16.1	7.0	91
HCKS-09-01	2.1	2.0	95
HCKS-10	20.6	3.7	94
HCKS-11	18.6	6.8	82

TABLE 9-2. SOUTH POLECAT CREEK SYSTEMS – HICKORY SOUTH DRAINAGE BASIN
EXISTING FLOW RATES AT MAJOR JUNCTIONS (CFS)

HMS Junction	Street Intersection	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
J-HCKS-01-01	Laura St. & Poplar St.	4	7	12	16	21	24	28	35
J-HCKS-02	Falcon Dr. & Main St.	431	638	944	1123	1367	1561	1759	2171
J-HCKS-02-02-UP	Norma St. & Cedar St.	11	18	31	39	50	57	65	81
J-HCKS-02-03	Hickory St. b/w Donna & Fairlane Dr.	55	84	129	157	192	219	245	298
J-HCKS-03	Fairlane Dr.	336	488	718	863	1052	1202	1351	1665
J-HCKS-03-UP	DS of Fairlane Pl.	318	461	678	817	996	1137	1276	1570
J-HCKS-04	US of Fairlane Pl.	305	443	651	786	958	1093	1227	1509
J-HCKS-04-01	Main St. & Fairlane Ct.	37	56	93	117	146	169	191	237
J-HCKS-04-02	Portland Ave. & Main St.	29	43	71	88	110	127	144	178
J-HCKS-04-UP	Fairlane Ct.	294	425	622	751	914	1041	1167	1435
J-HCKS-05	US of Hickory South Neighborhood	258	369	533	641	782	890	993	1231
J-HCKS-06-01	Monterey Ave.	48	70	105	128	156	176	197	239
J-HCKS-06-02	Teel Road	35	51	77	93	114	129	144	174
J-HCKS-08	Galaxy Rd. & Hickory St.	173	252	363	433	522	587	651	783
J-HCKS-09	US of Galaxy Rd.	112	164	236	282	341	383	425	512
J-HCKS-11	Teel Rd. b/w Oklahoma & Independence St.	24	39	64	79	99	114	129	158

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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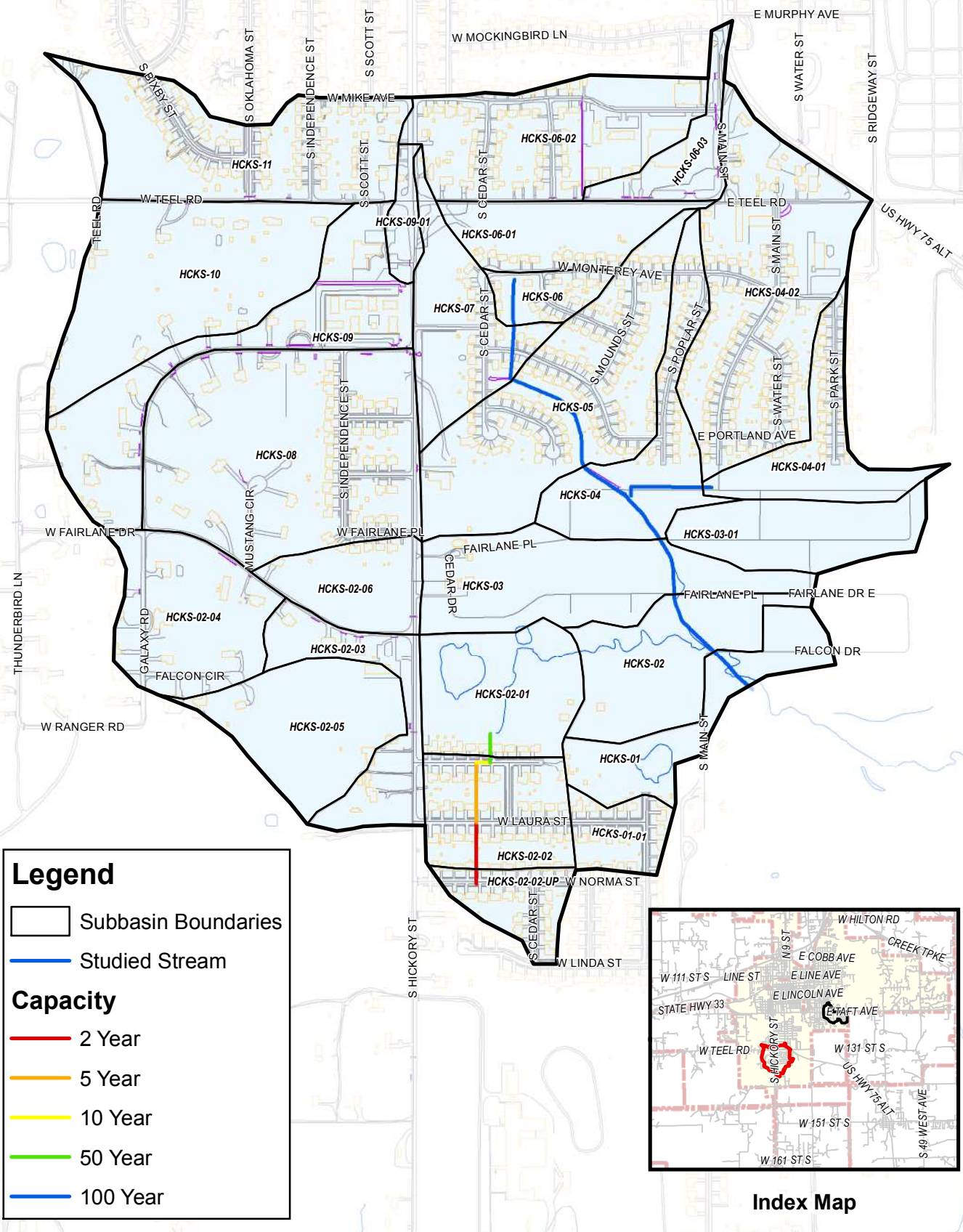

Legend

- Subbasin Boundaries
- Studied Stream

Capacity

- 2 Year
- 5 Year
- 10 Year
- 50 Year
- 100 Year

Index Map

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Hickory South Drainage Basin Studied Systems and Capacity

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Figure 9-4

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STORMWATER UTILITIES & MASTER DRAINAGE PLAN

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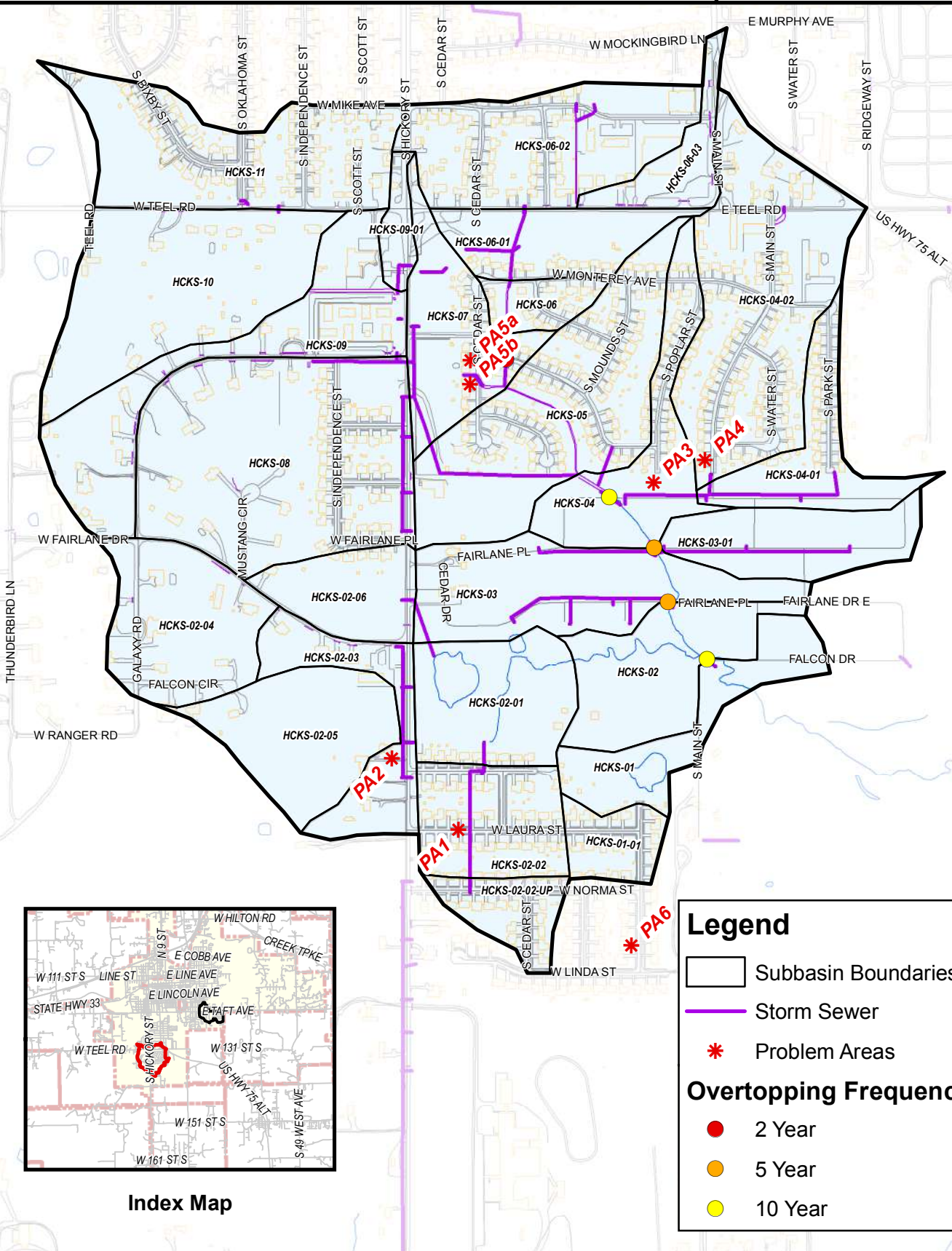

Index Map

Legend

- Subbasin Boundaries
- Storm Sewer
- Problem Areas

Overtopping Frequency

- 2 Year
- 5 Year
- 10 Year

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Hickory South Drainage Basin Problem Areas and Road Overtopping Frequecncy

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Figure 9-5

9.3. PROBLEM AREAS

The Hickory South Drainage Basin has several serious drainage problems. These Problem Areas are shown in **FIGURE 9-5** and were either provided by the City of Sapulpa or obtained during a Public Meeting to discuss drainage. The following provides a summary of Problem Areas identified for the Hickory South Drainage Basin.

A. Problem Area 1: 310 W. Laura Street

The existing system begins at W. Norma Street just east of Hickory Street and extends north 25 feet through an 18-inch RCP. At that point, the sewer continues north 295 feet through a 24-inch RCP and then 302 feet north through a 30-inch RCP until reaching W. Donna Street. At W. Donna Street, the system changes direction and proceeds east for 71 feet through a 30-inch RCP until changing direction back north again through a 36-inch RCP for 131 feet to its point of outfall into an open ditch.

According to this resident, the 24-inch RCP has collapsed in the backyard resulting in a dangerous situation with a sinkhole exposing gas lines.

B. Problem Area 2: 2600 S. Hickory Street

Runoff from heavy rains from the area north of this residence results in standing water two feet deep onsite and floods S. Hickory Street during heavy rains. Cars stall or have to brake suddenly due to the stormwater rushing onto S. Hickory Street. This location receives runoff from HICKS-02-03, -04, -05, and -06, a total drainage area of nearly 40 acres and flow rates ranging from 84 cfs in a 2-year storm to 245 cfs in a 100-year storm.

C. Problem Area 3: 65 Fairlane Court

From W. Monterey Avenue, stormwater flows approximately three blocks south down S. Poplar Street until the street deadends and the water continues overland through the property located at 65 Fairlane Court. Although just south of this residence, stormwater is collected by an existing 40-inch CPP running east-west along Fairlane Court, storm drains back up and flood the local streets and yards.

D. Problem Area 4: 2406 S. Main Street

Stormwater from E. Teel Road flows south down S. Main Street for approximately four blocks before entering a 4-inch CPP immediately south of the residence located at 2406 S. Main Street. At the junction of S. Main Street and E. Fairlane Court, a 24-inch RCP is joined with the 40-inch CPP and both continue westward as a single 40-inch CPP. Just west of this junction, an 18-inch RCP also enters the 40-inch CPP. The 40-inch CPP then flows west along W. Fairlane Court and drains into an open channel.

The result is the storm sewer system becomes surcharged and backs up into the street almost flooding the garage at 2406 S. Main Street. In addition, the drain pipe is settling and sink holes are developing. A damaged culvert was also found buried in this yard.

E. Problem Area 5: 2312 S. Cedar Street and 2322 S. Cedar Street

The drainage ditch behind these houses is filled with miscellaneous debris, such as trees and bicycles, and is in need of cleaning and maintenance. The residence at 2322 S. Cedar Street has flooded previously.

F. Problem Area 6: 2830 S. Poplar

This drainage problem is actually outside the Hickory South Basin and any studied basin areas. However, there is no storm sewer system in this location which results in water collecting at the intersection of Linda Street and Poplar Street and ponding in front of this residence.

9.4 EVALUATION OF ALTERNATIVES

Alternatives were considered for the identified Problem Areas. These alternatives are presented below with estimated costs presented in detail in **APPENDIX 9-F**:

A. Problem Area 1: 310 W. Laura Street

In this backyard, a 24-inch RCP has collapsed resulting in a sinkhole, exposing gas lines and creating a potentially hazardous condition according to the resident.

Alternative 1: Replace existing inlets with six new inlets (50% annual chance frequency). Alternative 1 would replace the existing inlets with a total of six 4-foot Shawnee steel inlets. Two of these would be located on W. Norma Street, two on W. Laura Street, and the last two on W. Donna Street at which point the system turns north to extend to the outfall.

This alternative would allow the system to capture the stormwater flow with a system capacity that could handle a 50% annual chance storm event.

Some City maintenance may be required to repair this backyard as well.

This alternative costs approximately $45,600 and is shown in **FIGURE 9-6**.

Alternative #2: Replace existing storm sewer system and inlets with new system to convey a 10% annual chance storm event. Alternative 2 proposes replacing the entire closed storm sewer system and the existing inlets. This alternative would construct 25 feet of 24-inch RCP and 807 feet of 36-inch RCP along the existing alignment north from Laura Street to the outfall north of Donna Street. It would include a total of seven 4-foot Shawnee steel inlets with three inlets located on W. Norma Street, two on W. Laura Street, and the remaining two on W. Donna Street.

This alternative would allow the system to capture the flow and have a capacity that could handle a 10% annual chance storm event.

This alternative would cost $151,000 and is shown in **FIGURE 9-7**.

B. Problem Area 2: 2600 S. Hickory Street

Runoff from heavy rains from the area north of this residence results in standing water two feet deep onsite and floods S. Hickory Street during heavy rains. Cars stall or have to brake suddenly due to the stormwater rushing onto S. Hickory Street. This location receives runoff from HCKS-02-03, -04, -05, and -06, a total drainage area of nearly 40 acres and flow rates ranging from 84 cfs in a 2-year storm to 245 cfs in a 100-year storm.

Alternative 1: Clean creek and upgrade pipe across Hickory Street to handle a 10% annual chance storm. The existing elliptical pipe crossing Hickory Street east-west is inadequate to handle the stormwater flowing from the north. This alternative would replace the existing pipe with approximately 70 feet of 8 X 3 foot RCB and the two existing inlets with new 4-foot steel inlets.

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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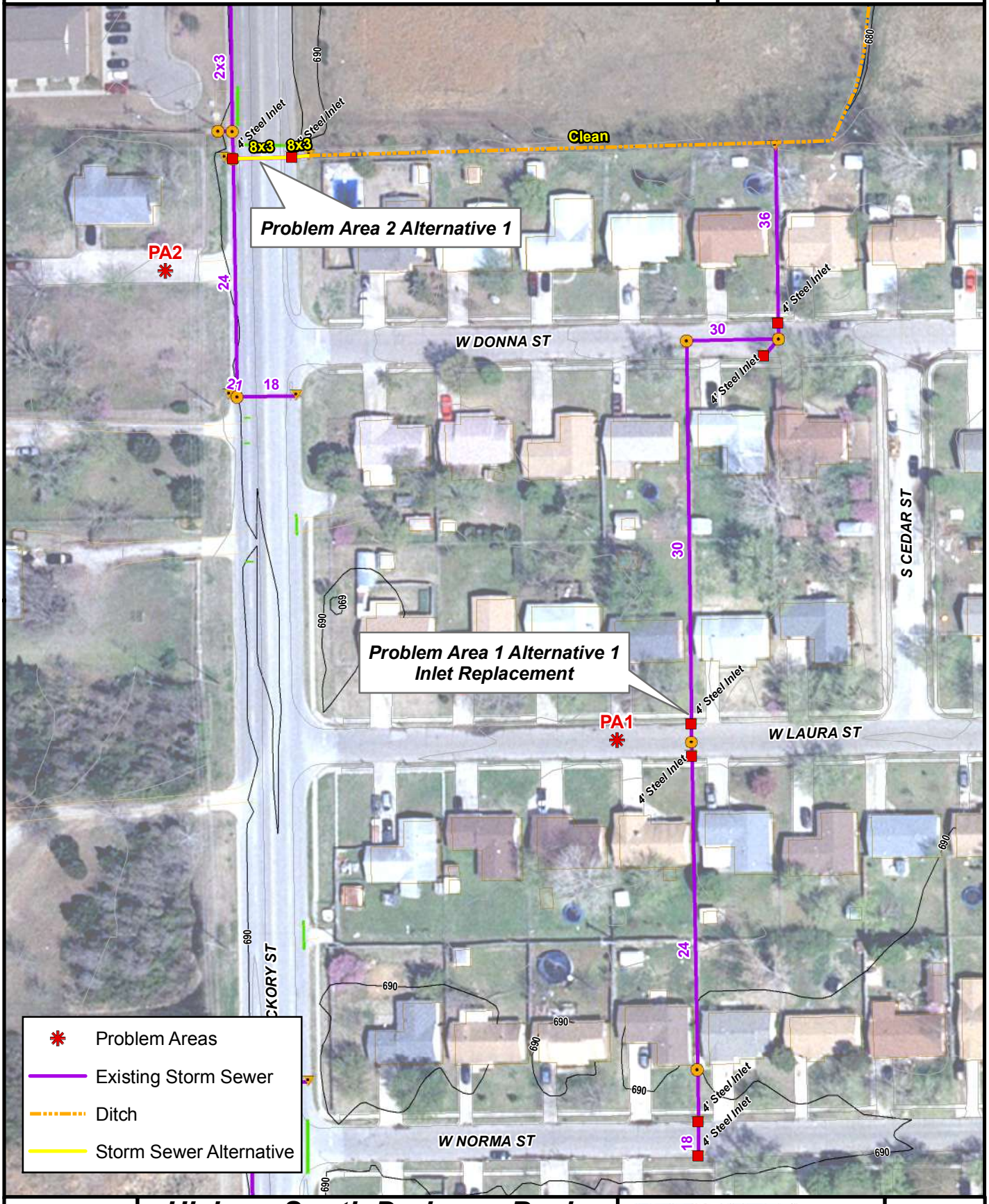

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Hickory South Drainage Basin
Problem Areas 1 & 2
Alternative 1

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Figure 9-6

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STORMWATER UTILITIES & MASTER DRAINAGE PLAN

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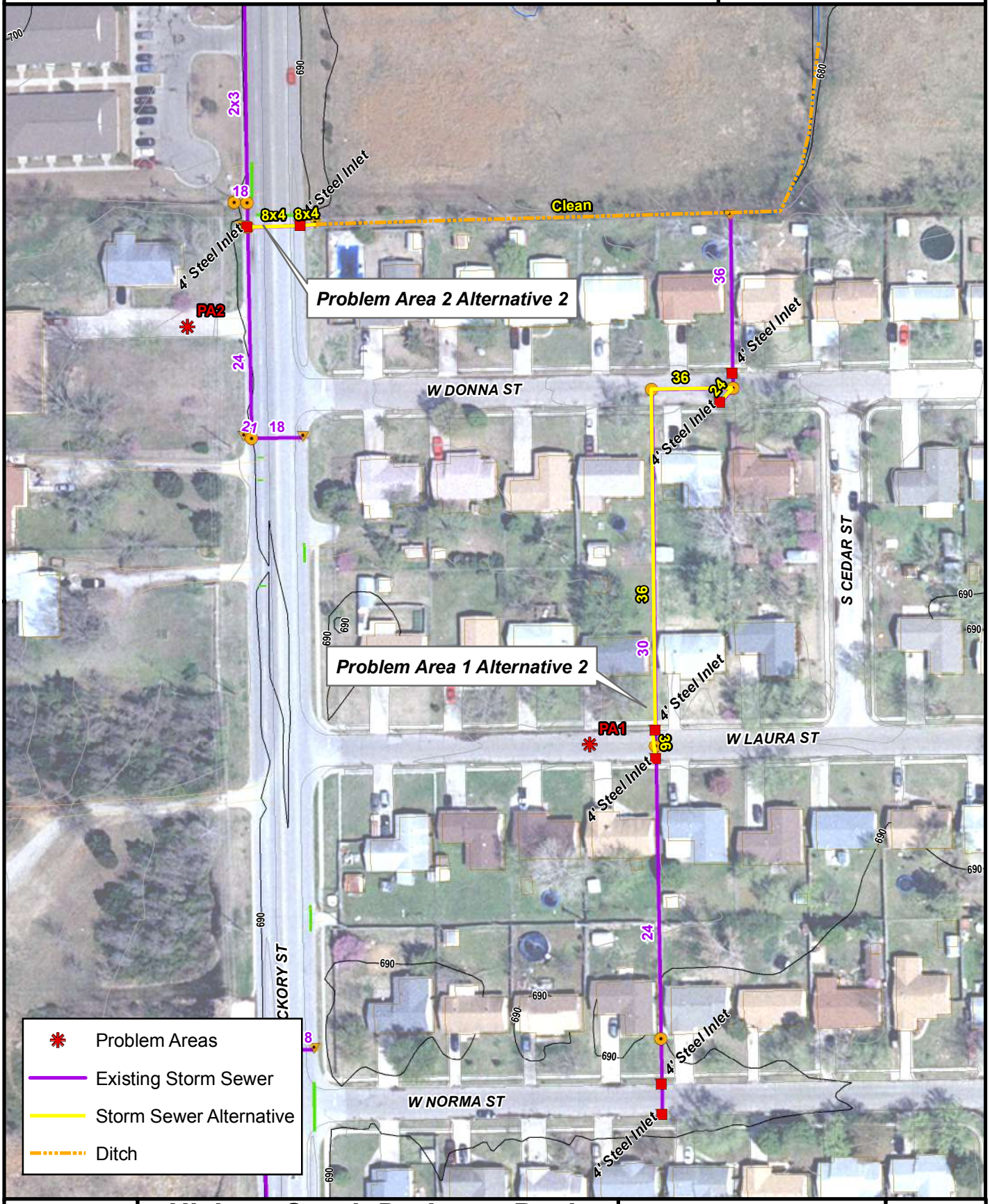

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Hickory South Drainage Basin
Problem Areas 1 & 2
Alternative 2

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Figure 9-7

On the east side of Hickory Street, the drainage ditch is overgrown with trees and underbrush. This alternative proposes to clean approximately 420 feet of creek east to the point at which the ditch angles north.

This alternative is estimated to cost $117,900 and is shown in **FIGURE 9-6** with Problem Area 1.

Alternative 2: Clean creek and upgrade pipe across Hickory Street (1% annual chance frequency). This alternative is similar to Alternative 1 except it would provide a higher level of protection by upgrading the existing pipe to an 8 X 4 foot RCB for a 1% annual chance storm event. This alternative also includes the upgrade of the existing inlets to 4-foot steel inlets and would clean the drainage ditch to the point at which it turned north.

This alternative is estimated to cost $121,900 and is shown in **FIGURE 9-7** on a previous page.

C. Problem Areas 3 and 4: 65 Fairlane Court and 2406 S. Main Street

Alternative 1: Construct a new storm sewer system and trench grates and inlets (10% annual chance storm frequency). Alternative 1 would construct 278 feet of 48-inch RCP from Main Street west to Poplar Street and then 127 feet of 48-inch RCP south along Poplar to Fairlane Court. The alternative would also include the installation of two new trench grates, one across S. Main Street and the other across S. Poplar Street. At Fairlane Court, it would join with an existing 40-inch CPP originating from the east. The proposed system would then flow west through 205 feet of 48-inch RCP to connect with an existing 48-inch pipe draining to an open ditch on the south side of Fairlane Court.

This alternative would also include another storm sewer system separate from the first and extending from W. Orleans Avenue to an outfall in an open drainage ditch on the north side of Fairlane Court. This system would involve 23 feet of 24-inch RCP across Orleans Avenue and then extending southwesterly through 216 feet of 30-inch pipe. Two 8-foot Shawnee steel inlets would be placed on each side of W. Orleans Avenue.

This alternative provides a way to capture the water and would be able to contain a 10% annual chance storm event.

Alternative 1 to address Problem Areas 3 and 4 would cost approximately $342,800 and is shown in **FIGURE 9-8**.

Alternative 2: Construct a new storm sewer system and trench grates and inlets (1% annual chance storm frequency). Alternative 2 is similar to that of Alternative 1 and would follow a similar alignment. The major differences would be the greater level of protection and the greater public cost.

Pipe sizes would increase considerably from those described in Alternative 1. The pipe extending from Main Street to Poplar Street would be constructed as a 54-inch RCP. The pipe extending south on Poplar and west on Fairlane Court to the outfall would be constructed as a 60-inch RCP.

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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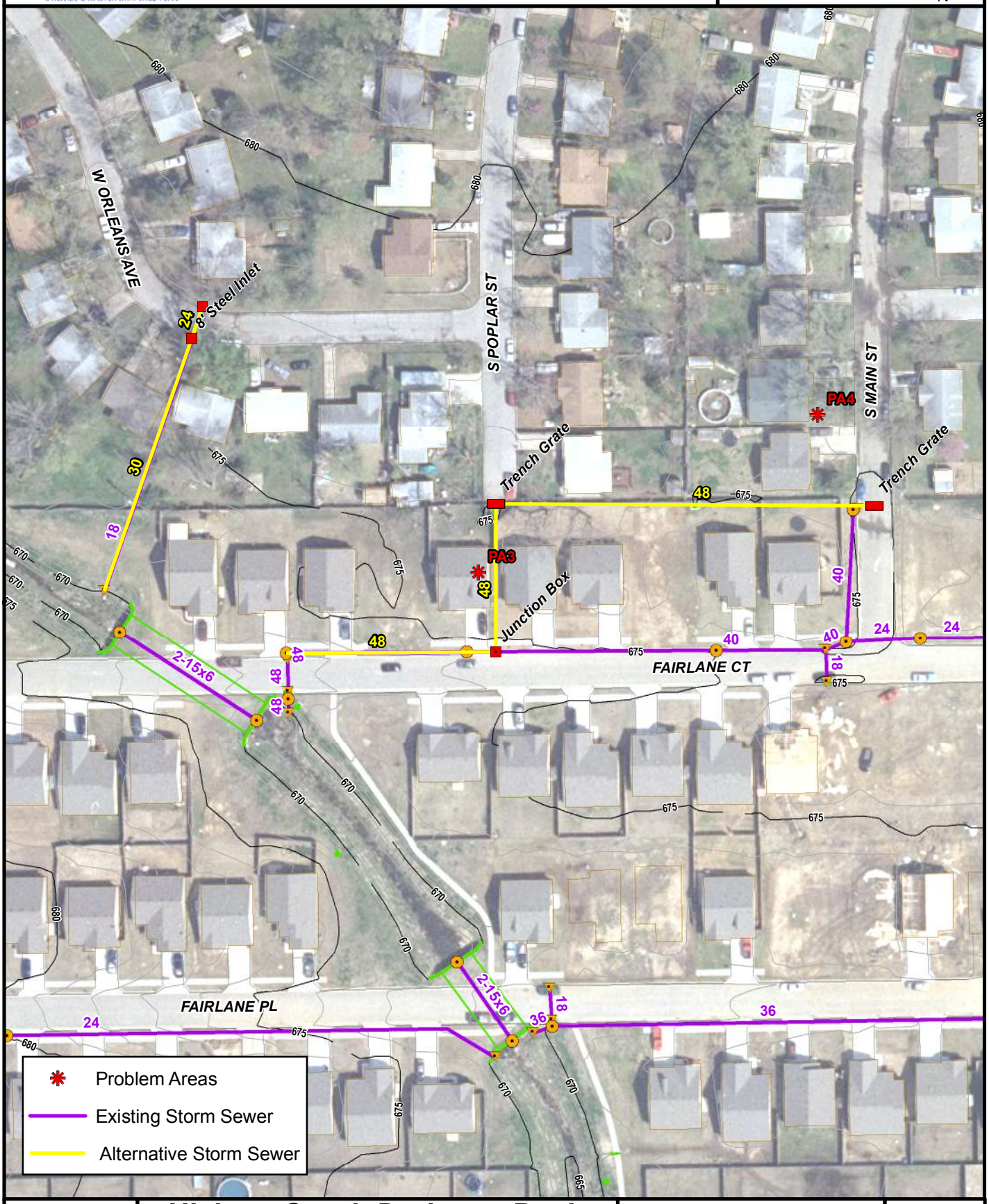

Problem Areas
Existing Storm Sewer
Alternative Storm Sewer

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Hickory South Drainage Basin
Problem Area 3-4
Alternative 1

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Figure 9-8

The second storm sewer system to the west would be constructed as 23 feet of 30-inch RCP across Orleans Avenue and 216 feet of 36-inch RCP to the outfall. All other components of this alternative would remain the same as Alternative 1.

Alternative 2 costs approximately $417,600 and is pictured in **FIGURE 9-9**.

A. Problem Area 5: 2312 S. Cedar Street and 2322 S. Cedar Street

The drainage ditch behind these houses is filled with miscellaneous debris, such as trees and bicycles, and is in need of cleaning and maintenance. The residence at 2322 S. Cedar Street has flooded previously.

Alternative 1: Construct a new storm sewer system south along Hickory Street and west to the open channel (10% annual chance capacity). Alternative 1 proposes to construct 563 feet of 7 x 5-foot RCB along Hickory Street from Galaxy Road south to Fairlane Place. It would then continue east for 828 feet through a 7 x 5-foot RCB along an alignment that would be Fairlane Place, if constructed, to the outfall into an open channel. At its point of origin, a 4 X 4-foot SMD would be constructed in addition to another 4'x 4-foot SMD inlet south of that one. Three more 4x 4-foot SMD inlets would be constructed at intervals along the east-west storm sewer.

This alternative has several advantages. First, it would allow the new system to capture the stormwater from a 10% annual chance storm event. At the same time, it would allow the existing double 30-inch pipe under Cedar Street to handle a 10% annual chance event as well.

This alternative costs approximately $1,305,000 and is shown in **FIGURE 9-10**.

Alternative #2: Construct a new storm sewer system (1% annual chance) south on Hickory Street and east to the channel. This alternative is a variation Alternative 1 except it would provide a greater level of protection, but at the same time, would also require larger pipes at a greater cost. In this alternative, the entire storm sewer system would be constructed as a 9 X 5-foot box (as opposed to the pipe sizes proposed in Alternative 1).

The advantages to Alternative 2 are consistent with those for Alternative 1.

This alternative would cost approximately $1,585,000 and is depicted in **FIGURE 9-11**.

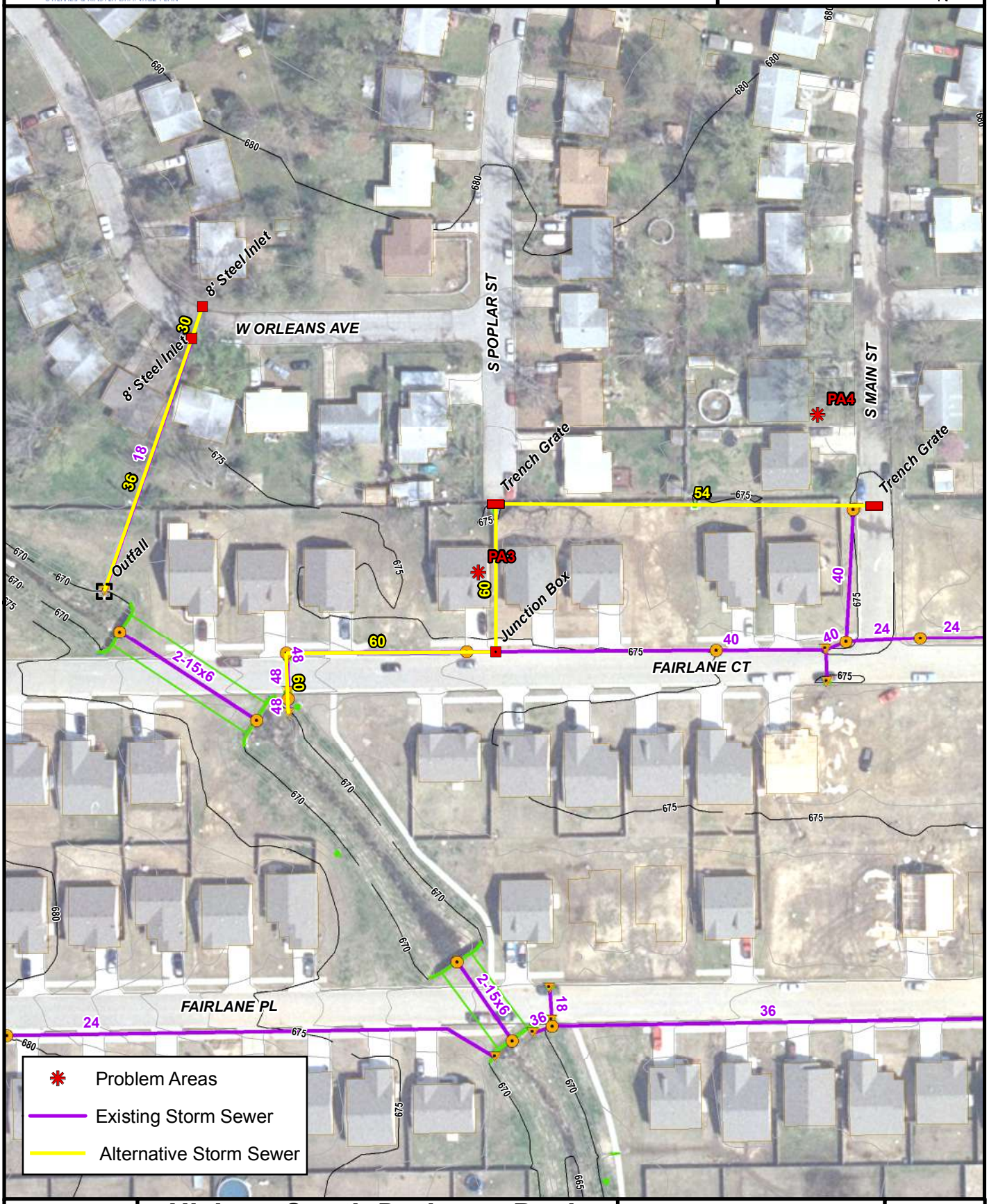
B. Problem Area 6: 2830 S. Poplar

This drainage problem is actually outside the Hickory South Basin and other studied basin areas. However, there is no storm sewer system in this location which results in water collecting at the intersection of Linda Street and Poplar Street and ponding in front of this residence.

To resolve this problem area, this alternative proposes the construction of approximately 35 feet of 18-inch RCP and 400 feet of 24-inch RCP as well as the installation of four new 4-foot steel inlets and one 4 X 4-foot SMD to transport the water east to an outfall point into drainage ditch.

This alternative is estimated to cost $160,000 and is shown in **FIGURE 9-12**.

City of Sapulpa Master Drainage Plan



Hickory South Drainage Basin
Problem Area 3-4
Alternative 2

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Figure 9-9

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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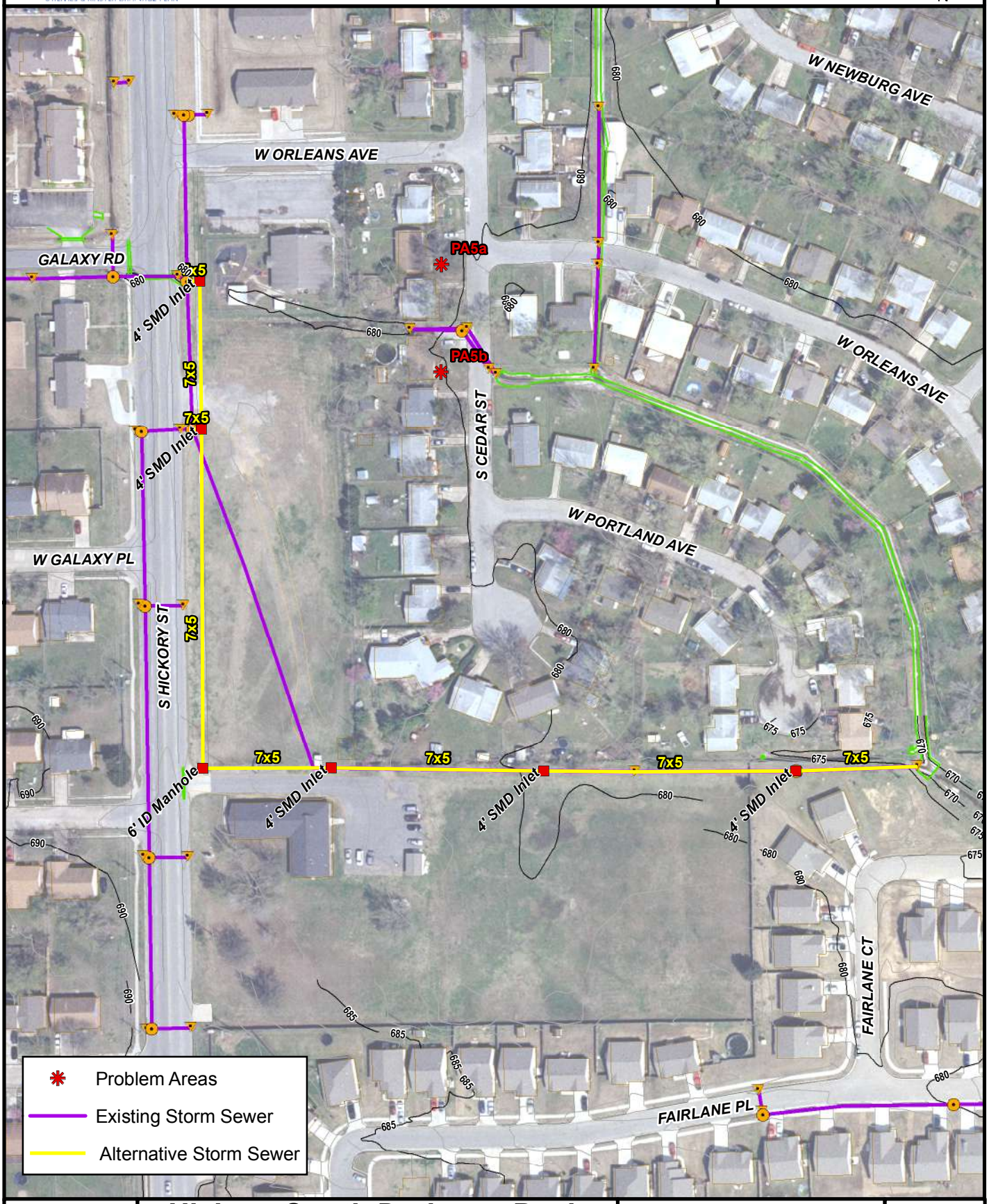

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Hickory South Drainage Basin
Problem Area 5
Alternative 1

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Figure 9-10

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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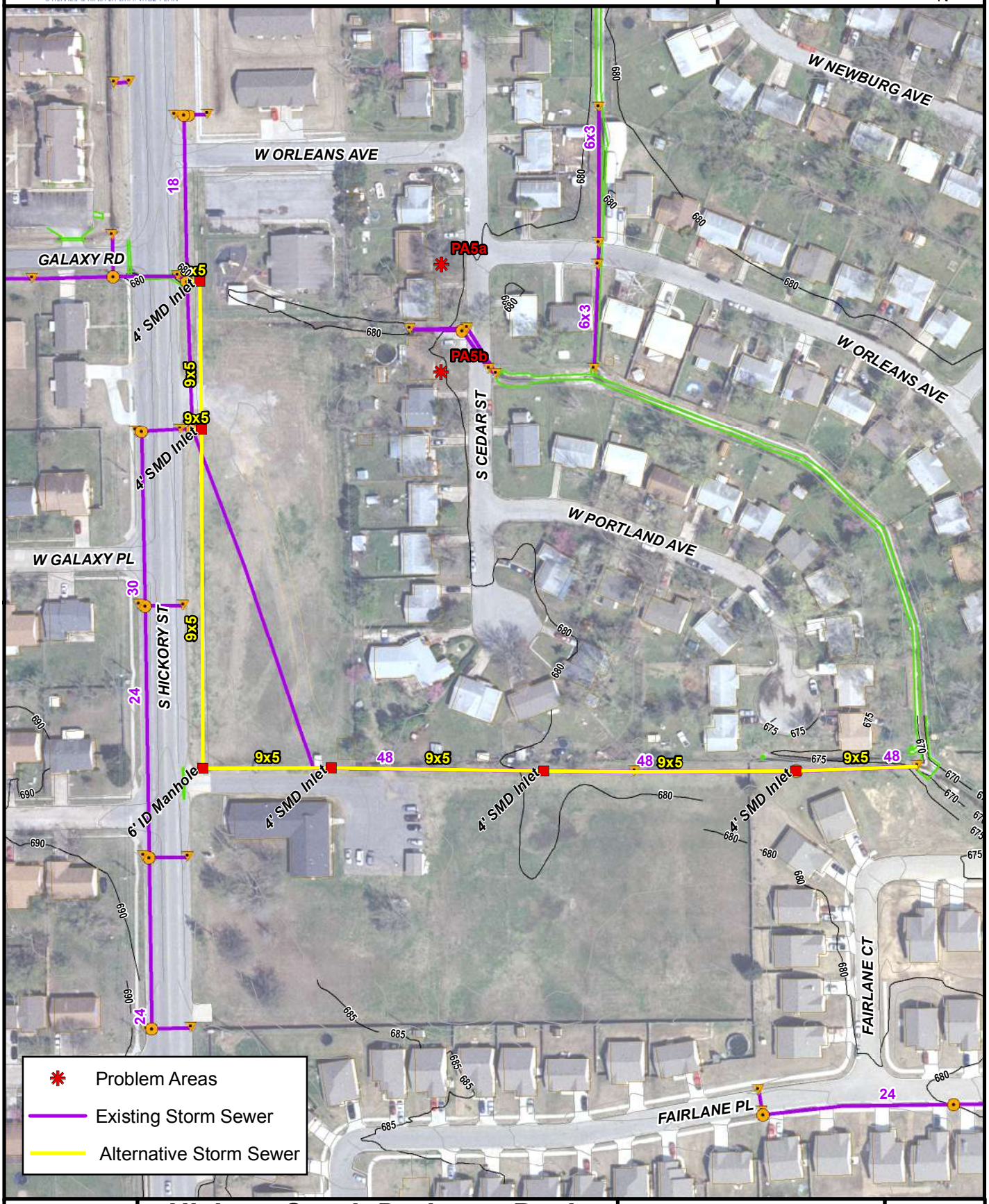

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Hickory South Drainage Basin
Problem Area 5
Alternative 2

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Figure 9-11

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

City of Sapulpa Master Drainage Plan

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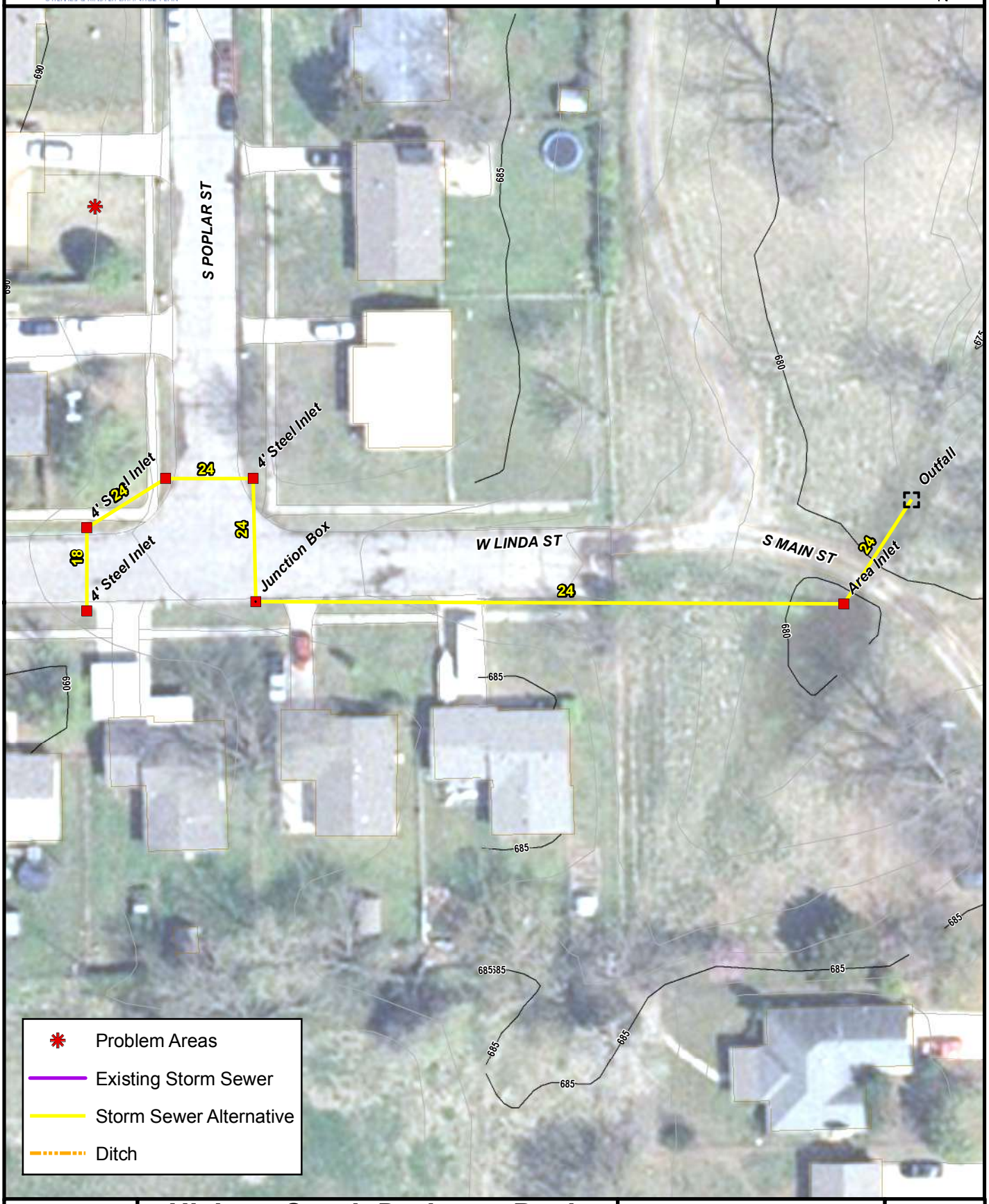

Hickory South Drainage Basin
Problem Area 6
Alternative 1

The City of Sapulpa, Oklahoma's Most Connected City

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Figure 9-12

9.5. RECOMMENDED PLAN

Based on discussions with City staff and a ranking of the alternatives using the prioritization criteria, the following alternatives were selected as the Recommended Plan for the Hickory South Drainage Basin. The alternative selected and an exhibit for each one are discussed in detail in **SECTION 9-4 EVALUATION OF ALTERNATIVES**, and cost estimates are located in **APPENDIX 9-F**.

The Recommended Plan for the Hickory South Drainage Basin is:

PROBLEM AREA	RECOMMENDED ALTERNATIVE	RATIONALE FOR SELECTION	ESTIMATED COST
Problem Area 1,	Alternative 2	Of the two alternatives, Alternative 2 would provide a much higher level of public protection than Alternative 1 (a 10% annual chance frequency vs. a 50% annual chance frequency) with only a moderate increase in cost.	$187,600
Problem Area 2	Alternative 2	At an insignificant difference in project cost above that of Alternative 1, Alternative 2 would provide a greater level of public protection and improve emergency access.	$121,900
Problem Areas 3 and 4	Alternative 1	Alternative 1 would provide protection up to that of a storm event with a 10% annual chance frequency and could be funded through the stormwater utility fee.	$342,800
Problem Area 5	Alternative 2	Alternative 2 would provide a much higher level of public protection than Alternative 1 and remove flooding from a residence during frequent events at a moderate increase in cost.	$1,585,000
Problem Area 6	No Action	No houses flood, access is not impacted and no easements exist downstream of this area.	-0-
		TOTAL COST	**$2,237,300**

Appendix 9-A. South Polecat Systems - Hickory South Drainage Basin - Hydrologic Coefficients for Existing Conditions

Tributary Subarea	Flow Type	Length (ft)	Weighted Slope (%)	Velocity (ft./sec.)	Tc (min.)	Lag (min.)	Lag (hr.)	Land Use:	% of Use	CN value for each Hydrologic Soil Group				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)
										A	B	C	D	A	B	C	D			
		1387																		
HCKS-01	Overland	193	3.39	1.29	2.49			Impervious	6	98	98	98	98	0.0	6.4	0.0	0.0	75.0	8.6	0.01342
	Channel (ditch)	599	1.74	1.96	5.10			Pasture: Good Condition	32	39	61	74	80	0.0	31.6	0.0	0.0			
	Paved	323	1.70	2.60	2.07			Residential 1/4 acre	62	61	75	83	87	0.0	37.8	0.0	24.2			
	Pipe			0.00	0.00															
	Stream	273	3.85	4.00	1.14	6.5	0.11													
		686																		
HCKS-01-01	Overland	205	2.48	1.10	3.09			Pasture: Good Condition	0	39	61	74	80	0.0	0.0	0.0	0.0	75.0	4.0	0.00619
	Channel (ditch)			0.00	0.00			Residential 1/4 acre	100	61	75	83	87	0.0	100.0	0.0	0.0			
	Paved	481	1.27	2.24	3.58															
	Pipe			0.00	0.00															
	Stream			0.00	0.00	4.0	0.07													
		1020																		
HCKS-02	Overland	141	1.80	0.94	2.50			Impervious	0	98	98	98	98	0.0	0.3	0.0	0.0	72.8	11.3	0.01771
	Channel (ditch)	573	0.98	1.46	6.53			Pasture: Good Condition	45	39	61	74	80	0.0	35.0	10.4	0.0			
	Paved			0.00	0.00			Residential 1/4 acre	54	61	75	83	87	0.0	26.7	14.0	13.6			
	Pipe			0.00	0.00															
	Stream	306	0.98	4.00	1.28	6.2	0.10													
		1071																		
HCKS-02-01	Overland	138	3.87	1.38	1.66			Impervious	9	98	98	98	98	0.0	0.5	8.8	0.0	74.4	11.3	0.01761
	Channel (ditch)	184	3.92	2.97	1.03			Pasture: Good Condition	74	39	61	74	80	0.0	24.0	49.5	0.0			
	Paved			0.00	0.00			Residential 1/4 acre	17	61	75	83	87	0.0	2.8	14.4	0.0			
	Pipe			0.00	0.00															
	Stream	749	0.80	4.00	3.12	3.5	0.06													
		838																		
HCKS-02-02	Overland	246	2.39	1.08	3.77			Pasture: Good Condition	1	39	61	74	80	0.0	0.8	0.0	0.0	79.0	9.4	0.01473
	Channel (ditch)			0.00	0.00			Residential 1/4 acre	99	61	75	83	87	0.0	47.8	51.3	0.0			
	Paved	593	0.69	1.65	5.98															
	Pipe			0.00	0.00															
	Stream			0.00	0.00	5.9	0.10													
		540																		
HCKS-02-02-UP	Overland	274	0.58	0.53	8.54			Pasture: Good Condition	0	39	61	74	80	0.0	0.0	0.0	0.0	79.0	4.5	0.00709
	Channel (ditch)			0.00	0.00			Residential 1/4 acre	0	61	75	83	87	0.0	0.0	0.0	0.0			
	Paved	192	1.35	2.32	1.38															
	Pipe	74	0.05	4.00	0.31															
	Stream			0.00	0.00	6.1	0.10													

Appendix 9-A. South Polecat Systems - Hickory South Drainage Basin - Hydrologic Coefficients for Existing Conditions

Tributary Subarea	Flow Type	Length (ft)	Weighted Slope (%)	Velocity (ft./sec.)	Tc (min.)	Lag (min.)	Lag (hr.)	Land Use:	% of Use	CN value for each Hydrologic Soil Group				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)
										A	B	C	D	A	B	C	D			
		1383																		
HCKS-02-03	Overland	72	11.85	2.43	0.49			Commercial	9	89	92	94	95	0.0	0.0	4.0	4.5	82.7	8.1	0.01267
	Channel (ditch)	729	6.99	3.99	3.04			Forest (good cover)	8	25	55	70	77	0.0	0.0	7.9	0.0			
	Paved			0.00	0.00			Forest (poor cover)	10	45	66	77	83	0.0	0.0	10.0	0.0			
	Pipe	583	0.57	4.00	2.43			Impervious	21	98	98	98	98	0.0	0.0	20.8	0.3			
	Stream			0.00	0.00	3.6	0.06	Pasture: Good Condition	38	39	61	74	80	0.0	0.0	34.2	4.2			
								Pasture: Poor Condition	0	68	79	86	89	0.0	0.0	0.0	0.0			
								Residential 1/4 acre	14	61	75	83	87	0.0	0.0	3.6	10.4			
		1557																		
HCKS-02-04	Overland	147	3.82	1.37	1.78			Commercial	76	89	92	94	95	0.0	0.0	70.6	5.0	89.9	12.4	0.01944
	Channel (ditch)	1410	8.30	4.36	5.40			Forest (poor cover)	24	45	66	77	83	0.0	0.0	24.4	0.0			
	Paved			0.00	0.00															
	Pipe			0.00	0.00															
	Stream			0.00	0.00	4.3	0.07													
		1364																		
HCKS-02-05	Overland	206	4.86	1.55	2.21			Commercial	19	89	92	94	95	0.0	0.0	17.8	0.7	80.7	12.0	0.01869
	Channel (ditch)	1158	9.33	4.62	4.17			Forest (good cover)	17	25	55	70	77	0.0	0.0	5.4	11.8			
	Paved			0.00	0.00			Forest (poor cover)	8	45	66	77	83	0.0	0.0	1.8	6.5			
	Pipe			0.00	0.00			Impervious	3	98	98	98	98	0.0	0.0	2.3	0.4			
	Stream			0.00	0.00	3.8	0.06	Pasture: Good Condition	53	39	61	74	80	0.0	0.0	26.8	26.2			
								Residential 1/4 acre	0	61	75	83	87	0.0	0.0	0.0	0.2			
		895																		
HCKS-02-06	Overland	160	7.17	1.88	1.42			Commercial	39	89	92	94	95	0.0	0.0	11.0	27.6	87.8	6.8	0.01059
	Channel (ditch)	735	3.52	2.81	4.36			Impervious	11	98	98	98	98	0.0	0.0	8.7	2.0			
	Paved			0.00	0.00			Pasture: Good Condition	32	39	61	74	80	0.0	0.0	7.1	24.9			
	Pipe			0.00	0.00			Residential 1/4 acre	19	61	75	83	87	0.0	0.0	18.5	0.1			
	Stream			0.00	0.00	3.5	0.06													
		1616																		
HCKS-03	Overland	148	2.26	1.05	2.33			Pasture: Good Condition	0	39	61	74	80	0.0	0.0	0.0	0.0	82.9	15.5	0.02415
	Channel (ditch)			0.00	0.00			Residential 1/4 acre	100	61	75	83	87	0.0	6.8	82.3	11.0			
	Paved	591	1.02	2.01	4.91															
	Pipe	620	2.42	4.00	2.58															
	Stream	258	0.58	4.00	1.07	6.5	0.11													
		1541																		
HCKS-03-01	Overland	170	1.10	0.73	3.87			Residential 1/4 acre	100	61	75	83	87	0.0	9.5	36.8	53.7	84.4	9.1	0.01420
	Channel (ditch)	441	0.76	1.28	5.73															
	Paved			0.00	0.00															
	Pipe	930	0.61	4.00	3.87															
	Stream			0.00	0.00	8.1	0.13													

Appendix 9-A. South Polecat Systems - Hickory South Drainage Basin - Hydrologic Coefficients for Existing Conditions

Tributary Subarea	Flow Type	Length (ft)	Weighted Slope (%)	Velocity (ft./sec.)	Tc (min.)	Lag (min.)	Lag (hr.)	Land Use:	% of Use	CN value for each Hydrologic Soil Group				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)
										A	B	C	D	A	B	C	D			
		2165																		
HCKS-04	Overland	300	3.25	1.27	3.94			Commercial	3	89	92	94	95	0.0	0.0	2.5	0.0	81.1	10.6	0.01659
	Channel (ditch)	350	0.84	1.35	4.32			Pasture: Good Condition	1	39	61	74	80	0.0	0.0	0.9	0.0			
	Paved	1055	1.53	2.46	7.14			Residential 1/4 acre	97	61	75	83	87	0.0	27.8	67.0	1.8			
	Pipe			0.00	0.00															
	Stream	460	0.28	4.00	1.92	10.4	0.17													
		1746																		
HCKS-04-01	Overland	132	1.62	0.89	2.46			Pasture: Good Condition	1	39	61	74	80	0.0	0.0	0.8	0.0	79.6	7.9	0.01239
	Channel (ditch)	117	2.51	2.36	0.82			Residential 1/4 acre	99	61	75	83	87	0.0	42.3	56.0	0.8			
	Paved	815	0.81	1.79	7.59															
	Pipe	683	0.56	4.00	2.85															
	Stream			0.00	0.00	8.2	0.14													
		2195																		
HCKS-04-02	Overland	279	2.86	1.19	3.92			Commercial	12	89	92	94	95	0.0	0.0	11.6	0.0	82.7	24.3	0.03804
	Channel (ditch)	506	1.53	1.84	4.59			Impervious	7	98	98	98	98	0.0	0.0	6.5	0.0			
	Paved	1410	1.21	2.19	10.75			Pasture: Good Condition	10	39	61	74	80	0.0	0.0	10.4	0.0			
	Pipe			0.00	0.00			Residential 1/4 acre	60	61	75	83	87	0.0	15.2	45.1	0.0			
	Stream			0.00	0.00	11.6	0.19	Residential 1 acre	11	51	68	79	84	0.0	0.0	11.2	0.0			
		1588																		
HCKS-05	Overland	197	3.65	1.34	2.45			Commercial	2	89	92	94	95	0.0	0.0	2.0	0.0	80.2	22.3	0.03481
	Channel (ditch)	241	1.94	2.07	1.94			Impervious	2	98	98	98	98	0.0	0.0	1.9	0.0			
	Paved	830	1.89	2.74	5.04			Pasture: Good Condition	19	39	61	74	80	0.0	0.0	19.1	0.0			
	Pipe			0.00	0.00			Residential 1/4 acre	77	61	75	83	87	0.0	19.6	57.4	0.0			
	Stream	320	1.16	4.00	1.33	6.5	0.11													
		749																		
HCKS-06	Overland	192	1.53	0.87	3.70			Residential 1/4 acre	100	61	75	83	87	0.0	0.0	100.0	0.0	83.0	3.1	0.00482
	Channel (ditch)			0.00	0.00															
	Paved	316	1.84	2.70	1.95															
	Pipe			0.00	0.00															
	Stream	241	1.24	4.00	1.01	4.0	0.07													
		1167																		
HCKS-06-01	Overland	178	1.50	0.86	3.47			Commercial	50	89	92	94	95	0.0	0.0	49.7	0.0	86.8	8.0	0.01244
	Channel (ditch)	817	1.01	1.49	9.17			Pasture: Good Condition	18	39	61	74	80	0.0	0.0	18.1	0.0			
	Paved			0.00	0.00			Residential 1/4 acre	32	61	75	83	87	0.0	0.0	32.2	0.0			
	Pipe	172	2.51	4.00	0.71															
	Stream			0.00	0.00	8.0	0.13													

Appendix 9-A. South Polecat Systems - Hickory South Drainage Basin - Hydrologic Coefficients for Existing Conditions

Tributary Subarea	Flow Type	Length (ft)	Weighted Slope (%)	Velocity (ft./sec.)	Tc (min.)	Lag (min.)	Lag (hr.)	Land Use:	% of Use	CN value for each Hydrologic Soil Group				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)
										A	B	C	D	A	B	C	D			
		1305																		
HCKS-06-02	Overland	173	2.15	1.03	2.81			Commercial	25	89	92	94	95	0.0	0.0	24.9	0.0	86.1	16.5	0.02577
	Channel (ditch)			0.00	0.00			Impervious	1	98	98	98	98	0.0	0.0	1.0	0.0			
	Paved	1131	0.89	1.88	10.04			Pasture: Good Condition	4	39	61	74	80	0.0	0.0	3.6	0.0			
	Pipe			0.00	0.00			Residential 1/8 acre	7	77	85	90	92	0.0	0.0	6.9	0.0			
	Stream			0.00	0.00	7.7	0.13	Residential 1/4 acre	64	61	75	83	87	0.0	0.0	63.6	0.0			
		1546																		
HCKS-06-03	Overland	147	0.36	0.42	5.82			Commercial	86	89	92	94	95	0.0	0.0	85.6	0.0	93.4	4.5	0.00709
	Channel (ditch)	1399	1.06	1.52	15.34			Impervious	8	98	98	98	98	0.0	0.0	7.5	0.0			
	Paved			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	0.0	0.0	1.4	0.0			
	Pipe			0.00	0.00			Residential 1/4 acre	6	61	75	83	87	0.0	0.0	5.6	0.0			
	Stream			0.00	0.00	12.7	0.21	Residential 1 acre	0	51	68	79	84	0.0	0.0	0.0	0.0			
		1550																		
HCKS-07	Overland	243	3.62	1.34	3.03			Commercial	33	89	92	94	95	0.0	9.4	23.2	0.0	83.9	10.1	0.01585
	Channel (ditch)	274	1.51	1.82	2.51			Impervious	3	98	98	98	98	0.0	1.5	1.6	0.0			
	Paved	351	2.65	3.25	1.80			Pasture: Good Condition	15	39	61	74	80	0.0	2.1	13.2	0.0			
	Pipe	197	1.16	4.00	0.82			Residential 1/4 acre	49	61	75	83	87	0.0	16.2	32.7	0.0			
	Stream	485	1.71	4.00	2.02	6.1	0.10													
		1976																		
HCKS-08	Overland			0.00	0.00			Commercial	62	89	92	94	95	0.0	5.2	41.9	15.3	90.0	30.5	0.04762
	Channel (ditch)	1976	2.91	2.55	12.92			Impervious	4	98	98	98	98	0.0	0.5	3.4	0.0			
	Paved			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	0.0	0.0	0.5	0.0			
	Pipe			0.00	0.00			Residential 1/8 acre	0	77	85	90	92	0.0	0.1	0.1	0.0			
	Stream			0.00	0.00	7.8	0.13	Residential 1/4 acre	33	61	75	83	87	0.0	5.3	27.7	0.0			
		2218																		
HCKS-09	Overland			0.00	0.00			Commercial	69	89	92	94	95	0.0	2.2	63.2	3.6	90.9	16.1	0.02515
	Channel (ditch)	2218	4.44	3.16	11.69			Impervious	2	98	98	98	98	0.0	1.1	0.7	0.0			
	Paved			0.00	0.00			Pasture: Good Condition	8	39	61	74	80	0.0	2.3	5.2	0.0			
	Pipe			0.00	0.00			Residential 1/8 acre	22	77	85	90	92	0.0	10.3	11.4	0.0			
	Stream			0.00	0.00	7.0	0.12													
		705																		
HCKS-09-01	Overland	67	9.99	2.23	0.50			Commercial	56	89	92	94	95	0.0	0.0	55.7	0.0	94.8	2.1	0.00321
	Channel (ditch)			0.00	0.00			Impervious	38	98	98	98	98	0.0	0.0	37.5	0.0			
	Paved	494	3.28	3.62	2.27			Residential 1/8 acre	0	77	85	90	92	0.0	0.0	0.0	0.0			
	Pipe	145	0.14	4.00	0.60			Residential 1/4 acre	7	61	75	83	87	0.0	0.0	6.8	0.0			
	Stream			0.00	0.00	2.0	0.03													

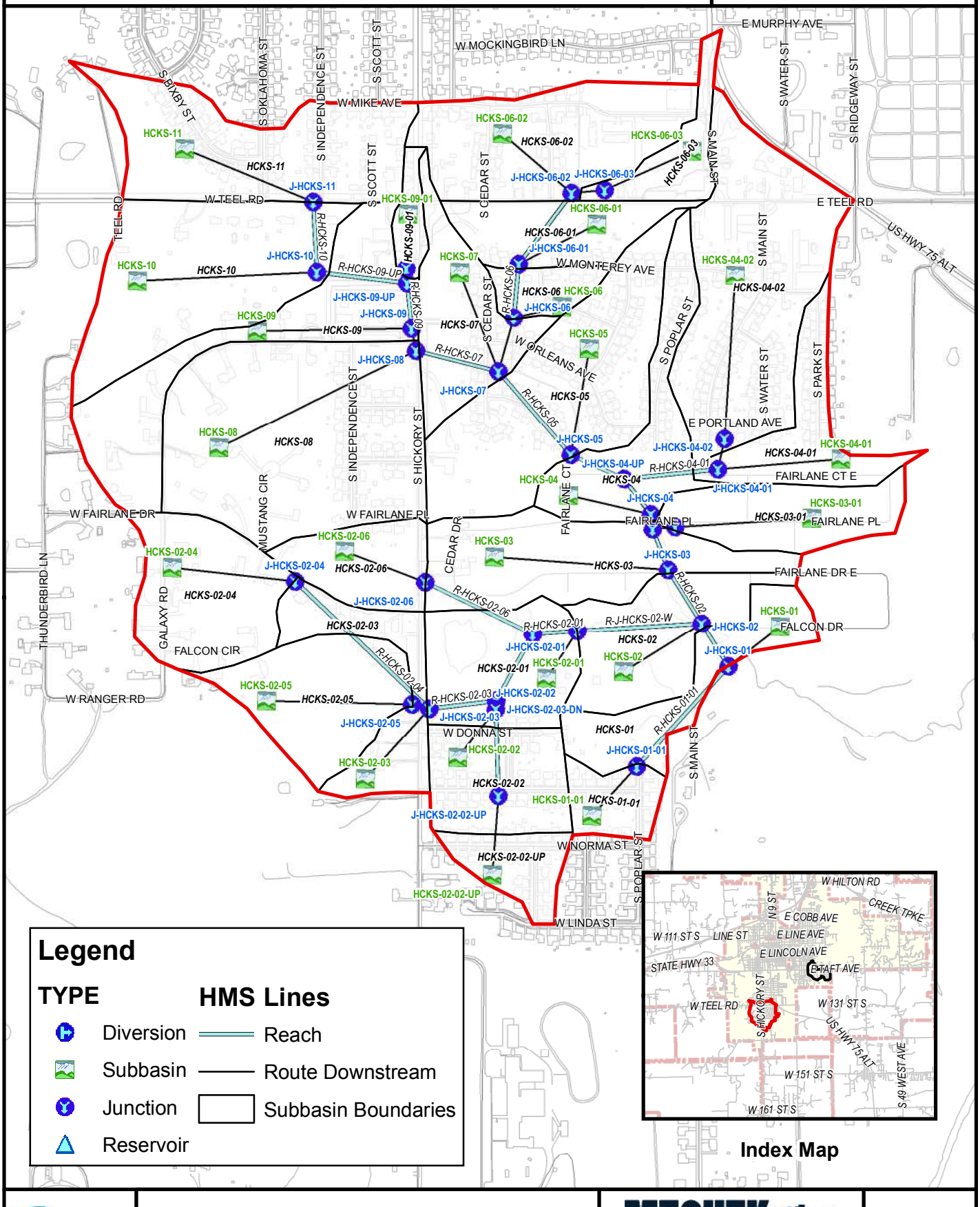
Appendix 9-A. South Polecat Systems - Hickory South Drainage Basin - Hydrologic Coefficients for Existing Conditions

Tributary Subarea	Flow Type	Length (ft)	Weighted Slope (%)	Velocity (ft./sec.)	Tc (min.)	Lag (min.)	Lag (hr.)	Land Use:	% of Use	CN value for each Hydrologic Soil Group				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)
										A	B	C	D	A	B	C	D			
		1539																		
HCKS-10	Overland			0.00	0.00			Commercial	99	89	92	94	95	0.0	11.3	75.9	12.1	93.8	20.6	0.03218
	Channel (ditch)	1427	7.71	4.19	5.67			Pasture: Good Condition	1	39	61	74	80	0.0	0.0	0.7	0.0			
	Paved			0.00	0.00															
	Pipe			0.00	0.00															
	Stream	112	0.63	4.00	0.47	3.7	0.06													
		1539																		
HCKS-11	Overland			0.00	0.00			Commercial	7	89	92	94	95	0.0	1.0	5.6	0.0	81.5	18.6	0.02908
	Channel (ditch)	1539	2.31	2.27	11.31			Forest (good cover)	5	25	55	70	77	0.0	0.0	4.4	0.1			
	Paved			0.00	0.00			Impervious	1	98	98	98	98	0.0	0.0	0.3	0.3			
	Pipe			0.00	0.00			Pasture: Good Condition	19	39	61	74	80	0.0	0.0	15.8	2.8			
	Stream			0.00	0.00	6.8	0.11	Residential 1/4 acre	70	61	75	83	87	0.0	2.7	66.7	0.4			

City of Sapulpa Master Drainage Plan

STORMWATER UTILITIES & MASTER DRAINAGE PLAN

Feet
0 350 700
N



Legend

TYPE

- Diversion
- Subbasin
- Junction
- Reservoir

HMS Lines

- Reach
- Route Downstream
- Subbasin Boundaries

Index Map

The City of Sapulpa — Oklahoma's Most Connected City

Hickory South Drainage Basin HMS Schematic

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Appendix 9-B

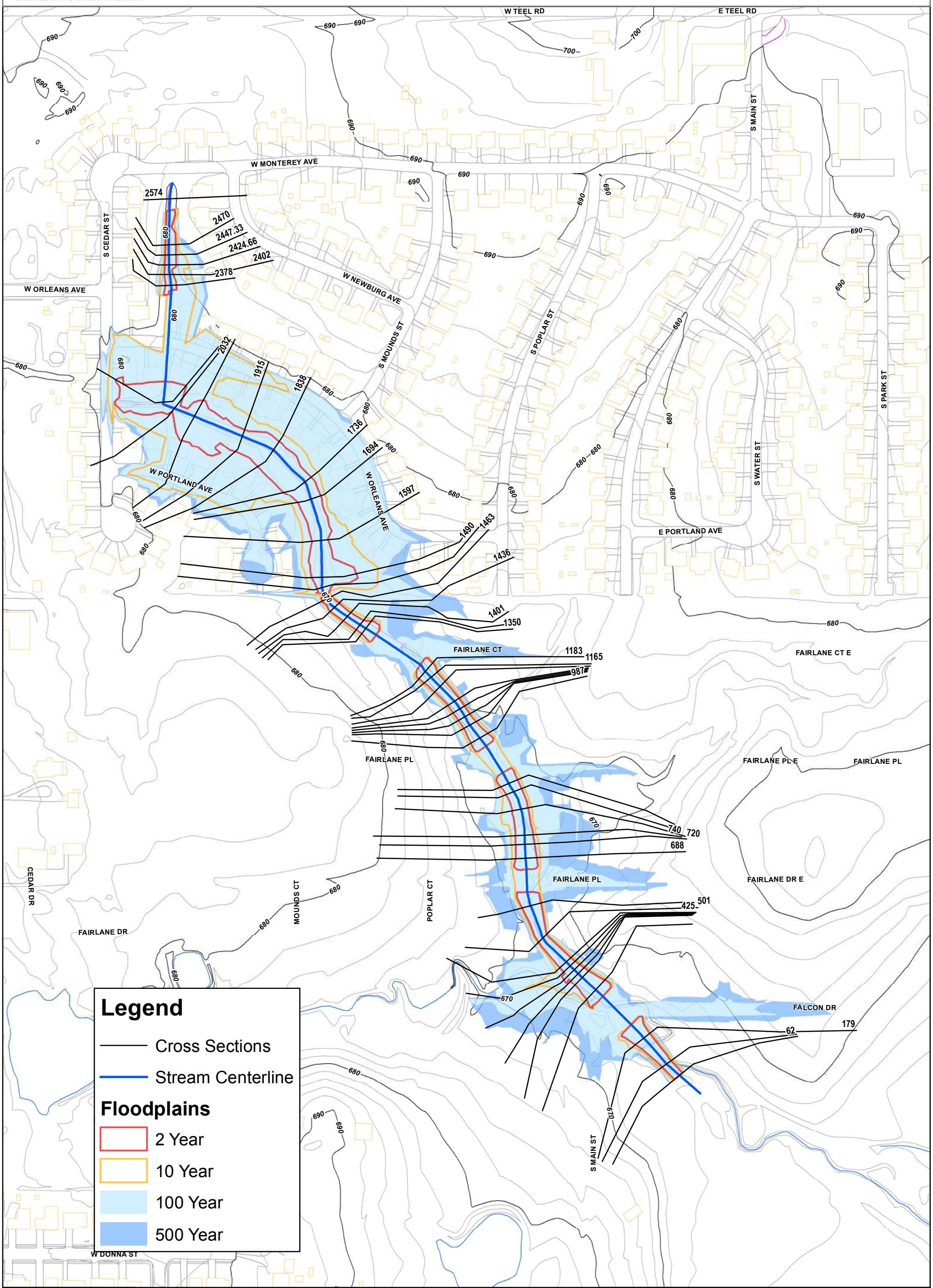
Appendix 9-C. South Polecat Systems - Hickory South Drainage Basin Existing Flow Rates (CFS)									
HMS Junction	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year	Drainage Area, mi^2
HCKS-01	7	13	24	31	40	47	54	67	0.013
HCKS-01-01	4	7	12	16	21	24	28	35	0.006
HCKS-02	8	15	29	38	50	59	68	87	0.018
HCKS-02-01	11	20	36	47	60	71	81	101	0.018
HCKS-02-02	5	9	15	19	24	27	31	38	0.007
HCKS-02-02-UP	11	18	31	39	50	57	65	81	0.015
HCKS-02-03	13	22	34	42	52	59	67	81	0.013
HCKS-02-04	28	43	61	72	87	97	107	128	0.019
HCKS-02-05	17	29	47	58	73	84	94	115	0.019
HCKS-02-06	14	23	33	40	48	54	60	71	0.011
HCKS-03	22	35	56	69	86	98	111	135	0.024
HCKS-03-01	13	20	32	39	49	55	62	76	0.014
HCKS-04	12	18	31	39	49	56	64	79	0.017
HCKS-04-01	9	14	24	30	38	44	50	62	0.012
HCKS-04-02	29	43	71	88	110	127	144	178	0.038
HCKS-05	27	44	74	93	117	135	153	189	0.035
HCKS-06	5	8	13	16	20	22	25	30	0.005
HCKS-06-01	13	20	30	37	45	51	57	69	0.012
HCKS-06-02	27	41	62	76	93	105	118	142	0.026
HCKS-06-03	9	12	17	20	24	27	29	35	0.007
HCKS-07	16	25	39	47	59	67	75	91	0.016
HCKS-08	60	88	126	151	181	204	226	271	0.048
HCKS-09	34	50	71	84	100	113	124	149	0.025
HCKS-09-01	6	9	12	14	17	19	20	24	0.003
HCKS-10	54	84	113	131	156	172	189	223	0.032
HCKS-11	24	39	64	79	99	114	129	158	0.029
J-HCKS-01	440	651	966	1153	1406	1604	1809	2235	0.482
J-HCKS-01-01	4	7	12	16	21	24	28	35	0.006
J-HCKS-02	431	638	944	1123	1367	1561	1759	2171	0.462
J-HCKS-02-01	93	146	231	286	354	406	457	559	0.101
J-HCKS-02-01-UP	84	132	206	252	310	354	397	483	0.083
J-HCKS-02-02	16	27	45	57	72	84	95	118	0.022
J-HCKS-02-02-UP	11	18	31	39	50	57	65	81	0.015
J-HCKS-02-03	55	84	129	157	192	219	245	298	0.051
J-HCKS-02-03-DN	70	110	174	214	264	302	339	414	0.073
J-HCKS-02-04	28	43	61	72	87	97	107	128	0.019
J-HCKS-02-05	17	29	47	58	73	84	94	115	0.019
J-HCKS-02-06	14	23	33	40	48	54	60	71	0.011
J-HCKS-03	336	488	718	863	1052	1202	1351	1665	0.343
J-HCKS-03-01	13	20	32	39	49	55	62	76	0.014
J-HCKS-03-UP	318	461	678	817	996	1137	1276	1570	0.319

Appendix 9-C. South Polecat Systems - Hickory South Drainage Basin Existing Flow Rates (CFS)									
HMS Junction	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year	Drainage Area, mi^2
J-HCKS-04	305	443	651	786	958	1093	1227	1509	0.305
J-HCKS-04-01	37	56	93	117	146	169	191	237	0.050
J-HCKS-04-02	29	43	71	88	110	127	144	178	0.038
J-HCKS-04-UP	294	425	622	751	914	1041	1167	1435	0.288
J-HCKS-05	258	369	533	641	782	890	993	1231	0.238
J-HCKS-06	50	74	112	136	167	190	212	259	0.050
J-HCKS-06-01	48	70	105	128	156	176	197	239	0.045
J-HCKS-06-02	35	51	77	93	114	129	144	174	0.033
J-HCKS-06-03	9	12	17	20	24	27	29	35	0.007
J-HCKS-07	236	345	502	608	738	836	930	1124	0.203
J-HCKS-08	173	252	363	433	522	587	651	783	0.137
J-HCKS-09	112	164	236	282	341	383	425	512	0.090
J-HCKS-09-01	6	9	12	14	17	19	20	24	0.003
J-HCKS-09-UP	78	115	166	199	241	272	302	365	0.064
J-HCKS-10	74	110	159	191	231	261	290	350	0.061
J-HCKS-11	24	39	64	79	99	114	129	158	0.029
R-HCKS-01	430	636	940	1120	1363	1556	1753	2163	0.462
R-HCKS-01-01	4	7	12	16	21	24	28	35	0.006
R-HCKS-02	335	486	714	858	1044	1192	1341	1647	0.343
R-HCKS-02-01	84	132	206	252	310	354	397	483	0.083
R-HCKS-02-01-UP	70	110	174	214	264	302	339	414	0.073
R-HCKS-02-02	11	18	31	39	50	57	65	81	0.015
R-HCKS-02-03	55	84	129	157	192	219	245	298	0.051
R-HCKS-02-04	28	43	61	72	87	97	107	128	0.019
R-HCKS-02-06	14	23	33	40	48	54	60	71	0.011
R-HCKS-03	318	461	678	817	994	1135	1276	1570	0.319
R-HCKS-04	294	425	622	751	913	1041	1168	1436	0.288
R-HCKS-04-01	37	56	93	117	146	169	191	237	0.050
R-HCKS-04-UP	258	369	530	637	773	878	983	1206	0.238
R-HCKS-05	233	333	478	573	696	789	879	1081	0.203
R-HCKS-06	47	69	105	127	155	176	197	239	0.045
R-HCKS-06-01	35	51	77	93	114	129	144	174	0.033
R-HCKS-07	173	252	363	433	522	587	651	783	0.137
R-HCKS-09	78	115	166	199	241	272	302	365	0.064
R-HCKS-09-UP	74	110	159	191	231	261	290	350	0.061
R-HCKS-10	24	39	64	79	99	114	129	158	0.029
R-J-HCKS-02-W	93	146	231	286	354	406	457	559	0.101

City of Sapulpa Master Drainage Plan

STORMWATER
UTILITIES & MASTER DRAINAGE PLAN

Feet
0 100 200
N

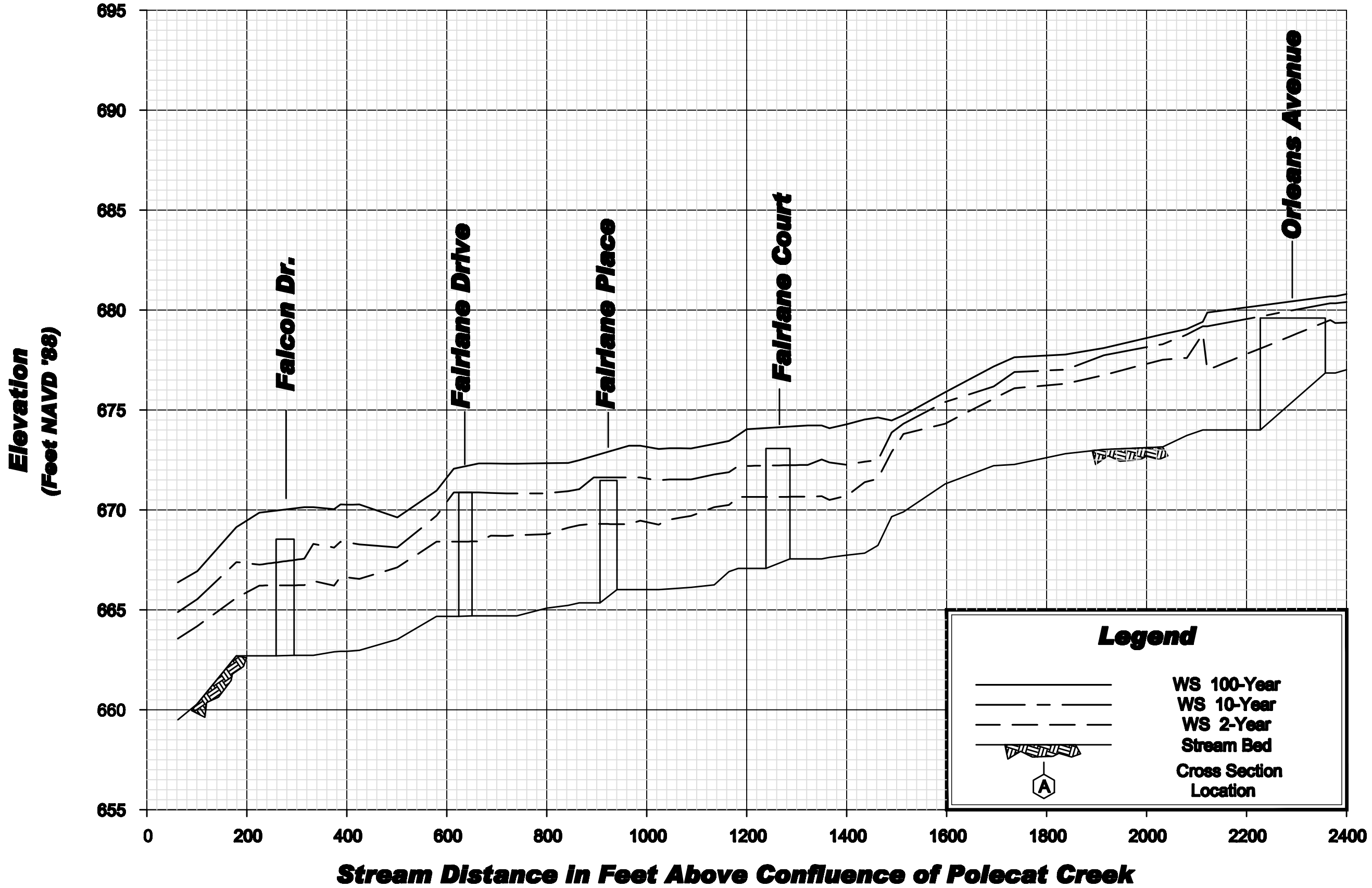


The City of Sapulpa
Oklahoma's Most Connected City

Hickory South Drainage Basin Floodplains

MESHEK & ASSOCIATES, PLC
1437 S Boulder Ave, Suite 1080 Tulsa, OK 74119
Ph:(918) 392-5620 www.meshekengr.com

Appendix 9-D



Appendix 9-E
Existing Flood Profiles
Polecat Creek
Hickory South

City of Sapulpa, OK

PREPARED BY

Meshek & Associates, PLC.
1437 S. Boulder Ave. - Suite 1050
Tulsa, OK 74119
(918) 382-8620

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 1 Alternate 1						
ITEM	**ITEM NO.**	**DESCRIPTION**	**UNIT**	**TOTAL**	**UNIT PRICE**	**TOTAL COST**
1	**223.06**	**TEMPORARY SILT FENCE**	**LF**	150	$ 2.00	$ 300.00
2	**230.06(A)**	**SOLID SLAB BERMUDA SODDING**	**SY**	160	$ 2.50	$ 400.00
3	**411.06(A)**	**PAVEMENT REPLACEMENT**	**SY**	100	$ 50.00	$ 5,000.00
4	**611.06(K)**	**4'x4' CURB INLET**	**EA**	6	$ 3,500.00	$ 21,000.00
5	**619.06(B)**	**REMOVAL OF STRUCTURES AND OBSTRUCTIONS**	**LS**	1	$ 5,000.00	$ 5,000.00
6	**619.06(B)**	**PAVEMENT REMOVAL**	**SY**	100	$ 7.00	$ 700.00
					Subtotal	**$ 31,700.00**
					15% Contingency	**$ 4,755.00**
					Subtotal	**$ 36,455.00**
					25% Utility Relocation Contingency	**$ 9,113.75**
					Total	***$ 45,568.75***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 1 Alternate 2						
ITEM	**ITEM NO.**	**DESCRIPTION**	**UNIT**	**TOTAL**	**UNIT PRICE**	**TOTAL COST**
1	**223.06**	**TEMPORARY SILT FENCE**	**LF**	794	$ 2.00	$ 1,588.00
2	**230.06(A)**	**SOLID SLAB BERMUDA SODDING**	**SY**	659	$ 2.50	$ 1,647.22
3	**411.06(A)**	**PAVEMENT REPLACEMENT**	**SY**	529	$ 50.00	$ 26,466.67
4	**611.06(K)**	**4'x4' CURB INLET**	**EA**	4	$ 3,500.00	$ 14,000.00
5	**613.06(B)**	**24" C76 CL IV RCP W/ OMNIFLEX GASKETS**	**LF**	25	$ 70.00	$ 1,750.00
6	**613.06(B)**	**36" C76 CL IV RCP W/ OMNIFLEX GASKETS**	**LF**	372	$ 120.00	$ 44,640.00
7	**613.06(S)**	**TRENCH EXCAVATION**	**CY**	529	$ 8.00	$ 4,228.57
8	**613.06(T)**	**STANDARD BEDDING MATERIAL**	**CY**	289	$ 20.00	$ 5,780.44
9	**619.06(B)**	**REMOVAL OF STRUCTURES AND OBSTRUCTIONS**	**LS**	1	$ 5,000.00	$ 5,000.00
10	**619.06(B)**	**PAVEMENT REMOVAL**	**SY**	529	$ 7.00	$ 3,705.33
					Subtotal	**$ 105,100.90**
					15% Contingency	**$ 15,765.14**
					Subtotal	**$ 120,866.04**
					25% Utility Relocation Contingency	**$ 30,216.51**
					Total	***$ 151,082.55***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 2 Alternate 1						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	202.06(A)	UNCLASSIFIED EXCAVATION	CY	4480	$ 1.00	$ 4,480.00
1	223.06	TEMPORARY SILT FENCE	LF	980	$ 2.00	$ 1,960.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	347	$ 2.50	$ 866.67
3	411.06(A)	PAVEMENT REPLACEMENT	SY	140	$ 50.00	$ 7,000.00
4	611.06(K)	4'X4' CURB INLET	EA	2	$ 3,500.00	$ 7,000.00
5	613.06(X)	8'x3' C850 REINFORCED CONCRETE BOX	LF	70	$ 560.00	$ 39,200.00
6	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 25,000.00	$ 25,000.00
7	619.06(B)	PAVEMENT REMOVAL	SY	140	$ 7.00	$ 980.00
					Subtotal	**$ 82,006.67**
					15% Contingency	**$ 12,301.00**
					Subtotal	**$ 94,307.67**
					25% Utility Relocation Contingency	**$ 23,576.92**
					Total	***$ 117,884.58***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 2 Alternate 2						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	202.06(A)	UNCLASSIFIED EXCAVATION	CY	4480	$ 1.00	$ 4,480.00
1	223.06	TEMPORARY SILT FENCE	LF	980	$ 2.00	$ 1,960.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	347	$ 2.50	$ 866.67
3	411.06(A)	PAVEMENT REPLACEMENT	SY	140	$ 50.00	$ 7,000.00
4	611.06(K)	4'X4' CURB INLET	EA	2	$ 3,500.00	$ 7,000.00
5	613.06(X)	8'x4' C850 REINFORCED CONCRETE BOX	LF	70	$ 600.00	$ 42,000.00
6	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 25,000.00	$ 25,000.00
7	619.06(B)	PAVEMENT REMOVAL	SY	140	$ 7.00	$ 980.00
					Subtotal	**$ 84,806.67**
					15% Contingency	**$ 12,721.00**
					Subtotal	**$ 97,527.67**
					25% Utility Relocation Contingency	**$ 24,381.92**
					Total	***$ 121,909.58***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Areas 3 and 4 Alternate 1						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	1638	$ 2.00	$ 3,276.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	1415	$ 2.50	$ 3,537.22
3	411.06(A)	PAVEMENT REPLACEMENT	SY	264	$ 50.00	$ 13,200.00
4	611.06(A)	STORM SEWER JUNCTION BOX	EA	1	$ 10,000.00	$ 10,000.00
5	611.06(K)	8'x4' CURB INLET	EA	2	$ 5,000.00	$ 10,000.00
6	611.06(K)	TRENCH GRATE INLET	EA	2	$ 10,000.00	$ 20,000.00
7	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	23	$ 70.00	$ 1,610.00
8	613.06(B)	30" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	216	$ 92.00	$ 19,872.00
9	613.06(B)	48" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	580	$ 220.00	$ 127,600.00
10	613.06(S)	TRENCH EXCAVATION	CY	1321	$ 8.00	$ 10,566.17
11	613.06(T)	STANDARD BEDDING MATERIAL	CY	689	$ 20.00	$ 13,778.84
12	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 5,000.00	$ 5,000.00
13	619.06(B)	PAVEMENT REMOVAL	SY	264	$ 7.00	$ 1,848.00
					Subtotal	**$ 238,440.24**
					15% Contingency	**$ 35,766.04**
					Subtotal	**$ 274,206.27**
					25% Utility Relocation Contingency	**$ 68,551.57**
					Total	***$ 342,757.84***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Areas 3 and 4 Alternate 2						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	1698	$ 2.00	$ 3,396.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	1534	$ 2.50	$ 3,834.58
3	411.06(A)	PAVEMENT REPLACEMENT	SY	264	$ 50.00	$ 13,200.00
4	611.06(A)	STORM SEWER JUNCTION BOX	EA	1	$ 10,000.00	$ 10,000.00
5	611.06(K)	8'x4' CURB INLET	EA	2	$ 5,000.00	$ 10,000.00
6	611.06(K)	TRENCH GRATE INLET	EA	2	$ 10,000.00	$ 20,000.00
7	613.06(B)	30" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	23	$ 92.00	$ 2,116.00
8	613.06(B)	36" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	216	$ 120.00	$ 25,920.00
9	613.06(B)	54" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	278	$ 255.00	$ 70,890.00
10	613.06(B)	60" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	332	$ 300.00	$ 99,600.00
11	613.06(S)	TRENCH EXCAVATION	CY	1266	$ 8.00	$ 10,129.68
12	613.06(T)	STANDARD BEDDING MATERIAL	CY	822	$ 20.00	$ 16,433.04
13	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 5,000.00	$ 5,000.00
14	619.06(B)	PAVEMENT REMOVAL	SY	264	$ 7.00	$ 1,848.00
					Subtotal	**$ 290,519.31**
					15% Contingency	**$ 43,577.90**
					Subtotal	**$ 334,097.20**
					25% Utility Relocation Contingency	**$ 83,524.30**
					Total	***$ 417,621.50***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 5 Alternate 1						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	2782	$ 2.00	$ 5,564.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	5873	$ 2.50	$ 14,682.78
3	411.06(A)	PAVEMENT REPLACEMENT	SY	1093	$ 50.00	$ 54,666.67
4	611.06(A)	6' I.D. MANHOLE W/FRAME AND LID	EA	1	$ 3,500.00	$ 3,500.00
5	611.06(K)	SMD INLET	EA	5	$ 3,500.00	$ 17,500.00
6	613.06(X)	7'x5' C850 REINFORCED CONCRETE BOX	LF	1391	$ 560.00	$ 778,960.00
7	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 25,000.00	$ 25,000.00
8	619.06(B)	PAVEMENT REMOVAL	SY	1093	$ 7.00	$ 7,653.33
					Subtotal	**$ 907,526.78**
					15% Contingency	**$ 136,129.02**
					Subtotal	**$ 1,043,655.79**
					25% Utility Relocation Contingency	**$ 260,913.95**
					Total	***$ 1,304,569.74***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 5 Alternate 2						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	2782	$ 2.00	$ 5,564.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	5873	$ 2.50	$ 14,682.78
3	411.06(A)	PAVEMENT REPLACEMENT	SY	1093	$ 50.00	$ 54,666.67
4	611.06(A)	6' I.D. MANHOLE W/FRAME AND LID	EA	1	$ 3,500.00	$ 3,500.00
5	611.06(K)	SMD INLET	EA	5	$ 3,500.00	$ 17,500.00
6	613.06(X)	9'x5' C850 REINFORCED CONCRETE BOX	LF	1391	$ 700.00	$ 973,700.00
7	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 25,000.00	$ 25,000.00
8	619.06(B)	PAVEMENT REMOVAL	SY	1093	$ 7.00	$ 7,653.33
					Subtotal	**$ 1,102,266.78**
					15% Contingency	**$ 165,340.02**
					Subtotal	**$ 1,267,606.79**
					25% Utility Relocation Contingency	**$ 316,901.70**
					Total	***$ 1,584,508.49***

City of Sapulpa						
Appendix 9-F. Hickory South Drainage Basin - Problem Area 6 Alternate 1						
ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	870	$ 2.00	$ 1,740.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	622	$ 2.50	$ 1,555.56
3	411.06(A)	PAVEMENT REPLACEMENT	SY	380	$ 50.00	$ 19,000.00
4	611.06(A)	STORM SEWER JUNCTION BOX	EA	1	$ 10,000.00	$ 10,000.00
5	611.06(K)	4'X4' CURB INLET	EA	4	$ 3,500.00	$ 14,000.00
6	611.06(K)	SMD INLET	EA	1	$ 3,500.00	$ 3,500.00
7	613.06(B)	18" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	35	$ 48.00	$ 1,680.00
8	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	400	$ 70.00	$ 28,000.00
9	613.06(S)	TRENCH EXCAVATION	CY	315	$ 8.00	$ 2,518.30
10	613.06(T)	STANDARD BEDDING MATERIAL	CY	164	$ 20.00	$ 3,279.80
11	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$ 25,000.00	$ 25,000.00
12	619.06(B)	PAVEMENT REMOVAL	SY	380	$ 7.00	$ 2,660.00
					Subtotal	**$ 111,193.66**
					15% Contingency	**$ 16,679.05**
					Subtotal	**$ 127,872.71**
					25% Utility Relocation Contingency	**$ 31,968.18**
					Total	***$ 159,840.89***