

SECTION VIII

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## VIII. IMPLEMENTATION

The Pine Creek Basin stormwater management plan involves a program of implementation that includes a reasonable staged construction for the proposed facilities both within the detailed study area and in the Exterior Basin and North Cottonwood Creek areas. A good implementation plan will allow for the orderly development of the basin, will distribute major construction costs over a reasonable time period, will prioritize the construction of facilities necessary to protect the safety of the public both in the study area and downstream, and will assure compliance with the jurisdictional guidelines of the City of Colorado Springs, Colorado Department of Highways, U.S. Air Force Academy, and El Paso County. The Drainage Plan and the Exterior Basin Plan show the ultimate fully developed and improved stormwater management systems for Pine Creek. The implementation items discussed in this section focus primarily on improvements below State Highway 83. The improvements upstream will for the most part follow an orderly sequence based on Subdivision and development of the various land uses in a manner that addresses an adequate outfall point for the developed runoff quantities.

The historic runoff quantity for the 24 hour, 100 year storm at State Highway 83 (Point No. 12) has been estimated in this study to be 1210 CFS. This is the point where flows leave the detailed study area which is likely to experience development and enter the U.S. Air Force Academy property. A letter dated November 3, 1986 from the Academy commenting on the preliminary submittal of this study indicated that downstream facilities must be in place prior to release of flows in excess of historic at this subject point. In a letter dated April 28, 1986 from the Colorado Department of Highways again commenting on this study, they indicated improvements to the Academy Boulevard box culvert (at the Sheraton Inn) are a condition of approval of the Pine Creek Study. The obvious conclusion from these jurisdictional comments is that the primary Basin management goal for this particular Drainage Basin is one of limiting a peak discharge

from the detailed study area at State Highway 83 to historic or below for as long a period of time as possible. This will allow ample time for planning, design, budgeting, and funding for the downstream facilities that have been defined in this study.

Construction of the Briargate interchange on I-25 is anticipated to be completed in late summer 1987. Construction of Briargate Parkway from State Highway 83 to Chapel Hills Drive is scheduled for calendar year 1989. This construction is proposed to include the embankment placement creating Detention Facility No. 1. The permanent outlet works would also be a part of this construction. Outlet works are proposed to be installed at Facility No. 1 in a manner to restrict discharge to historic levels at State Highway 83 (1210 CFS) while allowing the facility to function up to the design parameters established in this study. The Subbasin 25 (Business Campus Area) outfall system is not proposed to be routed through the Detention facility in its permanent configuration, therefore a temporary re-route in Explorer Drive and the Briargate Parkway system is also recommended. Since a small portion of this subbasin system cannot be routed into the pond, even the temporary route, restriction to the Detention Facilities outlet works must be designed to result in a combined discharge onto the U.S. Air Force Academy at the historic rate. This temporary storm system re-routing would allow considerable development upstream of the Facility No. 1 and in a majority of the Business Campus area while restricting discharge to historic rates.

Based on the current Briargate Development Group's five year development forecast, the development could conceivably occur for as much as seven years before the limits of Facility No. 1 are reached. It is estimated that up to 1500 acres could be developed prior to this occurrence if the development is a good mix of land usages. Obviously, if all of the Research and Development land developed first, the historic discharge would be reached prior to the 1500 acres. On the other hand, if the majority of development is residential, then more than 1500 acres could be developed

before reaching historic discharge. It is recommended that when approximately 1000 acres is developed, the basin be re-analyzed to determine how much additional development can occur in the basin. Based on that information, a time frame could be defined for that additional development that would set the time for construction of the downstream facilities.

The major channel improvements included in the Cottonwood Creek North Section VI for discussion and included for funding from the Cottonwood Creek fee structure are proposed to be completed in the following general sequence. The major channel would be inventoried as to existing conditions. This should include existing erosion, potential bank erosion, streambed condition relative to bedrock, ownership, and construction/maintenance accessibility. The proposed channel improvements (1979 study) include riprap protected sides with a natural bottom. This protection would likely be more necessary in the predetermined problem areas and not for the full length of the main channel as discussed in Section VI. Construction in the problem areas should be scheduled to be completed prior to the upstream discharge from Pine Creek exceeding the 100 year historic rate of 1210 CFS. It is very important to note that this recommendation does not take into account any contribution from either the Chapel Hills Mall system or the North Cottonwood Creek outfall. Additional flows generated in these contributing basins have apparently been aggravating downstream erosion problems that very likely will necessitate improvements in the main channel long before the contribution of flows in excess of historic by Pine Creek occur.

The relocation and construction of an adequate box culvert at the Academy Boulevard crossing is perhaps the most sensitive Basin implementation issue within this Study. Historic capacity is questionable with entrance and particularly exit conditions being the most notable deficiencies. The Academy Boulevard box culvert needs to be in place and operational prior to when the 100 year peak discharge from upstream exceeds historic flow rates and possibly earlier due to the past damage and potential additional damage that may occur immediately downstream.

Improvements to facilities between Academy Boulevard and State Highway 83 are proposed to be implemented in the following sequence. The extension of the existing concrete channel both upstream and downstream would be completed to the larger cross-section prior to the time 100 year flows in excess of historic are exceeded at State Highway 83. The improvement of the existing cross-section either by side slope extension with concrete or riprap, or by installation of vertical walls would be completed prior to when channel capacity - including freeboard - is exceeded by development. In conjunction with the channel improvements, a plan to preserve the two Air Force Academy ponds must be developed. This plan will require submittal, review, comment and approval by the U.S. Air Force Academy as well as the City and must be in compliance with the 404 permit.

Improvements to the existing State Highway 83 crossing and the construction of the new crossing would be part of the Facility No. 1 outlet works construction. This work may likely be staged to include some entrance/exit improvements to the existing box to accommodate the historic flows until full extension of the outlet and tie-in of the proposed storm sewer to the existing box are necessary. The State Highway 83 crossing (either existing or new) will need to accommodate the flow being proposed to cross the roadway.

The construction of various facilities above the Facility No. 1 structure would occur in the normal urbanization sequence of platting and development. With the implementation of the Detention Facility No. 1 and the storm sewer diversion on a temporary basis to detain to historic rates, a substantial amount of development could occur upstream. This can be quantified by saying peak discharge rates can increase from historic to developed so the difference is detained in the Detention Facility up to the facility's maximum storage capacity as defined in the Hydraulics section of this study while maintaining a historic discharge downstream. When this capacity for storage is exceeded, downstream facilities must be in place to accommodate the greater than historic flows.

END OF SECTION VIII

SECTION IX

DRAINAGE FACILITY CONSTRUCTION  
COST ESTIMATES FOR

## IX. COST ESTIMATE FOR DRAINAGE FACILITY CONSTRUCTION

An engineering cost estimate for all facilities proposed in this study has been prepared and summarized in detail in Exhibit II in the Appendix of this report and condensed in Figure VII at the end of this section. The estimate includes an update of the North Cottonwood Creek area improvements; the Academy Boulevard box culvert reconstruction; the Exterior Basin improvements; the major channel improvements within the study area; and the storm systems within the study area. The estimates for the North Cottonwood Creek area and the Academy Boulevard Box reconstruction are included for information only. These costs will be incorporated into a revised Cottonwood Creek fee structure. The estimate has been developed from unit prices, a tabulation of which is also included at the end of this section, Table II. These unit prices were developed from reviewing bid records for numerous projects within the Briargate Development over the last two (2) years, consulting with Briargate's construction management team, and reviewing the unit costs with local Contractors skilled in the drainage construction trades. It is felt that they accurately represent reasonable unit cost figures for the cost items identified in the study resulting in a reasonable engineering estimate for the Basin.

The drainage facilities are recommended to be constructed in accordance with current City of Colorado Springs Standards and Specifications for inclusion in the City's public maintenance program subject to standard warranties. A contingency is recommended to be added to the unit price cost estimate to cover such items as undefinable facilities not included in this study, unknown soils or subsurface (groundwater) conditions, and the fact that this stage of the planning process and study is still very preliminary. The recommended contingency amount is 5%. In addition, in accordance with current City/County drainage policy, an allowance of 10% for engineering design, bidding, construction observation and construction management has been included.

The unit prices typically include all associate costs for the item in place including labor, material, appurtenances etc. Storm sewer has been estimated using reinforced concrete pipe Class III. It is recognized that there are other acceptable materials that could be hydraulically equivalent and substituted at the time of final design. Inlets are standard City inlets of the size openings indicated. Channels include reinforced concrete by the square foot surface area. The riprap is by the cubic yard in place rather than weight. Guard rail has been added to channel costs where appropriate as a drainage cost. The estimate for structures has been given as a lump sum amount, but has been developed on a per foot unit cost basis for concrete, reinforcing, as well as excavation and backfill.

The cost estimates of the detention facilities have been indicated as lump sum amounts. In the case of No. 1, No. 2, and No. 4 the estimate includes roadway earthwork sufficient to create the embankment and perimeter fencing. There are no costs for outlet facilities since they are adjacent to arterial roadways and included in the Bridge Cost determination or the culvert cost estimate. In the case of No. 3 and No. 5 the outlet facilities were included in the lump sum amount. In no case was the cost of land included in the cost estimate. It was felt that the land cost in this particular Basin should not be a part of the Per Acre Drainage Cost determination since all of the lands the facilities are located on are owned or controlled by one land owner, the Briargate Development Group.

The updated cost estimate for facilities in the North Cottonwood Creek area has been presented herein for information only. Costs for improvements to the Exterior Basin Area (Air Force Academy land) have been included for cost determination, however no acreages have been included.

The Unit Drainage Cost has been developed based on the appropriate estimated costs divided by the eligible basin acreages. The eligible basin acreage has been computed to include all area that has a potential to have costs assessed through the City/County subdivision process. The



following Basin areas have been excluded from the total Basin area for purposes of unit cost determination:

- \* 1. Existing Platted County Subdivision.
- 2. U.S. Military Reservation - Air Force Academy.
- 3. Interstate 25 - within U.S. Air Force Academy.
- 4. Pine Creek Golf Course. (For purpose of this "No Fee" Basin Study only.)
- \*\* 5. County Lands at a 1 acre equivalent per 5 acre lot ratio.

\* The platted subdivisions that were platted under City jurisdiction were done so with the condition that they would be participatory in and subject to Pine Creek basin costs when determined. These acreages are therefore eligible and included.

\*\* The County lands include numerous unplatted residential parcels that are assessed at the 1 acre per 5 acre lot equivalent.

The result is an eligible Basin area of 2597 acres. (See Figure VI at the end of this section.) Based on this acreage and the eligible costs, the Unit Drainage Cost for the Pine Creek Basin is recommended to be \$3,680.00 per acre. (See Figure VII at the end of this section.)

A separate estimate has been prepared for the major channel crossings that have been designated by the Director of Public Works (City Engineer) as Arterial Bridges. The eligible cost for determining the Bridge cost is defined as that portion of the cost that is not a City responsibility. The City's responsibility as defined by Ordinance includes: (1) The percentage of the basin that is platted (City subdivisions only in this case), and (2) The portion of the structure cost in excess of 68 feet in length as measured perpendicular to the roadway centerline up to and not exceeding 120 feet in right-of-way width. Using the eligible costs and eligible acres the Unit Bridge Cost for the Pine Creek Basin is recommended to be \$150.00. (See Figure VIII at the end of this section.)

The unit prices used, cost estimates, and summaries, eligible acreages, and cost computations have all been summarized in tables and figures at the end of this section as indicated. Exhibit II of the Appendix includes the detailed cost estimates data.

**PINE CREEK  
DRAINAGE BASIN PLANNING STUDY  
UNIT PRICE SUMMARY**

DESCRIPTION	UNIT	UNIT PRICE
<u>REINFORCED CONCRETE PIPE</u>		\$
15"	L.F.	19.00
18"	L.F.	22.50
21"	L.F.	25.00
24"	L.F.	27.00
27"	L.F.	30.00
30"	L.F.	48.00
36"	L.F.	53.50
42"	L.F.	60.00
48"	L.F.	76.00
54"	L.F.	98.00
60"	L.F.	130.00
66"	L.F.	150.00
72"	L.F.	170.00
78"	L.F.	190.00
<u>MANHOLES</u>		
5' ID	Ea.	1,450.00
6' ID	Ea.	1,500.00
Junction Box	Ea.	3,000.00
<u>CATCH BASINS</u>		
4' (D-10-R-TYP.)	Ea.	1,950.00
6'	Ea.	2,300.00
8'	Ea.	2,400.00
10'	Ea.	2,800.00
12'	Ea.	3,000.00
14'	Ea.	3,500.00
16'	Ea.	4,000.00
18' & 20'	Ea.	4,600.00
Type "R"	Ea.	2,000.00
Type "C"	Ea.	600.00
<u>CHANNELS</u>		
6" Concrete - Reinforced	S.F.	2.50
Cut-Off-Walls	Ea.	450.00 - 500.00
Earthwork	C.Y.	1.50
Rock Riprap	C.Y.	25.00
<u>REINFORCED CONCRETE BOX CULVERTS</u>		
Concrete	C.Y.	175.00
Steel	Lbs.	0.45
Excavation, Structural	C.Y.	1.75
Backfill, Structural	C.Y.	4.00
Bedding Material	C.Y.	16.00
<u>DETENTION PONDS</u>		
Earthwork	C.Y.	3.00
6' Chain Link Fence	L.F.	8.00
Land Cost		Not included

TABLE III

# **PLATTED AREA TABULATION PINE CREEK DRAINAGE BASIN STUDY AREA**

SUBDIVISION NAME	PLAT BOOK/PG	TOTAL AREA PLAT ACRES	AREA WITHIN BASIN ACRES *
Briargate Subdivision Filing No. 21	V-3/48	24.059	3.09
Briargate Subdivision Filing No. 27	X-3/134	9.774	5.84
Briargate Subdivision Filing No. 37	Z-3/60	42.007	18.40
Briargate Business Campus Filing No. 1	B-4/23	86.422	5.57
Briargate Business Campus Filing No. 2	A-4/134	75.072	7.18
Briargate Business Campus Filing No. 3	A-4/118	7.858	
Briargate Business Campus Filing No. 4	I.P.	51.466	
Research Parkway Subdivision No. 2	X-3/144	13.722	6.86
Gatehouse Village at Briargate Filing No. 5	I.P.	36.748	16.75
Briargate Golf Course Filing No. 1	A-4/136	5.000	
Tall Trees Subdivision	Y-3/179	20.669	
Springcrest	B-2/16	373.51 **	72.59
Kittyhawk Village in Chapel Hills First Filing	I-2/77	42.75	12.78
School District No. 20 9495 Highway 83	Dev.	12.74	
School District No. 20 10215 Lexington Drive	Dev.	22.67	18.77

Dev. = Area Fully Developed but not Platted  
I.P. = Plat in the process of being recorded.

\* WHEN DIFFERENT THAN TOTAL AREA IN PLAT  
\*\* AREA IN THE COUNTY

## EXTERIOR BASIN

SHEET 2 OF 2

**FIGURE VI**  
**SUMMARY OF AREAS**

TOTAL PINE CREEK BASIN AREA 3196 Acres

Basin Area within City of Colorado Springs:	2789 Acres
Basin Area within El Paso County:	190 Acres
Basin Area within U.S. Air Force Academy:	217 Acres

BASIN AREA EXEMPT FROM DRAINAGE COSTS 598.45 Acres

The following areas are totally exempt:

U.S. Air Force Academy	217.0 Acres
Town North Centre Subdivision	14.7 Acres
Springcrest Area (County)	72.59 Acres
Kittyhawk Village (within Basin)	12.75 Acres
Golf Course	187.0 Acres
	504.04 Acres

County Assessment Area (Paritally Exempt):

Total assessment area = 117.41 Acres

Assesment = 117 acres ÷ 5 = 23 acre equivalent

Exempt area = 117.41 acres - 23 acres = 94.41 acres

AREA SUBJECT TO DRAINAGE COSTS 2597.6 Acres

(3196 acres - 598.45 acres)

BASIN AREA EXEMPT FROM BRIDGE COSTS 570.99 Acres

U.S. Air Force Academy	217.0 Acres
Golf Course	187.0 Acres
County Area	94.4 Acres
Springcrest Area	72.59 Acres

AREA SUBJECT TO CITY BRIDGE COSTS 2625.0 Acres  
 (3196 Acres - 571.0 Acres)

NOTE: This is for information only, the  
 Basin is considered a "No Fee" Basin.

## FIGURE VII

**PINE CREEK DRAINAGE BASIN  
BASIN COST SUMMARY**

<u>ITEM</u>	<u>COST</u>
Storm Sewer	\$3,537,194
Major Channels	\$2,139,704
Culverts	\$ 582,800
15% Storm System Contingency on above (See Page i-2)	\$ 974,257
Detention Facilities	\$ 370,000
Wetlands Mitigation (\$60,000 per acre)	\$ 600,000
	-----
Subtotal .....	\$8,204,595
5% Contingenices .....	\$ 410,230
10% Engineering .....	\$ 820,460
	-----
TOTAL .....	\$9,435,285
Preparation of Report:	\$ 125,000
	-----
Total Estimate to Basin:	<b>\$9,560,285</b>
	=====
Drainage Cost/Acre:	$\frac{\$9,560,285}{2597.6 \text{ Ac.}} = \underline{\underline{\$3680/\text{Acre}}}$

NOTE: This is for information only, the  
Basin is considered a "No Fee" Basin.

See Exhibit II for Detailed Cost Estimate

## FIGURE VIII

**PINE CREEK DRAINAGE BASIN  
BRIDGE COST SUMMARY**

Basin Area Subject to City Bridge Cost Participation = 2625.0 Acres

Construction Cost Estimate (Basin) = \$342,215 (Exhibit II-D)

5% Contingencies ..... \$ 17,110

10% Engineering ..... \$ 34,222

Total Cost to Basin ... \$393,547

Bridge Cost/Acre:  $\frac{\$393,547}{2625.0 \text{ Ac.}} = \$150.00/\text{Acre}$

Platted Area Costs: 27.4 acres\* x \$150.00 = \$4,110

Unplatted\*\* Area Costs: 2597.6 acres x \$150.00 = \$389,640

\*Includes Town North Centre Subdivision,  
and Kittyhawk Village.

\*\*Includes area platted recently in which  
Letters of Credit were set up for  
potential fees.

Construction Cost Estimate for  
Arterial Width (City) = \$159,535 (Exhibit II-D)

5% Contingencies ..... \$ 7,977

10% Engineering ..... \$ 15,954

**TOTAL COST TO CITY ..... \$183,466**

NOTE: The City Bridge Cost calculation is for information only, the Basin is considered a "No Fee" Basin, however the City is obligated by Ordinance to fund their amount to the basin.

There are no County Bridge obligations because there are no Major Arterial Road Bridge Structures within the County portion of the Basin.

END OF SECTION IX



## SECTION X

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## X. CONCLUSIONS AND RECOMMENDATIONS

The Pine Creek Drainage Basin is located in the extreme Northeast portion of the current political boundaries of the City of Colorado Springs. This Drainage Basin Planning Study has been prepared in response to the annexation requirements and in accordance with City of Colorado Springs Ordinances.

The Basin is currently in a natural condition with little development. The majority of the detailed studied Basin is under the ownership or control of one developer, The Briargate Development Group. This single ownership feature has the distinct advantages of reliable and consistent masterplanning, a timely sequence for implementation of recommended facilities, and the potential for the Developer to "self administer" the Basin Costs as a "No Fee" Basin within the guidelines of the City of Colorado Springs Subdivision Ordinance. All non-Briargate owned, undeveloped property in the Basin may have separate private agreements with Briargate as to the Basin costs. Private maintenance of natural channels through the Pine Creek Golf Course areas and asthetic maintenance of certain detention facilities is also possible with appropriate agreements with the City.

The Pine Creek Basin will undoubtedly experience extensive urbanization over the next 25 years. The information developed and contained within this study is intended to be a stormwater management plan for the orderly and timely sizing and implementation of stormwater facilities within the Basin study area as well as along the entire outfall route to Monument Creek.

Peak runoff information has been generated by accepted hydrologic methods based on the best development information available. Facilities, both for major channels and minor storm systems have been recommended together with both online and onsite partial stormwater detention. A cost estimate for facility construction, an implementation plan, and a Unit Basin Drainage Cost and Unit Basin Bridge Cost have been computed.

All facilities are subject to re-evaluation at the time of individual subdivision drainage studies and subsequent final design. A contingency amount has been included in the estimate and is intended to cover any unforeseen construction related problems or any other "surprises". All facilities are proposed to be designed and constructed in accordance with current City of Colorado Springs Standards and Specifications. Review and acceptance by interested parties including the U.S. Air Force Academy, Colorado Department of Highways, El Paso County, the Regional Floodplain Administrator, and F.E.M.A. is recommended. Suitable easements for public facilities both in the Study area and through the U.S. Air Force Academy lands are required. All public facilities are recommended to ultimately be included in the public storm system for maintenance purposes.

It is recommended and has been approved by the City/County Drainage Board that the Pine Creek Drainage Basin be a "No Fee" Basin. The administration of the Basin would be consistent with all City Ordinances, Subdivision and Construction Policies with the exception that no drainage or bridge fees would be due and payable and subsequently would not be reimbursable during the platting process. In order to allocate drainage costs to the Pine Creek Basin on a per acre basis the Unit Drainage Cost of \$3680 has been computed and a Unit Bridge Cost of \$150 has been computed on all eligible acres.

The Federal Emergency Management Association (F.E.M.A.) has developed floodplain delineation maps for the Pine Creek Basin. This information has been included as part of this study as Exhibit IV-E. The implementation of the stormwater management plan contained herein will substantially modify those floodplain boundaries. The map revision procedure is quite lengthy and complicated. It is recommended that upon acceptance of this study by the local authorities, application be made by the developer immediately for F.E.M.A. map revisions. It is further recommended that the local regulatory jurisdictions support this map revision process.

The Appendix of this study contains a detailed summary of data used in preparation of this study: hydrology, hydraulics, and detention data. Several maps are also included to illustrate soils and land use data. An Exterior Basin Map and a Basin Map illustrate existing and proposed stormwater management facilities. The report is subject to the conditions set forth herein.

A special thanks from the authors of this study to several local Consultants, The Briargate Development Group, the City of Colorado Springs Engineering Division, El Paso County Department of Public Works, the U.S. Air Force Academy, the Colorado Department of Highways and FEMA. Their input, comments, and guidelines have assisted greatly in the generation of this document.

END OF SECTION X

## APPENDIX

EXHIBIT I

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## **EXHIBIT I:**

### **EXPLANATION & APPLICATION OF ATTACHED COMPUTATIONS**

Exhibit I is divided into 5 sections of computations. The following is a summary of what each section contains and how it relates to the basin as a whole. Some of the discussions also include an explanation of how the computations were arrived at.

1. **EXHIBIT I-A:** This exhibit contains summaries of individual basin calculations (HEC 1) for the 28 basins in a historic condition. Both a 6 hour and a 24 hour storm were used. The historic flows are necessary when computing the 35% onsite detention which is defined as 35% of the difference between historic and developed flows.
2. **EXHIBIT I-B:** This exhibit contains summaries of individual basin calculations (HEC 1) for the 28 basins in a developed condition with no onsite detention. Both a 6 hour and a 24 hour storm were used. Again, these flows were used in the 35% detention computation in basins where it applies.
3. **EXHIBIT I-C:** This exhibit contains individual basin calculations for the 28 basins to determine the adjusted or resultant flows in the basins where there will be 35% onsite detention. In these basins, a percentage was computed for the acreage subject to the onsite detention. The  $Q_5$  and  $Q_{100}$  detained number was calculated by the following equation:

$$((\text{Developed} - \text{Historic}) \times .35) \times \text{basin percentage.}$$

NOTE: The adjusted flows represent the developed flows minus the amount detained. Both a 6 hour and a 24 hour storm were analyzed.

4. **EXHIBIT I-D:** This exhibit contains a tabulation of the accumulative flows calculated in the HEC-1 computer runs for 5 year and 100 year, 6 hour and 24 hour storm events.
5. **APPLICATIONS TO THIS BASIN:**
  - a. All minor facilities were sized based on a 6 hour 5 year storm event.
  - b. All major facilities were sized based on a 24 hour 100 year storm event.
  - c. The time of concentration for a basin or at a point may differ for the 5 year and 100 year storm. All flows were routed overland, in streets, and through facilities. Generally, the 100 year flows are routed overland where 5 year flows are in facilities which causes the 100 year time of concentration to be longer.

- d. In basins where there is 35% onsite detention occurring, the basin's time of concentration has been adjusted to compensate for the lag created by this partial detention.\*\*
- e. For summary points 14 and 15, the "North Cottonwood Creek" flows were converted to a 24 hour storm based on the parameters\* in the Lincoln DeVore Report, then routed and combined with flows from Pine Creek.

\*In Exhibit I-C "Adjusted Flows" were calculated for the 35% detention which are a guideline for the subbasins detention scheme when development occurs. In order to imitate that developed condition, the subbasins time of concentration was lengthened to achieve the desired "adjusted flow".

\*\*(Basin acreage, time of concentration, and curve number)



SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
1	155	0.2421	1.23	70	15	20
2	115	0.1796	1.60	70	9	12
3	230	0.3593	0.71	70	33	45
4A	132.5	0.2062	0.31	70	34	45
4B	93	0.1453	0.24	70	29	37
5	151	0.2359	1.09	70	16	22
6	51	0.0797	0.66	70	8	11
7	168	0.2624	0.81	66	13	19
8	90	0.1406	0.53	67	10	15
9	113	0.1765	0.49	69	18	25
10	94	0.1468	0.48	69	15	22
11	80	0.1250	0.67	65	6	9
12	110	0.1718	0.73	63	5	9
13	106.5	0.1664	0.94	55	1	1
14	189	0.2952	0.83	57	2	4
15	54	0.0843	0.34	65	6	9
16	23	0.0359	0.17	63	2	4

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-A - Individual Basins

6 hr/24 hr Storm: Historic

5 Year

Sheet 1 of 2

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
17	77	0.1203	0.55	55	1	1
18	68	0.1062	0.41	55	1	1
19	141.5	0.2210	1.24	56	1	2
20	169	0.2640	1.07	56	1	3
21	79	0.1234	0.48	60	2	5
22	104	0.1624	1.24	55	1	1
23	161	0.2515	2.02	55	1	1
24	120	0.1874	0.71	63	6	10
25A	56	0.0875	0.73	65	4	6
25B	34	0.0531	0.45	65	3	5
26	109	0.1703	0.80	58	1	3
27	20	0.0312	0.17	58	1	1
28	103	0.1609	0.55	65	8	13

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-A - Individual Basins

6 hr/24 hr Storm: Historic

5 Year

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
1	155	0.2421	1.23	70	64	79
2	115	0.1796	1.60	70	39	48
3	230	0.3593	0.71	70	146	179
4A	132.5	0.2062	0.31	70	161	174
4B	93	0.1453	0.24	70	139	147
5	151	0.2359	1.09	70	68	85
6	51	0.0797	0.66	70	34	42
7	168	0.2624	0.81	66	72	93
8	90	0.1406	0.53	67	58	72
9	113	0.1765	0.49	69	89	108
10	94	0.1468	0.48	69	76	91
11	80	0.1250	0.67	65	37	48
12	110	0.1718	0.73	63	40	53
13	106.5	0.1664	0.94	55	14	22
14	189	0.2952	0.83	57	35	51
15	54	0.0843	0.34	65	42	51
16	23	0.0359	0.17	63	25	26

# Summary of Hydrologic Computations PINE CREEK DRAINAGE BASIN

Exhibit 1-A - Individual Basins  
6 hr/24 hr Storm: Historic  
100 Year

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
17	77	0.1203	0.55	55	15	23
18	68	0.1062	0.41	55	15	25
19	141.5	0.2210	1.24	56	18	26
20	169	0.2640	1.07	56	23	35
21	79	0.1234	0.48	60	30	41
22	104	0.1624	1.24	55	12	17
23	161	0.2515	2.02	55	14	19
24	120	0.1874	0.71	63	45	60
25A	56	0.0875	0.73	65	24	31
25B	34	0.0531	0.45	65	21	27
26	109	0.1703	0.80	58	23	33
27	20	0.0312	0.17	58	13	16
28	103	0.1609	0.55	65	55	70

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-A - Individual Basins

6 hr/24 hr Storm: Historic

100 Year

Sheet 2 of 2

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ. MILES			6 HR.	24 HR.
1	155	0.2421	0.29	81	136	137
2	115	0.1796	0.19	81	142	124
3	230	0.3593	0.19	88	497	371
4A	132.5	0.2062	0.20	84	202	171
4B	93	0.1453	0.24	90	197	163
5	151	0.2359	0.18	89	371	262
6	51	0.0797	0.22	88	98	81
7	168	0.2624	0.27	86	236	221
8	90	0.1406	0.22	84	127	114
9	113	0.1765	0.27	79.5	91	95
10	94	0.1468	0.35	86	107	106
11	80	0.1250	0.23	83	101	94
12	110	0.1718	0.29	85	135	129
13	106.5	0.1664	0.36	84	101	104
14	189	0.2952	0.39	70	41	55
15	54	0.0843	0.15	82	86	66
16	23	0.0359	0.18	75.5	17	17

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-B - Individual Basins

6 hr/24 hr Storm: Developed - No Onsite Detention

5 Year

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ. MILES			6 HR.	24 HR.
17	77	0.1203	0.25	71	26	33
18	68	0.1062	0.16	78.5	76	62
19	141.5	0.2210	0.39	75	55	67
20	169	0.2640	0.18	70.5	69	82
21	79	0.1234	0.27	80.5	70	72
22	104	0.1624	0.35	82	86	90
23	161	0.2515	0.35	83	144	150
24	120	0.1874	0.20	91	314	225
25A	56	0.0875	0.18	91	160	110
25B	34	0.0531	0.15	91	112	72
26	109	0.1703	0.80	58	1	3
27	20	0.0312	0.12	58	1	1
28	103	0.1609	0.55	65	8	13
Chapel Hills Mall Outfall		3.6098	0.62	77	778	944
N. Cottonwood Creek		0.8107	0.55	81	273	311

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-B - Individual Basins

6 hr/24 hr Storm: Developed - No Onsite Detention

5 Year

Sheet 2 of 2

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
1	155	0.2421	0.37	81	318	322
2	115	0.1796	0.24	81	338	300
3	230	0.3593	0.27	88	875	746
4A	132.5	0.2062	0.26	84	424	376
4B	93	0.1453	0.24	90	431	333
5	151	0.2359	0.37	89	464	424
6	51	0.0797	0.28	88	189	163
7	168	0.2624	0.27	86	580	508
8	90	0.1406	0.22	84	331	268
9	113	0.1765	0.27	79.5	277	264
10	94	0.1468	0.35	86	262	241
11	80	0.1250	0.23	83	270	228
12	110	0.1718	0.35	85	291	272
13	106.5	0.1664	0.53	84	190	202
14	189	0.2952	0.39	70	192	223
15	54	0.0843	0.15	82	242	169
16	23	0.0359	0.18	75.5	62	50

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-B - Individual Basins

6 hr/24 hr Storm: Developed - No Onsite Detention  
100 Year

Sheet 1 of 2

SUB-BASIN	AREA		Tc (HR)	CURVE NUMBER (CN)	PEAK FLOW (CFS)	
	ACRES	SQ.MILES			6 HR.	24 HR.
17	77	0.1203	0.25	71	119	125
18	68	0.1062	0.16	78.5	239	178
19	141.5	0.2210	0.46	75	174	193
20	169	0.2640	0.18	70.5	326	283
21	79	0.1234	0.27	80.5	205	192
22	104	0.1624	0.35	82	236	229
23	161	0.2515	0.50	83	286	302
24	120	0.1874	0.30	91	481	411
25A	56	0.0875	0.26	91	253	202
25B	34	0.0531	0.15	91	237	145
26	109	0.1703	0.80	58	23	33
27	20	0.0312	0.12	58	17	17
28	103	0.1609	0.55	65	55	70
Chapel Hills Mall Outfall		3.6098	0.62	77	2503	2861
N. Cottonwood Creek		0.8107	0.55	81	769	843

## Summary of Hydrologic Computations

### PINE CREEK DRAINAGE BASIN

Exhibit 1-B - Individual Basins

6 hr/24 hr Storm: Developed - No Onsite Detention  
100 Year

Sheet 2 of 2



SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
1	155	3.5	2.3	15	136	1.0	64	318	2	132	312
2	115	0	--	--	--	--	--	--	--	--	--
3	230	128	55.6	33	497	90	146	875	142	401	724
4A	132.5	0	--	--	--	--	--	--	--	--	--
4B	93	86	92	29	197	54	139	431	94	140	331
5	151	93	61.3	16	371	76	68	464	85	295	372
6	51	51	100	8	98	32	34	189	54	66	129
7	168	168	100	13	236	78	72	580	178	157	400
8	90	3.7	4.1	10	127	2	58	331	4	123	320
9	113	10.65	9.4	18	91	2	89	277	6	89	269
10	94	63.3	67.3	15	107	22	76	262	44	85	216

### Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 6 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
11	80	42.3	52.9	6	101	18	37	270	43	83	223
12	110	0	--	--	--	--	--	--	--	--	--
13	106.5	14.5	13.6	1	101	5	14	190	8	94	179
14	189	0	--	--	--	--	--	--	--	--	--
15	54	0	--	--	--	--	--	--	--	--	--
16	23	0	--	--	--	--	--	--	--	--	--
17	77	0	--	--	--	--	--	--	--	--	--
18	68	21.3	31.3	1	76	8	15	239	25	67	209
19	141.5	27.4	19.4	1	55	4	18	174	11	51	160
20	169	8.9	5.3	1	69	1	23	326	6	66	315
21	79	58.7	74.3	2	70	18	30	205	46	52	155

# Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 6 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
22	104	43.1	41.4	1	86	12	12	236	32	72	199
23	161	37.8	23.5	1	144	12	14	286	22	129	261
24	120	120	100	6	314	108	45	481	153	204	324
25A	56	56	100	4	160	55	24	253	80	103	169
25B	34	34	100	3	112	38	21	237	76	72	159
26	109	0	--	--	--	--	--	--	--	--	--
27	20	0	--	--	--	--	--	--	--	--	--
28	103	0	--	--	--	--	--	--	--	--	--

# Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 6 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
1	155	3.5	2.3	20	137	1	79	322	2	133	319
2	115	0	--	--	--	--	--	--	--	--	--
3	230	128	55.6	45	371	63	179	746	110	305	637
4A	132.5	0	--	--	--	--	--	--	--	--	--
4B	93	86	92	37	163	41	147	333	60	123	273
5	151	93	61.3	22	262	51	85	424	73	208	348
6	51	51	100	11	81	25	42	163	42	59	119
7	168	168	100	19	221	71	93	508	145	148	360
8	90	3.7	4.1	15	114	1	72	268	3	112	266
9	113	10.7	9.4	25	95	2	108	264	5	92	258
10	94	63.3	67.3	22	106	20	91	241	35	87	206

### Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 24 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
11	80	42.3	52.9	9	94	16	48	228	33	78	189
12	110	0	--	--	--	--	--	--	--	--	--
13	106.5	14.5	13.6	1	104	5	22	202	9	99	191
14	189	0	--	--	--	--	--	--	--	--	--
15	54	0	--	--	--	--	--	--	--	--	--
16	23	0	--	--	--	--	--	--	--	--	--
17	77	0	--	--	--	--	--	--	--	--	--
18	68	21.3	31.3	1	62	7	25	178	17	56	160
19	141.5	27.4	19.4	2	67	4	26	193	11	63	183
20	169	8.9	5.3	3	82	1	35	283	5	80	278
21	79	58.7	74.3	5	72	17	41	192	39	56	147

### Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 24 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

SUB BASIN	TOTAL ACRES	35% DETENTION		Q5			Q100			ADJUSTED FLOWS	
		ACRES	% OF TOTAL	HISTORIC	DEVELOPED	MINIMUM DETAINED	HISTORIC	DEVELOPED	MINIMUM DETAINED	Q5	Q100
22	104	43.1	41.4	1	90	13	17	229	31	77	192
23	161	37.8	23.5	1	150	12	19	302	23	137	277
24	120	120	100	10	225	75	60	411	123	153	280
25A	56	56	100	6	110	36	31	202	60	74	140
25B	34	34	100	5	72	23	27	145	41	50	105
26	109	0	--	--	--	--	--	--	--	--	--
27	20	0	--	--	--	--	--	--	--	--	--
28	103	0	--	--	--	--	--	--	--	--	--

## Summary of Hydrologic Computations - PINE CREEK DRAINAGE BASIN

EXHIBIT I-C 24 HOUR STORM - DEVELOPED (WITH 35% ONSITE DETENTION)  
(INDIVIDUAL BASIN COMPUTATIONS)

POINT	ACCUMULATIVE FLOW - 5 YR.-c.f.s.			COMMENTS
	HISTORIC	DEVELOPED NO DETENTION	DEVELOPED WITH DETENTION	
1	44	572	in=520 out=221	Pond No. 2 at Powers Boulevard (North Fork)
2A	34	342	in=280 out= 174	Pond No. 3 at Street No. 3 (South Fork)
2B	51	885	in=560 out=486	Pond No. 4 at Powers Blvd. (South Fork)
--	--	--	in=493 out=368	Pond No. 5
3	76	1322	595	Union Boulevard/ Briargate Parkway (South Fork)
4	56	725	354	Street #10 (North Fork)
5	84	1542	662	Street #10 (South Fork)
6	136	2372	1112	Street #14 (North & South Forks)
7	137	2399	1151	At Green #10
8	138	2487	1239	Chapel Hills Drive
9	139	2611	in=1407 out=1171	Pond #1 at Briargate Parkway
10	139	2634	1182	Pond No. 1 Outflow at Highway 83
11	6	386	305	Business Campus Outfall at Highway 83
12	145	2906	1344	Combination of 10 & 11 at Air Force Academy Property
13	148	2843	1345	Academy Blvd. Crossing
14	--	2805	1348	Pine Creek at the Chapel Hills Mall Outfall (Not including Chapel Hills Mall Outfall)
15	--	3684	2359	Pine Creek - North Cottonwood Junction

SUMMARY OF HYDROLOGIC COMPUTATIONS (HEC 1 COMPUTER RUNS)  
PINE CREEK DRAINAGE BASIN

EXHIBIT I-D TABULATION OF ACCUMULATIVE FLOWS (6 HOUR)

SHEET 1 of 2

POINT	ACCUMULATIVE FLOW - 100 YR.-c.f.s.			COMMENTS
	HISTORIC	DEVELOPED NO DETENTION	DEVELOPED WITH DETENTION	
1	189	1127	in=1022 out=281	Pond No. 2 at Powers Boulevard (North Fork)
2A	161	758	in=758 out=256	Pond No. 3 at Street No. 3 (South Fork)
2B	277	1583	in=909 out=668	Pond No. 4 at Powers Blvd. (South Fork)
--	--	--	in=686 out=498	Pond No. 5
3	383	2598	1042	Union Blvd./Briargate Parkway (South Fork)
4	268	1592	645	Street #10 (North Fork)
5	440	3117	1265	Street #10 (South Fork)
6	718	4855	2070	Street #14 (North & South Forks)
7	753	5033	2259	At Green #10
8	784	5347	2549	Chapel Hills Drive
9	841	5918	in=3091 out=1865	Pond #1 at Briargate Parkway
10	851	5941	1883	Pond No. 1 Outflow at Highway 83
11	45	668	562	Business Campus Outfall at Highway 83
12	917	6603	2344	Combination of 10 & 11 at Air Force Academy Property
13	949	6603	2353	Academy Blvd. Crossing
14	--	6567	2376	Pine Creek at the Chapel Hills Mall Outfall (Not including Chapel Hills Mall Outfall)
15	--	9399	5557	Pine Creek - North Cottonwood Junction

SUMMARY OF HYDROLOGIC COMPUTATIONS (HEC 1 COMPUTER RUNS)  
PINE CREEK DRAINAGE BASIN

EXHIBIT I-D TABULATION OF ACCUMULATIVE FLOWS (6 HOUR)

SHEET 2 of 2



POINT	ACCUMULATIVE FLOW - 5 YR.-c.f.s.			COMMENTS
	HISTORIC	DEVELOPED NO DETENTION	DEVELOPED WITH DETENTION	
1	60	487	in=428 out=225	Pond No. 2 at Powers Boulevard (North Fork)
2A	46	293	in=268 out=178	Pond No. 3 at Street No. 3 (South Fork)
2B	79	703	in=499 out=472	Pond No. 4 at Powers Blvd. (South Fork)
--	--	--	in=483 out=379	Pond No. 5
3	111	1094	590	Union Boulevard/Briargate Parkway (South Fork)
4	84	652	360	Street #10 (North Fork)
5	126	1264	652	Street #10 (South Fork)
6	207	1964	1107	Street #14 (North & South Forks)
7	211	2013	1157	At Green #10
8	212	2137	1268	Chapel Hills Drive
9	220	2332	in=1458 out=1256	Pond #1 at Briargate Parkway
10	221	2319	1271	Pond No. 1 Outflow at Highway 83
11	10	346	285	Business Campus Outfall at Highway 83
12	232	2615	1473	Combination of 10 & 11 at Air Force Academy Property
13	236	2534	1467	Academy Blvd. Crossing
14	--	2501	1457	Pine Creek at the Chapel Hills Mall Outfall (Not including Chapel Hills Mall Outfall)
15	--	3635	2635	Pine Creek - North Cottonwood Junction

SUMMARY OF HYDROLOGIC COMPUTATIONS (HEC 1 COMPUTER RUNS)  
PINE CREEK DRAINAGE BASIN

EXHIBIT I-D TABULATION OF ACCUMULATIVE FLOWS (24 HOUR) SHEET 1 of 2

POINT	ACCUMULATIVE FLOW - 100 YR.-c.f.s.			COMMENTS
	HISTORIC	DEVELOPED NO DETENTION	DEVELOPED WITH DETENTION	
1	235	1011	in=944 out=289	Pond No. 2 at Powers Boulevard (North Fork)
2A	177	672	in=672 out=265	Pond No. 3 at Street No. 3 (South Fork)
2B	322	1402	in=855 out=671	Pond No. 4 at Powers Blvd. (South Fork)
--	--	--	in=691 out=509	Pond No. 5
3	476	2274	1049	Union Boulevard/Briargate Parkway (South Fork)
4	364	1446	683	Street #10 (North Fork)
5	563	2681	1251	Street #10 (South Fork)
6	949	4240	2124	Street #14 (North & South Forks)
7	995	4494	2321	At Green #10
8	1032	4865	2695	Chapel Hills Drive
9	1119	5557	in=3269 out=2028	Pond #1 at Briargate Parkway
10	1118	5571	2052	Pond No. 1 Outflow @ Hwy. 83
11	61	633	542	Business Campus Outfall at Highway 83
12	1210	6212	2536	Combination of 10 & 11 at Air Force Academy Property
13	1252	6067	2542	Academy Blvd. Crossing
14	--	5966	2559	Pine Creek at the Chapel Hills Mall Outfall (Not including Chapel Hills Mall Outfall)
15	--	9518	6095	Pine Creek - North Cottonwood Junction
16	--	--	6589	Junction with Monument Creek

SUMMARY OF HYDROLOGIC COMPUTATIONS (HEC 1 COMPUTER RUNS)  
PINE CREEK DRAINAGE BASIN

EXHIBIT I-D TABULATION OF ACCUMULATIVE FLOWS (24 HOUR)

SHEET 2 of 2

EXHIBIT II

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(FACILITIES  
INVENTORY  
AND COST  
ESTIMATES)

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
1		No Street - North of Old Ranch Road		30 CFS	24" RCP	670 LF	1-8' 1-10'	1 Manhole	\$24,740
1		Old Ranch Road		50 CFS	18" RCP 24" RCP 30" RCP	150 LF 190 LF 650 LF	1-6' 1-8' 2-10' 1-16'	1 Manhole	\$55,505
1		No Street - Old Ranch Road To Street #2		78 CFS	18" RCP 30" RCP	350 LF 1050 LF	1-4' 1-6' 1-8' 1-10'	2 Manholes	\$70,725
1		No Street - Street #2 to Street #3		120 CFS	18" RCP 36" RCP	240 LF 1100 LF	2-6' 2-8' 1-12'	2 Manholes	\$79,650
1		Street #8		138 CFS	18" RCP 42" RCP	300 LF 900 LF	3-6' 1-12'	2 Manholes	\$73,650
2		No Street- North of Old Ranch Road		25 CFS	18" RCP	340 LF	2-6'		\$12,250
2		Old Ranch Road		40 CFS	18" RCP 27" RCP	80 LF 840 LF	1-6' 1-8' 2-10'	1 Manhole	\$38,800
2		No Street Old Ranch Road To Street #1		67 CFS	30" RCP	860 LF		1 Manhole	\$42,780

SHEET TOTAL: \$398,100

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
2		No Street - North of Street #1		20 CFS	18" RCP	280 LF	1-6' 1-8'		\$11,000
2		Street #1		40 CFS	18" RCP 24" RCP 30" RCP	110 LF 1090 LF 100 LF	2-6' 1-8' 1-10'	1 Manhole	\$48,005
3		Union Boulevard Street #1 to Street #3		85 CFS	18" RCP 27" RCP	300 LF 1800 LF	1-6' 1-8' 1-10' 1-16'	3 Manholes	\$76,750
3		No Street - East of the Union/Street #3 Intersection		30 CFS	24" RCP	480 LF	1-6' 1-10'		\$18,060
3		Union Blvd. Street #3 Intersection		174 CFS	18" RCP 42" RCP	130 LF 290 LF	1-6' 1-8' 1-10' 1-14'	Junction Manhole	\$34,325
3		No street - North & South of Union Blvd.		35 CFS	18" RCP 24" RCP 27" RCP	180 LF 60 LF 210 LF	1-8' 1-10' 1-16'		\$20,870
3		No Street - Street #8 to Channel		152 CFS	18" RCP 42" RCP	120 LF 760 LF	2-8'		\$53,100
3		Powers Boulevard At Union Blvd.		60 CFS	18" RCP 24" RCP 30" RCP	150 LF 550 LF 500 LF	1-6' 1-8' 1-10' 1-14' 1-16'	1 Manhole	\$58,725

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$320,835

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

SHEET 2 OF 11

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
3	1	Powers Blvd. at Pond #2		30 CFS	24" RCP	180 LF	2-8'		\$ 9,660
4 A		No Street - Street #1 to Street #4		130 CFS	18" RCP 36" RCP	100 LF 1080 LF	4-6'	2 Manholes	\$72,230
4 A		No Street - North of Street #5		15 CFS	18" RCP	280 LF	1-6' 1-8'		\$11,000
4 A		Street #7		30 CFS	18" RCP 24" RCP	80 LF 550 LF	3-6' 1-10'		\$26,350
4 A		No Street - Street #7 to Pond #3		35 CFS	18" RCP 24" RCP 27" RCP	270 LF 660 LF 150 LF	1-4' 1-6' 1-8'		\$35,045
4 A	2A	Street #3 at Pond #3		20 CFS	18" RCP	120 LF	1-8' 1-10'		\$ 7,900
4 B		No Street - North of Pond #4 to Channel		--	18" RCP 24" RCP	210 LF 850 LF	2-6' 1-8' 2-10'		\$40,275
4 B	2 B	Powers Blvd. at Pond #4		22 CFS	18" RCP 48" RCP	100 LF 380 LF	1-10' 1-14'		\$37,430

SHEET TOTAL: \$239,890

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
5		No Street - Street #6 to Street #3		15 CFS	18" RCP 21" RCP 24" RCP	1180 LF 300 LF 60 LF	4-6' 1-8' 1-10'	2 Manholes	\$51,970
5		No Street Street #3 to Briargate Pkwy.		45 CFS	18" RCP 27" RCP 30" RCP	150 LF 400 LF 580 LF	1-6' 1-8'	1 Manhole	\$49,415
5		No Street South of Briargate Pkwy.		40 CFS	18" RCP 24" RCP	950 LF 375 LF	2-4' 3-6'	1 Manhole	\$43,750
5		Briargate Pkwy. West to Powers		159 CFS	18" RCP 24" RCP 42" RCP	120 LF 50 LF 2000 LF	1-6' 2-8' 1-12'	5 Manholes	\$141,650
5		Powers Blvd. Briargate Pkwy. Intersection		229 CFS	18" RCP 24" RCP 42" RCP 48" RCP	130 LF 70 LF 70 LF 70 LF	1-6' 1-10' 1-16'	Junction Manhole	\$26,435
6		Briargate Pkwy. West to Austin Bluffs		29 CFS	18" RCP 24" RCP 27" RCP	110 LF 850 LF 680 LF	1-6' 1-8' 1-10' 1-12'	3 Manholes	\$60,725
6		Austin Bluffs to Briargate Parkway		15 CFS	18" RCP	420 LF	1-8'		\$11,850
6		Austin Bluffs/ Briargate Intersection		67 CFS	18" RCP 36" RCP	160 LF 140 LF	1-8' 1-10' 1-12'	Junction Manhole	\$22,290

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$408,085

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
8		No Street - South of Briargate Pkwy.		20 CFS	24" RCP	230 LF	2-6'		\$10,810
8		Briargate Pkwy. West to Union		25 CFS	24" RCP	780 LF	1-8'	1 Manhole	\$24,910
8		No Street - Southeast of Union/Street #10 Intersection		15 CFS	24" RCP	140 LF	1-16'		\$ 7,780
8		Union Blvd. North to Briargate		66 CFS	24" RCP 36" RCP	70 LF 670 LF	2-8' 1-16'	1 Manhole	\$48,035
8	3	Union Blvd/ Briargate Intersection		91 CFS	18" RCP 36" RCP 42" RCP	100 LF 50 LF 120 LF	2-10' 1-14'	Junction Manhole	\$24,225
9		No Street-West of Powers/Union Intersection		15 CFS	24" RCP	280 LF	2-8'		\$12,360
9		No Street- Street #9 South to Channel		35 CFS	18" RCP 24" RCP 27" RCP	165 LF 310 LF 120 LF	2-6' 2-8'		\$25,082
9	4	No Street - East of Street #10, North of Channel		20 CFS	18" RCP	430 LF	2-4' 3-6' 1-12'		\$23,475

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$176,677

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY



LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
10		No Street - Union Blvd. North to Channel		30 CFS	18" RCP	650 LF	2-8' 1-12'		\$22,425
10	4	No Street - East of Street #10, South of Channel		25 CFS	24" RCP	220 LF	2-8'		\$10,740
11	5	Briargate Pkwy./ Street #10 Intersection		15 CFS	18" RCP	60 LF	2-8'		\$ 6,150
12	3	Briargate Pkwy and South		30 CFS	18" RCP 24" RCP	120 LF 140 LF	2-8' 1-10'		\$14,080
12		Street #10 and South		25 CFS	24" RCP	280 LF	1-8' 2-10' 1-16'		\$19,560
12		No Street - Street #10 to Briargate Pkwy.		53 CFS	18" RCP 36" RCP	60 LF 520 LF	1-6' 1-10'	1 Manhole	\$35,770
12	5	Briargate Pkwy. West to Street #10 Intersection		70 CFS	18" RCP 36" RCP	100 LF 900 LF	2-8'	2 Manholes	\$58,200
12	5	Briargate Pkwy/ Street #10 Intersection		108 CFS	18" RCP 24" RCP 42" RCP	100 LF 175 LF 110 LF	1-6' 1-10' 2-14'	Junction Manhole	\$28,675

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$195,600

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				ESTIMATED COST
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	
13		No Street - Sanguine Drive North to Briargate Pkwy		45 CFS	18" RCP 24" RCP 30" RCP	850 LF 680 LF 540 LF	4-4', 2-6' 2-8' 1-10' 1-16'	Junction Manhole 1 Manhole	\$91,855
13		Briargate Pkwy.		63 CFS	18" RCP 24" RCP 36" RCP 42" RCP	210 LF 1230 LF 915 LF 60 LF	1-4', 2-6' 1-8', 2-10' 1-12'	4 Manholes Junction Manhole	\$113,937
13	5	No Street - South of Briargate Pkwy.		30 CFS	18" RCP	900 LF	2-4' 4-6'		\$33,350
14	Green #2	Street #12/ Street #13 Intersection			18" RCP 24" RCP	80 LF 100 LF	2-6' 1-8'		\$11,500
14	Green #1	Street #12			18" RCP 36" RCP	50 LF 150 LF	2-6'		\$13,750
14		Street #15			27" RCP	520 LF	1-14'		\$19,100
14	6	No Street			18" RCP	230 LF	1-6'		\$ 7,475
16	6	No Street			18" RCP 21" RCP	160 LF 270 LF	1-6' 1-8'		\$15,050

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$306,017

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

SHEET 7 OF 11

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
17		Chapel Hills Drive		70 CFS	18" RCP 30" RCP 36" RCP	50 LF 1310 LF 150 LF	1-12' 1-14'	3 Manholes	\$83,030
17	Green #11	Street #17			24" RCP	100 LF	2-8'		\$ 7,500
18		Chapel Hills Drive		50 CFS	24" RCP	720 LF	2-8' 2-12'	1 Manhole	\$31,690
19		Chapel Hills Drive		50 CFS	24" RCP 30" RCP	210 LF 1350 LF	1-8' 2-12' 2-14' 1-16'	3 Manholes	\$94,370
20	Green #15	No Street		15 CFS	18" RCP	250 LF	2-4'		\$9,525
20	Green #14	Springcrest Rd. South to Channel	1-6' & 1-8' CB 620 LF 18" RCP					Existing facilities are adequate Tall Trees Subd. Outfall(5 yr. system)	
21	9	No Street - Explorer Drive North to Channel		20 CFS	18" RCP	510 LF	1-6' 1-12'		\$16,775
22		No Street South of Briargate Pkwy.		15 CFS	18" RCP	770 LF	1-4' 4-6'		\$28,475

SHEET TOTAL: \$271,365

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
22		Briargate Pkwy.		25 CFS	18" RCP 24" RCP	150 LF 1050 LF	1-8' 2-12' 1-14'	4 Manholes	\$49,425
22		Chapel Hills Drive / Telstar Dr.		49 CFS	36" RCP 24" RCP	1230 LF 700 LF	4-14' 1-10'	3 Manholes	\$105,955
23		Summerset Drive		100 CFS	24" RCP 30" RCP	60 LF 710 LF	1-10' 1-12' 1-20'	1 Manhole	\$47,600
23		Research Parkway	1-4', 1-6', 3-8' CBS 454 LF-18" RCP	123 CFS	18" RCP 42" RCP 48" RCP	350 LF 2000 LF 100 LF	1-6' 2-12' 1-16' 1-18'	5 Manholes The laterals & inlets on the South side & median of Research Parkway are existing	\$159,875
24		No Street - Chapel Hills Dr. to Criterione Drive		190 CFS	48" RCP	1200 LF		2 Manholes	\$ 94,200
24		Research Pkwy.			18" RCP 24" RCP	731 LF 21 LF	1-4' 1-6' 1-8'	2 Manholes	-0-
24		Criterione Dr.			24" RCP 48" RCP 54" RCP	460 LF 30 LF 30 LF	2-18'	1 Manhole	\$28,340

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$485,395

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

SHEET 9 OF 11

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
24		No Street - Criterione Dr. to Explorer Dr.		230 CFS	18" RCP 54" RCP	50 LF 1220 LF	2-12'	2 Manholes	\$129,685
24		Telstar Drive/ Explorer Dr. Intersection			18" RCP 30" RCP	160 LF 50 LF	3-12' 1-16' 1-20'		\$23,600
24		No Street - Explorer Dr. to State Hwy. 83		296 CFS	60" RCP 66" RCP	1440 LF 100 LF		3 Manholes Junction Box	\$209,700
24		No Street - Telstar Dr. to State Hwy. 83			36" RCP	780 LF	1-8' 1-14'	1 Manhole	\$46,455
24		Research Pkwy. @ Highway 83 to the Pine Creek Crossing	1-4', 2-6' CBS 268 LF-18" RCP 30 LF-24" RCP		24" RCP	1170 LF		2 Manholes	\$34,490
25A		Briargate Pkwy.- Chapel Hills Dr. to Criterione Dr.		77 CFS	42" RCP	600 LF		1 Manhole	\$37,500
25A		Briargate Pkwy. Criterione Dr. to Explorer Dr.		94 CFS	18" RCP 42" RCP	230 LF 1900 LF	3-10' 2-12' 1-16' 2-18'	5 Manholes	\$154,275
25A	9	Briargate Pkwy.- Explorer to Pond #1		132 CFS	18" RCP 48" RCP	50 LF 900 LF	2-16'	2 Manholes	\$80,525

SHEET TOTAL: \$716,230

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

LOCATION			EXISTING	MAXIMUM DESIGN FLOW (Q5)	REQUIRED				
SUB BASIN	NEAR POINT	STREET			FACILITY	LENGTH	CATCH BASINS	COMMENTS	ESTIMATED COST
25B	10	No Street			24" RCP	520 L.F.	2-10'		\$ 19,640
26		Briargate Pkwy./ I-25 Interchange	2-"C", 2-"R" inlets 298 LF-15" RCP 62 LF-24" RCP 958 LF-36" RCP					Existing facilities adequate, approved CDOH in conjunction with interchange design	-0-
26		Briargate Parkway	1-"C", 2-"R" inlets 118 LF-15" RCP 658 LF-36" RCP					Existing facilities adequate, approved CDOH in conjunction with interchange design	-0-

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$ 19,640  
INVENTORY TOTAL: \$3,537,834

EXHIBIT II-A STORM SEWER SYSTEMS INVENTORY

SHEET 11 OF 11

FROM	TO	BASIN	DESIGN FLOW 100YR	LENGTH (FT.)	AVERAGE SLOPE (%)	EXIST. FACILITY	REQUIRED FACILITY	COMMENTS	ESTIMATED COST
Street #3	Pond #2	3	882	1500	2.5	None	Concrete Channel b=10' d=3.67' z=1.5	Channel Location approx. in Historic Drainageway	\$111,293
Street #4	Pond #3	4	455	600	4.0	None	Concrete Channel b=8' d=3' z=1.5	Channel location approx. in Historic Drainageway	\$ 36,825
Pond #3	Pond #4	4	855	2100	2.8	None	Concrete Channel b=8' d=3.2' z=1.5	Channel Location approx in Historic Drainageway	\$133,851
Pond #4	Pond #5	7	691	150	2.0	None	Concrete Channel b=8' d=3.67' z=1.5	Channel Location approx. in Historic Drainageway	\$ 10,375
Pond #5	Union Blvd. (Pt.#3)	7	558	3200	2.5	None	Concrete Channel b=8' d=4' z=1.5	Channel Location Re-Routed from Historic Drainageway	\$230,133
Union Blvd. (Pt.#3)	Pt.#5	11	1049	2900	3.5	None	Concrete Channel b=10' d=3.6' z=1.5	Channel Location Re-Routed from Historic Drainageway	\$212,787
Pond #2 (Pt.#1)	Pt.#4	9 & 10	683	4700	3.0	None	Rock Riprap Channel b=10' d=4.25' z=3	Channel Location approx. in Historic Drainageway	\$560,947
Pt.#4	Pt.#6	15	698	1600	2.5	None	Concrete Channel b=10' d=3.0' z=1.5	Channel Location approx. in Historic Drainageway	\$107,146

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$1,403,357

EXHIBIT II-B MAJOR CHANNELS INVENTORY

SHEET 1 OF 2

FROM	TO	BASIN	DESIGN FLOW 100YR	LENGTH (FT.)	AVERAGE SLOPE (%)	EXIST. FACILITY	REQUIRED FACILITY	COMMENTS	ESTIMATED COST
Pt. #5	Pt. #6	15	1426	1650	2.3	None	Concrete Channel b=12' d=4.67' z=1.5	Channel Location Re-Routed from Historic Drainageway	\$147,952
Pt. #6	West 1000'	16	2124	1000	2.0	None	Concrete Channel b=12' d=6' z=1.5	Channel Location Re-Routed from Historic Drainageway	\$103,833
1000' West of Pt. #6	500' East of Pt. #8	16 & 18	2321	1900	2.0	None	None Natural channel through Golf course	Historic Drainageway	-0-
500' East of Pt. #8	150' West of Pt. #8	18, 20 & 21	2695	650	2.0	None	Concrete transitions into and out of Chapel Hills Drive Bridge	Historic Drainageway	\$ 67,899
150' West of Pt. #8	Pond #1 (Pt. #9)	20 & 21	2695	2800	3.0	None	None Natural Channel through Golf course	Historic Drainageway	-0-
Pt. #12	North end existing channel	28	2536	1200	0.75	None	Concrete channel B=25.5' d=5' z=1.5	Air Force Academy Property	\$157,070
North end existing Channel	South end existing Channel	28	2536	2057	0.75	Concrete channel b=25.5' d=3' z=3' cap=1559cfs	Add 1.75' of depth to channel with z=3	Air Force Academy Property	\$ 69,803
South end existing Channel	Pt. #13	28	2536	1450	0.75	None	b=25.5', d=5', z=1.5	Air Force Academy	\$189,790

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$736,347  
INVENTORY TOTAL: \$2,139,704

EXHIBIT II-B MAJOR CHANNELS INVENTORY



APPROXIMATE LOCATION	CROSSING	BASIN	DESIGN FLOW 100 YR	EXISTING FACILITY	REQUIRED FACILITY	LENGTH	COMMENTS	ESTIMATED COST
Pt #1	Powers Blvd.	3	289 CFS	None	48" RCP	200 LF	Outlet Structure for Facility #2	\$15,200
Pt #2B	Powers Blvd.	4B	671 CFS	None	6.5' x 8' RCBC	200 LF	Outlet Structure for Facility #4	\$58,000
Pt #3	Union Blvd.	7	1049 CFS	None	Double 6' x 8' RCBC	150 LF		\$63,000
Pt #4	Street #10	10	683 CFS	None	8' x 8' RCBC	80 LF		\$20,000
Pt #5	Street at Briargate Parkway	11	1251 CFS	None	Double 8' x 8' RCBC	80 LF		\$41,600

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN  
EXHIBIT II-C CULVERT INVENTORY

SUBTOTAL: \$197,800

SHEET 1 OF 2

APPROXIMATE LOCATION	CROSSING	BASIN	DESIGN FLOW 100 YR	EXISTING FACILITY	REQUIRED FACILITY	LENGTH	COMMENTS	ESTIMATED COST
Upstream of Pt. #10	East of State Hwy. 83 North to West of Briargate Parkway	25	2052 CFS	None	8 x 11.5' RCBC	1000 LF		\$385,000

SUMMARY OF HYDRAULICS(FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN  
EXHIBIT II-C CULVERT INVENTORY

TOTAL: \$582,800

SHEET 2 OF 2

DATE: 5/11/87

PINE DRAINAGE BASIN  
STRUCTURE INVENTORY

PAGE 1 OF 1 PAGES

Structure Type and Materials: 6' x 8' Concrete Box Culvert with wingwalls

Map No.: \_\_\_\_\_

Date of Review: \_\_\_\_\_

Location: State Highway 83 at Pine Creek

Condition: Fair, Full of silt

CULVERTS:

(A) Approach Channel Conditions:

Good

(B) Discharge Channel Condition:

Good

(C) Maximum Available Headwater:

13' (4-)

(D) Conduit Size:

6' x 8' CRC

(E) Inlet and Outlet:

STORM SEWER:

(A) Conduit Size:

(B) Inlet Conditions:

Continuous Grade:

Sump:

(C) Inlet Opening Size:

Type: Grated:

Curb Opening:

Other:

(D) Manholes:

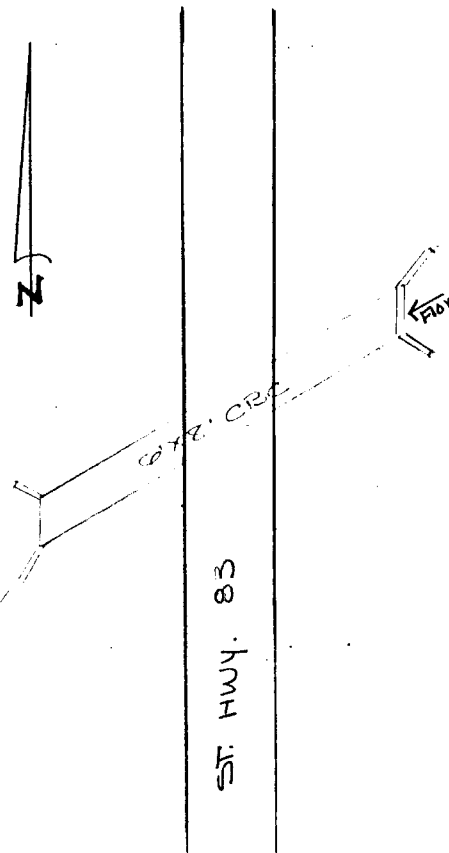
Size:

Materials:

CHANNEL IMPROVEMENTS:

Materials:

Condition:



PROVIDE SKETCH WITH PLAN AND ELEVATION VIEW

APPROXIMATE LOCATION	ARTERIAL STREET	DESIGN	FLOW	EXISTING FACILITY	REQUIRED FACILITY	LENGTH	COMMENTS	ESTIMATED COST
		5 YR	100 YR					
Pt #6	Street #14	—	2124 CFS	None	Double 8' x 13' RCBC	80 LF		\$70,800 TOTAL City = \$10,620 Developer = \$60,180
Pt #8	Chapel Hills Drive	--	2695 CFS	None	Clear Span Bridge	100 LF		\$250,000 TOTAL City = \$80,000 Developer = \$170,000
Pt #9	Briargate Parkway	--	2028 CFS	None	8' x 11.5' RCBC	320 LF	Outlet Structure for Pond #1	\$123,200 TOTAL City = \$37,345 Developer = \$85,855
Pt #10	State Highway 83	--	2052 CFS	None	8' x 11.5' RCBC	150 LF		\$57,750 TOTAL City = \$31,570 Developer = \$26,180
Pt #11	State Highway 83	—	542	6'x8' CBC* (+/- 105 L.F.)	None			—

**SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN  
EXHIBIT II-D BRIDGE INVENTORY**

\*SEE DETAIL SHEET AT  
THE END OF THIS EXHIBIT

TOTAL: \$501,750

SHEET 1 OF 1

POND NO.	APPROXIMATE LOCATION	DESIGN	FLOW	STORAGE VOLUME	OUTLET FACILITY	SPILLWAY LENGTH	COMMENTS	ESTIMATED COST
		Q <sub>IN</sub>	Q <sub>OUT</sub>					
1	Pt. #9 Briargate Parkway	3352 CFS	2057 CFS	72.3 Ac.Ft.	Ultimate 8'x11.5' RCBC (to be restricted for interim Historic discharge of 1210 CFS	100'	Outlet Facility Costs included with Bridge Inventory	\$100,000
2	Pt. #1 Powers Boulevard	944 CFS	289 CFS	33.8 Ac.Ft.	48" RCP	50'	Outlet Facility Costs included with culvert Inventory	\$100,000
3	Pt. #2A North of Pond #4	672 CFS	265 CFS	16 Ac.Ft.	54" RCP	80'		\$ 50,000
4	Pt. #2B Powers Boulevard	855 CFS	671 CFS	14.9 Ac.Ft.	6.5' x 8' RCBC	80'	Outlet Facility Costs included with culvert Inventory	\$ 70,000
5	South of Pond #4	691 CFS	509 CFS	19.6 Ac.Ft.	78" RCP	80		\$ 50,000

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

SHEET TOTAL: \$370,000

EXHIBIT II-E DETENTION POND INVENTORY

SHEET 1 OF 1

FROM	TO	EXISTING			REQUIRED			COMMENTS
		LENGTH	SLOPE	CONDITION	Q <sub>100</sub>	TREATMENT	COST	
M.P. 0.00	M.P. 0.25	1320'		Eroded to bedrock B=25', D=10'-30'	6000+ CFS	300 LF riprap bank stabilization on South side, 30"-36" Rock D=6', T=3'	\$ 27,000	Stabilization required where shown on map
M.P. 0.25	M.P. 0.40	800'		Narrow, incised into Claystone B=10'-20' D=10'-30'	6000+ CFS	50 LF Riprap protection for retaining wall 30"-36" Rock	\$ 4,500	Retaining Wall Footer partially exposed by erosion, protection required lower 50 feet
M.P. 0.40	M.P. 0.55	800'		Meandering, incised into claystone	5997 CFS	200 LF riprap bank stabilization on South side, 30"-36" rock D=6', T=3'	\$ 18,000	
M.P. 0.55	M.P. 0.70	800'		Large meanders eroded to claystone	5000 CFS (+/-)	None	-0-	Adequate Cross-section
M.P. 0.70	M.P. 0.81	600'		Poorly defined channel section not eroded to bedrock	2062 CFS	200 LF riprap East side only 24" Rock D=6' min, T=48"	\$ 24,000	Adequate cross-section, obvious difference in channel erosion History above Chapel Hills confluence
M.P. 0.81	M.P. 0.95	750'		Well defined manmade, partially improved (550'+/-) B=20', D=6'-10'	2062 CFS	400 LF riprap, East side only 24" Rock D=6' min, T=48"	\$ 48,000	
M.P. 0.95	M.P. 1.21	1375'		Broad, flat undefined	2094 CFS	1000 LF riprap, Southeast side only 24" Rock, D=6' min T=48"	\$120,000	Bank construction required
M.P. 1.21	M.P. 1.30	475'		Eroded section vertical walls check dams, poor condition		None	-0-	Inadequate cross-section will not exist after box reconstruction is complete

TOTAL COST: \$241,500.00 \*

\*FOR INFORMATION ONLY - NOT INCLUDED IN THE PINE CREEK BASIN COSTS. FACILITIES IN THE COTTONWOOD CREEK BASIN ARE SUBJECT TO REVISION AT TIME OF RESTUDY OF THE BASIN.

SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN

EXHIBIT II-F NORTH COTTONWOOD CREEK INVENTORY (CHANNELS)

SHEET 1 of 1

CROSSING LOCATION	EXISTING		REQUIRED		COMMENTS
	STRUCTURE	CONDITION	STRUCTURE	COST	
Pine Creek Road	30'x5' Concrete Channel Check	Good	None	-0-	
Pine Creek Road	Clear Span Bridge 40' Center, 24' ends	Adequate Clearance Piers on Caissons being eroded	30"-36" Rock Riprap on North Bank	\$ 6,000	
I-25	Twin Concrete Arch Bridges 80' Clear Span	Good	None	-0-	
M.P. 0.40 Abandoned Railroad	2-25' Clear x 21' Wide Stone Arch Bridges (1902) with Concrete footers (1933) Stone Wingwalls Upstream & North side Downstream	Bridges-Good South Footer of South Arch is eroded 6'-8' below bottom & partially failed	Concrete Footer (South Arch) Rehabilitation, paved invert in South Arch, Concrete drop with baffles at downstream, Cut-off wall upstream	\$ 85,000	Total channel flow currently being diverted through South Arch due to erosion. After improvements allow upstream to silt back to original streambed elevation.
M.P. 0.66 Pine Creek Aerial Sewer	36" Steel Conduit with 42" concrete caissons @ 70' o.c. 22' Clear		None	-0-	Adequate cross-section for $Q_{100}$ below structure.
M.P. 0.70, Chapel Hills Mall Outfall	Concrete & Grouted Rock drop @ 1:1 with concrete energy dissipator	Good	None	-0-	Large Base Flow entering
M.P. 0.77, Kelly Johnson Aerial Sewer	12" steel conduit with str.stl. supports W=30' HT=11' CLR	West Support Failed	None	-0-	Adequate cross-section for $Q_{100}$ below structure
Point 13 Academy Boulevard	6'x10' RCBC * with Concrete Walls(+/- 100 LF)	Poor	Triple 8'x12' RCBC 450 LF	\$495,000	Not included in Basin Cost determination, See implementation Section of Report

\* SEE DETAIL SHEETS, END THIS EXHIBIT

TOTAL COST: \$586,000.00 \*

**SUMMARY OF HYDRAULICS (FACILITIES INVENTORY)  
PINE CREEK DRAINAGE BASIN**

\*FOR INFORMATION ONLY - NOT INCLUDED IN THE PINE CREEK BASIN COSTS. FACILITIES IN THE COTTONWOOD CREEK BASIN ARE SUBJECT TO REVISION AT TIME OF RESTUDY OF THE BASIN.

EXHIBIT II-F NORTH COTTONWOOD CREEK INVENTORY (STRUCTURES)

SHEET 1 of 1

DATE: 5/11/87

PINE DRAINAGE BASIN  
STRUCTURE INVENTORY

PAGE 1 OF 2 PAGES

Structure Type and Materials: 6' X 10' Concrete Box Culvert with wingwalls

Map No.: \_\_\_\_\_

Date of Review: \_\_\_\_\_

Location: West side of Academy Blvd at Pine Creek,  
(Sheraton Inn.)

Conditions: Fair

CULVERTS:

(A) Approach Channel Conditions:

(B) Discharge Channel Condition:

(C) Maximum Available Headwater:

(D) Conduit Size:

(E) Inlet and Outlet:

STORM SEWER:

(A) Conduit Size:

(B) Inlet Conditions:

Continuous Grade:

Sump:

(C) Inlet Opening Size:

Type: Grated:

Curb Opening:

Other:

(D) Manholes:

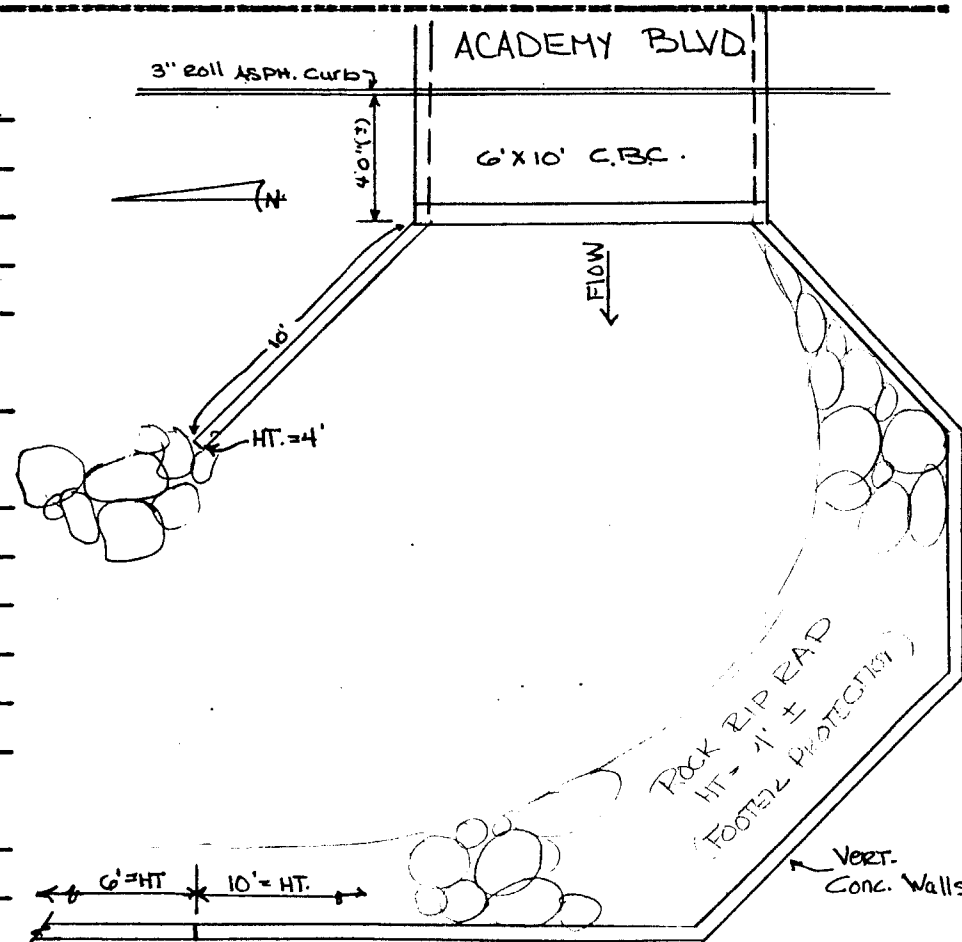
Size:

Materials:

CHANNEL IMPROVEMENTS:

Materials:

Condition:



PROVIDE SKETCH WITH PLAN AND ELEVATION VIEW



DATE: 5/11/87

PINE DRAINAGE BASIN  
STRUCTURE INVENTORY

PAGE 2 OF 2 PAGES

Structure Type and Materials: 6'x10' Concrete Box Culvert with wingwalls  
and grouted rock rip rap entrance.

Map No.: \_\_\_\_\_

Date of Review: \_\_\_\_\_

Location: East Side of Academy Blvd at Pine Creek

Condition: Fair

CULVERTS:

(A) Approach Channel Conditions:

POOR

(B) Discharge Channel Condition:

(C) Maximum Available Headwater:

22"

(D) Conduit Size:

6'x10' CRC

(E) Inlet and Outlet:

STORM SEWER:

(A) Conduit Size:

(B) Inlet Condition:

Continuous Grade:

Sump:

(C) Inlet Opening Size:

Type: Grated:

Curb Opening:

Other:

(D) Manholes:

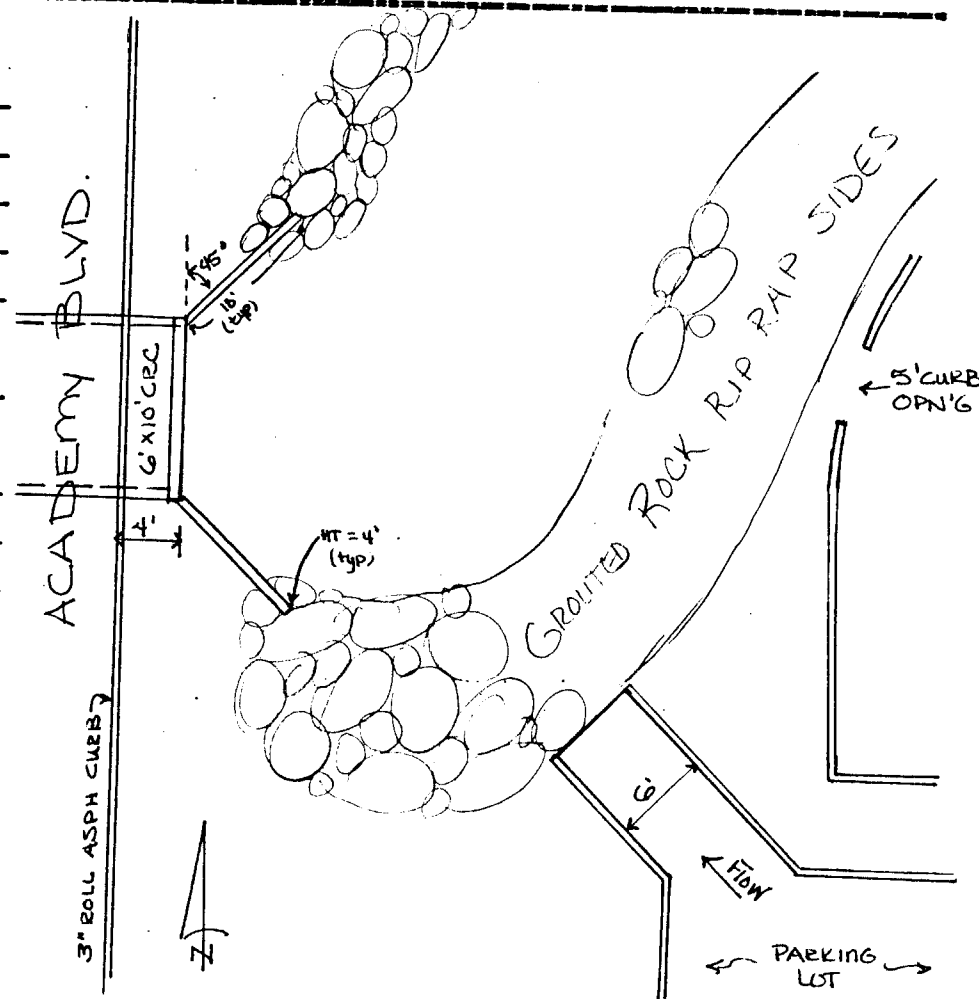
Size:

Materials:

CHANNEL IMPROVEMENTS:

Materials:

Condition:



PROVIDE SKETCH WITH PLAN AND ELEVATION VIEW

EXHIBIT III

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# DETENTION FACILITY

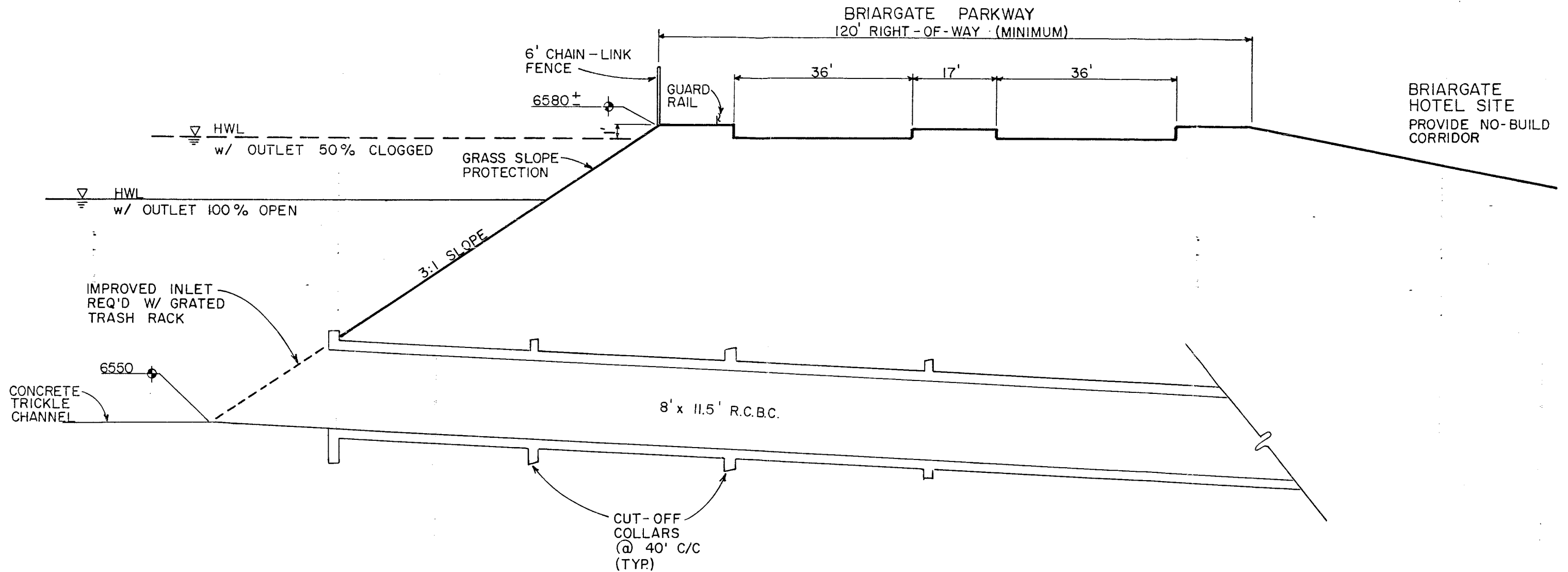
## HYDRAULIC SUMMARY - 6 HOUR STORM

DET. FAC.	#1		#2		#3		#4		#5	
ITEM	5yr	100yr	5yr	100yr	5yr	100yr	5yr	100yr	5yr	100yr
Q In (CFS)	1407	3091	520	1022	280	758	560	909	493	686
Q Out (CFS)	1171	1865	221	281	174	256	486	668	368	498
Maximum Storage (Ac.-Ft.)	14	59	8	27	3	13	4	12	6	18
Peak Stage Elevation	60.57	70.65	68.5	76.67	82.43	88.54	23.04	26.64	92.58	97.0
Spillway Crest Elevation	75.0	75.0	85.0	85.0	90.0	90.0	33	33	99.0	99.0
Bottom Elevation	50.0	50.0	53.0	53.0	75.0	75.0	15	15	84.0	84.0
Maximum Water Depth (Ft)	10.6	20.7	15.5	23.7	7.4	13.5	8.0	11.6	8.6	13.0
Detention Time (Hr.)	2.2	3.9	1.4	3.0	1.1	1.7	1.9	2.0	1.4	2.0

# DETENTION FACILITY

## HYDRAULIC SUMMARY - 24 HOUR STORM

DET. FAC.	#1		#2		#3		#4		#5	
ITEM	5yr	100yr	5yr	100yr	5yr	100yr	5yr	100yr	5yr	100yr
Q In (CFS)	1458	3269	428	944	268	672	499	855	483	691
Q Out (CFS)	1256	2028	225	289	178	265	472	671	379	509
Maximum Storage (Ac.-Ft.)	18	81	8	32	3	15	4	12	7	21
Peak Stage Elevation	61.82	74.27	68.96	77.87	82.67	89.32	22.83	26.72	92.9	97.45
Spillway Crest Elevation	75.0	75.0	85.0	85.0	90.0	90.0	33.0	33.0	99.0	99.0
Bottom Elevation	50.0	50.0	53.0	53.0	75.0	75.0	15.0	15.0	84.0	84.0
Maximum Water Depth (Ft)	11.8	24.3	16.0	24.9	7.7	14.3	7.8	11.7	8.9	13.5
Detention Time (Hr.)	2.8	3.9	1.7	3.47	2.93	3.07	2.13	3.1	2.9	2.9



NOTE: DETENTION FACILITY & EMBANKMENT  
SUBJECT TO FINAL DESIGN

## DETENTION FACILITY NO. 1 TYPICAL SECTION

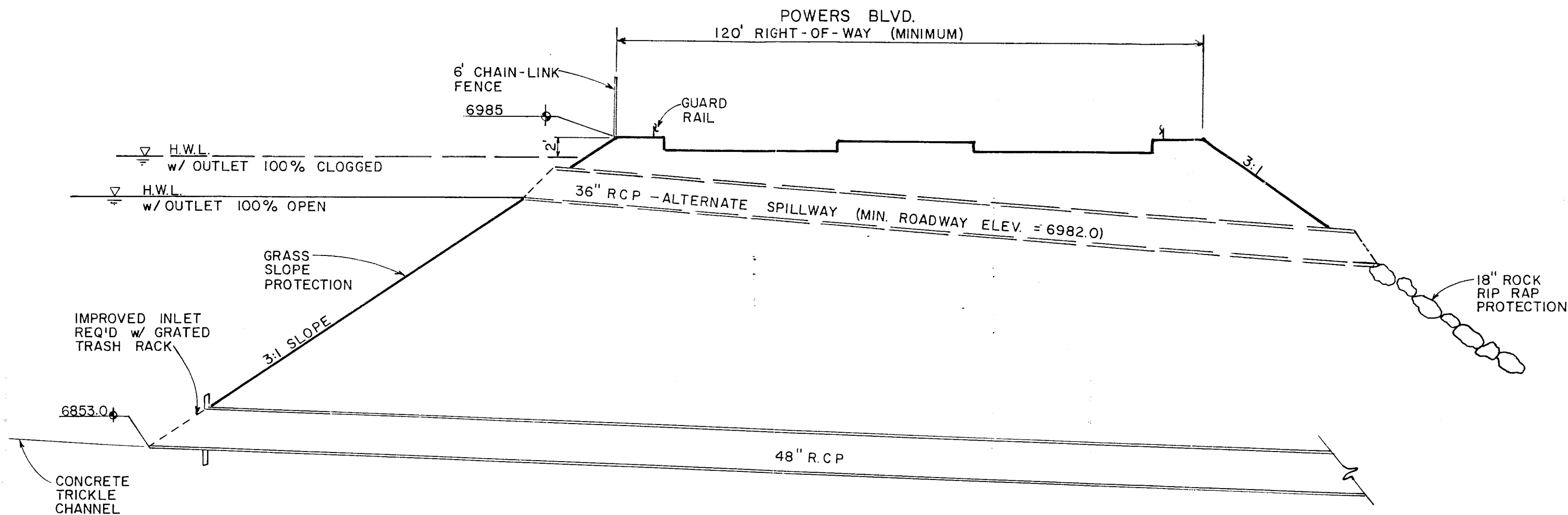
SCALE 1" = 20' H  
1" = 10' V

PREPARED BY:

**Obering, Wurth & Associates**  
Consulting Civil Engineers  
Registered Land Surveyors

1015 Elkton Drive  
Colorado Springs, Colorado 80907

EXHIBIT III - B  
SHEET 1 of 1



NOTE: DETENTION FACILITY & EMBANKMENT  
SUBJECT TO FINAL DESIGN

THIS SECTION IS ALSO TYPICAL FOR  
FACILITY NO. 4

## DETENTION FACILITY NO. 2 TYPICAL SECTION

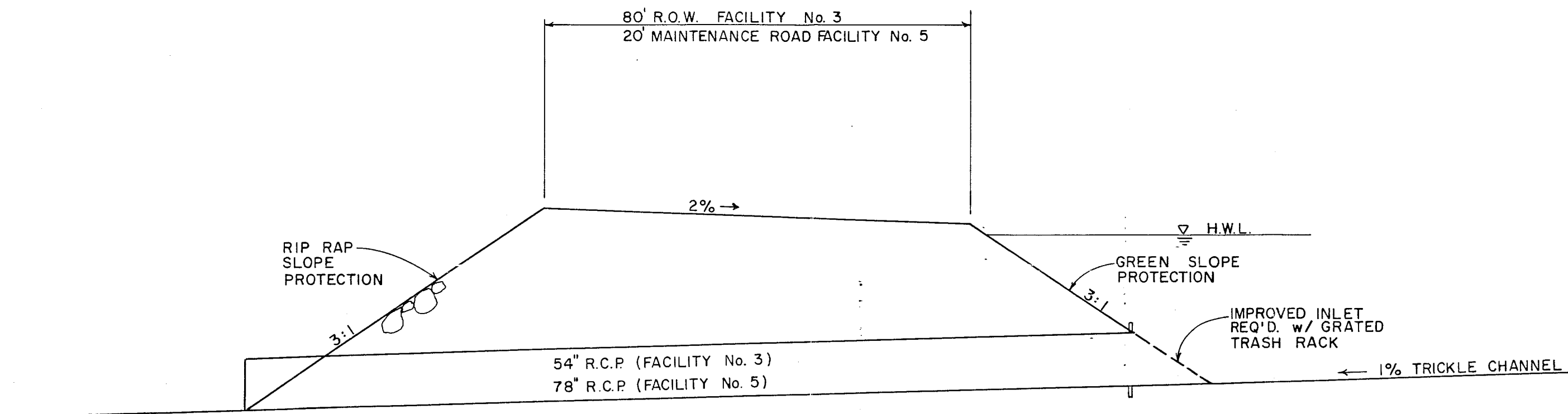
SCALE 1" = 20' H  
1" = 10' V

PREPARED BY:

**Obering, Wurth & Associates**  
Consulting Civil Engineers  
Registered Land Surveyors

1015 Elkton Drive  
Colorado Springs, Colorado 80907

EXHIBIT III - C  
SHEET I of I



NOTES: SCHEMATIC ONLY — DETENTION FACILITY & EMBANKMENT  
SUBJECT TO FINAL DESIGN.

FACILITY No. 3 SUBJECT TO CITY  
CRITERIA FOR SPILL UPON  
ROADWAY DESIGN.

FACILITY No. 5 SUBJECT TO STATE  
ENGINEER & CITY ENGINEER FOR  
SPILL UPON SITE WHEN DEVELOPMENT  
PLAN BECOMES AVAILABLE.

**DETENTION FACILITY No. 3 & 5**  
**TYPICAL SECTION**  
(SUBJECT TO FINAL DESIGN)

SCALE: 1" = 20' H  
1" = 10' V

PREPARED BY:  
**Obering, Wirth & Associates**  
Consulting Civil Engineers  
Registered Land Surveyors  
1015 Elkton Drive  
Colorado Springs, Colorado 80907

EXHIBIT III — D  
SHEET 1 of 1

EXHIBIT IV

M  
A  
P  
S