SOUTH SAND CREEK

DRAINAGE BASIN PLANNING STUDY

FOR

CANON CITY, COLORADO

PREPARED BY:

ASSOCIATED DESIGN PROFESSIONALS, INC.
1861 AUSTIN BLUFFS PARKWAY, SUITE 101
COLORADO SPRINGS, CO 80918

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ADP
Associated Design Professionals, Inc.

SOUTH SAND CREEK DRAINAGE BASIN
PLANNING STUDY
INTERIM IMPROVEMENTS

GENERAL

Improvements to structures in the South Sand Creek Drainage Basin will need to be addressed as the area gradually develops. Currently most structures at major storm crossings can effectively pass the 100-year storm flows downstream. However, as development continues in the upper reaches of the basin, all storm crossings will need to be upgraded.

INTERIM RECOMMENDATIONS

The pedestrian and aerial crossing of Forked Gulch near Catlin Avenue and 2nd Street should be upgraded to remove the constriction at the abutments of each structure. Under developed conditions, the constriction forces the water surface elevation upstream of the structures to rise and increases the possibility of channel bank failure.

The Lincoln Park area will require some major improvements that include at least two major storm sewers to convey flows to the Arkansas River. The most significant storm sewer would be located along Park Avenue and Sherman Avenue and would converge at the existing low point at Linden Street. This combined flow would converge at the existing riparian habitat just upstream of Raynolds Avenue. The system would require approximately 10,800 LF of 36" RCP along with numerous manholes and inlets. A smaller storm sewer along Ussie Avenue and 10th Street will convey flows to the Arkansas River via 2,700 LF of 24" RCP. A breakdown for costs of each storm sewer is located at the back of the report in the improvement recommendations section.

A 38-acre foot detention facility will be required to reduce the flow into the existing 54" storm sewer at 9th Street as development occurs upstream. The existing railroad crossing upstream of the proposed facility will need to be relocated approximately 300 feet upstream of its existing location to allow more area for the proposed detention basin due to recent development in the vicinity.

The estimated probable cost for interim construction is as follows:

Location	Structure #	Description	Cost
Forked Gulch at Catlin Avenue & 2nd Street	34	Pedestrian/Aerial Xing	$90,000
Lincoln Park	N/A	Storm Sewers	$1,166, 000
U / S 54" storm sewer at 9th Street	97	38 ac-ft Det. Facility	$400,000
		Total	**$1,656,000**

This cost does not include easement costs and is based on 1999 dollars.

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I. INTRODUCTION

A. Contract Authorization

The South Sand Creek Drainage Basin Planning Study was authorized under the terms of an agreement between the City of Canon City and Associated Design Professionals, Inc. This study covers drainage development alternatives within the South Sand Creek Drainage Basin.

B. Purpose and Scope of Work

The purpose of this study is to develop the most feasible drainage plans for the South Sand Creek Drainage Basin. The detailed scope of services is as follows:

I. South Sand Creek Drainage Basin as a whole

A. Review previous studies, maps and other available information.
B. Provide additional analysis and/or data that are critical to the project and not currently available, in order to accomplish II.

II. Conceptual Master Plan for Basin

A. Recommend improvements for the basin
B. Prioritize the improvements
C. Provide a planning level cost estimate for each improvement

C. Previous Drainage Reports

There have been three previous drainage studies performed within the South Sand Creek Drainage Basin. The following is a summary of those reports:

"Sand Creek Drainage Flood Characterization, Canon City Mill, Cotter Corporation" by HydroGeo Consultants, Inc. May 7, 1997.

"Watershed Work Plan, Canon Watershed, Fremont County, Colorado" February 1968

"Dawson Ranch Residential Planned Development District" by G. Verkaik & Associates, Inc. November 1998

D. Agency Jurisdictions

The City of Canon City and Fremont County have jurisdiction over the proposed drainage criteria and design requirements. Any proposed improvements or changes to the existing canals within the basins will need to be approved by one of the following canal boards:

- South Canon Ditch
- De Weese Dye Ditch
- Pump Ditch

The US Army Corps of Engineers will have review approval for any work that disturbs existing wetland areas or for any modifications to the Arkansas River.

E. Drainage Criteria

The drainage criteria used in this study were obtained from the City of Canon City. Flow calculations are determined from the TR-20 Computer Program for Project Formulation

Hydrology developed by the Soil Conservation Service. The charts used in determining input for the program are contained in the Appendix of this report.

F. Mapping

The Canon City and Royal Gorge, Colorado, 7.5-minute series topographic quadrangle maps prepared by the U.S. Geological Survey were used as the basin map for this project. These maps use 20 feet and 40 feet contour intervals and were photo revised in 1976. The maps were used for the general purposes of basin boundary delineation and for the establishment of principal tributary regions and sub-basins within these regions. Recent road improvements were added to the maps to reflect current conditions.

The mapping was supplemented with ¼ section aerial photographs of the region. These maps were produced in 1994 by Kucera West and used to better delineate the drainage in undeveloped areas and to identify current land uses.

G. Field Reconnaissance

Field reconnaissance of the basin was performed in order to supplement existing roadway and site development plans and existing drainage reports. Culvert locations, sizes, and depths were field checked and sub-basin flow patterns were analyzed. In addition, existing as well as potential problem areas were noted for a more in-depth evaluation.

H. Environmental Considerations

Although most of the basin is comprised of dry rangeland areas, some existing wetlands exist near the Arkansas River. An area of approximately 6 acres along Raynolds Avenue consists mainly of cattails and shallow standing water. The area along Willow Street and South Sand Creek is densely vegetated comprised mostly of cattails and native shrubs and trees. The lower reach of Forked Gulch in the region between Griffin Street and Stanley Street consists mainly of cattails and low-lying brush.

II. PROJECT DESCRIPTION

A. Basin Description and Location

The South Sand Creek Drainage Basin encompasses the southern portion of Canon City including Lincoln Park and a portion of Fremont County. It spans from Temple Canon Drainage Basin on the west to the Fawn Hollow Drainage Basin on the east and the Arkansas River to the north. It is situated in Township 18S and 19S, Range 70W of the 6th PM, Fremont County, Colorado. The basin contains approximately 13.4 Square Miles. A majority of the lands are currently platted, but not yet developed.

The runoff from this basin flows in a northerly direction and into the Arkansas River through three major drainage ways; Forked Gulch, Oak Creek Gulch, and South Sand Creek. The topography varies from mild slope of about 2.5% in the lower and central portion of the basin to about 6% to 13% in the upper portion of the basin. The vegetation consists primarily of native rangeland grasses and agricultural crops in the lower and central portion of the basin to forest land in the southern most part of the basin. The Cotter Mill Corporation encompasses most of section 16 and is considered to be an industrial use area.

B. Major Drainageways and Facilities

The upper channels in the South Sand Creek Drainage Basin vary from broad swales with heavy vegetation to well-defined channels and roadside ditches with relatively sparse vegetation. There are three irrigation canals that traverse the basin from the west to east. The southern-most canal is the De Weese Dye Ditch. The De Weese Dye Ditch is located

south of Lincoln Park and crosses Forked Gulch, Oak Creek Gulch and South Sand Creek. The second canal, South Canon Ditch, also crosses Forked Gulch, Oak Creek Gulch and South Sand Creek. The Pump Ditch connects the South Canon Ditch and South Sand Creek near the intersection of Elm Avenue and Locust Street. Although most basin run-off is currently tributary to these canals, their capacities are such that large storm flows will inundate the canals and allow water to overtop their banks.

Forked Gulch originates in the steep forested area in the southern most part of the basin that includes a portion of San Isabel National Forest. The upper reach of the basin contains several small natural swales that combine into a single, broad swale as it travels through the western portion of Wolf Park. A large existing storage area is located at the intersection of Temple Canon Road and Temple Road. Flows exit through 3 – 72" CMP pipes and combine with flows from the eastern portion Forked Gulch. Flow continues north toward a series of bridges along 2nd Street before converging with the Arkansas River.

Oak Creek Gulch originates near the steep grade adjacent to the hogbacks west of Oak Creek Grade Road. Flows travel north under the railroad spur to the Cotter Mill and pass under McDaniel Road through a 66" CMP. Flows continue north adjacent to the fairgrounds and enter a 2,650' storm sewer near the intersection of the South Canon Ditch and SH 115. Flows enter the 54" RCP storm sewer and are transported north along SH 115. Various curb inlets are located along SH 115 that combine gutter flow with flow from the south. The storm sewer crosses under SH 115 and discharges into the Arkansas River at a point northeast of the intersection of SH 115 and Sells Road.

South Sand Creek originates in the steep forested area in the southern most part of the basin. This upper region contains several natural reaches that combine at the break in the hogbacks at Oak Creek Grade Road. Flows then enter a portion of the Cotter Mill property and are directed through a 14' CMP and continue north along the eastern edge of the golf course. Flows from approximately 860 acres within the Cotter Mill facility combine roughly 1000 feet upstream of SCS C3 with flows described previously from the west. This combined flow from approximately 3.5 square miles enters the Soil Conservation Service retention facility C3 located in the eastern half of Section 9. Flows entering this facility are assumed to be fully contained and will contribute no flow downstream. Any precipitation falling north of SCS C3 will converge at Cedar Road and continue north and east in South Sand Creek. There are few structures along South Sand Creek to convey flows under the streets (see Existing Structures Map). The existing structures are undersized except for the SH 115 bridge at South Sand Creek. Flows pass under Willow Street and continue east to the Arkansas River.

The report prepared by Hydro-Geo Consultants, Inc. utilized different assumptions for runoff using the SCS method. First, they assumed a very conservative antecedent moisture condition of III. The flow calculations used in this report used an antecedent moisture condition of II. The previous report also assumed that the tailings dam within the Cotter Mill facility retained all flow within the facility and released no flow downstream to the SCS C3 dam. This resulted in a water surface elevation of 5487 feet. The flow calculations in this report assumed no retention within the facility and allowed all flows within the Cotter Mill facility to be released downstream. The result led to a water surface elevation at SCS C3 of 5486.46 feet, less than 1% of the previous water surface elevation determined by Hydro-Geo Consultants, Inc. This leads to skepticism of the findings in this report. However, the maximum capacity of the SCS C3 dam at its spillway is 1670 acre-feet. The volume stored at the 100-year flood occurrence interval is 368 acre-feet. Therefore, with some discretion

in the upstream characteristics of the basin there is considerable room for inaccuracy downstream at SCS C3.

Flows entering SCS C4 dam originate along the eastern face of the hogbacks and travel northeasterly through the golf course and neighborhoods in the area. The SCS C4 dam is assumed to retain all flows entering the facility and will contribute no flows downstream. Any precipitation falling north of SCS C4 will essentially be sheet flow across Lakeside Cemetery and eventually proceed into Lincoln Park.

The region along the Arkansas River is considerably flat with small areas contributing directly to the River. The vicinity south of Riverside Drive drains a small area of approximately 140 acres to a point near Colburn Street at Riverside Drive. The vicinity near Plum Street drains approximately 344 acres through a channel parallel to Plum Street and enters a 7' X 12' CMP arch before passing under Riverside Drive and into the Arkansas River.

The Lincoln Park area along the Arkansas River currently experiences periods of localized shallow flooding. This area has evolved into well established residential neighborhoods with schools and parks throughout. When this area was developed, roads were constructed above finish floor elevations and no apparent flow paths were established to effectively transport flows to the Arkansas River. Due to absorbent soils in this area, localized flows pond up and diffuse slowly into the ground. There are currently small confined drainage systems that transport flows to the River. However, there is no large scale drainage network at this time to effectively drain the Lincoln Park area of approximately 2 square miles.

C. Existing Surface Water Improvements

The two SCS ponds C3 and C4 located in Section 9 and the existing detention area at the intersection of Temple Canon Road and Temple Road are the only significant surface water impoundments within the South Sand Creek Drainage Basin. Each of these structures remain dry except during major storm events. The SCS pond C3 has a total volume capacity of 1670 acre-feet at its spillway. The SCS pond C4 has a total volume capacity of approximately 300 acre-feet. The existing detention area at the intersection of Temple Canon Road and Temple Road has a volume capacity of approximately 13 acre-feet.

III. HYDROLOGIC EVALUATION

A. Basin Hydrology

The hydrologic model used to determine peak flows and volumes throughout South Sand Creek Drainage Basin was the TR-20 Computer Program for Project Formulation Hydrology developed by the Soil Conservation Service.

The overall basin was divided into tributary basins and again into smaller sub-basins. The sub-basins and existing structures were then numbered for data input into TR-20 (see the Existing Structures Map in the back pocket of this report). The sub-basins were chosen with respect to the natural topography, roadway crossings and future development considerations. Peak flows for the 100-year, 50-year and 25-year, 24-hour storms, were calculated and evaluated.

B. Time of Concentration

The time of concentration (Tc) used in the TR-20 calculations was determined by first calculating an initial overland flow time from the sub-basin boundary to the naturally occurring swales and channels. Then a travel time was calculated in these natural swales

to the outlet of the sub-basins and added to the initial overland flow time to determine the overall time of concentration for existing conditions. For future developed conditions, the channel travel times were adjusted to reflect improved conditions and therefore, a shorter time of concentration.

C. Rainfall

Rainfall amounts for the South Sand Creek Basin were determined from the National Oceanic and Atmospheric Administration Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume III - Colorado, 1973.

Precipitation for the 100-year 50-year and 25-year, 24-hour storms were 3.80, 3.50 and 3.10 inches, respectively.

D. Projected Surface Characteristics

Existing land uses in the South Sand Creek Drainage Basin were determined by examining current development plans supplemented with field reconnaissance. Currently most development is occurring in the southern portion of the basin in the Wolf Park vicinity.

Projected surface characteristics for the area were determined through examination of current development plans and through discussions with Fremont County Planning Department officials and Canon City officials. For design purposes, undeveloped areas were assumed to be fully developed using projected densities. The projected surface characteristics map is a composite of this land use information. There is not a time frame or date associated with this ultimate projected land use.

E. Soil Characteristics

The soils information contained in this report is derived from the "Soil Survey of Fremont County Area, Colorado", issued December 1995. Of the 28 soils classifications found within the South Sand Creek drainage basin, 64% of the basin area includes Hydrologic Soil Group B, 5% for Hydrologic Soil Group C, and 31% for Hydrologic Soil Group D (see the enclosed Soils Map prepared by ADP for locations and soil numbers).

F. Runoff Curve Numbers

Runoff Curve Numbers (CN's) were determined for the basin by utilizing soils and land use information described in previous sections. Curve numbers for the undeveloped portions of the basin were prepared based on projected land densities with some agricultural and forest land remaining in its existing condition.

IV. HYDRAULIC DESIGN EVALUATION

A. Existing Structure Evaluation

Only the existing structures that transport flows out of major sub-basins have been examined in this report. An allowable headwater of 6" below the edge of pavement was utilized to calculate maximum culvert capacities. The existing capacities of these structures were estimated primarily using inlet control analysis.

The analysis revealed that a majority of the existing structures throughout the basin are unable to effectively handle the 100-year, 24-hour storm without overflowing the roadways. An existing structure evaluation chart was developed to summarize these findings and is included at the end of this section.

B. Existing Drainageway Evaluation

As outlined in the Major Drainageway and Facilities section, most of the major drainageways within the South Sand Creek Drainage Basin are natural, unimproved channels. In the upper reaches of the basin, the channels are typically wide, grassed swales with little or no signs of erosion. As development occurs adjacent to the natural drainage reaches, improvements must be made to ensure proper conveyance in these channels. The existing capacities of major channel reaches within the basin were estimated using normal depth flow analysis.

C. Environmental Inventory

The significant environmentally sensitive areas within the South Sand Creek Drainage Basin are the two SCS dams and the existing detention area as described in the Existing Surface Water Improvements Section.

V. ALTERNATE DRAINAGE SYSTEMS

A. Alternate Development Policies

The alternate drainage considerations were developed in a cooperative effort with input from the City of Canon City and the local residents. Several additional variations of the presented alternates were also examined but are not included in this report.

B. Alternate 1

This alternate investigates the existing flow conditions through the project area. It assumes that the South Canon Ditch, De Weese Dye Ditch, and the Pump Ditch are completely filled with storm flows from the south and west and will allow flows to overtop the canal banks. A second assumption is that SCS dams C3 and C4 will retain all flows and allow no upstream flow to proceed downstream.

Based on these assumptions, approximately 1,284 cfs from 1,670 acres accumulates in the west branch of Forked Gulch to a point at the intersection of Temple Canon Road and Temple Road. The existing structure contains 3 – 72" CMP's with a capacity of 1275 cfs at a head of 10 feet. The east branch of Forked Gulch contributes 224 cfs from 262 acres through a 60" CMP at the entrance to Wolf Park Subdivision. Flow continues north and crosses under Forge Road through a 60" CMP. The flow continues north along the west side of Forge Road through another 60" CMP near the industrial park, a 14' X 10' railroad bridge under the spur to Cotter Mill, and another 60" CMP at the entrance to College of the Canons. The flow then splits and crosses Valley Road at two locations before merging together once again just downstream of the intersection of Temple Canon Road and Temple Road. Flows pass under Valley Road through a 48" CMP to the west and a 30" CMP to the east. The combined flow of 550 cfs from 454 acres combines with the west branch of Forked Gulch and proceeds north with a combined flow of 1522 cfs. The flow then approaches a series of bridges along 2nd Street before confluence with the Arkansas River. The flow upstream of the roadway bridge at Pennsylvania Street is 1,550 cfs. This flow then continues through two additional roadway bridges, a pedestrian bridge, and an aerial crossing for the South Canon Ditch. Each of the roadway bridges allows flow to pass efficiently with two to three feet of freeboard to the bottom chord of the bridges. The spans for the pedestrian bridge and aerial crossing are not wide enough to effectively convey flow downstream to the River. The flow enters a 50-foot wide concrete channel that efficiently moves flows to the Arkansas River. The total flow from 4 square miles to the Arkansas River is 1,547 cfs.

The headwaters of Oak Creek convey approximately 500 cfs through 4 – 4' X 6' box culverts under the railroad spur to Cotter Mill. The flow continues north and passes through a 48" CMP at Forge Road and on to a 66" CMP at McDaniel Road. The total flow from 360 acres through the 66" CMP at McDaniel Road is 450 cfs. This flow continues north along the west side of the fairgrounds and passes under Highland Road through a 54" CMP and then crosses under the railroad once more through 3 – 36" CMP's. The flow then proceeds to the 54" RCP storm sewer located along SH 115. The total combined flow from 584 acres is 575 cfs at the storm sewer inlet. The existing capacity of the storm sewer is approximately *285 cfs* . Various curb inlets are located along SH 115 that combine gutter flow with flow from upstream. The storm sewer crosses under SH 115 and discharges into the Arkansas River at a point northeast of the intersection of SH 115 and Sells Road.

The South Sand Creek headwater region of 1075 acres contributes 1,315 cfs at the break in the hogbacks along Oak Creek Grade Road. Flows then enter the western portion of the Cotter Mill facility and are directed through a 14' CMP. Flows continue north along the eastern edge of the golf course through a wide shallow channel towards SCS C3. Flows from approximately 860 acres within the Cotter Mill facility combine roughly 1000 feet upstream of SCS C3 with flows described previously from the west. This combined flow of 3,515 cfs from approximately 3.5 square miles enters SCS C3 located in the eastern half of Section 9 and is retained. Precipitation falling north of SCS C3 will converge at Cedar Avenue and continue north and east into South Sand Creek. Flows pass over Cedar Avenue and Birch Street through low flow crossings. Flows continue northeasterly and pass under Poplar Avenue through a 30" CMP and pass over Lombard Street through a low flow crossing. The bridge at SH 115 effectively conveys flows downstream to a low flow crossing at Chestnut Street. Flows continue easterly, cross the Pump Ditch and continue to a 58" X 36" elliptical CMP at Elm Avenue. Flows continue through a 36" X 22" elliptical CMP and 15" CMP just north of Elm Avenue and on to a 78" CMP and 24" CMP at Ash Street. The final structure along South Sand Creek is a 36" X 22" elliptical CMP and a 24" CMP at Willow Street before confluence with the Arkansas River. The total flow from 808 acres is 420 cfs.

Flows entering SCS C4 dam originate from 460 acres along the eastern face of the hogbacks and travel northeasterly across Oak Creek Grade Road and through the golf course and neighborhoods in the area. Any precipitation falling north of SCS C4 will essentially be sheet flow across Lakeside Cemetery and eventually proceed into Lincoln Park. The total combined flow from 730 acres to eventually reach the Arkansas River is 1,145 cfs.

The region along the Arkansas River is considerably flat with small areas contributing directly to the River. The vicinity south of Riverside Drive contributes 170 cfs from 140 acres through a 4' X 4' box culvert at a point near Colburn Street at Riverside Drive. The vicinity near Plum Street drains approximately 344 acres through a channel parallel to Plum Street. Flows pass under Douglas Street through a 14' X 6' bridge and Stanley Street through a 15' X 7' bridge with 2 feet of freeboard to the bottom chord of the bridges. Flow then enters a 7' X 12' CMP arch before passing under Riverside Drive and into the Arkansas River. The total combined flow to reach the Arkansas River is 300 cfs.

The Lincoln Park area along the Arkansas River currently experiences periods of localized shallow flooding. This area of approximately 2 square miles contributes a total combined flow of approximately 2,800-cfs throughout a stretch of 3 miles along the Arkansas River. The area of 160 acres contained by 4th Street, 9th Street, and the South Canon Ditch contributes 674 cfs to the Arkansas River by means of a 58" X 36" arch CMP located along

side the outlet of the 54" storm sewer at SH 115. The area between 9th Street, Logan Street, and Elm Avenue contribute 1,145 cfs from downstream of SCS C4 as described previously. The area of 487 acres contained by Logan Street, Linden Street, and Elm Avenue contributes 795 cfs to the Arkansas River through small localized storm sewers and small roadside ditches. The area of 192 acres contained by Linden Street, the Arkansas River, and Elm Avenue contributes 80 cfs through 2 – 36" CMP's spaced approximately 100 feet apart at Raynolds Avenue.

C. Alternate 2

The assumptions presented in Alternate 1 were also considered in evaluating the suggested improvements for Alternative 2.

The developed flow from 1,670 acres at the intersection of Temple Canon Road and Temple Road is 1,600 cfs. The existing structure is conceived to be replaced with 4 – 60" RCP's that will convey 1,345 cfs and detain upstream flows to an depth of 1 foot below the centerline elevation at Temple Road. The developed flow in the west branch of Forked Gulch was calculated by assuming the developed runoff from Dawson Ranch would be released at the historic flow rate. The improvements made will allow more flow to be detained but will release more flow downstream. Currently a transfer station is located within the detention area. This operation would have to be relocated out of the 100-year floodway. The roadside ditch along Temple Road between Temple Canon Road and Valley Road should be lined with riprap its entire length to the detention facility. The existing roadway bridges along 2nd Street currently have the capacity for the increased flows. However, the pedestrian bridge and the aerial crossing for South Canon Ditch will need to be improved with cross sectional dimensions no less than 50 feet wide by 8 feet deep. No improvements are necessary to the existing structures along the east branch of Forked Gulch until flows approach Valley Road. Both structures should be upgraded to 4' X 8' box culverts to convey upstream flows of approximately 250 cfs. The total developed flow at the confluence with the Arkansas River would be 1,602 cfs.

The developed flow in Oak Creek Gulch resulted in a number of upgrades to the existing structures. The existing structures at Forge Road and McDaniel Road will need to be upgraded to a 6' X 10' box culvert and a 6' X 12' box culvert respectively to handle the upstream flow of approximately 560-cfs. The channel north of McDaniel Road will need to be upgraded to a depth of 6.5 feet to the storm sewer inlet at SH 115. The structure at Highland Road will need to be upgraded to a 6' X 16' box culvert to handle approximately 680 cfs. The existing structure under the railroad spur to Cotter Mill is currently 3 – 36" CMP's with a capacity of 210 cfs. This structure will need to be improved to a 6' X 14' box culvert to effectively handle developed flows. The total combined developed flow at the inlet to the storm sewer is 689 cfs. In order to effectively convey this flow and any additional flows along SH 115, the existing 54" storm sewer will need to be upsized to a 78" RCP storm sewer along its entire length to the Arkansas River. The estimated length of the storm sewer is 2,650 feet to the Arkansas River and 800' north of the inlet to Grand Avenue. The 800' segment of the storm sewer is currently 24" RCP and aids in draining the western portion of Lincoln Park.

The existing structures in the South Sand Creek channel will see little improvements for this alternative. Structures upstream of SCS C3 will be overtopped in the 100-year storm event. Structures that are currently low flow crossings will remain as is in this alternative. The structure at Poplar Avenue should be improved with 2 – 48" RCP's to prevent overtopping. The bridge at SH 115 effectively handles developed flows and will need no improvements. The structure at Elm Avenue will need to be upgraded with 2 – 4' X 8' box culverts and the

structure just down stream should be upgraded with 2 – 3' X 12' box culverts. The existing 78" CMP at Ash Street will need to be upgraded with 2 – 4' X 7' box culverts to effectively handle the upstream flows with the available head in the channel. The pipes under Willow Street will need to be upgraded with 4 – 3' X 6' box culverts to effectively handle the upstream flows with the available head in the channel. The total combined developed flow at the Arkansas River is 555 cfs.

No improvements are suggested for the channel upstream and downstream of SCS C4. All flows are assumed to be sheet flow except for a wide shallow channel just upstream of SCS C4.

Improvements are suggested for the small area of 140 acres south of Riverside Drive. Approximately 2000 feet of the channel will need to be excavated to a depth of 8.5 feet and lined with 12" riprap its entire length to effectively convey 171 cfs to the Arkansas River. The structure under Riverside Drive will need to be updated to a 4' X 6' box culvert to transport flows to the River. No improvements are necessary to the channel or bridges along Plum Street. All of these structures have sufficient capacities to handle developed flows in the area. The total combined developed flow to reach the Arkansas River is 300 cfs.

The area of 160 acres contained by 4th Street, 9th Street, and the South Canon Ditch contributes 674 cfs to the Arkansas River by means of an existing 58" X 36" arch CMP located along side the outlet of the storm sewer at SH 115. This structure should be replaced with a 6' X 16' box culvert to accept all of the runoff in this area. Alternate 2 will leave remaining conditions in the Lincoln Park area as is.

The estimated probable construction cost of Alternate 2 is $2,802,237. This cost does not include land or easement purchase costs and is based on 1998 dollars.

D. Alternate 3

This alternative contains the same detention alternatives as Alternate 2 as well as the same assumptions made in Alternate 1. The difference between Alternative 2 and Alternative 3 is that now a detention facility has been modeled upstream of the existing 54" storm sewer.

The conditions outlined in Alternate 2 for Forked Gulch will also apply in Alternate 3.

A 38 acre-foot detention facility is conceived to detain flows just upstream of the drop inlet to the 54" storm sewer parallel to SH 115. The facility will detain 689 cfs and release 281 cfs through 2 – 48" RCP's at a depth of 9 feet. This will require upsizing all four structures upstream of this facility. The existing structure under the railroad spur to Cotter Mill will need to be upgraded to a 6' X 14' box culvert to effectively handle developed flows. The structure at Highland Road will need to be upgraded to a 6' X 16' box culvert to handle approximately 680 cfs. The existing structures at Forge Road and McDaniel Road will need to be upgraded to a 6' X 10' box culvert and a 6' X 12' box culvert respectively to handle the upstream flow of approximately 560-cfs. The channel north of McDaniel Road will need to be upgraded to a depth of 6.5 feet downstream to the detention facility.

Improvements to the structures upstream of SCS C3 will be addressed in this alternate. The total flow to the private drive at the break in the hogbacks along Oak Creek Grade Road is 588 cfs from 474 acres. The existing concrete approach utilizes a 12" CMP to convey storm flows downstream. This structure will need to be upgraded to a 6' X 14' box culvert to handle the 100-year flow of 588 cfs for this particular area. A low flow crossing currently

exists approximately 300 feet south of the private driveway along Oak Creek Grade Road. A 6' X 14' box culvert is conceived to handle 558 cfs from 428 acres. Another 1500 feet south along Oak Creek Grade Road is a 36" CMP crossing to handle 173 cfs from 172 acres. This structure will need to be upgraded with 2 - 48" RCP's to effectively convey the 100-year flow downstream.

The low flow structures downstream of SCS C3 will be analyzed in this alternative. The improvements to the existing structures described in Alternate 2 are also included in this alternate, but not described. A 76" X 48" elliptical RCP is conceived to replace the low flow crossings at Cedar Avenue and Birch Street to accept a developed flow of approximately 190 cfs. A 4' X 12' box culvert will handle an upstream flow of approximately 450-cfs at Lombard Street. A 4' X 14' box culvert will be needed downstream of the bridge at SH 115 to handle a developed flow of 515 cfs. A 4' X 15' box culvert will be required to convey a flow of approximately 530-cfs under the Pump Ditch. The total flow to reach the Arkansas River is equivalent to the amount stated in Alternate 2.

There currently exists a low flow crossing along Oak Creek Grade Road approximately 1000 feet north of the entrance to the municipal golf course. A 76" X 48" elliptical RCP is conceived to allow 196 cfs from 198 acres along the eastern face of the hogbacks. This concentrated flow path will eventually spread out and enter SCS C4. Any precipitation falling north of SCS C4 will essentially be sheet flow across Lakeside Cemetery and eventually proceed into Lincoln Park. The total combined flow from 730 acres to eventually reach the Arkansas River is 1,145 cfs.

The improvements outlined in Alternate 2 for the region along Riverside Drive will also be included in this alternate, but not discussed in detail.

A storm sewer is envisioned for the Lincoln Park area to drain pockets of localized ponding resulting from a major storm event. The storm sewer would be designed for a two or five year storm and would require a pipe size of 24" to 36" in diameter. Included in the construction of the storm sewer would be to define specific floodways to the Arkansas River. To achieve this, streets would be reconstructed with curb and gutter or drainage ditches along each side of the street to convey flows to the River. A specific plan for the location of the storm sewer and floodways was discussed at the public hearing and with the City Engineering Department of Canon City.

The estimated probable construction cost of Alternate 3, not including the storm sewer in Lincoln Park, is $1,967,030. This cost does not include land or easement purchase costs and is based on 1998 dollars.

E. Summary of Alternatives

Factors used to evaluate the three alternatives explained in this report were cost, constructability, citizen feedback, and city input. As a result of the meetings held with public and private individuals, Alternate 3 was selected as the preferred alternative. It was recommended that the layout of the storm sewer in Lincoln Park be altered to allow the flow out of the storm sewer to be directed to an existing low point at Linden Street. The flow would then discharge into the existing riparian area upstream of Structure 18 at Raynolds Avenue and on to the Arkansas River.

The proposed 34 acre-foot detention facility near the intersection of the South Canon Ditch and SH 115 will need to be located behind the newly constructed business facing SH 115.

This would require the existing railroad crossing at structure 26 to be moved upstream approximately 300 feet to allow more area for the detention basin.

The estimated probable construction cost is $3,258,618. This cost does not include land or easement purchase costs and is based on 1998 dollars. This cost breakdown to construct the localized storm sewers in Lincoln Park is enclosed with the improvement recommendations map at the end of this report.

VI. PRELIMINARY DESIGN

A. General

Based on the results of the alternatives, the evaluation and comments from the public meetings and the City, the concepts from the chosen alternative were developed into preliminary designs. Each major system in the South Sand Creek drainage basin is delineated on the conceptual plans contained in Appendix B with the associated costs for the facilities included in a summary table in the Economic Analysis section.

Although specific types of erosion protection and pipe structures are delineated on the Preliminary Estimate of Probable Construction Costs, this does not preclude the use of other design materials or design schemes that will serve the intended purpose as well as or better than those presented herein both hydraulically and environmentally. The designs presented in this study represent one method of stabilizing the channel. Other methods of stabilization are permitted as long as they meet with the approval of the Canon City Engineering Department and other affected agencies.

VII. WATER QUALITY

A. General

Concern regarding storm water quality has grown since the past decade. The Environmental Protection Agency (EPA) has regulations for monitoring storm water and the use of Best Management Practices to control storm water. The actual design for any necessary control facilities will vary according to the type of pollutants present. Pollutants can enter storm water in the following manner:

1. Absorbed as raindrops pass through the atmosphere.
2. Extracted from paved and unpaved surfaces by storm water runoff.
3. Accumulated contaminates in storm sewers, ditches, and channels.

B. Treatments

Most of the pollutants expected to reach the main stem of the channel should be of the suspended solid variety. However, it may be necessary to sample and analyze the storm water to determine the exact control measures to implement.

Dry basins should be designed in areas where the main pollutants are suspended solids, which simply settle out in the basin when the channel velocity drops. However, if dissolved solids, nitrates and nitrites, and soluble phosphorus are present, a wet pond will need to be constructed to reduce these pollutants.

VIII. ECONOMIC ANALYSIS

A. General

The economic analysis of the channel improvements listed in this study was derived from current construction prices for materials and labor in the Canon City, Fremont County area. In addition, the 1997 edition of the Colorado Department of Highways "Cost Data" was utilized. Estimated probable construction costs were determined for each channel reach for the selected alternative utilizing the protection scheme delineated in the Alternate Drainage Systems section and on the Conceptual Plans located in Appendix B.

The following table lists the specific unit construction costs used in determining the Estimated Probable Construction Costs for each alternative:

UNIT CONSTRUCTION COSTS

Item Description	Unit	Estimated Unit Cost
Rip Rap	CY	$35.00
Heavy Rip Rap	CY	$45.00
Granular bedding materials	CY	$20.00
Reinforced concrete	CY	$275.00
Structural backfill	CY	$8.00
Structural excavation	CY	$5.00
Muck excavation	CY	$6.00
Unclassified excavation and embankment	CY	$3.00
Seeding (native)	Acre	$550.00
48" RCP	LF	$100.00
60" RCP	LF	$175.00
78" RCP	LF	$425.00
76" X 48" ERCP (60" EQIV.)	LF	$185.00
3' X 6' Box culvert	LF	$245.00
3' X 12' Box culvert	LF	$415.00
3' X 14' Box culvert	LF	$460.00
4' X 6' Box culvert	LF	$325.00
4' X 7' Box culvert	LF	$380.00
4' X 8' Box culvert	LF	$440.00
4' X 12' Box culvert	LF	$550.00
4' X 14' Box culvert	LF	$610.00
4' X 15' Box culvert	LF	$670.00
6' X 10' Box culvert	LF	$740.00
6' X 12' Box culvert	LF	$825.00
6' X 14' Box culvert	LF	$915.00
6' X 16' Box culvert	LF	$1,100.00

NOTE: Pipe and culvert costs do not include utility relocation costs.

B. Preliminary Estimate of Probable Construction Costs

As previously stated, the proposed improvements are illustrated on the alternate conceptual plans that are included in Appendix B. Conceptual construction costs were estimated for each alternate based on the unit construction costs provided in this section and are also in Appendix B. Preliminary construction costs for the selected alternate are provided in Appendix C.

PREVIOUS DRAINAGE STUDIES:

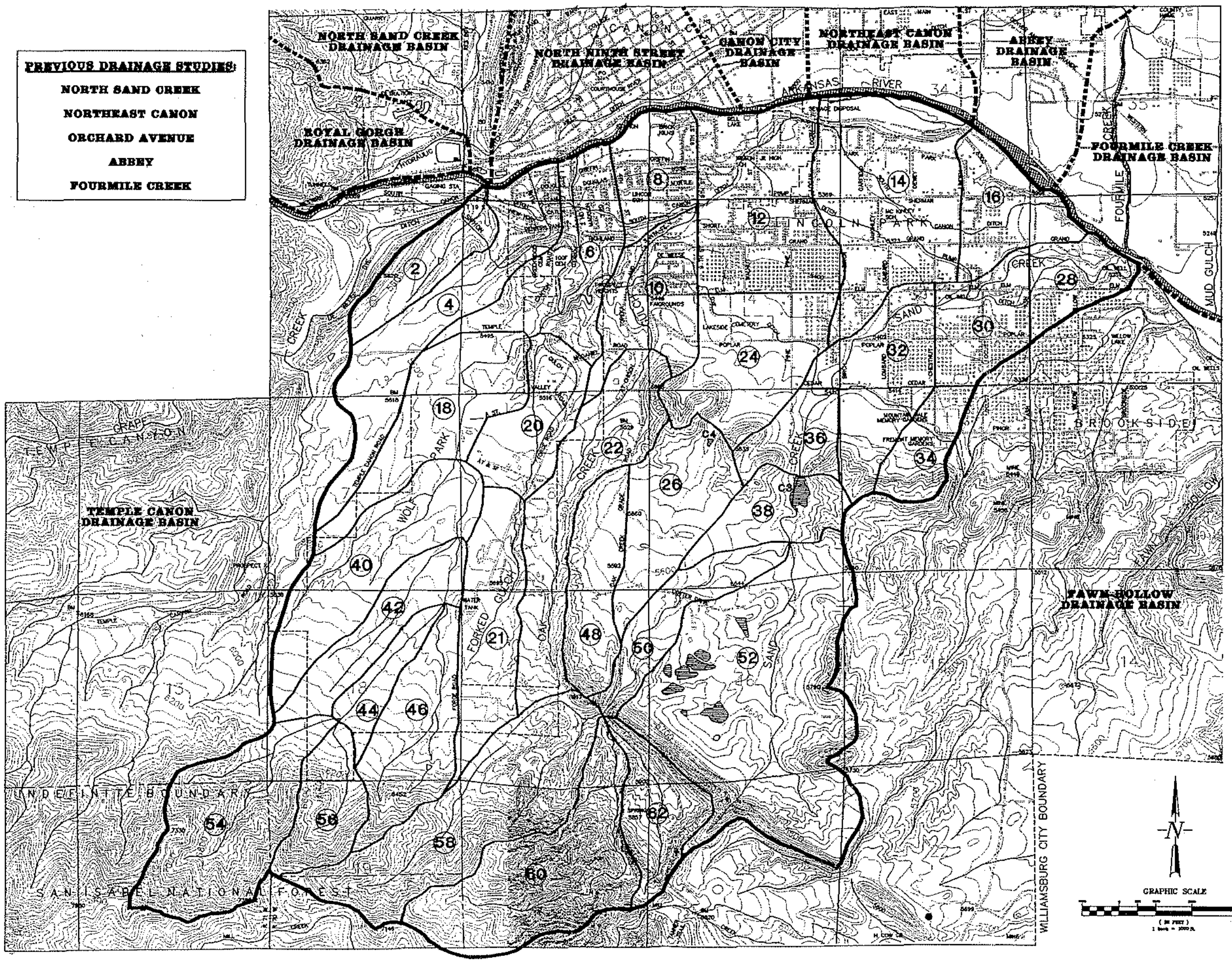
NORTH SAND CREEK

NORTHEAST CANON

ORCHARD AVENUE

ABBEY

FOURMILE CREEK

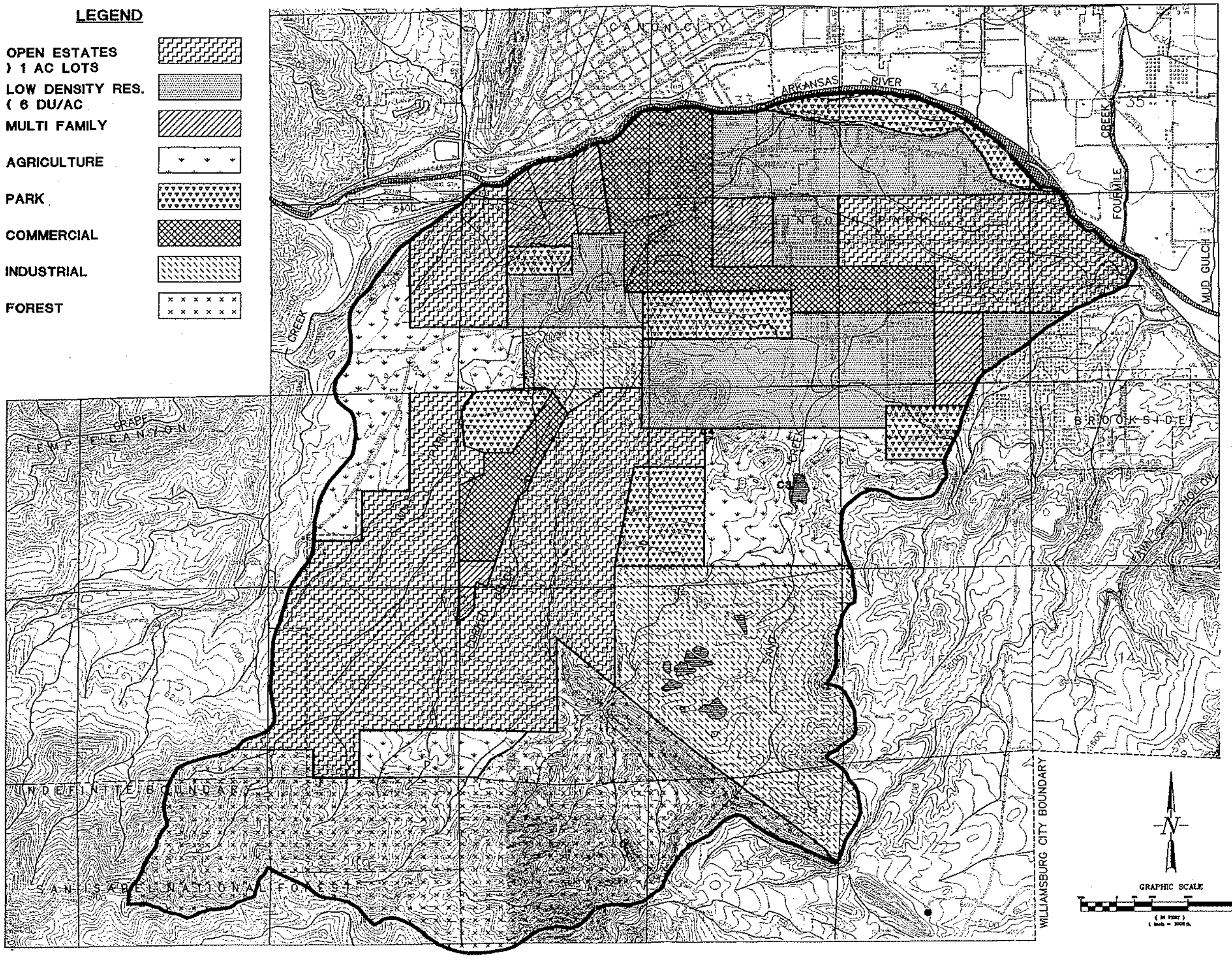


SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
ADJACENT BASINS MAP

PREPARED BY:

ADP

SHEET 1 of 1



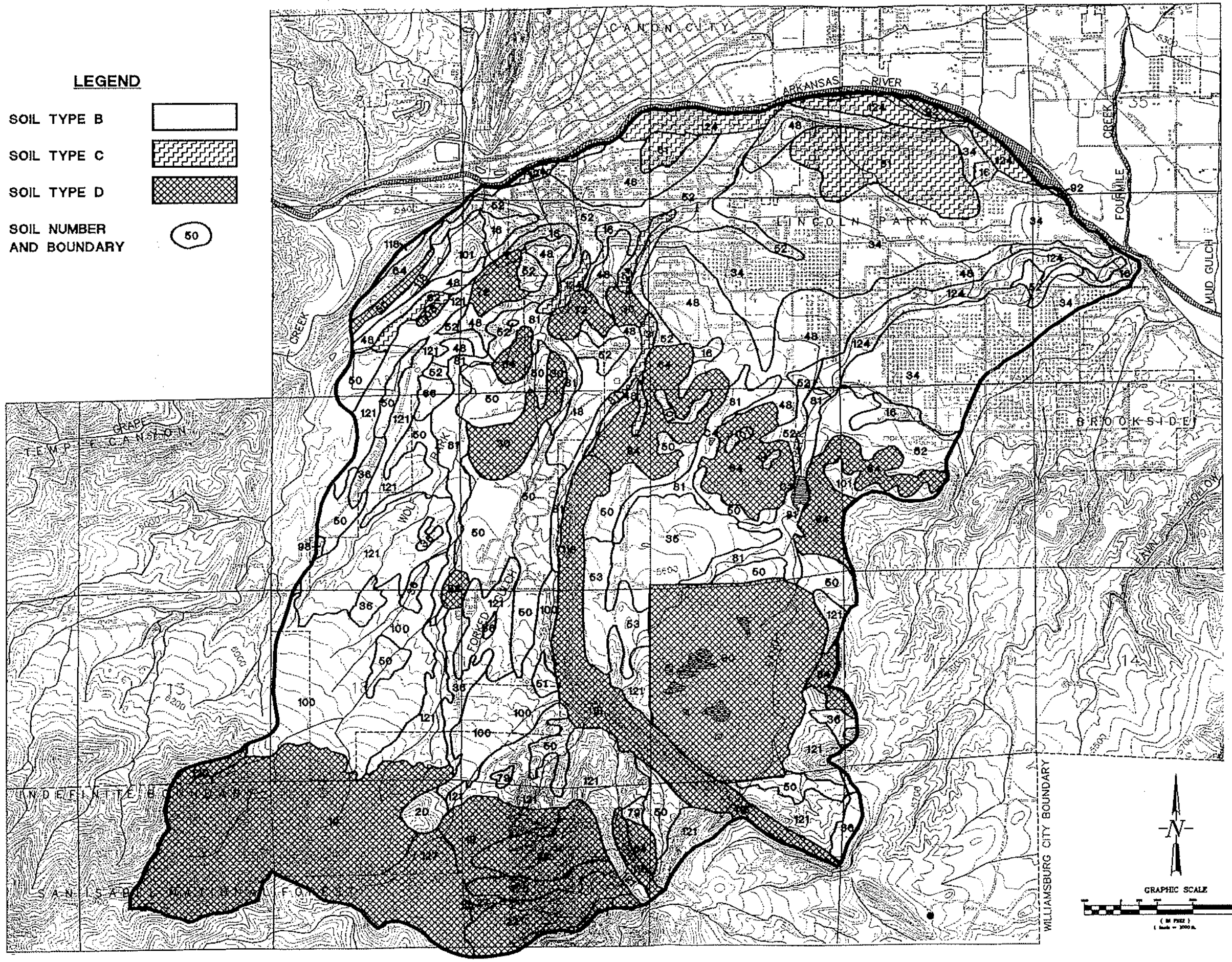
PREPARED BY:

ADP

NO.	DATE	REVISION	BY

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
PROJECTED SURFACE CHARACTERISTICS

SHEET
1 of 1

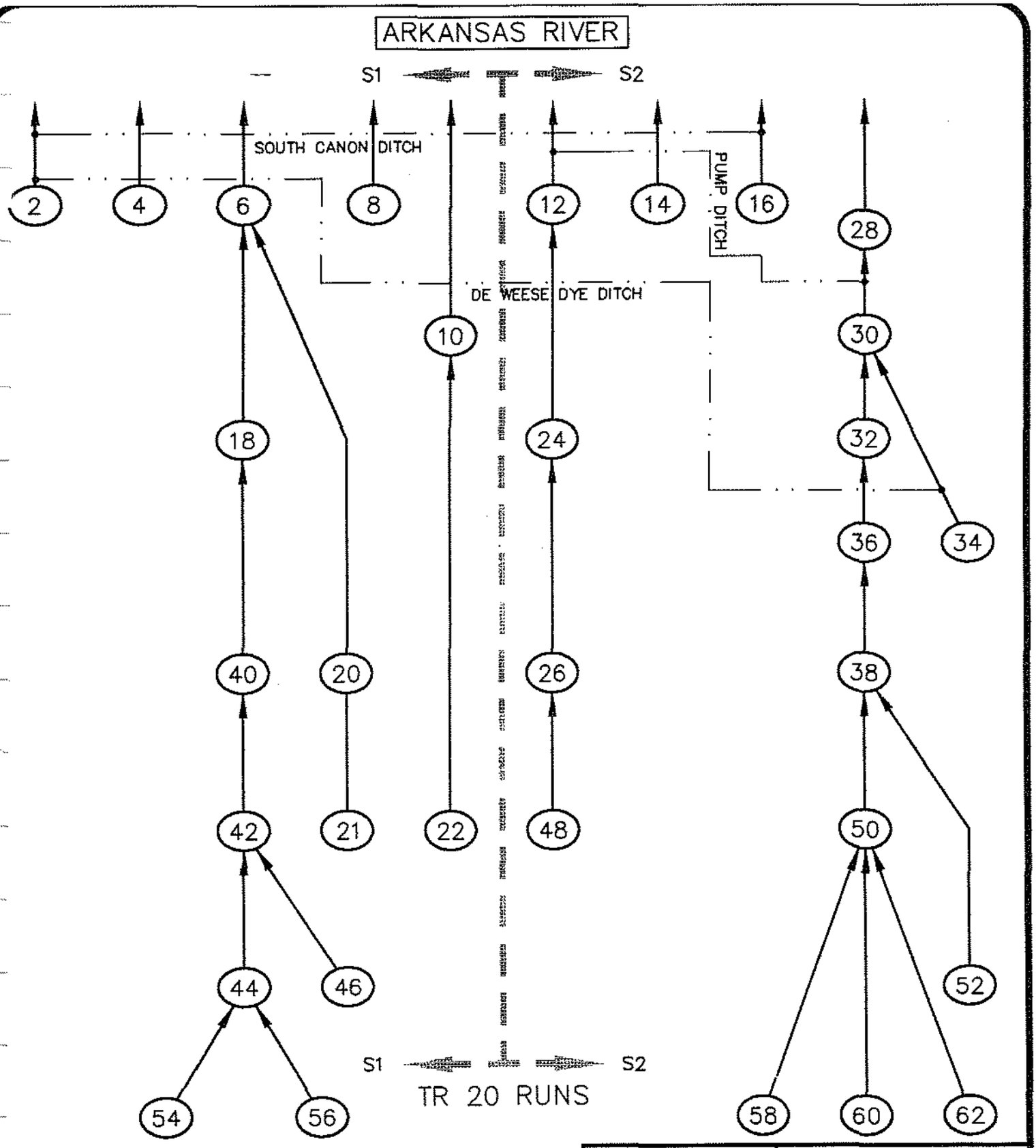


PREPARED BY:

ADP

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY
SOILS MAP

SHEET
1 of 1



SOUTH SAND CREEK BASIN PLANNING STUDY EXISTING CONDITIONS	
FLOW DIAGRAM	
DESIGNED BY: JJW	DRAWN BY: JJW
CHECKED BY: MAB	DATE: 6/17/99
FILE NO: 8_XFLOW.DWG	JOB NO: 980907

ADP
Applied Design Professionals
1861 Austin Bluffs Pkwy, Suite 101
Colorado Springs, CO 80918
(719) 266-5212
fax: (719) 266-5341

SOUTH SAND CREEK DBPS
DEVELOPED CN CALCULATION 1 OF 3

BASIN #	AREA (ac.)	SOIL TYPE	AGRI	%	EST	%	S.F.	%	M.F.	%	INDST	%	COMM	%	PARK	%	FRST	%	TOTAL SOIL %	DEV CN	BASIN #
		B	69	40	68	45	75		75		88		92		61		60		85		
2	141	C	79		79		83		83		91		94		74		73		0	70.8	2
		D	84	10	84	5	87		87		93		95		80		79		15		
		B	69	50	68	20	75		75	10	88		92		61	2	60		82		
4	344	C	79	2	79	2	83		83	5	91		94		74		73		9	71.6	4
		D	84		84	7	87		87		93		95		80	2	79		9		
		B	69		68	10	75	30	75	25	88	5	92	10	61	10	60		90		
6	291	C	79		79		83	5	83		91		94		74		73		5	76.3	6
		D	84		84		87	5	87		93		95		80		79		5		
		B	69		68		75		75		88		92	55	61		60		55		
8	160	C	79		79		83		83		91		94	45	74		73		45	92.9	8
		D	84		84		87		87		93		95		80		79		0		
		B	69	5	68		75	5	75		88	15	92	30	61	15	60		70		
10	224	C	79		79		83	5	83		91		94	5	74		73		10	83.1	10
		D	84	10	84		87	10	87		93		95		80		79		20		
		B	69		68		75	30	75	15	88		92	20	61	5	60		70		
12	421	C	79		79		83	20	83		91		94	5	74	5	73		30	80.2	12
		D	84		84		87		87		93		95		80		79		0		
		B	69		68	20	75	10	75		88		92	15	61	5	60		50		
14	487	C	79		79	5	83	25	83		91		94		74	15	73		45	77.8	14
		D	84		84		87		87		93		95		80	5	79		5		
		B	69		68	45	75	20	75		88		92		61	10	60		75		
16	192	C	79		79	5	83	5	83		91		94		74	15	73		25	70.9	16
		D	84		84		87		87		93		95		80		79		0		
		B	69	40	68	30	75		75		88		92		61	10	60		80		
18	290	C	79		79		83		83		91		94		74		73		0	71.2	18
		D	84	10	84		87		87		93	5	95		80	5	79		20		
		B	69		68	15	75		75		88	25	92	25	61	5	60		70		
20	191	C	79		79		83		83		91		94		74		73		0	84.6	20
		D	84		84	5	87		87		93	5	95	10	80	10	79		30		
		B	69	5	68	70	75		75	10	88		92	15	61		60		100		
21	262	C	79		79		83		83		91		94		74		73		0	72.4	21
		D	84		84		87		87		93		95		80		79		0		
		B	69		68	35	75		75		88	10	92		61		60		45		
22	359	C	79		79	5	83		83		91	5	94		74		73		10	79.1	22
		D	84		84	25	87	15	87		93		95		80		79	5	45		
		B	69		68		75	50	75		88		92	5	61	20	60		75		
24	310	C	79		79		83		83		91		94		74		73		0	76.1	24
		D	84		84		87	25	87		93		95		80		79		25		

SOUTH SAND CREEK DBPS
DEVELOPED CN CALCULATION 2 OF 3

BASIN #	AREA (ac.)	SOIL TYPE	AGRI	%	EST	%	S.F.	%	M.F.	%	INDST	%	COMM	%	PARK	%	FRST	%	TOTAL %	DEV CN	BASIN #
		B	69	10	68	10	75		75		88	15	92		61	30	60		65		
26	261	C	79		79		83		83		91		94		74		73		0	74.6	26
		D	84	15	84	10	87	5	87		93		95		80	5	79		35		
		B	69		68	90	75	10	75		88		92		61		60		100		
28	123	C	79		79		83		83		91		94		74		73		0	68.7	28
		D	84		84		87		87		93		95		80		79		0		
		B	69		68	40	75	25	75	35	88		92		61		60		100		
30	175	C	79		79		83		83		91		94		74		73		0	72.2	30
		D	84		84		87		87		93		95		80		79		0		
		B	69	10	68		75	50	75		88		92	15	61	10	60		85		
32	277	C	79		79		83		83		91		94		74		73		0	76.9	32
		D	84	15	84		87		87		93		95		80		79		15		
		B	69	10	68		75	5	75	15	88		92		61	50	60		80		
34	115	C	79		79		83		83		91		94		74		73		0	69.0	34
		D	84	15	84		87		87		93		95		80	5	79		20		
		B	69	40	68		75	30	75		88		92		61		60		70		
36	118	C	79		79		83		83		91		94		74		73		0	75.3	36
		D	84	30	84		87		87		93		95		80		79		30		
		B	69	45	68		75		75		88		92		61	5	60		50		
38	156	C	79		79		83		83		91		94		74		73		0	76.1	38
		D	84	50	84		87		87		93		95		80		79		50		
		B	69	5	68	95	75		75		88		92		61		60		100		
40	332	C	79		79		83		83		91		94		74		73		0	68.1	40
		D	84		84		87		87		93		95		80		79		0		
		B	69		68	90	75		75		88		92		61		60		90		
42	178	C	79		79		83		83		91		94		74		73		0	69.6	42
		D	84		84	10	87		87		93		95		80		79		10		
		B	69	5	68	95	75		75		88		92		61		60		100		
44	85	C	79		79		83		83		91		94		74		73		0	68.1	44
		D	84		84		87		87		93		95		80		79		0		
		B	69	20	68	50	75		75		88		92		61		60	5	75		
46	245	C	79		79		83		83		91		94		74		73		0	71.1	46
		D	84	10	84		87		87		93		95		80		79	15	25		
		B	69		68	55	75		75		88		92		61	5	60		60		
48	198	C	79		79		83		83		91		94		74		73		0	73.3	48
		D	84		84	25	87		87		93		95		80		79	15	40		
		B	69	15	68		75		75		88	30	92		61		60		45		
50	165	C	79		79		83		83		91		94		74		73		0	86.5	50
		D	84		84		87		87		93	45	95		80		79	10	55		

SOUTH SAND CREEK DBPS
DEVELOPED CN CALCULATION 3 OF 3

BASIN #	AREA (ac.)	SOIL TYPE	AGRI	%	EST	%	S.F.	%	M.F.	%	INDST	%	COMM	%	PARK	%	FRST	%	TOTAL %	DEV CN	BASIN #
		B	69		68		75		75		88	30	92		61		60		30		
52	860	C	79		79		83		83		91		94		74		73		0	90.1	52
		D	84		84		87		87		93	60	95		80		79	10	70		
		B	69		68	20	75		75		88		92		61		60		20		
54	389	C	79		79		83		83		91		94		74		73		0	77.1	54
		D	84		84	5	87		87		93		95		80		79	75	80		
		B	69		68		75		75		88		92		61		60		0		
56	151	C	79		79		83		83		91		94		74		73		0	80.0	56
		D	84		84	20	87		87		93		95		80		79	80	100		
		B	69	10	68	10	75		75		88		92		61		60	30	50		
58	474	C	79		79		83		83		91		94		74		73		0	71.2	58
		D	84		84		87		87		93		95		80		79	50	50		
		B	69		68		75		75		88		92		61		60	30	30		
60	427	C	79		79		83		83		91		94		74		73		0	73.3	60
		D	84		84		87		87		93		95		80		79	70	70		
		B	69		68		75		75		88		92		61		60	50	50		
62	172	C	79		79		83		83		91		94		74		73		0	69.5	62
		D	84		84		87		87		93		95		80		79	50	50		

SOUTH SAND CREEK DBPS - PROPOSED CONDITIONS
TIME OF CONCENTRATION CALCULATIONS

AREA DESIG	AREA (SQ-MI)	DEV C_{10} (10 yr.)	L_i (ft)	Initial Tc_i Slope (%)	t_i (min)	L (ft)	Travel Time Slope (%)	V (fps)	T_t (min)	T_c (min)	T_c (hr)	EXIST CN	DEV CN	AREA DESIG
2	0.220	0.4	300	4.80	14.19	3450	4.80	6.76	8.51	22.69	0.378	70.8	70.8	2
4	0.537	0.4	300	3.46	14.78	6900	3.46	5.72	20.10	34.89	0.581	71.6	71.6	4
6	0.454	0.5	300	3.08	12.51	5200	3.08	5.39	16.08	28.59	0.477	74.6	76.3	6
8	0.250	0.9	300	2.22	4.98	3200	2.22	7.36	7.25	12.23	0.204	83.7	92.9	8
10	0.350	0.7	300	1.60	11.79	4700	1.60	5.38	14.57	26.36	0.439	79.2	83.1	10
12	0.657	0.6	300	1.86	13.39	5200	1.86	7.39	11.73	25.12	0.419	80.2	80.2	12
14	0.761	0.5	300	1.36	16.39	5600	1.36	6.16	15.16	31.55	0.526	76.1	77.8	14
16	0.300	0.4	300	2.86	15.34	3200	2.86	2.99	17.82	33.16	0.553	70.9	70.9	16
18	0.453	0.4	300	1.82	18.21	5200	1.82	3.39	25.59	43.80	0.730	72.0	71.2	18
20	0.299	0.7	300	2.22	9.52	4200	2.22	6.22	11.25	20.78	0.346	80.4	84.6	20
21	0.410	0.5	300	2.22	15.99	5200	2.22	4.29	20.19	36.18	0.603	72.6	72.4	21
22	0.561	0.5	300	2.63	14.89	9500	2.63	7.13	22.22	37.11	0.618	78.9	79.1	22
24	0.485	0.5	300	1.67	17.78	3900	1.67	5.08	12.79	30.57	0.509	72.4	76.1	24
26	0.409	0.5	300	2.78	13.41	4000	2.78	6.40	10.41	23.82	0.397	74.6	74.6	26
28	0.192	0.4	300	1.43	21.44	3900	1.43	1.65	39.34	60.78	1.013	68.7	68.7	28
30	0.274	0.5	300	1.47	18.54	3100	1.47	3.90	13.25	31.79	0.530	71.5	72.2	30
32	0.433	0.5	300	1.43	17.63	3900	1.43	4.69	13.86	31.49	0.525	73.8	76.9	32
34	0.180	0.5	300	3.20	12.85	2900	3.20	4.93	9.79	22.65	0.377	69.0	69.0	34
36	0.184	0.4	300	2.76	16.51	2700	2.76	4.12	10.92	27.43	0.457	74.4	75.3	36
38	0.244	0.4	300	1.11	21.59	2400	1.11	3.65	10.96	32.55	0.542	76.1	76.1	38
40	0.518	0.4	300	4.17	15.16	6300	4.17	6.52	16.10	31.27	0.521	69.0	68.1	40
42	0.279	0.4	300	5.45	13.70	5400	5.45	6.36	14.15	27.85	0.464	70.5	69.6	42
44	0.133	0.4	300	6.36	13.19	4100	6.36	5.59	12.22	25.41	0.423	69.0	68.1	44
46	0.382	0.3	300	7.62	12.80	6200	7.62	7.22	14.32	27.12	0.452	64.6	71.1	46
48	0.309	0.4	300	2.86	16.89	4600	2.86	2.66	28.82	45.71	0.762	73.9	73.3	48
50	0.257	0.7	300	2.21	10.66	8300	2.21	4.21	32.83	43.49	0.725	86.5	86.5	50
52	1.344	0.7	300	5.10	6.81	9700	5.10	11.88	13.60	20.41	0.340	90.1	90.1	52
54	0.608	0.2	300	13.17	11.86	5700	13.17	11.12	8.55	20.41	0.340	77.3	77.1	54
56	0.237	0.3	300	12.50	11.96	3600	12.50	8.84	6.79	18.75	0.313	80.0	80.0	56
58	0.741	0.2	300	12.14	12.58	9200	12.14	10.32	14.85	27.43	0.457	71.2	71.2	58
60	0.668	0.2	300	8.47	14.64	8200	8.47	8.33	16.41	31.05	0.518	73.3	73.3	60
62	0.268	0.2	300	5.82	16.75	5200	5.82	5.72	15.15	31.90	0.532	69.5	69.5	62

SOUTH SAND CREEK DBPS
SUMMARY OF DISCHARGES

SUB-BASIN	SUB-BASIN FLOWS			ACCUMULATED FLOWS			DETAINED FLOWS			SUB-BASIN
	100 YR	50 YR	25 YR	100 YR	50 YR	25 YR	100 YR	50 YR	25 YR	
2	196	163	121							2
4	375	310	230							4
6	466	396	307	1550	1336	989	1604	1374	1002	6
8	674	612	528							8
10	525	458	373	576	499	401	689	589	463	10
12	888	768	614	1146	978	766				12
14	795	679	532							14
16	208	171	126							16
18	257	212	156	1599	1290	891				18
20	539	475	392	551	483	392				20
21	291	242	179							21
22	565	484	382							22
24	474	402	311	474	402	311				24
26	432	365	280	490	410	311				26
28	71	58	41	420	374	301	560	494	377	28
30	212	176	132	700	614	460				30
32	433	369	287	518	470	361				32
34	142	116	84							34
36	184	156	120	184	156	120				36
38	232	197	152	3515	3107	2580				38
40	329	269	194	1587	1294	931				40
42	213	175	129	1528	1266	936				42
44	97	79	58	1211	1032	804				44
46	196	155	106							46
48	196	163	123							48
50	329	290	239	1182	975	721				50
52	2963	2660	2257							52
54	798	684	539							54
56	367	318	256							56
58	588	487	362							58
60	558	467	353							60
62	173	141	103							62

SOUTH SAND CREEK DBPS
STRUCTURE EVALUATION

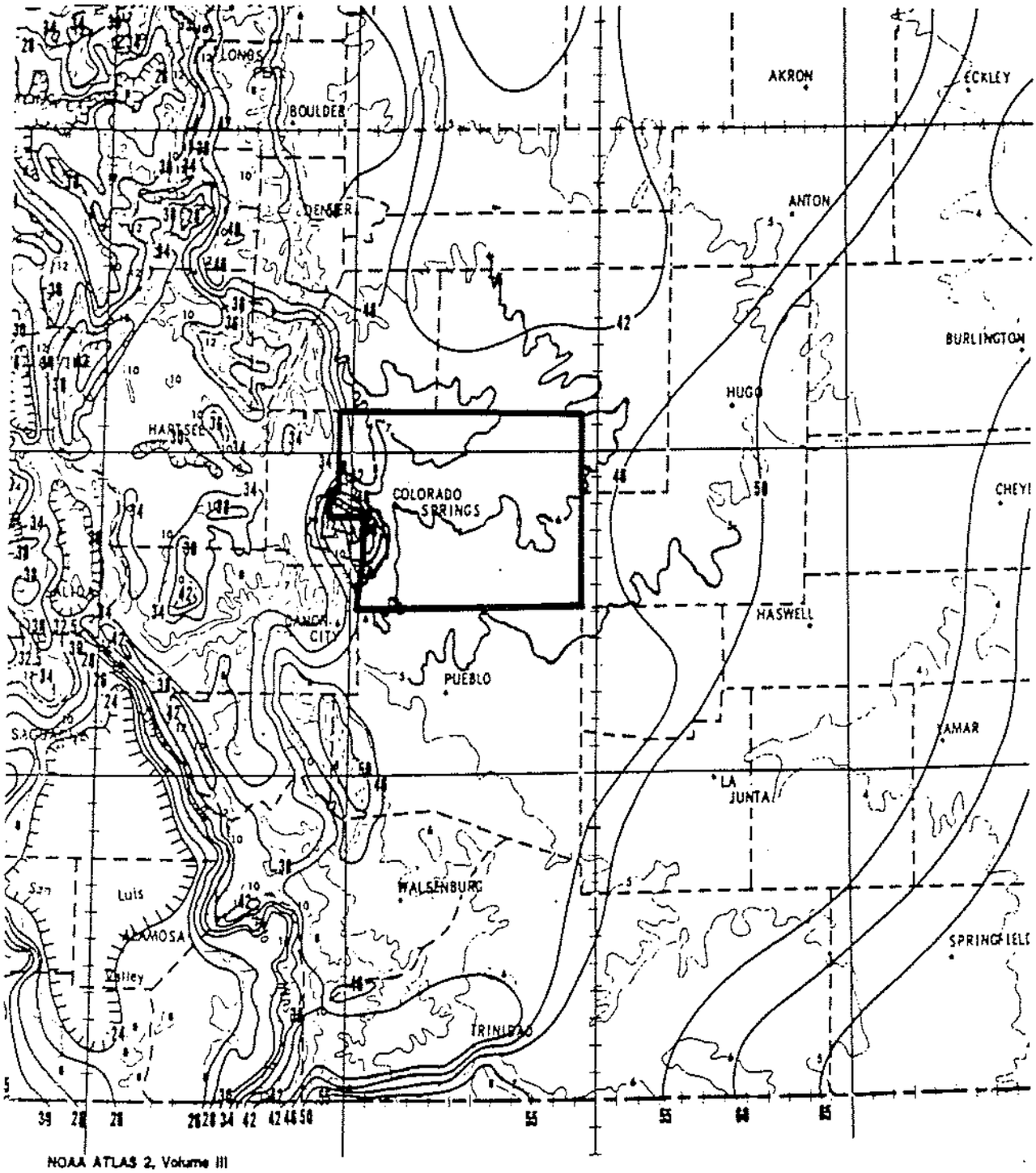
OAK CREEK GULCH - DETENTION FACILITY / STORM SEWER UPSIZE

STR. NO.	LOCATION	ALT 1 VS. ALT (2 / 3) 100 yr (cfs)	50 yr (cfs)	25 yr (cfs)	EXISTING CULVERT SIZE	CAPACITY (cfs)	PROPOSED CULVERT SIZE	CAPACITY (cfs)	COST	REMARKS
29	FORGE ROAD EAST OF RR	450 / 560			48" CMP	125	6' X 10' BOX	600	$ 38,721	LOCAL FLOWS
28	McDANIEL RD.	451 / 556	378 / 476	292 / 376	66" CMP	210	6' X 12' BOX	636	$ 30,241	LOCAL FLOWS
27	HIGHLAND RD.	570 / 680			54" CMP	150	6' X 16' BOX	680	$ 57,922	LOCAL FLOWS
26	RR XING N OF HIGHLAND ST.	570 / 680			3 - 36" CMP	210	6' X 14' BOX	742	$ 37,421	LOCAL FLOWS
97	DETENTION BASIN (IN / OUT)	689 / 280	589 / 251	463 / 199	-	-	2 - 48" RCP	300	$ 400,000	DETAINED FLOWS
24	54" STM SWR (1 / 3)	488 / 281	411 / 251	321 / 199	54" RCP	300	-	-	-	EXIST. STM SWR
24	78" STM SWR (1 / 2)	488 / 682	411 / 583	321 / 458	-	-	78" RCP	750	$ 1,353,335	PROP. STM SWR

FORKED GULCH - DETENTION FACILITY

STR. NO.	LOCATION	ALT 1 VS. ALT 2 100 yr (cfs)	50 yr (cfs)	25 yr (cfs)	EXISTING CULVERT SIZE	CAPACITY (cfs)	PROPOSED CULVERT SIZE	CAPACITY (cfs)	COST	REMARKS
42	TEMPLE CANON RD. & A ST.	1284 / 1345	1117 / 1160	850 / 859	3 - 72" CMP	1275	4 - 60" CMP	1420	$ 111,373	DETAINED FLOWS
35	PENNSYLVANIA ST.	1550 / 1605	1335 / 1372	988 / 1001	52' X 7' BRIDGE	3900	-	-	-	LOCAL FLOWS
34	CATLIN AVE. / S. CANON DITCH	1550 / 1605	1335 / 1372	988 / 1000	25' X 8' BRIDGE(S)	1750	50' X 8' BRIDGE(S)	3500	$ 90,000	LOCAL FLOWS
33	STANLEY AVE.	1550 / 1605	1335 / 1373	989 / 1000	50' X 8' BRIDGE	4000	-	-	-	LOCAL FLOWS
32	DOUGLAS ST.	1549 / 1605	1334 / 1374	989 / 1000	38' X 9' BRIDGE	3800	-	-	-	LOCAL FLOWS
31	GRIFFIN ST.	1547 / 1602	1334 / 1373	987 / 997	50' X 11' BRIDGE	6500	-	-	-	LOCAL FLOWS

APPENDIX A
Design Charts



NOAA ATLAS 2, Volume III

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL COVER COMPLEXES - URBAN AND SUBURBAN CONDITIONS 1/
(Antecedent Moisture Condition II)
(From: U.S. Dept. of Agriculture, Soil Conservation Service, 1977)

Land Use		Hydrologic Soil Group A	B	C	D
Open spaces, lawns, parks, golf courses, cemeteries, etc.					
Good condition:	grass cover on 75% or more of the area	39*	61	74	80
Fair condition:	grass cover on 50% to 75% of the area	49*	69	79	84
Commercial and Business areas (85% Impervious)		89*	92	94	95
Industrial Districts 72% Impervious)		81*	88	91	93
Residential: 2/					
Acres per Dwelling Unit	Average % Impervious 3/				
1/8 acre or less	65	77*	85	90	92
1/4 acre	38	61*	75	83	87
1/3 acre	30	57*	72	81	86
1/2 acre	25	54*	70	80	85
1 acre	20	51*	68	79	84
Paved parking lots, roofs, driveways, etc.		98	98	98	98
Streets and Roads:					
paved with curbs and storm sewers		98	98	98	98
gravel		76*	85	89	91
dirt		72*	82	87	89

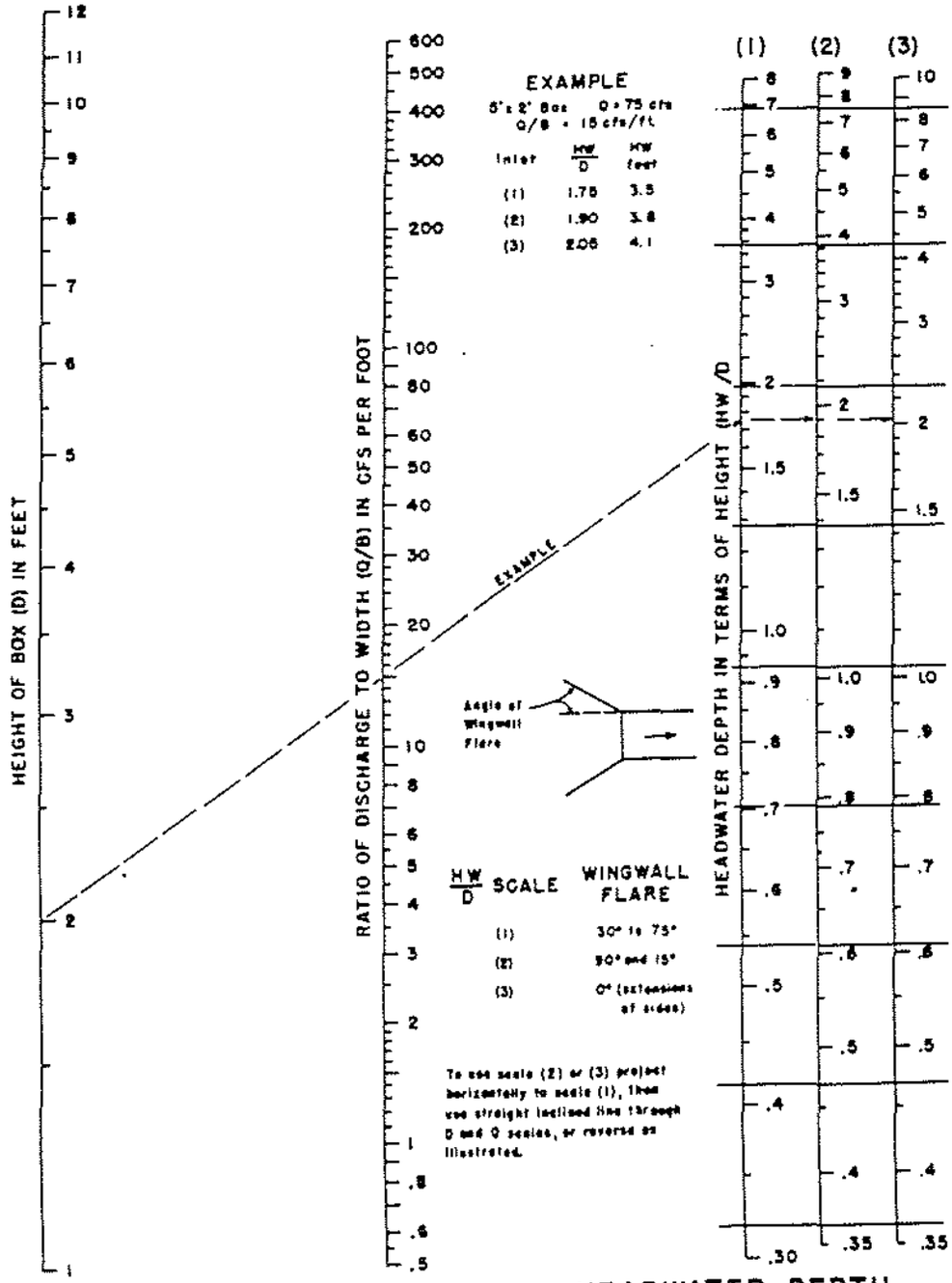
1/ For a more detailed description of agricultural land use curve numbers, refer to the National Engineering Handbook (U.S. Dept. of Agriculture, Soil Conservation Service, 1972).
2/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.
3/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

* Not to be used wherever overlot grading or filling is to occur.

RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL COVER COMPLEXES - RURAL CONDITIONS
(Antecedent Moisture Condition II, and Ia = 0.2 S)
(From: U.S. Dept. of Agriculture, Soil Conservation Service, 1977)

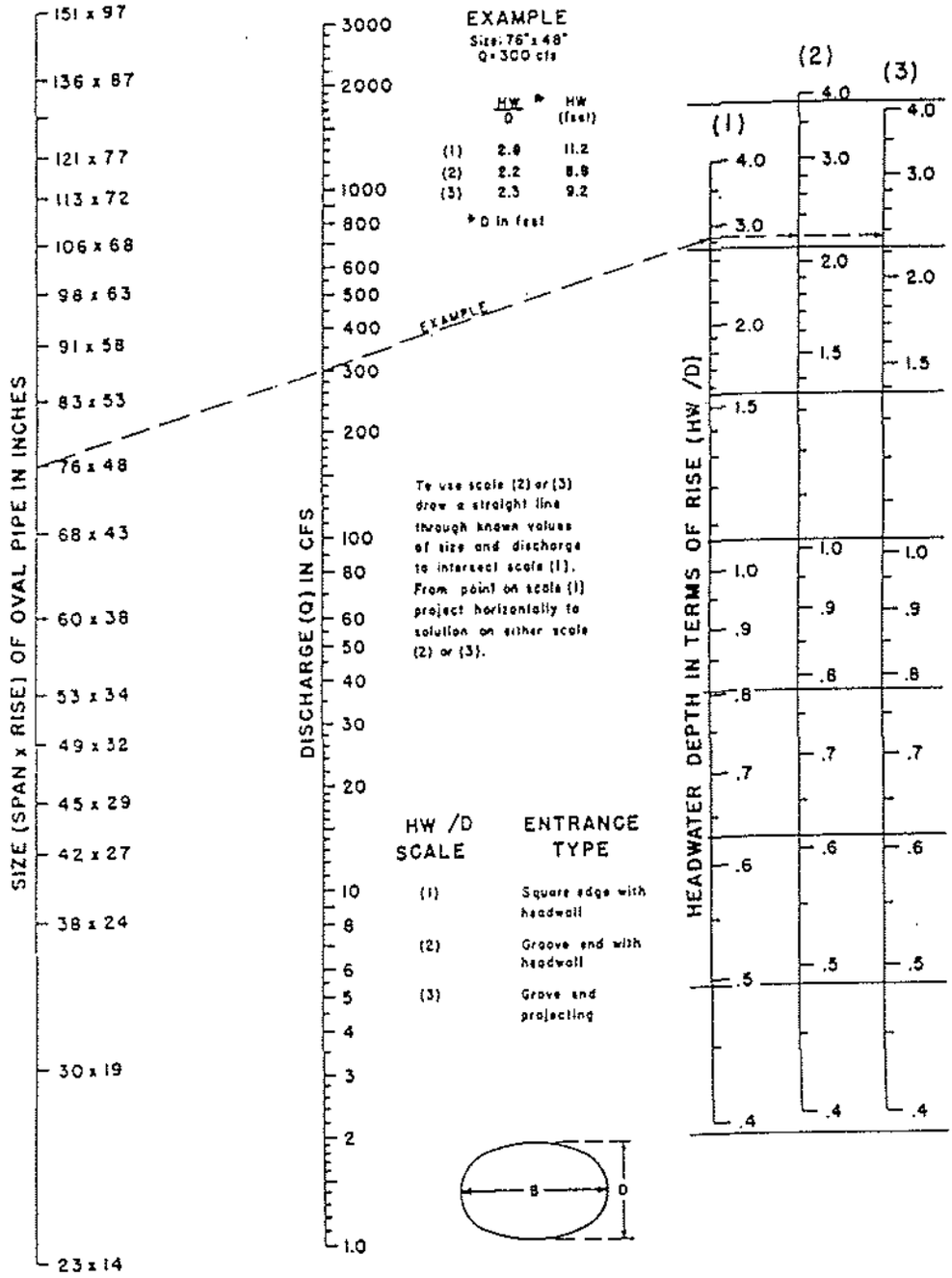
Land Use	Cover Treatment or Practice	Hydrologic Condition	Runoff Curve Number by Hydrologic Soil Group A	B	C	D
Fallow	Straight Row	----	77	86	91	94
Row Crops	Straight Row	Poor	72	81	88	91
	Straight Row	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	Contoured	Good	65	75	82	86
	Cont. & Terraced	Poor	66	74	80	82
	Cont. & Terraced	Good	62	71	78	81
Small Grain	Straight Row	Poor	65	76	84	88
	Straight Row	Good	63	75	83	87
	Contoured	Poor	63	74	82	85
	Contoured	Good	61	73	81	84
	Cont. & Terraced	Poor	61	72	79	82
	Cont. & Terraced	Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight Row	Poor	66	77	85	89
	Straight Row	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	Contoured	Good	55	69	78	83
	Cont. & Terraced	Poor	63	73	80	83
	Cont. & Terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	Contoured	Fair	25	59	75	83
	Contoured	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		----	74	84	90	92

1/ Close-drilled or broadcast
2/ Including right-of-way



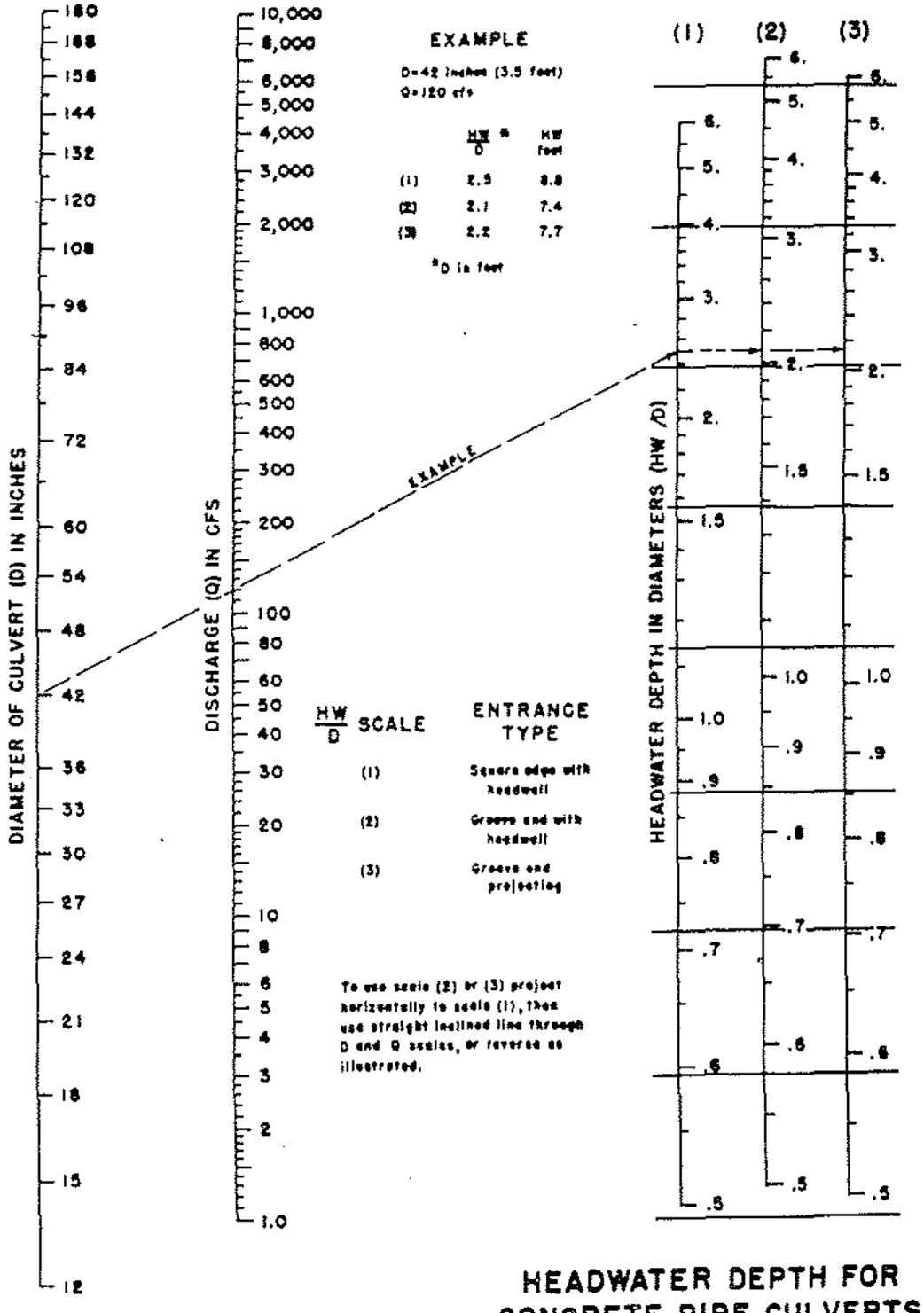
HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963



HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

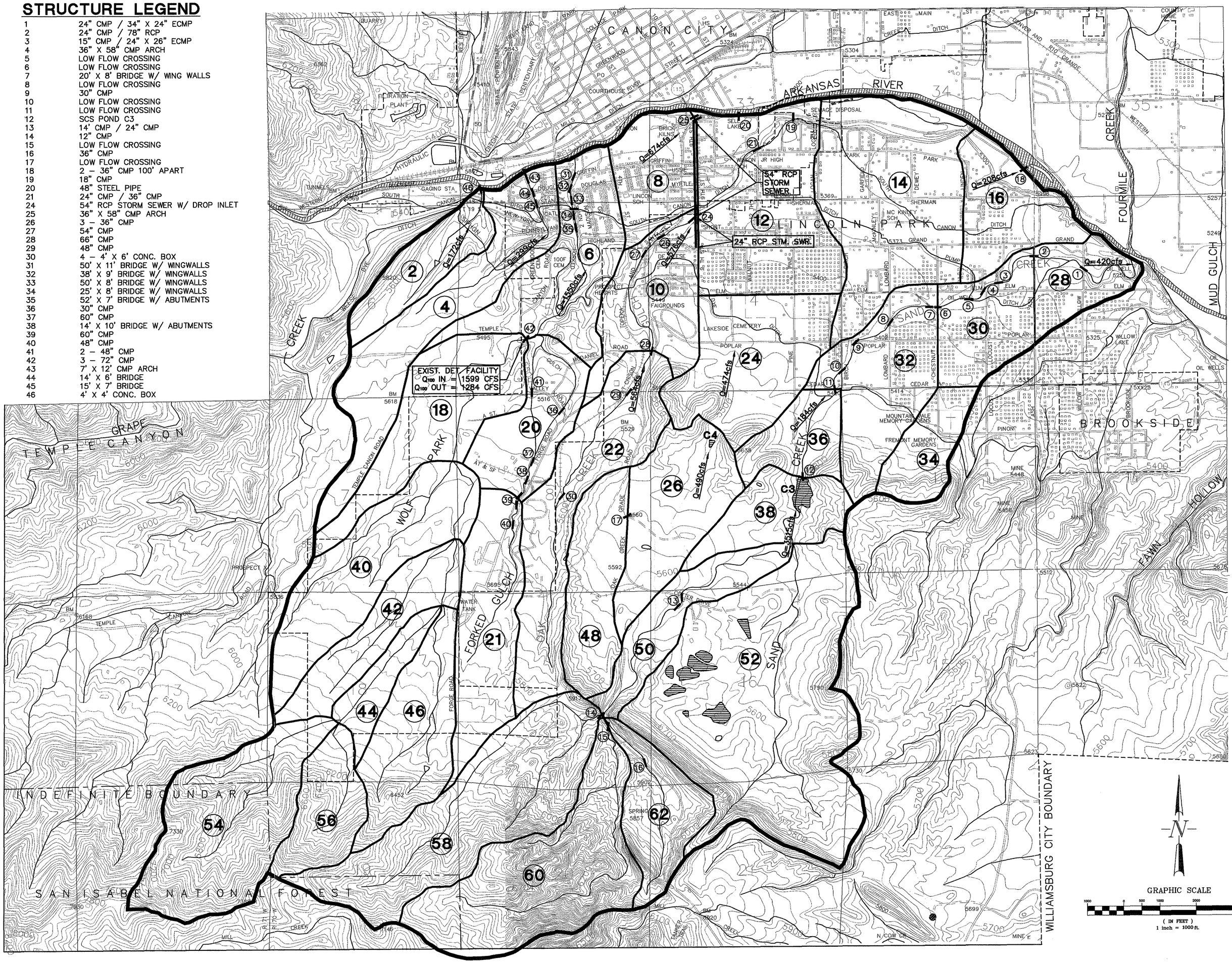
BUREAU OF PUBLIC ROADS JAN. 1963

APPENDIX B
Preliminary Construction Costs

ALTERNATE 1

STRUCTURE LEGEND

1	24" CMP / 34" X 24" ECMP
2	24" CMP / 78" RCP
3	15" CMP / 24" X 26" ECMP
4	36" X 58" CMP ARCH
5	LOW FLOW CROSSING
6	LOW FLOW CROSSING
7	20' X 8' BRIDGE W/ WING WALLS
8	LOW FLOW CROSSING
9	30" CMP
10	LOW FLOW CROSSING
11	LOW FLOW CROSSING
12	SCS POND C3
13	14' CMP / 24" CMP
14	12" CMP
15	LOW FLOW CROSSING
16	36" CMP
17	LOW FLOW CROSSING
18	2 – 36" CMP 100' APART
19	18" CMP
20	48" STEEL PIPE
21	24" CMP / 36" CMP
24	54" RCP STORM SEWER W/ DROP INLET
25	36" X 58" CMP ARCH
26	3 – 36" CMP
27	54" CMP
28	66" CMP
29	48" CMP
30	4 – 4' X 6' CONC. BOX
31	50' X 11' BRIDGE W/ WINGWALLS
32	38' X 9' BRIDGE W/ WINGWALLS
33	50' X 8' BRIDGE W/ WINGWALLS
34	25' X 8' BRIDGE W/ WINGWALLS
35	52' X 7' BRIDGE W/ ABUTMENTS
36	30" CMP
37	60" CMP
38	14' X 10' BRIDGE W/ ABUTMENTS
39	60" CMP
40	48" CMP
41	2 – 48" CMP
42	3 – 72" CMP
43	7' X 12' CMP ARCH
44	14' X 6' BRIDGE
45	15' X 7' BRIDGE
46	4' X 4' CONC. BOX



DESIGNED BY JJW
DRAWN BY JJW
PROJECT ENGINEER MAB
PROJECT MANAGER MAB
DATE 9/22/99
JOB NO. 980907
CAD FILE NO. S_ALT_1.DWG
SCALE: HOR. 1"=1000'
VERT. ____

PREPARED BY:

ADP Associated Design Professionals, Inc.
1861 Austin Bluffs Parkway Suite 101
Colorado Springs, CO 80918
(719) 266-5812
fax: (719) 265-5341

NO.	DATE	REVISION	BY

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
ALTERNATE 1

SHEET 1 of 3

ALTERNATE 2

ESTIMATED PROBABLE CONSTRUCTION COST
ALTERNATE 2

FORKED GULCH

STR #	SIZE	LOCATION	ITEM COST
42	4 - 60" RCP	TEMPLE CANON RD. & A ST.	$ 111,373
34	50' X 8' PED XING	CATLIN AVE.	$ 52,500
34	50' X 8' AERIAL XING	SOUTH CANON DITCH	$ 37,500
36	4' X 8' BOX	VALLEY RD.	$ 23,159
41	4' X 8' BOX	VALLEY RD.	$ 23,159
CHAN	1500' @ 4' DEEP	VALLEY RD. TO TEMLE CANON RD.	$ 88,147
		SUB-TOTAL	**$ 335,839**

OAK CREEK GULCH

STR #	SIZE	LOCATION	ITEM COST
29	6' X 10' BOX	FORGE ROAD EAST OF RR	$ 38,721
28	6' X 12' BOX	McDANIEL RD.	$ 30,241
27	6' X 16' BOX	HIGHLAND RD.	$ 57,922
26	6' X 14' BOX	RAILROAD SPUR	$ 37,421
24	78" RCP @ 2650'	SH 115 STM SWR TO ARK. RIVER	$ 1,353,335
CHAN	5000' @ 8.5' DEEP	McDANIEL RD. TO SH 115	$ 706,861
		SUB-TOTAL	**$ 2,224,501**

SOUTH SAND CREEK

STR #	SIZE	LOCATION	ITEM COST
9	3' X 14' BOX	POPLAR AVE.	$ 25,192
4	2 - 4' X 8' BOX	ELM AVE.	$ 45,275
3	2 - 3' X 12' BOX	BETWEEN ELM AND GRAND	$ 42,507
2	2 - 4' X 7' BOX	ASH ST.	$ 71,055
1	4 - 3' X 6' BOX	WILLOW ST.	$ 32,974
		SUB-TOTAL	**$ 217,003**

RIVERSIDE DRIVE

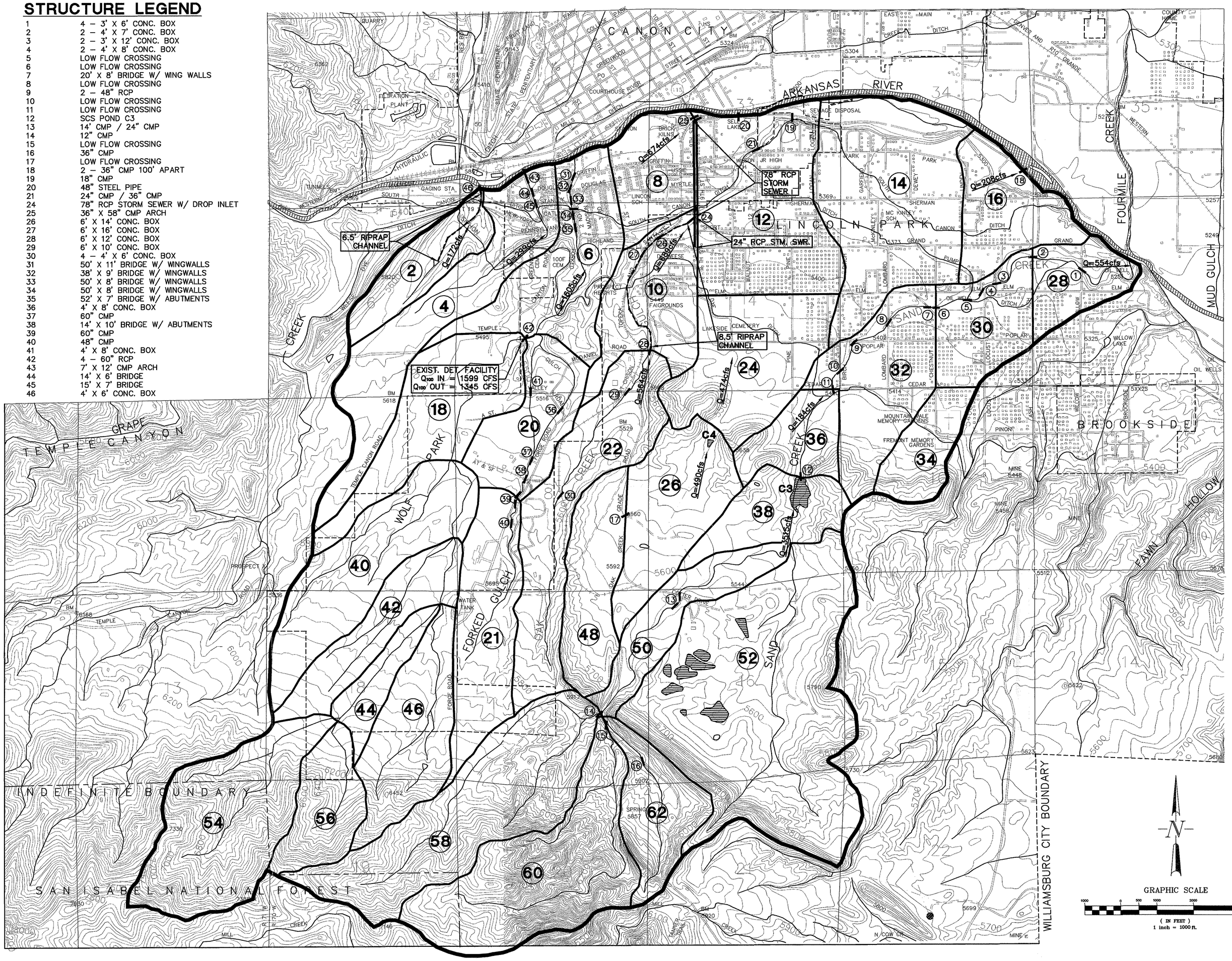
STR #	SIZE	LOCATION	ITEM COST
46	4' X 6' BOX	RIVERSIDE DR.	$ 17,129
CHAN	2000' @ 6.5' DEEP	2000' U / S OF STR. 46	$ 133,333
		SUB-TOTAL	**$ 150,463**

GRAND TOTAL	**$ 2,927,805**

NOTE: TOTAL COST ESTIMATE INCLUDES COST OF PIPE, HEADWALL, RIPRAP AND ANY REQUIRED CHANNEL EXCAVATION. IT DOES NOT INCLUDE COST FOR REMOVAL OF EXISTING STRUCTURES OR RELOCATION OF UTILITIES.

STRUCTURE LEGEND

1	4 – 3' X 6' CONC. BOX
2	2 – 4' X 7' CONC. BOX
3	2 – 3' X 12' CONC. BOX
4	2 – 4' X 8' CONC. BOX
5	LOW FLOW CROSSING
6	LOW FLOW CROSSING
7	20' X 8' BRIDGE W/ WING WALLS
8	LOW FLOW CROSSING
9	2 – 48" RCP
10	LOW FLOW CROSSING
11	LOW FLOW CROSSING
12	SCS POND C3
13	14' CMP / 24" CMP
14	12" CMP
15	LOW FLOW CROSSING
16	36" CMP
17	LOW FLOW CROSSING
18	2 – 36" CMP 100' APART
19	18" CMP
20	48" STEEL PIPE
21	24" CMP / 36" CMP
24	78" RCP STORM SEWER W/ DROP INLET
25	36" X 58" CMP ARCH
26	6' X 14' CONC. BOX
27	6' X 16' CONC. BOX
28	6' X 12' CONC. BOX
29	6' X 10' CONC. BOX
30	4 – 4' X 6' CONC. BOX
31	50' X 11' BRIDGE W/ WINGWALLS
32	38' X 9' BRIDGE W/ WINGWALLS
33	50' X 8' BRIDGE W/ WINGWALLS
34	50' X 8' BRIDGE W/ WINGWALLS
35	52' X 7' BRIDGE W/ ABUTMENTS
36	4' X 8' CONC. BOX
37	60" CMP
38	14' X 10' BRIDGE W/ ABUTMENTS
39	60" CMP
40	48" CMP
41	4' X 8' CONC. BOX
42	4 – 60" RCP
43	7' X 12' CMP ARCH
44	14' X 6' BRIDGE
45	15' X 7' BRIDGE
46	4' X 6' CONC. BOX



DESIGNED BY: JAM
PROJECT ENGINEER: MAB
PROJECT MANAGER: MAB
DATE: 4/25/99
JOB NO: 980907
CAD FILE NO: S_AT_2.DWG
DRAWN BY: JAM
SCALE: 1"=1000'
VERT.:

PREPARED BY:

ADP
Associated Design Professionals, Inc.
1861 Austin Bluffs Parkway
Suite 101
Colorado Springs, CO 80918
(719) 598-5215
fax: (719) 598-5341

NO.	DATE	REVISION	BY

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
ALTERNATE 2

SHEET 2 of 3

ALTERNATE 3

ESTIMATED PROBABLE CONSTRUCTION COST
ALTERNATE 3

FORKED GULCH

STR #	SIZE	LOCATION	ITEM COST
42	4 - 60" RCP	TEMPLE CANON RD. & A ST.	$ 111,373
34	50' X 8' PED XING	CATLIN AVE.	$ 52,500
34	50' X 8' AERIAL XING	SOUTH CANON DITCH	$ 37,500
36	4' X 8' BOX	VALLEY RD.	$ 23,159
41	4' X 8' BOX	VALLEY RD.	$ 23,159
CHAN	1500' @ 4' DEEP	VALLEY RD. TO TEMLE CANON RD.	$ 88,147
		SUB-TOTAL	**$ 335,839**

OAK CREEK GULCH

STR #	SIZE	LOCATION	ITEM COST
29	6' X 10' BOX	FORGE ROAD EAST OF RR	$ 38,721
28	6' X 12' BOX	McDANIEL RD.	$ 30,241
27	6' X 16' BOX	HIGHLAND RD.	$ 57,922
26	6' X 14' BOX	RAILROAD SPUR	$ 37,421
97	2 - 48" RCP	DETENTION FACILITY OUTLET	$ 19,838
CHAN	5000' @ 8.5' DEEP	McDANIEL RD. TO SH 115	$ 706,861
DET	38 AC-FT DET. FACILITY	U / S 54" STM SWR @ SH115	$ 400,000
		SUB-TOTAL	**$ 1,291,005**

SOUTH SAND CREEK

STR #	SIZE	LOCATION	ITEM COST
17	76" X 48" ERCP	OAK CREEK GRADE RD. U / S SCS C4	$ 11,273
16	2 - 48" RCP	OAK CREEK GRADE RD.	$ 13,838
15	6' X 14' BOX	OAK CREEK GRADE RD.	$ 48,401
14	6' X 14' BOX	OAK CREEK GRADE RD.	$ 48,401
11	76" X 48" ERCP	CEDAR AVE.	$ 11,273
10	76" X 48" ERCP	BIRCH ST.	$ 11,273
9	3' X 14' BOX	POPLAR AVE.	$ 25,192
8	4' X 12' BOX	LOMBARD ST.	$ 29,459
6	4' X 14' BOX	CHESTNUT ST.	$ 32,848
5	4' X 15' BOX	PUMP DITCH	$ 35,983
4	2 - 4' X 8' BOX	ELM AVE.	$ 45,275
3	2 - 3' X 12' BOX	BETWEEN ELM AND GRAND	$ 42,507
2	2 - 4' X 7' BOX	ASH ST.	$ 71,055
1	4 - 3' X 6' BOX	WILLOW ST.	$ 32,974
		SUB-TOTAL	**$ 315,293**

RIVERSIDE DRIVE

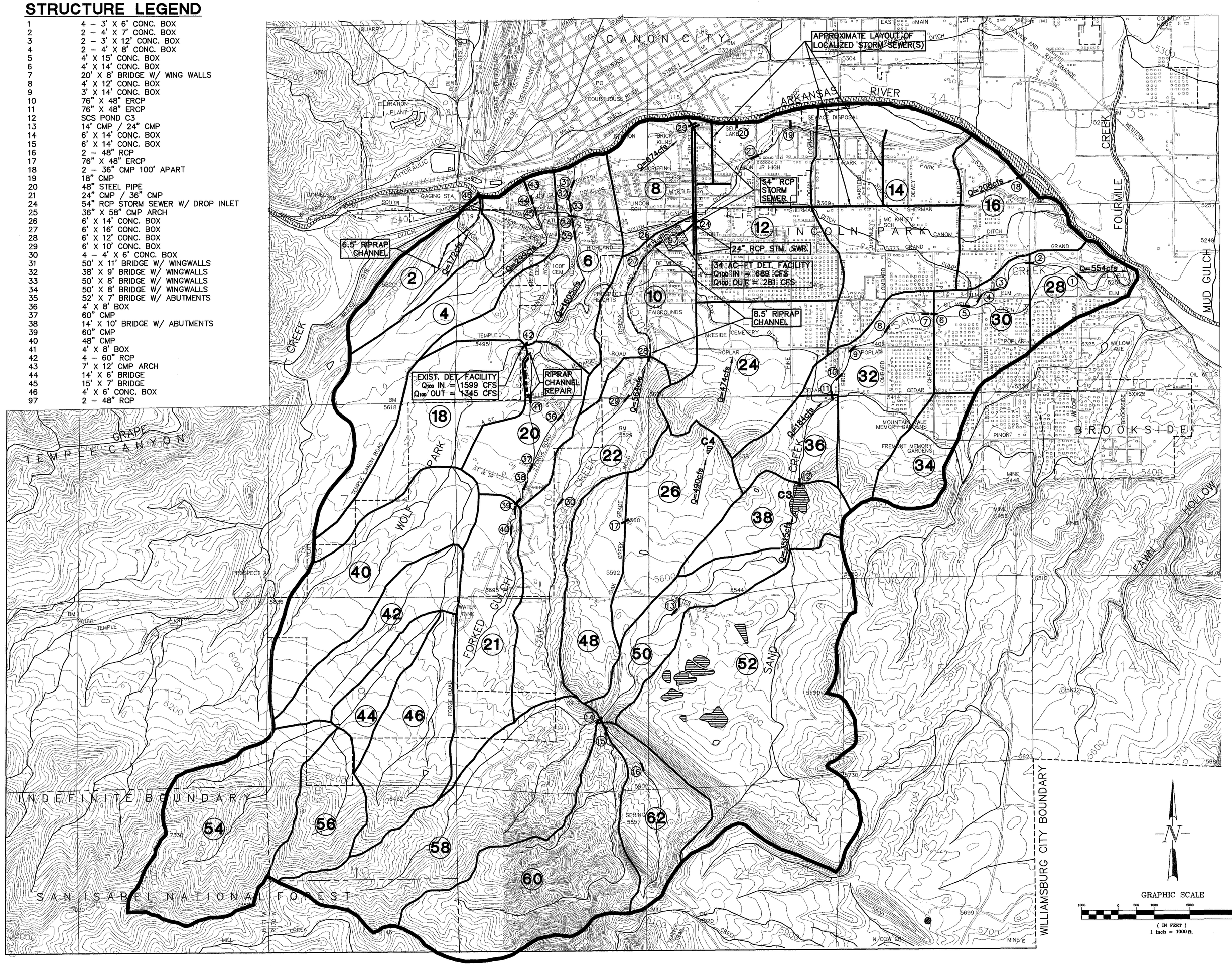
STR #	SIZE	LOCATION	ITEM COST
46	4' X 6' BOX	RIVERSIDE DR.	$ 17,129
CHAN	2000' @ 6.5' DEEP	2000' U / S OF STR. 46	$ 133,333
		SUB-TOTAL	**$ 150,463**

GRAND TOTAL	**$ 2,092,598**

NOTE: TOTAL COST ESTIMATE INCLUDES COST OF PIPE, HEADWALL, RIPRAP AND ANY REQUIRED CHANNEL EXCAVATION. IT DOES NOT INCLUDE COST FOR ANY REQUIRED CHANNEL EXCAVATION. IT DOES NOT INCLUDE COST FOR REMOVAL OF EXISTING STRUCTURES OR RELOCATION OF UTILITIES.

STRUCTURE LEGEND

1	4 – 3' X 6' CONC. BOX
2	2 – 4' X 7' CONC. BOX
3	2 – 3' X 12' CONC. BOX
4	2 – 4' X 8' CONC. BOX
5	4' X 15' CONC. BOX
6	4' X 14' CONC. BOX
7	20' X 8' BRIDGE W/ WING WALLS
8	4' X 12' CONC. BOX
9	3' X 14' CONC. BOX
10	76" X 48" ERCP
11	76" X 48" ERCP
12	SCS POND C-3
13	14' CMP / 24" CMP
14	6' X 14' CONC. BOX
15	6' X 14' CONC. BOX
16	2 – 48" RCP
17	76" X 48" ERCP
18	2 – 36" CMP 100' APART
19	18" CMP
20	48" STEEL PIPE
21	24" CMP / 36" CMP
24	54" RCP STORM SEWER W/ DROP INLET
25	36" X 58" CMP ARCH
26	6' X 14' CONC. BOX
27	6' X 16' CONC. BOX
28	6' X 12' CONC. BOX
29	6' X 10' CONC. BOX
30	4 – 4' X 6' CONC. BOX
31	50' X 11' BRIDGE W/ WINGWALLS
32	38' X 9' BRIDGE W/ WINGWALLS
33	50' X 8' BRIDGE W/ WINGWALLS
34	50' X 8' BRIDGE W/ WINGWALLS
35	52' X 7' BRIDGE W/ ABUTMENTS
36	4' X 8' BOX
37	60" CMP
38	14' X 10' BRIDGE W/ ABUTMENTS
39	60" CMP
40	48" CMP
41	4' X 8' BOX
42	4 – 60" RCP
43	7' X 12' CMP ARCH
44	14' X 6' BRIDGE
45	15' X 7' BRIDGE
46	4' X 6' CONC. BOX
97	2 – 48" RCP



DESIGNED BY JJW
DRAWN BY JJW
PROJECT ENGINEER MAB
PROJECT MANAGER MAB
DATE: 4/22/99
JOB NO. 1400.01
CAD FILE NO. S_ALT_3.DWG
SCALE: HORZ. 1"=1000'
VERT. ——

PREPARED BY:

ADP
Associated Design Professionals Inc
1861 Austin Bluffs Parkway Suite 101
Colorado Springs, CO 80918
(719) 266-5212
fax: (719) 265-5341

NO.	DATE	REVISION	BY

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
ALTERNATE 3

SHEET
3 of 3

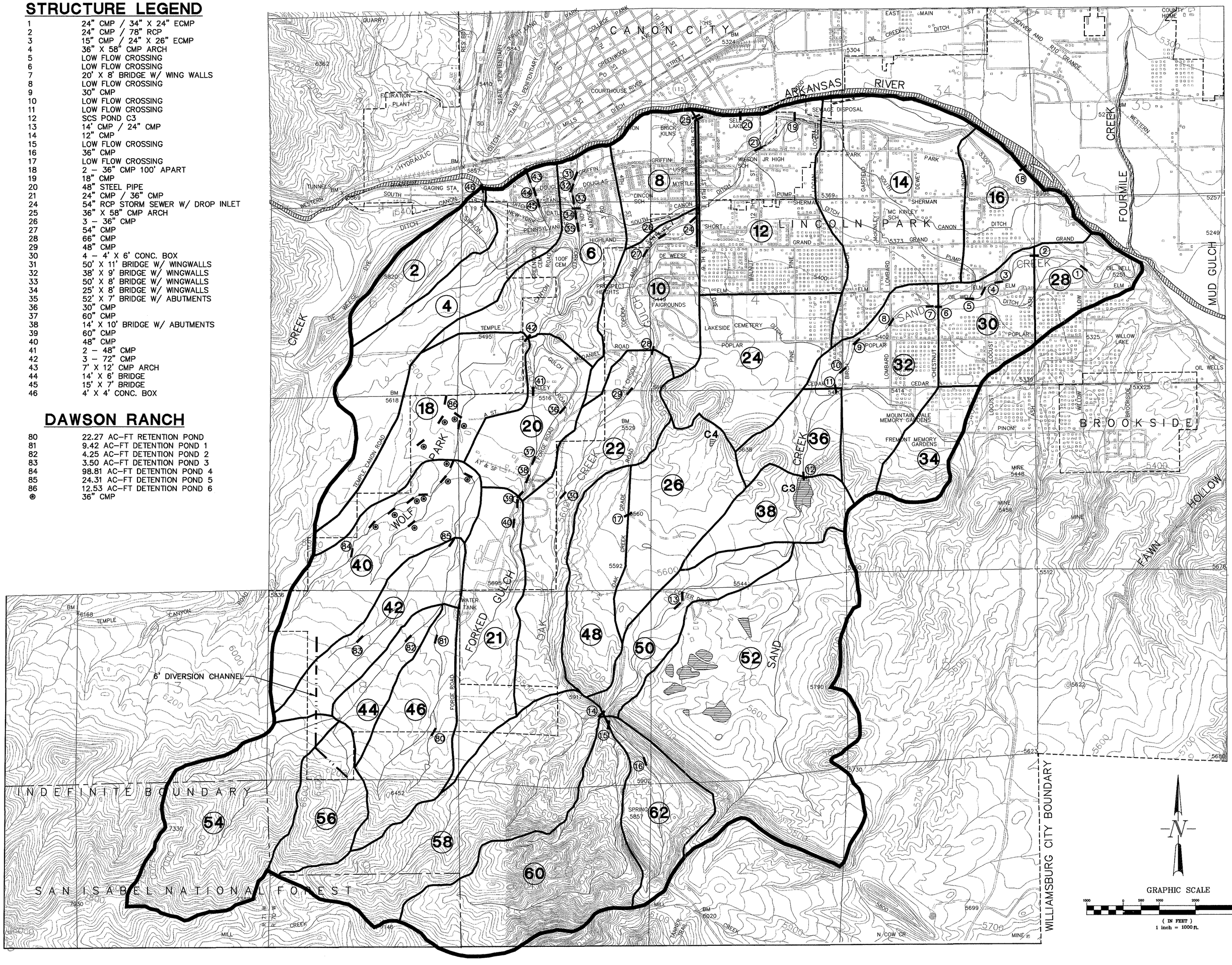
APPENDIX C
Alternate Conceptual Plans

STRUCTURE LEGEND

1	24" CMP / 34" X 24" ECMP
2	24" CMP / 78" RCP
3	15" CMP / 24" X 26" ECMP
4	36" X 58" CMP ARCH
5	LOW FLOW CROSSING
6	LOW FLOW CROSSING
7	20' X 8' BRIDGE W/ WING WALLS
8	LOW FLOW CROSSING
9	30" CMP
10	LOW FLOW CROSSING
11	LOW FLOW CROSSING
12	SCS POND C3
13	14' CMP / 24" CMP
14	12" CMP
15	LOW FLOW CROSSING
16	36" CMP
17	LOW FLOW CROSSING
18	2 – 36" CMP 100' APART
19	18" CMP
20	48" STEEL PIPE
21	24" CMP / 36" CMP
24	54" RCP STORM SEWER W/ DROP INLET
25	36" X 58" CMP ARCH
26	3 – 36" CMP
27	54" CMP
28	66" CMP
29	48" CMP
30	4 – 4' X 6' CONC. BOX
31	50' X 11' BRIDGE W/ WINGWALLS
32	38' X 9' BRIDGE W/ WINGWALLS
33	50' X 8' BRIDGE W/ WINGWALLS
34	25' X 8' BRIDGE W/ WINGWALLS
35	52' X 7' BRIDGE W/ ABUTMENTS
36	30" CMP
37	60" CMP
38	14' X 10' BRIDGE W/ ABUTMENTS
39	60" CMP
40	48" CMP
41	2 – 48" CMP
42	3 – 72" CMP
43	7' X 12' CMP ARCH
44	14' X 6' BRIDGE
45	15' X 7' BRIDGE
46	4' X 4' CONC. BOX

DAWSON RANCH

80	22.27 AC–FT RETENTION POND
81	9.42 AC–FT DETENTION POND 1
82	4.25 AC–FT DETENTION POND 2
83	3.50 AC–FT DETENTION POND 3
84	98.81 AC–FT DETENTION POND 4
85	24.31 AC–FT DETENTION POND 5
86	12.53 AC–FT DETENTION POND 6
⊕	36" CMP



DESIGNED BY JJW
DRAWN BY JJW
PROJECT ENGINEER MAB
PROJECT MANAGER MAB
DATE: 4/22/99
JOB NO. 980907
CAD FILE NO. S...STRUCTURES
SCALE: HOR. 1000' VERT. ____

PREPARED BY:

ADP
Associated Design Professionals
1961 Austin Bluffs Parkway
Suite 101
Colorado Springs, CO 80918
(719) 266-5212
fax: (719) 266-5341

NO.	DATE	REVISION	BY
1	2/22/00	INSERT DAWSON RANCH MAJOR STR	JJW

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
EXISTING STRUCTURES

SHEET
1 of 1

APPENDIX D
Improvement Recommendations

ESTIMATED PROBABLE CONSTRUCTION COST
-- IMPROVEMENT RECOMMENDATIONS

LINCOLN PARK IMPROVEMENTS			
ITEM	DESCRIPTION		ITEM COST
1	10,800 LF 36" RCP STORM SEWER	$	648,000
2	20,800 LF 6"CURB AND GUTTER	$	162,000
3	(16) 10' D10R INLETS	$	67,200
4	(20) 48" MANHOLES	$	108,000
5	RIRPAP OUTLET DISSIPATION STRUCTURE	$	1,500
6	36" HEADWALL	$	1,200
	SUBTOTAL	$	987,900
1	2,700 LF 24" RCP STORM SEWER	$	97,200
2	5,400 LF 6" CURB AND GUTTER	$	42,120.00
3	(4) 10' D10R INLETS	$	16,800.00
4	(5) 36" MANHOLES	$	21,000.00
5	24" HEADWALL	$	1,000
	SUBTOTAL	$	178,120

LINCOLN PARK IMPROVEMENTS TOTAL	$	1,166,020

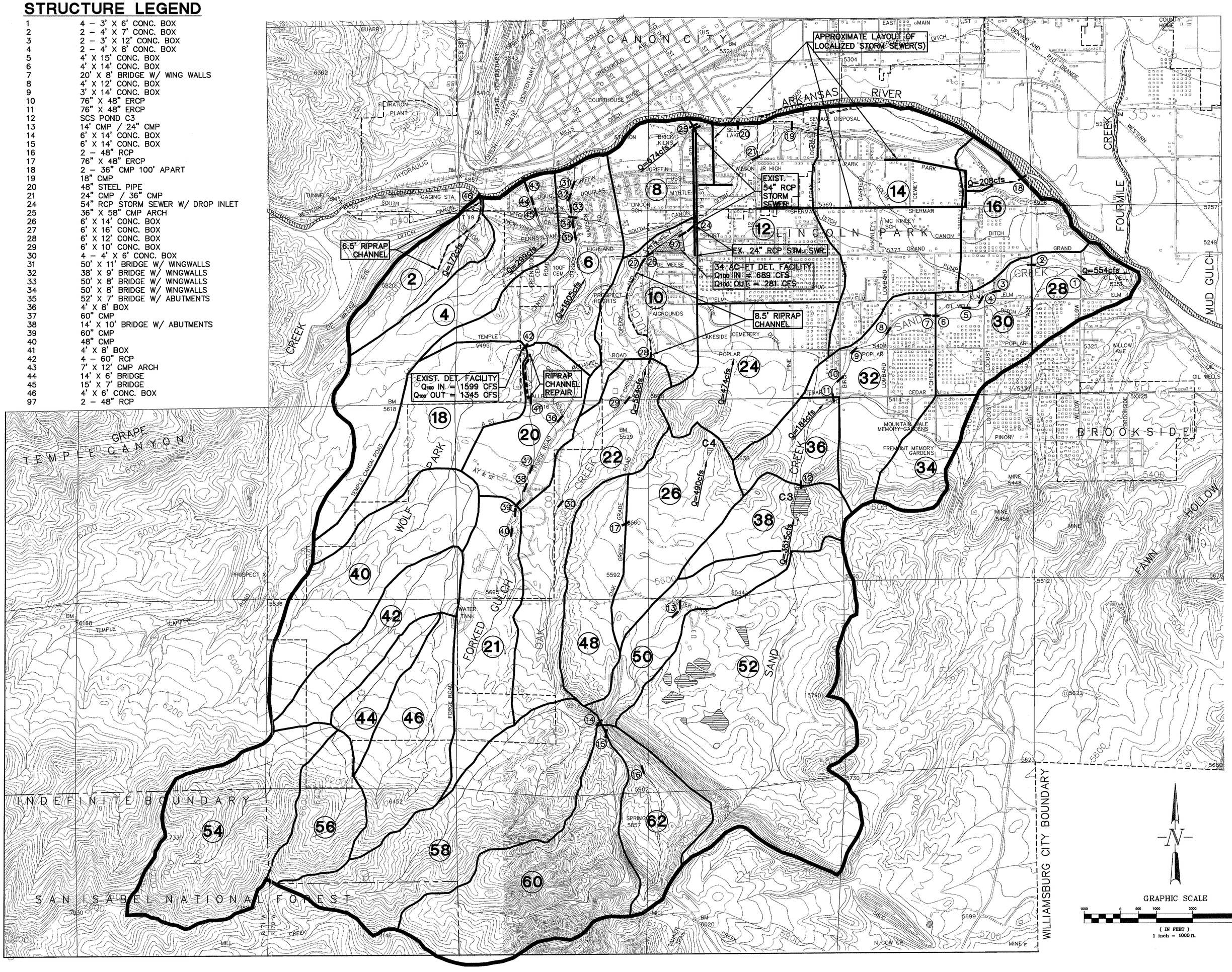
ALTERNATE 3 IMPROVEMENTS TOTAL	$	2,092,598

GRAND TOTAL	$	3,258,618

NOTE: TOTAL COST ESTIMATE INCLUDES COST OF PIPE, HEADWALL, RIPRAP AND ANY REQUIRED CHANNEL EXCAVATION. IT DOES NOT INCLUDE COST FOR ANY REQUIRED CHANNEL EXCAVATION. IT DOES NOT INCLUDE COST FOR REMOVAL OF EXISTING STRUCTURES OR RELOCATION OF UTILITIES.

STRUCTURE LEGEND

1	4 – 3' X 6' CONC. BOX
2	2 – 4' X 7' CONC. BOX
3	2 – 3' X 12' CONC. BOX
4	2 – 4' X 8' CONC. BOX
5	4' X 15' CONC. BOX
6	4' X 14' CONC. BOX
7	20' X 8' BRIDGE W/ WING WALLS
8	4' X 12' CONC. BOX
9	3' X 14' CONC. BOX
10	76" X 48" ERCP
11	76" X 48" ERCP
12	SCS POND C3
13	14' CMP / 24" CMP
14	6' X 14' CONC. BOX
15	6' X 14' CONC. BOX
16	2 – 48" RCP
17	76" X 48" ERCP
18	2 – 36" CMP 100' APART
19	18" CMP
20	48" STEEL PIPE
21	24" CMP / 36" CMP
24	54" RCP STORM SEWER W/ DROP INLET
25	36" X 58" CMP ARCH
26	6' X 14' CONC. BOX
27	6' X 16' CONC. BOX
28	6' X 12' CONC. BOX
29	6' X 10' CONC. BOX
30	4 – 4' X 6' CONC. BOX
31	50' X 11' BRIDGE W/ WINGWALLS
32	38' X 9' BRIDGE W/ WINGWALLS
33	50' X 8' BRIDGE W/ WINGWALLS
34	50' X 8' BRIDGE W/ WINGWALLS
35	52' X 7' BRIDGE W/ ABUTMENTS
36	4' X 8' BOX
37	60" CMP
38	14' X 10' BRIDGE W/ ABUTMENTS
39	60" CMP
40	48" CMP
41	4' X 8' BOX
42	4 – 60" RCP
43	7' X 12' CMP ARCH
44	14' X 6' BRIDGE
45	15' X 7' BRIDGE
46	4' X 6' CONC. BOX
97	2 – 48" RCP



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PROJECT MANAGER
CHECKED BY
DATE: 1/3/00
JOB NO. 983907
CAD FILE NO. S_AT_C.DWG
SCALE HORZ. 1"=1000'
VERT. ———

PREPARED BY:

ADP
Associated Design Professionals, Inc.
1661 Austin Bluffs Parkway
Suite 101
Colorado Springs, CO 80916
(719) 266-6215
fax: (719) 266-6341

NO.	DATE	REVISION	BY
1	12/29/99	LINC PK STG SWR/DET LOCATION	JJW

SOUTH SAND CREEK
DRAINAGE BASIN PLANNING STUDY
CITY OF CANON CITY, COLORADO
IMPROVEMENT RECOMMENDATIONS

SHEET 1 of 1