File in MDDP's

FAIRLANE PARKWAY

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

TRM

Interstate 25
Fairlane Parkway
Interchange

Final Hydraulic Report
(Phase I)

Prepared for: **SCHUCK HOLDINGS LLC.**

Date
August 26,1998
DMJM Project No. 3821.3803

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

1933

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

Interstate 25
Fairlane Parkway
Interchange

Final Hydraulic Report
(Phase I)

This report was performed under my direct supervision and is correct to the best of my knowledge and belief.

Prepared for: **SCHUCK HOLDINGS LLC.**

Date
August 26, 1998
DMJM Project No. 3821.3803

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

Table of Contents

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

I. INTRODUCTION

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
410 Seventeenth Street, Suite 300, Denver, Colorado 80202 - (303) 892-1300
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

FINAL HYDRAULIC REPORT
PHASE I

I. INTRODUCTION

A. PURPOSE AND SCOPE

The purpose of this document is to provide a final drainage study to facilitate the proposed construction of Phase One of Fairlane Parkway Interchange. This report is based upon the Colorado Department of Transportation Drainage Criteria, 1995 draft and the City of Colorado Springs Drainage criteria developed in October 1987, revised November 1991. HEC-12 was utilized as an additional reference.

This study defines the general nature of existing historic runoff conditions and the impact of the development of Phase I of Fairlane Parkway Interchange on existing downstream drainage facilities. This report also determines proposed drainage facilities designed to accommodate both offsite and onsite runoff occurring in Phase I.

More specifically this report includes determining the limits of contributory drainage basins and the major drainage facilities in Phase One while recognizing the contributions Phase II will have on pipe sizing and detention facilities. The drainage basin data was established including: delineating basins, determining basin size, determining waterway geometries, and establishing vegetation cover and land use. Based on this hydrologic analysis, preliminary structure hydraulic design, structure cross sections, and a storm water management plan were produced. In the appendix; drainage basin maps, preliminary storm sewer design, structure cross sections, project design criteria, and channel designs are included.

B. PROJECT LIMITS

The proposed Fairlane Interchange study area is located in north Colorado Springs in Sections 19, 20, 21, 15, 16, 17, Township12 South, Range 66, west of the Sixth Principal Meridian. The study area is displayed in Figure 1, page 3. It is bounded on the west by Interstate 25 (including its surface and proposed interchange ramps), on the north by a ridgeline that divides drainage north toward Black Squirrel Basin and south toward the Fairlane Parkway Interchange, to the east by the Kettle Creek Drainage Basin, and on the south by the proposed Fairlane Parkway. The construction of the project has been broken into two phases, with Phase I ending at the intersection of present State Highway 83 (SH83) and existing Stout Allen Road and Phase II ending with the future northern intersection of SH 83 and Fairlane Parkway. The proposed project disturbance area contains approximately 126.37 acres or .197 square miles; including ramp infield areas and a proposed detention pond site. Phase I includes approximately 66.32 Acres of this area. Historically, the project area receives runoff from an area of about 227 acres to the northeast of the property. This area is currently undeveloped pasture land. A small ridge line along the southerly limits of the basin may currently prevent this runoff from reaching Kettle

Creek. An extended Powers Boulevard proposed by others may alter historic drainage patterns in offsite area O-1 (See Appendix A/Design Point 1).

The current network of roadways and development has slightly affected drainage patterns: Flows traveling southwest from the northeast sector of the project run into State Highway 83 (SH83) and are channelized north of this highway until crossing into the Pikes Peak Community College (PPCC) site in an existing 24" pipe at design point 2. The community college does not recognize this historic flow in their drainage report as flowing through their property and rather shows flow routed west in a roadside ditch where it is eventually discharged at the northeast corner of SH 83 and the existing Stout Allen Road at design point 4. The remainder of the flow from the PPCC is released from the property at historic levels from a recently completed onsite detention pond.

The New Life Church has also constructed an onsite detention facility that releases flow at historic rates from its property to the northeast side of the Stout Allen, SH 83 Intersection.

Although most of the above discussion relates to Phase II, it is important to document as Phase II contributes runoff to Phase I.

All of the areas studied drain to Monument Creek to the west.

VICINITY MAP
PHASE II
FAIRLANE INTERCHANGE

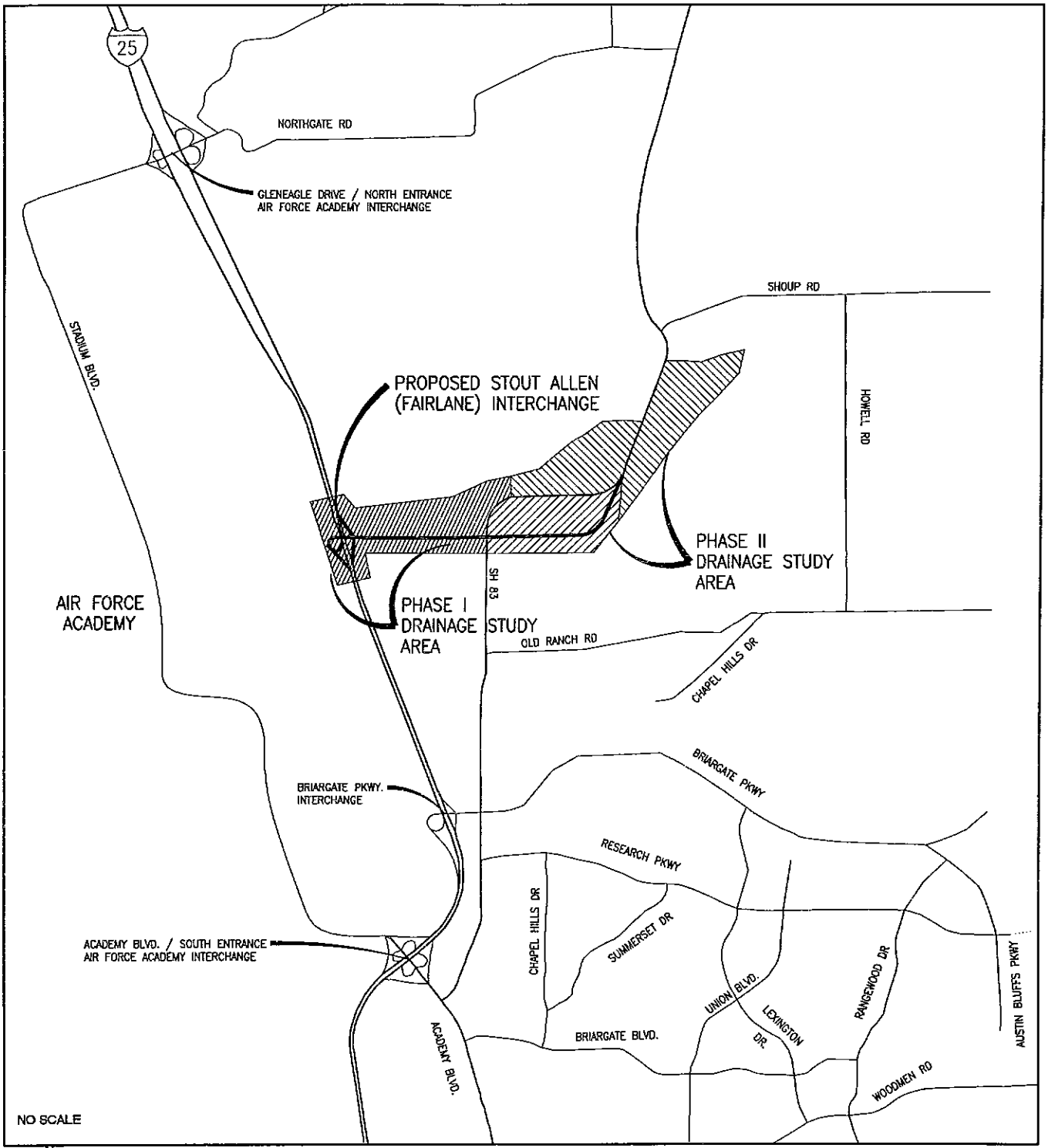


Figure 1

Job. No. 3821.00

DMJM

Daniel, Mann, Johnson, & Mendenhall
1450 West Fillmore Street, Suite 101
Colorado Springs, CO 80904

Date Prepared: 05/07/98

Drawing: S:3821\CADD\HYDR\REPORT\VICMAP.DWG

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

II. HYDROLOGY

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
410 Seventeenth Street, Suite 300, Denver, Colorado 80202 - (303) 892-1300
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

II. HYDROLOGY

A. GENERAL DISCUSSION

This report includes review of the drainage limits associated with the area surrounding the proposed project. The review included previous drainage reports and plans that were available from CDOT or the City of Colorado Springs (City). These drainage reports and plans include the following:

1. "Fairlane Technology Park - Hydrology Update," Ayres Associates, November 13, 1997.

2. "Master Development Drainage Report and Plan", Fairlane Technology Park., URS Project No. 42044. October 22, 1993, Revised January 6, 1994.

3. "Preliminary and Final Drainage Report and Plan", Fairlane Technology Park Filing No. 2. URS Project No. 42044. Revised January 6, 1994.

4. "Drainage Memorandum for Pikes Peak Community College North Campus", Colorado Springs, Colorado., El Paso County. URS Project No. 67.42154, October 7, 1996

5. "New Life Church Drainage Report," KLH Engineering, INC., April, 1991.

6. "Preliminary and Final Drainage Report for International Bible Society Filing NO. 1.", URS Project NO. 48404. August, 1988.

7. "Northgate Phase 1 Drainage Plan", URS Project No. 45206, June 15, 1987, Revised August 27, 1987.

8. "Northgate Phase 1 Drainage Plan", URS Project No. 45206, June 15, 1987, Revised August 27, 1987. Addendum Date October 6, 1987.

B. DRAINAGE AREA CHARACTERISTICS

The project is surrounded by undeveloped pasture land with parcels of recently developed light industrial and commercial land. The topography of the site consists of moderately sloping hills which slope in general from northeast to southwest at an average slope of slightly greater than 2%. Existing drainage paths within the basin are not clearly defined by channels or gullies, indicating runoff travels across the site in sheet flows. Offsite basins and on site sub-basins have been delineated and labeled on the "Drainage Basin Area" (DBA) sheets located in Appendix A.

Vegetation within the basin boundaries consists mostly of prairie grasses with some small stands of trees and scrub oak. In this study the undeveloped areas have been considered as pasture or

range land. Upstream of Phase I, Phase II soils consist mostly of Blakeland Sandy Loam soil type 8. This soil type generally exists in slope ranges between 1-9% and is Hydrologic Soil Type A. The majority of the offsite contributory areas to the northwest are classified as Petyon Pring Complex, Pring Course Sandy Loam, Stapleton Sandy Loam or Stapleton-Bernal-Sandy-Loam. These soils have evolved from material weathered from Arkosic sedimentary rock. Arkosic sedimentary rock is considered a sandstone with granitic source for sand. The sand sized Feldspar particles are much stronger than the cementing material in the sandstone and remaining as discrete particles after loss of cementation in the rock. The result is a granular soil considered to be part of the Hydrologic Soils Group B which is easily erodible by surface water runoff.

Basin soil and land use characteristics determine the resultant level of precipitation runoff that travels over the ground or infiltrates into the soil. The U.S. Soil Conservation Service classifies soils into four hydrologic groups (A, B, C, and D) according to runoff potential. Group A soils exhibit high infiltration rates when thoroughly wetted and are considered to have low runoff potential. Group B soils exhibit moderate infiltration rates when thoroughly wetted. Group C soils exhibit slow infiltration rates when thoroughly wetted. Group D soils exhibit very slow infiltration rates when thoroughly wetted and are considered to have high runoff potential.

Phase 1 consists of approximately 70% soil type Stapleton Sandy Loam; which has a hydrologic classification of A and 30% Blakeland Loamy Sand and Columbine gravelly which have a hydrologic classification of B. As a result of current City of Colorado Springs Criteria, type A soils are not allowed in runoff analysis where any grading or fill operations have or will occur. Therefore, both Phase I and Phase 2 of the project were analyzed with soil type B parameters.

C. DESIGN METHODS AND CRITERIA

Project design criteria were developed that incorporated critical elements of both CDOT and City of Colorado Springs criteria. The methods and criteria utilized are included in Appendix B. The design references used for this project are as follows:

1. "Drainage Design Manual, 1995 Draft", Colorado Department of Transportation, July 1995.

2. "Drainage Criteria Manual", City of Colorado Springs and El Paso County, October, 1987 including amendments in November, 1991 and October, 1994.

3. "Erosion Control and Stormwater Quality Guide", Colorado Department of Transportation, June, 1995.

4. "Soil Survey of El Paso County Area, Colorado" United States Department of Agriculture Soil Conservation Service. 1975.

5. "Design of Small Dams" United States Department of the Interior, Bureau of Reclamation. Revised Reprint, 1977.

6. "NOAA Atlas 2-Precipitation-Frequency Atlas of the Western U.S.," Volume III-Colorado. National Oceanic and Atmospheric Administration, 1973.

7. "Drainage of Highway Pavements", Hydraulic Engineering Circular No. 12, U.S. Department of Transportation/Federal Highway Administration, March 1984.

D. HYDROLOGIC CRITERIA

The design rainfall intensity for sizing of hydraulic structures is the 100 year storm intensity. The on-site calculations of this drainage study area based upon the criteria and requirements of the State Drainage Design Manual (State Manual) and the City of Colorado Springs Design Manual (City Manual). In accordance with chapter 6 of the City Manual, the Rational Method was applied to only basins less than 100 Acres. The Rational Method was used to calculate the 5 and 100 year frequency storm runoffs for any areas that were determined by hand calculations. The Rational Method is defined as follows:

$$Q=CiA$$

Q = maximum rate of runoff in cubic feet per second
C = a runoff coefficient as a ratio between the maximum rate of runoff and the average rate of rainfall intensity over a duration equal to the time of concentration
i = average intensity of rainfall in in/hr for a duration equal to the time of concentration.
A = area of basin or sub-basin in acres

The overall storm sewer system was analyzed using XPRAT storm sewer software.

The time of concentration is defined as the time required for water to flow from the most remote point of the area to the point being investigated. The runoff coefficients are based on the subasin's historic and proposed land use. A table for these coefficients can be found in the design criteria in Appendix C. The rainfall time/intensity/frequency curve for Zone 11A was taken from the City Manual. (Appendix C).

The time of concentration for basins under with overland flows of less than 300 feet was calculated by utilizing the formula below from the City Manual.

$$Tc = 1.87\ (1.1-C_{10})L^{.5}S^{-.33}$$

Where C_{10} = adjusted runoff coefficient for 10 year flow (City of Colorado Springs)
L = length of overland flow in feet
S = slope of flow path in percent; and
Tc = travel time in minutes

For basins over 100 acres, or for basins part of a larger analysis, the HEC-1 computer program was utilized. HEC-1 output can be viewed in Appendix C. The time of concentration used for the larger basins was calculated using the formula below with adjustments made for the project location west of the 105 meridian.

$$Tc = \frac{(11.9\,L^3)}{H}^{.385}$$

Where Tc = time of concentration in hours
L = length of longest watercourse in miles
H = elevation difference in feet

The adjustment table for watersheds west of the 105 meridian and mountainous timber-covered watersheds east of the 105 meridian is shown below:

CN	T'c/Tc
80.....	1.0
70.....	1.4
60.....	1.8
50.....	2.2

Rainfall depths of 3.0 and 4.4 inches were obtained from the NOAA Atlas 2 isopluvials for the project area for the 5-year 24-hour, 10-year 24 hour, and the 100-year 24 hour storm events respectively. Currently no analysis has been performed for the 2-hour 10 year and 2-hour 100 year storm events.

Flow capacities for the proposed road were based on the allowable capacities for major storms according to road type, major arterial and highway respectively. Design assumptions for these systems are located in the design criteria. (Appendix C).

E. OFFSITE HYDROLOGY

The offsite basin flows were calculated using the above hydrologic computation methods and were compared to flows established in the other studied basins. The flows generated by offsite flow analysis were then used to determine culvert capacities on I-25, size proposed pipes, determine grading and other drainage related items. These basins, while not geographically included in Phase I, are included in the Phase I report as they generate flows which influence the sizing of the stormsewer system and detention facilities in Phase 1.

Offsite Basin O-1

Offsite Basin O-1 was last studied in report reference #1. This basin is shown as containing 170 Acres and producing a 100 year 24 hour historic flow of 230 CFS directly onto the northwest quadrant of the proposed Phase II of the project. Reference #2 shows almost identical data of 169.1 acres and 230 CFS historic flow.

The construction of Phase I has no effect on basin O-1. This basin is only discussed in the context of Phase II construction. If Phase II is constructed, flow from Offsite Area O-1 will travel through Phase II onto Phase I. If Phase II of the project is not constructed, Offsite Basin O-1 will continue on its historic flow path southeast to existing facilities presently in place.

Additionally, Offsite basin O-1 will most likely be cutoff from contributing to the Phase II project site by the future construction of Powers Boulevard. With Powers Boulevard in place, an estimated 16.16 acres of the 169.1 acres is assumed to contribute runoff onto Phase II of the project. However, there may be an interim period when Phase II is completed and Powers Boulevard is not. In this scenario the full 230 CFS would have to be accommodated by Phase II of the project until Powers Boulevard is completed. A trapezoidal ditch and berming is proposed adjacent to the southeast edge of the Phase II roadway to prevent road overtopping. Part of the ditch would occupy road right-of-way designated for additional lanes, while the remaining portion of the ditch would require additional temporary easement. This ditch would accommodate the 230 cfs and outfall south into the historic channel. More solutions are possible and further detail will be contained in the "Addendum to the Final Drainage Report (Phase II) which covers Phase II.

Offsite Basin O-2 (O-2A, O-2B)

Offsite Basin O-2 was last studied in report reference #1. This basin is shown as "not contributing" to the project site. This assumption may be based on the assertion that an existing 24" CMP would be removed. In fact, this CMP is undersized but does transfer some flow from approximately 55 acres of OS-2 to the project site. Flow is predicted to travel through the CMP pipe from OS-2, along a roadside ditch on the north side of PCC, through a 24" culvert at the New Life Church's north access, along a small swale adjacent to the west boundary New Life Church, and through and existing 30" RCP under SH83. At this point an existing 30" CMP crosses Stout Allen Road and maintains the hitoric flow pattern to the southeast. The culvert at present is completely plugged. Reference #2 shows this relationship correctly, displaying 55 acres of contributory area and 148.5 cfs 100 year flow. However, it should be noted that only approximately 35 CFS would be able to pass through the pipe in peak flow conditions before possible road overtop or cross basin flow diversion. For clarity OS-2 is broken into 2 parts in this report; OS-2B which is assumed to contribute to the project, and OS-2A which contributes to a miscellaneous basin. (See Appendix A, Design Point 2).

Offsite Basins O-4, O-3B, O-3C

Offsite Basin O-4, O-3B and O-3C exist in a miscellaneous basin south of the Black Squirrel Basin and northwest of the Kettle Creek Basin. Runoff from O-4, O-3B and O-3C historically

sheet flows southeast to I-25, collects at low points adjacent to I-25, and flows east under I-25 in two 24" CMP culverts and one 30" CMP culvert at design points 12,11, and 10 respectively. These culverts are under-designed for the present City Manual Criteria, and State Manual Criteria. These offsite basins could not be located in any previous reports. All runoff that would contribute to the project from the north from these basins is cutoff from Phase 1 by a roadside ditch on the north side of existing Stout Allen which is to be left in place.

A summary of design point flows is included below:

DESIGN POINT SUMMARY

DESIGN POINT SUMMARY					
DS PT	HISTORIC 100 YEAR FLOW	DEVELOPED 100 YEAR FLOW	FLOW INCREASE + FLOW DECREASE -	FLOW CHANGE %	DESCRIPTION OF DESIGN POINT LOCATION
1	230	*45	-200	-80.43%	OFFSITE AREA O-1
2	148.5	148.5	0	0.00%	CROSS CULVERT/O-2B TO B-9
3	173	60	-113	-65.32%	PIKES PEAK POND
4	178	34	-144	-80.90%	NEW LIFE POND
5	36	34	-2	-5.56%	NEW LIFE DOWNSTREAM CROSS CULVERT
6	NA	**182.82	NA	NA	OUTFALL OF PROPOSED STORM SEWER
7	NA	**49.94	NA	NA	OUTFALL OF PROPOSED STORM SEWER
8	NA	NA	NA	NA	I-25 CROSS CULVERT/BURIED
9	193	202	9	4.66%	I-25 CROSS CULVERT/DOWNSTREAM OF POND
10	95	27	-68	-71.58%	I-25 CROSS CULVERT/OUTFALL OF POND A
11	117	117	0	0.00%	I-25 CROSS CULVERT
12	61	61	0	0.00%	I-25 CROSS CULVERT
13	0	28	28	NA	OUTFALL OF POND B

*Preliminary Quantity-Assuming future alignment of Powers Boulevard

**Storm Sewer Outfall FOR Design Flow

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

III. EXISTING STRUCTURE

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
410 Seventeenth Street, Suite 300, Denver, Colorado 80202 - (303) 892-1300
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

III. EXISTING STRUCTURE

A. GENERAL DISCUSSION

Existing drainage systems vary in design capacity and functionability on and around the project. As a result of the different design criteria and land use during the original construction of respective facilities, most existing systems were designed for lower flows. The following discussion will be organized by I-25 facilities, and other facilities in the Phase I project area and contributory offsite area. Most Phase II facilities will be excluded and discussed in the Addendum to the Final Drainage Report (Phase II.)

B. EXISTING HIGHWAY/ROAD CROSSINGS/CHANNELS

I-25

There are five pipe crossings of I-25 in the project limits.

STATION 1423+26/DESIGN POINT 8

A median inlet connects to a 24" CMP which flows west. A pipe comes into the inlet on the east side but the pipe's inlet end cannot be located and is presumed buried. This culvert has little impact on the project.

STATION 1435+19/DESIGN POINT 9

A 24" RCP crosses under I-25. This pipe's existing capacity is 28 CFS and a historic flow of 193 CFS is estimated by reference #2 to come to this crossing in a 100 year event.

STATION 1447+21/1446+58/DESIGN POINT 10

A 24" RCP crosses perpendicular under the east lanes of I-25, connects to a median inlet and continues southwest at a skew where it outfalls on the west side of I-25. This pipe is under designed for its estimated historic flow of 95 CFS.

STATION 1455+90/DESIGN POINT 11

A 24" CMP crosses perpendicular to I-25 through a median inlet and discharges to the west. Flow to this site is estimated at 117 CFS.

STATION 1466+91/DESIGN POINT 120

A 30" CMP crosses perpendicular to I-25 through a median inlet and discharges to the west. Flow to this sight is estimated at 61 CFS.

OTHER FACILITIES

There is one other drainage facility in Phase I. A private detention pond is located on New Life Church Property which discharges into a 30" RCP which exists under SH83. A plugged (debris) 30" CMP is located downstream of the 30" RCP and it is oriented to direct flow to the southeast.

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

IV. DESIGN DISCUSSION

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

IV. DESIGN DISCUSSION

A. GENERAL DISCUSSION

Overall, the design criteria of CDOT and the City has been established and the project design based on its guidelines. HEC-12 was also utilized during design to supplement the criteria.

B. SITE SPECIFIC CONDITIONS AND CONSTRAINTS

ROW constraints along the proposed Fairlane Parkway limit some of the choices in transferring drainage through the project.

At the intersection of SH 83 and proposed Fairlane Parkway a 36" water is located 4.67" below the existing ground. In addition, a 12" Sanitary Sewer is located approximately 9.76' below existing ground and a 12" gas 5.0' below existing. As a result, a 2' X 6' RCBC is proposed to cross SH 83 under the 36" water and 12" gas and over the 12" Sanitary. The objective is to avoid costly alteration of the waterline or gas line while accommodating stormwater flow in the trunkline through the SH83 intersection.

C. MAJOR DRAINAGE ALTERNATIVES

The routing of this cumulative flows generated from offsite and developed interchange areas has been discussed in detail with the Air Force Academy (see Appendix F), City of Colorado Springs, Colorado Department of Transportation and the Developer. The challenge was to accommodate the facilities that were under-designed for the historic flows; and subsequently the historic plus developed flows from the roadway areas.

In the Preliminary Drainage Report, a detention pond was proposed in the southeast quadrant of the property on AFA property. This pond was designed to accommodate historic and developed flows. It was recognized that the crossing of I-25 downstream from this location was inadequate and the pond was sized to release to the AFA at the crossing capacity at the request of the AFA. To release such a low discharge a large pond was required that would store the majority of the 100 year storm. After review by the AFA the pond was rejected in this location and requested by the AFA to be placed in the interior of the loop ramp. In addition, the AFA requested that the pond only accommodate water from development of the Fairlane Interchange and no other subsequent development.

As a result, it is the understanding of DMJM at this time to locate a detention facility in the loop ramp to accommodate historic flow and developed flow from the interchange; and to locate a pond adjacent to the northeast ramp of the project to accommodate historic flows from offsite areas O-3B and a portion of O-3C. The purpose of the ponds is to eliminate increased flows onto the Air Force Academy(AFA) that would result in sizing the I-25 cross culverts to the appropriate size for the 100

year flow and limit flows to the present cross culvert capacities. The detention facilities will release at or below the capacity of the I-25 cross culverts onto the AFA property. Design parameters for these ponds are included in Appendix D.

In addition, various channel alternatives were compared to storm sewer alternatives. Wherever possible natural channels were utilized. At this time ROW constraints require the shown storm sewer conveyance systems to be underground in Fairlane Parkway.

D. PERMITTING REQUIREMENTS

A stormwater drainage permit will be prepared and submitted by the consultant.

A section 404 permit will not be submitted as there are no wetlands in the project limits.

A floodplain development permit will not be submitted as there are no designated flood plains within the project area.

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

V. RECOMMENDED DESIGN

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
410 Seventeenth Street, Suite 300, Denver, Colorado 80202 - (303) 892-1300
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

V. RECOMMENDED DESIGN

A. GENERAL DISCUSSION

The overall Phase 1 system transports runoff in a storm sewer in two locations. The main storm sewer ends at Federal Street where it outfalls onto private property. This storm sewer will be extended by the developer during future construction. A second storm sewer system outfalls into a channel and is transported into Detention Pond B. The remainder of the areas collect in various channels which converge into Detention Pond A or Detention Pond B. The outfalls from each pond discharge at the capacity of 22 and 28 cfs respectively. This discharge is much below historic and matches the culvert capacities across I-25. The most complete information on the recommended design is located in Appendix B Drainage Plan Sheets.

B. PROPOSED HYDRAULIC DESIGN

Appendix A - drainage basin area sheets.
Appendix B - design sheets
Appendix C - design criteria
Appendix D - pond hydrographs and details
Appendix E - calculations
Appendix F - related correspondence/meeting notes

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX A

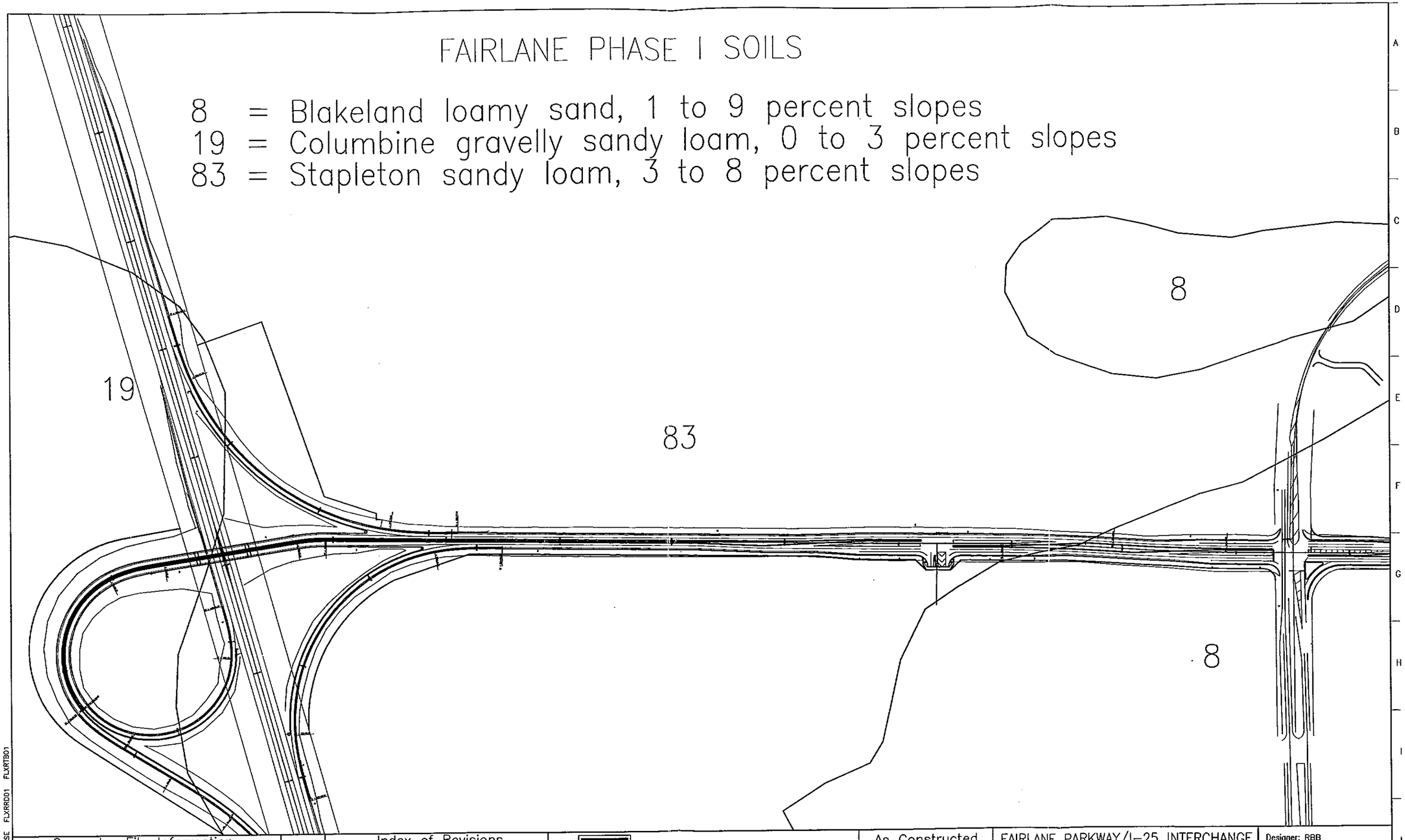
DRAINAGE BASIN AREA SHEETS

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

FAIRLANE PHASE I SOILS

8 = Blakeland loamy sand, 1 to 9 percent slopes
19 = Columbine gravelly sandy loam, 0 to 3 percent slopes
83 = Stapleton sandy loam, 3 to 8 percent slopes



13:40 XREF = FLXRBASE FLXRRDD1 FLXRTB01

Computer File Information		
Creation Date: 07/21/98		Initials: RBB
Last Modification Date: 07/21/98		Initials: RBB
Full Path: S:\3821\CADD\DRAINAGE\		
Drawing File Name: SOIL_TYP.DWG		
Acad Ver. 14	Scale: 1:200	Units: E

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

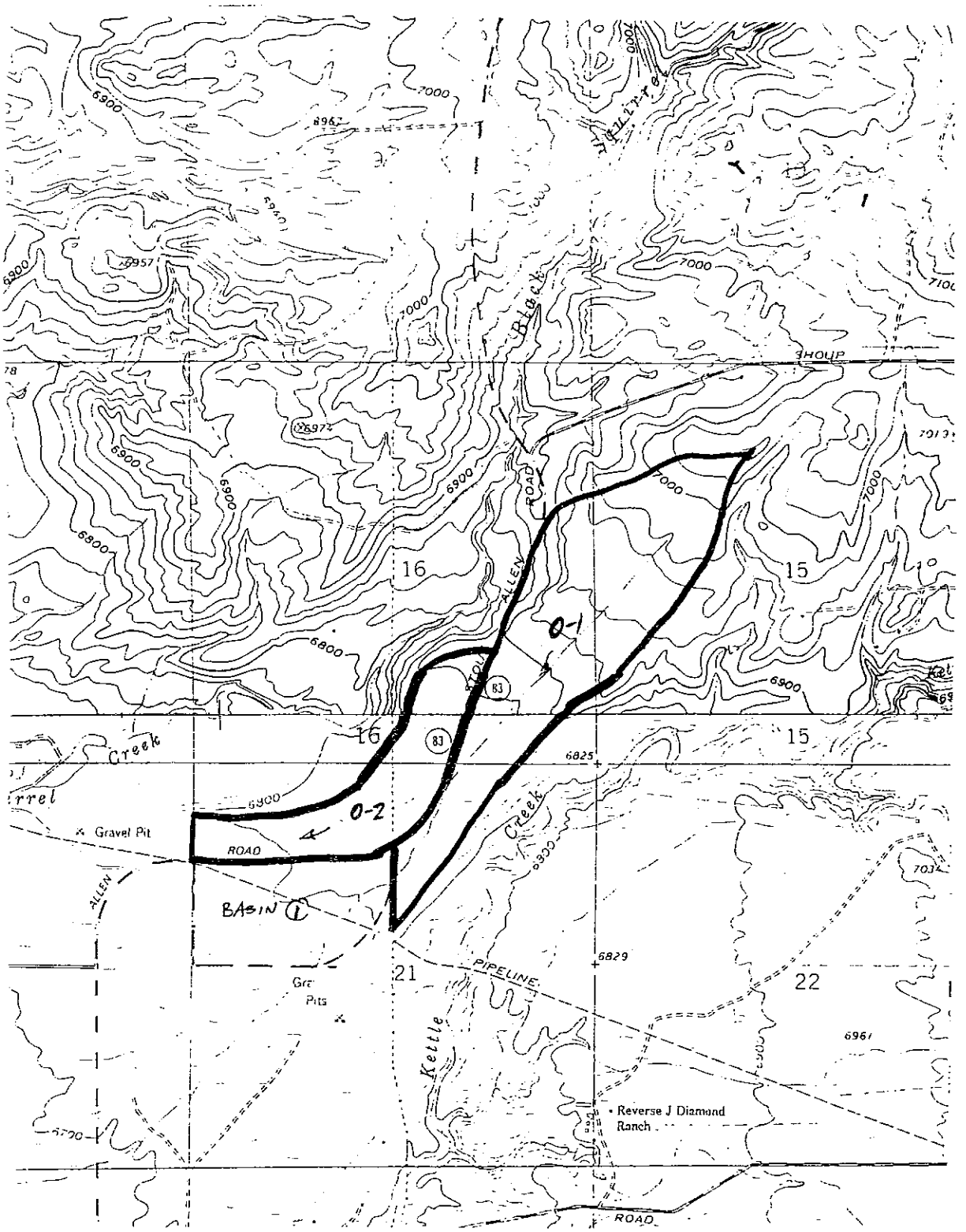
FAIRLANE SOILS

Sheet Subset: Drainage | Subset Sheets: 1 of 1

Designer: RBB
Detailer: RBB
Checked:
Sheet Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

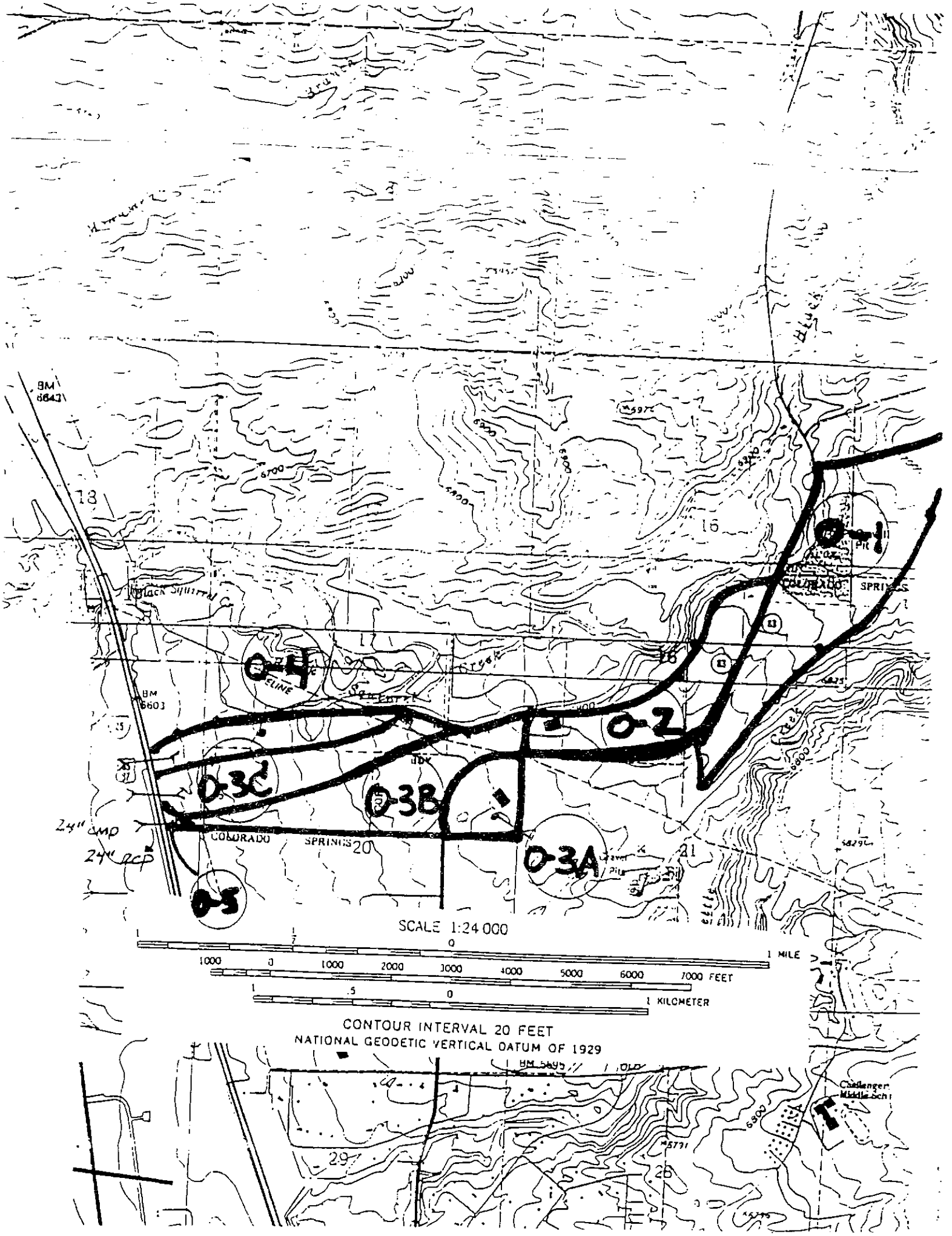
A B C D E F G H I J



HISTORIC BASIN MAP

URS CONSULTANTS, INC. COLORADO SPRINGS, COLORADO PROJ NO. 67.42154	PIKES PEAK COMMMUNITY COLLEGE NORTH CAMPUS BUILDING	FIGURE 2

FIG1.DWG RJS 09/05/96


O-4
O-2
O-3C
O-3B
O-3A
O-5
24" CMP
24" RCP
COLORADO SPRINGS
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
Challenger Middle Sch

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX B

DRAINAGE PLAN SHEETS

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

INDEX OF DRAINAGE SHEETS

LEGEND

- PROPOSED MANHOLE
- PROPOSED INLET
- PROPOSED CURB INLET
- PROPOSED DRAINAGE DITCH
- PROPOSED RIPRAP
- PROPOSED STORM SEWER
- PROPOSED SWALE
- STUB-OUT PIPE
- FLARED END SECTION
- (144691) MANHOLE\INLET IDENTIFICATION

GENERAL NOTES (DRAINAGE PLAN SHEETS TYPICAL)

1. THE CONTRACTOR SHALL CONDUCT POTHOLING AT LOCATIONS IDENTIFIED ON THE PLANS AND AS DIRECTED BY THE ENGINEER. ADDITIONAL POTHOLING SHALL BE PERFORMED BY THE CONTRACTOR AS NECESSARY TO CONFIRM EXISTING UTILITY LOCATIONS.

2. FOR ADDITIONAL UTILITY INFORMATION SEE UTILITY PLANS. FOR ADDITIONAL DETAIL CONCERNING SUBSURFACE FEATURES, REFER TO STRUCTURE PLANS, LIGHTING PLANS, SIGNAL PLANS AND SIGNING & PAVEMENT MARKING PLANS.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCEPTANCE AND CONTROL OF ALL SURFACE AND SUBSURFACE DRAINAGE AND GROUND WATER ENTERING THE AREA. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING DEWATERING IF NEEDED AT NO ADDITIONAL COST TO THE PROJECT. DEWATERING METHODS SHALL BE APPROVED BY THE ENGINEER. SEE SPECIFICATIONS FOR PROPER HANDLING OF DISCHARGE FROM TRENCH DEWATERING OPERATIONS.

4. ALL CURB INLETS ON CDOT ROW ARE CDOT TYPE R, ALL OTHER CURB INLETS ARE CITY D-10-R, UNLESS OTHERWISE NOTED. STATION/OFFSET INFORMATION IS AS SHOWN ON THE DETAILS.

5. STATION/OFFSET INFORMATION FOR MANHOLES TO CENTER OF STRUCTURE.

6. MANHOLE & RIM ELEVATIONS SHOWN ON THE PLANS ARE APPOX. FINAL ELEVATIONS ARE TO BE DETERMINED IN THE FIELD.

7. OMITS OR REMOVAL ITEMS SHALL BE VERIFIED BY THE ENGINEER PRIOR TO THEIR REMOVAL.

8. SEE PROJECT GENERAL NOTES FOR ADDITIONAL INFORMATION RELATING TO STORM SEWER/DRAINAGE ITEM CONSTRUCTION.

9. CORRUGATED METAL STORM SEWER CONDUIT JOINTS SHALL BE CONNECTED WITH GALVANIZED STEEL CONNECTING BANDS AND TIGHTENED SECURELY. KEEP DIRT AND GRAVEL OUT OF JOINT TO ENSURE WATERTIGHT SEAL.

10. THE COST FOR ALL JOINT GASKETS, CRADLES, COLLARS, INLET AND MANHOLE CONNECTIONS TO STORM SEWER SHALL BE INCLUDED IN THE COST OF THE WORK.

11. TYPE I BASE MANHOLE BARREL DIAMETERS SHALL CONFORM TO THE FOLLOWING TABLE:

Pipe Dia.	Manhole Barrel Dia.
48" or less	6'-4"
54" or less	6'-10"
60" and larger	O.D.+16"

12. RCP JOINT TOLERANCE IS 1/4" TO 1". JOINTS GREATER THAN 1" SHALL BE GROUTED.

13. DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.

07:14 XREF = FLXRTB01

Computer File Information		
Creation Date: 01/27/98		Initials: LDS
Last Modification Date: 08/27/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\		
Drawing File Name: DFLRCOV.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

DRAINAGE COVER SHEET

Sheet Subset: Drainage | Subset Sheets: DC01 of 1

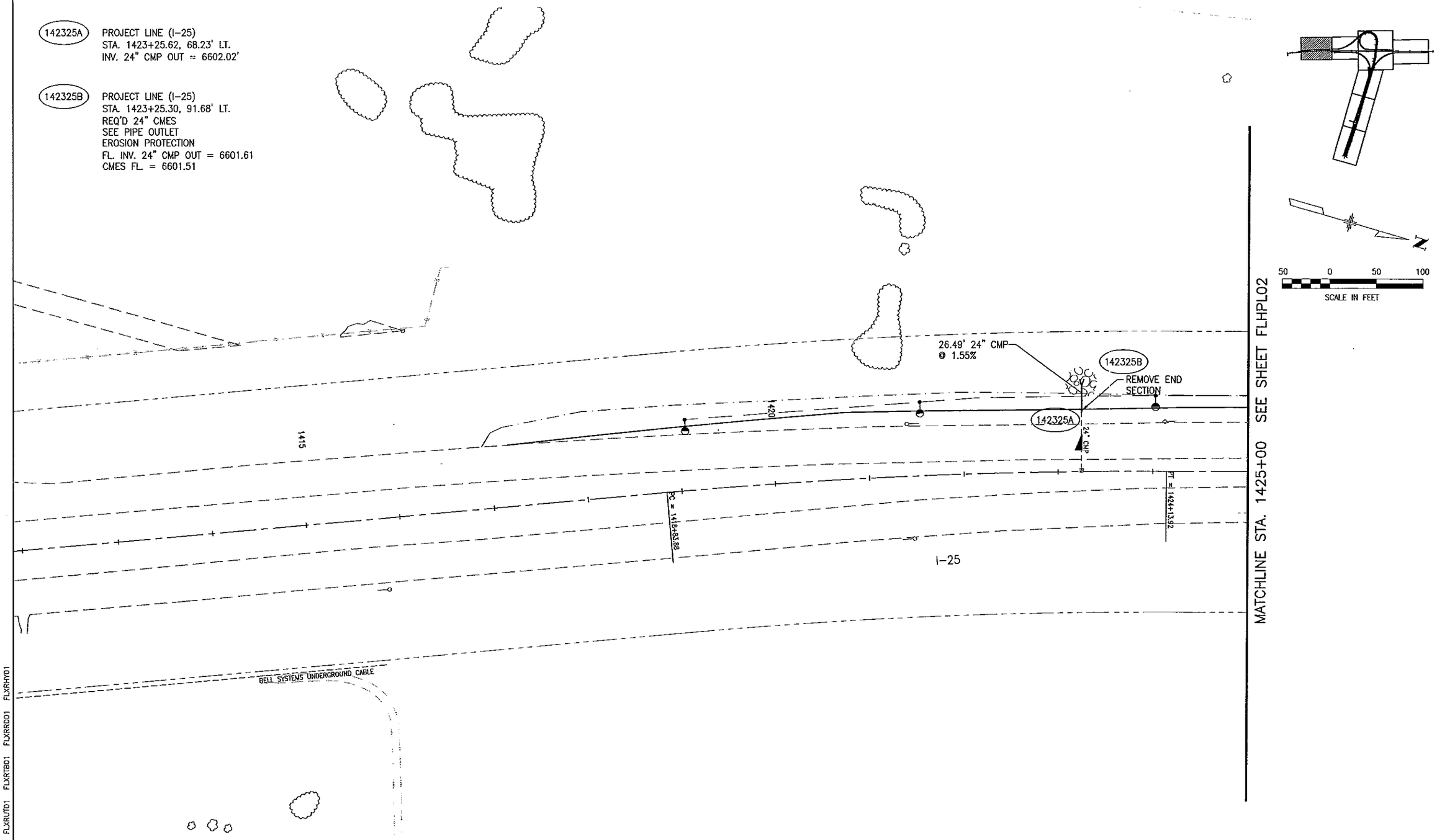
Designer: RBB
Detailer: GES
Checked: CLP
Sheet Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

142325A PROJECT LINE (I-25)
STA. 1423+25.62, 68.23' LT.
INV. 24" CMP OUT = 6602.02'

142325B PROJECT LINE (I-25)
STA. 1423+25.30, 91.68' LT.
REQ'D 24" CMES
SEE PIPE OUTLET
EROSION PROTECTION
FL. INV. 24" CMP OUT = 6601.61
CMES FL. = 6601.51



Computer File Information		
Creation Date: 12/12/97		Initials: BLS
Last Modification Date: 07/21/98		Initials: SBE
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\		
Drawing File Name: FLHPL01.DWG		
Acad Ver. R14	Scale: 1"=50'	Units: ENGLISH

Index of Revisions

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	
No Revisions:	
Revised:	
Void:	

FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25
DRAINAGE PLAN

Sheet Subset: DRAINAGE	Subset Sheets: FLHPL01 of 8

Designer: RBB	
Detailer: LLT/LDS	
Checked: CLP	
Sheet Number	

13:36 XREF = FLXRBASE FLXRUTO1 FLXRTB01 FLXRRD01 FLXRHY01

143496 PROJECT LINE (I-25)
STA. 1434+96.98, 75.81' LT.
REQ'D 54" RCES
FL. INV. 54" RCP OUT = 6599.06
RCES FL. = 6598.95

143499 PROJECT LINE (I-25)
STA. 1434+98.73, 96.06' RT.
REQ'D 54" RCES
FL. INV. 54" RCP IN = 6601.30
RCES FL. = 6601.40

143509A PROJECT LINE (I-25)
STA. 1435+08.74, 70.50' RT.
INV. 24" RCP IN = 6602.14'

143509B PROJECT LINE (I-25)
STA. 1435+09.05, 92.94' RT.
REQ'D 24" RCES
FL. INV. 24" RCP IN = 6602.92
RCES FL. = 6603.12

23741 PROJECT LINE (RAMP "A")
STA. 237+41.05, 36.07'RT.
REQ'D. 24" RCES
FL. INV. 24" RCP = 6603.03'
RCES FL. = 6602.94

MATCHLINE STA. 1425+00 SEE SHEET FLHPL01

MATCHLINE STA. 1438+00 SEE SHEET FLHPL03

MATCHLINE STA. 1438+00 SEE SHEET HPL05

RAMP "C"

RAMP "A"

I-25

PROPOSED CHANNEL SECTION A

PROPOSED CHANNEL SECTION B (PECMAT)

PROPOSED CHANNEL SECTION C

SEE DOUBLE CULVERT OUTLET PROTECTION DETAIL HYDT05

BEG CH A

BEG CH B

END CH C

C5

C6

C1

LIMITS OF JACKING

171.07' 54" RCP @ 1.31%

REMOVE END SECTION

25.44 24" RCP @ 3.07%

143.72' 24" RCP @ 0.50%

MOUNTAIN VIEW OHE

SCALE IN FEET

BEG CH. A PROJECT LINE (RAMP "C")
STA. 80+42.59, 73.28 RT.
CHANNEL STATION=0+00.00
CHANNEL INVERT=6591.79'
CHANNEL SLOPE=1.70%

END CH. C PROJECT LINE (I-25)
STA. 1435+09.46, 102.59 RT.
CHANNEL STATION=21+10.71
CHANNEL INVERT=6603.00
CHANNEL SLOPE=1.67%
SEE PROFILE

BEG CH. B PROJECT LINE (I-25)
STA. 1435+00.56, 79.41 LT.
CHANNEL STATION=23+00.00
CHANNEL INVERT= 6595.67'
CHANNEL SLOPE=1.57%

CURVE TABLE			
CURVE	DELTA	LENGTH	RADIUS
C1	73°20'17"	884.72	691.19
C5	92°18'24"	137.00	85.04
C6	03°11'04"	282.83	5088.94

Computer File Information	
Creation Date: 12/12/97	Initials: BLS
Last Modification Date: 08/27/98	Initials: SBE
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\	
Drawing File Name: FLHPL02.DWG	
Acad Ver. R14 Scale: 1"=50'	Units: ENGLISH

Index of Revisions

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

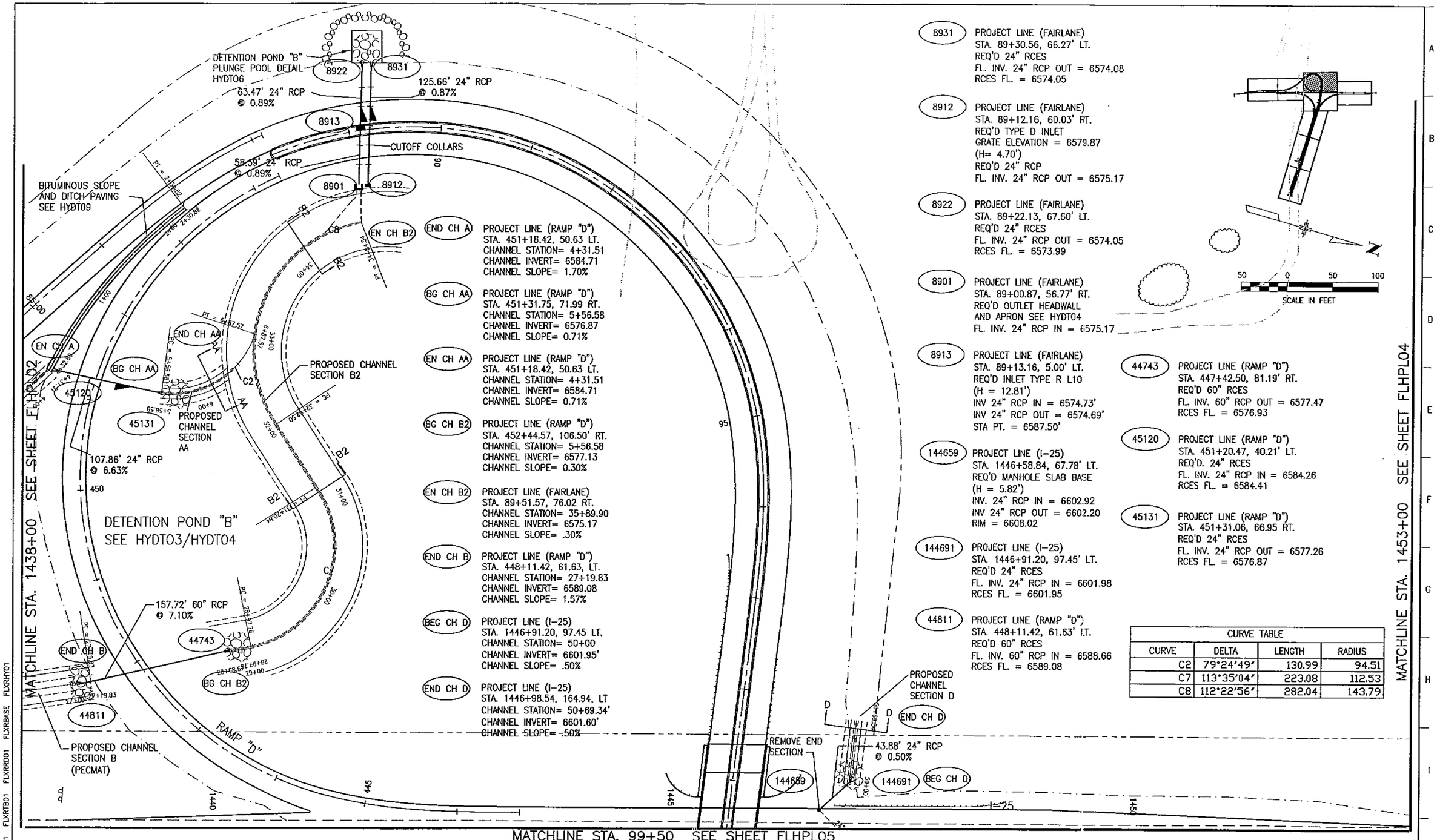
FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25 RAMP-C
DRAINAGE PLAN

Sheet Subset: DRAINAGE | Subset Sheets:FLHPL02 of 8

Designer: RBB
Detailer: BLS
Checked: CLP
Sheet Number

07:57 XREF = FLXRBASE FLXRUT01 FLXRRD01 FLXRHY01 FLXRTB01



END CH A — PROJECT LINE (RAMP "D")
STA. 451+18.42, 50.63 LT.
CHANNEL STATION= 4+31.51
CHANNEL INVERT= 6584.71
CHANNEL SLOPE= 1.70%

BG CH AA — PROJECT LINE (RAMP "D")
STA. 451+31.75, 71.99 RT.
CHANNEL STATION= 5+56.58
CHANNEL INVERT= 6576.87
CHANNEL SLOPE= 0.71%

EN CH AA — PROJECT LINE (RAMP "D")
STA. 451+18.42, 50.63 LT.
CHANNEL STATION= 4+31.51
CHANNEL INVERT= 6584.71
CHANNEL SLOPE= 0.71%

BG CH B2 — PROJECT LINE (RAMP "D")
STA. 452+44.57, 106.50' RT.
CHANNEL STATION= 5+56.58
CHANNEL INVERT= 6577.13
CHANNEL SLOPE= 0.30%

EN CH B2 — PROJECT LINE (FAIRLANE)
STA. 89+51.57, 76.02 RT.
CHANNEL STATION= 35+89.90
CHANNEL INVERT= 6575.17
CHANNEL SLOPE= .30%

END CH B — PROJECT LINE (RAMP "D")
STA. 448+11.42, 61.63, LT.
CHANNEL STATION= 27+19.83
CHANNEL INVERT= 6589.08
CHANNEL SLOPE= 1.57%

BEG CH D — PROJECT LINE (I-25)
STA. 1446+91.20, 97.45 LT.
CHANNEL STATION= 50+00
CHANNEL INVERT= 6601.95'
CHANNEL SLOPE= .50%

END CH D — PROJECT LINE (I-25)
STA. 1446+98.54, 164.94, LT
CHANNEL STATION= 50+69.34'
CHANNEL INVERT= 6601.60'
CHANNEL SLOPE= .50%

8931 — PROJECT LINE (FAIRLANE)
STA. 89+30.56, 66.27' LT.
REQ'D 24" RCES
FL. INV. 24" RCP OUT = 6574.08
RCES FL. = 6574.05

8912 — PROJECT LINE (FAIRLANE)
STA. 89+12.16, 60.03' RT.
REQ'D TYPE D INLET
GRATE ELEVATION = 6579.87
(H= 4.70')
REQ'D 24" RCP
FL. INV. 24" RCP OUT = 6575.17

8922 — PROJECT LINE (FAIRLANE)
STA. 89+22.13, 67.60' LT.
REQ'D 24" RCES
FL. INV. 24" RCP OUT = 6574.05
RCES FL. = 6573.99

8901 — PROJECT LINE (FAIRLANE)
STA. 89+00.87, 56.77' RT.
REQ'D OUTLET HEADWALL
AND APRON SEE HYDT04
FL. INV. 24" RCP IN = 6575.17

8913 — PROJECT LINE (FAIRLANE)
STA. 89+13.16, 5.00' LT.
REQ'D INLET TYPE R L10
(H = 12.81')
INV 24" RCP IN = 6574.73'
INV 24" RCP OUT = 6574.69'
STA PT. = 6587.50'

144659 — PROJECT LINE (I-25)
STA. 1446+58.84, 67.78' LT.
REQ'D MANHOLE SLAB BASE
(H = 5.82')
INV. 24" RCP IN = 6602.92
INV 24" RCP OUT = 6602.20
RIM = 6608.02

144691 — PROJECT LINE (I-25)
STA. 1446+91.20, 97.45' LT.
REQ'D 24" RCES
FL. INV. 24" RCP IN = 6601.98
RCES FL. = 6601.95

44811 — PROJECT LINE (RAMP "D")
STA. 448+11.42, 61.63' LT.
REQ'D 60" RCES
FL. INV. 60" RCP IN = 6588.66
RCES FL. = 6589.08

44743 — PROJECT LINE (RAMP "D")
STA. 447+42.50, 81.19' RT.
REQ'D 60" RCES
FL. INV. 60" RCP OUT = 6577.47
RCES FL. = 6576.93

45120 — PROJECT LINE (RAMP "D")
STA. 451+20.47, 40.21' LT.
REQ'D. 24" RCES
FL. INV. 24" RCP IN = 6584.26
RCES FL. = 6584.41

45131 — PROJECT LINE (RAMP "D")
STA. 451+31.06, 66.95 RT.
REQ'D 24" RCES
FL. INV. 24" RCP OUT = 6577.26
RCES FL. = 6576.87

CURVE TABLE			
CURVE	DELTA	LENGTH	RADIUS
C2	79°24'49"	130.99	94.51
C7	113°35'04"	223.08	112.53
C8	112°22'56"	282.04	143.79

Computer File Information	
Creation Date: 12/12/97	Initials: BLS
Last Modification Date: 08/27/98	Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\	
Drawing File Name: FLHPL03.DWG	
Acad Ver. R14 Scale: 1"=50'	Units: ENGLISH

Index of Revisions

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	
No Revisions:	
Revised:	
Void:	

FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25 RAMP-D DRAINAGE PLAN

Sheet Subset: DRAINAGE | Subset Sheets: FLHPL03 of 8

Designer: RBB	
Detailer: BLS	
Checked: CLP	
Sheet Number	

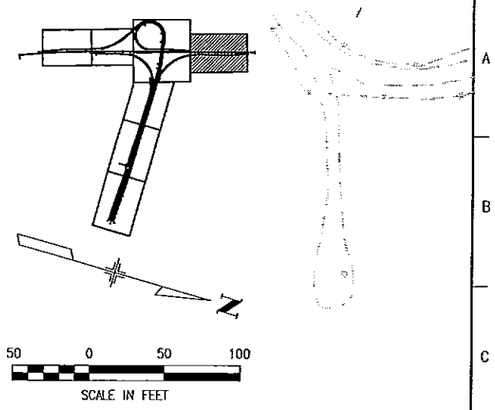
08:52 XREF = FLXRUT01 FLXRTB01 FLXRRD01 FLXRBASE FLXRHY01

145590A PROJECT LINE (I–25)
STA. 1455+90.03, 101.56' RT.
REQ'D 24" CMES
FL. INV. 24" CMP IN = 6604.60'
CMES FL. = 6604.65'

145590B PROJECT LINE (I–25)
STA. 1455+89.81, 75.22' RT.
INV. 24" RCP OUT = 6604.03'

146691A PROJECT LINE (I–25)
STA. 1466+91.50, 87.40' RT.
REQ'D 30" CMES
FL. INV. 30" CMP IN = 6603.93'
CMES FL. = 6604.00'

146691B PROJECT LINE (I–25)
STA. 1466+91.01, 71.09' RT.
INV. 30" RCP OUT = 6603.65'



FLXRBASE FLXRUTO1 FLXRTB01 FLXRRD01 FLXRHY01 FLXREP01
14:20 XREF =

Computer File Information		
Creation Date: 12/12/97		Initials: BLS
Last Modification Date: 07/21/98		Initials: SBE
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\		
Drawing File Name: FLHPL04.DWG		
Acad Ver. R14	Scale: 1"=50'	Units: ENGLISH

Index of Revisions

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471–9866 Fax: (719) 471–9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I–25 INTERCHANGE

I–25
DRAINAGE PLAN

Sheet Subset: DRAINAGE | Subset Sheets: FLHPL04 of 8

Designer: RBB	
Detailer: BLS	
Checked: CLP	
Sheet Number	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F G H I J

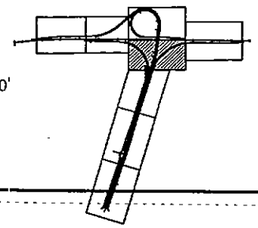
23863 PROJECT LINE (RAMP "A")
STA. 238+62.83, 40.18' LT.
REQ'D 24" RCES
FL. INV. 24" RCP IN = 6603.67'
RCES FL. = 6603.70'

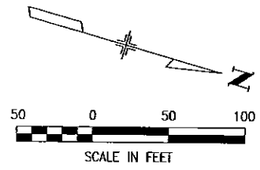
10451 PROJECT LINE (FAIRLANE)
STA. 104+50.59 67.64 RT.
REQ'D 18" RCES
FL. INV. 18" RCP OUT = 6620.86'
RCES FL. = 6620.22'

10480 PROJECT LINE (FAIRLANE)
STA. 104+80.32, 4.03 LT.
REQ'D INLET TYPE R L10
(H= 4.5')
INV. 18" RCP OUT = 6627.13'
STA. PT. = 6631.63'

34890 PROJECT LINE (RAMP "B")
STA. 348+90.43, 43.06' LT.
REQ'D 24" RCES
FL. INV. 24" RCP OUT = 6606.79'
RCES FL. = 6606.73

34918 PROJECT LINE (RAMP "B")
STA. 349+18.44, 27.01' RT.
REQ'D. OUTLET STRUCTURE
SEE HYDT02
FL. INV. 24" RCP OUT = 6607.50'





MATCHLINE STA. 99+50 SEE SHEET FLHPL03

MATCHLINE STA. 1438+00 SEE SHEET FLHPL02

MATCHLINE STA. 1453+00 SEE SHEET FLHPL04

MATCHLINE STA. 107+00 SEE SHEET FLHPP06

CURVE TABLE			
CURVE	DELTA	LENGTH	RADIUS
C3	65°23'01"	790.25	692.50
C10	63°24'14"	44.51	40.22
C11	03°46'55"	487.13	7380.02
C12	53°48'51"	162.87	173.41

23863
END CH F
10451
BEG CH F
10480
73.20' 18" RCP
@ 8.56%
34890
BEG CH G
END CH G
34918
75.52' 24" RCP
@ .94%
SEE DETAIL HYDT01/HYDT02
I-25
PT = 62+25.85
PC = 64+81.34
PROPOSED CHANNEL SECTION F
PROPOSED CHANNEL SECTION E
PROPOSED CHANNEL SECTION G
RAMP "A"
RAMP "B"
MOUNTAIN VIEW DRIVE
DETENTION POND "A"
OUTLINE OF POND
RELOCATED MOUNTAIN VIEW ELECTRIC (BY OTHERS)
34.5kv ELEC.
12.5kv ELEC.
12" SAN
24" RCP

BEG CH G PROJECT LINE (RAMP "B")
STA. 648+94.26, 46.11 LT.
CHANNEL STATION=60+00
CHANNEL INVERT=6606.73'
CHANNEL SLOPE=.50%

END CH G PROJECT LINE (I-25)
STA. 1447+24.24, 72.63 RT.
CHANNEL STATION=62+25.85
CHANNEL INVERT=6605.60'
CHANNEL SLOPE=.50%

BEG CH F PROJECT LINE (RAMP "A")
STA. 104+50.59, 67.64 RT.
CHANNEL STATION=40+00
CHANNEL INVERT=6620.22'
CHANNEL SLOPE=2.64%
SEE PROFILE

END CH F PROJECT LINE (RAMP "A")
STA.238+62.83, 40.18 LT.
CHANNEL STATION=46+50
CHANNEL INVERT=6603.70'
CHANNEL SLOPE=2.64%
SEE PROFILE

Computer File Information	
Creation Date: 12/12/97	Initials: BLS
Last Modification Date: 08/27/98	Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\	
Drawing File Name: FLHPL05.DWG	
Acad Ver. R14 Scale: 1"=50'	Units: ENGLISH

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

I-25 RAMPS-A & B
DRAINAGE PLAN

Sheet Subset: DRAINAGE | Subset Sheets: FLHPL05 of 8

Designer: RBB
Detailer: BLS
Checked: CLP
Sheet Number

09:36 XREF = FLXRBASE FLXRUT01 FLXRTB01 FLXRRD01 FLXRHY01 FLXREP01

MATCHLINE STA. 107+00 SEE SHEET FLHPL05

MATCHLINE STA. 120+00 SEE SHEET FLHPL07

24811 PROJECT LINE (RAMP "A")
STA. 248+16.68, 6.08 RT.
REQ'D. INLET TYPE D-10-R L=6'
(H = 6.51')
INV. 30" RCP IN = 6627.47'
INV. 36" RCP OUT = 6626.97'
STA. PT. = 6633.48'

24671 PROJECT LINE (RAMP "A")
STA. 246+70.60, 52.86 RT.
REQ'D. 36" RCES
FL. INV. 36" RCP OUT = 6625.96'
RCES FL. = 6625.89'

11302A PROJECT LINE (FAIRLANE)
STA. 113+02.16, 35.04 RT.
REQ'D INLET TYPE D-10-R L=20'
(H = 5.00')
INV. 24" RCP OUT = 6639.40'
STA. PT. = 6644.40'

BEG CH E PROJECT LINE (RAMP "A")
STA. 246+85.97, 53.68 RT.
CHANNEL STA = 10+00
CHANNEL INVERT = 6625.89'
SEE PROFILE

N

50 0 50 100
SCALE IN FEET

MOUNTAIN STATES TELE.

U.S. WEST

8" SAN FORCEMAIN

STOUT ALLEN RD.

340 110 115

70.01' 24" RCP
@ 1.30%

24" STEEL SLEEVE

24" STEEL SLEEVE

RAMP "A"

250

24811

11302A

11302B

FAIRLANE PARKWAY

BEG CH E

10+00

11+00

344.12' 30" RCP
@ 3.06%

11302B PROJECT LINE (FAIRLANE)
STA. 113+02.15, 35.00 RT.
REQ'D INLET TYPE D-10-R L=20'
(H = 6.41')
INV. 24" RCP IN (N) = 6638.49'
INV. 30" RCP OUT = 6637.99'
STA. PT. = 6644.40'

U.S. WEST F.O.

144.00' 36" RCP
@ 0.70%
PROPOSED CHANNEL

24671

PROPOSED GRADE
AT CENTERLINE

EXISTING GRADE ABOVE PIPE

EXISTING GRADE ON CENTERLINE

INLET TYPE D-10-R 11302B

INV. OUT 6637.99'

HGL

Q5=28.07 CFS
Q100=48.08 CFS

INV. OUT 6626.97' INLET TYPE D-10-R 24811

INV. IN 6627.47'

Q5=29.13 CFS
Q100=49.94 CFS

INV. OUT ± 6625.89
INV. IN ± 6625.96' RCES 24671

24" SLEEVE

24" SLEEVE

FIBER OPTIC

HGL

144.00' 36" RCP
@ .70%

344.12' 30" RCP
@ 3.06%

6660 6650 6640 6630

110+00 115+00 120+00

FLXRHY01 PROFILE FLXRRD01 FLXRTB01 FLXRUT01 FLXRBASE GRID1 09:41 XREF =

Computer File Information	
Creation Date: 12/12/97	Initials: BLS
Last Modification Date: 08/27/98	Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\	
Drawing File Name: FLHPP06.DWG	
Acad Ver. R14 Scale: 1"=50'	Units: ENGLISH

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE PARKWAY
DRAINAGE PLAN & PROFILE

Sheet Subset: DRAINAGE
Subset Sheets: FLHPL06 of 8

Designer: RBB
Detailer: BLS
Checked: CLP
Sheet Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

MATCHLINE STA. 120+00 SEE SHEET FLHPL06

MATCHLINE STA. 133+50 SEE SHEET FLHPL08

STOUT ALLEN RD.

8" SAN FORCEMAIN

FAIRLANE PARKWAY

U.S. WEST F.O.

125.00' 18" RCP @ 0.50%

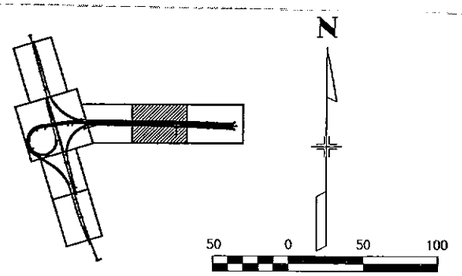
13275A

13275B

15" SAN

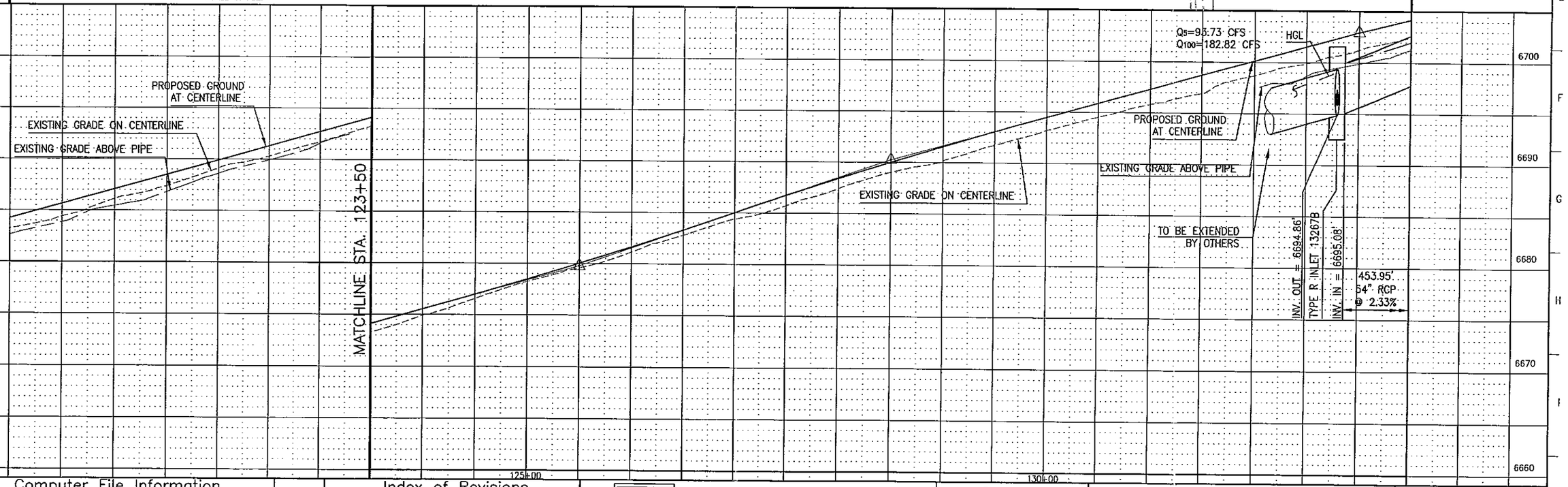
FEDERAL DRIVE

CONTRACTOR SHALL GRADE TO DRAIN IF STORM SEWER BY OTHERS IS NOT IN PLACE.



13275A PROJECT LINE (FAIRLANE)
STA. 132+74.61, 62.50 LT.
REQ'D MOD. EMBANKMENT PROTECTOR TYPE 5
REQ'D. INLET TYPE D-10-R L=16'
(H = 4.50')
INV. 18" RCP OUT = 6697.03'
STA. PT. = 6701.53'

13275B PROJECT LINE (FAIRLANE)
STA. 132+74.61, 62.50 RT.
REQ'D MOD. EMBANKMENT PROTECTOR TYPE 5
REQ'D. INLET TYPE D-10-R L=16'
(H = 6.70')
INV. 18" RCP IN (N) = 6696.41'
INV. 54" RCP IN (E) = 6695.08'
INV. 54" RCP OUT = 6694.86'
STA. PT. = 6701.56'



PROFILE FLXRHY01
FLXRUT01
FLXRBASE
GRID1
FLXRRD01
FLXRTB01
13:47 XREF

Computer File Information		
Creation Date: 12/12/97		Initials: BLS
Last Modification Date: 08/19/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\		
Drawing File Name: FLHPP07.DWG		
Acad Ver. R14	Scale: 1"=50'	Units: ENGLISH

Index of Revisions		

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	FAIRLANE PARKWAY DRAINAGE PLAN & PROFILE	Detailer: BLS
Revised:		Checked: CLP
Void:	Sheet Subset: DRAINAGE / Subset Sheets: FLHPL07 of 8	Sheet Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

MATCHLINE STA. 133+50 SEE SHEET FLHPL07

14650 PROJECT LINE (FAIRLANE)
STA. 146+49.95, 87.53 LT.
REQ'D. TYPE I BASE MANHOLE
(H = 7.93')
BW = 6.83'
INV. 30" RCP IN = 6734.26'
INV. 30" RCP OUT = 6732.00'
RIM = 6739.93

14680 PROJECT LINE (FAIRLANE)
STA. 146+79.56, 88.31 LT.
FL. INV. 30" RCP OUT = 6735.00'

STOUT ALLEN RD.

26.25' 30" RCP
@ 2.82%

156.13' 30" RCP
@ 2.47%

246.92' 6'x2' RCBC
@ 0.50%

13742

453.95' 54" RCP
@ 2.33%

600.72' 54" RCP
@ 2.75%

14348

239.33' 54" RCP
@ 0.84%

14594

FAIRLANE PARKWAY

U.S. WEST F.O.

S.H. 83

13742 PROJECT LINE (FAIRLANE)
STA. 137+41.95, 62.50 RT.
TYPE I BASE MANHOLE
(H = 7.53')
BW = 6.83'
INV. 54" RCP IN = 6705.85'
INV. 54" RCP OUT = 6705.65'
RIM = 6713.18'

14348 PROJECT LINE (FAIRLANE)
STA. 143+48.03, 65.79 RT.
REQ'D TYPE I BASE MANHOLE
(H = 7.21')
BW = 6.83'
INV. 54" RCP IN = 6722.57'
INV. 54" RCP OUT = 6722.37'
RIM = 6729.58'

14594 PROJECT LINE (FAIRLANE)
STA. 145+93.96, 66.30 RT.
REQ'D. TYPE I BASE MANHOLE
(H = 10.00')
BW = 8.5'
INV. 2'x6' RCBC IN (E) = 6724.78'
INV. 30" RCP IN (N) = 6728.15'
INV. 54" RCP OUT = 6724.58'
RIM = 6734.58'

N

50 0 50 100
SCALE IN FEET

TYPE I BASE MANHOLE 13792

TYPE I BASE MANHOLE 14348

TYPE I BASE MANHOLE 14954

Q5=81.99 CFS
Q100=159.05 CFS

Q5=84.42 CFS
Q100=163.08 CFS

Q5=85.44 CFS
Q100=166.33 CFS

PROPOSED GROUND AT CENTERLINE
EXISTING GRADE ABOVE PIPE
EXISTING GRADE ON CENTERLINE
EXISTING GRADE ABOVE CENTERLINE
PROPOSED GROUND ABOVE CENTERLINE
HGL

INV. OUT = 6705.65'
INV. IN = 6706.85'

INV. OUT = 6722.37'
INV. IN = 6722.57'

INV. OUT = 6724.58'
INV. IN = 6724.78'

INV = 6722.59' 12" SAN
INV = 6729.33' 36" W.
INV = 6729.47' 12" GAS

TELE
FUTURE IDG

453.95' 54" @ 2.33%
600.72' 54" RCP @ 2.75%
239.33' 54" RCP @ 0.84%
246.92' 6'x2' RCBC @ 0.50%

MATCHLINE STA. 160+00

135+00
140+00
145+00

6740
6730
6720
6710
6700
6690

FLXRHYO1 PROFILE FLXRUT01 FLXRBASE GRID1 FLXRRDO1 FLXRTB01 XREF = 16:18

Computer File Information		
Creation Date: 12/12/97		Initials: BLS
Last Modification Date: 08/20/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\		
Drawing File Name: FLHPP08.DWG		
Acad Ver. R14	Scale: 1"=50'	Units: ENGLISH

Index of Revisions

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

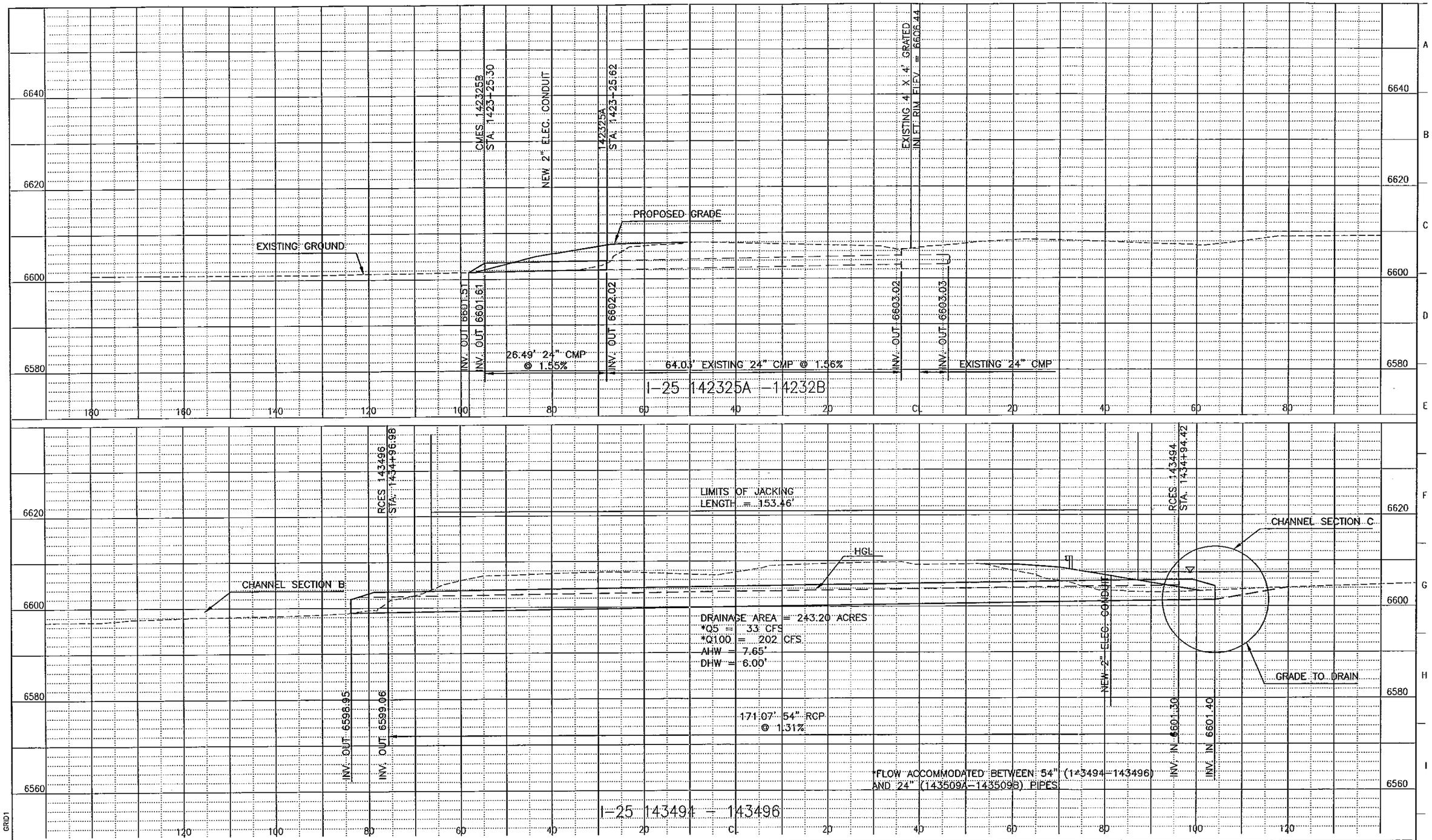
FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE PARKWAY
DRAINAGE PLAN & PROFILE

Sheet Subset: DRAINAGE
Subset Sheets: FLHPL08 of 8

Designer: RBB
Detailer: BLS
Checked: CLP
Sheet Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F G H I J



Computer File Information		
Creation Date: 01/27/98		Initials: LDS
Last Modification Date: 08/27/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS01.DWG		
Acad Ver. R14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed

No Revisions:

Revised:

Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS01 of 9

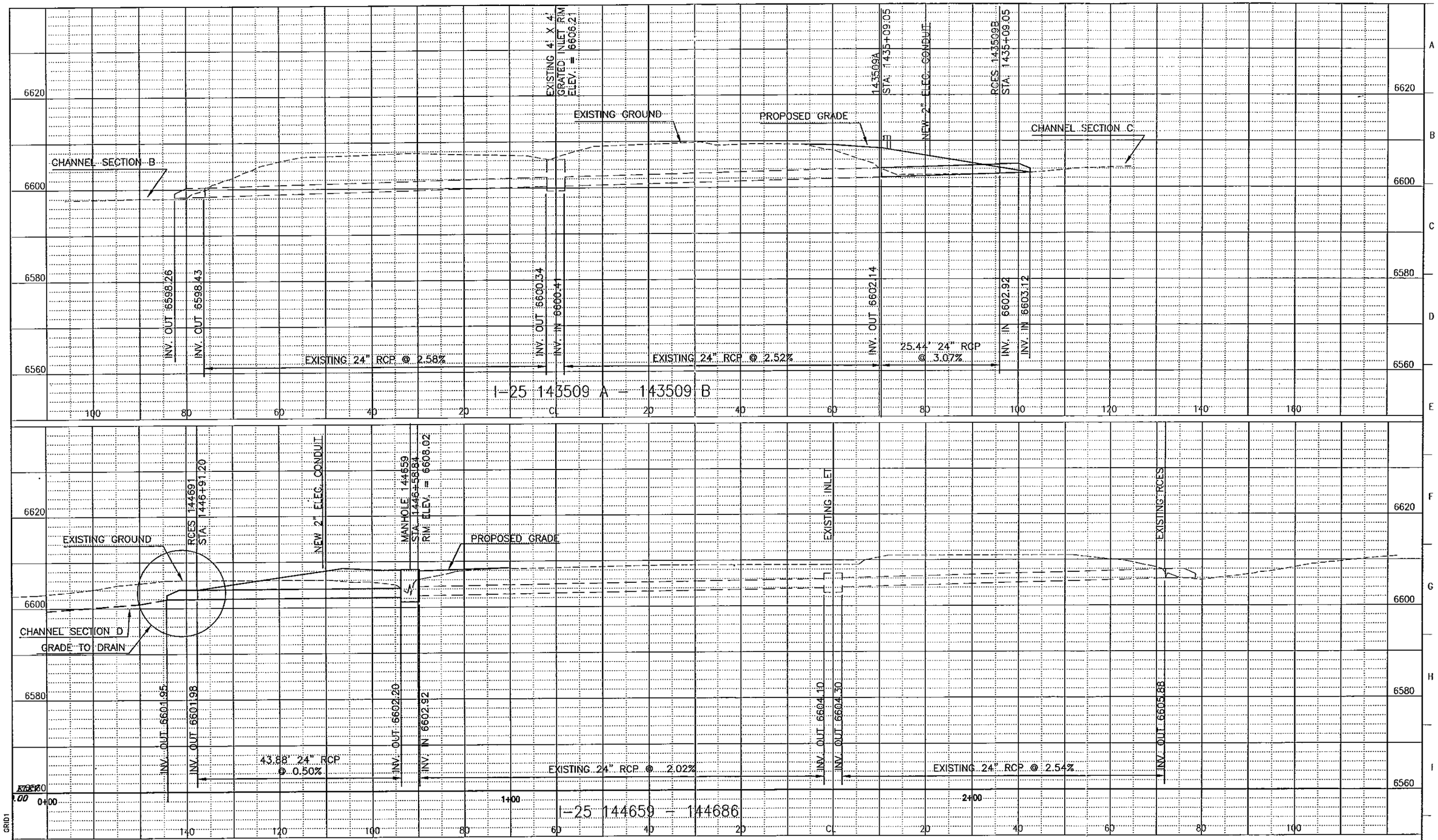
Designer: RBB

Detailer: GES

Checked: CLP

Sheet Number of

FLXRTB01 = GRID1
09:47 XREF



Computer File Information		
Creation Date: 01/27/98		Initials: LDS
Last Modification Date: 07/23/98		Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS02.DWG		
Acad Ver. 14	Scale: 1"=10'	Units: ENGLISH

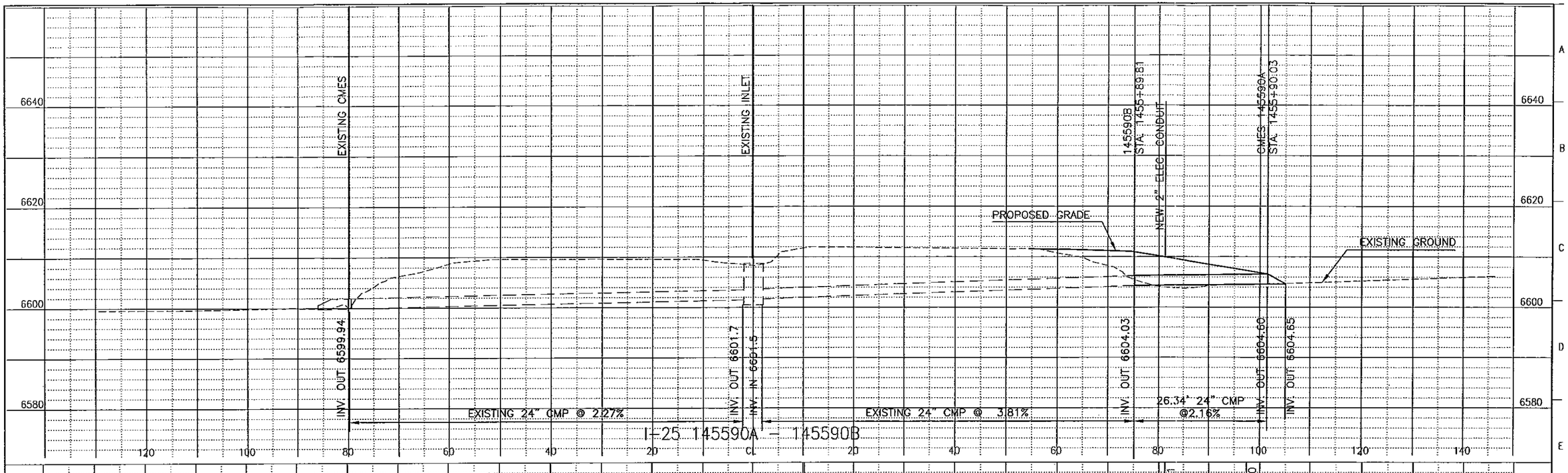
Index of Revisions

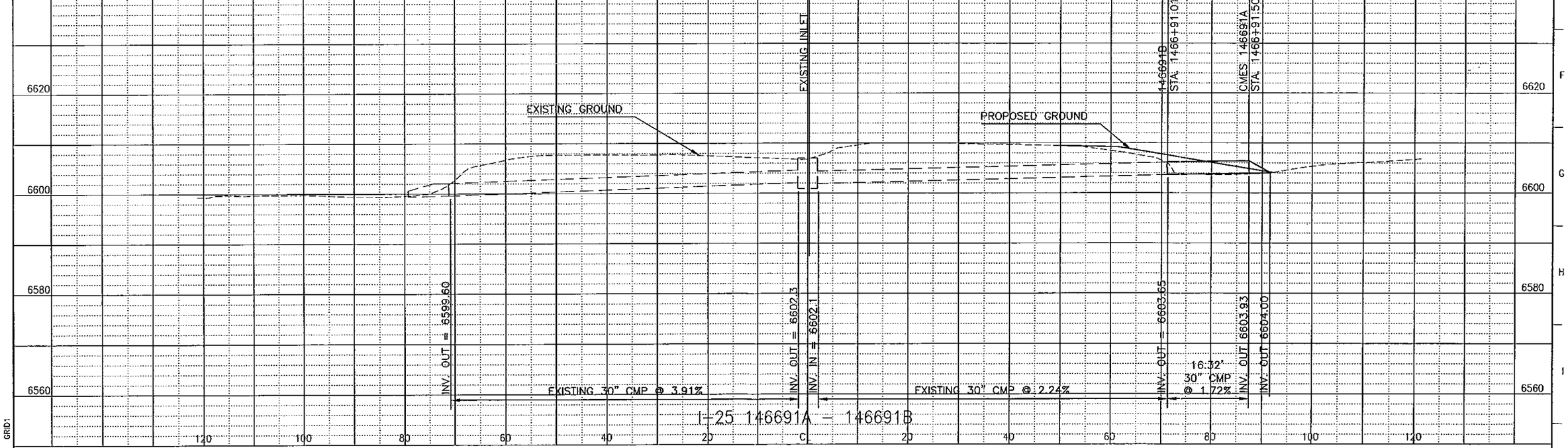
DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	STRUCTURE CROSS SECTIONS	Detailer: GES
Revised:		Checked: CLP
Void:	Sheet Subset: Drainage / Subset Sheets: FLXS02 of 9	Sheet Number of

GRID1 FLXRTB01 = XREF 16:25





07.26 XREF = FLXRTB01 GRID1

Computer File Information		
Creation Date: 01/27/98		Initials: LDS
Last Modification Date: 07/20/98		Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS03.DWG		
Acad Ver. 14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions		

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

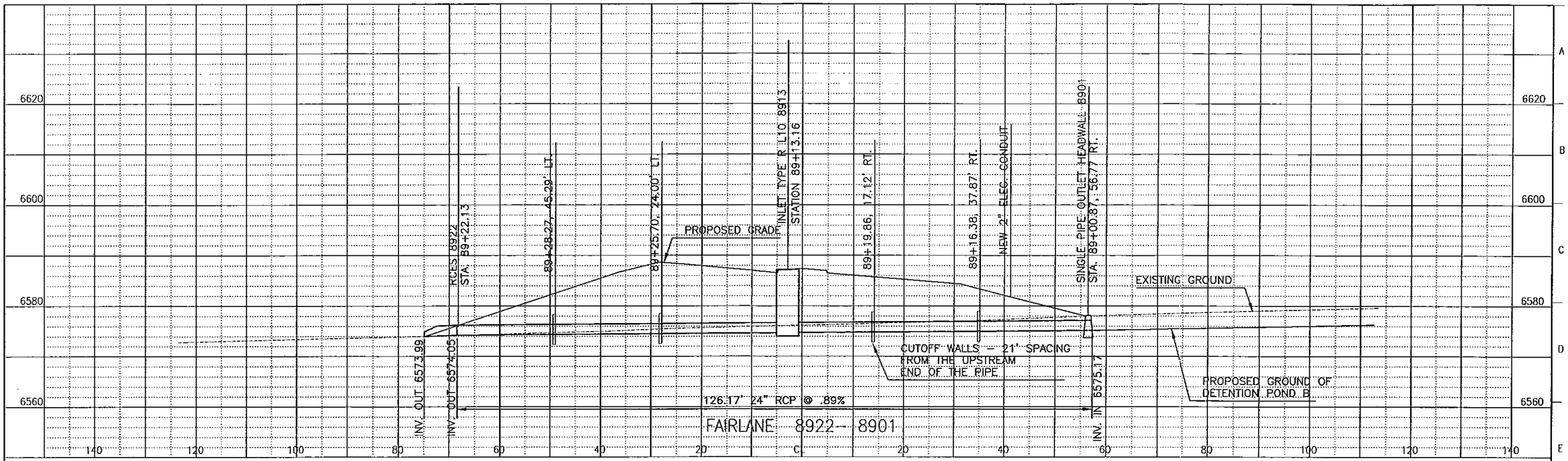
FAIRLANE PARKWAY/I-25 INTERCHANGE

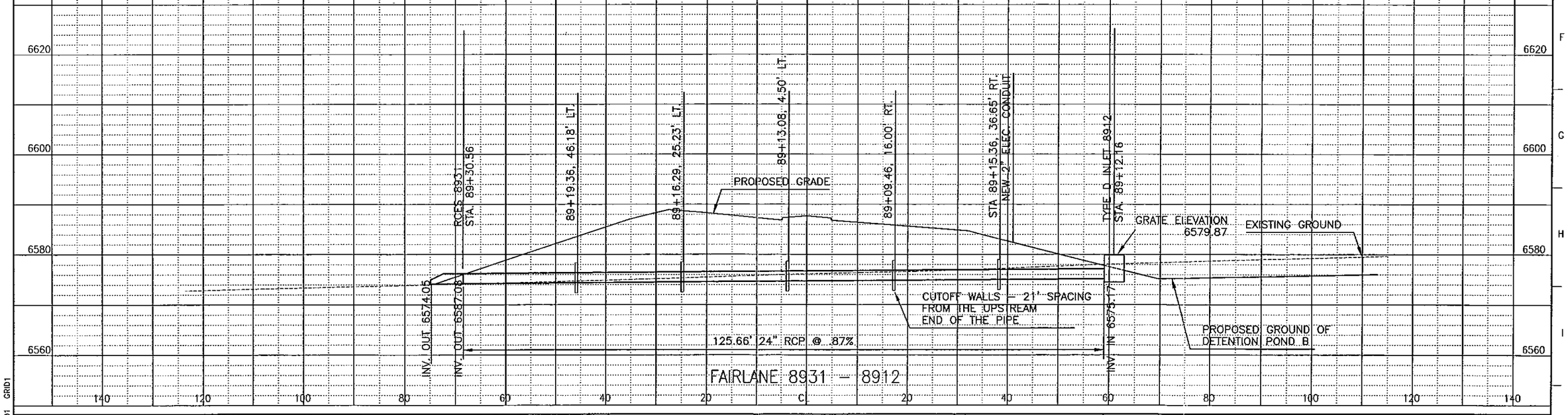
STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage	Subset Sheets: FLXS03 of 9

Designer: RBB
Detailer: GES
Checked: CLP
Sheet Number of

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15





Computer File Information		
Creation Date: 05/04/98		Initials: LLT
Last Modification Date: 08/19/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS04.DWG		
Acad Ver. R14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions		

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

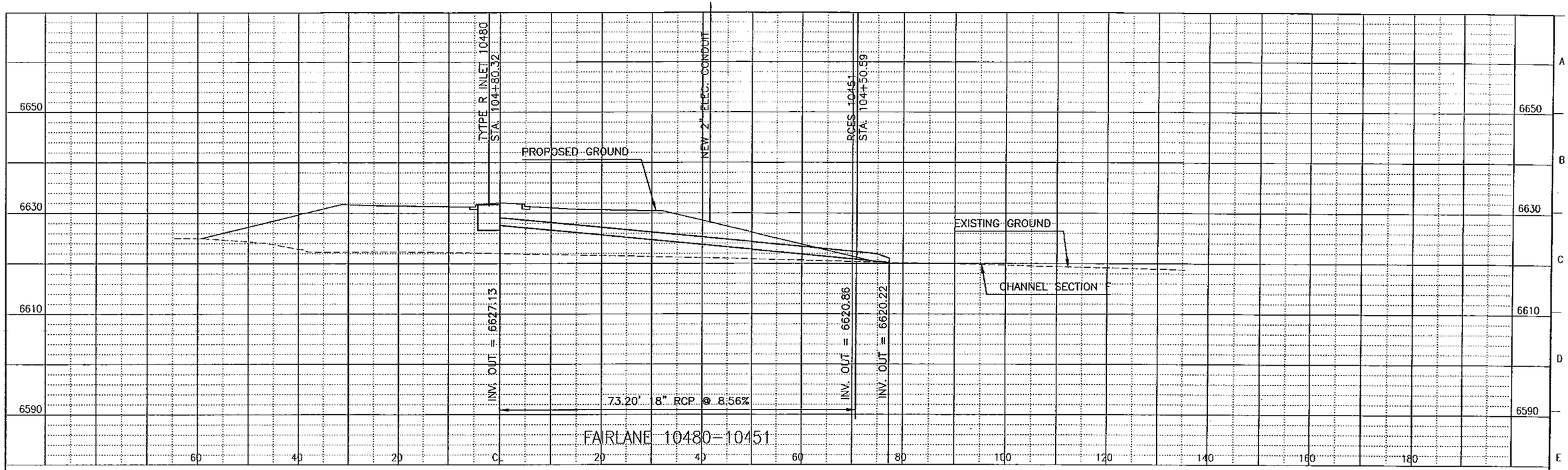
STRUCTURE
CROSS SECTIONS

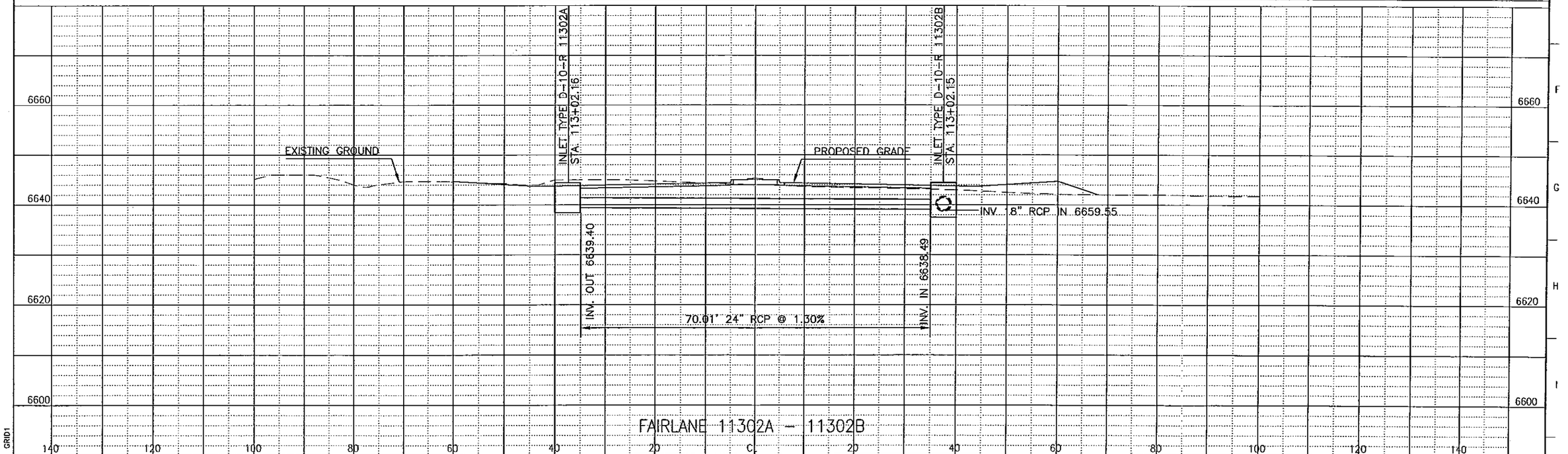
Sheet Subset: Drainage | Subset Sheets: FLXS04 of 9

Designer: RBB	
Detailer: GES	
Checked: CLP	
Sheet Number	of

GRID1 FLXRTB01 12:02 XREF =

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15





GRID1
FLXRTBD1
14:32 XREF =

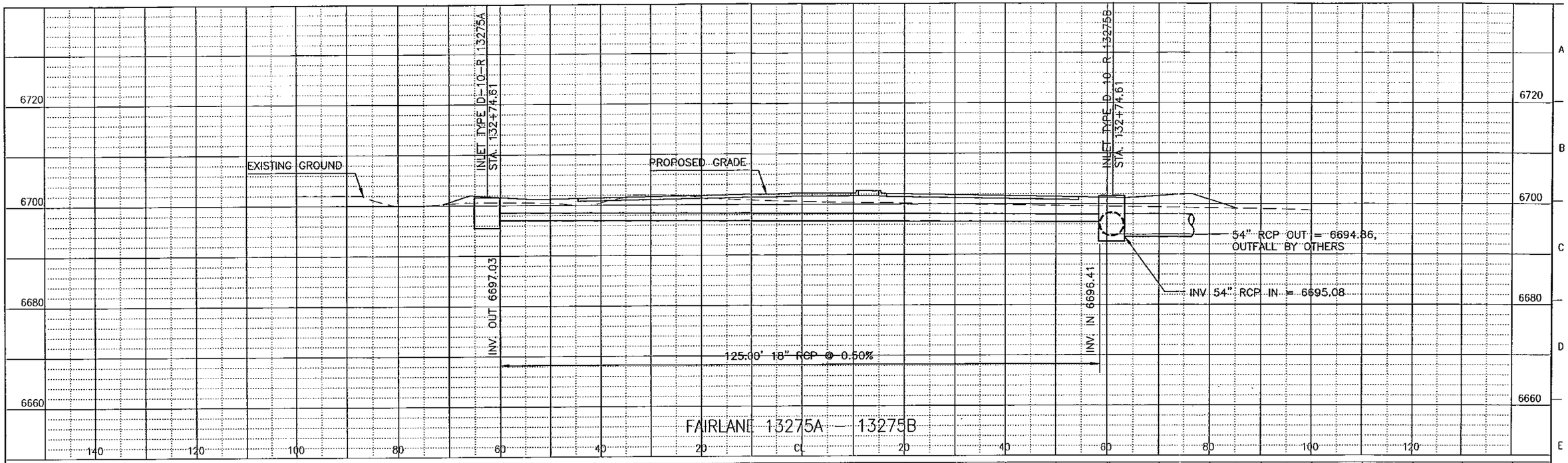
Computer File Information		
Creation Date: 04/30/98		Initials: LLT
Last Modification Date: 07/20/98		Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS05.DWG		
Acad Ver. R14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions		

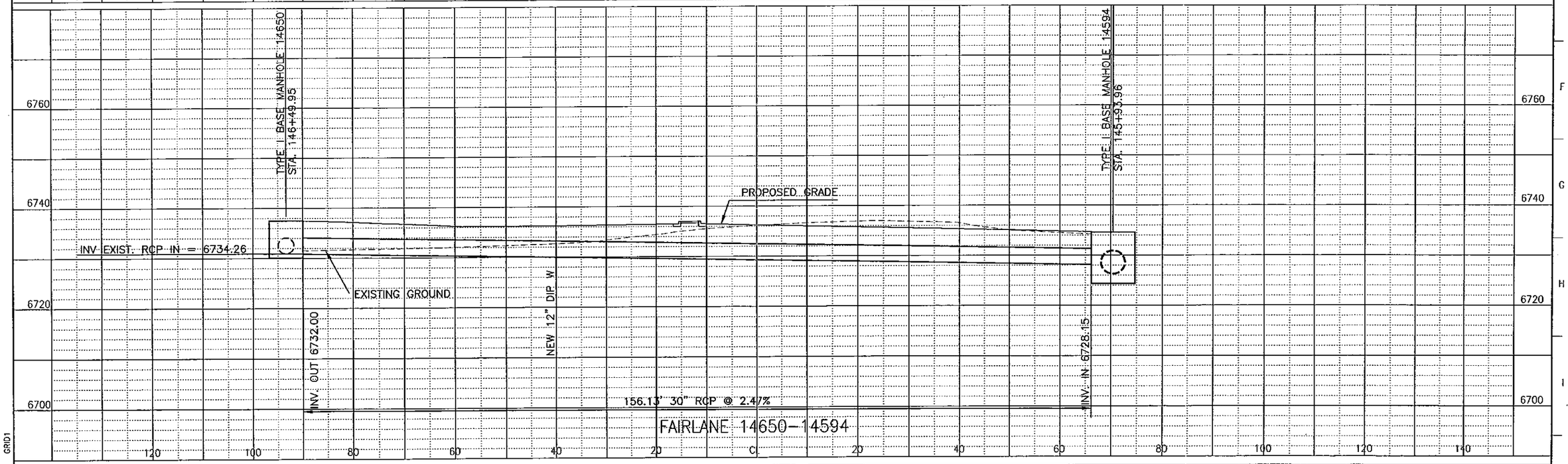
DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	STRUCTURE CROSS SECTIONS	Detailer: GES
Revised:		Checked: CLP
Void:	Sheet Subset: Drainage / Subset Sheets: FLXS05 of 9	Sheet Number of

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



FAIRLANE 13275A — 13275B



FAIRLANE 14650—14594

GRID1
16:42 XREF = FLXRTB01

Computer File Information		
Creation Date: 05/04/98		Initials: LLT
Last Modification Date: 07/23/98		Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS06.DWG		
Acad Ver. R14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

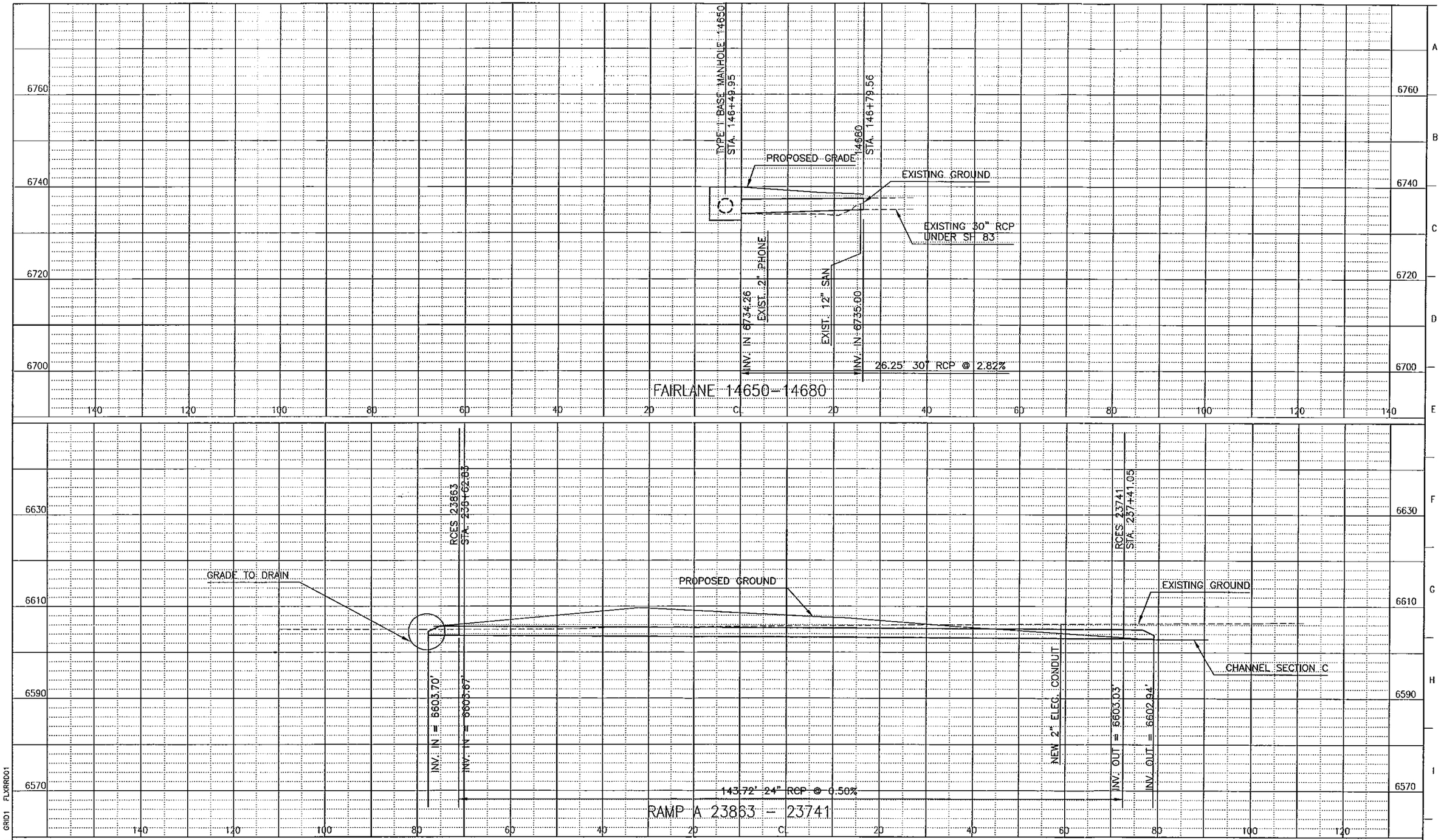
FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS06 of 9

Designer: RRB
Detailer: GES
Checked: CLP
Sheet Number of

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F G H I J



GRID1 FLXRR001

18:45 XREF = FLXRTB01

Computer File Information	
Creation Date: 01/27/98	Initials: LDS
Last Modification Date: 07/23/98	Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\	
Drawing File Name: FLXS07.DWG	
Acad Ver. 14	Scale: 1"=10' Units: ENGLISH

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

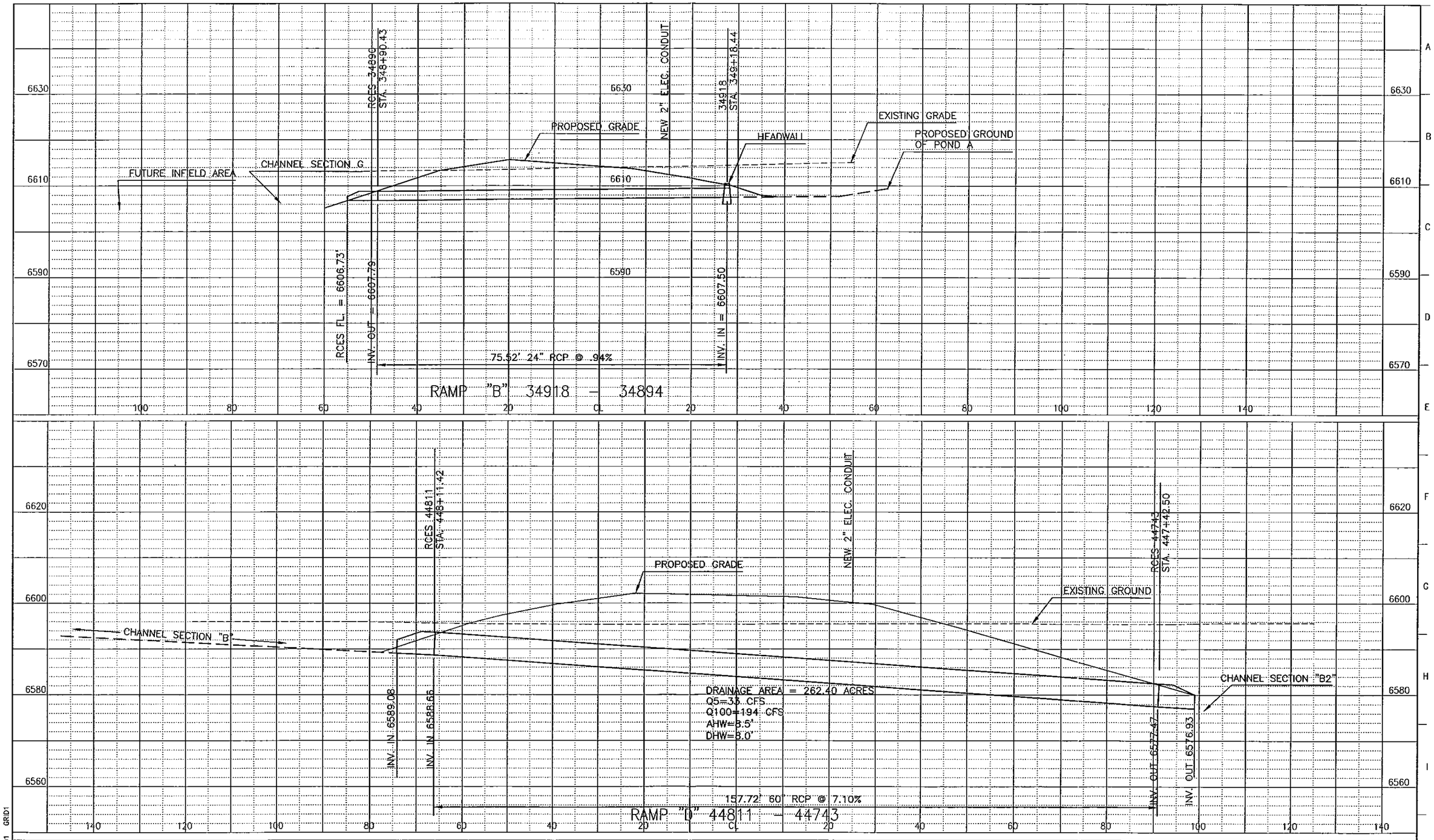
FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS07 of 9

Designer: RBB	
Detailer: GES	
Checked: CLP	
Sheet Number	of

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



Computer File Information		
Creation Date: 02/11/98		Initials: LDS
Last Modification Date: 08/27/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS08.DWG		
Acad Ver. 14	Scale: 1"= 10'	Units: ENGLISH

Index of Revisions

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

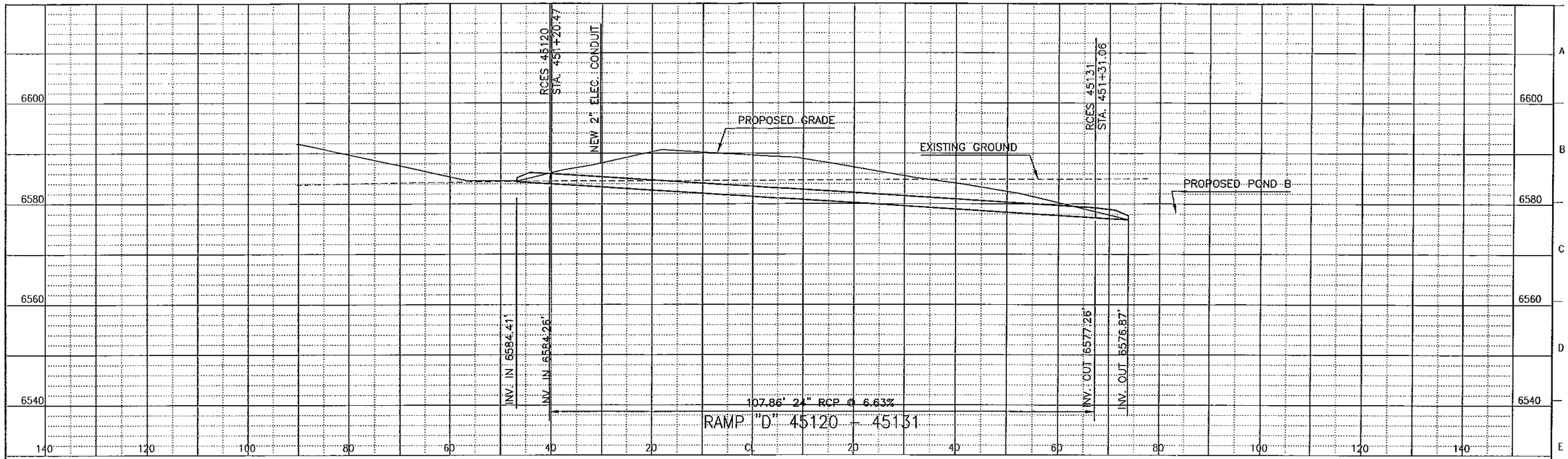
FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS08 of 9

Designer: RBB
Detailer: GES
Checked: CLP
Sheet Number

09:53 XREF = FLXRTB01 GRID1



Computer File Information		
Creation Date: 05/04/98		Initials: LLT
Last Modification Date: 08/27/98		Initials: GES
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\Xsec\		
Drawing File Name: FLXS09.DWG		
Acad Ver. R14	Scale: 1"=10'	Units: ENGLISH

Index of Revisions

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

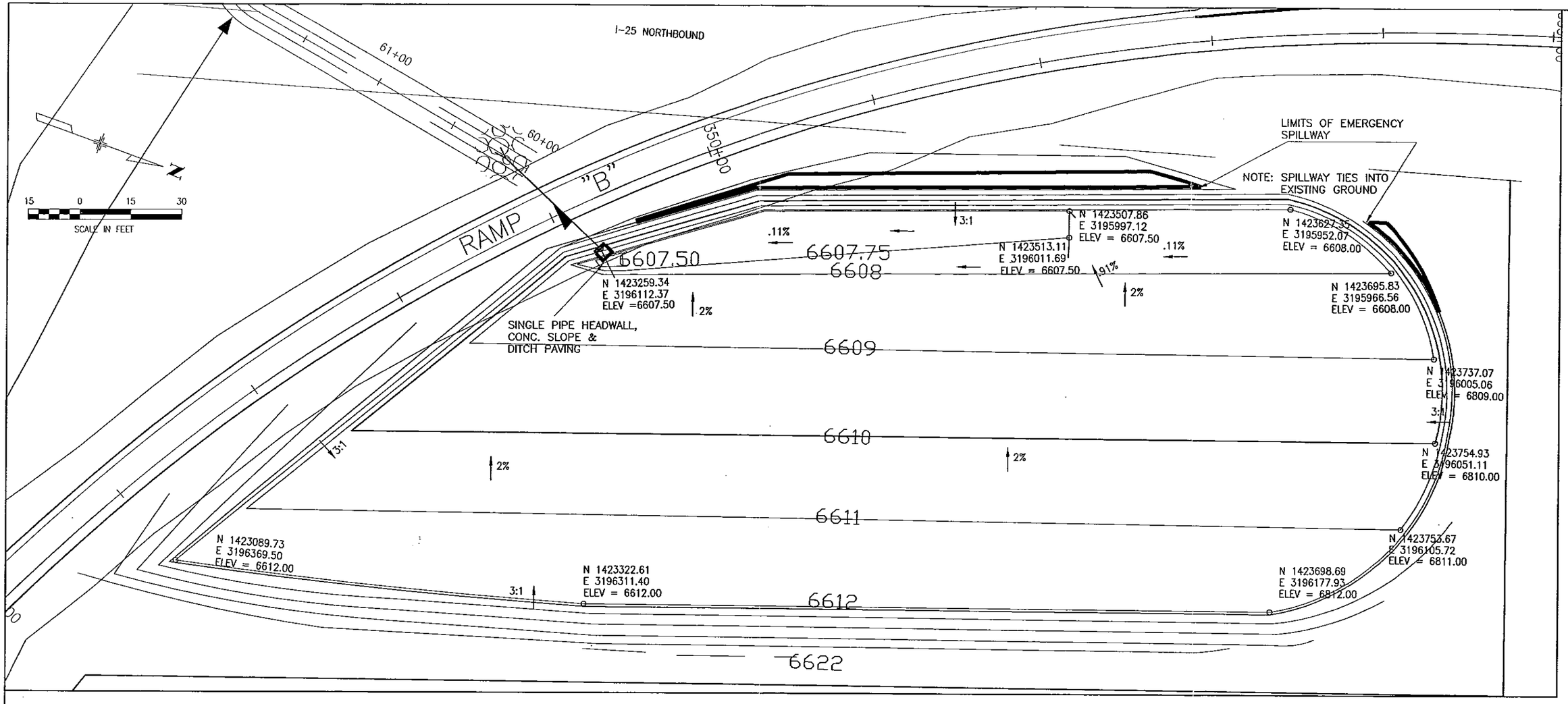
FAIRLANE PARKWAY/I-25 INTERCHANGE

STRUCTURE
CROSS SECTIONS

Sheet Subset: Drainage | Subset Sheets: FLXS09 of 9

Designer: RBB	
Detailer: GES	
Checked: CLP	
Sheet Number	of

09:57 XREF = FLXRTBD1 GRID1



HYDROLOGIC DATA
DRAINAGE AREA = .15 SQARE MILES
Q RELEASE 100 YR. = 23CFS
DETENSION VOLUME = 5 ACRE FT TO 100 YR. WSL
100 YEAR WSL = 6811.20 FT.

XREF = FLXREP01 FLXRRD01 FLXRTB01 FLXRHY01
15:31

Computer File Information		
Creation Date: 07/20/98		Initials: GES
Last Modification Date: 08/19/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT01.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions		

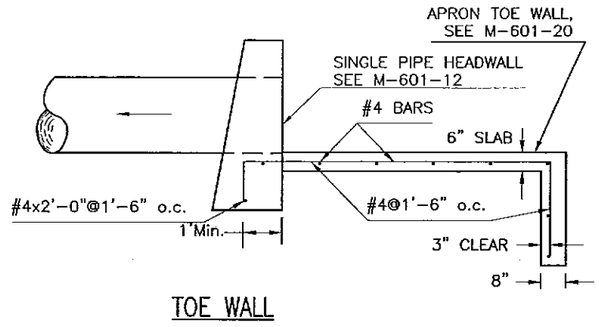
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

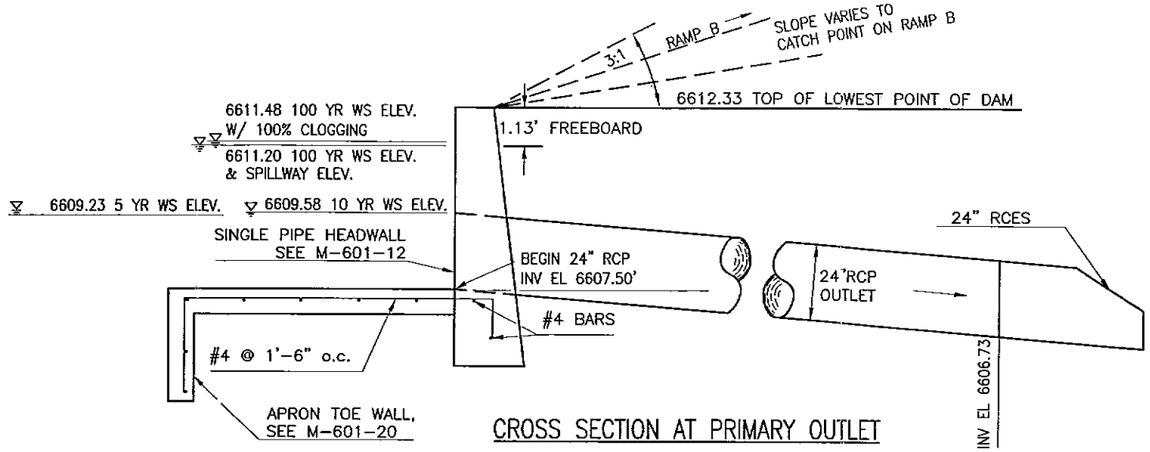
FAIRLANE PARKWAY/I-25 INTERCHANGE		
DETENTION POND "A" LAYOUT		
Sheet Subset: DRAINAGE	Subset Sheets:HYDT01 of 9	

Designer: RBB
Detailer: GES
Checked: CLP
Sheet Number

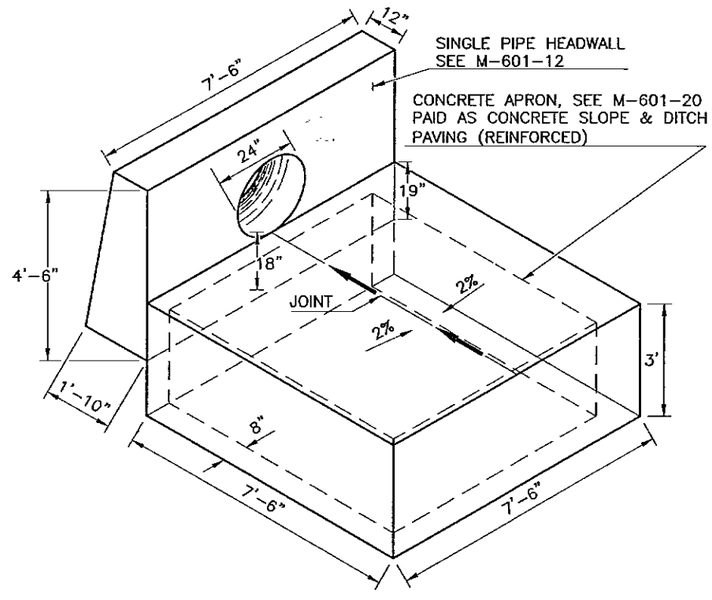
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
A B C D E F G H I J

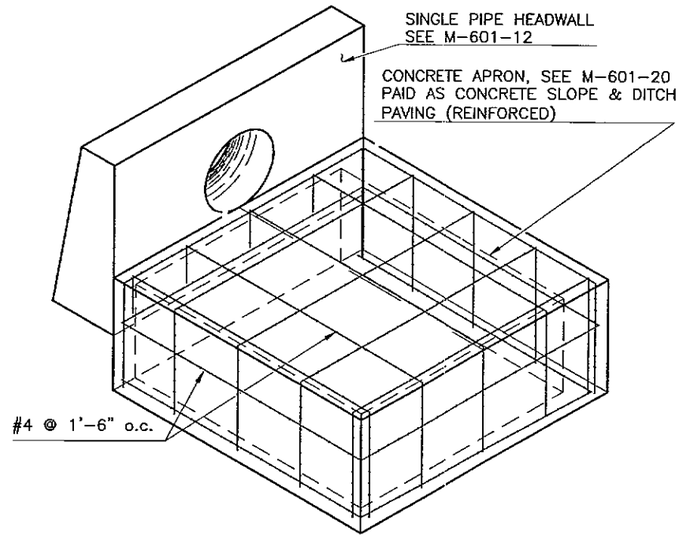


TOE WALL



CROSS SECTION AT PRIMARY OUTLET





SINGLE PIPE HEADWALL

Computer File Information		
Creation Date: 07/20/98		Initials: GES
Last Modification Date: 08/19/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT02.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions		

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

DETENTION POND "A" DETAILS

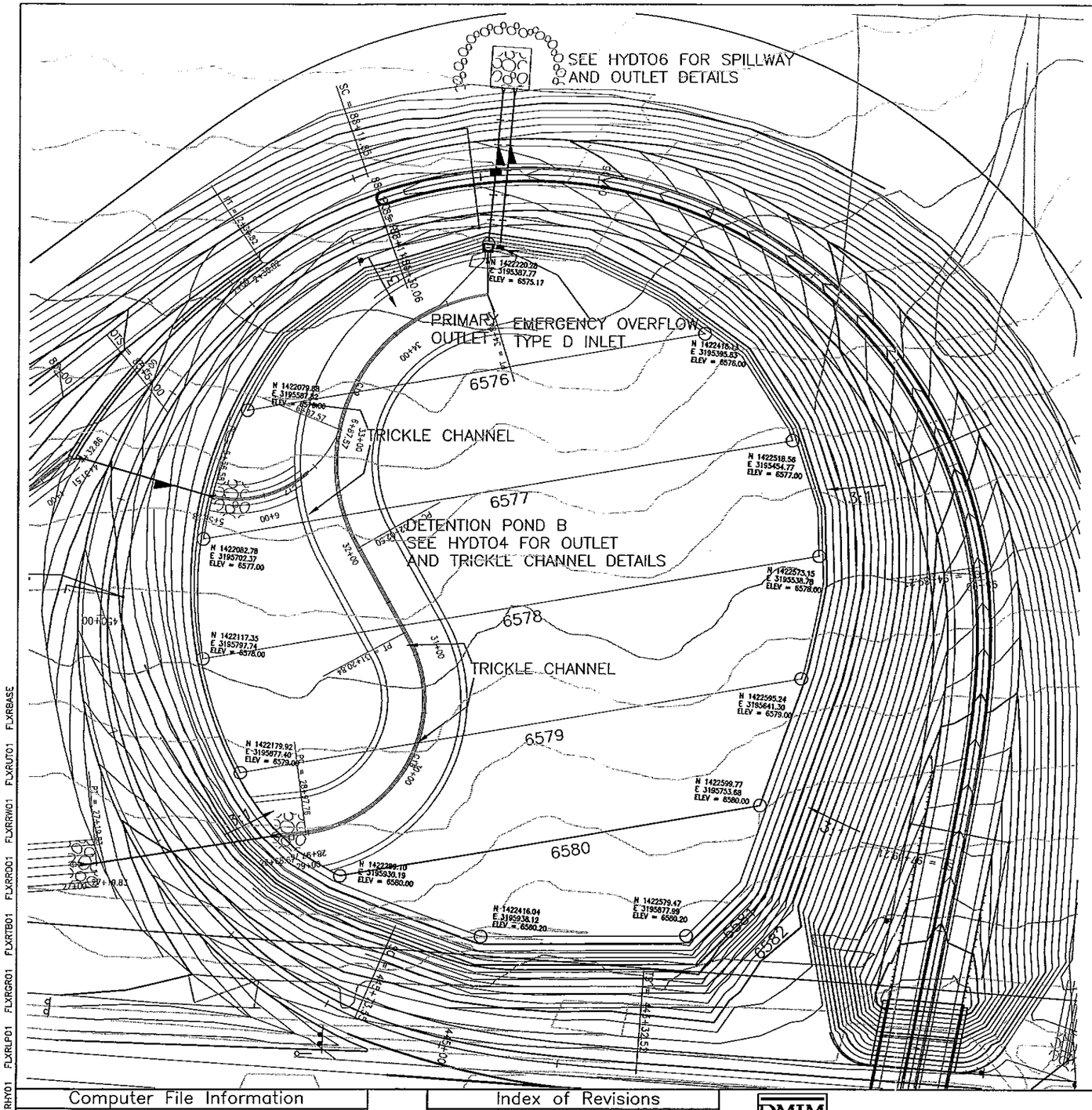
Sheet Subset: DRAINAGE | Subset Sheets:HYDT02 of 9

Designer: RBB	
Detailer: GES	
Checked: CLP	
Sheet Number	

15:45 XREF = FLXRTB01 HYDTDETL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J



HYDROLOGIC DATA
DRAINAGE AREA = .41 SQUARE MILES
Q RELEASE 100 YR. = 28 CFS
DETENTION VOLUME = 11 ACRE FT TO 100 YR. WSL
100 YEAR WSL = 6579.87 FT.

N

50 0 50 100
SCALE IN FEET

FLXRBASE FLXRUT01 FLXRRW01 FLXRRD01 FLXRTB01 FLXRGR01 FLXRLP01 FLXRHY01 = 16:20 XREF

Computer File Information		
Creation Date: 1/13/97		Initials: BLS
Last Modification Date: 08/19/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDTO3.DWG		
Acad Ver. 14	Scale: 1"=100'	Units: ENGLISH

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

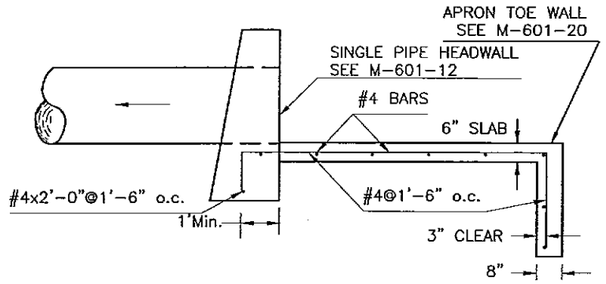
DETENTION POND "B" LAYOUT

Sheet Subset: DRAINAGE | Subset Sheets: HYDTO3 of 9

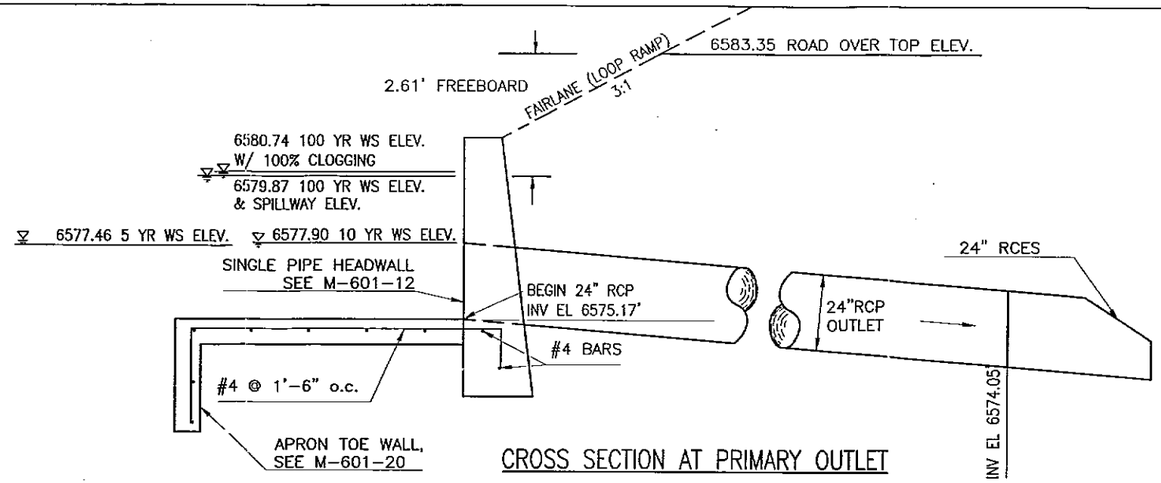
Designer: RBB	
Detailer: BLS	
Checked: CLP	
Sheet Number	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

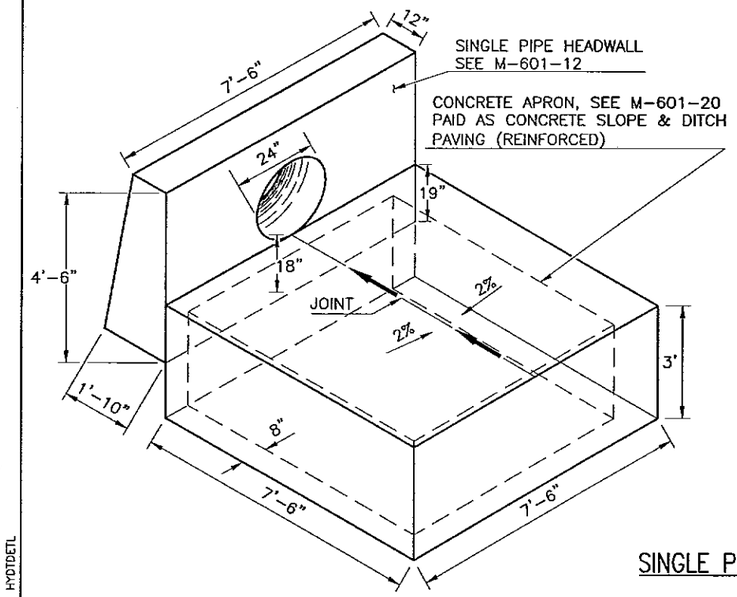
A B C D E F G H I J

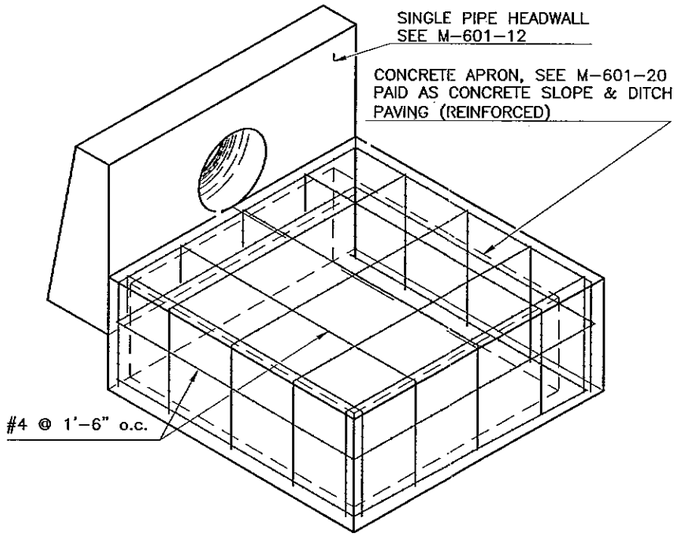


TOE WALL

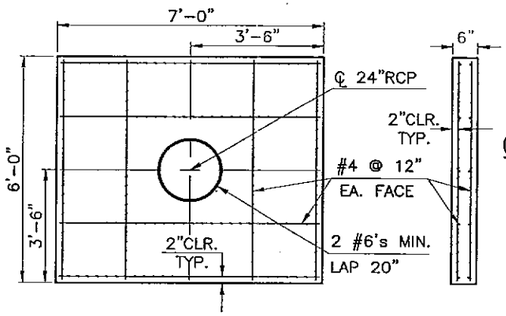


CROSS SECTION AT PRIMARY OUTLET

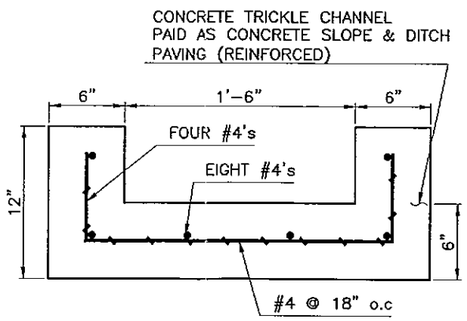




SINGLE PIPE HEADWALL



CONCRETE CUTOFF
COLLAR DETAIL



CONCRETE TRICKLE CHANNEL DETAIL

Computer File Information		
Creation Date: 07/21/98		Initials: RBB
Last Modification Date: 08/20/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT04.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions

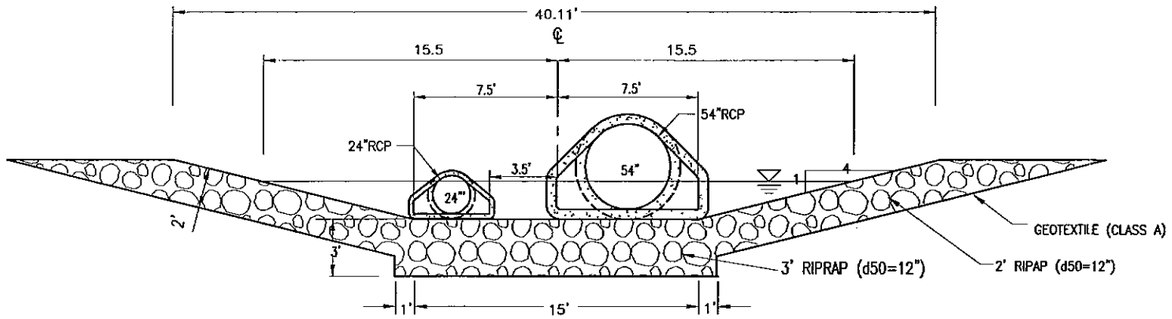
DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9868 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	DETENTION POND "B" DETAILS	Detailer: GES
Revised:		Checked: CLP
Void:	Sheet Subset: DRAINAGE / Subset Sheets: HYDT04 of 9	Sheet Number

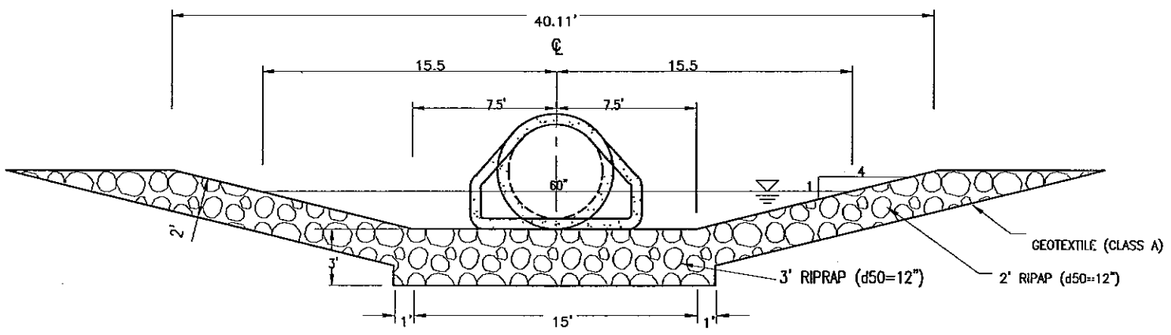
07:13 XREF = FLXRTB01 FLXS04 GRID1 HYDTDETL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

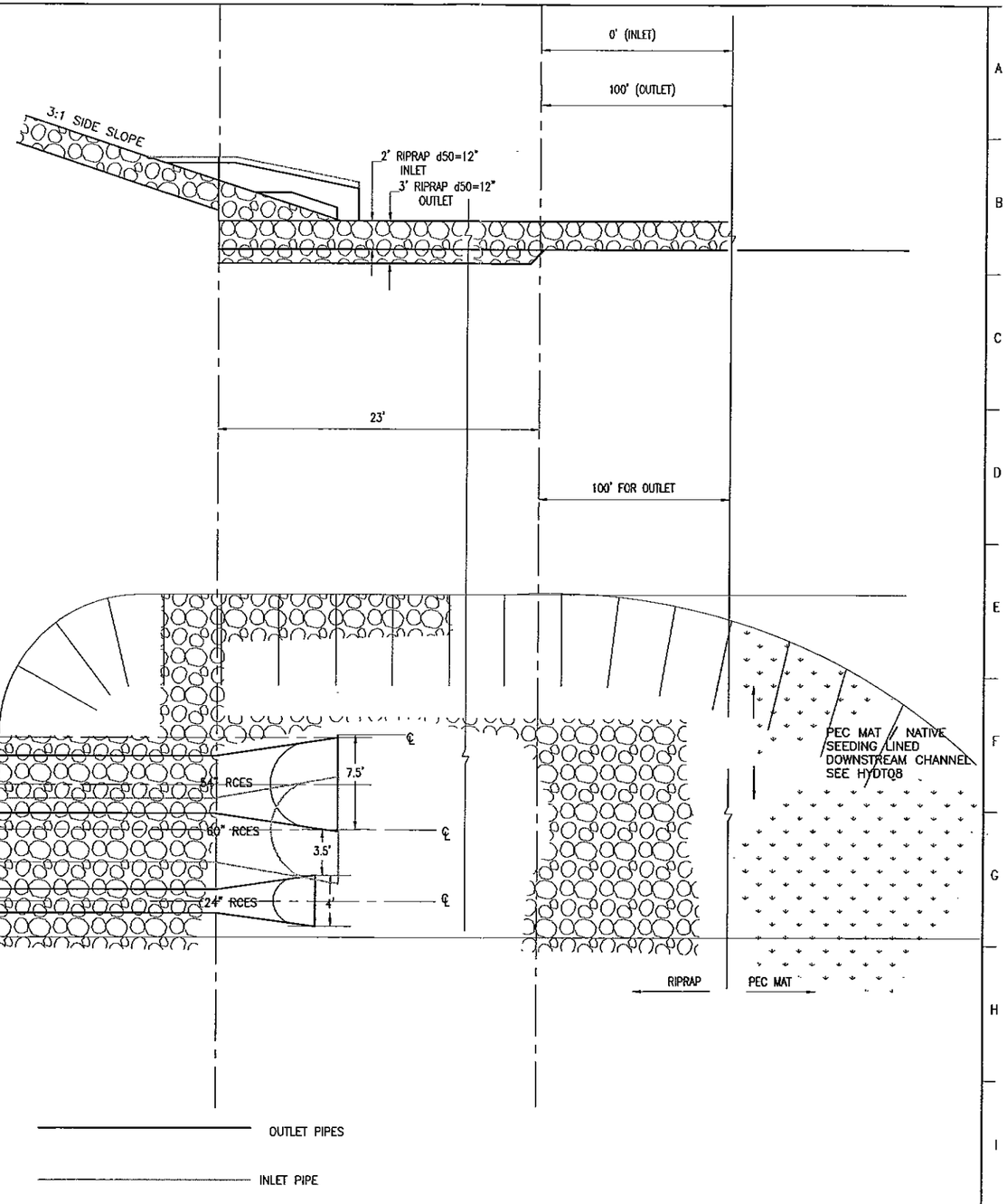
A B C D E F G H I J



CROSS SECTION
OUTLET – I–25 STATION
1434+96.98, 75.81 LT.



CROSS SECTION
INLET – RAMP "D" STATION
448+11.42, 61.63' LT.



09:54 XREF = FLXRTB01

Computer File Information		
Creation Date: 07/21/98		Initials: GES
Last Modification Date: 08/20/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT05.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions		

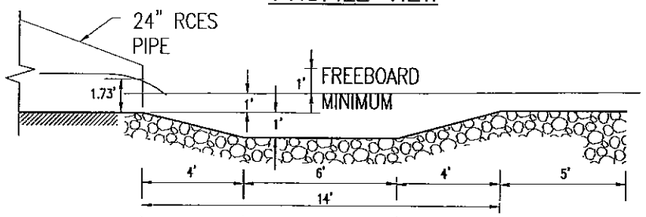
DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

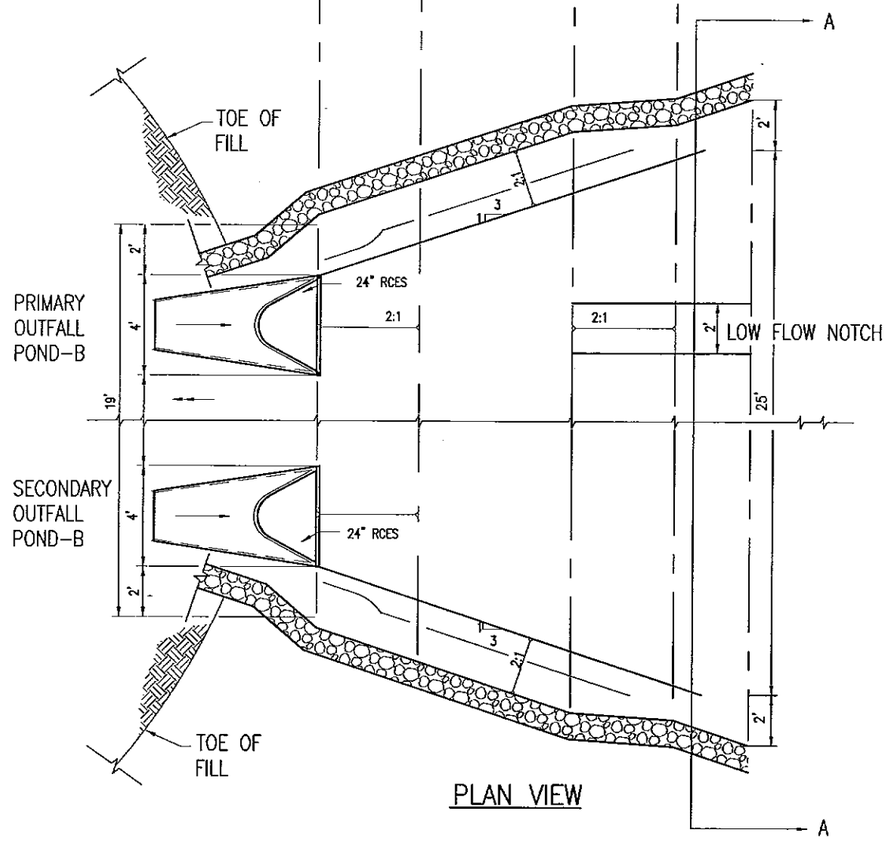
As Constructed	FAIRLANE PARKWAY/I–25 INTERCHANGE	Designer: BBR
No Revisions:	DOUBLE CULVERT OUTLET/ INLET PROTECTION POND DETAIL	Detailer: GER
Revised:		Checked: CLP
Void:	Sheet Subset: DRAINAGE / Subset Sheets:HYDT05 of 9	Sheet Number 8

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

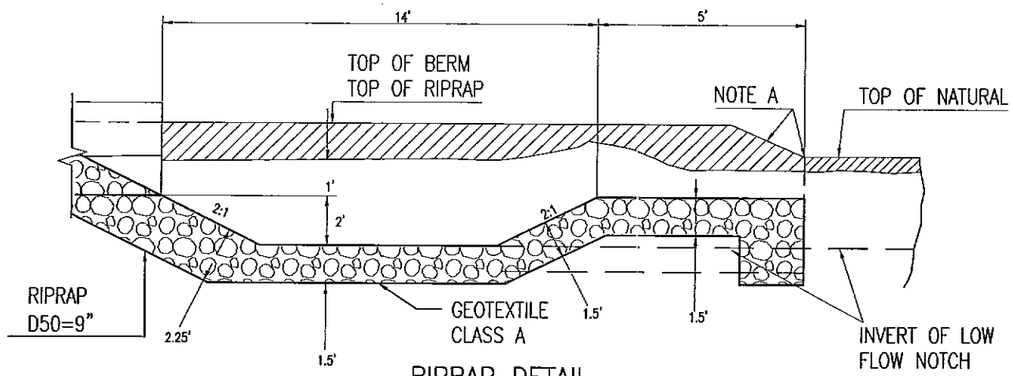
A B C D E F G H I J

PROFILE VIEW



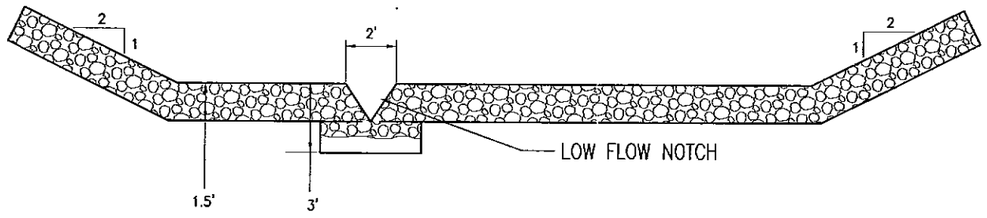


PLAN VIEW



RIPRAP DETAIL

NOTE A – WARP BASIN TO CONFORM TO NATURAL STREAM CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT THE SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM.



SECTION A – A

Computer File Information		
Creation Date: 07/21/98		Initials: GES
Last Modification Date: 08/12/98		Initials: SBE
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT06.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions			

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

OUTFALL ENERGY DISSIPATOR DETAIL

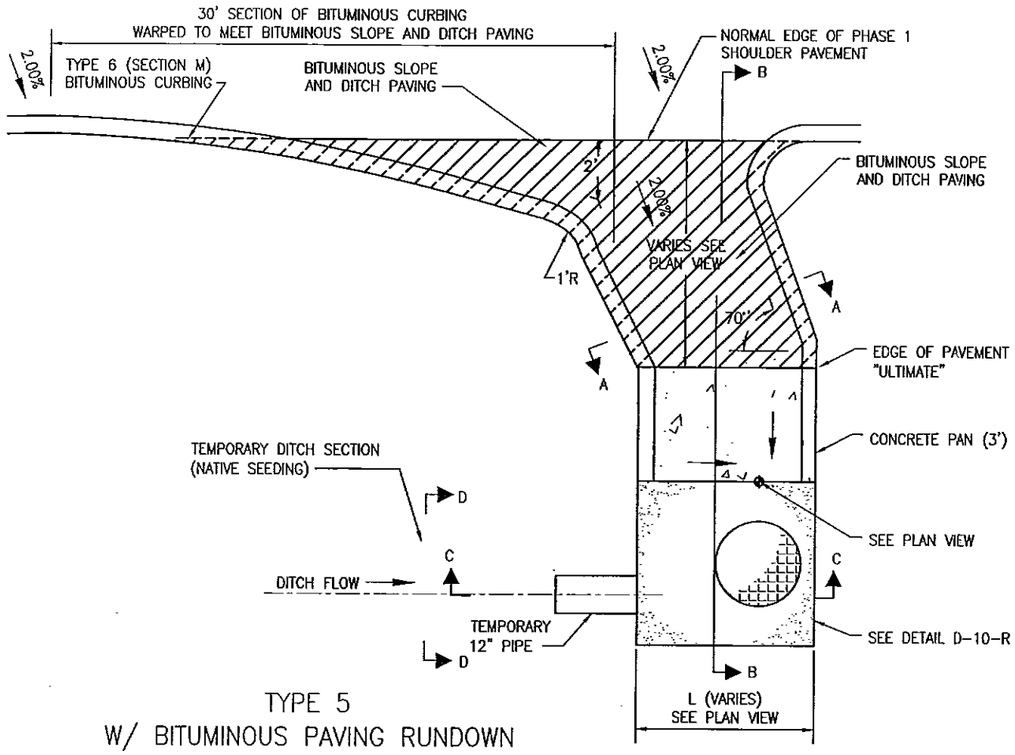
Sheet Subset: DRAINAGE | Subset Sheets:HYDT06 of 9

Designer: BBR	
Detailer: GER	
Checked: CLP	
Sheet Number	

10:15 XREF = FLXRTB01

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J



TYPE 5
W/ BITUMINOUS PAVING RUNDOWN

NOTES:

DETAILS OF BITUMINOUS CURBING ARE SHOWN ELSEWHERE IN THE PLANS.

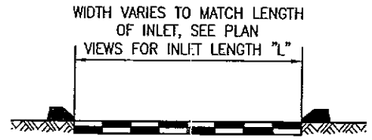
STRUCTURE BACKFILL MATERIAL SHALL NOT BE USED IN THE WORK. EMBANKMENT MATERIAL SHALL BE USED WITH CONSTRUCTION REQUIREMENTS IN ACCORDANCE WITH SECTION 203. PAYMENT FOR EMBANKMENT MATERIAL SHALL BE INCLUDED IN THE PAY ITEM FOR EMBANKMENT PROTECTOR.

PAYMENT FOR THIS WORK SHALL BE AS FOLLOWS:

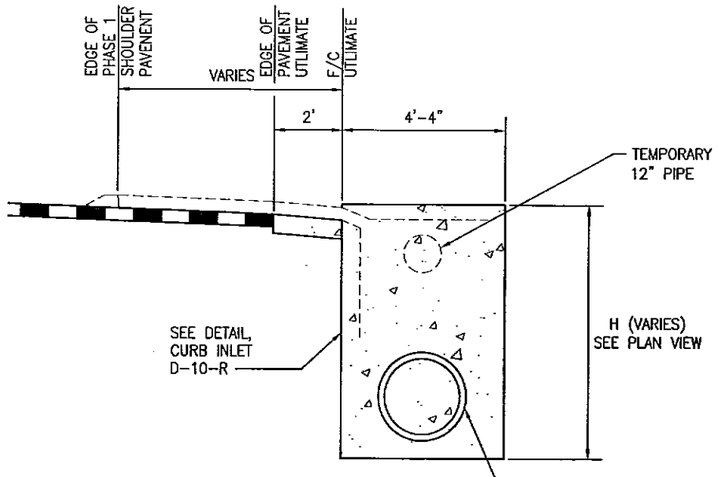
520 – BITUMINOUS SLOPE AND DITCH PAVING (ASPHALT) . . . . . .TON

609 – CURB, TYPE 6 (SECTION M) . . . . . .LINEAR FOOT

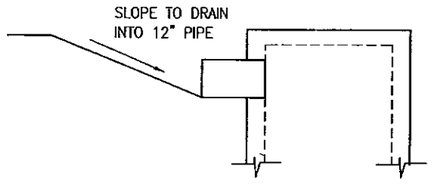
603 – 12" REINFORCED CONCRETE PIPE . . . . . .LINEAR FOOT



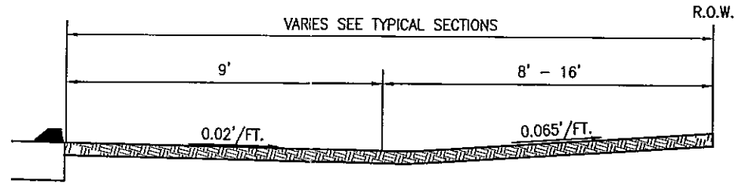
SECTION A–A
W/ 4" BITUMINOUS SLOPE
AND DITCH PAVING



SECTION B–B
WITH 4" BITUMINOUS
SLOPE AND DITCH PAVING &
CURB INLET TYPE R SPECIAL



SECTION C–C
SLOPE/STUB-OUT
SECTION



SECTION D–D
DITCH SECTION APPROACHING
TEMPORARY SECTION

Computer File Information		
Creation Date: 02/13/98		Initials: LLT
Last Modification Date: 08/20/98		Initials: RBB
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT07.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions			

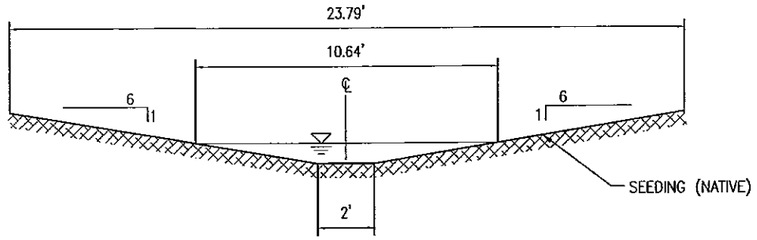
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	EMBANKMENT PROTECTOR	Detailer: RBB
Revised:		Checked: CLP
Void:	Sheet Subset: DRAINAGE / Subset Sheets: HYDT07 of 9	Sheet Number

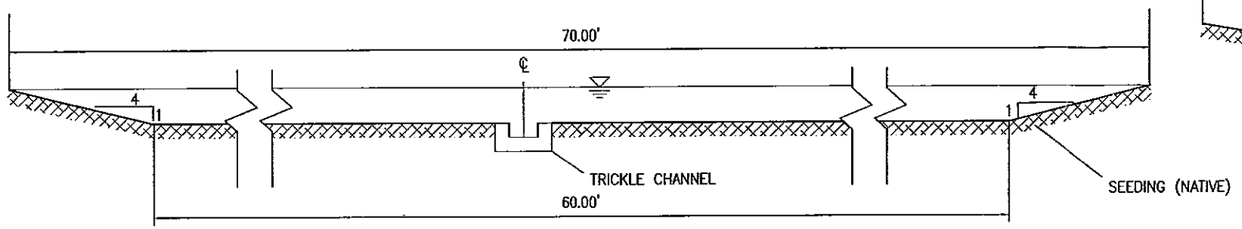
11:35 XREF = FLXRTB01

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

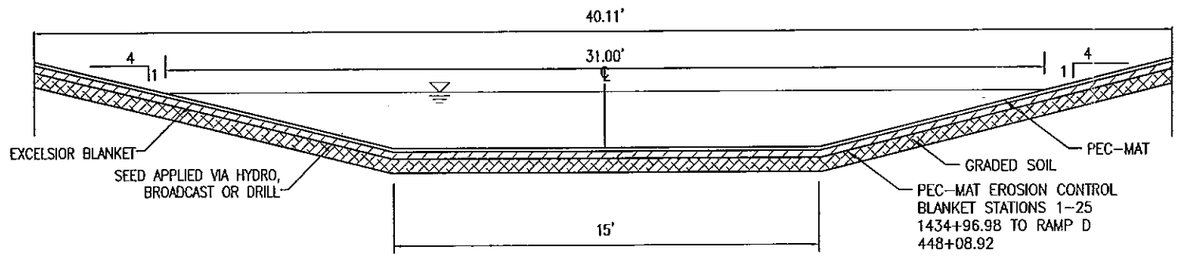
A B C D E F G H I J



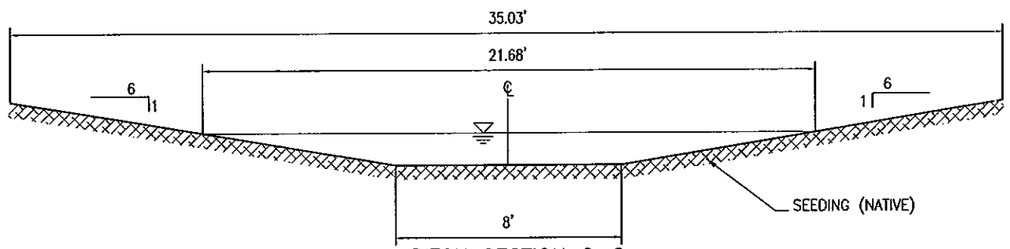
DITCH SECTION A-A/AA-AA



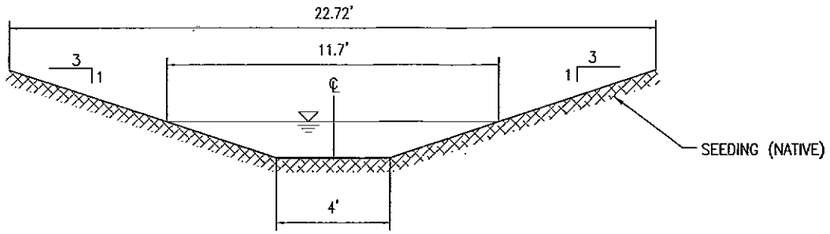
DITCH SECTION B2-B2



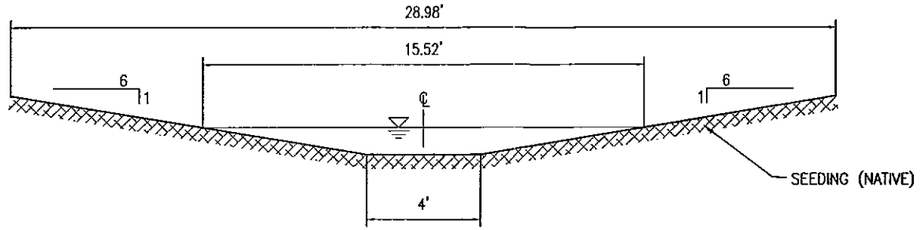
DITCH SECTION B-B (W/PEC-MAT)



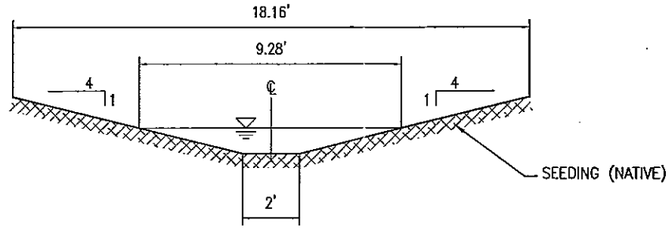
DITCH SECTION C-C



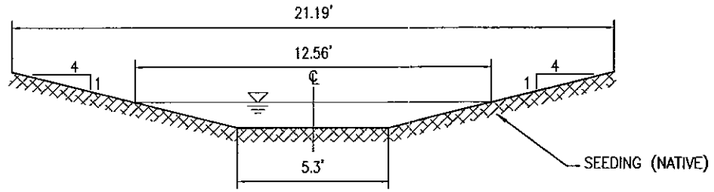
DITCH SECTION D-D



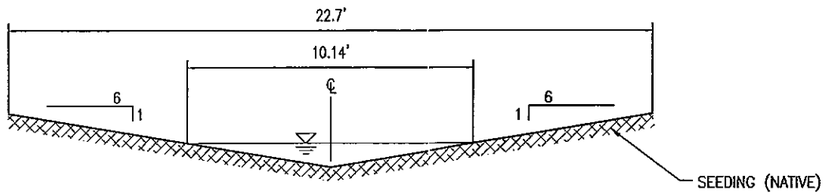
DITCH SECTION E-E



DITCH SECTION F--F



DITCH SECTION F2--F2



DITCH SECTION G-G

Computer File Information		
Creation Date: 07/21/98		Initials: RBB
Last Modification Date: 08/27/98		Initials: SBE
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\		
Drawing File Name: HYDT08.DWG		
Acad Ver. 14	Scale: NONE	Units: ENGLISH

Index of Revisions

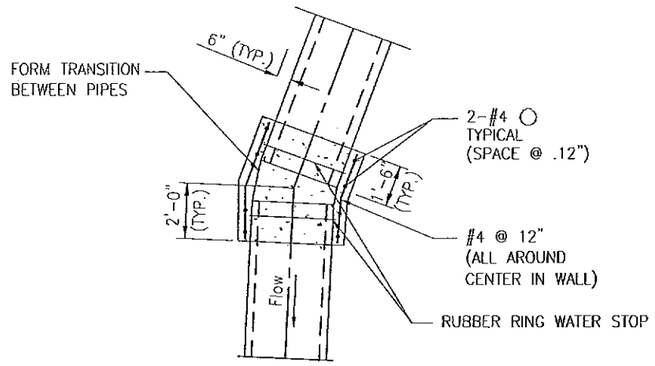
DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
No Revisions:	CHANNEL SECTIONS	Detailer: RBB
Revised:		Checked: CLP
Void:	Sheet Subset: DRAINAGE / Subset Sheets: HYDT08 of 9	Sheet Number

09:00 XREF = FLXRTB01

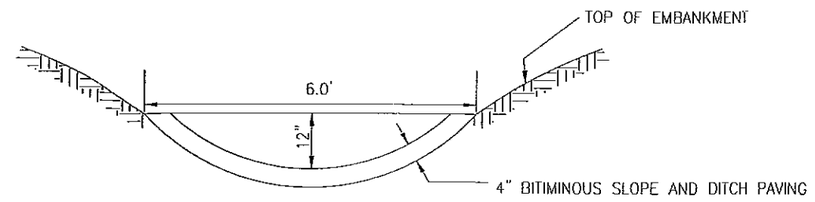
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

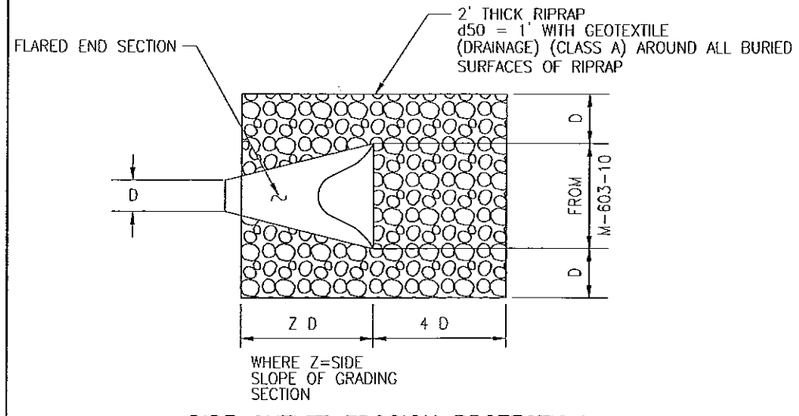


NOTES:

1) ALL WORK TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2) CONCRETE FOR COLLAR SHALL BE CLASS A OR B.
3) PAYMENT FOR CONCRETE, RUBBER RING, REINFORCED STEEL, AND ALL INCIDENTAL MATERIALS WILL NOT BE MADE SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK.
4) PIPING MAY BE IN ANY DIRECTION.
5) REINFORCING SHALL HAVE fy=60,000 PSI



BITUMINOUS SLOPE AND DITCH PAVING



PIPE OUTLET EROSION PROTECTION

Computer File Information		Index of Revisions			DMJM	As Constructed	FAIRLANE PARKWAY/I-25 INTERCHANGE	Designer: RBB
Creation Date: 02/04/98	Initials: LLT				DANIEL, MANN, JOHNSON, & MENDENHALL 1490 West Fillmore Street, Suite 101 Colorado Springs, Colorado 80904 Phone: (719) 471-9866 Fax: (719) 471-9063	No Revisions:	MISC. HYDRAULIC DETAILS	Detailer: RBB
Last Modification Date: 08/20/98	Initials: RBB					Revised:		Checked: CLP
Full Path: S:\3821\CADD\PLANS\Phase1\Drain\DETAILS\						Void:	Sheet Subset: DRAINAGE	Subset Sheets: HYDT09 of 9
Drawing File Name: HYDT09.DWG								Sheet Number
Acad Ver. 14	Scale: NONE	Units: ENGLISH						

FLXRTB01 = 12:01 XREF

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX C

DESIGN CRITERIA

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

DRAINAGE - PERMITS

STORMWATER DISCHARGE PERMIT

ANY CONSTRUCTION PROJECT WHICH DISTURBS OVER 5 ACRES REQUIRES A STORMWATER DISCHARGE PERMIT FROM CDPHE. THIS PROJECT IS EXPECTED TO DISTURB OVER THIS AMOUNT. THIS WILL INVOLVE CREATING A STORM WATER MANAGEMENT PLAN FOR THE PROJECT. THE KEY ELEMENTS OF THIS ARE EROSION CONTROL MEASURES AND A LIST OF BEST MANAGEMENT PRACTICES TO BE USED DURING CONSTRUCTION OF THE PROJECT. THE PLAN WILL BE SUBMITTED BY CDOT. A COPY OF THE LIKELY GENERAL PERMIT TO BE USED ON THE PROJECT IS INCLUDED. ADDITIONAL INFORMATION IS AVAILABLE.

CDOT DRAINAGE DESIGN MANUAL
CDPHE GENERAL PERMIT FORMS

SECTION 404 PERMIT

ANY CONSTRUCTION PROJECT WHICH DISTURBS JURISDICTIONAL WETLANDS OR "WATERS OF THE U.S." REQUIRES A 404 PERMIT FROM THE CORPS OF ENGINEERS. IT IS ANTICIPATED THAT THE PROJECT WILL EITHER REQUIRE NO PERMIT OR WILL BE PERMITTED UNDER A NATIONWIDE OR REGIONAL PERMIT. THE EXISTENCE OF WETLANDS WITHIN THE PROJECT WILL BE VERIFIED BY THE EA UPDATE FOR THE PROJECT. IT APPEARS THAT THERE MAY NOT BE ANY WETLANDS AFFECTED. ADDITIONAL INFORMATION IS AVAILABLE.

CDOT DRAINAGE DESIGN MANUAL

FLOODPLAIN DEVELOPMENT PERMIT

ANY PROJECT WHICH AFFECTS AREAS DESIGNATED AS FLOODPLAINS BY THE NATIONAL FLOOD INSURANCE ACT REQUIRE A PERMIT FROM FEMA. IT IS ANTICIPATED THAT THERE ARE NO DESIGNATED FLOODPLAINS WITHIN THE PROJECT AREA. THIS WILL BE VERIFIED WITH THE REGIONAL FLOOD PLAIN ADMINISTRATOR FOR THE PIKES PEAK AREA.

CDOT DRAINAGE DESIGN MANUAL

OTHER PERMITS

IT NEEDS TO BE VERIFIED IF A FUGITIVE DUST PERMIT OR OTHER PERMITS ARE REQUIRED FOR THIS PROJECT.

DRAINAGE - DATA COLLECTION

THE FOLLOWING REPORTS HAVE BEEN OBTAIN THAT ARE RELATED TO THE PROJECT:

PROJECT SPECIFIC

"FAIRLANE TECHNOLOGY PARK -HYDROLOGY UPDATE", AYRES AND ASSOCIATES, NOVEMBER 13, 1997.

"MASTER DEVELOPMENT DRAINAGE REPORT AND PLAN", FAIRLANE TECHNOLOGY PARK FILING NO.2", URS PROJECT # 42044, OCTOBER 22, 1993. REVISED JANUARY 6, 1994.

"PRELIMINARY AND FINAL DRAINAGE REPORT AND PLAN", FAIRLANE TECHNOLOGY PARK FILING NO.2", URS PROJECT # 42044, JANUARY 6, 1994.

"DRAINAGE MEMORANDUM FOR PIKES PEAK COMMUNITY COLLEGE NORTH CAMPUS", COLORADO SPRING, COLORADO., EL PASO COUNTY, URS PROJECT NO. 67.42154., OCTOBER 7, 1996

"NEW LIFE CHURCH DRAINAGE REPORT", KLH ENGINEERING, INC. APRIL, 1991.

"PRELIMINARY AND FINAL DRAINAGE REPORT FOR INTERNATIONAL BIBLE SOCIETY FILING NO. 1", URS PROJECT NO 48404, AUGUST, 1988.

"NORTHGATE PHASE 1 DRAINAGE PLAN", URS PROJECT NO. 45206, JUNE 15, 1987., REVISED AUGUST 27, 1987

"NORTHGATE PHASE 1 DRAINAGE PLAN", URS PROJECT NO. 45206, JUNE 15, 1987., REVISED AUGUST 27, 1987. ADDENDUM DATED OCTOBER 6, 1987

DRAINAGE - HYDROLOGY

I-25 MAINLINE DESIGN STORMS

I-25 CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM — CDOT DRAINAGE DESIGN MANUAL

I-25 PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD TO THE EDGE OF SHOULDER.

I-25 PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 4' ONTO ANY TRAVEL LANE.

I-25 PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM. — CDOT DRAINAGE DESIGN MANUAL CRITERIA MANUAL

FAIRLANE PARKWAY DESIGN STORMS

FAIRLANE PARKWAY CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM — CCS DRAINAGE CRITERIA MANUAL

FAIRLANE PARKWAY PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM DEPTH OF 6" @ FLOWLINE UP TO A MAXIMUM OF 34 CFS PER SIDE.

FAIRLANE PARKWAY PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR

STORM WITH A MAXIMUM DEPTH OF 12" @ FLOWLINE OR 4" AT CENTERLINE WHICHEVER IS MORE RESTRICTIVE.

RAMP DESIGN STORMS

RAMP CROSS CULVERTS WILL BE DESIGNED FOR THE 100 YEAR STORM — CDOT DRAINAGE DESIGN MANUAL

RAMP PARALLEL STORM SEWER - INITIAL STORM IS THE 5 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 4 FT. ONTO ONE TRAVEL LANE FOR MULTI-LANE RAMPS.

RAMP PARALLEL STORM SEWER - MAJOR STORM IS THE 100 YEAR STORM WITH A MAXIMUM ALLOWABLE SPREAD OF 12 FT. (ONE TRAVEL LANE) FOR MULTI-LANE RAMPS.

RAMP PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM. — CDOT DRAINAGE DESIGN MANUAL, CCS DRAINAGE

RAMP PERMANENT ROADSIDE DITCHES WILL BE CHECKED FOR THE 100 YEAR STORM TO ENSURE THAT THE WATER LEVEL IS BELOW THE PAVEMENT OR BASE.

OTHER ROADS

NO OTHER ROADS WILL NOT INCLUDE STORM SEWER UNLESS IT IS NECESSARY TO PREVENT FLOW FROM CROSSING OVER INTERSECTIONS AND THERE IS A STORM SEWER LINE NEARBY TO DISCHARGE INTO. — PROJECT SPECIFIC

ALL OTHER ROADS WITH PERMANENT ROADSIDE DITCHES WILL BE DESIGNED FOR THE 10 YEAR STORM. THE ROUTING OF THE 100 YEAR STORM NEEDS TO BE CHECKED TO ENSURE THAT FLOODING OF THE ROAD OR NEARBY STRUCTURES DOES NOT OCCUR. — CDOT DRAINAGE DESIGN MANUAL

HYDROLOGIC METHODS

THE OFFSITE DRAINAGE ANALYSIS WILL BE DEVELOPED USING THE PREVIOUS DRAINAGE STUDIES IN THE AREA. THE STANDARD USED IS THE CITY OF COLORADO SPRINGS STANDARD FOR BASINS OVER APPROXIMATELY (100 ACRES) IN TRIBUTARY AREA. THIS METHOD IS THE SCS METHOD TYPICALLY UTILIZING EITHER THE TR-20 OR HEC-1 COMPUTER PROGRAM. THE DESIGN STORM TO BE UTILIZED IS THE 100 YEAR 24 HOUR STORM WITH ANTECEDENT MOISTURE CONDITION II. — PROJECT SPECIFIC, CCS DRAINAGE CRITERIA MANUAL

THE ONSITE DRAINAGE ANALYSIS WILL BE DEVELOPED FROM PROJECT

TOPOGRAPHY AND PREVIOUS DRAINAGE STUDIES IN THE AREA. THE METHOD USED WILL BE THE RATIONAL METHOD WHICH IS AS FOLLOWS FOR ENGLISH UNITS: CDOT DRAINAGE DESIGN MANUAL

$Q=C\ i\ A$

WHERE: Q = THE RUNOFF IN CUBIC FEET PER SECOND (CFS)
C = RUNOFF COEFFICIENT OF THE AREA
i = THE AVERAGE RAINFALL INTENSITY IN IN/HR
A = THE AREA IN ACRES

VALUES FOR C AND i ARE PROVIDED FROM CDOT AND THE CITY, RESPECTIVELY. THE INTENSITIES ARE BASED ON THE TIME OF CONCENTRATION FOR A BASIN. THIS IS CALCULATED BASED ON THE FOLLOWING: CDOT DRAINAGE DESIGN MANUAL

$T_c = T_i + T_t$

WHERE: T_c = TIME OF CONCENTRATION IN MINUTES
T_i = OVERLAND FLOW TIME IN MINUTES
T_t = TRAVEL TIME IN MINUTES

$$T_i = \frac{1.8\ (1.1-C)\ D^{.5}}{S^{0.33}}$$

WHERE: C = RUNOFF COEFFICIENT FROM THE RATIONAL METHOD
D = DISTANCE OF FLOW PATH IN FEET
(500 FT. MAX. NON-URBAN AREAS)
(300 FT. MAX. URBAN AREAS)
S = AVERAGE SLOPE OF BASIN IN %

VARIOUS METHODS ARE AVAILABLE TO ESTIMATE THE TRAVEL TIME BASED ON AVERAGE VELOCITIES OR EMPIRICAL FORMULAS.

DRAINAGE - CHANNELS

DESIGN OF CHANNELS AND ROADSIDE DITCHES WILL BE DONE USING MANNING'S EQUATION. IN SIMPLE CASES THIS WILL BE DONE ASSUMING UNIFORM FLOW AND DIRECT APPLICATION OF THE MANNING EQUATION TO DETERMINE THE NORMAL DEPTH. THIS IS AS FOLLOWS: CDOT DRAINAGE DESIGN MANUAL

$Q = (1.49/n)\ A\ R^{2/3}\ S^{1/2}$

WHERE: Q = DISCHARGE IN CUBIC FEET PER SECOND (CFS)
n = MANNING'S ROUGHNESS COEFFICIENT
A = CROSS SECTIONAL AREA IN SQUARE FEET

R = HYDRAULIC RADIUS IN FEET
S = CHANNEL SLOPE IN FT/FT

VALUES OF MANNING'S ROUGHNESS COEFFICIENT ARE AVAILABLE IN THE CDOT MANUAL. THE INITIAL ANALYSIS SHOULD INCLUDE A CHECK OF THE FOLLOWING PARAMETERS:

CDOT DRAINAGE DESIGN MANUAL

$V = Q / A$

WHERE: V = AVERAGE VELOCITY IN FEET PER SECOND (FPS)

GENERALLY, THE VELOCITY SHOULD BE WITHIN THE FOLLOWING LIMITS FOR NATURAL OR GRASS LINED CHANNELS:

PROJECT SPECIFIC

V >2 FPS WHERE POSSIBLE
V < 3 FPS FOR BARE ERODIBLE SOILS
V < 5 FPS FOR BARE NON-ERODIBLE SOILS
V < 5 FPS FOR VEGETATED ERODIBLE SOILS
V < 7 FPS FOR VEGETATED NON-ERODIBLE SOILS

ADDITIONAL DETAILED INFORMATION IS AVAILABLE FOR THIS, IF NECESSARY. THE FROUDE NUMBER SHOULD ALSO BE CALCULATED FOR EACH CASE, AS FOLLOWS:

CCS DRAINAGE CRITERIA MANUAL

$$F_r = \frac{V}{(g\,d)^{0.5}}$$

WHERE: Fr = FROUDE NUMBER
g = ACCELERATION DUE TO GRAVITY (32.2 FPS^2)
d = NORMAL DEPTH IN FEET

IT SHOULD BE NOTED THAT THE FOLLOWING GUIDELINES SHOULD BE USED WHERE POSSIBLE WHEN CHECKING THE FROUDE NUMBER:

PROJECT SPECIFIC

$F_r = 1$	CRITICAL DEPTH
$F_r < 1$	SUBCRITICAL FLOW
$F_r > 1$	SUPERCRITICAL FLOW
$F_r < 0.9$ OR $F_r > 1.1$	DESIRABLE RANGE OF FROUDE NUMBERS SINCE THE FLOW IS GENERALLY UNSTABLE NEAR CRITICAL DEPTH.

FOR CASES WHERE GRADUALLY VARIED FLOW IS EXPECTED, THE U.S. ARMY CORPS OF ENGINEERS' HEC-2 COMPUTER PROGRAM WILL BE UTILIZED FOR THE PROJECT.

CDOT DRAINAGE DESIGN MANUAL

DRAINAGE - CROSS CULVERTS

THE CROSS CULVERTS WILL BE ASSUMED TO BE REINFORCED CONCRETE PIPE (RCP) OR REINFORCED CONCRETE BOX CULVERTS (CBC). HOWEVER, SEVERAL CORRUGATED STEEL PIPES MAY BE EXTENDED WITH LIKE MATERIAL.
USE A MANNING'S n VALUE OF 0.013 FOR RCP'S, 0.012 FOR CBC'S AND .026 FOR CSP'S

PROJECT SPECIFIC

CROSS CULVERTS ARE SIZED BASED ON THE "HYDRAULIC DESIGN OF HIGHWAY CULVERTS" BY FHWA.

CDOT DRAINAGE DESIGN MANUAL

DRAINAGE - STORM SEWER

AREAS THAT REQUIRE STORM SEWER WILL BE DESIGNED WITH STORM SEWER DESIGN SOFTWARE. DESIGN WILL ALSO UTILIZE SPREADSHEETS TO HELP ESTIMATE THE LOCATION AND NUMBER OF INLETS, PIPE SIZES AND KEY LOCATIONS.

INLETS

INLETS ARE REQUIRED 10 FT BEFORE THE POINT WHERE STREET CROSS SLOPE BEGINS TO SUPERELEVATE TOWARDS THE OPPOSITE SIDE TO PREVENT CROSS STREET FLOW.

CDOT DRAINAGE DESIGN MANUAL

SUMP INLETS REQUIRE FLANKING INLETS ON EACH SIDE OF THE SUMP INLET TO PROVIDE RELIEF FROM DEBRIS CLOGGING. SUMP INLETS ON I-25 SHOULD BE CHECKED TO ENSURE THAT THE 50 YEAR STORM DOES NOT CAUSE PONDING OF WATER OUTSIDE THE SHOULDER. THERE ARE NO SUMP INTLETS ON THE PROJECT AT THIS TIME.

CDOT DRAINAGE DESIGN MANUAL

THE ROAD CAPACITY IS BASED ON MANNING'S EQUATION WITH THE SIMPLIFYING ASSUMPTION THAT THE WETTED PERIMETER IS EQUAL TO THE WIDTH OF FLOW. ASSUME n=0.016.

HEC-12 FROM FHWA

THE INLETS ON FAIRLANE PARKWAY WILL BE CURB OPENING INLETS IN THE 8 INCH CURB. MODIFIED EMBANKMENT PROTECTORS TYPE 5 MAY BE USED IN THE INTERIM TO CONVEY FLOW FROM THE PHASE 1 PAVED SECTION TO THE ULTIMATE LOCATION OF THE TYPE R INLETS

CCS DESIGN MANUAL M-STANDARD

DRAINAGE - DETENTION FACILITIES

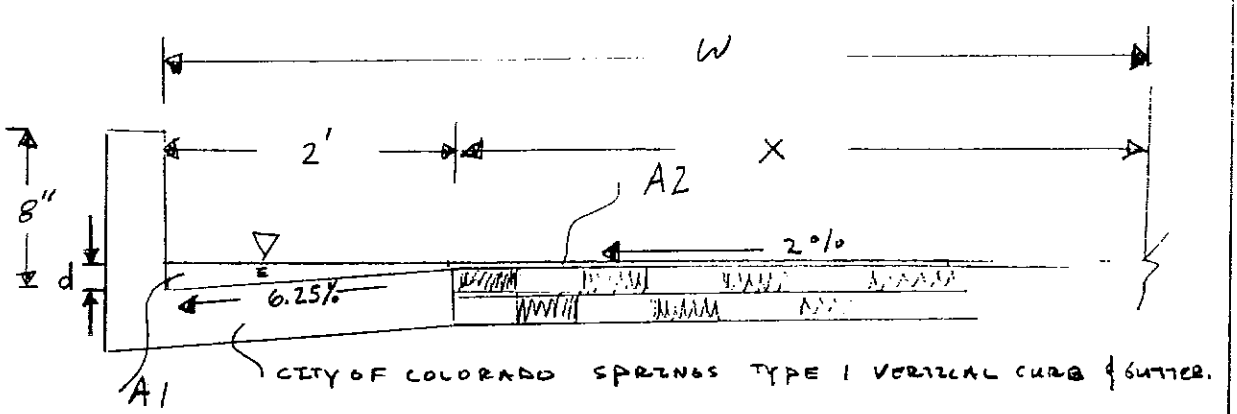
CDOT DRAINAGE

TWO DETENTION FACILITY HAS BEEN DESIGNED TO ACCOMMODATE DEVELOPED FLOW FROM THE PROJECT AREA.	DESIGN MANUAL
SIDE SLOPES OF 3:1 HAVE BEEN UTILIZED IN THE CONSTRAINED SPACE. RIPRAP PROTECTED EMBANKMENTS ARE LESS THAN 2:1 A MINIMUM FREEBOARD OF ONE FOOT ABOVE THE 100 YEAR DESIGN STORM WATER ELEVATION HAS BEEN PROVIDED IN BOTH FACILITIES	
THE IMPOUNDMENT DEPTHS OF BOTH PONDS IS LESS THAN 10 FEET.	
POND A HAS A BOTTOM SLOPE GRADED AT 2% AND POND B HAS A BOTTOM SLOPE GRADED AT 1%.	
A SMALL PAVED APRON HAS BEEN PROPOSED AT BOTH OUTLET WORKS TO ALLOW MAINTENANCE ACCESS AND PREVENT VEGETATION FROM CLOGGING TH E RELEASE STRUCTURE.	
A TRICKLE CHANNEL HAS BEEN PROPOSED ACROSS THE FACILITY BOTTOM FROM INLETS AND PREDICTED FLOW ACCUMULATION POINTS TO THE OUTLET WORKS TO CONVEY LOW FLOW AND PREVENT STANDING WATER. THE TRICKLE CHANNEL IS PROPOSED IN POND B ONLY.	
A PRINCIPAL OUTLET PIPE AND EMERGENCY SPILLWAY ARE INCLUDED IN POND A A PRINCIPAL OUTLET PIPE AND SECONDARY OUTLET PIPE ARE INCLUDED IN POND POND B.	
THE DETENTION FACILITIES ARE INTENDED TO MEET ALL STANDARDS OF THE SAFE DAMS ACT IN THE CDOT CRITERIA.	

DMJM

Planning
Architecture
Engineering
Program/Construction
Management

STANDARD STREET CAPACITY CITY STREET – TYPE I	JOB No. 3821.02	SHEET No.
	DESIGNED BY	DATE 27 MAR 92
	APPROVED	



$(x)(.02) = d - .125 \qquad x = \frac{d - .125}{.02}$

$A_1 = \left(\frac{d + d - .125}{2}\right)(2') = 2d - .125$

$A_2 = \frac{(d - .125)}{2}\frac{(d - .125)}{.02} = \frac{d^2 - .25d + .0156}{.04}$

$= 25d^2 - 6.25d + .39$

$A = A_1 + A_2 = 25d^2 - 4.25d + .265$

$P = w \quad \frac{d - .125}{.02} + 2' = 50d - 6.25 + 2 = 50d - 4.25$

$n = .016$

$Q = \frac{1.49}{n}\frac{A^{5/3}}{P^{2/3}} S^{1/2}$ ∴ FOR 6" DEPTH AT CURB $Q = 145.15\, S^{1/2}$

AT 6" DEPTH AT THE CURB $\quad Q = \frac{1.49}{.016}\frac{4.39^{5/3}}{20.75^{2/3}} S^{1/2}$

$Q = 145.15\, S^{1/2}$

~~$Q = 350.87\, S^{1/2}$~~

AT 8" DEPTH $Q = \frac{1.49}{.016}\frac{8.64^{5/3}}{}\, S^{1/2}$

COMPARISON OF EXISTING AND PROPOSED CRITERIA

INITIAL STORM:

STREET TYPE	OLD	NEW
Hillside Residential ramp curb	flow spread to crown, maximum 25 cfs. per side, whichever is more restrictive	flow spread to crown max. 15 cfs. per side
Hillside Residential vertical curb	flow spread to crown, maximum 25 cfs. per side, whichever is more restrictive	6" allowable depth @ flowline max. 25 cfs. per side
Residential Street ramp curb	flow spread to crown	flow spread to crown max. 20 cfs. per side
Residential Street vertical curb	flow spread to crown	6" allowable depth @ flowline max. 34 cfs. per side
Collector Street	20 foot flow spread	6" allowable depth @ flowline, max. 34 cfs. per side, no overtopping the crown
Arterial Street	flow may encroach onto one outside lane	6" allowable depth @ flowline, max. 34 cfs. per side, one ten foot lane free of water in each direction

MAJOR STORM:

STREET TYPE	OLD	NEW
Hillside Residential Residential Streets Collector Streets	12" max. depth @ flowline no adjacent flooding	NO CHANGE
Arterial Streets	8" max. depth @ flowline (no curb overtopping)	NO CHANGE

CROSS FLOWS: No changes to any street types for the initial storm.
Only change for Major Storm is the Arterial street will now allow 12" max. depth @ flowline and 4" max. depth @ crown whichever is more restrictive. Existing criteria allows no crossflow

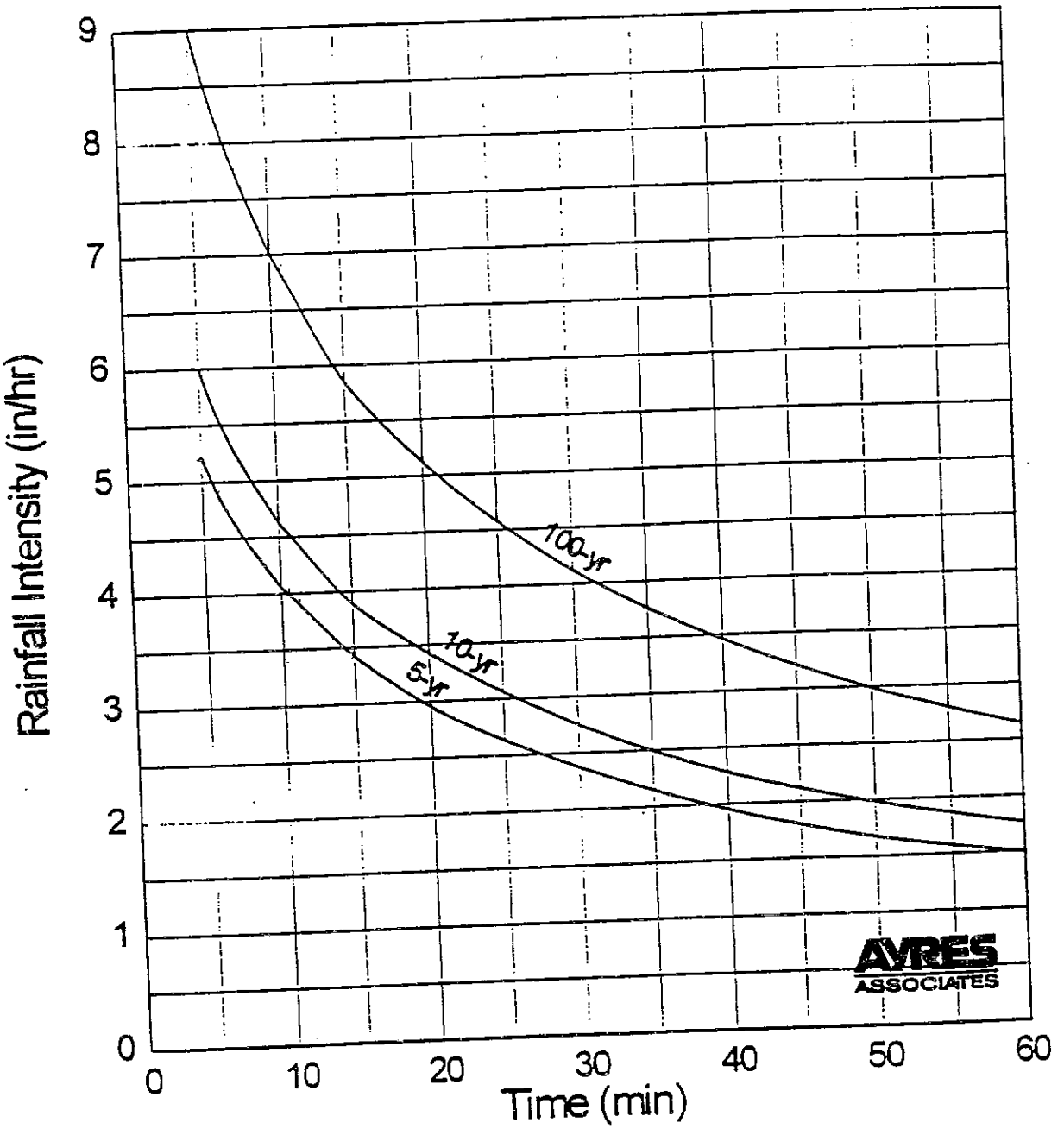
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

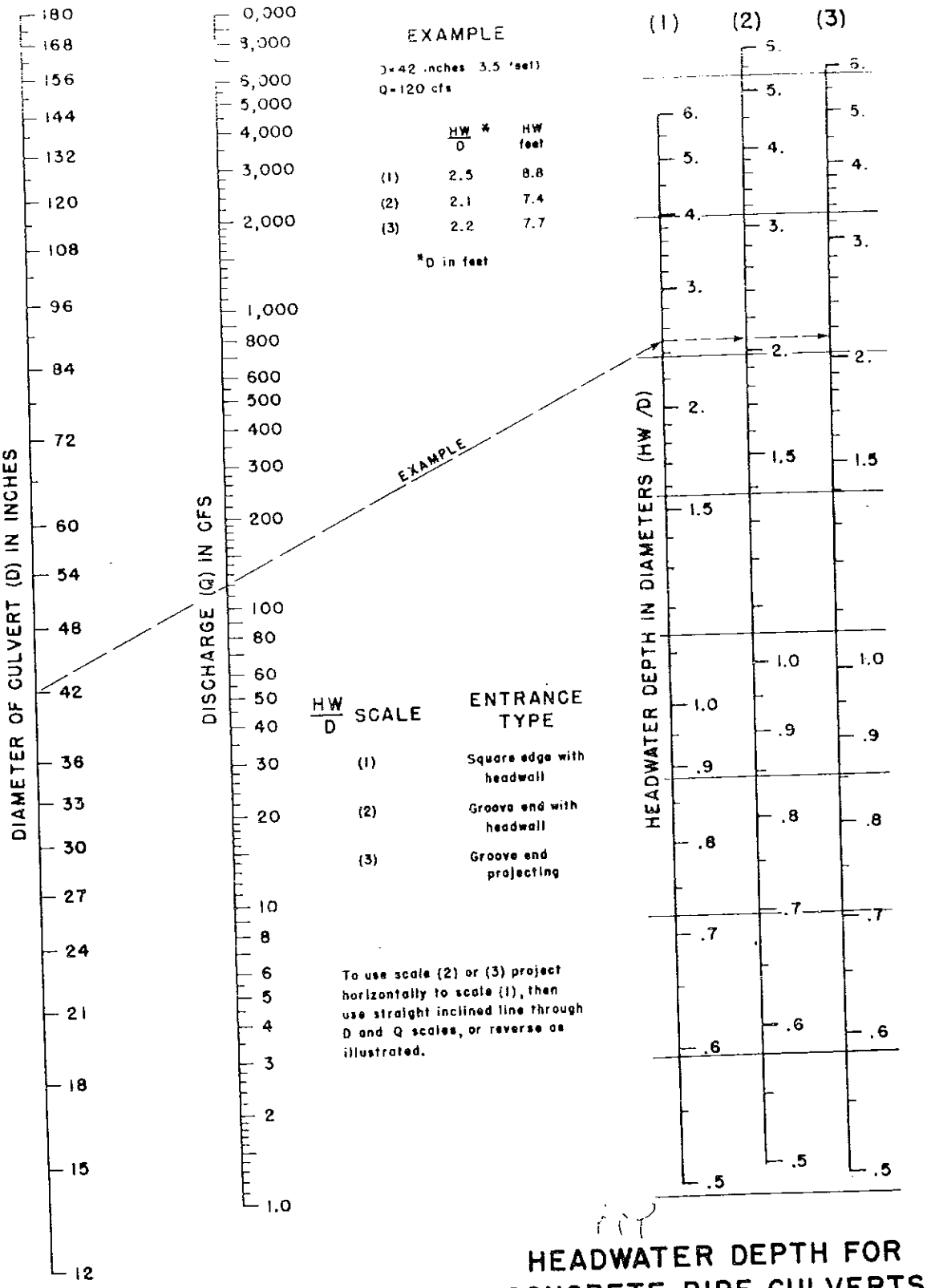
* Hydrologic Soil Group

9/30/90



Interim Release October 12, 1994 , Rainfall Intensity Curves
City Of Colorado Springs Drainage Criteria Manual

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

DEPARTMENT OF TRANSPORTATION

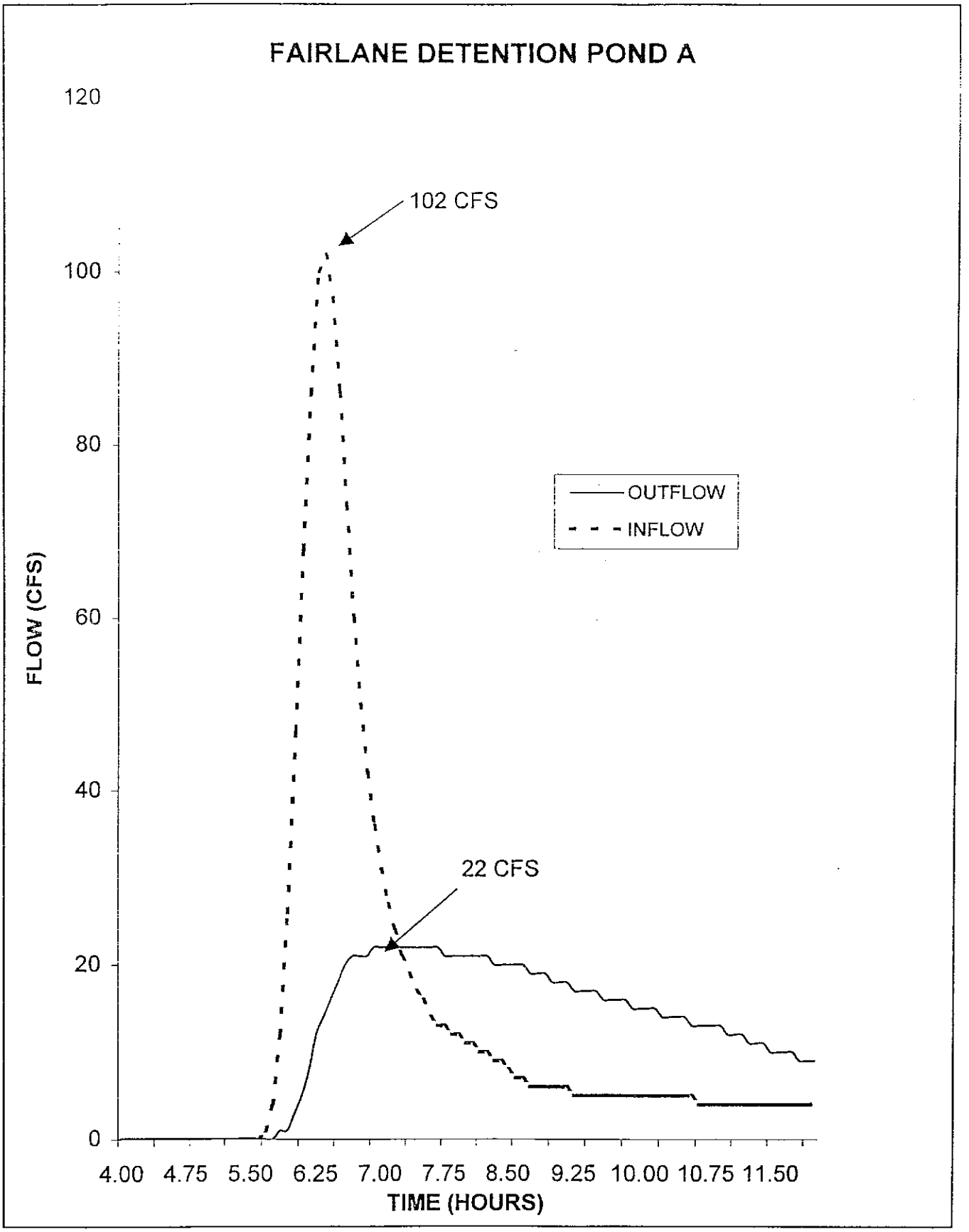
CITY OF COLORADO SPRINGS

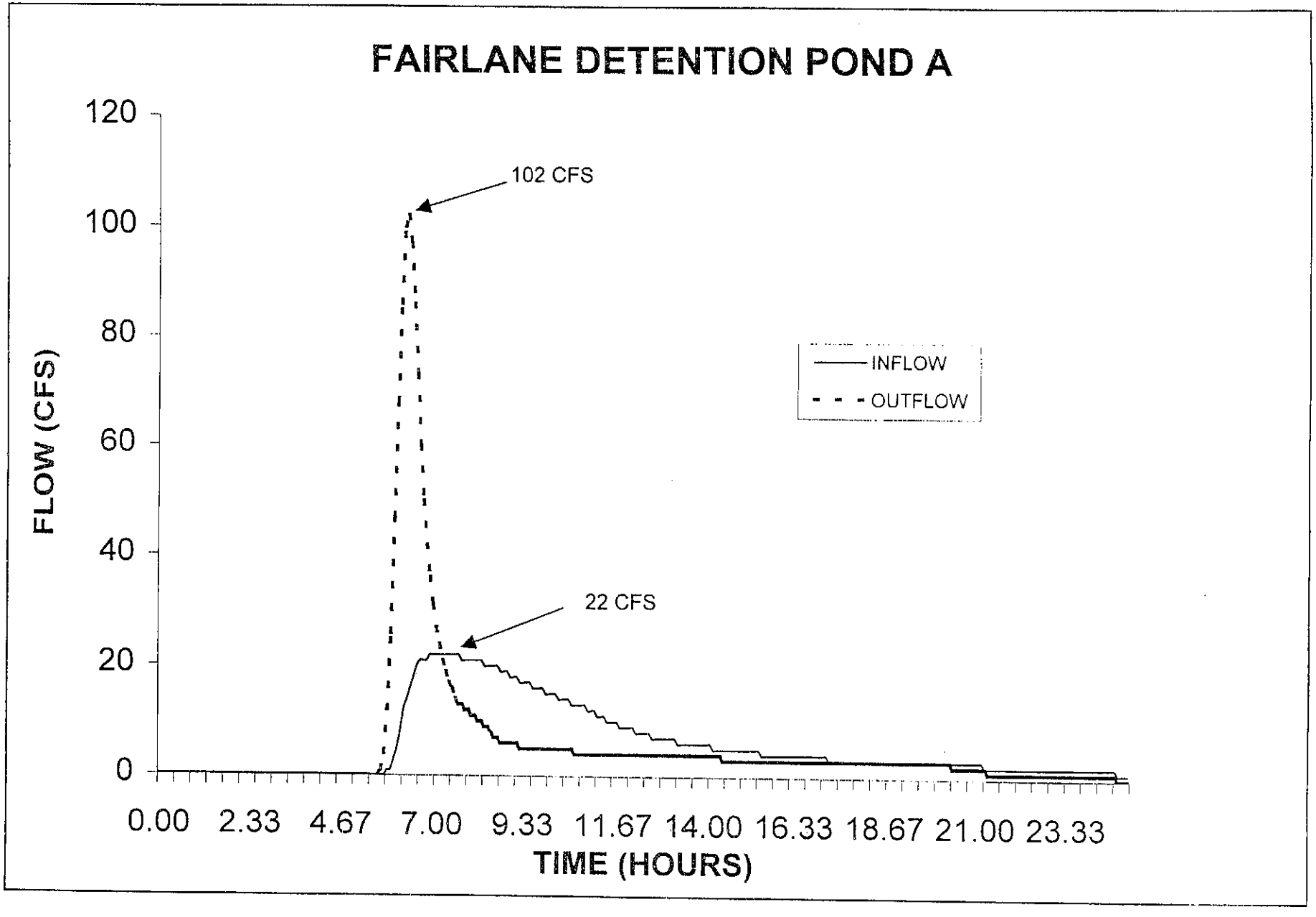
APPENDIX D

POND HYDROGRAPHS AND DETAILS

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

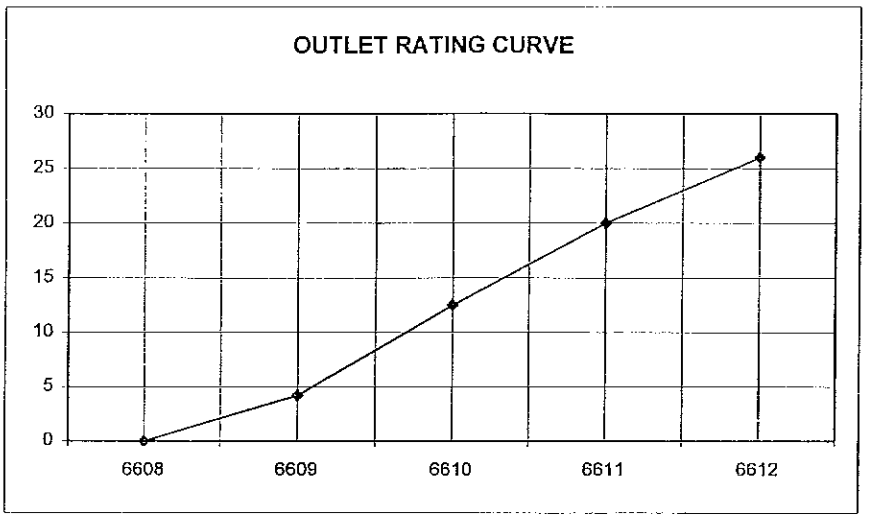

FAIRLANE DETENTION POND A
120
100
80
60
40
20
0
FLOW (CFS)
102 CFS
22 CFS
OUTFLOW
INFLOW
4.00
4.75
5.50
6.25
7.00
7.75
8.50
9.25
10.00
10.75
11.50
TIME (HOURS)


FAIRLANE DETENTION POND A
120
100
80
60
40
20
0
FLOW (CFS)
102 CFS
22 CFS
INFLOW
OUTFLOW
0.00
2.33
4.67
7.00
9.33
11.67
14.00
16.33
18.67
21.00
23.33
TIME (HOURS)

NE POND
FAIRLANE INTERCHANGE

OUTLET RATING CURVE

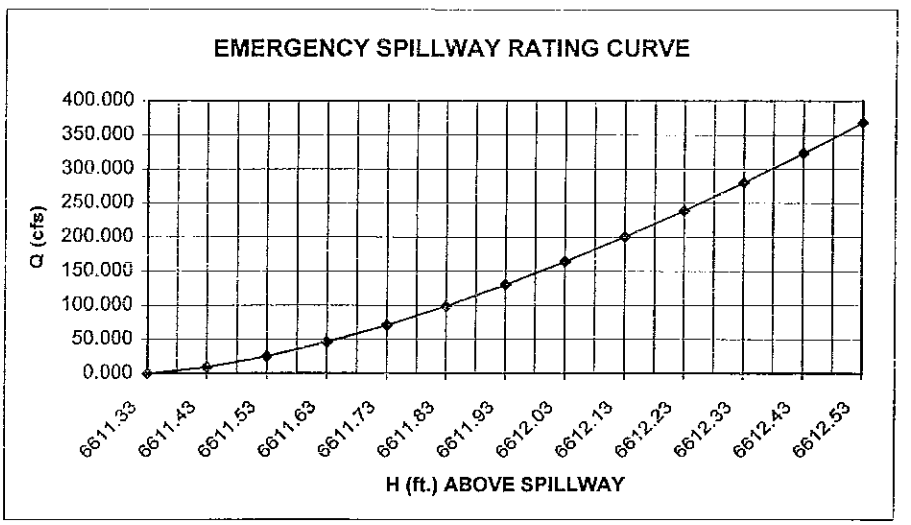
HT	Q
6608	0
6609	4.2
6610	12.5
6611	20
6612	26



OUTLET RATING CURVE
d/D = 1.0
Area = 3.14 ft^2

EMERGENCY SPILLWAY RATING CURVE

ELEV	HT	Q
6611.33	0	0.000
6611.43	0.1	8.854
6611.53	0.2	25.044
6611.63	0.3	46.009
6611.73	0.4	70.835
6611.83	0.5	98.995
6611.93	0.6	130.132
6612.03	0.7	163.985
6612.13	0.8	200.352
6612.23	0.9	239.068
6612.33	1	280.000
6612.43	1.1	323.033
6612.53	1.2	368.070



EMERGENCY SPILLWAY RATING CURVE
Q=CLH $^{3/2}$ WHERE C=2.8 L=30'

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)*
*         SEPTEMBER 1990            *
*          VERSION 4.0              *
*                                   *
* RUN DATE 07/06/1998  TIME 13:04:08*
*                                   *
*************************************
```

```
*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*       609 SECOND STREET           *
*     DAVIS, CALIFORNIA 95616       *
*         (916) 756-1104            *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXX           X
X     X  X        X    X         XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X    X         X
X     X  XXXXXXX   XXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

             1          ID        FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
             2          ID        EXISTING CONDITIONS W/ INTERCHANGE & ROAD - INPUT FILE NEPON.INP
             3          ID        USING THE 100-YEAR 24-HOUR STORM
             4          ID        RUN DATE 7-06-1998
                        *DIAGRAM
             5          IT       5 06JUL98     800     300
             6          IO       5

             7          KK    O-3B
             8          KM     RUNOFF FROM OFFSITE AREAS O-3B AND NE POND BASIN
             9          BA   0.145
            10          LS       0    69.0
            11          UD   0.434
            12          IN      15
            13          PB   4.400
            14          PC   .0000   .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143
            15          PC   .0165   .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0510
            16          PC   .0600   .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900
            17          PC   .8000   .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550
            18          PC   .8600   .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938
            19          PC   .8975   .9013   .9050   .9083   .9115   .9148   .9180   .9210   .9240   .9270
            20          PC   .9300   .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525
            21          PC   .9550   .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775
            22          PC   .9800   .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913
            23          PC   .9925   .9938   .9950   .9963   .9975   .9988  1.000

            24          KK     O-5
            25          KM     RUNOFF FROM INFIELD AREA AND ROAD
            26          BA   .0058
            27          LS       0      67
            28          UD    .083

            29          KK      10
            30          KM     COMBINE O-5, NE POND, O-3B
            31          HC       2
            32          KO       1

            33          KK    DPNE
            34          KM   DETENTION POND IN NORTHEAST SECTOR
            35          SV       0     .63    1.94    4.01    6.89
            36          SE    6608    6609    6610    6611    6612
            37          SQ       0     4.2    12.5      20      26
            38          RS       1    ELEV    6608
            39          KO       1
            40          ZZ
```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

    7       O-3B
              .
              .
   24         .         O-5
              .          .
              .          .
   29        10...........
              V
              V
   33       DPNE
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION


```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)*
*         SEPTEMBER 1990            *
*          VERSION 4.0              *
*                                   *
* RUN DATE 07/06/1998  TIME 13:04:08*
*                                   *
*************************************
```

```
*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*       609 SECOND STREET           *
*     DAVIS, CALIFORNIA 95616       *
*         (916) 756-1104            *
*                                   *
*************************************
```

FAIRLANE PARKWAY/INTERCHANGE SMJM PROJECT NO. 1821.31
EXISTING CONDITIONS W/ INTERCHANGE & ROAD - INPUT FILE WEPON.INP
USING THE 100-YEAR 24-HOUR STORM
RUN DATE 7-06-1998

```
 , IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                   NMIN           5  MINUTES IN COMPUTATION INTERVAL
                  IDATE      6JUL98  STARTING DATE
                  ITIME        0800  STARTING TIME
                     NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      7JUL98  ENDING DATE
                 NDTIME        0855  ENDING TIME
                  ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL      .08 HOURS
                  TOTAL TIME BASE    24.92 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 29 KK      *       10   *
            *            *
            **************

 32 KO          OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

 31 HC          HYDROGRAPH COMBINATION
                    ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***
```

HYDROGRAPH AT STATION 10
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
6	JUL	0800	1	0.	6	JUL	1415	76	100.	6	JUL	2030	151	4.	7	JUL	0245	226	3.
6	JUL	0805	2	0.	6	JUL	1420	77	102.	6	JUL	2035	152	4.	7	JUL	0250	227	3.
6	JUL	0810	3	0.	6	JUL	1425	78	97.	6	JUL	2040	153	4.	7	JUL	0255	228	3.
6	JUL	0815	4	0.	6	JUL	1430	79	86.	6	JUL	2045	154	4.	7	JUL	0300	229	3.
6	JUL	0820	5	0.	6	JUL	1435	80	73.	6	JUL	2050	155	4.	7	JUL	0305	230	3.
6	JUL	0825	6	0.	6	JUL	1440	81	60.	6	JUL	2055	156	4.	7	JUL	0310	231	3.
6	JUL	0830	7	0.	6	JUL	1445	82	50.	6	JUL	2100	157	4.	7	JUL	0315	232	3.
6	JUL	0835	8	0.	6	JUL	1450	83	42.	6	JUL	2105	158	4.	7	JUL	0320	233	3.
6	JUL	0840	9	0.	6	JUL	1455	84	36.	6	JUL	2110	159	4.	7	JUL	0325	234	3.
6	JUL	0845	10	0.	6	JUL	1500	85	31.	6	JUL	2115	160	4.	7	JUL	0330	235	3.
6	JUL	0850	11	0.	6	JUL	1505	86	27.	6	JUL	2120	161	4.	7	JUL	0335	236	3.
6	JUL	0855	12	0.	6	JUL	1510	87	24.	6	JUL	2125	162	4.	7	JUL	0340	237	3.
6	JUL	0900	13	0.	6	JUL	1515	88	21.	6	JUL	2130	163	4.	7	JUL	0345	238	3.
6	JUL	0905	14	0.	6	JUL	1520	89	19.	6	JUL	2135	164	4.	7	JUL	0350	239	3.
6	JUL	0910	15	0.	6	JUL	1525	90	17.	6	JUL	2140	165	4.	7	JUL	0355	240	3.
6	JUL	0915	16	0.	6	JUL	1530	91	16.	6	JUL	2145	166	4.	7	JUL	0400	241	3.
6	JUL	0920	17	0.	6	JUL	1535	92	14.	6	JUL	2150	167	4.	7	JUL	0405	242	3.
6	JUL	0925	18	0.	6	JUL	1540	93	13.	6	JUL	2155	168	4.	7	JUL	0410	243	3.
6	JUL	0930	19	0.	6	JUL	1545	94	13.	6	JUL	2200	169	4.	7	JUL	0415	244	3.
6	JUL	0935	20	0.	6	JUL	1550	95	12.	6	JUL	2205	170	4.	7	JUL	0420	245	3.
6	JUL	0940	21	0.	6	JUL	1555	96	12.	6	JUL	2210	171	4.	7	JUL	0425	246	2.
6	JUL	0945	22	0.	6	JUL	1600	97	11.	6	JUL	2215	172	4.	7	JUL	0430	247	2.
6	JUL	0950	23	0.	6	JUL	1605	98	11.	6	JUL	2220	173	4.	7	JUL	0435	248	2.
6	JUL	0955	24	0.	6	JUL	1610	99	10.	6	JUL	2225	174	4.	7	JUL	0440	249	2.
6	JUL	1000	25	0.	6	JUL	1615	100	10.	6	JUL	2230	175	3.	7	JUL	0445	250	2.
6	JUL	1005	26	0.	6	JUL	1620	101	9.	6	JUL	2235	176	3.	7	JUL	0450	251	2.
6	JUL	1010	27	0.	6	JUL	1625	102	9.	6	JUL	2240	177	3.	7	JUL	0455	252	2.
6	JUL	1015	28	0.	6	JUL	1630	103	8.	6	JUL	2245	178	3.	7	JUL	0500	253	2.
6	JUL	1020	29	0.	6	JUL	1635	104	7.	6	JUL	2250	179	3.	7	JUL	0505	254	2.
6	JUL	1025	30	0.	6	JUL	1640	105	7.	6	JUL	2255	180	3.	7	JUL	0510	255	2.
6	JUL	1030	31	0.	6	JUL	1645	106	6.	6	JUL	2300	181	3.	7	JUL	0515	256	2.
6	JUL	1035	32	0.	6	JUL	1650	107	6.	6	JUL	2305	182	3.	7	JUL	0520	257	1.
6	JUL	1040	33	0.	6	JUL	1655	108	6.	6	JUL	2310	183	3.	7	JUL	0525	258	1.
6	JUL	1045	34	0.	6	JUL	1700	109	6.	6	JUL	2315	184	3.	7	JUL	0530	259	1.
6	JUL	1050	35	0.	6	JUL	1705	110	6.	6	JUL	2320	185	3.	7	JUL	0535	260	1.
6	JUL	1055	36	0.	6	JUL	1710	111	6.	6	JUL	2325	186	3.	7	JUL	0540	261	1.
6	JUL	1100	37	0.	6	JUL	1715	112	5.	6	JUL	2330	187	3.	7	JUL	0545	262	1.
6	JUL	1105	38	0.	6	JUL	1720	113	5.	6	JUL	2335	188	3.	7	JUL	0550	263	1.
6	JUL	1110	39	0.	6	JUL	1725	114	5.	6	JUL	2340	189	3.	7	JUL	0555	264	1.
6	JUL	1115	40	0.	6	JUL	1730	115	5.	6	JUL	2345	190	3.	7	JUL	0600	265	1.
6	JUL	1120	41	0.	6	JUL	1735	116	5.	6	JUL	2350	191	3.	7	JUL	0605	266	1.
6	JUL	1125	42	0.	6	JUL	1740	117	5.	6	JUL	2355	192	3.	7	JUL	0610	267	1.
6	JUL	1130	43	0.	6	JUL	1745	118	5.	7	JUL	0000	193	3.	7	JUL	0615	268	1.
6	JUL	1135	44	0.	6	JUL	1750	119	5.	7	JUL	0005	194	3.	7	JUL	0620	269	1.
6	JUL	1140	45	0.	6	JUL	1755	120	5.	7	JUL	0010	195	3.	7	JUL	0625	270	1.
6	JUL	1145	46	0.	6	JUL	1800	121	5.	7	JUL	0015	196	3.	7	JUL	0630	271	1.
6	JUL	1150	47	0.	6	JUL	1805	122	5.	7	JUL	0020	197	3.	7	JUL	0635	272	1.
6	JUL	1155	48	0.	6	JUL	1810	123	5.	7	JUL	0025	198	3.	7	JUL	0640	273	1.
6	JUL	1200	49	0.	6	JUL	1815	124	5.	7	JUL	0030	199	3.	7	JUL	0645	274	1.
6	JUL	1205	50	0.	6	JUL	1820	125	5.	7	JUL	0035	200	3.	7	JUL	0650	275	1.
6	JUL	1210	51	0.	6	JUL	1825	126	5.	7	JUL	0040	201	3.	7	JUL	0655	276	1.

6	JUL	1215	52	0.	*	6	JUL	1830	127	5.	*	7	JUL	0045	202	3.	*	7	JUL	0700	277	1.	
6	JUL	1220	53	0.	*	6	JUL	1835	128	5.	*	7	JUL	0050	203	3.	*	7	JUL	0705	278	1.	
6	JUL	1225	54	0.	*	6	JUL	1840	129	4.	*	7	JUL	0055	204	3.	*	7	JUL	0710	279	1.	
6	JUL	1230	55	0.	*	6	JUL	1845	130	4.	*	7	JUL	0100	205	3.	*	7	JUL	0715	280	1.	
6	JUL	1235	56	0.	*	6	JUL	1850	131	4.	*	7	JUL	0105	206	3.	*	7	JUL	0720	281	1.	
6	JUL	1240	57	0.	*	6	JUL	1855	132	4.	*	7	JUL	0110	207	3.	*	7	JUL	0725	282	1.	
6	JUL	1245	58	0.	*	6	JUL	1900	133	4.	*	7	JUL	0115	208	3.	*	7	JUL	0730	283	1.	
6	JUL	1250	59	0.	*	6	JUL	1905	134	4.	*	7	JUL	0120	209	3.	*	7	JUL	0735	284	1.	
6	JUL	1255	60	0.	*	6	JUL	1910	135	4.	*	7	JUL	0125	210	3.	*	7	JUL	0740	285	1.	
6	JUL	1300	61	0.	*	6	JUL	1915	136	4.	*	7	JUL	0130	211	3.	*	7	JUL	0745	286	1.	
6	JUL	1305	62	0.	*	6	JUL	1920	137	4.	*	7	JUL	0135	212	3.	*	7	JUL	0750	287	1.	
6	JUL	1310	63	0.	*	6	JUL	1925	138	4.	*	7	JUL	0140	213	3.	*	7	JUL	0755	288	1.	
6	JUL	1315	64	0.	*	6	JUL	1930	139	4.	*	7	JUL	0145	214	3.	*	7	JUL	0800	289	1.	
6	JUL	1320	65	0.	*	6	JUL	1935	140	4.	*	7	JUL	0150	215	3.	*	7	JUL	0805	290	1.	
6	JUL	1325	66	0.	*	6	JUL	1940	141	4.	*	7	JUL	0155	216	3.	*	7	JUL	0810	291	1.	
6	JUL	1330	67	0.	*	6	JUL	1945	142	4.	*	7	JUL	0200	217	3.	*	7	JUL	0815	292	1.	
6	JUL	1335	68	0.	*	6	JUL	1950	143	4.	*	7	JUL	0205	218	3.	*	7	JUL	0820	293	1.	
6	JUL	1340	69	1.	*	6	JUL	1955	144	4.	*	7	JUL	0210	219	3.	*	7	JUL	0825	294	1.	
6	JUL	1345	70	4.	*	6	JUL	2000	145	4.	*	7	JUL	0215	220	3.	*	7	JUL	0830	295	1.	
6	JUL	1350	71	12.	*	6	JUL	2005	146	4.	*	7	JUL	0220	221	3.	*	7	JUL	0835	296	1.	
6	JUL	1355	72	26.	*	6	JUL	2010	147	4.	*	7	JUL	0225	222	3.	*	7	JUL	0840	297	0.	
6	JUL	1400	73	47.	*	6	JUL	2015	148	4.	*	7	JUL	0230	223	3.	*	7	JUL	0845	298	0.	
6	JUL	1405	74	68.	*	6	JUL	2020	149	4.	*	7	JUL	0235	224	3.	*	7	JUL	0850	299	0.	
6	JUL	1410	75	86.	*	6	JUL	2025	150	4.	*	7	JUL	0240	225	3.	*	7	JUL	0855	300	0.	
					*						*						*						

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)					
		(CFS)				
102.	6.33		19.	6.	6.	6.
		(INCHES)	1.171	1.528	1.528	1.528
		(AC-FT)	9.	12.	12.	12.

CUMULATIVE AREA = .15 SQ MI

```
33 KK          *************
               *           *
               *    DPNE   *
               *           *
               *************
```

```
39 KO          OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

38 RS          STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       ELEV  TYPE OF INITIAL CONDITION
                   RSVRIC    6608.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

34 SV            STORAGE         .0        .6       1.9       4.0       6.9

36 SE          ELEVATION    6608.00   6609.00   6610.00   6611.00   6612.00

37 SQ          DISCHARGE          0.        4.       13.       20.       26.
                                                                  ***
```

HYDROGRAPH AT STATION DPNE

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
6	JUL	0800	1	0.	.0	6608.0	*	6	JUL	1620	101	20.	4.2	6611.1	*	7	JUL	0040	201	4.	.6	6608.9
6	JUL	0805	2	0.	.0	6608.0	*	6	JUL	1625	102	20.	4.2	6611.1	*	7	JUL	0045	202	4.	.6	6608.9
6	JUL	0810	3	0.	.0	6608.0	*	6	JUL	1630	103	20.	4.1	6611.0	*	7	JUL	0050	203	4.	.5	6608.9
6	JUL	0815	4	0.	.0	6608.0	*	6	JUL	1635	104	20.	4.0	6611.0	*	7	JUL	0055	204	4.	.5	6608.9
6	JUL	0820	5	0.	.0	6608.0	*	6	JUL	1640	105	20.	3.9	6611.0	*	7	JUL	0100	205	4.	.5	6608.8
6	JUL	0825	6	0.	.0	6608.0	*	6	JUL	1645	106	19.	3.8	6610.9	*	7	JUL	0105	206	4.	.5	6608.8
6	JUL	0830	7	0.	.0	6608.0	*	6	JUL	1650	107	19.	3.7	6610.9	*	7	JUL	0110	207	4.	.5	6608.8
6	JUL	0835	8	0.	.0	6608.0	*	6	JUL	1655	108	19.	3.6	6610.8	*	7	JUL	0115	208	3.	.5	6608.8
6	JUL	0840	9	0.	.0	6608.0	*	6	JUL	1700	109	18.	3.6	6610.8	*	7	JUL	0120	209	3.	.5	6608.8
6	JUL	0845	10	0.	.0	6608.0	*	6	JUL	1705	110	18.	3.5	6610.7	*	7	JUL	0125	210	3.	.5	6608.8
6	JUL	0850	11	0.	.0	6608.0	*	6	JUL	1710	111	18.	3.4	6610.7	*	7	JUL	0130	211	3.	.5	6608.8
6	JUL	0855	12	0.	.0	6608.0	*	6	JUL	1715	112	17.	3.3	6610.7	*	7	JUL	0135	212	3.	.5	6608.8
6	JUL	0900	13	0.	.0	6608.0	*	6	JUL	1720	113	17.	3.2	6610.6	*	7	JUL	0140	213	3.	.5	6608.8
6	JUL	0905	14	0.	.0	6608.0	*	6	JUL	1725	114	17.	3.1	6610.6	*	7	JUL	0145	214	3.	.5	6608.8
6	JUL	0910	15	0.	.0	6608.0	*	6	JUL	1730	115	17.	3.1	6610.5	*	7	JUL	0150	215	3.	.5	6608.8
6	JUL	0915	16	0.	.0	6608.0	*	6	JUL	1735	116	16.	3.0	6610.5	*	7	JUL	0155	216	3.	.5	6608.8
6	JUL	0920	17	0.	.0	6608.0	*	6	JUL	1740	117	16.	2.9	6610.5	*	7	JUL	0200	217	3.	.5	6608.8
6	JUL	0925	18	0.	.0	6608.0	*	6	JUL	1745	118	16.	2.8	6610.4	*	7	JUL	0205	218	3.	.5	6608.8
6	JUL	0930	19	0.	.0	6608.0	*	6	JUL	1750	119	16.	2.8	6610.4	*	7	JUL	0210	219	3.	.5	6608.8
6	JUL	0935	20	0.	.0	6608.0	*	6	JUL	1755	120	15.	2.7	6610.4	*	7	JUL	0215	220	3.	.5	6608.8
6	JUL	0940	21	0.	.0	6608.0	*	6	JUL	1800	121	15.	2.6	6610.3	*	7	JUL	0220	221	3.	.5	6608.8
6	JUL	0945	22	0.	.0	6608.0	*	6	JUL	1805	122	15.	2.6	6610.3	*	7	JUL	0225	222	3.	.5	6608.8
6	JUL	0950	23	0.	.0	6608.0	*	6	JUL	1810	123	15.	2.5	6610.3	*	7	JUL	0230	223	3.	.5	6608.8
6	JUL	0955	24	0.	.0	6608.0	*	6	JUL	1815	124	14.	2.4	6610.2	*	7	JUL	0235	224	3.	.5	6608.8
6	JUL	1000	25	0.	.0	6608.0	*	6	JUL	1820	125	14.	2.4	6610.2	*	7	JUL	0240	225	3.	.5	6608.7
6	JUL	1005	26	0.	.0	6608.0	*	6	JUL	1825	126	14.	2.3	6610.2	*	7	JUL	0245	226	3.	.5	6608.7
6	JUL	1010	27	0.	.0	6608.0	*	6	JUL	1830	127	14.	2.3	6610.2	*	7	JUL	0250	227	3.	.5	6608.7
6	JUL	1015	28	0.	.0	6608.0	*	6	JUL	1835	128	13.	2.2	6610.1	*	7	JUL	0255	228	3.	.5	6608.7
6	JUL	1020	29	0.	.0	6608.0	*	6	JUL	1840	129	13.	2.1	6610.1	*	7	JUL	0300	229	3.	.5	6608.7
6	JUL	1025	30	0.	.0	6608.0	*	6	JUL	1845	130	13.	2.1	6610.1	*	7	JUL	0305	230	3.	.5	6608.7
6	JUL	1030	31	0.	.0	6608.0	*	6	JUL	1850	131	13.	2.0	6610.0	*	7	JUL	0310	231	3.	.5	6608.7
6	JUL	1035	32	0.	.0	6608.0	*	6	JUL	1855	132	13.	2.0	6610.0	*	7	JUL	0315	232	3.	.5	6608.7
6	JUL	1040	33	0.	.0	6608.0	*	6	JUL	1900	133	12.	1.9	6610.0	*	7	JUL	0320	233	3.	.5	6608.7
6	JUL	1045	34	0.	.0	6608.0	*	6	JUL	1905	134	12.	1.8	6609.9	*	7	JUL	0325	234	3.	.5	6608.7
6	JUL	1050	35	0.	.0	6608.0	*	6	JUL	1910	135	12.	1.8	6609.9	*	7	JUL	0330	235	3.	.5	6608.7
6	JUL	1055	36	0.	.0	6608.0	*	6	JUL	1915	136	11.	1.7	6609.8	*	7	JUL	0335	236	3.	.5	6608.7

6	JUL	1100	37	0.	.0	6608.0	*	6	JUL	1920	137	11.	1.7	6609.8	*	7	JUL	0340	237	1.	.5	6608.7
6	JUL	1105	38	0.	.0	6608.0	*	6	JUL	1925	138	11.	1.6	6609.8	*	7	JUL	0345	238	1.	.5	6608.7
6	JUL	1110	39	0.	.0	6608.0	*	6	JUL	1930	139	10.	1.6	6609.7	*	7	JUL	0350	239	1.	.5	6608.7
6	JUL	1115	40	0	.0	6608.0	*	6	JUL	1935	140	10.	1.6	6609.7	*	7	JUL	0355	240	1.	.5	6608.7
6	JUL	1120	41	0.	.0	6608.0	*	6	JUL	1940	141	10.	1.6	6609.7	*	7	JUL	0400	241	1.	.5	6608.7
6	JUL	1125	42	0.	.0	6608.0	*	6	JUL	1945	142	10.	1.6	6609.6	*	7	JUL	0405	242	1.	.4	6608.7
6	JUL	1130	43	0.	.0	6608.0	*	6	JUL	1950	143	9.	1.4	6609.6	*	7	JUL	0410	243	1.	.4	6608.7
6	JUL	1135	44	0	.0	6608.0	*	6	JUL	1955	144	9.	1.4	6609.6	*	7	JUL	0415	244	1.	.4	6608.7
6	JUL	1140	45	0.	.0	6608.0	*	6	JUL	2000	145	9.	1.4	6609.6	*	7	JUL	0420	245	1.	.4	6608.7
6	JUL	1145	46	0.	.0	6608.0	*	6	JUL	2005	146	9.	1.4	6609.5	*	7	JUL	0425	246	1.	.4	6608.7
6	JUL	1150	47	0.	.0	6608.0	*	6	JUL	2010	147	9.	1.3	6609.5	*	7	JUL	0430	247	1.	.4	6608.7
6	JUL	1155	48	0.	.0	6608.0	*	6	JUL	2015	148	9.	1.3	6609.5	*	7	JUL	0435	248	1.	.4	6608.7
6	JUL	1200	49	0.	.0	6608.0	*	6	JUL	2020	149	8.	1.3	6609.5	*	7	JUL	0440	249	1.	.4	6608.7
6	JUL	1205	50	0.	.0	6608.0	*	6	JUL	2025	150	8.	1.2	6609.5	*	7	JUL	0445	250	1.	.4	6608.7
6	JUL	1210	51	0.	.0	6608.0	*	6	JUL	2030	151	8.	1.2	6609.4	*	7	JUL	0450	251	1.	.4	6608.7
6	JUL	1215	52	0.	.0	6608.0	*	6	JUL	2035	152	8.	1.2	6609.4	*	7	JUL	0455	252	1.	.4	6608.6
6	JUL	1220	53	0.	.0	6608.0	*	6	JUL	2040	153	7.	1.2	6609.4	*	7	JUL	0500	253	1.	.4	6608.6
6	JUL	1225	54	0.	.0	6608.0	*	6	JUL	2045	154	7.	1.1	6609.4	*	7	JUL	0505	254	1.	.4	6608.6
6	JUL	1230	55	0.	.0	6608.0	*	6	JUL	2050	155	7.	1.1	6609.4	*	7	JUL	0510	255	1.	.4	6608.6
6	JUL	1235	56	0.	.0	6608.0	*	6	JUL	2055	156	7.	1.1	6609.3	*	7	JUL	0515	256	1.	.4	6608.6
6	JUL	1240	57	0.	.0	6608.0	*	6	JUL	2100	157	7.	1.1	6609.3	*	7	JUL	0520	257	1.	.4	6608.6
6	JUL	1245	58	0.	.0	6608.0	*	6	JUL	2105	158	7.	1.0	6609.3	*	7	JUL	0525	258	1.	.4	6608.6
6	JUL	1250	59	0.	.0	6608.0	*	6	JUL	2110	159	7.	1.0	6609.3	*	7	JUL	0530	259	1.	.4	6608.6
6	JUL	1255	60	0.	.0	6608.0	*	6	JUL	2115	160	7.	1.0	6609.3	*	7	JUL	0535	260	1.	.3	6608.6
6	JUL	1300	61	0.	.0	6608.0	*	6	JUL	2120	161	6.	1.0	6609.3	*	7	JUL	0540	261	1.	.3	6608.5
6	JUL	1305	62	0.	.0	6608.0	*	6	JUL	2125	162	6.	1.0	6609.3	*	7	JUL	0545	262	1.	.3	6608.5
6	JUL	1310	63	0.	.0	6608.0	*	6	JUL	2130	163	6.	1.0	6609.3	*	7	JUL	0550	263	1.	.3	6608.5
6	JUL	1315	64	0.	.0	6608.0	*	6	JUL	2135	164	6.	.9	6609.2	*	7	JUL	0555	264	1.	.3	6608.5
6	JUL	1320	65	0.	.0	6608.0	*	6	JUL	2140	165	6.	.9	6609.2	*	7	JUL	0600	265	1.	.3	6608.5
6	JUL	1325	66	0.	.0	6608.0	*	6	JUL	2145	166	6.	.9	6609.2	*	7	JUL	0605	266	1.	.3	6608.5
6	JUL	1330	67	0.	.0	6608.0	*	6	JUL	2150	167	6.	.9	6609.2	*	7	JUL	0610	267	1.	.3	6608.5
6	JUL	1335	68	0.	.0	6608.0	*	6	JUL	2155	168	6.	.9	6609.2	*	7	JUL	0615	268	1.	.3	6608.5
6	JUL	1340	69	0.	.0	6608.0	*	6	JUL	2200	169	6.	.9	6609.2	*	7	JUL	0620	269	1.	.3	6608.5
6	JUL	1345	70	0.	.0	6608.0	*	6	JUL	2205	170	6.	.9	6609.2	*	7	JUL	0625	270	1.	.3	6608.5
6	JUL	1350	71	1.	.1	6608.1	*	6	JUL	2210	171	6.	.8	6609.2	*	7	JUL	0630	271	1.	.3	6608.5
6	JUL	1355	72	1.	.2	6608.3	*	6	JUL	2215	172	5.	.8	6609.1	*	7	JUL	0635	272	1.	.3	6608.5
6	JUL	1400	73	3.	.4	6608.7	*	6	JUL	2220	173	5.	.8	6609.1	*	7	JUL	0640	273	1.	.3	6608.5
6	JUL	1405	74	5.	.8	6609.1	*	6	JUL	2225	174	5.	.8	6609.1	*	7	JUL	0645	274	1.	.3	6608.5
6	JUL	1410	75	8.	1.3	6609.5	*	6	JUL	2230	175	5.	.8	6609.1	*	7	JUL	0650	275	1.	.3	6608.5
6	JUL	1415	76	12.	1.9	6609.9	*	6	JUL	2235	176	5.	.8	6609.1	*	7	JUL	0655	276	1.	.3	6608.4
6	JUL	1420	77	14.	2.5	6610.3	*	6	JUL	2240	177	5.	.8	6609.1	*	7	JUL	0700	277	1.	.3	6608.4
6	JUL	1425	78	16.	3.0	6610.5	*	6	JUL	2245	178	5.	.8	6609.1	*	7	JUL	0705	278	1.	.3	6608.4
6	JUL	1430	79	18.	3.6	6610.8	*	6	JUL	2250	179	5.	.7	6609.1	*	7	JUL	0710	279	1.	.3	6608.4
6	JUL	1435	80	20.	4.0	6611.0	*	6	JUL	2255	180	5.	.7	6609.1	*	7	JUL	0715	280	1.	.3	6608.4
6	JUL	1440	81	21.	4.3	6611.1	*	6	JUL	2300	181	5.	.7	6609.1	*	7	JUL	0720	281	1.	.3	6608.4
6	JUL	1445	82	21.	4.5	6611.2	*	6	JUL	2305	182	5.	.7	6609.1	*	7	JUL	0725	282	1.	.3	6608.4
6	JUL	1450	83	21.	4.7	6611.2	*	6	JUL	2310	183	5.	.7	6609.1	*	7	JUL	0730	283	1.	.3	6608.4
6	JUL	1455	84	22.	4.8	6611.3	*	6	JUL	2315	184	5.	.7	6609.1	*	7	JUL	0735	284	1.	.3	6608.4
6	JUL	1500	85	22.	4.9	6611.3	*	6	JUL	2320	185	5.	.7	6609.0	*	7	JUL	0740	285	1.	.3	6608.4
6	JUL	1505	86	22.	4.9	6611.3	*	6	JUL	2325	186	5.	.7	6609.0	*	7	JUL	0745	286	1.	.3	6608.4
6	JUL	1510	87	22.	5.0	6611.3	*	6	JUL	2330	187	4.	.7	6609.0	*	7	JUL	0750	287	1.	.3	6608.4
6	JUL	1515	88	22.	5.0	6611.3	*	6	JUL	2335	188	4.	.7	6609.0	*	7	JUL	0755	288	1.	.3	6608.4
6	JUL	1520	89	22.	5.0	6611.3	*	6	JUL	2340	189	4.	.7	6609.0	*	7	JUL	0800	289	1.	.3	6608.4
6	JUL	1525	90	22.	4.9	6611.3	*	6	JUL	2345	190	4.	.6	6609.0	*	7	JUL	0805	290	1.	.3	6608.4
6	JUL	1530	91	22.	4.9	6611.3	*	6	JUL	2350	191	4.	.6	6609.0	*	7	JUL	0810	291	1.	.2	6608.4
6	JUL	1535	92	22.	4.8	6611.3	*	6	JUL	2355	192	4.	.6	6609.0	*	7	JUL	0815	292	1.	.2	6608.4
6	JUL	1540	93	22.	4.8	6611.3	*	7	JUL	0000	193	4.	.6	6609.0	*	7	JUL	0820	293	1.	.2	6608.4
6	JUL	1545	94	21.	4.7	6611.2	*	7	JUL	0005	194	4.	.6	6609.0	*	7	JUL	0825	294	1.	.2	6608.4
6	JUL	1550	95	21.	4.7	6611.2	*	7	JUL	0010	195	4.	.6	6608.9	*	7	JUL	0830	295	1.	.2	6608.4
6	JUL	1555	96	21.	4.6	6611.2	*	7	JUL	0015	196	4.	.6	6608.9	*	7	JUL	0835	296	1.	.2	6608.4
6	JUL	1600	97	21.	4.5	6611.2	*	7	JUL	0020	197	4.	.6	6608.9	*	7	JUL	0840	297	1.	.2	6608.4
6	JUL	1605	98	21.	4.5	6611.2	*	7	JUL	0025	198	4.	.6	6608.9	*	7	JUL	0845	298	1.	.2	6608.3
6	JUL	1610	99	21.	4.4	6611.1	*	7	JUL	0030	199	4.	.6	6608.9	*	7	JUL	0850	299	1.	.2	6608.3
6	JUL	1615	100	21.	4.3	6611.1	*	7	JUL	0035	200	4.	.6	6608.9	*	7	JUL	0855	300	1.	.2	6608.3

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)					
		(CFS)				
22.	7.25		16.	6.	6.	6.
		(INCHES)	1.016	1.503	1.503	1.503
		(AC-FT)	8.	12.	12.	12.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
(AC-FT)	(HR)				
5.	7.25	3.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
(FEET)	(HR)				
6611.33	7.25	6610.55	6609.08	6609.04	6609.04

CUMULATIVE AREA = .15 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	O-3B	101.	6.33	18.	6.	6.	.14		
HYDROGRAPH AT	O-5	8.	6.00	1.	0.	0.	.01		
2 COMBINED AT	10	102.	6.33	19.	6.	6.	.15		
ROUTED TO	DPNE	22.	7.25	16.	6.	6.	.15		
								6611.33	7.25

*** NORMAL END OF HEC-1 ***

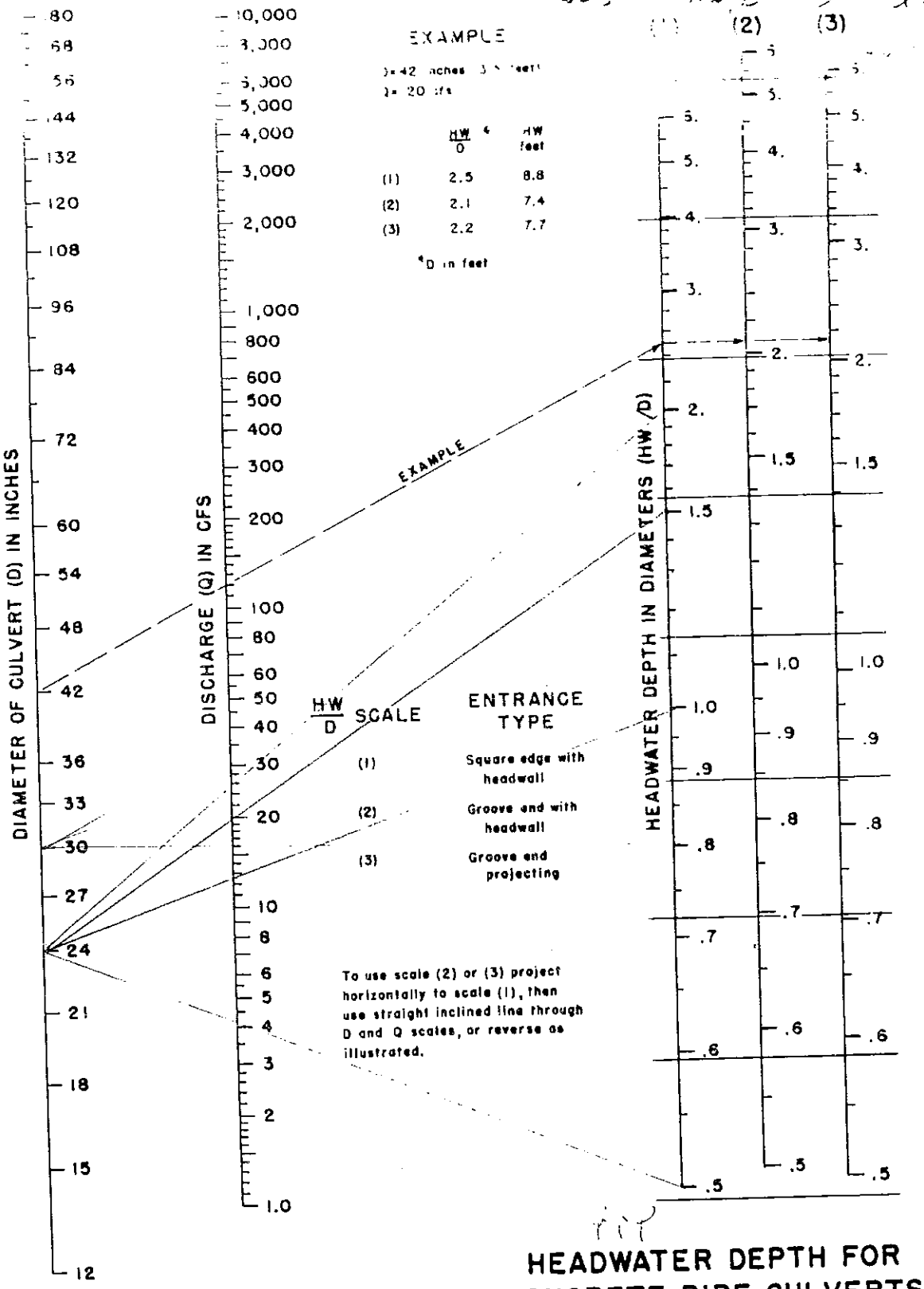
AVG END AREA POND A

ELEV	AREA (FT^2)	AVG END AREA (FT^2)	CUMULATIVE VOL (FT^3)	HEC ACRES
6608	13903.32			
6609	40752.66	27327.99	27327.99	0.63
6610	73224.1	56988.38	84316.37	1.94
6611	107758.49	90491.295	174807.665	4.02
6612	143447.1	125602.795	300410.46	6.91
6613	146015.32	144731.21	445141.67	10.24

24" RCP HW = 1 HW/D = .5 Q = 12.5
HW = 2 HW/D = 1

CHART 1

HW = 3 HW/D = 1.5 Q = 20



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

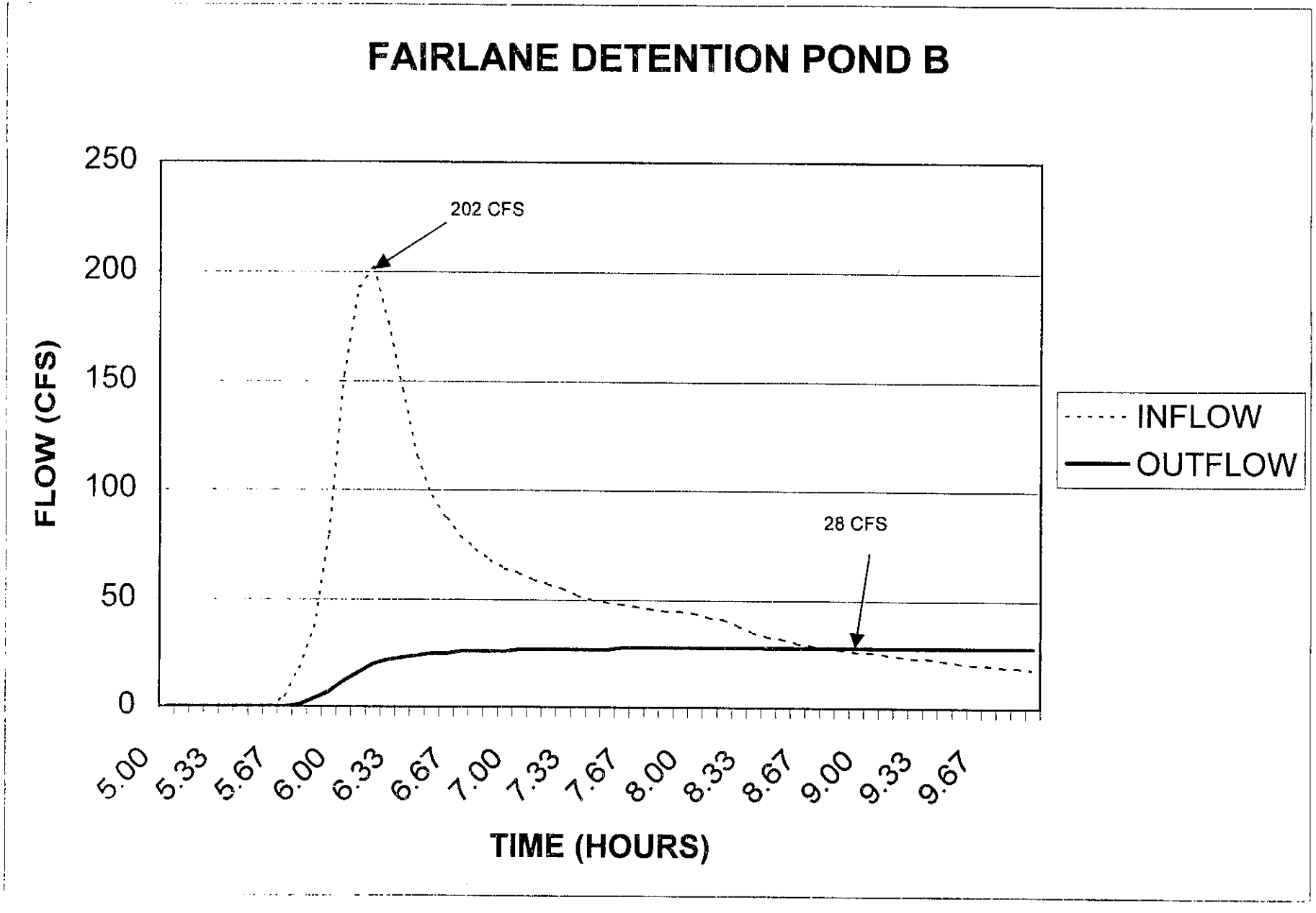
30" RCP

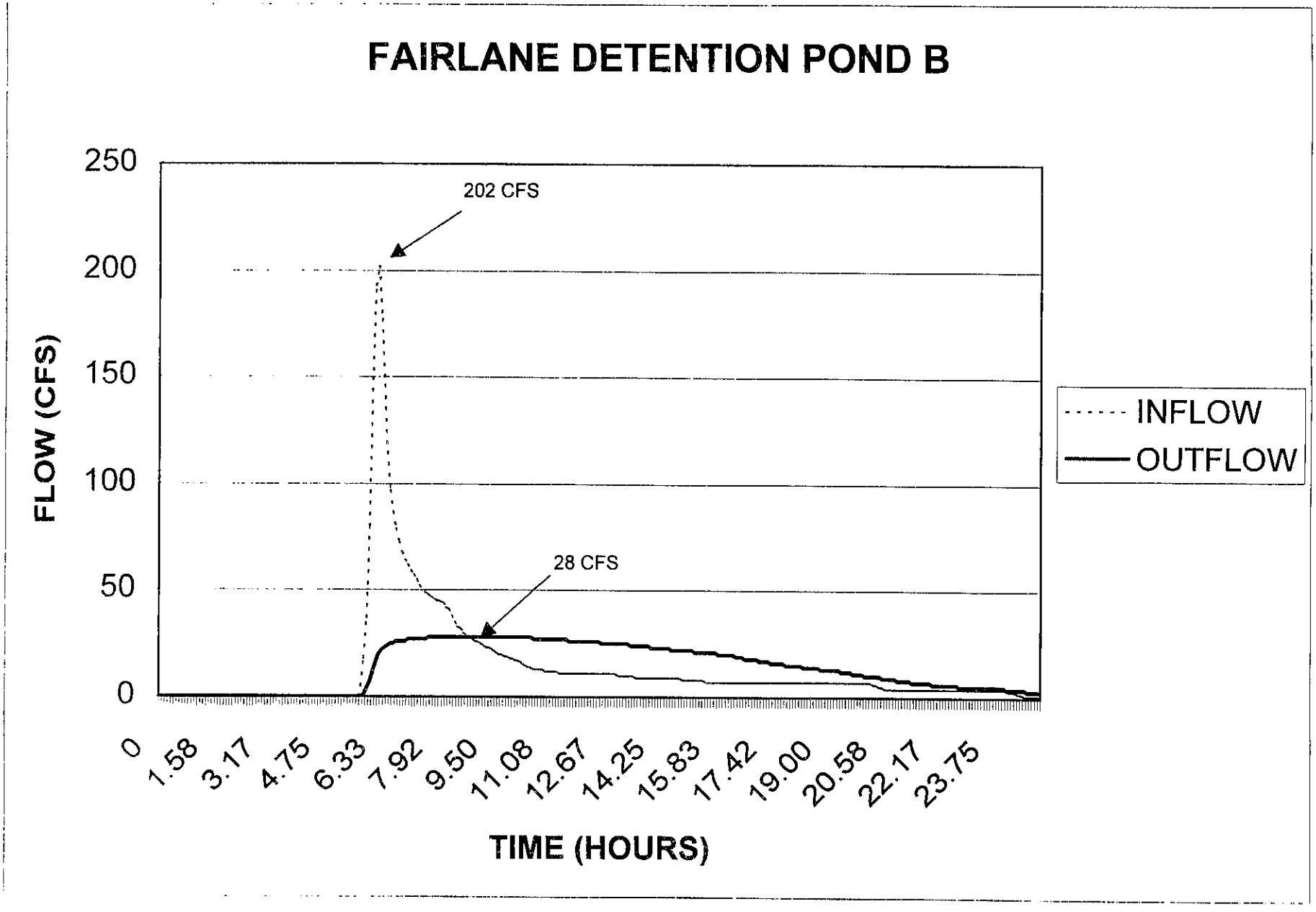
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

D = 1 Hw/D = .4 Q =

D = 2 Hw/D = .8 Q = 16 CFS

D = 3 Hw/D = 1.2 Q = 29 CFS

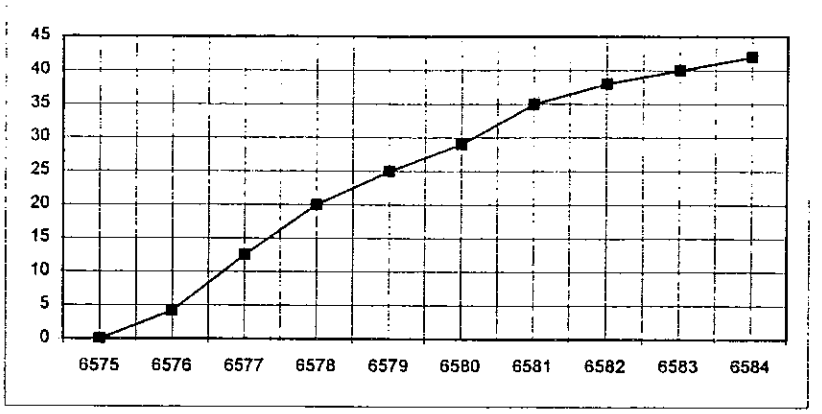

FAIRLANE DETENTION POND B
250
200
150
100
50
0
FLOW (CFS)
202 CFS
28 CFS
INFLOW
OUTFLOW
5.00
5.33
5.67
6.00
6.33
6.67
7.00
7.33
7.67
8.00
8.33
8.67
9.00
9.33
9.67
TIME (HOURS)


FAIRLANE DETENTION POND B
FLOW (CFS)
250
200
150
100
50
0
202 CFS
28 CFS
INFLOW
OUTFLOW
0
1.58
3.17
4.75
6.33
7.92
9.50
11.08
12.67
14.25
15.83
17.42
19.00
20.58
22.17
23.75
TIME (HOURS)

POND B LOCATED IN LOOP RAMP

OUTLET RATING CURVE

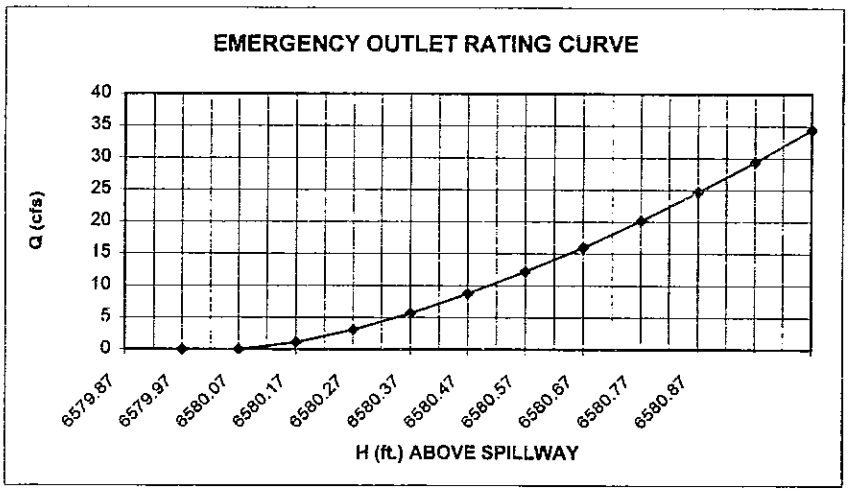
HT	Q
6575	0
6576	4.2
6577	12.5
6578	20
6579	25
6580	29
6581	35
6582	38
6583	40
6584	42



OUTLET RATING CURVE
d/D = 1.0
Area = 3.14 ft^2

EMERGENCY OUTLET RATING CURVE/FLOW THROUGH CDOT TYPE "D" INLET

ELEV	HT	Q
6579.87	0	**0.000**
6579.97	0.1	**1.088**
6580.07	0.2	**3.078**
6580.17	0.3	**5.654**
6580.27	0.4	**8.706**
6580.37	0.5	**12.166**
6580.47	0.6	**15.993**
6580.57	0.7	**20.154**
6580.67	0.8	**24.623**
6580.77	0.9	**29.381**
6580.87	1	**34.412**
6580.97	1.1	**39.701**
6581.07	1.2	**45.236**



EMERGENCY SPILLWAY RATING CURVE
Q=CLH $^{3/2}$ WHERE C=2.8 L=12.29' (PERIMETER OF GRATE)

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  RUN DATE  07/14/1998  TIME  07:21:20 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*             (916) 756-1104            *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1       ID        FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
  2       ID        HISTORIC CONDITIONS - INPUT FILE FINFAIR4.INP
  3       ID        WITH DEVELOPED FAIRLANE PARKWAY ALTERING BASIN B CURVE NUMBER
  4       ID        ADDING FAIRLANE INTERCHANGE-ADDING POND IN LOOP
  5       ID        USING THE 100-YEAR 24-HOUR STORM FROM CITY CRITERIA
  6       ID        USE 1 - 24"RCP RELEASE
  7       ID        RUN DATE 7-13-1998
          *DIAGRAM
  8       IT       5 13JUL98     800     100
  9       IO       5

 10       KK      B8
 11       KM     RUNOFF FROM NEW LIFE CHURCH AREA B-8<KLH BSN I/II) KLH AREA/DMJM CN/KLH TC
 12       KM     CN BASED ON COMMERCIAL AND BUSINESS AREA SOIL TYPE B
 13       BA   0.055
 14       LS       0    92.0
 15       UD   0.138
 16       IN      15
 17       PB   4.400
 18       PC   .0000   .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143
 19       PC   .0165   .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530
 20       PC   .0600   .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900
 21       PC   .8000   .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550
 22       PC   .8600   .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938
 23       PC   .8975   .9013   .9050   .9088   .9115   .9148   .9180   .9210   .9240   .9270
 24       PC   .9300   .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525
 25       PC   .9550   .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775
 26       PC   .9800   .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913
 27       PC   .9925   .9938   .9950   .9963   .9975   .9988  1.000

 28       KK     2AP
 29       KM     NEW LIFE CHURCH POND BY KLH ENG.
 30       SV       0     .65    1.43    2.31    3.30    4.41
 31       SE    6736    6737    6738    6739    6740    6741
 32       SQ       0     4.1    14.0    22.0    28.0    33.0
 33       RS       1    ELEV    6736

 34       KK     B83
 35       KM     RUNOFF FROM BASIN III NEW LIFE CHURCH KLH AREA/TC DMJM CN
 36       KM     CN BASED ON OPEN SPACE/GOOD CONDITION/SOIL TYPE B
 37       BA   0.003
 38       LS       0      61
 39       UD   0.050

 40       KK       5
 41       KM     COMBINE 2AP, B83
 42       HC       2

 43       KK     5-9
 44       KM     ROUTE FROM DESIGN POINT 5 TO DESIGN POINT 9
 45       RD    4000    .030    .035           TRAP       0      50
```

1 HEC-1 INPUT PAGE 2

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 46       KK       B
 47       KM     HISTORIC RUNOFF FROM B1, B2, B3, B4, B5, B6, B7, ROADWAY BASIN "B" SOIL
 48       KM     MDDP BASINS B1, B3.1, B3.2, B4.1, B4.2, B5.1, B5.2
 49       BA   0.310
 50       LS       0   59.31
 51       UD   0.179

 52       KK    2389
 53       KM   RUNOFF FROM INFIELD AREA 2389
 54       BA    .010
 55       LS       0    68.8
 56       UD     .05

 57       KK       9
 58       KM   COMBINE 5-9,B,2389
 59       HC       3
 60       KO       1

 61       KK    9-13
 62       KM   ROUTE DESIGN POINT 9 TO DESIGN POINT 13
```

```
            63           RD    1200    .022    .035            TRAP       4      30

            64           KK      12
            65           KM   RUNOFF FROM INTERCHANGE AREAS 1507, 3895, AND ROADWAY SURFACES
            66           BA    3.029
            67           LS       0    98.3
            68           UD    1.35

            69           KK      13
            70           KM   COMBINE 9-13, 12
            71           HC       2
            72           KO       1

            73           KK     DPB
            74           KM   LOOP DETENTION POND OUTFALL TO DESIGN POINT 14
            75           SV       0     .26    1.42    3.76    7.34   12.07   17.63   23.59   29.70   35.38
            76           SE    6575    6576    6577    6578    6579    6580    6581    6582    6583    6584
            77           SQ       0     4.2    12.5      20      25      29      35      38      40      42
            78           RS       1    ELEV    6575
            79           KO       1
            80           ZZ
1
                    SCHEMATIC DIAGRAM OF STREAM NETWORK

 INPUT
  LINE      (V) ROUTING           (---->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<----) RETURN OF DIVERTED OR PUMPED FLOW

    10          B8
                 V
                 V
    28         2AP
                 .
                 .
    34           .          881
                 .            .
                 .            .
    40           5.............
                 V
                 V
    43         5-9
                 .
                 .
    46           .            8
                 .            .
                 .            .
    52           .            .        2389
                 .            .           .
                 .            .           .
    57           9............................
                 V
                 V
    61        9-13
                 .
                 .
    64           .           12
                 .            .
                 .            .
    69          13.............
                 V
                 V
    73         DPB

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
*            SEPTEMBER 1990            *                    *    HYDROLOGIC ENGINEERING CENTER     *
*             VERSION 4.0              *                    *         609 SECOND STREET            *
*                                      *                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE  07/14/1998  TIME  07:23:20 *                    *           (916) 756-1104             *
*                                      *                    *                                      *
****************************************                    ****************************************

                                FAIRLANE PARKWAY/INTERCHANGE  DMJM PROJECT NO. 3821.01
                                HISTORIC CONDITIONS - INPUT FILE FINFAIR4.INP
                                WITH DEVELOPED FAIRLANE PARKWAY ALTERING BASIN B CURVE NUMBER
                                ADDING FAIRLANE INTERCHANGE-ADDING POND IN LOOP
                                USING THE 100-YEAR 24-HOUR STORM FROM CITY CRITERIA
                                USE 1 - 24"RCP RELEASE
                                RUN DATE 7-13-1998

   9 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     13JUL98  STARTING DATE
                      ITIME        0800  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    14JUL98  ENDING DATE
                      NDTIME        0855  ENDING TIME
                      ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL      .08 HOURS
                        TOTAL TIME BASE    24.92 HOURS

            ENGLISH UNITS
                 DRAINAGE AREA          SQUARE MILES
                 PRECIPITATION DEPTH    INCHES
                 LENGTH, ELEVATION      FEET
                 FLOW                   CUBIC FEET PER SECOND
                 STORAGE VOLUME         ACRE-FEET
                 SURFACE AREA           ACRES
                 TEMPERATURE            DEGREES FAHRENHEIT

WARNING --- ROUTED OUTFLOW (     35.) IS GREATER THAN MAXIMUM OUTFLOW (     33.) IN STORAGE-OUTFLOW TABLE
```

WARNING --- ROUTED OUTFLOW (36.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (36.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (36.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (36.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (35.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (34.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (34.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (33.) IS GREATER THAN MAXIMUM OUTFLOW (33.) IN STORAGE-OUTFLOW TABLE

*** ***

```
              *************
              *           *
 57 KK        *       9   *
              *           *
              *************

 60 KO           OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 59 HC           HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

HYDROGRAPH AT STATION 9
SUM OF 3 HYDROGRAPHS

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
13 JUL 0800	1	0.	13 JUL 1415	76	150.	13 JUL 2030	151	10.	14 JUL 0245	226	6.
13 JUL 0805	2	0.	13 JUL 1420	77	115.	13 JUL 2035	152	10.	14 JUL 0250	227	6.
13 JUL 0810	3	0.	13 JUL 1425	78	92.	13 JUL 2040	153	10.	14 JUL 0255	228	6.
13 JUL 0815	4	0.	13 JUL 1430	79	85.	13 JUL 2045	154	10.	14 JUL 0300	229	6.
13 JUL 0820	5	0.	13 JUL 1435	80	77.	13 JUL 2050	155	10.	14 JUL 0305	230	6.
13 JUL 0825	6	0.	13 JUL 1440	81	71.	13 JUL 2055	156	10.	14 JUL 0310	231	6.
13 JUL 0830	7	0.	13 JUL 1445	82	65.	13 JUL 2100	157	10.	14 JUL 0315	232	6.
13 JUL 0835	8	0.	13 JUL 1450	83	61.	13 JUL 2105	158	9.	14 JUL 0320	233	6.
13 JUL 0840	9	0.	13 JUL 1455	84	59.	13 JUL 2110	159	9.	14 JUL 0325	234	6.
13 JUL 0845	10	0.	13 JUL 1500	85	57.	13 JUL 2115	160	9.	14 JUL 0330	235	6.
13 JUL 0850	11	0.	13 JUL 1505	86	55.	13 JUL 2120	161	9.	14 JUL 0335	236	6.
13 JUL 0855	12	0.	13 JUL 1510	87	53.	13 JUL 2125	162	9.	14 JUL 0340	237	6.
13 JUL 0900	13	0.	13 JUL 1515	88	50.	13 JUL 2130	163	9.	14 JUL 0345	238	6.
13 JUL 0905	14	0.	13 JUL 1520	89	48.	13 JUL 2135	164	9.	14 JUL 0350	239	6.
13 JUL 0910	15	0.	13 JUL 1525	90	47.	13 JUL 2140	165	9.	14 JUL 0355	240	6.
13 JUL 0915	16	0.	13 JUL 1530	91	46.	13 JUL 2145	166	9.	14 JUL 0400	241	6.
13 JUL 0920	17	0.	13 JUL 1535	92	45.	13 JUL 2150	167	9.	14 JUL 0405	242	6.
13 JUL 0925	18	0.	13 JUL 1540	93	44.	13 JUL 2155	168	8.	14 JUL 0410	243	6.
13 JUL 0930	19	0.	13 JUL 1545	94	43.	13 JUL 2200	169	8.	14 JUL 0415	244	5.
13 JUL 0935	20	0.	13 JUL 1550	95	43.	13 JUL 2205	170	8.	14 JUL 0420	245	4.
13 JUL 0940	21	0.	13 JUL 1555	96	42.	13 JUL 2210	171	8.	14 JUL 0425	246	4.
13 JUL 0945	22	0.	13 JUL 1600	97	41.	13 JUL 2215	172	8.	14 JUL 0430	247	4.
13 JUL 0950	23	0.	13 JUL 1605	98	40.	13 JUL 2220	173	8.	14 JUL 0435	248	4.
13 JUL 0955	24	0.	13 JUL 1610	99	37.	13 JUL 2225	174	8.	14 JUL 0440	249	4.
13 JUL 1000	25	0.	13 JUL 1615	100	34.	13 JUL 2230	175	8.	14 JUL 0445	250	4.
13 JUL 1005	26	0.	13 JUL 1620	101	32.	13 JUL 2235	176	8.	14 JUL 0450	251	4.
13 JUL 1010	27	0.	13 JUL 1625	102	31.	13 JUL 2240	177	8.	14 JUL 0455	252	4.
13 JUL 1015	28	0.	13 JUL 1630	103	29.	13 JUL 2245	178	8.	14 JUL 0500	253	4.
13 JUL 1020	29	0.	13 JUL 1635	104	28.	13 JUL 2250	179	8.	14 JUL 0505	254	4.
13 JUL 1025	30	0.	13 JUL 1640	105	27.	13 JUL 2255	180	8.	14 JUL 0510	255	4.
13 JUL 1030	31	0.	13 JUL 1645	106	26.	13 JUL 2300	181	8.	14 JUL 0515	256	4.
13 JUL 1035	32	0.	13 JUL 1650	107	25.	13 JUL 2305	182	8.	14 JUL 0520	257	4.
13 JUL 1040	33	0.	13 JUL 1655	108	24.	13 JUL 2310	183	7.	14 JUL 0525	258	4.
13 JUL 1045	34	0.	13 JUL 1700	109	24.	13 JUL 2315	184	7.	14 JUL 0530	259	4.
13 JUL 1050	35	0.	13 JUL 1705	110	23.	13 JUL 2320	185	7.	14 JUL 0535	260	4.
13 JUL 1055	36	0.	13 JUL 1710	111	22.	13 JUL 2325	186	7.	14 JUL 0540	261	4.
13 JUL 1100	37	0.	13 JUL 1715	112	22.	13 JUL 2330	187	7.	14 JUL 0545	262	4.
13 JUL 1105	38	0.	13 JUL 1720	113	21.	13 JUL 2335	188	7.	14 JUL 0550	263	4.
13 JUL 1110	39	0.	13 JUL 1725	114	20.	13 JUL 2340	189	7.	14 JUL 0555	264	4.
13 JUL 1115	40	0.	13 JUL 1730	115	19.	13 JUL 2345	190	7.	14 JUL 0600	265	4.
13 JUL 1120	41	0.	13 JUL 1735	116	19.	13 JUL 2350	191	7.	14 JUL 0605	266	4.
13 JUL 1125	42	0.	13 JUL 1740	117	18.	13 JUL 2355	192	7.	14 JUL 0610	267	4.
13 JUL 1130	43	0.	13 JUL 1745	118	18.	14 JUL 0000	193	7.	14 JUL 0615	268	4.
13 JUL 1135	44	0.	13 JUL 1750	119	17.	14 JUL 0005	194	7.	14 JUL 0620	269	4.
13 JUL 1140	45	0.	13 JUL 1755	120	17.	14 JUL 0010	195	7.	14 JUL 0625	270	3.
13 JUL 1145	46	0.	13 JUL 1800	121	16.	14 JUL 0015	196	7.	14 JUL 0630	271	3.
13 JUL 1150	47	0.	13 JUL 1805	122	16.	14 JUL 0020	197	7.	14 JUL 0635	272	3.
13 JUL 1155	48	0.	13 JUL 1810	123	15.	14 JUL 0025	198	7.	14 JUL 0640	273	3.
13 JUL 1200	49	0.	13 JUL 1815	124	14.	14 JUL 0030	199	7.	14 JUL 0645	274	3.
13 JUL 1205	50	0.	13 JUL 1820	125	13.	14 JUL 0035	200	7.	14 JUL 0650	275	3.
13 JUL 1210	51	0.	13 JUL 1825	126	13.	14 JUL 0040	201	6.	14 JUL 0655	276	3.
13 JUL 1215	52	0.	13 JUL 1830	127	13.	14 JUL 0045	202	6.	14 JUL 0700	277	3.
13 JUL 1220	53	0.	13 JUL 1835	128	12.	14 JUL 0050	203	6.	14 JUL 0705	278	3.
13 JUL 1225	54	0.	13 JUL 1840	129	12.	14 JUL 0055	204	6.	14 JUL 0710	279	3.
13 JUL 1230	55	0.	13 JUL 1845	130	12.	14 JUL 0100	205	6.	14 JUL 0715	280	3.
13 JUL 1235	56	0.	13 JUL 1850	131	12.	14 JUL 0105	206	6.	14 JUL 0720	281	3.
13 JUL 1240	57	0.	13 JUL 1855	132	11.	14 JUL 0110	207	6.	14 JUL 0725	282	3.
13 JUL 1245	58	0.	13 JUL 1900	133	11.	14 JUL 0115	208	6.	14 JUL 0730	283	3.
13 JUL 1250	59	0.	13 JUL 1905	134	11.	14 JUL 0120	209	6.	14 JUL 0735	284	3.
13 JUL 1255	60	0.	13 JUL 1910	135	11.	14 JUL 0125	210	6.	14 JUL 0740	285	3.
13 JUL 1300	61	0.	13 JUL 1915	136	11.	14 JUL 0130	211	6.	14 JUL 0745	286	3.
13 JUL 1305	62	0.	13 JUL 1920	137	11.	14 JUL 0135	212	6.	14 JUL 0750	287	3.
13 JUL 1310	63	0.	13 JUL 1925	138	11.	14 JUL 0140	213	6.	14 JUL 0755	288	3.
13 JUL 1315	64	0.	13 JUL 1930	139	10.	14 JUL 0145	214	6.	14 JUL 0800	289	3.
13 JUL 1320	65	0.	13 JUL 1935	140	10.	14 JUL 0150	215	6.	14 JUL 0805	290	3.
13 JUL 1325	66	0.	13 JUL 1940	141	10.	14 JUL 0155	216	6.	14 JUL 0810	291	2.
13 JUL 1330	67	0.	13 JUL 1945	142	10.	14 JUL 0200	217	6.	14 JUL 0815	292	2.
13 JUL 1335	68	0.	13 JUL 1950	143	10.	14 JUL 0205	218	6.	14 JUL 0820	293	1.

13 JUL 1340	69	2.	*	13 JUL 1955	144	10.	*	14 JUL 0210	219	6.	*	14 JUL 0825	294	1.					
13 JUL 1345	70	10.	*	13 JUL 2000	145	10.	*	14 JUL 0215	220	6.	*	14 JUL 0830	295	1.					
13 JUL 1350	71	36.	*	13 JUL 2005	146	10.	*	14 JUL 0220	221	6.	*	14 JUL 0835	296	1.					
13 JUL 1355	72	89.	*	13 JUL 2010	147	10.	*	14 JUL 0225	222	6.	*	14 JUL 0840	297	1.					
13 JUL 1400	73	163.	*	13 JUL 2015	148	10.	*	14 JUL 0230	223	6.	*	14 JUL 0845	298	1.					
13 JUL 1405	74	202.	*	13 JUL 2020	149	10.	*	14 JUL 0235	224	6.	*	14 JUL 0850	299	1.					
13 JUL 1410	75	182.	*	13 JUL 2025	150	10.	*	14 JUL 0240	225	6.	*	14 JUL 0855	300	1.					

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	144-HR
(CPS)	(HR)				
		(CPS)			
202.	6.08	40.	13.	13.	13.
		(INCHES) .991	1.313	1.313	1.313
		(AC-FT) 20.	26.	26.	26.

CUMULATIVE AREA = .38 SQ MI

69 KK 13

72 KO OUTPUT CONTROL VARIABLES
IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

71 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

HYDROGRAPH AT STATION 13
SUM OF 2 HYDROGRAPHS

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
13 JUL 0800	1	0.	13 JUL 1415	76	177.	13 JUL 2030	151	11.	14 JUL 0245	226	7.
13 JUL 0805	2	0.	13 JUL 1420	77	146.	13 JUL 2035	152	11.	14 JUL 0250	227	7.
13 JUL 0810	3	0.	13 JUL 1425	78	115.	13 JUL 2040	153	11.	14 JUL 0255	228	7.
13 JUL 0815	4	0.	13 JUL 1430	79	97.	13 JUL 2045	154	11.	14 JUL 0300	229	7.
13 JUL 0820	5	0.	13 JUL 1435	80	87.	13 JUL 2050	155	11.	14 JUL 0305	230	7.
13 JUL 0825	6	0.	13 JUL 1440	81	79.	13 JUL 2055	156	11.	14 JUL 0310	231	7.
13 JUL 0830	7	0.	13 JUL 1445	82	73.	13 JUL 2100	157	10.	14 JUL 0315	232	7.
13 JUL 0835	8	0.	13 JUL 1450	83	68.	13 JUL 2105	158	10.	14 JUL 0320	233	7.
13 JUL 0840	9	0.	13 JUL 1455	84	64.	13 JUL 2110	159	10.	14 JUL 0325	234	7.
13 JUL 0845	10	0.	13 JUL 1500	85	62.	13 JUL 2115	160	10.	14 JUL 0330	235	7.
13 JUL 0850	11	0.	13 JUL 1505	86	59.	13 JUL 2120	161	10.	14 JUL 0335	236	7.
13 JUL 0855	12	0.	13 JUL 1510	87	57.	13 JUL 2125	162	10.	14 JUL 0340	237	7.
13 JUL 0900	13	0.	13 JUL 1515	88	55.	13 JUL 2130	163	9.	14 JUL 0345	238	7.
13 JUL 0905	14	0.	13 JUL 1520	89	52.	13 JUL 2135	164	9.	14 JUL 0350	239	7.
13 JUL 0910	15	0.	13 JUL 1525	90	50.	13 JUL 2140	165	9.	14 JUL 0355	240	7.
13 JUL 0915	16	0.	13 JUL 1530	91	49.	13 JUL 2145	166	9.	14 JUL 0400	241	7.
13 JUL 0920	17	0.	13 JUL 1535	92	48.	13 JUL 2150	167	9.	14 JUL 0405	242	7.
13 JUL 0925	18	0.	13 JUL 1540	93	47.	13 JUL 2155	168	9.	14 JUL 0410	243	7.
13 JUL 0930	19	0.	13 JUL 1545	94	46.	13 JUL 2200	169	9.	14 JUL 0415	244	6.
13 JUL 0935	20	0.	13 JUL 1550	95	45.	13 JUL 2205	170	9.	14 JUL 0420	245	6.
13 JUL 0940	21	0.	13 JUL 1555	96	45.	13 JUL 2210	171	9.	14 JUL 0425	246	5.
13 JUL 0945	22	0.	13 JUL 1600	97	44.	13 JUL 2215	172	9.	14 JUL 0430	247	5.
13 JUL 0950	23	0.	13 JUL 1605	98	42.	13 JUL 2220	173	9.	14 JUL 0435	248	4.
13 JUL 0955	24	0.	13 JUL 1610	99	41.	13 JUL 2225	174	9.	14 JUL 0440	249	4.
13 JUL 1000	25	0.	13 JUL 1615	100	38.	13 JUL 2230	175	9.	14 JUL 0445	250	4.
13 JUL 1005	26	0.	13 JUL 1620	101	35.	13 JUL 2235	176	9.	14 JUL 0450	251	4.
13 JUL 1010	27	0.	13 JUL 1625	102	33.	13 JUL 2240	177	9.	14 JUL 0455	252	4.
13 JUL 1015	28	0.	13 JUL 1630	103	32.	13 JUL 2245	178	9.	14 JUL 0500	253	4.
13 JUL 1020	29	0.	13 JUL 1635	104	30.	13 JUL 2250	179	8.	14 JUL 0505	254	4.
13 JUL 1025	30	0.	13 JUL 1640	105	29.	13 JUL 2255	180	8.	14 JUL 0510	255	4.
13 JUL 1030	31	0.	13 JUL 1645	106	28.	13 JUL 2300	181	8.	14 JUL 0515	256	4.
13 JUL 1035	32	0.	13 JUL 1650	107	27.	13 JUL 2305	182	8.	14 JUL 0520	257	4.
13 JUL 1040	33	0.	13 JUL 1655	108	26.	13 JUL 2310	183	8.	14 JUL 0525	258	4.
13 JUL 1045	34	0.	13 JUL 1700	109	26.	13 JUL 2315	184	8.	14 JUL 0530	259	4.
13 JUL 1050	35	0.	13 JUL 1705	110	25.	13 JUL 2320	185	8.	14 JUL 0535	260	4.
13 JUL 1055	36	0.	13 JUL 1710	111	24.	13 JUL 2325	186	8.	14 JUL 0540	261	4.
13 JUL 1100	37	0.	13 JUL 1715	112	23.	13 JUL 2330	187	7.	14 JUL 0545	262	4.
13 JUL 1105	38	0.	13 JUL 1720	113	21.	13 JUL 2335	188	7.	14 JUL 0550	263	4.
13 JUL 1110	39	0.	13 JUL 1725	114	22.	13 JUL 2340	189	7.	14 JUL 0555	264	4.
13 JUL 1115	40	0.	13 JUL 1730	115	21.	13 JUL 2345	190	7.	14 JUL 0600	265	4.
13 JUL 1120	41	0.	13 JUL 1735	116	20.	13 JUL 2350	191	7.	14 JUL 0605	266	4.
13 JUL 1125	42	0.	13 JUL 1740	117	20.	13 JUL 2355	192	7.	14 JUL 0610	267	4.
13 JUL 1130	43	0.	13 JUL 1745	118	19.	14 JUL 0000	193	7.	14 JUL 0615	268	4.
13 JUL 1135	44	0.	13 JUL 1750	119	19.	14 JUL 0005	194	7.	14 JUL 0620	269	4.
13 JUL 1140	45	0.	13 JUL 1755	120	18.	14 JUL 0010	195	7.	14 JUL 0625	270	4.
13 JUL 1145	46	0.	13 JUL 1800	121	18.	14 JUL 0015	196	7.	14 JUL 0630	271	4.
13 JUL 1150	47	0.	13 JUL 1805	122	17.	14 JUL 0020	197	7.	14 JUL 0635	272	4.
13 JUL 1155	48	0.	13 JUL 1810	123	17.	14 JUL 0025	198	7.	14 JUL 0640	273	4.
13 JUL 1200	49	0.	13 JUL 1815	124	16.	14 JUL 0030	199	7.	14 JUL 0645	274	4.
13 JUL 1205	50	0.	13 JUL 1820	125	15.	14 JUL 0035	200	7.	14 JUL 0650	275	4.
13 JUL 1210	51	0.	13 JUL 1825	126	14.	14 JUL 0040	201	7.	14 JUL 0655	276	4.
13 JUL 1215	52	0.	13 JUL 1830	127	14.	14 JUL 0045	202	7.	14 JUL 0700	277	4.
13 JUL 1220	53	0.	13 JUL 1835	128	13.	14 JUL 0050	203	7.	14 JUL 0705	278	4.
13 JUL 1225	54	0.	13 JUL 1840	129	13.	14 JUL 0055	204	7.	14 JUL 0710	279	4.
13 JUL 1230	55	0.	13 JUL 1845	130	13.	14 JUL 0100	205	7.	14 JUL 0715	280	4.
13 JUL 1235	56	0.	13 JUL 1850	131	13.	14 JUL 0105	206	7.	14 JUL 0720	281	4.
13 JUL 1240	57	0.	13 JUL 1855	132	12.	14 JUL 0110	207	7.	14 JUL 0725	282	4.
13 JUL 1245	58	0.	13 JUL 1900	133	12.	14 JUL 0115	208	7.	14 JUL 0730	283	4.
13 JUL 1250	59	0.	13 JUL 1905	134	12.	14 JUL 0120	209	7.	14 JUL 0735	284	4.
13 JUL 1255	60	0.	13 JUL 1910	135	12.	14 JUL 0125	210	7.	14 JUL 0740	285	4.
13 JUL 1300	61	0.	13 JUL 1915	136	12.	14 JUL 0130	211	7.	14 JUL 0745	286	4.
13 JUL 1305	62	0.	13 JUL 1920	137	11.	14 JUL 0135	212	7.	14 JUL 0750	287	4.
13 JUL 1310	63	0.	13 JUL 1925	138	11.	14 JUL 0140	213	7.	14 JUL 0755	288	4.

13 JUL 1315	64	0.	*	13 JUL 1930	139	11.	*	14 JUL 0145	214	7.	*	14 JUL 0800	289	4.
13 JUL 1320	65	0.	*	13 JUL 1935	140	11.	*	14 JUL 0150	215	7.	*	14 JUL 0805	290	3.
13 JUL 1325	66	0.	*	13 JUL 1940	141	11.	*	14 JUL 0155	216	7.	*	14 JUL 0810	291	3.
13 JUL 1330	67	0.	*	13 JUL 1945	142	11.	*	14 JUL 0200	217	7.	*	14 JUL 0815	292	3.
13 JUL 1335	68	0.	*	13 JUL 1950	143	11.	*	14 JUL 0205	218	7.	*	14 JUL 0820	293	3.
13 JUL 1340	69	0.	*	13 JUL 1955	144	11.	*	14 JUL 0210	219	7.	*	14 JUL 0825	294	3.
13 JUL 1345	70	.8.	*	13 JUL 2000	145	11.	*	14 JUL 0215	220	7.	*	14 JUL 0830	295	3.
13 JUL 1350	71	37	*	13 JUL 2005	146	11.	*	14 JUL 0220	221	7.	*	14 JUL 0835	296	3.
13 JUL 1355	72	40.	*	13 JUL 2010	147	11.	*	14 JUL 0225	222	7.	*	14 JUL 0840	297	3.
13 JUL 1400	73	153.	*	13 JUL 2015	148	11.	*	14 JUL 0230	223	7.	*	14 JUL 0845	298	3.
13 JUL 1405	74	193.	*	13 JUL 2020	149	11.	*	14 JUL 0235	224	7.	*	14 JUL 0850	299	3.
13 JUL 1410	75	202.	*	13 JUL 2025	150	11.	*	14 JUL 0240	225	7.	*	14 JUL 0855	300	3.
			*				*				*			

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	24.92-HR	
* (CFS)	(HR)					
		(CFS)				
* 202.	6.17	44.	15.	14.	14.	
		(INCHES) .998	1.328	1.328	1.328	
		(AC-FT) 22.	29.	29.	29.	

CUMULATIVE AREA = .41 SQ MI

*** ***

```
          **************
          *            *
73 KK     *     DPB    *
          *            *
          **************
```

79 KO OUTPUT CONTROL VARIABLES
IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

78 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP ELEV TYPE OF INITIAL CONDITION
RSVRIC 6575.00 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

74 SV	STORAGE	.0	.1	1.4	3.8	7.1	12.1	17.6	23.6	29.7	36.0
76 SE	ELEVATION	6575.00	6576.00	6577.00	6578.00	6579.00	6580.00	6581.00	6582.00	6583.00	6584.00
77 SQ	DISCHARGE	0.	4.	13.	20.	25.	29.	35.	38.	40.	42.

***

****

HYDROGRAPH AT STATION DPB

****

DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE
13 JUL 0800	1	0.	.0	6575.0	13 JUL 1620	101	28.	11.4	6579.9	14 JUL 0040	201	18.	3.2	6577.8
13 JUL 0805	2	0.	.0	6575.0	13 JUL 1625	102	28.	11.4	6579.9	14 JUL 0045	202	18.	3.1	6577.7
13 JUL 0810	3	0.	.0	6575.0	13 JUL 1630	103	28.	11.4	6579.9	14 JUL 0050	203	18.	3.1	6577.7
13 JUL 0815	4	0.	.0	6575.0	13 JUL 1635	104	28.	11.5	6579.9	14 JUL 0055	204	18.	3.0	6577.7
13 JUL 0820	5	0.	.0	6575.0	13 JUL 1640	105	28.	11.5	6579.9	14 JUL 0100	205	17.	2.9	6577.6
13 JUL 0825	6	0.	.0	6575.0	13 JUL 1645	106	28.	11.5	6579.9	14 JUL 0105	206	17.	2.8	6577.6
13 JUL 0830	7	0.	.0	6575.0	13 JUL 1650	107	28.	11.5	6579.9	14 JUL 0110	207	17.	2.8	6577.6
13 JUL 0835	8	0.	.0	6575.0	13 JUL 1655	108	28.	11.5	6579.9	14 JUL 0115	208	17.	2.7	6577.6
13 JUL 0840	9	0.	.0	6575.0	13 JUL 1700	109	28.	11.4	6579.9	14 JUL 0120	209	16.	2.6	6577.5
13 JUL 0845	10	0.	.0	6575.0	13 JUL 1705	110	28.	11.4	6579.9	14 JUL 0125	210	16.	2.6	6577.5
13 JUL 0850	11	0.	.0	6575.0	13 JUL 1710	111	28.	11.4	6579.9	14 JUL 0130	211	16.	2.5	6577.5
13 JUL 0855	12	0.	.0	6575.0	13 JUL 1715	112	28.	11.4	6579.8	14 JUL 0135	212	16.	2.5	6577.4
13 JUL 0900	13	0.	.0	6575.0	13 JUL 1720	113	28.	11.3	6579.8	14 JUL 0140	213	16.	2.4	6577.4
13 JUL 0905	14	0.	.0	6575.0	13 JUL 1725	114	28.	11.3	6579.8	14 JUL 0145	214	15.	2.3	6577.4
13 JUL 0910	15	0.	.0	6575.0	13 JUL 1730	115	28.	11.2	6579.8	14 JUL 0150	215	15.	2.3	6577.4
13 JUL 0915	16	0.	.0	6575.0	13 JUL 1735	116	28.	11.2	6579.8	14 JUL 0155	216	15.	2.2	6577.3
13 JUL 0920	17	0.	.0	6575.0	13 JUL 1740	117	28.	11.1	6579.8	14 JUL 0200	217	15.	2.2	6577.3
13 JUL 0925	18	0.	.0	6575.0	13 JUL 1745	118	28.	11.1	6579.8	14 JUL 0205	218	15.	2.1	6577.3
13 JUL 0930	19	0.	.0	6575.0	13 JUL 1750	119	28.	11.0	6579.8	14 JUL 0210	219	15.	2.1	6577.3
13 JUL 0935	20	0.	.0	6575.0	13 JUL 1755	120	28.	10.9	6579.8	14 JUL 0215	220	14.	2.0	6577.2
13 JUL 0940	21	0.	.0	6575.0	13 JUL 1800	121	28.	10.9	6579.7	14 JUL 0220	221	14.	2.0	6577.2
13 JUL 0945	22	0.	.0	6575.0	13 JUL 1805	122	28.	10.8	6579.7	14 JUL 0225	222	14.	1.9	6577.2
13 JUL 0950	23	0.	.0	6575.0	13 JUL 1810	123	28.	10.7	6579.7	14 JUL 0230	223	14.	1.9	6577.2
13 JUL 0955	24	0.	.0	6575.0	13 JUL 1815	124	28.	10.6	6579.7	14 JUL 0235	224	14.	1.8	6577.2
13 JUL 1000	25	0.	.0	6575.0	13 JUL 1820	125	28.	10.6	6579.7	14 JUL 0240	225	14.	1.8	6577.1
13 JUL 1005	26	0.	.0	6575.0	13 JUL 1825	126	28.	10.5	6579.7	14 JUL 0245	226	13.	1.7	6577.1
13 JUL 1010	27	0.	.0	6575.0	13 JUL 1830	127	28.	10.4	6579.6	14 JUL 0250	227	13.	1.7	6577.1
13 JUL 1015	28	0.	.0	6575.0	13 JUL 1835	128	27.	10.3	6579.6	14 JUL 0255	228	13.	1.6	6577.1
13 JUL 1020	29	0.	.0	6575.0	13 JUL 1840	129	27.	10.2	6579.6	14 JUL 0300	229	13.	1.6	6577.1
13 JUL 1025	30	0.	.0	6575.0	13 JUL 1845	130	27.	10.1	6579.6	14 JUL 0305	230	13.	1.5	6577.1
13 JUL 1030	31	0.	.0	6575.0	13 JUL 1850	131	27.	10.0	6579.6	14 JUL 0310	231	13.	1.5	6577.0
13 JUL 1035	32	0.	.0	6575.0	13 JUL 1855	132	27.	9.9	6579.5	14 JUL 0315	232	13.	1.5	6577.0
13 JUL 1040	33	0.	.0	6575.0	13 JUL 1900	133	27.	9.8	6579.5	14 JUL 0320	233	12.	1.4	6577.0
13 JUL 1045	34	0.	.0	6575.0	13 JUL 1905	134	27.	9.7	6579.5	14 JUL 0325	234	12.	1.4	6577.0
13 JUL 1050	35	0.	.0	6575.0	13 JUL 1910	135	27.	9.6	6579.5	14 JUL 0330	235	12.	1.3	6576.9
13 JUL 1055	36	0.	.0	6575.0	13 JUL 1915	136	27.	9.5	6579.5	14 JUL 0335	236	12.	1.3	6576.9
13 JUL 1100	37	0.	.0	6575.0	13 JUL 1920	137	27.	9.4	6579.4	14 JUL 0340	237	11.	1.3	6576.9
13 JUL 1105	38	0.	.0	6575.0	13 JUL 1925	138	27.	9.3	6579.4	14 JUL 0345	238	11.	1.2	6576.9
13 JUL 1110	39	0.	.0	6575.0	13 JUL 1930	139	27.	9.2	6579.4	14 JUL 0350	239	11.	1.2	6576.8
13 JUL 1115	40	0.	.0	6575.0	13 JUL 1935	140	26.	9.1	6579.4	14 JUL 0355	240	11.	1.2	6576.8
13 JUL 1120	41	0.	.0	6575.0	13 JUL 1940	141	26.	8.9	6579.3	14 JUL 0400	241	11.	1.2	6576.8
13 JUL 1125	42	0.	.0	6575.0	13 JUL 1945	142	26.	8.8	6579.3	14 JUL 0405	242	10.	1.1	6576.8
13 JUL 1130	43	0.	.0	6575.0	13 JUL 1950	143	26.	8.7	6579.3	14 JUL 0410	243	10.	1.1	6576.7
13 JUL 1135	44	0.	.0	6575.0	13 JUL 1955	144	26.	8.6	6579.3	14 JUL 0415	244	10.	1.1	6576.7

13	JUL	1140	45	0.	.0	6575.0	*	13	JUL	2000	145	26.	8.5	6579.3	*	14	JUL	0420	245	10.	1.1	6576.7
13	JUL	1145	46	0.	.0	6575.0	*	13	JUL	2005	146	26.	8.4	6579.2	*	14	JUL	0425	246	10.	1.0	6576.7
13	JUL	1150	47	0.	.0	6575.0	*	13	JUL	2010	147	26.	8.3	6579.2	*	14	JUL	0430	247	9.	1.0	6576.6
13	JUL	1155	48	0.	.0	6575.0	*	13	JUL	2015	148	26.	8.2	6579.2	*	14	JUL	0435	248	9.	1.0	6576.6
13	JUL	1200	49	0.	.0	6575.0	*	13	JUL	2020	149	26.	8.1	6579.2	*	14	JUL	0440	249	9.	.9	6576.6
13	JUL	1205	50	0.	.0	6575.0	*	13	JUL	2025	150	26.	8.0	6579.1	*	14	JUL	0445	250	9.	.9	6576.5
13	JUL	1210	51	0.	.0	6575.0	*	13	JUL	2030	151	25.	7.9	6579.1	*	14	JUL	0450	251	9.	.9	6576.5
13	JUL	1215	52	0.	.0	6575.0	*	13	JUL	2035	152	25.	7.8	6579.1	*	14	JUL	0455	252	8.	.8	6576.5
13	JUL	1220	53	0.	.0	6575.0	*	13	JUL	2040	153	25.	7.7	6579.1	*	14	JUL	0500	253	8.	.8	6576.5
13	JUL	1225	54	0.	.0	6575.0	*	13	JUL	2045	154	25.	7.6	6579.1	*	14	JUL	0505	254	8.	.8	6576.4
13	JUL	1230	55	0.	.0	6575.0	*	13	JUL	2050	155	25.	7.5	6579.0	*	14	JUL	0510	255	8.	.8	6576.4
13	JUL	1235	56	0.	.0	6575.0	*	13	JUL	2055	156	25.	7.4	6579.0	*	14	JUL	0515	256	8.	.7	6576.4
13	JUL	1240	57	0.	.0	6575.0	*	13	JUL	2100	157	25.	7.3	6579.0	*	14	JUL	0520	257	7.	.7	6576.4
13	JUL	1245	58	0.	.0	6575.0	*	13	JUL	2105	158	25.	7.2	6579.0	*	14	JUL	0525	258	7.	.7	6576.4
13	JUL	1250	59	0.	.0	6575.0	*	13	JUL	2110	159	25.	7.1	6578.9	*	14	JUL	0530	259	7.	.7	6576.3
13	JUL	1255	60	0.	.0	6575.0	*	13	JUL	2115	160	25.	7.0	6578.9	*	14	JUL	0535	260	7.	.6	6576.3
13	JUL	1300	61	0.	.0	6575.0	*	13	JUL	2120	161	24.	6.9	6578.9	*	14	JUL	0540	261	7.	.6	6576.3
13	JUL	1305	62	0.	.0	6575.0	*	13	JUL	2125	162	24.	6.8	6578.9	*	14	JUL	0545	262	7.	.6	6576.3
13	JUL	1310	63	0.	.0	6575.0	*	13	JUL	2130	163	24.	6.7	6578.8	*	14	JUL	0550	263	7.	.6	6576.3
13	JUL	1315	64	0.	.0	6575.0	*	13	JUL	2135	164	24.	6.6	6578.8	*	14	JUL	0555	264	6.	.6	6576.3
13	JUL	1320	65	0.	.0	6575.0	*	13	JUL	2140	165	24.	6.5	6578.8	*	14	JUL	0600	265	6.	.6	6576.3
13	JUL	1325	66	0.	.0	6575.0	*	13	JUL	2145	166	24.	6.4	6578.7	*	14	JUL	0605	266	6.	.5	6576.2
13	JUL	1330	67	0.	.0	6575.0	*	13	JUL	2150	167	24.	6.3	6578.7	*	14	JUL	0610	267	5.	.5	6576.2
13	JUL	1335	68	0.	.0	6575.0	*	13	JUL	2155	168	23.	6.2	6578.7	*	14	JUL	0615	268	6.	.5	6576.2
13	JUL	1340	69	0.	.0	6575.1	*	13	JUL	2200	169	23.	6.1	6578.7	*	14	JUL	0620	269	6.	.5	6576.2
13	JUL	1345	70	1.	.1	6575.3	*	13	JUL	2205	170	23.	6.0	6578.6	*	14	JUL	0625	270	6.	.5	6576.2
13	JUL	1350	71	4.	.3	6576.0	*	13	JUL	2210	171	23.	5.9	6578.6	*	14	JUL	0630	271	6.	.5	6576.2
13	JUL	1355	72	7.	.6	6576.3	*	13	JUL	2215	172	23.	5.8	6578.6	*	14	JUL	0635	272	5.	.5	6576.2
13	JUL	1400	73	12.	1.4	6576.9	*	13	JUL	2220	173	23.	5.7	6578.5	*	14	JUL	0640	273	5.	.4	6576.2
13	JUL	1405	74	16.	2.5	6577.4	*	13	JUL	2225	174	23.	5.6	6578.5	*	14	JUL	0645	274	5.	.4	6576.1
13	JUL	1410	75	20.	3.7	6578.0	*	13	JUL	2230	175	22.	5.5	6578.5	*	14	JUL	0650	275	5.	.4	6576.1
13	JUL	1415	76	22.	4.8	6578.3	*	13	JUL	2235	176	22.	5.4	6578.5	*	14	JUL	0655	276	5.	.4	6576.1
13	JUL	1420	77	23.	5.8	6578.6	*	13	JUL	2240	177	22.	5.3	6578.4	*	14	JUL	0700	277	5.	.4	6576.1
13	JUL	1425	78	24.	6.5	6578.8	*	13	JUL	2245	178	22.	5.2	6578.4	*	14	JUL	0705	278	5.	.4	6576.1
13	JUL	1430	79	25.	7.1	6578.9	*	13	JUL	2250	179	22.	5.2	6578.4	*	14	JUL	0710	279	5.	.4	6576.1
13	JUL	1435	80	25.	7.6	6579.0	*	13	JUL	2255	180	22.	5.1	6578.4	*	14	JUL	0715	280	5.	.4	6576.1
13	JUL	1440	81	26.	8.0	6579.1	*	13	JUL	2300	181	22.	5.0	6578.3	*	14	JUL	0720	281	5.	.4	6576.1
13	JUL	1445	82	26.	8.3	6579.2	*	13	JUL	2305	182	22.	4.9	6578.3	*	14	JUL	0725	282	5.	.3	6576.1
13	JUL	1450	83	26.	8.6	6579.3	*	13	JUL	2310	183	21.	4.8	6578.3	*	14	JUL	0730	283	5.	.3	6576.1
13	JUL	1455	84	26.	8.9	6579.3	*	13	JUL	2315	184	21.	4.7	6578.3	*	14	JUL	0735	284	5.	.3	6576.1
13	JUL	1500	85	27.	9.1	6579.4	*	13	JUL	2320	185	21.	4.6	6578.2	*	14	JUL	0740	285	5.	.3	6576.1
13	JUL	1505	86	27.	9.4	6579.4	*	13	JUL	2325	186	21.	4.5	6578.2	*	14	JUL	0745	286	5.	.3	6576.1
13	JUL	1510	87	27.	9.6	6579.5	*	13	JUL	2330	187	21.	4.4	6578.2	*	14	JUL	0750	287	5.	.3	6576.0
13	JUL	1515	88	27.	9.8	6579.5	*	13	JUL	2335	188	21.	4.3	6578.2	*	14	JUL	0755	288	5.	.3	6576.0
13	JUL	1520	89	27.	10.0	6579.6	*	13	JUL	2340	189	21.	4.2	6578.1	*	14	JUL	0800	289	4.	.3	6576.0
13	JUL	1525	90	27.	10.1	6579.6	*	13	JUL	2345	190	21.	4.1	6578.1	*	14	JUL	0805	290	4.	.3	6576.0
13	JUL	1530	91	27.	10.3	6579.6	*	13	JUL	2350	191	20.	4.1	6578.1	*	14	JUL	0810	291	4.	.3	6576.0
13	JUL	1535	92	28.	10.4	6579.7	*	13	JUL	2355	192	20.	4.0	6578.1	*	14	JUL	0815	292	4.	.3	6576.0
13	JUL	1540	93	28.	10.6	6579.7	*	14	JUL	0000	193	20.	3.9	6578.0	*	14	JUL	0820	293	4.	.3	6576.0
13	JUL	1545	94	28.	10.7	6579.7	*	14	JUL	0005	194	20.	3.8	6578.0	*	14	JUL	0825	294	4.	.2	6576.0
13	JUL	1550	95	28.	10.8	6579.7	*	14	JUL	0010	195	20.	3.7	6578.0	*	14	JUL	0830	295	4.	.2	6575.9
13	JUL	1555	96	28.	10.9	6579.8	*	14	JUL	0015	196	20.	3.6	6577.9	*	14	JUL	0835	296	3.	.2	6575.8
13	JUL	1600	97	28.	11.1	6579.8	*	14	JUL	0020	197	19.	3.5	6577.9	*	14	JUL	0840	297	3.	.2	6575.8
13	JUL	1605	98	28.	11.2	6579.8	*	14	JUL	0025	198	19.	3.4	6577.9	*	14	JUL	0845	298	3.	.2	6575.7
13	JUL	1610	99	28.	11.2	6579.8	*	14	JUL	0030	199	19.	3.4	6577.8	*	14	JUL	0850	299	3.	.2	6575.7
13	JUL	1615	100	28.	11.3	6579.8	*	14	JUL	0035	200	18.	3.3	6577.8	*	14	JUL	0855	300	3.	.2	6575.6
							*								*							

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)					
		(CFS)				
28.	8.75		27.	14.	14.	14.
		(INCHES)	.624	1.321	1.321	1.321
		(AC-FT)	14.	29.	29.	29.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
(AC-FT)	(HR)				
11.	8.75	10.	4.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
(FEET)	(HR)				
6579.87	8.67	6579.58	6577.39	6577.30	6577.30

CUMULATIVE AREA = .41 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	B8	163.	6.00	18.	5.	5.	.05		
ROUTED TO	2AP	36.	6.33	17.	5.	5.	.05		
								6741.68	6.33
HYDROGRAPH AT	B83	3.	6.00	0.	0.	0.	.00		
2 COMBINED AT	5	37.	6.33	17.	5.	5.	.06		
ROUTED TO	5-9	37.	6.50	17.	5.	5.	.06		
HYDROGRAPH AT	B	195.	6.08	22.	8.	7.	.31		
HYDROGRAPH AT	2389	16.	6.00	1.	0.	0.	.01		
3 COMBINED AT	9	202.	6.08	40.	13.	13.	.38		
ROUTED TO									

+		9-13	194.	6.17	40.	13.	13.	.38	
	HYDROGRAPH AT								
+		12	47	6.00	4.	1.	1.	03	
	2 COMBINED AT								
+		13	202.	6.17	44.	5	14.	41	
	ROUTED TO								
+		OPB	28.	8.75	27.	.4.	14	41	
-								6579.47	6.47

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
5-9	MANE	5.00	37.06	390.00	3.34	5.00	37.06	390.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1036E+02 EXCESS= .0000E+00 OUTFLOW= .1031E+02 BASIN STORAGE= .5928E-01 PERCENT ERROR= -.3

9-13	MANE	3.96	198.80	368.15	1.31	5.00	193.66	370.00	1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2648E+02 EXCESS= .0000E+00 OUTFLOW= .2648E+02 BASIN STORAGE= .2108E-01 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

AVG END AREA POND B

ELEV	AREA (FT^2)	AVG END AREA (FT^2)	CUMULATIVE VOL (FT^3)	HEC ACRES
6575.17	435.11			
6576	26772	13603.555	11290.95065	0.26
6577	74426	50599	61889.95065	1.42
6578	128628.57	101527.285	163417.2357	3.76
6579	182364.92	155496.745	318913.9807	7.34
6580	228663.81	205514.365	524428.3457	12.07
6581	255205	241934.405	766362.7507	17.63
6582	262735	258970	1025332.751	23.59
6583	268288	265511.5	1290844.251	29.70
6584	277803	273045.5	1563889.751	35.98

100 YR WSL = 6579.87' AT 11 AC FT OUTFLOW 28 CFS

FREEBOARD = 6583.35 (ROAD OVERTOP) − 6579.87 = 3.48'

DEPTH OF 100 YR WSL = INVERT OF OUTFLOW PIPE 6575.17 − 100 YR WSL 6579.87
= 4.7'

USE TYPE D INLET FOR SECONDARY OUTFLOW IN CASE OF 100 YR FLOOD + 100 % CLOGGING

CHECK GRATE CAPACITY OF TYPE D GRATE TO ENSURE 28 CFS CAP

WEIR EQUATION $Q = CLH^{3/2}$

$C = 2.8$

$L = 12.29'$ (PERIMETER OF GRATE)

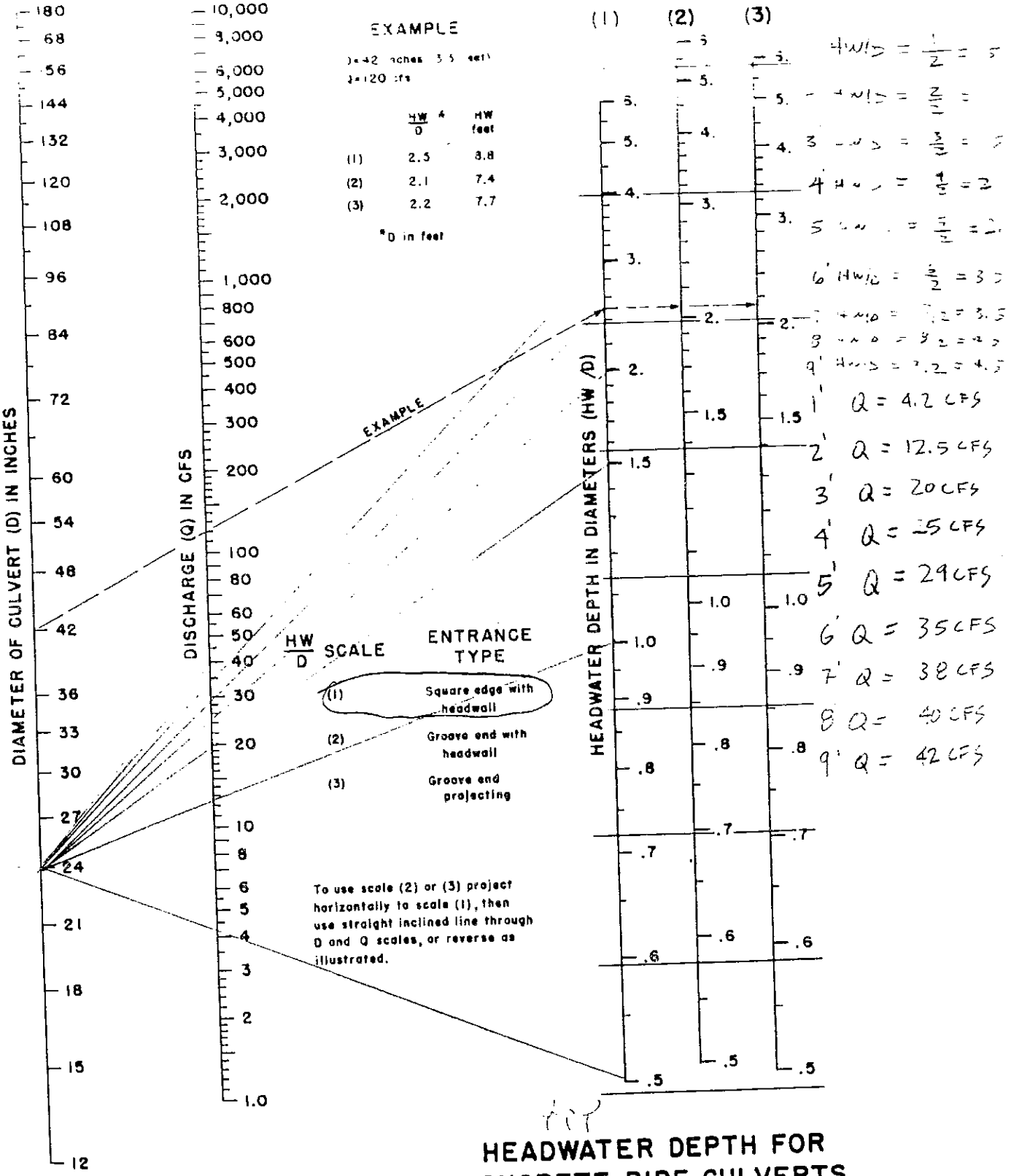
$Q = 28$ CFS

$H = ?$

$H = .87'$ OR $10.46''$

∴ W/ 100% CLOGGING WATER IS PREDICTED TO POND TO $6579.87' + .87' = 6580.74'$

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX E

CALCULATIONS

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

STREET CAPACITY AND INLET SPACING CHART

ANY INLETS NOT INCLUDED HAVE BEEN PLACED ACCORDING TO GEOMETRIC CONTRAINTS
SUCH AS SUPER ELEVATION CHANGES, INTERSECTIONS, SUMP LOCATIONS ETC.

7/21/98 10:05

FAIRLANE INTERCHANGE

INITIAL CALCULATIONS FOR STORM SEWER IN FAIRLANE PARKWAY 7/21/98

	Initial Storm - 5 Year Storm				MAX STREET CAPACITY						Assumed 60% capture		ACTUAL SPREAD/DEPTH							
	Rational Method Hydrology				Manning's Equation for Street Flow (2% Cross Slope)								Manning's Equation for Street Flow (2% Cross Slope)						ROAD WIDTH	MAXIMUM ALLOW LENGTH
BASIN	C	A (acres)	I (in/hr)	Q (cms)	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	V (FPS)	FLOWBY (CFS)	RATIONAL + FLOWBY	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	PATH	ASSUME WIDEST	LENGTH BETWEEN INLETS
19764A	0.90	0.83	5.2	3.898	0.500	20.750	2.38%	4.390	22.393	5.10	1.56	3.898	0.293	10.400	2.38%	1.166	3.895	offsite -19764A	60	GEOMETRY
19764B	0.90	0.83	5.2	3.898	0.500	20.750	2.38%	4.390	22.393	5.10	1.56	3.898	0.293	10.400	2.38%	1.166	3.895	offsite -19764B	60	GEOMETRY
18967	0.90	0.69	5.2	3.229	0.500	20.750	0.99%	4.390	14.443	3.29	1.29	4.789	0.355	13.500	0.99%	1.907	4.792	19764B-18967	60	GEOMETRY
17598A	0.90	3.45	5.2	16.146	0.500	20.750	1.50%	4.390	17.778	4.05	6.46	17.705	0.500	20.750	1.50%	4.390	17.778	19764A-17598A	60	2504.70
17598B	0.90	2.76	5.2	12.917	0.500	20.750	1.50%	4.390	17.778	4.05	5.17	14.476	0.470	19.250	1.50%	3.790	14.629	19764B-17598B	60	2003.76
16200A	0.90	1.93	5.2	9.032	0.500	20.750	2.00%	4.390	20.528	4.68	3.61	15.491	0.458	18.650	2.00%	3.563	15.562	17598A-16200A	60	1401.18
16200B	0.90	1.93	5.2	9.032	0.500	20.750	2.00%	4.390	20.528	4.68	3.61	14.199	0.458	18.650	2.00%	3.563	15.562	17598B-16200B	60	1401.18
15000	0.90	1.65	5.2	7.722	0.500	20.750	2.74%	4.390	24.027	5.47	3.09	11.335	0.395	15.500	2.74%	2.487	11.319	16200B-15000	60	GEOMETRY
14862A	0.90	1.84	5.2	8.611	0.500	20.750	2.00%	4.390	20.528	4.68	3.44	12.224	0.425	17.000	2.00%	2.974	12.254	15000-14862B	60	GEOMETRY
13275A	0.90	2.50	5.2	11.700	0.500	20.750	2.82%	4.390	24.375	5.55	4.68	11.700	0.398	15.650	2.82%	2.534	11.769	SH83-13275A	60	1815.00
13275B	0.90	2.40	5.2	11.232	0.500	20.750	2.82%	4.390	24.375	5.55	4.49	11.232	0.393	15.400	2.82%	2.456	11.295	SH83-13275B	60	1742.40
CHECK				131.255																
11302A	0.90	2.80	5.2	13.104	0.500	20.750	2.82%	4.390	24.375	5.55	5.24	17.784	0.452	18.350	2.82%	3.452	17.720	13275A-11302A	60	2032.80
11302B	0.90	2.89	5.2	13.525	0.500	20.750	2.82%	4.390	24.375	5.55	5.41	13.525	0.415	16.500	2.82%	2.807	13.476	FED-11302B	60	2098.14
24811	0.90	0.37	5.2	1.732	0.500	20.750	2.82%	4.390	24.375	5.55	0.69	7.142	0.341	12.800	2.82%	1.723	7.076	11302B-24811	60	GEOMETRY
CHECK				28.361																

1. ASSUME Tc= 5 Minutes
2. ASSUME n=0.016
3. BASED N ASSUMPTION #4. ASSUME MAXIMUM DEPTH OF FLOW @ GUTTER OF 6" OR .5 FT
4. ASSUME CITY STREET AND LEAVE ONE INSIDE 12 FT LANE (10' REQUIRED) OPEN FOR INITIAL STORM OR 6" AT FLOWLINE WHICHEVER IS MORE RESTRICTIVE

FAIRLANE INTERCHANGE

INITIAL CALCULATIONS FOR STORM SEWER IN FAIRLANE PARKWAY 7/21/98

	Major Storm - 100 Year Storm				MAX STREET CAPACITY						Assumed 60% capture		ACTUAL SPREAD/DEPTH							
	Rational Method Hydrology				Manning's Equation for Street Flow (2% Cross Slope)								Manning's Equation for Street Flow (2% Cross Slope)						ROAD WIDTH	MAXIMUM ALLOW LENGTH
BASIN	C	A (acres)	I (in/hr)	Q (cfs)	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	V (FPS)	FLOWBY (CFS)	RATIONAL + FLOWBY	d (FT)	W (FT)	S (%)	A (FT2)	Q (CFS)	PATH	ASSUME WIDEST	LENGTH BETWEEN INLETS
19764A	0.95	0.83	9.0	7.122	0.670	29.250	2.38%	8.640	55.055	6.37	2.85	7.122	0.346	13.050	2.38%	1.787	6.823	offsite -19764A	60	GEOMETRY
19764B	0.95	0.83	9.0	7.122	0.670	29.250	2.38%	8.640	55.055	6.37	2.85	7.122	0.346	13.050	2.38%	1.787	6.823	offsite -19764B	60	GEOMETRY
18967	0.95	0.69	9.0	5.900	0.670	29.250	0.99%	8.640	35.508	4.11	2.36	8.748	0.420	16.750	0.99%	2.890	8.299	19764B-18967	60	GEOMETRY
17598A	0.95	3.45	9.0	29.498	0.670	29.250	1.50%	8.640	43.707	5.06	11.80	32.346	0.596	25.550	1.50%	6.612	30.628	19764A-17598A	60	5 year/geometry dictates
17598B	0.95	2.76	9.0	23.598	0.670	29.250	1.50%	8.640	43.707	5.06	9.44	26.447	0.558	23.650	1.50%	5.678	25.013	19764B-17598B	60	5 year/geometry dictates
16200A	0.95	1.93	9.0	16.502	0.670	29.250	2.00%	8.640	50.468	5.84	6.60	28.301	0.545	23.000	2.00%	5.374	26.852	17598A-16200A	60	5 year/geometry dictates
16200B	0.95	1.93	9.0	16.502	0.670	29.250	2.00%	8.640	50.468	5.84	6.60	25.941	0.545	23.000	2.00%	5.374	26.852	17598B-16200B	60	5 year/geometry dictates
15000	0.95	1.65	9.0	14.108	0.670	29.250	2.74%	8.640	59.072	6.84	5.64	20.708	0.470	19.250	2.74%	3.790	19.772	17598B-16200B	60	5 year/geometry dictates
14862A	0.95	1.84	9.0	15.732	0.670	29.250	2.00%	8.640	50.468	5.84	6.28	22.333	0.497	20.600	2.00%	4.328	20.144	17598B-16200B	60	5 year/geometry dictates
13275B	0.95	2.50	9.0	21.375	0.670	29.250	2.82%	8.640	59.928	6.94	8.55	21.375	0.479	19.700	2.82%	3.965	21.298	SH83-13275A	60	5 year/geometry dictates
13275A	0.95	2.40	9.0	20.520	0.670	29.250	2.82%	8.640	59.928	6.94	8.21	20.520	0.472	19.350	2.82%	3.829	20.330	SH83-13275B	60	5 year/geometry dictates
CHECK				255.611																
11302A	0.95	2.80	9.0	23.940	0.670	29.250	2.82%	8.640	59.928	6.94	9.58	32.490	0.550	23.250	2.82%	5.490	32.799	13275A-11302A	60	5 year/geometry dictates
11302B	0.95	2.89	9.0	24.710	0.670	29.250	2.82%	8.640	59.928	6.94	9.88	24.710	0.500	20.750	2.82%	4.390	24.375	FED-11302B	60	5 year/geometry dictates
24811	0.95	0.37	9.0	3.164	0.670	29.250	2.82%	8.640	59.928	6.94	1.27	13.047	0.410	16.250	2.82%	2.725	12.959	11302B-24811	60	GEOMETRY
CHECK				51.813																

1. ASSUME Tc= 5 Minutes
2. ASSUME n=0.016
3. ASSUME MAXIMUM DEPTH OF FLOW @ GUTTER OF .666 FT OR 8 INCHES (CITY OF COLORADO SPRINGS)
(New criteria allows 12" max at flowline and 4" max at crown of street whichever is more restrictive. In this case 12" at FL is more restrictive, however using 8" at flowline for 100 , the 5 year still controls spacing.)

7/9/98 6:11						TIME OF CONCENTRATION									
						FAIRLANE									
SUBBASIN DATA				INITIAL/OVERLAND TIME			TRAVEL TIME					tc CHECK		CRITERIA	
Design Point		C5	C100	LENGTH (FT)	SLOPE (%)	ti (min)	LENGTH (FT)	SLOPE (%)	VEL (Fps)	tt (min)	tc (min)	LENGTH (FT)	tc CHECK	Smallest tc	tc Used
19764A		0.9	0.95	80	2	2.56	300.0	2.33	3.05	1.64	4.20	380	12.11	4.20	5.00
19764B		0.9	0.95	80	2	2.56	300.0	2.33	3.05	1.64	4.20	380	12.11	4.20	5.00
18967		0.9	0.95	85	2	2.64	805.0	2.33	3.05	4.39	7.04	890	14.94	7.04	7.04
17598A		0.9	0.95	80	2	2.56	1289.0	1.5	2.45	8.77	11.33	1369	17.61	11.33	11.33
17598B		0.9	0.95	80	2	2.56	1289.0	1.5	2.45	8.77	11.33	1369	17.61	11.33	11.33
16200A		0.9	0.95	80	2	2.56	1318.0	2.16	2.94	7.47	10.03	1398	17.77	10.03	10.03
16200B		0.9	0.95	80	2	2.56	1318.0	2.16	2.94	7.47	10.03	1398	17.77	10.03	10.03
15000		0.9	0.95	80	2	2.56	1120.0	2.74	3.31	5.64	8.20	1200	16.67	8.20	8.20
14862		0.9	0.95	80	2	2.56	1258.0	2.33	3.05	6.87	9.43	1338	17.43	9.43	9.43
13275A		0.9	0.95	80	2	2.56	1507.0	2.66	3.26	7.70	10.26	1587	18.82	10.26	10.26
13275B		0.9	0.95	80	2	2.56	1507.0	2.66	3.26	7.70	10.26	1587	18.82	10.26	10.26

FAIRLANE/PIPE DATA AND HYDRAULIC GRADE LINE-100 YEAR STORM

DATA AT D/S MH				CONDUIT DATA						DATA AT U/S MH			
D/S PIT NAME	D/S REF STATION	D/S INVERT	D/S HGL	PIPE FLOW	DIAMETER OR HEIGHT	# OF PAR. CONDUITS	DISTANCE BTWN MH'S	PIPE LENGTH	CONDUIT GRADE	U/S PIT NAME	U/S REF. STATION	U/S INVERT	U/S HGL
		FT	FT	CFS	FT	#	FT	FT	%			FT	FT
11302B	113+02.15	6638.49	6640.602	21.258	30	1	70.01	70.01	1.3	11302A	113+02.16	6639.4	6640.952
24811	248+16.68	6627.47	6629.435	48.078	30	1	344.12	344.12	3.06	11302B	113+02.15	6637.99	6640.278
24761	-	6625.96	6628.176	49.938	36	1	144	144	0.7	24811	-	6626.97	6629.187

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE/PIPE DATA AND HYDRAULIC GRADE LINE-5 YEAR STORM

DATA AT D/S MH				CONDUIT DATA						DATA AT U/S MH			
D/S PIT NAME	D/S REF STATION	D/S INVERT	D/S HGL	PIPE FLOW	DIAMETER OR HEIGHT	# OF PAR. CONDUITS	DISTANCE BTWN MH'S	PIPE LENGTH	CONDUIT GRADE	U/S PIT NAME	U/S REF. STATION	U/S INVERT	U/S HGL
		FT	FT	CFS	FT	#	FT	FT	%			FT	FT
11302B	113+02.15	6638.49	6639.958	13.946	30	1	70.01	70.01	1.3	11302A	113+02.16	6639.4	6640.643
24811	248+16.68	6627.47	6628.709	28.071	30	1	344.12	344.12	3.06	11302B	113+02.15	6637.99	6639.786
24761	-	6625.96	6627.501	29.127	36	1	144	144	0.7	24811	-	6626.97	6628.512

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE INTERCHANGE
XPRAT HYDROLOGIC DATA
100 YEAR STORM

NODE NAME	AREA		FLOWS						CRITICAL AREA DATA			
			SURFACE FLOWS				OVERFLOW					
	TOTAL	IMPERVIOUS	PIPE FLOW	CATCHMENT CONTRIBUTION	TOTAL GUTTER FLOW	CAPTURED FLOW	BYPASS FLOW	OVERFLOW DESTINATION	CRITICAL AREA Tc	INTENSITY	EQ. IMPERVIOUS AREA	CRITICAL PEAK FLOWS
	acre	acre	cfs	cfs	cfs	cfs	cfs		min	in/hr	acre	
11302A	2.8	0	21.258	24.138	24.138	21.258	2.880	11302B	5.00	9.00	2.66	22.264
11302B	2.89	0	48.078	24.673	27.525	27.230	0.500	24811	5.22	8.91	5.405	44.803
24811	0.37	0	49.938	3.076	3.562	3.370	0.434	24761	5.81	8.68	5.757	48.462
24761	-	-	-	0.000	0.428	3.370	0.000	-	6.10	8.56	5.757	45.841

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE INTERCHANGE
XPRAT HYDROLOGIC DATA
5 YEAR STORM

NODE NAME	AREA		FLOWS						CRITICAL AREA DATA			
			SURFACE FLOWS				OVERFLOW					
	TOTAL	IMPERVIOUS	PIPE FLOW	CATCHMENT CONTRIBUTION	TOTAL GUTTER FLOW	CAPTURED FLOW	BYPASS FLOW	OVERFLOW DESTINATION	CRITICAL AREA Tc	INTENSITY	EQ. IMPERVIOUS AREA	CRITICAL PEAK FLOWS
	acre	acre	cfs	cfs	cfs	cfs	cfs		min	in/hr	acre	
11302A	2.8	0	13.946	13.948	13.948	13.946	0.000	11302B	5.00	5.20	2.66	12.864
11302B	2.89	0	28.071	14.258	14.258	14.258	0.000	24811	5.23	5.15	5.405	25.892
24811	0.37	0	29.127	1.778	1.778	1.778	0.000	24761	5.83	5.02	5.757	26.866
24761	-	-	-	0.000	0.000	3.370	0.000	-	6.13	4.95	5.757	26.513

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE/PIPE DATA AND HYDRAULIC GRADE LINE-100 YEAR STORM

DATA AT D/S MH				CONDUIT DATA						DATA AT U/S MH			
D/S PIT NAME	D/S REF STATION	D/S INVERT	D/S HGL	PIPE FLOW	DIAMETER OR HEIGHT	# OF PAR. CONDUITS	DISTANCE BTWN MH'S	PIPE LENGTH	CONDUIT GRADE	U/S PIT NAME	U/S REF. STATION	U/S INVERT	U/S HGL
		FT	FT	CFS	FT	#	FT	FT	%			FT	FT
14650	146+49.95	6734.26	6735.675	33.998	30	1	150	150	1.83	NLIFPD	NEW LIFE	6737	6738.417
14594	145+93.96	6728.15	6732.459	33.885	30	1	156.13	156.13	2.47	14650	14650	6732	6733.97
14298	142+97.71	6721.4	6727.638	166.326	54	1	289.88	289.88	1.71	14594	14594	6726.35	6730.114
13697	136+97.30	6704.83	6710.953	163.078	54	1	594.3	594.3	2.75	14298	142+91.72	6721.2	6724.93
13275A	132+74.61	6695.08	6700.479	159.049	54	1	409.4	409.4	2.33	13697	136+91.28	6704.63	6708.294
13275B	132+74.61	6696.41	6700.479	6.411	18	1	123.5	123.5	0.5	13275A	132+66.68	6697.03	6700.94
OUT	-	6693.86	6697	182.821	54	1	50	50	2	13275B	-	6694.86	6698.832

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE/PIPE DATA AND HYDRAULIC GRADE LINE-5 YEAR STORM

DATA AT D/S MH				CONDUIT DATA						DATA AT U/S MH			
D/S PIT NAME	D/S REF STATION	D/S INVERT	D/S HGL	PIPE FLOW	DIAMETER OR HEIGHT	# OF PAR. CONDUITS	DISTANCE BTWN MH'S	PIPE LENGTH	CONDUIT GRADE	U/S PIT NAME	U/S REF. STATION	U/S INVERT	U/S HGL
		FT	FT	CFS	FT	#	FT	FT	%			FT	FT
14650	146+49.95	6734.26	6735.147	15	30	1	150	150	1.83	NLIFPD	NEW LIFE	6737	6737.89
14594	145+93.96	6728.15	6730.311	14.949	30	1	156.13	156.13	2.47	14650	14650	6732	6733.303
14298	142+97.71	6721.4	6725.361	85.442	54	1	289.88	289.88	1.71	14594	14594	6726.35	6729.034
13697	136+97.30	6704.83	6708.714	84.424	54	1	594.3	594.3	2.75	14298	142+91.72	6721.2	6723.87
13275A	132+74.61	6695.08	6699.363	81.985	54	1	409.4	409.4	2.33	13697	136+91.28	6704.63	6707.268
13275B	132+74.61	6698.41	6699.363	3.706	18	1	123.5	123.5	0.5	13275A	132+66.68	6697.03	6699.518
OUT	-	6693.86	6695.659	93.725	54	1	50	50	2	13275B	-	6694.86	6698.66

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE INTERCHANGE
XPRAT HYDROLOGIC DATA
100 YEAR STORM

NODE NAME	AREA		FLOWS						CRITICAL AREA DATA			
				SURFACE FLOWS			OVERFLOW					
	TOTAL	IMPERVIOUS	PIPE FLOW	CATCHMENT CONTRIBUTION	TOTAL GUTTER FLOW	CAPTURED FLOW	BYPASS FLOW	OVERFLOW DESTINATION	CRITICAL AREA Tc	INTENSITY	EQ. IMPERVIOUS AREA	CRITICAL PEAK FLOWS
	acre	acre	cfs	cfs	cfs	cfs	cfs		min	in/hr	acre	
NLIFPD	-	-	33.988	34.000	34.000	34.000	0.002	14650	54.00	2.84	11.874	31.362
14650	-	-	33.885	0.000	0.002	0.000	0.002	14594	54.24	2.83	11.874	31.262
14594	-	-	166.326	0.000	0.006	0.000	0.837	14298	29.26	4.17	39.717	154.174
14298	-	-	163.078	0.000	0.825	0.000	1.600	13897	29.88	4.11	39.717	151.884
13897	-	-	159.048	0.000	1.568	0.000	2.338	13275B	31.17	4.03	39.717	148.855
13275A	0.76	0	6.411	6.414	6.414	6.414	0.003	13275B	5.00	9.00	0.707	5.918
13275B	5.46	0	182.821	20.791	23.099	23.099	0.003	OFFSIT	32.08	3.98	45.611	168.612
OFFSIT	-	-	142.805	0.000	0.003	29.243	0.000	-	32.13	3.97	45.611	168.485

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

FAIRLANE INTERCHANGE
XPRAT HYDROLOGIC DATA
5 YEAR STORM

NODE NAME	AREA		FLOWS						CRITICAL AREA DATA			
				SURFACE FLOWS			OVERFLOW					
	TOTAL	IMPERVIOUS	PIPE FLOW	CATCHMENT CONTRIBUTION	TOTAL GUTTER FLOW	CAPTURED FLOW	BYPASS FLOW	OVERFLOW DESTINATION	CRITICAL AREA Tc	INTENSITY	EQ. IMPERVIOUS AREA	CRITICAL PEAK FLOWS
	acre	acre	cfs	cfs	cfs	cfs	cfs		min	in/hr	acre	
NLIFPD	-	-	15.000	15.000	15.000	15.000	0.000	14650	54.00	1.62	9.183	13.835
14650	-	-	14.949	0.000	0.000	0.000	0.003	14594	54.26	1.62	9.183	13.792
14594	-	-	85.442	0.000	0.004	0.000	0.000	14298	29.52	2.42	35.032	78.810
14298	-	-	84.424	0.000	0.000	0.000	0.002	13897	30.20	2.39	35.032	77.866
13897	-	-	81.985	0.000	0.002	0.000	0.003	13275B	31.56	2.32	35.032	75.618
13275A	0.76	0	3.706	3.706	3.706	3.706	0.000	13275B	5.00	5.20	0.707	3.419
13275B	5.46	0	93.725	11.879	11.883	11.883	0.003	OFFSIT	32.57	2.27	40.925	86.435
OFFSIT	-	-	142.805	0.000	0.003	29.243	0.000	-	32.62	2.27	40.925	86.359

*Note-Flows in this chart include projected cumulative flows from phase 2 of this project which is upstream of phase 1.

INLET LENGTH CALCULATION CHART
FROM HEC-12 - USING 100 YEAR Q VALUES

INLET #	Street Flow	*Inlet Drop*	*Gutter Width*	*Total Spread*	*Cross Slope*	*Longitudinal Slope*	Equivalent Cross Slope	*Roughness Coefficient*	Ratio of flow in a chosen width	Cross slope of gutter measured from slope of street section	Length of inlet for total interception	*Length of inlet selected*		MUST BE > OR = TO 60% Efficiency	Select Length does it give 60%+ pickup?
#	Q	a	W	T	Sx	S	Se	n	Eo	Sw'	Lt	L	L/Lt	E	L
19764A	6.747	0.333333	2	13.05	0.02	0.0238	0.080	0.016	0.36	0.17	23.76	4.00	0.17	28.2%	NO
19764A	6.747	0.333333	2	13.05	0.02	0.0238	0.080	0.016	0.36	0.17	23.76	10.00	0.42	62.6%	YES
19764B	6.747	0.333333	2	13.05	0.02	0.0238	0.080	0.016	0.36	0.17	23.76	4.00	0.17	28.2%	NO
19764B	6.747	0.333333	2	13.05	0.02	0.0238	0.080	0.016	0.36	0.17	23.76	10.00	0.42	62.6%	YES
17598A	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	4.00	0.08	13.9%	NO
17598A	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	10.00	0.20	33.0%	NO
17598A	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	18.00	0.36	55.1%	*YES
17598A	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	20.00	0.40	60.0%	YES
17598B	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	4.00	0.08	13.9%	NO
17598B	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	10.00	0.20	33.0%	NO
17598B	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	18.00	0.36	55.1%	*YES
17598B	30.644	0.333333	2	25.55	0.02	0.015	0.053	0.016	0.20	0.17	50.14	20.00	0.40	60.0%	YES
16200A	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	4.00	0.08	14.0%	NO
16200A	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	10.00	0.20	33.2%	NO
16200A	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	18.00	0.36	55.4%	NO
16200A	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	20.00	0.40	60.3%	YES
16200B	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	4.00	0.08	14.0%	NO
16200B	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	10.00	0.20	33.2%	NO
16200B	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	18.00	0.36	55.4%	NO
16200B	26.811	0.333333	2	23	0.02	0.02	0.056	0.016	0.22	0.17	49.80	20.00	0.40	60.3%	YES
15000	19.618	0.333333	2	19.25	0.02	0.0274	0.062	0.016	0.25	0.17	44.99	5.00	0.11	19.1%	NO
15000	19.618	0.333333	2	19.25	0.02	0.0274	0.062	0.016	0.25	0.17	44.99	14.00	0.31	48.9%	NO
15000	19.618	0.333333	2	19.25	0.02	0.0274	0.062	0.016	0.25	0.17	44.99	18.00	0.40	60.1%	YES
14862A															
14862A	IN SUMP USE SEPARATE METHOD TO CALCULATE CAPACITY.														
14862A															
13276A	18.63	0.333333	2	20	0.02	0.02	0.061	0.016	0.25	0.17	40.63	4.00	0.10	17.0%	NO
13276A	18.63	0.333333	2	20	0.02	0.02	0.061	0.016	0.25	0.17	40.63	8.00	0.20	32.6%	NO
13276A	18.63	0.333333	2	20	0.02	0.02	0.061	0.016	0.25	0.17	40.63	14.00	0.34	53.3%	NO
13276A	18.63	0.333333	2	20	0.02	0.02	0.061	0.016	0.25	0.17	40.63	16.00	0.39	59.4%	YES
13276B	18.63	0.333333	2	20	0.02	0.02	0.061	0.016	0.25	0.17	40.63	16.00	0.39	59.4%	YES
11278A	22.194	0.333333	2	23.1	0.02	0.0238	0.056	0.016	0.21	0.17	48.54	18.00	0.37	56.6%	NO
11278A	22.194	0.333333	2	23.1	0.02	0.0238	0.056	0.016	0.21	0.17	48.54	20.00	0.41	61.6%	YES
11278B	22.194	0.333333	2	23.1	0.02	0.0238	0.056	0.016	0.21	0.17	48.54	20.00	0.41	61.6%	YES
13275A	21.375	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	43.36	6.00	0.14	23.5%	NO
13275A	21.375	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	43.36	8.00	0.18	30.7%	NO
13275A	21.375	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	43.36	10.00	0.23	37.6%	NO
13275A	21.375	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	43.36	12.00	0.28	44.2%	NO
13275A	21.375	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	43.36	18.00	0.42	61.9%	YES
13275B	20.52	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	42.62	6.00	0.14	23.9%	NO
13275B	20.52	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	42.62	8.00	0.19	31.2%	NO
13275B	20.52	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	42.62	10.00	0.23	38.2%	NO
13275B	20.52	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	42.62	12.00	0.28	44.9%	NO
13275B	20.52	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	42.62	18.00	0.42	62.8%	YES
11302A	32.49	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	51.69	22.00	0.43	63.1%	YES
11302B	24.71	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	46.08	20.00	0.43	64.1%	YES

INLET LENGTH CALCULATION CHART
FROM HEC-12 - USING 5 YEAR Q VALUES

INLET #	Street Flow	*Inlet Drop*	*Gutter Width*	*Total Spread*	*Cross Slope*	*Longitudinal Slope*	Equivalent Cross Slope	*Roughness Coefficient*	Ratio of flow in a chosen width	Cross slope of gutter measured from slope of street section	Length of inlet for total interception	*Length of inlet selected*		MUST BE > OR = TO 60% Efficiency	Actual Physical length of inlet For 60%+ pickup
#	Q	a	W	T	Sx	S	Se	n	Eo	Sw'	Lt	L	L/Lt	E	L
19764A	3.898	0.333333	2	10.4	0.02	0.0238	0.092	0.016	0.43	0.17	17.27	4.00	0.23	37.8%	NO
19764A	3.898	0.333333	2	10.4	0.02	0.0238	0.092	0.016	0.43	0.17	17.27	8.00	0.46	67.4%	YES
19764B	3.898	0.333333	2	10.4	0.02	0.0238	0.092	0.016	0.43	0.17	17.27	4.00	0.23	37.8%	NO
19764B	3.898	0.333333	2	10.4	0.02	0.0238	0.092	0.016	0.43	0.17	17.27	8.00	0.46	67.4%	YES
17598A	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	4.00	0.12	20.2%	NO
17598A	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	10.00	0.29	46.6%	NO
17598A	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	16.00	0.47	68.2%	YES
17598B	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	4.00	0.12	20.2%	NO
17598B	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	10.00	0.29	46.6%	NO
17598B	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	14.00	0.41	61.6%	*YES
17598B	14.476	0.333333	2	20.75	0.02	0.015	0.060	0.016	0.24	0.17	33.98	16.00	0.47	68.2%	YES
16200A	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	4.00	0.11	18.8%	NO
16200A	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	10.00	0.27	43.7%	NO
16200A	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	14.00	0.38	58.0%	*YES
16200A	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	16.00	0.44	64.4%	YES
16200B	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	4.00	0.11	18.8%	NO
16200B	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	10.00	0.27	43.7%	NO
16200B	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	14.00	0.38	58.0%	*YES
16200B	15.491	0.333333	2	18.65	0.02	0.02	0.064	0.016	0.26	0.17	36.64	16.00	0.44	64.4%	YES
15000	11.335	0.333333	2	15.5	0.02	0.0274	0.071	0.016	0.31	0.17	32.93	5.00	0.15	25.7%	NO
15000	11.335	0.333333	2	15.5	0.02	0.0274	0.071	0.016	0.31	0.17	32.93	10.00	0.30	47.9%	NO
15000	11.335	0.333333	2	15.5	0.02	0.0274	0.071	0.016	0.31	0.17	32.93	14.00	0.43	63.1%	YES
14862A															
14862A	IN SUMP USE SEPARATE METHOD TO CALCULATE CAPACITY.														
14862A															
13275A	11.335	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.22	6.00	0.18	30.1%	NO
13275A	11.335	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.22	8.00	0.24	39.1%	NO
13275A	11.335	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.22	10.00	0.30	47.5%	NO
13275A	11.335	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.22	12.00	0.36	55.4%	NO
13275A	11.335	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.22	14.00	0.42	62.7%	YES
13275B	11.232	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.09	6.00	0.18	30.2%	NO
13275B	11.232	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.09	8.00	0.24	39.2%	NO
13275B	11.232	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.09	10.00	0.30	47.7%	NO
13275B	11.232	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.09	12.00	0.36	55.6%	NO
13275B	11.232	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	33.09	14.00	0.42	62.8%	YES
11302A	17.784	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	40.13	16.00	0.40	60.0%	YES
11302B	13.525	0.333333	2	15.5	0.02	0.0282	0.071	0.016	0.31	0.17	35.77	16.00	0.45	65.6%	YES

DEPARTMENT OF TRANSPORTATION

CITY OF COLORADO SPRINGS

APPENDIX F

RELATED CORRESPONDENCE AND MEETING NOTES

DMJM

Daniel, Mann, Johnson, & Mendenhall, Inc. (DMJM)
1490 West Fillmore Street, Suite 101, Colorado Springs, Colorado 80904 - (719) 471-9866

DEPARTMENT OF THE AIR FORCE

10TH CIVIL ENGINEER GROUP

USAF ACADEMY COLORADO

Mr. Thomas M. Mitchell
Deputy Civil Engineer
8120 Edgerton Drive, Suite 40
USAF Academy CO 80840-2240

Mr. Clyde L. Pikkaraine, Project Manager
Daniel, Mann, Johnson, & Mendenhall
1490 West Fillmore Street, Suite 101
Colorado Springs, CO 80904

Dear Mr. Pikkaraine

Thank you for continuing to work with my staff on the Fairlane Interchange project. In response to your verbal request, we have reviewed the alternative site locations for the detention related to the interchange. USAF Academy's preferred site for the bulk of Fairlane Interchange's detention is the Loop Pond.

Sincerely

THOMAS M. MITCHELL, GM14, DAF
Deputy Civil Engineer
10th Civil Engineer Group

FAIRLANE **DMJM**

APRIL 21, 1998

Subject: FAIRLANE DRAINAGE

By: rbb

Daniel, Mann, Johnson, & Mendenhall
1490 West Fillmore Street, Suite 101
Colorado Springs, CO 80904

Shelley L. Light
Base Community Planner
10 CEG/CEPD
8120 Edgerton Drive, Suite 40
USAF Academy, CO 80840

Dear Ms. Light

Attached you will find two plots which display the pond sizes you requested. These pond sizes are preliminary, however accurate for planning purposes. Pond sizes are reflected on the plots and also listed below. With the present grading the pond sizes are:

SE Pond
10.44 acres of surface area and approximately 7 feet of depth. This pond is required to store approximately 7 acre ft. Additional surface area results from landscaping grading with slopes as gradual as 10:1 which increase the footprint of the grading and not the storage of the pond.

Loop Pond
8.45 acres of surface area and approximately 5 feet of depth. This pond is required to store approximately 9 acre ft.

NE Pond
3.72 Acres of surface area and approximately 4 feet of depth. This pond is required to store approximately 4 acre ft.

As you recall the choices we discussed included the SE pond (yellow) in conjunction with the NE pond (blue). Or the Loop Pond (pink) in conjunction with NE pond (blue).

Sincerely,

Clyde L. Pikkaraine, PE
Project Manager

Robert B. Blegen, EIT
Designer

Stout Allen (Fairlane) Interchange Meeting Minutes

DMJM

June 23, 1998

Subject: Offsite Drainage

By: rbb

A meeting was held on the 9th of June 1998 at the CDOT office on Arvada Street in Colorado Springs. A list of attendees is attached. The subject of the meeting was offsite flow in relation to the Fairlane Interchange and Fairlane Parkway road project currently under design by DMJM.

Clyde Pikkaraine, the DMJM project manager stated some facts that are summarized as follows:

Offsite area O-1 (as designated in the last MDDP of the area) is situated northeast of the project. It is bounded by the Kettle Creek Basin on the south and Black Squirrel Basin on the north and flows southwest toward the project site in a "undefined" basin area between the aforementioned basins.

Runoff from offsite area O-1 presently is shown to contribute to the Fairlane Interchange project area on the last approved MDDP, but is shown to contribute to Kettle Creek in another study. Therefore a convoluted precedence for the runoff exists.

Runoff from offsite area O-1 generally has no defined channels indicating sheet flows. Flow appears to convergence at the very end of the basin where it is bounded by a ridge on the southeast. This flow would presumably travel southwest across a portion of the project. However, it was noted that the construction of Pikes Peak Community College and its surrounding road would cut this flow off, pushing the runoff south and then returning the flow into its original southwest direction. The proposed Fairlane Parkway parallels this access road already in place by the community college and therefore would not alter runoff to a much greater degree then is already altered by the community college.

Last, and possibly most import, future construction of the Powers Extension will most likely cut off the flow. It is unlikely from DMJM's assessment of a logical future profile that flow would be able to economically traverse this structure.

With the above information presented DMJM intended to proceed with the assumption that flow is at least cutoff by the future Powers extension if it even contributes today. DMJM intended to size the downstream storm sewer system based on this assumption.

Dennis Minchow stated that as the client representative he would not like to have the client pay for an improvement that in two years is not needed. The estimated cost difference was approximately 60K.

The CH2M Hill and URS representatives who are working on the future Powers Extension generally concurred with the fact that the proposed profile would most likely cutoff the flow onto the Fairlane Interchange site. They however stated that they could not say this for sure at this point. They would like to look at it in more detail before they committed to that statement. They are waiting survey and this examination would not occur in a time frame acceptable to the Fairlane Project.

Paul Reinsma (CDOT Hydraulics) brought up a number of issues related to the project. In the end of the discussion he wanted to know what we would do in the 2 year interim to deal with a 100 year event. A temporary detention facility was discussed. It was discussed that a temporary facility is probably needed there today then, as the new road would alter very little.

There are numerous permutations of basin combinations and pond sizings. For clarity, the questions you raised in your 30 March memo will be addressed individually below.

"What amount of detention is required for the interchange and what is required for offsite development?"

First it is important to clarify that detention for the interchange and historic offsite areas (not developed offsite areas) is the analysis target for this memorandum. All basins are taken from the URS Master Drainage Development Drainage Plan and Report approved by the AFA in 1994.

As a result, the question that is answered below reads "what amount of detention is required for the Fairlane Interchange and Fairlane Parkway west of SH83, and what is required for these road areas plus the offsite historic flows tributary to the interchange?" Three progressive scenarios are shown below.

1) To accommodate historic flows (based on the URS Master Development Drainage Plan) which accumulate at design point 7, no pond would be required if a 54" RCP was installed under I-25. In this scenario the AFA would receive the historic predicted peak flow of 193 CFS. If this historic flow was detained to release at the cross culvert capacity, a 6 Acre Ft. pond would be required which would discharge through the existing 24" RCP toward the crossing of I-25 at 23 CFS. This pond would be sited east of I-25 as shown in the preliminary hydraulics report. Historic flow is based on the 1994 URS ~~MDDP and assumes hydrologic~~ soil type A and B depending on the basin. Type A soils exhibit ~~high~~ infiltration rates when thoroughly ~~wetted~~ and are considered to have low runoff potential. – SURFACE AREA – PLAN VIEW

2) To accommodate historic flow ~~plus the developed~~ roadway of ~~Fairlane~~ Parkway up to Highway 83 a 1 acre ft. pond would be required discharging at the historic peak flow of 193 CFS toward the AFA. To limit flows toward the AFA to match the existing crossing capacity, a 7 acre ft. pond is required which would discharge through a 24" RCP at 24 CFS toward the AFA. Both of these ponds would be sited east of I-25 as shown in the preliminary hydraulics report. Historic flow is based on the 1994 URS MDDP and assumes hydrologic type A and B soils, depending on the basin.

3) To accommodate historic flow, the developed roadway of Fairlane Parkway up to Highway 83, and the developed Fairlane Interchange; a 2 acre ft. pond would be required discharging at the historic peak flow of 193 CFS toward the AFA. To limit flows toward the AFA to match the existing crossing capacity, a 9 acre ft. pond is required which would discharge at 24 CFS toward the AFA. These ponds would be sited in the loop ramp. Historic flow is based on the 1994 URS MDDP and assumes hydrologic type A and B soils, depending on the basin.

Design point 10 also requires detention consideration. Flows from offsite areas O-3B and O-5 collect at this point and require a 42" RCP to accommodate predicted flows of 93 CFS. Once again, the pipes under I-25 can be upsized and the flow to the AFA would be 93 CFS. To limit flows toward the AFA to existing crossing capacity, a 4 acre ft. pond is required which would discharge toward the AFA at 24 CFS. This pond would be sited east of the northeast ramp.

"Are the offsite areas referenced strictly related to the interchange, or other development?"

Other conversation occurred, but the above was a summary of the highlights. The conclusion of the meeting was that all in the room believed that the reality of Powers cutting off the flow was reasonable. This assumption will also be made in the DMJM drainage study.

Last, Paul Reinsma asked for a document be given to all involved that fully explained existing structures, historic flow patterns, and future liability of the area under discussion.

Robert Blegen E.I.T
Civil Designer

copy to:

file
C. Pikkaraine

SUBJECT _____ BY _____ DATE _____

SHEET NO. ____ OF ____

PROJECT NO _____

June 9 -

Fairlane Parkview / Powers Drainage
Coordination Mtg -

Attendees -

Name	Org	Ph #
Lee Eick	CH2M Hill	303-713-5209
Tim Mitros	City Eng	719-385-5061
Clyde Pikkaraine	DMJM	719-471-9866
Robert Bleegen	DMJM	" "
Dick Bennand	CDOT-R2 Envir.	719 546-5410
Paul Reinsma	CDOT Hydraulics	303-634-4365
Robert W. Burch	CDOT R2 Engineering	719-634-2323
Dennis Minchow	Rockwell-Minchow Const.	719-475-2575
Doug Lollar	CDOT R2 Engr.	719-382-9465
Gary Eckhardt	CDOT	719-634-2323
Duane Kramer	URSGreiner	(719) 531-0001

FAIRLANE **DMJM**

APRIL 20, 1998

Subject: FAIRLANE DRAINAGE By: rbb

Daniel, Mann, Johnson, & Mendenhall
1490 West Fillmore Street, Suite 101
Colorado Springs, CO 80904

Shelley L. Light
Base Community Planner
10 CEG/CEPD
8120 Edgerton Drive, Suite 40
USAF Academy, CO 80840

Dear Ms. Light

Thank you for your 30 March response to our memo regarding drainage issues for the Fairlane Parkway Interchange. This memo will further clarify options and issues and attempt to answer the questions you raised in your 30 March response.

First, the fundamental drainage issue is the balance between, 1) routing historic flows under I-25 west to the Air Force Academy, or 2) detaining these flows beyond historic in an attempt to limit flows to the Air Force Academy. Secondly, this memorandum will show the additional detention required beyond historic with the addition of developed flows **only** from the Fairlane Interchange and Fairlane Parkway west of SH83 as requested in your memos.

Although undersized I-25 crossings are usually simply upsized, it has been our continued understanding that the Air Force Academy would prefer to limit flow under I-25 to the capacity of the existing cross culverts. Recognizing the above, DMJM has developed scenarios to detain a portion of the historic flow and the developed flow associated **only** with the road improvements west of SH 83 in ponds. The only way to keep the downstream discharge lower, is to make the size of ponds upstream larger. The ponds would detain the majority of the 100 year storm runoff volume, while releasing at under historic peak flow (or the crossing culvert capacity) onto the Air Force Academy. In effect the detention takes the peak off the storm and discharges a smaller peak for a longer period of time. It is essential to understand the HEC-1 models predict that in a 100 year event the historic flow exceeds the capacity of the cross culverts. **Without any development, a pond or a larger cross culvert is currently required to accommodate the 100 year event.**

It should also be noted for comparison purposes that the last report approved by the AFA is the 1994 Master Development Drainage Report and Plan for Fairlane Technology Park. In this report the design proposed a detention pond collecting developed flows and discharging these flows through a 60" RCP to I-25 where flow would cross under I-25 through a 54" RCP in parallel with the existing 24" RCP. This pipe would discharge the historic peak flow of 193 CFS onto the AFA.

The offsite areas referenced in this memorandum are strictly related to the interchange. Numerous HEC-1 runs were made including and not including developed factors. However, in response to direction from the AFA we have included in this document (above) only offsite areas that have historically drained to I-25 and with historic (undeveloped) conditions. Once again, if the AFA does not want increased peak flows during a 100 year event, detention is required due to the inadequacy of the culverts to convey even the historic flows without any development. As mentioned above, the only developed flows that are included in the above analysis are from the proposed Fairlane Parkway up to SH 83 and from the developed interchange area.

In reference to siting alternatives you asked us to explain the statement **"just upstream as previously delineated". Is this location currently shown in the hydraulic report?**

Yes, this means upstream of design point seven, in the location that is delineated on the drainage basin map that was included in the preliminary hydraulic report.

In reference to the statement **"to base detention designs on an assumption that there will be no new development is not realistic, especially since the interchange is being built to encourage development."**

The preliminary drainage report included HEC-1 analysis that did include assumptions of higher curve numbers to reflect development. The preliminary analysis was based on the assumption that the pond may be allowed to serve the regional site when developed. However, with further input from the AFA we have now limited our analysis in this document to the request in the 16 March memo asking for "size of detention associated with the interchange itself." In this sizing assumption we have included developed Fairlane Parkway west of SH83 and all historic basins (with historic, **not** developed flows) which are tributary to it.

In addition, this proposed interchange and roadway network are more than a system being built to encourage development. This road network will be the connector between I-25, SH83 and the proposed extension of Powers Boulevard. As our project is a highway interchange and City Arterial, it is not in the scope of this drainage study to analyze the development that may occur in and around the road network. Some information related to developed conditions was included in the preliminary drainage report as a potential scenario. However, it is our realization and intention for future developed flows unrelated to the interchange to be worked out between the developer and the AFA.

Simply stated we have attempted first to show the AFA (above) what size of pond would be required based on historic flows (without development) as requested. These flows come to the highway cross culvert presently without any alteration. In a 100 year event these flows exceed the culvert capacity and need detention or a larger cross culvert. Next, we included a portion of Fairlane Parkway west of SH83 and the developed interchange to demonstrate what would be needed in terms of detention to accommodate historic flows, plus developed flows from a portion of Fairlane Parkway and the developed interchange. These scenarios are in response to your request in the 16 March memo asking for "size if detention associated with the interchange itself." It is not possible to detain just for the interchange without recognizing the historic flows which flow toward it.

In respect to additional development and subsequent "aggregate detention" on this site, we will have to defer those questions once again for the developers and the AFA to decide. Again, some overall basin characteristics were explored in the preliminary drainage report. However, it is not the intent of the present study to present another Master Drainage Development Plan and Report, but to simply address the issues

which affect the construction of our project which consists of a freeway interchange and City Arterial.

A table summarizing some scenarios is attached.

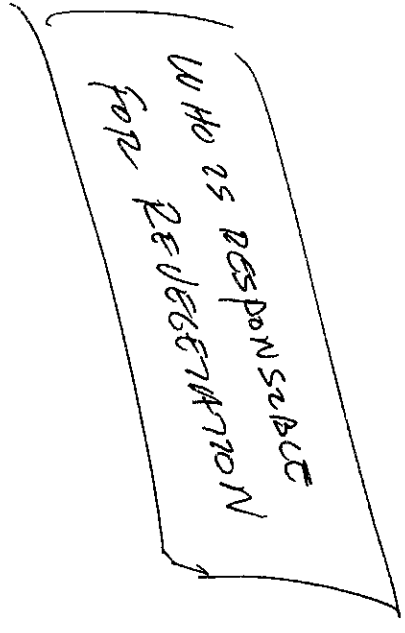
Sincerely,

Clyde L. Pikkaraine, PE
Project Manager

Robert B. Blegen, EIT
Designer

SUMMARY TABLES FOR POND/BASIN OPTIONS
FAIRLANE PARKWAY

Hec-1 File Name	REQUIRED POND SIZE	POND SITING	OUTFALL PIPE SIZE	HISTORIC FLOW TO AFA	PROPOSED FLOW TO AFA	BASIN DESCRIPTION
HISB.INP/URS	0 Acre ft.	No Pond	Single 54" + 24" Exist RCP/MDDP	193 CFS/DSPT 7	193 CFS / DSPT 7	Historic (type A & B soils)/URS MDDP
HISBA.INP	6 Acre ft.	EAST	Single 24" RCP/PROPOSED	193 CFS/DSPT 7	23 CFS / DSPT 7	Historic (type A & B soils)/URS MDDP
HISBB2.INP	1 Acre ft.	EAST	Single 60" RCP/MDDP	193 CFS/DSPT 7	193 CFS / DSPT 7	Historic (type A & B soils)/+Developed Fairlane Parkway
HISBB.INP	7 Acre ft.	EAST	Single 24" RCP/PROPOSED	193 CFS/DSPT 7	24 CFS / DSPT 7	Historic (type A & B soils)/+Developed Fairlane Parkway
HISBC1.INP	2 Acre ft.	LOOP	Single 60" RCP/ = to MDDP	213 CFS/DSPT 13	193 CFS / DSPT 13	Historic (type A & B soils)/+Developed Fairlane Parkway+Developed Interchange
HISBC2.INP	9 Acre ft.	LOOP	Single 24" RCP/PROPOSED	213 CFS/DSPT 13	24 CFS / DSPT 13	Historic (type A & B soils)/+Developed Fairlane Parkway+Developed Interchange
FOR10.INP	4 Acre ft.	North East	Outfall Pipe Size 24" RCP	unstudied basin Pipe capacity 25 cfs	24 CFS /DSPT 10	Historic Basin (type B soil)



Name	Org.	#
Shelton Light	10 CEG/CEPD	333-2153
Phil Voegtle	510 CES/CEVCW	3-4483
Dennis Minchow	Rockwell-Minchow Consult.	475-2575
Clyde Pikkarainc	DMJM	471-9866
Robert Blegen	"	"
Reed Olson	510 CES/CECE	333-3460
JOSH KELLAR	510 CES/CEVP	333-4483

FAIRLANE INTERCHANGE HYDRAULIC REPORT
PHASE 1 FINAL PHASE 2 PRELIMINARY

0 400 800 1200
SCALE IN FEET

N

LEGEND
- 0-2A / 20.37 — BASIN DESIGNATION / BASIN AREA (ACRES)
- FLOW ARROW
- 1 — DESIGN POINT
- BASIN BOUNDARY

0-4 / 50
HISTORIC 100 YEAR FLOW = 61 CFS 36RCP/24CMP EXIST
30"

0-3C / 104
HISTORIC 100 YEAR FLOW = 117 CFS 48RCP/24CMP EXIST

HISTORIC 100 YEAR FLOW = 95CFS 42RCP/24RCP EXIST

STORM SEWER
150 CFS 54"RCP
23.375 Tc

I-25 CULVERT CAPACITY 42 CFS
HISTORIC 100 YEAR FLOW 193 CFS
POND OUTFLOW 43 CFS/100 YEAR
HISTORIC 10 YEAR FLOW = 52CFS
POND OUTFLOW 31 CFS/10 YEAR
HISTORIC 5 YEAR FLOW = 34CFS
POND OUTFLOW 29 CFS/5 YEAR

POWERS

PROPOSED POWERS ALIGNMENT (OTHERS)

0-1 / 170
0-1MOD2 / 16.16
0-1MOD / 16.52
0-2BMOD / 14.11
0-2B / 44.62
0-2A / 23.31
19864A / 1.41
19864B / 1.32
18967 / 1.37
17596A / 3.88
17598B / 2.04
B-9 / 72.88
B-10 / 11.6
03A/B8 / 41.29
16200A / 2.22
16200B / 2.21
14862 / 2.05
1487A / 0.27
1487B / 0.27
15000 / 1.95
13275A / 2.50
13275B / 2.40
11302A / 2.80
11302B / 2.89
A3 / 57.15
B7 / 29.41
B6 / 9.9
B5 / 15.4
B4 / 35.9
B3 / 34.41
B2 / 14.6
B1 / 33.19
EP1 / 4.03
0-5 / 3.74
1059 / 1.28
0989 / 0.13
2389A / 2.56
2389B / 4.13
24671 / 0.37
0935 / 0.30
4507A / 2.37
4507B / 5.10

FLXRLP01 FLXRGR03 FLXRGR01 FLXRHY01 FLXREP01 FLXRTB01 FLXRRD01 FLXRBASE = 08:02 XREF

Computer File Information		
Creation Date: 07/24/98		Initials: RBB
Last Modification Date: 07/23/98		Initials: RBB
Full Path: S:\3821\CADD\XREF\		
Drawing File Name: FLXRHYBN.DWG		
Acad Ver. 14	Scale: 1:400	Units: ENGLISH

Index of Revisions		

DMJM
DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
- No Revisions:
- Revised:
- Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE

FAIRLANE BASINS
PHASE 1 FINAL/PHASE 2 PRELIM

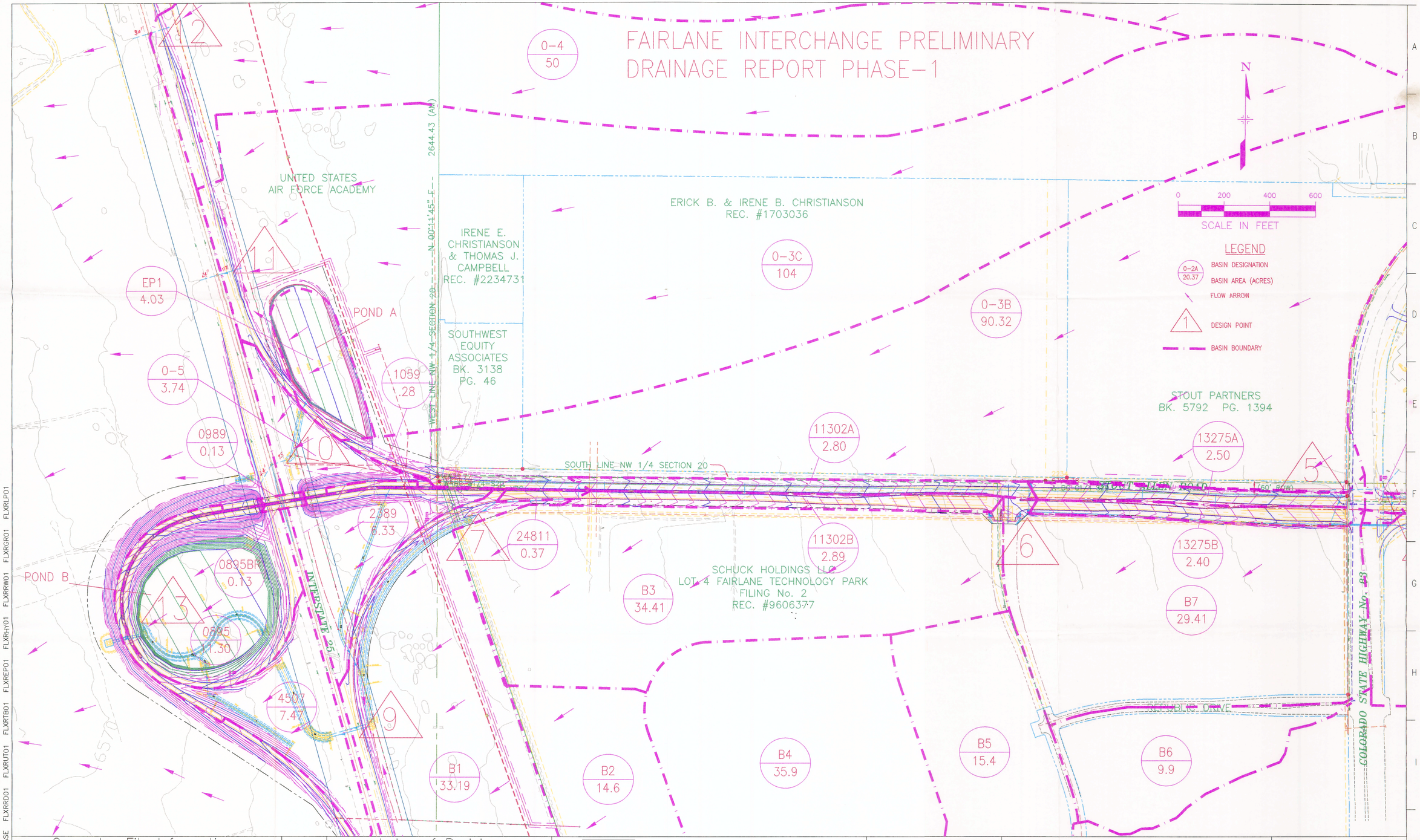
Sheet Subset: DRAINAGE | Subset Sheets: 1 of 1

Designer: RBB
Detailer: RBB
Checked:
Sheet Number 1 of

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J

FAIRLANE INTERCHANGE PRELIMINARY DRAINAGE REPORT PHASE-1



FLXRBASE FLXRRD01 FLXRUT01 FLXRTB01 FLXREP01 FLXRHY01 FLXRRW01 FLXRGR01 FLXRLP01

08:51 XREF =

Computer File Information		
Creation Date: 02/25/98		Initials: RBB
Last Modification Date: 07/22/98		Initials: LLT
Full Path: S:\3821\CADD\XREF\		
Drawing File Name: FLXRHYB1.DWG		
Acad Ver. 14	Scale: 1:200	Units: ENGLISH

Index of Revisions		

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
1490 West Fillmore Street, Suite 101
Colorado Springs, Colorado 80904
Phone: (719) 471-9866 Fax: (719) 471-9063

As Constructed
No Revisions:
Revised:
Void:

FAIRLANE PARKWAY/I-25 INTERCHANGE		
DRAINAGE BASINS PHASE I		
Sheet Subset: Roadway	Subset Sheets: 1 of 1	

Designer: RBB	
Detailer: RBB	
Checked:	
Sheet Number 1	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

A B C D E F G H I J