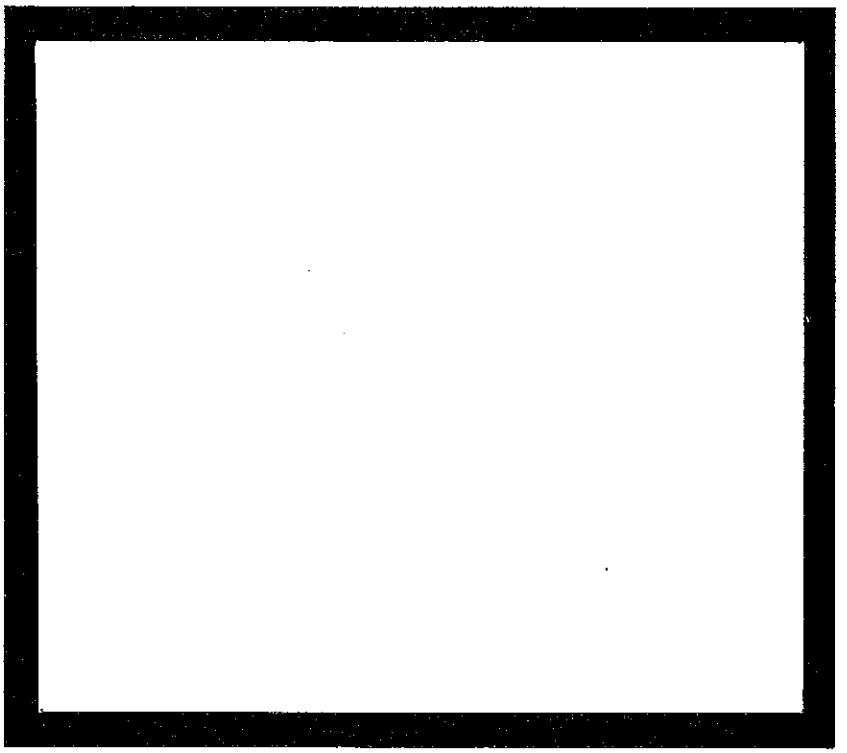
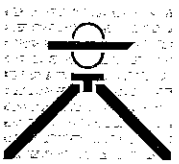
NOT TO BE CHECKED OUT





Drexel Barrell

Engineers/Surveyors Incorporated

Boulder, Colorado Springs

4840 Pearl East Circle
Suite 114
Boulder, Colorado 80301

303 442 4338

MASTER DEVELOPMENT DRAINAGE PLAN
FOR REGIONAL
DETENTION PONDS
AT BROADMOOR BLUFFS
COLORADO SPRINGS, COLORADO

Prepared By:

DREXEL BARRELL
4840 Pearl East Circle
Suite 114
Boulder, Colorado 80301

Prepared For:

GATES LAND COMPANY
202 E. Cheyenne Mountain Blvd.
Colorado Springs, Colorado
80906

Date: January 24, 1989
Revised: May 31, 1989
Revised: October 26, 1989
Revised: February 28, 1990
Revised: February 8, 1991
Revised: May 13, 1991
Revised: June 17, 1993
Revised: April 19, 1994

EW-1011
(0280R.RM)

Drexel Barrell

RECEIVED

AUG 28 [illegible]

Engineers/Surveyors Incorporated

Boulder,
Colorado Springs

6365 Corporate Drive
Colorado Springs,
Colorado 80919

719 260 0887
719 260 8352 Fax

Letter of Transmittal

To: City of C.S.
Stormwater & Subdivision
101 West Costilla
CS CO 80903

Date 8/26/96

☐ Via Carrier
☐ Time Delivered By
☒ Mail
☐ Fed Express/Express Mail
☐ Phone Number
☐ Other

Attention Robin Kidder

Job No. EM-1011

RE: MDDP for Regional Detention Ponds at Broadmoor Bluffs

We are sending you:

☒ Prints ☐ Original ☐
☐ Sepia ☐ Report ☐

No. Copies	Dwg. No.	Description
1		Revision to Det. Pond No. 2 Construction Estimate

These are transmitted as checked below:

☐ For your information ☐ As requested ☐ For your processing
☐ For your approval ☒ Other Amend report

Remarks

Robin

It has been brought to our attention that the 96" RCP quantity is incorrect as shown on page 7 in the above mentioned report. Attached is an amended table. Please attach to your reports on file.

Thank You

Copy to: Bob Svejkovsky
file

Signed: [signature]

DETENTION POND NO. 2 (SOUTH) (revised*)

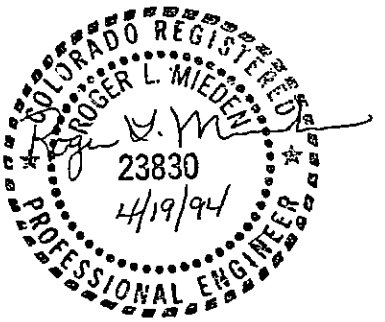
ITEM	QTY	UNIT	UNIT $	TOTAL
Earthwork	34,000	CY	$2	$68,000
Seeding	8	AC	$2,000	$16,000
Rip-rap	330	CY	$50	$16,500
96" RCP*	250	LF	$325	$81,250
Inlet	L.S.	L.S.	$15,000	$15,000
Low Flow Channel	1500	LF	$60	$90,000
Emergency Spillway				
Cut off walls	L.S.	L.S.	$50,000	$50,000
SUBTOTAL				$336,750
Contingencies (15%)				$50,513
Legal, Engineering & Admin costs (15%)				$50,513
SUBTOTAL				$437,776
Land 7.2 acres @ $15,200/AC				$109,440
TOTAL				$547,216

* 96"RCP length reduced from 750' to 250'

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City/County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

FOR REVIEW & APPROVAL



Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

Gates Land Co.
Business Name

By: _____

Title: _____

Address: 202 E. Cheyenne Mountain Blvd.
Colorado Springs, Co 80906

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

Developer's Statement:

I, the developer have read and will comply all of the requirements specified in this drainage report and plan.

_____
Business Name

By: _____

Title: _____

Address: _____
_____

CONTENTS

GENERAL LOCATION AND DESCRIPTION

Purpose

The purpose of this study is to provide a schematic design and cost allocation for proposed regional detention ponds located at Broadmoor Bluffs just west of State Highway 115. The contributing drainage area is partially developed and consists of numerous owners and developments. The need for regional detention ponds has been documented by the Master Drainage Study for Neal Ranch and updates (Reference 4 and 5). Regional detention ponds are necessary to reduce developed discharge to historic rates in accordance with requirements of the City of Colorado Springs Drainage Criteria Manual.

This study is not intended to serve as a Master Development Drainage Plan for the entire basin and does not include all elements normally required by the Drainage Criteria Manual of the City of Colorado Springs (Reference 1). The report also does not address detention ponds or drainage improvements for which Broadmoor Bluffs is the only contributing drainage area. It is recognized that detention facilities and other drainage improvements will be necessary for Broadmoor Bluffs, however, these will be addressed at a later date as development of Broadmoor Bluffs occurs. Only regional detention facilities are addressed in this report. The study is prepared for Gates Land Company (owners of Broadmoor Bluffs), however, it is anticipated that other upstream landowners with potential future development will participate in funding of the detention facilities shown in this study.

The intent of this most recent edition (April 19, 1993) is to incorporate City of Colorado Springs review comments, reflect changes in ownership within the basin and to update known land use data for the Broadmoor Master Plans which, according to current plans, will be less intensely developed than indicated previously. Minor changes were made to drainage areas in the computer model due to more accurate mapping available for individual parcels. Original basin boundaries were based on USGS quad sheets. These changes do not result in significant changes to basin hydrology and do not affect the overall concept. In addition, two regional detention ponds at Broadmoor Bluffs and three temporary detention areas are evaluated in this report. The location of the proposed detention ponds is shown on Sheet 1 of the drainage plans included with this report. The temporary detention areas were constructed in Mountain Oaks Filing No. 2 (Reference 6) and Country Walk at Broadmoor and Glen Oaks at Broadmoor Filing No. 2 (References 7 and 8).

Location

Broadmoor Bluffs is located in Section 7 and the South 1/2 of Section 6, T15S, R66W, City of Colorado Springs, El Paso County, Colorado. It is bordered on the east by State Highway 115, on the north by Broadmoor Valley, on the west by Broadmoor Oaks and the J.L. Ranch and on the south by the Bensburg Estate. Fort Carson lies immediately east of State Highway 115. The location of Broadmoor Bluffs is shown on Figure 1 in the Appendix.

Zoning & Revisions

The existing plan as submitted herein is accurate for the current zoning of the property within the project. Zoning changes, road alignments and other elements are currently being considered for the project and as of the date of this edition have not been approved or completed their processing processed through the City to a level which would reflect sufficient need to update this report. The developer will revise and resubmit all maps, hydrological data and this report when approvals are secured for such zoning and alignment changes from the City. It shall be each developers responsibility to demonstrate that the changes are "minor", and create no substantative increases or consequences to release rates presented herein.

Description

The total drainage area evaluated in this study is 2.55 square miles (1630 acres) and extends from State Highway 115 on the east side to the top of Cheyenne Mountain approximately 2-3/4 miles west of State Highway 115. Slopes range from approximately 100% on the mountain in the western portion of the basin to approximately 10% or less in the eastern portion of the basin. Several unnamed channels traverse the drainage area from the west to east and discharge from the drainage areas is conveyed under State Highway 115 by several culverts. Some existing temporary, privately maintained detention ponds to the West provide some flood control at the present time. These will be discussed in more detail later in this report.

Soils consist primarily of rock outcrops in the extreme western portion of the basin, sandy and rocky loam (Bresser and Jarre-Tecolate Complex) in the central portion of the basin and clayey soils (Razor and Razor-Midway complex) in the eastern portion of the basin.

Portions of the basin are currently developed including the northwestern portion of Broadmoor Bluffs and portions of Broadmoor Oaks. No part of the basin is within an identified floodplain as designated on current FEMA Flood Insurance Rate Maps (Reference 9). Based on field observation, no wetland vegetation appears to be present on the detention pond sites and a Corps of Engineers 404 permit will either not be required or will most likely consist of a nationwide permit, since the disturbed channel is less than an acre. These items shall be verified during final design.

DRAINAGE DESIGN CRITERIA

Regulations

Governing Criteria

This study was conducted in conformance with the Drainage Criteria Manual of the City of Colorado Springs/El Paso County (Reference 1). The design basis is the 10 year and 100 year 24 hour rainfall event for fully developed conditions.

State of Colorado Dam Safety Criteria

Neither of the detention ponds presented herein fall within the jurisdiction of the State Engineer's, Safety of Dams Division. Detention Pond #1 (North) has been designed to be a dry pond whose emergency spillway depth to outfall pipe invert (as defined by the regulations of the State Engineer) is less than 10 feet. Detention Pond #2 (South) is a multipurpose embankment which consists of roadway embankment fill and detention of flood flows; as such, this structure is exempt from State of Colorado jurisdiction.

Hydrologic and Hydraulic Criteria

Hydrologic and hydraulic criteria for this study are based on the Drainage Criteria Manual (DCM). Storm discharges were developed for the 10-year and 100-year storm using the Soil Conservation Service TR-20 Computer Program (Reference 3). Discharges were computed for a 24-hour Type IIA rainfall as designated in the DCM. Rainfall depths for the 24-hour rainfall are 4.6 inches and 3.0 inches for the 100-year and 10-year storm respectively. Time of concentrations are determined by combining overland travel times with channel travel times in accordance with the DCM.

The runoff curve number is based on the DCM or SCS publications (Reference 11) for a given land use, soil type and hydrologic soil group. The standard dimensionless unit hydrograph included with TR-20 is also utilized to generate storm hydrographs.

The developer may utilize wetlands mitigation credits in both of the ponds to offset disturbances in other areas.

Hydraulic design parameters are in general obtained from the DCM. Hydraulic parameters used include friction factors, orifice and weir coefficients for the schematic design of detention pond outlet structures.

DRAINAGE BASINS AND SUB-BASINS

For evaluation of historic conditions, the entire drainage basin was divided into 8 subbasins. For evaluation of developed conditions, the basin was divided into 16 sub-basins. Basin boundaries as currently approved for zoning & roadway alignments are shown on the Land Use/Ownership Map included in the appendix of this report.

DRAINAGE FACILITY DESIGN

Design Criteria

A detention pond was evaluated for each of the two basins with drainage areas extending to more than one owner. The detention ponds were evaluated for the 10-year and 100-year storm for a 24-hour rainfall durations. Release rates are designed to be equal to or less than historic at locations where actual historic flows occur.

All regional detention ponds will be constructed to city regulations as required. After construction and acceptance by the city, the detention ponds will become publicly owned and maintained. The detention ponds will consist of earthen embankments with two stage outlet structures to control both a 10-year and 100-year flood. A large pipe and inlet structure will control the 100-year flood and a smaller pipe will control 10-year or smaller floods. The embankment and pond area will have a 4:1 maximum slope to facilitate maintenance. An emergency spillway will be provided to safely convey flows in excess of the 100-year discharge or in the event that the outlet structure becomes inoperable. Current design approach contemplates an emergency spillway with a capacity for passing the peak 100 year developed flow with the ponds full.

Design Details - Regional Detention Ponds

Detention Pond No. 1 is located just south of Broadmoor Bluffs Drive on the west side of State Highway 115. The structure consists of earth fill along the State Highway 115 right of way to a maximum height of less than 10 feet. Two outlet structures release a total of 430 cfs compared to a historic rate of 460 cfs for the 100-year, 24-hour storm.

Two release structures are shown for Pond 1 to split flow according to historic discharge points. The total 100-year release rate is 430 cfs versus a total downstream capacity of 590 cfs. This should be examined in more detail during final design. Downstream capacity was not evaluated beyond the existing culverts at State Highway 115.

Detention Pond No. 2 is located just west of the State Highway 115 right of way and north of the Bensburg Estate property. This structure consists of earth fill to a maximum height of approximately 28 feet. However based on criteria, it will not be subject to state dam safety requirements. The outlet structure as shown releases a total of 1280 cfs compared to a historic discharge of 1360 cfs for the 100-year, 24-hour storm. The capacity of existing culverts at State Highway 115 is 850 cfs. It should be emphasized that the designs developed in this study are schematic and subject to revision as additional information is developed.

Design Details - Temporary Detention

Three temporary detention facilities have been constructed with recent site development within the basins and are evaluated schematically in this study.

A 120" structural plate culvert was constructed under Broadmoor Bluffs Drive at the south end of the Country Walk at Broadmoor, No. 4 subdivision. This culvert was designed to provide temporary storage for the subdivision and has a storage volume of 15,050 cu. ft. (0.35 acre-feet)(Reference 7 and 8). This culvert is located on the stream that flows to Regional Detention Pond No. 2 in Drainage Basin 164. The total storage requirement for the 100-year storm at Regional Detention Pond No. 2 is 43.0 acre-feet and assuming that the storage at the 120" culvert reduces the volume required at Regional Detention Pond No. 2 by an equivalent amount, the 100-year reservoir elevation would only be reduced by approximately 0.1 feet and would not have a significant effect on construction cost. The 120" culvert was thus omitted from the TR-20 model for the evaluation.

A 90" culvert was also constructed under Broadmoor Bluffs Drive near the south boundary of Glen Oaks at Broadmoor. This culvert was designed to provide temporary storage for the subdivision and has a storage capacity or 40,504 cu.ft. (0.93 acre-feet). Assuming that the storage at the 90" culvert reduces the volume required at Regional Detention Pond No. 2 by an equivalent amount, the 100-year reservoir elevation would be reduced by approximately 0.2 to 0.3 feet. The 90" culvert is also omitted from the TR-20 model for the evaluation due to the relatively minor effect on the cost of Regional Detention Pond No. 2.

A 60" culvert was constructed as part of Mountain Oaks Subdivision No. 2 in a park located at the downstream end of Basin 061 and provides detention storage of approximately 24354 cu.ft. (0.56 ac.ft.). The culvert is further restricted by a 27" diameter orifice placed at the inlet of the 60" culvert and is intended to provide detention for the Mountain Oaks Subdivision. This structure was evaluated in the TR-20 model both with and without the 27" orifice. Without the orifice, the effect of the detention storage is negligible and has no effect on the 100-year flood elevation of Regional Detention Pond No. 1. With the 27" orifice in place, the temporary detention pond would be overtopped due to flows generated by upstream development. The effect of this temporary detention pond is also negligible and is not included in the final TR-20 results presented in this report. TR-20 printouts for the analysis of the 60" culvert are not included in this report but are available for reference upon request.

Cost Estimate/Allocation

The construction cost estimates and cost allocation information is provided herein for the use of the developers in establishing cost sharing for the facilities.

The following cost estimates are based on schematic designs presented in this report and are subject to revision during final design. Cost allocations are prorated based on the percentage increase of runoff curve number and the drainage area as shown on Sheet 1 of the drainage plans. The extreme western portion of the basins and U.S. Government property are assumed to remain undeveloped in the future and are omitted from the cost allocation. Areas that were final platted as of January 1994 or specified as park are omitted from the cost allocation. Land acquisition (approximately 12.9 acres for Pond No. 1 and 7.2 acres for Pond No. 2) will be necessary and should be made in accordance with current City policy at the time of construction. No land costs are included in the following cost estimates.

CONSTRUCTION COST ESTIMATE

Detention Pond No. 1 (North)

Item	Quantity	Unit	Price	Total
Earthwork (fill)	40,000	C.Y.	$2/C.Y.	$ 80,000
Seeding	11	AC.	$2000/AC.	22,000
Riprap	170	C.Y.	$50/C.Y.	8,500
78" RCP	160	L.F.	$225/L.F.	36,000
54" RCP	180	L.F.	$100/L.F.	18,000
Concrete risers		L.S.		12,000
Low Flow Channel	950	L.F.	$50/L.F.	47,500
Riprap Emergency Spillway	900	C.Y.	$50/C.Y.	45,000
Subtotal				$269,000
Contingencies (15%)				40,350
Legal, engineering and administrative costs (15%)				40,350
Sub-Total				$349,700
Land 12.9 Ac. @ $15,200/AC				196,000
Total				**$545,780**

Detention Pond No. 2 (South)

Item	Quantity	Unit	Price	
Earthwork	34,000	C.Y.	$2/C.Y.	$ 68,000
Seeding	8	AC.	$2000/AC.	16,000
Riprap	330	C.Y.	$50/C.Y.	16,500
96" RCP	750	L.F.	$325/L.F.	243,750
Inlet		L.S.		15,000
Low Flow Channel	1500	L.F.	$60/L.F.	90,000
Emergency Spillway Cutoff Walls	L.S.			50,000
Subtotal				$499,250
Contingencies (15%)	74,900			
Legal, engineering and administrative costs (15%)				74,900
Sub-Total				$649,050
Land 7.2 Ac. @ $15,200/AC				$109,440
Total				**$758,480**

All costs based on 1994 dollars (not adjusted for inflation).The runoff curve number is a hydrologic parameter that is based on soil type and land use and is an indicator of the runoff volume from a particular site. Clay soils are less permeable and have a higher curve number than sandy soils, indicating that a larger portion of rainfall will run off and contribute to streamflow downstream. soil types are classified as A, B, C or D by the SCS with "A" soils being the most permeable and with lower curve numbers and "D" soils being the least permeable with higher curve numbers.

Land use also affects the curve number and "wooded" areas have lower curve numbers than range or pasture conditions. For developed conditions, more dense development results in a higher curve number and thus greater runoff for a given rainfall. The cost allocation shown on the following page is based on the percentage increase in average curve number for each owner from historic to developed condition. To determine the average curve number a curve number is computed for each segment with a different drainage basin, land use or soil type for each owner and averaged based on the area for each owner. Detailed information for each segment is included in Section E at the calculation in the Appendix of this report.

CONCLUSIONS

This study presents schematic designs and cost estimates for 2 regional detention ponds to serve onsite and offsite drainage areas. The detention ponds are intended to reduce developed flows from the basin to historic discharge rates. Detention Pond No. 1 has an estimated total cost of $349,700 allocated among 4 upstream owners. Detention Pond No. 2 has an estimated cost of $649,050 allocated among 7 upstream owners. Costs for land acquisition of approximately 12.6 acres for Pond No. 1 and 7.2 acres for Pond No. 2 will also be necessary and are not included in the above costs. This is a no-fee drainage basin by the terms of the annexation agreement.

RECOMMENDATIONS

The primary purpose of this study is to establish the procedure for allocating costs of proposed detention facilities to owners within each drainage basin. The following recommendations should apply to further design of the sites and cost allocation to each owner:

- The drainage basin should be converted to a fee basin to provide funding for the final design and construction of the two regional detention ponds shown in this report. The drainage basin fees included in this report apply only to the two regional detention ponds. Costs for other required drainage facilities within the basin should be the responsibility of individual owners.

- Flood routing of the inflow hydrographs should be refined with final design to reflect the final design of each detention pond and insure that discharges are at or below the historic rates for the 10-year and 100-year storms.

- Cost allocations for developers in this report are based on preliminary designs. Final cost allocations, if possible, should be based on a final design or constructed cost.

- This report shall be submitted for review tp the Colorado Department of Transportation and Fort Carson. Additional revisions and updates shall also be provided to CDOT and Fort Carson.

Reviewed by,

Clifford R. Brockman
Colorado P.E. No. 22117

Prepared by,

Roger L. Mieden
Colorado P.E. 23830

REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual; City of Colorado Springs, HDR Infrastructure, Inc., and El Paso County, November 1991.

2. Soil Survey of El Paso County Area, Colorado, United States Department of Agriculture, Soil Conservation Service, June 1981.

3. Technical Release No. 20, User's Manual, Project Formulation - Hydrology (1982 Version), United States Department of Agriculture, Soil Conservation Service, May 1982.

4. Master Drainage Study for Neal Ranch, Weiss Consulting Engineers, Inc., June 24, 1987.

5. Neal Ranch Master Drainage Plan Update, Broadmoor Oaks Filing 3, 4, 7, 8, 9 and 10, Oliver E. Watts, July 21, 1988.

6. Preliminary and Final Drainage Plan and Report, Mountain Oaks Subdivision Filing No. 2, Oliver E. Watts, Consulting Engineer, December 14, 1990.

7. Preliminary and Final Drainage Study, Glen Oaks at Broadmoor, Country Walk at Broadmoor, Glen Oaks at Broadmoor Filing No. 2, Donell Jeffries, October 17, 1988.

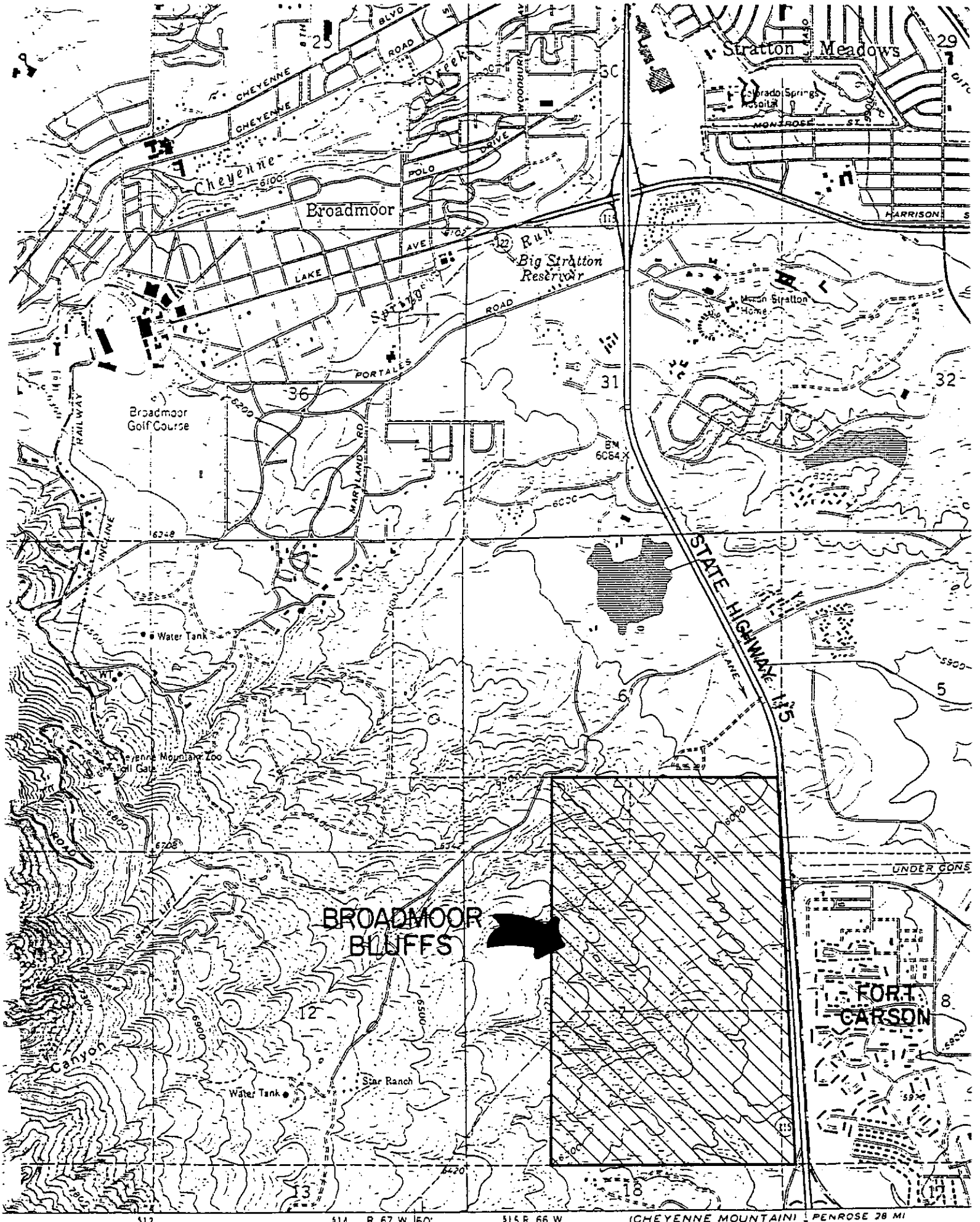
8. Country Walk at Broadmoor No. 4, letter report, Jeffries Engineering, June 16, 1992.

9. Flood Insurance Rate Map, City of Colorado Springs, El Paso County, Community Panel Number 080060 0290B, Federal Emergency Management Agency, December 18, 1986.

10. Urban Hydrology for Small Watersheds, Technical Release No. 55, United States Department of Agriculture, Soil Conservation Service, January 1975.

11. Procedures for Determining Peak Flows in Colorado, Soil Conservation Service, U.S. Department of Agriculture, March 1980.

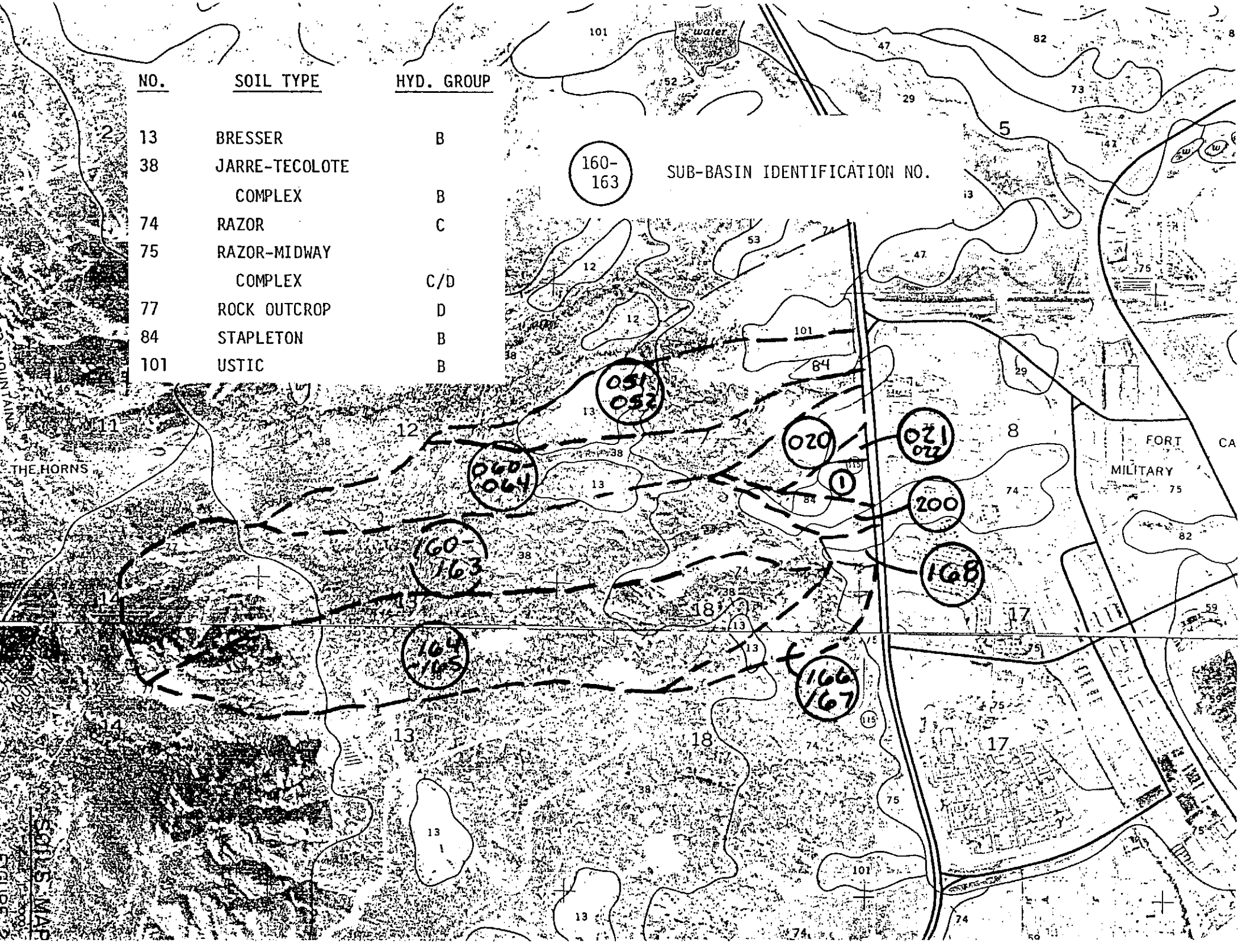
APPENDIX



VICINITY MAP

SCALE: 1" = 2000'

FIGURE


NO. SOIL TYPE HYD. GROUP
13 BRESSER B
38 JARRE-TECOLOTE COMPLEX B
74 RAZOR C
75 RAZOR-MIDWAY COMPLEX C/D
77 ROCK OUTCROP D
84 STAPLETON B
101 USTIC B
160-163 SUB-BASIN IDENTIFICATION NO.
water
THE HORNS
FORT
MILITARY
051
052
020
021
022
200
168
060-064
160-163
164-165
166-167

Project	Job N°
REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS	EW-1011

Client	By	Date
GATES LAND CO.	RM	6/17/93

TABLE OF CONTENTS (CALCULATIONS)

Project: CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (TR-20) | Job No: E-3729

Client: GATES | By: RM | Date: 5 JUNE 83

RAINFALL DATA

ALL BASINS WILL BE EVALUATED FOR THE 10-YEAR AND 100-YEAR RAINFALLS FOR RAINFALL DURATIONS OF 2 HRS. AND 24 HRS. IN ACCORDANCE WITH THE CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL (DCM)

24-HR. PRECIPITATION

P_{10} (24-HR.) = 3.0 IN. (F16.5-4d, DCM)

P_{100} (24-HR.) = 4.6 IN. (F16.5-4e, DCM)

2-HR. PRECIPITATION

2-HR. PRECIPITATION AMOUNTS ARE DERIVED FROM 2-YR., 6-HR & 24-HR. AND 100-YR., 6-HR & 24-HR. VALUES AS DESCRIBED IN THE DCM.

2-YR, 6-HR. PRECIP. = 1.6" = X_1 (F16.5-4a, DCM)
2-YR, 24-HR. PRECIP. = 2.0" = X_2 (" 5-4c, ")
100-YR, 6-HR. " = 3.4" = X_3 (" 5-4b, ")
100-YR, 24-HR. " = 4.6 = X_4 (" 5-4e, ")
ELEV. (IN HUNDREDS) = 65 = Z

2-YR., 1-HR. PRECIP. (Y_2)

$= 0.718 + 0.709\left[(X_1)(X_1/X_2)\right]$

$= 0.718 + 0.709\left[(1.6)(1.6/2.0)\right] = 1.13$ IN.

100-YR., 1-HR. PRECIP. (Y_{100})

$= 1.897 + 0.439\left[(X_3)(X_3/X_4)\right] - .008Z$

$= 1.897 + 0.439\left[(3.4)(3.4/4.6)\right] - .008(65)$

$= 2.48$ IN.

Project: DRAINAGE W. OF SH 115 | Job No: E-3729

Client: GATES, | By: RM | Date: 3/31/89 REV: 10/26/89

HISTORIC CONDITIONS (REVISED T_c's)

BASIN 200

T_i: $L = 500'$ (PASTURE)

$S = \frac{6148-6060}{500} = 18\%$

$C_{10} = .30$ (PASTURE C/D SOILS)

$T_i = \frac{1.87(1.1-C)\sqrt{L}}{\sqrt[3]{S}} = \frac{1.87(1.1-.30)\sqrt{500}}{\sqrt[3]{18}}$

$T_i = 12.8$ MIN.

T_t: $L = 1600$ FT.

$S = \frac{6060-5968}{1600} = 5.75\%$

ASSUME CHANNEL W/ 5' B.W.

2.5:1 S/S & 2' DEPTH

$n = .035$ (EARTH W/ SOME ROCKS & VEG.)

$Q = 239$ CFS $V = 11.9$ $F_r = 1.8$

$T_t = \frac{1600}{60(11.9)} = 2.2$

$T_c = 12.8 + 2.2 = 15.0$ MIN. $= 0.25$ HR.

BASIN 001

T_i: $L = 500'$

$C = .30$ (PASTURE C/D)

$S = \frac{6106-6014}{500} = 18\%$

$C = .30$ (PASTURE C/D SOILS)

$T_i = \frac{1.87(1.1-.30)\sqrt{500}}{\sqrt[3]{18}} = 12.8$ MIN.

T_t: $L = 900'$

ASSUME CHAN. W/ 5' B.W. 2' DEPTH

2.5:1 S/S $S = 6014-5964/900 = 5.5\%$ $n = .035$

$Q = 233$ $V = 11.7$ $F_r = 1.8$

$T_t = 900/60(11.7) = 1.3$ MIN.

T_c: $T_c = 12.8 + 1.3 = 14.1$ MIN. $= 0.24$ HR

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
DRAINAGE W. OF SH. 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 10/26/89

BASIN 020 (INCLUDES BASINS 020, 021, 022)

T_i: L = 500'

$S = \frac{6220 - 6116}{500} = .21$

C = .30 (PASTURE C/D SOILS)

$T_i = \frac{1.87(1.1 - .30)\sqrt{500}}{\sqrt[3]{21}} = 12.1$ MIN.

T_t: L = 400'

$S = \frac{6116 - 6050}{400} = 17\%$

SWALE 17% n = .040 B.W. = 5' d = 1' 2.5:1 S/S

Q = 92.5 V = 12.3 F_r = 2.5

$T_t = \frac{400}{60(12.3)} = 0.5$ MIN.

L = 900'

$S = \frac{6050 - 5970}{900} = 9\%$

BW = 5' S/S = 2.5:1 n = .040 d = 1.5

Q = 147 V = 11.2

$T_t = \frac{900}{60(11.2)} = 1.3$

L = 1000'

$S = \frac{5970 - 5944}{800} = 3.3\%$

BW = 5' S = 3.3 n = .035 d = 2 SS = 2.5:1

Q = 181 V = 9.0 F_r = 1.4

$T_t = \frac{1000}{60(9.0)} = 1.9$ MIN.

T_c = 12.1 + 0.5 + 1.3 + 1.9 = 15.8 MIN. = 0.26 HR.

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LAND SURVEYORS
CIVIL ENGINEERS

Project	Job Nº
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 10/26/89 & 2/28/90

BASIN 021 — INCLUDED W/ 020

T_i: $L = 500$

$S = 5990 - 5960/500 = 6.0\%$

$C = 0.30$ (PASTURE C/D SOILS)

$T_i = \frac{1.87(1.1-.30)\sqrt{500}}{\sqrt{6.0}} = 18.4$ MIN.

T_t NEGLIGIBLE

T_c: $T_c = T_i = 18.4$ MIN. $= 0.31$ HRS.

BASIN 050 (DEVELOPED BASINS 051 & 052 COMBINED)

T_i: $L = 500$ FT.

$S = 34/500 = 6.8\%$

$C = 0.25$ (PASTURE A/B)

$T_i = \frac{1.87(1.1-.25)\sqrt{500}}{\sqrt{6.8}} = 18.8$ MIN.

T_t: $L = 2100$

$S = 260'/2100 = 12.4\%$

EW S $d = 0.5$ S: 2.5:1 $n = .040$

$Q = 22.4$ $V = 7.2$ $F = 2.0$

$T_t = 2100/7.2(60) = 4.9$

$L = 4300$

$S = 6390 - 5950/4300 = 7.9$ $d = 1.5$ B.W. $= 5$ $Z = 2.5$ $n = .040$

$Q = 137$ $V = 10.5$ $F = 1.8$

$T_t = 2100/60(7.9) = 4.4$

T_c: $18.8 + 4.9 + 4.4 = 28.1$ MIN. $= 0.47$ HR.

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Project	Job No
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RMT	3/31/89 REV: 10/26/89

BASIN 060 (INCL. BASINS 060 – 064)

T_i: L = 500'

S = 60'/500' = 12%

C = .25 (PASTURE A/B SOILS)

$T_i = \frac{1.87(1.1-.25)\sqrt{500}}{\sqrt[3]{12}} = 15.5$ MIN.

T_t L = 3600'

S = 6820 – 6400/3600 = 11.7%

BW = 5 d = 0.5' Z = 2.5 n = .040

Q = 22 V = 7.0 F_r = 1.9 T_t = 3600/60(7) = 8.6 MIN.

L = 6000'

S = 6400 – 5960/6000 = 7.3%

BW = 5' d = 1.5 Z = 2.5 n = .035

Q = 151 V = 11.5 F_r = 2.0 T_t = 6000/60(11.5) = 8.7

T_c = 15.5 + 8.6 + 8.7 = 32.8 MIN. = 0.55 HR.

BASIN 160 (INCLUDES BASINS 160-163)

T_i : L = 500'

C = .15 (FOREST C/D)

S = 33% ±

$T_i = \frac{1.87(1.1-0.15)\sqrt{500}}{\sqrt[3]{33}} = 12.4$ MIN.

T_t : L = 3700'

S = 7800 – 7200/2300 = 35%

R = 5' D = 0.5 Z = 3 n = .040

Q = 39 V = 11.9 F = 3.3 T_t = 3700/60(11.9) = 5.2 MIN.

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job No
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 10/26/89 & 2/28/90

$L = 5200$

$S = \frac{7000 - 6400}{5200} = 11.5\%$

$BW = 10'$ $D = 1'$ $Z = 3:1$ $n = .040$

$Q = 141$ $V = 10.8$ $F = 2.1$

$T_t = \frac{5200}{60(10.8)} = 8.0$ MIN.

$L = 5000'$

$S = \frac{6400 - 5980}{5000} = 8.4\%$

$BW = 15'$ $D = 2.5$ $Z = 3.0:1$ $n = .040$

$Q = 905$ $V = 16.1$ $F = 2.1$

$T_t = \frac{5000}{60(16.1)} = 5.2$ MIN.

$T_c = 12.4 + 5.2 + 8.0 + 5.2 = 30.8$ MIN. $= 0.51$ HR.

BASIN 164 (INCL. BASINS 164 & 165)

T_i: $L = 500'$

$C = 0.15$ (FOREST C/D) - SOME C ALSO - CONSERVATION

$S = \frac{40'}{500} = 8.0\%$

$T_i = \frac{1.87(1.1 - 0.15)\sqrt{500}}{\sqrt[3]{8}} = 19.9$ MIN.

T_t: $L = 3700'$

$RW = 5$ $S:S = 2.5:1$ $n = .040$ $S = \frac{9260 - 7330}{3700} = 52\%$ $d = 1.0$

$Q = 163$ $V = 22.0$ $F_t = 4.4$

$T_t = \frac{3700}{60(22)} = 2.8$ MIN.

$L = 4400$ $RW = 5$ $S = 3:1$ $n = .040$ $S = \frac{11200 - 6422}{4400} = 17.4\%$ $d = 1.0$

$Q = 94$ $V = 11.8$ $F_t = 2.4$

$T_t = \frac{4400}{60(11.8)} = 6.2$ MIN.

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DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 10/26/89

BASIN 164 (CONT.)

$L = 6600'$

$S = {}^{6600-5960}/_{6600} = 9.7\%$

$D = 1.5$ $BW = 10$ $n = .040$ $Z = 3$

$Q = 271$ $V = 12.5$ $F_r = 2.1$

$T_t = {}^{6600}/_{60(12.5)} = 8.8$ MIN.

$T_c = 19.9 + 2.8 + 6.2 + 8.8 = 37.7$ MIN. $= 0.63$ HR.

BASIN 166 (INCL. BASINS 166 & 167)

T_i: $L = 500'$

$S = {}^{40}/_{500'} = 8\%$

$C = .25$ (PASTURE A/B) - SOME C @ LOWER END - NO SIGNIFICANT EFFECT

$$T_i = \frac{1.87(1.1-0.25)\sqrt{500}}{\sqrt[3]{8}} = 17.8 \text{ MIN.}$$

T_t: $L = 3500'$

$S = {}^{6660-5960}/_{3500} = 8.6\%$

$BW = 10$ $D = 1$ $n = .035$ $S = 8.6$ $Z = 3$

$Q = 139$ $V = 10.7$ $F_r = 2.1$

$T_t = {}^{3500}/_{60(10.7)} = 5.5$ MIN.

$T_c = 17.8 + 5.5 = 23.3$ MIN. $= 0.39$ HR.

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DREXEL, BARRELL & CO.
LAND SURVEYORS
CIVIL ENGINEERS

Project	Job No
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RM	3/31/89

BASIN 168

T_i: $L = 400'$

$S = 6024 - 5990/400 = 8.5\%$

$C = .30$ (C/D - PASTURE)

$T_i = \frac{1.87(1.1-.30)\sqrt{400}}{\sqrt[3]{8.5}} = 14.7$ MIN.

T_t: $L = 950'$

$S = 5990 - 5960/950 = 3.2\%$

$B = 5'$ $D = 1.0'$ $n = .040$ $S = 3:1$

$Q = 42$ $V = 5.3$ $F = 1.1$

$T_t = 950/60(5.3) = 3.0$

$T_c = 14.7 + 3.0 = 17.7$ MIN. $= 0.30$ HR.

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Project: DRAINAGE W. OF SH 115 | Job Nº: E-3729

Client: GATES | By: RM | Date: 3/31/89 Rev. 2/25/90

DEVELOPED CONDITIONS

REVISED TIME OF CONCENTRATION FOR DEVELOPED CONDITIONS (ALL BASINS REVISED PER CITY COMMENTS)

BASIN 060

T_i: $C_{10} = 0.35$ (RES - 1/2 Ac. - B SOIL)

$L = 300$

$S = 18/300' = 6\%$

$$T_i = \frac{1.87(1.1-0.35)\sqrt{300}}{\sqrt[3]{6}} = 13.4 \text{ MIN.}$$

T_t: $L = 1200'$ (SWALE/CHANNEL)

$EW = 10$

$S = 100/1200 = 8.3\%$

$n = .015$ (CONC.)

$Z = 4$, $D = 1$

$Q = 330$ $V = 24$ USE 20 FPS MAX.

$T_t = 1200/60(20) = 1.0$ MIN.

$L = 3500'$ (STORM SEWER)

$S = 120/1900 = 6.3\%$

ASSUME 300 CFS ± DIA'D. @ $n = .013$ = 44.8"

$\Rightarrow V = 27$ FPS

$T_t = 1900/27(60) = 1.2$ MIN.

$T_c = 13.4 + 1.0 + 1.2 = 15.6$ MIN. = 0.26 HR.

Project: DRAINAGE W. OF SH 115 | Job No: E-3729

Client: GATES | By: RNJ | Date: 3/31/89

BASIN 061

T_i: $L = 300'$
$S = 10\%$
$C = 0.35$ (RES 1/2 - B SOILS)

$$T_i = \frac{1.87(1.1 - 0.35)\sqrt{300}}{\sqrt[3]{10}} = 11.3 \text{ MIN.}$$

$L = 2200$
$S = 6780 - 6600/2200 = 8.2$
ASSUME STORM SEWER @ 8.2% $Q \approx 100$ CFS (THEN START RAN.)
$D_{REQ'D} = 28"$ $V = 23.0$ FPS

$$T_t = 2200/60(23) = 1.6 \text{ MIN.}$$

$L = 3500'$
(ASSUME IMPROVED NAT. CHANNEL)
$S = 6580 - 6240/3500 = 9.7\%$

$BW = 25$ $S = 9.7$ $Z = 4$ $D = 0.8'$ $n = .040$
$Q = 209$ $V = 9.2$ $F = 2$

$$T_t = 3500/60(9.2) = 6.3 \text{ MIN.}$$

$$T_c = 11.3 + 1.6 + 6.3 = 19.2 \text{ MIN.} = 0.32 \text{ HR.}$$

BASIN 160

T_i: $T_i = 12.4$ MIN. (SAME AS HIST.)

T_t: T_t #1 = 5.2 MIN. (SAME AS HIST.)

T_t #2 IMPROVED CHAN.
$BW = 20$ $Z = 4:1$ $D = .8$ $n = .040$ $S = 11.5\%$
$Q = 185$ $V = 9.9$ $L = 5200$

$$T_t = 5200/60(9.9) = 8.8 \text{ MIN.}$$

Project: DRAINAGE W. OF SH 115 | Job No: E-3729

Client: GATES | By: RM | Date: 3/31/89

T_t #3: L=5000'

S=8.4%

ASSUME IMPROVED CHAN.
B.W.=30' D=1.0 Z=4 n=.040

Q=338 V=10.0

$T_t = 5000/60(10.0) = 8.3$ MIN.

T_c: $T_c = 12.4 + 5.2 + 8.8 + 8.3 = 34.7$ MIN. = 0.58 HR.

BASIN 164

T_i: $T_i = 19.9$ MIN (NO CHANGE FROM HISTORIC)

T_t: $T_{t1} = 2.8$ MIN. (SAME AS HIST.)

T_{t2}: L=2100 (NAT. CHANNEL)

$S = 7160 - 6800/2100 = 17.1$

BW=5 D=1' S=3:1 n=.040

Q=97 V=12.2

$T_{t2} = 2100/12.2(60) = 2.9$ MIN.

T_{t3}: IMPROVED CHANNEL

L=2300' BW=20 Z=4 n=.040 D=1

$S = 6900 - 6600/2300 = 8.7\%$ Q=236 V=9.8 $T_t = \frac{2300}{60(9.8)} = 3.9$

L=6600 BW=30' D=1.0 Z=4 n=.040 S=9.7%

Q=364 V=10.7

$T_{t4} = 6600/60(10.7) = 10.3$ MIN.

$T_c = 19.9 + 2.8 + 2.9 + 3.9 + 10.3 = 39.8$ MIN. = 0.66 HR.

Project: DRAINAGE W. OF SH 115 | Job No: E-3729

Client: GATES | By: KM | Date: 3/31/89

BASIN 020

T_i: L = 200'
C = 0.70 (LT. INDUST. - D SOILS)
S = 6088 - 6055/200 = 16.5%

$$T_i = \frac{1.87(1.1-.70)\sqrt{200}}{\sqrt[3]{16.5}} = 4.2 \text{ MIN.}$$

T_t: L = 1100' (STORM SEWER / CHAN.)
Q ≈ 150
S = 6090 - 5950/100 = 9%
@ n = 0.013 & Q = 150 Dreq'd = 32" V = 26 FPS.

$$T_t = \frac{1100}{60(26)} = 0.7 \text{ MIN.}$$

T_c = 4.2 + 0.7 = 4.9 MIN, = .08 HR. USE .10 MIN.

BASIN 021

USE T_c = 0.10 (MINIMUM) (SMALL BASIN)

BASIN 022

USE T_c = 0.10 HR. (MINIMUM) (SMALL BASIN)

BASIN 051

USE T_c = 0.10 HR.

BASIN 052

T_i: L = 200'
C = 0.70 (LT. IND. C/D SOILS)
S = 10'/200 = 5%

$$T_i = \frac{1.87(1.1-0.70)\sqrt{200}}{\sqrt[3]{5}} = 6.2 \text{ MIN.}$$

T_t: L = 1500' (STORM SEWER)
S = 5% ±
Q ≈ 150 @ n = .013 Dreq. = 36 V = 21

$$T_t = \frac{1500}{60(21)} = 1.2$$

T_c = 6.2 + 1.2 = 8.4 MIN. = 0.14 HR.

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Project	Job Nº
DRAINAGE W. OF CH 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 2/28/90

BASIN C62

T_i : $L = 200'$

$C = 0.45$ (S.F. 1.5/AC.) ("C" SOILS)

$S = 25/200 = 13\%$

$T_i = \frac{1.87(1.1-0.45)\sqrt{200}}{\sqrt[3]{13}} = 1.3$ MIN.

T_t $L = 2400'$ (SWALE/CHANNEL)

$S = 6230-6049/2400 = 7.9\%$

$BW = 15$ $d = 0.8$ $Z = 4$ $n = .035$

$Q = 134$ $V = 9.2$ USE DROPS TO RED. V TO 7 FPS

$T_t = 2400/60(7) = 5.7$ MIN.

$T_c = 7.3 + 5.7 = 13.0$ MIN. $= 0.22$ HR.

BASIN C63

T_i : $L = 300'$

$C = 0.40$ ("D" SOILS - RES.)

$S = 10\% \pm$

$T_i = \frac{1.87(1.1-0.40)\sqrt{300}}{\sqrt[3]{10}} = 10.5$ MIN.

T_t : $L = 2100$ (IMPROVED/STAB. CHAN.)

$S = 6230-6000/2700 = 8.5\%$

$BW = 30'$ $S = 8.5\%$ $Z = 4$ $n = .040$ $d = 1.0$

$Q = 340$ $V = 10.0$

$T_t = 2700/60(10) = 4.5$ MIN.

$T_c = 10.5 + 4.5 = 15.0^{MIN} = 0.25$ HR.

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DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RM	3/31/89 REV. 2/28/90

BASIN 064

T_i: $L = 200'$
$S = 10'/200 = 5\%$
$C = 0.70$ ("D" SOILS - INDUST.)

$$T_i = \frac{1.87(1.1-0.70)\sqrt{200}}{\sqrt[3]{5}} = 6.2 \text{ MIN.}$$

T_T $L = 2400'$
$S = 6030-5950/2400 = 3.3\%$

IMPROVED CHANNEL
$BW = 30$ $D = 1.5$ $Z = 4$ $n = .040$
$Q = 428$ $V = 7.9$

$$T_T = 2400/60(7.9) = 5.1 \text{ MIN.}$$

$T_c = 6.2 + 5.1 = 11.3 \text{ MIN.} = 0.19$ HR.

BASIN 162

T_i: $L = 200'$
$C = 0.40$ ("C" SOIL - RES. 1 UNIT/AC.)
$S = 32/200 = 16\%$

$$T_i = \frac{1.87(1.1-0.40)\sqrt{200}}{\sqrt[3]{16}} = 7.4 \text{ MIN.}$$

T_T $L = 1700'$
$BW = 30$ $d = 1.5'$ $Z = 4$ $n = .040$ $S = 120/1700 = 7.1\%$
$Q = 628$ $V = 11.6$ $F_T = 1.8$

$$T_T = 1700/60(11.6) = 2.4$$

$T_c = 7.4 + 2.4 = 9.8 \text{ MIN.} = 0.16$

BASIN 163

SMALL AREA - USE $T_c = 0.10$

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Project	Job No
DRAINAGE	E-3729

Client	By	Date
GATES	RM	3/31/89

BASIN 165

T_i: $L = 200'$
$S = 7\%$
$C = 0.40$ (RES. - D.)

$$T_i = \frac{1.87(1.1-0.40)\sqrt{200}}{\sqrt[3]{7}} = 9.7 \text{ MIN.}$$

T_t: $L = 3200$

$$S = \frac{6190-5960}{3200} = 7.2\%$$

B.W. = 30' $D = 1.5$ $Z = 4$ $n = .040$

$Q = 632$ $V = 11.7$

$$T_t = \frac{3200}{60(11.7)} = 4.6 \text{ MIN.}$$

$T_c = 9.7 + 4.6 = 14.3$ MIN. $= 0.24$ HR.

BASIN 167

T_i: $L = 200'$
$S = 10\%$
$C = 0.70$ (LT. IND. - C/D SOILS)

$$T_i = \frac{1.87(1.1-0.70)\sqrt{200}}{\sqrt[3]{10}} = 4.9 \text{ MIN.}$$

T_t: $L = 1500'$ (ASSUME C&G)

$$S = \frac{60}{1500} = 4\%$$

$Q \approx 25$ $n = .018$ $d = 6" \Rightarrow Q \approx 40$ $V = 6.6$

$$T_t = \frac{1500}{60(6.6)} = 3.8 \text{ MIN.}$$

$L = 2900'$ (ST.S)

$$S = \frac{300}{2900} = 10\%$$

$Q \approx 75$ $n = .013$ $D_{EQ.} = 24$ $V = 23$

$$T_t = \frac{2900}{60(23)} = 2.1$$

$T_c = 4.9 + 3.8 + 2.1 = 10.8$ MIN. $= 0.18$ HR.

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Project: CHEYENNE MOUNTAIN RANCH
TR-20
Job No: E-3729
Client: GATES
By: RM
Date: 9 JUNE 88

REACH ROUTING COEFFICIENTS FOR SCS TR-20

CHANNEL ROUTING

$Q = XA^m$ DEVELOP DEPTH-DISCHARGE-AREA CURVE BASED ON REPRESENTATIVE CROSS SECTION

REACH 060 - 062

L = 2400 FT.

B.W. = 15'
AVG. SLOPE 4:1
n = .035
S = 7.9%

ELEV.	DEPTH	Q (CFS)	V (FPS)	A (FT.²)
6140	0	0	0	0
6141	1	198	10.4	19.0
6142	2	707	15.4	45.9
6143	3	1554	19.2	81.
6144	4	2786	22.5	124.
6140.5	0.5	59.	7.0	8.

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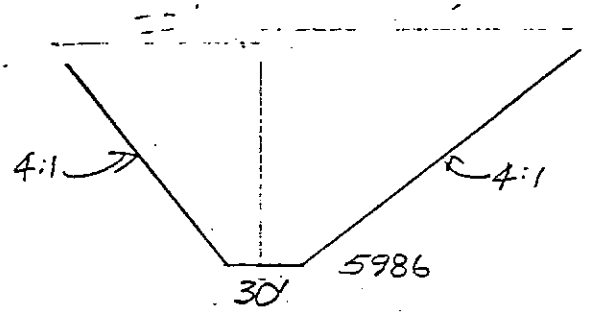
CIVIL ENGINEERS

Project	Job Nº
CHEYENNE MTN. RANCH TR-20	E-3729

Client	By	Date
GATES	RM	9 JUNE 88

REACH 062-064

L=2400'
S=3.3%



n=.040
AVG. S/S = 4

ELEV.	D.	Q	V	A
5986.	0	0	0	0
5988	2	712.	9.4	76.
5990	4	2537	13.8	184.
5992	6	5579	17.2	324
5986.5	0.5	65.	4.1	16.

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Project	Job Nº
CHEYENNE MTN. RANCH TR-20	E-3729

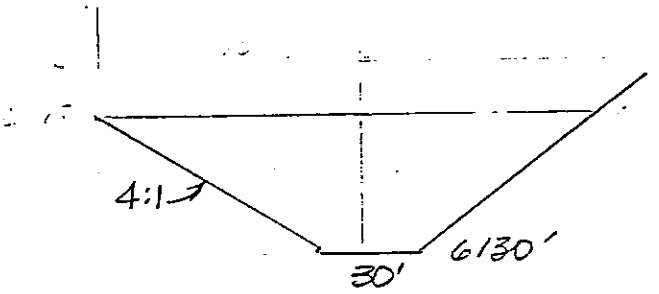
Client	By	Date
GATES	RM	9 JUNE 88

REACH 061-063

L= 2700'

n= .040

S= 8.5%



AVG. S/S = ~~6:1~~ 4:1

ELEV.	D	Q	V	A
6130	0	0	0	0
6132	2	1142	15.0	76.
6134	4	4072	22.1	184.
6130.5	0.5	105.	6.5	16.
6131	1.0	340	10.0	34.

REACH 063-064

L= 2400'

SEE REACH 062-064 FOR HYDRAULIC CHAR.

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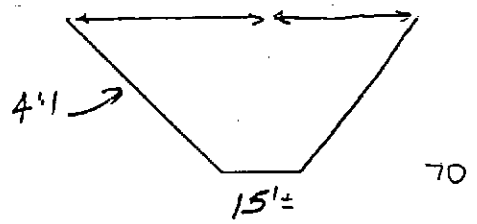
Project	Job Nº
CHEYENNE MTN. RANCH TR-20	E-3729

Client	By	Date
GATES	RM	9 JUNE 88

REACH 021-022

L = 1700

n = .040



AVG. SIDE SLOPE ~~3.75:1~~ 4:1

S = 20/260 = 7.7 %

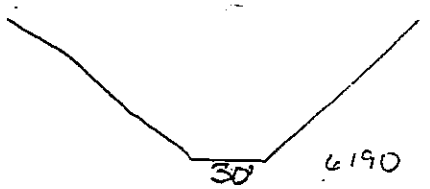
ELEV.	D	Q	V	A
59.70	0	0	0	0
72	2	610	13.3	46.
~~74~~	~~4~~			
~~75~~	~~5~~			
70.5	.5	51.	6.0	9.

REACH 160-161

L = 1100

n = 0.040

S = 20/160 = 12.5 %



AVG. SLOPE 4:1

ELEV.	D	Q	V	A
6190	0	0	0	0
6192	2	1385	18.2	76.
6194	4	4938	26.8	184.
6190.5	0.5	127.	7.9	16.

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CIVIL ENGINEERS

Project	Job No
CHEYENNE MTN. RANCH TR-20	E-3729

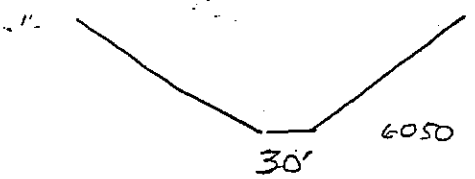
Client	By	Date
GATES	RDN	9 JUNE 83

REACH 161-162

L = 1700'

n = 0.040

S = 7.1%



AVG. SIDE SLOPE 4.0:1

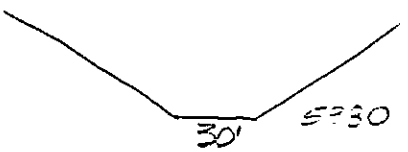
ELEV.	D	Q	V	A
6050	0	0	0	0
6052	2	1044	13.7	76.
6053	3	2174	17.3	126.
6054	4	3722	20.2	184.
6051	1	311	9.2	34.

REACH 162-163

L = 900'

n = .040

S = 30/900 = 3.3%



AVG. SIDE SLOPE 4:1

ELEV.	D	Q	V	A
5980	0	0	0	0
82	2	712	9.4	76.
84	4	2537	13.8	184.
~~85~~	~~5~~			
~~86~~	~~6~~			

81 1 212. 6.2 34.

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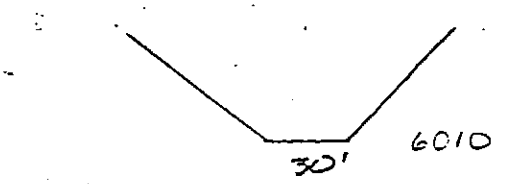
Project	Job Nº
CHEYENNE MTN. RANCH TR-20	E-3729

Client	By	Date
GATES	RMJ	9 JUNE 88

REACH 164-165

L= 3200
n= .040
s= 7.2%



AVG. SIDESLOPE 4:1

ELEV.	D	Q	V	A
6010	0	0	0	0
6012	2	1051	13.8	76.
6014	4	3748	20.4	184.
~~6015~~	~~5~~			
~~6016~~	~~6~~			
6011	1	313	9.2	34.

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LAND SURVEYORS
CIVIL ENGINEERS

Project	Job No
CHEYENNE MTN. RANCH TR-20	E-3729

Client	By	Date
GATES	RM	6/14/89 REV. 5/30/89 & 2/28/90

DES. PT. 1 & 2 COMBINED

STRUCTURE 1 (ALT 1 - 24 HR. STORM) (STR. 020 IN TR-20)

ELEV. - STORAGE

ELEV.	AREA (IN.²)	AREA (AC)	INC. VOL. (AF)	TOT. VOL. (AF)
43	0+0	0	0	0
44	0.17+0.37	0.11	0.06	0.06
46	0.85+1.10	0.44	0.55	0.61
48	1.92+2.50	1.01	1.45	2.06
50	4.55+4.65	2.11	3.12	5.18
52	7.75+8.35	3.70	5.81	10.99
54	23.6	5.42	9.12	20.11
56	29.2	6.70	12.12	32.23

SEE SHT. D6 FOR REVISED HIST. Q & RELEASE RATE

HIST. DISCHARGE

HISTORIC

Q_{10} HIST = 115 CFS (24 HR) } BASIN C60

Q_{100} HIST = 320 CFS (24 HR.)

Q_{10} HIST = 60 CFS (24 HR.) } BASIN 020

Q_{100} HIST = 135 CFS (24 HR)

ALLOWABLE RELEASE RATE

Q_{10} = 115+60 = 175 CFS

Q_{100} = 320+135 = 455 CFS

NOTE: THE ABOVE ALLOWABLE RELEASE RATES ARE BASED ON HISTORIC Q'S AT TWO CULVERTS @ SH 115 AND RELEASE TO TWO DIFFERENT POINTS TO CORRESPOND TO HISTORIC DRAINAGE PATTERNS. IF IT IS DETERMINED THAT ONE RELEASE POINT CAN BE USED, ONLY ONE OUTLET STRUCTURE WILL BE NECESSARY. THIS SHOULD BE EVALUATED FURTHER IN FUTURE DESIGN.

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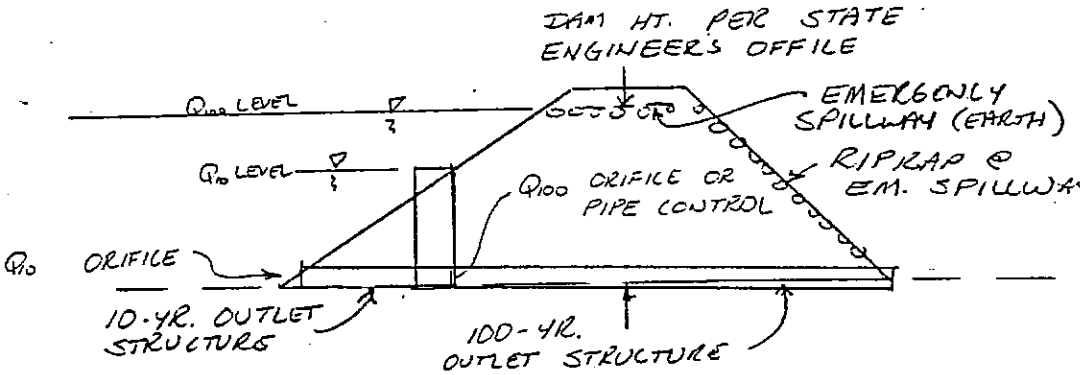
Project: CHEYENNE MTN. RANCH
TR-20
Job No: E-3729
Client: GATES
By: RM
Date: 6/14/83 REV. 5/30/89 8/28/90

TYPICAL OUTLET STRUCTURE - POND 1&2



ASSUME 6' HEAD TO CONTROL Q_{10}
FIND ORIFICE SIZE

$Q = CA\sqrt{2gH}$

C = 0.6 (WEIR COEFFICIENT)

A = ORIFICE AREA (SF)
Q = RELEASE RATE (CFS)

~~Q_{10} REQ'D = 60 CFS (ENSIN SUB)~~

$60 = 0.6\,A\sqrt{64.4(50)}$

$A = 5.57$ SF D = 32" ½ D = 1.25 → H = 6 - 1.25 = 4.75

H = 4.75 ≈ 5.0 ✓

Q_{10} (HIST.) = 115 CFS (ENSIN SUB)

ASSUME H = 4'

$115 = 0.6\,A\sqrt{64.4(4)}$

~~A = 11.94 SF D = 46.8" ½ D 1.95 H = 6 - 1.95 = 4.05~~ ✓

Project: CHEYENNE MTN. RANCH TR-20 | Job No: E-3729
Client: GATES | By: RAM | Date: 6/14/88 REV. 5/30/89

PRELIM. - SEE SHT. 6 FOR REVISED ELEV-Q

ELEV. - DISCHARGE

$A_P = 5.57$ (32" ORIF.) $A_P = 10.38$ (44" ORIF.) FINAL A

ELEV.	H_1	Q_1	H_2	Q_2	H.P.	$Q_{TOT.}$	VOL.
43	0	0	0	0		0	0
44	0.5	6.6	0.5	7.8	2.30	14.4	0.06
46	1.67	34.7	1.5	54.6	9.26	89.3	0.61
48	3.67	51.4	3.17	89.0	FF	140.4	2.06
49	4.67	58.0	4.17	102.1	↓	160.0	3.62
50		60					5.18
52		↓				↓	10.99
54							20.11
56							32.23

FROM PRELIM. RUN. ELEV. MAX. @ Q_{10-24} · 52.5± FOR Q_{10-24}

ASSUME 2.5' D. ORIFICE @ O20

$H = 52.5 - (43 + 1.25) = 8.25$

$60 = 0.6\, A \sqrt{64.4(8.25)}$

$A = 4.37$ SF , $D = 2.35'$ ✓

$D = 28.2"$ DIA

ASSUME 3' D ORIF @ O60

$H = 52.5 - (43 + 1.5) = 8.0$

$115 = 0.6\, A \sqrt{64.4(8.0)}$

$A = 8.44$ SF $D = 3.28'$ ✓

$D = 39.4"$ (33.7"D)

ELEV.	H_1	A_P	Q_1	H_2	A_2	Q_2	Q_T	VOL.
43	0	0	0	0	0	0	0	0
44	0.5	1.78	6.1	0.5	2.11	7.2	13.3	0.06
46	1.83	4.34	28.3	1.5	7.31	43.1	71.4	0.61
48	3.83	↓	40.9	3.47	7.34	65.8	106.7	2.06
50	5.83		50.5	5.47	↓	82.7	133.2	5.18
51.0	6.83		54.6	6.47		89.9	144.5	8.09
52.5	8.33		60.3	7.97		99.8	160.1	13.27

Q_{100} ORIFICE - BASIN O60

$Q_{100-24\,(HIST.)} = 320\,(060) + 135(020) = 455$

060 - $Q_{100} = 320$ CFS ASSUME 4.5' ORIFICE

$H \approx 56 - (42 + 2.25) = 11.75'$

$320 = 0.6\, A \sqrt{64.4(11.75)}$ $A = 19.39$ S.F. $D = 59.6"$ (4.97')

Project: CHEYENNE MTN. RANCH TR-20 | Job No: E-3729
Client: GATES | By: RM | Date: 6/14/88 REV. 5/30/89

@ 60
ASSUME 8'x8' RISER - WEIR LENGTH 32'
WEIR CREST EL. 52.5

$Q = 3.1 L H^{3/2}$

ASSUME ORIFICE @ 42.0
MAX. WSEL @ 56.0
& $Q_R = 320$ CFS

ASSUME 48" ORIF.
$H = 56 - (42 + 2.0) = 12.0'$

$320 = 0.6 A \sqrt{64.4(12.0)}$ $A = 19.19$ S.F. $D = 4.94'$ <

ASSUME 54" ORIF.
$H = 56 - (42 + 2.25) = 11.75$

$320 = 0.6 (A) \sqrt{64.4(11.75)}$ $A = 19.39$ S.F. $D = 4.97'$ ✓

@ 53 $Q_w = 3.1(32)(0.5)^{3/2} = 35.1$ CFS

$Q_o = 0.6(7.34)\sqrt{64.4(8.47)} = 102.9$

$Q_T = 35.1 + 102.9 = 138.0$

@ 54 $Q_w = 3.1(32)(1.5)^{3/2} = 182.2$ CFS

$Q_o = 0.6(7.34)\sqrt{64.4(9.47)} = 108.8$ CFS @ 10 YR ORIFICE

$Q_T = 182.2 + 108.8 = 291.0$ (> Q_{100} HIST. - 283 - Q_{100} ORIFICE CONTROL)

$H = 54 - (42 + \frac{4.67}{2}) = 9.67$

$A = 17.15$ S.F.

$Q_o = 0.6(17.15)\sqrt{64.4(9.67)} = 256.8$ CFS

@ 56 $H = 11.67$ FT.
$A = 17.15$ S.F.

$Q_o = 0.6(17.15)\sqrt{64.4(11.67)} = 282.1$ CFS

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Project: CHEYENNE MTN. RANCH TR-20 | Job No: E-3729

Client: GATES | By: RM | Date: 6/14/88 REV. 5:30/89

Q_{100} ORIFICE – BASIN O2O

$Q_{100\text{-}24}$ HIST. = 135 CFS
ASSUME 3.5' ORICICE ✓
H ≈ 56 − (42 + 1.75) = 12.25'

$Q = CA\sqrt{2gH}$

$135 = 0.6\ A\sqrt{64.4(12.25)}$

$A = 8.01$ SF $D = 38.3''$ (3.19')

ASSUME 6'×6' RISER (L = 24' WEIR @ CREST EL 52.5)

@ 53.0

$Q_W = CLH^{3/2} = 3.1(24)(0.5)^{3/2} = 26.3$ CFS

$Q_O = CA\sqrt{2gH} = 0.6(4.34)\sqrt{64.4(8.83)} = 62.1$

$Q_T = 26.3 + 62.1 = 88.4$ CFS

@ 54.0

$Q_W = 3.1\ (24)(1.5)^{3/2} = 137.7$ CFS.

$Q_O = 0.6\ (4.34)\sqrt{64.4(9.83)} = 65.5$ CFS

$Q_T = 137.7 + 65.5 = 203.2$ (> $Q_{ALLOWABLE}$ – Q_{100} ORIFICE CONTROL)

$Q_O = C.6\,(2.01)\left(\sqrt{64.4(10.25)}\right) = 123.5$ CFS

@ 56.0

$Q_O = 135$ CFS (FROM CRITIC. DESIGN ABOVE)

Project: CHEYENNE MOUNTAIN RANCH
DRAINAGE WEST OF HIGHWAY 115
Job No: E-3729
Client: GATES
By: RM
Date: 29 JULY 87 REV. 5/30/89 REV. 10/26/89 " 2/23/90

DETENTION POND No. 1 (REVISED)

MODIFY DETENTION POND NO. 1 TO PROVIDE DETENTION STORAGE FOR BASINS OS1, OS2, C21 & OS22 IN ADDITION TO OTHER BASINS (TOT. IS NOW FOR DESIGN PTS. 1-4)

HISTORIC FLOW

BASIN	DA.	Q_{10}	Q_{100}
060	.545	60	290
020	.078	80	170
		140	460

REVISE OUTLET CAPACITY TO EQUAL NEW HISTORIC DISCHARGES

STRUCTURE 20 REVISED (DATA FILE E-3729.FED)
REV. 10/26/89

	ELEV.	$Q_{TOT.}$	Q_{OUT}	
	43	0	0	PRORATE REVISED Q $Q_{TOT-NEW} = Q_{TOT} \times \frac{140}{220}$
	44	27	17.	
	46	98	62.	
	48	147	94.	
	50	183	116.	
	51.8	199	127.	
2ND STAGE →	52.5	220	140	
	53	313	240	
	54	525	403	$Q_{NEW} = \frac{\cancel{330}\ 460}{460/600} \times Q_{OLD}$
	56	530	445	
	57	600	460	

FROM TR-20 RESULTS (DEVELOPED Q STRUCTURE 20)

Q_{10} OUTFLOW = ~~210~~ 140 CFS. ✓ (≤ ~~265~~ CFS HIST.)

Q_{100} OUTFLOW = ~~560~~ 430 CFS ✓ (< ~~610~~ 460 CFS HIST.)

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Project: CHEYENNE MOUNTAIN RANCH
DRAINAGE W. OF SH 115
Job No: CE-3729
Client: GATES
By: RM
Date: 2/8/91

DETENTION POND NO. 2 (STRUCTURE 80 IN TR-20)

ELEVATION - STORAGE

ELEV.	AREA (AC.)	INC. VOL. (AC. FT.)	TOT. VOL. (AC-FT)
5960	0.52	0	0
65	1.26	4.45	4.45
67.5	1.43	3.36	7.81
70	1.84	4.09	11.90
72.5	2.34	5.23	17.13
75	3.06	6.75	23.88
77.5	3.70	8.45	32.33
80	4.12	9.78	42.11
82.5	4.68	11.00	53.11

OUTLET DESIGN

ASSUME $Q \approx 400$ CFS @ ELEV. 75 (Q_{10})

INV. @ 5960 $H = 14'$ (4' HIGH ORIFICE)

$\Rightarrow$ ORIFICE SIZE = 5' HIGH × 4.6' WIDE

$Q_o = 0.61 (23.2) \sqrt{64.4 (H)}$

ELEV.	H	Q_o
60	0	0
65	2.5	180
67.5	5	254
70	7.5	311
72.5	10	359
75	12.5	402.
77.5	15.0	440

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Project: CHEYENNE MTN. RANCH
DRAINAGE W/ OF SH 115

Job Nº: CE-3729

Client: GATES

By: RM

Date: 2/8/91

ELEV.	H	Q
80	16	1280
82.5	18.5	1380

(NOTE: 8'H = 8.17'W ORIFICE

FOR $Q_{100} - Q = \frac{0.61(65.40)}{\sqrt{64.4(H)}}$

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CIVIL ENGINEERS

Project: CHEYENNE MTN. RANCH
DRAINAGE W. OF SH 115

Job No: E-3729

Client: GATES

By: RMM

Date: 3 AUG. 88
REV. 5/30/89 12/28/90

QUANTITY / COST ESTIMATE - DETENTION POND 1

EXC. - 54,000 C.Y. } TO ELEV. 60 - CONSERV.
FILL - 39,600 C.Y. } USE 40,000 AS FILL QUAN.

SEED / MULCH / FERTILIZE

250' x 1800'. ÷ 43,560 = 10.3 Ac. → 11 Ac.

LOW FLOW CHANNEL — 1' DEEP 2% SLOPE 10' R/W 4:1 S:S n=.04
Q=62 ~5% Q_{100} INFLOW ✓ 1.5 THICK ROCK w/ 0.5 BEDDING
⇒ 1.35 C.Y./L.F. x $35/C.Y. = $47/L.F.
x 950' = $

OUTFALL STRUCTURE DESIGN — (EARTHEN EMERG. SPILLWAY TO BE PROVIDED W/ FINAL DESIGN)

NORTH - BARREL LENGTH - 160 FT. IN 43 OUT 42
RISER HT. - 7.5 FT.

SOUTH - BARREL LENGTH - 180 FT. IN 43 OUT 41
RISER HT. - 7.5'

NORTH OUTLET - Q_{100} = 420 CFS
ASSUME T/I TW @ 48 (APPROX. TOP OF ROAD)
ΔH = 55.0 - 48 = 7'

CHECK SIZE W/ PRESSURE FLOW
Q = 420 h = 7'
n = .015
$K_e \cdot K_o$ = 1.0
L = 160'

d = 72 → Q = 340
d = 78 → Q = 403 V = 12.2
d = 84" → Q = 472 CFS USE 78" W/ IMP. INLET

RISER : Q_{100} = 420 Q_{10} = 150 Q_{WEIR} = 270 CFS
H = 3.1
$Q = 3.1 L H^{3/2}$ $270 = 3.1 L (3.1)^{3/2}$
L = 16'
USE 7' x 7' BOX (CONCRETE)

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EARTHWORK CALCULATIONS

JOB NO E-3729
DATE 8/3/88
CALC. BY: RM
CHECKED BY:
PAGE: 1/1

PROJECT: CHEYENNE ATTN. RANCH DET POND 1
CLIENT: GATES

	STATION	CUT	FILL	AVE. CUT	AVE. FILL	DISTANCE	VOL. CUT	VOL. FILL	REMARKS
	10+00	0	0						
	10+50	0	60	0	30	50	0	56	
	12+30	144	200	72	130	180	480	867	
	14+30	1016	104	530	152	200	4296	1126	
	15+70	1634	16	1325	60	140	6870	311	
	16+40	2128	14	1581	15	70	4877	39	
	17+00	1816	16	1972	15	60	4382	33	
	17+70	845	605	1330.5	310.5	70	3449	805	
	18+40	1578	32	1211.5	318.5	70	3141	826	
	19+30	4592	0	3085	16	90	10,283	53	
	20+00	2208	320	3400	160	70	8815	415	
	20+65	989	1008	1598.5	664	65	3848	1599	
	21+65	115	1288	552	1148	100	2044	4252	
	23+35	122	1370	118.5	1329	170	746	8368	
	26+45	0	954	61	1162	310	700	13,341	
	29+50	0	128	0	541	305	0	6111	
	30+85	0	0	0	64	135	0	320	
						2055'	55951	33,522	

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Project	Job Nº
CHEYENNE MTN. RANCH DRAINAGE W. OF SH 115	E-3729
Client GATES	**By** RM / **Date** 3 Aug. 88

RISER CONCRETE – 4 WALLS × 8' × 7.5' × 1' THICK = 240 CF
BASE 9 × 9 × 1 = 81
TOT. 321 CF/27
= 11.9 C.Y.
USE 12

RIPRAP & BEDDING
ASSUME 20' WIDE × 30' LONG × 4' THICK ÷ 27
= 89 C.Y.

SOUTH OUTLET
Q_{100} = 160 CFS
n = .015
L = 180'
$K_e \overset{0.5}{=} K_o = 1.0$
ΔH = 55.0 – 48 = 7'
48" → Q = 139
54" → Q = 180 ✓

RIPRAP 20' × 30' × 3.5' ÷ 27 = 78 (TOT 167)

~~CULVERT @ DES. PT. (6)~~
~~Q_{100} = 460 CFS~~
~~HW/D = 1.5~~ 6' HIGH BOX → 60 CFS/FT.
~~460/60 = 7.67'~~ USE 8' WIDE × 6' HIGH BOX
~~VOL CONC. (10" WALLS) = .83/12 × 12' ÷ 27 = 0.37~~
~~(6) 10" FLOOR TOP 2 × 10' × 10/12 ÷ 27 = 0.62~~
~~0.99 C.Y./L.F. × 250 C.Y. = 250 L.F.~~
USE 275 L.F.

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Project	Job Nº
CHEYENNE MOUNTAIN RANCH DRAINAGE W. OF SH 115	CE-3729

Client	By	Date
GATES	RJM	OCT. 26, 1989

EMERGENCY SPILLWAY FOR POND 1:

Q_{100} = 430 CFS (OUTFLOW)

WEIR EQN: $Q = CLH^{3/2}$

C = 3.1

L = WEIR LENGTH

H = DEPTH

ASSUME 2' FLOW DEPTH @ CREST

$440 = 3.1(L)(2)^{3/2}$

$\Rightarrow L = 50.2$ FT. (REASONABLE)

LENGTH OF SPILLWAY ~ 150'

SLOPE = 55 - 40 ± / 150 = 10%

TRY 40' BOTTOM WIDTH TRAP. CHANNEL

BW = 40'

n = .040 (RIPRAP)

Z = 4:1 S = 10%

d = 1.0 FT.

Q = 490 CFS

V = 11.0 FPS

ASSUME

50' WIDE RIPRAP × 150' LONG × 3' THICK ÷ 27 =

833 C.Y. RIPRAP USE 900 C.Y. @ $50

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LAND SURVEYORS
CIVIL ENGINEERS

Project: CHEYENNE MTN. RANCH
DRAINAGE W. OF SH 115

Job No: CE-3729

Client: GATES

By: AMM

Date: 2/8/91

QUANTITY/COST EST. - POND NO. 2

EARTH FILL EST. - DETENTION POND #2
(ASSUME 16' TOP, 4:1 S/S, TOP ELEV. 87.0)

STA.	H(FT.)	A(SF)	A(AVG.)	L(FT.)	V(CF)	V(CY)
0	0	0				
			154	210	32,340	1198
2+10	7	308				
			658	170	111,860	4143
3+80	14	1008				
			1074	240	257,760	9547
6+20	15	1140				
			1074	40	42,960	1591
6+60	14	1008				
			1074	20	21,480	796
6+80	15	1140				
			1284	5	6420	238
6+85	17	1428				
			2388	35	83,580	3096
7+20	27	3348				
			3844	10	38,440	1424
7+30	31	4340				
			4340	30	130,200	4822
7+60	31	4340				
			2884	40	115,360	4273
8+00	17	1428				
			948	50	47,400	1756
8+50	9	468				
			234	45	10,530	390
8+95	0	0				
				Σ= 895 ✓	898,330	33,274

34,000 C.Y.

1700 38TH STREET [303] 442-4338
BOULDER, COLORADO 80301

740 WOOTEN RD. #108 [303] 591-5151
COLORADO SPRINGS, COLORADO 80915

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
CHEYENNE MTN. RANCH DRAINAGE W. OF SH 115	E-3729

Client	By	Date
GATES	RMJ	3 AUG. 88 REV. 2/8/91

QUANTITY / COST ESTIMATE - DETENTION POND 2

OUTFALL STRUCTURE

BARREL LENGTH - 250 FT. IN 59 OUT 55

RISER HT. - 10 FT. ±

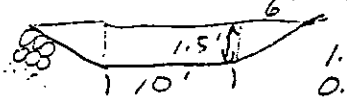
$L = 250'$
$Q = 1340$ CFS
$n = .013$
$\phi / H = 10'$

$d = 90' \rightarrow Q = 637 \times 3 = 1911$ CFS
$d = 96' \rightarrow Q = 730 \times 3 = 2190$
$d = 102' \rightarrow Q = 830$

RIPRAP $50' \times 40' \times 4.5 \div 27 = 330$ C.Y.

RISER $Q_{100} = 2200$
$Q_{10} = 850$
$Q_{\text{WEIR}} = 1350$ CFS
$H = 5'$
$1350 = 3.1\ L\ (5)^{3/2}$
$L = 39'$

LOW FLOW CHAN. 2% SLOPE ± $n = .040$
10' B.W. 4:1 S/S 1.5' DEEP
$Q = 132$ CFS (~7% Q_{100} INFLOW) ✓
VOL./FT. = $(10' + 12.37') \times 2'$ THICK $\times {}^{135}/_{27} \div 27 = {}^{5}58$/LF
↓ 60



1.5' RIPRAP
0.5' BEDDING

Project: CHEYENNE MTN. RANCH
DRAINAGE W. OF SH 115
Job No: CE-3729
Client: GATES
By: RJT
Date: 26 OCT. 1989
REV. 2/28/90 & 2/8/91

EMERGENCY SPILLWAY - POND #2

Q_{100} (OUTFLOW) = 1320 CFS

LENGTH = 800' ±

$S = 81-54/800 = 3.4\%$

TRAPEZOIDAL CHANNEL

60' B.W.
3:1 S/S
n = .040
w/ d = 2' Q = 1350 CFS V = 10.2

RIPRAP 70' × 800' × 3' ÷ 27 = 6222 C.Y.
(NOT PRACTICAL)

TRY EARTH CHANNEL w/ 5 8' DEEP CONCRETE CUTOFF WALLS

5 × 80' LONG × 8' DEEP × 1.5' THICK ÷ 27
= 177.8 C.Y. CONCRETE
@ 250/C.Y. = $44,444
↓
$50,000

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
CHEYENNE MTN. RANCH DRAINAGE W. OF SH 115	CE-3729

Client	By	Date
GATES	RM	10/26/89 REV. 2/28/90

CURVE NUMBERS/LAND USE:

LAND USE FOR DEVELOPED CONDITIONS IS OBTAINED FROM CURRENT MASTER PLANS FOR BROADMOOR, EL POMAR, NEAL RANCH, STAR RANCH, V.L. RANCH AND CHEYENNE MOUNTAIN RANCH. NO MASTER PLANS ARE AVAILABLE FOR THE U.S. GOV'T., MILDRED BEISSIG PROPERTY OR THE BENSBURG ESTATE. IT IS ASSUMED THAT NO DEVELOPMENT WILL OCCUR ON THE BEISSIG PROPERTY. THE U.S. GOVERNMENT IS ASSUMED TO BE UNDEVELOPED. (A PREVIOUS DRAINAGE STUDY FOR THE NEAL RANCH (REF. 5) DETERMINED THAT ANY DEVELOPMENT ON THE U.S. GOV'T. SITE WAS OFFSET BY DETENTION AT ROAD CROSSINGS). FOR THE BENSBURG ESTATE, A DENSITY OF 4 RESIDENTIAL UNITS PER ACRE IS ASSUMED. IF ACTUAL DENSITY IS GREATER THAN THAT, SOME ONSITE DETENTION MAY BE REQUIRED. THIS WILL BE DETERMINED DURING SITE DEVELOPMENT. DEVELOPED CURVE NOS. ARE BASED ON THE DCM. HISTORIC CURVE NUMBERS ARE DERIVED FROM REF. 8 AND ASSUME A 20% COVER PONDEROSA PINE/OAK COVER IN THE WESTERN PORTION OF THE BASIN, A 60% COVER PONDEROSA PINE/OAK IN THE EASTERN PORTION OF THE BASIN, AND RANGE IN FAIR CONDITION FOR THE UNWOODED PORTIONS OF THE BASIN. ALL CURVE NUMBERS ARE BASED ON ANTECEDANT MOISTURE CONDITION 2.

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
BASIN CURVE NUMBER - DEVELOPED AND HISTORIC CONDITIONS

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	DEV. AVG. BASIN CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN	HIST.AVG. BASIN CN
52	GATES	B	23.7	INDUST.	88	2085.6			RANGE	69	1635.3		
	TOTAL		23.7			2085.6	88.0	88.0			1635.3	69.0	69.0
64	GATES	B	15.7	INDUST.	88	1381.6			RANGE	69	1083.3		
		C	30.8	INDUST.	91	2802.8			RANGE	79	2433.2		
	TOTAL		46.5			4184.4	90.0	90.0			3516.5	75.6	75.6
20	GATES	C	8.8	INDUST.	91	800.8			RANGE	79	695.2		
		C/D	10.9	INDUST.	92	1002.8			RANGE	81.5	888.4		
	TOTAL		19.7			1803.6	91.6	91.6			1583.6	80.4	80.4
22	GATES	C	5.9	INDUST	91	536.9			RANGE	79	466.1		
		C/D	10.5	INDUST	92	966.0			RANGE	81.5	855.8		
	TOTAL		16.4			1502.9	91.6	91.6			1321.9	80.6	80.6
1	GATES	B	2.4	INDUST.	88	211.2			RANGE	69	165.6		
		C	2.2	INDUST.	91	200.2			RANGE	79.0	173.8		
		C/D	10.7	INDUST.	92	984.4			RANGE	81.5	872.1		
	TOTAL		15.3			1395.8	91.2	91.2			1211.5	79.2	79.2
200	GATES	B	4.2	INDUST.	88	369.6			RANGE	69	289.8		
		C/D	8.4	INDUST.	92	772.8			RANGE	81.5	684.6		
		C	4.5	INDUST.	91	409.5			RANGE	79	355.5		
	TOTAL		17.1			1551.9	90.8	90.8			1329.9	77.8	77.8
168	GATES	C	10.6	INDUST.	91	964.6			RANGE	79	837.4		
		C/D	4.6	INDUST.	92	423.2			RANGE	81.5	374.9		
	TOTAL		15.2			1387.8	91.3	91.3			1212.3	79.8	79.8
167	GATES	C/D	8.6	INDUST.	92	791.2			RANGE	81.5	700.9		
		C	4.0	INDUST.	91	364.0			RANGE	79	316.0		
	TOTAL		12.6			1155.2	91.7	91.7			1016.9	80.7	80.7
51	GATES	C	1.7	SCHOOL	79	134.3			WOODS	60	102.0		
		C	2.5	COMM.	94	235.0			WOODS	60	150.0		
		B	2.5	SCHOOL	69	172.5			RANGE	69	172.5		
		C	3.6	S.F. - 1.7	79.7	286.9			WOODS	60	216.0		
		B	4.4	COMM.	92	404.8			RANGE	69	303.6		
	TOTAL		14.7			1233.5	83.9	83.9			944.1	64.2	64.2
62	GATES-F.P.	B	21.9	S.F. - 1.0	68	1489.2			WOODS	55	1204.5		
	GATES-F.P.	C	7.7	S.F. - 1.0	79	608.3			WOODS	60	462.0		
	GATES-F.P.	C	4.0	PARK	74	296.0			WOODS	60	240.0		
	TOTAL		33.6			2393.5	71.2	71.2			1906.5	56.7	56.7
63	GATES	C	2.5	S.F. - 1.9	79.9	199.8			WOODS	60	150.0		
		C	19.6	SCHOOL	79	1548.4			WOODS	60	1176.0		
		C	20.8	M.F. - 6.0	86.5	1799.2			WOODS	60	1248.0		
		C	4.3	S.F. - 1.3	79.3	341.0			WOODS	60	258.0		
		B	4.7	S.F. - 1.3	68.6	322.4			WOODS	55	258.5		
		C	19.2	O.S.	74	1420.8			WOODS	60	1152.0		
	TOTAL		71.1			5631.6	79.2	79.2			4242.5	59.7	59.7

E2/11

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
BASIN CURVE NUMBER - DEVELOPED AND HISTORIC CONDITIONS

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	DEV. AVG. BASIN CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN	HIST.AVG. BASIN CN
21	GATES	C	13.4	S.F. - 1.0	79	1058.6			RANGE	79	1058.6		
	TOTAL		13.4			1058.6	79.0	79.0			1058.6	79.0	79.0
162	GATES	C	24.1	O.S.	74	1783.4			WOODS	60	1446.0		
		C/D	4.5	O.S.	81.5	366.8			WOODS	65	292.5		
		C/D	3.5	M.F. - 6.0	88	308.0			WOODS	65	227.5		
		C	4.9	M.F. - 6.0	86.5	423.9			WOODS	60	294.0		
	TOTAL		37.0			2882.0	77.9	77.9			2260.0	61.1	61.1
163	GATES	C	2.6	M.F. - 8.0	90	234.0			WOODS	60	156.0		
		C/D	7.0	M.F. - 8.0	91	637.0			WOODS	65	455.0		
	TOTAL		9.6			871.0	90.7	90.7			611.0	63.6	63.6
165	GATES	C	28.7	M.F. - 8.0	90	2583.0			WOODS	60	1722.0		
		C	18.1	O.S.	74	1339.4			WOODS	60	1086.0		
		B	3.8	O.S.	61	231.8			WOODS	55	209.0		
	TOTAL		50.6			4154.2	82.1	82.1			3017.0	59.6	59.6
161	GATES	B	12.1	S.F. - 1.0	68	822.8			WOODS	55	665.5		
		C	17.9	S.F. - 1.0	79	1414.1			WOODS	60	1074.0		
	GATES/NR	B	4.8	S.F. - 3.5	73.5	352.8			WOODS	55	264.0		
	TOTAL		34.8			2589.7	74.4	74.4			2003.5	57.6	57.6
166	BENSBURG	B	4.8	S.F. - 2.0	70	336			RANGE	69	331.2		
		C	15.4	S.F. - 2.0	80	1232			RANGE	79	1216.6		
		C/D	6.0	S.F. - 2.0	82.5	495			RANGE	81.5	489		
	TOTAL		26.2			2063.0	78.7	78.7			2036.8	77.7	77.7
60	SELLON NR #2 - F.P.	B	15.0	S.F. - 2.4	70.8	1062.0			WOODS	55	825.0		
	SELLON NR#3 - F.P.	B	11.2	S.F. - 2.3	70.6	790.7			WOODS	55	616.0		
	SELLON NR #5 - F.P.	B	10.5	M.F. - 7.0	82.5	866.3			WOODS	55	577.5		
	SELLON BO #5 - F.P.	B	1.0	S.F. - 3.0	72	72.0			WOODS	55	55.0		
	SELLON BO #5 - F.P.	B	3.0	PARK	61	183.0			WOODS	55	165.0		
	SELLON	B	9.3	SCHOOL	69	641.7			WOODS	55	511.5		
	SUBTOTAL SELLON		50.0			3615.7	72.3				2750.0	55.0	
	MLV (DEV. CN PER O.E. WATTS STUDY)	B	3.2	S.F. - 2.0	69.8	223.4			WOODS	55	176.0	55.0	
	SUBTOT. MLV		3.2			223.4	69.8				176.0	55.0	
	TOTAL		53.2			3839.0		72.2			2926.0		55.0

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
BASIN CURVE NUMBER - DEVELOPED AND HISTORIC CONDITIONS

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	DEV. AVG. BASIN CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN	HIST.AVG. BASIN CN
61	SELLON - F.P.	B	5.9	PARK	61	359.9			WOODS	55	324.5		
	SELLON	B	5.1	SCHOOL	69	351.9			WOODS	55	280.5		
	SELLON - F.P.	B	2.0	PARK	61	122.0			WOODS	55	110.0		
	SELLON - BO #5	B	1.4	S.F. - 3.0	72	100.8			WOODS	55	77.0		
	SELLON - BO #8	B	2.9	S.F. - 1.9	69.8	202.4			WOODS	55	159.5		
	SELLON - MO #2	B	18.4	S.F. - 3.5	73.5	1352.4			WOODS	55	1012.0		
	SELLON - BO #3 - F.P.(DEV CN PER WATTS)	B	6.7	S.F. 2.2	70.2	470.3			WOODS	55	368.5		
	SUBTOT. SELLON		42.4			2959.8	69.8				2332.0	55.0	
	MLV	B	15.0	S.F. - 2.0	69.8	1047.0			WOODS	55	825.0		
	MLV	B	0.3	S.F. - 2.0	70	21.0			WOODS	55	16.5		
	SUBTOT. MLV		15.3			1068.0	69.8				841.5	55.0	
	BROADMOOR	B	16.5	S.F. - 1.4	68.6	1131.9			WOODS	55	907.5		
		B	1.0	S.F. - 0.9	67.6	67.6			WOODS	55	55.0		
	SUBTOT. BROADMOOR		17.5			1199.5	68.5				962.5	55.0	
	GATES	B	0.5	S.F. - 3.5	73.5	36.8			WOODS	55	27.5		
	SUBTOT. GATES		0.5			36.8	73.5				27.5	55.0	
	STAR RANCH	B	30.0	S.F. - 5.1	77.8	2334.0			WOODS	55	1650.0		
	SUBTOT. STAR RANCH		30.0			2334.0	77.8				1650.0	55.0	
	TOTAL BASIN		105.7			7598.0		71.9			5813.5		55.0
160	SELLON MO #2 - F.P.	B	6.8	S.F. - 3.5	73.5	499.8			WOODS	55	374.0		
	SELLON BO #1 - F.P.	B	4.5	S.F. - 2.2	70.4	316.8			WOODS	55	247.5		
	SELLON	B	1.6	S.F. - 2.4	70.8	113.3			WOODS	55	88.0		
	SELLON BO #3 - F.P.	B	20.3	S.F. - 2.2	70	1421.0			WOODS	55	1116.5		
	SELLON BO #4	B	5.5	S.F. - 2.2	70	385.0			WOODS	55	302.5		
	PER OE WATTS STUDY)	B	0.7	S.F. - 2.4	70.3	49.2			WOODS	55	38.5		
	SELLON - PARK	B	5.0	PARK	61	305.0			WOODS	55	275.0		
	SUBTOTAL - SELLON		44.4			3090.1	69.6				2442.0	55.0	
	J.L. RANCH	B	23.1	O.S.	55	1270.5			WOODS	55	1270.5		
	J.L. RANCH	B	1.1	O.S.	55	60.5			WOODS	55	60.5		
	J.L. RANCH	B	6.6	S.F. - 2.0	70	462.0			WOODS	55	363.0		
	J.L. RANCH	B	11.3	S.F. - 2.0	70	791.0			WOODS	55	621.5		
	SUBTOTAL J.L. RANCH		42.1			2584.0	61.4				2315.5	55.0	
	MLV	B	5.6	S.F. - 2.0	69.8	390.9			WOODS	55	308.0		
	MLV	B	4.0	S.F. - 2.0	70	280.0			WOODS	55	220.0		
	MLV	B	3.5	S.F. - 2.4	69.8	244.3			WOODS	55	192.5		
	MLV	B	1.3	S.F. - 1.9	69.8	90.7			WOODS	55	71.5		
	MLV	B	42.0	S.F. - 1.9	69.8	2931.6			WOODS	55	2310.0		
	SUBTOTAL MLV		56.4			3937.5	69.8				3102.0	55.0	
	GATES	B	3.2	S.F. - 3.5	73.5	235.2			WOODS	55	176.0		
	SUBTOTAL GATES		3.2			235.2	73.5				176.0	55.0	

E4/11

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
BASIN CURVE NUMBER - DEVELOPED AND HISTORIC CONDITIONS

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	DEV. AVG. BASIN CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN	HIST.AVG. BASIN CN
160	BROADMOOR	B	32.9	S.F. - 0.8	67.7	2227.3			WOODS	55	1809.5		
CONT.	BROADMOOR	B	62.1	O.S.	55	3415.5			WOODS	55	3415.5		
	BROADMOOR	D	10.7	O.S.	81	866.7			WOODS	81	866.7		
	BROADMOOR	D	93.0	O.S.	81	7533.0			WOODS	81	7533.0		
	SUBTOTAL BROADMOOR		198.7			14042.5	70.7				13624.7	68.6	
	M. BEISSIG	D	17.0	O.S.	81	1377.0			WOODS	81	1377.0		
	SUBTOTAL BEISSIG		17.0			1377.0	81.0				1377.0	81.0	
	STAR RANCH	B	17.5	M.F. - 5.1	77.8	1361.5			WOODS	55	962.5		
	SUBTOTAL STAR RANCH		17.5			1361.5	77.8				962.5	55.0	
	TOTAL BASIN		379.3			26627.8		70.2			23999.7		63.3
164	BENSBURG	C	40.2	S.F. - 2.0	80	3216.0			WOODS	60	2412.0		
	BENSBURG	B	25.3	S.F. - 2.0	70	1771.0			WOODS	55	1391.5		
	SUBTOTAL BENSBURG		65.5			4987.0	76.1				3803.5	58.1	
	J.L. RANCH	C	4.7	O.S.	60	282.0			WOODS	60	282.0		
	J.L. RANCH	C	0.5	S.F. - 2.0	80	40.0			WOODS	60	30.0		
	J.L. RANCH	B	5.7	O.S.	55	313.5			WOODS	55	313.5		
	J.L. RANCH	B	7.7	O.S.	55	423.5			WOODS	55	423.5		
	J.L. RANCH	B	1.7	O.S.	55	93.5			WOODS	55	93.5		
	J.L. RANCH	B	1.9	O.S.	55	104.5			WOODS	55	104.5		
	J.L. RANCH	B	9.6	S.F. - 2.0	70	672.0			WOODS	55	528.0		
	J.L. RANCH	B	3.1	S.F. - 2.0	70	217.0			WOODS	55	170.5		
	J.L. RANCH	B	2.0	S.F. - 3.0	72	144.0			WOODS	55	110.0		
	J.L. RANCH	B	1.2	S.F. - 1.0	68	81.6			WOODS	55	66.0		
	J.L. RANCH	B	18.2	S.F. - 2.0	70	1274.0			WOODS	55	1001.0		
	J.L. RANCH	B	4.0	S.F. - 2.0	70	280.0			WOODS	55	220.0		
	J.L. RANCH	B	1.7	O.S.	55	93.5			WOODS	55	93.5		
	J.L. RANCH	C	0.5	S.F. - 2.0	80	40.0			WOODS	60	30.0		
	SUBTOTAL J.L. RANCH		62.5			4059.1	64.9				3466.0	55.5	
	SELLON	B	0.8	S.F. - 2.7	71.4	57.1			WOODS	55	44.0		
	SELLON BO #7 (DEV CN PER OE WATTS STUDY)	B	37.3	S.F. - 2.4	70.9	2644.6			WOODS	55	2051.5		
	SUBTOTAL SELLON		38.1			2701.7	70.9				2095.5	55.0	
	MLV	B	20.8	S.F. - 1.5	69	1435.2			WOODS	55	1144.0		
	MLV	B	5.9	S.F. - 2.7	71.4	421.3			WOODS	55	324.5		
	MLV	B	1.8	S.F. - 2.2	70.4	126.7			WOODS	55	99.0		
	MLV	B	0.8	S.F. - 2.0	70	56.0			WOODS	55	44.0		
	MLV	B	8.3	S.F. - 2.0	70	581.0			WOODS	55	456.5		
	MLV	B	4.8	S.F. - 1.2	68.4	328.3			WOODS	55	264.0		
	MLV	B	3.4	S.F. - 1.9	69.8	237.3			WOODS	55	187.0		
	MLV	B	4.9	S.F. - 1.9	69.8	342.0			WOODS	55	269.5		
	MLV	B	13.3	S.F. - 1.9	69.8	928.3			WOODS	55	731.5		
	MLV	B	22.5	S.F. - 1.9	69.8	1570.5			WOODS	55	1237.5		
	SUBTOTAL MLV		86.5			6026.7	69.7				4757.5	55.0	

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
BASIN CURVE NUMBER - DEVELOPED AND HISTORIC CONDITIONS

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	DEV. AVG. BASIN CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN	HIST.AVG. BASIN CN
164	U.S. GOVERNMENT	B	36.0	O.S.	55	1980.0			WOODS	55	1980.0		
CONT.	U.S. GOVERNMENT	D	48.0	O.S.	81	3888.0			WOODS	81	3888.0		
	U.S. GOVERNMENT	D	46.5	O.S.	81	3766.5			WOODS	81	3766.5		
	SUBTOTAL - U.S. GOV.		130.5			9634.5	73.8				9634.5	73.8	
	M. BEISSIG	D	176.0	O.S.	81	14256.0			WOODS	81	14256.0		
	SUBTOTAL BEISSIG		176.0			14256.0	81.0				14256.0	81.0	
	BROADMOOR	B	11.6	S.F. - 0.8	67.5	783.0			WOODS	55	638.0		
	BROADMOOR	B	18.4	O.S.	55	1012.0			WOODS	55	1012.0		
	BROADMOOR	D	10.0	O.S.	81	810.0			WOODS	81	810.0		
	BROADMOOR	D	22.0	O.S.	81	1782.0			WOODS	81	1782.0		
	SUBTOTAL BROADMOOR		62.0			4387.0	70.8				4242.0	68.4	
	BASIN TOTAL		621.1			46052.0		74.1			42255.0		68.0

E6/11

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
OWNER CURVE NUMBERS - DETENTION POND NO. 1

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN
52	GATES	B	23.7	INDUST.	88	2085.6		RANGE	69	1635.3	
64	GATES	B	15.7	INDUST.	88	1381.6		RANGE	69	1083.3	
64		C	30.8	INDUST.	91	2802.8		RANGE	79	2433.2	
20	GATES	C	8.8	INDUST.	91	800.8		RANGE	79	695.2	
20		C/D	10.9	INDUST.	92	1002.8		RANGE	81.5	888.4	
22	GATES	C	5.9	INDUST	91	536.9		RANGE	79	466.1	
22		C/D	10.5	INDUST	92	966.0		RANGE	81.5	855.8	
51	GATES	C	1.7	SCHOOL	79	134.3		WOODS	60	102.0	
51		C	2.5	COMM.	94	235.0		WOODS	60	150.0	
51		B	2.5	SCHOOL	69	172.5		RANGE	69	172.5	
51		C	3.6	S.F. - 1.7	79.7	286.9		WOODS	60	216.0	
51		B	4.4	COMM.	92	404.8		RANGE	69	303.6	
63	GATES	C	2.5	S.F. - 1.9	79.9	199.8		WOODS	60	150.0	
63		C	19.6	SCHOOL	79	1548.4		WOODS	60	1176.0	
63		C	20.8	M.F. - 6.0	86.5	1799.2		WOODS	60	1248.0	
63		C	4.3	S.F. - 1.3	79.3	341.0		WOODS	60	258.0	
63		B	4.7	S.F. - 1.3	68.6	322.4		WOODS	55	258.5	
63		C	19.2	O.S.	74	1420.8		WOODS	60	1152.0	
21	GATES	C	13.4	S.F. - 1.0	79	1058.6		RANGE	79	1058.6	
61	GATES	B	0.5	S.F. - 3.5	73.5	36.8		WOODS	55	27.5	
	TOTAL GATES		**206**			**17536.9**	**85.1**			**14329.9**	**69.6**
60	SELLON	B	9.3	SCHOOL	69	641.7		WOODS	55	511.5	
61	SELLON	B	5.1	SCHOOL	69	351.9		WOODS	55	280.5	
61	SELLON - BO #5	B	1.4	S.F. - 3.0	72	100.8		WOODS	55	77.0	
61	SELLON - BO #8	B	2.9	S.F. - 1.9	69.8	202.4		WOODS	55	159.5	
61	SELLON - MO #2	B	18.4	S.F. - 3.5	73.5	1352.4		WOODS	55	1012.0	
	TOTAL SELLON		**37.1**			**2649.2**	**71.4**			**2040.5**	**55.0**
61	MLV	B	0.3	S.F. - 2.0	70	21.0		WOODS	55	16.5	
60	MLV (DEV. CN PER O.E. V	B	3.2	S.F. - 2.0	69.8	223.4		WOODS	55	176.0	
61	MLV	B	15	S.F. - 2.0	69.8	1047.0		WOODS	55	825.0	
	TOTAL MLV		**18.5**			**1291.4**	**69.8**			**1017.5**	**55.0**
61	BROADMOOR	B	16.5	S.F. - 1.4	68.6	1131.9		WOODS	55	907.5	
61		B	1	S.F. - 0.9	67.6	67.6		WOODS	55	55.0	
	TOTAL BROADMOOR		**17.5**			**1199.5**	**68.5**			**962.5**	**55.0**
61	STAR RANCH	B	30	S.F. - 5.1	77.8	2334.0		WOODS	55	1650.0	
	TOTAL STAR RANCH		**30**			**2334.0**	**77.8**			**1650.0**	**55.0**

REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
OWNER CURVE NUMBERS - DETENTION POND NO. 2

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN
162	GATES	C	24.1	O.S.	74.0	1783.4		WOODS	60.0	1446.0	
162		C/D	4.5	O.S.	81.5	366.8		WOODS	65.0	292.5	
162		C/D	3.5	M.F. - 6.0	88.0	308.0		WOODS	65.0	227.5	
162		C	4.9	M.F. - 6.0	86.5	423.9		WOODS	60.0	294.0	
163	GATES	C	2.6	M.F. - 8.0	90.0	234.0		WOODS	60.0	156.0	
163		C/D	7	M.F. - 8.0	91.0	637.0		WOODS	65.0	455.0	
165	GATES	C	28.7	M.F. - 8.0	90.0	2583.0		WOODS	60.0	1722.0	
165		C	18.1	O.S.	74.0	1339.4		WOODS	60.0	1086.0	
165		B	3.8	O.S.	61.0	231.8		WOODS	55.0	209.0	
161	GATES	B	12.1	S.F. - 1.0	68.0	822.8		WOODS	55.0	665.5	
161		C	17.9	S.F. - 1.0	79.0	1414.1		WOODS	60.0	1074.0	
161	GATES/NR	B	4.8	S.F. - 3.5	73.5	352.8		WOODS	55.0	264.0	
160	GATES	B	3.2	S.F. - 3.5	73.5	235.2		WOODS	55.0	176.0	
	TOTAL GATES		**135.2**			**10732.1**	**79.4**			**8067.5**	**59.7**
160	SELLON	B	1.6	S.F. - 2.4	70.8	113.3		WOODS	55.0	88.0	
160	SELLON BO #4	B	5.5	S.F. - 2.2	70.0	385.0		WOODS	55.0	302.5	
160	SELLON BO #7 (DEV. CN	B	0.7	S.F. - 2.4	70.3	49.2		WOODS	55.0	38.5	
164	SELLON	B	0.8	S.F. - 2.7	71.4	57.1		WOODS	55.0	44.0	
164	SELLON BO #7 (DEV CN F	B	37.3	S.F. - 2.4	70.9	2644.6		WOODS	55.0	2051.5	
	TOTAL SELLON		**45.9**			**3249.2**	**70.8**			**2524.5**	**55.0**
160	J.L. RANCH	B	23.1	O.S.	55.0	1270.5		WOODS	55.0	1270.5	
160	J.L. RANCH	B	1.1	O.S.	55.0	60.5		WOODS	55.0	60.5	
160	J.L. RANCH	B	6.6	S.F. - 2.0	70.0	462.0		WOODS	55.0	363.0	
160	J.L. RANCH	B	11.3	S.F. - 2.0	70.0	791.0		WOODS	55.0	621.5	
164	J.L. RANCH	C	4.7	O.S.	60.0	282.0		WOODS	60.0	282.0	
164	J.L. RANCH	C	0.5	S.F. - 2.0	80.0	40.0		WOODS	60.0	30.0	
164	J.L. RANCH	B	5.7	O.S.	55.0	313.5		WOODS	55.0	313.5	
164	J.L. RANCH	B	7.7	O.S.	55.0	423.5		WOODS	55.0	423.5	
164	J.L. RANCH	B	1.7	O.S.	55.0	93.5		WOODS	55.0	93.5	
164	J.L. RANCH	B	1.9	O.S.	55.0	104.5		WOODS	55.0	104.5	
164	J.L. RANCH	B	9.6	S.F. - 2.0	70.0	672.0		WOODS	55.0	528.0	
164	J.L. RANCH	B	3.1	S.F. - 2.0	70.0	217.0		WOODS	55.0	170.5	
164	J.L. RANCH	B	2	S.F. - 3.0	72.0	144.0		WOODS	55.0	110.0	
164	J.L. RANCH	B	1.2	S.F. - 1.0	68.0	81.6		WOODS	55.0	66.0	
164	J.L. RANCH	B	18.2	S.F. - 2.0	70.0	1274.0		WOODS	55.0	1001.0	
164	J.L. RANCH	B	4	S.F. - 2.0	70.0	280.0		WOODS	55.0	220.0	
164	J.L. RANCH	B	1.7	O.S.	55.0	93.5		WOODS	55.0	93.5	

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REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
OWNER CURVE NUMBERS - DETENTION POND NO. 2

BASIN	OWNER	SOIL TYPE	DRAINAGE AREA (AC)	DEV. LAND USE	DEV. CN	DEV. CN * DA	DEV. AVG. OWNER CN	HIST. LAND USE	HIST. CN	HIST. CN*DA	HIST.AVG. OWNER CN
164	J.L. RANCH	C	0.5	S.F. - 2.0	80.0	40.0		WOODS	60.0	30.0	
	TOTAL J.L. RANCH		**104.6**			**6643.1**	**63.5**			**5781.5**	**55.3**
160	MLV	B	5.6	S.F. - 2.0	69.8	390.9		WOODS	55.0	308.0	
160	MLV	B	3.5	S.F. - 2.4	69.8	244.3		WOODS	55.0	192.5	
160	MLV	B	1.3	S.F. - 1.9	69.8	90.7		WOODS	55.0	71.5	
160	MLV	B	4	S.F. - 2.0	70.0	280.0		WOODS	55.0	220.0	
160	MLV	B	42	S.F. - 1.9	69.8	2931.6		WOODS	55.0	2310.0	
164	MLV	B	5.9	S.F. - 2.7	71.4	421.3		WOODS	55.0	324.5	
164	MLV	B	1.8	S.F. - 2.2	70.4	126.7		WOODS	55.0	99.0	
164	MLV	B	0.8	S.F. - 2.0	70.0	56.0		WOODS	55.0	44.0	
164	MLV	B	20.8	S.F. - 1.5	69.0	1435.2		WOODS	55.0	1144.0	
164	MLV	B	8.3	S.F. - 2.0	70.0	581.0		WOODS	55.0	456.5	
164	MLV	B	4.8	S.F. - 1.2	68.4	328.3		WOODS	55.0	264.0	
164	MLV	B	3.4	S.F. - 1.9	69.8	237.3		WOODS	55.0	187.0	
164	MLV	B	4.9	S.F. - 1.9	69.8	342.0		WOODS	55.0	269.5	
164	MLV	B	13.3	S.F. - 1.9	69.8	928.3		WOODS	55.0	731.5	
164	MLV	B	22.5	S.F. - 1.9	69.8	1570.5		WOODS	55.0	1237.5	
	TOTAL MLV		**142.9**			**9964.2**	**69.7**			**7859.5**	**55.0**
160	BROADMOOR	B	32.9	S.F. - 0.8	67.7	2227.3		WOODS	55.0	1809.5	
164	BROADMOOR	B	11.6	S.F. - 0.8	67.5	783.0		WOODS	55.0	638.0	
	TOTAL BROADMOOR		**44.5**			**3010.3**	**67.6**			**2447.5**	**55.0**
160	STAR RANCH	B	17.5	M.F. - 5.1	77.8	1361.5		WOODS	55.0	962.5	
	TOTAL STAR RANCH		**17.5**			**1361.5**	**77.8**			**962.5**	**55.0**
164	BENSBURG	C	40.2	S.F. - 2.0	80.0	3216.0		WOODS	60.0	2412.0	
164	BENSBURG	B	25.3	S.F. - 2.0	70.0	1771.0		WOODS	55.0	1391.5	
	TOTAL BENSBURG		**65.5**			**4987.0**	**76.1**			**3803.5**	**58.1**

E 9/11

Project: MASTER DEVELOPMENT DRAINAGE PLAN
REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
Job No: EW-1011

Client: GATES LAND CO.
By: RM
Date: 6/16/93

HISTORIC CURVE NOS. FOR TR-20

BASIN 060 (DEV. BASINS 051-064)

BASIN	D.A.	HIST. CN	DA x CN
051	14.7 AC.	64.2	944.1
052	23.7	69.0	1635.3
060	53.2	55.0	2926.0
061	105.7	55.0	5813.5
062	33.6	56.7	1906.5
063	71.1	59.7	4242.5
064	46.5	75.6	3516.5
	348.5 Ac.		20,984.4

0.545 SQ. MI.

$$CN = \frac{20,984.4}{348.5} \sim 60.2$$

BASIN 020 (DEV. BASINS 020, 021, 022)

BASIN	D.A.	HIST. CN	DA x CN
020	19.7 (.031)	80.4	1583.6
021	13.4 (.021)	79.0	1058.6
022	16.4 (.026)	80.6	1321.9
	49.5 AC. (.078 MI.^{2})		3964.1

$$CN = \frac{3964.1}{49.5} = 80.1$$

BASIN 001

DA.: 15.3 Ac. (.024 SQ. MI.)

CN: 79.2 (FROM CN SPREADSHEET)

Project: MASTER DEVELOPMENT DRAINAGE PLAN
REGIONAL DETENTION PONDS AT ROADMOOR BLUFFS
Job No: EW-1011

Client: GATES LAND CO.
By: RM
Date: 6/16/93

BASIN 200

D.A. = 17.1 Ac. (.027 SQ. MI.)

CN = 77.8 (PER CN SPREADSHEET)

BASIN 160 (DEV. BASINS 160-163)

BASIN	D.A.	HIST CN	DA × CN
160	379.3	63.0	23999.7
161	34.8	57.6	2003.5
162	37.0	61.1	2260.0
163	9.6	63.6	611.0
	460.7 Ac. (.72050 MI)		28,874.2

$$CN = \frac{28,874.2}{460.7} = 62.7$$

BASIN 164 (DEV. BASINS 164 & 165)

BASIN	D.A.	HIST. CN	DA × CN
164	621.1 (.970)	68.0	42,255
165	50.6 (.079)	59.6	3017.0
	671.7 Ac. (1.049)		45,272

$$CN = \frac{45,272}{671.7} = 67.4$$

BASIN 168

DA. = 15.2 Ac. (.024 SQ. MI.) CN = 79.8 (FROM CN SPREADSHEET)

BASIN 166 (DEV. BASINS 166 & 167)

BASIN	DA	HIST CN	CN × DA
166	26.2	77.7	2036.8
167	12.6	80.7	1016.9

DA. = 38.8 (.061 SQ MI) $CN = \frac{2036.8 + 1016.9}{38.8} = 78.7$

TABLE 5-5
RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL COVER COMPLEXES - URBAN AND SUBURBAN CONDITIONS 1/
(Antecedent Moisture Condition II)
(From: U.S. Dept. of Agriculture, Soil Conservation Service, 1977)

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

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

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

Project: MASTER DEVELOPMENT DRAINAGE PLAN
REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
Job N°: EW-1011
Client: GATES LAND CO.
By: RM
Date: 6/11/93

REVIEW/EVALUATE TEMPORARY DETENTION PONDS PRESENTED IN PRELIMINARY AND FINAL DRAINAGE STUDY, GLEN OAKS AT BROADMOOR, COUNTRY WALK AT BROADMOOR, GLEN OAKS AT BROADMOOR FILING NO. 2, DONNELL JEFFRIES, OCT. 17, 1988 AND COUNTRY WALK AT BROADMOOR NO. 4 (LETTER REPORT), JEFFRIES ENGINEERING, JUNE 16, 1992.

DETENTION AVAILABLE AT 120"/84" CM CULVERT @ BROADMOOR BLUFFS DRIVE @ SOUTH END OF DEVELOPMENT. (COUNTRYWALK AT BROADMOOR NO. 4). = 15,060 CU. FT.

TR-20 PRINTOUT W/ DETENTION POND NO. 2

⇒ 100-YR. ELEV. = 5980.4
" " VOL. = 43.9 AC. FT.
" " AREA OF POOL = 4.21 AC.

ASSUME STORAGE IS 100% EFFECTIVE (I.E. 1 AC.-FT. STORAGE @ TEMP. POND REDUCES VOLUME OF POND 2 BY 1 AC-FT. (MOST LIKELY NOT 100% EFFECTIVE)).

REDUCTION IN DAM HEIGHT $\approx \frac{15,060}{4.21 \times 43,560} = 0.08'$

REDUCTION IN DAM HEIGHT $< 0.1'$ — NOT SIGNIFICANT.

Project: MASTER DEVELOPMENT DRAINAGE PLAN
REGIONAL DETENTION PONDS AT BROADMOOR BLUFFS
Job No: EW-1011

Client: GATES LAND CO.
By: RM
Date: 6/11/93

REVIEW/EVALUATE TEMPORARY DETENTION POND AT 90" CM CULVERT UNDER BROADMOOR BLUFFS DRIVE NEAR THE SOUTH BOUNDARY OF GLEN OAKS @ BROADMOOR

VOLUME AVAILABLE 40,504 CU.FT. @ ELEV. 37.2
RISER CREST ELEV. = 35.7

REDUCTION IN DAM HEIGHT $\approx \frac{40,504}{4.21 \times 43,560} \approx 0.22'$

REDUCTION IN DAM HEIGHT $\approx$ 0.2' WILL NOT HAVE A SIGNIFICANT EFFECT ON COST. IN ADDITION, THE HOUSE JUST SOUTH OF THE OUTLET STRUCTURE HAS A WALK-OUT LEVEL THAT APPEARS TO BE ONLY 1-2' ABOVE THE TOP OF RISER ELEVATION AND IS LESS THAN THE ELEVATION OF BROADMOOR BLUFFS DRIVE AT THAT LOCATION. FLOWS IN EXCESS OF DESIGN FLOWS OR PARTIAL BLOCKING OF THE OUTLET STRUCTURE COULD POTENTIALLY RESULT IN FLOODING OF THE LOWER LEVEL OF THE HOUSE.

Project: CHEYENNE MOUNTAIN RANCH REGIONAL DETENTION
Job No: EW-1011
Client: GATES
By: RM
Date: 6/11/93

ADD ADDITIONAL DETENTION POND TO MODEL (STRUCTURE NO. 7D).

REFERENCE: - DRAINAGE REPORT, MOUNTAIN OAKS SUBDIVISION NO. 2 BY OLIVER E. WATTS, DECEMBER 14, 1990.

- LETTER FROM OLIVER E. WATTS TO BOB ADAMCZYK, JAN. 10, 1991.

AS-BUILT ELEVATION STORAGE CURVE (PER 1/10/91 LETTER)

ELEV.	STORAGE (Ac.-Ft.)
39.7	0
42.0	0.01
44.0	0.03
46.0	0.09
48.0	0.22
50.0	0.56
50.9	0.67*
51.5	0.74*
53.0	0.93*

* - STORAGE ABOVE ELEV. 50.0 EXTRAPOLATED BASED ON ASSUMED POOL AREA OF 5364 SQ. FT. (AREA @ 50.0) - CONSERVATIVE

DREXEL BARRELL

LAND SURVEYORS
CIVIL ENGINEERS

Project	Job N°
CHEYENNE MOUNTAIN RANCH REGIONAL DETENTION	EW-1011

Client	By	Date
GATES	RM	6/11/93

ELEVATION - DISCHARGE CURVE BASED ON P6. 5 OF 9. OLIVER E. WATTS DRAINAGE STUDY, MOUNTAIN OAKS SUBDIVISION NO. 2.

CHECK W/ 27" RESTRICTOR

ELEV.	Q
39.7	0
42.0	33
44.0	99
46.0	163
48.0	219
50.0	259

4840 PEARL EAST CIRCLE, SUITE 114 (303) 442-4338
BOULDER, COLORADO 80301

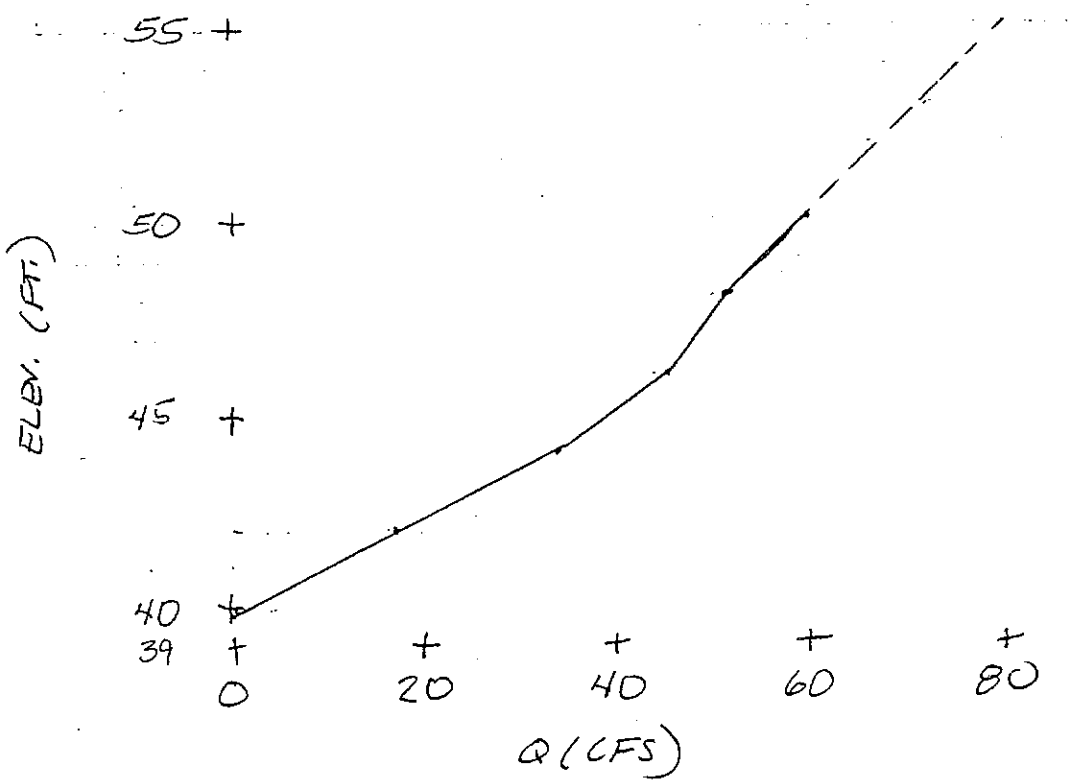
740 WOOTEN RD. #108 (719) 591-5151
COLORADO SPRINGS, COLORADO 80915

Project: CHEYENNE MTN. RANCH REGIONAL DETENTION — Job No: EW-1011

Client: GATES — By: RM — Date: 6/11/93

W/ 27" RESTRICTOR

ELEV.	Q	
39.7	0	
42	17.2	
44	34.0	
46	45.0	
48	51.	
50	60	
50.9	63	
51.5	79	$(65+3.1(10)(.6)^{3/2}$
53.0	640	$(72+3.1(100)(1.5)^{3/2}$



4840 PEARL EAST CIRCLE, SUITE 114 (303) 442-4338
BOULDER, COLORADO 80301

740 WOOTEN RD. #108 (719) 591-5151
COLORADO SPRINGS, COLORADO 80915

 FC/8

OLIVER E. WATTS, PE-LS
CONSULTING ENGINEER, INC.
614 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907
719-593-0173

January 10, 1991

Bob Adamczyk
City Engineering Division
30 South Nevada Ave #403
P.O. Box 1575, Mail Code 435
Colorado Springs, CO 80901

SUBJECT: Mountain Oaks Filing No. 2
Drainage Design

Dear Bob

Enclosed for your review and approval are the original and two prints of drawing 90-1926-02, temporary detention modifications for the Broadmoor Oaks Subdivision, Filing No. 2.

The detailed computations and schematic design for this plan were filed in the Mountain Oaks Subdivision Filing No. 2 drainage report on December 19, 1990. This design is based on a current as-built survey, and the storage curve may be compared with the one on page 5 of the computations in the report, as follows:

Elev.	Report			As-Built		
	PR -SI-	A -SF-	V -CF-	PR -SI-	A -SF-	V -CF-
39.73	0	0	0	0	0	0
						8
40			308.7	0.15	60	8
						106
41				0.38	152	114
						198
42	0.68		308.7	0.61	244	312
						332
43			1412	1.05	420	644
						570
44	2.85	1140	1721	1.80	720	1214
						1044
45			3680	3.42	1368	2258

						1724
46	6.35	2540	5401	5.20	2080	3982
						2482
47			6764	7.21	2884	6464
						3246
48	10.56	4224	12165	9.02	3608	9710
						4010
49			11180	11.03	4412	13720
						4888
50	17.3	6956	23385	13.41	5364?	24354

The storage required to provide the required detention, according to the drainage report, was 23,687 CF, which would interpolate at elevation 50.88. This is the elevation chosen for the overflow spillway put on the South abutment of the fill, and freeboard to elevation 51.5 is provided for a berm along the Westerly side of the roadway.

Sincerely

Oliver E. Watts
Consulting Engineer

Encl

cc: Dave Sellon w/encl

Computations
Mountain Oaks Subdivision No. 2

O.E.Watts
November 30, 1990

STORAGE DATA: 60"CMP w/mfes, Inlet Control, Condition (1)

ELEV -	STORAGE DATA			OUTLET CAPACITY									
	PR -SI-	A -SF-	V -CF-	60"CMP		36"CMP		30"CMP		27"CMP		18"CMP	
				HW/D	CFS	HW/D	CFS	HW/D	CFS	HW/D	CFS	HW/D	CFS
39.73	0	0	0	0	0	0	0	0	0	0	0	0	0
			308.7		33		23.2		19.8		17.2		10
42	0.68	272	308.7	0.45	33	0.76	23.2	0.91	19.8	1.01	17.2	1.51	10
			1412		66		29.8		20.2		16.8		6
44	2.85	1140	1721	0.85	99	1.42	53	1.71	40	1.90	34	2.85	16
			3680		64		20		14		11		5
46	6.35	2540	5401	1.25	163	2.09	73	2.51	54	2.79	45	4.18	21
			6764		56		17		9		6		4
48	10.56	4224	12165	1.65	219	2.76	90	3.31	63	3.68	51	5.51	25
			11180		40		11		9		9		
6250	17.3	6956	23345	2.05	259	3.42	101	4.11	72	4.56	60	6.85	

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

District II
905 Erie - P.O. Box 536
Pueblo, Colorado 81002
(719) 546-5400

October 17, 1989

Mr. Robert F. Svejkovsky, P.E.
Drexel Barrell
740 Wooten Road
Suite 108
Colorado Springs, CO 80915

Dear Mr. Svejkovsky:

This letter is in response to your request for the Colorado Department of Highways to provide written agreement to accept historic flows to its culverts for your drainage study area west of State Highway 115 between Academy and O'Connell Boulevards.

It is Department policy that "Drainage to the state highway right-of-way shall not exceed the undeveloped historic flow. The use of controlled flow detention ponds shall be considered to control this flow from developed properties".

Subject to review of the drainage report, the Department, as stated above, will agree to accept the historic flow. To expedite the process and perhaps avoid revisions, it would be beneficial for CDOH to review the drainage report concurrent with the City of Colorado Springs.

If you have any questions or need additional information, please feel free to contact me at (719) 546-5405.

Sincerely,

Robert D. Torres

Robert D. Torres
District Design Engineer

TR-20 PRINTOUT
HISTORIC CONDITIONS

6/11/93
HISTORIC CONDITION
DATAFILE:
EW1011EX.TR

1

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******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                        FULLPRINT          SUMMARY
TITLE     CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)
TITLE     EXISTING CONDITIONS (6/11/93)
 5 RAINFL 7              0.2500
 8          0.0000       0.0005       0.0015       0.0030       0.0045
 8          0.0060       0.0080       0.0100       0.0120       0.0143
 8          0.0165       0.0188       0.0210       0.0233       0.0255
 8          0.0278       0.0320       0.0390       0.0460       0.0530
 8          0.0600       0.0750       0.1000       0.4000       0.7000
 8          0.7250       0.7500       0.7650       0.7800       0.7900
 8          0.8000       0.8100       0.8200       0.8250       0.8300
 8          0.8350       0.8400       0.8450       0.8500       0.8550
 8          0.8600       0.8638       0.8675       0.8713       0.8750
 8          0.8788       0.8825       0.8863       0.8900       0.8938
 8          0.8975       0.9013       0.9050       0.9083       0.9115
 8          0.9148       0.9180       0.9210       0.9240       0.9270
 8          0.9300       0.9325       0.9350       0.9375       0.9400
 8          0.9425       0.9450       0.9475       0.9500       0.9525
 8          0.9550       0.9575       0.9600       0.9625       0.9650
 8          0.9675       0.9700       0.9725       0.9750       0.9775
 8          0.9800       0.9813       0.9825       0.9838       0.9850
 8          0.9863       0.9875       0.9888       0.9900       0.9913
 8          0.9925       0.9938       0.9950       0.9963       0.9975
 8          0.9988       1.0000       1.0000       1.0000       1.0000
 9 ENDTBL
 5 RAINFL 8              0.08333
 8          0.000        0.020        0.057        0.139        0.289
 8          0.539        0.659        0.715        0.758        0.796
 8          0.828        0.860        0.892        0.924        0.956
 8          0.988        1.013        1.032        1.051        1.070
 8          1.089        1.108        1.127        1.144        1.157
 9 ENDTBL
 5 RAINFL 9              0.08333
 8          0.000        0.010        0.040        0.086        0.166
 8          0.306        0.556        0.696        0.776        0.838
 8          0.888        0.928        0.968        1.008        1.028
 8          1.048        1.060        1.072        1.084        1.096
 8          1.108        1.120        1.132        1.144        1.156
 9 ENDTBL
 6 RUNOFF 1 060        6 0.545        60.2         0.55         1 1   1   1
 6 RUNOFF 1 020        6 0.078        80.1         0.26         1 1   1   1
 6 RUNOFF 1 001        6 0.024        79.2         0.24         1 1   1   1
 6 RUNOFF 1 200        6 0.027        77.8         0.25         1 1   1   1
 6 RUNOFF 1 160        6 0.720        62.7         0.51         1 1   1   1
 6 RUNOFF 1 164        5 1.049        67.4         0.63         1 1   1   1
 6 ADDHYD 4 164   5 6 7                                        1 1   1   1
1

**********************80-80 LIST OF INPUT DATA (CONTINUED)**********************

 6 RUNOFF 1 166        6 0.061        78.7         0.39         1 1   1   1
 6 ADDHYD 4 166   6 7 S                                        1 1   1   1
 6 RUNOFF 1 168        6 0.024        79.8         0.30         1 1   1   1
   ENDATA
 7 INCREM 6              0.1
 7 COMPUT 7 060   168    0.0          3.0          1.0          7 2  01  10
   ENDCMP 1
 7 COMPUT 7 060   168    0.0          4.6          1.0          7 2  01  99
   ENDCMP 1
   ENDJOB 2
0*******************************END OF 80-80 LIST********************************
1
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0 COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

1

CUMULATIVE RAINFALL TABLE 7 TIME INCREMENT= .25

8	.0000	.0005	.0015	.0030	.0045
8	.0060	.0080	.0100	.0120	.0143
8	.0165	.0188	.0210	.0233	.0255
8	.0278	.0320	.0390	.0460	.0530
8	.0600	.0750	.1000	.4000	.7000
8	.7250	.7500	.7650	.7800	.7900
8	.8000	.8100	.8200	.8250	.8300
8	.8350	.8400	.8450	.8500	.8550
8	.8600	.8638	.8675	.8713	.8750
8	.8788	.8825	.8863	.8900	.8938
8	.8975	.9013	.9050	.9083	.9115

```
 8                .9148       .9180       .9210       .9240       .9270
 8                .9300       .9325       .9350       .9375       .9400
 8                .9425       .9450       .9475       .9500       .9525
 8                .9550       .9575       .9600       .9625       .9650
 8                .9675       .9700       .9725       .9750       .9775
 8                .9800       .9813       .9825       .9838       .9850
 8                .9863       .9875       .9888       .9900       .9913
 8                .9925       .9938       .9950       .9963       .9975
 8                .9988      1.0000      1.0000      1.0000      1.0000
 9 ENDTBL


   CUMULATIVE RAINFALL TABLE  8          TIME INCREMENT=   .08

 8                .0000       .0200       .0570       .1390       .2890
 8                .5390       .6590       .7150       .7580       .7960
 8                .8280       .8600       .8920       .9240       .9560
 8                .9880      1.0130      1.0320      1.0510      1.0700
 8               1.0890      1.1080      1.1270      1.1440      1.1570
 9 ENDTBL


   CUMULATIVE RAINFALL TABLE  9          TIME INCREMENT=   .08

 8                .0000       .0100       .0400       .0860       .1660
 8                .3060       .5560       .6960       .7760       .8380
 8                .8880       .9280       .9680      1.0080      1.0280
 8               1.0480      1.0600      1.0720      1.0840      1.0960
 8               1.1080      1.1200      1.1320      1.1440      1.1560
 9 ENDTBL
1


TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)          JOB  1   PASS
     REV 09/01/83           EXISTING CONDITIONS (6/11/93)                                                    PAGE


   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  60                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .5450     60.2000       .550
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  20                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .0780     80.1000       .260
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION   1                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .0240     79.2000       .240
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 200                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .0270     77.8000       .250
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 160                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .7200     62.7000       .510
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 164                                                RECORD ID
           OUTPUT HYDROGRAPH = 5                          DATA FIELD VALUES =     1.0490     67.4000       .6300
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 164                                                RECORD ID
           INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7   DATA FIELD VALUES =      .0000      .0000       .0000
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 166                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .0610     78.7000       .3900
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 166                                                RECORD ID
           INPUT HYDROGRAPHS = 6,7    OUTPUT HYDROGRAPH = 5   DATA FIELD VALUES =      .0000      .0000       .0000
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 168                                                RECORD ID
           OUTPUT HYDROGRAPH = 6                          DATA FIELD VALUES =      .0240     79.8000       .3000
           OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM
1
```

EXECUTIVE CONTROL OPERATION INCREM RECORD ID
+ MAIN TIME INCREMENT = .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 60
+ TO XSECTION 168
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=10 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 60
OUTPUT HYDROGRAPH= 6
AREA= .55 SQ MI INPUT RUNOFF CURVE= 60. TIME OF CONCENTRATION= .55 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0733 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.30	62.13	(RUNOFF)
9.99	6.10	(RUNOFF)
12.98	4.98	(RUNOFF)
19.94	3.71	(RUNOFF)
23.91	1.92	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .55 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.10	2.85
6.00	DISCHG	13.89	35.47	55.46	62.12	56.29	45.65	36.69	31.12	26.49	22.80
7.00	DISCHG	20.13	18.23	16.69	15.17	13.81	12.76	12.03	11.56	11.34	11.26
8.00	DISCHG	11.23	11.07	10.54	9.56	8.47	7.52	6.90	6.52	6.28	6.14
9.00	DISCHG	6.05	6.01	5.99	5.98	5.99	6.00	6.02	6.03	6.06	6.08
10.00	DISCHG	6.10	6.07	5.94	5.70	5.41	5.16	4.99	4.88	4.83	4.80
11.00	DISCHG	4.78	4.76	4.76	4.77	4.79	4.80	4.80	4.80	4.82	4.84
12.00	DISCHG	4.85	4.86	4.87	4.89	4.91	4.92	4.92	4.93	4.95	4.97
13.00	DISCHG	4.98	4.96	4.90	4.79	4.68	4.58	4.50	4.46	4.44	4.44
14.00	DISCHG	4.43	4.41	4.37	4.31	4.25	4.21	4.18	4.16	4.16	4.15
15.00	DISCHG	4.15	4.14	4.07	3.95	3.82	3.71	3.63	3.59	3.56	3.54
16.00	DISCHG	3.53	3.53	3.53	3.53	3.54	3.54	3.54	3.55	3.55	3.56
17.00	DISCHG	3.56	3.57	3.57	3.58	3.58	3.59	3.59	3.60	3.60	3.61
18.00	DISCHG	3.62	3.62	3.63	3.63	3.64	3.64	3.65	3.65	3.66	3.66
19.00	DISCHG	3.67	3.67	3.68	3.68	3.69	3.69	3.70	3.70	3.71	3.71
20.00	DISCHG	3.71	3.66	3.48	3.16	2.80	2.48	2.25	2.11	2.03	1.98
21.00	DISCHG	1.95	1.91	1.89	1.89	1.90	1.89	1.88	1.87	1.88	1.90
22.00	DISCHG	1.89	1.88	1.88	1.89	1.90	1.90	1.89	1.89	1.90	1.91
23.00	DISCHG	1.91	1.90	1.89	1.90	1.92	1.91	1.90	1.90	1.91	1.92
24.00	DISCHG	1.91	1.84	1.64	1.29	.91	.60	.38	.24	.15	.10
25.00	DISCHG	.06	.04	.02	.01	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = .34 WATERSHED INCHES, 119.32 CFS-HRS, 9.86 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 20
OUTPUT HYDROGRAPH= 6
AREA= .08 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .26 HOURS
1

INTERNAL HYDROGRAPH TIME INCREMENT= .0347 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.06	83.32	(RUNOFF)
7.95	4.16	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .08 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.33	7.30	28.25	54.49
6.00	DISCHG	77.62	80.21	48.37	24.75	15.62	12.03	10.06	7.96	6.67	6.25
7.00	DISCHG	6.11	5.77	4.95	4.40	4.20	4.13	4.11	4.11	4.11	4.12
8.00	DISCHG	4.13	3.82	3.00	2.44	2.22	2.14	2.10	2.09	2.09	2.09
9.00	DISCHG	2.10	2.10	2.10	2.10	2.11	2.11	2.11	2.11	2.12	2.12

10.00	DISCHG	2.12	2.04	1.84	1.70	1.64	1.60	1.59	1.61	1.61	1.61
11.00	DISCHG	1.59	1.59	1.61	1.62	1.61	1.60	1.60	1.62	1.63	1.62
12.00	DISCHG	1.61	1.61	1.62	1.63	1.63	1.61	1.61	1.63	1.64	1.63
13.00	DISCHG	1.62	1.59	1.51	1.47	1.43	1.41	1.41	1.42	1.43	1.42
14.00	DISCHG	1.41	1.39	1.35	1.33	1.32	1.32	1.32	1.32	1.32	1.32
15.00	DISCHG	1.32	1.29	1.20	1.14	1.12	1.11	1.10	1.10	1.10	1.10
16.00	DISCHG	1.10	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
17.00	DISCHG	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
18.00	DISCHG	1.11	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
19.00	DISCHG	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
20.00	DISCHG	1.12	1.04	.82	.68	.61	.57	.56	.57	.58	.57
21.00	DISCHG	.55	.55	.57	.58	.57	.55	.55	.57	.58	.57
22.00	DISCHG	.55	.55	.57	.58	.57	.55	.55	.57	.58	.57
23.00	DISCHG	.56	.55	.57	.58	.57	.56	.56	.57	.58	.57
24.00	DISCHG	.55	.46	.24	.09	.04	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 1.26 WATERSHED INCHES, 63.36 CFS-HRS, 5.24 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 6
AREA= .02 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= .24 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0320 HOURS

PEAK TIME(HRS) 6.05 | PEAK DISCHARGE(CFS) 24.34 | PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.05	2.10	8.68	16.69
6.00	DISCHG	23.58	23.30	12.97	6.48	4.18	3.37	2.87	2.25	1.94	1.84
7.00	DISCHG	1.81	1.70	1.44	1.29	1.24	1.23	1.22	1.23	1.23	1.23
8.00	DISCHG	1.24	1.13	.86	.71	.65	.63	.63	.63	.63	.63
9.00	DISCHG	.63	.63	.63	.63	.63	.63	.63	.63	.63	.63
10.00	DISCHG	.63	.61	.54	.50	.49	.48	.48	.48	.48	.48
11.00	DISCHG	.48	.48	.48	.49	.48	.48	.48	.49	.49	.48
12.00	DISCHG	.48	.48	.49	.49	.49	.48	.48	.49	.49	.49
13.00	DISCHG	.48	.47	.45	.44	.43	.42	.42	.43	.43	.43
14.00	DISCHG	.42	.42	.40	.40	.40	.40	.40	.40	.40	.40

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15.00	DISCHG	.40	.38	.36	.34	.33	.33	.33	.33	.33	.33
16.00	DISCHG	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33
17.00	DISCHG	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33
18.00	DISCHG	.33	.34	.34	.34	.34	.34	.34	.34	.34	.34
19.00	DISCHG	.34	.34	.34	.34	.34	.34	.34	.34	.34	.34
20.00	DISCHG	.34	.31	.24	.20	.18	.17	.17	.17	.17	.17
21.00	DISCHG	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
22.00	DISCHG	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
23.00	DISCHG	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
24.00	DISCHG	.17	.14	.06	.02	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = 1.20 WATERSHED INCHES, 18.60 CFS-HRS, 1.54 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 200
OUTPUT HYDROGRAPH= 6
AREA= .03 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .25 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0333 HOURS

PEAK TIME(HRS) 6.06 | PEAK DISCHARGE(CFS) 25.76 | PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .03 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.02	1.49	7.57	16.04
6.00	DISCHG	23.85	24.75	14.25	7.19	4.64	3.68	3.13	2.46	2.09	1.98
7.00	DISCHG	1.95	1.83	1.56	1.39	1.34	1.32	1.31	1.31	1.32	1.32
8.00	DISCHG	1.33	1.22	.94	.77	.71	.68	.67	.67	.67	.67
9.00	DISCHG	.67	.67	.68	.68	.68	.68	.68	.68	.68	.68
10.00	DISCHG	.68	.66	.59	.55	.53	.52	.51	.52	.52	.52
11.00	DISCHG	.51	.51	.52	.52	.52	.52	.52	.52	.53	.52
12.00	DISCHG	.52	.52	.53	.53	.53	.52	.52	.53	.53	.53
13.00	DISCHG	.52	.51	.49	.47	.46	.46	.46	.46	.46	.46
14.00	DISCHG	.46	.45	.44	.43	.43	.43	.43	.43	.43	.43
15.00	DISCHG	.43	.42	.39	.37	.36	.36	.36	.36	.36	.36
16.00	DISCHG	.36	.36	.36	.36	.36	.36	.36	.36	.36	.36

17.00	DISCHG	.36	.36	.36	.36	.36	.36	.36	.36	.36	.36
18.00	DISCHG	.36	.36	.36	.36	.36	.36	.36	.36	.36	.36
19.00	DISCHG	.36	.36	.36	.36	.36	.37	.37	.37	.37	.37
20.00	DISCHG	.37	.34	.26	.22	.20	.18	.18	.19	.19	.18
21.00	DISCHG	.18	.18	.19	.19	.18	.18	.18	.19	.19	.19
22.00	DISCHG	.18	.18	.19	.19	.19	.18	.18	.19	.19	.19
23.00	DISCHG	.18	.18	.19	.19	.19	.18	.18	.19	.19	.19
24.00	DISCHG	.18	.15	.07	.03	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = 1.12 WATERSHED INCHES, 19.49 CFS-HRS, 1.61 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 160
OUTPUT HYDROGRAPH= 6
AREA= .72 SQ MI INPUT RUNOFF CURVE= 63. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.25	121.89	(RUNOFF)
9.98	9.43	(RUNOFF)
13.87	6.75	(RUNOFF)
19.95	5.59	(RUNOFF)
23.92	2.88	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .72 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.94	9.09
6.00	DISCHG	38.40	85.46	119.22	119.55	99.87	76.36	60.46	50.17	41.74	35.55
7.00	DISCHG	31.16	28.34	25.86	23.34	21.11	19.43	18.39	17.89	17.67	17.57
8.00	DISCHG	17.53	17.25	16.22	14.52	12.73	11.29	10.44	9.91	9.61	9.43
9.00	DISCHG	9.33	9.28	9.26	9.26	9.27	9.29	9.31	9.34	9.37	9.40
10.00	DISCHG	9.43	9.37	9.14	8.68	8.21	7.83	7.58	7.44	7.38	7.36
11.00	DISCHG	7.33	7.30	7.30	7.33	7.35	7.36	7.35	7.36	7.40	7.43
12.00	DISCHG	7.44	7.43	7.45	7.48	7.51	7.52	7.52	7.53	7.56	7.59
13.00	DISCHG	7.60	7.56	7.45	7.27	7.09	6.93	6.81	6.76	6.75	6.75
14.00	DISCHG	6.74	6.70	6.62	6.53	6.43	6.37	6.33	6.31	6.30	6.30
15.00	DISCHG	6.30	6.27	6.14	5.94	5.73	5.56	5.46	5.40	5.37	5.35
16.00	DISCHG	5.34	5.34	5.34	5.34	5.35	5.35	5.36	5.37	5.37	5.38
17.00	DISCHG	5.39	5.39	5.40	5.41	5.41	5.42	5.43	5.43	5.44	5.45
18.00	DISCHG	5.45	5.46	5.47	5.47	5.48	5.49	5.49	5.50	5.51	5.51
19.00	DISCHG	5.52	5.53	5.53	5.54	5.55	5.55	5.56	5.57	5.57	5.58
20.00	DISCHG	5.58	5.49	5.18	4.62	4.05	3.58	3.26	3.08	2.99	2.94
21.00	DISCHG	2.89	2.84	2.82	2.84	2.85	2.84	2.81	2.81	2.83	2.85
22.00	DISCHG	2.84	2.82	2.82	2.84	2.86	2.85	2.83	2.82	2.85	2.87
23.00	DISCHG	2.86	2.84	2.83	2.86	2.87	2.87	2.84	2.84	2.86	2.88
24.00	DISCHG	2.87	2.74	2.38	1.79	1.20	.74	.46	.28	.17	.11
25.00	DISCHG	.06	.04	.02	.01	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = .42 WATERSHED INCHES, 196.05 CFS-HRS, 16.20 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 164
OUTPUT HYDROGRAPH= 5
AREA= 1.05 SQ MI INPUT RUNOFF CURVE= 67. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.31	259.82	(RUNOFF)
9.98	17.54	(RUNOFF)
12.99	13.91	(RUNOFF)
19.95	10.01	(RUNOFF)
23.91	5.11	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.05 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.19	4.86	28.12
6.00	DISCHG	82.85	160.91	230.30	259.43	242.28	204.20	163.02	130.93	107.84	90.34
7.00	DISCHG	77.02	67.02	59.31	52.86	47.35	42.95	39.66	37.39	35.82	34.70

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8.00	DISCHG	34.01	33.31	31.95	29.60	26.71	23.96	21.74	20.21	19.20	18.52
9.00	DISCHG	18.09	17.81	17.64	17.53	17.47	17.45	17.45	17.46	17.48	17.51
10.00	DISCHG	17.54	17.48	17.20	16.64	15.92	15.20	14.61	14.21	13.96	13.82
11.00	DISCHG	13.71	13.63	13.59	13.58	13.59	13.60	13.60	13.60	13.63	13.66
12.00	DISCHG	13.68	13.69	13.70	13.73	13.77	13.80	13.81	13.82	13.85	13.89
13.00	DISCHG	13.91	13.87	13.74	13.51	13.23	12.94	12.69	12.52	12.43	12.38
14.00	DISCHG	12.35	12.29	12.18	12.04	11.88	11.74	11.63	11.56	11.52	11.50
15.00	DISCHG	11.48	11.43	11.29	11.03	10.71	10.40	10.15	9.97	9.86	9.79
16.00	DISCHG	9.75	9.72	9.71	9.70	9.70	9.70	9.70	9.71	9.71	9.72
17.00	DISCHG	9.73	9.74	9.75	9.76	9.77	9.78	9.79	9.80	9.81	9.82
18.00	DISCHG	9.82	9.83	9.84	9.85	9.86	9.87	9.88	9.89	9.90	9.91
19.00	DISCHG	9.92	9.93	9.94	9.94	9.95	9.96	9.97	9.98	9.99	10.00
20.00	DISCHG	10.00	9.89	9.53	8.86	8.02	7.18	6.48	5.99	5.69	5.49
21.00	DISCHG	5.35	5.24	5.16	5.13	5.12	5.10	5.07	5.05	5.06	5.07
22.00	DISCHG	5.08	5.06	5.05	5.06	5.08	5.09	5.07	5.06	5.07	5.09
23.00	DISCHG	5.10	5.08	5.07	5.08	5.10	5.11	5.09	5.08	5.09	5.11
24.00	DISCHG	5.10	4.97	4.56	3.83	2.95	2.11	1.43	.96	.65	.44
25.00	DISCHG	.30	.20	.13	.09	.06	.04	.02	.01	.01	.00

RUNOFF VOLUME ABOVE BASEFLOW = .60 WATERSHED INCHES, 407.26 CFS-HRS, 33.66 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 164
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.29	379.08	(NULL)
9.98	26.97	(NULL)
12.98	21.51	(NULL)
19.95	15.61	(NULL)
23.91	7.99	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.77 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.19	5.80	37.20
6.00	DISCHG	121.25	246.37	349.52	378.98	342.15	280.56	223.48	181.11	149.58	125.89
7.00	DISCHG	108.18	95.37	85.17	76.20	68.47	62.37	58.05	55.29	53.48	52.27
8.00	DISCHG	51.54	50.57	48.17	44.12	39.44	35.25	32.18	30.12	28.80	27.94
9.00	DISCHG	27.41	27.09	26.90	26.79	26.74	26.74	26.76	26.80	26.85	26.91
10.00	DISCHG	26.97	26.85	26.33	25.32	24.13	23.03	22.18	21.65	21.35	21.17
11.00	DISCHG	21.04	20.94	20.89	20.91	20.95	20.96	20.95	20.97	21.02	21.09
12.00	DISCHG	21.12	21.13	21.15	21.22	21.28	21.32	21.32	21.35	21.41	21.48
13.00	DISCHG	21.51	21.43	21.19	20.78	20.31	19.86	19.50	19.28	19.18	19.13
14.00	DISCHG	19.08	18.98	18.81	18.56	18.31	18.11	17.96	17.87	17.82	17.80
15.00	DISCHG	17.78	17.70	17.44	16.97	16.44	15.96	15.61	15.38	15.24	15.15
16.00	DISCHG	15.09	15.06	15.05	15.04	15.05	15.05	15.06	15.07	15.09	15.10
17.00	DISCHG	15.12	15.13	15.15	15.17	15.18	15.20	15.21	15.23	15.25	15.26
18.00	DISCHG	15.28	15.29	15.31	15.33	15.34	15.36	15.37	15.39	15.41	15.42
19.00	DISCHG	15.44	15.45	15.47	15.49	15.50	15.52	15.53	15.55	15.56	15.58
20.00	DISCHG	15.58	15.38	14.71	13.49	12.07	10.75	9.74	9.08	8.68	8.43

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21.00	DISCHG	8.24	8.08	7.99	7.96	7.97	7.94	7.89	7.86	7.89	7.92
22.00	DISCHG	7.92	7.88	7.87	7.90	7.94	7.94	7.90	7.89	7.92	7.96
23.00	DISCHG	7.95	7.92	7.91	7.94	7.98	7.97	7.94	7.93	7.96	7.99
24.00	DISCHG	7.97	7.71	6.94	5.62	4.15	2.86	1.88	1.24	.83	.55
25.00	DISCHG	.36	.24	.15	.10	.06	.04	.02	.01	.01	.00

RUNOFF VOLUME ABOVE BASEFLOW = .53 WATERSHED INCHES, 603.30 CFS-HRS, 49.86 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 166
OUTPUT HYDROGRAPH= 6
AREA= .06 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= .39 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0520 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.12	49.61	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .06 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.08	1.83	9.00	22.47
6.00	DISCHG	38.64	49.25	45.18	31.99	20.44	14.27	10.87	8.51	6.80	5.70
7.00	DISCHG	5.11	4.69	4.20	3.73	3.41	3.23	3.15	3.10	3.09	3.08
8.00	DISCHG	3.08	2.99	2.66	2.24	1.92	1.75	1.66	1.61	1.59	1.58
9.00	DISCHG	1.57	1.57	1.57	1.57	1.57	1.58	1.58	1.58	1.58	1.58

10.00	DISCHG	1.58	1.56	1.48	1.38	1.30	1.25	1.22	1.21	1.21	1.21
11.00	DISCHG	1.20	1.20	1.20	1.21	1.21	1.21	1.20	1.21	1.21	1.22
12.00	DISCHG	1.21	1.21	1.21	1.22	1.22	1.22	1.21	1.22	1.22	1.23
13.00	DISCHG	1.22	1.21	1.18	1.14	1.11	1.08	1.07	1.07	1.07	1.07
14.00	DISCHG	1.07	1.06	1.04	1.02	1.00	1.00	.99	.99	.99	.99
15.00	DISCHG	.99	.98	.95	.90	.87	.85	.84	.84	.83	.83
16.00	DISCHG	.83	.83	.83	.83	.83	.83	.83	.83	.83	.83
17.00	DISCHG	.84	.84	.84	.84	.84	.84	.84	.84	.84	.84
18.00	DISCHG	.84	.84	.84	.84	.84	.84	.84	.84	.84	.84
19.00	DISCHG	.84	.84	.84	.84	.84	.85	.85	.85	.85	.85
20.00	DISCHG	.85	.82	.73	.62	.53	.48	.45	.44	.44	.43
21.00	DISCHG	.43	.42	.42	.43	.43	.42	.42	.42	.43	.43
22.00	DISCHG	.42	.42	.42	.43	.43	.43	.42	.42	.43	.43
23.00	DISCHG	.43	.42	.42	.43	.43	.43	.42	.42	.43	.43
24.00	DISCHG	.43	.39	.30	.19	.10	.05	.03	.01	.01	.00

RUNOFF VOLUME ABOVE BASEFLOW = 1.17 WATERSHED INCHES, 46.03 CFS-HRS, 3.80 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 166
INPUT HYDROGRAPHS= 6,7 OUTPUT HYDROGRAPH= 5

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.28	412.96	(NULL)
9.98	28.56	(NULL)
12.97	22.73	(NULL)
19.95	16.46	(NULL)
23.91	8.43	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.83 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.08	2.02	14.80	59.68
6.00	DISCHG	159.89	295.62	394.70	410.97	362.60	294.83	234.35	189.62	156.38	131.59
7.00	DISCHG	113.29	100.06	89.37	79.94	71.87	65.61	61.20	58.39	56.57	55.35
8.00	DISCHG	54.62	53.55	50.83	46.36	41.36	37.00	33.84	31.73	30.39	29.52
9.00	DISCHG	28.99	28.66	28.47	28.36	28.32	28.31	28.34	28.38	28.43	28.50
10.00	DISCHG	28.56	28.42	27.82	26.70	25.43	24.28	23.40	22.86	22.56	22.38
11.00	DISCHG	22.24	22.14	22.09	22.12	22.16	22.17	22.15	22.17	22.24	22.31
12.00	DISCHG	22.33	22.34	22.36	22.43	22.51	22.54	22.54	22.56	22.63	22.71
13.00	DISCHG	22.73	22.64	22.37	21.92	21.42	20.95	20.57	20.34	20.25	20.21
14.00	DISCHG	20.15	20.04	19.84	19.58	19.32	19.10	18.96	18.86	18.82	18.79
15.00	DISCHG	18.77	18.68	18.38	17.87	17.31	16.81	16.45	16.21	16.07	15.98
16.00	DISCHG	15.92	15.89	15.88	15.87	15.88	15.89	15.90	15.91	15.92	15.94
17.00	DISCHG	15.95	15.97	15.99	16.00	16.02	16.04	16.05	16.07	16.09	16.10
18.00	DISCHG	16.12	16.13	16.15	16.17	16.18	16.20	16.22	16.23	16.25	16.26
19.00	DISCHG	16.28	16.30	16.31	16.33	16.35	16.36	16.38	16.39	16.41	16.43
20.00	DISCHG	16.43	16.20	15.44	14.11	12.60	11.23	10.18	9.51	9.12	8.87
21.00	DISCHG	8.67	8.50	8.41	8.39	8.40	8.36	8.31	8.29	8.32	8.35
22.00	DISCHG	8.34	8.30	8.29	8.33	8.37	8.36	8.32	8.31	8.35	8.39
23.00	DISCHG	8.38	8.34	8.33	8.37	8.41	8.40	8.36	8.35	8.39	8.43
24.00	DISCHG	8.40	8.10	7.24	5.81	4.25	2.91	1.91	1.25	.83	.55
25.00	DISCHG	.36	.24	.15	.10	.06	.04	.02	.01	.01	.00

RUNOFF VOLUME ABOVE BASEFLOW = .55 WATERSHED INCHES, 649.34 CFS-HRS, 53.66 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 168
OUTPUT HYDROGRAPH= 6
AREA= .02 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .30 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0400 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.08	23.92	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.05	1.58	6.64	14.10
6.00	DISCHG	21.31	23.65	16.86	9.37	5.76	4.22	3.40	2.70	2.20	1.97
7.00	DISCHG	1.89	1.79	1.58	1.39	1.31	1.27	1.26	1.25	1.25	1.25
8.00	DISCHG	1.26	1.19	.98	.79	.70	.67	.65	.64	.64	.64
9.00	DISCHG	.64	.64	.64	.64	.64	.64	.64	.64	.64	.65
10.00	DISCHG	.65	.63	.58	.53	.51	.49	.49	.49	.49	.49
11.00	DISCHG	.49	.49	.49	.49	.49	.49	.49	.49	.50	.49

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12.00	DISCHG	.49	.49	.49	.50	.50	.49	.49	.50	.50	.50
13.00	DISCHG	.49	.49	.47	.45	.44	.43	.43	.43	.44	.44
14.00	DISCHG	.43	.43	.42	.41	.40	.40	.40	.40	.40	.40
15.00	DISCHG	.40	.40	.37	.35	.34	.34	.34	.34	.34	.34
16.00	DISCHG	.34	.34	.34	.34	.34	.34	.34	.34	.34	.34
17.00	DISCHG	.34	.34	.34	.34	.34	.34	.34	.34	.34	.34
18.00	DISCHG	.34	.34	.34	.34	.34	.34	.34	.34	.34	.34
19.00	DISCHG	.34	.34	.34	.34	.34	.34	.34	.34	.34	.34
20.00	DISCHG	.34	.33	.27	.22	.19	.18	.17	.17	.18	.17
21.00	DISCHG	.17	.17	.17	.18	.17	.17	.17	.17	.18	.17
22.00	DISCHG	.17	.17	.17	.18	.17	.17	.17	.17	.18	.17
23.00	DISCHG	.17	.17	.17	.18	.17	.17	.17	.17	.18	.17
24.00	DISCHG	.17	.15	.09	.04	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 1.24 WATERSHED INCHES, 19.16 CFS-HRS, 1.58 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 1

1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 60
+ TO XSECTION 168
STARTING TIME = .00 RAIN DEPTH = 4.60 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=99 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 60
OUTPUT HYDROGRAPH= 6
AREA= .55 SQ MI INPUT RUNOFF CURVE= 60. TIME OF CONCENTRATION= .55 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0733 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.25	286.75	(RUNOFF)
9.97	15.64	(RUNOFF)
12.96	12.32	(RUNOFF)
19.91	8.77	(RUNOFF)
23.91	4.48	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .55 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.93	10.14	47.82
6.00	DISCHG	123.75	218.70	279.59	278.35	231.88	176.85	134.46	108.27	87.97	72.68
7.00	DISCHG	62.04	54.54	48.75	43.55	39.02	35.54	33.08	31.48	30.70	30.33
8.00	DISCHG	30.13	29.58	28.05	25.37	22.42	19.87	18.18	17.13	16.45	16.06
9.00	DISCHG	15.80	15.65	15.57	15.53	15.52	15.52	15.53	15.56	15.59	15.62
10.00	DISCHG	15.64	15.55	15.20	14.55	13.81	13.15	12.68	12.39	12.24	12.16
11.00	DISCHG	12.10	12.04	12.02	12.04	12.06	12.07	12.05	12.06	12.10	12.13
12.00	DISCHG	12.15	12.14	12.15	12.18	12.22	12.24	12.23	12.24	12.27	12.31
13.00	DISCHG	12.32	12.26	12.10	11.84	11.55	11.28	11.08	10.96	10.91	10.90
14.00	DISCHG	10.87	10.81	10.70	10.54	10.40	10.27	10.20	10.15	10.13	10.12
15.00	DISCHG	10.11	10.06	9.88	9.59	9.26	8.99	8.80	8.68	8.61	8.57
16.00	DISCHG	8.54	8.53	8.52	8.52	8.52	8.53	8.53	8.54	8.55	8.55
17.00	DISCHG	8.56	8.57	8.57	8.58	8.59	8.60	8.60	8.61	8.62	8.63
18.00	DISCHG	8.63	8.64	8.65	8.65	8.66	8.67	8.68	8.68	8.69	8.70
19.00	DISCHG	8.70	8.71	8.72	8.72	8.73	8.74	8.75	8.75	8.76	8.77
20.00	DISCHG	8.76	8.64	8.20	7.46	6.61	5.85	5.29	4.96	4.78	4.67
21.00	DISCHG	4.58	4.49	4.45	4.45	4.46	4.45	4.42	4.40	4.42	4.45
22.00	DISCHG	4.44	4.42	4.41	4.43	4.46	4.45	4.43	4.42	4.44	4.47
23.00	DISCHG	4.46	4.44	4.43	4.45	4.48	4.47	4.44	4.43	4.46	4.48
24.00	DISCHG	4.46	4.29	3.82	3.00	2.13	1.39	.89	.57	.36	.23
25.00	DISCHG	.14	.09	.06	.03	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 1.09 WATERSHED INCHES, 381.79 CFS-HRS, 31.55 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 20
OUTPUT HYDROGRAPH= 6
AREA= .08 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .26 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0347 HOURS

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.04	168.77	(RUNOFF)
7.95	7.57	(RUNOFF)
23.80	1.02	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .08 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	4.55	34.21	84.36	130.77
6.00	DISCHG	165.79	161.43	95.36	48.20	29.89	22.66	18.75	14.75	12.32	11.52
7.00	DISCHG	11.25	10.60	9.08	8.07	7.69	7.54	7.50	7.49	7.49	7.50
8.00	DISCHG	7.50	6.94	5.44	4.42	4.02	3.87	3.81	3.79	3.78	3.78
9.00	DISCHG	3.79	3.79	3.79	3.80	3.80	3.80	3.80	3.81	3.81	3.81
10.00	DISCHG	3.81	3.67	3.31	3.06	2.94	2.87	2.86	2.88	2.90	2.88
11.00	DISCHG	2.86	2.86	2.88	2.90	2.89	2.86	2.86	2.89	2.91	2.89
12.00	DISCHG	2.87	2.87	2.90	2.92	2.90	2.88	2.88	2.90	2.92	2.91
13.00	DISCHG	2.88	2.83	2.70	2.61	2.55	2.51	2.51	2.53	2.55	2.53
14.00	DISCHG	2.51	2.47	2.40	2.36	2.34	2.34	2.34	2.34	2.34	2.34
15.00	DISCHG	2.34	2.28	2.12	2.02	1.98	1.96	1.96	1.95	1.95	1.95
16.00	DISCHG	1.95	1.95	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
17.00	DISCHG	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
18.00	DISCHG	1.96	1.96	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97
19.00	DISCHG	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97
20.00	DISCHG	1.97	1.83	1.45	1.19	1.06	.99	.98	1.00	1.01	1.00
21.00	DISCHG	.97	.97	1.00	1.01	1.00	.97	.97	1.00	1.01	1.00
22.00	DISCHG	.97	.97	1.00	1.01	1.00	.97	.97	1.00	1.01	1.00
23.00	DISCHG	.97	.97	1.00	1.02	1.00	.97	.97	1.00	1.02	1.00
24.00	DISCHG	.97	.81	.43	.16	.06	.02	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 2.56 WATERSHED INCHES, 128.91 CFS-HRS, 10.65 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 6
AREA= .02 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= .24 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0320 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.02	51.21	(RUNOFF)
7.95	2.29	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	1.22	10.78	26.48	40.50
6.00	DISCHG	50.79	47.34	25.83	12.72	8.05	6.39	5.40	4.22	3.63	3.44
7.00	DISCHG	3.38	3.16	2.67	2.40	2.30	2.27	2.26	2.26	2.26	2.27
8.00	DISCHG	2.27	2.07	1.57	1.29	1.20	1.16	1.15	1.14	1.14	1.15
9.00	DISCHG	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
10.00	DISCHG	1.15	1.10	.99	.92	.88	.87	.86	.87	.88	.87
11.00	DISCHG	.86	.87	.87	.88	.87	.87	.87	.88	.88	.88
12.00	DISCHG	.87	.87	.88	.88	.88	.87	.87	.88	.89	.88
13.00	DISCHG	.87	.85	.81	.79	.77	.76	.76	.77	.77	.77

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14.00	DISCHG	.76	.75	.73	.71	.71	.71	.71	.71	.71	.71
15.00	DISCHG	.71	.69	.64	.61	.60	.59	.59	.59	.59	.59
16.00	DISCHG	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59
17.00	DISCHG	.59	.59	.59	.59	.59	.60	.60	.60	.60	.60
18.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
19.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
20.00	DISCHG	.60	.55	.42	.35	.32	.30	.30	.30	.31	.30
21.00	DISCHG	.29	.29	.30	.31	.30	.29	.29	.30	.31	.30
22.00	DISCHG	.29	.29	.30	.31	.30	.29	.29	.30	.31	.30
23.00	DISCHG	.29	.30	.30	.31	.30	.29	.30	.30	.31	.30

24.00	DISCHG	.29	.24	.11	.04	.01	.00

RUNOFF VOLUME ABOVE BASEFLOW = 2.48 WATERSHED INCHES, 38.40 CFS-HRS, 3.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 200

OUTPUT HYDROGRAPH= 6
AREA= .03 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .25 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0333 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.04	54.47	(RUNOFF)
7.95	2.51	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS			TIME INCREMENT = .10 HOURS			DRAINAGE AREA =		.03 SQ.MI.
5.00	DISCHG	.00	.00	.00	.00	.00	.87	9.39	25.61	41.25
6.00	DISCHG	53.45	51.87	29.21	14.53	9.17	7.16	6.02	4.71	3.99	3.77
7.00	DISCHG	3.70	3.48	2.95	2.64	2.52	2.49	2.47	2.47	2.47	2.48
8.00	DISCHG	2.48	2.29	1.76	1.44	1.32	1.27	1.26	1.25	1.25	1.25
9.00	DISCHG	1.25	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
10.00	DISCHG	1.26	1.22	1.09	1.01	.97	.95	.95	.96	.96	.96
11.00	DISCHG	.95	.95	.96	.96	.96	.95	.95	.96	.97	.96
12.00	DISCHG	.95	.95	.96	.97	.96	.96	.96	.97	.97	.97
13.00	DISCHG	.96	.94	.89	.87	.85	.83	.83	.84	.85	.84
14.00	DISCHG	.83	.82	.80	.78	.78	.78	.78	.78	.78	.78
15.00	DISCHG	.78	.76	.70	.67	.66	.65	.65	.65	.65	.65
16.00	DISCHG	.65	.65	.65	.65	.65	.65	.65	.65	.65	.65
17.00	DISCHG	.65	.65	.65	.65	.65	.65	.65	.65	.65	.65
18.00	DISCHG	.66	.66	.66	.66	.66	.66	.66	.66	.66	.66
19.00	DISCHG	.66	.66	.66	.66	.66	.66	.66	.66	.66	.66
20.00	DISCHG	.66	.61	.47	.39	.35	.33	.33	.33	.34	.33
21.00	DISCHG	.32	.32	.33	.34	.33	.32	.32	.33	.34	.33
22.00	DISCHG	.32	.32	.33	.34	.33	.32	.32	.33	.34	.33
23.00	DISCHG	.32	.32	.33	.34	.33	.32	.32	.33	.34	.33
24.00	DISCHG	.32	.27	.13	.05	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 2.36 WATERSHED INCHES, 41.17 CFS-HRS, 3.40 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 160

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OUTPUT HYDROGRAPH= 6
AREA= .72 SQ MI INPUT RUNOFF CURVE= 63. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.21	480.52	(RUNOFF)
9.97	22.64	(RUNOFF)
12.95	17.73	(RUNOFF)
19.94	12.51	(RUNOFF)
23.91	6.39	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS			TIME INCREMENT = .10 HOURS			DRAINAGE AREA =		.72 SQ.MI.
5.00	DISCHG	.00	.00	.00	.00	.00	.00	.03	2.69	27.37	104.00
6.00	DISCHG	246.41	403.44	479.32	437.10	342.71	251.07	189.99	151.22	121.22	100.24
7.00	DISCHG	85.50	76.10	68.24	60.75	54.23	49.38	46.43	44.97	44.22	43.83
8.00	DISCHG	43.58	42.76	40.09	35.81	31.33	27.73	25.59	24.25	23.47	22.98
9.00	DISCHG	22.71	22.55	22.47	22.44	22.43	22.44	22.47	22.51	22.55	22.60
10.00	DISCHG	22.63	22.47	21.87	20.77	19.62	18.69	18.06	17.73	17.56	17.48
11.00	DISCHG	17.40	17.32	17.30	17.35	17.39	17.39	17.36	17.37	17.44	17.50
12.00	DISCHG	17.50	17.47	17.49	17.55	17.61	17.61	17.59	17.60	17.66	17.72
13.00	DISCHG	17.72	17.61	17.33	16.91	16.47	16.09	15.81	15.67	15.63	15.63
14.00	DISCHG	15.59	15.48	15.30	15.07	14.85	14.68	14.59	14.53	14.51	14.49
15.00	DISCHG	14.48	14.40	14.11	13.64	13.14	12.75	12.52	12.37	12.29	12.24
16.00	DISCHG	12.21	12.20	12.20	12.20	12.20	12.21	12.21	12.22	12.23	12.24
17.00	DISCHG	12.25	12.26	12.27	12.28	12.29	12.30	12.31	12.31	12.32	12.33
18.00	DISCHG	12.34	12.35	12.36	12.37	12.38	12.39	12.40	12.40	12.41	12.42
19.00	DISCHG	12.43	12.44	12.45	12.46	12.47	12.48	12.48	12.49	12.50	12.51
20.00	DISCHG	12.51	12.30	11.59	10.35	9.06	8.01	7.29	6.89	6.69	6.57
21.00	DISCHG	6.46	6.35	6.31	6.33	6.35	6.33	6.28	6.27	6.31	6.35
22.00	DISCHG	6.33	6.29	6.28	6.32	6.36	6.34	6.30	6.29	6.33	6.37
23.00	DISCHG	6.36	6.31	6.30	6.35	6.39	6.37	6.32	6.31	6.35	6.39
24.00	DISCHG	6.37	6.08	5.28	3.98	2.66	1.65	1.01	.62	.38	.23
25.00	DISCHG	.14	.08	.05	.03	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 1.24 WATERSHED INCHES, 576.81 CFS-HRS, 47.67 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 164
OUTPUT HYDROGRAPH= 5
AREA= 1.05 SQ MI INPUT RUNOFF CURVE= 67. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.28	804.17	(RUNOFF)
9.97	38.18	(RUNOFF)
12.97	29.62	(RUNOFF)
19.93	20.67	(RUNOFF)
23.91	10.49	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.05 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.63	10.10	53.54	174.16

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6.00	DISCHG	373.71	600.52	766.29	801.16	711.46	578.37	449.37	351.80	282.34	230.99
7.00	DISCHG	192.71	164.38	142.90	125.48	111.05	99.70	91.19	85.15	80.87	77.88
8.00	DISCHG	76.04	74.29	71.10	65.76	59.24	53.06	48.08	44.62	42.32	40.77
9.00	DISCHG	39.77	39.12	38.69	38.42	38.25	38.16	38.12	38.10	38.11	38.14
10.00	DISCHG	38.17	38.00	37.35	36.11	34.52	32.93	31.62	30.73	30.18	29.84
11.00	DISCHG	29.59	29.41	29.29	29.25	29.26	29.25	29.22	29.21	29.24	29.30
12.00	DISCHG	29.33	29.33	29.33	29.38	29.44	29.48	29.48	29.48	29.53	29.59
13.00	DISCHG	29.62	29.53	29.23	28.72	28.10	27.47	26.92	26.55	26.35	26.24
14.00	DISCHG	26.14	26.00	25.77	25.44	25.10	24.79	24.55	24.39	24.29	24.23
15.00	DISCHG	24.18	24.07	23.77	23.20	22.52	21.86	21.32	20.95	20.71	20.55
16.00	DISCHG	20.45	20.38	20.34	20.32	20.31	20.30	20.30	20.31	20.31	20.32
17.00	DISCHG	20.33	20.34	20.36	20.37	20.38	20.39	20.40	20.42	20.43	20.44
18.00	DISCHG	20.45	20.46	20.48	20.49	20.50	20.51	20.52	20.53	20.55	20.56
19.00	DISCHG	20.57	20.58	20.59	20.60	20.62	20.63	20.64	20.65	20.66	20.67
20.00	DISCHG	20.67	20.44	19.69	18.30	16.56	14.81	13.36	12.37	11.74	11.33
21.00	DISCHG	11.03	10.80	10.64	10.57	10.54	10.51	10.45	10.40	10.41	10.44
22.00	DISCHG	10.44	10.41	10.39	10.41	10.45	10.46	10.43	10.40	10.42	10.46
23.00	DISCHG	10.47	10.44	10.42	10.44	10.47	10.48	10.45	10.43	10.45	10.49
24.00	DISCHG	10.46	10.19	9.35	7.84	6.05	4.34	2.93	1.96	1.34	.91
25.00	DISCHG	.61	.41	.27	.18	.12	.08	.05	.03	.01	.01
26.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 1.56 WATERSHED INCHES, 1054.65 CFS-HRS, 87.16 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 164
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.25	1273.17	(NULL)
9.97	60.82	(NULL)
12.96	47.35	(NULL)
19.94	33.19	(NULL)
23.91	16.88	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.77 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.66	12.79	80.91	278.16
6.00	DISCHG	620.12	1003.96	1245.61	1238.26	1054.17	829.45	639.36	503.01	403.56	331.23
7.00	DISCHG	278.21	240.48	211.14	186.23	165.28	149.08	137.63	130.12	125.09	121.71
8.00	DISCHG	119.62	117.05	111.19	101.57	90.58	80.79	73.67	68.87	65.79	63.75
9.00	DISCHG	62.48	61.67	61.16	60.86	60.69	60.60	60.59	60.61	60.67	60.73
10.00	DISCHG	60.80	60.47	59.23	56.88	54.14	51.62	49.69	48.46	47.75	47.32
11.00	DISCHG	46.99	46.73	46.59	46.60	46.65	46.64	46.58	46.58	46.68	46.80
12.00	DISCHG	46.83	46.80	46.82	46.93	47.05	47.09	47.07	47.08	47.19	47.31
13.00	DISCHG	47.33	47.13	46.56	45.63	44.57	43.56	42.73	42.22	41.98	41.87
14.00	DISCHG	41.73	41.48	41.07	40.51	39.94	39.47	39.14	38.92	38.80	38.73
15.00	DISCHG	38.66	38.47	37.87	36.84	35.66	34.61	33.84	33.32	33.00	32.79
16.00	DISCHG	32.66	32.58	32.54	32.51	32.51	32.51	32.52	32.53	32.55	32.56
17.00	DISCHG	32.58	32.60	32.62	32.65	32.67	32.69	32.71	32.73	32.75	32.77

1

18.00	DISCHG	32.79	32.81	32.83	32.86	32.88	32.90	32.92	32.94	32.96	32.98
19.00	DISCHG	33.00	33.02	33.04	33.06	33.08	33.10	33.12	33.14	33.16	33.18
20.00	DISCHG	33.18	32.73	31.28	28.66	25.61	22.82	20.65	19.26	18.42	17.90
21.00	DISCHG	17.49	17.15	16.95	16.90	16.90	16.84	16.72	16.67	16.72	16.80
22.00	DISCHG	16.78	16.70	16.67	16.73	16.81	16.80	16.72	16.69	16.76	16.83
23.00	DISCHG	16.83	16.75	16.72	16.78	16.86	16.85	16.77	16.74	16.81	16.88
24.00	DISCHG	16.83	16.26	14.63	11.82	8.71	5.98	3.94	2.58	1.72	1.14
25.00	DISCHG	.75	.49	.32	.21	.13	.08	.05	.03	.01	.01
26.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 1.43 WATERSHED INCHES, 1631.46 CFS-HRS, 134.82 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 166
OUTPUT HYDROGRAPH= 6
AREA= .06 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= .39 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0520 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.10	108.38	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .06 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	1.25	10.23	32.44	63.04
6.00	DISCHG	92.80	108.36	95.30	66.10	41.68	28.62	21.43	16.56	13.07	10.86
7.00	DISCHG	9.65	8.82	7.88	6.98	6.36	6.03	5.86	5.77	5.74	5.72
8.00	DISCHG	5.71	5.53	4.92	4.14	3.55	3.23	3.06	2.98	2.93	2.91
9.00	DISCHG	2.89	2.89	2.89	2.89	2.89	2.89	2.90	2.90	2.90	2.90
10.00	DISCHG	2.90	2.86	2.71	2.52	2.37	2.28	2.23	2.21	2.21	2.21
11.00	DISCHG	2.19	2.18	2.19	2.20	2.20	2.20	2.19	2.20	2.21	2.21
12.00	DISCHG	2.20	2.19	2.20	2.21	2.22	2.21	2.20	2.21	2.22	2.22
13.00	DISCHG	2.21	2.19	2.13	2.06	2.00	1.96	1.93	1.93	1.94	1.94
14.00	DISCHG	1.93	1.91	1.87	1.84	1.81	1.80	1.79	1.79	1.79	1.79
15.00	DISCHG	1.79	1.77	1.70	1.62	1.56	1.53	1.51	1.50	1.50	1.50
16.00	DISCHG	1.49	1.49	1.49	1.49	1.49	1.50	1.50	1.50	1.50	1.50
17.00	DISCHG	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
18.00	DISCHG	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51
19.00	DISCHG	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
20.00	DISCHG	1.51	1.46	1.31	1.11	.95	.85	.80	.78	.78	.77
21.00	DISCHG	.76	.75	.75	.76	.77	.76	.75	.75	.76	.77
22.00	DISCHG	.76	.75	.75	.76	.77	.76	.75	.75	.76	.77
23.00	DISCHG	.76	.75	.75	.77	.77	.76	.75	.75	.77	.77
24.00	DISCHG	.76	.70	.53	.33	.18	.09	.05	.03	.01	.01
25.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 2.43 WATERSHED INCHES, 95.76 CFS-HRS, 7.91 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 166
INPUT HYDROGRAPHS= 6,7 OUTPUT HYDROGRAPH= 5

1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.24	1358.29	(NULL)
9.97	63.73	(NULL)
12.96	49.57	(NULL)
19.93	34.70	(NULL)
23.91	17.65	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = 1.83 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	1.90	23.02	113.35	341.20
6.00	DISCHG	712.92	1112.31	1340.91	1304.36	1095.85	858.07	660.80	519.57	416.63	342.08
7.00	DISCHG	287.86	249.29	219.02	193.21	171.64	155.12	143.49	135.89	130.82	127.43
8.00	DISCHG	125.33	122.58	116.11	105.70	94.12	84.02	76.74	71.85	68.72	66.66
9.00	DISCHG	65.37	64.56	64.05	63.75	63.58	63.50	63.48	63.51	63.57	63.63
10.00	DISCHG	63.70	63.33	61.94	59.40	56.51	53.89	51.91	50.67	49.96	49.53
11.00	DISCHG	49.19	48.92	48.78	48.80	48.85	48.84	48.77	48.78	48.89	49.01
12.00	DISCHG	49.03	49.00	49.02	49.15	49.27	49.30	49.27	49.29	49.41	49.53
13.00	DISCHG	49.55	49.32	48.69	47.69	46.57	45.52	44.66	44.15	43.92	43.80
14.00	DISCHG	43.66	43.39	42.95	42.35	41.76	41.27	40.93	40.71	40.59	40.51
15.00	DISCHG	40.45	40.23	39.58	38.46	37.22	36.14	35.35	34.82	34.50	34.29
16.00	DISCHG	34.16	34.08	34.03	34.01	34.00	34.00	34.01	34.03	34.04	34.06
17.00	DISCHG	34.08	34.10	34.12	34.14	34.17	34.19	34.21	34.23	34.25	34.27

18.00	DISCHG	34.30	34.32	34.34	34.36	34.38	34.40	34.42	34.44	34.46	34.49
19.00	DISCHG	34.51	34.53	34.55	34.57	34.59	34.61	34.63	34.65	34.67	34.69
20.00	DISCHG	34.69	34.19	32.59	29.77	26.56	23.67	21.45	20.04	19.20	18.67
21.00	DISCHG	18.25	17.90	17.70	17.66	17.66	17.59	17.47	17.42	17.49	17.56
22.00	DISCHG	17.53	17.44	17.42	17.50	17.58	17.56	17.47	17.44	17.52	17.60
23.00	DISCHG	17.58	17.50	17.47	17.55	17.63	17.61	17.52	17.50	17.57	17.65
24.00	DISCHG	17.59	16.96	15.16	12.15	8.89	6.07	3.99	2.61	1.73	1.15
25.00	DISCHG	.75	.49	.32	.21	.13	.08	.05	.03	.01	.01
26.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 1.46 WATERSHED INCHES, 1727.22 CFS-HRS, 142.74 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 168
OUTPUT HYDROGRAPH= 6
AREA= .02 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .30 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0400 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.06	50.03	(RUNOFF)
7.95	2.31	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.87	7.82	21.20	35.38
6.00	DISCHG	46.97	48.74	33.81	18.55	11.22	8.08	6.42	5.05	4.09	3.66
7.00	DISCHG	3.49	3.31	2.91	2.56	2.40	2.33	2.30	2.30	2.29	2.29
8.00	DISCHG	2.30	2.17	1.78	1.44	1.28	1.21	1.18	1.17	1.16	1.16
9.00	DISCHG	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.17	1.17

1

10.00	DISCHG	1.17	1.14	1.04	.96	.91	.89	.88	.88	.89	.88
11.00	DISCHG	.88	.87	.88	.89	.88	.88	.88	.88	.89	.89
12.00	DISCHG	.88	.88	.89	.89	.89	.88	.88	.89	.89	.89
13.00	DISCHG	.88	.87	.84	.81	.79	.77	.77	.77	.78	.78
14.00	DISCHG	.77	.76	.74	.73	.72	.72	.72	.72	.72	.72
15.00	DISCHG	.72	.70	.66	.63	.61	.60	.60	.60	.60	.60
16.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
17.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
18.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
19.00	DISCHG	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
20.00	DISCHG	.60	.57	.47	.39	.34	.31	.30	.31	.31	.31
21.00	DISCHG	.30	.30	.30	.31	.31	.30	.30	.30	.31	.31
22.00	DISCHG	.30	.30	.30	.31	.31	.30	.30	.30	.31	.31
23.00	DISCHG	.30	.30	.30	.31	.31	.30	.30	.30	.31	.31
24.00	DISCHG	.30	.26	.16	.07	.03	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 2.53 WATERSHED INCHES, 39.17 CFS-HRS, 3.24 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
\+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 1 STORM 10

XSECTION 60	RUNOFF	.55	7	2	.10	.0	3.00	24.00	.34	---	6.30	62.13	114.0
XSECTION 20	RUNOFF	.08	7	2	.10	.0	3.00	24.00	1.26	---	6.06	83.32	1068.1
XSECTION 1	RUNOFF	.02	7	2	.10	.0	3.00	24.00	1.20	---	6.05	24.34	1014.1
XSECTION 200	RUNOFF	.03	7	2	.10	.0	3.00	24.00	1.12	---	6.06	25.76	954.2
XSECTION 160	RUNOFF	.72	7	2	.10	.0	3.00	24.00	.42	---	6.25	121.89	169.3
XSECTION 164	RUNOFF	1.05	7	2	.10	.0	3.00	24.00	.60	---	6.31	259.82	247.7
XSECTION 164	ADDHYD	1.77	7	2	.10	.0	3.00	24.00	.53	---	6.29	379.08	214.3
XSECTION 166	RUNOFF	.06	7	2	.10	.0	3.00	24.00	1.17	---	6.12	49.61	813.3
XSECTION 166	ADDHYD	1.83	7	2	.10	.0	3.00	24.00	.55	---	6.28	412.96	225.7
XSECTION 168	RUNOFF	.02	7	2	.10	.0	3.00	24.00	1.24	---	6.08	23.92	996.7

ALTERNATE 1 STORM 99

XSECTION 60	RUNOFF	.55	7	2	.10	.0	4.60	24.00	1.09	---	6.25	286.75	526.1
XSECTION 20	RUNOFF	.08	7	2	.10	.0	4.60	24.00	2.56	---	6.04	168.77	2163.7
XSECTION 1	RUNOFF	.02	7	2	.10	.0	4.60	24.00	2.48	---	6.02	51.21	2133.9
XSECTION 200	RUNOFF	.03	7	2	.10	.0	4.60	24.00	2.36	---	6.04	54.47	2017.5
XSECTION 160	RUNOFF	.72	7	2	.10	.0	4.60	24.00	1.24	---	6.21	480.52	667.4
XSECTION 164	RUNOFF	1.05	7	2	.10	.0	4.60	24.00	1.56	---	6.28	804.17	766.6
XSECTION 164	ADDHYD	1.77	7	2	.10	.0	4.60	24.00	1.43	---	6.25	1273.17	719.7
XSECTION 166	RUNOFF	.06	7	2	.10	.0	4.60	24.00	2.43	---	6.10	108.38	1776.8
XSECTION 166	ADDHYD	1.83	7	2	.10	.0	4.60	24.00	1.46	---	6.24	1358.29	742.2
XSECTION 168	RUNOFF	.02	7	2	.10	.0	4.60	24.00	2.53	---	6.06	50.03	2084.6

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 10	99
0 XSECTION 1	.02		
ALTERNATE 1		24.34	51.21
0 XSECTION 20	.08		
ALTERNATE 1		83.32	168.77
0 XSECTION 60	.55		
ALTERNATE 1		62.13	286.75
0 XSECTION 160	.72		
ALTERNATE 1		121.89	480.52
0 XSECTION 164	1.77		
ALTERNATE 1		379.08	1273.17
0 XSECTION 166	1.83		
ALTERNATE 1		412.96	1358.29
0 XSECTION 168	.02		
ALTERNATE 1		23.92	50.03
0 XSECTION 200	.03		
ALTERNATE 1		25.76	54.47

1END OF 1 JOBS IN THIS RUN

TR-20 PRINTOUT
DEVELOPED CONDITIONS
DETENTION POND NO. 1

6/11/93

FUTURE CONDITIONS
DETENTION POND NO. 1

DATAFILE:
EW1011F1.TZ

1

**********80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY**********

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JOB TR-20                                                  SUMMARY   NOPLOTS
TITLE     CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)
TITLE     FUT. CONDITIONS (FULL DEV., 2 AND 24 HR. STORMS, ST. 20)
 5 RAINFL 7              0.2500
 8          0.0000       0.0005      0.0015      0.0030      0.0045
 8          0.0060       0.0080      0.0100      0.0120      0.0143
 8          0.0165       0.0188      0.0210      0.0233      0.0255
 8          0.0278       0.0320      0.0390      0.0460      0.0530
 8          0.0600       0.0750      0.1000      0.4000      0.7000
 8          0.7250       0.7500      0.7650      0.7800      0.7900
 8          0.8000       0.8100      0.8200      0.8250      0.8300
 8          0.8350       0.8400      0.8450      0.8500      0.8550
 8          0.8600       0.8638      0.8675      0.8713      0.8750
 8          0.8788       0.8825      0.8863      0.8900      0.8938
 8          0.8975       0.9013      0.9050      0.9083      0.9115
 8          0.9148       0.9180      0.9210      0.9240      0.9270
 8          0.9300       0.9325      0.9350      0.9375      0.9400
 8          0.9425       0.9450      0.9475      0.9500      0.9525
 8          0.9550       0.9575      0.9600      0.9625      0.9650
 8          0.9675       0.9700      0.9725      0.9750      0.9775
 8          0.9800       0.9813      0.9825      0.9838      0.9850
 8          0.9863       0.9875      0.9888      0.9900      0.9913
 8          0.9925       0.9938      0.9950      0.9963      0.9975
 8          0.9988       1.0000      1.0000      1.0000      1.0000
 9 ENDTBL
 5 RAINFL 8              0.08333
 8          0.000        0.020       0.057       0.139       0.289
 8          0.539        0.659       0.715       0.758       0.796
 8          0.828        0.860       0.892       0.924       0.956
 8          0.988        1.013       1.032       1.051       1.070
 8          1.089        1.108       1.127       1.144       1.157
 9 ENDTBL
 5 RAINFL 9              0.08333
 8          0.000        0.010       0.040       0.086       0.166
 8          0.306        0.556       0.696       0.776       0.838
 8          0.888        0.928       0.968       1.008       1.028
 8          1.048        1.060       1.072       1.084       1.096
 8          1.108        1.120       1.132       1.144       1.156
 9 ENDTBL
 3 STRUCT      20
 8                       5943.       0.0         0.00
 8                       5944.       17.         0.06
 8                       5946.       62.         0.61
 8                       5948.       94.         2.06
 8                       5950.       116.        5.18
 8                       5951.       127.        8.09
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**********80-80 LIST OF INPUT DATA (CONTINUED)**********

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 8                       5952.5      140.        13.27
 8                       5953.       240.        15.55
 8                       5954.       403.        20.11
 8                       5956.       445.        32.23
 8                       5957.       460.        38.0
 9 ENDTBL
 2 XSECTN   062          1.0
 8                       6140.       0.0         0.0
 8                       6140.5      59.         8.
 8                       6141.       198.        19.
 8                       6142.       707.        46.
 8                       6143.       1554.       81.
 8                       6145.       3047.       168.
 9 ENDTBL
 2 XSECTN   064          1.0
 8                       5986.       0.0         0.0
 8                       5986.5      65.         16.
 8                       5988.       712.        76.
 8                       5990.       2537.       184.
 8                       5992.       5579.       324.
 9 ENDTBL
 2 XSECTN   063          1.0
 8                       6130.       0.0         0.0
```

```
  8                     6130.5      105.        16.
  8                     6131.       340.        34.
  8                     6132.       1142.       76.
  8                     6134.       4072.       184.
  9 ENDTBL
  2 XSECTN   022        1.0
  8                     5970.       0.0         0.0
  8                     5970.5      51.         9.
  8                     5972.       610.        46.
  9 ENDTBL
  6 RUNOFF 1 051        6 0.023     83.9        0.10
  6 RUNOFF 1 052        5 0.037     88.         0.14
  6 ADDHYD 4 052    5 6 3
  6 RUNOFF 1 060        6 0.083     72.2        0.26
  6 REACH  3 062    6   5 2400.
  6 RUNOFF 1 062        6 0.053     71.2        0.22
  6 ADDHYD 4 062    5 6 7
  6 REACH  3 064    7   4 2400.
  6 RUNOFF 1 061        6 0.165     71.9        0.32
  6 REACH  3 063    6   5 2700.
  6 RUNOFF 1 063        6 0.111     79.2        0.25
  6 ADDHYD 4 063    5 6 7
  6 REACH  3 064    7   5 2400.
1


 **********80-80 LIST OF INPUT DATA (CONTINUED)**********

  6 RUNOFF 1 064        6 0.073     90.         0.19
  6 ADDHYD 4 064    5 6 7
  6 ADDHYD 4 064    4 7 5
  6 RUNOFF 1 020        7 0.031     91.6        0.10
  6 ADDHYD 4 064    5 7 6
  6 ADDHYD 4 064    6 3 4
  6 RUNOFF 1 021        6 0.021     79.         0.10
  6 REACH  3 022    6   5 1700.
  6 RUNOFF 1 022        6 0.026     91.6        0.10
  6 ADDHYD 4 022    5 6 7
  6 ADDHYD 4 022    7 4 6                                 1 1   1
  6 RESVOR 2    20  6   5 5943.
    ENDATA
  7 INCREM 6            0.05
  7 COMPUT 7 051    20  0.0         4.6         1.0       7 2  01  99
    ENDCMP 1
  7 COMPUT 7 051    20  0.0         3.0         1.0       7 2  01  10
    ENDCMP 1
    ENDJOB 2
0**********END OF 80-80 LIST**********
1


 TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)        JOB  1   PASS  1
      REV 09/01/83           FUT. CONDITIONS (FULL DEV., 2 AND 24 HR. STORMS, ST. 20)                  PAGE  1


0                              COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY   USER NOTES

          THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

          REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
             PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

             THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH.  IT IS RECOMMENDED THAT
             THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED.
             THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M"
             VALUES USED IN THE ROUTING PROCEDURE.

             GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS
             MANUAL.  SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

          HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT
             HYDROGRAPH HAVE BEEN IMPROVED.  PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION.  OUTPUT
             HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

          INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

          OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT.  USER
             OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES
             EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED.  THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.
```

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION.
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH .
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

1

CUMULATIVE RAINFALL TABLE 7 TIME INCREMENT= .25

8	.0000	.0005	.0015	.0030	.0045
8	.0060	.0080	.0100	.0120	.0143
8	.0165	.0188	.0210	.0233	.0255
8	.0278	.0320	.0390	.0460	.0530
8	.0600	.0750	.1000	.4000	.7000
8	.7250	.7500	.7650	.7800	.7900
8	.8000	.8100	.8200	.8250	.8300
8	.8350	.8400	.8450	.8500	.8550
8	.8600	.8638	.8675	.8713	.8750
8	.8788	.8825	.8863	.8900	.8938
8	.8975	.9013	.9050	.9083	.9115
8	.9148	.9180	.9210	.9240	.9270
8	.9300	.9325	.9350	.9375	.9400
8	.9425	.9450	.9475	.9500	.9525
8	.9550	.9575	.9600	.9625	.9650
8	.9675	.9700	.9725	.9750	.9775
8	.9800	.9813	.9825	.9838	.9850
8	.9863	.9875	.9888	.9900	.9913
8	.9925	.9938	.9950	.9963	.9975
8	.9988	1.0000	1.0000	1.0000	1.0000

9 ENDTBL

CUMULATIVE RAINFALL TABLE 8 TIME INCREMENT= .08

8	.0000	.0200	.0570	.1390	.2890
8	.5390	.6590	.7150	.7580	.7960
8	.8280	.8600	.8920	.9240	.9560
8	.9880	1.0130	1.0320	1.0510	1.0700
8	1.0890	1.1080	1.1270	1.1440	1.1570

9 ENDTBL

CUMULATIVE RAINFALL TABLE 9 TIME INCREMENT= .08

8	.0000	.0100	.0400	.0860	.1660
8	.3060	.5560	.6960	.7760	.8380
8	.8880	.9280	.9680	1.0080	1.0280

```
 8              1.0480      1.0600      1.0720      1.0840      1.0960
 8              1.1080      1.1200      1.1320      1.1440      1.1560
 9 ENDTBL
1
```


STRUCTURE DATA, STRUCTURE NO. 20

	ELEVATION	DISCHARGE	STORAGE
8	5943.00	.00	.00
8	5944.00	17.00	.06
8	5946.00	62.00	.61
8	5948.00	94.00	2.06
8	5950.00	116.00	5.18
8	5951.00	127.00	8.09
8	5952.50	140.00	13.27
8	5953.00	240.00	15.55
8	5954.00	403.00	20.11
8	5956.00	445.00	32.23
8	5957.00	460.00	38.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 62 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	6140.00	.00	.00
8	6140.50	59.00	8.00
8	6141.00	198.00	19.00
8	6142.00	707.00	46.00
8	6143.00	1554.00	81.00
8	6145.00	3047.00	168.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 64 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	5986.00	.00	.00
8	5986.50	65.00	16.00
8	5988.00	712.00	76.00
8	5990.00	2537.00	184.00
8	5992.00	5579.00	324.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 63 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	6130.00	.00	.00
8	6130.50	105.00	16.00
8	6131.00	340.00	34.00
8	6132.00	1142.00	76.00

1

8	6134.00	4072.00	184.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 22 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	5970.00	.00	.00
8	5970.50	51.00	9.00
8	5972.00	610.00	46.00

9 ENDTBL

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 51 RECORD ID

```
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .0230      83.9000        .1000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  52                                                  RECORD ID
        OUTPUT HYDROGRAPH = 5                                   DATA FIELD VALUES =       .0370      88.0000        .1400
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  52                                                  RECORD ID
        INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 3        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  60                                                  RECORD ID
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .0830      72.2000        .2600
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION REACH    CROSS SECTION  62                                                  RECORD ID
        INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 5        DATA FIELD VALUES =    2400.0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  62                                                  RECORD ID
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .0530      71.2000        .2200
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  62                                                  RECORD ID
        INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION REACH    CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPH = 7       OUTPUT HYDROGRAPH = 4        DATA FIELD VALUES =    2400.0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  61                                                  RECORD ID
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .1650      71.9000        .3200
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION REACH    CROSS SECTION  63                                                  RECORD ID
1
```



```
        INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 5        DATA FIELD VALUES =    2700.0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  63                                                  RECORD ID
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .1110      79.2000        .2500
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  63                                                  RECORD ID
        INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION REACH    CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPH = 7       OUTPUT HYDROGRAPH = 5        DATA FIELD VALUES =    2400.0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  64                                                  RECORD ID
        OUTPUT HYDROGRAPH = 6                                   DATA FIELD VALUES =       .0730      90.0000        .1900
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPHS = 4,7    OUTPUT HYDROGRAPH = 5        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  20                                                  RECORD ID
        OUTPUT HYDROGRAPH = 7                                   DATA FIELD VALUES =       .0310      91.6000        .1000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPHS = 5,7    OUTPUT HYDROGRAPH = 6        DATA FIELD VALUES =       .0000       .0000        .0000
        OUTPUT OPTIONS IN EFFECT  SUM

   STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  64                                                  RECORD ID
        INPUT HYDROGRAPHS = 6,3    OUTPUT HYDROGRAPH = 4        DATA FIELD VALUES =       .0000       .0000        .0000
```

```
          OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  21                                                    RECORD ID
          OUTPUT HYDROGRAPH = 6                                  DATA FIELD VALUES =       .0210     79.0000       .1000
          OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION REACH    CROSS SECTION  22                                                    RECORD ID
          INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 5       DATA FIELD VALUES =   1700.0000      .0000       .0000
          OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION  22                                                    RECORD ID
1


 TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)                JOB  1   PASS   1
      REV 09/01/83           FUT. CONDITIONS (FULL DEV., 2 AND 24 HR. STORMS, ST. 20)                                PAGE   6


          OUTPUT HYDROGRAPH = 6                                  DATA FIELD VALUES =       .0260     91.6000       .1000
          OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  22                                                    RECORD ID
          INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7       DATA FIELD VALUES =       .0000      .0000       .0000
          OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION  22                                                    RECORD ID
          INPUT HYDROGRAPHS = 7,4    OUTPUT HYDROGRAPH = 6       DATA FIELD VALUES =       .0000      .0000       .0000
          OUTPUT OPTIONS IN EFFECT  PEAK  HYD  VOL  SUM

    STANDARD CONTROL OPERATION RESVOR   STRUCTURE 20                                                          RECORD ID
          INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 5       DATA FIELD VALUES =   5943.0000      .0000       .0000
          OUTPUT OPTIONS IN EFFECT  SUM


 EXECUTIVE CONTROL OPERATION INCREM                                                                           RECORD ID
+                                  MAIN TIME INCREMENT =   .05 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT                                                                           RECORD ID
+                                  FROM XSECTION  51
+                                                 TO STRUCTURE 20
       STARTING TIME =    .00    RAIN DEPTH =  4.60    RAIN DURATION=  1.00    RAIN TABLE NO.= 7    ANT. MOIST. COND= 2
       ALTERNATE NO.= 1          STORM NO.=99    MAIN TIME INCREMENT =   .05 HOURS

 ***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE 22. MAX.FLOW LESS THAN 2ND TABLE VALUE.


 OPERATION ADDHYD   CROSS SECTION  22

          PEAK TIME(HRS)          PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              6.03                      1075.75                      5973.25
              7.98                        57.73                      5970.52
              9.98                        29.32                      5970.29
             12.79                        22.37                      5970.22
             13.78                        19.52                      5970.19

 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .05 HOURS      DRAINAGE AREA =    .62 SQ.MI.
    4.00    DISCHG       .00      .00      .00      .00      .00      .00      .00      .02      .06      .12
    4.50    DISCHG       .18      .24      .30      .36      .44      .54      .64      .76      .87      .99
    5.00    DISCHG      1.11     1.55     2.44     3.22     3.92     4.55     5.85     8.14    10.19    11.99
    5.50    DISCHG     14.15    54.10   169.87   293.12   406.00   509.01   611.43   717.28   827.07   939.44
    6.00    DISCHG   1049.81  1064.71   938.04   829.31   734.91   637.55   535.75   439.94   357.93   292.62
    6.50    DISCHG    244.35   206.87   175.30   152.38   135.57   122.63   112.39   104.41    98.41    94.03
    7.00    DISCHG     90.94    87.13    81.60    77.10    73.43    70.13    67.11    64.49    62.37    60.75
    7.50    DISCHG     59.60    58.81    58.27    57.93    57.72    57.59    57.53    57.50    57.50    57.51
    8.00    DISCHG     57.52    55.85    51.72    48.10    44.93    41.91    39.04    36.48    34.37    32.74
    8.50    DISCHG     31.55    30.71    30.14    29.75    29.50    29.34    29.23    29.16    29.12    29.10
    9.00    DISCHG     29.09    29.09    29.09    29.10    29.10    29.11    29.12    29.13    29.15    29.16
    9.50    DISCHG     29.17    29.18    29.19    29.20    29.21    29.22    29.23    29.24    29.25    29.27
   10.00    DISCHG     29.27    28.87    27.88    27.00    26.23    25.49    24.75    24.05    23.46    23.00
1


 TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)                JOB  1   PASS   1
      REV 09/01/83           FUT. CONDITIONS (FULL DEV., 2 AND 24 HR. STORMS, ST. 20)                                PAGE   7


   10.50    DISCHG     22.64    22.42    22.31    22.25    22.22    22.22    22.20    22.15    22.10    22.06
   11.00    DISCHG     22.02    22.02    22.06    22.10    22.14    22.19    22.20    22.17    22.14    22.11
```

11.50	DISCHG	22.07	22.07	22.12	22.16	22.20	22.25	22.26	22.23	22.19	22.16
12.00	DISCHG	22.13	22.13	22.17	22.21	22.26	22.30	22.32	22.28	22.25	22.22
12.50	DISCHG	22.19	22.18	22.23	22.27	22.31	22.36	22.37	22.34	22.31	22.28
13.00	DISCHG	22.24	22.06	21.69	21.36	21.07	20.80	20.51	20.21	19.95	19.74
13.50	DISCHG	19.58	19.49	19.47	19.47	19.48	19.51	19.51	19.47	19.43	19.39
14.00	DISCHG	19.35	19.24	19.03	18.85	18.69	18.54	18.41	18.29	18.20	18.13
14.50	DISCHG	18.08	18.05	18.02	18.01	18.00	18.00	17.99	17.99	17.99	18.00

RUNOFF VOLUME ABOVE BASEFLOW = 2.20 WATERSHED INCHES, 885.04 CFS-HRS, 73.14 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 51
+ TO STRUCTURE 20
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=10 MAIN TIME INCREMENT = .05 HOURS

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE 62. MAX.FLOW LESS THAN 2ND TABLE VALUE.

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE 63. MAX.FLOW LESS THAN 2ND TABLE VALUE.

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE 22. MAX.FLOW LESS THAN 2ND TABLE VALUE.

OPERATION ADDHYD CROSS SECTION 22

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.02	494.64	5971.69
7.98	31.45	5970.31
9.98	16.13	5970.16
12.78	12.42	5970.12

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .05 HOURS DRAINAGE AREA = .62 SQ.MI.

5.00	DISCHG	.00	.00	.05	.14	.26	.38	.63	1.10	1.62	2.18
5.50	DISCHG	2.96	16.78	63.83	123.81	182.52	235.91	285.81	334.41	383.88	435.25
6.00	DISCHG	488.19	487.75	409.37	352.37	313.97	281.19	247.45	214.12	183.33	156.52
6.50	DISCHG	134.71	115.78	98.35	85.27	75.63	68.30	62.58	58.12	54.71	52.13
7.00	DISCHG	50.22	47.82	44.41	41.76	39.75	38.08	36.60	35.32	34.24	33.38
7.50	DISCHG	32.72	32.23	31.88	31.64	31.48	31.39	31.33	31.31	31.30	31.31
8.00	DISCHG	31.32	30.30	27.86	25.85	24.25	22.83	21.49	20.28	19.23	18.35
8.50	DISCHG	17.67	17.15	16.76	16.49	16.30	16.17	16.08	16.02	15.98	15.96
9.00	DISCHG	15.95	15.95	15.95	15.95	15.96	15.96	15.97	15.98	15.99	16.00
9.50	DISCHG	16.01	16.02	16.03	16.04	16.05	16.05	16.07	16.07	16.08	16.09
10.00	DISCHG	16.10	15.86	15.26	14.78	14.39	14.04	13.69	13.34	13.03	12.79

1

10.50	DISCHG	12.59	12.46	12.39	12.34	12.31	12.29	12.27	12.23	12.19	12.17
11.00	DISCHG	12.15	12.16	12.19	12.22	12.24	12.26	12.27	12.24	12.22	12.21
11.50	DISCHG	12.20	12.20	12.24	12.27	12.29	12.31	12.32	12.29	12.27	12.26
12.00	DISCHG	12.25	12.25	12.29	12.32	12.34	12.36	12.37	12.34	12.32	12.31
12.50	DISCHG	12.29	12.30	12.34	12.37	12.39	12.41	12.42	12.39	12.37	12.36
13.00	DISCHG	12.34	12.24	12.02	11.84	11.70	11.57	11.42	11.26	11.13	11.02
13.50	DISCHG	10.93	10.88	10.87	10.87	10.87	10.87	10.87	10.83	10.80	10.79
14.00	DISCHG	10.77	10.71	10.59	10.49	10.41	10.34	10.27	10.22	10.17	10.13
14.50	DISCHG	10.10	10.08	10.06	10.05	10.04	10.04	10.04	10.04	10.04	10.04

RUNOFF VOLUME ABOVE BASEFLOW = 1.07 WATERSHED INCHES, 432.05 CFS-HRS, 35.70 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 99													
XSECTION 51	RUNOFF	.02	7	2	.05	.0	4.60	24.00	2.60	---	5.98	66.64	2897.4
XSECTION 52	RUNOFF	.04	7	2	.05	.0	4.60	24.00	2.98	---	5.99	113.42	3065.3
XSECTION 52	ADDHYD	.06	7	2	.05	.0	4.60	24.00	2.83	---	5.98	180.04	3000.6
XSECTION 60	RUNOFF	.08	7	2	.05	.0	4.60	24.00	1.66	---	6.06	135.33	1630.4
XSECTION 62	REACH	.08	7	2	.05	.0	4.60	24.00	1.66	6140.76	6.13	130.94	1577.6
XSECTION 62	RUNOFF	.05	7	2	.05	.0	4.60	24.00	1.59	---	6.04	87.70	1654.8
XSECTION 62	ADDHYD	.14	7	2	.05	.0	4.60	24.00	1.63	6141.02	6.08	207.95	1529.1
XSECTION 64	REACH	.14	7	2	.05	.0	4.60	24.00	1.63	5986.80	6.17	193.91	1425.8
XSECTION 61	RUNOFF	.17	7	2	.05	.0	4.60	24.00	1.64	---	6.09	244.04	1479.1
XSECTION 63	REACH	.17	7	2	.05	.0	4.60	24.00	1.64	6130.78	6.16	234.53	1421.4
XSECTION 63	RUNOFF	.11	7	2	.05	.0	4.60	24.00	2.19	---	6.04	241.17	2172.7
XSECTION 63	ADDHYD	.28	7	2	.05	.0	4.60	24.00	1.86	6131.13	6.09	443.11	1605.5
XSECTION 64	REACH	.28	7	2	.05	.0	4.60	24.00	1.86	5987.34	6.16	427.14	1547.6
XSECTION 64	RUNOFF	.07	7	2	.05	.0	4.60	24.00	3.17	---	6.00	226.47	3102.3
XSECTION 64	ADDHYD	.35	7	2	.05	.0	4.60	24.00	2.13	5987.68	6.08	573.60	1643.6
XSECTION 64	ADDHYD	.49	7	2	.05	.0	4.60	24.00	1.99	5988.04	6.11	749.53	1545.4
XSECTION 20	RUNOFF	.03	7	2	.05	.0	4.60	24.00	3.34	---	5.98	105.25	3395.1
XSECTION 64	ADDHYD	.52	7	2	.05	.0	4.60	24.00	2.07	5988.10	6.07	799.47	1549.4
XSECTION 64	ADDHYD	.58	7	2	.05	.0	4.60	24.00	2.15	5988.26	6.04	950.93	1650.9
XSECTION 21	RUNOFF	.02	7	2	.05	.0	4.60	24.00	2.19	---	5.98	53.31	2538.5
XSECTION 22	REACH	.02	7	2	.05	.0	4.60	24.00	2.18	5970.50	6.04	50.94	2425.5
XSECTION 22	RUNOFF	.03	7	2	.05	.0	4.60	24.00	3.34	---	5.98	88.27	3395.1
XSECTION 22	ADDHYD	.05	7	2	.05	.0	4.60	24.00	2.82	5970.72	5.99	134.69	2865.7
XSECTION 22	ADDHYD	.62	7	2	.05	.0	4.60	24.00	2.20	5973.25	6.03	1075.75	1726.7
STRUCTURE 20	RESVOR	.62	7	2	.05	.0	4.60	24.00	2.20	5955.24	6.36	429.09	688.8
ALTERNATE 1 STORM 10													
XSECTION 51	RUNOFF	.02	7	2	.05	.0	3.00	24.00	1.34	---	5.99	36.13	1570.9
XSECTION 52	RUNOFF	.04	7	2	.05	.0	3.00	24.00	1.63	---	5.99	64.78	1750.7
XSECTION 52	ADDHYD	.06	7	2	.05	.0	3.00	24.00	1.52	---	5.99	100.88	1681.3
XSECTION 60	RUNOFF	.08	7	2	.05	.0	3.00	24.00	.69	---	6.07	54.98	662.4
XSECTION 62	REACH	.08	7	2	.05	.0	3.00	24.00	.69	6140.43	6.15	50.96	614.0
XSECTION 62	RUNOFF	.05	7	2	.05	.0	3.00	24.00	.65	---	6.05	35.16	663.4

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 10													
XSECTION 62	ADDHYD	.14	7	2	.05	.0	3.00	24.00	.67	6140.57	6.10	79.70	586.0
XSECTION 64	REACH	.14	7	2	.05	.0	3.00	24.00	.67	5986.51	6.21	68.97	507.1
XSECTION 61	RUNOFF	.17	7	2	.05	.0	3.00	24.00	.68	---	6.10	96.48	584.8

XSECTION	63	REACH	.17	7	2	.05	.0	3.00	24.00	.67	6130.42	6.19	87.72	531.7
XSECTION	63	RUNOFF	.11	7	2	.05	.0	3.00	24.00	1.04	---	6.05	115.37	1039.4
XSECTION	63	ADDHYD	.28	7	2	.05	.0	3.00	24.00	.82	6130.66	6.10	182.05	659.6
XSECTION	64	REACH	.28	7	2	.05	.0	3.00	24.00	.82	5986.74	6.19	168.07	608.9
XSECTION	64	RUNOFF	.07	7	2	.05	.0	3.00	24.00	1.78	---	6.01	131.97	1807.9
XSECTION	64	ADDHYD	.35	7	2	.05	.0	3.00	24.00	1.02	5986.93	6.07	250.48	717.7
XSECTION	64	ADDHYD	.49	7	2	.05	.0	3.00	24.00	.92	5987.05	6.11	301.65	621.9
XSECTION	20	RUNOFF	.03	7	2	.05	.0	3.00	24.00	1.92	---	5.98	63.82	2058.7
XSECTION	64	ADDHYD	.52	7	2	.05	.0	3.00	24.00	.98	5987.13	6.06	336.54	652.2
XSECTION	64	ADDHYD	.58	7	2	.05	.0	3.00	24.00	1.04	5987.34	6.03	427.13	741.5
XSECTION	21	RUNOFF	.02	7	2	.05	.0	3.00	24.00	1.03	---	5.99	26.61	1267.2
XSECTION	22	REACH	.02	7	2	.05	.0	3.00	24.00	1.03	5970.24	6.05	24.27	1155.5
XSECTION	22	RUNOFF	.03	7	2	.05	.0	3.00	24.00	1.92	---	5.98	53.53	2058.7
XSECTION	22	ADDHYD	.05	7	2	.05	.0	3.00	24.00	1.52	5970.56	5.99	74.42	1583.4
XSECTION	22	ADDHYD	.62	7	2	.05	.0	3.00	24.00	1.07	5971.69	6.02	494.64	794.0
STRUCTURE	20	RESVOR	.62	7	2	.05	.0	3.00	24.00	1.07	5952.51	6.50	141.09	226.5

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK
						OUTFLOW+			VOLUME	MAIN	ITER-	Q AND A			PEAK	S/Q	ATT-	TRAVEL TIME
XSEC	REACH	INFLOW		OUTFLOW		INTERV.AREA		BASE-	ABOVE	TIME	ATION	EQUATION		LENGTH	RATIO	*PEAK	KIN	STOR- KINE-
ID	LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	FLOW (CFS)	BASE (IN)	INCR (HR)	#	COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 99																		
												3.21						
62	2400	135	6.1	129	6.2			0	1.66	.05	1		1.40	.045	.957	183	.66	.10 .05
						207	6.1											
												.919						
64	2400	207	6.1	193	6.2			0	1.63	.05	1		1.54	.059	.934	257	.52	.05 .07
						---	---											
												1.39						
63	2700	243	6.1	234	6.2			0	1.64	.05	1		1.56	.036	.963	195	.63	.05 .05
						442	6.1											
												.919						
64	2400	442	6.1	426	6.2			0	1.86	.05	1		1.54	.035	.964	197	.63	.05 .06
						571	6.1											
												1.80						
22	1700	53	6.0	51	6.1			0	2.19	.05	1		1.52	.054	.965	195	.63	.05 .05
						134	6.0											
ALTERNATE 1 STORM 10																		
												3.21						
62	2400	54	6.1	51	6.2			0	.69	.05	1		1.40	.061	.942	238	.55	.10 .07
						80	6.1											
												.919						
64	2400	80	6.1	69	6.2			0	.67	.05	1		1.54	.089	.864	358	.40	.10 .10
						---	---											
												1.39						
63	2700	96	6.1	88	6.2			0	.68	.05	1		1.56	.056	.909	272	.50	.10 .08
						182	6.1											
												.919						
64	2400	182	6.1	168	6.2			0	.82	.05	1		1.54	.050	.922	268	.50	.10 .08
						248	6.1											
												1.80						
22	1700	26	6.0	24	6.1			0	1.03	.05	1		1.52	.084	.917	247	.53	.05 .07
						74	6.0											

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 10	99
0 STRUCTURE 20	.62		
+ ALTERNATE 1		141.09	429.09
0 XSECTION 20	.03		
+ ALTERNATE 1		63.82	105.25
0 XSECTION 21	.02		
+ ALTERNATE 1		26.61	53.31
0 XSECTION 22	.62		
+ ALTERNATE 1		494.64	1075.75
0 XSECTION 51	.02		
+ ALTERNATE 1		36.13	66.64
0 XSECTION 52	.06		
+ ALTERNATE 1		100.88	180.04
0 XSECTION 60	.08		
+ ALTERNATE 1		54.98	135.33
0 XSECTION 61	.17		
+ ALTERNATE 1		96.48	244.04
0 XSECTION 62	.14		
+ ALTERNATE 1		79.70	207.95
0 XSECTION 63	.28		
+ ALTERNATE 1		182.05	443.11
0 XSECTION 64	.58		
+ ALTERNATE 1		427.13	950.93

1END OF 1 JOBS IN THIS RUN

TR-20 PRINTOUT
DEVELOPED CONDITIONS
DETENTION POND NO. 2

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******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                                                SUMMARY   NOPLOTS
TITLE     CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)
TITLE     FUT. COND. (FULL DEV., 10 AND 100 YR. STORMS, ST.80)
 5 RAINFL 7             0.2500
 8          0.0000      0.0005      0.0015      0.0030      0.0045
 8          0.0060      0.0080      0.0100      0.0120      0.0143
 8          0.0165      0.0188      0.0210      0.0233      0.0255
 8          0.0278      0.0320      0.0390      0.0460      0.0530
 8          0.0600      0.0750      0.1000      0.4000      0.7000
 8          0.7250      0.7500      0.7650      0.7800      0.7900
 8          0.8000      0.8100      0.8200      0.8250      0.8300
 8          0.8350      0.8400      0.8450      0.8500      0.8550
 8          0.8600      0.8638      0.8675      0.8713      0.8750
 8          0.8788      0.8825      0.8863      0.8900      0.8938
 8          0.8975      0.9013      0.9050      0.9083      0.9115
 8          0.9148      0.9180      0.9210      0.9240      0.9270
 8          0.9300      0.9325      0.9350      0.9375      0.9400
 8          0.9425      0.9450      0.9475      0.9500      0.9525
 8          0.9550      0.9575      0.9600      0.9625      0.9650
 8          0.9675      0.9700      0.9725      0.9750      0.9775
 8          0.9800      0.9813      0.9825      0.9838      0.9850
 8          0.9863      0.9875      0.9888      0.9900      0.9913
 8          0.9925      0.9938      0.9950      0.9963      0.9975
 8          0.9988      1.0000      1.0000      1.0000      1.0000
 9 ENDTBL
 5 RAINFL 8             0.08333
 8          0.000       0.020       0.057       0.139       0.289
 8          0.539       0.659       0.715       0.758       0.796
 8          0.828       0.860       0.892       0.924       0.956
 8          0.988       1.013       1.032       1.051       1.070
 8          1.089       1.108       1.127       1.144       1.157
 9 ENDTBL
 5 RAINFL 9             0.08333
 8          0.000       0.010       0.040       0.086       0.166
 8          0.306       0.556       0.696       0.776       0.838
 8          0.888       0.928       0.968       1.008       1.028
 8          1.048       1.060       1.072       1.084       1.096
 8          1.108       1.120       1.132       1.144       1.156
 9 ENDTBL
 3 STRUCT      80
 8                      5960.       0.0         0.0
 8                      5965.       180.        4.4
 8                      5967.5      254.        7.8
 8                      5970.       311.        11.9
 8                      5972.5      359.        17.1
 8                      5975.       402.        23.9
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**********************80-80 LIST OF INPUT DATA (CONTINUED)**********************

 8                      5977.5      440.        32.3
 8                      5980.       1280.       42.1
 8                      5982.5      1380.       53.1
 9 ENDTBL
 3 STRUCT      81
 9 ENDTBL
 2 XSECTN   161         1.0
 8                      6190.       0.0         0.0
 8                      6190.5      127.        16.
 8                      6192.       1385.       76.
 9 ENDTBL
 2 XSECTN   162         1.0
 8                      6050.       0.0         0.0
 8                      6051.       311.        34.
 8                      6052.       1044.       76.
 8                      6053.       2174.       126.
 8                      6054.       3722.       184.
 9 ENDTBL
 2 XSECTN   163         1.0
 8                      5980.       0.0         0.0
 8                      5981.       212.        34.
 8                      5982.       712.        76.
 8                      5984.       2537.       184.
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  9 ENDTBL
  2 XSECTN   165          1.0
  8                       6010.       0.0         0.0
  8                       6011.       313.        34.
  8                       6012.       1051.       76.
  8                       6014.       3748.       184.
  9 ENDTBL
  6 RUNOFF 1 160       6 0.593        70.2        0.58
  6 REACH  3 161   6   5 1100.
  6 RUNOFF 1 161       6 0.054        74.4        0.10
  6 ADDHYD 4 161   5 6 7
  6 REACH  3 162   7   5 1700.
  6 RUNOFF 1 162       6 0.058        77.9        0.16
  6 ADDHYD 4 162   5 6 7
  6 REACH  3 163   7   5 900.
  6 RUNOFF 1 163       6 0.015        90.7        0.10
  6 ADDHYD 4 163   5 6 4
  6 RUNOFF 1 164       6 0.970        74.5        0.66
  6 REACH  3 165   6   5 3200.
  6 RUNOFF 1 165       6 0.079        82.1        0.24
  6 ADDHYD 4 165   5 6 7                                    1 1   1
  6 ADDHYD 4 165   4 7 6
  6 RESVOR 2    80 6   4 5960.
1


 **********80-80 LIST OF INPUT DATA (CONTINUED)**********

    ENDATA
  7 INCREM 6              0.05
  7 COMPUT 7 160      80 0.0          4.6         1.0         7 2  01  99
    ENDCMP 1
  7 COMPUT 7 160      80 0.0          3.0         1.0         7 2  01  10
    ENDCMP 1
    ENDJOB 2
0**********END OF 80-80 LIST**********
1


TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)        JOB  1   PASS   1
     REV 09/01/83           FUT. COND. (FULL DEV., 10 AND 100 YR. STORMS, ST.80)                      PAGE   1


0                              COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY   USER NOTES

          THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

          REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
             PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

             THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH.  IT IS RECOMMENDED THAT
             THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED.
             THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M"
             VALUES USED IN THE ROUTING PROCEDURE.

             GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS
             MANUAL.  SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

          HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT
             HYDROGRAPH HAVE BEEN IMPROVED.  PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION.  OUTPUT
             HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

          INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

          OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT.  USER
             OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES
             EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED.  THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

          PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

               CHESTER, PA (NORTHEAST)  -- 215-499-3933,       FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
               LINCOLN, NB (MIDWEST)    -- 541-5318 (FTS),     PORTLAND, OR (WEST)    -- 423-4099 (FTS)
               OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).


       PROGRAM CHANGES SINCE MAY 1982:

            12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
                       CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
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                5/02/83 - CORRECT COMPUTATIONS FOR ---
                                1. DIVISION OF BASEFLOW IN DIVERT OPERATION
                                2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
                                3. CROSS SECTION DATA PLOTTING POSITION
                                4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
                                5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
                                6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
                                7. BASEFLOW ENTERED WITH READHYD
                                8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
                        ENHANCEMENTS ---
                                1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
                                2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
                09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
                        CORRECT COMBINATION OF RATING TABLES FOR DIVERT
                        CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
                        ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE
1


TR20 XEQ                        CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)       JOB  1   PASS   1
     REV 09/01/83               FUT. COND. (FULL DEV., 10 AND 100 YR. STORMS, ST.80)                            PAGE   2


   CUMULATIVE RAINFALL TABLE  7          TIME INCREMENT=   .25

 8                .0000       .0005       .0015       .0030       .0045
 8                .0060       .0080       .0100       .0120       .0143
 8                .0165       .0188       .0210       .0233       .0255
 8                .0278       .0320       .0390       .0460       .0530
 8                .0600       .0750       .1000       .4000       .7000
 8                .7250       .7500       .7650       .7800       .7900
 8                .8000       .8100       .8200       .8250       .8300
 8                .8350       .8400       .8450       .8500       .8550
 8                .8600       .8638       .8675       .8713       .8750
 8                .8788       .8825       .8863       .8900       .8938
 8                .8975       .9013       .9050       .9083       .9115
 8                .9148       .9180       .9210       .9240       .9270
 8                .9300       .9325       .9350       .9375       .9400
 8                .9425       .9450       .9475       .9500       .9525
 8                .9550       .9575       .9600       .9625       .9650
 8                .9675       .9700       .9725       .9750       .9775
 8                .9800       .9813       .9825       .9838       .9850
 8                .9863       .9875       .9888       .9900       .9913
 8                .9925       .9938       .9950       .9963       .9975
 8                .9988      1.0000      1.0000      1.0000      1.0000
 9 ENDTBL


   CUMULATIVE RAINFALL TABLE  8          TIME INCREMENT=   .08

 8                .0000       .0200       .0570       .1390       .2890
 8                .5390       .6590       .7150       .7580       .7960
 8                .8280       .8600       .8920       .9240       .9560
 8                .9880      1.0130      1.0320      1.0510      1.0700
 8               1.0890      1.1080      1.1270      1.1440      1.1570
 9 ENDTBL


   CUMULATIVE RAINFALL TABLE  9          TIME INCREMENT=   .08

 8                .0000       .0100       .0400       .0860       .1660
 8                .3060       .5560       .6960       .7760       .8380
 8                .8880       .9280       .9680      1.0080      1.0280
 8               1.0480      1.0600      1.0720      1.0840      1.0960
 8               1.1080      1.1200      1.1320      1.1440      1.1560
 9 ENDTBL
1


TR20 XEQ                        CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)       JOB  1   PASS   1
     REV 09/01/83               FUT. COND. (FULL DEV., 10 AND 100 YR. STORMS, ST.80)                            PAGE   3
```

STRUCTURE DATA, STRUCTURE NO. 80

	ELEVATION	DISCHARGE	STORAGE
8	5960.00	.00	.00
8	5965.00	180.00	4.40
8	5967.50	254.00	7.80
8	5970.00	311.00	11.90
8	5972.50	359.00	17.10
8	5975.00	402.00	23.90
8	5977.50	440.00	32.30
8	5980.00	1280.00	42.10
8	5982.50	1380.00	53.10

9 ENDTBL

STRUCTURE DATA, STRUCTURE NO. 81

	ELEVATION	DISCHARGE	STORAGE

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 161 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	6190.00	.00	.00
8	6190.50	127.00	16.00
8	6192.00	1385.00	76.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 162 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	6050.00	.00	.00
8	6051.00	311.00	34.00
8	6052.00	1044.00	76.00
8	6053.00	2174.00	126.00
8	6054.00	3722.00	184.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 163 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	5980.00	.00	.00
8	5981.00	212.00	34.00
8	5982.00	712.00	76.00

1

8	5984.00	2537.00	184.00

9 ENDTBL

CROSS-SECTION DATA, CROSS-SECTION NO. 165 DRAINAGE AREA= 1.00 BANKFULL ELEV.= .00

	ELEVATION	DISCHARGE	END AREA
8	6010.00	.00	.00
8	6011.00	313.00	34.00
8	6012.00	1051.00	76.00
8	6014.00	3748.00	184.00

9 ENDTBL

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 160 RECORD ID
OUTPUT HYDROGRAPH = 6 DATA FIELD VALUES = .5930 70.2000 .5800
OUTPUT OPTIONS IN EFFECT SUM

STANDARD CONTROL OPERATION REACH CROSS SECTION 161 RECORD ID
INPUT HYDROGRAPH = 6 OUTPUT HYDROGRAPH = 5 DATA FIELD VALUES = 1100.0000 .0000 .0000
OUTPUT OPTIONS IN EFFECT SUM

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 161 RECORD ID
OUTPUT HYDROGRAPH = 6 DATA FIELD VALUES = .0540 74.4000 .1000
OUTPUT OPTIONS IN EFFECT SUM

```
    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 161                                                    RECORD ID
            INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7          DATA FIELD VALUES =       .0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION REACH    CROSS SECTION 162                                                    RECORD ID
            INPUT HYDROGRAPH = 7       OUTPUT HYDROGRAPH = 5          DATA FIELD VALUES =   1700.0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 162                                                    RECORD ID
            OUTPUT HYDROGRAPH = 6                                     DATA FIELD VALUES =       .0580     77.9000       .1600
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 162                                                    RECORD ID
            INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7          DATA FIELD VALUES =       .0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION REACH    CROSS SECTION 163                                                    RECORD ID
            INPUT HYDROGRAPH = 7       OUTPUT HYDROGRAPH = 5          DATA FIELD VALUES =    900.0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 163                                                    RECORD ID
            OUTPUT HYDROGRAPH = 6                                     DATA FIELD VALUES =       .0150     90.7000       .1000
            OUTPUT OPTIONS IN EFFECT  SUM
1


 TR20 XEQ                    CHEYENNE MOUNTAIN RANCH DRAINAGE STUDY (DREXEL BARRELL JN EW-1011)          JOB  1   PASS   1
      REV 09/01/83           FUT. COND. (FULL DEV., 10 AND 100 YR. STORMS, ST.80)                                PAGE   5


    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 163                                                    RECORD ID
            INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 4          DATA FIELD VALUES =       .0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 164                                                    RECORD ID
            OUTPUT HYDROGRAPH = 6                                     DATA FIELD VALUES =       .9700     74.5000       .6600
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION REACH    CROSS SECTION 165                                                    RECORD ID
            INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 5          DATA FIELD VALUES =   3200.0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION RUNOFF   CROSS SECTION 165                                                    RECORD ID
            OUTPUT HYDROGRAPH = 6                                     DATA FIELD VALUES =       .0790     82.1000       .2400
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 165                                                    RECORD ID
            INPUT HYDROGRAPHS = 5,6    OUTPUT HYDROGRAPH = 7          DATA FIELD VALUES =       .0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM

    STANDARD CONTROL OPERATION ADDHYD   CROSS SECTION 165                                                    RECORD ID
            INPUT HYDROGRAPHS = 4,7    OUTPUT HYDROGRAPH = 6          DATA FIELD VALUES =       .0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  PEAK  HYD   VOL   SUM

    STANDARD CONTROL OPERATION RESVOR   STRUCTURE 80                                                       RECORD ID
            INPUT HYDROGRAPH = 6       OUTPUT HYDROGRAPH = 4          DATA FIELD VALUES =   5960.0000       .0000       .0000
            OUTPUT OPTIONS IN EFFECT  SUM


 EXECUTIVE CONTROL OPERATION INCREM                                                                          RECORD ID
+                                   MAIN TIME INCREMENT =   .05 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT                                                                          RECORD ID
+                                   FROM XSECTION 160
+                                                 TO STRUCTURE 80
        STARTING TIME =    .00     RAIN DEPTH =  4.60     RAIN DURATION=  1.00     RAIN TABLE NO.= 7     ANT. MOIST. COND= 2
        ALTERNATE NO.= 1           STORM NO.=99     MAIN TIME INCREMENT =   .05 HOURS

     ***  WARNING  REACH 161 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 162 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 163 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***

     ***  WARNING  REACH 165 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT  ***


 OPERATION ADDHYD   CROSS SECTION 165
```

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.32	1668.28	6012.46
9.98	75.57	6010.24
12.99	57.95	6010.19

FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .05 HOURS DRAINAGE AREA = 1.77 SQ.MI.

TIME(HRS)											
4.50	DISCHG	.00	.01	.02	.04	.05	.07	.08	.09	.11	.12
5.00	DISCHG	.14	.20	.32	.40	.47	.52	.69	.97	1.16	1.30
5.50	DISCHG	1.51	9.11	34.58	80.97	154.52	245.33	347.91	467.41	612.49	788.74
6.00	DISCHG	995.53	1197.07	1319.42	1402.04	1511.00	1609.69	1663.33	1658.00	1598.29	1498.13
6.50	DISCHG	1372.42	1233.80	1092.05	958.33	841.93	744.36	663.65	595.21	536.38	485.66
7.00	DISCHG	441.66	403.15	368.58	338.09	312.64	291.02	272.09	255.13	239.83	226.03
7.50	DISCHG	213.67	202.73	193.17	184.99	178.08	172.31	167.53	163.60	160.36	157.71
8.00	DISCHG	155.55	153.09	149.06	144.31	140.37	136.57	132.31	127.34	121.85	116.09
8.50	DISCHG	110.36	104.91	99.91	95.52	91.79	88.72	86.23	84.21	82.55	81.20
9.00	DISCHG	80.08	79.17	78.42	77.81	77.31	76.91	76.59	76.33	76.13	75.97
9.50	DISCHG	75.84	75.74	75.66	75.61	75.57	75.54	75.53	75.52	75.53	75.54
10.00	DISCHG	75.55	75.41	74.80	73.95	73.21	72.44	71.48	70.30	68.95	67.53
10.50	DISCHG	66.11	64.76	63.53	62.45	61.51	60.74	60.10	59.57	59.13	58.78
11.00	DISCHG	58.51	58.29	58.14	58.02	57.91	57.81	57.73	57.65	57.58	57.54
11.50	DISCHG	57.52	57.51	57.53	57.55	57.56	57.56	57.56	57.54	57.53	57.54
12.00	DISCHG	57.55	57.57	57.62	57.67	57.69	57.71	57.72	57.72	57.71	57.72
12.50	DISCHG	57.75	57.77	57.82	57.87	57.90	57.91	57.93	57.92	57.91	57.93
13.00	DISCHG	57.95	57.91	57.69	57.37	57.07	56.74	56.34	55.83	55.26	54.68
13.50	DISCHG	54.11	53.57	53.09	52.68	52.32	52.01	51.76	51.53	51.34	51.21
14.00	DISCHG	51.10	50.98	50.78	50.53	50.30	50.06	49.79	49.50	49.20	48.90
14.50	DISCHG	48.61	48.34	48.11	47.90	47.73	47.59	47.47	47.38	47.31	47.25

RUNOFF VOLUME ABOVE BASEFLOW = 1.76 WATERSHED INCHES, 2009.81 CFS-HRS, 166.09 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
\+ COMPUTATIONS COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
\+ FROM XSECTION 160
\+ TO STRUCTURE 80
STARTING TIME = .00 RAIN DEPTH = 3.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=10 MAIN TIME INCREMENT = .05 HOURS

*** WARNING REACH 161 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

***WARNING - LACK OF LOW FLOW DEFINITION FOR XSECT TABLE162. MAX.FLOW LESS THAN 2ND TABLE VALUE.

*** WARNING REACH 162 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

*** WARNING REACH 163 ATT-KIN COEFF.(C) GREATER THAN 0.667, CONSIDER REDUCING MAIN TIME INCREMENT ***

OPERATION ADDHYD CROSS SECTION 165

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
6.39	646.55	6011.45
9.99	38.53	6010.12
13.02	29.99	6010.10

FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .05 HOURS DRAINAGE AREA = 1.77 SQ.MI.

TIME(HRS)											
5.00	DISCHG	.00	.00	.00	.00	.00	.02	.07	.14	.22	.29
5.50	DISCHG	.38	2.59	9.65	19.50	34.09	57.61	91.92	135.14	185.44	244.69
6.00	DISCHG	315.49	389.10	450.86	492.90	522.40	567.04	612.20	640.71	645.76	628.98
6.50	DISCHG	594.95	549.00	496.73	442.38	391.02	347.22	311.11	280.75	254.67	231.98

7.00	DISCHG	212.14	194.68	179.21	165.26	152.89	142.58	133.80	126.02	118.98	112.54
7.50	DISCHG	106.71	101.47	96.85	92.84	89.43	86.58	84.22	82.28	80.66	79.32
8.00	DISCHG	78.23	77.12	75.67	73.66	71.38	69.41	67.49	65.30	62.79	60.06
8.50	DISCHG	57.24	54.47	51.86	49.48	47.42	45.70	44.30	43.17	42.24	41.49
9.00	DISCHG	40.87	40.36	39.95	39.62	39.35	39.13	38.96	38.83	38.72	38.64
9.50	DISCHG	38.58	38.54	38.51	38.49	38.47	38.47	38.47	38.48	38.49	38.51
10.00	DISCHG	38.53	38.49	38.33	38.00	37.56	37.17	36.75	36.24	35.63	34.94
10.50	DISCHG	34.23	33.54	32.88	32.29	31.78	31.35	30.99	30.69	30.45	30.24
11.00	DISCHG	30.09	29.97	29.88	29.81	29.77	29.72	29.68	29.65	29.61	29.59
11.50	DISCHG	29.58	29.58	29.59	29.60	29.62	29.64	29.64	29.64	29.64	29.64
12.00	DISCHG	29.65	29.67	29.69	29.72	29.75	29.78	29.79	29.80	29.80	29.80
12.50	DISCHG	29.82	29.84	29.86	29.90	29.93	29.95	29.96	29.97	29.97	29.98
13.00	DISCHG	29.99	29.99	29.93	29.81	29.64	29.48	29.30	29.09	28.82	28.53
13.50	DISCHG	28.24	27.96	27.70	27.47	27.28	27.10	26.96	26.84	26.74	26.65
14.00	DISCHG	26.59	26.53	26.46	26.35	26.23	26.11	25.98	25.84	25.70	25.55
14.50	DISCHG	25.40	25.26	25.13	25.02	24.92	24.84	24.78	24.73	24.69	24.66

RUNOFF VOLUME ABOVE BASEFLOW = .76 WATERSHED INCHES, 864.54 CFS-HRS, 71.45 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 99													
\+													
XSECTION 160	RUNOFF	.59	7	2	.05	.0	4.60	24.00	1.51	---	6.24	567.45	956.9
XSECTION 161	REACH	.59	7	2	.05	.0	4.60	24.00	1.51	6191.03	6.24	567.45	956.9
XSECTION 161	RUNOFF	.05	7	2	.05	.0	4.60	24.00	1.83	---	5.99	118.46	2193.7
XSECTION 161	ADDHYD	.65	7	2	.05	.0	4.60	24.00	1.54	6191.04	6.24	579.04	895.0
XSECTION 162	REACH	.65	7	2	.05	.0	4.60	24.00	1.53	6051.36	6.29	578.26	893.8
XSECTION 162	RUNOFF	.06	7	2	.05	.0	4.60	24.00	2.09	---	6.01	131.87	2273.7
XSECTION 162	ADDHYD	.71	7	2	.05	.0	4.60	24.00	1.58	6051.39	6.29	595.35	844.5
XSECTION 163	REACH	.71	7	2	.05	.0	4.60	24.00	1.58	5981.77	6.29	595.35	844.5
XSECTION 163	RUNOFF	.01	7	2	.05	.0	4.60	24.00	3.25	---	5.98	50.17	3344.3
XSECTION 163	ADDHYD	.72	7	2	.05	.0	4.60	24.00	1.62	5981.78	6.29	599.59	832.8
XSECTION 164	RUNOFF	.97	7	2	.05	.0	4.60	24.00	1.82	---	6.28	1051.79	1084.3
XSECTION 165	REACH	.97	7	2	.05	.0	4.60	24.00	1.81	6011.99	6.35	1042.06	1074.3
XSECTION 165	RUNOFF	.08	7	2	.05	.0	4.60	24.00	2.44	---	6.03	191.19	2420.1
XSECTION 165	ADDHYD	1.05	7	2	.05	.0	4.60	24.00	1.86	6012.02	6.34	1077.25	1026.9
XSECTION 165	ADDHYD	1.77	7	2	.05	.0	4.60	24.00	1.76	6012.46	6.32	1668.28	943.1
STRUCTURE 80	RESVOR	1.77	7	2	.05	.0	4.60	24.00	1.75	5980.14	6.53	1285.70	726.8
ALTERNATE 1 STORM 10													
\+													
XSECTION 160	RUNOFF	.59	7	2	.05	.0	3.00	24.00	.60	---	6.27	202.68	341.8
XSECTION 161	REACH	.59	7	2	.05	.0	3.00	24.00	.60	6190.59	6.27	202.68	341.8
XSECTION 161	RUNOFF	.05	7	2	.05	.0	3.00	24.00	.79	---	5.99	54.04	1000.7
XSECTION 161	ADDHYD	.65	7	2	.05	.0	3.00	24.00	.61	6190.60	6.27	208.09	321.6
XSECTION 162	REACH	.65	7	2	.05	.0	3.00	24.00	.61	6050.66	6.34	206.11	318.6
XSECTION 162	RUNOFF	.06	7	2	.05	.0	3.00	24.00	.97	---	6.02	63.18	1089.2
XSECTION 162	ADDHYD	.71	7	2	.05	.0	3.00	24.00	.64	6050.69	6.33	213.82	303.3
XSECTION 163	REACH	.71	7	2	.05	.0	3.00	24.00	.64	5981.00	6.38	213.69	303.1
XSECTION 163	RUNOFF	.01	7	2	.05	.0	3.00	24.00	1.85	---	5.98	30.06	2003.9
XSECTION 163	ADDHYD	.72	7	2	.05	.0	3.00	24.00	.67	5981.01	6.38	216.25	300.4

XSECTION 164	RUNOFF	.97	7	2	.05	.0	3.00	24.00	.79	---	6.31	423.91	437.0
XSECTION 165	REACH	.97	7	2	.05	.0	3.00	24.00	.79	6011.14	6.40	414.51	427.3
XSECTION 165	RUNOFF	.08	7	2	.05	.0	3.00	24.00	1.21	---	6.04	96.89	1226.5
XSECTION 165	ADDHYD	1.05	7	2	.05	.0	3.00	24.00	.82	6011.16	6.39	430.31	410.2
XSECTION 165	ADDHYD	1.77	7	2	.05	.0	3.00	24.00	.76	6011.45	6.39	646.55	365.5

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 10													
STRUCTURE 80	RESVOR	1.77	7	2	.05	.0	3.00	24.00	.75	5972.54	6.74	359.77	203.4

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SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

XSEC ID	REACH LENGTH (FT)	HYDROGRAPH INFORMATION INFLOW PEAK (CFS)	INFLOW TIME (HR)	OUTFLOW PEAK (CFS)	OUTFLOW TIME (HR)	OUTFLOW+ INTERV.AREA PEAK (CFS)	INTERV.AREA TIME (HR)	BASE-FLOW (CFS)	ROUTING PARAMETERS VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	Q AND A EQUATION COEFF (X)	Q AND A EQUATION POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO O/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	PEAK TRAVEL TIME STOR-AGE (HR)	PEAK TRAVEL TIME KINE-MATIC (HR)
ALTERNATE 1 STORM 99																			
+161	1100	567	6.3	567	6.3			0	1.51	.05	0	1.81	1.53	.003	1.000	54	1.00?	.00	.00
+						579	6.3												
+162	1700	579	6.3	578	6.3			0	1.54	.05	1	1.54	1.51	.007	.999	100	.95?	.05	.03
+						595	6.3												
+163	900	595	6.3	595	6.3			0	1.58	.05	0	1.05	1.51	.004	1.000	68	1.00?	.00	.00
+						599	6.3												
+165	3200	1050	6.3	1042	6.3			0	1.82	.05	1	1.55	1.51	.014	.992	154	.74?	.05	.04
+						1077	6.3												
ALTERNATE 1 STORM 10																			
+161	1100	201	6.3	201	6.3			0	.60	.05	0	1.81	1.53	.004	1.000	77	1.00?	.00	.00
+						207	6.3												
+162	1700	207	6.3	206	6.3			0	.61	.05	1	1.54	1.51	.010	.994	142	.78?	.10	.04
+						213	6.3												
+163	900	213	6.3	213	6.4			0	.64	.05	1	1.05	1.51	.005	1.000	96	.97?	.05	.03
+						216	6.4												
+165	3200	423	6.3	414	6.4			0	.79	.05	1	1.55	1.51	.020	.979	209	.60	.10	.06
+						430	6.4												

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SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 10	99
0 STRUCTURE 80	1.77		
+ ALTERNATE 1		359.77	1285.70
0 XSECTION 160	.59		
+ ALTERNATE 1		202.68	567.45
0 XSECTION 161	.65		
+ ALTERNATE 1		208.09	579.04
0 XSECTION 162	.71		
+ ALTERNATE 1		213.82	595.35
0 XSECTION 163	.72		
+ ALTERNATE 1		216.25	599.59
0 XSECTION 164	.97		
+ ALTERNATE 1		423.91	1051.79
0 XSECTION 165	1.77		
+ ALTERNATE 1		646.55	1668.28

1END OF 1 JOBS IN THIS RUN