



# BIVENS CREEK DRAINAGE BASIN

# SAPULPA CITYWIDE MASTER DRAINAGE PLAN

JUNE 2010

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## SECTION 6. BIVENS CREEK DRAINAGE BASIN

### 6.1. EXISTING CONDITIONS HYDROLOGY

The Bivens Drainage Basin extends southwest from U.S. Highway 75 and State Highway 117, south of Taft Avenue, north of West 146<sup>th</sup> Street South, west almost to 177<sup>th</sup> West Avenue and east to Galaxy Road. It drains northeasterly to Rock Creek and is shown with its subbasins in **FIGURE 6-1**.

The hydrologic soil groups are presented in **FIGURE 6-2** with more information available in **SECTION 2.1 HYDROLOGIC ANALYSIS**. **FIGURE 6-3** includes the basin's existing land use. Currently, the basin is relatively undeveloped. Primarily, it is comprised of forestland and pasture although a few scattered industrial sites and some residential developments do exist. The residential areas range in size from large acreages to standard lot sizes.

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 6-1** with more detailed data in **APPENDIX 6-A**.

The HEC-HMS schematic used to develop flow rates for the Bivens Creek Drainage Basin is located in **APPENDIX 6-B**, and a complete list of the flow rates for the existing conditions is available in **APPENDIX 6-C**. **TABLE 6-2** shows the resulting flow rates at major junctions in the Bivens Drainage Basin.

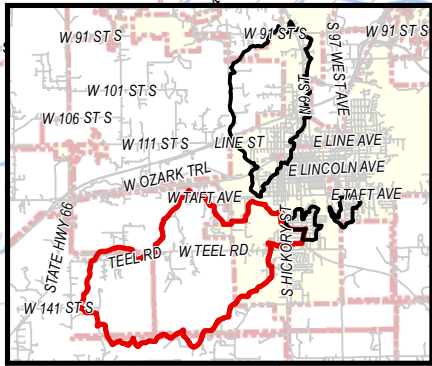
### 6.2. EXISTING CONDITIONS HYDRAULICS

The storm sewer system in Bivens Creek Basin is minimal. Any studied systems are depicted in **FIGURE 6-4**. 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. Tables with flow rates and capacities are included in **APPENDIX 6-C**.

The floodplains in Bivens Creek Drainage Basin were mapped for the 100- and 500-year frequency events and in some cases more frequent events. The location of the studied floodplains is shown in **FIGURE 6-4** with detailed maps found in **APPENDIX 6-D**. Buildings located within the floodplain are also shown. The resulting water surface profiles for each frequency are presented in **APPENDIX 6-E**.

Finally, bridges and culverts were studied to determine the likelihood of being overtopped during certain storm frequencies and are depicted in **FIGURE 6-5**. Of three roadways experiencing overtopped structures, two would overtop with a storm event having a frequency of a 50% annual chance. These structures are located on W. Teel Road east of Wickham Road and on Wickham Road north of W. Teel Road where Bivens Creek crosses both of these roads. Just slightly east of the first overtopped structure on W. Teel Road, Bivens Creek crosses Teel

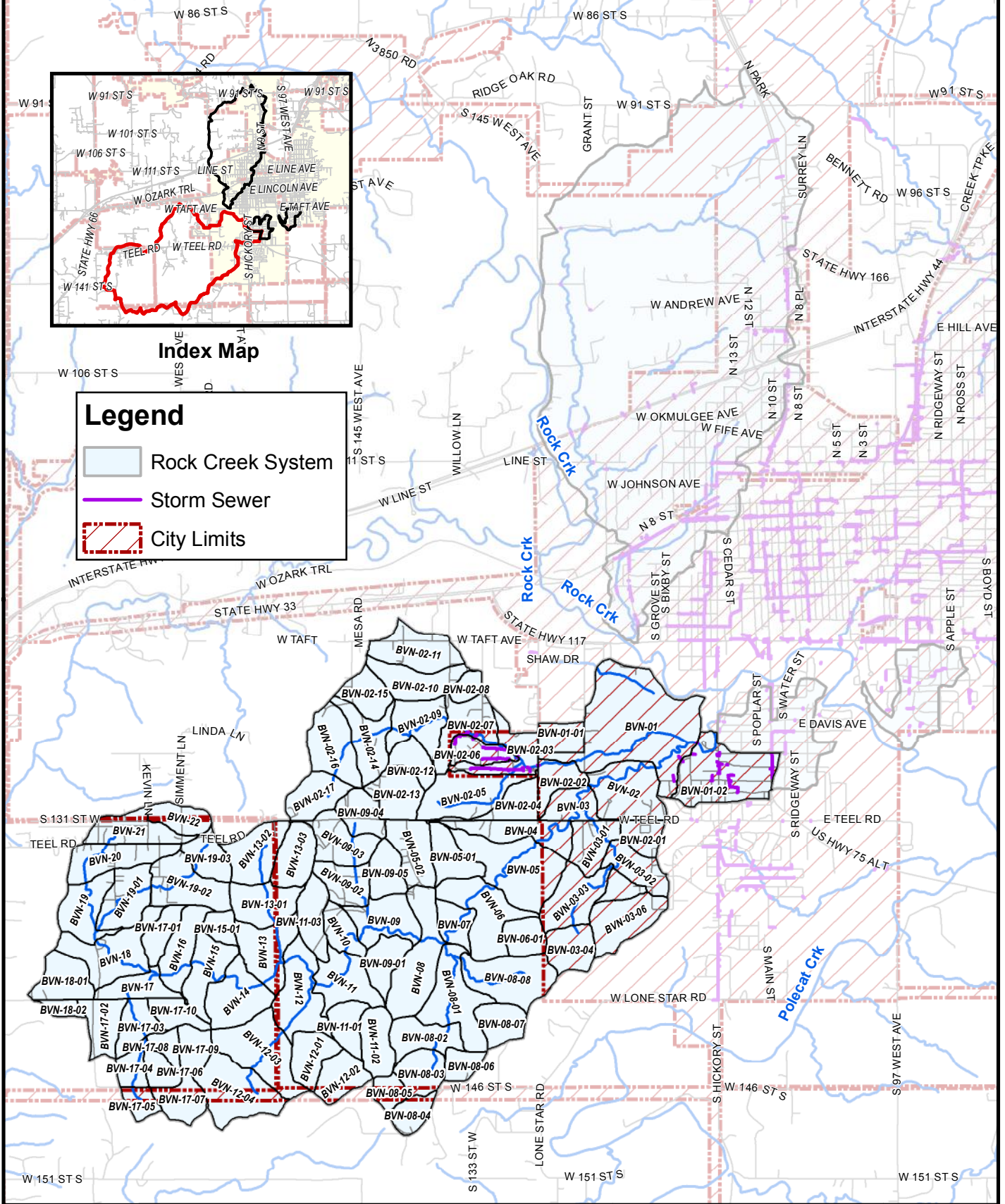


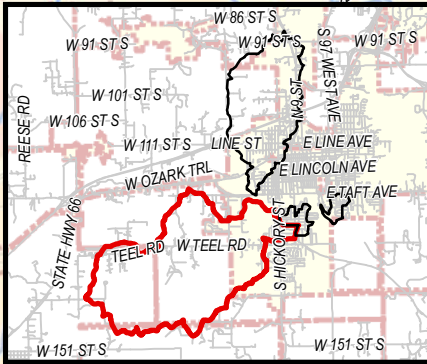


**Index Map**

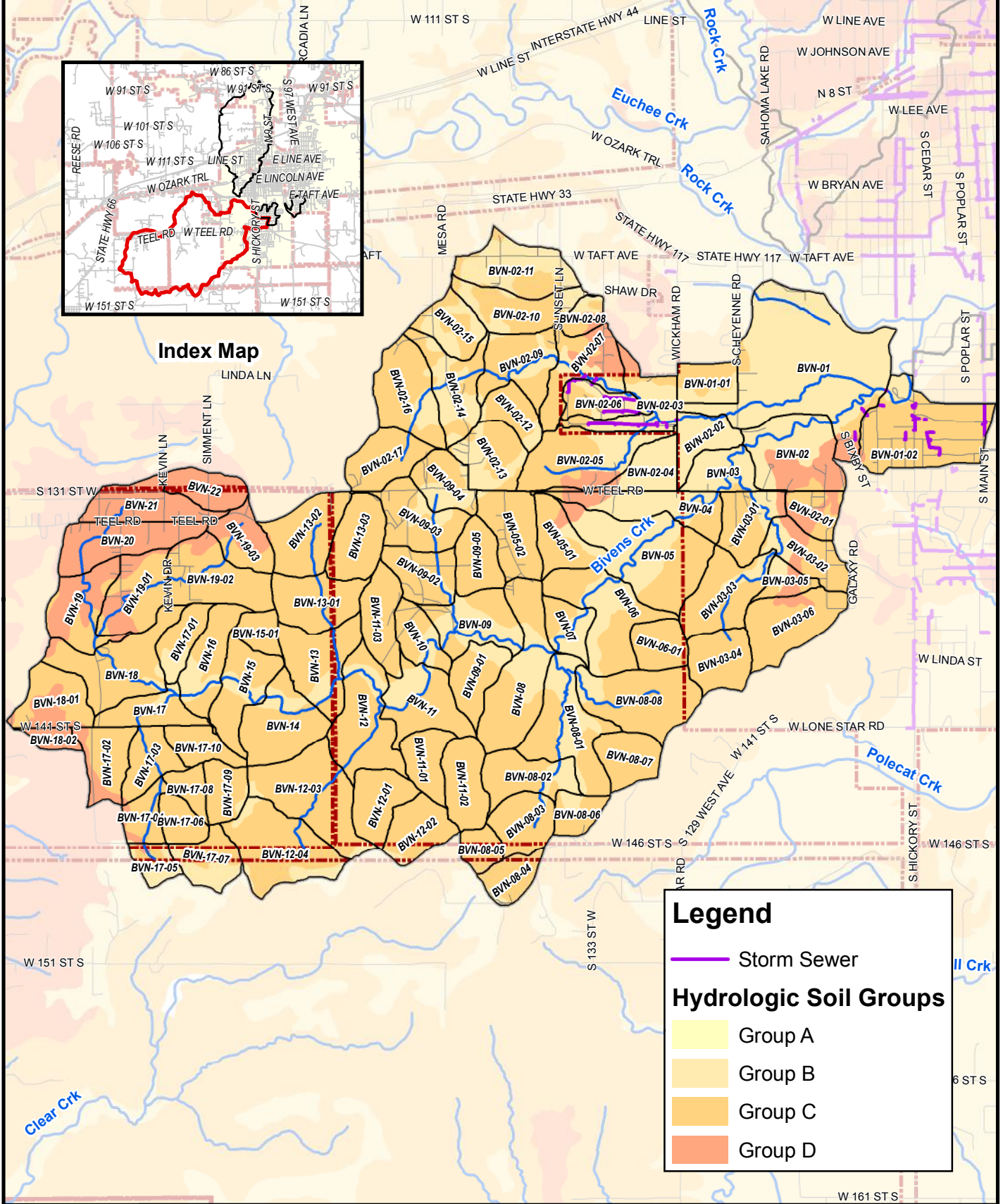
## Legend

- Rock Creek System
- Storm Sewer
- City Limits





**Index Map**



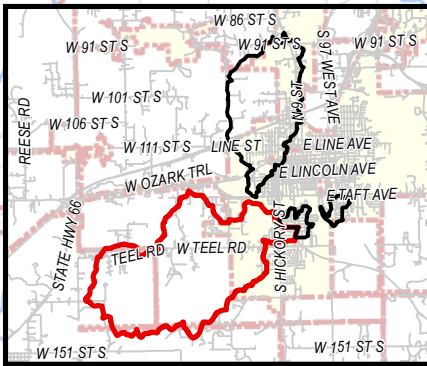
**Legend**

- Storm Sewer

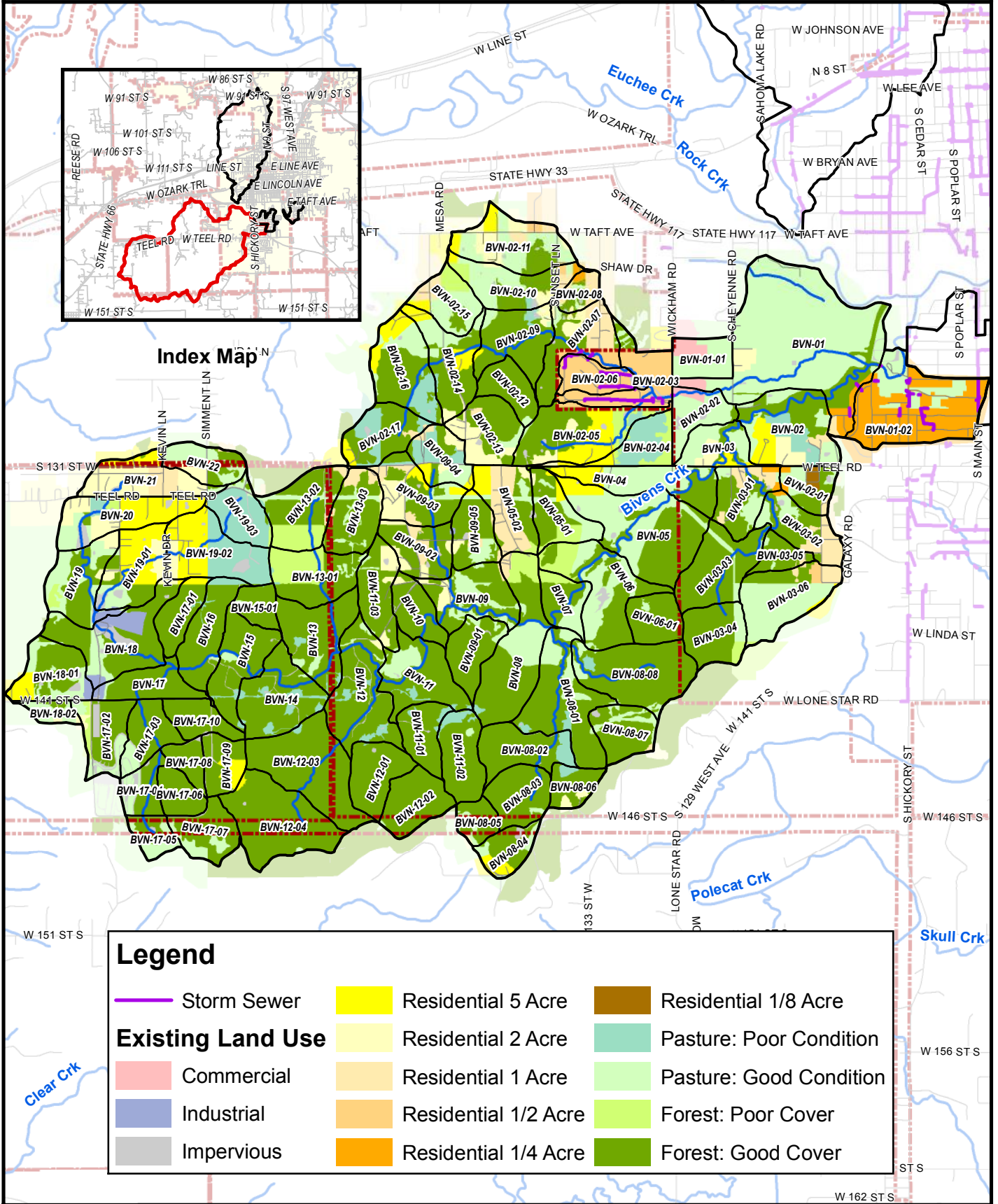
**Hydrologic Soil Groups**

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





**Index Map**



## Legend

Storm Sewer	Residential 5 Acre	Residential 1/8 Acre
<b>Existing Land Use</b>	Residential 2 Acre	Pasture: Poor Condition
Commercial	Residential 1 Acre	Pasture: Good Condition
Industrial	Residential 1/2 Acre	Forest: Poor Cover
Impervious	Residential 1/4 Acre	Forest: Good Cover

**TABLE 6-1. BIVENS CREEK DRAINAGE BASIN –  
SUMMARY OF HYDROLOGIC COEFFICIENTS FOR EXISTING CONDITIONS**

Sub-Area	Drainage Area, Acres	Lag Time, Minutes	Composite CN
BVN-01	214.91	20.4	63.0
BVN-01-01	28.36	14.3	74.3
BVN-01-02	32.24	10.8	75.7
BVN-01-03	18.14	6.1	83.3
BVN-01-04	17.73	11.8	80.2
BVN-01-05	22.58	8.5	81.5
BVN-01-06	15.35	9.2	83.0
BVN-02	74.90	11.8	70.4
BVN-02-01	25.52	5.0	78.4
BVN-02-02	30.98	17.1	68.0
BVN-02-03	43.58	8.7	73.5
BVN-02-04	33.61	19.2	76.9
BVN-02-05	71.80	11.4	72.0
BVN-02-06	27.46	10.0	75.4
BVN-02-07	51.88	9.1	74.1
BVN-02-08	15.38	6.3	75.6
BVN-02-09	50.34	8.2	67.8
BVN-02-10	49.10	7.0	71.0
BVN-02-11	60.51	6.6	67.0
BVN-02-12	27.04	5.3	67.5
BVN-02-13	44.99	5.4	67.7
BVN-02-14	50.37	8.7	66.2
BVN-02-15	35.25	5.7	69.4
BVN-02-16	60.93	4.7	72.9
BVN-02-17	42.36	5.1	75.8
BVN-03	32.06	10.5	62.2
BVN-03-01	40.45	6.2	71.8
BVN-03-02	39.98	8.7	72.8
BVN-03-03	57.73	9.9	68.0
BVN-03-04	40.66	3.9	71.0
BVN-03-05	16.89	4.7	68.6
BVN-03-06	60.93	7.4	74.6
BVN-04	52.29	17.6	66.5
BVN-05	103.46	12.1	65.0
BVN-05-01	37.77	6.3	70.8

Sub-Area	Drainage Area, Acres	Lag Time, Minutes	Composite CN
BVN-05-02	48.98	3.5	76.2
BVN-06	75.44	6.2	68.0
BVN-06-01	29.28	3.1	70.1
BVN-07	26.97	2.7	63.6
BVN-08	83.39	9.2	68.1
BVN-08-01	75.99	11.2	65.4
BVN-08-02	43.24	6.7	69.7
BVN-08-03	38.02	4.6	69.5
BVN-08-04	25.41	4.7	72.8
BVN-08-05	18.16	3.2	71.0
BVN-08-06	21.26	2.4	69.9
BVN-08-07	34.90	4.7	71.3
BVN-08-08	76.06	7.4	69.0
BVN-09	53.14	7.0	63.7
BVN-09-01	34.68	7.3	67.7
BVN-09-02	38.88	5.3	72.9
BVN-09-03	50.64	5.6	72.3
BVN-09-04	33.79	4.3	73.5
BVN-09-05	33.78	4.7	72.6
BVN-10	28.96	3.1	66.9
BVN-11	54.96	5.5	67.4
BVN-11-01	30.11	4.7	71.6
BVN-11-02	41.15	6.6	71.5
BVN-11-03	39.48	8.0	72.0
BVN-12	72.77	6.6	70.6
BVN-12-01	38.94	7.0	70.0
BVN-12-02	38.92	4.7	69.2
BVN-12-03	83.99	9.6	69.3
BVN-12-04	80.25	6.7	67.9
BVN-13	59.37	5.6	68.7
BVN-13-01	50.52	5.8	73.1
BVN-13-02	55.30	6.0	73.4
BVN-13-03	45.06	5.5	71.8
BVN-14	61.93	5.7	70.8
BVN-15	49.31	7.7	68.4
BVN-15-01	18.46	3.5	71.2
BVN-16	44.98	7.8	67.5

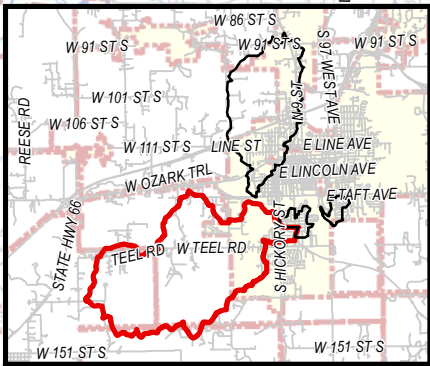
Sub-Area	Drainage Area, Acres	Lag Time, Minutes	Composite CN
BVN-17	32.92	6.4	69.8
BVN-17-01	26.74	6.8	66.1
BVN-17-02	38.74	7.5	77.6
BVN-17-03	32.34	5.9	72.0
BVN-17-04	23.65	5.5	75.5
BVN-17-05	18.34	5.9	66.3
BVN-17-06	21.13	4.1	70.4
BVN-17-07	34.84	5.3	64.2
BVN-17-08	16.06	4.6	72.1
BVN-17-09	26.67	4.6	71.8
BVN-17-10	25.40	6.0	71.2
BVN-18	74.02	9.6	75.2
BVN-18-01	45.72	6.9	76.7
BVN-18-02	12.14	3.7	80.3
BVN-19	50.80	8.0	77.9
BVN-19-01	52.19	8.1	78.6
BVN-19-02	63.54	11.4	82.6
BVN-19-03	33.62	8.3	87.4
BVN-20	56.31	11.3	83.7
BVN-21	48.52	12.4	82.9
BVN-22	30.35	10.1	80.0

Road a second time. In this case, this structure would overtop during a storm having a frequency of a 4% annual chance.

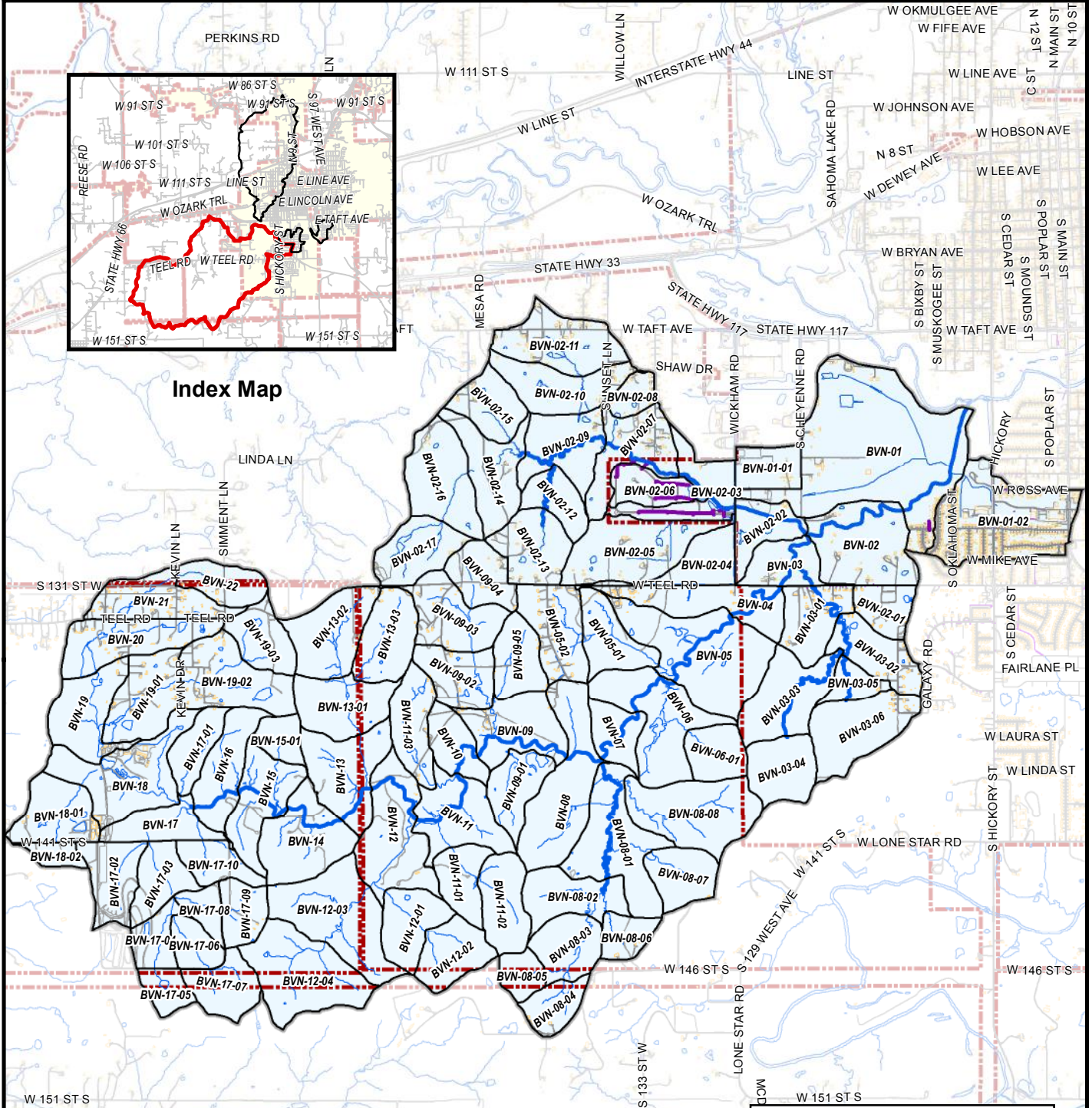
**TABLE 6-2. BIVENS CREEK DRAINAGE BASIN -  
EXISTING FLOW RATES AT MAJOR JUNCTIONS (CFS)**

HMS Junction	Street Intersection	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
J-BVN-01-03	Cul-de-sac at Oklahoma St.	26	41	65	80	99	113	127	157
J-BVN-01-04	Hickory St. & Ross Ave.	17	26	45	57	72	84	96	121
J-BVN-01-05	Hickory St. b/w Mary Lynn Dr & Ross Ave	45	69	114	142	177	205	231	288
J-BVN-01-06	Cedar St. & Mary Lynn Dr.	19	29	47	59	73	84	94	118
J-BVN-02-03	Wickham Rd.	116	273	629	864	1120	1433	1654	2235
J-BVN-02-07	Downstream of Western Rd.	152	306	592	800	1065	1277	1488	1972
J-BVN-04	Teel Rd	481	859	2025	2999	4263	5386	6572	9196
J-BVN-12	Southfork Rd.	425	774	1601	2191	2926	3549	4184	5606





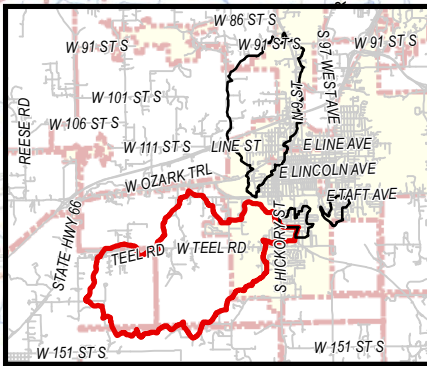
**Index Map**



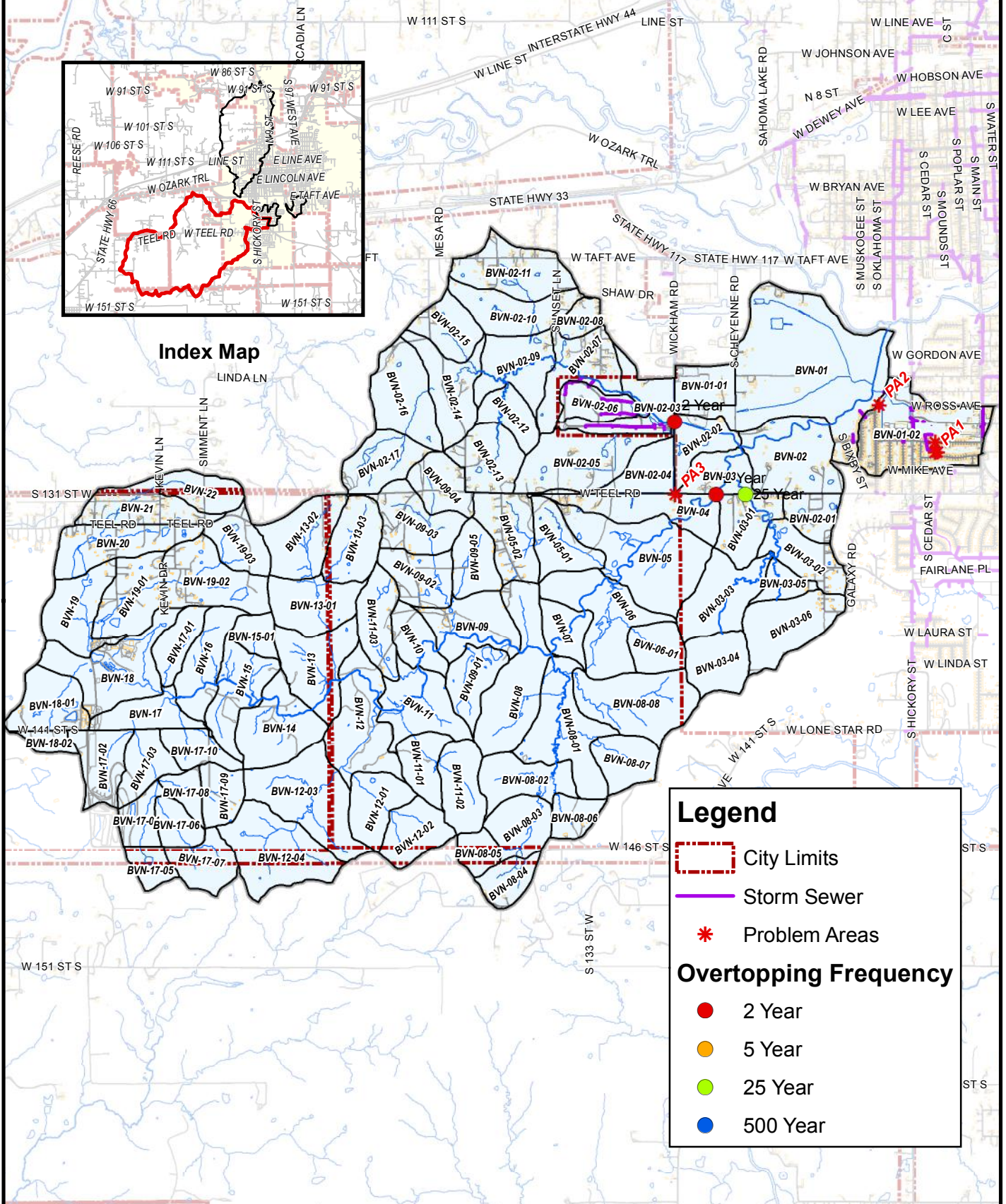
**Legend**

- City Limits
- Existing Storm Sewer
- Studied Stream





**Index Map**



**Legend**

- City Limits
- Storm Sewer
- \* Problem Areas

**Overtopping Frequency**

- 2 Year
- 5 Year
- 25 Year
- 500 Year

## 6.5. PROBLEM AREAS

As stated previously, the Bivens Creek Drainage Basin is relatively undeveloped so there are very few drainage problems at this time. The most serious flooding problem is the overtopping of three roadways where Bivens Creek crosses Wickham Road and West Teel Road. In addition to the road overtoppings, two other localized Problem Areas were identified. A summary of these Problem Areas, including the overtopped structures, is presented below. Their locations are shown in **FIGURE 6-5**.

### A. Problem Area 1: 66 W. Mary Lynn Drive and 63 and 67 W. Mockingbird Lane

The existing system extends north from W. Mockingbird Lane through 142 feet of 18-inch CPP and then west 232 feet of 30-inch RCP. From there the pipe extends northwesterly through 337 feet of 36-inch RCP to its outfall north of W. Mary Lynn Drive.

Overland drainage causes erosion problems in this general area. Several residents have voiced concerns regarding areas eroding near gas meters, fences and in the adjacent alley.

### B. Problem Area 2: 1715 S. Oklahoma Street

The existing system at this location includes two adjacent pipes, one an 18-inch RCP and the other a 21-inch RCP, which extend from the cul de sac east along the south side of the property where it outfalls to a drainage ditch. This system's capacity will only handle those storm events with a 100% annual chance or more frequent storm events.

According to the local resident, water has flooded his neighbors' houses, his car and almost flooded his house. The resident believes the flooding is due to either a blocked storm pipe or an inadequately sized pipe.

### C. Problem Area 3: Overtopped Structures

The existing structures on W. Teel Road and Wickham Road are overtopped frequently at the location at which Bivens Creek crosses both roads. Two of the three overtoppings occur with storm events having a 50% annual chance frequency (or greater). Slightly east of the first overtopped structure on W. Teel Road, Bivens Creek crosses Teel Road a second time. At this crossing, this structure would be overtopped during a storm having a frequency of a 4% annual chance or greater. These overtopped structures need enlarging.

#### 6.4. EVALUATION OF ALTERNATIVES

Several alternatives were considered for the identified Problem Areas. Cost estimates can be found in **APPENDIX 6-F**. Alternatives with figures are summarized in the following pages.

##### A. Problem Area 1 - 66 W. Mary Lynn Drive and 63 and 67 W. Mockingbird Lane

Alternative 1 - Replace existing storm sewer system and inlets to provide storm capacity for a 50% annual chance event. This alternative would replace the existing storm sewer system with a new system to provide a storm capacity for a 10% annual chance event. It would follow the same general alignment and would require some profile changes to ensure the system's maximum capacity.

This alternative would replace the existing 142 feet of 18-inch CPP with a 21-inch RCP. In addition, 232 feet of 30-inch RCP and 338 feet of 36-inch RCP would be replaced with the same size pipe at a profile designed to maximize the system's capacity and efficiency. At the point that the system extends north from Mockingbird Lane, one manhole would be added to the system. In addition, the existing inlets, at W. Mockingbird Lane and W. Mary Lynn Drive, would be replaced with four 4-foot recessed curb inlets with steel inserts, two at each intersection. Two new 4 x 4-foot SMDs would be added to the alley, one at the east end and the other at the west end.

This alternative would allow the system to capture the stormwater for handling a 50% annual chance storm.

The cost for this alternative is approximately \$172,300 and is depicted in **FIGURE 6-6**.

Alternative 2 – Replace existing storm sewer system and inlets (20% annual chance event). Starting at Mockingbird Lane, Alternative 2 would replace 556 feet of the existing system with 36-inch RCP. From that point, the pipe size would change to a 42-inch RCP and continue 156 feet to the outfall. Like Alternative 1, this alternative would include an additional manhole on the north side of Mockingbird Lane as the system extends north to the alley. The existing inlets would be replaced with seven 4-foot recessed curb inlets with steel inserts and three 4 x 4-foot SMDs. Three of the inlets would be located on W. Mockingbird Lane and the remaining four on W. Mary Lynn Drive. Two of the SMDs would be located at each end of the alley where the system is aligned east to west.

This system would capture the water and provide the capacity adequate to handle a 20% annual storm event.

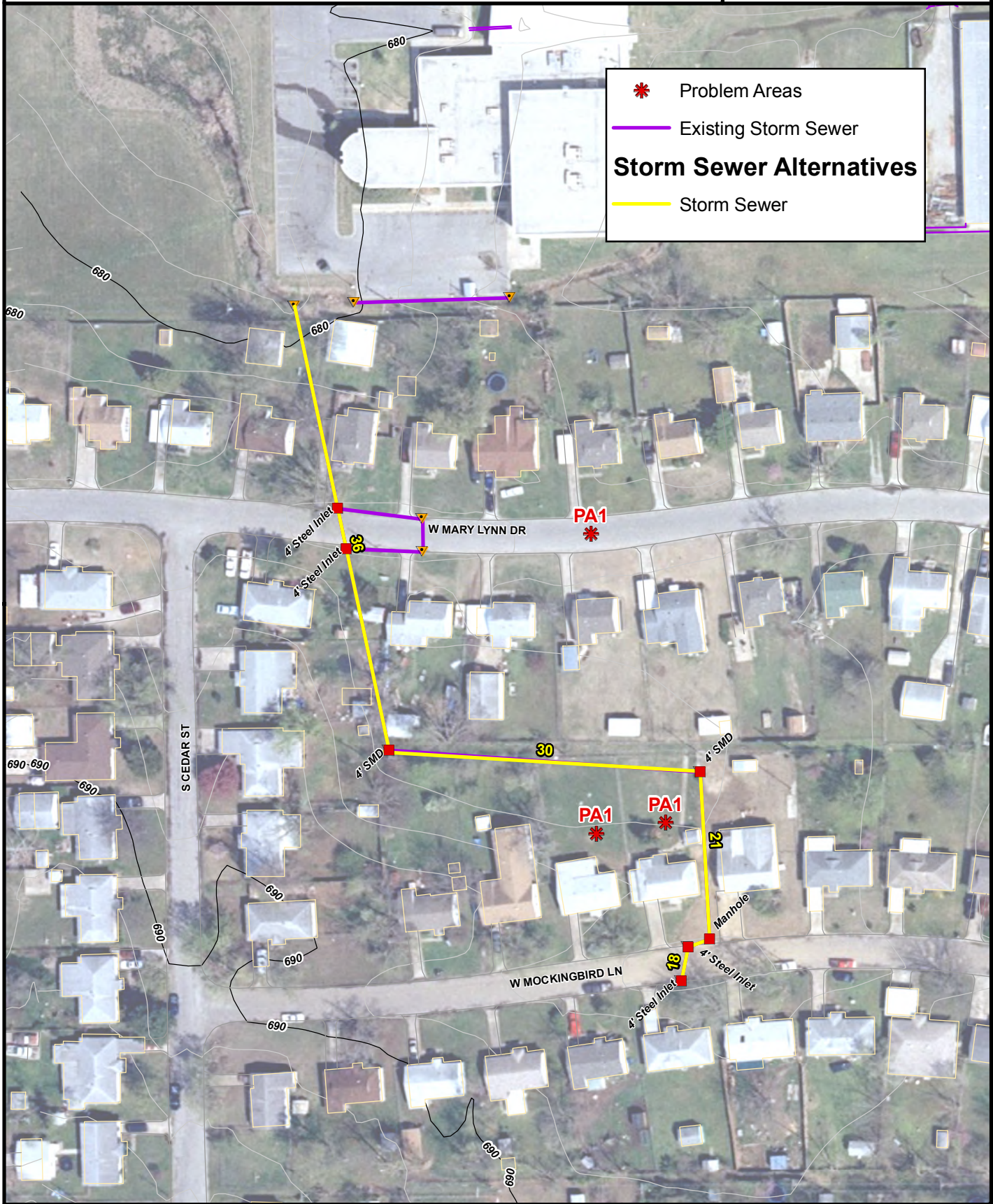
It is estimated that this alternative would cost \$237,000 and can be viewed in **FIGURE 6-7**.

Alternative 3 – Replace existing storm sewer system and inlets (1% annual chance event). Alternative 3 is similar to Alternatives 1 and 2 but would convey more water than the other alternatives. The existing system would be replaced with 375 feet of 42-inch RCP and 338 feet of 48-inch RCP (extending to the outfall). Like the other alternatives, one manhole would be added at the point at which the system extends north from Mockingbird Lane.



**Storm Sewer Alternatives**

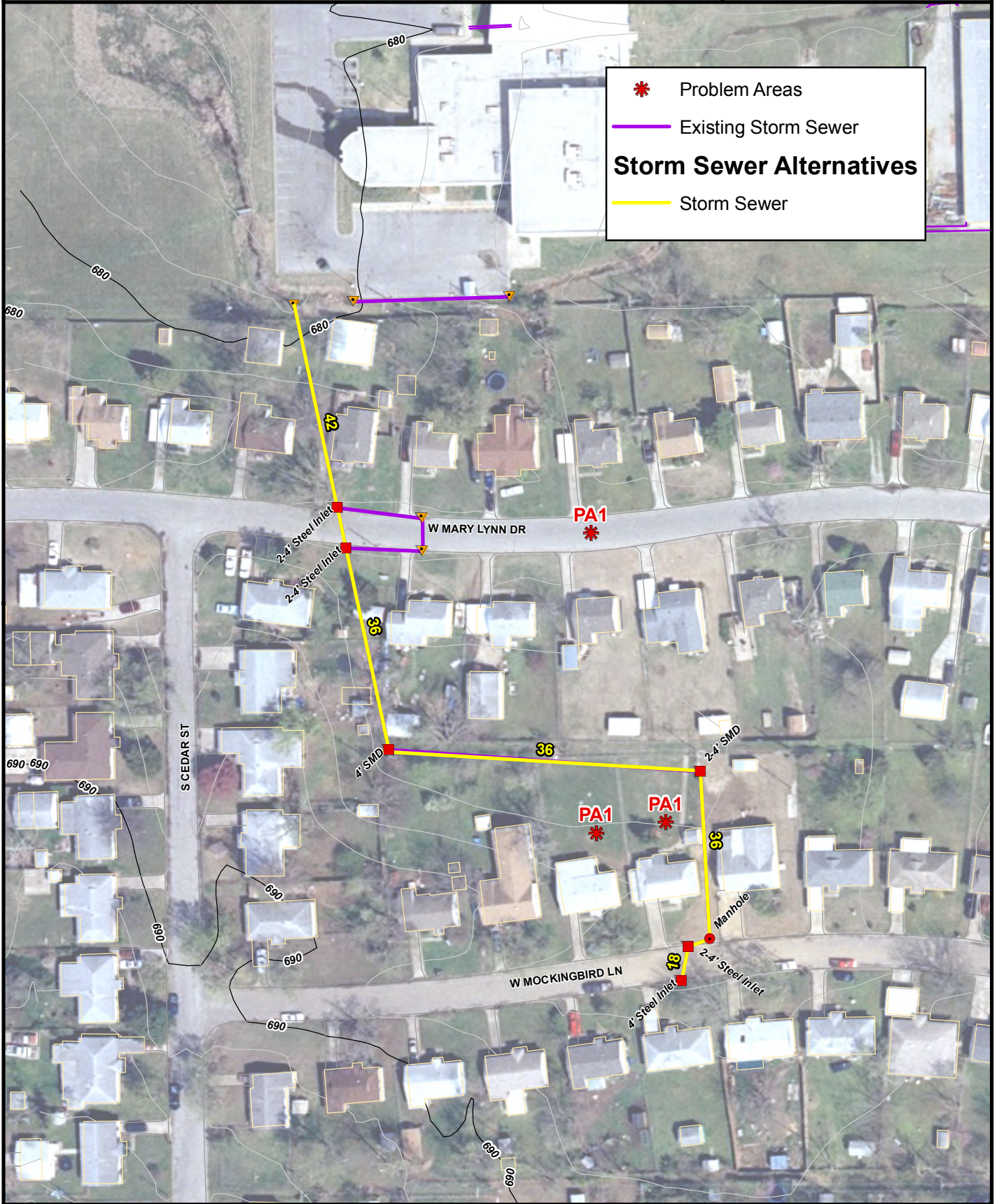
- \* Problem Areas
- Existing Storm Sewer
- Storm Sewer





**Storm Sewer Alternatives**

- \* Problem Areas
- Existing Storm Sewer
- Storm Sewer



The alternative would also replace the existing inlets with nine 4-foot recessed curb inlets with steel inserts and three 4 x 4-foot SMDs. Four recessed curb inlets with steel inserts would be located on W. Mockingbird Lane and connected by 27 feet of 24-inch RCP. Five inlets would be installed on W. Mary Lynn Drive. Like Alternative 1, two SMDs would be located at each end of the alley.

This alternative would provide enough capacity to handle a 1% annual chance event at an estimated cost of \$315,800. This alternative can be viewed in **FIGURE 6-8**.

B. Problem Area 2: 1715 S. Oklahoma Street

Alternative 1 – Replace the existing system with a larger storm sewer and improved inlets (10% annual chance). Alternative 1 would replace the existing inlets at the cul de sac with three 4-foot recessed curb inlets with steel inserts and replace the existing pipes, draining east, with 95 feet of 48-inch RCP. It would also include upgrading the existing inlets along S. Muskogee Street with two 4-foot recessed curb inlets with steel inserts and the two inlets at W. Mary Lynn Drive with two new 4-foot recessed curb inlets with steel inserts. This alternative would capture the flow and provide conveyance for a 10% annual chance storm event.

This alternative would cost approximately \$85,300. This alternative is shown in detail in **FIGURE 6-9**.

Alternative 2 - Enlarge existing system with a larger storm sewer system and improved inlets (1% annual chance). This alternative is a variation of Alternative 1. It would replace the existing cul de sac inlets with three 4-foot s and the storm sewer with 95 feet of 54-inch RCP. It would also include upgrades of the existing inlets along Muskogee Street and Mary Lynn Drive, as in Alternative 1, with an upgrade of the existing connecting pipe on Muskogee to an 18-inch RCP. In addition, this alternative would upgrade the existing 18-inch RCP on Mary Lynn Drive to a 24-inch RCP. This alternative would handle a 1% annual chance storm event.

The cost for this alternative is approximately \$118,200 and is shown in **FIGURE 6-10**.

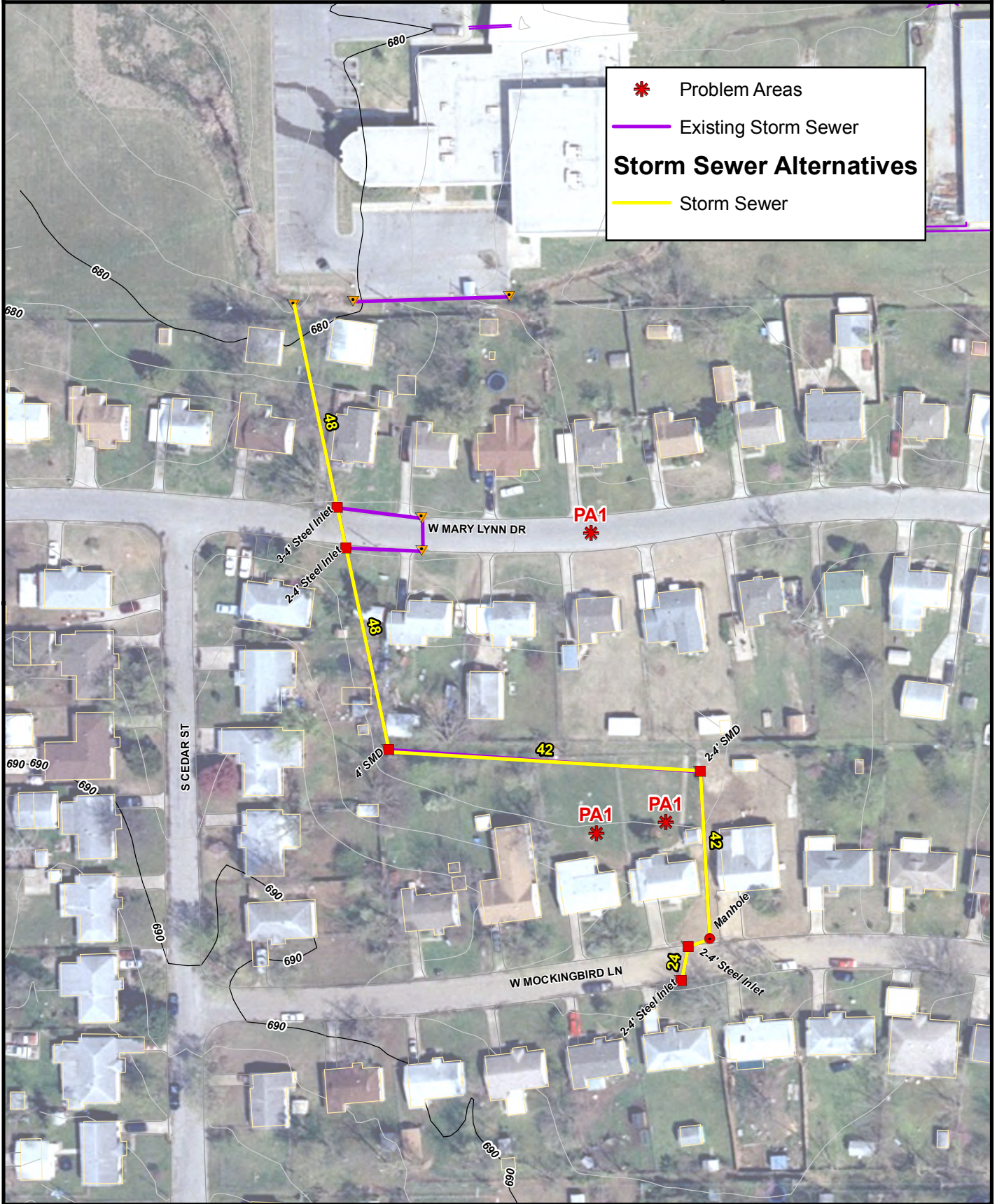
C. Problem Area 3: Overtopped Structures

Based on direction from the City, no replacement alternatives were studied for the overtopped structures in this basin.



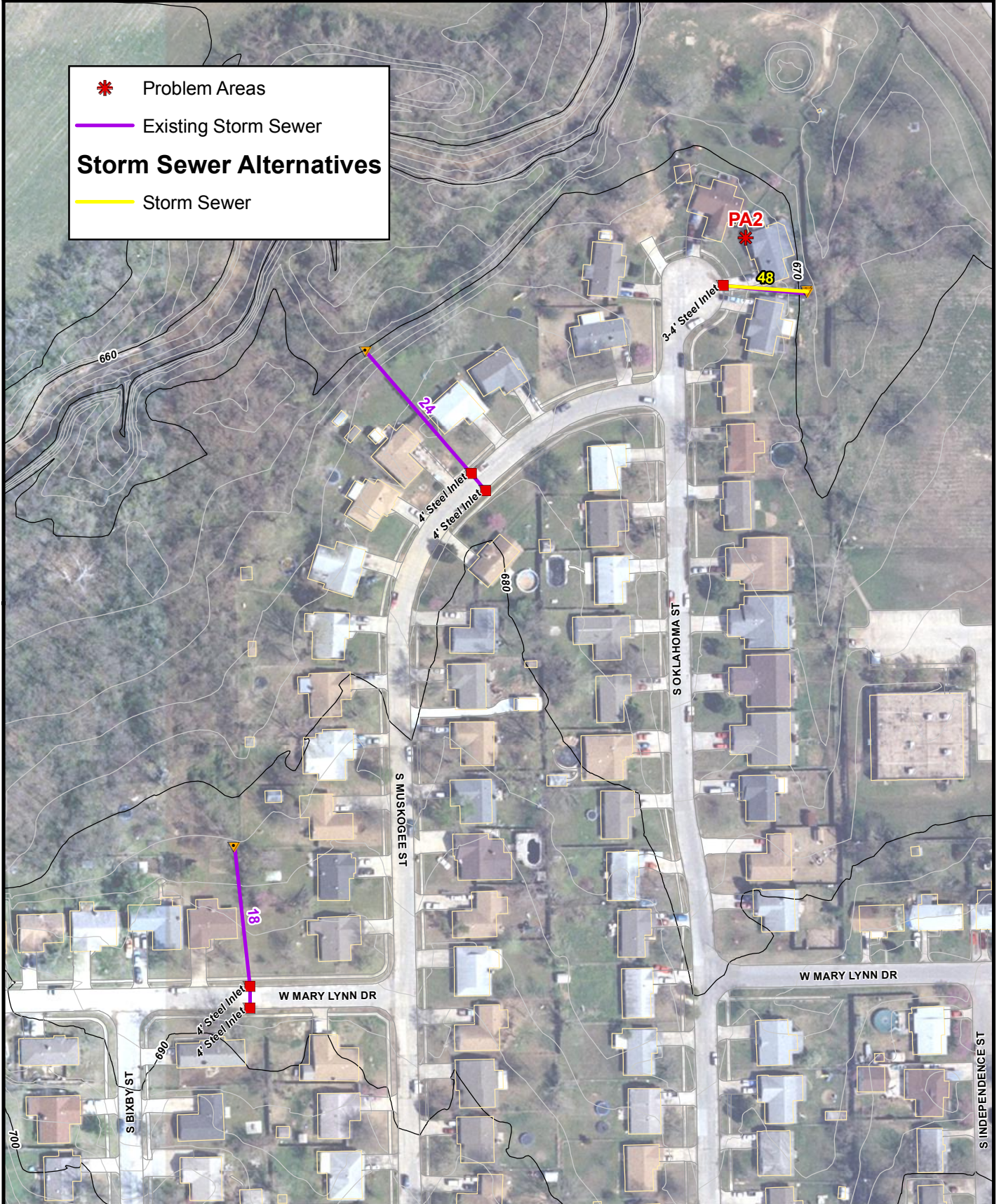
**Storm Sewer Alternatives**

- \* Problem Areas
- Existing Storm Sewer
- Storm Sewer





\* Problem Areas  
— Existing Storm Sewer  
**Storm Sewer Alternatives**  
— Storm Sewer





**Problem Areas**

- \* Problem Areas

**Existing Storm Sewer**

- Existing Storm Sewer

**Storm Sewer Alternatives**

- Storm Sewer



6.5. RECOMMENDED PLAN

Using prioritization criteria from **SECTION 1 INTRODUCTION** and discussions with City staff, the following alternatives were selected for the Bivens Creek Drainage Basin. In some cases, “No Action” was the selected course. For more details, please refer to the text and exhibits in **SECTION 6-4 EVALUATION OF ALTERNATIVES** and **APPENDIX 6-F**.

The Recommended Plan for the Bivens Creek Drainage Basin is:

<b>PROBLEM AREA</b>	<b>RECOMMENDED ALTERNATIVE</b>	<b>RATIONALE FOR SELECTION</b>	<b>ESTIMATED COST</b>
Problem Area 1	Alternative 3	Of the three alternatives reviewed, Alternative 3 would provide the greatest level of protection for the public at a modest additional cost over the others. At the same time, it would address a long-term health and safety hazard.	\$315,800
Problem Area 2	Alternative 2	This alternative is a variation of Alternative 1 while providing a greater level of protection at a modest additional public cost.	\$118,200
Problem Area 3	No Action	No replacement alternatives were studied for the overtopped structures in this basin.	-0-
		<b>TOTAL COST</b>	<b>\$434,000</b>

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C					D
		6164																							4128.0	
BVN-01	Overland	152	0.88	0.65	3.88			Commercial	2	89	92	94	95	#N/A	1.8	#N/A	#N/A	0.0	1.8	0.0	0.0	168.7	63.0	214.9	0.33580	
	Channel (ditch)	3598	0.47	3.00	19.99			Forest (good cover)	8	25	55	70	77	#N/A	7.3	0.9	0.0	0.0	7.3	0.9	0.0	466.5				
	Paved			0.00	0.00			Impervious	1	98	98	98	98	#N/A	0.7	0.0	#N/A	0.0	0.7	0.0	0.0	69.6				
	Pipe			0.00	0.00			Pasture: Good Condition	82	39	61	74	80	#N/A	80.1	1.6	0.0	0.0	80.1	1.6	0.0	5010.2				
	Stream	2413	0.88	4.00	10.05	20.4	0.34	Residential 1 acre	1	51	68	79	84	#N/A	#N/A	#N/A	0.9	0.0	0.0	0.9	71.7					
								Residential 1/4 acre	4	61	75	83	87	#N/A	0.2	1.4	2.4	0.0	0.2	1.4	2.4	344.3				
								Residential 2 acre	3	46	65	77	82	#N/A	2.5	#N/A	#N/A	0.0	2.5	0.0	0.0	165.5				
BVN-01-01	Overland	116	0.57	0.53	3.66			Commercial	23	89	92	94	95	#N/A	1.1	21.6	#N/A	0.0	1.1	21.6	0.0	2131.8	74.3	28.4	0.04432	
	Channel (ditch)	984	0.75	1.27	12.90			Impervious	2	98	98	98	98	#N/A	1.2	1.2	#N/A	0.0	1.2	1.2	0.0	234.5				
	Paved	711	0.67	1.63	7.26			Pasture: Good Condition	75	39	61	74	80	#N/A	36.6	38.3	#N/A	0.0	36.6	38.3	0.0	5067.6				
	Pipe			0.00	0.00																					
	Stream			0.00	0.00		14.3	0.24																		
BVN-01-02	Overland	286	2.70	1.15	4.13			Forest (good cover)	0	25	55	70	77	#N/A	#N/A	#N/A	#N/A	0.0	0.0	0.0	0.0	0.0	75.7	32.2	0.05038	
	Channel (ditch)	1167	1.79	1.99	9.77			Impervious	1	98	98	98	98	#N/A	1.1	#N/A	#N/A	0.0	1.1	0.0	0.0	108.7				
	Paved			0.00	0.00			Pasture: Good Condition	47	39	61	74	80	#N/A	24.5	22.1	#N/A	0.0	24.5	22.1	0.0	3130.9				
	Pipe			0.00	0.00			Residential 1/4 acre	52	61	75	83	87	#N/A	0.2	52.0	#N/A	0.0	0.2	52.0	0.0	4327.2				
	Stream	986	0.00	4.00	4.11	10.8	0.18																			
BVN-01-03	Overland	239	5.13	1.59	2.50			Residential 1/4 acre	100	61	75	83	87	#N/A	#N/A	92.3	7.7	0.0	0.0	92.3	7.7	8331.0	83.3	18.1	0.02834	
	Channel (ditch)			0.00	0.00																					
	Paved	1340	2.09	2.88	7.75																					
	Pipe			0.00	0.00																					
BVN-01-04	Overland	296	1.26	0.79	6.26			Pasture: Good Condition	30	39	61	74	80	#N/A	#N/A	29.9	#N/A	0.0	0.0	29.9	0.0	2212.7	80.2	17.7	0.02770	
	Channel (ditch)	1587	1.76	1.97	13.40			Residential 1/4 acre	70	61	75	83	87	#N/A	1.4	68.7	#N/A	0.0	1.4	68.7	0.0	5807.4				
	Paved			0.00	0.00																					
	Pipe			0.00	0.00																					
	Stream			0.00	0.00		11.8	0.20																		
BVN-01-05	Overland	218	1.89	0.97	3.77			Pasture: Good Condition	17	39	61	74	80	#N/A	#N/A	17.0	#N/A	0.0	0.0	17.0	0.0	1255.5	81.5	22.6	0.03529	
	Channel (ditch)	178	1.35	1.72	1.72			Residential 1/4 acre	83	61	75	83	87	#N/A	#N/A	83.0	#N/A	0.0	0.0	83.0	0.0	6891.8				
	Paved	1005	1.59	2.51	6.66																					
	Pipe			0.00	0.00																					
	Stream	500	0.00	4.00	2.08	8.5	0.14																			
BVN-01-06	Overland	221	2.17	1.03	3.57			Residential 1/4 acre	100	61	75	83	87	#N/A	#N/A	100.0	#N/A	0.0	0.0	100.0	0.0	8300.0	83.0	15.3	0.02398	
	Channel (ditch)	1238	1.39	1.75	11.81																					
	Paved			0.00	0.00																					
	Pipe			0.00	0.00																					
	Stream			0.00	0.00		9.2	0.15																		



**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
4128.0																									
BVN-02		2680																							
	Overland	103	4.81	1.54	1.11			Forest (good cover)	32	25	55	70	77	#N/A	29.7	#N/A	2.2	0.0	29.7	0.0	2.2	1806.3	70.4	74.9	0.11702
	Channel (ditch)	1518	1.45	1.79	14.17			Impervious	1	98	98	98	98	#N/A	0.3	0.4	0.7	0.0	0.3	0.4	0.7	145.4			
	Paved			0.00	0.00			Pasture: Good Condition	20	39	61	74	80	#N/A	10.9	0.7	8.0	0.0	10.9	0.7	8.0	1360.7			
	Pipe			0.00	0.00			Pasture: Poor Condition	18	68	79	86	89	#N/A	9.0	1.8	7.0	0.0	9.0	1.8	7.0	1484.3			
	Stream	1059	0.59	4.00	4.41	11.8	0.20	Residential 1 acre	4	51	68	79	84	#N/A	#N/A	0.1	4.1	0.0	0.0	0.1	4.1	350.3			
								Residential 1/4 acre	0	61	75	83	87	#N/A	0.2	#N/A	0.1	0.0	0.2	0.0	0.1	18.9			
								Residential 2 acre	10	46	65	77	82	#N/A	#N/A	1.1	8.8	0.0	0.0	1.1	8.8	807.8			
							Residential 5 acre	15	46	65	77	82	#N/A	8.9	#N/A	6.0	0.0	8.9	0.0	6.0	1065.2				
BVN-02-01		1666																							
	Overland	126	3.93	1.39	1.50			Forest (good cover)	40	25	55	70	77	#N/A	#N/A	20.0	20.2	0.0	0.0	20.0	20.2	2954.0	78.4	25.5	0.03987
	Channel (ditch)	1540	6.23	3.76	6.82			Impervious	3	98	98	98	98	#N/A	#N/A	1.0	1.8	0.0	0.0	1.0	1.8	276.4			
	Paved			0.00	0.00			Pasture: Good Condition	31	39	61	74	80	#N/A	#N/A	21.0	9.8	0.0	0.0	21.0	9.8	2337.8			
	Pipe			0.00	0.00			Residential 1 acre	6	51	68	79	84	#N/A	#N/A	6.3	0.0	0.0	0.0	6.3	0.0	499.7			
	Stream			0.00	0.00	5.0	0.08	Residential 1/4 acre	5	61	75	83	87	#N/A	#N/A	2.0	3.3	0.0	0.0	2.0	3.3	450.9			
							Residential 1/8 acre	15	77	85	90	92	#N/A	#N/A	9.5	5.1	0.0	0.0	9.5	5.1	1324.5				
BVN-02-02		2729																							
	Overland	166	0.56	0.52	5.27			Commercial	11	89	92	94	95	#N/A	10.7	#N/A	#N/A	0.0	10.7	0.0	0.0	987.4	68.0	31.0	0.04841
	Channel (ditch)	878	0.38	0.90	16.24			Forest (good cover)	4	25	55	70	77	#N/A	4.1	#N/A	#N/A	0.0	4.1	0.0	0.0	227.5			
	Paved			0.00	0.00			Impervious	11	98	98	98	98	#N/A	10.7	#N/A	#N/A	0.0	10.7	0.0	0.0	1049.7			
	Pipe			0.00	0.00			Pasture: Good Condition	74	39	61	74	80	#N/A	74.4	#N/A	#N/A	0.0	74.4	0.0	0.0	4539.6			
Stream	1685	1.22	4.00	7.02	17.1	0.29																			
BVN-02-03		2802																							
	Overland	122	4.39	1.47	1.38			Forest (good cover)	7	25	55	70	77	#N/A	#N/A	1.7	5.6	0.0	0.0	1.7	5.6	550.4	73.5	43.6	0.06810
	Channel (ditch)	1856	4.50	3.18	9.71			Forest (poor cover)	0	45	66	77	83	#N/A	0.1	#N/A	#N/A	0.0	0.1	0.0	0.0	6.7			
	Paved			0.00	0.00			Impervious	3	98	98	98	98	#N/A	2.9	0.2	#N/A	0.0	2.9	0.2	0.0	298.9			
	Pipe			0.00	0.00			Pasture: Good Condition	4	39	61	74	80	#N/A	#N/A	0.1	3.5	0.0	0.0	0.1	3.5	288.7			
	Stream	824	0.87	4.00	3.43	8.7	0.15	Residential 1 acre	0	51	68	79	84	#N/A	#N/A	#N/A	0.4	0.0	0.0	0.0	0.4	30.8			
							Residential 1/2 acre	86	54	70	80	85	#N/A	66.7	18.9	#N/A	0.0	66.7	18.9	0.0	6177.9				
BVN-02-04		4390																							
	Overland	158	7.34	1.91	1.38			Forest (good cover)	0	25	55	70	77	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	2.5	76.9	33.6	0.05252
	Channel (ditch)	4232	2.38	2.30	30.69			Forest (poor cover)	25	45	66	77	83	#N/A	24.0	#N/A	0.6	0.0	24.0	0.0	0.6	1633.7			
	Paved			0.00	0.00			Impervious	4	98	98	98	98	#N/A	2.5	0.8	0.9	0.0	2.5	0.8	0.9	410.9			
	Pipe			0.00	0.00			Pasture: Poor Condition	60	68	79	86	89	#N/A	59.6	#N/A	0.0	0.0	59.6	0.0	0.0	4709.5			
	Stream			0.00	0.00	19.2	0.32	Residential 2 acre	2	46	65	77	82	#N/A	#N/A	2.1	#N/A	0.0	0.0	2.1	0.0	158.9			
							Residential 5 acre	9	46	65	77	82	#N/A	0.2	0.2	9.1	0.0	0.2	0.2	9.1	774.1				
BVN-02-05		4411																							
	Overland	143	7.93	1.98	1.20			Forest (good cover)	43	25	55	70	77	#N/A	0.6	42.0	0.1	0.0	0.6	42.0	0.1	2983.5	72.0	71.8	0.11219
	Channel (ditch)	753	6.73	3.91	3.21			Forest (poor cover)	12	45	66	77	83	#N/A	12.2	#N/A	0.2	0.0	12.2	0.0	0.2	818.2			
	Paved			0.00	0.00			Impervious	3	98	98	98	98	#N/A	1.0	1.6	0.1	0.0	1.0	1.6	0.1	262.9			
	Pipe			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	#N/A	0.0	0.5	#N/A	0.0	0.0	0.5	0.0	42.9			
	Stream	3515	2.28	4.00	14.65	11.4	0.19	Pasture: Poor Condition	4	68	79	86	89	#N/A	4.0	#N/A	0.0	0.0	4.0	0.0	0.0	321.3			
								Residential 1/2 acre	2	54	70	80	85	#N/A	0.7	1.7	#N/A	0.0	0.7	1.7	0.0	185.9			
								Residential 2 acre	6	46	65	77	82	#N/A	#N/A	6.1	0.0	0.0	0.0	6.1	0.0	468.0			
							Residential 5 acre	29	46	65	77	82	#N/A	14.8	2.6	11.6	0.0	14.8	2.6	11.6	2118.6				

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)																							
										6400	A	B	C	D	A	B	C	D	A	B	C				D	hide																					
																							4128.0																								
BVN-02-06	2828																																														
	Overland	101	3.96	1.40	1.20			Forest (good cover)	0	25	55	70	77	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	1.7	75.4	27.5	0.04291																						
	Channel (ditch)	2255	3.49	2.80	13.43			Impervious	5	98	98	98	98	#N/A	4.7	#N/A	#N/A	0.0	4.7	0.0	0.0	465.5																									
	Paved			0.00	0.00			Residential 1/2 acre	95	54	70	80	85	#N/A	54.5	40.7	#N/A	0.0	54.5	40.7	0.0	7073.0																									
	Pipe			0.00	0.00																																										
Stream	473	0.95	4.00	1.97		10.0	0.17																																								
BVN-02-07	3191																																														
	Overland	129	3.31	1.28	1.68			Forest (good cover)	38	25	55	70	77	#N/A	10.8	24.5	2.3	0.0	10.8	24.5	2.3	2485.2	74.1	51.9	0.08107																						
	Channel (ditch)	1876	5.87	3.65	8.57			Impervious	1	98	98	98	98	#N/A	0.6	0.7	0.1	0.0	0.6	0.7	0.1	140.2																									
	Paved			0.00	0.00			Pasture: Good Condition	3	39	61	74	80	#N/A	0.0	2.4	0.5	0.0	0.0	2.4	0.5	217.7																									
	Pipe			0.00	0.00			Residential 1 acre	28	51	68	79	84	#N/A	1.6	1.9	24.2	0.0	1.6	1.9	24.2	2297.3																									
	Stream	1186	0.76	4.00	4.94		9.1	0.15	Residential 1/2 acre	18	54	70	80	85	#N/A	13.1	4.8	0.3	0.0	13.1	4.8	0.3	1322.8																								
								Residential 2 acre	12	46	65	77	82	#N/A	0.9	7.7	3.6	0.0	0.9	7.7	3.6	943.1																									
BVN-02-08	1558																																														
	Overland	134	1.99	0.99	2.26			Forest (good cover)	22	25	55	70	77	#N/A	3.0	16.1	2.9	0.0	3.0	16.1	2.9	1511.1	75.6	15.4	0.02404																						
	Channel (ditch)	780	2.39	2.31	5.63			Impervious	2	98	98	98	98	#N/A	2.3	0.0	0.0	0.0	0.0	2.3	0.0	233.5																									
	Paved			0.00	0.00			Pasture: Good Condition	13	39	61	74	80	#N/A	4.1	5.0	3.4	0.0	4.1	5.0	3.4	896.6																									
	Pipe			0.00	0.00			Residential 1 acre	51	51	68	79	84	#N/A	11.0	22.5	17.3	0.0	11.0	22.5	17.3	3977.0																									
	Stream	644	4.50	4.00	2.68		6.3	0.11	Residential 1/4 acre	8	61	75	83	87	#N/A	7.4	0.1	#N/A	0.0	7.4	0.1	0.0	564.4																								
								Residential 2 acre	5	46	65	77	82	#N/A	#N/A	3.2	1.6	0.0	0.0	3.2	1.6	379.7																									
BVN-02-09	2967																																														
	Overland	129	3.93	1.39	1.54			Forest (good cover)	84	25	55	70	77	#N/A	22.4	61.2	#N/A	0.0	22.4	61.2	0.0	5516.2	67.8	50.3	0.07865																						
	Channel (ditch)	795	5.79	3.62	3.66			Impervious	1	98	98	98	98	#N/A	0.8	0.2	#N/A	0.0	0.8	0.2	0.0	94.7																									
	Paved			0.00	0.00			Pasture: Good Condition	5	39	61	74	80	#N/A	2.0	2.9	#N/A	0.0	2.0	2.9	0.0	334.3																									
	Pipe			0.00	0.00			Pasture: Poor Condition	4	68	79	86	89	#N/A	0.7	3.1	#N/A	0.0	0.7	3.1	0.0	320.3																									
	Stream	2043	1.18	4.00	8.51		8.2	0.14	Residential 2 acre	6	46	65	77	82	#N/A	0.6	5.0	#N/A	0.0	0.6	5.0	0.0	424.8																								
								Residential 5 acre	1	46	65	77	82	#N/A	#N/A	1.2	#N/A	0.0	0.0	1.2	0.0	90.7																									
BVN-02-10	2727																																														
	Overland	97	17.92	2.99	0.54			Forest (good cover)	32	25	55	70	77	#N/A	2.6	29.2	#N/A	0.0	2.6	29.2	0.0	2185.2	71.0	49.1	0.07673																						
	Channel (ditch)	1433	6.58	3.87	6.17			Forest (poor cover)	6	45	66	77	83	#N/A	4.8	1.1	#N/A	0.0	4.8	1.1	0.0	406.0																									
	Paved			0.00	0.00			Impervious	3	98	98	98	98	#N/A	0.1	3.0	#N/A	0.0	0.1	3.0	0.0	304.6																									
	Pipe			0.00	0.00			Pasture: Good Condition	38	39	61	74	80	#N/A	14.7	23.3	#N/A	0.0	14.7	23.3	0.0	2618.5																									
	Stream	1197	1.94	4.00	4.99		7.0	0.12	Pasture: Poor Condition	2	68	79	86	89	#N/A	#N/A	2.0	#N/A	0.0	0.0	2.0	0.0	175.6																								
									Residential 1 acre	5	51	68	79	84	#N/A	4.3	1.0	#N/A	0.0	4.3	1.0	0.0	371.0																								
									Residential 1/2 acre	2	54	70	80	85	#N/A	1.9	0.0	#N/A	0.0	1.9	0.0	0.0	135.0																								
									Residential 1/4 acre	3	61	75	83	87	#N/A	2.5	#N/A	#N/A	0.0	2.5	0.0	0.0	187.7																								
								Residential 2 acre	7	46	65	77	82	#N/A	0.5	6.8	#N/A	0.0	0.5	6.8	0.0	552.4																									
								Residential 5 acre	2	46	65	77	82	#N/A	0.0	2.2	#N/A	0.0	0.0	2.2	0.0	167.5																									
BVN-02-11	2327																																														
	Overland	69	7.14	1.88	0.61			Forest (good cover)	16	25	55	70	77	#N/A	2.5	13.3	#N/A	0.0	2.5	13.3	0.0	1066.1	67.0	60.5	0.09455																						
	Channel (ditch)	1177	4.89	3.33	5.90			Impervious	3	98	98	98	98	#N/A	2.4	0.7	#N/A	0.0	2.4	0.7	0.0	305.8																									
	Paved			0.00	0.00			Pasture: Good Condition	41	39	61	74	80	#N/A	32.5	8.3	#N/A	0.0	32.5	8.3	0.0	2592.2																									
	Pipe			0.00	0.00			Residential 1 acre	6	51	68	79	84	#N/A	5.9	#N/A	#N/A	0.0	5.9	0.0	0.0	402.7																									
	Stream	1080	3.81	4.00	4.50		6.6	0.11	Residential 1/2 acre	3	54	70	80	85	#N/A	3.2	#N/A	#N/A	0.0	3.2	0.0	0.0	221.0																								
								Residential 2 acre	21	46	65	77	82	#N/A	20.2	1.0	#N/A	0.0	20.2	1.0	0.0	1387.6																									
								Residential 5 acre	10	46	65	77	82	#N/A	4.5	5.6	#N/A	0.0	4.5	5.6	0.0	723.5																									

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C					D
		2184																							4128.0	
BVN-02-12	Overland	173	5.84	1.70	1.70			Forest (good cover)	96	25	55	70	77	#N/A	15.0	80.8	#N/A	0.0	15.0	80.8	0.0	6476.6	67.5	27.0	0.04225	
	Channel (ditch)	636	25.77	7.77	1.36			Impervious	0	98	98	98	98	#N/A	#N/A	0.1	#N/A	0.0	0.0	0.1	0.0	10.8				
	Paved			0.00	0.00			Pasture: Good Condition	4	39	61	74	80	#N/A	3.3	0.8	#N/A	0.0	3.3	0.8	0.0	264.3				
	Pipe			0.00	0.00																					
	Stream	1375	3.89	4.00	5.73	5.3	0.09																			
BVN-02-13	Overland	109	8.19	2.01	0.90			Forest (good cover)	54	25	55	70	77	#N/A	11.0	43.3	#N/A	0.0	11.0	43.3	0.0	3629.9	67.7	45.0	0.07030	
	Channel (ditch)	771	5.17	3.42	3.76			Impervious	3	98	98	98	98	#N/A	1.9	1.0	#N/A	0.0	1.9	1.0	0.0	290.6				
	Paved			0.00	0.00			Pasture: Good Condition	6	39	61	74	80	#N/A	4.6	1.3	#N/A	0.0	4.6	1.3	0.0	373.9				
	Pipe			0.00	0.00			Residential 1 acre	2	51	68	79	84	#N/A	1.7	0.6	#N/A	0.0	1.7	0.6	0.0	164.3				
	Stream	1041	3.77	4.00	4.34	5.4	0.09	Residential 2 acre	35	46	65	77	82	#N/A	29.6	5.1	#N/A	0.0	29.6	5.1	0.0	2313.6				
BVN-02-14	Overland	156	7.69	1.95	1.33			Forest (good cover)	48	25	55	70	77	#N/A	32.0	16.0	#N/A	0.0	32.0	16.0	0.0	2881.0	66.2	50.4	0.07871	
	Channel (ditch)	1438	5.38	3.49	6.87			Impervious	3	98	98	98	98	#N/A	2.3	0.8	#N/A	0.0	2.3	0.8	0.0	306.0				
	Paved			0.00	0.00			Pasture: Good Condition	22	39	61	74	80	#N/A	11.0	11.4	#N/A	0.0	11.0	11.4	0.0	1519.2				
	Pipe			0.00	0.00			Pasture: Poor Condition	1	68	79	86	89	#N/A	1.1	#N/A	#N/A	0.0	1.1	0.0	0.0	89.1				
	Stream	1513	2.00	4.00	6.30	8.7	0.15	Residential 2 acre	4	46	65	77	82	#N/A	2.4	1.5	#N/A	0.0	2.4	1.5	0.0	270.7				
							Residential 5 acre	21	46	65	77	82	#N/A	8.0	13.4	#N/A	0.0	8.0	13.4	0.0	1549.9					
BVN-02-15	Overland	146	11.88	2.43	1.00			Forest (good cover)	9	25	55	70	77	#N/A	2.6	6.5	#N/A	0.0	2.6	6.5	0.0	600.3	69.4	35.2	0.05507	
	Channel (ditch)	1297	7.26	4.07	5.31			Forest (poor cover)	17	45	66	77	83	#N/A	9.0	8.3	#N/A	0.0	9.0	8.3	0.0	1234.1				
	Paved			0.00	0.00			Impervious	2	98	98	98	98	#N/A	1.3	0.2	#N/A	0.0	1.3	0.2	0.0	151.7				
	Pipe			0.00	0.00			Pasture: Good Condition	51	39	61	74	80	#N/A	25.8	25.2	#N/A	0.0	25.8	25.2	0.0	3438.0				
	Stream	783	3.70	4.00	3.26	5.7	0.10	Residential 1 acre	14	51	68	79	84	#N/A	7.0	7.3	#N/A	0.0	7.0	7.3	0.0	1050.1				
							Residential 5 acre	7	46	65	77	82	#N/A	4.1	2.6	#N/A	0.0	4.1	2.6	0.0	469.4					
BVN-02-16	Overland	113	5.89	1.71	1.10			Forest (good cover)	48	25	55	70	77	#N/A	7.1	41.3	#N/A	0.0	7.1	41.3	0.0	3278.8	72.9	60.9	0.09520	
	Channel (ditch)	1211	7.79	4.22	4.79			Impervious	1	98	98	98	98	#N/A	#N/A	0.7	#N/A	0.0	0.0	0.7	0.0	71.7				
	Paved			0.00	0.00			Pasture: Good Condition	18	39	61	74	80	#N/A	0.8	17.5	#N/A	0.0	0.8	17.5	0.0	1342.2				
	Pipe			0.00	0.00			Pasture: Poor Condition	17	68	79	86	89	#N/A	9.8	7.4	#N/A	0.0	9.8	7.4	0.0	1412.3				
	Stream	466	0.64	4.00	1.94	4.7	0.08	Residential 1 acre	0	51	68	79	84	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	0.2				
							Residential 2 acre	0	46	65	77	82	#N/A	#N/A	0.4	#N/A	0.0	0.0	0.4	0.0	30.8					
							Residential 5 acre	15	46	65	77	82	#N/A	#N/A	15.0	#N/A	0.0	0.0	15.0	0.0	1155.8					
BVN-02-17	Overland	122	4.70	1.52	1.33			Forest (good cover)	60	25	55	70	77	#N/A	#N/A	60.4	#N/A	0.0	0.0	60.4	0.0	4230.6	75.8	42.4	0.06619	
	Channel (ditch)	606	21.02	7.00	1.44			Impervious	2	98	98	98	98	#N/A	#N/A	2.0	#N/A	0.0	0.0	2.0	0.0	195.7				
	Paved			0.00	0.00			Pasture: Good Condition	0	39	61	74	80	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	0.0				
	Pipe			0.00	0.00			Pasture: Poor Condition	28	68	79	86	89	#N/A	#N/A	28.1	#N/A	0.0	0.0	28.1	0.0	2415.7				
	Stream	1368	4.30	4.00	5.70	5.1	0.08	Residential 1 acre	3	51	68	79	84	#N/A	#N/A	3.3	#N/A	0.0	0.0	3.3	0.0	257.7				
							Residential 5 acre	6	46	65	77	82	#N/A	#N/A	6.2	#N/A	0.0	0.0	6.2	0.0	478.5					

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)																						
										6400	A	B	C	D	A	B	C	D	A	B	C					D																					
																							4128.0																								
BVN-03	2483																																														
	Overland	134	1.80	0.94	2.37			Forest (good cover)	19	25	55	70	77	#N/A	19.0	0.4	#N/A	0.0	19.0	0.4	0.0	1073.7	62.2	32.1	0.05010																						
	Channel (ditch)	809	1.10	1.55	8.67			Impervious	2	98	98	98	98	#N/A	1.7	0.4	0.2	0.0	1.7	0.4	0.2	214.4																									
	Paved			0.00	0.00			Pasture: Good Condition	52	39	61	74	80	#N/A	51.6	#N/A	#N/A	0.0	51.6	0.0	0.0	3146.6																									
	Pipe			0.00	0.00			Residential 2 acre	16	46	65	77	82	#N/A	15.6	#N/A	0.1	0.0	15.6	0.0	0.1	1028.1																									
Stream	1540	0.40	4.00	6.42	10.5	0.17	Residential 5 acre	11	46	65	77	82	#N/A	7.6	3.3	0.1	0.0	7.6	3.3	0.1	759.4																										
BVN-03-01	2419																																														
	Overland	131	4.38	1.47	1.48			Forest (good cover)	52	25	55	70	77	#N/A	8.4	44.1	#N/A	0.0	8.4	44.1	0.0	3547.7	71.8	40.5	0.06321																						
	Channel (ditch)	1373	9.15	4.58	5.00			Impervious	3	98	98	98	98	#N/A	1.1	1.8	0.2	0.0	1.1	1.8	0.2	299.6																									
	Paved			0.00	0.00			Pasture: Good Condition	21	39	61	74	80	#N/A	2.4	17.1	1.3	0.0	2.4	17.1	1.3	1512.9																									
	Pipe			0.00	0.00			Residential 1 acre	19	51	68	79	84	#N/A	7.6	9.5	1.7	0.0	7.6	9.5	1.7	1407.9																									
Stream	915	2.40	4.00	3.81	6.2	0.10	Residential 1/4 acre	5	61	75	83	87	#N/A	1.8	#N/A	3.2	0.0	1.8	0.0	3.2	408.2																										
BVN-03-02	3072																																														
	Overland	148	2.17	1.03	2.38			Forest (good cover)	42	25	55	70	77	#N/A	13.1	17.4	11.0	0.0	13.1	17.4	11.0	2788.1	72.8	40.0	0.06247																						
	Channel (ditch)	918	7.48	4.13	3.70			Impervious	2	98	98	98	98	#N/A	0.8	0.9	0.6	0.0	0.8	0.9	0.6	222.5																									
	Paved			0.00	0.00			Pasture: Good Condition	20	39	61	74	80	#N/A	10.3	1.6	8.2	0.0	10.3	1.6	8.2	1399.2																									
	Pipe			0.00	0.00			Residential 1 acre	34	51	68	79	84	#N/A	#N/A	34.2	#N/A	0.0	0.0	34.2	0.0	2704.7																									
Stream	2007	2.89	4.00	8.36	8.7	0.14	Residential 1/2 acre	0	54	70	80	85	#N/A	#N/A	0.1	#N/A	0.0	0.0	0.1	0.0	10.0																										
							Residential 1/4 acre	2	61	75	83	87	#N/A	0.2	#N/A	1.6	0.0	0.2	0.0	1.6	152.1																										
BVN-03-03	4254																																														
	Overland	88	11.42	2.38	0.61			Forest (good cover)	91	25	55	70	77	#N/A	13.8	77.7	#N/A	0.0	13.8	77.7	0.0	6197.5	68.0	57.7	0.09021																						
	Channel (ditch)	944	17.95	6.46	2.43			Pasture: Good Condition	8	39	61	74	80	#N/A	1.9	6.5	#N/A	0.0	1.9	6.5	0.0	601.4																									
	Paved			0.00	0.00			Residential 1 acre	0	51	68	79	84	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	3.8																									
	Pipe			0.00	0.00																																										
Stream	3222	1.47	4.00	13.43	9.9	0.16																																									
BVN-03-04	1718																																														
	Overland	113	5.89	1.71	1.11			Forest (good cover)	80	25	55	70	77	#N/A	#N/A	79.9	#N/A	0.0	0.0	79.9	0.0	5595.5	71.0	40.7	0.06354																						
	Channel (ditch)	785	19.27	6.70	1.95			Forest (poor cover)	7	45	66	77	83	#N/A	#N/A	7.1	#N/A	0.0	0.0	7.1	0.0	546.1																									
	Paved			0.00	0.00			Impervious	0	98	98	98	98	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	1.1																									
	Pipe			0.00	0.00			Pasture: Good Condition	13	39	61	74	80	#N/A	#N/A	13.0	#N/A	0.0	0.0	13.0	0.0	959.1																									
Stream	820	7.89	4.00	3.41	3.9	0.06																																									
BVN-03-05	1813																																														
	Overland	188	5.17	1.60	1.97			Forest (good cover)	85	25	55	70	77	#N/A	26.3	28.2	30.2	0.0	26.3	28.2	30.2	5742.1	68.6	16.9	0.02639																						
	Channel (ditch)	512	14.16	5.72	1.49			Pasture: Good Condition	7	39	61	74	80	#N/A	4.9	1.8	0.4	0.0	4.9	1.8	0.4	471.4																									
	Paved	308	6.92	5.27	0.97			Residential 1 acre	8	51	68	79	84	#N/A	#N/A	7.7	0.4	0.0	0.0	7.7	0.4	645.2																									
	Pipe			0.00	0.00																																										
Stream	804	1.27	4.00	3.35	4.7	0.08																																									
BVN-03-06	2508																																														
	Overland	164	1.87	0.96	2.86			Forest (good cover)	16	25	55	70	77	#N/A	#N/A	9.9	5.9	0.0	0.0	9.9	5.9	1148.0	74.6	60.9	0.09520																						
	Channel (ditch)	1932	7.53	4.14	7.77			Forest (poor cover)	1	45	66	77	83	#N/A	#N/A	0.7	#N/A	0.0	0.0	0.7	0.0	55.5																									
	Paved			0.00	0.00			Impervious	0	98	98	98	98	#N/A	#N/A	0.2	#N/A	0.0	0.0	0.2	0.0	16.2																									
	Pipe			0.00	0.00			Pasture: Good Condition	68	39	61	74	80	#N/A	#N/A	68.4	0.0	0.0	0.0	68.4	0.0	5061.0																									
	Stream	411	2.31	4.00	1.71	7.4	0.12	Residential 1 acre	9	51	68	79	84	#N/A	#N/A	7.8	0.9	0.0	0.0	7.8	0.9	692.8																									
							Residential 1/2 acre	4	54	70	80	85	#N/A	#N/A	4.1	#N/A	0.0	0.0	4.1	0.0	328.2																										
							Residential 5 acre	2	46	65	77	82	#N/A	#N/A	2.1	#N/A	0.0	0.0	2.1	0.0	161.6																										

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
		4629																						4128.0	
BVN-04	Overland	71	13.27	2.57	0.46			Forest (good cover)	30	25	55	70	77	#N/A	6.9	23.4	#N/A	0.0	6.9	23.4	0.0	2020.3	66.5	52.3	0.08170
	Channel (ditch)	3863	2.77	2.49	25.90			Impervious	2	98	98	98	98	#N/A	1.2	0.4	0.8	0.0	1.2	0.4	0.8	239.3			
	Paved			0.00	0.00			Pasture: Good Condition	51	39	61	74	80	#N/A	50.1	0.5	0.6	0.0	50.1	0.5	0.6	3148.3			
	Pipe			0.00	0.00			Residential 2 acre	0	46	65	77	82	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	0.4			
	Stream	695	0.24	4.00	2.90	17.6	0.29	Residential 5 acre	16	46	65	77	82	#N/A	3.1	1.2	11.6	0.0	3.1	1.2	11.6	1246.1			
BVN-05	Overland	152	6.74	1.83	1.39			Forest (good cover)	48	25	55	70	77	#N/A	13.2	35.2	#N/A	0.0	13.2	35.2	0.0	3188.3	65.0	103.5	0.16166
	Channel (ditch)	2438	3.28	2.71	14.99			Impervious	1	98	98	98	98	#N/A	0.9	0.1	0.1	0.0	0.9	0.1	0.1	108.5			
	Paved			0.00	0.00			Pasture: Good Condition	44	39	61	74	80	#N/A	41.0	3.0	0.1	0.0	41.0	3.0	0.1	2729.6			
	Pipe			0.00	0.00			Residential 5 acre	6	46	65	77	82	#N/A	2.9	0.2	3.3	0.0	2.9	0.2	3.3	476.7			
	Stream	915	0.13	4.00	3.81	12.1	0.20																		
BVN-05-01	Overland	91	13.58	2.60	0.59			Forest (good cover)	50	25	55	70	77	#N/A	4.0	43.4	2.7	0.0	4.0	43.4	2.7	3464.4	70.8	37.8	0.05902
	Channel (ditch)	1329	7.20	4.05	5.47			Forest (poor cover)	16	45	66	77	83	#N/A	0.1	16.3	#N/A	0.0	0.1	16.3	0.0	1257.6			
	Paved			0.00	0.00			Impervious	1	98	98	98	98	#N/A	#N/A	0.6	#N/A	0.0	0.0	0.6	0.0	63.7			
	Pipe			0.00	0.00			Pasture: Good Condition	26	39	61	74	80	#N/A	13.9	11.3	1.2	0.0	13.9	11.3	1.2	1778.0			
	Stream	1068	1.54	4.00	4.45	6.3	0.11	Residential 2 acre	1	46	65	77	82	#N/A	#N/A	1.3	#N/A	0.0	0.0	1.3	0.0	101.6			
								Residential 5 acre	5	46	65	77	82	#N/A	0.2	1.1	3.9	0.0	0.2	1.1	3.9	419.7			
BVN-05-02	Overland	101	16.35	2.85	0.59			Forest (good cover)	25	25	55	70	77	#N/A	#N/A	24.7	#N/A	0.0	0.0	24.7	0.0	1730.7	76.2	49.0	0.07652
	Channel (ditch)	949	11.84	5.22	3.03			Forest (poor cover)	3	45	66	77	83	#N/A	#N/A	3.1	#N/A	0.0	0.0	3.1	0.0	237.7			
	Paved			0.00	0.00			Impervious	1	98	98	98	98	#N/A	0.2	1.2	#N/A	0.0	0.2	1.2	0.0	138.1			
	Pipe			0.00	0.00			Pasture: Good Condition	7	39	61	74	80	#N/A	#N/A	6.8	#N/A	0.0	0.0	6.8	0.0	505.6			
	Stream	548	4.78	4.00	2.28	3.5	0.06	Residential 1 acre	50	51	68	79	84	#N/A	#N/A	49.6	#N/A	0.0	0.0	49.6	0.0	3919.1			
								Residential 2 acre	3	46	65	77	82	#N/A	#N/A	2.9	#N/A	0.0	0.0	2.9	0.0	219.7			
								Residential 5 acre	11	46	65	77	82	#N/A	1.5	10.0	#N/A	0.0	1.5	10.0	0.0	866.7			
BVN-06	Overland	100	15.04	2.73	0.61			Forest (good cover)	48	25	55	70	77	#N/A	11.3	36.6	#N/A	0.0	11.3	36.6	0.0	3182.1	68.0	75.4	0.11788
	Channel (ditch)	1093	18.64	6.59	2.77			Forest (poor cover)	13	45	66	77	83	#N/A	0.0	12.6	#N/A	0.0	0.0	12.6	0.0	969.6			
	Paved			0.00	0.00			Impervious	2	98	98	98	98	#N/A	1.7	0.6	#N/A	0.0	1.7	0.6	0.0	218.5			
	Pipe			0.00	0.00			Pasture: Good Condition	37	39	61	74	80	#N/A	25.4	11.9	#N/A	0.0	25.4	11.9	0.0	2429.8			
	Stream	1660	1.45	4.00	6.92	6.2	0.10																		
BVN-06-01	Overland	136	14.88	2.72	0.83			Forest (good cover)	97	25	55	70	77	#N/A	#N/A	97.4	#N/A	0.0	0.0	97.4	0.0	6820.6	70.1	29.3	0.04574
	Channel (ditch)	967	21.40	7.07	2.28			Pasture: Good Condition	3	39	61	74	80	#N/A	#N/A	2.6	#N/A	0.0	0.0	2.6	0.0	189.6			
	Paved			0.00	0.00																				
	Pipe			0.00	0.00																				
	Stream	473	5.25	4.00	1.97	3.1	0.05																		
BVN-07	Overland	124	5.05	1.58	1.31			Forest (good cover)	57	25	55	70	77	#N/A	30.8	26.1	#N/A	0.0	30.8	26.1	0.0	3520.9	63.6	27.0	0.04215
	Channel (ditch)	993	15.18	5.93	2.79			Forest (poor cover)	13	45	66	77	83	#N/A	0.2	13.0	#N/A	0.0	0.2	13.0	0.0	1018.8			
	Paved			0.00	0.00			Pasture: Good Condition	30	39	61	74	80	#N/A	29.8	#N/A	#N/A	0.0	29.8	0.0	0.0	1820.1			
	Pipe			0.00	0.00																				
	Stream	113	0.53	4.00	0.47	2.7	0.05																		



**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
		3401																						4128.0	
BVN-08	Overland	110	7.42	1.92	0.95			Forest (good cover)	63	25	55	70	77	#N/A	8.2	55.2	#N/A	0.0	8.2	55.2	0.0	4316.0	68.1	83.4	0.13029
	Channel (ditch)	2686	6.31	3.79	11.82			Forest (poor cover)	11	45	66	77	83	#N/A	#N/A	10.9	#N/A	0.0	0.0	10.9	0.0	840.2			
	Paved			0.00	0.00			Pasture: Good Condition	22	39	61	74	80	#N/A	20.9	1.0	#N/A	0.0	20.9	1.0	0.0	1351.1			
	Pipe			0.00	0.00			Pasture: Poor Condition	1	68	79	86	89	#N/A	#N/A	0.9	#N/A	0.0	0.0	0.9	0.0	81.6			
	Stream	605	2.68	4.00	2.52	9.2	0.15	Residential 1 acre	3	51	68	79	84	#N/A	#N/A	2.8	#N/A	0.0	0.0	2.8	0.0	220.9			
BVN-08-01	Overland	103	48.25	4.91	0.35			Forest (good cover)	75	25	55	70	77	#N/A	23.5	51.8	#N/A	0.0	23.5	51.8	0.0	4918.6	65.4	76.0	0.11874
	Channel (ditch)	1875	6.68	3.90	8.01			Impervious	0	98	98	98	98	#N/A	0.1	0.4	#N/A	0.0	0.1	0.4	0.0	46.2			
	Paved			0.00	0.00			Pasture: Good Condition	20	39	61	74	80	#N/A	18.9	1.1	#N/A	0.0	18.9	1.1	0.0	1237.9			
	Pipe			0.00	0.00			Pasture: Poor Condition	4	68	79	86	89	#N/A	2.8	1.3	#N/A	0.0	2.8	1.3	0.0	338.9			
	Stream	2462	0.97	4.00	10.26	11.2	0.19																		
BVN-08-02	Overland	164	3.90	1.39	1.97			Forest (good cover)	85	25	55	70	77	#N/A	11.5	73.8	#N/A	0.0	11.5	73.8	0.0	5800.4	69.7	43.2	0.06756
	Channel (ditch)	1336	18.38	6.54	3.41			Impervious	1	98	98	98	98	#N/A	0.4	0.3	#N/A	0.0	0.4	0.3	0.0	64.6			
	Paved			0.00	0.00			Pasture: Poor Condition	14	68	79	86	89	#N/A	14.0	0.0	#N/A	0.0	14.0	0.0	0.0	1106.5			
	Pipe			0.00	0.00																				
	Stream	1398	2.00	4.00	5.82	6.7	0.11																		
BVN-08-03	Overland	145	5.51	1.65	1.47			Forest (good cover)	97	25	55	70	77	#N/A	4.0	93.0	#N/A	0.0	4.0	93.0	0.0	6730.8	69.5	38.0	0.05941
	Channel (ditch)	912	24.58	7.59	2.00			Pasture: Good Condition	3	39	61	74	80	#N/A	#N/A	3.0	#N/A	0.0	0.0	3.0	0.0	220.9			
	Paved			0.00	0.00																				
	Pipe			0.00	0.00																				
	Stream	1012	2.06	4.00	4.22	4.6	0.08																		
BVN-08-04	Overland	130	1.44	0.84	2.57			Forest (good cover)	57	25	55	70	77	#N/A	#N/A	56.6	#N/A	0.0	0.0	56.6	0.0	3964.7	72.8	25.4	0.03971
	Channel (ditch)	1308	12.31	5.33	4.09			Impervious	6	98	98	98	98	#N/A	0.9	5.0	#N/A	0.0	0.9	5.0	0.0	569.5			
	Paved			0.00	0.00			Pasture: Good Condition	19	39	61	74	80	#N/A	1.4	17.3	#N/A	0.0	1.4	17.3	0.0	1366.1			
	Pipe			0.00	0.00			Residential 2 acre	0	46	65	77	82	#N/A	0.0	0.0	#N/A	0.0	0.0	0.0	0.0	5.3			
	Stream	277	0.36	4.00	1.15	4.7	0.08	Residential 5 acre	19	46	65	77	82	#N/A	5.8	13.0	#N/A	0.0	5.8	13.0	0.0	1376.1			
BVN-08-05	Overland	138	1.74	0.93	2.48			Forest (good cover)	78	25	55	70	77	#N/A	#N/A	78.1	#N/A	0.0	0.0	78.1	0.0	5466.9	71.0	18.2	0.02838
	Channel (ditch)	547	22.22	7.20	1.27			Pasture: Good Condition	19	39	61	74	80	#N/A	#N/A	18.7	#N/A	0.0	0.0	18.7	0.0	1383.5			
	Paved			0.00	0.00			Residential 2 acre	3	46	65	77	82	#N/A	0.1	3.1	#N/A	0.0	0.1	3.1	0.0	245.1			
	Pipe			0.00	0.00																				
	Stream	377	14.26	4.00	1.57	3.2	0.05																		
BVN-08-06	Overland	85	33.79	4.11	0.34			Forest (good cover)	77	25	55	70	77	#N/A	12.4	65.1	#N/A	0.0	12.4	65.1	0.0	5238.2	69.9	21.3	0.03322
	Channel (ditch)	893	16.54	6.20	2.40			Pasture: Poor Condition	8	68	79	86	89	#N/A	8.4	#N/A	#N/A	0.0	8.4	0.0	0.0	667.3			
	Paved			0.00	0.00			Residential 2 acre	14	46	65	77	82	#N/A	#N/A	14.1	#N/A	0.0	0.0	14.1	0.0	1082.5			
	Pipe			0.00	0.00																				
	Stream	308	6.05	4.00	1.28	2.4	0.04																		

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
		1839																					4128.0		
BVN-08-07	Overland	129	2.70	1.15	1.86			Forest (good cover)	79	25	55	70	77	#N/A	#N/A	78.9	#N/A	0.0	0.0	78.9	0.0	5524.9	71.3	34.9	0.05454
	Channel (ditch)	592	24.46	7.57	1.30			Impervious	1	98	98	98	98	#N/A	#N/A	1.5	#N/A	0.0	0.0	1.5	0.0	143.1			
	Paved			0.00	0.00			Pasture: Good Condition	18	39	61	74	80	#N/A	#N/A	17.7	#N/A	0.0	0.0	17.7	0.0	1307.7			
	Pipe			0.00	0.00			Residential 1 acre	2	51	68	79	84	#N/A	#N/A	1.9	#N/A	0.0	0.0	1.9	0.0	153.3			
	Stream	1119	5.38	4.00	4.66	4.7	0.08																		
BVN-08-08	Overland	106	11.74	2.41	0.73			Forest (good cover)	91	25	55	70	77	#N/A	6.4	85.0	#N/A	0.0	6.4	85.0	0.0	6299.5	69.0	76.1	0.11885
	Channel (ditch)	1508	13.20	5.52	4.55			Impervious	0	98	98	98	98	#N/A	#N/A	0.1	#N/A	0.0	0.0	0.1	0.0	10.3			
	Paved			0.00	0.00			Pasture: Good Condition	6	39	61	74	80	#N/A	3.9	2.6	#N/A	0.0	3.9	2.6	0.0	424.5			
	Pipe			0.00	0.00			Pasture: Poor Condition	2	68	79	86	89	#N/A	2.1	#N/A	#N/A	0.0	2.1	0.0	0.0	167.1			
	Stream	1706	2.40	4.00	7.11	7.4	0.12																		
BVN-09	Overland	150	17.77	2.97	0.84			Forest (good cover)	63	25	55	70	77	#N/A	28.8	34.3	#N/A	0.0	28.8	34.3	0.0	3984.0	63.7	53.1	0.08303
	Channel (ditch)	887	11.99	5.26	2.81			Forest (poor cover)	0	45	66	77	83	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	1.2			
	Paved			0.00	0.00			Impervious	0	98	98	98	98	#N/A	0.2	0.1	#N/A	0.0	0.2	0.1	0.0	24.6			
	Pipe			0.00	0.00			Pasture: Good Condition	27	39	61	74	80	#N/A	23.7	3.2	#N/A	0.0	23.7	3.2	0.0	1684.2			
	Stream	1942	0.36	4.00	8.09	7.0	0.12	Residential 1 acre	1	51	68	79	84	#N/A	#N/A	1.3	#N/A	0.0	0.0	1.3	0.0	99.8			
								Residential 2 acre	8	46	65	77	82	#N/A	6.3	2.1	#N/A	0.0	6.3	2.1	0.0	574.9			
BVN-09-01	Overland	187	8.70	2.08	1.50			Pasture: Good Condition	9	39	61	74	80	#N/A	8.7	0.6	#N/A	0.0	8.7	0.6	0.0	572.7	67.7	34.7	0.05418
	Channel (ditch)	1063	14.99	5.89	3.01			Impervious	1	98	98	98	98	#N/A	0.5	0.2	#N/A	0.0	0.5	0.2	0.0	69.2			
	Paved			0.00	0.00			Forest (good cover)	90	25	55	70	77	#N/A	11.9	78.0	#N/A	0.0	11.9	78.0	0.0	6113.0			
	Pipe			0.00	0.00			Pasture: Poor Condition	0	68	79	86	89	#N/A	#N/A	0.2	#N/A	0.0	0.0	0.2	0.0	13.0			
	Stream	1827	2.16	4.00	7.61	7.3	0.12																		
BVN-09-02	Overland	116	8.94	2.11	0.92			Forest (good cover)	68	25	55	70	77	#N/A	4.8	62.9	#N/A	0.0	4.8	62.9	0.0	4669.6	72.9	38.9	0.06076
	Channel (ditch)	1188	15.01	5.90	3.36			Residential 1 acre	13	51	68	79	84	#N/A	#N/A	13.0	#N/A	0.0	0.0	13.0	0.0	1023.1			
	Paved			0.00	0.00			Impervious	5	98	98	98	98	#N/A	1.1	3.6	#N/A	0.0	1.1	3.6	0.0	461.9			
	Pipe			0.00	0.00			Residential 2 acre	14	46	65	77	82	#N/A	0.0	14.0	#N/A	0.0	0.0	14.0	0.0	1079.0			
	Stream	1106	1.75	4.00	4.61	5.3	0.09	Industrial	1	81	88	91	93	#N/A	#N/A	0.6	#N/A	0.0	0.0	0.6	0.0	52.6			
BVN-09-03	Overland	123	5.19	1.60	1.28			Forest (good cover)	45	25	55	70	77	#N/A	6.0	39.2	#N/A	0.0	6.0	39.2	0.0	3072.3	72.3	50.6	0.07912
	Channel (ditch)	734	6.14	3.73	3.28			Impervious	3	98	98	98	98	#N/A	0.6	2.3	#N/A	0.0	0.6	2.3	0.0	291.8			
	Paved			0.00	0.00			Residential 1 acre	10	51	68	79	84	#N/A	#N/A	10.4	#N/A	0.0	0.0	10.4	0.0	818.5			
	Pipe			0.00	0.00			Residential 2 acre	21	46	65	77	82	#N/A	0.5	20.8	#N/A	0.0	0.5	20.8	0.0	1631.5			
	Stream	1139	3.47	4.00	4.75	5.6	0.09	Residential 5 acre	8	46	65	77	82	#N/A	3.3	4.3	#N/A	0.0	3.3	4.3	0.0	547.2			
								Pasture: Good Condition	11	39	61	74	80	#N/A	6.1	4.9	#N/A	0.0	6.1	4.9	0.0	736.4			
								Pasture: Poor Condition	2	68	79	86	89	#N/A	#N/A	1.6	#N/A	0.0	0.0	1.6	0.0	134.9			
BVN-09-04	Overland	98	5.56	1.66	0.99			Forest (good cover)	21	25	55	70	77	#N/A	6.4	14.1	#N/A	0.0	6.4	14.1	0.0	1344.1	73.5	33.8	0.05280
	Channel (ditch)	665	6.08	3.72	2.98			Impervious	3	98	98	98	98	#N/A	2.6	0.1	#N/A	0.0	2.6	0.1	0.0	262.0			
	Paved			0.00	0.00			Pasture: Good Condition	18	39	61	74	80	#N/A	16.5	1.0	#N/A	0.0	16.5	1.0	0.0	1081.8			
	Pipe			0.00	0.00			Pasture: Poor Condition	32	68	79	86	89	#N/A	5.1	26.9	#N/A	0.0	5.1	26.9	0.0	2710.3			
	Stream	755	3.76	4.00	3.15	4.3	0.07	Residential 1 acre	4	51	68	79	84	#N/A	#N/A	4.3	#N/A	0.0	0.0	4.3	0.0	340.3			
								Residential 2 acre	13	46	65	77	82	#N/A	6.9	5.8	#N/A	0.0	6.9	5.8	0.0	896.1			
								Residential 5 acre	10	46	65	77	82	#N/A	6.7	3.6	#N/A	0.0	6.7	3.6	0.0	710.8			

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C					D
		1961																							4128.0	
BVN-09-05	Overland	108	16.24	2.84	0.64			Forest (good cover)	65	25	55	70	77	#N/A	0.1	64.5	#N/A	0.0	0.1	64.5	0.0	4519.3	72.6	33.8	0.05278	
	Channel (ditch)	453	14.62	5.82	1.30			Pasture: Good Condition	17	39	61	74	80	#N/A	0.0	17.1	#N/A	0.0	0.0	17.1	0.0	1265.1				
	Paved			0.00	0.00			Impervious	2	98	98	98	98	#N/A	#N/A	1.8	#N/A	0.0	0.0	1.8	0.0	177.6				
	Pipe			0.00	0.00			Residential 1 acre	10	51	68	79	84	#N/A	#N/A	10.5	#N/A	0.0	0.0	10.5	0.0	826.0				
	Stream	1399	4.89	4.00	5.83	4.7	0.08	Residential 2 acre	4	46	65	77	82	#N/A	#N/A	3.7	#N/A	0.0	0.0	3.7	0.0	286.0				
								Residential 5 acre	2	46	65	77	82	#N/A	#N/A	1.7	#N/A	0.0	0.0	1.7	0.0	131.2				
								Industrial	1	81	88	91	93	#N/A	#N/A	0.6	#N/A	0.0	0.0	0.6	0.0	58.8				
BVN-10	Overland	111	15.83	2.81	0.66			Forest (good cover)	95	25	55	70	77	#N/A	25.4	69.8	#N/A	0.0	25.4	69.8	0.0	6280.1	66.9	29.0	0.04524	
	Channel (ditch)	1150	13.58	5.60	3.42			Impervious	2	98	98	98	98	#N/A	#N/A	1.9	#N/A	0.0	0.0	1.9	0.0	187.2				
	Paved			0.00	0.00			Residential 2 acre	3	46	65	77	82	#N/A	#N/A	2.9	#N/A	0.0	0.0	2.9	0.0	226.2				
	Pipe			0.00	0.00																					
	Stream	275	0.25	4.00	1.14	3.1	0.05																			
BVN-11	Overland	157	4.68	1.52	1.72			Forest (good cover)	79	25	55	70	77	#N/A	13.0	66.3	#N/A	0.0	13.0	66.3	0.0	5357.6	67.4	55.0	0.08587	
	Channel (ditch)	1167	14.14	5.72	3.40			Impervious	0	98	98	98	98	#N/A	0.2	0.2	#N/A	0.0	0.2	0.2	0.0	35.3				
	Paved			0.00	0.00			Pasture: Good Condition	16	39	61	74	80	#N/A	15.9	0.2	#N/A	0.0	15.9	0.2	0.0	986.2				
	Pipe			0.00	0.00			Pasture: Poor Condition	4	68	79	86	89	#N/A	#N/A	4.1	#N/A	0.0	0.0	4.1	0.0	350.5				
	Stream	962	4.18	4.00	4.01	5.5	0.09	Residential 2 acre	0	46	65	77	82	#N/A	#N/A	0.1	#N/A	0.0	0.0	0.1	0.0	8.3				
BVN-11-01	Overland	128	6.23	1.76	1.22			Forest (good cover)	91	25	55	70	77	#N/A	#N/A	90.8	#N/A	0.0	0.0	90.8	0.0	6357.0	71.6	30.1	0.04704	
	Channel (ditch)	861	20.85	6.97	2.06			Impervious	1	98	98	98	98	#N/A	#N/A	1.1	#N/A	0.0	0.0	1.1	0.0	109.2				
	Paved			0.00	0.00			Pasture: Poor Condition	8	68	79	86	89	#N/A	#N/A	8.1	#N/A	0.0	0.0	8.1	0.0	694.1				
	Pipe			0.00	0.00																					
	Stream	1106	4.54	4.00	4.61	4.7	0.08																			
BVN-11-02	Overland	163	1.31	0.80	3.38			Forest (good cover)	89	25	55	70	77	#N/A	#N/A	89.5	#N/A	0.0	0.0	89.5	0.0	6263.8	71.5	41.1	0.06430	
	Channel (ditch)	847	14.20	5.73	2.46			Pasture: Poor Condition	9	68	79	86	89	#N/A	#N/A	9.0	#N/A	0.0	0.0	9.0	0.0	771.3				
	Paved			0.00	0.00			Pasture: Good Condition	2	39	61	74	80	#N/A	#N/A	1.5	#N/A	0.0	0.0	1.5	0.0	114.7				
	Pipe			0.00	0.00																					
	Stream	1247	7.44	4.00	5.19	6.6	0.11																			
BVN-11-03	Overland	116	4.25	1.45	1.34			Forest (good cover)	76	25	55	70	77	#N/A	0.5	76.0	#N/A	0.0	0.5	76.0	0.0	5346.5	72.0	39.5	0.06168	
	Channel (ditch)	743	13.58	5.60	2.21			Impervious	3	98	98	98	98	#N/A	#N/A	3.0	#N/A	0.0	0.0	3.0	0.0	289.6				
	Paved			0.00	0.00			Pasture: Good Condition	3	39	61	74	80	#N/A	0.5	3.0	#N/A	0.0	0.5	3.0	0.0	248.4				
	Pipe			0.00	0.00			Residential 2 acre	17	46	65	77	82	#N/A	#N/A	17.1	#N/A	0.0	0.0	17.1	0.0	1317.5				
	Stream	2357	4.25	4.00	9.82	8.0	0.13																			
BVN-12	Overland	110	7.49	1.93	0.96			Forest (good cover)	85	25	55	70	77	#N/A	10.0	75.4	#N/A	0.0	10.0	75.4	0.0	5826.3	70.6	72.8	0.11370	
	Channel (ditch)	341	12.55	5.38	1.06			Impervious	3	98	98	98	98	#N/A	0.2	2.6	#N/A	0.0	0.2	2.6	0.0	275.6				
	Paved			0.00	0.00			Pasture: Good Condition	3	39	61	74	80	#N/A	1.3	1.2	#N/A	0.0	1.3	1.2	0.0	169.6				
	Pipe			0.00	0.00			Pasture: Poor Condition	8	68	79	86	89	#N/A	#N/A	8.0	#N/A	0.0	0.0	8.0	0.0	687.2				
	Stream	2171	1.61	4.00	9.04	6.6	0.11	Residential 2 acre	1	46	65	77	82	#N/A	0.1	1.2	#N/A	0.0	0.1	1.2	0.0	99.6				

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)																						
										6400	A	B	C	D	A	B	C	D	A	B	C					D																					
																							4128.0																								
BVN-12-01		2229																																													
	Overland	132	5.77	1.69	1.30			Forest (good cover)	99	25	55	70	77	#N/A	1.1	98.0	#N/A	0.0	1.1	98.0	0.0	6919.2	70.0	38.9	0.06084																						
	Channel (ditch)	1018	3.71	2.89	5.88			Impervious	0	98	98	98	98	#N/A	#N/A	0.5	#N/A	0.0	0.0	0.5	0.0	48.6																									
	Paved			0.00	0.00			Pasture: Good Condition	0	39	61	74	80	#N/A	0.1	0.0	#N/A	0.0	0.1	0.0	0.0	7.9																									
	Pipe			0.00	0.00			Pasture: Poor Condition	0	68	79	86	89	#N/A	#N/A	0.3	#N/A	0.0	0.0	0.3	0.0	24.9																									
Stream	1080	4.61	4.00	4.50		7.0	0.12																																								
BVN-12-02		1719																																													
	Overland	162	2.31	1.07	2.53			Forest (good cover)	99	25	55	70	77	#N/A	5.4	93.9	#N/A	0.0	5.4	93.9	0.0	6867.4	69.2	38.9	0.06082																						
	Channel (ditch)	765	16.73	6.23	2.05			Pasture: Good Condition	1	39	61	74	80	#N/A	0.6	0.2	#N/A	0.0	0.6	0.2	0.0	47.8																									
	Paved			0.00	0.00																																										
	Pipe			0.00	0.00																																										
Stream	792	6.34	4.00	3.30		4.7	0.08																																								
BVN-12-03		3314																																													
	Overland	200	1.07	0.72	4.60			Forest (good cover)	99	25	55	70	77	#N/A	5.6	93.7	#N/A	0.0	5.6	93.7	0.0	6865.9	69.3	84.0	0.13123																						
	Channel (ditch)	1407	13.22	5.53	4.24			Pasture: Good Condition	0	39	61	74	80	#N/A	0.0	#N/A	#N/A	0.0	0.0	0.0	0.0	0.9																									
	Paved			0.00	0.00			Pasture: Poor Condition	1	68	79	86	89	#N/A	#N/A	0.7	#N/A	0.0	0.0	0.7	0.0	60.5																									
	Pipe			0.00	0.00																																										
Stream	1707	2.95	4.00	7.11		9.6	0.16																																								
BVN-12-04		2537																																													
	Overland	115	4.63	1.51	1.27			Forest (good cover)	98	25	55	70	77	#N/A	13.7	84.5	#N/A	0.0	13.7	84.5	0.0	6672.8	67.9	80.2	0.12539																						
	Channel (ditch)	1054	7.72	4.20	4.18			Impervious	0	98	98	98	98	#N/A	0.0	0.2	#N/A	0.0	0.0	0.2	0.0	20.2																									
	Paved			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	#N/A	0.6	#N/A	#N/A	0.0	0.6	0.0	0.0	37.9																									
	Pipe			0.00	0.00			Residential 5 acre	1	46	65	77	82	#N/A	0.9	#N/A	#N/A	0.0	0.9	0.0	0.0	58.8																									
Stream	1368	4.57	4.00	5.70		6.7	0.11																																								
BVN-13		2321																																													
	Overland	122	5.13	1.59	1.28			Forest (good cover)	91	25	55	70	77	#N/A	11.4	79.5	#N/A	0.0	11.4	79.5	0.0	6193.7	68.7	59.4	0.09276																						
	Channel (ditch)	1387	10.53	4.92	4.70			Impervious	0	98	98	98	98	#N/A	#N/A	0.4	#N/A	0.0	0.0	0.4	0.0	37.0																									
	Paved			0.00	0.00			Pasture: Good Condition	5	39	61	74	80	#N/A	3.6	1.8	#N/A	0.0	3.6	1.8	0.0	346.2																									
	Pipe			0.00	0.00			Pasture: Poor Condition	3	68	79	86	89	#N/A	#N/A	3.4	#N/A	0.0	0.0	3.4	0.0	292.5																									
Stream	812	3.10	4.00	3.38		5.6	0.09																																								
BVN-13-01		2384																																													
	Overland	145	4.15	1.43	1.69			Forest (good cover)	55	25	55	70	77	#N/A	#N/A	55.4	#N/A	0.0	0.0	55.4	0.0	3881.2	73.1	50.5	0.07894																						
	Channel (ditch)	928	16.95	6.27	2.47			Impervious	0	98	98	98	98	#N/A	#N/A	0.2	#N/A	0.0	0.0	0.2	0.0	20.7																									
	Paved			0.00	0.00			Forest (poor cover)	40	45	66	77	83	#N/A	#N/A	39.6	#N/A	0.0	0.0	39.6	0.0	3051.6																									
	Pipe			0.00	0.00			Pasture: Good Condition	4	39	61	74	80	#N/A	#N/A	3.9	#N/A	0.0	0.0	3.9	0.0	287.5																									
Stream	1311	1.74	4.00	5.46		5.8	0.10	Pasture: Poor Condition	1	68	79	86	89	#N/A	#N/A	0.8	#N/A	0.0	0.0	0.8	0.0	71.2																									
BVN-13-02		2508																																													
	Overland	112	10.12	2.24	0.83			Forest (good cover)	57	25	55	70	77	#N/A	#N/A	57.0	0.4	0.0	0.0	57.0	0.4	4020.4	73.4	55.3	0.08641																						
	Channel (ditch)	511	18.01	6.47	1.32			Impervious	2	98	98	98	98	#N/A	#N/A	2.3	0.0	0.0	0.0	2.3	0.0	228.6																									
	Paved			0.00	0.00			Residential 1 acre	4	51	68	79	84	#N/A	#N/A	4.2	#N/A	0.0	0.0	4.2	0.0	331.0																									
	Pipe			0.00	0.00			Pasture: Good Condition	8	39	61	74	80	#N/A	#N/A	7.9	0.1	0.0	0.0	7.9	0.1	590.6																									
Stream	1885	3.93	4.00	7.85		6.0	0.10	Forest (poor cover)	27	45	66	77	83	#N/A	#N/A	27.3	#N/A	0.0	0.0	27.3	0.0	2099.6																									
								Residential 5 acre	0	46	65	77	82	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	2.8																									
								Pasture: Poor Condition	1	68	79	86	89	#N/A	#N/A	0.5	0.3	0.0	0.0	0.5	0.3	70.0																									

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C					D
		2322																							4128.0	
BVN-13-03	Overland	108	19.11	3.08	0.58			Forest (good cover)	74	25	55	70	77	#N/A	#N/A	73.7	#N/A	0.0	0.0	73.7	0.0	5162.0	71.8	45.1	0.07041	
	Channel (ditch)	475	13.49	5.58	1.42			Impervious	0	98	98	98	98	#N/A	#N/A	0.2	#N/A	0.0	0.0	0.2	0.0	16.4				
	Paved			0.00	0.00			Forest (poor cover)	0	45	66	77	83	#N/A	#N/A	0.2	#N/A	0.0	0.0	0.2	0.0	13.1				
	Pipe			0.00	0.00			Pasture: Good Condition	12	39	61	74	80	#N/A	#N/A	11.6	#N/A	0.0	0.0	11.6	0.0	857.0				
	Stream	1739	3.27		4.00	7.25	5.5	0.09	Residential 1 acre	12	51	68	79	84	#N/A	#N/A	11.7	#N/A	0.0	0.0	11.7	0.0	926.4			
									Residential 2 acre	3	46	65	77	82	#N/A	#N/A	2.6	#N/A	0.0	0.0	2.6	0.0	201.0			
BVN-14	Overland	117	5.35	1.63	1.20			Forest (good cover)	84	25	55	70	77	#N/A	12.3	72.2	#N/A	0.0	12.3	72.2	0.0	5727.9	70.8	61.9	0.09677	
	Channel (ditch)	1032	14.80	5.85	2.94			Impervious	2	98	98	98	98	#N/A	0.6	1.6	#N/A	0.0	0.6	1.6	0.0	215.2				
	Paved			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	#N/A	0.4	0.2	#N/A	0.0	0.4	0.2	0.0	35.9				
	Pipe			0.00	0.00			Pasture: Poor Condition	13	68	79	86	89	#N/A	#N/A	12.8	#N/A	0.0	0.0	12.8	0.0	1100.2				
	Stream	1274	2.76	4.00	5.31	5.7	0.09																			
BVN-15	Overland	120	2.22	1.05	1.91			Forest (good cover)	92	25	55	70	77	#N/A	15.2	77.2	#N/A	0.0	15.2	77.2	0.0	6244.0	68.4	49.3	0.07705	
	Channel (ditch)	1270	12.93	5.46	3.87			Impervious	2	98	98	98	98	#N/A	0.1	1.5	#N/A	0.0	0.1	1.5	0.0	154.9				
	Paved			0.00	0.00			Pasture: Good Condition	3	39	61	74	80	#N/A	2.9	0.0	#N/A	0.0	2.9	0.0	0.0	180.1				
	Pipe			0.00	0.00			Pasture: Poor Condition	3	68	79	86	89	#N/A	#N/A	3.0	#N/A	0.0	0.0	3.0	0.0	258.8				
	Stream	1686	1.63	4.00	7.02	7.7	0.13																			
BVN-15-01	Overland	166	1.44	0.84	3.29			Forest (good cover)	91	25	55	70	77	#N/A	#N/A	90.6	#N/A	0.0	0.0	90.6	0.0	6344.0	71.2	18.5	0.02884	
	Channel (ditch)	929	16.67	6.22	2.49			Impervious	3	98	98	98	98	#N/A	#N/A	3.4	#N/A	0.0	0.0	3.4	0.0	330.6				
	Paved			0.00	0.00			Pasture: Good Condition	6	39	61	74	80	#N/A	#N/A	5.7	#N/A	0.0	0.0	5.7	0.0	419.0				
	Pipe			0.00	0.00			Pasture: Poor Condition	0	68	79	86	89	#N/A	#N/A	0.3	#N/A	0.0	0.0	0.3	0.0	28.9				
	Stream			0.00	0.00	3.5	0.06																			
BVN-16	Overland	186	2.51	1.11	2.78			Forest (good cover)	90	25	55	70	77	#N/A	26.4	63.8	#N/A	0.0	26.4	63.8	0.0	5923.0	67.5	45.0	0.07028	
	Channel (ditch)	1520	8.40	4.38	5.78			Impervious	1	98	98	98	98	#N/A	0.2	1.1	#N/A	0.0	0.2	1.1	0.0	121.4				
	Paved			0.00	0.00			Residential 5 acre	0	46	65	77	82	#N/A	#N/A	0.0	#N/A	0.0	0.0	0.0	0.0	0.5				
	Pipe			0.00	0.00			Pasture: Good Condition	1	39	61	74	80	#N/A	0.9	0.1	#N/A	0.0	0.9	0.1	0.0	58.7				
	Stream	1084	4.38	4.00	4.52	7.8	0.13		Pasture: Poor Condition	8	68	79	86	89	#N/A	#N/A	7.5	#N/A	0.0	0.0	7.5	0.0	646.8			
BVN-17	Overland	254	5.68	1.68	2.52			Forest (good cover)	90	25	55	70	77	#N/A	14.2	75.9	#N/A	0.0	14.2	75.9	0.0	6094.7	69.8	32.9	0.05143	
	Channel (ditch)	949	10.74	4.97	3.18			Impervious	3	98	98	98	98	#N/A	#N/A	3.3	#N/A	0.0	0.0	3.3	0.0	324.6				
	Paved			0.00	0.00			Industrial	5	81	88	91	93	#N/A	#N/A	4.5	#N/A	0.0	0.0	4.5	0.0	412.0				
	Pipe			0.00	0.00			Pasture: Good Condition	2	39	61	74	80	#N/A	#N/A	2.0	#N/A	0.0	0.0	2.0	0.0	151.7				
	Stream	1205	1.39	4.00	5.02	6.4	0.11																			
BVN-17-01	Overland	127	3.69	1.35	1.57			Forest (good cover)	90	25	55	70	77	#N/A	32.1	58.3	#N/A	0.0	32.1	58.3	0.0	5844.9	66.1	26.7	0.04179	
	Channel (ditch)	790	11.89	5.23	2.52			Pasture: Poor Condition	3	68	79	86	89	#N/A	#N/A	2.7	#N/A	0.0	0.0	2.7	0.0	232.1				
	Paved			0.00	0.00			Residential 5 acre	7	46	65	77	82	#N/A	#N/A	6.9	#N/A	0.0	0.0	6.9	0.0	533.5				
	Pipe			0.00	0.00																					
	Stream	1722	2.60	4.00	7.18	6.8	0.11																			

**Appendix 6-A. Rock Creek System - Bivens Creek - 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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
		2409																					4128.0		
BVN-17-02	Overland	157	1.70	0.91	2.87			Forest (good cover)	52	25	55	70	77	#N/A	#N/A	47.9	4.2	0.0	0.0	47.9	4.2	3678.4	77.6	38.7	0.06054
	Channel (ditch)	1338	6.36	3.80	5.87			Impervious	16	98	98	98	98	#N/A	#N/A	11.2	5.0	0.0	0.0	11.2	5.0	1587.6			
	Paved			0.00	0.00			Residential 2 acre	3	46	65	77	82	#N/A	#N/A	0.9	2.1	0.0	0.0	0.9	2.1	244.3			
	Pipe			0.00	0.00			Pasture: Good Condition	20	39	61	74	80	#N/A	#N/A	7.4	13.1	0.0	0.0	7.4	13.1	1590.4			
	Stream	913	4.65	4.00	3.81	7.5	0.13	Forest (poor cover)	8	45	66	77	83	#N/A	#N/A	2.9	5.3	0.0	0.0	2.9	5.3	663.6			
BVN-17-03	Overland	129	5.70	1.68	1.28			Forest (good cover)	80	25	55	70	77	#N/A	#N/A	79.6	#N/A	0.0	0.0	79.6	0.0	5570.8	72.0	32.3	0.05053
	Channel (ditch)	992	10.08	4.81	3.44			Impervious	5	98	98	98	98	#N/A	#N/A	4.6	0.2	0.0	0.0	4.6	0.2	473.7			
	Paved			0.00	0.00			Pasture: Good Condition	16	39	61	74	80	#N/A	#N/A	14.5	1.1	0.0	0.0	14.5	1.1	1160.0			
	Pipe			0.00	0.00																				
	Stream	1241	1.69	4.00	5.17	5.9	0.10																		
BVN-17-04	Overland	115	2.79	1.17	1.63			Forest (good cover)	65	25	55	70	77	#N/A	0.1	62.5	2.8	0.0	0.1	62.5	2.8	4594.3	75.5	23.6	0.03695
	Channel (ditch)	437	7.71	4.20	1.74			Impervious	15	98	98	98	98	#N/A	0.5	9.0	5.2	0.0	0.5	9.0	5.2	1446.7			
	Paved			0.00	0.00			Pasture: Good Condition	20	39	61	74	80	#N/A	0.9	11.1	7.9	0.0	0.9	11.1	7.9	1506.5			
	Pipe			0.00	0.00																				
	Stream	1376	4.83	4.00	5.73	5.5	0.09																		
BVN-17-05	Overland	186	1.07	0.73	4.28			Forest (good cover)	37	25	55	70	77	#N/A	7.1	23.6	6.5	0.0	7.1	23.6	6.5	2543.0	66.3	18.3	0.02866
	Channel (ditch)	524	2.90	2.55	3.43			Impervious	5	98	98	98	98	#N/A	0.6	3.4	0.6	0.0	0.6	3.4	0.6	446.7			
	Paved			0.00	0.00			Pasture: Good Condition	58	39	61	74	80	#N/A	51.2	7.0	#N/A	0.0	51.2	7.0	0.0	3644.2			
	Pipe			0.00	0.00																				
	Stream	509	5.30	4.00	2.12	5.9	0.10																		
BVN-17-06	Overland	122	7.62	1.94	1.05			Forest (good cover)	98	25	55	70	77	#N/A	0.9	97.1	#N/A	0.0	0.9	97.1	0.0	6842.8	70.4	21.1	0.03301
	Channel (ditch)	456	9.03	4.55	1.67			Impervious	2	98	98	98	98	#N/A	0.3	1.8	#N/A	0.0	0.3	1.8	0.0	201.7			
	Paved			0.00	0.00																				
	Pipe			0.00	0.00																				
	Stream	997	5.32	4.00	4.15	4.1	0.07																		
BVN-17-07	Overland	178	1.94	0.98	3.04			Forest (good cover)	76	25	55	70	77	#N/A	28.0	47.8	#N/A	0.0	28.0	47.8	0.0	4888.9	64.2	34.8	0.05444
	Channel (ditch)	625	3.95	2.98	3.50			Impervious	1	98	98	98	98	#N/A	0.2	1.2	#N/A	0.0	0.2	1.2	0.0	140.2			
	Paved			0.00	0.00			Pasture: Good Condition	23	39	61	74	80	#N/A	22.7	#N/A	#N/A	0.0	22.7	0.0	0.0	1386.1			
	Pipe			0.00	0.00																				
	Stream	556	5.22	4.00	2.32	5.3	0.09																		
BVN-17-08	Overland	107	5.97	1.72	1.04			Forest (good cover)	92	25	55	70	77	#N/A	#N/A	92.5	#N/A	0.0	0.0	92.5	0.0	6473.8	72.1	16.1	0.02509
	Channel (ditch)	977	8.10	4.30	3.78			Impervious	8	98	98	98	98	#N/A	#N/A	7.5	#N/A	0.0	0.0	7.5	0.0	736.6			
	Paved			0.00	0.00																				
	Pipe			0.00	0.00																				
	Stream	684	4.75	4.00	2.85	4.6	0.08																		

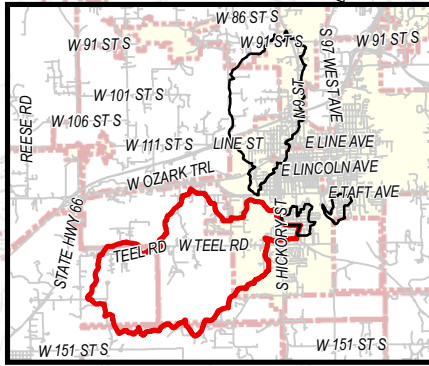
**Appendix 6-A. Rock Creek System - Bivens Creek - Hydrologic Coefficients for Existing Conditions**

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				HSG Calcs (hide)				Hydrologic Soil Groups and %				Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C				D
4128.0																									
BVN-17-09		1244																							
	Overland	129	2.38	1.08	1.98			Forest (good cover)	74	25	55	70	77	#N/A	0.8	73.6	#N/A	0.0	0.8	73.6	0.0	5197.6	71.8	26.7	0.04167
	Channel (ditch)	1115	4.70	3.26	5.70			Impervious	4	98	98	98	98	#N/A	#N/A	3.5	#N/A	0.0	0.0	3.5	0.0	346.4			
	Paved			0.00	0.00			Residential 5 acre	22	46	65	77	82	#N/A	5.3	16.8	#N/A	0.0	5.3	16.8	0.0	1633.7			
	Pipe			0.00	0.00																				
Stream				0.00	0.00	4.6	0.08																		
BVN-17-10		1715																							
	Overland	296	3.11	1.24	3.98			Forest (good cover)	96	25	55	70	77	#N/A	#N/A	95.9	#N/A	0.0	0.0	95.9	0.0	6710.4	71.2	25.4	0.03969
	Channel (ditch)	379	6.20	3.75	1.68			Impervious	4	98	98	98	98	#N/A	#N/A	4.1	#N/A	0.0	0.0	4.1	0.0	405.5			
	Paved			0.00	0.00																				
	Pipe			0.00	0.00																				
Stream	1041	8.45	4.00	4.34	6.0	0.10																			
BVN-18		3405																							
	Overland	204	2.61	1.13	3.00			Forest (good cover)	64	25	55	70	77	#N/A	5.0	57.0	2.2	0.0	5.0	57.0	2.2	4428.9	75.2	74.0	0.11565
	Channel (ditch)	764	8.80	4.49	2.84			Impervious	8	98	98	98	98	#N/A	#N/A	7.9	#N/A	0.0	0.0	7.9	0.0	769.6			
	Paved			0.00	0.00			Residential 5 acre	1	46	65	77	82	#N/A	#N/A	0.5	#N/A	0.0	0.0	0.5	0.0	42.1			
	Pipe			0.00	0.00			Pasture: Good Condition	12	39	61	74	80	#N/A	#N/A	11.1	1.1	0.0	0.0	11.1	1.1	910.2			
Stream	2437	1.58	4.00	10.15	9.6	0.16	Residential 2 acre	2	46	65	77	82	#N/A	#N/A	1.6	#N/A	0.0	0.0	1.6	0.0	126.4				
							Industrial	14	81	88	91	93	#N/A	#N/A	13.2	0.4	0.0	0.0	13.2	0.4	1240.1				
BVN-18-01		2068																							
	Overland	173	2.09	1.01	2.84			Forest (good cover)	47	25	55	70	77	#N/A	#N/A	31.0	16.3	0.0	0.0	31.0	16.3	3426.6	76.7	45.7	0.07143
	Channel (ditch)	618	4.27	3.10	3.32			Impervious	6	98	98	98	98	#N/A	#N/A	3.1	2.4	0.0	0.0	3.1	2.4	540.8			
	Paved			0.00	0.00			Residential 5 acre	15	46	65	77	82	#N/A	#N/A	10.1	4.7	0.0	0.0	10.1	4.7	1164.0			
	Pipe			0.00	0.00			Pasture: Good Condition	28	39	61	74	80	#N/A	#N/A	16.7	11.0	0.0	0.0	16.7	11.0	2114.7			
Stream	1278	3.19	4.00	5.32	6.9	0.11	Industrial	5	81	88	91	93	#N/A	#N/A	4.6	0.0	0.0	0.0	4.6	0.0	424.4				
BVN-18-02		895																							
	Overland	136	2.06	1.01	2.25			Forest (good cover)	13	25	55	70	77	#N/A	#N/A	#N/A	13.3	0.0	0.0	0.0	13.3	1027.0	80.3	12.1	0.01896
	Channel (ditch)	759	4.67	3.25	3.90			Impervious	3	98	98	98	98	#N/A	#N/A	0.5	2.1	0.0	0.0	0.5	2.1	254.1			
	Paved			0.00	0.00			Residential 2 acre	16	46	65	77	82	#N/A	#N/A	#N/A	15.5	0.0	0.0	0.0	15.5	1272.3			
	Pipe			0.00	0.00			Pasture: Good Condition	69	39	61	74	80	#N/A	#N/A	2.1	66.5	0.0	0.0	2.1	66.5	5471.9			
Stream			0.00	0.00	3.7	0.06																			
BVN-19		2633																							
	Overland	154	1.99	0.99	2.59			Forest (good cover)	45	25	55	70	77	#N/A	#N/A	18.6	26.2	0.0	0.0	18.6	26.2	3317.3	77.9	50.8	0.07938
	Channel (ditch)	824	5.66	3.58	3.83			Impervious	1	98	98	98	98	#N/A	#N/A	1.0	0.4	0.0	0.0	1.0	0.4	136.4			
	Paved			0.00	0.00			Residential 2 acre	8	46	65	77	82	#N/A	#N/A	0.0	7.8	0.0	0.0	0.0	7.8	638.8			
	Pipe			0.00	0.00			Pasture: Good Condition	37	39	61	74	80	#N/A	#N/A	8.6	28.0	0.0	0.0	8.6	28.0	2880.2			
Stream	1655	1.34	4.00	6.90	8.0	0.13	Forest (poor cover)	5	45	66	77	83	#N/A	#N/A	0.1	4.7	0.0	0.0	0.1	4.7	396.8				
							Industrial	5	81	88	91	93	#N/A	#N/A	2.7	1.9	0.0	0.0	2.7	1.9	423.2				
BVN-19-01		2833																							
	Overland	148	2.88	1.19	2.07			Forest (good cover)	19	25	55	70	77	#N/A	#N/A	13.0	5.6	0.0	0.0	13.0	5.6	1341.7	78.6	52.2	0.08155
	Channel (ditch)	1067	6.40	3.81	4.66			Impervious	6	98	98	98	98	#N/A	#N/A	3.8	2.2	0.0	0.0	3.8	2.2	581.6			
	Paved			0.00	0.00			Industrial	1	81	88	91	93	#N/A	#N/A	0.1	0.5	0.0	0.0	0.1	0.5	58.7			
	Pipe			0.00	0.00			Pasture: Good Condition	12	39	61	74	80	#N/A	#N/A	1.9	10.2	0.0	0.0	1.9	10.2	955.3			
Stream	1618	1.30	4.00	6.74	8.1	0.13	Residential 2 acre	16	46	65	77	82	#N/A	#N/A	12.7	3.0	0.0	0.0	12.7	3.0	1222.4				
							Residential 5 acre	47	46	65	77	82	#N/A	#N/A	31.8	15.3	0.0	0.0	31.8	15.3	3699.8				

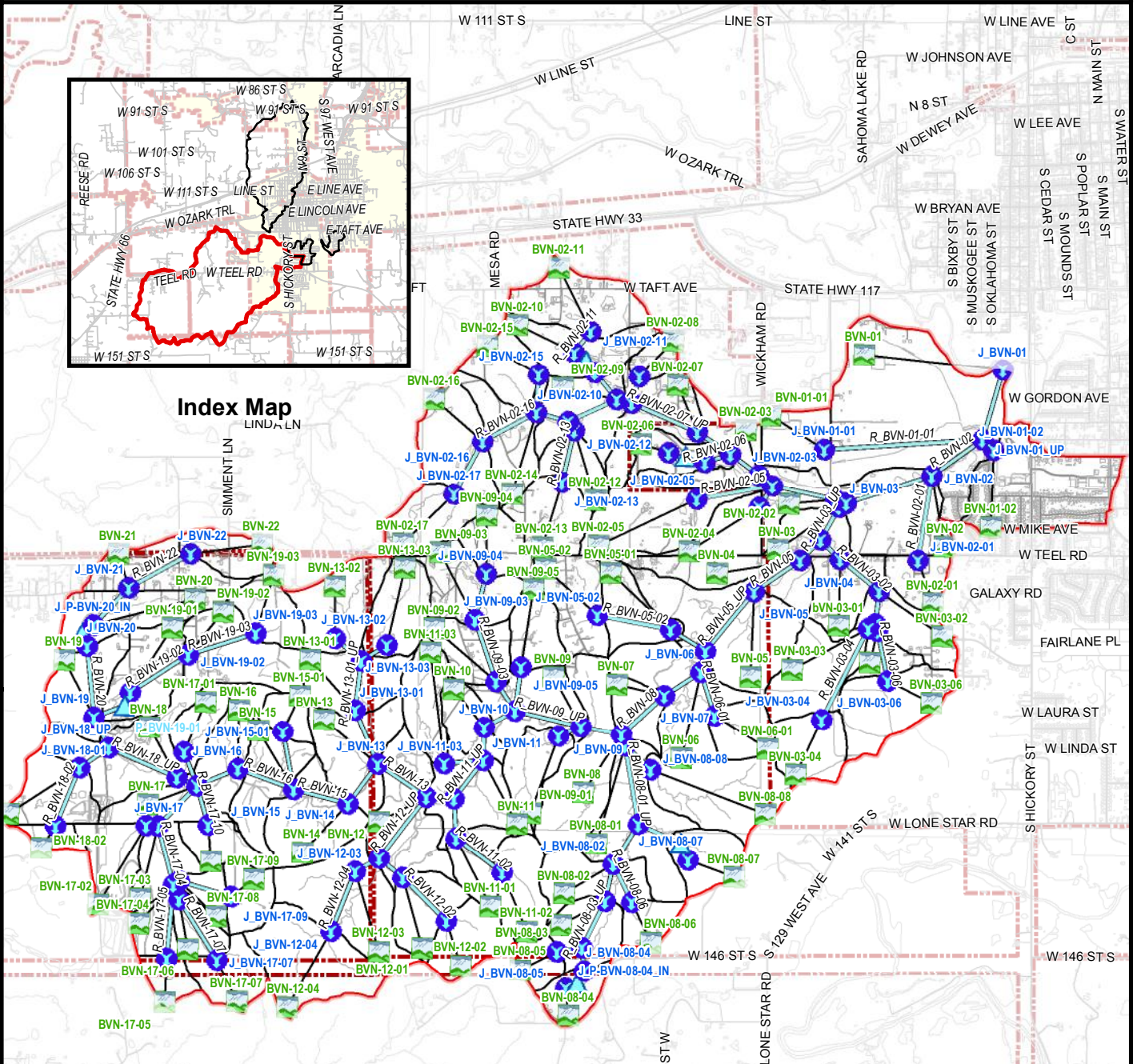
**Appendix 6-A. Rock Creek System - Bivens Creek - Hydrologic Coefficients for Existing Conditions**

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				HSG Calcs (hide)				Hydrologic Soil Groups and %				hide	Composite CN	Drainage Area (acres)	Drainage Area (sq. mi.)	
										6400	A	B	C	D	A	B	C	D	A	B	C					D
		4128.0																								
		3011																								
BVN-19-02	Overland	154	1.29	0.80	3.23			Forest (good cover)	0	25	55	70	77	#N/A	#N/A	0.4	#N/A	0.0	0.0	0.4	0.0	27.2	82.6	63.5	0.09929	
	Channel (ditch)	1346	2.50	2.36	9.51			Impervious	5	98	98	98	98	#N/A	#N/A	4.5	0.3	0.0	0.0	4.5	0.3	467.2				
	Paved			0.00	0.00			Forest (poor cover)	1	45	66	77	83	#N/A	#N/A	0.7	#N/A	0.0	0.0	0.7	0.0	51.7				
	Pipe			0.00	0.00			Pasture: Poor Condition	47	68	79	86	89	#N/A	#N/A	45.6	1.5	0.0	0.0	45.6	1.5	4059.1				
	Stream		1511	2.90	4.00	6.30	11.4	0.19	Residential 2 acre	8	46	65	77	82	#N/A	#N/A	8.0	#N/A	0.0	0.0	8.0	0.0				613.9
									Residential 5 acre	39	46	65	77	82	#N/A	#N/A	31.5	7.6	0.0	0.0	31.5	7.6				3044.8
		1825																								
BVN-19-03	Overland	195	1.30	0.80	4.07			Forest (good cover)	3	25	55	70	77	#N/A	#N/A	0.3	2.5	0.0	0.0	0.3	2.5	211.5	87.4	33.6	0.05253	
	Channel (ditch)	1630	3.49	2.80	9.70			Impervious	7	98	98	98	98	#N/A	#N/A	0.8	6.0	0.0	0.0	0.8	6.0	662.4				
	Paved			0.00	0.00			Forest (poor cover)	3	45	66	77	83	#N/A	#N/A	2.7	#N/A	0.0	0.0	2.7	0.0	209.9				
	Pipe			0.00	0.00			Pasture: Good Condition	5	39	61	74	80	#N/A	#N/A	0.1	5.4	0.0	0.0	0.1	5.4	436.0				
	Stream				0.00	0.00	8.3	0.14	Pasture: Poor Condition	82	68	79	86	89	#N/A	#N/A	34.7	47.1	0.0	0.0	34.7	47.1				7177.9
									Residential 1 acre	0	51	68	79	84	#N/A	#N/A	0.0	0.0	0.0	0.0	0.0	0.0				0.3
								Residential 5 acre	0	46	65	77	82	#N/A	#N/A	#N/A	0.5	0.0	0.0	0.0	0.5	38.0				
		3667																								
BVN-20	Overland	144	3.98	1.40	1.71			Forest (good cover)	2	25	55	70	77	#N/A	#N/A	#N/A	2.0	0.0	0.0	0.0	2.0	156.9	83.7	56.3	0.08798	
	Channel (ditch)	924	2.74	2.47	6.22			Impervious	11	98	98	98	98	#N/A	#N/A	#N/A	10.5	0.0	0.0	0.0	10.5	1033.2				
	Paved			0.00	0.00			Forest (poor cover)	6	45	66	77	83	#N/A	#N/A	#N/A	6.3	0.0	0.0	0.0	6.3	521.2				
	Pipe			0.00	0.00			Pasture: Good Condition	14	39	61	74	80	#N/A	#N/A	#N/A	13.6	0.0	0.0	0.0	13.6	1091.0				
	Stream		2599	1.85	4.00	10.83	11.3	0.19	Pasture: Poor Condition	5	68	79	86	89	#N/A	#N/A	#N/A	4.6	0.0	0.0	0.0	4.6				409.3
									Residential 2 acre	22	46	65	77	82	#N/A	#N/A	#N/A	21.9	0.0	0.0	0.0	21.9				1795.0
								Residential 5 acre	41	46	65	77	82	#N/A	#N/A	#N/A	41.0	0.0	0.0	0.0	41.0	3363.2				
		2804																								
BVN-21	Overland	134	1.90	0.97	2.31			Forest (good cover)	1	25	55	70	77	#N/A	#N/A	#N/A	1.2	0.0	0.0	0.0	1.2	94.1	82.9	48.5	0.07581	
	Channel (ditch)	2670	2.66	2.43	18.28			Impervious	4	98	98	98	98	#N/A	#N/A	#N/A	3.6	0.0	0.0	0.0	3.6	351.8				
	Paved			0.00	0.00			Residential 1 acre	20	51	68	79	84	#N/A	#N/A	#N/A	20.2	0.0	0.0	0.0	20.2	1694.9				
	Pipe			0.00	0.00			Pasture: Good Condition	2	39	61	74	80	#N/A	#N/A	#N/A	2.3	0.0	0.0	0.0	2.3	181.1				
	Stream				0.00	0.00	12.4	0.21	Residential 2 acre	56	46	65	77	82	#N/A	#N/A	#N/A	56.0	0.0	0.0	0.0	56.0				4594.6
									Residential 5 acre	17	46	65	77	82	#N/A	#N/A	#N/A	16.7	0.0	0.0	0.0	16.7				1370.7
		2017																								
BVN-22	Overland	173	2.32	1.07	2.70			Forest (good cover)	28	25	55	70	77	#N/A	#N/A	#N/A	27.7	0.0	0.0	0.0	27.7	2129.4	79.9	30.4	0.04743	
	Channel (ditch)	1845	2.13	2.18	14.13			Impervious	2	98	98	98	98	#N/A	#N/A	#N/A	1.5	0.0	0.0	0.0	1.5	151.8				
	Paved			0.00	0.00			Residential 1 acre	5	51	68	79	84	#N/A	#N/A	#N/A	4.5	0.0	0.0	0.0	4.5	378.7				
	Pipe			0.00	0.00			Pasture: Good Condition	50	39	61	74	80	#N/A	#N/A	#N/A	50.1	0.0	0.0	0.0	50.1	4004.8				
	Stream				0.00	0.00	10.1	0.17	Residential 2 acre	16	46	65	77	82	#N/A	#N/A	#N/A	16.1	0.0	0.0	0.0	16.1				1321.1
									Residential 5 acre	0	46	65	77	82	#N/A	#N/A	#N/A	0.0	0.0	0.0	0.0	0.0				0.0





**Index Map**



**Legend**

HMS Points	HMS Lines
Diversion	Reach
Subbasin	Route Downstream
Junction	Subbasin Boundaries
Reservoir	

W 161 ST S

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area  
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 <sup>2</sup>
BVN-02-02	8	17	40	56	76	94	111	153	0.04841
BVN-02-03	28	50	96	127	166	198	230	299	0.06810
BVN-02-04	20	32	61	79	103	122	141	184	0.05252
BVN-02-05	36	66	134	179	237	285	333	440	0.11219
BVN-02-06	20	33	62	81	105	125	144	186	0.04291
BVN-02-07	34	60	116	152	198	236	273	354	0.08107
BVN-02-08	13	23	42	54	69	81	94	119	0.02404
BVN-02-09	18	38	87	120	163	199	235	317	0.07865
BVN-02-10	27	51	105	141	187	224	262	344	0.07673
BVN-02-11	21	46	108	149	204	250	297	400	0.09455
BVN-02-12	11	23	53	73	99	121	143	191	0.04225
BVN-02-13	19	39	89	122	166	202	238	317	0.07030
BVN-02-14	14	32	78	109	151	186	221	301	0.07871
BVN-02-15	18	35	74	101	135	164	192	254	0.05507
BVN-02-16	45	83	160	210	275	327	378	488	0.09520
BVN-02-17	38	68	123	158	203	239	274	348	0.06619
BVN-03	4	12	36	53	76	96	117	165	0.05010
bVN-03-01	25	47	94	124	164	196	227	297	0.06321
BVN-03-02	24	43	86	114	149	178	207	271	0.06247
BVN-03-03	20	41	94	129	176	215	255	344	0.09021
BVN-03-04	26	51	102	136	181	216	252	328	0.06354
BVN-03-05	8	17	36	49	67	81	95	125	0.02639
BVN-03-06	45	80	150	195	254	300	346	446	0.09520
BVN-04	11	24	61	87	120	149	179	247	0.08170
BVN-05	21	50	131	187	262	326	391	541	0.16166
BVN-05-01	21	40	83	111	148	177	207	271	0.05902
BVN-05-02	49	89	158	202	259	303	345	436	0.07652
BVN-06	31	64	145	199	270	328	386	516	0.11788
BVN-06-01	18	36	74	99	132	158	184	240	0.04574
BVN-07	7	18	49	70	98	122	146	198	0.04215
BVN-08	30	61	140	193	262	320	378	510	0.13029
BVN-08-01	17	40	102	145	201	250	299	412	0.11874
BVN-08-02	21	41	88	119	160	193	226	300	0.06756
BVN-08-03	20	40	86	116	155	187	219	288	0.05941
BVN-08-04	18	34	66	87	115	136	157	203	0.03971
BVN-08-05	12	24	48	64	84	100	116	150	0.02838
BVN-08-06	13	27	56	75	100	119	139	180	0.03322
BVN-08-07	22	42	85	114	150	180	209	272	0.05454
BVN-08-08	33	66	145	197	266	323	380	506	0.11885
BVN-09	11	28	76	110	155	194	232	321	0.08303

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area  
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 <sup>2</sup>
BVN-09-01	13	27	62	86	116	142	168	226	0.05418
BVN-09-02	28	51	99	130	170	202	234	302	0.06076
BVN-09-03	34	63	123	163	215	256	297	386	0.07912
BVN-09-04	27	49	93	122	159	187	216	277	0.05280
BVN-09-05	24	45	88	115	151	180	208	269	0.05278
BVN-10	12	27	63	86	117	143	168	223	0.04524
BVN-11	22	46	106	146	199	243	287	384	0.08587
BVN-11-01	20	37	75	99	131	156	182	236	0.04704
BVN-11-02	24	45	92	122	162	194	226	296	0.06430
BVN-11-03	23	42	84	112	148	177	206	271	0.06168
BVN-12	39	75	155	209	278	335	391	515	0.11370
BVN-12-01	19	38	79	107	143	173	202	268	0.06084
BVN-12-02	20	40	86	116	157	189	221	292	0.06082
BVN-12-03	34	67	147	201	271	329	387	519	0.13123
BVN-12-04	32	66	149	205	278	340	401	538	0.12539
BVN-13	27	56	122	166	224	272	319	424	0.09276
BVN-13-01	36	65	126	166	217	258	299	387	0.07894
BVN-13-02	40	72	138	181	237	281	326	421	0.08641
BVN-13-03	29	54	108	143	189	226	262	342	0.07041
BVN-14	35	68	140	187	249	299	349	458	0.09677
BVN-15	20	40	90	123	166	203	239	321	0.07705
BVN-15-01	12	24	48	64	85	101	117	152	0.02884
BVN-16	16	34	78	108	147	179	212	286	0.07028
BVN-17	16	32	68	93	124	150	175	231	0.05143
BVN-17-01	8	18	45	63	87	106	127	172	0.04179
BVN-17-02	36	60	107	136	174	204	233	295	0.06054
BVN-17-03	21	39	77	101	134	160	186	242	0.05053
BVN-17-04	21	36	66	86	110	130	149	190	0.03695
BVN-17-05	6	14	33	46	62	77	91	123	0.02866
BVN-17-06	13	25	51	69	91	109	127	167	0.03301
BVN-17-07	9	21	56	81	113	140	168	229	0.05444
BVN-17-08	11	21	41	54	71	85	98	128	0.02509
BVN-17-09	18	34	67	89	117	140	162	211	0.04167
BVN-17-10	15	28	58	77	102	122	142	186	0.03969
BVN-18	53	90	169	221	286	339	391	506	0.11565
BVN-18-01	41	70	125	160	206	242	277	353	0.07143
BVN-18-02	16	27	45	56	70	81	91	113	0.01896
BVN-19	47	79	138	176	225	263	300	382	0.07938
BVN-19-01	51	84	145	184	234	273	311	394	0.08155
BVN-19-02	71	108	177	222	277	319	361	452	0.09929
BVN-19-03	55	81	122	148	180	204	227	277	0.05253

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area**  
**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 <sup>2</sup>
BVN-20	67	101	163	203	252	290	326	406	0.08798
BVN-21	53	81	132	165	206	238	269	337	0.07581
BVN-22	30	48	82	103	130	152	172	218	0.04743
J_BVN-01	590	1038	2660	3875	5670	7256	9044	13177	6.45013
J_BVN-01_UP	585	1030	2618	3818	5574	7122	8813	12761	6.11433
J_BVN-01-01	16	27	53	70	92	110	127	167	0.04432
J_BVN-01-02	103	162	276	350	442	514	585	740	0.16569
J_BVN-01-02_UP	61	95	158	198	249	288	326	409	0.08697
J_BVN-01-03	26	41	65	80	99	113	127	157	0.02834
J_BVN-01-04	17	26	45	57	72	84	96	121	0.02770
J_BVN-01-05	45	69	114	142	177	205	231	288	0.05927
J_BVN-01-06	19	29	47	59	73	84	94	118	0.02398
J_BVN-02	579	1022	2590	3784	5515	7047	8703	12596	5.90432
J_BVN-02_UP	578	1020	2579	3826	5524	7046	8658	12516	5.74743
J_BVN-02-01	28	48	82	104	132	153	174	219	0.03987
J_BVN-02-02	131	301	705	1036	1410	1732	2081	2795	1.08689
J_BVN-02-02_UP	129	302	755	1063	1364	1776	2075	2764	1.03848
J_BVN-02-03	116	273	629	864	1120	1433	1654	2235	0.87377
J_BVN-02-03_UP	150	302	595	804	1082	1309	1540	2066	0.80567
J_BVN-02-04	20	32	61	79	103	122	141	184	0.05252
J_BVN-02-05	36	66	134	179	237	285	333	440	0.11219
J_BVN-02-07	152	306	592	800	1065	1277	1488	1972	0.76276
J_BVN-02-07_UP	149	294	545	725	941	1117	1300	1732	0.68169
J_BVN-02-08	13	23	42	54	69	81	94	119	0.02404
J_BVN-02-09	145	285	521	685	886	1048	1223	1631	0.65765
J_BVN-02-09_UP	122	232	348	450	589	717	856	1196	0.40772
J_BVN-02-10	30	73	187	267	365	450	532	716	0.17128
J_BVN-02-11	21	46	108	149	204	250	297	400	0.09455
J_BVN-02-12	20	47	114	160	223	278	333	460	0.11255
J_BVN-02-13	19	39	89	122	166	202	238	317	0.07030
J_BVN-02-14	105	192	387	517	685	822	959	1261	0.29517
J_BVN-02-15	18	35	74	101	135	164	192	254	0.05507
J_BVN-02-16	76	134	252	328	426	505	584	755	0.16139
J_BVN-02-17	38	68	123	158	203	239	274	348	0.06619
J_BVN-03	496	881	2092	3140	4541	5793	7103	10080	4.66054
J_BVN-03_UP	497	881	2093	3136	4533	5780	7084	10045	4.61044
J_BVN-03-01	90	174	395	553	758	932	1111	1527	0.40102
J_BVN-03-02	82	159	367	504	682	836	996	1354	0.33781
J_BVN-03-02_UP	69	139	314	426	570	700	834	1131	0.27534
J_BVN-03-03	31	67	159	218	302	375	451	619	0.15375
J_BVN-03-04	26	51	102	136	181	216	252	328	0.06354



**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area  
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 <sup>2</sup>
J_BVN-03-05	47	84	164	216	286	343	398	519	0.12159
J_BVN-03-06	45	80	150	195	254	300	346	446	0.09520
J_BVN-04	481	859	2025	2999	4263	5386	6572	9196	4.20942
J_BVN-05	482	857	2019	2986	4226	5326	6488	9059	4.12772
J_BVN-05_UP	483	859	2010	2966	4177	5245	6378	8863	3.96606
J_BVN-05-01	67	125	230	299	388	458	527	675	0.13554
J_BVN-05-02	49	89	158	202	259	303	345	436	0.07652
J_BVN-06	477	855	1990	2929	4102	5135	6239	8648	3.83052
J_BVN-06-01	18	36	74	99	132	158	184	240	0.04574
J_BVN-07	474	853	1976	2904	4053	5049	6111	8435	3.66690
J_BVN-08	478	862	1990	2918	4066	5058	6109	8404	3.62475
J_BVN-08-01	97	206	472	668	929	1152	1379	1874	0.52041
J_BVN-08-01_UP	80	159	341	463	627	760	893	1190	0.28282
J_BVN-08-02	71	136	282	380	507	612	718	955	0.22828
J_BVN-08-03	43	84	171	228	301	361	420	552	0.12750
J_BVN-08-03_UP	30	56	110	146	191	228	265	344	0.06809
J_BVN-08-04	18	33	64	85	111	132	153	198	0.03971
J_BVN-08-05	12	24	48	64	84	100	116	150	0.02838
J_BVN-08-06	13	27	56	75	100	119	139	180	0.03322
J_BVN-08-07	22	42	85	114	150	180	209	272	0.05454
J_BVN-08-08	33	66	145	197	266	323	380	506	0.11885
J_BVN-09	442	798	1688	2412	3331	4122	4959	6785	2.97405
J_BVN-09_UP	443	799	1685	2366	3253	4020	4827	6585	2.83684
J_BVN-09-01	13	27	62	86	116	142	168	226	0.05418
J_BVN-09-02	79	147	286	377	494	588	681	884	0.19268
J_BVN-09-03	60	110	214	282	369	439	507	656	0.13192
J_BVN-09-04	27	49	93	122	159	187	216	277	0.05280
J_BVN-09-05	24	45	88	115	151	180	208	269	0.05278
J_BVN-10	429	779	1645	2267	3029	3683	4407	6009	2.59138
J_BVN-11	435	786	1646	2266	3023	3673	4368	5949	2.54614
J_BVN-11_UP	433	785	1629	2233	2979	3614	4262	5713	2.39859
J_BVN-11-01	40	75	152	203	268	322	375	492	0.11134
J_BVN-11-02	24	45	92	122	162	194	226	296	0.06430
J_BVN-11-03	23	42	84	112	148	177	206	271	0.06168
J_BVN-12	425	774	1601	2191	2926	3549	4184	5606	2.28725
J_BVN-12_UP	101	204	449	613	826	1002	1178	1574	0.37828
J_BVN-12-01	38	76	162	219	293	354	415	549	0.12166
J_BVN-12-02	20	40	86	116	157	189	221	292	0.06082
J_BVN-12-03	64	131	293	401	542	659	777	1042	0.25662
J_BVN-12-04	32	66	149	205	278	340	401	538	0.12539
J_BVN-13	379	689	1418	1935	2581	3128	3683	4920	1.79527

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area  
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 <sup>2</sup>
J_BVN-13-01	95	177	346	456	598	712	825	1072	0.23576
J_BVN-13-01_UP	68	126	246	325	426	506	586	761	0.15682
J_BVN-13-02	40	72	138	181	237	281	326	421	0.08641
J_BVN-13-03	29	54	108	143	189	226	262	342	0.07041
J_BVN-14	342	623	1283	1749	2332	2828	3328	4443	1.46675
J_BVN-15	333	605	1247	1698	2266	2746	3232	4315	1.36998
J_BVN-15-01	12	24	48	64	85	101	117	152	0.02884
J_BVN-16	320	580	1191	1622	2165	2619	3083	4111	1.26409
J_BVN-17	310	560	1147	1560	2080	2515	2959	3940	1.19381
J_BVN-17-01	8	18	45	63	87	106	127	172	0.04179
J_BVN-17-02	36	60	107	136	174	204	233	295	0.06054
J_BVN-17-03	113	210	427	570	754	904	1054	1386	0.33089
J_BVN-17-04	67	131	279	377	504	609	714	947	0.21982
J_BVN-17-05	6	14	33	46	62	77	91	123	0.02866
J_BVN-17-06	16	37	91	128	175	215	255	346	0.08745
J_BVN-17-07	9	21	56	81	113	140	168	229	0.05444
J_BVN-17-08	27	51	102	135	177	211	245	319	0.06676
J_BVN-17-09	18	34	67	89	117	140	162	211	0.04167
J_BVN-17-10	15	28	58	77	102	122	142	186	0.03969
J_BVN-18	203	356	733	986	1312	1593	1914	2539	0.73001
J_BVN-18_UP	188	328	670	898	1188	1451	1734	2285	0.61436
J_BVN-18-01	56	96	169	215	274	320	365	461	0.09039
J_BVN-18-02	16	27	45	56	70	81	91	113	0.01896
J_BVN-19	172	300	609	814	1069	1313	1553	2027	0.52397
J_BVN-19-01	156	238	389	487	609	703	795	999	0.23337
J_BVN-19-02	125	188	297	366	452	518	583	723	0.15182
J_BVN-19-03	55	81	122	148	180	204	227	277	0.05253
J_BVN-20	58	110	241	331	445	561	661	859	0.21122
J_BVN-21	81	126	210	264	332	384	436	548	0.12324
J_BVN-22	30	48	82	103	130	152	172	218	0.04743
J_P-BVN-02-06	0	2	9	20	37	54	71	111	0.04291
J_P-BVN-02-06_IN	20	33	62	81	105	125	144	186	0.04291
J_P-BVN-02-10_IN	48	97	212	290	391	474	558	743	0.17128
J_P-BVN-08-04_IN	18	34	66	87	115	136	157	203	0.03971
J_P-BVN-20_IN	144	219	361	453	566	655	741	931	0.21122
P_BVN-02-06	0	2	9	20	37	54	71	111	0.04291
P_BVN-02-10	30	73	187	267	365	450	532	716	0.17128
P_BVN-08-04	18	33	64	85	111	132	153	198	0.03971
P_BVN-08-07	13	28	67	93	127	155	183	245	0.05454
P_BVN-19-01	107	179	334	431	557	651	771	983	0.23337
P_BVN-20	58	110	241	331	445	561	661	859	0.21122

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area**  
**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 <sup>2</sup>
R_02-15	18	35	74	101	135	164	192	254	0.05507
R_BVN-01_UP	585	1030	2618	3816	5558	7097	8802	12752	6.11433
R_BVN-01-01	16	27	53	70	92	110	127	167	0.04432
R_BVN-01-02	61	95	158	198	249	288	326	409	0.08697
R_BVN-01-02-UP	45	69	114	142	177	205	231	288	0.05927
R_BVN-01-05	19	29	47	59	73	84	94	118	0.02398
R_BVN-02	577	1019	2580	3774	5503	7027	8679	12557	5.90432
R_BVN-02_UP	575	1018	2565	3755	5470	6986	8616	12455	5.74743
R_BVN-02-01	28	48	82	104	132	153	174	219	0.03987
R_BVN-02-01_UP	128	295	683	996	1351	1658	1992	2674	1.03848
R_BVN-02-03_UP	112	265	590	801	1046	1310	1522	2054	0.80567
R_BVN-02-04	20	32	61	79	103	122	141	184	0.05252
R_BVN-02-05	36	66	134	179	237	285	333	440	0.11219
R_BVN-02-06	0	2	9	20	37	54	71	111	0.04291
R_BVN-02-07	150	302	588	793	1054	1266	1478	1960	0.76276
R_BVN-02-07_UP	142	285	531	705	923	1098	1279	1701	0.68169
R_BVN-02-08	13	23	42	54	69	81	94	119	0.02404
R_BVN-02-09_UP	111	212	340	443	581	707	843	1177	0.40772
R_BVN-02-10	30	73	187	267	365	450	532	716	0.17128
R_BVN-02-11	21	46	108	149	204	250	297	400	0.09455
R_BVN-02-13	12	28	69	97	136	170	204	283	0.07030
R_BVN-02-14	104	191	313	408	537	650	770	1057	0.29517
R_BVN-02-16	76	134	252	328	426	505	584	755	0.16139
R_BVN-02-17	38	68	123	158	203	239	274	348	0.06619
R_BVN-03_UP	495	880	2087	3131	4527	5772	7075	10032	4.61044
R_BVN-03-01	89	172	387	535	728	884	1051	1461	0.40102
R_BVN-03-02	80	158	359	496	675	827	982	1341	0.33781
R_BVN-03-02_UP	67	136	308	421	567	695	826	1122	0.27534
R_BVN-03-04	19	39	84	113	151	185	219	294	0.06354
R_BVN-03-06	43	74	142	186	244	290	335	433	0.09520
R_BVN-04	481	858	2018	2984	4247	5368	6552	9184	4.20942
R_BVN-05	479	856	2010	2970	4213	5313	6476	9048	4.12772
R_BVN-05_UP	478	853	1996	2941	4148	5216	6343	8823	3.96606
R_BVN-05-01	67	125	230	299	388	458	527	675	0.13554
R_BVN-05-02	49	89	158	202	259	303	345	436	0.07652
R_BVN-06	477	853	1986	2924	4098	5130	6233	8644	3.83052
R_BVN-06-01	18	36	74	99	132	158	184	240	0.04574
R_BVN-07	472	850	1966	2886	4039	5036	6097	8422	3.66690
R_BVN-08	473	852	1971	2895	4041	5033	6086	8388	3.62475
R_BVN-08-01_UP	73	148	322	443	599	729	860	1147	0.28282
R_BVN-08-02	68	130	275	372	501	605	710	945	0.22828

**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area**  
**Existing Flow Rates (CFS)**

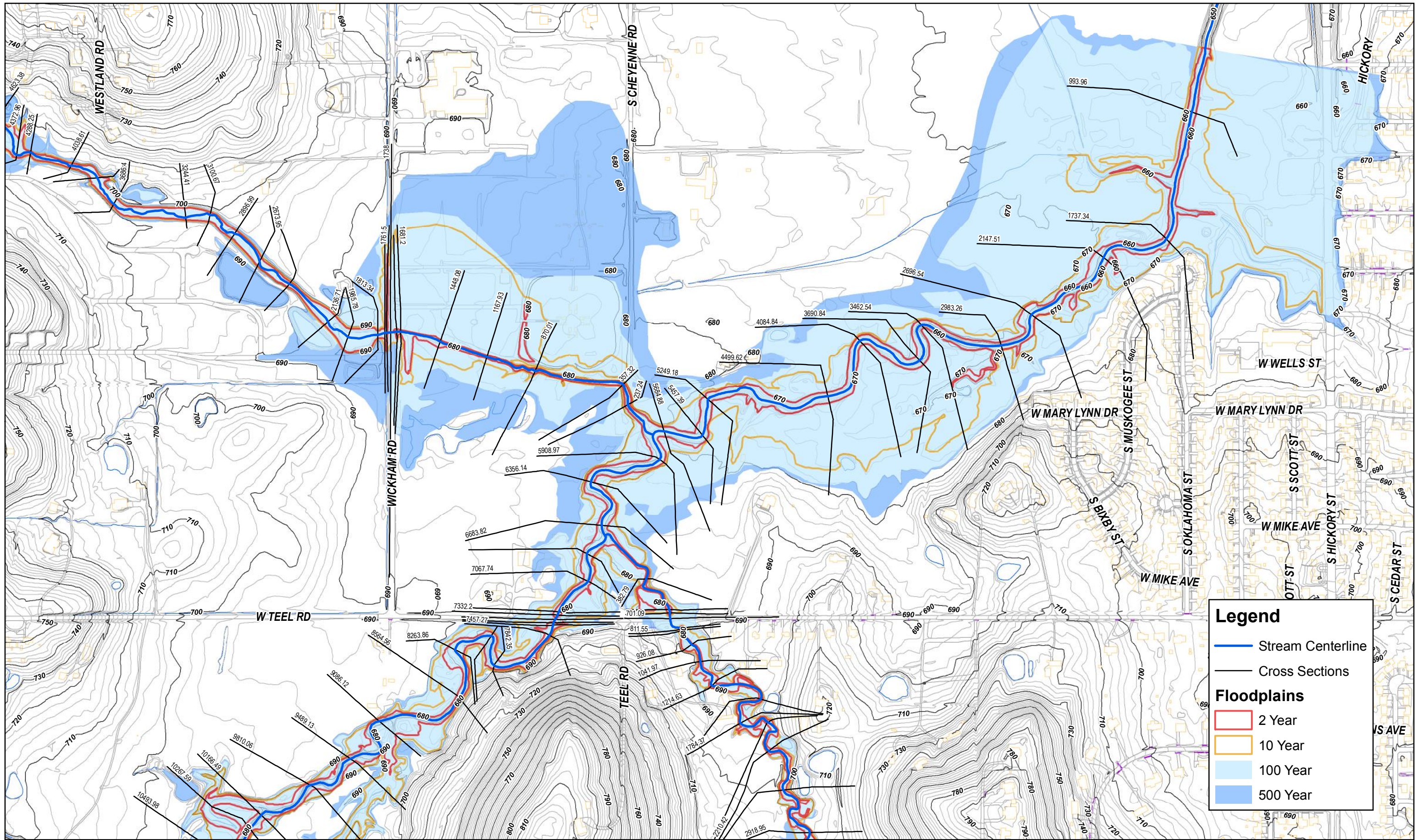
HMS Junction	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year	Drainage Area, mi <sup>2</sup>
R_BVN-08-03	43	84	171	228	301	361	420	552	0.12750
R_BVN-08-03_UP	30	56	110	146	191	228	265	344	0.06809
R_BVN-08-04	18	33	64	85	111	132	153	198	0.03971
R_BVN-08-05	12	24	48	64	84	100	116	150	0.02838
R_BVN-08-06	13	27	56	75	100	119	139	180	0.03322
R_BVN-08-07	13	28	67	93	127	155	183	245	0.05454
R_BVN-08-08	33	66	145	197	266	323	380	506	0.11885
R_BVN-09	440	794	1683	2403	3316	4109	4945	6768	2.97405
R_BVN-09_UP	438	790	1672	2350	3232	3995	4802	6559	2.83684
R_BVN-09-01	13	27	62	86	116	142	168	226	0.05418
R_BVN-09-02	79	147	286	377	494	588	681	884	0.19268
R_BVN-09-03	60	110	214	282	369	439	507	656	0.13192
R_BVN-09-04	27	49	93	122	159	187	216	277	0.05280
R_BVN-09-05	24	45	88	115	151	180	208	269	0.05278
R_BVN-10	427	775	1640	2263	3025	3680	4402	6002	2.59138
R_BVN-11	427	776	1639	2258	3018	3669	4359	5940	2.54614
R_BVN-11_UP	426	773	1618	2224	2970	3606	4255	5710	2.39859
R_BVN-11-01	40	75	152	203	268	322	375	492	0.11134
R_BVN-11-02	24	45	92	122	162	194	226	296	0.06430
R_BVN-11-03	23	42	84	112	148	177	206	271	0.06168
R_BVN-12	424	771	1600	2191	2924	3546	4182	5604	2.28725
R_BVN-12_UP	101	204	449	613	826	1002	1178	1574	0.37828
R_BVN-12-01	38	76	162	219	293	354	415	549	0.12166
R_BVN-12-02	20	40	86	116	157	189	221	292	0.06082
R_BVN-12-03	64	131	293	401	542	659	777	1042	0.25662
R_BVN-12-04	32	66	149	205	278	340	401	538	0.12539
R_BVN-13	379	689	1418	1935	2581	3128	3683	4920	1.79527
R_BVN-13-01	95	177	346	456	598	712	825	1072	0.23576
R_BVN-13-01_UP	68	126	246	325	426	506	586	761	0.15682
R_BVN-13-02	40	72	138	181	237	281	326	421	0.08641
R_BVN-13-03	29	54	108	143	189	226	262	342	0.07041
R_BVN-14	342	623	1283	1749	2332	2828	3328	4443	1.46675
R_BVN-15	333	605	1247	1698	2266	2746	3232	4315	1.36998
R_BVN-15-01	12	24	48	64	85	101	117	152	0.02884
R_BVN-16	320	580	1191	1622	2165	2619	3083	4111	1.26409
R_BVN-17	310	560	1147	1560	2080	2515	2959	3940	1.19381
R_BVN-17-01	8	18	45	63	87	106	127	172	0.04179
R_BVN-17-03	113	210	427	570	754	904	1054	1386	0.33089
R_BVN-17-04	67	131	279	377	504	609	714	947	0.21982
R_BVN-17-05	6	14	33	46	62	77	91	123	0.02866
R_BVN-17-06	16	37	91	128	175	215	255	346	0.08745



**Appendix 6-C. Rock Creek Systems - Bivens Creek Drainage Area  
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 <sup>2</sup>
R_BVN-17-07	9	21	56	81	113	140	168	229	0.05444
R_BVN-17-09	18	34	67	89	117	140	162	211	0.04167
R_BVN-17-10	15	28	58	77	102	122	142	186	0.03969
R_BVN-18	203	356	733	986	1312	1593	1914	2539	0.73001
R_BVN-18_UP	188	328	670	898	1188	1451	1734	2285	0.61436
R_BVN-18-01	56	96	169	215	274	320	365	461	0.09039
R_BVN-18-02	16	27	45	56	70	81	91	113	0.01896
R_BVN-19	172	300	609	814	1069	1313	1553	2027	0.52397
R_BVN-19-01	107	179	334	431	557	651	771	983	0.23337
R_BVN-19-02	125	188	297	366	452	518	583	723	0.15182
R_BVN-19-03	55	81	122	148	180	204	227	277	0.05253
R_BVN-20	58	110	241	331	445	561	661	859	0.21122
R_BVN-20-01	81	126	210	264	332	384	436	548	0.12324
R_BVN-22	30	48	82	103	130	152	172	218	0.04743





**Legend**

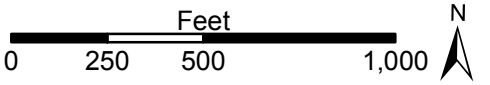
- Stream Centerline
- Cross Sections

**Floodplains**

- 2 Year
- 10 Year
- 100 Year
- 500 Year



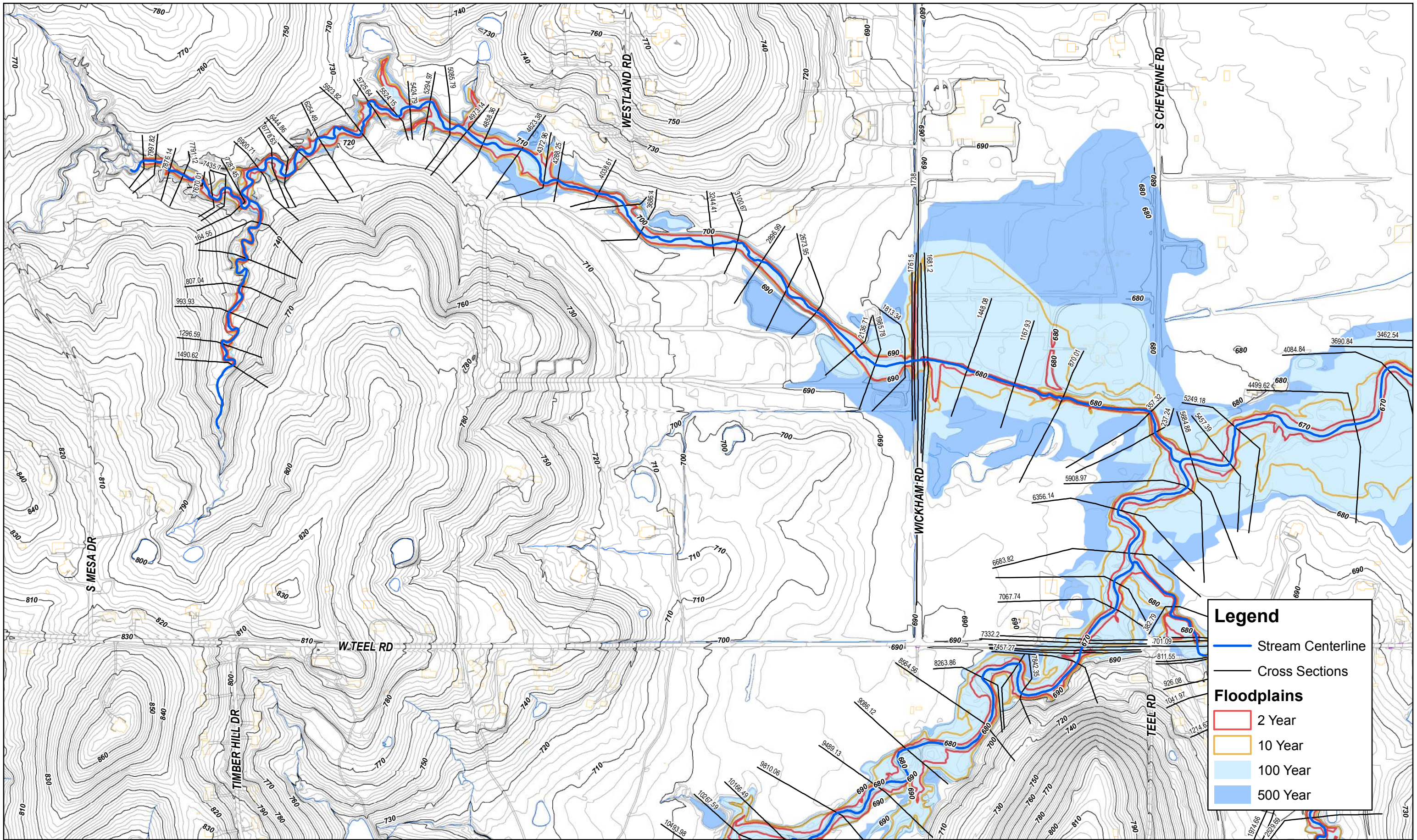
**City of Sapulpa Master Drainage Plan**



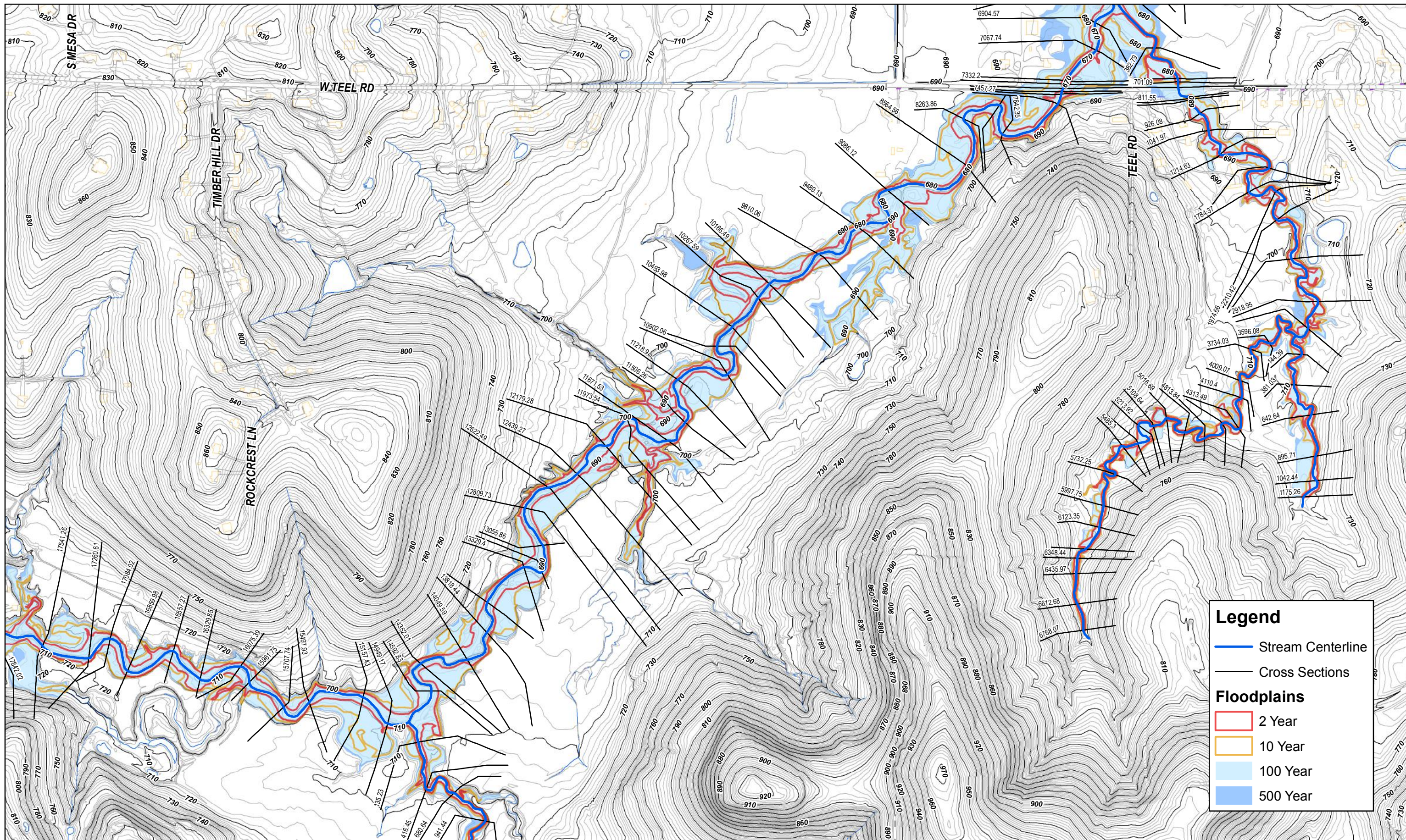
**Bivens Creek Drainage Basin  
Floodplains**











**Legend**

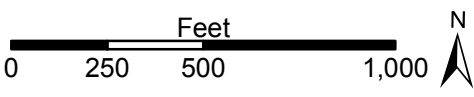
- Stream Centerline
- Cross Sections

**Floodplains**

- 2 Year
- 10 Year
- 100 Year
- 500 Year



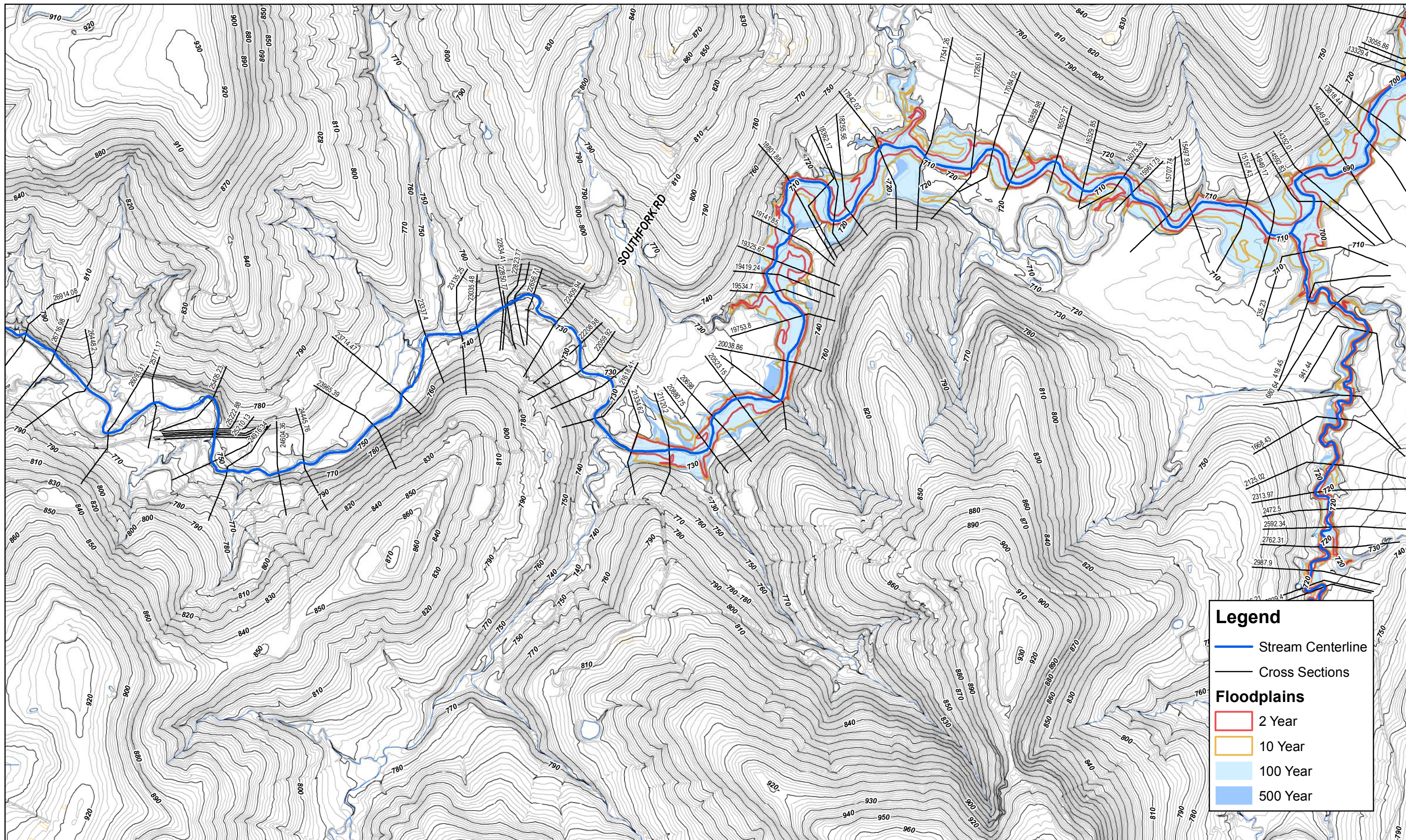
**City of Sapulpa Master Drainage Plan**



**Bivens Creek Drainage Basin  
Floodplains**

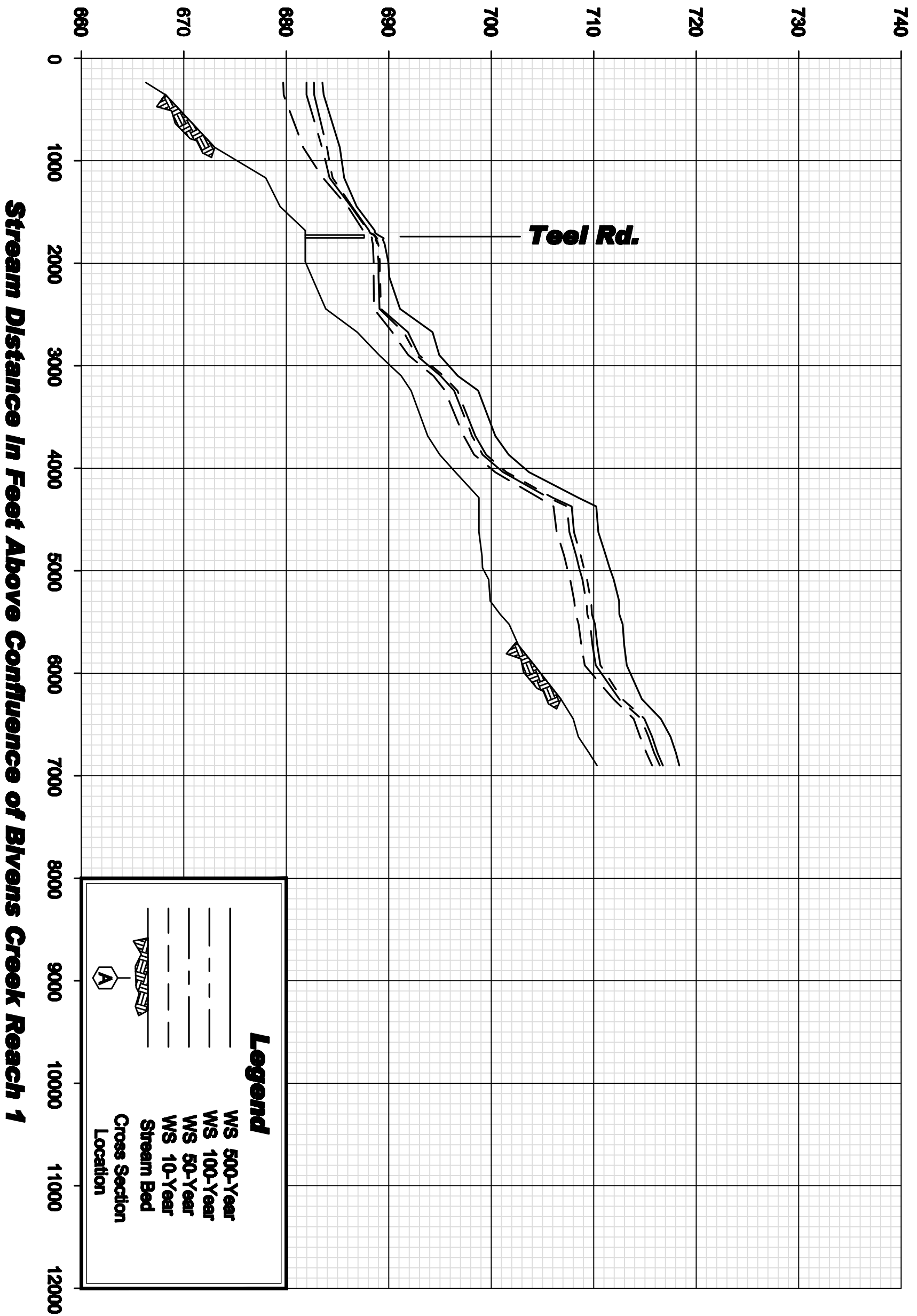








**Elevation  
(Feet NAVD '88)**



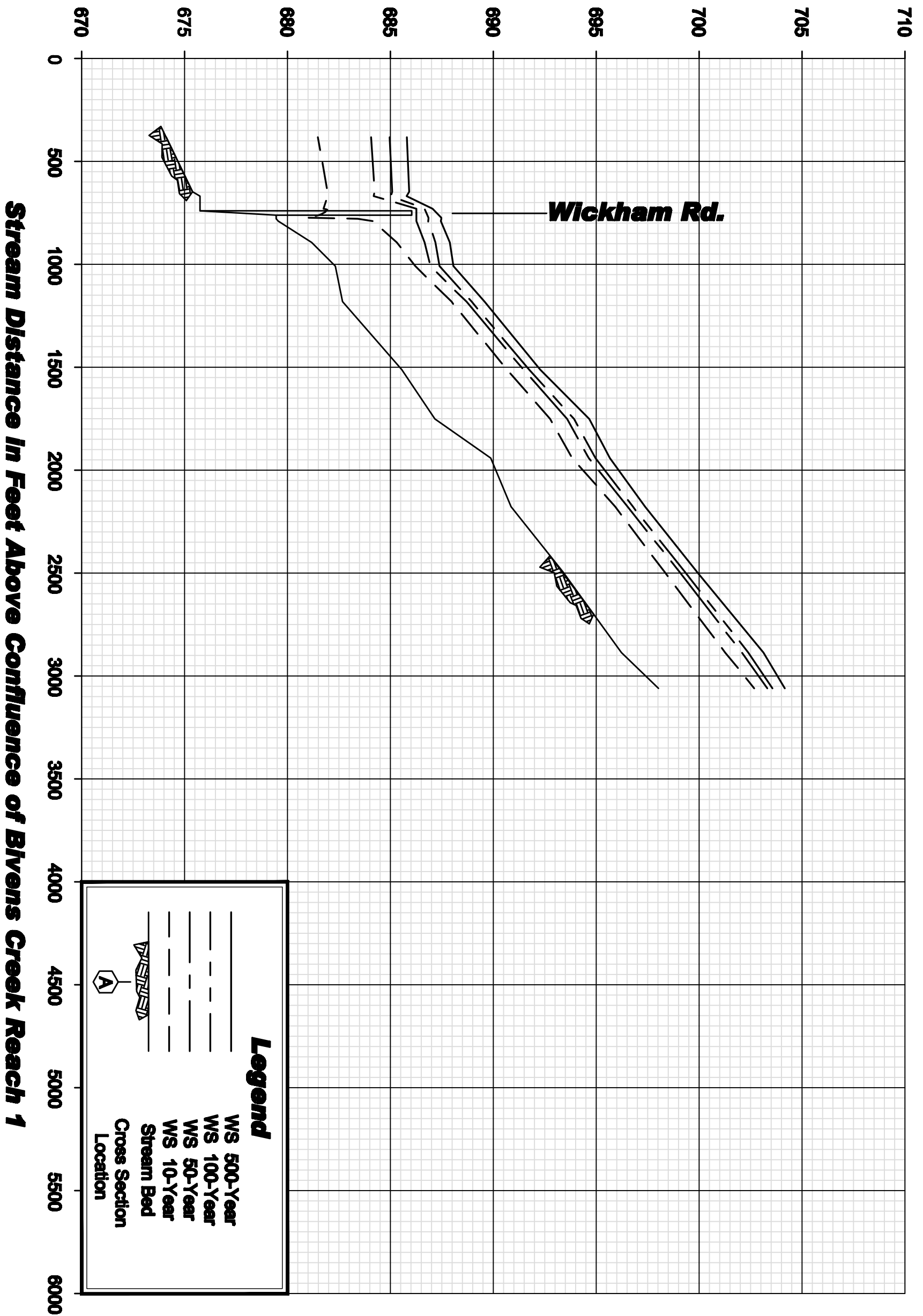
**Legend**

- WS 500-Year
- - - WS 100-Year
- - - WS 50-Year
- - - WS 10-Year
- Stream Bed
- ⬠ Cross Section Location

**City of Sapulpa, OK**  
 PREPARED BY  
**Meshek & Associates, PLC.**  
 1437 S. Boulder Ave. - Suite 1080  
 Tulsa, OK 74119  
 (918) 392-8820

**Appendix 6-E-1  
 Existing Flood Profiles  
 Bivens Creek  
 Tributary A Lower Reach A**

**Elevation  
(Feet NAVD '88)**



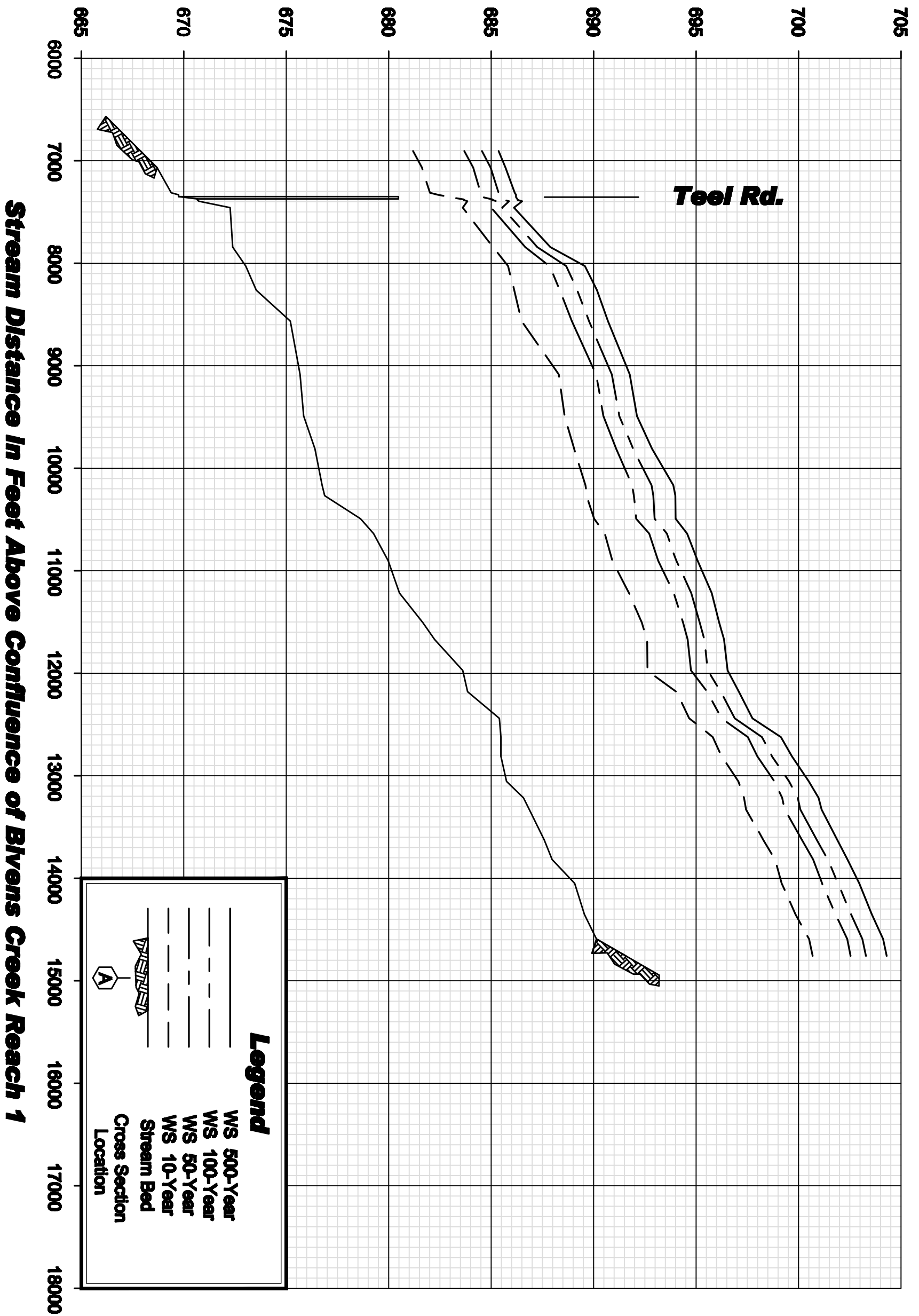
**Legend**

- WS 500-Year
- - - WS 100-Year
- - - WS 50-Year
- - - WS 10-Year
- Stream Bed
- ⬠ Cross Section Location

**City of Sapulpa, OK**  
 PREPARED BY  
**Meshek & Associates, PLC.**  
 1437 S. Boulder Ave. - Suite 1080  
 Tulsa, OK 74119  
 (918) 392-8820

**Appendix 6-E-2  
 Existing Flood Profiles  
 Bivens Creek  
 Tributary B Lower Reach B**

**Elevation**  
**(Feet NAVD '88)**



**City of Sapulpa, OK**

PREPARED BY

**Meshek & Associates, PLC.**

1437 S. Boulder Ave. - Suite 1080  
Tulsa, OK 74119

(918) 392-8820

**Appendix 6-E-3**  
**Existing Flood Profiles**  
**Bivens Creek**  
**Bivens Creek Reach 3**



**City of Sapulpa**

**Appendix 6-F. Bivens Creek Drainage Basin - Problem Area 1 Alternate 1**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	1424	\$ 2.00	\$ 2,848.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	633	\$ 2.50	\$ 1,582.22
3	611.06(K)	SMD INLET	EA	2	\$ 3,500.00	\$ 7,000.00
4	611.06(K)	4'x4' STEEL INLET	EA	4	\$ 3,500.00	\$ 14,000.00
5	613.06(B)	21" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	142	\$ 60.00	\$ 8,520.00
6	613.06(B)	30" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	232	\$ 90.00	\$ 20,880.00
7	613.06(B)	36" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	338	\$ 120.00	\$ 40,560.00
8	613.06(S)	TRENCH EXCAVATION	CY	780	\$ 8.00	\$ 6,238.47
9	613.06(T)	STANDARD BEDDING MATERIAL	CY	411	\$ 20.00	\$ 8,213.32
10	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>						<b>\$ 119,842.01</b>
<b>15% Contingency</b>						<b>\$ 17,976.30</b>
<b>Subtotal</b>						<b>\$ 137,818.32</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 34,454.58</b>
<b>Total</b>						<b>\$ 172,272.89</b>

**City of Sapulpa**

**Appendix 6-F. Bivens Creek Drainage Basin - Problem Area 1 Alternate 2**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	1428	\$ 2.00	\$ 2,856.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	635	\$ 2.50	\$ 1,586.67
3	411.06(A)	PAVEMENT REPLACEMENT	SY	69	\$ 50.00	\$ 3,466.67
4	611.06(K)	SMD INLET	EA	3	\$ 3,500.00	\$ 10,500.00
5	611.06(K)	4'x4' STEEL INLET	EA	7	\$ 3,500.00	\$ 24,500.00
6	613.06(B)	36" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	558	\$ 120.00	\$ 66,960.00
7	613.06(B)	42" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	156	\$ 162.00	\$ 25,272.00
8	613.06(S)	TRENCH EXCAVATION	CY	1019	\$ 8.00	\$ 8,148.64
9	613.06(T)	STANDARD BEDDING MATERIAL	CY	555	\$ 20.00	\$ 11,095.56
10	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
11	619.06(B)	PAVEMENT REMOVAL	SY	69	\$ 7.00	\$ 485.33
<b>Subtotal</b>						<b>\$ 164,870.87</b>
<b>15% Contingency</b>						<b>\$ 24,730.63</b>
<b>Subtotal</b>						<b>\$ 189,601.50</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 47,400.37</b>
<b>Total</b>						<b>\$ 237,001.87</b>

**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 1 Alternate 3**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	1480	\$ 2.00	\$ 2,960.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	658	\$ 2.50	\$ 1,644.44
3	411.06(A)	PAVEMENT REPLACEMENT	SY	69	\$ 50.00	\$ 3,466.67
4	611.06(K)	SMD INLET	EA	3	\$ 3,500.00	\$ 10,500.00
5	611.06(K)	4'x4' STEEL INLET	EA	9	\$ 3,500.00	\$ 31,500.00
6	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	27	\$ 70.00	\$ 1,890.00
7	613.06(B)	42" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	375	\$ 162.00	\$ 60,750.00
8	613.06(B)	48" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	338	\$ 220.00	\$ 74,360.00
9	613.06(S)	TRENCH EXCAVATION	CY	1083	\$ 8.00	\$ 8,667.33
10	613.06(T)	STANDARD BEDDING MATERIAL	CY	673	\$ 20.00	\$ 13,466.40
11	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
12	619.06(B)	PAVEMENT REMOVAL	SY	69	\$ 7.00	\$ 485.33
<b>Subtotal</b>						<b>\$ 219,690.18</b>
<b>15% Contingency</b>						<b>\$ 32,953.53</b>
<b>Subtotal</b>						<b>\$ 252,643.70</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 63,160.93</b>
<b>Total</b>						<b>\$ 315,804.63</b>

**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 2 Alternate 1**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	190	\$ 2.00	\$ 380.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	84	\$ 2.50	\$ 211.11
3	611.06(K)	4'x4' STEEL INLET	EA	7	\$ 3,500.00	\$ 24,500.00
4	613.06(B)	48" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	95	\$ 220.00	\$ 20,900.00
5	613.06(S)	TRENCH EXCAVATION	CY	181	\$ 8.00	\$ 1,444.28
6	613.06(T)	STANDARD BEDDING MATERIAL	CY	95	\$ 20.00	\$ 1,892.40
7	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>						<b>\$ 59,327.79</b>
<b>15% Contingency</b>						<b>\$ 8,899.17</b>
<b>Subtotal</b>						<b>\$ 68,226.96</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 17,056.74</b>
<b>Total</b>						<b>\$ 85,283.70</b>

**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 2 Alternate 2**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	552	\$ 2.00	\$ 1,104.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	245	\$ 2.50	\$ 613.33
3	411.06(A)	PAVEMENT REPLACEMENT	SY	67	\$ 50.00	\$ 3,333.33
4	611.06(K)	4'x4' STEEL INLET	EA	7	\$ 3,500.00	\$ 24,500.00
5	613.06(B)	18" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	25	\$ 40.00	\$ 1,000.00
6	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	156	\$ 70.00	\$ 10,920.00
7	613.06(B)	54" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	95	\$ 255.00	\$ 24,225.00
8	613.06(S)	TRENCH EXCAVATION	CY	324	\$ 8.00	\$ 2,590.64
9	613.06(T)	STANDARD BEDDING MATERIAL	CY	174	\$ 20.00	\$ 3,480.72
10	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
11	619.06(B)	PAVEMENT REMOVAL	SY	67	\$ 7.00	\$ 466.67
<b>Subtotal</b>						<b>\$ 82,233.70</b>
<b>15% Contingency</b>						<b>\$ 12,335.05</b>
<b>Subtotal</b>						<b>\$ 94,568.75</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 23,642.19</b>
<b>Total</b>						<b>\$ 118,210.94</b>



**City of Sapulpa**

**Appendix 6-F. Bivens Creek Drainage Basin - Problem Area 1 Alternate 1**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	1424	\$ 2.00	\$ 2,848.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	633	\$ 2.50	\$ 1,582.22
3	611.06(K)	SMD INLET	EA	2	\$ 3,500.00	\$ 7,000.00
4	611.06(K)	4'x4' STEEL INLET	EA	4	\$ 3,500.00	\$ 14,000.00
5	613.06(B)	21" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	142	\$ 60.00	\$ 8,520.00
6	613.06(B)	30" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	232	\$ 90.00	\$ 20,880.00
7	613.06(B)	36" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	338	\$ 120.00	\$ 40,560.00
8	613.06(S)	TRENCH EXCAVATION	CY	780	\$ 8.00	\$ 6,238.47
9	613.06(T)	STANDARD BEDDING MATERIAL	CY	411	\$ 20.00	\$ 8,213.32
10	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>						<b>\$ 119,842.01</b>
<b>15% Contingency</b>						<b>\$ 17,976.30</b>
<b>Subtotal</b>						<b>\$ 137,818.32</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 34,454.58</b>
<b>Total</b>						<b>\$ 172,272.89</b>

**City of Sapulpa**

**Appendix 6-F. Bivens Creek Drainage Basin - Problem Area 1 Alternate 2**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	1428	\$ 2.00	\$ 2,856.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	635	\$ 2.50	\$ 1,586.67
3	411.06(A)	PAVEMENT REPLACEMENT	SY	69	\$ 50.00	\$ 3,466.67
4	611.06(K)	SMD INLET	EA	3	\$ 3,500.00	\$ 10,500.00
5	611.06(K)	4'x4' STEEL INLET	EA	7	\$ 3,500.00	\$ 24,500.00
6	613.06(B)	36" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	558	\$ 120.00	\$ 66,960.00
7	613.06(B)	42" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	156	\$ 162.00	\$ 25,272.00
8	613.06(S)	TRENCH EXCAVATION	CY	1019	\$ 8.00	\$ 8,148.64
9	613.06(T)	STANDARD BEDDING MATERIAL	CY	555	\$ 20.00	\$ 11,095.56
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<b>Subtotal</b>						<b>\$ 164,870.87</b>
<b>15% Contingency</b>						<b>\$ 24,730.63</b>
<b>Subtotal</b>						<b>\$ 189,601.50</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 47,400.37</b>
<b>Total</b>						<b>\$ 237,001.87</b>

**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 1 Alternate 3**

ITEM	ITEM NO.	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	TOTAL COST
1	223.06	TEMPORARY SILT FENCE	LF	1480	\$ 2.00	\$ 2,960.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	658	\$ 2.50	\$ 1,644.44
3	411.06(A)	PAVEMENT REPLACEMENT	SY	69	\$ 50.00	\$ 3,466.67
4	611.06(K)	SMD INLET	EA	3	\$ 3,500.00	\$ 10,500.00
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6	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	27	\$ 70.00	\$ 1,890.00
7	613.06(B)	42" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	375	\$ 162.00	\$ 60,750.00
8	613.06(B)	48" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	338	\$ 220.00	\$ 74,360.00
9	613.06(S)	TRENCH EXCAVATION	CY	1083	\$ 8.00	\$ 8,667.33
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11	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
12	619.06(B)	PAVEMENT REMOVAL	SY	69	\$ 7.00	\$ 485.33
<b>Subtotal</b>						<b>\$ 219,690.18</b>
<b>15% Contingency</b>						<b>\$ 32,953.53</b>
<b>Subtotal</b>						<b>\$ 252,643.70</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 63,160.93</b>
<b>Total</b>						<b>\$ 315,804.63</b>

**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 2 Alternate 1**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	190	\$ 2.00	\$ 380.00
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7	619.06(B)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	\$ 10,000.00	\$ 10,000.00
<b>Subtotal</b>						<b>\$ 59,327.79</b>
<b>15% Contingency</b>						<b>\$ 8,899.17</b>
<b>Subtotal</b>						<b>\$ 68,226.96</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 17,056.74</b>
<b>Total</b>						<b>\$ 85,283.70</b>



**City of Sapulpa**

**Appendix 6-D. Bivens Creek Drainage Basin - Problem Area 2 Alternate 2**

<b>ITEM</b>	<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>TOTAL</b>	<b>UNIT PRICE</b>	<b>TOTAL COST</b>
1	223.06	TEMPORARY SILT FENCE	LF	552	\$ 2.00	\$ 1,104.00
2	230.06(A)	SOLID SLAB BERMUDA SODDING	SY	245	\$ 2.50	\$ 613.33
3	411.06(A)	PAVEMENT REPLACEMENT	SY	67	\$ 50.00	\$ 3,333.33
4	611.06(K)	4'x4' STEEL INLET	EA	7	\$ 3,500.00	\$ 24,500.00
5	613.06(B)	18" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	25	\$ 40.00	\$ 1,000.00
6	613.06(B)	24" C76 CL IV RCP W/ OMNIFLEX GASKETS	LF	156	\$ 70.00	\$ 10,920.00
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<b>Subtotal</b>						<b>\$ 82,233.70</b>
<b>15% Contingency</b>						<b>\$ 12,335.05</b>
<b>Subtotal</b>						<b>\$ 94,568.75</b>
<b>25% Utility Relocation Contingency</b>						<b>\$ 23,642.19</b>
<b>Total</b>						<b>\$ 118,210.94</b>