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June 21, 1995,

SWW35441.GT.40

Michael Lopez, P.E.
Project Manager
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

Subject: Addendum No.1, Final Design Report

Dear Mr. Lopez:

This letter presents our response to comments on the 90 percent design of the subject project. We have provided responses to the comments from the following District and ADWR correspondence:

- District comment letter to CH2M HILL from Michael Lopez dated April 26, 1995
- ADWR comment letter to the District, dated April 26, 1995
- ADWR comment letter to the District, dated May 2, 1995
- ADWR comment letter to the District, dated May 16, 1995

We have presented our responses in the form of an Addendum to the Final Design Report, dated February 1995. Our responses reference each comment by comment number. A copy of the comments are attached. As soon as you have a chance to review our responses, we will arrange for a meeting to resolve any outstanding issues so the plans and special provisions can be finalized.

Please call if you have any questions.

Michael Lopez, P.E.
Page 2
June 12, 1995
SWW35441.GT.40

Sincerely,

CH2M HILL

A handwritten signature in cursive script, appearing to read "Steve Walker".

Steve Walker, P.E.
Project Manager

c: David Allard/CH2M HILL/PHX
John Livingston/CH2M HILL/RDD
Tom Wolf/CH2M HILL/PHX

**Addendum No. 1
Casandro Wash Dam
Final Design Report**

Comments from District in Letter to CH2M HILL dated April 26, 1995

General Comments

Plans

Cover Sheet

1. Will add Wickenburg approval
2. Will change

Sheet 2

1. Will change

Sheet 3

1. Will increase line weight

Sheet 4

1. Will add easement
2. Will increase line weight

Sheet 5

1. Will remove grid lines
2. It is necessary to keep the chimney adjacent to the spillway to collect water that could move adjacent to the spillway wall.

Sheet 6

1. The geotechnical report used the 100-year water surface elevation to look at the steady state seepage requirements. It is useful to extend the chimney drain as high as possible in the dam ($\frac{1}{2}$ PMF elevation) to intercept any water that could pass through the dam during larger events when the spillway is operating.

2. Material zone types are referenced to special provision sections. Cross references might be confusing.
3. A total of four Zone 2 finger drains will be included in the design. The drains will consist of Zone 2 material without any pipes. All drains will daylight on the downstream face of the dam.

Sheet 7

1. Concrete slurry backfill will be used for the entire length of the principal spillway. The concrete will be encased in Zone 2 filter material downstream of the chimney drain.

Sheet 8

1. The PVC drain pipes in the chimney drain have been deleted.
2. The rip-pap will be buried at 1 foot below the downstream sill of the stilling basin.

Sheet 11

1. The conduit will be lowered to the floor of the structure.

Sheet 13

1. The sump will be removed.

Sheet 15

1. The bench will be eliminated and both pipes will be installed in the same trench.

Bidding Schedule

These two items will be added to the bidding schedule.

Special Provisions

The requested changes will be made to the special provisions.

Comments from ADWR Letter to District dated 4/27/95

Initial Review Comments

1. Additional subsurface investigation was conducted at the left portion of the dam. Four borings were drilled at locations recommended by ADWR. The information from the additional investigation was submitted to the District as Addendum No. 1 to the geotechnical data report on May 15, 1995.
2. Foundation acceptance criteria have been developed and will be included in the Construction Quality Assurance Plan. The acceptance criteria that will be included in the plan follows.

Foundation Acceptance Criteria

Definitions

Roadway Embankments. Roadway embankments are those soil embankments which will not contact water in the main reservoir or contribute to freeboard above Elevation 2163.5 around the reservoir perimeter. The primary purpose of these embankments is to support vehicles under dry and wet conditions.

Dam Embankments. Dam embankments are those soil embankments which retain water up to Elevation 2163.5.

Reservoir Perimeter Embankments. Reservoir perimeter embankments are those soil embankments which form the perimeter of the reservoir and whose purpose is to reduce erosion, enhance slope stability, and allow future vegetation.

The decision as to which areas fall into the above classification is mostly self-evident. Areas which fall into a combination of categories will be classified by the Engineer and Owner. In case of discrepancy, the more restrictive foundation acceptance criteria will apply.

Acceptance Criteria

Acceptance of the foundation for embankments will be as follows:

Roadway Embankments. Complete Clearing and Grubbing—Section 201. Complete Subgrade Preparation—Section 301. Compact the upper 12 inches of subgrade to at least 100 percent relative compaction—Subsection 301.3. Proof roll entire subgrade—Subsection 301.3 to find any deep loose soil areas. Remove, replace, recompact areas

which are soft, unstable, contain organic or deleterious material, or are otherwise unacceptable to the Engineer. Maintain moisture content and density as specified fill material is placed.

Dam Embankments. Complete Clearing and Grubbing—Section 201. Complete excavation in accordance with Subsection 204.3 down to the elevations shown on the drawings over the entire footprint of the embankment. The engineer will determine the relative compaction of the soils from the ground surface to a depth of 6 inches. Spacing of the tests will be a grid with intervals of approximately 100 feet. The desired foundation material is a slightly cemented silty sand. Samples of the material will be taken at each compaction test location and approximately 50 percent of the samples will be tested for gradation. Areas with relative compaction of at least 95 percent containing silty sand will be deemed acceptable provided no undesirable conditions are present. If any areas have clean sand, the Engineer will consider whether additional excavation is appropriate. The sandy areas will generally not exhibit any cohesion and will readily pass water. Although no permeability tests are anticipated, the Engineer has the discretion to perform additional field and laboratory tests as deemed appropriate to establish that the foundation is suitable.

If extensive non-cemented sandy soil is found, an evaluation will be made to determine if its presence will be detrimental to the embankment. Elements that will be considered include height of overlying embankment, settlement potential, length of seepage path, duration of seepage, permeability, location relative to chimney drain, and potential alternatives for reconfiguring the embankment. The Engineer and Owner will perform the evaluations and make a determination on the best course of action.

Reservoir Perimeter Embankments. Complete Clearing and Grubbing—Section 201. Complete removal of loose soil to a depth of approximately 1 to 3 feet in accordance with Subsection 204.5. The Engineer will determine the relative compaction from the excavated surface to 6 inches below the excavated surface at selected points around the reservoir. Test spacing will be about every 100 to 200 feet. If the soil has at least 90 percent relative compaction it will be considered dense soil suitable for the perimeter embankments. Soil which is not dense shall be removed to a depth acceptable to the Engineer. Compact the upper 12 inches of native soil to at least 95 percent relative compaction. Maintain moisture content and density as specified fill material is placed.

3. The report was returned by the District.
4. The additional routings requested have been completed. Computations are included in Attachment A. The 100-year peak stage would increase by about 0.2 feet if the low flow

outlet were completely clogged and the 0.5 PMF stage would increase by about 0.5 feet. Peak discharges would increase by approximately 30 cfs in either event.

5. The outlet pipe will be encased in concrete slurry for the entire length (see comment response for District's Sheet 7 comment).
6. The emergency action plan will be provided by the District. A revised dam failure analysis was prepared and submitted to the FCDMC. A copy will be provided to the Department.
7. An instrumentation and monitoring plan will be provided by the District.
8. A Construction Quality Assurance Plan has been prepared and will be provided to the District for use during construction. A draft copy of that document is included in Attachment B to this addendum.
9. No response required.
10.
 - a. Response to the drain/filter comments are presented in specific responses to the special provisions. The maximum allowable width of a crack in the concrete spillway should be 1/8-inch. Calculations used to determine this width are included in Attachment C.
 - b. Foundation acceptance criteria have been presented above.
 - c. The District provided ADWR with a copy of the MAG specifications.
 - d. The data from the field permeability test were evaluated to estimate a permeability for the in-place, older alluvium. Calculations are included as Attachment C. The analysis indicated a permeability between 1.2×10^{-3} and 7.0×10^{-5} cm/sec. This compares with a remolded permeability of the embankment fill material range of 1.1×10^{-3} to 2.1×10^{-6} cm/sec. A value of 1.0×10^{-3} cm/sec was used in the seepage analysis.
 - e. Three sets of final documents will be provided to AWDR.
 - f. The sewer pipe will be backfilled to the top of the trench with concrete slurry.
11. No response is required. We acknowledge the concerns of ADWR staff and appreciate your efforts in resolving this issue.

Special Provisions Comments

It is our intent to include ADWR's recommendations in the special provisions. We have only provided comment responses where additional information is requested or where there is a disagreement with the comment.

Subsection 204.3

SP 4, Paragraph 1: Foundation acceptance criteria will be contained in the Construction Quality Assurance Plan. To avoid duplication, the testing requirements are not provided in the Special Provisions.

Subsection 211.1

SP 9, Paragraph 7: The Zone 2 material was designed in general accordance with NRCS design guides referenced. The material specified is on the finer side of the recommendations as the filtering requirements are more critical. Filter zone calculations are included as Attachment C. As specified, the Zone 2 material is expected to have permeabilities greater than 1 ft/sec. Permeability calculations, along with maximum slot size calculations, are attached. A requirement for less than 1 percent passing the No. 200 sieve will be added.

Subsection 211.2

SP10, Paragraph 4: We will add to the specification wording that requires the contractor to place the chimney drain material to the tolerances recommended by ADWR. We will not specify a recommended construction method, but will require the contractor to submit to the Engineer a method for approval that will result in a 4-foot minimum width drain without contaminating the Zone 2 material with Zone 1 soil.

Subsection 211.3

SP 12, Paragraph 3: This equipment is appropriate. If the contractor can demonstrate equivalent compaction, a smaller piece of equipment may be used.

SP 14, Paragraph 1: All sieve analysis test results indicate 30 percent or less material retained on the ¾-inch sieve. If a greater percentage of material is found in the borrow area, it will be blended with the finer-grained material more typically found at the site. Corrections can also be made to ASTM D698 using ASTM D4718.

SP14, Last Paragraph: Foundation stabilization material will only be used below the sewer pipeline pipebase material if the trench is overexcavated. This only applies outside the dam footprint where the pipe backfill is a granular material.

Subsection 211.4

A testing program is presented in the Construction Quality Assurance Plan.

Subsection 405.1

SP 19, Paragraph 1: The contractor will be required to set control points required to accomplish construction of the project. The surveying section of the Quality Assurance Plan will include verification of critical survey information.

General Comments

B. A Construction Quality Assurance Plan will be provided to the District.

Review Comments on the Construction Drawings

CH2M HILL intends to incorporate ADWR's recommendations into the final plans. Comment responses are only presented where additional information is required or there is a disagreement with the recommendation.

Miscellaneous Comments

2. The Flood Control District does not routinely provide rip rap on their dams and the design conforms to the District's standards for erosion protection. A seed mix has been provided to aid in stabilizing the fill slopes of the dam and detention basin perimeter slopes. Some erosion is anticipated which will be repaired by the District as part of maintenance.

Specific Drawing Comments

4. Sheet 8, comment b. The fence on the spillway lip will be removed as requested and relocated to the upstream toe of the dam.

6. Sheet 11, comment c. When the 2x2 foot gate is opened at the inlet to the pipe through the dam there will be some turbulence. The concrete could be brought up to the top of the structure but we believe the thin concrete section will spall off and would not be appropriate. This gate is only to be used in an emergency should the orifice get plugged. Some turbulence will occur.
8. Sheet 13, comment a. The sump will be eliminated.

Review Comments on Final Design Report

1. The Final Design Report will not be revised because it would be confusing to have two different final design documents. These comment responses will serve as Addendum No. 1 to the Final Design Report and, as such, it will revise the report.
2. A foundation acceptance criterion has been previously discussed.
3. The test pits ranged from 5 to 20 feet in depth.
4. The depth to the cemented layer varied from near the ground surface to greater than 20 feet. It was not encountered in a few of the test pits.
5. The results of the permeability test were discussed previously.
6. The primary purpose of the chimney drain is to collect any potential seepage through the dam. The purpose of the dam is for stormwater detention and therefore will not be filled often or for long enough for a steady state seepage phreatic surface to develop. If there is localized seepage the chimney drain will collect and take the water to the downstream toe via the finger drains.
7. The table will be revised to include the missing data and will be included in an addendum to the Geotechnical Data Report.
8. These comments are addressed in the appropriate section.
9. This was a initial pay limit estimate for foundation excavation which has since been revised.
10. That is the intent of the seed mix. The seed mix has been further revised by the District.

11. Noted.

12. Noted.

13. a. Spillway Side Walls. The 2 inches of cover over the reinforcing steel is appropriate for formed walls and in compliance with ACI Code, Section 7.7.1. The general notes on Sheet 8 have the correct cover over the steel. The slab and sidewalls for the stilling basin act together. The reinforcing steel is continuous through the water stop. Calculations are provided for the design of the drain beneath the spillway floor. The two expansion joints in the spillway side walls are appropriate and are supplemented by the construction joints which are designed with a waterstop so that if a crack develops the steel will hold the joint together and the waterstop will maintain the hydraulic integrity.

b. Entrance Apron Side Walls. The walls will be modified to use an equivalent fluid pressure of 90 pcf for saturated active earth pressure. Revised structural calculations are included in Appendix C.

c. Stilling Basin. The factor of safety against sliding is greater than 1.0 for the stilling basin if there is complete scour of the rip rap and the walls and slab become disconnected from the spillway chute. Calculations are provided in Appendix C.

The calculations for the 13-foot side wall, Plan Sheet 10, Section EE are given on Sheet 6 of the structural calculations provided in the design report.

The stilling basin subdrain system outlets allow drainage of the slab during operation of the spillway. Calculations for flow capacity are provided in Appendix C. Should they become plugged and the seepage pressures develop uplift under the slab, the slab will mobilize the weight of the floor, walls, and chute blocks. If this is not sufficient the slab will probably crack. We do not believe the cost of providing excess dead weight is appropriate for this project. Several meetings with the District have led to this design. Extending the underdrain outlet to a manhole is possible but the flow will never be observed and the manhole will not drain unless a pipeline is constructed far downstream.

d. Geotechnical Data . The 60 pcf is active earth pressure per attached calculations in Appendix C.

e. Miscellaneous. The chimney drain pipes have been deleted from the design and finger drains provided.

Review Comments on the Geotechnical Report

1. Responses to review comments will be included in an addendum to the geotechnical reports for the same reason as stated above.

Volume 1

1. The table will be revised as noted above.

The soil classifications on the logs reflect field information and were not necessarily changed to reflect all laboratory test results. This primarily affects the Silty Sand versus Sand with Silt and the Sand and Gravel versus Sand with Gravel Classifications. The laboratory results were taken into account during design.

2. The contact between the upper and lower alluvium is not called out on the test pit logs. The Engineer's best estimate of that contact at the dam site is shown on Figure 2 of the Geotechnical Design Report and on Sheet 5 of the plans. A foundation acceptance criterion has been presented previously which will help ensure that the dam is founded on a dense low permeability material.

As noted on the boring log legend, ground elevations were estimated by interpolating between contour lines on the site plan.

3. This information will be included in an addendum to the Geotechnical Data Report.

Volume 2

1. Noted
2. Results of the consolidated undrained compression test were not used in the slope stability analysis because the material tested contained significantly more fines than typically encountered during site exploration and is not representative of the embankment material anticipated. The material tested in the direct shear tests is more typical of the site soil available for construction of the embankment, therefore it was appropriate to use these results.

The occurrence of the two slope stability loading conditions questioned, rapid drawdown and seismic stability, are very rare for a stormwater detention basin the size of Casandro Wash.

- Rapid drawdown is typically considered in dams with drawdown rates of 6 inches or more per day after prolonged storage at high reservoir level (USBR, Design of Small Dams). The Casandro Wash Dam reservoir is normally dry. The spillway will only flow above the 100 year flood. The reservoir fills in a few hours and is designed to drain rapidly (less than 3 days from full reservoir level). It is very conservative to consider that the material would become saturated to any extent in that amount of time. Material that did saturate in the short amount of time would be relatively free draining and would not build up excessive pore pressures during drawdown. Under these conditions, some shallow surface raveling may occur during rapid draining of the reservoir. The landscape plantings on the dam should help minimize the amount of raveling.

Our initial slope analysis results indicated a factor of safety greater than 1.2 with steady state seepage conditions and instantaneous drop of the reservoir level using results of the remolded direct shear tests. The results of a check using infinite slope analysis (SCS, Earth Dams and Reservoirs and Davis, Handbook of Applied Hydraulics) with seepage horizontal and parallel to the slope, a factor of safety of greater than 1 is obtained for a shear strength phi angle of 35 degrees (chart from Davis included in Attachment C). A shear strength in excess of 35° is expected of the borrow soil compacted to 95 percent of standard proctor (ASTM D698).

- Seismic analyses outlined in the SCS manual evaluate the seismic slope stability under steady static seepage conditions and maximum seismic ground surface acceleration. This is a very conservative analysis. Steady state seepage conditions are not likely given the design drainage conditions of the basin. It is a remote possibility for the maximum ground accelerations to occur at the same time the basin is full for a long enough time for steady state seepage to develop. Our stability analysis indicates a factor of safety greater than 1.1 under the conditions of full pool and steady state seepage.
3. Previously addressed
 4. The 1/2 PMF water surface is 2160.2 . With 3 feet of freeboard the crest of the dam is 2163.2. The minimum crest is 2163.5 plus 4 inches of road base. The overbuild is therefore about 7.6 inches. Should any settlement occur, additional fill and road base will be placed by the District as part of normal maintenance.

Review Comments From ADWR dated May 2, 1995

Comments on Special Provisions

Subsection 640.6

SP 40, Paragraph 1:

The District will provide the General Requirements.

Review Comments on the Construction Drawings

1. Rebar detail on Sheet 13, Section 110 has been revised.

Review Comments on the Final Design Report

1. The primary outlet structure for the basin is the orifice plate with an open area of 1.4 ft². The gated outlet referred to in the report provides a redundant means of draining the basin after the passage of a flood, should the primary outlet become clogged. The area of the backup outlet is 4 ft². The primary outlet is protected from debris by screened enclosure, making debris clogging unlikely. As addressed previously, the dam will operate as designed, assuming a fully clogged outlet with less than 0.5 ft increase in maximum water surface elevation in a 100-year event. The gated opening would allow maintenance crews to drain the basin after the flood event if the primary outlet were to become fully or partially clogged.

The operational plan for the outlet calls for the gated backup outlet to remain closed during normal operation and only be opened in the event of a clogged outlet.

Comments from ADWR Letter to CH2M HILL dated May 16, 1995

Special Provisions

Section 505—Concrete Structures

Subsection 505.6—Placing Concrete

Paragraph 4. Placement of intermediate construction joints is normally done by CH2M HILL at a spacing of 40 feet or less. As you requested, the joint spacing will be changed to 30 feet.

Section 601–Trench Excavation, Backfilling, and Compaction
Subsection 601.2.1–General

Paragraph 1. Sentence changed.

Paragraph 2. Sentence changed.

Section 615–Sewerline Construction
Subsection 615.1–Description

Paragraph 1. Sentence changed.

Section 618–Storm Drain Construction
Subsection 618.1–Materials

Paragraph 1. The reinforced-concrete pipe (RCP) outlet pipe will be designed in accordance with the Special Provisions for the anticipated operating conditions. The Special Provisions will be modified. The 2 foot x 2 foot gate is for emergency use and some turbulence is anticipated.

Subsection 618.3–Construction Methods

Subsection moved as requested

Paragraph 3. References to granular pipe bedding will be deleted for the 36-inch outlet pipe.

Paragraph 4. Wording will be changed in Special Provisions.

Subsection 618.2.1–Testing

Paragraphs 1, 2, and 4 will be moved to Section 735.

Section 735–Reinforced Concrete Pipe

Pipe diameter will be referenced.

Subsection 735.4–Materials

Paragraph 1. Pipe Special Provisions will be modified.

Fly Ash. Fly Ash heading will be deleted.

Concrete Pipe Joints. The sentence will be deleted.

Section 740–Ductile Iron Pipe

The pipe diameter of 12 inches will be referenced.

Subsection 740.2–Materials

Ductile Iron pipe was requested to be used by the City of Wickenburg as indicated in Attachment A. It is specified in Section 750 of the MAG specifications. A copy of American National Standards Institute (ANSI) and American Water Works Association (AWWA) specification quoted in the Special Provisions will be sent to Arizona Department of Water Resources (ADWR).

Paragraph 3. The Thickness Class will be changed to 51. The AWWA specification for this pipe indicates that it is acceptable for the intended loading conditions.

Review Comments on the Construction Drawings

1. Sheets 5, 6, and 15

The outlet system to the chimney drain is being modified to delete the PVC pipe and provide four Zone 2 finger drains.

2. Sheet 10

The designed rebar is #8 at 6 inches top and bottom. A rebar note has been added to the downstream ramp of the stilling basin. Our review of the reinforcing steel for Sunset FRS stilling basin did not indicate any obvious justification. We believe the reinforcing shown for Casandro Wash Dam is consistent with the overall loading conditions anticipated.

Attachment A
HEC-1 Calculations

SUBJECT: CASANDRO WASH
ADWR Review Comments
Response to comment #4

BY: H. Allen DATE: 5/16/95
SHEET NO. 1 OF 1
PROJECT NO.: SWW35441.HY.10

Goal: Run the 100-year (Q100) and Half PMF (HPMF) files without the low-flow outlet discharge and compare the results.

Procedures:

- Q100 file Q100.hc1 was copied and renamed Q100-NLF.hc1
- HPMF file HPM.hc1 was copied and renamed HPMF-NLF.hc1
- The low-flow outlet discharge was eliminated in the new runs by adjusting the discharges in the rating curve. The discharges occurring at water surface elevations (WSE's) below the spillway crest were set at zero. For the discharges occurring at WSE's above the spillway crest, 31 cfs (the discharge from the low-flow outlet when the WSE is at the spillway crest) was subtracted from the Q's.

Results:

Results are summarized in the following table:

Dam Hydraulics: With and Without Low-Flow Discharges				
	Peak Stage, ft.		Peak Discharge, cfs	
	With Low-Flow	Without Low-Flow	With Low-Flow	Without Low-Flow
Q100	2155.33	2155.57	118	151
HPMF	2160.23	2160.69	3708	3744

Attachments:

Output for the following files:

- Q100.out
- Q100-NLF.out
- HPM.out
- HPMF-NLF.out

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*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*       MAY 1991
*       VERSION 4.0.1E
*
* RUN DATE 05/02/1995 TIME 11:03:44
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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
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X    X  XXXXXXX  XXXXX      X
X    X  X       X   X       XX
X    X  X       X           X
XXXXXXXX XXXX   X           XXXXX X
X    X  X       X           X
X    X  X       X   X       X
X    X  XXXXXXX  XXXXX      XXX
  
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.:. Full Microcomputer Implementation .:.
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
* filename = Q100-NLF.HC1
* No low-flow outlet discharge. Modified spillway rating curve by
* subtracting the low-flow outlet Q at El. 2155 which was 31 cfs.
*
*
*DIAGRAM
*
1  ID  Casandro Wash Detention Dam CH2M Hill April, 1994
2  ID  HEC-1 for Q100, revised dam location alternative #3
*
3  IT      5          900
4  IO      3
*
5  KK  SAC230
6  KM  SUB-BASIN SAC230
7  KM  6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
8  KM  THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
9  KM  BASIN FROM WICKENBERG ADMS
10 BA   .720
11 IN   15
12 KM  RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
* 10 year = 2.202, 100 year = 3.350
13 PB  3.350
14 KM  THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53
15 PC  .000 .009 .016 .025 .034 .042 .051 .059 .067 .075
16 PC  .087 .100 .119 .151 .235 .416 .760 .872 .915 .944
17 PC  .956 .967 .979 .989 1.000
18 LG  .100 .250 5.200 .240 35.000
19 UC  .446 .367
20 UA  0      5      16      30      65      77      84      90      94      97
21 UA  100
*
22 KK  SAC235
23 KM  SUB-BASIN sac235
24 KM  6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
25 KM  THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
26 KM  BASIN FROM WICKENBERG ADMS
27 BA  .380
28 LG  .100 .230 6.200 .150 36.000
29 UC  .450 .461
30 UA  0      5      16      30      65      77      84      90      94      97
31 UA  100
*
32 KK  ADD
33 KM  ADD SAC230 & SAC235
34 HC  2
*

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LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
35	KK ROUTE
36	KM ROUTE COMBINED HYDROGRAPH TO DAM LOCATION
37	RS 1 FLOW -1
38	RC .045 .03 .045 4200 .0175
39	RX 463.5 467.5 477.5 487.5 512.5 522.5 532.5 536.5
40	RY 16.5 12.5 12.5 10.0 10.0 12.5 12.5 16.5
	*
41	KK CAS240
42	KM SUB-BASIN cas240
43	KM 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
44	KM THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
45	KM BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION
46	BA .140
47	LG .100 .210 6.400 .140 21.000
48	UC .258 .232
49	UA 0 5 16 30 65 77 84 90 94 97
50	UA 100
	*
51	KK DAMIN
52	KO 1
53	KM ADD ROUTED HYDROGRAPH TO CAS240
54	HC 2
	*
55	KK DAMOUT
56	KM Route Hydrograph Through Dam.
57	KM
58	RS 1 STOR 2
59	KO 1
	*
60	SA 2.05 2.49 5.80 6.77 9.06 10.20 10.96 11.34 11.61 11.88
61	SA 12.09 12.31 12.81 13.31 13.81
62	SE 2135 2137 2140 2144 2150 2153 2155 2156 2157 2158
63	SE 2159 2160 2161 2162 2163
64	SQ 0 0 0 0 0 0 0 264 792 1508
65	SQ 2392 3419 4546 5742 6984
	*
66	ZZ

SCHMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
5	SAC230	
	.	
22	.	SAC235
	.	.
32	ADD.....	.
	V	
	V	
35	ROUTE	
	.	
41	.	CAS240
	.	.
51	DAMIN.....	.
	V	
	V	
55	DAMOUT	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* RUN DATE 05/02/1995 TIME 11:03:44 *
*****
```

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

Casandro Wash Detention Dam CH2M Hill April, 1994
 HEC-1 for Q100, revised dam location alternative #3

```
4 IO OUTPUT CONTROL VARIABLES
    IPRNT 3 PRINT CONTROL
    IPLOT 0 PLOT CONTROL
    QSCAL 0. HYDROGRAPH PLOT SCALE
```

```
IT HYDROGRAPH TIME DATA
    NMIN 5 MINUTES IN COMPUTATION INTERVAL
    IDATE 1 0 STARTING DATE
    ITIME 0000 STARTING TIME
    NQ 900 NUMBER OF HYDROGRAPH ORDINATES
    NDDATE 4 0 ENDING DATE
    NDTIME 0255 ENDING TIME
    ICENT 19 CENTURY MARK
```

```
COMPUTATION INTERVAL 0.08 HOURS
TOTAL TIME BASE 74.92 HOURS
```

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

*** **

```
*****
* SAC230 *
*****
```

SUB-BASIN SAC230
 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
 THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 BASIN FROM WICKENBERG ADMS
 RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53

```
11 IN TIME DATA FOR INPUT TIME SERIES
    JXMIN 15 TIME INTERVAL IN MINUTES
    JXDATE 1 0 STARTING DATE
```

JXTIME 0 STARTING TIME

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 0.72 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.03
0.03 0.03 0.06 0.06 0.06 0.11 0.11 0.11 0.04 0.04
0.04 0.01 0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00

18 LG GREEN AND AMPT LOSS RATE
STRTL 0.10 STARTING LOSS
DTH 0.25 MOISTURE DEFICIT
PSIF 5.20 WETTING FRONT SUCTION
XKSAT 0.24 HYDRAULIC CONDUCTIVITY
RTIMP 35.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC 0.45 TIME OF CONCENTRATION
R 0.37 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.45 HR, R= 0.37 HR
SNYDER TP= 0.29 HR, CP= 0.48

UNIT HYDROGRAPH
26 END-OF-PERIOD ORDINATES
83. 383. 684. 750. 692. 597. 487. 387. 308. 246.
195. 156. 124. 99. 79. 62. 50. 40. 32. 25.
20. 16. 13. 10. 8. 6.

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

HYDROGRAPH AT STATION SAC230

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
(CFS) (HR) 6-HR 24-HR 72-HR 74.92-HR
1078. 4.17 (CFS) 178. 45. 15. 14.
(INCHES) 2.293 2.306 2.306 2.306
(AC-FT) 88. 89. 89. 89.

CUMULATIVE AREA = 0.72 SQ MI

*** **

1014PRINT

 * *
 22 KK * SAC235 *
 * *

SUB-BASIN sac235
 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
 THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 BASIN FROM WICKENBERG ADMS

SUBBASIN RUNOFF DATA

27 BA SUBBASIN CHARACTERISTICS
 TAREA 0.38 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
0.03	0.03	0.06	0.06	0.06	0.11	0.11	0.11	0.04	0.04	0.04
0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00									

28 LG GREEN AND AMPT LOSS RATE

STRTL	0.10	STARTING LOSS
DTH	0.23	MOISTURE DEFICIT
PSIF	6.20	WETTING FRONT SUCTION
XKSAT	0.15	HYDRAULIC CONDUCTIVITY
RTIMP	36.00	PERCENT IMPERVIOUS AREA

29 UC CLARK UNITGRAPH

TC	0.45	TIME OF CONCENTRATION
R	0.46	STORAGE COEFFICIENT

30 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES

0.0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
100.0									

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.45 HR, R= 0.46 HR
 SNYDER TP= 0.31 HR, CP= 0.44

UNIT HYDROGRAPH
 32 END-OF-PERIOD ORDINATES

35.	162.	298.	339.	324.	290.	248.	207.	172.	144.
120.	100.	84.	70.	58.	48.	40.	34.	28.	23.
20.	16.	14.	11.	9.	8.	7.	6.	5.	4.
3.	3.								

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

HYDROGRAPH AT STATION SAC235

TOTAL RAINFALL = 3.35, TOTAL LOSS = 0.87, TOTAL EXCESS = 2.48

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

(CFS)	(HR)		6-HR	24-HR	72-HR	74.92-HR
532.	4.25	(CFS)	100.	25.	8.	8.
		(INCHES)	2.450	2.467	2.467	2.467
		(AC-FT)	50.	50.	50.	50.

CUMULATIVE AREA = 0.38 SQ MI

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*****
*
32 KK * ADD *
*
*****

```

ADD SAC230 & SAC235

34 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION ADD

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	(CFS)	6-HR	24-HR	72-HR	74.92-HR
1608.	4.17	278.	278.	70.	23.	22.
		(INCHES)	2.347	2.361	2.361	2.361
		(AC-FT)	138.	139.	139.	139.

CUMULATIVE AREA = 1.10 SQ MI

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*****
*
35 KK * ROUTE *
*
*****

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ROUTE COMBINED HYDROGRAPH TO DAM LOCATION

HYDROGRAPH ROUTING DATA

37 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP		FLOW TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

38 RC NORMAL DEPTH CHANNEL

ANL	0.045	LEFT OVERBANK N-VALUE
ANCH	0.030	MAIN CHANNEL N-VALUE
ANR	0.045	RIGHT OVERBANK N-VALUE
RLNTH	4200.	REACH LENGTH
SEL	0.0175	ENERGY SLOPE
ELMAX	0.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

		CROSS-SECTION DATA								
		--- LEFT OVERBANK ---			+ ----- MAIN CHANNEL -----			+ --- RIGHT OVERBANK ---		
40 RY	ELEVATION	16.50	12.50	12.50	10.00	10.00	12.50	12.50	16.50	
39 RX	DISTANCE	463.50	467.50	477.50	487.50	512.50	522.50	532.50	536.50	

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.87	1.83	2.88	4.02	5.25	6.57	7.98	9.93	12.10
OUTFLOW	0.00	27.97	90.60	181.95	300.62	446.32	619.30	820.07	1082.86	1405.42
ELEVATION	10.00	10.34	10.68	11.03	11.37	11.71	12.05	12.39	12.74	13.08
STORAGE	14.29	16.51	18.75	21.01	23.29	25.60	27.93	30.28	32.65	35.05
OUTFLOW	1769.68	2172.41	2611.51	3085.39	3592.83	4132.80	4704.46	5307.08	5940.05	6602.82
ELEVATION	13.42	13.76	14.11	14.45	14.79	15.13	15.47	15.82	16.16	16.50

HYDROGRAPH AT STATION ROUTE

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.92-HR
1552.	4.25	277. (INCHES)	277. (INCHES)	23. (INCHES)	22. (INCHES)
		2.341 (AC-FT)	2.361 (AC-FT)	2.361 (AC-FT)	2.361 (AC-FT)
		137.	139.	139.	139.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	74.92-HR
13.	4.25	3.	1.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	74.92-HR
13.22	4.25	10.97	10.25	10.08	10.08

CUMULATIVE AREA = 1.10 SQ MI

*
* CAS240 *
*

SUB-BASIN cas240
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION

SUBBASIN RUNOFF DATA

46 BA SUBBASIN CHARACTERISTICS
TAREA 0.14 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.03
0.03	0.03	0.06	0.06	0.06	0.11	0.11	0.11	0.04	0.04
0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

47 LG GREEN AND AMPT LOSS RATE
 STRTL 0.10 STARTING LOSS
 DTH 0.21 MOISTURE DEFICIT
 PSIF 6.40 WETTING FRONT SUCTION
 XKSAT 0.14 HYDRAULIC CONDUCTIVITY
 RTIMP 21.00 PERCENT IMPERVIOUS AREA

48 UC CLARK UNITGRAPH
 TC 0.26 TIME OF CONCENTRATION
 R 0.23 STORAGE COEFFICIENT

49 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.26 HR, R= 0.23 HR
 SNYDER TP= 0.19 HR, CP= 0.52

UNIT HYDROGRAPH
 16 END-OF-PERIOD ORDINATES

63.	187.	231.	182.	128.	89.	62.	43.	30.	21.
15.	10.	7.	5.	3.	2.				

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

HYDROGRAPH AT STATION CAS240

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (AC-FT)
275.	4.08	35.	2.300	2.305	2.305
		17.	17.	17.	17.

CUMULATIVE AREA = 0.14 SQ MI

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 * *
 * *
 * *
 * *

51 KK

DAMIN

52 KO

OUTPUT CONTROL VARIABLES

IPRNT 1 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 ADD ROUTED HYDROGRAPH TO CAS240

54 HC

HYDROGRAPH COMBINATION

HYDROGRAPH AT STATION DAMIN
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		1845	226	0.	*	2		1330	451	0.	*	3		0815	676	0.
1		0005	2	0.	*	1		1850	227	0.	*	2		1335	452	0.	*	3		0820	677	0.
1		0010	3	1.	*	1		1855	228	0.	*	2		1340	453	0.	*	3		0825	678	0.
1		0015	4	2.	*	1		1900	229	0.	*	2		1345	454	0.	*	3		0830	679	0.
1		0020	5	4.	*	1		1905	230	0.	*	2		1350	455	0.	*	3		0835	680	0.
1		0025	6	6.	*	1		1910	231	0.	*	2		1355	456	0.	*	3		0840	681	0.
1		0030	7	8.	*	1		1915	232	0.	*	2		1400	457	0.	*	3		0845	682	0.
1		0035	8	10.	*	1		1920	233	0.	*	2		1405	458	0.	*	3		0850	683	0.
1		0040	9	12.	*	1		1925	234	0.	*	2		1410	459	0.	*	3		0855	684	0.
1		0045	10	14.	*	1		1930	235	0.	*	2		1415	460	0.	*	3		0900	685	0.
1		0050	11	16.	*	1		1935	236	0.	*	2		1420	461	0.	*	3		0905	686	0.
1		0055	12	18.	*	1		1940	237	0.	*	2		1425	462	0.	*	3		0910	687	0.
1		0100	13	20.	*	1		1945	238	0.	*	2		1430	463	0.	*	3		0915	688	0.
1		0105	14	21.	*	1		1950	239	0.	*	2		1435	464	0.	*	3		0920	689	0.
1		0110	15	23.	*	1		1955	240	0.	*	2		1440	465	0.	*	3		0925	690	0.
1		0115	16	24.	*	1		2000	241	0.	*	2		1445	466	0.	*	3		0930	691	0.
1		0120	17	25.	*	1		2005	242	0.	*	2		1450	467	0.	*	3		0935	692	0.
1		0125	18	26.	*	1		2010	243	0.	*	2		1455	468	0.	*	3		0940	693	0.
1		0130	19	26.	*	1		2015	244	0.	*	2		1500	469	0.	*	3		0945	694	0.
1		0135	20	27.	*	1		2020	245	0.	*	2		1505	470	0.	*	3		0950	695	0.
1		0140	21	28.	*	1		2025	246	0.	*	2		1510	471	0.	*	3		0955	696	0.
1		0145	22	28.	*	1		2030	247	0.	*	2		1515	472	0.	*	3		1000	697	0.
1		0150	23	29.	*	1		2035	248	0.	*	2		1520	473	0.	*	3		1005	698	0.
1		0155	24	29.	*	1		2040	249	0.	*	2		1525	474	0.	*	3		1010	699	0.
1		0200	25	29.	*	1		2045	250	0.	*	2		1530	475	0.	*	3		1015	700	0.
1		0205	26	29.	*	1		2050	251	0.	*	2		1535	476	0.	*	3		1020	701	0.
1		0210	27	29.	*	1		2055	252	0.	*	2		1540	477	0.	*	3		1025	702	0.
1		0215	28	29.	*	1		2100	253	0.	*	2		1545	478	0.	*	3		1030	703	0.
1		0220	29	29.	*	1		2105	254	0.	*	2		1550	479	0.	*	3		1035	704	0.
1		0225	30	30.	*	1		2110	255	0.	*	2		1555	480	0.	*	3		1040	705	0.
1		0230	31	30.	*	1		2115	256	0.	*	2		1600	481	0.	*	3		1045	706	0.
1		0235	32	31.	*	1		2120	257	0.	*	2		1605	482	0.	*	3		1050	707	0.
1		0240	33	33.	*	1		2125	258	0.	*	2		1610	483	0.	*	3		1055	708	0.
1		0245	34	34.	*	1		2130	259	0.	*	2		1615	484	0.	*	3		1100	709	0.
1		0250	35	36.	*	1		2135	260	0.	*	2		1620	485	0.	*	3		1105	710	0.
1		0255	36	38.	*	1		2140	261	0.	*	2		1625	486	0.	*	3		1110	711	0.
1		0300	37	41.	*	1		2145	262	0.	*	2		1630	487	0.	*	3		1115	712	0.
1		0305	38	44.	*	1		2150	263	0.	*	2		1635	488	0.	*	3		1120	713	0.
1		0310	39	49.	*	1		2155	264	0.	*	2		1640	489	0.	*	3		1125	714	0.
1		0315	40	54.	*	1		2200	265	0.	*	2		1645	490	0.	*	3		1130	715	0.
1		0320	41	65.	*	1		2205	266	0.	*	2		1650	491	0.	*	3		1135	716	0.
1		0325	42	86.	*	1		2210	267	0.	*	2		1655	492	0.	*	3		1140	717	0.
1		0330	43	118.	*	1		2215	268	0.	*	2		1700	493	0.	*	3		1145	718	0.
1		0335	44	174.	*	1		2220	269	0.	*	2		1705	494	0.	*	3		1150	719	0.
1		0340	45	265.	*	1		2225	270	0.	*	2		1710	495	0.	*	3		1155	720	0.
1		0345	46	402.	*	1		2230	271	0.	*	2		1715	496	0.	*	3		1200	721	0.
1		0350	47	590.	*	1		2235	272	0.	*	2		1720	497	0.	*	3		1205	722	0.
1		0355	48	845.	*	1		2240	273	0.	*	2		1725	498	0.	*	3		1210	723	0.
1		0400	49	1157.	*	1		2245	274	0.	*	2		1730	499	0.	*	3		1215	724	0.
1		0405	50	1463.	*	1		2250	275	0.	*	2		1735	500	0.	*	3		1220	725	0.
1		0410	51	1685.	*	1		2255	276	0.	*	2		1740	501	0.	*	3		1225	726	0.
1		0415	52	1769.	*	1		2300	277	0.	*	2		1745	502	0.	*	3		1230	727	0.
1		0420	53	1723.	*	1		2305	278	0.	*	2		1750	503	0.	*	3		1235	728	0.

1	0425	54	1594.	*	1	2310	279	0.	*	2	1755	504	0.	*	3	1240	729	0.
1	0430	55	1425.	*	1	2315	280	0.	*	2	1800	505	0.	*	3	1245	730	0.
1	0435	56	1241.	*	1	2320	281	0.	*	2	1805	506	0.	*	3	1250	731	0.
1	0440	57	1066.	*	1	2325	282	0.	*	2	1810	507	0.	*	3	1255	732	0.
1	0445	58	907.	*	1	2330	283	0.	*	2	1815	508	0.	*	3	1300	733	0.
1	0450	59	762.	*	1	2335	284	0.	*	2	1820	509	0.	*	3	1305	734	0.
1	0455	60	637.	*	1	2340	285	0.	*	2	1825	510	0.	*	3	1310	735	0.
1	0500	61	536.	*	1	2345	286	0.	*	2	1830	511	0.	*	3	1315	736	0.
1	0505	62	449.	*	1	2350	287	0.	*	2	1835	512	0.	*	3	1320	737	0.
1	0510	63	378.	*	1	2355	288	0.	*	2	1840	513	0.	*	3	1325	738	0.
1	0515	64	317.	*	2	0000	289	0.	*	2	1845	514	0.	*	3	1330	739	0.
1	0520	65	269.	*	2	0005	290	0.	*	2	1850	515	0.	*	3	1335	740	0.
1	0525	66	229.	*	2	0010	291	0.	*	2	1855	516	0.	*	3	1340	741	0.
1	0530	67	195.	*	2	0015	292	0.	*	2	1900	517	0.	*	3	1345	742	0.
1	0535	68	169.	*	2	0020	293	0.	*	2	1905	518	0.	*	3	1350	743	0.
1	0540	69	148.	*	2	0025	294	0.	*	2	1910	519	0.	*	3	1355	744	0.
1	0545	70	129.	*	2	0030	295	0.	*	2	1915	520	0.	*	3	1400	745	0.
1	0550	71	112.	*	2	0035	296	0.	*	2	1920	521	0.	*	3	1405	746	0.
1	0555	72	98.	*	2	0040	297	0.	*	2	1925	522	0.	*	3	1410	747	0.
1	0600	73	88.	*	2	0045	298	0.	*	2	1930	523	0.	*	3	1415	748	0.
1	0605	74	79.	*	2	0050	299	0.	*	2	1935	524	0.	*	3	1420	749	0.
1	0610	75	70.	*	2	0055	300	0.	*	2	1940	525	0.	*	3	1425	750	0.
1	0615	76	62.	*	2	0100	301	0.	*	2	1945	526	0.	*	3	1430	751	0.
1	0620	77	53.	*	2	0105	302	0.	*	2	1950	527	0.	*	3	1435	752	0.
1	0625	78	45.	*	2	0110	303	0.	*	2	1955	528	0.	*	3	1440	753	0.
1	0630	79	37.	*	2	0115	304	0.	*	2	2000	529	0.	*	3	1445	754	0.
1	0635	80	31.	*	2	0120	305	0.	*	2	2005	530	0.	*	3	1450	755	0.
1	0640	81	26.	*	2	0125	306	0.	*	2	2010	531	0.	*	3	1455	756	0.
1	0645	82	23.	*	2	0130	307	0.	*	2	2015	532	0.	*	3	1500	757	0.
1	0650	83	20.	*	2	0135	308	0.	*	2	2020	533	0.	*	3	1505	758	0.
1	0655	84	18.	*	2	0140	309	0.	*	2	2025	534	0.	*	3	1510	759	0.
1	0700	85	15.	*	2	0145	310	0.	*	2	2030	535	0.	*	3	1515	760	0.
1	0705	86	13.	*	2	0150	311	0.	*	2	2035	536	0.	*	3	1520	761	0.
1	0710	87	11.	*	2	0155	312	0.	*	2	2040	537	0.	*	3	1525	762	0.
1	0715	88	10.	*	2	0200	313	0.	*	2	2045	538	0.	*	3	1530	763	0.
1	0720	89	8.	*	2	0205	314	0.	*	2	2050	539	0.	*	3	1535	764	0.
1	0725	90	7.	*	2	0210	315	0.	*	2	2055	540	0.	*	3	1540	765	0.
1	0730	91	6.	*	2	0215	316	0.	*	2	2100	541	0.	*	3	1545	766	0.
1	0735	92	5.	*	2	0220	317	0.	*	2	2105	542	0.	*	3	1550	767	0.
1	0740	93	4.	*	2	0225	318	0.	*	2	2110	543	0.	*	3	1555	768	0.
1	0745	94	3.	*	2	0230	319	0.	*	2	2115	544	0.	*	3	1600	769	0.
1	0750	95	3.	*	2	0235	320	0.	*	2	2120	545	0.	*	3	1605	770	0.
1	0755	96	2.	*	2	0240	321	0.	*	2	2125	546	0.	*	3	1610	771	0.
1	0800	97	2.	*	2	0245	322	0.	*	2	2130	547	0.	*	3	1615	772	0.
1	0805	98	2.	*	2	0250	323	0.	*	2	2135	548	0.	*	3	1620	773	0.
1	0810	99	1.	*	2	0255	324	0.	*	2	2140	549	0.	*	3	1625	774	0.
1	0815	100	1.	*	2	0300	325	0.	*	2	2145	550	0.	*	3	1630	775	0.
1	0820	101	1.	*	2	0305	326	0.	*	2	2150	551	0.	*	3	1635	776	0.
1	0825	102	1.	*	2	0310	327	0.	*	2	2155	552	0.	*	3	1640	777	0.
1	0830	103	1.	*	2	0315	328	0.	*	2	2200	553	0.	*	3	1645	778	0.
1	0835	104	0.	*	2	0320	329	0.	*	2	2205	554	0.	*	3	1650	779	0.
1	0840	105	0.	*	2	0325	330	0.	*	2	2210	555	0.	*	3	1655	780	0.
1	0845	106	0.	*	2	0330	331	0.	*	2	2215	556	0.	*	3	1700	781	0.
1	0850	107	0.	*	2	0335	332	0.	*	2	2220	557	0.	*	3	1705	782	0.
1	0855	108	0.	*	2	0340	333	0.	*	2	2225	558	0.	*	3	1710	783	0.
1	0900	109	0.	*	2	0345	334	0.	*	2	2230	559	0.	*	3	1715	784	0.
1	0905	110	0.	*	2	0350	335	0.	*	2	2235	560	0.	*	3	1720	785	0.
1	0910	111	0.	*	2	0355	336	0.	*	2	2240	561	0.	*	3	1725	786	0.
1	0915	112	0.	*	2	0400	337	0.	*	2	2245	562	0.	*	3	1730	787	0.
1	0920	113	0.	*	2	0405	338	0.	*	2	2250	563	0.	*	3	1735	788	0.
1	0925	114	0.	*	2	0410	339	0.	*	2	2255	564	0.	*	3	1740	789	0.
1	0930	115	0.	*	2	0415	340	0.	*	2	2300	565	0.	*	3	1745	790	0.
1	0935	116	0.	*	2	0420	341	0.	*	2	2305	566	0.	*	3	1750	791	0.
1	0940	117	0.	*	2	0425	342	0.	*	2	2310	567	0.	*	3	1755	792	0.
1	0945	118	0.	*	2	0430	343	0.	*	2	2315	568	0.	*	3	1800	793	0.
1	0950	119	0.	*	2	0435	344	0.	*	2	2320	569	0.	*	3	1805	794	0.

1	0955	120	0.	*	2	0440	345	0.	*	2	2325	570	0.	*	3	1810	795	0.
1	1000	121	0.	*	2	0445	346	0.	*	2	2330	571	0.	*	3	1815	796	0.
1	1005	122	0.	*	2	0450	347	0.	*	2	2335	572	0.	*	3	1820	797	0.
1	1010	123	0.	*	2	0455	348	0.	*	2	2340	573	0.	*	3	1825	798	0.
1	1015	124	0.	*	2	0500	349	0.	*	2	2345	574	0.	*	3	1830	799	0.
1	1020	125	0.	*	2	0505	350	0.	*	2	2350	575	0.	*	3	1835	800	0.
1	1025	126	0.	*	2	0510	351	0.	*	2	2355	576	0.	*	3	1840	801	0.
1	1030	127	0.	*	2	0515	352	0.	*	3	0000	577	0.	*	3	1845	802	0.
1	1035	128	0.	*	2	0520	353	0.	*	3	0005	578	0.	*	3	1850	803	0.
1	1040	129	0.	*	2	0525	354	0.	*	3	0010	579	0.	*	3	1855	804	0.
1	1045	130	0.	*	2	0530	355	0.	*	3	0015	580	0.	*	3	1900	805	0.
1	1050	131	0.	*	2	0535	356	0.	*	3	0020	581	0.	*	3	1905	806	0.
1	1055	132	0.	*	2	0540	357	0.	*	3	0025	582	0.	*	3	1910	807	0.
1	1100	133	0.	*	2	0545	358	0.	*	3	0030	583	0.	*	3	1915	808	0.
1	1105	134	0.	*	2	0550	359	0.	*	3	0035	584	0.	*	3	1920	809	0.
1	1110	135	0.	*	2	0555	360	0.	*	3	0040	585	0.	*	3	1925	810	0.
1	1115	136	0.	*	2	0600	361	0.	*	3	0045	586	0.	*	3	1930	811	0.
1	1120	137	0.	*	2	0605	362	0.	*	3	0050	587	0.	*	3	1935	812	0.
1	1125	138	0.	*	2	0610	363	0.	*	3	0055	588	0.	*	3	1940	813	0.
1	1130	139	0.	*	2	0615	364	0.	*	3	0100	589	0.	*	3	1945	814	0.
1	1135	140	0.	*	2	0620	365	0.	*	3	0105	590	0.	*	3	1950	815	0.
1	1140	141	0.	*	2	0625	366	0.	*	3	0110	591	0.	*	3	1955	816	0.
1	1145	142	0.	*	2	0630	367	0.	*	3	0115	592	0.	*	3	2000	817	0.
1	1150	143	0.	*	2	0635	368	0.	*	3	0120	593	0.	*	3	2005	818	0.
1	1155	144	0.	*	2	0640	369	0.	*	3	0125	594	0.	*	3	2010	819	0.
1	1200	145	0.	*	2	0645	370	0.	*	3	0130	595	0.	*	3	2015	820	0.
1	1205	146	0.	*	2	0650	371	0.	*	3	0135	596	0.	*	3	2020	821	0.
1	1210	147	0.	*	2	0655	372	0.	*	3	0140	597	0.	*	3	2025	822	0.
1	1215	148	0.	*	2	0700	373	0.	*	3	0145	598	0.	*	3	2030	823	0.
1	1220	149	0.	*	2	0705	374	0.	*	3	0150	599	0.	*	3	2035	824	0.
1	1225	150	0.	*	2	0710	375	0.	*	3	0155	600	0.	*	3	2040	825	0.
1	1230	151	0.	*	2	0715	376	0.	*	3	0200	601	0.	*	3	2045	826	0.
1	1235	152	0.	*	2	0720	377	0.	*	3	0205	602	0.	*	3	2050	827	0.
1	1240	153	0.	*	2	0725	378	0.	*	3	0210	603	0.	*	3	2055	828	0.
1	1245	154	0.	*	2	0730	379	0.	*	3	0215	604	0.	*	3	2100	829	0.
1	1250	155	0.	*	2	0735	380	0.	*	3	0220	605	0.	*	3	2105	830	0.
1	1255	156	0.	*	2	0740	381	0.	*	3	0225	606	0.	*	3	2110	831	0.
1	1300	157	0.	*	2	0745	382	0.	*	3	0230	607	0.	*	3	2115	832	0.
1	1305	158	0.	*	2	0750	383	0.	*	3	0235	608	0.	*	3	2120	833	0.
1	1310	159	0.	*	2	0755	384	0.	*	3	0240	609	0.	*	3	2125	834	0.
1	1315	160	0.	*	2	0800	385	0.	*	3	0245	610	0.	*	3	2130	835	0.
1	1320	161	0.	*	2	0805	386	0.	*	3	0250	611	0.	*	3	2135	836	0.
1	1325	162	0.	*	2	0810	387	0.	*	3	0255	612	0.	*	3	2140	837	0.
1	1330	163	0.	*	2	0815	388	0.	*	3	0300	613	0.	*	3	2145	838	0.
1	1335	164	0.	*	2	0820	389	0.	*	3	0305	614	0.	*	3	2150	839	0.
1	1340	165	0.	*	2	0825	390	0.	*	3	0310	615	0.	*	3	2155	840	0.
1	1345	166	0.	*	2	0830	391	0.	*	3	0315	616	0.	*	3	2200	841	0.
1	1350	167	0.	*	2	0835	392	0.	*	3	0320	617	0.	*	3	2205	842	0.
1	1355	168	0.	*	2	0840	393	0.	*	3	0325	618	0.	*	3	2210	843	0.
1	1400	169	0.	*	2	0845	394	0.	*	3	0330	619	0.	*	3	2215	844	0.
1	1405	170	0.	*	2	0850	395	0.	*	3	0335	620	0.	*	3	2220	845	0.
1	1410	171	0.	*	2	0855	396	0.	*	3	0340	621	0.	*	3	2225	846	0.
1	1415	172	0.	*	2	0900	397	0.	*	3	0345	622	0.	*	3	2230	847	0.
1	1420	173	0.	*	2	0905	398	0.	*	3	0350	623	0.	*	3	2235	848	0.
1	1425	174	0.	*	2	0910	399	0.	*	3	0355	624	0.	*	3	2240	849	0.
1	1430	175	0.	*	2	0915	400	0.	*	3	0400	625	0.	*	3	2245	850	0.
1	1435	176	0.	*	2	0920	401	0.	*	3	0405	626	0.	*	3	2250	851	0.
1	1440	177	0.	*	2	0925	402	0.	*	3	0410	627	0.	*	3	2255	852	0.
1	1445	178	0.	*	2	0930	403	0.	*	3	0415	628	0.	*	3	2300	853	0.
1	1450	179	0.	*	2	0935	404	0.	*	3	0420	629	0.	*	3	2305	854	0.
1	1455	180	0.	*	2	0940	405	0.	*	3	0425	630	0.	*	3	2310	855	0.
1	1500	181	0.	*	2	0945	406	0.	*	3	0430	631	0.	*	3	2315	856	0.
1	1505	182	0.	*	2	0950	407	0.	*	3	0435	632	0.	*	3	2320	857	0.
1	1510	183	0.	*	2	0955	408	0.	*	3	0440	633	0.	*	3	2325	858	0.
1	1515	184	0.	*	2	1000	409	0.	*	3	0445	634	0.	*	3	2330	859	0.
1	1520	185	0.	*	2	1005	410	0.	*	3	0450	635	0.	*	3	2335	860	0.

1	1525	186	0.	*	2	1010	411	0.	*	3	0455	636	0.	*	3	2340	861	0.
1	1530	187	0.	*	2	1015	412	0.	*	3	0500	637	0.	*	3	2345	862	0.
1	1535	188	0.	*	2	1020	413	0.	*	3	0505	638	0.	*	3	2350	863	0.
1	1540	189	0.	*	2	1025	414	0.	*	3	0510	639	0.	*	3	2355	864	0.
1	1545	190	0.	*	2	1030	415	0.	*	3	0515	640	0.	*	4	0000	865	0.
1	1550	191	0.	*	2	1035	416	0.	*	3	0520	641	0.	*	4	0005	866	0.
1	1555	192	0.	*	2	1040	417	0.	*	3	0525	642	0.	*	4	0010	867	0.
1	1600	193	0.	*	2	1045	418	0.	*	3	0530	643	0.	*	4	0015	868	0.
1	1605	194	0.	*	2	1050	419	0.	*	3	0535	644	0.	*	4	0020	869	0.
1	1610	195	0.	*	2	1055	420	0.	*	3	0540	645	0.	*	4	0025	870	0.
1	1615	196	0.	*	2	1100	421	0.	*	3	0545	646	0.	*	4	0030	871	0.
1	1620	197	0.	*	2	1105	422	0.	*	3	0550	647	0.	*	4	0035	872	0.
1	1625	198	0.	*	2	1110	423	0.	*	3	0555	648	0.	*	4	0040	873	0.
1	1630	199	0.	*	2	1115	424	0.	*	3	0600	649	0.	*	4	0045	874	0.
1	1635	200	0.	*	2	1120	425	0.	*	3	0605	650	0.	*	4	0050	875	0.
1	1640	201	0.	*	2	1125	426	0.	*	3	0610	651	0.	*	4	0055	876	0.
1	1645	202	0.	*	2	1130	427	0.	*	3	0615	652	0.	*	4	0100	877	0.
1	1650	203	0.	*	2	1135	428	0.	*	3	0620	653	0.	*	4	0105	878	0.
1	1655	204	0.	*	2	1140	429	0.	*	3	0625	654	0.	*	4	0110	879	0.
1	1700	205	0.	*	2	1145	430	0.	*	3	0630	655	0.	*	4	0115	880	0.
1	1705	206	0.	*	2	1150	431	0.	*	3	0635	656	0.	*	4	0120	881	0.
1	1710	207	0.	*	2	1155	432	0.	*	3	0640	657	0.	*	4	0125	882	0.
1	1715	208	0.	*	2	1200	433	0.	*	3	0645	658	0.	*	4	0130	883	0.
1	1720	209	0.	*	2	1205	434	0.	*	3	0650	659	0.	*	4	0135	884	0.
1	1725	210	0.	*	2	1210	435	0.	*	3	0655	660	0.	*	4	0140	885	0.
1	1730	211	0.	*	2	1215	436	0.	*	3	0700	661	0.	*	4	0145	886	0.
1	1735	212	0.	*	2	1220	437	0.	*	3	0705	662	0.	*	4	0150	887	0.
1	1740	213	0.	*	2	1225	438	0.	*	3	0710	663	0.	*	4	0155	888	0.
1	1745	214	0.	*	2	1230	439	0.	*	3	0715	664	0.	*	4	0200	889	0.
1	1750	215	0.	*	2	1235	440	0.	*	3	0720	665	0.	*	4	0205	890	0.
1	1755	216	0.	*	2	1240	441	0.	*	3	0725	666	0.	*	4	0210	891	0.
1	1800	217	0.	*	2	1245	442	0.	*	3	0730	667	0.	*	4	0215	892	0.
1	1805	218	0.	*	2	1250	443	0.	*	3	0735	668	0.	*	4	0220	893	0.
1	1810	219	0.	*	2	1255	444	0.	*	3	0740	669	0.	*	4	0225	894	0.
1	1815	220	0.	*	2	1300	445	0.	*	3	0745	670	0.	*	4	0230	895	0.
1	1820	221	0.	*	2	1305	446	0.	*	3	0750	671	0.	*	4	0235	896	0.
1	1825	222	0.	*	2	1310	447	0.	*	3	0755	672	0.	*	4	0240	897	0.
1	1830	223	0.	*	2	1315	448	0.	*	3	0800	673	0.	*	4	0245	898	0.
1	1835	224	0.	*	2	1320	449	0.	*	3	0805	674	0.	*	4	0250	899	0.
1	1840	225	0.	*	2	1325	450	0.	*	3	0810	675	0.	*	4	0255	900	0.

PEAK FLOW (CFS) 1769. TIME (HR) 4.25
 (CFS) 312. 6-HR
 (INCHES) 2.336 24-HR
 (AC-FT) 154. 79. 72-HR
 26. 74.92-HR
 156. 2.355
 156. 156.

CUMULATIVE AREA = 1.24 SQ MI

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 55 KK * DAMOUT *
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 Route Hydrograph Through Dam.

L24444

IPRNT 1 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 WSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

58 RS	STORAGE ROUTING	1 NUMBER OF SUBREACHES									
	NSTPS	STOR TYPE OF INITIAL CONDITION									
	ITYP	2.00 INITIAL CONDITION									
	RSV RIC	0.00 WORKING R AND D COEFFICIENT									
	X										
60 SA	AREA	2.0	2.5	5.8	6.8	9.1	10.2	11.0	11.3	11.6	11.9
		12.1	12.3	12.8	13.3	13.8					
62 SE	ELEVATION	2135.00	2137.00	2140.00	2144.00	2150.00	2153.00	2155.00	2156.00	2157.00	2158.00
		2159.00	2160.00	2161.00	2162.00	2163.00					
64 SQ	DISCHARGE	0.	0.	0.	0.	0.	0.	0.	264.	792.	1508.
		2392.	3419.	4546.	5742.	6984.					

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	4.53	16.62	41.74	89.06	117.93	139.09	150.24	161.71	173.46
ELEVATION	2135.00	2137.00	2140.00	2144.00	2150.00	2153.00	2155.00	2156.00	2157.00	2158.00
STORAGE	185.44	197.64	210.20	223.26	236.82					
ELEVATION	2159.00	2160.00	2161.00	2162.00	2163.00					

HYDROGRAPH AT STATION DAMOUT

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	2.0	2135.9	* 2	0100	301	0.	139.1	2155.0	* 3	0200	601	0.	139.1	2155.0		
1		0005	2	0.	2.0	2135.9	* 2	0105	302	0.	139.1	2155.0	* 3	0205	602	0.	139.1	2155.0		
1		0010	3	0.	2.0	2135.9	* 2	0110	303	0.	139.1	2155.0	* 3	0210	603	0.	139.1	2155.0		
1		0015	4	0.	2.0	2135.9	* 2	0115	304	0.	139.1	2155.0	* 3	0215	604	0.	139.1	2155.0		
1		0020	5	0.	2.0	2135.9	* 2	0120	305	0.	139.1	2155.0	* 3	0220	605	0.	139.1	2155.0		
1		0025	6	0.	2.1	2135.9	* 2	0125	306	0.	139.1	2155.0	* 3	0225	606	0.	139.1	2155.0		
1		0030	7	0.	2.1	2135.9	* 2	0130	307	0.	139.1	2155.0	* 3	0230	607	0.	139.1	2155.0		
1		0035	8	0.	2.2	2136.0	* 2	0135	308	0.	139.1	2155.0	* 3	0235	608	0.	139.1	2155.0		
1		0040	9	0.	2.2	2136.0	* 2	0140	309	0.	139.1	2155.0	* 3	0240	609	0.	139.1	2155.0		
1		0045	10	0.	2.3	2136.0	* 2	0145	310	0.	139.1	2155.0	* 3	0245	610	0.	139.1	2155.0		
1		0050	11	0.	2.4	2136.1	* 2	0150	311	0.	139.1	2155.0	* 3	0250	611	0.	139.1	2155.0		
1		0055	12	0.	2.6	2136.1	* 2	0155	312	0.	139.1	2155.0	* 3	0255	612	0.	139.1	2155.0		
1		0100	13	0.	2.7	2136.2	* 2	0200	313	0.	139.1	2155.0	* 3	0300	613	0.	139.1	2155.0		
1		0105	14	0.	2.8	2136.2	* 2	0205	314	0.	139.1	2155.0	* 3	0305	614	0.	139.1	2155.0		
1		0110	15	0.	3.0	2136.3	* 2	0210	315	0.	139.1	2155.0	* 3	0310	615	0.	139.1	2155.0		
1		0115	16	0.	3.1	2136.4	* 2	0215	316	0.	139.1	2155.0	* 3	0315	616	0.	139.1	2155.0		
1		0120	17	0.	3.3	2136.5	* 2	0220	317	0.	139.1	2155.0	* 3	0320	617	0.	139.1	2155.0		
1		0125	18	0.	3.5	2136.5	* 2	0225	318	0.	139.1	2155.0	* 3	0325	618	0.	139.1	2155.0		
1		0130	19	0.	3.7	2136.6	* 2	0230	319	0.	139.1	2155.0	* 3	0330	619	0.	139.1	2155.0		
1		0135	20	0.	3.8	2136.7	* 2	0235	320	0.	139.1	2155.0	* 3	0335	620	0.	139.1	2155.0		
1		0140	21	0.	4.0	2136.8	* 2	0240	321	0.	139.1	2155.0	* 3	0340	621	0.	139.1	2155.0		
1		0145	22	0.	4.2	2136.9	* 2	0245	322	0.	139.1	2155.0	* 3	0345	622	0.	139.1	2155.0		
1		0150	23	0.	4.4	2136.9	* 2	0250	323	0.	139.1	2155.0	* 3	0350	623	0.	139.1	2155.0		
1		0155	24	0.	4.6	2137.0	* 2	0255	324	0.	139.1	2155.0	* 3	0355	624	0.	139.1	2155.0		
1		0200	25	0.	4.8	2137.1	* 2	0300	325	0.	139.1	2155.0	* 3	0400	625	0.	139.1	2155.0		
1		0205	26	0.	5.0	2137.1	* 2	0305	326	0.	139.1	2155.0	* 3	0405	626	0.	139.1	2155.0		
1		0210	27	0.	5.2	2137.2	* 2	0310	327	0.	139.1	2155.0	* 3	0410	627	0.	139.1	2155.0		

1	0215	28	0.	5.4	2137.2	*	2	0315	328	0.	139.1	2155.0	*	3	0415	628	0.	139.1	2155.0
1	0220	29	0.	5.6	2137.3	*	2	0320	329	0.	139.1	2155.0	*	3	0420	629	0.	139.1	2155.0
1	0225	30	0.	5.8	2137.3	*	2	0325	330	0.	139.1	2155.0	*	3	0425	630	0.	139.1	2155.0
1	0230	31	0.	6.0	2137.4	*	2	0330	331	0.	139.1	2155.0	*	3	0430	631	0.	139.1	2155.0
1	0235	32	0.	6.2	2137.4	*	2	0335	332	0.	139.1	2155.0	*	3	0435	632	0.	139.1	2155.0
1	0240	33	0.	6.5	2137.5	*	2	0340	333	0.	139.1	2155.0	*	3	0440	633	0.	139.1	2155.0
1	0245	34	0.	6.7	2137.5	*	2	0345	334	0.	139.1	2155.0	*	3	0445	634	0.	139.1	2155.0
1	0250	35	0.	6.9	2137.6	*	2	0350	335	0.	139.1	2155.0	*	3	0450	635	0.	139.1	2155.0
1	0255	36	0.	7.2	2137.7	*	2	0355	336	0.	139.1	2155.0	*	3	0455	636	0.	139.1	2155.0
1	0300	37	0.	7.5	2137.7	*	2	0400	337	0.	139.1	2155.0	*	3	0500	637	0.	139.1	2155.0
1	0305	38	0.	7.7	2137.8	*	2	0405	338	0.	139.1	2155.0	*	3	0505	638	0.	139.1	2155.0
1	0310	39	0.	8.1	2137.9	*	2	0410	339	0.	139.1	2155.0	*	3	0510	639	0.	139.1	2155.0
1	0315	40	0.	8.4	2138.0	*	2	0415	340	0.	139.1	2155.0	*	3	0515	640	0.	139.1	2155.0
1	0320	41	0.	8.8	2138.1	*	2	0420	341	0.	139.1	2155.0	*	3	0520	641	0.	139.1	2155.0
1	0325	42	0.	9.3	2138.2	*	2	0425	342	0.	139.1	2155.0	*	3	0525	642	0.	139.1	2155.0
1	0330	43	0.	10.0	2138.4	*	2	0430	343	0.	139.1	2155.0	*	3	0530	643	0.	139.1	2155.0
1	0335	44	0.	11.1	2138.6	*	2	0435	344	0.	139.1	2155.0	*	3	0535	644	0.	139.1	2155.0
1	0340	45	0.	12.6	2139.0	*	2	0440	345	0.	139.1	2155.0	*	3	0540	645	0.	139.1	2155.0
1	0345	46	0.	14.9	2139.6	*	2	0445	346	0.	139.1	2155.0	*	3	0545	646	0.	139.1	2155.0
1	0350	47	0.	18.3	2140.3	*	2	0450	347	0.	139.1	2155.0	*	3	0550	647	0.	139.1	2155.0
1	0355	48	0.	23.2	2141.1	*	2	0455	348	0.	139.1	2155.0	*	3	0555	648	0.	139.1	2155.0
1	0400	49	0.	30.1	2142.1	*	2	0500	349	0.	139.1	2155.0	*	3	0600	649	0.	139.1	2155.0
1	0405	50	0.	39.1	2143.6	*	2	0505	350	0.	139.1	2155.0	*	3	0605	650	0.	139.1	2155.0
1	0410	51	0.	50.0	2145.0	*	2	0510	351	0.	139.1	2155.0	*	3	0610	651	0.	139.1	2155.0
1	0415	52	0.	61.9	2146.6	*	2	0515	352	0.	139.1	2155.0	*	3	0615	652	0.	139.1	2155.0
1	0420	53	0.	73.9	2148.1	*	2	0520	353	0.	139.1	2155.0	*	3	0620	653	0.	139.1	2155.0
1	0425	54	0.	85.3	2149.5	*	2	0525	354	0.	139.1	2155.0	*	3	0625	654	0.	139.1	2155.0
1	0430	55	0.	95.7	2150.7	*	2	0530	355	0.	139.1	2155.0	*	3	0630	655	0.	139.1	2155.0
1	0435	56	0.	104.9	2151.6	*	2	0535	356	0.	139.1	2155.0	*	3	0635	656	0.	139.1	2155.0
1	0440	57	0.	112.8	2152.5	*	2	0540	357	0.	139.1	2155.0	*	3	0640	657	0.	139.1	2155.0
1	0445	58	0.	119.6	2153.2	*	2	0545	358	0.	139.1	2155.0	*	3	0645	658	0.	139.1	2155.0
1	0450	59	0.	125.4	2153.7	*	2	0550	359	0.	139.1	2155.0	*	3	0650	659	0.	139.1	2155.0
1	0455	60	0.	130.2	2154.2	*	2	0555	360	0.	139.1	2155.0	*	3	0655	660	0.	139.1	2155.0
1	0500	61	0.	134.2	2154.5	*	2	0600	361	0.	139.1	2155.0	*	3	0700	661	0.	139.1	2155.0
1	0505	62	0.	137.6	2154.9	*	2	0605	362	0.	139.1	2155.0	*	3	0705	662	0.	139.1	2155.0
1	0510	63	31.	140.4	2155.1	*	2	0610	363	0.	139.1	2155.0	*	3	0710	663	0.	139.1	2155.0
1	0515	64	78.	142.4	2155.3	*	2	0615	364	0.	139.1	2155.0	*	3	0715	664	0.	139.1	2155.0
1	0520	65	111.	143.8	2155.4	*	2	0620	365	0.	139.1	2155.0	*	3	0720	665	0.	139.1	2155.0
1	0525	66	132.	144.7	2155.5	*	2	0625	366	0.	139.1	2155.0	*	3	0725	666	0.	139.1	2155.0
1	0530	67	144.	145.2	2155.5	*	2	0630	367	0.	139.1	2155.0	*	3	0730	667	0.	139.1	2155.0
1	0535	68	150.	145.4	2155.6	*	2	0635	368	0.	139.1	2155.0	*	3	0735	668	0.	139.1	2155.0
1	0540	69	151.	145.5	2155.6	*	2	0640	369	0.	139.1	2155.0	*	3	0740	669	0.	139.1	2155.0
1	0545	70	149.	145.4	2155.6	*	2	0645	370	0.	139.1	2155.0	*	3	0745	670	0.	139.1	2155.0
1	0550	71	145.	145.2	2155.5	*	2	0650	371	0.	139.1	2155.0	*	3	0750	671	0.	139.1	2155.0
1	0555	72	139.	145.0	2155.5	*	2	0655	372	0.	139.1	2155.0	*	3	0755	672	0.	139.1	2155.0
1	0600	73	132.	144.7	2155.5	*	2	0700	373	0.	139.1	2155.0	*	3	0800	673	0.	139.1	2155.0
1	0605	74	125.	144.4	2155.5	*	2	0705	374	0.	139.1	2155.0	*	3	0805	674	0.	139.1	2155.0
1	0610	75	117.	144.0	2155.4	*	2	0710	375	0.	139.1	2155.0	*	3	0810	675	0.	139.1	2155.0
1	0615	76	109.	143.7	2155.4	*	2	0715	376	0.	139.1	2155.0	*	3	0815	676	0.	139.1	2155.0
1	0620	77	102.	143.4	2155.4	*	2	0720	377	0.	139.1	2155.0	*	3	0820	677	0.	139.1	2155.0
1	0625	78	94.	143.0	2155.4	*	2	0725	378	0.	139.1	2155.0	*	3	0825	678	0.	139.1	2155.0
1	0630	79	86.	142.7	2155.3	*	2	0730	379	0.	139.1	2155.0	*	3	0830	679	0.	139.1	2155.0
1	0635	80	78.	142.4	2155.3	*	2	0735	380	0.	139.1	2155.0	*	3	0835	680	0.	139.1	2155.0
1	0640	81	70.	142.1	2155.3	*	2	0740	381	0.	139.1	2155.0	*	3	0840	681	0.	139.1	2155.0
1	0645	82	64.	141.8	2155.2	*	2	0745	382	0.	139.1	2155.0	*	3	0845	682	0.	139.1	2155.0
1	0650	83	57.	141.5	2155.2	*	2	0750	383	0.	139.1	2155.0	*	3	0850	683	0.	139.1	2155.0
1	0655	84	52.	141.3	2155.2	*	2	0755	384	0.	139.1	2155.0	*	3	0855	684	0.	139.1	2155.0
1	0700	85	46.	141.0	2155.2	*	2	0800	385	0.	139.1	2155.0	*	3	0900	685	0.	139.1	2155.0
1	0705	86	41.	140.8	2155.2	*	2	0805	386	0.	139.1	2155.0	*	3	0905	686	0.	139.1	2155.0
1	0710	87	37.	140.7	2155.1	*	2	0810	387	0.	139.1	2155.0	*	3	0910	687	0.	139.1	2155.0
1	0715	88	33.	140.5	2155.1	*	2	0815	388	0.	139.1	2155.0	*	3	0915	688	0.	139.1	2155.0
1	0720	89	29.	140.3	2155.1	*	2	0820	389	0.	139.1	2155.0	*	3	0920	689	0.	139.1	2155.0
1	0725	90	26.	140.2	2155.1	*	2	0825	390	0.	139.1	2155.0	*	3	0925	690	0.	139.1	2155.0
1	0730	91	23.	140.1	2155.1	*	2	0830	391	0.	139.1	2155.0	*	3	0930	691	0.	139.1	2155.0
1	0735	92	20.	140.0	2155.1	*	2	0835	392	0.	139.1	2155.0	*	3	0935	692	0.	139.1	2155.0
1	0740	93	18.	139.8	2155.1	*	2	0840	393	0.	139.1	2155.0	*	3	0940	693	0.	139.1	2155.0

1	0745	94	16.	139.8	2155.1	*	2	0845	394	0.	139.1	2155.0	*	3	0945	694	0.	139.1	2155.0
1	0750	95	14.	139.7	2155.1	*	2	0850	395	0.	139.1	2155.0	*	3	0950	695	0.	139.1	2155.0
1	0755	96	12.	139.6	2155.0	*	2	0855	396	0.	139.1	2155.0	*	3	0955	696	0.	139.1	2155.0
1	0800	97	11.	139.5	2155.0	*	2	0900	397	0.	139.1	2155.0	*	3	1000	697	0.	139.1	2155.0
1	0805	98	9.	139.5	2155.0	*	2	0905	398	0.	139.1	2155.0	*	3	1005	698	0.	139.1	2155.0
1	0810	99	8.	139.4	2155.0	*	2	0910	399	0.	139.1	2155.0	*	3	1010	699	0.	139.1	2155.0
1	0815	100	7.	139.4	2155.0	*	2	0915	400	0.	139.1	2155.0	*	3	1015	700	0.	139.1	2155.0
1	0820	101	6.	139.4	2155.0	*	2	0920	401	0.	139.1	2155.0	*	3	1020	701	0.	139.1	2155.0
1	0825	102	5.	139.3	2155.0	*	2	0925	402	0.	139.1	2155.0	*	3	1025	702	0.	139.1	2155.0
1	0830	103	5.	139.3	2155.0	*	2	0930	403	0.	139.1	2155.0	*	3	1030	703	0.	139.1	2155.0
1	0835	104	4.	139.3	2155.0	*	2	0935	404	0.	139.1	2155.0	*	3	1035	704	0.	139.1	2155.0
1	0840	105	3.	139.2	2155.0	*	2	0940	405	0.	139.1	2155.0	*	3	1040	705	0.	139.1	2155.0
1	0845	106	3.	139.2	2155.0	*	2	0945	406	0.	139.1	2155.0	*	3	1045	706	0.	139.1	2155.0
1	0850	107	3.	139.2	2155.0	*	2	0950	407	0.	139.1	2155.0	*	3	1050	707	0.	139.1	2155.0
1	0855	108	2.	139.2	2155.0	*	2	0955	408	0.	139.1	2155.0	*	3	1055	708	0.	139.1	2155.0
1	0900	109	2.	139.2	2155.0	*	2	1000	409	0.	139.1	2155.0	*	3	1100	709	0.	139.1	2155.0
1	0905	110	2.	139.2	2155.0	*	2	1005	410	0.	139.1	2155.0	*	3	1105	710	0.	139.1	2155.0
1	0910	111	1.	139.1	2155.0	*	2	1010	411	0.	139.1	2155.0	*	3	1110	711	0.	139.1	2155.0
1	0915	112	1.	139.1	2155.0	*	2	1015	412	0.	139.1	2155.0	*	3	1115	712	0.	139.1	2155.0
1	0920	113	1.	139.1	2155.0	*	2	1020	413	0.	139.1	2155.0	*	3	1120	713	0.	139.1	2155.0
1	0925	114	1.	139.1	2155.0	*	2	1025	414	0.	139.1	2155.0	*	3	1125	714	0.	139.1	2155.0
1	0930	115	1.	139.1	2155.0	*	2	1030	415	0.	139.1	2155.0	*	3	1130	715	0.	139.1	2155.0
1	0935	116	1.	139.1	2155.0	*	2	1035	416	0.	139.1	2155.0	*	3	1135	716	0.	139.1	2155.0
1	0940	117	1.	139.1	2155.0	*	2	1040	417	0.	139.1	2155.0	*	3	1140	717	0.	139.1	2155.0
1	0945	118	0.	139.1	2155.0	*	2	1045	418	0.	139.1	2155.0	*	3	1145	718	0.	139.1	2155.0
1	0950	119	0.	139.1	2155.0	*	2	1050	419	0.	139.1	2155.0	*	3	1150	719	0.	139.1	2155.0
1	0955	120	0.	139.1	2155.0	*	2	1055	420	0.	139.1	2155.0	*	3	1155	720	0.	139.1	2155.0
1	1000	121	0.	139.1	2155.0	*	2	1100	421	0.	139.1	2155.0	*	3	1200	721	0.	139.1	2155.0
1	1005	122	0.	139.1	2155.0	*	2	1105	422	0.	139.1	2155.0	*	3	1205	722	0.	139.1	2155.0
1	1010	123	0.	139.1	2155.0	*	2	1110	423	0.	139.1	2155.0	*	3	1210	723	0.	139.1	2155.0
1	1015	124	0.	139.1	2155.0	*	2	1115	424	0.	139.1	2155.0	*	3	1215	724	0.	139.1	2155.0
1	1020	125	0.	139.1	2155.0	*	2	1120	425	0.	139.1	2155.0	*	3	1220	725	0.	139.1	2155.0
1	1025	126	0.	139.1	2155.0	*	2	1125	426	0.	139.1	2155.0	*	3	1225	726	0.	139.1	2155.0
1	1030	127	0.	139.1	2155.0	*	2	1130	427	0.	139.1	2155.0	*	3	1230	727	0.	139.1	2155.0
1	1035	128	0.	139.1	2155.0	*	2	1135	428	0.	139.1	2155.0	*	3	1235	728	0.	139.1	2155.0
1	1040	129	0.	139.1	2155.0	*	2	1140	429	0.	139.1	2155.0	*	3	1240	729	0.	139.1	2155.0
1	1045	130	0.	139.1	2155.0	*	2	1145	430	0.	139.1	2155.0	*	3	1245	730	0.	139.1	2155.0
1	1050	131	0.	139.1	2155.0	*	2	1150	431	0.	139.1	2155.0	*	3	1250	731	0.	139.1	2155.0
1	1055	132	0.	139.1	2155.0	*	2	1155	432	0.	139.1	2155.0	*	3	1255	732	0.	139.1	2155.0
1	1100	133	0.	139.1	2155.0	*	2	1200	433	0.	139.1	2155.0	*	3	1300	733	0.	139.1	2155.0
1	1105	134	0.	139.1	2155.0	*	2	1205	434	0.	139.1	2155.0	*	3	1305	734	0.	139.1	2155.0
1	1110	135	0.	139.1	2155.0	*	2	1210	435	0.	139.1	2155.0	*	3	1310	735	0.	139.1	2155.0
1	1115	136	0.	139.1	2155.0	*	2	1215	436	0.	139.1	2155.0	*	3	1315	736	0.	139.1	2155.0
1	1120	137	0.	139.1	2155.0	*	2	1220	437	0.	139.1	2155.0	*	3	1320	737	0.	139.1	2155.0
1	1125	138	0.	139.1	2155.0	*	2	1225	438	0.	139.1	2155.0	*	3	1325	738	0.	139.1	2155.0
1	1130	139	0.	139.1	2155.0	*	2	1230	439	0.	139.1	2155.0	*	3	1330	739	0.	139.1	2155.0
1	1135	140	0.	139.1	2155.0	*	2	1235	440	0.	139.1	2155.0	*	3	1335	740	0.	139.1	2155.0
1	1140	141	0.	139.1	2155.0	*	2	1240	441	0.	139.1	2155.0	*	3	1340	741	0.	139.1	2155.0
1	1145	142	0.	139.1	2155.0	*	2	1245	442	0.	139.1	2155.0	*	3	1345	742	0.	139.1	2155.0
1	1150	143	0.	139.1	2155.0	*	2	1250	443	0.	139.1	2155.0	*	3	1350	743	0.	139.1	2155.0
1	1155	144	0.	139.1	2155.0	*	2	1255	444	0.	139.1	2155.0	*	3	1355	744	0.	139.1	2155.0
1	1200	145	0.	139.1	2155.0	*	2	1300	445	0.	139.1	2155.0	*	3	1400	745	0.	139.1	2155.0
1	1205	146	0.	139.1	2155.0	*	2	1305	446	0.	139.1	2155.0	*	3	1405	746	0.	139.1	2155.0
1	1210	147	0.	139.1	2155.0	*	2	1310	447	0.	139.1	2155.0	*	3	1410	747	0.	139.1	2155.0
1	1215	148	0.	139.1	2155.0	*	2	1315	448	0.	139.1	2155.0	*	3	1415	748	0.	139.1	2155.0
1	1220	149	0.	139.1	2155.0	*	2	1320	449	0.	139.1	2155.0	*	3	1420	749	0.	139.1	2155.0
1	1225	150	0.	139.1	2155.0	*	2	1325	450	0.	139.1	2155.0	*	3	1425	750	0.	139.1	2155.0
1	1230	151	0.	139.1	2155.0	*	2	1330	451	0.	139.1	2155.0	*	3	1430	751	0.	139.1	2155.0
1	1235	152	0.	139.1	2155.0	*	2	1335	452	0.	139.1	2155.0	*	3	1435	752	0.	139.1	2155.0
1	1240	153	0.	139.1	2155.0	*	2	1340	453	0.	139.1	2155.0	*	3	1440	753	0.	139.1	2155.0
1	1245	154	0.	139.1	2155.0	*	2	1345	454	0.	139.1	2155.0	*	3	1445	754	0.	139.1	2155.0
1	1250	155	0.	139.1	2155.0	*	2	1350	455	0.	139.1	2155.0	*	3	1450	755	0.	139.1	2155.0
1	1255	156	0.	139.1	2155.0	*	2	1355	456	0.	139.1	2155.0	*	3	1455	756	0.	139.1	2155.0
1	1300	157	0.	139.1	2155.0	*	2	1400	457	0.	139.1	2155.0	*	3	1500	757	0.	139.1	2155.0
1	1305	158	0.	139.1	2155.0	*	2	1405	458	0.	139.1	2155.0	*	3	1505	758	0.	139.1	2155.0
1	1310	159	0.	139.1	2155.0	*	2	1410	459	0.	139.1	2155.0	*	3	1510	759	0.	139.1	2155.0

1	1315	160	0.	139.1	2155.0	*	2	1415	460	0.	139.1	2155.0	*	3	1515	760	0.	139.1	2155.0
1	1320	161	0.	139.1	2155.0	*	2	1420	461	0.	139.1	2155.0	*	3	1520	761	0.	139.1	2155.0
1	1325	162	0.	139.1	2155.0	*	2	1425	462	0.	139.1	2155.0	*	3	1525	762	0.	139.1	2155.0
1	1330	163	0.	139.1	2155.0	*	2	1430	463	0.	139.1	2155.0	*	3	1530	763	0.	139.1	2155.0
1	1335	164	0.	139.1	2155.0	*	2	1435	464	0.	139.1	2155.0	*	3	1535	764	0.	139.1	2155.0
1	1340	165	0.	139.1	2155.0	*	2	1440	465	0.	139.1	2155.0	*	3	1540	765	0.	139.1	2155.0
1	1345	166	0.	139.1	2155.0	*	2	1445	466	0.	139.1	2155.0	*	3	1545	766	0.	139.1	2155.0
1	1350	167	0.	139.1	2155.0	*	2	1450	467	0.	139.1	2155.0	*	3	1550	767	0.	139.1	2155.0
1	1355	168	0.	139.1	2155.0	*	2	1455	468	0.	139.1	2155.0	*	3	1555	768	0.	139.1	2155.0
1	1400	169	0.	139.1	2155.0	*	2	1500	469	0.	139.1	2155.0	*	3	1600	769	0.	139.1	2155.0
1	1405	170	0.	139.1	2155.0	*	2	1505	470	0.	139.1	2155.0	*	3	1605	770	0.	139.1	2155.0
1	1410	171	0.	139.1	2155.0	*	2	1510	471	0.	139.1	2155.0	*	3	1610	771	0.	139.1	2155.0
1	1415	172	0.	139.1	2155.0	*	2	1515	472	0.	139.1	2155.0	*	3	1615	772	0.	139.1	2155.0
1	1420	173	0.	139.1	2155.0	*	2	1520	473	0.	139.1	2155.0	*	3	1620	773	0.	139.1	2155.0
1	1425	174	0.	139.1	2155.0	*	2	1525	474	0.	139.1	2155.0	*	3	1625	774	0.	139.1	2155.0
1	1430	175	0.	139.1	2155.0	*	2	1530	475	0.	139.1	2155.0	*	3	1630	775	0.	139.1	2155.0
1	1435	176	0.	139.1	2155.0	*	2	1535	476	0.	139.1	2155.0	*	3	1635	776	0.	139.1	2155.0
1	1440	177	0.	139.1	2155.0	*	2	1540	477	0.	139.1	2155.0	*	3	1640	777	0.	139.1	2155.0
1	1445	178	0.	139.1	2155.0	*	2	1545	478	0.	139.1	2155.0	*	3	1645	778	0.	139.1	2155.0
1	1450	179	0.	139.1	2155.0	*	2	1550	479	0.	139.1	2155.0	*	3	1650	779	0.	139.1	2155.0
1	1455	180	0.	139.1	2155.0	*	2	1555	480	0.	139.1	2155.0	*	3	1655	780	0.	139.1	2155.0
1	1500	181	0.	139.1	2155.0	*	2	1600	481	0.	139.1	2155.0	*	3	1700	781	0.	139.1	2155.0
1	1505	182	0.	139.1	2155.0	*	2	1605	482	0.	139.1	2155.0	*	3	1705	782	0.	139.1	2155.0
1	1510	183	0.	139.1	2155.0	*	2	1610	483	0.	139.1	2155.0	*	3	1710	783	0.	139.1	2155.0
1	1515	184	0.	139.1	2155.0	*	2	1615	484	0.	139.1	2155.0	*	3	1715	784	0.	139.1	2155.0
1	1520	185	0.	139.1	2155.0	*	2	1620	485	0.	139.1	2155.0	*	3	1720	785	0.	139.1	2155.0
1	1525	186	0.	139.1	2155.0	*	2	1625	486	0.	139.1	2155.0	*	3	1725	786	0.	139.1	2155.0
1	1530	187	0.	139.1	2155.0	*	2	1630	487	0.	139.1	2155.0	*	3	1730	787	0.	139.1	2155.0
1	1535	188	0.	139.1	2155.0	*	2	1635	488	0.	139.1	2155.0	*	3	1735	788	0.	139.1	2155.0
1	1540	189	0.	139.1	2155.0	*	2	1640	489	0.	139.1	2155.0	*	3	1740	789	0.	139.1	2155.0
1	1545	190	0.	139.1	2155.0	*	2	1645	490	0.	139.1	2155.0	*	3	1745	790	0.	139.1	2155.0
1	1550	191	0.	139.1	2155.0	*	2	1650	491	0.	139.1	2155.0	*	3	1750	791	0.	139.1	2155.0
1	1555	192	0.	139.1	2155.0	*	2	1655	492	0.	139.1	2155.0	*	3	1755	792	0.	139.1	2155.0
1	1600	193	0.	139.1	2155.0	*	2	1700	493	0.	139.1	2155.0	*	3	1800	793	0.	139.1	2155.0
1	1605	194	0.	139.1	2155.0	*	2	1705	494	0.	139.1	2155.0	*	3	1805	794	0.	139.1	2155.0
1	1610	195	0.	139.1	2155.0	*	2	1710	495	0.	139.1	2155.0	*	3	1810	795	0.	139.1	2155.0
1	1615	196	0.	139.1	2155.0	*	2	1715	496	0.	139.1	2155.0	*	3	1815	796	0.	139.1	2155.0
1	1620	197	0.	139.1	2155.0	*	2	1720	497	0.	139.1	2155.0	*	3	1820	797	0.	139.1	2155.0
1	1625	198	0.	139.1	2155.0	*	2	1725	498	0.	139.1	2155.0	*	3	1825	798	0.	139.1	2155.0
1	1630	199	0.	139.1	2155.0	*	2	1730	499	0.	139.1	2155.0	*	3	1830	799	0.	139.1	2155.0
1	1635	200	0.	139.1	2155.0	*	2	1735	500	0.	139.1	2155.0	*	3	1835	800	0.	139.1	2155.0
1	1640	201	0.	139.1	2155.0	*	2	1740	501	0.	139.1	2155.0	*	3	1840	801	0.	139.1	2155.0
1	1645	202	0.	139.1	2155.0	*	2	1745	502	0.	139.1	2155.0	*	3	1845	802	0.	139.1	2155.0
1	1650	203	0.	139.1	2155.0	*	2	1750	503	0.	139.1	2155.0	*	3	1850	803	0.	139.1	2155.0
1	1655	204	0.	139.1	2155.0	*	2	1755	504	0.	139.1	2155.0	*	3	1855	804	0.	139.1	2155.0
1	1700	205	0.	139.1	2155.0	*	2	1800	505	0.	139.1	2155.0	*	3	1900	805	0.	139.1	2155.0
1	1705	206	0.	139.1	2155.0	*	2	1805	506	0.	139.1	2155.0	*	3	1905	806	0.	139.1	2155.0
1	1710	207	0.	139.1	2155.0	*	2	1810	507	0.	139.1	2155.0	*	3	1910	807	0.	139.1	2155.0
1	1715	208	0.	139.1	2155.0	*	2	1815	508	0.	139.1	2155.0	*	3	1915	808	0.	139.1	2155.0
1	1720	209	0.	139.1	2155.0	*	2	1820	509	0.	139.1	2155.0	*	3	1920	809	0.	139.1	2155.0
1	1725	210	0.	139.1	2155.0	*	2	1825	510	0.	139.1	2155.0	*	3	1925	810	0.	139.1	2155.0
1	1730	211	0.	139.1	2155.0	*	2	1830	511	0.	139.1	2155.0	*	3	1930	811	0.	139.1	2155.0
1	1735	212	0.	139.1	2155.0	*	2	1835	512	0.	139.1	2155.0	*	3	1935	812	0.	139.1	2155.0
1	1740	213	0.	139.1	2155.0	*	2	1840	513	0.	139.1	2155.0	*	3	1940	813	0.	139.1	2155.0
1	1745	214	0.	139.1	2155.0	*	2	1845	514	0.	139.1	2155.0	*	3	1945	814	0.	139.1	2155.0
1	1750	215	0.	139.1	2155.0	*	2	1850	515	0.	139.1	2155.0	*	3	1950	815	0.	139.1	2155.0
1	1755	216	0.	139.1	2155.0	*	2	1855	516	0.	139.1	2155.0	*	3	1955	816	0.	139.1	2155.0
1	1800	217	0.	139.1	2155.0	*	2	1900	517	0.	139.1	2155.0	*	3	2000	817	0.	139.1	2155.0
1	1805	218	0.	139.1	2155.0	*	2	1905	518	0.	139.1	2155.0	*	3	2005	818	0.	139.1	2155.0
1	1810	219	0.	139.1	2155.0	*	2	1910	519	0.	139.1	2155.0	*	3	2010	819	0.	139.1	2155.0
1	1815	220	0.	139.1	2155.0	*	2	1915	520	0.	139.1	2155.0	*	3	2015	820	0.	139.1	2155.0
1	1820	221	0.	139.1	2155.0	*	2	1920	521	0.	139.1	2155.0	*	3	2020	821	0.	139.1	2155.0
1	1825	222	0.	139.1	2155.0	*	2	1925	522	0.	139.1	2155.0	*	3	2025	822	0.	139.1	2155.0
1	1830	223	0.	139.1	2155.0	*	2	1930	523	0.	139.1	2155.0	*	3	2030	823	0.	139.1	2155.0
1	1835	224	0.	139.1	2155.0	*	2	1935	524	0.	139.1	2155.0	*	3	2035	824	0.	139.1	2155.0
1	1840	225	0.	139.1	2155.0	*	2	1940	525	0.	139.1	2155.0	*	3	2040	825	0.	139.1	2155.0

1	1845	226	0.	139.1	2155.0	*	2	1945	526	0.	139.1	2155.0	*	3	2045	826	0.	139.1	2155.0
1	1850	227	0.	139.1	2155.0	*	2	1950	527	0.	139.1	2155.0	*	3	2050	827	0.	139.1	2155.0
1	1855	228	0.	139.1	2155.0	*	2	1955	528	0.	139.1	2155.0	*	3	2055	828	0.	139.1	2155.0
1	1900	229	0.	139.1	2155.0	*	2	2000	529	0.	139.1	2155.0	*	3	2100	829	0.	139.1	2155.0
1	1905	230	0.	139.1	2155.0	*	2	2005	530	0.	139.1	2155.0	*	3	2105	830	0.	139.1	2155.0
1	1910	231	0.	139.1	2155.0	*	2	2010	531	0.	139.1	2155.0	*	3	2110	831	0.	139.1	2155.0
1	1915	232	0.	139.1	2155.0	*	2	2015	532	0.	139.1	2155.0	*	3	2115	832	0.	139.1	2155.0
1	1920	233	0.	139.1	2155.0	*	2	2020	533	0.	139.1	2155.0	*	3	2120	833	0.	139.1	2155.0
1	1925	234	0.	139.1	2155.0	*	2	2025	534	0.	139.1	2155.0	*	3	2125	834	0.	139.1	2155.0
1	1930	235	0.	139.1	2155.0	*	2	2030	535	0.	139.1	2155.0	*	3	2130	835	0.	139.1	2155.0
1	1935	236	0.	139.1	2155.0	*	2	2035	536	0.	139.1	2155.0	*	3	2135	836	0.	139.1	2155.0
1	1940	237	0.	139.1	2155.0	*	2	2040	537	0.	139.1	2155.0	*	3	2140	837	0.	139.1	2155.0
1	1945	238	0.	139.1	2155.0	*	2	2045	538	0.	139.1	2155.0	*	3	2145	838	0.	139.1	2155.0
1	1950	239	0.	139.1	2155.0	*	2	2050	539	0.	139.1	2155.0	*	3	2150	839	0.	139.1	2155.0
1	1955	240	0.	139.1	2155.0	*	2	2055	540	0.	139.1	2155.0	*	3	2155	840	0.	139.1	2155.0
1	2000	241	0.	139.1	2155.0	*	2	2100	541	0.	139.1	2155.0	*	3	2200	841	0.	139.1	2155.0
1	2005	242	0.	139.1	2155.0	*	2	2105	542	0.	139.1	2155.0	*	3	2205	842	0.	139.1	2155.0
1	2010	243	0.	139.1	2155.0	*	2	2110	543	0.	139.1	2155.0	*	3	2210	843	0.	139.1	2155.0
1	2015	244	0.	139.1	2155.0	*	2	2115	544	0.	139.1	2155.0	*	3	2215	844	0.	139.1	2155.0
1	2020	245	0.	139.1	2155.0	*	2	2120	545	0.	139.1	2155.0	*	3	2220	845	0.	139.1	2155.0
1	2025	246	0.	139.1	2155.0	*	2	2125	546	0.	139.1	2155.0	*	3	2225	846	0.	139.1	2155.0
1	2030	247	0.	139.1	2155.0	*	2	2130	547	0.	139.1	2155.0	*	3	2230	847	0.	139.1	2155.0
1	2035	248	0.	139.1	2155.0	*	2	2135	548	0.	139.1	2155.0	*	3	2235	848	0.	139.1	2155.0
1	2040	249	0.	139.1	2155.0	*	2	2140	549	0.	139.1	2155.0	*	3	2240	849	0.	139.1	2155.0
1	2045	250	0.	139.1	2155.0	*	2	2145	550	0.	139.1	2155.0	*	3	2245	850	0.	139.1	2155.0
1	2050	251	0.	139.1	2155.0	*	2	2150	551	0.	139.1	2155.0	*	3	2250	851	0.	139.1	2155.0
1	2055	252	0.	139.1	2155.0	*	2	2155	552	0.	139.1	2155.0	*	3	2255	852	0.	139.1	2155.0
1	2100	253	0.	139.1	2155.0	*	2	2200	553	0.	139.1	2155.0	*	3	2300	853	0.	139.1	2155.0
1	2105	254	0.	139.1	2155.0	*	2	2205	554	0.	139.1	2155.0	*	3	2305	854	0.	139.1	2155.0
1	2110	255	0.	139.1	2155.0	*	2	2210	555	0.	139.1	2155.0	*	3	2310	855	0.	139.1	2155.0
1	2115	256	0.	139.1	2155.0	*	2	2215	556	0.	139.1	2155.0	*	3	2315	856	0.	139.1	2155.0
1	2120	257	0.	139.1	2155.0	*	2	2220	557	0.	139.1	2155.0	*	3	2320	857	0.	139.1	2155.0
1	2125	258	0.	139.1	2155.0	*	2	2225	558	0.	139.1	2155.0	*	3	2325	858	0.	139.1	2155.0
1	2130	259	0.	139.1	2155.0	*	2	2230	559	0.	139.1	2155.0	*	3	2330	859	0.	139.1	2155.0
1	2135	260	0.	139.1	2155.0	*	2	2235	560	0.	139.1	2155.0	*	3	2335	860	0.	139.1	2155.0
1	2140	261	0.	139.1	2155.0	*	2	2240	561	0.	139.1	2155.0	*	3	2340	861	0.	139.1	2155.0
1	2145	262	0.	139.1	2155.0	*	2	2245	562	0.	139.1	2155.0	*	3	2345	862	0.	139.1	2155.0
1	2150	263	0.	139.1	2155.0	*	2	2250	563	0.	139.1	2155.0	*	3	2350	863	0.	139.1	2155.0
1	2155	264	0.	139.1	2155.0	*	2	2255	564	0.	139.1	2155.0	*	3	2355	864	0.	139.1	2155.0
1	2200	265	0.	139.1	2155.0	*	2	2300	565	0.	139.1	2155.0	*	4	0000	865	0.	139.1	2155.0
1	2205	266	0.	139.1	2155.0	*	2	2305	566	0.	139.1	2155.0	*	4	0005	866	0.	139.1	2155.0
1	2210	267	0.	139.1	2155.0	*	2	2310	567	0.	139.1	2155.0	*	4	0010	867	0.	139.1	2155.0
1	2215	268	0.	139.1	2155.0	*	2	2315	568	0.	139.1	2155.0	*	4	0015	868	0.	139.1	2155.0
1	2220	269	0.	139.1	2155.0	*	2	2320	569	0.	139.1	2155.0	*	4	0020	869	0.	139.1	2155.0
1	2225	270	0.	139.1	2155.0	*	2	2325	570	0.	139.1	2155.0	*	4	0025	870	0.	139.1	2155.0
1	2230	271	0.	139.1	2155.0	*	2	2330	571	0.	139.1	2155.0	*	4	0030	871	0.	139.1	2155.0
1	2235	272	0.	139.1	2155.0	*	2	2335	572	0.	139.1	2155.0	*	4	0035	872	0.	139.1	2155.0
1	2240	273	0.	139.1	2155.0	*	2	2340	573	0.	139.1	2155.0	*	4	0040	873	0.	139.1	2155.0
1	2245	274	0.	139.1	2155.0	*	2	2345	574	0.	139.1	2155.0	*	4	0045	874	0.	139.1	2155.0
1	2250	275	0.	139.1	2155.0	*	2	2350	575	0.	139.1	2155.0	*	4	0050	875	0.	139.1	2155.0
1	2255	276	0.	139.1	2155.0	*	2	2355	576	0.	139.1	2155.0	*	4	0055	876	0.	139.1	2155.0
1	2300	277	0.	139.1	2155.0	*	3	0000	577	0.	139.1	2155.0	*	4	0100	877	0.	139.1	2155.0
1	2305	278	0.	139.1	2155.0	*	3	0005	578	0.	139.1	2155.0	*	4	0105	878	0.	139.1	2155.0
1	2310	279	0.	139.1	2155.0	*	3	0010	579	0.	139.1	2155.0	*	4	0110	879	0.	139.1	2155.0
1	2315	280	0.	139.1	2155.0	*	3	0015	580	0.	139.1	2155.0	*	4	0115	880	0.	139.1	2155.0
1	2320	281	0.	139.1	2155.0	*	3	0020	581	0.	139.1	2155.0	*	4	0120	881	0.	139.1	2155.0
1	2325	282	0.	139.1	2155.0	*	3	0025	582	0.	139.1	2155.0	*	4	0125	882	0.	139.1	2155.0
1	2330	283	0.	139.1	2155.0	*	3	0030	583	0.	139.1	2155.0	*	4	0130	883	0.	139.1	2155.0
1	2335	284	0.	139.1	2155.0	*	3	0035	584	0.	139.1	2155.0	*	4	0135	884	0.	139.1	2155.0
1	2340	285	0.	139.1	2155.0	*	3	0040	585	0.	139.1	2155.0	*	4	0140	885	0.	139.1	2155.0
1	2345	286	0.	139.1	2155.0	*	3	0045	586	0.	139.1	2155.0	*	4	0145	886	0.	139.1	2155.0
1	2350	287	0.	139.1	2155.0	*	3	0050	587	0.	139.1	2155.0	*	4	0150	887	0.	139.1	2155.0
1	2355	288	0.	139.1	2155.0	*	3	0055	588	0.	139.1	2155.0	*	4	0155	888	0.	139.1	2155.0
2	0000	289	0.	139.1	2155.0	*	3	0100	589	0.	139.1	2155.0	*	4	0200	889	0.	139.1	2155.0
2	0005	290	0.	139.1	2155.0	*	3	0105	590	0.	139.1	2155.0	*	4	0205	890	0.	139.1	2155.0
2	0010	291	0.	139.1	2155.0	*	3	0110	591	0.	139.1	2155.0	*	4	0210	891	0.	139.1	2155.0

2	0015	292	0.	139.1	2155.0	*	3	0115	592	0.	139.1	2155.0	*	4	0215	892	0.	139.1	2155.0
2	0020	293	0.	139.1	2155.0	*	3	0120	593	0.	139.1	2155.0	*	4	0220	893	0.	139.1	2155.0
2	0025	294	0.	139.1	2155.0	*	3	0125	594	0.	139.1	2155.0	*	4	0225	894	0.	139.1	2155.0
2	0030	295	0.	139.1	2155.0	*	3	0130	595	0.	139.1	2155.0	*	4	0230	895	0.	139.1	2155.0
2	0035	296	0.	139.1	2155.0	*	3	0135	596	0.	139.1	2155.0	*	4	0235	896	0.	139.1	2155.0
2	0040	297	0.	139.1	2155.0	*	3	0140	597	0.	139.1	2155.0	*	4	0240	897	0.	139.1	2155.0
2	0045	298	0.	139.1	2155.0	*	3	0145	598	0.	139.1	2155.0	*	4	0245	898	0.	139.1	2155.0
2	0050	299	0.	139.1	2155.0	*	3	0150	599	0.	139.1	2155.0	*	4	0250	899	0.	139.1	2155.0
2	0055	300	0.	139.1	2155.0	*	3	0155	600	0.	139.1	2155.0	*	4	0255	900	0.	139.1	2155.0

PEAK FLOW (CFS)	TIME (HR)		6-HR	24-HR	72-HR	74.92-HR
151.	5.67	(CFS)	38.	9.	3.	3.
		(INCHES)	0.282	0.282	0.282	0.282
		(AC-FT)	19.	19.	19.	19.
PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	24-HR	72-HR	74.92-HR
145.	5.67		141.	139.	137.	131.
PEAK STAGE (FEET)	TIME (HR)		6-HR	24-HR	72-HR	74.92-HR
2155.57	5.67		2155.14	2155.04	2154.69	2153.99

CUMULATIVE AREA = 1.24 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	SAC230	1078.	4.17	178.	45.	15.	0.72		
HYDROGRAPH AT	SAC235	532.	4.25	100.	25.	8.	0.38		
2 COMBINED AT	ADD	1608.	4.17	278.	70.	23.	1.10		
ROUTED TO	ROUTE	1552.	4.25	277.	70.	23.	1.10	13.22 4.25	
HYDROGRAPH AT	CAS240	275.	4.08	35.	9.	3.	0.14		
2 COMBINED AT	DAMIN	1769.	4.25	312.	79.	26.	1.24		
ROUTED TO	DAMOUT	151.	5.67	38.	9.	3.	1.24	2155.57 5.67	

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

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*****  
*  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
* MAY 1991 *  
* VERSION 4.0.1E *  
*  
* RUN DATE 02/02/1995 TIME 14:12:34 *  
*  
*****
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*****  
*  
* U.S. ARMY CORPS OF ENGINEERS *  
* HYDROLOGIC ENGINEERING CENTER *  
* 609 SECOND STREET *  
* DAVIS, CALIFORNIA 95616 *  
* (916) 756-1104 *  
*  
*****
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    X    X  XXXXXXX  XXXXX          X  
    X    X  X          X    X      XX  
    X    X  X          X          X  
XXXXXXX  XXXX  X          XXXXX  X  
    X    X  X          X          X  
    X    X  X          X    X      X  
    X    X  XXXXXXX  XXXXX          XXX
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.....  
: Full Microcomputer Implementation :  
: by :  
: Haestad Methods, Inc. :  
:.....  
:.....  
:.....
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
* FINAL 1/2 PMF RUN  HPM.HC1
*
*DIAGRAM
*
1  ID  Casandro Wash Detention Dam    CH2M Hill    August, 1994
2  ID  Copy of HEC-1 for Q100, changed precipitation
3  ID  Revised dam location and basin grading
* 1/2 PMF Run - routed
*
4  IT      5                900
5  IO      3
*
6  JR      FLOW      .5
*
7  KK  SAC230
8  KM  SUB-BASIN SAC230
9  KM  6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
10 KM  THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
11 KM  BASIN FROM WICKENBERG ADMS
12 BA   .720
13 IN   15
14 PB   15
15 KM  THE FOLLOWING PI RECORD USES A 6-HOUR STORM - HMR#5 DISTRIBUTION
16 PI  0.075  0.075  0.075  0.075  0.125  0.125  0.125  0.125  0.4  0.4
17 PI  0.4    0.4    8.4    1.7    0.7    0.7    0.2    0.2    0.2  0.2
18 PI  0.075  0.075  0.075  0.075
19 LG  .100    .250    5.200  .240  35.000
20 UC  .446    .367
21 UA  0      5      16     30     65     77     84     90     94     97
22 UA  100
*
23 KK  SAC235
24 KM  SUB-BASIN sac235
25 KM  6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
26 KM  THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
27 KM  BASIN FROM WICKENBERG ADMS
28 BA   .380
29 LG  .100    .230    6.200  .150  36.000
30 UC  .450    .461
31 UA  0      5      16     30     65     77     84     90     94     97
32 UA  100
*
33 KK  ADD
34 KM  ADD SAC230 & SAC235
35 HC  2
*

```

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
36	KK ROUTE
37	KM ROUTE COMBINED HYDROGRAPH TO DAM LOCATION
38	RS 1 FLOW -1
39	RC .045 .03 .045 4200 .0175
40	RX 463.5 467.5 477.5 487.5 512.5 522.5 532.5 536.5
41	RY 16.5 12.5 12.5 10.0 10.0 12.5 12.5 16.5
	*
42	KK CAS240
43	KM SUB-BASIN cas240
44	KM 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
45	KM THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
46	KM BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION
47	BA .140
48	LG .100 .210 6.400 .140 21.000
49	UC .258 .232
50	UA 0 5 16 30 65 77 84 90 94 97
51	UA 100
	*
52	KK DAMIN
53	KM ADD ROUTED HYDROGRAPH TO CAS240
54	KO 1
55	HC 2
	*
56	KK DAMOUT
57	KM Route Hydrograph Through Dam.
58	KM
59	RS 1 STOR 2
60	KO 1
	*
61	SA 2.05 2.49 5.80 6.77 9.06 10.20 10.96 11.34 11.61 11.88
62	SA 12.09 12.31 12.81 13.31 13.81
63	SE 2135 2137 2140 2144 2150 2153 2155 2156 2157 2158
64	SE 2159 2160 2161 2162 2163
65	SQ 0 9.5 13.5 19.1 23.3 28.6 30.9 295 823 1539
66	SQ 2423 3450 4577 5773 7015
	*
67	ZZ

SCHMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
7	SAC230	
	.	
23	.	SAC235
	.	.
33	ADD.....	.
	V	
	V	
36	ROUTE	
	.	
42	.	CAS240
	.	.
52	DAMIN.....	.
	V	
	V	
56	DAMOUT	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*       MAY 1991                *
*       VERSION 4.0.1E          *
*
* RUN DATE 02/02/1995 TIME 14:12:34 *
*
*****

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

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Casandro Wash Detention Dam CH2M Hill August, 1994
 Copy of HEC-1 for Q100, changed precipitation
 Revised dam location and basin grading

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5 IO  OUTPUT CONTROL VARIABLES
      IPRNT      3  PRINT CONTROL
      IPLOT      0  PLOT CONTROL
      QSCAL      0. HYDROGRAPH PLOT SCALE

IT   HYDROGRAPH TIME DATA
      NMIN      5  MINUTES IN COMPUTATION INTERVAL
      IDATE     1  0  STARTING DATE
      ITIME     0000 STARTING TIME
      NQ        900 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE    4  0  ENDING DATE
      NDTIME    0255 ENDING TIME
      ICENT     19  CENTURY MARK

      COMPUTATION INTERVAL 0.08 HOURS
      TOTAL TIME BASE     74.92 HOURS

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

```

JP   MULTI-PLAN OPTION
      NPLAN      1  NUMBER OF PLANS

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JR   MULTI-RATIO OPTION
      RATIOS OF RUNOFF
      0.50

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*****
*
* SAC230 *
*
*****

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SUB-BASIN SAC230
 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN

THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 BASIN FROM WICKENBERG ADMS
 THE FOLLOWING PI RECORD USES A 6-HOUR STORM - HMR#5 DISTRIBUTION

13 IN TIME DATA FOR INPUT TIME SERIES
 JXMIN 15 TIME INTERVAL IN MINUTES
 JXDATE 1 0 STARTING DATE
 JXTIME 0 STARTING TIME

SUBBASIN RUNOFF DATA

12 BA SUBBASIN CHARACTERISTICS
 TAREA 0.72 SUBBASIN AREA

PRECIPITATION DATA

15 PB STORM 15.00 BASIN TOTAL PRECIPITATION

15 PI INCREMENTAL PRECIPITATION PATTERN

0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.02
0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	2.80	2.80	2.80	2.80	0.57
0.57	0.57	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.07
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.02
0.03	0.02									

19 LG GREEN AND AMPT LOSS RATE
 STRL 0.10 STARTING LOSS
 DTH 0.25 MOISTURE DEFICIT
 PSIF 5.20 WETTING FRONT SUCTION
 XKSAT 0.24 HYDRAULIC CONDUCTIVITY
 RTIMP 35.00 PERCENT IMPERVIOUS AREA

20 UC CLARK UNITGRAPH
 TC 0.45 TIME OF CONCENTRATION
 R 0.37 STORAGE COEFFICIENT

21 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES

0.0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0	
100.0										

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.45 HR, R= 0.37 HR
 SNYDER TP= 0.29 HR, CP= 0.48

UNIT HYDROGRAPH
 26 END-OF-PERIOD ORDINATES

83.	383.	684.	750.	692.	597.	487.	387.	308.	246.
195.	156.	124.	99.	79.	62.	50.	40.	32.	25.
20.	16.	13.	10.	8.	6.				

HYDROGRAPH AT STATION SAC230
 FOR PLAN 1, RATIO = 0.50

TOTAL RAINFALL = 15.00, TOTAL LOSS = 1.64, TOTAL EXCESS = 13.36

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (INCHES)	74.92-HR (INCHES)
6516.	3.50	1028.	13.305	13.305	13.305
		13.275			

(AC-FT) 510. 511. 511. 511.

CUMULATIVE AREA = 0.72 SQ MI

*** **

HYDROGRAPH AT STATION SAC230
FOR PLAN 1, RATIO = 0.50

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.92-HR
3258.	3.50	(CFS) 514.	129.	43.	41.
		(INCHES) 6.637	6.652	6.652	6.652
		(AC-FT) 255.	255.	255.	255.

CUMULATIVE AREA = 0.72 SQ MI

*** **

* *
* SAC235 *
* *

SUB-BASIN sac235
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN FROM WICKENBERG ADMS

SUBBASIN RUNOFF DATA

28 BA SUBBASIN CHARACTERISTICS
TAREA 0.38 SUBBASIN AREA

PRECIPITATION DATA

15 PB STORM 15.00 BASIN TOTAL PRECIPITATION

15 PI INCREMENTAL PRECIPITATION PATTERN

0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.02
0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	2.80	2.80	2.80	0.57
0.57	0.57	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.07
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02
0.03	0.02								

29 LG GREEN AND AMPT LOSS RATE

STRTL	0.10	STARTING LOSS
DTH	0.23	MOISTURE DEFICIT
PSIF	6.20	WETTING FRONT SUCTION
XKSAT	0.15	HYDRAULIC CONDUCTIVITY
RTIMP	36.00	PERCENT IMPERVIOUS AREA

30 UC CLARK UNITGRAPH

TC	0.45	TIME OF CONCENTRATION
R	0.46	STORAGE COEFFICIENT

31 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES

0.0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
-----	-----	------	------	------	------	------	------	------	------

100.0

UNIT HYDROGRAPH PARAMETERS

CLARK TC= 0.45 HR, R= 0.46 HR
SNYDER TP= 0.31 HR, CP= 0.44

UNIT HYDROGRAPH
32 END-OF-PERIOD ORDINATES

35.	162.	298.	339.	324.	290.	248.	207.	172.	144.
120.	100.	84.	70.	58.	48.	40.	34.	28.	23.
20.	16.	14.	11.	9.	8.	7.	6.	5.	4.
3.	3.								

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

HYDROGRAPH AT STATION SAC235
FOR PLAN 1, RATIO = 0.50

TOTAL RAINFALL = 15.00, TOTAL LOSS = 1.32, TOTAL EXCESS = 13.68

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (CFS)
3076.	3.50	555.	13.570	275.	45.
		139.	13.617	276.	46.
		276.	13.617	276.	45.
		276.	13.617	276.	45.

CUMULATIVE AREA = 0.38 SQ MI

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

HYDROGRAPH AT STATION SAC235
FOR PLAN 1, RATIO = 0.50

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (CFS)
1538.	3.50	277.	6.785	138.	22.
		70.	6.808	138.	23.
		138.	6.808	138.	23.
		138.	6.808	138.	22.

CUMULATIVE AREA = 0.38 SQ MI

*** **

33 KK * *
* ADD *
* *

ADD SAC230 & SAC235

35 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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

HYDROGRAPH AT STATION ADD
FOR PLAN 1, RATIO = 0.50

HPM.OUT 2-2-95 2:13p

ICL4PRINT

PEAK FLOW (CFS) 4796.	TIME (HR) 3.50		MAXIMUM AVERAGE FLOW			
		(CFS)	6-HR	24-HR	72-HR	74.92-HR
		(INCHES)	791.	198.	66.	64.
		(AC-FT)	6.688	6.706	6.706	6.706
			392.	393.	393.	393.

CUMULATIVE AREA = 1.10 SQ MI

*** **

*
* ROUTE *
*

ROUTE COMBINED HYDROGRAPH TO DAM LOCATION

HYDROGRAPH ROUTING DATA

38 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP FLOW TYPE OF INITIAL CONDITION
RSVRIC -1.00 INITIAL CONDITION
X 0.00 WORKING R AND D COEFFICIENT

39 RC NORMAL DEPTH CHANNEL
ANL 0.045 LEFT OVERBANK N-VALUE
ANCH 0.030 MAIN CHANNEL N-VALUE
ANR 0.045 RIGHT OVERBANK N-VALUE
RLNTH 4200. REACH LENGTH
SEL 0.0175 ENERGY SLOPE
ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK ---	+	----- MAIN CHANNEL -----	+	--- RIGHT OVERBANK ---			
41 RY	ELEVATION	16.50	12.50	12.50	10.00	10.00	12.50	12.50	16.50
40 RX	DISTANCE	463.50	467.50	477.50	487.50	512.50	522.50	532.50	536.50

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.87	1.83	2.88	4.02	5.25	6.57	7.98	9.93	12.10
OUTFLOW	0.00	27.97	90.60	181.95	300.62	446.32	619.30	820.07	1082.86	1405.42
ELEVATION	10.00	10.34	10.68	11.03	11.37	11.71	12.05	12.39	12.74	13.08
STORAGE	14.29	16.51	18.75	21.01	23.29	25.60	27.93	30.28	32.65	35.05
OUTFLOW	1769.68	2172.41	2611.51	3085.39	3592.83	4132.80	4704.46	5307.08	5940.05	6602.82
ELEVATION	13.42	13.76	14.11	14.45	14.79	15.13	15.47	15.82	16.16	16.50

HYDROGRAPH AT STATION ROUTE
FOR PLAN 1, RATIO = 0.50

PEAK FLOW (CFS) 4700.	TIME (HR) 3.50		MAXIMUM AVERAGE FLOW			
		(CFS)	6-HR	24-HR	72-HR	74.92-HR
		(INCHES)	791.	198.	66.	64.
		(AC-FT)	6.682	6.706	6.706	6.706
			392.	393.	393.	393.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	74.92-HR
28.	3.50	6.	2.	1.	1.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	74.92-HR
15.47	3.50	11.66	10.42	10.14	10.14

CUMULATIVE AREA = 1.10 SQ MI

*** **

42 KK

* CAS240 *

SUB-BASIN cas240
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION

SUBBASIN RUNOFF DATA

47 BA SUBBASIN CHARACTERISTICS
TAREA 0.14 SUBBASIN AREA

PRECIPITATION DATA

15 PB STORM 15.00 BASIN TOTAL PRECIPITATION

15 PI INCREMENTAL PRECIPITATION PATTERN

0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.02
0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.04	0.04	0.04	0.04	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	2.80	2.80	2.80	0.57
0.57	0.57	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.07
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02
0.03	0.02								

48 LG GREEN AND AMPT LOSS RATE

STRTL	0.10	STARTING LOSS
DTH	0.21	MOISTURE DEFICIT
PSIF	6.40	WETTING FRONT SUCTION
XKSAT	0.14	HYDRAULIC CONDUCTIVITY
RTIMP	21.00	PERCENT IMPERVIOUS AREA

49 UC CLARK UNITGRAPH

TC	0.26	TIME OF CONCENTRATION
R	0.23	STORAGE COEFFICIENT

50 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES

0.0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
100.0									

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.26 HR, R= 0.23 HR
SNYDER TP= 0.19 HR, CP= 0.52

UNIT HYDROGRAPH
16 END-OF-PERIOD ORDINATES

63. 187. 231. 182. 128. 89. 62. 43. 30. 21.
15. 10. 7. 5. 3. 2.

*** **

HYDROGRAPH AT STATION CAS240
FOR PLAN 1, RATIO = 0.50

TOTAL RAINFALL = 15.00, TOTAL LOSS = 1.55, TOTAL EXCESS = 13.45

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (CFS)
1748.	3.33	201.	50.	17.	16.
		13.372	13.387	13.387	13.387
		100.	100.	100.	100.

CUMULATIVE AREA = 0.14 SQ MI

*** **

HYDROGRAPH AT STATION CAS240
FOR PLAN 1, RATIO = 0.50

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (CFS)
874.	3.33	101.	25.	8.	8.
		6.686	6.693	6.693	6.693
		50.	50.	50.	50.

CUMULATIVE AREA = 0.14 SQ MI

*** **

* *
* DAMIN *
* *

52 KK

ADD ROUTED HYDROGRAPH TO CAS240

54 KO

OUTPUT CONTROL VARIABLES

IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

55 HC

HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

HYDROGRAPH AT STATION DAMIN
SUM OF 2 HYDROGRAPHS
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		1845	226	0.	*	2		1330	451	0.	*	3		0815	676	0.
1		0005	2	0.	*	1		1850	227	0.	*	2		1335	452	0.	*	3		0820	677	0.
1		0010	3	1.	*	1		1855	228	0.	*	2		1340	453	0.	*	3		0825	678	0.
1		0015	4	3.	*	1		1900	229	0.	*	2		1345	454	0.	*	3		0830	679	0.
1		0020	5	5.	*	1		1905	230	0.	*	2		1350	455	0.	*	3		0835	680	0.
1		0025	6	7.	*	1		1910	231	0.	*	2		1355	456	0.	*	3		0840	681	0.
1		0030	7	10.	*	1		1915	232	0.	*	2		1400	457	0.	*	3		0845	682	0.
1		0035	8	13.	*	1		1920	233	0.	*	2		1405	458	0.	*	3		0850	683	0.
1		0040	9	16.	*	1		1925	234	0.	*	2		1410	459	0.	*	3		0855	684	0.
1		0045	10	19.	*	1		1930	235	0.	*	2		1415	460	0.	*	3		0900	685	0.
1		0050	11	22.	*	1		1935	236	0.	*	2		1420	461	0.	*	3		0905	686	0.
1		0055	12	24.	*	1		1940	237	0.	*	2		1425	462	0.	*	3		0910	687	0.
1		0100	13	26.	*	1		1945	238	0.	*	2		1430	463	0.	*	3		0915	688	0.
1		0105	14	28.	*	1		1950	239	0.	*	2		1435	464	0.	*	3		0920	689	0.
1		0110	15	31.	*	1		1955	240	0.	*	2		1440	465	0.	*	3		0925	690	0.
1		0115	16	34.	*	1		2000	241	0.	*	2		1445	466	0.	*	3		0930	691	0.
1		0120	17	39.	*	1		2005	242	0.	*	2		1450	467	0.	*	3		0935	692	0.
1		0125	18	43.	*	1		2010	243	0.	*	2		1455	468	0.	*	3		0940	693	0.
1		0130	19	47.	*	1		2015	244	0.	*	2		1500	469	0.	*	3		0945	694	0.
1		0135	20	50.	*	1		2020	245	0.	*	2		1505	470	0.	*	3		0950	695	0.
1		0140	21	53.	*	1		2025	246	0.	*	2		1510	471	0.	*	3		0955	696	0.
1		0145	22	55.	*	1		2030	247	0.	*	2		1515	472	0.	*	3		1000	697	0.
1		0150	23	58.	*	1		2035	248	0.	*	2		1520	473	0.	*	3		1005	698	0.
1		0155	24	60.	*	1		2040	249	0.	*	2		1525	474	0.	*	3		1010	699	0.
1		0200	25	62.	*	1		2045	250	0.	*	2		1530	475	0.	*	3		1015	700	0.
1		0205	26	67.	*	1		2050	251	0.	*	2		1535	476	0.	*	3		1020	701	0.
1		0210	27	83.	*	1		2055	252	0.	*	2		1540	477	0.	*	3		1025	702	0.
1		0215	28	111.	*	1		2100	253	0.	*	2		1545	478	0.	*	3		1030	703	0.
1		0220	29	152.	*	1		2105	254	0.	*	2		1550	479	0.	*	3		1035	704	0.
1		0225	30	200.	*	1		2110	255	0.	*	2		1555	480	0.	*	3		1040	705	0.
1		0230	31	249.	*	1		2115	256	0.	*	2		1600	481	0.	*	3		1045	706	0.
1		0235	32	296.	*	1		2120	257	0.	*	2		1605	482	0.	*	3		1050	707	0.
1		0240	33	336.	*	1		2125	258	0.	*	2		1610	483	0.	*	3		1055	708	0.
1		0245	34	371.	*	1		2130	259	0.	*	2		1615	484	0.	*	3		1100	709	0.
1		0250	35	400.	*	1		2135	260	0.	*	2		1620	485	0.	*	3		1105	710	0.
1		0255	36	423.	*	1		2140	261	0.	*	2		1625	486	0.	*	3		1110	711	0.
1		0300	37	442.	*	1		2145	262	0.	*	2		1630	487	0.	*	3		1115	712	0.
1		0305	38	586.	*	1		2150	263	0.	*	2		1635	488	0.	*	3		1120	713	0.
1		0310	39	1152.	*	1		2155	264	0.	*	2		1640	489	0.	*	3		1125	714	0.
1		0315	40	2270.	*	1		2200	265	0.	*	2		1645	490	0.	*	3		1130	715	0.
1		0320	41	3801.	*	1		2205	266	0.	*	2		1650	491	0.	*	3		1135	716	0.
1		0325	42	4989.	*	1		2210	267	0.	*	2		1655	492	0.	*	3		1140	717	0.
1		0330	43	5398.	*	1		2215	268	0.	*	2		1700	493	0.	*	3		1145	718	0.
1		0335	44	5240.	*	1		2220	269	0.	*	2		1705	494	0.	*	3		1150	719	0.
1		0340	45	4808.	*	1		2225	270	0.	*	2		1710	495	0.	*	3		1155	720	0.
1		0345	46	4259.	*	1		2230	271	0.	*	2		1715	496	0.	*	3		1200	721	0.
1		0350	47	3708.	*	1		2235	272	0.	*	2		1720	497	0.	*	3		1205	722	0.
1		0355	48	3221.	*	1		2240	273	0.	*	2		1725	498	0.	*	3		1210	723	0.
1		0400	49	2812.	*	1		2245	274	0.	*	2		1730	499	0.	*	3		1215	724	0.
1		0405	50	2470.	*	1		2250	275	0.	*	2		1735	500	0.	*	3		1220	725	0.
1		0410	51	2159.	*	1		2255	276	0.	*	2		1740	501	0.	*	3		1225	726	0.
1		0415	52	1864.	*	1		2300	277	0.	*	2		1745	502	0.	*	3		1230	727	0.
1		0420	53	1600.	*	1		2305	278	0.	*	2		1750	503	0.	*	3		1235	728	0.
1		0425	54	1364.	*	1		2310	279	0.	*	2		1755	504	0.	*	3		1240	729	0.
1		0430	55	1162.	*	1		2315	280	0.	*	2		1800	505	0.	*	3		1245	730	0.
1		0435	56	995.	*	1		2320	281	0.	*	2		1805	506	0.	*	3		1250	731	0.
1		0440	57	855.	*	1		2325	282	0.	*	2		1810	507	0.	*	3		1255	732	0.
1		0445	58	734.	*	1		2330	283	0.	*	2		1815	508	0.	*	3		1300	733	0.
1		0450	59	638.	*	1		2335	284	0.	*	2		1820	509	0.	*	3		1305	734	0.
1		0455	60	564.	*	1		2340	285	0.	*	2		1825	510	0.	*	3		1310	735	0.
1		0500	61	502.	*	1		2345	286	0.	*	2		1830	511	0.	*	3		1315	736	0.
1		0505	62	451.	*	1		2350	287	0.	*	2		1835	512	0.	*	3		1320	737	0.
1		0510	63	403.	*	1		2355	288	0.	*	2		1840	513	0.	*	3		1325	738	0.
1		0515	64	353.	*	2		0000	289	0.	*	2		1845	514	0.	*	3		1330	739	0.

1	0520	65	303.	*	2	0005	290	0.	*	2	1850	515	0.	*	3	1335	740	0.
1	0525	66	258.	*	2	0010	291	0.	*	2	1855	516	0.	*	3	1340	741	0.
1	0530	67	218.	*	2	0015	292	0.	*	2	1900	517	0.	*	3	1345	742	0.
1	0535	68	185.	*	2	0020	293	0.	*	2	1905	518	0.	*	3	1350	743	0.
1	0540	69	161.	*	2	0025	294	0.	*	2	1910	519	0.	*	3	1355	744	0.
1	0545	70	139.	*	2	0030	295	0.	*	2	1915	520	0.	*	3	1400	745	0.
1	0550	71	120.	*	2	0035	296	0.	*	2	1920	521	0.	*	3	1405	746	0.
1	0555	72	104.	*	2	0040	297	0.	*	2	1925	522	0.	*	3	1410	747	0.
1	0600	73	92.	*	2	0045	298	0.	*	2	1930	523	0.	*	3	1415	748	0.
1	0605	74	83.	*	2	0050	299	0.	*	2	1935	524	0.	*	3	1420	749	0.
1	0610	75	74.	*	2	0055	300	0.	*	2	1940	525	0.	*	3	1425	750	0.
1	0615	76	65.	*	2	0100	301	0.	*	2	1945	526	0.	*	3	1430	751	0.
1	0620	77	56.	*	2	0105	302	0.	*	2	1950	527	0.	*	3	1435	752	0.
1	0625	78	48.	*	2	0110	303	0.	*	2	1955	528	0.	*	3	1440	753	0.
1	0630	79	41.	*	2	0115	304	0.	*	2	2000	529	0.	*	3	1445	754	0.
1	0635	80	34.	*	2	0120	305	0.	*	2	2005	530	0.	*	3	1450	755	0.
1	0640	81	28.	*	2	0125	306	0.	*	2	2010	531	0.	*	3	1455	756	0.
1	0645	82	25.	*	2	0130	307	0.	*	2	2015	532	0.	*	3	1500	757	0.
1	0650	83	22.	*	2	0135	308	0.	*	2	2020	533	0.	*	3	1505	758	0.
1	0655	84	20.	*	2	0140	309	0.	*	2	2025	534	0.	*	3	1510	759	0.
1	0700	85	17.	*	2	0145	310	0.	*	2	2030	535	0.	*	3	1515	760	0.
1	0705	86	15.	*	2	0150	311	0.	*	2	2035	536	0.	*	3	1520	761	0.
1	0710	87	13.	*	2	0155	312	0.	*	2	2040	537	0.	*	3	1525	762	0.
1	0715	88	11.	*	2	0200	313	0.	*	2	2045	538	0.	*	3	1530	763	0.
1	0720	89	9.	*	2	0205	314	0.	*	2	2050	539	0.	*	3	1535	764	0.
1	0725	90	8.	*	2	0210	315	0.	*	2	2055	540	0.	*	3	1540	765	0.
1	0730	91	7.	*	2	0215	316	0.	*	2	2100	541	0.	*	3	1545	766	0.
1	0735	92	6.	*	2	0220	317	0.	*	2	2105	542	0.	*	3	1550	767	0.
1	0740	93	5.	*	2	0225	318	0.	*	2	2110	543	0.	*	3	1555	768	0.
1	0745	94	4.	*	2	0230	319	0.	*	2	2115	544	0.	*	3	1600	769	0.
1	0750	95	3.	*	2	0235	320	0.	*	2	2120	545	0.	*	3	1605	770	0.
1	0755	96	3.	*	2	0240	321	0.	*	2	2125	546	0.	*	3	1610	771	0.
1	0800	97	2.	*	2	0245	322	0.	*	2	2130	547	0.	*	3	1615	772	0.
1	0805	98	2.	*	2	0250	323	0.	*	2	2135	548	0.	*	3	1620	773	0.
1	0810	99	2.	*	2	0255	324	0.	*	2	2140	549	0.	*	3	1625	774	0.
1	0815	100	1.	*	2	0300	325	0.	*	2	2145	550	0.	*	3	1630	775	0.
1	0820	101	1.	*	2	0305	326	0.	*	2	2150	551	0.	*	3	1635	776	0.
1	0825	102	1.	*	2	0310	327	0.	*	2	2155	552	0.	*	3	1640	777	0.
1	0830	103	1.	*	2	0315	328	0.	*	2	2200	553	0.	*	3	1645	778	0.
1	0835	104	1.	*	2	0320	329	0.	*	2	2205	554	0.	*	3	1650	779	0.
1	0840	105	0.	*	2	0325	330	0.	*	2	2210	555	0.	*	3	1655	780	0.
1	0845	106	0.	*	2	0330	331	0.	*	2	2215	556	0.	*	3	1700	781	0.
1	0850	107	0.	*	2	0335	332	0.	*	2	2220	557	0.	*	3	1705	782	0.
1	0855	108	0.	*	2	0340	333	0.	*	2	2225	558	0.	*	3	1710	783	0.
1	0900	109	0.	*	2	0345	334	0.	*	2	2230	559	0.	*	3	1715	784	0.
1	0905	110	0.	*	2	0350	335	0.	*	2	2235	560	0.	*	3	1720	785	0.
1	0910	111	0.	*	2	0355	336	0.	*	2	2240	561	0.	*	3	1725	786	0.
1	0915	112	0.	*	2	0400	337	0.	*	2	2245	562	0.	*	3	1730	787	0.
1	0920	113	0.	*	2	0405	338	0.	*	2	2250	563	0.	*	3	1735	788	0.
1	0925	114	0.	*	2	0410	339	0.	*	2	2255	564	0.	*	3	1740	789	0.
1	0930	115	0.	*	2	0415	340	0.	*	2	2300	565	0.	*	3	1745	790	0.
1	0935	116	0.	*	2	0420	341	0.	*	2	2305	566	0.	*	3	1750	791	0.
1	0940	117	0.	*	2	0425	342	0.	*	2	2310	567	0.	*	3	1755	792	0.
1	0945	118	0.	*	2	0430	343	0.	*	2	2315	568	0.	*	3	1800	793	0.
1	0950	119	0.	*	2	0435	344	0.	*	2	2320	569	0.	*	3	1805	794	0.
1	0955	120	0.	*	2	0440	345	0.	*	2	2325	570	0.	*	3	1810	795	0.
1	1000	121	0.	*	2	0445	346	0.	*	2	2330	571	0.	*	3	1815	796	0.
1	1005	122	0.	*	2	0450	347	0.	*	2	2335	572	0.	*	3	1820	797	0.
1	1010	123	0.	*	2	0455	348	0.	*	2	2340	573	0.	*	3	1825	798	0.
1	1015	124	0.	*	2	0500	349	0.	*	2	2345	574	0.	*	3	1830	799	0.
1	1020	125	0.	*	2	0505	350	0.	*	2	2350	575	0.	*	3	1835	800	0.
1	1025	126	0.	*	2	0510	351	0.	*	2	2355	576	0.	*	3	1840	801	0.
1	1030	127	0.	*	2	0515	352	0.	*	3	0000	577	0.	*	3	1845	802	0.
1	1035	128	0.	*	2	0520	353	0.	*	3	0005	578	0.	*	3	1850	803	0.
1	1040	129	0.	*	2	0525	354	0.	*	3	0010	579	0.	*	3	1855	804	0.
1	1045	130	0.	*	2	0530	355	0.	*	3	0015	580	0.	*	3	1900	805	0.

1	1050	131	0.	*	2	0535	356	0.	*	3	0020	581	0.	*	3	1905	806	0.
1	1055	132	0.	*	2	0540	357	0.	*	3	0025	582	0.	*	3	1910	807	0.
1	1100	133	0.	*	2	0545	358	0.	*	3	0030	583	0.	*	3	1915	808	0.
1	1105	134	0.	*	2	0550	359	0.	*	3	0035	584	0.	*	3	1920	809	0.
1	1110	135	0.	*	2	0555	360	0.	*	3	0040	585	0.	*	3	1925	810	0.
1	1115	136	0.	*	2	0600	361	0.	*	3	0045	586	0.	*	3	1930	811	0.
1	1120	137	0.	*	2	0605	362	0.	*	3	0050	587	0.	*	3	1935	812	0.
1	1125	138	0.	*	2	0610	363	0.	*	3	0055	588	0.	*	3	1940	813	0.
1	1130	139	0.	*	2	0615	364	0.	*	3	0100	589	0.	*	3	1945	814	0.
1	1135	140	0.	*	2	0620	365	0.	*	3	0105	590	0.	*	3	1950	815	0.
1	1140	141	0.	*	2	0625	366	0.	*	3	0110	591	0.	*	3	1955	816	0.
1	1145	142	0.	*	2	0630	367	0.	*	3	0115	592	0.	*	3	2000	817	0.
1	1150	143	0.	*	2	0635	368	0.	*	3	0120	593	0.	*	3	2005	818	0.
1	1155	144	0.	*	2	0640	369	0.	*	3	0125	594	0.	*	3	2010	819	0.
1	1200	145	0.	*	2	0645	370	0.	*	3	0130	595	0.	*	3	2015	820	0.
1	1205	146	0.	*	2	0650	371	0.	*	3	0135	596	0.	*	3	2020	821	0.
1	1210	147	0.	*	2	0655	372	0.	*	3	0140	597	0.	*	3	2025	822	0.
1	1215	148	0.	*	2	0700	373	0.	*	3	0145	598	0.	*	3	2030	823	0.
1	1220	149	0.	*	2	0705	374	0.	*	3	0150	599	0.	*	3	2035	824	0.
1	1225	150	0.	*	2	0710	375	0.	*	3	0155	600	0.	*	3	2040	825	0.
1	1230	151	0.	*	2	0715	376	0.	*	3	0200	601	0.	*	3	2045	826	0.
1	1235	152	0.	*	2	0720	377	0.	*	3	0205	602	0.	*	3	2050	827	0.
1	1240	153	0.	*	2	0725	378	0.	*	3	0210	603	0.	*	3	2055	828	0.
1	1245	154	0.	*	2	0730	379	0.	*	3	0215	604	0.	*	3	2100	829	0.
1	1250	155	0.	*	2	0735	380	0.	*	3	0220	605	0.	*	3	2105	830	0.
1	1255	156	0.	*	2	0740	381	0.	*	3	0225	606	0.	*	3	2110	831	0.
1	1300	157	0.	*	2	0745	382	0.	*	3	0230	607	0.	*	3	2115	832	0.
1	1305	158	0.	*	2	0750	383	0.	*	3	0235	608	0.	*	3	2120	833	0.
1	1310	159	0.	*	2	0755	384	0.	*	3	0240	609	0.	*	3	2125	834	0.
1	1315	160	0.	*	2	0800	385	0.	*	3	0245	610	0.	*	3	2130	835	0.
1	1320	161	0.	*	2	0805	386	0.	*	3	0250	611	0.	*	3	2135	836	0.
1	1325	162	0.	*	2	0810	387	0.	*	3	0255	612	0.	*	3	2140	837	0.
1	1330	163	0.	*	2	0815	388	0.	*	3	0300	613	0.	*	3	2145	838	0.
1	1335	164	0.	*	2	0820	389	0.	*	3	0305	614	0.	*	3	2150	839	0.
1	1340	165	0.	*	2	0825	390	0.	*	3	0310	615	0.	*	3	2155	840	0.
1	1345	166	0.	*	2	0830	391	0.	*	3	0315	616	0.	*	3	2200	841	0.
1	1350	167	0.	*	2	0835	392	0.	*	3	0320	617	0.	*	3	2205	842	0.
1	1355	168	0.	*	2	0840	393	0.	*	3	0325	618	0.	*	3	2210	843	0.
1	1400	169	0.	*	2	0845	394	0.	*	3	0330	619	0.	*	3	2215	844	0.
1	1405	170	0.	*	2	0850	395	0.	*	3	0335	620	0.	*	3	2220	845	0.
1	1410	171	0.	*	2	0855	396	0.	*	3	0340	621	0.	*	3	2225	846	0.
1	1415	172	0.	*	2	0900	397	0.	*	3	0345	622	0.	*	3	2230	847	0.
1	1420	173	0.	*	2	0905	398	0.	*	3	0350	623	0.	*	3	2235	848	0.
1	1425	174	0.	*	2	0910	399	0.	*	3	0355	624	0.	*	3	2240	849	0.
1	1430	175	0.	*	2	0915	400	0.	*	3	0400	625	0.	*	3	2245	850	0.
1	1435	176	0.	*	2	0920	401	0.	*	3	0405	626	0.	*	3	2250	851	0.
1	1440	177	0.	*	2	0925	402	0.	*	3	0410	627	0.	*	3	2255	852	0.
1	1445	178	0.	*	2	0930	403	0.	*	3	0415	628	0.	*	3	2300	853	0.
1	1450	179	0.	*	2	0935	404	0.	*	3	0420	629	0.	*	3	2305	854	0.
1	1455	180	0.	*	2	0940	405	0.	*	3	0425	630	0.	*	3	2310	855	0.
1	1500	181	0.	*	2	0945	406	0.	*	3	0430	631	0.	*	3	2315	856	0.
1	1505	182	0.	*	2	0950	407	0.	*	3	0435	632	0.	*	3	2320	857	0.
1	1510	183	0.	*	2	0955	408	0.	*	3	0440	633	0.	*	3	2325	858	0.
1	1515	184	0.	*	2	1000	409	0.	*	3	0445	634	0.	*	3	2330	859	0.
1	1520	185	0.	*	2	1005	410	0.	*	3	0450	635	0.	*	3	2335	860	0.
1	1525	186	0.	*	2	1010	411	0.	*	3	0455	636	0.	*	3	2340	861	0.
1	1530	187	0.	*	2	1015	412	0.	*	3	0500	637	0.	*	3	2345	862	0.
1	1535	188	0.	*	2	1020	413	0.	*	3	0505	638	0.	*	3	2350	863	0.
1	1540	189	0.	*	2	1025	414	0.	*	3	0510	639	0.	*	3	2355	864	0.
1	1545	190	0.	*	2	1030	415	0.	*	3	0515	640	0.	*	4	0000	865	0.
1	1550	191	0.	*	2	1035	416	0.	*	3	0520	641	0.	*	4	0005	866	0.
1	1555	192	0.	*	2	1040	417	0.	*	3	0525	642	0.	*	4	0010	867	0.
1	1600	193	0.	*	2	1045	418	0.	*	3	0530	643	0.	*	4	0015	868	0.
1	1605	194	0.	*	2	1050	419	0.	*	3	0535	644	0.	*	4	0020	869	0.
1	1610	195	0.	*	2	1055	420	0.	*	3	0540	645	0.	*	4	0025	870	0.
1	1615	196	0.	*	2	1100	421	0.	*	3	0545	646	0.	*	4	0030	871	0.

1	1620	197	0.	*	2	1105	422	0.	*	3	0550	647	0.	*	4	0035	872	0.
1	1625	198	0.	*	2	1110	423	0.	*	3	0555	648	0.	*	4	0040	873	0.
1	1630	199	0.	*	2	1115	424	0.	*	3	0600	649	0.	*	4	0045	874	0.
1	1635	200	0.	*	2	1120	425	0.	*	3	0605	650	0.	*	4	0050	875	0.
1	1640	201	0.	*	2	1125	426	0.	*	3	0610	651	0.	*	4	0055	876	0.
1	1645	202	0.	*	2	1130	427	0.	*	3	0615	652	0.	*	4	0100	877	0.
1	1650	203	0.	*	2	1135	428	0.	*	3	0620	653	0.	*	4	0105	878	0.
1	1655	204	0.	*	2	1140	429	0.	*	3	0625	654	0.	*	4	0110	879	0.
1	1700	205	0.	*	2	1145	430	0.	*	3	0630	655	0.	*	4	0115	880	0.
1	1705	206	0.	*	2	1150	431	0.	*	3	0635	656	0.	*	4	0120	881	0.
1	1710	207	0.	*	2	1155	432	0.	*	3	0640	657	0.	*	4	0125	882	0.
1	1715	208	0.	*	2	1200	433	0.	*	3	0645	658	0.	*	4	0130	883	0.
1	1720	209	0.	*	2	1205	434	0.	*	3	0650	659	0.	*	4	0135	884	0.
1	1725	210	0.	*	2	1210	435	0.	*	3	0655	660	0.	*	4	0140	885	0.
1	1730	211	0.	*	2	1215	436	0.	*	3	0700	661	0.	*	4	0145	886	0.
1	1735	212	0.	*	2	1220	437	0.	*	3	0705	662	0.	*	4	0150	887	0.
1	1740	213	0.	*	2	1225	438	0.	*	3	0710	663	0.	*	4	0155	888	0.
1	1745	214	0.	*	2	1230	439	0.	*	3	0715	664	0.	*	4	0200	889	0.
1	1750	215	0.	*	2	1235	440	0.	*	3	0720	665	0.	*	4	0205	890	0.
1	1755	216	0.	*	2	1240	441	0.	*	3	0725	666	0.	*	4	0210	891	0.
1	1800	217	0.	*	2	1245	442	0.	*	3	0730	667	0.	*	4	0215	892	0.
1	1805	218	0.	*	2	1250	443	0.	*	3	0735	668	0.	*	4	0220	893	0.
1	1810	219	0.	*	2	1255	444	0.	*	3	0740	669	0.	*	4	0225	894	0.
1	1815	220	0.	*	2	1300	445	0.	*	3	0745	670	0.	*	4	0230	895	0.
1	1820	221	0.	*	2	1305	446	0.	*	3	0750	671	0.	*	4	0235	896	0.
1	1825	222	0.	*	2	1310	447	0.	*	3	0755	672	0.	*	4	0240	897	0.
1	1830	223	0.	*	2	1315	448	0.	*	3	0800	673	0.	*	4	0245	898	0.
1	1835	224	0.	*	2	1320	449	0.	*	3	0805	674	0.	*	4	0250	899	0.
1	1840	225	0.	*	2	1325	450	0.	*	3	0810	675	0.	*	4	0255	900	0.

PEAK FLOW (CFS)	TIME (HR)		6-HR 24-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	74.92-HR
5398.	3.50	(CFS)	891.	224.	75.	72.
		(INCHES)	6.681	6.705	6.705	6.705
		(AC-FT)	442.	443.	443.	443.

CUMULATIVE AREA = 1.24 SQ MI

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* *
56 KK * DAMOUT *
* *

Route Hydrograph Through Dam.

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

HYDROGRAPH ROUTING DATA

59 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP STOR TYPE OF INITIAL CONDITION
RSVRIC 2.00 INITIAL CONDITION
X 0.00 WORKING R AND D COEFFICIENT

HPM.OUT 2-2-95 2:13p

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61 SA	AREA	2.0 12.1	2.5 12.3	5.8 12.8	6.8 13.3	9.1 13.8	10.2	11.0	11.3	11.6	11.9
63 SE	ELEVATION	2135.00 2159.00	2137.00 2160.00	2140.00 2161.00	2144.00 2162.00	2150.00 2163.00	2153.00	2155.00	2156.00	2157.00	2158.00
65 SQ	DISCHARGE	0. 2423.	10. 3450.	14. 4577.	19. 5773.	23. 7015.	29.	31.	295.	823.	1539.

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	4.53	16.62	41.74	89.06	117.93	139.09	150.24	161.71	173.46
ELEVATION	2135.00	2137.00	2140.00	2144.00	2150.00	2153.00	2155.00	2156.00	2157.00	2158.00
STORAGE	185.44	197.64	210.20	223.26	236.82					
ELEVATION	2159.00	2160.00	2161.00	2162.00	2163.00					

HYDROGRAPH AT STATION DAMOUT
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	4.	2.0	2135.9	*	2		0100	301	25.	98.4	2151.0	*	3		0200	601	20.	52.7	2145.4
1		0005	2	4.	2.0	2135.9	*	2		0105	302	25.	98.2	2151.0	*	3		0205	602	20.	52.6	2145.4
1		0010	3	4.	1.9	2135.9	*	2		0110	303	25.	98.0	2150.9	*	3		0210	603	20.	52.4	2145.4
1		0015	4	4.	1.9	2135.9	*	2		0115	304	25.	97.9	2150.9	*	3		0215	604	20.	52.3	2145.3
1		0020	5	4.	1.9	2135.9	*	2		0120	305	25.	97.7	2150.9	*	3		0220	605	20.	52.2	2145.3
1		0025	6	4.	1.9	2135.9	*	2		0125	306	25.	97.5	2150.9	*	3		0225	606	20.	52.0	2145.3
1		0030	7	4.	2.0	2135.9	*	2		0130	307	25.	97.4	2150.9	*	3		0230	607	20.	51.9	2145.3
1		0035	8	4.	2.0	2135.9	*	2		0135	308	25.	97.2	2150.8	*	3		0235	608	20.	51.7	2145.3
1		0040	9	4.	2.1	2135.9	*	2		0140	309	25.	97.0	2150.8	*	3		0240	609	20.	51.6	2145.3
1		0045	10	5.	2.2	2136.0	*	2		0145	310	25.	96.9	2150.8	*	3		0245	610	20.	51.5	2145.2
1		0050	11	5.	2.3	2136.0	*	2		0150	311	25.	96.7	2150.8	*	3		0250	611	20.	51.3	2145.2
1		0055	12	5.	2.4	2136.1	*	2		0155	312	25.	96.5	2150.8	*	3		0255	612	20.	51.2	2145.2
1		0100	13	5.	2.6	2136.1	*	2		0200	313	25.	96.3	2150.8	*	3		0300	613	20.	51.1	2145.2
1		0105	14	6.	2.7	2136.2	*	2		0205	314	25.	96.2	2150.7	*	3		0305	614	20.	50.9	2145.2
1		0110	15	6.	2.9	2136.3	*	2		0210	315	25.	96.0	2150.7	*	3		0310	615	20.	50.8	2145.1
1		0115	16	6.	3.1	2136.3	*	2		0215	316	25.	95.8	2150.7	*	3		0315	616	20.	50.6	2145.1
1		0120	17	7.	3.3	2136.4	*	2		0220	317	25.	95.7	2150.7	*	3		0320	617	20.	50.5	2145.1
1		0125	18	7.	3.5	2136.5	*	2		0225	318	24.	95.5	2150.7	*	3		0325	618	20.	50.4	2145.1
1		0130	19	8.	3.7	2136.7	*	2		0230	319	24.	95.3	2150.7	*	3		0330	619	20.	50.2	2145.1
1		0135	20	8.	4.0	2136.8	*	2		0235	320	24.	95.2	2150.6	*	3		0335	620	20.	50.1	2145.1
1		0140	21	9.	4.3	2136.9	*	2		0240	321	24.	95.0	2150.6	*	3		0340	621	20.	50.0	2145.0
1		0145	22	10.	4.6	2137.0	*	2		0245	322	24.	94.8	2150.6	*	3		0345	622	20.	49.8	2145.0
1		0150	23	10.	4.9	2137.1	*	2		0250	323	24.	94.7	2150.6	*	3		0350	623	20.	49.7	2145.0
1		0155	24	10.	5.3	2137.2	*	2		0255	324	24.	94.5	2150.6	*	3		0355	624	20.	49.5	2145.0
1		0200	25	10.	5.6	2137.3	*	2		0300	325	24.	94.3	2150.5	*	3		0400	625	20.	49.4	2145.0
1		0205	26	10.	6.0	2137.4	*	2		0305	326	24.	94.2	2150.5	*	3		0405	626	20.	49.3	2145.0
1		0210	27	10.	6.5	2137.5	*	2		0310	327	24.	94.0	2150.5	*	3		0410	627	20.	49.1	2144.9
1		0215	28	10.	7.1	2137.6	*	2		0315	328	24.	93.8	2150.5	*	3		0415	628	20.	49.0	2144.9
1		0220	29	11.	7.9	2137.8	*	2		0320	329	24.	93.7	2150.5	*	3		0420	629	20.	48.9	2144.9
1		0225	30	11.	9.0	2138.1	*	2		0325	330	24.	93.5	2150.5	*	3		0425	630	20.	48.7	2144.9
1		0230	31	11.	10.5	2138.5	*	2		0330	331	24.	93.3	2150.4	*	3		0430	631	20.	48.6	2144.9
1		0235	32	12.	12.3	2138.9	*	2		0335	332	24.	93.2	2150.4	*	3		0435	632	20.	48.5	2144.9
1		0240	33	13.	14.4	2139.4	*	2		0340	333	24.	93.0	2150.4	*	3		0440	633	20.	48.3	2144.8
1		0245	34	14.	16.7	2140.0	*	2		0345	334	24.	92.8	2150.4	*	3		0445	634	20.	48.2	2144.8
1		0250	35	14.	19.3	2140.4	*	2		0350	335	24.	92.7	2150.4	*	3		0450	635	20.	48.1	2144.8
1		0255	36	15.	22.0	2140.9	*	2		0355	336	24.	92.5	2150.4	*	3		0455	636	20.	47.9	2144.8
1		0300	37	15.	24.9	2141.3	*	2		0400	337	24.	92.3	2150.3	*	3		0500	637	20.	47.8	2144.8

1	0305	38	16.	28.3	2141.9	*	2	0405	338	24.	92.2	2150.3	*	3	0505	638	20.	47.6	2144.7
1	0310	39	17.	34.2	2142.8	*	2	0410	339	24.	92.0	2150.3	*	3	0510	639	20.	47.5	2144.7
1	0315	40	19.	45.9	2144.5	*	2	0415	340	24.	91.8	2150.3	*	3	0515	640	20.	47.4	2144.7
1	0320	41	21.	66.6	2147.2	*	2	0420	341	24.	91.7	2150.3	*	3	0520	641	20.	47.2	2144.7
1	0325	42	25.	96.7	2150.8	*	2	0425	342	24.	91.5	2150.3	*	3	0525	642	20.	47.1	2144.7
1	0330	43	30.	132.3	2154.4	*	2	0430	343	24.	91.3	2150.2	*	3	0530	643	20.	47.0	2144.7
1	0335	44	1040.	165.3	2157.3	*	2	0435	344	24.	91.2	2150.2	*	3	0535	644	20.	46.8	2144.6
1	0340	45	2586.	187.4	2159.2	*	2	0440	345	24.	91.0	2150.2	*	3	0540	645	20.	46.7	2144.6
1	0345	46	3462.	197.8	2160.0	*	2	0445	346	24.	90.9	2150.2	*	3	0545	646	20.	46.6	2144.6
1	0350	47	3708.	200.5	2160.2	*	2	0450	347	24.	90.7	2150.2	*	3	0550	647	20.	46.4	2144.6
1	0355	48	3593.	199.2	2160.1	*	2	0455	348	24.	90.5	2150.2	*	3	0555	648	20.	46.3	2144.6
1	0400	49	3327.	196.2	2159.9	*	2	0500	349	24.	90.4	2150.1	*	3	0600	649	19.	46.2	2144.6
1	0405	50	3019.	192.5	2159.6	*	2	0505	350	24.	90.2	2150.1	*	3	0605	650	19.	46.0	2144.5
1	0410	51	2702.	188.8	2159.3	*	2	0510	351	23.	90.0	2150.1	*	3	0610	651	19.	45.9	2144.5
1	0415	52	2395.	185.1	2159.0	*	2	0515	352	23.	89.9	2150.1	*	3	0615	652	19.	45.8	2144.5
1	0420	53	2126.	181.4	2158.7	*	2	0520	353	23.	89.7	2150.1	*	3	0620	653	19.	45.6	2144.5
1	0425	54	1865.	177.9	2158.4	*	2	0525	354	23.	89.6	2150.1	*	3	0625	654	19.	45.5	2144.5
1	0430	55	1621.	174.6	2158.1	*	2	0530	355	23.	89.4	2150.0	*	3	0630	655	19.	45.4	2144.5
1	0435	56	1421.	171.5	2157.8	*	2	0535	356	23.	89.2	2150.0	*	3	0635	656	19.	45.2	2144.4
1	0440	57	1249.	168.7	2157.6	*	2	0540	357	23.	89.1	2150.0	*	3	0640	657	19.	45.1	2144.4
1	0445	58	1091.	166.1	2157.4	*	2	0545	358	23.	88.9	2150.0	*	3	0645	658	19.	45.0	2144.4
1	0450	59	951.	163.8	2157.2	*	2	0550	359	23.	88.8	2150.0	*	3	0650	659	19.	44.8	2144.4
1	0455	60	829.	161.8	2157.0	*	2	0555	360	23.	88.6	2149.9	*	3	0655	660	19.	44.7	2144.4
1	0500	61	747.	160.1	2156.9	*	2	0600	361	23.	88.4	2149.9	*	3	0700	661	19.	44.6	2144.4
1	0505	62	673.	158.5	2156.7	*	2	0605	362	23.	88.3	2149.9	*	3	0705	662	19.	44.4	2144.3
1	0510	63	606.	157.0	2156.6	*	2	0610	363	23.	88.1	2149.9	*	3	0710	663	19.	44.3	2144.3
1	0515	64	544.	155.6	2156.5	*	2	0615	364	23.	88.0	2149.9	*	3	0715	664	19.	44.2	2144.3
1	0520	65	485.	154.4	2156.4	*	2	0620	365	23.	87.8	2149.8	*	3	0720	665	19.	44.0	2144.3
1	0525	66	429.	153.1	2156.3	*	2	0625	366	23.	87.6	2149.8	*	3	0725	666	19.	43.9	2144.3
1	0530	67	376.	152.0	2156.2	*	2	0630	367	23.	87.5	2149.8	*	3	0730	667	19.	43.8	2144.3
1	0535	68	329.	151.0	2156.1	*	2	0635	368	23.	87.3	2149.8	*	3	0735	668	19.	43.6	2144.2
1	0540	69	290.	150.0	2156.0	*	2	0640	369	23.	87.2	2149.8	*	3	0740	669	19.	43.5	2144.2
1	0545	70	269.	149.1	2155.9	*	2	0645	370	23.	87.0	2149.7	*	3	0745	670	19.	43.4	2144.2
1	0550	71	248.	148.3	2155.8	*	2	0650	371	23.	86.8	2149.7	*	3	0750	671	19.	43.2	2144.2
1	0555	72	228.	147.4	2155.7	*	2	0655	372	23.	86.7	2149.7	*	3	0755	672	19.	43.1	2144.2
1	0600	73	208.	146.6	2155.7	*	2	0700	373	23.	86.5	2149.7	*	3	0800	673	19.	43.0	2144.2
1	0605	74	190.	145.8	2155.6	*	2	0705	374	23.	86.4	2149.7	*	3	0805	674	19.	42.8	2144.1
1	0610	75	173.	145.1	2155.5	*	2	0710	375	23.	86.2	2149.6	*	3	0810	675	19.	42.7	2144.1
1	0615	76	157.	144.4	2155.5	*	2	0715	376	23.	86.0	2149.6	*	3	0815	676	19.	42.6	2144.1
1	0620	77	143.	143.8	2155.4	*	2	0720	377	23.	85.9	2149.6	*	3	0820	677	19.	42.4	2144.1
1	0625	78	129.	143.2	2155.4	*	2	0725	378	23.	85.7	2149.6	*	3	0825	678	19.	42.3	2144.1
1	0630	79	116.	142.7	2155.3	*	2	0730	379	23.	85.6	2149.6	*	3	0830	679	19.	42.2	2144.1
1	0635	80	104.	142.2	2155.3	*	2	0735	380	23.	85.4	2149.5	*	3	0835	680	19.	42.0	2144.0
1	0640	81	93.	141.7	2155.2	*	2	0740	381	23.	85.3	2149.5	*	3	0840	681	19.	41.9	2144.0
1	0645	82	83.	141.3	2155.2	*	2	0745	382	23.	85.1	2149.5	*	3	0845	682	19.	41.8	2144.0
1	0650	83	74.	140.9	2155.2	*	2	0750	383	23.	84.9	2149.5	*	3	0850	683	19.	41.6	2144.0
1	0655	84	66.	140.6	2155.1	*	2	0755	384	23.	84.8	2149.5	*	3	0855	684	19.	41.5	2144.0
1	0700	85	59.	140.3	2155.1	*	2	0800	385	23.	84.6	2149.4	*	3	0900	685	19.	41.4	2143.9
1	0705	86	53.	140.0	2155.1	*	2	0805	386	23.	84.5	2149.4	*	3	0905	686	19.	41.3	2143.9
1	0710	87	47.	139.8	2155.1	*	2	0810	387	23.	84.3	2149.4	*	3	0910	687	19.	41.1	2143.9
1	0715	88	41.	139.5	2155.0	*	2	0815	388	23.	84.2	2149.4	*	3	0915	688	19.	41.0	2143.9
1	0720	89	37.	139.3	2155.0	*	2	0820	389	23.	84.0	2149.4	*	3	0920	689	19.	40.9	2143.9
1	0725	90	33.	139.2	2155.0	*	2	0825	390	23.	83.8	2149.3	*	3	0925	690	19.	40.7	2143.8
1	0730	91	31.	139.0	2155.0	*	2	0830	391	23.	83.7	2149.3	*	3	0930	691	19.	40.6	2143.8
1	0735	92	31.	138.8	2155.0	*	2	0835	392	23.	83.5	2149.3	*	3	0935	692	19.	40.5	2143.8
1	0740	93	31.	138.6	2155.0	*	2	0840	393	23.	83.4	2149.3	*	3	0940	693	19.	40.3	2143.8
1	0745	94	31.	138.5	2154.9	*	2	0845	394	23.	83.2	2149.3	*	3	0945	694	19.	40.2	2143.8
1	0750	95	31.	138.3	2154.9	*	2	0850	395	23.	83.1	2149.2	*	3	0950	695	19.	40.1	2143.7
1	0755	96	31.	138.1	2154.9	*	2	0855	396	23.	82.9	2149.2	*	3	0955	696	19.	40.0	2143.7
1	0800	97	31.	137.9	2154.9	*	2	0900	397	23.	82.7	2149.2	*	3	1000	697	19.	39.8	2143.7
1	0805	98	31.	137.7	2154.9	*	2	0905	398	23.	82.6	2149.2	*	3	1005	698	19.	39.7	2143.7
1	0810	99	31.	137.5	2154.8	*	2	0910	399	23.	82.4	2149.2	*	3	1010	699	19.	39.6	2143.7
1	0815	100	31.	137.3	2154.8	*	2	0915	400	23.	82.3	2149.1	*	3	1015	700	19.	39.4	2143.6
1	0820	101	31.	137.1	2154.8	*	2	0920	401	23.	82.1	2149.1	*	3	1020	701	19.	39.3	2143.6
1	0825	102	31.	136.9	2154.8	*	2	0925	402	23.	82.0	2149.1	*	3	1025	702	19.	39.2	2143.6
1	0830	103	31.	136.7	2154.8	*	2	0930	403	23.	81.8	2149.1	*	3	1030	703	19.	39.1	2143.6

1	0835	104	31.	136.5	2154.8	*	2	0935	404	23.	81.6	2149.1	*	3	1035	704	18.	38.9	2143.6
1	0840	105	31.	136.3	2154.7	*	2	0940	405	23.	81.5	2149.0	*	3	1040	705	18.	38.8	2143.5
1	0845	106	31.	136.1	2154.7	*	2	0945	406	23.	81.3	2149.0	*	3	1045	706	18.	38.7	2143.5
1	0850	107	31.	135.8	2154.7	*	2	0950	407	23.	81.2	2149.0	*	3	1050	707	18.	38.6	2143.5
1	0855	108	31.	135.6	2154.7	*	2	0955	408	23.	81.0	2149.0	*	3	1055	708	18.	38.4	2143.5
1	0900	109	31.	135.4	2154.7	*	2	1000	409	23.	80.9	2149.0	*	3	1100	709	18.	38.3	2143.5
1	0905	110	30.	135.2	2154.6	*	2	1005	410	23.	80.7	2148.9	*	3	1105	710	18.	38.2	2143.4
1	0910	111	30.	135.0	2154.6	*	2	1010	411	23.	80.6	2148.9	*	3	1110	711	18.	38.0	2143.4
1	0915	112	30.	134.8	2154.6	*	2	1015	412	23.	80.4	2148.9	*	3	1115	712	18.	37.9	2143.4
1	0920	113	30.	134.6	2154.6	*	2	1020	413	23.	80.2	2148.9	*	3	1120	713	18.	37.8	2143.4
1	0925	114	30.	134.4	2154.6	*	2	1025	414	23.	80.1	2148.9	*	3	1125	714	18.	37.7	2143.4
1	0930	115	30.	134.2	2154.5	*	2	1030	415	22.	79.9	2148.8	*	3	1130	715	18.	37.5	2143.3
1	0935	116	30.	134.0	2154.5	*	2	1035	416	22.	79.8	2148.8	*	3	1135	716	18.	37.4	2143.3
1	0940	117	30.	133.8	2154.5	*	2	1040	417	22.	79.6	2148.8	*	3	1140	717	18.	37.3	2143.3
1	0945	118	30.	133.5	2154.5	*	2	1045	418	22.	79.5	2148.8	*	3	1145	718	18.	37.2	2143.3
1	0950	119	30.	133.3	2154.5	*	2	1050	419	22.	79.3	2148.8	*	3	1150	719	18.	37.0	2143.3
1	0955	120	30.	133.1	2154.4	*	2	1055	420	22.	79.2	2148.7	*	3	1155	720	18.	36.9	2143.2
1	1000	121	30.	132.9	2154.4	*	2	1100	421	22.	79.0	2148.7	*	3	1200	721	18.	36.8	2143.2
1	1005	122	30.	132.7	2154.4	*	2	1105	422	22.	78.9	2148.7	*	3	1205	722	18.	36.7	2143.2
1	1010	123	30.	132.5	2154.4	*	2	1110	423	22.	78.7	2148.7	*	3	1210	723	18.	36.5	2143.2
1	1015	124	30.	132.3	2154.4	*	2	1115	424	22.	78.5	2148.7	*	3	1215	724	18.	36.4	2143.2
1	1020	125	30.	132.1	2154.3	*	2	1120	425	22.	78.4	2148.6	*	3	1220	725	18.	36.3	2143.1
1	1025	126	30.	131.9	2154.3	*	2	1125	426	22.	78.2	2148.6	*	3	1225	726	18.	36.2	2143.1
1	1030	127	30.	131.7	2154.3	*	2	1130	427	22.	78.1	2148.6	*	3	1230	727	18.	36.1	2143.1
1	1035	128	30.	131.5	2154.3	*	2	1135	428	22.	77.9	2148.6	*	3	1235	728	18.	35.9	2143.1
1	1040	129	30.	131.3	2154.3	*	2	1140	429	22.	77.8	2148.6	*	3	1240	729	18.	35.8	2143.1
1	1045	130	30.	131.1	2154.2	*	2	1145	430	22.	77.6	2148.5	*	3	1245	730	18.	35.7	2143.0
1	1050	131	30.	130.8	2154.2	*	2	1150	431	22.	77.5	2148.5	*	3	1250	731	18.	35.6	2143.0
1	1055	132	30.	130.6	2154.2	*	2	1155	432	22.	77.3	2148.5	*	3	1255	732	18.	35.4	2143.0
1	1100	133	30.	130.4	2154.2	*	2	1200	433	22.	77.2	2148.5	*	3	1300	733	18.	35.3	2143.0
1	1105	134	30.	130.2	2154.2	*	2	1205	434	22.	77.0	2148.5	*	3	1305	734	18.	35.2	2143.0
1	1110	135	30.	130.0	2154.1	*	2	1210	435	22.	76.9	2148.5	*	3	1310	735	18.	35.1	2142.9
1	1115	136	30.	129.8	2154.1	*	2	1215	436	22.	76.7	2148.4	*	3	1315	736	18.	35.0	2142.9
1	1120	137	30.	129.6	2154.1	*	2	1220	437	22.	76.6	2148.4	*	3	1320	737	18.	34.8	2142.9
1	1125	138	30.	129.4	2154.1	*	2	1225	438	22.	76.4	2148.4	*	3	1325	738	18.	34.7	2142.9
1	1130	139	30.	129.2	2154.1	*	2	1230	439	22.	76.2	2148.4	*	3	1330	739	18.	34.6	2142.9
1	1135	140	30.	129.0	2154.0	*	2	1235	440	22.	76.1	2148.4	*	3	1335	740	17.	34.5	2142.8
1	1140	141	30.	128.8	2154.0	*	2	1240	441	22.	75.9	2148.3	*	3	1340	741	17.	34.4	2142.8
1	1145	142	30.	128.6	2154.0	*	2	1245	442	22.	75.8	2148.3	*	3	1345	742	17.	34.2	2142.8
1	1150	143	30.	128.4	2154.0	*	2	1250	443	22.	75.6	2148.3	*	3	1350	743	17.	34.1	2142.8
1	1155	144	30.	128.2	2154.0	*	2	1255	444	22.	75.5	2148.3	*	3	1355	744	17.	34.0	2142.8
1	1200	145	30.	128.0	2153.9	*	2	1300	445	22.	75.3	2148.3	*	3	1400	745	17.	33.9	2142.7
1	1205	146	30.	127.8	2153.9	*	2	1305	446	22.	75.2	2148.2	*	3	1405	746	17.	33.8	2142.7
1	1210	147	30.	127.6	2153.9	*	2	1310	447	22.	75.0	2148.2	*	3	1410	747	17.	33.6	2142.7
1	1215	148	30.	127.4	2153.9	*	2	1315	448	22.	74.9	2148.2	*	3	1415	748	17.	33.5	2142.7
1	1220	149	30.	127.2	2153.9	*	2	1320	449	22.	74.7	2148.2	*	3	1420	749	17.	33.4	2142.7
1	1225	150	30.	126.9	2153.9	*	2	1325	450	22.	74.6	2148.2	*	3	1425	750	17.	33.3	2142.7
1	1230	151	30.	126.7	2153.8	*	2	1330	451	22.	74.4	2148.1	*	3	1430	751	17.	33.2	2142.6
1	1235	152	30.	126.5	2153.8	*	2	1335	452	22.	74.3	2148.1	*	3	1435	752	17.	33.0	2142.6
1	1240	153	30.	126.3	2153.8	*	2	1340	453	22.	74.1	2148.1	*	3	1440	753	17.	32.9	2142.6
1	1245	154	29.	126.1	2153.8	*	2	1345	454	22.	74.0	2148.1	*	3	1445	754	17.	32.8	2142.6
1	1250	155	29.	125.9	2153.8	*	2	1350	455	22.	73.8	2148.1	*	3	1450	755	17.	32.7	2142.6
1	1255	156	29.	125.7	2153.7	*	2	1355	456	22.	73.7	2148.0	*	3	1455	756	17.	32.6	2142.5
1	1300	157	29.	125.5	2153.7	*	2	1400	457	22.	73.5	2148.0	*	3	1500	757	17.	32.5	2142.5
1	1305	158	29.	125.3	2153.7	*	2	1405	458	22.	73.4	2148.0	*	3	1505	758	17.	32.3	2142.5
1	1310	159	29.	125.1	2153.7	*	2	1410	459	22.	73.2	2148.0	*	3	1510	759	17.	32.2	2142.5
1	1315	160	29.	124.9	2153.7	*	2	1415	460	22.	73.1	2148.0	*	3	1515	760	17.	32.1	2142.5
1	1320	161	29.	124.7	2153.6	*	2	1420	461	22.	72.9	2148.0	*	3	1520	761	17.	32.0	2142.4
1	1325	162	29.	124.5	2153.6	*	2	1425	462	22.	72.8	2147.9	*	3	1525	762	17.	31.9	2142.4
1	1330	163	29.	124.3	2153.6	*	2	1430	463	22.	72.6	2147.9	*	3	1530	763	17.	31.8	2142.4
1	1335	164	29.	124.1	2153.6	*	2	1435	464	22.	72.5	2147.9	*	3	1535	764	17.	31.6	2142.4
1	1340	165	29.	123.9	2153.6	*	2	1440	465	22.	72.3	2147.9	*	3	1540	765	17.	31.5	2142.4
1	1345	166	29.	123.7	2153.5	*	2	1445	466	22.	72.2	2147.9	*	3	1545	766	17.	31.4	2142.4
1	1350	167	29.	123.5	2153.5	*	2	1450	467	22.	72.0	2147.8	*	3	1550	767	17.	31.3	2142.3
1	1355	168	29.	123.3	2153.5	*	2	1455	468	22.	71.9	2147.8	*	3	1555	768	17.	31.2	2142.3
1	1400	169	29.	123.1	2153.5	*	2	1500	469	22.	71.7	2147.8	*	3	1600	769	17.	31.1	2142.3

1	1405	170	29.	122.9	2153.5	*	2	1505	470	22.	71.6	2147.8	*	3	1605	770	17.	30.9	2142.3
1	1410	171	29.	122.7	2153.5	*	2	1510	471	22.	71.4	2147.8	*	3	1610	771	17.	30.8	2142.3
1	1415	172	29.	122.5	2153.4	*	2	1515	472	22.	71.3	2147.7	*	3	1615	772	17.	30.7	2142.2
1	1420	173	29.	122.3	2153.4	*	2	1520	473	22.	71.1	2147.7	*	3	1620	773	17.	30.6	2142.2
1	1425	174	29.	122.1	2153.4	*	2	1525	474	22.	71.0	2147.7	*	3	1625	774	17.	30.5	2142.2
1	1430	175	29.	121.9	2153.4	*	2	1530	475	22.	70.8	2147.7	*	3	1630	775	17.	30.4	2142.2
1	1435	176	29.	121.7	2153.4	*	2	1535	476	22.	70.7	2147.7	*	3	1635	776	17.	30.3	2142.2
1	1440	177	29.	121.5	2153.3	*	2	1540	477	22.	70.5	2147.6	*	3	1640	777	17.	30.1	2142.2
1	1445	178	29.	121.3	2153.3	*	2	1545	478	22.	70.4	2147.6	*	3	1645	778	16.	30.0	2142.1
1	1450	179	29.	121.1	2153.3	*	2	1550	479	22.	70.2	2147.6	*	3	1650	779	16.	29.9	2142.1
1	1455	180	29.	120.9	2153.3	*	2	1555	480	22.	70.1	2147.6	*	3	1655	780	16.	29.8	2142.1
1	1500	181	29.	120.7	2153.3	*	2	1600	481	22.	69.9	2147.6	*	3	1700	781	16.	29.7	2142.1
1	1505	182	29.	120.5	2153.2	*	2	1605	482	22.	69.8	2147.6	*	3	1705	782	16.	29.6	2142.1
1	1510	183	29.	120.3	2153.2	*	2	1610	483	22.	69.6	2147.5	*	3	1710	783	16.	29.5	2142.0
1	1515	184	29.	120.1	2153.2	*	2	1615	484	22.	69.5	2147.5	*	3	1715	784	16.	29.4	2142.0
1	1520	185	29.	119.9	2153.2	*	2	1620	485	22.	69.3	2147.5	*	3	1720	785	16.	29.2	2142.0
1	1525	186	29.	119.7	2153.2	*	2	1625	486	22.	69.2	2147.5	*	3	1725	786	16.	29.1	2142.0
1	1530	187	29.	119.5	2153.1	*	2	1630	487	22.	69.0	2147.5	*	3	1730	787	16.	29.0	2142.0
1	1535	188	29.	119.3	2153.1	*	2	1635	488	22.	68.9	2147.4	*	3	1735	788	16.	28.9	2142.0
1	1540	189	29.	119.1	2153.1	*	2	1640	489	21.	68.7	2147.4	*	3	1740	789	16.	28.8	2141.9
1	1545	190	29.	118.9	2153.1	*	2	1645	490	21.	68.6	2147.4	*	3	1745	790	16.	28.7	2141.9
1	1550	191	29.	118.7	2153.1	*	2	1650	491	21.	68.4	2147.4	*	3	1750	791	16.	28.6	2141.9
1	1555	192	29.	118.5	2153.1	*	2	1655	492	21.	68.3	2147.4	*	3	1755	792	16.	28.5	2141.9
1	1600	193	29.	118.3	2153.0	*	2	1700	493	21.	68.1	2147.3	*	3	1800	793	16.	28.3	2141.9
1	1605	194	29.	118.1	2153.0	*	2	1705	494	21.	68.0	2147.3	*	3	1805	794	16.	28.2	2141.8
1	1610	195	29.	117.9	2153.0	*	2	1710	495	21.	67.8	2147.3	*	3	1810	795	16.	28.1	2141.8
1	1615	196	29.	117.7	2153.0	*	2	1715	496	21.	67.7	2147.3	*	3	1815	796	16.	28.0	2141.8
1	1620	197	29.	117.5	2153.0	*	2	1720	497	21.	67.5	2147.3	*	3	1820	797	16.	27.9	2141.8
1	1625	198	28.	117.3	2152.9	*	2	1725	498	21.	67.4	2147.3	*	3	1825	798	16.	27.8	2141.8
1	1630	199	28.	117.1	2152.9	*	2	1730	499	21.	67.3	2147.2	*	3	1830	799	16.	27.7	2141.8
1	1635	200	28.	117.0	2152.9	*	2	1735	500	21.	67.1	2147.2	*	3	1835	800	16.	27.6	2141.7
1	1640	201	28.	116.8	2152.9	*	2	1740	501	21.	67.0	2147.2	*	3	1840	801	16.	27.5	2141.7
1	1645	202	28.	116.6	2152.9	*	2	1745	502	21.	66.8	2147.2	*	3	1845	802	16.	27.4	2141.7
1	1650	203	28.	116.4	2152.8	*	2	1750	503	21.	66.7	2147.2	*	3	1850	803	16.	27.2	2141.7
1	1655	204	28.	116.2	2152.8	*	2	1755	504	21.	66.5	2147.1	*	3	1855	804	16.	27.1	2141.7
1	1700	205	28.	116.0	2152.8	*	2	1800	505	21.	66.4	2147.1	*	3	1900	805	16.	27.0	2141.7
1	1705	206	28.	115.8	2152.8	*	2	1805	506	21.	66.2	2147.1	*	3	1905	806	16.	26.9	2141.6
1	1710	207	28.	115.6	2152.8	*	2	1810	507	21.	66.1	2147.1	*	3	1910	807	16.	26.8	2141.6
1	1715	208	28.	115.4	2152.7	*	2	1815	508	21.	65.9	2147.1	*	3	1915	808	16.	26.7	2141.6
1	1720	209	28.	115.2	2152.7	*	2	1820	509	21.	65.8	2147.0	*	3	1920	809	16.	26.6	2141.6
1	1725	210	28.	115.0	2152.7	*	2	1825	510	21.	65.6	2147.0	*	3	1925	810	16.	26.5	2141.6
1	1730	211	28.	114.8	2152.7	*	2	1830	511	21.	65.5	2147.0	*	3	1930	811	16.	26.4	2141.6
1	1735	212	28.	114.6	2152.7	*	2	1835	512	21.	65.3	2147.0	*	3	1935	812	16.	26.3	2141.5
1	1740	213	28.	114.4	2152.6	*	2	1840	513	21.	65.2	2147.0	*	3	1940	813	16.	26.2	2141.5
1	1745	214	28.	114.2	2152.6	*	2	1845	514	21.	65.1	2147.0	*	3	1945	814	16.	26.1	2141.5
1	1750	215	28.	114.0	2152.6	*	2	1850	515	21.	64.9	2146.9	*	3	1950	815	16.	25.9	2141.5
1	1755	216	28.	113.9	2152.6	*	2	1855	516	21.	64.8	2146.9	*	3	1955	816	16.	25.8	2141.5
1	1800	217	28.	113.7	2152.6	*	2	1900	517	21.	64.6	2146.9	*	3	2000	817	16.	25.7	2141.5
1	1805	218	28.	113.5	2152.5	*	2	1905	518	21.	64.5	2146.9	*	3	2005	818	16.	25.6	2141.4
1	1810	219	28.	113.3	2152.5	*	2	1910	519	21.	64.3	2146.9	*	3	2010	819	15.	25.5	2141.4
1	1815	220	28.	113.1	2152.5	*	2	1915	520	21.	64.2	2146.8	*	3	2015	820	15.	25.4	2141.4
1	1820	221	28.	112.9	2152.5	*	2	1920	521	21.	64.0	2146.8	*	3	2020	821	15.	25.3	2141.4
1	1825	222	28.	112.7	2152.5	*	2	1925	522	21.	63.9	2146.8	*	3	2025	822	15.	25.2	2141.4
1	1830	223	28.	112.5	2152.4	*	2	1930	523	21.	63.7	2146.8	*	3	2030	823	15.	25.1	2141.3
1	1835	224	28.	112.3	2152.4	*	2	1935	524	21.	63.6	2146.8	*	3	2035	824	15.	25.0	2141.3
1	1840	225	28.	112.1	2152.4	*	2	1940	525	21.	63.5	2146.8	*	3	2040	825	15.	24.9	2141.3
1	1845	226	28.	111.9	2152.4	*	2	1945	526	21.	63.3	2146.7	*	3	2045	826	15.	24.8	2141.3
1	1850	227	27.	111.8	2152.4	*	2	1950	527	21.	63.2	2146.7	*	3	2050	827	15.	24.7	2141.3
1	1855	228	27.	111.6	2152.3	*	2	1955	528	21.	63.0	2146.7	*	3	2055	828	15.	24.6	2141.3
1	1900	229	27.	111.4	2152.3	*	2	2000	529	21.	62.9	2146.7	*	3	2100	829	15.	24.5	2141.2
1	1905	230	27.	111.2	2152.3	*	2	2005	530	21.	62.7	2146.7	*	3	2105	830	15.	24.4	2141.2
1	1910	231	27.	111.0	2152.3	*	2	2010	531	21.	62.6	2146.6	*	3	2110	831	15.	24.3	2141.2
1	1915	232	27.	110.8	2152.3	*	2	2015	532	21.	62.4	2146.6	*	3	2115	832	15.	24.1	2141.2
1	1920	233	27.	110.6	2152.2	*	2	2020	533	21.	62.3	2146.6	*	3	2120	833	15.	24.0	2141.2
1	1925	234	27.	110.4	2152.2	*	2	2025	534	21.	62.2	2146.6	*	3	2125	834	15.	23.9	2141.2
1	1930	235	27.	110.3	2152.2	*	2	2030	535	21.	62.0	2146.6	*	3	2130	835	15.	23.8	2141.1

1	1935	236	27.	110.1	2152.2	*	2	2035	536	21.	61.9	2146.6	*	3	2135	836	15.	23.7	2141.1
1	1940	237	27.	109.9	2152.2	*	2	2040	537	21.	61.7	2146.5	*	3	2140	837	15.	23.6	2141.1
1	1945	238	27.	109.7	2152.1	*	2	2045	538	21.	61.6	2146.5	*	3	2145	838	15.	23.5	2141.1
1	1950	239	27.	109.5	2152.1	*	2	2050	539	21.	61.4	2146.5	*	3	2150	839	15.	23.4	2141.1
1	1955	240	27.	109.3	2152.1	*	2	2055	540	21.	61.3	2146.5	*	3	2155	840	15.	23.3	2141.1
1	2000	241	27.	109.1	2152.1	*	2	2100	541	21.	61.2	2146.5	*	3	2200	841	15.	23.2	2141.0
1	2005	242	27.	108.9	2152.1	*	2	2105	542	21.	61.0	2146.4	*	3	2205	842	15.	23.1	2141.0
1	2010	243	27.	108.8	2152.0	*	2	2110	543	21.	60.9	2146.4	*	3	2210	843	15.	23.0	2141.0
1	2015	244	27.	108.6	2152.0	*	2	2115	544	21.	60.7	2146.4	*	3	2215	844	15.	22.9	2141.0
1	2020	245	27.	108.4	2152.0	*	2	2120	545	21.	60.6	2146.4	*	3	2220	845	15.	22.8	2141.0
1	2025	246	27.	108.2	2152.0	*	2	2125	546	21.	60.4	2146.4	*	3	2225	846	15.	22.7	2141.0
1	2030	247	27.	108.0	2152.0	*	2	2130	547	21.	60.3	2146.4	*	3	2230	847	15.	22.6	2141.0
1	2035	248	27.	107.8	2152.0	*	2	2135	548	21.	60.1	2146.3	*	3	2235	848	15.	22.5	2140.9
1	2040	249	27.	107.7	2151.9	*	2	2140	549	21.	60.0	2146.3	*	3	2240	849	15.	22.4	2140.9
1	2045	250	27.	107.5	2151.9	*	2	2145	550	21.	59.9	2146.3	*	3	2245	850	15.	22.3	2140.9
1	2050	251	27.	107.3	2151.9	*	2	2150	551	21.	59.7	2146.3	*	3	2250	851	15.	22.2	2140.9
1	2055	252	27.	107.1	2151.9	*	2	2155	552	21.	59.6	2146.3	*	3	2255	852	15.	22.1	2140.9
1	2100	253	27.	106.9	2151.9	*	2	2200	553	21.	59.4	2146.2	*	3	2300	853	15.	22.0	2140.9
1	2105	254	27.	106.7	2151.8	*	2	2205	554	21.	59.3	2146.2	*	3	2305	854	15.	21.9	2140.8
1	2110	255	27.	106.6	2151.8	*	2	2210	555	21.	59.2	2146.2	*	3	2310	855	15.	21.8	2140.8
1	2115	256	26.	106.4	2151.8	*	2	2215	556	21.	59.0	2146.2	*	3	2315	856	15.	21.7	2140.8
1	2120	257	26.	106.2	2151.8	*	2	2220	557	21.	58.9	2146.2	*	3	2320	857	15.	21.6	2140.8
1	2125	258	26.	106.0	2151.8	*	2	2225	558	21.	58.7	2146.2	*	3	2325	858	15.	21.5	2140.8
1	2130	259	26.	105.8	2151.7	*	2	2230	559	21.	58.6	2146.1	*	3	2330	859	15.	21.4	2140.8
1	2135	260	26.	105.6	2151.7	*	2	2235	560	21.	58.4	2146.1	*	3	2335	860	15.	21.3	2140.7
1	2140	261	26.	105.5	2151.7	*	2	2240	561	21.	58.3	2146.1	*	3	2340	861	15.	21.2	2140.7
1	2145	262	26.	105.3	2151.7	*	2	2245	562	21.	58.2	2146.1	*	3	2345	862	14.	21.1	2140.7
1	2150	263	26.	105.1	2151.7	*	2	2250	563	21.	58.0	2146.1	*	3	2350	863	14.	21.0	2140.7
1	2155	264	26.	104.9	2151.6	*	2	2255	564	21.	57.9	2146.0	*	3	2355	864	14.	20.9	2140.7
1	2200	265	26.	104.7	2151.6	*	2	2300	565	21.	57.7	2146.0	*	4	0000	865	14.	20.8	2140.7
1	2205	266	26.	104.6	2151.6	*	2	2305	566	21.	57.6	2146.0	*	4	0005	866	14.	20.7	2140.6
1	2210	267	26.	104.4	2151.6	*	2	2310	567	20.	57.5	2146.0	*	4	0010	867	14.	20.6	2140.6
1	2215	268	26.	104.2	2151.6	*	2	2315	568	20.	57.3	2146.0	*	4	0015	868	14.	20.5	2140.6
1	2220	269	26.	104.0	2151.6	*	2	2320	569	20.	57.2	2146.0	*	4	0020	869	14.	20.4	2140.6
1	2225	270	26.	103.8	2151.5	*	2	2325	570	20.	57.0	2145.9	*	4	0025	870	14.	20.3	2140.6
1	2230	271	26.	103.7	2151.5	*	2	2330	571	20.	56.9	2145.9	*	4	0030	871	14.	20.2	2140.6
1	2235	272	26.	103.5	2151.5	*	2	2335	572	20.	56.7	2145.9	*	4	0035	872	14.	20.1	2140.6
1	2240	273	26.	103.3	2151.5	*	2	2340	573	20.	56.6	2145.9	*	4	0040	873	14.	20.0	2140.5
1	2245	274	26.	103.1	2151.5	*	2	2345	574	20.	56.5	2145.9	*	4	0045	874	14.	19.9	2140.5
1	2250	275	26.	102.9	2151.4	*	2	2350	575	20.	56.3	2145.8	*	4	0050	875	14.	19.8	2140.5
1	2255	276	26.	102.8	2151.4	*	2	2355	576	20.	56.2	2145.8	*	4	0055	876	14.	19.7	2140.5
1	2300	277	26.	102.6	2151.4	*	3	0000	577	20.	56.0	2145.8	*	4	0100	877	14.	19.6	2140.5
1	2305	278	26.	102.4	2151.4	*	3	0005	578	20.	55.9	2145.8	*	4	0105	878	14.	19.5	2140.5
1	2310	279	26.	102.2	2151.4	*	3	0010	579	20.	55.8	2145.8	*	4	0110	879	14.	19.4	2140.4
1	2315	280	26.	102.1	2151.4	*	3	0015	580	20.	55.6	2145.8	*	4	0115	880	14.	19.3	2140.4
1	2320	281	26.	101.9	2151.3	*	3	0020	581	20.	55.5	2145.7	*	4	0120	881	14.	19.2	2140.4
1	2325	282	26.	101.7	2151.3	*	3	0025	582	20.	55.3	2145.7	*	4	0125	882	14.	19.1	2140.4
1	2330	283	26.	101.5	2151.3	*	3	0030	583	20.	55.2	2145.7	*	4	0130	883	14.	19.0	2140.4
1	2335	284	26.	101.4	2151.3	*	3	0035	584	20.	55.1	2145.7	*	4	0135	884	14.	18.9	2140.4
1	2340	285	26.	101.2	2151.3	*	3	0040	585	20.	54.9	2145.7	*	4	0140	885	14.	18.8	2140.4
1	2345	286	25.	101.0	2151.2	*	3	0045	586	20.	54.8	2145.7	*	4	0145	886	14.	18.7	2140.3
1	2350	287	25.	100.8	2151.2	*	3	0050	587	20.	54.6	2145.6	*	4	0150	887	14.	18.6	2140.3
1	2355	288	25.	100.7	2151.2	*	3	0055	588	20.	54.5	2145.6	*	4	0155	888	14.	18.5	2140.3
2	0000	289	25.	100.5	2151.2	*	3	0100	589	20.	54.4	2145.6	*	4	0200	889	14.	18.4	2140.3
2	0005	290	25.	100.3	2151.2	*	3	0105	590	20.	54.2	2145.6	*	4	0205	890	14.	18.3	2140.3
2	0010	291	25.	100.1	2151.1	*	3	0110	591	20.	54.1	2145.6	*	4	0210	891	14.	18.2	2140.3
2	0015	292	25.	100.0	2151.1	*	3	0115	592	20.	54.0	2145.5	*	4	0215	892	14.	18.2	2140.2
2	0020	293	25.	99.8	2151.1	*	3	0120	593	20.	53.8	2145.5	*	4	0220	893	14.	18.1	2140.2
2	0025	294	25.	99.6	2151.1	*	3	0125	594	20.	53.7	2145.5	*	4	0225	894	14.	18.0	2140.2
2	0030	295	25.	99.4	2151.1	*	3	0130	595	20.	53.5	2145.5	*	4	0230	895	14.	17.9	2140.2
2	0035	296	25.	99.3	2151.1	*	3	0135	596	20.	53.4	2145.5	*	4	0235	896	14.	17.8	2140.2
2	0040	297	25.	99.1	2151.0	*	3	0140	597	20.	53.3	2145.5	*	4	0240	897	14.	17.7	2140.2
2	0045	298	25.	98.9	2151.0	*	3	0145	598	20.	53.1	2145.4	*	4	0245	898	14.	17.6	2140.2
2	0050	299	25.	98.7	2151.0	*	3	0150	599	20.	53.0	2145.4	*	4	0250	899	14.	17.5	2140.1
2	0055	300	25.	98.6	2151.0	*	3	0155	600	20.	52.8	2145.4	*	4	0255	900	14.	17.4	2140.1

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.92-HR
3708.	3.83	(CFS)	622.	176.	72.	69.
		(INCHES)	4.663	5.281	6.444	6.472
		(AC-FT)	308.	349.	426.	428.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)		6-HR	24-HR	72-HR	74.92-HR
201.	3.83		151.	123.	76.	73.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
(FEET)	(HR)		6-HR	24-HR	72-HR	74.92-HR
2160.23	3.83		2156.05	2153.36	2147.89	2147.47

CUMULATIVE AREA = 1.24 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO 1	0.50
HYDROGRAPH AT	SAC230	0.72	1	FLOW	3258.
				TIME	3.50
HYDROGRAPH AT	SAC235	0.38	1	FLOW	1538.
				TIME	3.50
2 COMBINED AT	ADD	1.10	1	FLOW	4796.
				TIME	3.50
ROUTED TO	ROUTE	1.10	1	FLOW	4700.
				TIME	3.50
** PEAK STAGES IN FEET **					
			1	STAGE	15.47
				TIME	3.50
HYDROGRAPH AT	CAS240	0.14	1	FLOW	874.
				TIME	3.33
2 COMBINED AT	DAMIN	1.24	1	FLOW	5398.
				TIME	3.50
ROUTED TO	DAMOUT	1.24	1	FLOW	3708.
				TIME	3.83
** PEAK STAGES IN FEET **					
			1	STAGE	2160.23
				TIME	3.83

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

```
*****  
*  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
*        MAY 1991                    *  
*        VERSION 4.0.1E             *  
*  
* RUN DATE 02/02/1995 TIME 14:11:15 *  
*  
*****
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*****  
*  
* U.S. ARMY CORPS OF ENGINEERS      *  
* HYDROLOGIC ENGINEERING CENTER    *  
* 609 SECOND STREET                *  
* DAVIS, CALIFORNIA 95616         *  
* (916) 756-1104                   *  
*  
*****
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  X  X  XXXXXXX  XXXXX          X  
  X  X  X          X      X      XX  
  X  X  X          X          X  
XXXXXXX  XXXX  X          XXXXX  X  
  X  X  X          X          X  
  X  X  X          X      X      X  
  X  X  XXXXXXX  XXXXX          XXX
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.....  
::  
:: Full Microcomputer Implementation ::  
:: by ::  
:: Haestad Methods, Inc. ::  
::  
.....  
.....
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

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

* filename = Q100.HC1

*

*

*DIAGRAM

*

1 ID Casandro Wash Detention Dam CH2M Hill April, 1994
 2 ID HEC-1 for Q100, revised dam location alternative #3

*

3 IT 5 900
 4 IO 3

*

5 KK SAC230
 6 KM SUB-BASIN SAC230
 7 KM 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
 8 KM THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 9 KM BASIN FROM WICKENBERG ADMS

10 BA .720
 11 IN 15
 12 KM RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 * 10 year = 2.202, 100 year = 3.350

13 PB 3.350
 14 KM THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53
 15 PC .000 .009 .016 .025 .034 .042 .051 .059 .067 .075
 16 PC .087 .100 .119 .151 .235 .416 .760 .872 .915 .944
 17 PC .956 .967 .979 .989 1.000
 18 LG .100 .250 5.200 .240 35.000
 19 UC .446 .367
 20 UA 0 5 16 30 65 77 84 90 94 97
 21 UA 100

*

22 KK SAC235
 23 KM SUB-BASIN sac235
 24 KM 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
 25 KM THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 26 KM BASIN FROM WICKENBERG ADMS

27 BA .380
 28 LG .100 .230 6.200 .150 36.000
 29 UC .450 .461
 30 UA 0 5 16 30 65 77 84 90 94 97
 31 UA 100

*

32 KK ADD
 33 KM ADD SAC230 & SAC235
 34 HC 2

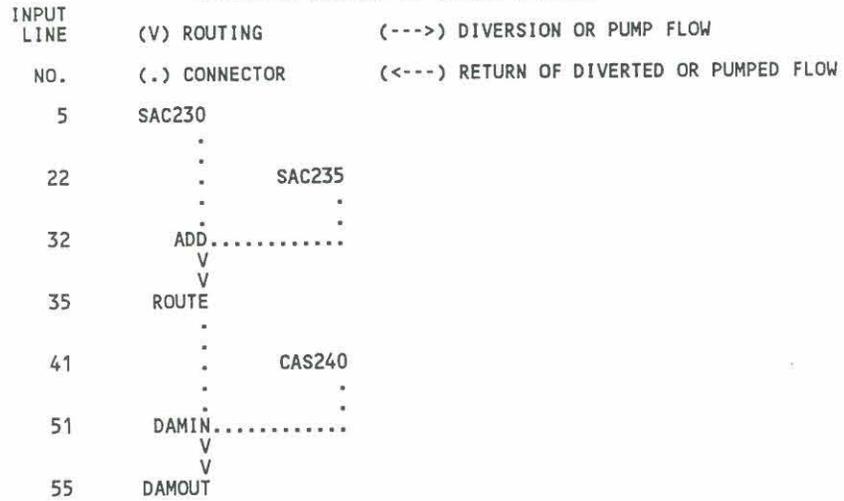
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35 KK ROUTE
 36 KM ROUTE COMBINED HYDROGRAPH TO DAM LOCATION
 37 RS 1 FLOW -1
 38 RC .045 .03 .045 4200 .0175
 39 RX 463.5 467.5 477.5 487.5 512.5 522.5 532.5 536.5
 40 RY 16.5 12.5 12.5 10.0 10.0 12.5 12.5 16.5

*

LINE	ID.....	1.....	2.....	3.....	4.....	5.....	6.....	7.....	8.....	9.....	10
41	KK	CAS240									
42	KM	SUB-BASIN cas240									
43	KM	6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN									
44	KM	THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985									
45	KM	BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION									
46	BA	.140									
47	LG	.100	.210	6.400	.140	21.000					
48	UC	.258	.232								
49	UA	0	5	16	30	65	77	84	90	94	97
50	UA	100									
	*										
51	KK	DAMIN									
52	KO	1									
53	KM	ADD ROUTED HYDROGRAPH TO CAS240									
54	HC	2									
	*										
55	KK	DAMOUT									
56	KM	Route Hydrograph Through Dam.									
57	KM										
58	RS	1	STOR	2							
59	KO	1									
	*										
60	SA	2.05	2.49	5.80	6.77	9.06	10.20	10.96	11.34	11.61	11.88
61	SA	12.09	12.31	12.81	13.31	13.81					
62	SE	2135	2137	2140	2144	2150	2153	2155	2156	2157	2158
63	SE	2159	2160	2161	2162	2163					
64	SQ	0	9.5	13.5	19.1	23.3	28.6	30.9	295	823	1539
65	SQ	2423	3450	4577	5773	7015					
	*										
66	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* RUN DATE 02/02/1995 TIME 14:11:15 *

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

Casandro Wash Detention Dam CH2M Hill April, 1994
HEC-1 for Q100, revised dam location alternative #3

4 IO OUTPUT CONTROL VARIABLES
IPRNT 3 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 900 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 4 0 ENDING DATE
NDTIME 0255 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.08 HOURS
TOTAL TIME BASE 74.92 HOURS

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

*** **

* SAC230 *

SUB-BASIN SAC230
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN FROM WICKENBERG ADMS
RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53

11 IN TIME DATA FOR INPUT TIME SERIES
JXMIN 15 TIME INTERVAL IN MINUTES
JXDATE 1 0 STARTING DATE

JXTIME 0 STARTING TIME

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 0.72 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.01
0.03 0.03 0.06 0.06 0.06 0.11 0.11 0.11 0.04 0.04
0.04 0.01 0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00

18 LG GREEN AND AMPT LOSS RATE
STRIL 0.10 STARTING LOSS
DTH 0.25 MOISTURE DEFICIT
PSIF 5.20 WETTING FRONT SUCTION
XKSAT 0.24 HYDRAULIC CONDUCTIVITY
RTIMP 35.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC 0.45 TIME OF CONCENTRATION
R 0.37 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.45 HR, R= 0.37 HR
SNYDER TP= 0.29 HR, CP= 0.48

UNIT HYDROGRAPH
26 END-OF-PERIOD ORDINATES
83. 383. 684. 750. 692. 597. 487. 387. 308. 246.
195. 156. 124. 99. 79. 62. 50. 40. 32. 25.
20. 16. 13. 10. 8. 6.

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

HYDROGRAPH AT STATION SAC230

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
(CFS) (HR) (CFS) 6-HR 24-HR 72-HR 74.92-HR
1078. 4.17 178. 45. 15. 14.
(INCHES) 2.293 2.306 2.306 2.306
(AC-FT) 88. 89. 89. 89.

CUMULATIVE AREA = 0.72 SQ MI

*** **

 * SAC235 *
 *

SUB-BASIN sac235
 6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
 THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
 BASIN FROM WICKENBERG ADMS

SUBBASIN RUNOFF DATA

27 BA SUBBASIN CHARACTERISTICS
 TAREA 0.38 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
0.03	0.03	0.06	0.06	0.06	0.06	0.11	0.11	0.11	0.04	0.04
0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00									

28 LG GREEN AND AMPT LOSS RATE

STRTL	0.10	STARTING LOSS
DTH	0.23	MOISTURE DEFICIT
PS1F	6.20	WETTING FRONT SUCTION
XKSAT	0.15	HYDRAULIC CONDUCTIVITY
RTIMP	36.00	PERCENT IMPERVIOUS AREA

29 UC CLARK UNITGRAPH

TC	0.45	TIME OF CONCENTRATION
R	0.46	STORAGE COEFFICIENT

30 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES

0.0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
100.0									

 UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.45 HR, R= 0.46 HR
 SNYDER TP= 0.31 HR, CP= 0.44

UNIT HYDROGRAPH
 32 END-OF-PERIOD ORDINATES

35.	162.	298.	339.	324.	290.	248.	207.	172.	144.
120.	100.	84.	70.	58.	48.	40.	34.	28.	23.
20.	16.	14.	11.	9.	8.	7.	6.	5.	4.
3.	3.								

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

HYDROGRAPH AT STATION SAC235

TOTAL RAINFALL = 3.35, TOTAL LOSS = 0.87, TOTAL EXCESS = 2.48

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

q100.out 2-2-95 2:11p

(CFS)	(HR)	6-HR	24-HR	72-HR	74.92-HR
532.	4.25	100.	25.	8.	8.
		(INCHES)	2.450	2.467	2.467
		(AC-FT)	50.	50.	50.

CUMULATIVE AREA = 0.38 SQ MI

*** **

 *
 32 KK * ADD *
 *

ADD SAC230 & SAC235

34 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION ADD

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
(CFS)	(HR)	6-HR	24-HR	72-HR	74.92-HR
1608.	4.17	278.	70.	23.	22.
		(INCHES)	2.347	2.361	2.361
		(AC-FT)	138.	139.	139.

CUMULATIVE AREA = 1.10 SQ MI

*** **

 *
 35 KK * ROUTE *
 *

ROUTE COMBINED HYDROGRAPH TO DAM LOCATION

HYDROGRAPH ROUTING DATA

37 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP FLOW TYPE OF INITIAL CONDITION
 RSVRIC -1.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

38 RC NORMAL DEPTH CHANNEL
 ANL 0.045 LEFT OVERBANK N-VALUE
 ANCH 0.030 MAIN CHANNEL N-VALUE
 ANR 0.045 RIGHT OVERBANK N-VALUE
 RLNTH 4200. REACH LENGTH
 SEL 0.0175 ENERGY SLOPE
 ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA										
		--- LEFT OVERBANK ---		+ ----- MAIN CHANNEL ----- +					--- RIGHT OVERBANK ---	
40 RY	ELEVATION	16.50	12.50	12.50	10.00	10.00	12.50	12.50	16.50	
39 RX	DISTANCE	463.50	467.50	477.50	487.50	512.50	522.50	532.50	536.50	

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.87	1.83	2.88	4.02	5.25	6.57	7.98	9.93	12.10
OUTFLOW	0.00	27.97	90.60	181.95	300.62	446.32	619.30	820.07	1082.86	1405.42
ELEVATION	10.00	10.34	10.68	11.03	11.37	11.71	12.05	12.39	12.74	13.08
STORAGE	14.29	16.51	18.75	21.01	23.29	25.60	27.93	30.28	32.65	35.05
OUTFLOW	1769.68	2172.41	2611.51	3085.39	3592.83	4132.80	4704.46	5307.08	5940.05	6602.82
ELEVATION	13.42	13.76	14.11	14.45	14.79	15.13	15.47	15.82	16.16	16.50

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

HYDROGRAPH AT STATION ROUTE

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	74.92-HR	
1552.	4.25	277.	70.	23.	22.	
		(INCHES)	2.341	2.361	2.361	2.361
		(AC-FT)	137.	139.	139.	139.
PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE				
		6-HR	24-HR	72-HR	74.92-HR	
13.	4.25	3.	1.	0.	0.	
PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE				
		6-HR	24-HR	72-HR	74.92-HR	
13.22	4.25	10.97	10.25	10.08	10.08	

CUMULATIVE AREA = 1.10 SQ MI

*** **

*
* CAS240 *
*

SUB-BASIN cas240
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION

SUBBASIN RUNOFF DATA

46 BA SUBBASIN CHARACTERISTICS
 TAREA 0.14 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1214PRINT

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.03
0.03	0.03	0.06	0.06	0.06	0.11	0.11	0.11	0.04	0.04
0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

47 LG GREEN AND AMPT LOSS RATE
 STRTL 0.10 STARTING LOSS
 DTH 0.21 MOISTURE DEFICIT
 PSIF 6.40 WETTING FRONT SUCTION
 XKSAT 0.14 HYDRAULIC CONDUCTIVITY
 RTIMP 21.00 PERCENT IMPERVIOUS AREA

48 UC CLARK UNITGRAPH
 TC 0.26 TIME OF CONCENTRATION
 R 0.23 STORAGE COEFFICIENT

49 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.26 HR, R= 0.23 HR
 SNYDER TP= 0.19 HR, CP= 0.52

UNIT HYDROGRAPH
 16 END-OF-PERIOD ORDINATES
 63. 187. 231. 182. 128. 89. 62. 43. 30. 21.
 15. 10. 7. 5. 3. 2.

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

HYDROGRAPH AT STATION CAS240

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (INCHES)	74.92-HR (INCHES)
275.	4.08	35.	2.300	2.305	2.305
		17.	17.	17.	17.

CUMULATIVE AREA = 0.14 SQ MI

*** **

 * *
 * DAMIN *
 * *

52 KO OUTPUT CONTROL VARIABLES
 IPRNT 1 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 ADD ROUTED HYDROGRAPH TO CAS240

54 HC HYDROGRAPH COMBINATION

LOT4PRINT

HYDROGRAPH AT STATION DAMIN
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	
1		0000	1	0.	*	1	1845	226	0.	*	2	1330	451	0.	*	3	0815	676	0.				
1		0005	2	0.	*	1	1850	227	0.	*	2	1335	452	0.	*	3	0820	677	0.				
1		0010	3	1.	*	1	1855	228	0.	*	2	1340	453	0.	*	3	0825	678	0.				
1		0015	4	2.	*	1	1900	229	0.	*	2	1345	454	0.	*	3	0830	679	0.				
1		0020	5	4.	*	1	1905	230	0.	*	2	1350	455	0.	*	3	0835	680	0.				
1		0025	6	6.	*	1	1910	231	0.	*	2	1355	456	0.	*	3	0840	681	0.				
1		0030	7	8.	*	1	1915	232	0.	*	2	1400	457	0.	*	3	0845	682	0.				
1		0035	8	10.	*	1	1920	233	0.	*	2	1405	458	0.	*	3	0850	683	0.				
1		0040	9	12.	*	1	1925	234	0.	*	2	1410	459	0.	*	3	0855	684	0.				
1		0045	10	14.	*	1	1930	235	0.	*	2	1415	460	0.	*	3	0900	685	0.				
1		0050	11	16.	*	1	1935	236	0.	*	2	1420	461	0.	*	3	0905	686	0.				
1		0055	12	18.	*	1	1940	237	0.	*	2	1425	462	0.	*	3	0910	687	0.				
1		0100	13	20.	*	1	1945	238	0.	*	2	1430	463	0.	*	3	0915	688	0.				
1		0105	14	21.	*	1	1950	239	0.	*	2	1435	464	0.	*	3	0920	689	0.				
1		0110	15	23.	*	1	1955	240	0.	*	2	1440	465	0.	*	3	0925	690	0.				
1		0115	16	24.	*	1	2000	241	0.	*	2	1445	466	0.	*	3	0930	691	0.				
1		0120	17	25.	*	1	2005	242	0.	*	2	1450	467	0.	*	3	0935	692	0.				
1		0125	18	26.	*	1	2010	243	0.	*	2	1455	468	0.	*	3	0940	693	0.				
1		0130	19	26.	*	1	2015	244	0.	*	2	1500	469	0.	*	3	0945	694	0.				
1		0135	20	27.	*	1	2020	245	0.	*	2	1505	470	0.	*	3	0950	695	0.				
1		0140	21	28.	*	1	2025	246	0.	*	2	1510	471	0.	*	3	0955	696	0.				
1		0145	22	28.	*	1	2030	247	0.	*	2	1515	472	0.	*	3	1000	697	0.				
1		0150	23	29.	*	1	2035	248	0.	*	2	1520	473	0.	*	3	1005	698	0.				
1		0155	24	29.	*	1	2040	249	0.	*	2	1525	474	0.	*	3	1010	699	0.				
1		0200	25	29.	*	1	2045	250	0.	*	2	1530	475	0.	*	3	1015	700	0.				
1		0205	26	29.	*	1	2050	251	0.	*	2	1535	476	0.	*	3	1020	701	0.				
1		0210	27	29.	*	1	2055	252	0.	*	2	1540	477	0.	*	3	1025	702	0.				
1		0215	28	29.	*	1	2100	253	0.	*	2	1545	478	0.	*	3	1030	703	0.				
1		0220	29	29.	*	1	2105	254	0.	*	2	1550	479	0.	*	3	1035	704	0.				
1		0225	30	30.	*	1	2110	255	0.	*	2	1555	480	0.	*	3	1040	705	0.				
1		0230	31	30.	*	1	2115	256	0.	*	2	1600	481	0.	*	3	1045	706	0.				
1		0235	32	31.	*	1	2120	257	0.	*	2	1605	482	0.	*	3	1050	707	0.				
1		0240	33	33.	*	1	2125	258	0.	*	2	1610	483	0.	*	3	1055	708	0.				
1		0245	34	34.	*	1	2130	259	0.	*	2	1615	484	0.	*	3	1100	709	0.				
1		0250	35	36.	*	1	2135	260	0.	*	2	1620	485	0.	*	3	1105	710	0.				
1		0255	36	38.	*	1	2140	261	0.	*	2	1625	486	0.	*	3	1110	711	0.				
1		0300	37	41.	*	1	2145	262	0.	*	2	1630	487	0.	*	3	1115	712	0.				
1		0305	38	44.	*	1	2150	263	0.	*	2	1635	488	0.	*	3	1120	713	0.				
1		0310	39	49.	*	1	2155	264	0.	*	2	1640	489	0.	*	3	1125	714	0.				
1		0315	40	54.	*	1	2200	265	0.	*	2	1645	490	0.	*	3	1130	715	0.				
1		0320	41	65.	*	1	2205	266	0.	*	2	1650	491	0.	*	3	1135	716	0.				
1		0325	42	86.	*	1	2210	267	0.	*	2	1655	492	0.	*	3	1140	717	0.				
1		0330	43	118.	*	1	2215	268	0.	*	2	1700	493	0.	*	3	1145	718	0.				
1		0335	44	174.	*	1	2220	269	0.	*	2	1705	494	0.	*	3	1150	719	0.				
1		0340	45	265.	*	1	2225	270	0.	*	2	1710	495	0.	*	3	1155	720	0.				
1		0345	46	402.	*	1	2230	271	0.	*	2	1715	496	0.	*	3	1200	721	0.				
1		0350	47	590.	*	1	2235	272	0.	*	2	1720	497	0.	*	3	1205	722	0.				
1		0355	48	845.	*	1	2240	273	0.	*	2	1725	498	0.	*	3	1210	723	0.				
1		0400	49	1157.	*	1	2245	274	0.	*	2	1730	499	0.	*	3	1215	724	0.				
1		0405	50	1463.	*	1	2250	275	0.	*	2	1735	500	0.	*	3	1220	725	0.				
1		0410	51	1685.	*	1	2255	276	0.	*	2	1740	501	0.	*	3	1225	726	0.				
1		0415	52	1769.	*	1	2300	277	0.	*	2	1745	502	0.	*	3	1230	727	0.				
1		0420	53	1723.	*	1	2305	278	0.	*	2	1750	503	0.	*	3	1235	728	0.				

1	0425	54	1594.	*	1	2310	279	0.	*	2	1755	504	0.	*	3	1240	729	0.
1	0430	55	1425.	*	1	2315	280	0.	*	2	1800	505	0.	*	3	1245	730	0.
1	0435	56	1241.	*	1	2320	281	0.	*	2	1805	506	0.	*	3	1250	731	0.
1	0440	57	1066.	*	1	2325	282	0.	*	2	1810	507	0.	*	3	1255	732	0.
1	0445	58	907.	*	1	2330	283	0.	*	2	1815	508	0.	*	3	1300	733	0.
1	0450	59	762.	*	1	2335	284	0.	*	2	1820	509	0.	*	3	1305	734	0.
1	0455	60	637.	*	1	2340	285	0.	*	2	1825	510	0.	*	3	1310	735	0.
1	0500	61	536.	*	1	2345	286	0.	*	2	1830	511	0.	*	3	1315	736	0.
1	0505	62	449.	*	1	2350	287	0.	*	2	1835	512	0.	*	3	1320	737	0.
1	0510	63	378.	*	1	2355	288	0.	*	2	1840	513	0.	*	3	1325	738	0.
1	0515	64	317.	*	2	0000	289	0.	*	2	1845	514	0.	*	3	1330	739	0.
1	0520	65	269.	*	2	0005	290	0.	*	2	1850	515	0.	*	3	1335	740	0.
1	0525	66	229.	*	2	0010	291	0.	*	2	1855	516	0.	*	3	1340	741	0.
1	0530	67	195.	*	2	0015	292	0.	*	2	1900	517	0.	*	3	1345	742	0.
1	0535	68	169.	*	2	0020	293	0.	*	2	1905	518	0.	*	3	1350	743	0.
1	0540	69	148.	*	2	0025	294	0.	*	2	1910	519	0.	*	3	1355	744	0.
1	0545	70	129.	*	2	0030	295	0.	*	2	1915	520	0.	*	3	1400	745	0.
1	0550	71	112.	*	2	0035	296	0.	*	2	1920	521	0.	*	3	1405	746	0.
1	0555	72	98.	*	2	0040	297	0.	*	2	1925	522	0.	*	3	1410	747	0.
1	0600	73	88.	*	2	0045	298	0.	*	2	1930	523	0.	*	3	1415	748	0.
1	0605	74	79.	*	2	0050	299	0.	*	2	1935	524	0.	*	3	1420	749	0.
1	0610	75	70.	*	2	0055	300	0.	*	2	1940	525	0.	*	3	1425	750	0.
1	0615	76	62.	*	2	0100	301	0.	*	2	1945	526	0.	*	3	1430	751	0.
1	0620	77	53.	*	2	0105	302	0.	*	2	1950	527	0.	*	3	1435	752	0.
1	0625	78	45.	*	2	0110	303	0.	*	2	1955	528	0.	*	3	1440	753	0.
1	0630	79	37.	*	2	0115	304	0.	*	2	2000	529	0.	*	3	1445	754	0.
1	0635	80	31.	*	2	0120	305	0.	*	2	2005	530	0.	*	3	1450	755	0.
1	0640	81	26.	*	2	0125	306	0.	*	2	2010	531	0.	*	3	1455	756	0.
1	0645	82	23.	*	2	0130	307	0.	*	2	2015	532	0.	*	3	1500	757	0.
1	0650	83	20.	*	2	0135	308	0.	*	2	2020	533	0.	*	3	1505	758	0.
1	0655	84	18.	*	2	0140	309	0.	*	2	2025	534	0.	*	3	1510	759	0.
1	0700	85	15.	*	2	0145	310	0.	*	2	2030	535	0.	*	3	1515	760	0.
1	0705	86	13.	*	2	0150	311	0.	*	2	2035	536	0.	*	3	1520	761	0.
1	0710	87	11.	*	2	0155	312	0.	*	2	2040	537	0.	*	3	1525	762	0.
1	0715	88	10.	*	2	0200	313	0.	*	2	2045	538	0.	*	3	1530	763	0.
1	0720	89	8.	*	2	0205	314	0.	*	2	2050	539	0.	*	3	1535	764	0.
1	0725	90	7.	*	2	0210	315	0.	*	2	2055	540	0.	*	3	1540	765	0.
1	0730	91	6.	*	2	0215	316	0.	*	2	2100	541	0.	*	3	1545	766	0.
1	0735	92	5.	*	2	0220	317	0.	*	2	2105	542	0.	*	3	1550	767	0.
1	0740	93	4.	*	2	0225	318	0.	*	2	2110	543	0.	*	3	1555	768	0.
1	0745	94	3.	*	2	0230	319	0.	*	2	2115	544	0.	*	3	1600	769	0.
1	0750	95	3.	*	2	0235	320	0.	*	2	2120	545	0.	*	3	1605	770	0.
1	0755	96	2.	*	2	0240	321	0.	*	2	2125	546	0.	*	3	1610	771	0.
1	0800	97	2.	*	2	0245	322	0.	*	2	2130	547	0.	*	3	1615	772	0.
1	0805	98	2.	*	2	0250	323	0.	*	2	2135	548	0.	*	3	1620	773	0.
1	0810	99	1.	*	2	0255	324	0.	*	2	2140	549	0.	*	3	1625	774	0.
1	0815	100	1.	*	2	0300	325	0.	*	2	2145	550	0.	*	3	1630	775	0.
1	0820	101	1.	*	2	0305	326	0.	*	2	2150	551	0.	*	3	1635	776	0.
1	0825	102	1.	*	2	0310	327	0.	*	2	2155	552	0.	*	3	1640	777	0.
1	0830	103	1.	*	2	0315	328	0.	*	2	2200	553	0.	*	3	1645	778	0.
1	0835	104	0.	*	2	0320	329	0.	*	2	2205	554	0.	*	3	1650	779	0.
1	0840	105	0.	*	2	0325	330	0.	*	2	2210	555	0.	*	3	1655	780	0.
1	0845	106	0.	*	2	0330	331	0.	*	2	2215	556	0.	*	3	1700	781	0.
1	0850	107	0.	*	2	0335	332	0.	*	2	2220	557	0.	*	3	1705	782	0.
1	0855	108	0.	*	2	0340	333	0.	*	2	2225	558	0.	*	3	1710	783	0.
1	0900	109	0.	*	2	0345	334	0.	*	2	2230	559	0.	*	3	1715	784	0.
1	0905	110	0.	*	2	0350	335	0.	*	2	2235	560	0.	*	3	1720	785	0.
1	0910	111	0.	*	2	0355	336	0.	*	2	2240	561	0.	*	3	1725	786	0.
1	0915	112	0.	*	2	0400	337	0.	*	2	2245	562	0.	*	3	1730	787	0.
1	0920	113	0.	*	2	0405	338	0.	*	2	2250	563	0.	*	3	1735	788	0.
1	0925	114	0.	*	2	0410	339	0.	*	2	2255	564	0.	*	3	1740	789	0.
1	0930	115	0.	*	2	0415	340	0.	*	2	2300	565	0.	*	3	1745	790	0.
1	0935	116	0.	*	2	0420	341	0.	*	2	2305	566	0.	*	3	1750	791	0.
1	0940	117	0.	*	2	0425	342	0.	*	2	2310	567	0.	*	3	1755	792	0.
1	0945	118	0.	*	2	0430	343	0.	*	2	2315	568	0.	*	3	1800	793	0.
1	0950	119	0.	*	2	0435	344	0.	*	2	2320	569	0.	*	3	1805	794	0.

1	0955	120	0.	*	2	0440	345	0.	*	2	2325	570	0.	*	3	1810	795	0.
1	1000	121	0.	*	2	0445	346	0.	*	2	2330	571	0.	*	3	1815	796	0.
1	1005	122	0.	*	2	0450	347	0.	*	2	2335	572	0.	*	3	1820	797	0.
1	1010	123	0.	*	2	0455	348	0.	*	2	2340	573	0.	*	3	1825	798	0.
1	1015	124	0.	*	2	0500	349	0.	*	2	2345	574	0.	*	3	1830	799	0.
1	1020	125	0.	*	2	0505	350	0.	*	2	2350	575	0.	*	3	1835	800	0.
1	1025	126	0.	*	2	0510	351	0.	*	2	2355	576	0.	*	3	1840	801	0.
1	1030	127	0.	*	2	0515	352	0.	*	3	0000	577	0.	*	3	1845	802	0.
1	1035	128	0.	*	2	0520	353	0.	*	3	0005	578	0.	*	3	1850	803	0.
1	1040	129	0.	*	2	0525	354	0.	*	3	0010	579	0.	*	3	1855	804	0.
1	1045	130	0.	*	2	0530	355	0.	*	3	0015	580	0.	*	3	1900	805	0.
1	1050	131	0.	*	2	0535	356	0.	*	3	0020	581	0.	*	3	1905	806	0.
1	1055	132	0.	*	2	0540	357	0.	*	3	0025	582	0.	*	3	1910	807	0.
1	1100	133	0.	*	2	0545	358	0.	*	3	0030	583	0.	*	3	1915	808	0.
1	1105	134	0.	*	2	0550	359	0.	*	3	0035	584	0.	*	3	1920	809	0.
1	1110	135	0.	*	2	0555	360	0.	*	3	0040	585	0.	*	3	1925	810	0.
1	1115	136	0.	*	2	0600	361	0.	*	3	0045	586	0.	*	3	1930	811	0.
1	1120	137	0.	*	2	0605	362	0.	*	3	0050	587	0.	*	3	1935	812	0.
1	1125	138	0.	*	2	0610	363	0.	*	3	0055	588	0.	*	3	1940	813	0.
1	1130	139	0.	*	2	0615	364	0.	*	3	0100	589	0.	*	3	1945	814	0.
1	1135	140	0.	*	2	0620	365	0.	*	3	0105	590	0.	*	3	1950	815	0.
1	1140	141	0.	*	2	0625	366	0.	*	3	0110	591	0.	*	3	1955	816	0.
1	1145	142	0.	*	2	0630	367	0.	*	3	0115	592	0.	*	3	2000	817	0.
1	1150	143	0.	*	2	0635	368	0.	*	3	0120	593	0.	*	3	2005	818	0.
1	1155	144	0.	*	2	0640	369	0.	*	3	0125	594	0.	*	3	2010	819	0.
1	1200	145	0.	*	2	0645	370	0.	*	3	0130	595	0.	*	3	2015	820	0.
1	1205	146	0.	*	2	0650	371	0.	*	3	0135	596	0.	*	3	2020	821	0.
1	1210	147	0.	*	2	0655	372	0.	*	3	0140	597	0.	*	3	2025	822	0.
1	1215	148	0.	*	2	0700	373	0.	*	3	0145	598	0.	*	3	2030	823	0.
1	1220	149	0.	*	2	0705	374	0.	*	3	0150	599	0.	*	3	2035	824	0.
1	1225	150	0.	*	2	0710	375	0.	*	3	0155	600	0.	*	3	2040	825	0.
1	1230	151	0.	*	2	0715	376	0.	*	3	0200	601	0.	*	3	2045	826	0.
1	1235	152	0.	*	2	0720	377	0.	*	3	0205	602	0.	*	3	2050	827	0.
1	1240	153	0.	*	2	0725	378	0.	*	3	0210	603	0.	*	3	2055	828	0.
1	1245	154	0.	*	2	0730	379	0.	*	3	0215	604	0.	*	3	2100	829	0.
1	1250	155	0.	*	2	0735	380	0.	*	3	0220	605	0.	*	3	2105	830	0.
1	1255	156	0.	*	2	0740	381	0.	*	3	0225	606	0.	*	3	2110	831	0.
1	1300	157	0.	*	2	0745	382	0.	*	3	0230	607	0.	*	3	2115	832	0.
1	1305	158	0.	*	2	0750	383	0.	*	3	0235	608	0.	*	3	2120	833	0.
1	1310	159	0.	*	2	0755	384	0.	*	3	0240	609	0.	*	3	2125	834	0.
1	1315	160	0.	*	2	0800	385	0.	*	3	0245	610	0.	*	3	2130	835	0.
1	1320	161	0.	*	2	0805	386	0.	*	3	0250	611	0.	*	3	2135	836	0.
1	1325	162	0.	*	2	0810	387	0.	*	3	0255	612	0.	*	3	2140	837	0.
1	1330	163	0.	*	2	0815	388	0.	*	3	0300	613	0.	*	3	2145	838	0.
1	1335	164	0.	*	2	0820	389	0.	*	3	0305	614	0.	*	3	2150	839	0.
1	1340	165	0.	*	2	0825	390	0.	*	3	0310	615	0.	*	3	2155	840	0.
1	1345	166	0.	*	2	0830	391	0.	*	3	0315	616	0.	*	3	2200	841	0.
1	1350	167	0.	*	2	0835	392	0.	*	3	0320	617	0.	*	3	2205	842	0.
1	1355	168	0.	*	2	0840	393	0.	*	3	0325	618	0.	*	3	2210	843	0.
1	1400	169	0.	*	2	0845	394	0.	*	3	0330	619	0.	*	3	2215	844	0.
1	1405	170	0.	*	2	0850	395	0.	*	3	0335	620	0.	*	3	2220	845	0.
1	1410	171	0.	*	2	0855	396	0.	*	3	0340	621	0.	*	3	2225	846	0.
1	1415	172	0.	*	2	0900	397	0.	*	3	0345	622	0.	*	3	2230	847	0.
1	1420	173	0.	*	2	0905	398	0.	*	3	0350	623	0.	*	3	2235	848	0.
1	1425	174	0.	*	2	0910	399	0.	*	3	0355	624	0.	*	3	2240	849	0.
1	1430	175	0.	*	2	0915	400	0.	*	3	0400	625	0.	*	3	2245	850	0.
1	1435	176	0.	*	2	0920	401	0.	*	3	0405	626	0.	*	3	2250	851	0.
1	1440	177	0.	*	2	0925	402	0.	*	3	0410	627	0.	*	3	2255	852	0.
1	1445	178	0.	*	2	0930	403	0.	*	3	0415	628	0.	*	3	2300	853	0.
1	1450	179	0.	*	2	0935	404	0.	*	3	0420	629	0.	*	3	2305	854	0.
1	1455	180	0.	*	2	0940	405	0.	*	3	0425	630	0.	*	3	2310	855	0.
1	1500	181	0.	*	2	0945	406	0.	*	3	0430	631	0.	*	3	2315	856	0.
1	1505	182	0.	*	2	0950	407	0.	*	3	0435	632	0.	*	3	2320	857	0.
1	1510	183	0.	*	2	0955	408	0.	*	3	0440	633	0.	*	3	2325	858	0.
1	1515	184	0.	*	2	1000	409	0.	*	3	0445	634	0.	*	3	2330	859	0.
1	1520	185	0.	*	2	1005	410	0.	*	3	0450	635	0.	*	3	2335	860	0.

1	1525	186	0.	*	2	1010	411	0.	*	3	0455	636	0.	*	3	2340	861	0.
1	1530	187	0.	*	2	1015	412	0.	*	3	0500	637	0.	*	3	2345	862	0.
1	1535	188	0.	*	2	1020	413	0.	*	3	0505	638	0.	*	3	2350	863	0.
1	1540	189	0.	*	2	1025	414	0.	*	3	0510	639	0.	*	3	2355	864	0.
1	1545	190	0.	*	2	1030	415	0.	*	3	0515	640	0.	*	4	0000	865	0.
1	1550	191	0.	*	2	1035	416	0.	*	3	0520	641	0.	*	4	0005	866	0.
1	1555	192	0.	*	2	1040	417	0.	*	3	0525	642	0.	*	4	0010	867	0.
1	1600	193	0.	*	2	1045	418	0.	*	3	0530	643	0.	*	4	0015	868	0.
1	1605	194	0.	*	2	1050	419	0.	*	3	0535	644	0.	*	4	0020	869	0.
1	1610	195	0.	*	2	1055	420	0.	*	3	0540	645	0.	*	4	0025	870	0.
1	1615	196	0.	*	2	1100	421	0.	*	3	0545	646	0.	*	4	0030	871	0.
1	1620	197	0.	*	2	1105	422	0.	*	3	0550	647	0.	*	4	0035	872	0.
1	1625	198	0.	*	2	1110	423	0.	*	3	0555	648	0.	*	4	0040	873	0.
1	1630	199	0.	*	2	1115	424	0.	*	3	0600	649	0.	*	4	0045	874	0.
1	1635	200	0.	*	2	1120	425	0.	*	3	0605	650	0.	*	4	0050	875	0.
1	1640	201	0.	*	2	1125	426	0.	*	3	0610	651	0.	*	4	0055	876	0.
1	1645	202	0.	*	2	1130	427	0.	*	3	0615	652	0.	*	4	0100	877	0.
1	1650	203	0.	*	2	1135	428	0.	*	3	0620	653	0.	*	4	0105	878	0.
1	1655	204	0.	*	2	1140	429	0.	*	3	0625	654	0.	*	4	0110	879	0.
1	1700	205	0.	*	2	1145	430	0.	*	3	0630	655	0.	*	4	0115	880	0.
1	1705	206	0.	*	2	1150	431	0.	*	3	0635	656	0.	*	4	0120	881	0.
1	1710	207	0.	*	2	1155	432	0.	*	3	0640	657	0.	*	4	0125	882	0.
1	1715	208	0.	*	2	1200	433	0.	*	3	0645	658	0.	*	4	0130	883	0.
1	1720	209	0.	*	2	1205	434	0.	*	3	0650	659	0.	*	4	0135	884	0.
1	1725	210	0.	*	2	1210	435	0.	*	3	0655	660	0.	*	4	0140	885	0.
1	1730	211	0.	*	2	1215	436	0.	*	3	0700	661	0.	*	4	0145	886	0.
1	1735	212	0.	*	2	1220	437	0.	*	3	0705	662	0.	*	4	0150	887	0.
1	1740	213	0.	*	2	1225	438	0.	*	3	0710	663	0.	*	4	0155	888	0.
1	1745	214	0.	*	2	1230	439	0.	*	3	0715	664	0.	*	4	0200	889	0.
1	1750	215	0.	*	2	1235	440	0.	*	3	0720	665	0.	*	4	0205	890	0.
1	1755	216	0.	*	2	1240	441	0.	*	3	0725	666	0.	*	4	0210	891	0.
1	1800	217	0.	*	2	1245	442	0.	*	3	0730	667	0.	*	4	0215	892	0.
1	1805	218	0.	*	2	1250	443	0.	*	3	0735	668	0.	*	4	0220	893	0.
1	1810	219	0.	*	2	1255	444	0.	*	3	0740	669	0.	*	4	0225	894	0.
1	1815	220	0.	*	2	1300	445	0.	*	3	0745	670	0.	*	4	0230	895	0.
1	1820	221	0.	*	2	1305	446	0.	*	3	0750	671	0.	*	4	0235	896	0.
1	1825	222	0.	*	2	1310	447	0.	*	3	0755	672	0.	*	4	0240	897	0.
1	1830	223	0.	*	2	1315	448	0.	*	3	0800	673	0.	*	4	0245	898	0.
1	1835	224	0.	*	2	1320	449	0.	*	3	0805	674	0.	*	4	0250	899	0.
1	1840	225	0.	*	2	1325	450	0.	*	3	0810	675	0.	*	4	0255	900	0.

PEAK FLOW (CFS) 1769.
 TIME (HR) 4.25
 (CFS) 312.
 (INCHES) 2.336
 (AC-FT) 154.
 MAXIMUM AVERAGE FLOW
 6-HR 79.
 24-HR 2.355
 72-HR 26.
 2.355
 74.92-HR 25.
 156.
 CUMULATIVE AREA = 1.24 SQ MI

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 * DAMOUT *
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 Route Hydrograph Through Dam.

59 KO OUTPUT CONTROL VARIABLES

q100.OUT 2-2-95 2:11p

1014PRINT

1	1620	197	0.	*	2	1105	422	0.	*	3	0550	647	0.	*	4	0035	872	0.
1	1625	198	0.	*	2	1110	423	0.	*	3	0555	648	0.	*	4	0040	873	0.
1	1630	199	0.	*	2	1115	424	0.	*	3	0600	649	0.	*	4	0045	874	0.
1	1635	200	0.	*	2	1120	425	0.	*	3	0605	650	0.	*	4	0050	875	0.
1	1640	201	0.	*	2	1125	426	0.	*	3	0610	651	0.	*	4	0055	876	0.
1	1645	202	0.	*	2	1130	427	0.	*	3	0615	652	0.	*	4	0100	877	0.
1	1650	203	0.	*	2	1135	428	0.	*	3	0620	653	0.	*	4	0105	878	0.
1	1655	204	0.	*	2	1140	429	0.	*	3	0625	654	0.	*	4	0110	879	0.
1	1700	205	0.	*	2	1145	430	0.	*	3	0630	655	0.	*	4	0115	880	0.
1	1705	206	0.	*	2	1150	431	0.	*	3	0635	656	0.	*	4	0120	881	0.
1	1710	207	0.	*	2	1155	432	0.	*	3	0640	657	0.	*	4	0125	882	0.
1	1715	208	0.	*	2	1200	433	0.	*	3	0645	658	0.	*	4	0130	883	0.
1	1720	209	0.	*	2	1205	434	0.	*	3	0650	659	0.	*	4	0135	884	0.
1	1725	210	0.	*	2	1210	435	0.	*	3	0655	660	0.	*	4	0140	885	0.
1	1730	211	0.	*	2	1215	436	0.	*	3	0700	661	0.	*	4	0145	886	0.
1	1735	212	0.	*	2	1220	437	0.	*	3	0705	662	0.	*	4	0150	887	0.
1	1740	213	0.	*	2	1225	438	0.	*	3	0710	663	0.	*	4	0155	888	0.
1	1745	214	0.	*	2	1230	439	0.	*	3	0715	664	0.	*	4	0200	889	0.
1	1750	215	0.	*	2	1235	440	0.	*	3	0720	665	0.	*	4	0205	890	0.
1	1755	216	0.	*	2	1240	441	0.	*	3	0725	666	0.	*	4	0210	891	0.
1	1800	217	0.	*	2	1245	442	0.	*	3	0730	667	0.	*	4	0215	892	0.
1	1805	218	0.	*	2	1250	443	0.	*	3	0735	668	0.	*	4	0220	893	0.
1	1810	219	0.	*	2	1255	444	0.	*	3	0740	669	0.	*	4	0225	894	0.
1	1815	220	0.	*	2	1300	445	0.	*	3	0745	670	0.	*	4	0230	895	0.
1	1820	221	0.	*	2	1305	446	0.	*	3	0750	671	0.	*	4	0235	896	0.
1	1825	222	0.	*	2	1310	447	0.	*	3	0755	672	0.	*	4	0240	897	0.
1	1830	223	0.	*	2	1315	448	0.	*	3	0800	673	0.	*	4	0245	898	0.
1	1835	224	0.	*	2	1320	449	0.	*	3	0805	674	0.	*	4	0250	899	0.
1	1840	225	0.	*	2	1325	450	0.	*	3	0810	675	0.	*	4	0255	900	0.

PEAK FLOW (CFS)	TIME (HR)		6-HR	24-HR	72-HR	74.92-HR
5398.	3.50	(CFS)	891.	224.	75.	72.
		(INCHES)	6.681	6.705	6.705	6.705
		(AC-FT)	442.	443.	443.	443.

CUMULATIVE AREA = 1.24 SQ MI

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56 KK * DAMOUT *
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Route Hydrograph Through Dam.

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

HYDROGRAPH ROUTING DATA

59 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP STOR TYPE OF INITIAL CONDITION
RSVRIC 2.00 INITIAL CONDITION
X 0.00 WORKING R AND D COEFFICIENT

61 SA	AREA	2.0 12.1	2.5 12.3	5.8 12.8	6.8 13.3	9.1 13.8	10.2	11.0	11.3	11.6	11.9
63 SE	ELEVATION	2135.00 2159.00	2137.00 2160.00	2140.00 2161.00	2144.00 2162.00	2150.00 2163.00	2153.00	2155.00	2156.00	2157.00	2158.00
65 SQ	DISCHARGE	0. 2392.	0. 3419.	0. 4546.	0. 5742.	0. 6984.	0.	0.	264.	792.	1508.

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	4.53	16.62	41.74	89.06	117.93	139.09	150.24	161.71	173.46
ELEVATION	2135.00	2137.00	2140.00	2144.00	2150.00	2153.00	2155.00	2156.00	2157.00	2158.00
STORAGE	185.44	197.64	210.20	223.26	236.82					
ELEVATION	2159.00	2160.00	2161.00	2162.00	2163.00					

HYDROGRAPH AT STATION DAMOUT
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000	1	0.	2.0	2135.9	*	*	2	0100	301	0.	139.1	2155.0	*	*	3	0200	601	0.	139.1	2155.0	*
1	0005	2	0.	2.0	2135.9	*	*	2	0105	302	0.	139.1	2155.0	*	*	3	0205	602	0.	139.1	2155.0	*
1	0010	3	0.	2.0	2135.9	*	*	2	0110	303	0.	139.1	2155.0	*	*	3	0210	603	0.	139.1	2155.0	*
1	0015	4	0.	2.0	2135.9	*	*	2	0115	304	0.	139.1	2155.0	*	*	3	0215	604	0.	139.1	2155.0	*
1	0020	5	0.	2.0	2135.9	*	*	2	0120	305	0.	139.1	2155.0	*	*	3	0220	605	0.	139.1	2155.0	*
1	0025	6	0.	2.1	2135.9	*	*	2	0125	306	0.	139.1	2155.0	*	*	3	0225	606	0.	139.1	2155.0	*
1	0030	7	0.	2.1	2135.9	*	*	2	0130	307	0.	139.1	2155.0	*	*	3	0230	607	0.	139.1	2155.0	*
1	0035	8	0.	2.2	2136.0	*	*	2	0135	308	0.	139.1	2155.0	*	*	3	0235	608	0.	139.1	2155.0	*
1	0040	9	0.	2.3	2136.0	*	*	2	0140	309	0.	139.1	2155.0	*	*	3	0240	609	0.	139.1	2155.0	*
1	0045	10	0.	2.4	2136.1	*	*	2	0145	310	0.	139.1	2155.0	*	*	3	0245	610	0.	139.1	2155.0	*
1	0050	11	0.	2.6	2136.1	*	*	2	0150	311	0.	139.1	2155.0	*	*	3	0250	611	0.	139.1	2155.0	*
1	0055	12	0.	2.7	2136.2	*	*	2	0155	312	0.	139.1	2155.0	*	*	3	0255	612	0.	139.1	2155.0	*
1	0100	13	0.	2.9	2136.3	*	*	2	0200	313	0.	139.1	2155.0	*	*	3	0300	613	0.	139.1	2155.0	*
1	0105	14	0.	3.1	2136.4	*	*	2	0205	314	0.	139.1	2155.0	*	*	3	0305	614	0.	139.1	2155.0	*
1	0110	15	0.	3.3	2136.5	*	*	2	0210	315	0.	139.1	2155.0	*	*	3	0310	615	0.	139.1	2155.0	*
1	0115	16	0.	3.5	2136.6	*	*	2	0215	316	0.	139.1	2155.0	*	*	3	0315	616	0.	139.1	2155.0	*
1	0120	17	0.	3.8	2136.7	*	*	2	0220	317	0.	139.1	2155.0	*	*	3	0320	617	0.	139.1	2155.0	*
1	0125	18	0.	4.1	2136.8	*	*	2	0225	318	0.	139.1	2155.0	*	*	3	0325	618	0.	139.1	2155.0	*
1	0130	19	0.	4.4	2136.9	*	*	2	0230	319	0.	139.1	2155.0	*	*	3	0330	619	0.	139.1	2155.0	*
1	0135	20	0.	4.7	2137.0	*	*	2	0235	320	0.	139.1	2155.0	*	*	3	0335	620	0.	139.1	2155.0	*
1	0140	21	0.	5.1	2137.1	*	*	2	0240	321	0.	139.1	2155.0	*	*	3	0340	621	0.	139.1	2155.0	*
1	0145	22	0.	5.4	2137.2	*	*	2	0245	322	0.	139.1	2155.0	*	*	3	0345	622	0.	139.1	2155.0	*
1	0150	23	0.	5.8	2137.3	*	*	2	0250	323	0.	139.1	2155.0	*	*	3	0350	623	0.	139.1	2155.0	*
1	0155	24	0.	6.2	2137.4	*	*	2	0255	324	0.	139.1	2155.0	*	*	3	0355	624	0.	139.1	2155.0	*
1	0200	25	0.	6.6	2137.5	*	*	2	0300	325	0.	139.1	2155.0	*	*	3	0400	625	0.	139.1	2155.0	*
1	0205	26	0.	7.1	2137.6	*	*	2	0305	326	0.	139.1	2155.0	*	*	3	0405	626	0.	139.1	2155.0	*
1	0210	27	0.	7.6	2137.8	*	*	2	0310	327	0.	139.1	2155.0	*	*	3	0410	627	0.	139.1	2155.0	*
1	0215	28	0.	8.3	2137.9	*	*	2	0315	328	0.	139.1	2155.0	*	*	3	0415	628	0.	139.1	2155.0	*
1	0220	29	0.	9.2	2138.2	*	*	2	0320	329	0.	139.1	2155.0	*	*	3	0420	629	0.	139.1	2155.0	*
1	0225	30	0.	10.4	2138.5	*	*	2	0325	330	0.	139.1	2155.0	*	*	3	0425	630	0.	139.1	2155.0	*
1	0230	31	0.	11.9	2138.8	*	*	2	0330	331	0.	139.1	2155.0	*	*	3	0430	631	0.	139.1	2155.0	*
1	0235	32	0.	13.8	2139.3	*	*	2	0335	332	0.	139.1	2155.0	*	*	3	0435	632	0.	139.1	2155.0	*
1	0240	33	0.	16.0	2139.8	*	*	2	0340	333	0.	139.1	2155.0	*	*	3	0440	633	0.	139.1	2155.0	*
1	0245	34	0.	18.4	2140.3	*	*	2	0345	334	0.	139.1	2155.0	*	*	3	0445	634	0.	139.1	2155.0	*
1	0250	35	0.	21.1	2140.7	*	*	2	0350	335	0.	139.1	2155.0	*	*	3	0450	635	0.	139.1	2155.0	*
1	0255	36	0.	23.9	2141.2	*	*	2	0355	336	0.	139.1	2155.0	*	*	3	0455	636	0.	139.1	2155.0	*
1	0300	37	0.	26.9	2141.6	*	*	2	0400	337	0.	139.1	2155.0	*	*	3	0500	637	0.	139.1	2155.0	*

1	0305	38	0.	30.4	2142.2	* 2	0405	338	0.	139.1	2155.0	* 3	0505	638	0.	139.1	2155.0
1	0310	39	0.	36.4	2143.2	* 2	0410	339	0.	139.1	2155.0	* 3	0510	639	0.	139.1	2155.0
1	0315	40	0.	48.2	2144.8	* 2	0415	340	0.	139.1	2155.0	* 3	0515	640	0.	139.1	2155.0
1	0320	41	0.	69.1	2147.5	* 2	0420	341	0.	139.1	2155.0	* 3	0520	641	0.	139.1	2155.0
1	0325	42	0.	99.4	2151.1	* 2	0425	342	0.	139.1	2155.0	* 3	0525	642	0.	139.1	2155.0
1	0330	43	0.	135.2	2154.6	* 2	0430	343	0.	139.1	2155.0	* 3	0530	643	0.	139.1	2155.0
1	0335	44	1162.	167.8	2157.5	* 2	0435	344	0.	139.1	2155.0	* 3	0535	644	0.	139.1	2155.0
1	0340	45	2699.	189.1	2159.3	* 2	0440	345	0.	139.1	2155.0	* 3	0540	645	0.	139.1	2155.0
1	0345	46	3529.	198.9	2160.1	* 2	0445	346	0.	139.1	2155.0	* 3	0545	646	0.	139.1	2155.0
1	0350	47	3744.	201.3	2160.3	* 2	0450	347	0.	139.1	2155.0	* 3	0550	647	0.	139.1	2155.0
1	0355	48	3612.	199.8	2160.2	* 2	0455	348	0.	139.1	2155.0	* 3	0555	648	0.	139.1	2155.0
1	0400	49	3335.	196.6	2159.9	* 2	0500	349	0.	139.1	2155.0	* 3	0600	649	0.	139.1	2155.0
1	0405	50	3023.	192.9	2159.6	* 2	0505	350	0.	139.1	2155.0	* 3	0605	650	0.	139.1	2155.0
1	0410	51	2704.	189.2	2159.3	* 2	0510	351	0.	139.1	2155.0	* 3	0610	651	0.	139.1	2155.0
1	0415	52	2393.	185.5	2159.0	* 2	0515	352	0.	139.1	2155.0	* 3	0615	652	0.	139.1	2155.0
1	0420	53	2125.	181.8	2158.7	* 2	0520	353	0.	139.1	2155.0	* 3	0620	653	0.	139.1	2155.0
1	0425	54	1865.	178.3	2158.4	* 2	0525	354	0.	139.1	2155.0	* 3	0625	654	0.	139.1	2155.0
1	0430	55	1621.	175.0	2158.1	* 2	0530	355	0.	139.1	2155.0	* 3	0630	655	0.	139.1	2155.0
1	0435	56	1416.	172.0	2157.9	* 2	0535	356	0.	139.1	2155.0	* 3	0635	656	0.	139.1	2155.0
1	0440	57	1246.	169.2	2157.6	* 2	0540	357	0.	139.1	2155.0	* 3	0640	657	0.	139.1	2155.0
1	0445	58	1089.	166.6	2157.4	* 2	0545	358	0.	139.1	2155.0	* 3	0645	658	0.	139.1	2155.0
1	0450	59	949.	164.3	2157.2	* 2	0550	359	0.	139.1	2155.0	* 3	0650	659	0.	139.1	2155.0
1	0455	60	828.	162.3	2157.1	* 2	0555	360	0.	139.1	2155.0	* 3	0655	660	0.	139.1	2155.0
1	0500	61	740.	160.6	2156.9	* 2	0600	361	0.	139.1	2155.0	* 3	0700	661	0.	139.1	2155.0
1	0505	62	668.	159.0	2156.8	* 2	0605	362	0.	139.1	2155.0	* 3	0705	662	0.	139.1	2155.0
1	0510	63	602.	157.6	2156.6	* 2	0610	363	0.	139.1	2155.0	* 3	0710	663	0.	139.1	2155.0
1	0515	64	541.	156.3	2156.5	* 2	0615	364	0.	139.1	2155.0	* 3	0715	664	0.	139.1	2155.0
1	0520	65	483.	155.0	2156.4	* 2	0620	365	0.	139.1	2155.0	* 3	0720	665	0.	139.1	2155.0
1	0525	66	427.	153.8	2156.3	* 2	0625	366	0.	139.1	2155.0	* 3	0725	666	0.	139.1	2155.0
1	0530	67	375.	152.7	2156.2	* 2	0630	367	0.	139.1	2155.0	* 3	0730	667	0.	139.1	2155.0
1	0535	68	328.	151.6	2156.1	* 2	0635	368	0.	139.1	2155.0	* 3	0735	668	0.	139.1	2155.0
1	0540	69	286.	150.7	2156.0	* 2	0640	369	0.	139.1	2155.0	* 3	0740	669	0.	139.1	2155.0
1	0545	70	255.	149.9	2156.0	* 2	0645	370	0.	139.1	2155.0	* 3	0745	670	0.	139.1	2155.0
1	0550	71	237.	149.1	2155.9	* 2	0650	371	0.	139.1	2155.0	* 3	0750	671	0.	139.1	2155.0
1	0555	72	218.	148.3	2155.8	* 2	0655	372	0.	139.1	2155.0	* 3	0755	672	0.	139.1	2155.0
1	0600	73	200.	147.5	2155.8	* 2	0700	373	0.	139.1	2155.0	* 3	0800	673	0.	139.1	2155.0
1	0605	74	183.	146.8	2155.7	* 2	0705	374	0.	139.1	2155.0	* 3	0805	674	0.	139.1	2155.0
1	0610	75	167.	146.1	2155.6	* 2	0710	375	0.	139.1	2155.0	* 3	0810	675	0.	139.1	2155.0
1	0615	76	152.	145.5	2155.6	* 2	0715	376	0.	139.1	2155.0	* 3	0815	676	0.	139.1	2155.0
1	0620	77	138.	144.9	2155.5	* 2	0720	377	0.	139.1	2155.0	* 3	0820	677	0.	139.1	2155.0
1	0625	78	125.	144.4	2155.5	* 2	0725	378	0.	139.1	2155.0	* 3	0825	678	0.	139.1	2155.0
1	0630	79	113.	143.9	2155.4	* 2	0730	379	0.	139.1	2155.0	* 3	0830	679	0.	139.1	2155.0
1	0635	80	102.	143.4	2155.4	* 2	0735	380	0.	139.1	2155.0	* 3	0835	680	0.	139.1	2155.0
1	0640	81	91.	142.9	2155.3	* 2	0740	381	0.	139.1	2155.0	* 3	0840	681	0.	139.1	2155.0
1	0645	82	81.	142.5	2155.3	* 2	0745	382	0.	139.1	2155.0	* 3	0845	682	0.	139.1	2155.0
1	0650	83	73.	142.2	2155.3	* 2	0750	383	0.	139.1	2155.0	* 3	0850	683	0.	139.1	2155.0
1	0655	84	65.	141.8	2155.2	* 2	0755	384	0.	139.1	2155.0	* 3	0855	684	0.	139.1	2155.0
1	0700	85	58.	141.5	2155.2	* 2	0800	385	0.	139.1	2155.0	* 3	0900	685	0.	139.1	2155.0
1	0705	86	52.	141.3	2155.2	* 2	0805	386	0.	139.1	2155.0	* 3	0905	686	0.	139.1	2155.0
1	0710	87	46.	141.0	2155.2	* 2	0810	387	0.	139.1	2155.0	* 3	0910	687	0.	139.1	2155.0
1	0715	88	41.	140.8	2155.2	* 2	0815	388	0.	139.1	2155.0	* 3	0915	688	0.	139.1	2155.0
1	0720	89	36.	140.6	2155.1	* 2	0820	389	0.	139.1	2155.0	* 3	0920	689	0.	139.1	2155.0
1	0725	90	32.	140.4	2155.1	* 2	0825	390	0.	139.1	2155.0	* 3	0925	690	0.	139.1	2155.0
1	0730	91	28.	140.3	2155.1	* 2	0830	391	0.	139.1	2155.0	* 3	0930	691	0.	139.1	2155.0
1	0735	92	25.	140.1	2155.1	* 2	0835	392	0.	139.1	2155.0	* 3	0935	692	0.	139.1	2155.0
1	0740	93	22.	140.0	2155.1	* 2	0840	393	0.	139.1	2155.0	* 3	0940	693	0.	139.1	2155.0
1	0745	94	19.	139.9	2155.1	* 2	0845	394	0.	139.1	2155.0	* 3	0945	694	0.	139.1	2155.0
1	0750	95	17.	139.8	2155.1	* 2	0850	395	0.	139.1	2155.0	* 3	0950	695	0.	139.1	2155.0
1	0755	96	15.	139.7	2155.1	* 2	0855	396	0.	139.1	2155.0	* 3	0955	696	0.	139.1	2155.0
1	0800	97	13.	139.6	2155.0	* 2	0900	397	0.	139.1	2155.0	* 3	1000	697	0.	139.1	2155.0
1	0805	98	11.	139.6	2155.0	* 2	0905	398	0.	139.1	2155.0	* 3	1005	698	0.	139.1	2155.0
1	0810	99	10.	139.5	2155.0	* 2	0910	399	0.	139.1	2155.0	* 3	1010	699	0.	139.1	2155.0
1	0815	100	9.	139.5	2155.0	* 2	0915	400	0.	139.1	2155.0	* 3	1015	700	0.	139.1	2155.0
1	0820	101	7.	139.4	2155.0	* 2	0920	401	0.	139.1	2155.0	* 3	1020	701	0.	139.1	2155.0
1	0825	102	6.	139.4	2155.0	* 2	0925	402	0.	139.1	2155.0	* 3	1025	702	0.	139.1	2155.0
1	0830	103	6.	139.3	2155.0	* 2	0930	403	0.	139.1	2155.0	* 3	1030	703	0.	139.1	2155.0

1	0835	104	5.	139.3	2155.0	*	2	0935	404	0.	139.1	2155.0	*	3	1035	704	0.	139.1	2155.0
1	0840	105	4.	139.3	2155.0	*	2	0940	405	0.	139.1	2155.0	*	3	1040	705	0.	139.1	2155.0
1	0845	106	4.	139.2	2155.0	*	2	0945	406	0.	139.1	2155.0	*	3	1045	706	0.	139.1	2155.0
1	0850	107	3.	139.2	2155.0	*	2	0950	407	0.	139.1	2155.0	*	3	1050	707	0.	139.1	2155.0
1	0855	108	3.	139.2	2155.0	*	2	0955	408	0.	139.1	2155.0	*	3	1055	708	0.	139.1	2155.0
1	0900	109	2.	139.2	2155.0	*	2	1000	409	0.	139.1	2155.0	*	3	1100	709	0.	139.1	2155.0
1	0905	110	2.	139.2	2155.0	*	2	1005	410	0.	139.1	2155.0	*	3	1105	710	0.	139.1	2155.0
1	0910	111	2.	139.2	2155.0	*	2	1010	411	0.	139.1	2155.0	*	3	1110	711	0.	139.1	2155.0
1	0915	112	1.	139.2	2155.0	*	2	1015	412	0.	139.1	2155.0	*	3	1115	712	0.	139.1	2155.0
1	0920	113	1.	139.1	2155.0	*	2	1020	413	0.	139.1	2155.0	*	3	1120	713	0.	139.1	2155.0
1	0925	114	1.	139.1	2155.0	*	2	1025	414	0.	139.1	2155.0	*	3	1125	714	0.	139.1	2155.0
1	0930	115	1.	139.1	2155.0	*	2	1030	415	0.	139.1	2155.0	*	3	1130	715	0.	139.1	2155.0
1	0935	116	1.	139.1	2155.0	*	2	1035	416	0.	139.1	2155.0	*	3	1135	716	0.	139.1	2155.0
1	0940	117	1.	139.1	2155.0	*	2	1040	417	0.	139.1	2155.0	*	3	1140	717	0.	139.1	2155.0
1	0945	118	1.	139.1	2155.0	*	2	1045	418	0.	139.1	2155.0	*	3	1145	718	0.	139.1	2155.0
1	0950	119	0.	139.1	2155.0	*	2	1050	419	0.	139.1	2155.0	*	3	1150	719	0.	139.1	2155.0
1	0955	120	0.	139.1	2155.0	*	2	1055	420	0.	139.1	2155.0	*	3	1155	720	0.	139.1	2155.0
1	1000	121	0.	139.1	2155.0	*	2	1100	421	0.	139.1	2155.0	*	3	1200	721	0.	139.1	2155.0
1	1005	122	0.	139.1	2155.0	*	2	1105	422	0.	139.1	2155.0	*	3	1205	722	0.	139.1	2155.0
1	1010	123	0.	139.1	2155.0	*	2	1110	423	0.	139.1	2155.0	*	3	1210	723	0.	139.1	2155.0
1	1015	124	0.	139.1	2155.0	*	2	1115	424	0.	139.1	2155.0	*	3	1215	724	0.	139.1	2155.0
1	1020	125	0.	139.1	2155.0	*	2	1120	425	0.	139.1	2155.0	*	3	1220	725	0.	139.1	2155.0
1	1025	126	0.	139.1	2155.0	*	2	1125	426	0.	139.1	2155.0	*	3	1225	726	0.	139.1	2155.0
1	1030	127	0.	139.1	2155.0	*	2	1130	427	0.	139.1	2155.0	*	3	1230	727	0.	139.1	2155.0
1	1035	128	0.	139.1	2155.0	*	2	1135	428	0.	139.1	2155.0	*	3	1235	728	0.	139.1	2155.0
1	1040	129	0.	139.1	2155.0	*	2	1140	429	0.	139.1	2155.0	*	3	1240	729	0.	139.1	2155.0
1	1045	130	0.	139.1	2155.0	*	2	1145	430	0.	139.1	2155.0	*	3	1245	730	0.	139.1	2155.0
1	1050	131	0.	139.1	2155.0	*	2	1150	431	0.	139.1	2155.0	*	3	1250	731	0.	139.1	2155.0
1	1055	132	0.	139.1	2155.0	*	2	1155	432	0.	139.1	2155.0	*	3	1255	732	0.	139.1	2155.0
1	1100	133	0.	139.1	2155.0	*	2	1200	433	0.	139.1	2155.0	*	3	1300	733	0.	139.1	2155.0
1	1105	134	0.	139.1	2155.0	*	2	1205	434	0.	139.1	2155.0	*	3	1305	734	0.	139.1	2155.0
1	1110	135	0.	139.1	2155.0	*	2	1210	435	0.	139.1	2155.0	*	3	1310	735	0.	139.1	2155.0
1	1115	136	0.	139.1	2155.0	*	2	1215	436	0.	139.1	2155.0	*	3	1315	736	0.	139.1	2155.0
1	1120	137	0.	139.1	2155.0	*	2	1220	437	0.	139.1	2155.0	*	3	1320	737	0.	139.1	2155.0
1	1125	138	0.	139.1	2155.0	*	2	1225	438	0.	139.1	2155.0	*	3	1325	738	0.	139.1	2155.0
1	1130	139	0.	139.1	2155.0	*	2	1230	439	0.	139.1	2155.0	*	3	1330	739	0.	139.1	2155.0
1	1135	140	0.	139.1	2155.0	*	2	1235	440	0.	139.1	2155.0	*	3	1335	740	0.	139.1	2155.0
1	1140	141	0.	139.1	2155.0	*	2	1240	441	0.	139.1	2155.0	*	3	1340	741	0.	139.1	2155.0
1	1145	142	0.	139.1	2155.0	*	2	1245	442	0.	139.1	2155.0	*	3	1345	742	0.	139.1	2155.0
1	1150	143	0.	139.1	2155.0	*	2	1250	443	0.	139.1	2155.0	*	3	1350	743	0.	139.1	2155.0
1	1155	144	0.	139.1	2155.0	*	2	1255	444	0.	139.1	2155.0	*	3	1355	744	0.	139.1	2155.0
1	1200	145	0.	139.1	2155.0	*	2	1300	445	0.	139.1	2155.0	*	3	1400	745	0.	139.1	2155.0
1	1205	146	0.	139.1	2155.0	*	2	1305	446	0.	139.1	2155.0	*	3	1405	746	0.	139.1	2155.0
1	1210	147	0.	139.1	2155.0	*	2	1310	447	0.	139.1	2155.0	*	3	1410	747	0.	139.1	2155.0
1	1215	148	0.	139.1	2155.0	*	2	1315	448	0.	139.1	2155.0	*	3	1415	748	0.	139.1	2155.0
1	1220	149	0.	139.1	2155.0	*	2	1320	449	0.	139.1	2155.0	*	3	1420	749	0.	139.1	2155.0
1	1225	150	0.	139.1	2155.0	*	2	1325	450	0.	139.1	2155.0	*	3	1425	750	0.	139.1	2155.0
1	1230	151	0.	139.1	2155.0	*	2	1330	451	0.	139.1	2155.0	*	3	1430	751	0.	139.1	2155.0
1	1235	152	0.	139.1	2155.0	*	2	1335	452	0.	139.1	2155.0	*	3	1435	752	0.	139.1	2155.0
1	1240	153	0.	139.1	2155.0	*	2	1340	453	0.	139.1	2155.0	*	3	1440	753	0.	139.1	2155.0
1	1245	154	0.	139.1	2155.0	*	2	1345	454	0.	139.1	2155.0	*	3	1445	754	0.	139.1	2155.0
1	1250	155	0.	139.1	2155.0	*	2	1350	455	0.	139.1	2155.0	*	3	1450	755	0.	139.1	2155.0
1	1255	156	0.	139.1	2155.0	*	2	1355	456	0.	139.1	2155.0	*	3	1455	756	0.	139.1	2155.0
1	1300	157	0.	139.1	2155.0	*	2	1400	457	0.	139.1	2155.0	*	3	1500	757	0.	139.1	2155.0
1	1305	158	0.	139.1	2155.0	*	2	1405	458	0.	139.1	2155.0	*	3	1505	758	0.	139.1	2155.0
1	1310	159	0.	139.1	2155.0	*	2	1410	459	0.	139.1	2155.0	*	3	1510	759	0.	139.1	2155.0
1	1315	160	0.	139.1	2155.0	*	2	1415	460	0.	139.1	2155.0	*	3	1515	760	0.	139.1	2155.0
1	1320	161	0.	139.1	2155.0	*	2	1420	461	0.	139.1	2155.0	*	3	1520	761	0.	139.1	2155.0
1	1325	162	0.	139.1	2155.0	*	2	1425	462	0.	139.1	2155.0	*	3	1525	762	0.	139.1	2155.0
1	1330	163	0.	139.1	2155.0	*	2	1430	463	0.	139.1	2155.0	*	3	1530	763	0.	139.1	2155.0
1	1335	164	0.	139.1	2155.0	*	2	1435	464	0.	139.1	2155.0	*	3	1535	764	0.	139.1	2155.0
1	1340	165	0.	139.1	2155.0	*	2	1440	465	0.	139.1	2155.0	*	3	1540	765	0.	139.1	2155.0
1	1345	166	0.	139.1	2155.0	*	2	1445	466	0.	139.1	2155.0	*	3	1545	766	0.	139.1	2155.0
1	1350	167	0.	139.1	2155.0	*	2	1450	467	0.	139.1	2155.0	*	3	1550	767	0.	139.1	2155.0
1	1355	168	0.	139.1	2155.0	*	2	1455	468	0.	139.1	2155.0	*	3	1555	768	0.	139.1	2155.0
1	1400	169	0.	139.1	2155.0	*	2	1500	469	0.	139.1	2155.0	*	3	1600	769	0.	139.1	2155.0

1	1405	170	0.	139.1	2155.0	* 2	1505	470	0.	139.1	2155.0	* 3	1605	770	0.	139.1	2155.0
1	1410	171	0.	139.1	2155.0	* 2	1510	471	0.	139.1	2155.0	* 3	1610	771	0.	139.1	2155.0
1	1415	172	0.	139.1	2155.0	* 2	1515	472	0.	139.1	2155.0	* 3	1615	772	0.	139.1	2155.0
1	1420	173	0.	139.1	2155.0	* 2	1520	473	0.	139.1	2155.0	* 3	1620	773	0.	139.1	2155.0
1	1425	174	0.	139.1	2155.0	* 2	1525	474	0.	139.1	2155.0	* 3	1625	774	0.	139.1	2155.0
1	1430	175	0.	139.1	2155.0	* 2	1530	475	0.	139.1	2155.0	* 3	1630	775	0.	139.1	2155.0
1	1435	176	0.	139.1	2155.0	* 2	1535	476	0.	139.1	2155.0	* 3	1635	776	0.	139.1	2155.0
1	1440	177	0.	139.1	2155.0	* 2	1540	477	0.	139.1	2155.0	* 3	1640	777	0.	139.1	2155.0
1	1445	178	0.	139.1	2155.0	* 2	1545	478	0.	139.1	2155.0	* 3	1645	778	0.	139.1	2155.0
1	1450	179	0.	139.1	2155.0	* 2	1550	479	0.	139.1	2155.0	* 3	1650	779	0.	139.1	2155.0
1	1455	180	0.	139.1	2155.0	* 2	1555	480	0.	139.1	2155.0	* 3	1655	780	0.	139.1	2155.0
1	1500	181	0.	139.1	2155.0	* 2	1600	481	0.	139.1	2155.0	* 3	1700	781	0.	139.1	2155.0
1	1505	182	0.	139.1	2155.0	* 2	1605	482	0.	139.1	2155.0	* 3	1705	782	0.	139.1	2155.0
1	1510	183	0.	139.1	2155.0	* 2	1610	483	0.	139.1	2155.0	* 3	1710	783	0.	139.1	2155.0
1	1515	184	0.	139.1	2155.0	* 2	1615	484	0.	139.1	2155.0	* 3	1715	784	0.	139.1	2155.0
1	1520	185	0.	139.1	2155.0	* 2	1620	485	0.	139.1	2155.0	* 3	1720	785	0.	139.1	2155.0
1	1525	186	0.	139.1	2155.0	* 2	1625	486	0.	139.1	2155.0	* 3	1725	786	0.	139.1	2155.0
1	1530	187	0.	139.1	2155.0	* 2	1630	487	0.	139.1	2155.0	* 3	1730	787	0.	139.1	2155.0
1	1535	188	0.	139.1	2155.0	* 2	1635	488	0.	139.1	2155.0	* 3	1735	788	0.	139.1	2155.0
1	1540	189	0.	139.1	2155.0	* 2	1640	489	0.	139.1	2155.0	* 3	1740	789	0.	139.1	2155.0
1	1545	190	0.	139.1	2155.0	* 2	1645	490	0.	139.1	2155.0	* 3	1745	790	0.	139.1	2155.0
1	1550	191	0.	139.1	2155.0	* 2	1650	491	0.	139.1	2155.0	* 3	1750	791	0.	139.1	2155.0
1	1555	192	0.	139.1	2155.0	* 2	1655	492	0.	139.1	2155.0	* 3	1755	792	0.	139.1	2155.0
1	1600	193	0.	139.1	2155.0	* 2	1700	493	0.	139.1	2155.0	* 3	1800	793	0.	139.1	2155.0
1	1605	194	0.	139.1	2155.0	* 2	1705	494	0.	139.1	2155.0	* 3	1805	794	0.	139.1	2155.0
1	1610	195	0.	139.1	2155.0	* 2	1710	495	0.	139.1	2155.0	* 3	1810	795	0.	139.1	2155.0
1	1615	196	0.	139.1	2155.0	* 2	1715	496	0.	139.1	2155.0	* 3	1815	796	0.	139.1	2155.0
1	1620	197	0.	139.1	2155.0	* 2	1720	497	0.	139.1	2155.0	* 3	1820	797	0.	139.1	2155.0
1	1625	198	0.	139.1	2155.0	* 2	1725	498	0.	139.1	2155.0	* 3	1825	798	0.	139.1	2155.0
1	1630	199	0.	139.1	2155.0	* 2	1730	499	0.	139.1	2155.0	* 3	1830	799	0.	139.1	2155.0
1	1635	200	0.	139.1	2155.0	* 2	1735	500	0.	139.1	2155.0	* 3	1835	800	0.	139.1	2155.0
1	1640	201	0.	139.1	2155.0	* 2	1740	501	0.	139.1	2155.0	* 3	1840	801	0.	139.1	2155.0
1	1645	202	0.	139.1	2155.0	* 2	1745	502	0.	139.1	2155.0	* 3	1845	802	0.	139.1	2155.0
1	1650	203	0.	139.1	2155.0	* 2	1750	503	0.	139.1	2155.0	* 3	1850	803	0.	139.1	2155.0
1	1655	204	0.	139.1	2155.0	* 2	1755	504	0.	139.1	2155.0	* 3	1855	804	0.	139.1	2155.0
1	1700	205	0.	139.1	2155.0	* 2	1800	505	0.	139.1	2155.0	* 3	1900	805	0.	139.1	2155.0
1	1705	206	0.	139.1	2155.0	* 2	1805	506	0.	139.1	2155.0	* 3	1905	806	0.	139.1	2155.0
1	1710	207	0.	139.1	2155.0	* 2	1810	507	0.	139.1	2155.0	* 3	1910	807	0.	139.1	2155.0
1	1715	208	0.	139.1	2155.0	* 2	1815	508	0.	139.1	2155.0	* 3	1915	808	0.	139.1	2155.0
1	1720	209	0.	139.1	2155.0	* 2	1820	509	0.	139.1	2155.0	* 3	1920	809	0.	139.1	2155.0
1	1725	210	0.	139.1	2155.0	* 2	1825	510	0.	139.1	2155.0	* 3	1925	810	0.	139.1	2155.0
1	1730	211	0.	139.1	2155.0	* 2	1830	511	0.	139.1	2155.0	* 3	1930	811	0.	139.1	2155.0
1	1735	212	0.	139.1	2155.0	* 2	1835	512	0.	139.1	2155.0	* 3	1935	812	0.	139.1	2155.0
1	1740	213	0.	139.1	2155.0	* 2	1840	513	0.	139.1	2155.0	* 3	1940	813	0.	139.1	2155.0
1	1745	214	0.	139.1	2155.0	* 2	1845	514	0.	139.1	2155.0	* 3	1945	814	0.	139.1	2155.0
1	1750	215	0.	139.1	2155.0	* 2	1850	515	0.	139.1	2155.0	* 3	1950	815	0.	139.1	2155.0
1	1755	216	0.	139.1	2155.0	* 2	1855	516	0.	139.1	2155.0	* 3	1955	816	0.	139.1	2155.0
1	1800	217	0.	139.1	2155.0	* 2	1900	517	0.	139.1	2155.0	* 3	2000	817	0.	139.1	2155.0
1	1805	218	0.	139.1	2155.0	* 2	1905	518	0.	139.1	2155.0	* 3	2005	818	0.	139.1	2155.0
1	1810	219	0.	139.1	2155.0	* 2	1910	519	0.	139.1	2155.0	* 3	2010	819	0.	139.1	2155.0
1	1815	220	0.	139.1	2155.0	* 2	1915	520	0.	139.1	2155.0	* 3	2015	820	0.	139.1	2155.0
1	1820	221	0.	139.1	2155.0	* 2	1920	521	0.	139.1	2155.0	* 3	2020	821	0.	139.1	2155.0
1	1825	222	0.	139.1	2155.0	* 2	1925	522	0.	139.1	2155.0	* 3	2025	822	0.	139.1	2155.0
1	1830	223	0.	139.1	2155.0	* 2	1930	523	0.	139.1	2155.0	* 3	2030	823	0.	139.1	2155.0
1	1835	224	0.	139.1	2155.0	* 2	1935	524	0.	139.1	2155.0	* 3	2035	824	0.	139.1	2155.0
1	1840	225	0.	139.1	2155.0	* 2	1940	525	0.	139.1	2155.0	* 3	2040	825	0.	139.1	2155.0
1	1845	226	0.	139.1	2155.0	* 2	1945	526	0.	139.1	2155.0	* 3	2045	826	0.	139.1	2155.0
1	1850	227	0.	139.1	2155.0	* 2	1950	527	0.	139.1	2155.0	* 3	2050	827	0.	139.1	2155.0
1	1855	228	0.	139.1	2155.0	* 2	1955	528	0.	139.1	2155.0	* 3	2055	828	0.	139.1	2155.0
1	1900	229	0.	139.1	2155.0	* 2	2000	529	0.	139.1	2155.0	* 3	2100	829	0.	139.1	2155.0
1	1905	230	0.	139.1	2155.0	* 2	2005	530	0.	139.1	2155.0	* 3	2105	830	0.	139.1	2155.0
1	1910	231	0.	139.1	2155.0	* 2	2010	531	0.	139.1	2155.0	* 3	2110	831	0.	139.1	2155.0
1	1915	232	0.	139.1	2155.0	* 2	2015	532	0.	139.1	2155.0	* 3	2115	832	0.	139.1	2155.0
1	1920	233	0.	139.1	2155.0	* 2	2020	533	0.	139.1	2155.0	* 3	2120	833	0.	139.1	2155.0
1	1925	234	0.	139.1	2155.0	* 2	2025	534	0.	139.1	2155.0	* 3	2125	834	0.	139.1	2155.0
1	1930	235	0.	139.1	2155.0	* 2	2030	535	0.	139.1	2155.0	* 3	2130	835	0.	139.1	2155.0

1	1935	236	0.	139.1	2155.0	*	2	2035	536	0.	139.1	2155.0	*	3	2135	836	0.	139.1	2155.0
1	1940	237	0.	139.1	2155.0	*	2	2040	537	0.	139.1	2155.0	*	3	2140	837	0.	139.1	2155.0
1	1945	238	0.	139.1	2155.0	*	2	2045	538	0.	139.1	2155.0	*	3	2145	838	0.	139.1	2155.0
1	1950	239	0.	139.1	2155.0	*	2	2050	539	0.	139.1	2155.0	*	3	2150	839	0.	139.1	2155.0
1	1955	240	0.	139.1	2155.0	*	2	2055	540	0.	139.1	2155.0	*	3	2155	840	0.	139.1	2155.0
1	2000	241	0.	139.1	2155.0	*	2	2100	541	0.	139.1	2155.0	*	3	2200	841	0.	139.1	2155.0
1	2005	242	0.	139.1	2155.0	*	2	2105	542	0.	139.1	2155.0	*	3	2205	842	0.	139.1	2155.0
1	2010	243	0.	139.1	2155.0	*	2	2110	543	0.	139.1	2155.0	*	3	2210	843	0.	139.1	2155.0
1	2015	244	0.	139.1	2155.0	*	2	2115	544	0.	139.1	2155.0	*	3	2215	844	0.	139.1	2155.0
1	2020	245	0.	139.1	2155.0	*	2	2120	545	0.	139.1	2155.0	*	3	2220	845	0.	139.1	2155.0
1	2025	246	0.	139.1	2155.0	*	2	2125	546	0.	139.1	2155.0	*	3	2225	846	0.	139.1	2155.0
1	2030	247	0.	139.1	2155.0	*	2	2130	547	0.	139.1	2155.0	*	3	2230	847	0.	139.1	2155.0
1	2035	248	0.	139.1	2155.0	*	2	2135	548	0.	139.1	2155.0	*	3	2235	848	0.	139.1	2155.0
1	2040	249	0.	139.1	2155.0	*	2	2140	549	0.	139.1	2155.0	*	3	2240	849	0.	139.1	2155.0
1	2045	250	0.	139.1	2155.0	*	2	2145	550	0.	139.1	2155.0	*	3	2245	850	0.	139.1	2155.0
1	2050	251	0.	139.1	2155.0	*	2	2150	551	0.	139.1	2155.0	*	3	2250	851	0.	139.1	2155.0
1	2055	252	0.	139.1	2155.0	*	2	2155	552	0.	139.1	2155.0	*	3	2255	852	0.	139.1	2155.0
1	2100	253	0.	139.1	2155.0	*	2	2200	553	0.	139.1	2155.0	*	3	2300	853	0.	139.1	2155.0
1	2105	254	0.	139.1	2155.0	*	2	2205	554	0.	139.1	2155.0	*	3	2305	854	0.	139.1	2155.0
1	2110	255	0.	139.1	2155.0	*	2	2210	555	0.	139.1	2155.0	*	3	2310	855	0.	139.1	2155.0
1	2115	256	0.	139.1	2155.0	*	2	2215	556	0.	139.1	2155.0	*	3	2315	856	0.	139.1	2155.0
1	2120	257	0.	139.1	2155.0	*	2	2220	557	0.	139.1	2155.0	*	3	2320	857	0.	139.1	2155.0
1	2125	258	0.	139.1	2155.0	*	2	2225	558	0.	139.1	2155.0	*	3	2325	858	0.	139.1	2155.0
1	2130	259	0.	139.1	2155.0	*	2	2230	559	0.	139.1	2155.0	*	3	2330	859	0.	139.1	2155.0
1	2135	260	0.	139.1	2155.0	*	2	2235	560	0.	139.1	2155.0	*	3	2335	860	0.	139.1	2155.0
1	2140	261	0.	139.1	2155.0	*	2	2240	561	0.	139.1	2155.0	*	3	2340	861	0.	139.1	2155.0
1	2145	262	0.	139.1	2155.0	*	2	2245	562	0.	139.1	2155.0	*	3	2345	862	0.	139.1	2155.0
1	2150	263	0.	139.1	2155.0	*	2	2250	563	0.	139.1	2155.0	*	3	2350	863	0.	139.1	2155.0
1	2155	264	0.	139.1	2155.0	*	2	2255	564	0.	139.1	2155.0	*	3	2355	864	0.	139.1	2155.0
1	2200	265	0.	139.1	2155.0	*	2	2300	565	0.	139.1	2155.0	*	4	0000	865	0.	139.1	2155.0
1	2205	266	0.	139.1	2155.0	*	2	2305	566	0.	139.1	2155.0	*	4	0005	866	0.	139.1	2155.0
1	2210	267	0.	139.1	2155.0	*	2	2310	567	0.	139.1	2155.0	*	4	0010	867	0.	139.1	2155.0
1	2215	268	0.	139.1	2155.0	*	2	2315	568	0.	139.1	2155.0	*	4	0015	868	0.	139.1	2155.0
1	2220	269	0.	139.1	2155.0	*	2	2320	569	0.	139.1	2155.0	*	4	0020	869	0.	139.1	2155.0
1	2225	270	0.	139.1	2155.0	*	2	2325	570	0.	139.1	2155.0	*	4	0025	870	0.	139.1	2155.0
1	2230	271	0.	139.1	2155.0	*	2	2330	571	0.	139.1	2155.0	*	4	0030	871	0.	139.1	2155.0
1	2235	272	0.	139.1	2155.0	*	2	2335	572	0.	139.1	2155.0	*	4	0035	872	0.	139.1	2155.0
1	2240	273	0.	139.1	2155.0	*	2	2340	573	0.	139.1	2155.0	*	4	0040	873	0.	139.1	2155.0
1	2245	274	0.	139.1	2155.0	*	2	2345	574	0.	139.1	2155.0	*	4	0045	874	0.	139.1	2155.0
1	2250	275	0.	139.1	2155.0	*	2	2350	575	0.	139.1	2155.0	*	4	0050	875	0.	139.1	2155.0
1	2255	276	0.	139.1	2155.0	*	2	2355	576	0.	139.1	2155.0	*	4	0055	876	0.	139.1	2155.0
1	2300	277	0.	139.1	2155.0	*	3	0000	577	0.	139.1	2155.0	*	4	0100	877	0.	139.1	2155.0
1	2305	278	0.	139.1	2155.0	*	3	0005	578	0.	139.1	2155.0	*	4	0105	878	0.	139.1	2155.0
1	2310	279	0.	139.1	2155.0	*	3	0010	579	0.	139.1	2155.0	*	4	0110	879	0.	139.1	2155.0
1	2315	280	0.	139.1	2155.0	*	3	0015	580	0.	139.1	2155.0	*	4	0115	880	0.	139.1	2155.0
1	2320	281	0.	139.1	2155.0	*	3	0020	581	0.	139.1	2155.0	*	4	0120	881	0.	139.1	2155.0
1	2325	282	0.	139.1	2155.0	*	3	0025	582	0.	139.1	2155.0	*	4	0125	882	0.	139.1	2155.0
1	2330	283	0.	139.1	2155.0	*	3	0030	583	0.	139.1	2155.0	*	4	0130	883	0.	139.1	2155.0
1	2335	284	0.	139.1	2155.0	*	3	0035	584	0.	139.1	2155.0	*	4	0135	884	0.	139.1	2155.0
1	2340	285	0.	139.1	2155.0	*	3	0040	585	0.	139.1	2155.0	*	4	0140	885	0.	139.1	2155.0
1	2345	286	0.	139.1	2155.0	*	3	0045	586	0.	139.1	2155.0	*	4	0145	886	0.	139.1	2155.0
1	2350	287	0.	139.1	2155.0	*	3	0050	587	0.	139.1	2155.0	*	4	0150	887	0.	139.1	2155.0
1	2355	288	0.	139.1	2155.0	*	3	0055	588	0.	139.1	2155.0	*	4	0155	888	0.	139.1	2155.0
2	0000	289	0.	139.1	2155.0	*	3	0100	589	0.	139.1	2155.0	*	4	0200	889	0.	139.1	2155.0
2	0005	290	0.	139.1	2155.0	*	3	0105	590	0.	139.1	2155.0	*	4	0205	890	0.	139.1	2155.0
2	0010	291	0.	139.1	2155.0	*	3	0110	591	0.	139.1	2155.0	*	4	0210	891	0.	139.1	2155.0
2	0015	292	0.	139.1	2155.0	*	3	0115	592	0.	139.1	2155.0	*	4	0215	892	0.	139.1	2155.0
2	0020	293	0.	139.1	2155.0	*	3	0120	593	0.	139.1	2155.0	*	4	0220	893	0.	139.1	2155.0
2	0025	294	0.	139.1	2155.0	*	3	0125	594	0.	139.1	2155.0	*	4	0225	894	0.	139.1	2155.0
2	0030	295	0.	139.1	2155.0	*	3	0130	595	0.	139.1	2155.0	*	4	0230	895	0.	139.1	2155.0
2	0035	296	0.	139.1	2155.0	*	3	0135	596	0.	139.1	2155.0	*	4	0235	896	0.	139.1	2155.0
2	0040	297	0.	139.1	2155.0	*	3	0140	597	0.	139.1	2155.0	*	4	0240	897	0.	139.1	2155.0
2	0045	298	0.	139.1	2155.0	*	3	0145	598	0.	139.1	2155.0	*	4	0245	898	0.	139.1	2155.0
2	0050	299	0.	139.1	2155.0	*	3	0150	599	0.	139.1	2155.0	*	4	0250	899	0.	139.1	2155.0
2	0055	300	0.	139.1	2155.0	*	3	0155	600	0.	139.1	2155.0	*	4	0255	900	0.	139.1	2155.0

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.92-HR
3744.	3.83	(CFS)	618.	154.	51.	49.
		(INCHES)	4.631	4.632	4.632	4.632
		(AC-FT)	306.	306.	306.	306.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)		6-HR	24-HR	72-HR	74.92-HR
201.	3.83		153.	143.	140.	134.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
(FEET)	(HR)		6-HR	24-HR	72-HR	74.92-HR
2160.29	3.83		2156.19	2155.30	2155.02	2154.33

CUMULATIVE AREA = 1.24 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO 1	
					0.50
HYDROGRAPH AT	SAC230	0.72	1	FLOW TIME	3258. 3.50
HYDROGRAPH AT	SAC235	0.38	1	FLOW TIME	1538. 3.50
2 COMBINED AT	ADD	1.10	1	FLOW TIME	4796. 3.50
ROUTED TO	ROUTE	1.10	1	FLOW TIME	4700. 3.50
				** PEAK STAGES IN FEET **	
			1	STAGE TIME	15.47 3.50
HYDROGRAPH AT	CAS240	0.14	1	FLOW TIME	874. 3.33
2 COMBINED AT	DAMIN	1.24	1	FLOW TIME	5398. 3.50
ROUTED TO	DAMOUT	1.24	1	FLOW TIME	3744. 3.83
				** PEAK STAGES IN FEET **	
			1	STAGE TIME	2160.29 3.83

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

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*****  
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *  
* MAY 1991 *  
* VERSION 4.0.1E *  
* RUN DATE 02/02/1995 TIME 14:11:15 *  
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*****  
* U.S. ARMY CORPS OF ENGINEERS *  
* HYDROLOGIC ENGINEERING CENTER *  
* 609 SECOND STREET *  
* DAVIS, CALIFORNIA 95616 *  
* (916) 756-1104 *  
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  X   X  XXXXXXX  XXXXX   X  
  X   X  X       X   X   XX  
  X   X  X       X       X  
 XXXXXXX XXXX   X       XXXXX X  
  X   X  X       X       X  
  X   X  X       X   X   X  
  X   X  XXXXXXX  XXXXX   XXX
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.....  
Full Microcomputer Implementation  
by  
Haestad Methods, Inc.  
.....  
.....
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
* filename = Q100.HC1
*
*
*DIAGRAM
*
1         ID   Casandro Wash Detention Dam CH2M Hill   April, 1994
2         ID   HEC-1 for Q100, revised dam location alternative #3
*
3         IT       5           900
4         IO       3
*
5         KK   SAC230
6         KM   SUB-BASIN SAC230
7         KM   6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
8         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
9         KM   BASIN FROM WICKENBERG ADMS
10        BA    .720
11        IN    15
12        KM   RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
* 10 year = 2.202, 100 year = 3.350
13        PB    3.350
14        KM   THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53
15        PC    .000 .009 .016 .025 .034 .042 .051 .059 .067 .075
16        PC    .087 .100 .119 .151 .235 .416 .760 .872 .915 .944
17        PC    .956 .967 .979 .989 1.000
18        LG    .100 .250 5.200 .240 35.000
19        UC    .446 .367
20        UA    0      5      16      30      65      77      84      90      94      97
21        UA    100
*
22        KK   SAC235
23        KM   SUB-BASIN sac235
24        KM   6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
25        KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
26        KM   BASIN FROM WICKENBERG ADMS
27        BA    .380
28        LG    .100 .230 6.200 .150 36.000
29        UC    .450 .461
30        UA    0      5      16      30      65      77      84      90      94      97
31        UA    100
*
32        KK   ADD
33        KM   ADD SAC230 & SAC235
34        HC    2
*
35        KK   ROUTE
36        KM   ROUTE COMBINED HYDROGRAPH TO DAM LOCATION
37        RS    1      FLOW      -1
38        RC    .045 .03 .045 4200 .0175
39        RX    463.5 467.5 477.5 487.5 512.5 522.5 532.5 536.5
40        RY    16.5 12.5 12.5 10.0 10.0 12.5 12.5 16.5
*

```

LINE	ID	1	2	3	4	5	6	7	8	9	10
41	KK	CAS240									
42	KM	SUB-BASIN cas240									
43	KM	6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN									
44	KM	THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985									
45	KM	BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION									
46	BA	.140									
47	LG	.100	.210	6.400	.140	21.000					
48	UC	.258	.232								
49	UA	0	5	16	30	65	77	84	90	94	97
50	UA	100									
	*										
51	KK	DAMIN									
52	KO	1									
53	KM	ADD ROUTED HYDROGRAPH TO CAS240									
54	HC	2									
	*										
55	KK	DAMOUT									
56	KM	Route Hydrograph Through Dam.									
57	KM										
58	RS	1	STOR	2							
59	KO	1									
	*										
60	SA	2.05	2.49	5.80	6.77	9.06	10.20	10.96	11.34	11.61	11.88
61	SA	12.09	12.31	12.81	13.31	13.81					
62	SE	2135	2137	2140	2144	2150	2153	2155	2156	2157	2158
63	SE	2159	2160	2161	2162	2163					
64	SQ	0	9.5	13.5	19.1	23.3	28.6	30.9	295	823	1539
65	SQ	2423	3450	4577	5773	7015					
	*										
66	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
LINE	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
NO.		
5	SAC230	
	.	
22	.	SAC235
	.	.
32	ADD.....	.
	V	
	V	
35	ROUTE	
	.	
41	.	CAS240
	.	.
51	DAMIN.....	.
	V	
	V	
55	DAMOUT	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.C.1E *
*
* RUN DATE 02/02/1995 TIME 14:11:15 *
*

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

Casandro Wash Detention Dam CH2M Hill April, 1994
HEC-1 for Q100, revised dam location alternative #3

4 IO OUTPUT CONTROL VARIABLES
IPRNT 3 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 900 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 4 0 ENDING DATE
NDTIME 0255 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.08 HOURS
TOTAL TIME BASE 74.92 HOURS

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

*** ** ** ** **

*
5 KK * SAC230 *
*

SUB-BASIN SAC230
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN FROM WICKENBERG ADMS
RAINFALL DEPTH OF 3.40 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 1.53

11 IN TIME DATA FOR INPUT TIME SERIES
JXMIN 15 TIME INTERVAL IN MINUTES
JXDATE 1 0 STARTING DATE

JXTIME 0 STARTING TIME

SUBBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS
TAREA 0.72 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.03
0.03 0.03 0.06 0.06 0.06 0.11 0.11 0.11 0.04 0.04
0.04 0.01 0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00

18 LG GREEN AND AMPT LOSS RATE
STRTL 0.10 STARTING LOSS
DTH 0.25 MOISTURE DEFICIT
PSIF 5.20 WETTING FRONT SUCTION
XKSAT 0.24 HYDRAULIC CONDUCTIVITY
RTIMP 35.00 PERCENT IMPERVIOUS AREA

19 UC CLARK UNITGRAPH
TC 0.45 TIME OF CONCENTRATION
R 0.37 STORAGE COEFFICIENT

20 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.45 HR, R= 0.37 HR
SNYDER TP= 0.29 HR, CP= 0.48

UNIT HYDROGRAPH
26 END-OF-PERIOD ORDINATES
83. 383. 684. 750. 692. 597. 487. 387. 308. 246.
195. 156. 124. 99. 79. 62. 50. 40. 32. 25.
20. 16. 13. 10. 8. 6.

*** **

HYDROGRAPH AT STATION SAC230

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
(CFS) (HR) 6-HR 24-HR 72-HR 74.92-HR
1078. 4.17 (CFS) 178. 45. 15. 14.
(INCHES) 2.293 2.306 2.306 2.306
(AC-FT) 88. 89. 89. 89.

CUMULATIVE AREA = 0.72 SQ MI

*** **

22 KK

* SAC235 *
* *

SUB-BASIN sac235
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN FROM WICKENBERG ADMS

SUBBASIN RUNOFF DATA

27 BA SUBBASIN CHARACTERISTICS
TAREA 0.38 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.03
0.03 0.03 0.06 0.06 0.06 0.11 0.11 0.11 0.11 0.04 0.04
0.04 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00

28 LG GREEN AND AMPT LOSS RATE
STRTL 0.10 STARTING LOSS
DTH 0.23 MOISTURE DEFICIT
PS1F 6.20 WETTING FRONT SUCTION
XKSAT 0.15 HYDRAULIC CONDUCTIVITY
RTIMP 36.00 PERCENT IMPERVIOUS AREA

29 UC CLARK UNITGRAPH
TC 0.45 TIME OF CONCENTRATION
R 0.46 STORAGE COEFFICIENT

30 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.45 HR, R= 0.46 HR
SNYDER TP= 0.31 HR, CP= 0.44

UNIT HYDROGRAPH
32 END-OF-PERIOD ORDINATES
35. 162. 298. 339. 324. 290. 248. 207. 172. 144.
120. 100. 84. 70. 58. 48. 40. 34. 28. 23.
20. 16. 14. 11. 9. 8. 7. 6. 5. 4.
3. 3.

*** **

HYDROGRAPH AT STATION SAC235

TOTAL RAINFALL = 3.35, TOTAL LOSS = 0.87, TOTAL EXCESS = 2.48

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

10148111

(CFS)	(HR)		6-HR	24-HR	72-HR	74.92-HR
532.	4.25	(CFS)	100.	25.	8.	8.
		(INCHES)	2.450	2.467	2.467	2.467
		(AC-FT)	50.	50.	50.	50.

CUMULATIVE AREA = 0.38 SQ MI

*** **

```

*****
*
32 KK *      ADD *
*
*****
ADD SAC230 & SAC235

```

34 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

```

***          ***          ***          ***          ***
HYDROGRAPH AT STATION  ADD

```

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.92-HR
1608.	4.17	(CFS)	278.	70.	23.	22.
		(INCHES)	2.347	2.361	2.361	2.361
		(AC-FT)	138.	139.	139.	139.

CUMULATIVE AREA = 1.10 SQ MI

*** **

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*****
*
35 KK *      ROUTE *
*
*****
ROUTE COMBINED HYDROGRAPH TO DAM LOCATION

```

HYDROGRAPH ROUTING DATA

37 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	FLOW	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

38 RC NORMAL DEPTH CHANNEL

ANL	0.045	LEFT OVBANK N-VALUE
ANCH	0.030	MAIN CHANNEL N-VALUE
ANR	0.045	RIGHT OVBANK N-VALUE
RLNTH	4200.	REACH LENGTH
SEL	0.0175	ENERGY SLOPE
ELMAX	0.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

		CROSS-SECTION DATA							
		--- LEFT OVERBANK ---		+ ----- MAIN CHANNEL ----- +				--- RIGHT OVERBANK ---	
40 RY	ELEVATION	16.50	12.50	12.50	10.00	10.00	12.50	12.50	16.50
39 RX	DISTANCE	463.50	467.50	477.50	487.50	512.50	522.50	532.50	536.50

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.87	1.83	2.88	4.02	5.25	6.57	7.98	9.93	12.10
OUTFLOW	0.00	27.97	90.60	181.95	300.62	446.32	619.30	820.07	1082.86	1405.42
ELEVATION	10.00	10.34	10.68	11.03	11.37	11.71	12.05	12.39	12.74	13.08
STORAGE	14.29	16.51	18.75	21.01	23.29	25.60	27.93	30.28	32.65	35.05
OUTFLOW	1769.68	2172.41	2611.51	3085.39	3592.83	4132.80	4704.46	5307.08	5940.05	6602.82
ELEVATION	13.42	13.76	14.11	14.45	14.79	15.13	15.47	15.82	16.16	16.50

HYDROGRAPH AT STATION ROUTE

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	74.92-HR	
1552.	4.25	277.	70.	23.	22.	
		(INCHES)	2.341	2.361	2.361	2.361
		(AC-FT)	137.	139.	139.	139.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	74.92-HR
13.	4.25	3.	1.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	74.92-HR
13.22	4.25	10.97	10.25	10.08	10.08

CUMULATIVE AREA = 1.10 SQ MI

*** **

* *
41 KK * CAS240 *
* *

SUB-BASIN cas240
6-HOUR RAINFALL, PATTERN NO. 1.53 WAS USED TO FIND TC & R FOR THIS BASIN
THIS BASIN USED RAINFALL REDUCTION FACTOR OF .985
BASIN MODIFIED FROM WICKENBERG ADMS TO REFLECT DAM LOCATION

SUBBASIN RUNOFF DATA

46 BA SUBBASIN CHARACTERISTICS
TAREA 0.14 SUBBASIN AREA

PRECIPITATION DATA

14 PB STORM 3.35 BASIN TOTAL PRECIPITATION

14 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
0.03	0.03	0.06	0.06	0.06	0.11	0.11	0.11	0.04	0.04	0.04
0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00									

47 LG GREEN AND AMPT LOSS RATE
 STRTL 0.10 STARTING LOSS
 DTH 0.21 MOISTURE DEFICIT
 PSIF 6.40 WETTING FRONT SUCTION
 XKSAT 0.14 HYDRAULIC CONDUCTIVITY
 RTIMP 21.00 PERCENT IMPERVIOUS AREA

48 UC CLARK UNITGRAPH
 TC 0.26 TIME OF CONCENTRATION
 R 0.23 STORAGE COEFFICIENT

49 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.26 HR, R= 0.23 HR
 SNYDER TP= 0.19 HR, CP= 0.52

UNIT HYDROGRAPH
 16 END-OF-PERIOD ORDINATES
 63. 187. 231. 182. 128. 89. 62. 43. 30. 21.
 15. 10. 7. 5. 3. 2.

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

HYDROGRAPH AT STATION CAS240

TOTAL RAINFALL = 3.35, TOTAL LOSS = 1.03, TOTAL EXCESS = 2.32

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	74.92-HR (CFS)
275.	4.08	35.	2.300	17.	3.
			2.305	17.	2.305
				17.	17.

CUMULATIVE AREA = 0.14 SQ MI

 * *
 51 KK * DAMIN *
 * *

52 KO OUTPUT CONTROL VARIABLES
 IPRNT 1 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 ADD ROUTED HYDROGRAPH TO CAS240

54 HC HYDROGRAPH COMBINATION

HYDROGRAPH AT STATION DAMIN
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		1845	226	0.	*	2		1330	451	0.	*	3		0815	676	0.
1		0005	2	0.	*	1		1850	227	0.	*	2		1335	452	0.	*	3		0820	677	0.
1		0010	3	1.	*	1		1855	228	0.	*	2		1340	453	0.	*	3		0825	678	0.
1		0015	4	2.	*	1		1900	229	0.	*	2		1345	454	0.	*	3		0830	679	0.
1		0020	5	4.	*	1		1905	230	0.	*	2		1350	455	0.	*	3		0835	680	0.
1		0025	6	6.	*	1		1910	231	0.	*	2		1355	456	0.	*	3		0840	681	0.
1		0030	7	8.	*	1		1915	232	0.	*	2		1400	457	0.	*	3		0845	682	0.
1		0035	8	10.	*	1		1920	233	0.	*	2		1405	458	0.	*	3		0850	683	0.
1		0040	9	12.	*	1		1925	234	0.	*	2		1410	459	0.	*	3		0855	684	0.
1		0045	10	14.	*	1		1930	235	0.	*	2		1415	460	0.	*	3		0900	685	0.
1		0050	11	16.	*	1		1935	236	0.	*	2		1420	461	0.	*	3		0905	686	0.
1		0055	12	18.	*	1		1940	237	0.	*	2		1425	462	0.	*	3		0910	687	0.
1		0100	13	20.	*	1		1945	238	0.	*	2		1430	463	0.	*	3		0915	688	0.
1		0105	14	21.	*	1		1950	239	0.	*	2		1435	464	0.	*	3		0920	689	0.
1		0110	15	23.	*	1		1955	240	0.	*	2		1440	465	0.	*	3		0925	690	0.
1		0115	16	24.	*	1		2000	241	0.	*	2		1445	466	0.	*	3		0930	691	0.
1		0120	17	25.	*	1		2005	242	0.	*	2		1450	467	0.	*	3		0935	692	0.
1		0125	18	26.	*	1		2010	243	0.	*	2		1455	468	0.	*	3		0940	693	0.
1		0130	19	26.	*	1		2015	244	0.	*	2		1500	469	0.	*	3		0945	694	0.
1		0135	20	27.	*	1		2020	245	0.	*	2		1505	470	0.	*	3		0950	695	0.
1		0140	21	28.	*	1		2025	246	0.	*	2		1510	471	0.	*	3		0955	696	0.
1		0145	22	28.	*	1		2030	247	0.	*	2		1515	472	0.	*	3		1000	697	0.
1		0150	23	29.	*	1		2035	248	0.	*	2		1520	473	0.	*	3		1005	698	0.
1		0155	24	29.	*	1		2040	249	0.	*	2		1525	474	0.	*	3		1010	699	0.
1		0200	25	29.	*	1		2045	250	0.	*	2		1530	475	0.	*	3		1015	700	0.
1		0205	26	29.	*	1		2050	251	0.	*	2		1535	476	0.	*	3		1020	701	0.
1		0210	27	29.	*	1		2055	252	0.	*	2		1540	477	0.	*	3		1025	702	0.
1		0215	28	29.	*	1		2100	253	0.	*	2		1545	478	0.	*	3		1030	703	0.
1		0220	29	29.	*	1		2105	254	0.	*	2		1550	479	0.	*	3		1035	704	0.
1		0225	30	30.	*	1		2110	255	0.	*	2		1555	480	0.	*	3		1040	705	0.
1		0230	31	30.	*	1		2115	256	0.	*	2		1600	481	0.	*	3		1045	706	0.
1		0235	32	31.	*	1		2120	257	0.	*	2		1605	482	0.	*	3		1050	707	0.
1		0240	33	33.	*	1		2125	258	0.	*	2		1610	483	0.	*	3		1055	708	0.
1		0245	34	34.	*	1		2130	259	0.	*	2		1615	484	0.	*	3		1100	709	0.
1		0250	35	36.	*	1		2135	260	0.	*	2		1620	485	0.	*	3		1105	710	0.
1		0255	36	38.	*	1		2140	261	0.	*	2		1625	486	0.	*	3		1110	711	0.
1		0300	37	41.	*	1		2145	262	0.	*	2		1630	487	0.	*	3		1115	712	0.
1		0305	38	44.	*	1		2150	263	0.	*	2		1635	488	0.	*	3		1120	713	0.
1		0310	39	49.	*	1		2155	264	0.	*	2		1640	489	0.	*	3		1125	714	0.
1		0315	40	54.	*	1		2200	265	0.	*	2		1645	490	0.	*	3		1130	715	0.
1		0320	41	65.	*	1		2205	266	0.	*	2		1650	491	0.	*	3		1135	716	0.
1		0325	42	86.	*	1		2210	267	0.	*	2		1655	492	0.	*	3		1140	717	0.
1		0330	43	118.	*	1		2215	268	0.	*	2		1700	493	0.	*	3		1145	718	0.
1		0335	44	174.	*	1		2220	269	0.	*	2		1705	494	0.	*	3		1150	719	0.
1		0340	45	265.	*	1		2225	270	0.	*	2		1710	495	0.	*	3		1155	720	0.
1		0345	46	402.	*	1		2230	271	0.	*	2		1715	496	0.	*	3		1200	721	0.
1		0350	47	590.	*	1		2235	272	0.	*	2		1720	497	0.	*	3		1205	722	0.
1		0355	48	845.	*	1		2240	273	0.	*	2		1725	498	0.	*	3		1210	723	0.
1		0400	49	1157.	*	1		2245	274	0.	*	2		1730	499	0.	*	3		1215	724	0.
1		0405	50	1463.	*	1		2250	275	0.	*	2		1735	500	0.	*	3		1220	725	0.
1		0410	51	1685.	*	1		2255	276	0.	*	2		1740	501	0.	*	3		1225	726	0.
1		0415	52	1769.	*	1		2300	277	0.	*	2		1745	502	0.	*	3		1230	727	0.
1		0420	53	1723.	*	1		2305	278	0.	*	2		1750	503	0.	*	3		1235	728	0.

1	0425	54	1594.	*	1	2310	279	0.	*	2	1755	504	0.	*	3	1240	729	0.
1	0430	55	1425.	*	1	2315	280	0.	*	2	1800	505	0.	*	3	1245	730	0.
1	0435	56	1241.	*	1	2320	281	0.	*	2	1805	506	0.	*	3	1250	731	0.
1	0440	57	1066.	*	1	2325	282	0.	*	2	1810	507	0.	*	3	1255	732	0.
1	0445	58	907.	*	1	2330	283	0.	*	2	1815	508	0.	*	3	1300	733	0.
1	0450	59	762.	*	1	2335	284	0.	*	2	1820	509	0.	*	3	1305	734	0.
1	0455	60	637.	*	1	2340	285	0.	*	2	1825	510	0.	*	3	1310	735	0.
1	0500	61	536.	*	1	2345	286	0.	*	2	1830	511	0.	*	3	1315	736	0.
1	0505	62	449.	*	1	2350	287	0.	*	2	1835	512	0.	*	3	1320	737	0.
1	0510	63	378.	*	1	2355	288	0.	*	2	1840	513	0.	*	3	1325	738	0.
1	0515	64	317.	*	2	0000	289	0.	*	2	1845	514	0.	*	3	1330	739	0.
1	0520	65	269.	*	2	0005	290	0.	*	2	1850	515	0.	*	3	1335	740	0.
1	0525	66	229.	*	2	0010	291	0.	*	2	1855	516	0.	*	3	1340	741	0.
1	0530	67	195.	*	2	0015	292	0.	*	2	1900	517	0.	*	3	1345	742	0.
1	0535	68	169.	*	2	0020	293	0.	*	2	1905	518	0.	*	3	1350	743	0.
1	0540	69	148.	*	2	0025	294	0.	*	2	1910	519	0.	*	3	1355	744	0.
1	0545	70	129.	*	2	0030	295	0.	*	2	1915	520	0.	*	3	1400	745	0.
1	0550	71	112.	*	2	0035	296	0.	*	2	1920	521	0.	*	3	1405	746	0.
1	0555	72	98.	*	2	0040	297	0.	*	2	1925	522	0.	*	3	1410	747	0.
1	0600	73	88.	*	2	0045	298	0.	*	2	1930	523	0.	*	3	1415	748	0.
1	0605	74	79.	*	2	0050	299	0.	*	2	1935	524	0.	*	3	1420	749	0.
1	0610	75	70.	*	2	0055	300	0.	*	2	1940	525	0.	*	3	1425	750	0.
1	0615	76	62.	*	2	0100	301	0.	*	2	1945	526	0.	*	3	1430	751	0.
1	0620	77	53.	*	2	0105	302	0.	*	2	1950	527	0.	*	3	1435	752	0.
1	0625	78	45.	*	2	0110	303	0.	*	2	1955	528	0.	*	3	1440	753	0.
1	0630	79	37.	*	2	0115	304	0.	*	2	2000	529	0.	*	3	1445	754	0.
1	0635	80	31.	*	2	0120	305	0.	*	2	2005	530	0.	*	3	1450	755	0.
1	0640	81	26.	*	2	0125	306	0.	*	2	2010	531	0.	*	3	1455	756	0.
1	0645	82	23.	*	2	0130	307	0.	*	2	2015	532	0.	*	3	1500	757	0.
1	0650	83	20.	*	2	0135	308	0.	*	2	2020	533	0.	*	3	1505	758	0.
1	0655	84	18.	*	2	0140	309	0.	*	2	2025	534	0.	*	3	1510	759	0.
1	0700	85	15.	*	2	0145	310	0.	*	2	2030	535	0.	*	3	1515	760	0.
1	0705	86	13.	*	2	0150	311	0.	*	2	2035	536	0.	*	3	1520	761	0.
1	0710	87	11.	*	2	0155	312	0.	*	2	2040	537	0.	*	3	1525	762	0.
1	0715	88	10.	*	2	0200	313	0.	*	2	2045	538	0.	*	3	1530	763	0.
1	0720	89	8.	*	2	0205	314	0.	*	2	2050	539	0.	*	3	1535	764	0.
1	0725	90	7.	*	2	0210	315	0.	*	2	2055	540	0.	*	3	1540	765	0.
1	0730	91	6.	*	2	0215	316	0.	*	2	2100	541	0.	*	3	1545	766	0.
1	0735	92	5.	*	2	0220	317	0.	*	2	2105	542	0.	*	3	1550	767	0.
1	0740	93	4.	*	2	0225	318	0.	*	2	2110	543	0.	*	3	1555	768	0.
1	0745	94	3.	*	2	0230	319	0.	*	2	2115	544	0.	*	3	1600	769	0.
1	0750	95	3.	*	2	0235	320	0.	*	2	2120	545	0.	*	3	1605	770	0.
1	0755	96	2.	*	2	0240	321	0.	*	2	2125	546	0.	*	3	1610	771	0.
1	0800	97	2.	*	2	0245	322	0.	*	2	2130	547	0.	*	3	1615	772	0.
1	0805	98	2.	*	2	0250	323	0.	*	2	2135	548	0.	*	3	1620	773	0.
1	0810	99	1.	*	2	0255	324	0.	*	2	2140	549	0.	*	3	1625	774	0.
1	0815	100	1.	*	2	0300	325	0.	*	2	2145	550	0.	*	3	1630	775	0.
1	0820	101	1.	*	2	0305	326	0.	*	2	2150	551	0.	*	3	1635	776	0.
1	0825	102	1.	*	2	0310	327	0.	*	2	2155	552	0.	*	3	1640	777	0.
1	0830	103	1.	*	2	0315	328	0.	*	2	2200	553	0.	*	3	1645	778	0.
1	0835	104	0.	*	2	0320	329	0.	*	2	2205	554	0.	*	3	1650	779	0.
1	0840	105	0.	*	2	0325	330	0.	*	2	2210	555	0.	*	3	1655	780	0.
1	0845	106	0.	*	2	0330	331	0.	*	2	2215	556	0.	*	3	1700	781	0.
1	0850	107	0.	*	2	0335	332	0.	*	2	2220	557	0.	*	3	1705	782	0.
1	0855	108	0.	*	2	0340	333	0.	*	2	2225	558	0.	*	3	1710	783	0.
1	0900	109	0.	*	2	0345	334	0.	*	2	2230	559	0.	*	3	1715	784	0.
1	0905	110	0.	*	2	0350	335	0.	*	2	2235	560	0.	*	3	1720	785	0.
1	0910	111	0.	*	2	0355	336	0.	*	2	2240	561	0.	*	3	1725	786	0.
1	0915	112	0.	*	2	0400	337	0.	*	2	2245	562	0.	*	3	1730	787	0.
1	0920	113	0.	*	2	0405	338	0.	*	2	2250	563	0.	*	3	1735	788	0.
1	0925	114	0.	*	2	0410	339	0.	*	2	2255	564	0.	*	3	1740	789	0.
1	0930	115	0.	*	2	0415	340	0.	*	2	2300	565	0.	*	3	1745	790	0.
1	0935	116	0.	*	2	0420	341	0.	*	2	2305	566	0.	*	3	1750	791	0.
1	0940	117	0.	*	2	0425	342	0.	*	2	2310	567	0.	*	3	1755	792	0.
1	0945	118	0.	*	2	0430	343	0.	*	2	2315	568	0.	*	3	1800	793	0.
1	0950	119	0.	*	2	0435	344	0.	*	2	2320	569	0.	*	3	1805	794	0.

1	0955	120	0.	*	2	0440	345	0.	*	2	2325	570	0.	*	3	1810	795	0.
1	1000	121	0.	*	2	0445	346	0.	*	2	2330	571	0.	*	3	1815	796	0.
1	1005	122	0.	*	2	0450	347	0.	*	2	2335	572	0.	*	3	1820	797	0.
1	1010	123	0.	*	2	0455	348	0.	*	2	2340	573	0.	*	3	1825	798	0.
1	1015	124	0.	*	2	0500	349	0.	*	2	2345	574	0.	*	3	1830	799	0.
1	1020	125	0.	*	2	0505	350	0.	*	2	2350	575	0.	*	3	1835	800	0.
1	1025	126	0.	*	2	0510	351	0.	*	2	2355	576	0.	*	3	1840	801	0.
1	1030	127	0.	*	2	0515	352	0.	*	3	0000	577	0.	*	3	1845	802	0.
1	1035	128	0.	*	2	0520	353	0.	*	3	0005	578	0.	*	3	1850	803	0.
1	1040	129	0.	*	2	0525	354	0.	*	3	0010	579	0.	*	3	1855	804	0.
1	1045	130	0.	*	2	0530	355	0.	*	3	0015	580	0.	*	3	1900	805	0.
1	1050	131	0.	*	2	0535	356	0.	*	3	0020	581	0.	*	3	1905	806	0.
1	1055	132	0.	*	2	0540	357	0.	*	3	0025	582	0.	*	3	1910	807	0.
1	1100	133	0.	*	2	0545	358	0.	*	3	0030	583	0.	*	3	1915	808	0.
1	1105	134	0.	*	2	0550	359	0.	*	3	0035	584	0.	*	3	1920	809	0.
1	1110	135	0.	*	2	0555	360	0.	*	3	0040	585	0.	*	3	1925	810	0.
1	1115	136	0.	*	2	0600	361	0.	*	3	0045	586	0.	*	3	1930	811	0.
1	1120	137	0.	*	2	0605	362	0.	*	3	0050	587	0.	*	3	1935	812	0.
1	1125	138	0.	*	2	0610	363	0.	*	3	0055	588	0.	*	3	1940	813	0.
1	1130	139	0.	*	2	0615	364	0.	*	3	0100	589	0.	*	3	1945	814	0.
1	1135	140	0.	*	2	0620	365	0.	*	3	0105	590	0.	*	3	1950	815	0.
1	1140	141	0.	*	2	0625	366	0.	*	3	0110	591	0.	*	3	1955	816	0.
1	1145	142	0.	*	2	0630	367	0.	*	3	0115	592	0.	*	3	2000	817	0.
1	1150	143	0.	*	2	0635	368	0.	*	3	0120	593	0.	*	3	2005	818	0.
1	1155	144	0.	*	2	0640	369	0.	*	3	0125	594	0.	*	3	2010	819	0.
1	1200	145	0.	*	2	0645	370	0.	*	3	0130	595	0.	*	3	2015	820	0.
1	1205	146	0.	*	2	0650	371	0.	*	3	0135	596	0.	*	3	2020	821	0.
1	1210	147	0.	*	2	0655	372	0.	*	3	0140	597	0.	*	3	2025	822	0.
1	1215	148	0.	*	2	0700	373	0.	*	3	0145	598	0.	*	3	2030	823	0.
1	1220	149	0.	*	2	0705	374	0.	*	3	0150	599	0.	*	3	2035	824	0.
1	1225	150	0.	*	2	0710	375	0.	*	3	0155	600	0.	*	3	2040	825	0.
1	1230	151	0.	*	2	0715	376	0.	*	3	0200	601	0.	*	3	2045	826	0.
1	1235	152	0.	*	2	0720	377	0.	*	3	0205	602	0.	*	3	2050	827	0.
1	1240	153	0.	*	2	0725	378	0.	*	3	0210	603	0.	*	3	2055	828	0.
1	1245	154	0.	*	2	0730	379	0.	*	3	0215	604	0.	*	3	2100	829	0.
1	1250	155	0.	*	2	0735	380	0.	*	3	0220	605	0.	*	3	2105	830	0.
1	1255	156	0.	*	2	0740	381	0.	*	3	0225	606	0.	*	3	2110	831	0.
1	1300	157	0.	*	2	0745	382	0.	*	3	0230	607	0.	*	3	2115	832	0.
1	1305	158	0.	*	2	0750	383	0.	*	3	0235	608	0.	*	3	2120	833	0.
1	1310	159	0.	*	2	0755	384	0.	*	3	0240	609	0.	*	3	2125	834	0.
1	1315	160	0.	*	2	0800	385	0.	*	3	0245	610	0.	*	3	2130	835	0.
1	1320	161	0.	*	2	0805	386	0.	*	3	0250	611	0.	*	3	2135	836	0.
1	1325	162	0.	*	2	0810	387	0.	*	3	0255	612	0.	*	3	2140	837	0.
1	1330	163	0.	*	2	0815	388	0.	*	3	0300	613	0.	*	3	2145	838	0.
1	1335	164	0.	*	2	0820	389	0.	*	3	0305	614	0.	*	3	2150	839	0.
1	1340	165	0.	*	2	0825	390	0.	*	3	0310	615	0.	*	3	2155	840	0.
1	1345	166	0.	*	2	0830	391	0.	*	3	0315	616	0.	*	3	2200	841	0.
1	1350	167	0.	*	2	0835	392	0.	*	3	0320	617	0.	*	3	2205	842	0.
1	1355	168	0.	*	2	0840	393	0.	*	3	0325	618	0.	*	3	2210	843	0.
1	1400	169	0.	*	2	0845	394	0.	*	3	0330	619	0.	*	3	2215	844	0.
1	1405	170	0.	*	2	0850	395	0.	*	3	0335	620	0.	*	3	2220	845	0.
1	1410	171	0.	*	2	0855	396	0.	*	3	0340	621	0.	*	3	2225	846	0.
1	1415	172	0.	*	2	0900	397	0.	*	3	0345	622	0.	*	3	2230	847	0.
1	1420	173	0.	*	2	0905	398	0.	*	3	0350	623	0.	*	3	2235	848	0.
1	1425	174	0.	*	2	0910	399	0.	*	3	0355	624	0.	*	3	2240	849	0.
1	1430	175	0.	*	2	0915	400	0.	*	3	0400	625	0.	*	3	2245	850	0.
1	1435	176	0.	*	2	0920	401	0.	*	3	0405	626	0.	*	3	2250	851	0.
1	1440	177	0.	*	2	0925	402	0.	*	3	0410	627	0.	*	3	2255	852	0.
1	1445	178	0.	*	2	0930	403	0.	*	3	0415	628	0.	*	3	2300	853	0.
1	1450	179	0.	*	2	0935	404	0.	*	3	0420	629	0.	*	3	2305	854	0.
1	1455	180	0.	*	2	0940	405	0.	*	3	0425	630	0.	*	3	2310	855	0.
1	1500	181	0.	*	2	0945	406	0.	*	3	0430	631	0.	*	3	2315	856	0.
1	1505	182	0.	*	2	0950	407	0.	*	3	0435	632	0.	*	3	2320	857	0.
1	1510	183	0.	*	2	0955	408	0.	*	3	0440	633	0.	*	3	2325	858	0.
1	1515	184	0.	*	2	1000	409	0.	*	3	0445	634	0.	*	3	2330	859	0.
1	1520	185	0.	*	2	1005	410	0.	*	3	0450	635	0.	*	3	2335	860	0.

1	1525	186	0.	*	2	1010	411	0.	*	3	0455	636	0.	*	3	2340	861	0.
1	1530	187	0.	*	2	1015	412	0.	*	3	0500	637	0.	*	3	2345	862	0.
1	1535	188	0.	*	2	1020	413	0.	*	3	0505	638	0.	*	3	2350	863	0.
1	1540	189	0.	*	2	1025	414	0.	*	3	0510	639	0.	*	3	2355	864	0.
1	1545	190	0.	*	2	1030	415	0.	*	3	0515	640	0.	*	4	0000	865	0.
1	1550	191	0.	*	2	1035	416	0.	*	3	0520	641	0.	*	4	0005	866	0.
1	1555	192	0.	*	2	1040	417	0.	*	3	0525	642	0.	*	4	0010	867	0.
1	1600	193	0.	*	2	1045	418	0.	*	3	0530	643	0.	*	4	0015	868	0.
1	1605	194	0.	*	2	1050	419	0.	*	3	0535	644	0.	*	4	0020	869	0.
1	1610	195	0.	*	2	1055	420	0.	*	3	0540	645	0.	*	4	0025	870	0.
1	1615	196	0.	*	2	1100	421	0.	*	3	0545	646	0.	*	4	0030	871	0.
1	1620	197	0.	*	2	1105	422	0.	*	3	0550	647	0.	*	4	0035	872	0.
1	1625	198	0.	*	2	1110	423	0.	*	3	0555	648	0.	*	4	0040	873	0.
1	1630	199	0.	*	2	1115	424	0.	*	3	0600	649	0.	*	4	0045	874	0.
1	1635	200	0.	*	2	1120	425	0.	*	3	0605	650	0.	*	4	0050	875	0.
1	1640	201	0.	*	2	1125	426	0.	*	3	0610	651	0.	*	4	0055	876	0.
1	1645	202	0.	*	2	1130	427	0.	*	3	0615	652	0.	*	4	0100	877	0.
1	1650	203	0.	*	2	1135	428	0.	*	3	0620	653	0.	*	4	0105	878	0.
1	1655	204	0.	*	2	1140	429	0.	*	3	0625	654	0.	*	4	0110	879	0.
1	1700	205	0.	*	2	1145	430	0.	*	3	0630	655	0.	*	4	0115	880	0.
1	1705	206	0.	*	2	1150	431	0.	*	3	0635	656	0.	*	4	0120	881	0.
1	1710	207	0.	*	2	1155	432	0.	*	3	0640	657	0.	*	4	0125	882	0.
1	1715	208	0.	*	2	1200	433	0.	*	3	0645	658	0.	*	4	0130	883	0.
1	1720	209	0.	*	2	1205	434	0.	*	3	0650	659	0.	*	4	0135	884	0.
1	1725	210	0.	*	2	1210	435	0.	*	3	0655	660	0.	*	4	0140	885	0.
1	1730	211	0.	*	2	1215	436	0.	*	3	0700	661	0.	*	4	0145	886	0.
1	1735	212	0.	*	2	1220	437	0.	*	3	0705	662	0.	*	4	0150	887	0.
1	1740	213	0.	*	2	1225	438	0.	*	3	0710	663	0.	*	4	0155	888	0.
1	1745	214	0.	*	2	1230	439	0.	*	3	0715	664	0.	*	4	0200	889	0.
1	1750	215	0.	*	2	1235	440	0.	*	3	0720	665	0.	*	4	0205	890	0.
1	1755	216	0.	*	2	1240	441	0.	*	3	0725	666	0.	*	4	0210	891	0.
1	1800	217	0.	*	2	1245	442	0.	*	3	0730	667	0.	*	4	0215	892	0.
1	1805	218	0.	*	2	1250	443	0.	*	3	0735	668	0.	*	4	0220	893	0.
1	1810	219	0.	*	2	1255	444	0.	*	3	0740	669	0.	*	4	0225	894	0.
1	1815	220	0.	*	2	1300	445	0.	*	3	0745	670	0.	*	4	0230	895	0.
1	1820	221	0.	*	2	1305	446	0.	*	3	0750	671	0.	*	4	0235	896	0.
1	1825	222	0.	*	2	1310	447	0.	*	3	0755	672	0.	*	4	0240	897	0.
1	1830	223	0.	*	2	1315	448	0.	*	3	0800	673	0.	*	4	0245	898	0.
1	1835	224	0.	*	2	1320	449	0.	*	3	0805	674	0.	*	4	0250	899	0.
1	1840	225	0.	*	2	1325	450	0.	*	3	0810	675	0.	*	4	0255	900	0.

PEAK FLOW (CFS)	TIME (HR)		6-HR 312.	24-HR 79.	72-HR 26.	74.92-HR 25.
1769.	4.25	(CFS)	2.336	2.355	2.355	2.355
		(INCHES)	154.	156.	156.	156.
		(AC-FT)				

CUMULATIVE AREA = 1.24 SQ MI

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* *
55 KK * DAMOUT *
* *

Route Hydrograph Through Dam.

59 KO OUTPUT CONTROL VARIABLES

q100.OUT 2-2-95 2:11p

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1074PRINT

IPRNT 1 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

58 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP STOR TYPE OF INITIAL CONDITION
 RSVRIC 2.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

60 SA	AREA	2.0 12.1	2.5 12.3	5.8 12.8	6.8 13.3	9.1 13.8	10.2	11.0	11.3	11.6	11.9
62 SE	ELEVATION	2135.00 2159.00	2137.00 2160.00	2140.00 2161.00	2144.00 2162.00	2150.00 2163.00	2153.00	2155.00	2156.00	2157.00	2158.00
64 SQ	DISCHARGE	0. 2423.	10. 3450.	14. 4577.	19. 5773.	23. 7015.	29.	31.	295.	823.	1539.

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	4.53	16.62	41.74	89.06	117.93	139.09	150.24	161.71	173.46
ELEVATION	2135.00	2137.00	2140.00	2144.00	2150.00	2153.00	2155.00	2156.00	2157.00	2158.00
STORAGE	185.44	197.64	210.20	223.26	236.82					
ELEVATION	2159.00	2160.00	2161.00	2162.00	2163.00					

HYDROGRAPH AT STATION DAMOUT

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	4.	2.0	2135.9	*	2		0100	301	25.	98.1	2150.9	*	3		0200	601	20.	52.4	2145.4
1		0005	2	4.	2.0	2135.9	*	2		0105	302	25.	97.9	2150.9	*	3		0205	602	20.	52.3	2145.3
1		0010	3	4.	1.9	2135.9	*	2		0110	303	25.	97.7	2150.9	*	3		0210	603	20.	52.2	2145.3
1		0015	4	4.	1.9	2135.9	*	2		0115	304	25.	97.6	2150.9	*	3		0215	604	20.	52.0	2145.3
1		0020	5	4.	1.9	2135.8	*	2		0120	305	25.	97.4	2150.9	*	3		0220	605	20.	51.9	2145.3
1		0025	6	4.	1.9	2135.8	*	2		0125	306	25.	97.2	2150.8	*	3		0225	606	20.	51.8	2145.3
1		0030	7	4.	1.9	2135.9	*	2		0130	307	25.	97.0	2150.8	*	3		0230	607	20.	51.6	2145.3
1		0035	8	4.	2.0	2135.9	*	2		0135	308	25.	96.9	2150.8	*	3		0235	608	20.	51.5	2145.2
1		0040	9	4.	2.0	2135.9	*	2		0140	309	25.	96.7	2150.8	*	3		0240	609	20.	51.3	2145.2
1		0045	10	4.	2.1	2135.9	*	2		0145	310	25.	96.5	2150.8	*	3		0245	610	20.	51.2	2145.2
1		0050	11	5.	2.2	2136.0	*	2		0150	311	25.	96.4	2150.8	*	3		0250	611	20.	51.1	2145.2
1		0055	12	5.	2.2	2136.0	*	2		0155	312	25.	96.2	2150.7	*	3		0255	612	20.	50.9	2145.2
1		0100	13	5.	2.3	2136.0	*	2		0200	313	25.	96.0	2150.7	*	3		0300	613	20.	50.8	2145.1
1		0105	14	5.	2.4	2136.1	*	2		0205	314	25.	95.9	2150.7	*	3		0305	614	20.	50.7	2145.1
1		0110	15	5.	2.6	2136.1	*	2		0210	315	25.	95.7	2150.7	*	3		0310	615	20.	50.5	2145.1
1		0115	16	6.	2.7	2136.2	*	2		0215	316	24.	95.5	2150.7	*	3		0315	616	20.	50.4	2145.1
1		0120	17	6.	2.8	2136.2	*	2		0220	317	24.	95.3	2150.7	*	3		0320	617	20.	50.2	2145.1
1		0125	18	6.	2.9	2136.3	*	2		0225	318	24.	95.2	2150.6	*	3		0325	618	20.	50.1	2145.1
1		0130	19	6.	3.1	2136.4	*	2		0230	319	24.	95.0	2150.6	*	3		0330	619	20.	50.0	2145.0
1		0135	20	7.	3.2	2136.4	*	2		0235	320	24.	94.8	2150.6	*	3		0335	620	20.	49.8	2145.0
1		0140	21	7.	3.4	2136.5	*	2		0240	321	24.	94.7	2150.6	*	3		0340	621	20.	49.7	2145.0
1		0145	22	7.	3.5	2136.5	*	2		0245	322	24.	94.5	2150.6	*	3		0345	622	20.	49.6	2145.0
1		0150	23	8.	3.6	2136.6	*	2		0250	323	24.	94.3	2150.5	*	3		0350	623	20.	49.4	2145.0
1		0155	24	8.	3.8	2136.7	*	2		0255	324	24.	94.2	2150.5	*	3		0355	624	20.	49.3	2145.0
1		0200	25	8.	3.9	2136.7	*	2		0300	325	24.	94.0	2150.5	*	3		0400	625	20.	49.2	2144.9
1		0205	26	9.	4.1	2136.8	*	2		0305	326	24.	93.8	2150.5	*	3		0405	626	20.	49.0	2144.9
1		0210	27	9.	4.2	2136.9	*	2		0310	327	24.	93.7	2150.5	*	3		0410	627	20.	48.9	2144.9

1	0215	28	9.	4.3	2136.9	*	2	0315	328	24.	93.5	2150.5	*	3	0415	628	20.	48.7	2144.9
1	0220	29	9.	4.5	2137.0	*	2	0320	329	24.	93.3	2150.4	*	3	0420	629	20.	48.6	2144.9
1	0225	30	10.	4.6	2137.0	*	2	0325	330	24.	93.2	2150.4	*	3	0425	630	20.	48.5	2144.9
1	0230	31	10.	4.8	2137.1	*	2	0330	331	24.	93.0	2150.4	*	3	0430	631	20.	48.3	2144.8
1	0235	32	10.	4.9	2137.1	*	2	0335	332	24.	92.8	2150.4	*	3	0435	632	20.	48.2	2144.8
1	0240	33	10.	5.1	2137.1	*	2	0340	333	24.	92.7	2150.4	*	3	0440	633	20.	48.1	2144.8
1	0245	34	10.	5.2	2137.2	*	2	0345	334	24.	92.5	2150.4	*	3	0445	634	20.	47.9	2144.8
1	0250	35	10.	5.4	2137.2	*	2	0350	335	24.	92.3	2150.3	*	3	0450	635	20.	47.8	2144.8
1	0255	36	10.	5.6	2137.3	*	2	0355	336	24.	92.2	2150.3	*	3	0455	636	20.	47.7	2144.8
1	0300	37	10.	5.8	2137.3	*	2	0400	337	24.	92.0	2150.3	*	3	0500	637	20.	47.5	2144.7
1	0305	38	10.	6.0	2137.4	*	2	0405	338	24.	91.9	2150.3	*	3	0505	638	20.	47.4	2144.7
1	0310	39	10.	6.3	2137.4	*	2	0410	339	24.	91.7	2150.3	*	3	0510	639	20.	47.3	2144.7
1	0315	40	10.	6.6	2137.5	*	2	0415	340	24.	91.5	2150.3	*	3	0515	640	20.	47.1	2144.7
1	0320	41	10.	6.9	2137.6	*	2	0420	341	24.	91.4	2150.2	*	3	0520	641	20.	47.0	2144.7
1	0325	42	10.	7.3	2137.7	*	2	0425	342	24.	91.2	2150.2	*	3	0525	642	20.	46.8	2144.6
1	0330	43	11.	8.0	2137.9	*	2	0430	343	24.	91.0	2150.2	*	3	0530	643	20.	46.7	2144.6
1	0335	44	11.	8.9	2138.1	*	2	0435	344	24.	90.9	2150.2	*	3	0535	644	20.	46.6	2144.6
1	0340	45	11.	10.3	2138.4	*	2	0440	345	24.	90.7	2150.2	*	3	0540	645	20.	46.4	2144.6
1	0345	46	12.	12.5	2139.0	*	2	0445	346	24.	90.5	2150.2	*	3	0545	646	20.	46.3	2144.6
1	0350	47	13.	15.9	2139.8	*	2	0450	347	24.	90.4	2150.1	*	3	0550	647	19.	46.2	2144.6
1	0355	48	14.	20.7	2140.7	*	2	0455	348	24.	90.2	2150.1	*	3	0555	648	19.	46.0	2144.5
1	0400	49	16.	27.5	2141.7	*	2	0500	349	23.	90.1	2150.1	*	3	0600	649	19.	45.9	2144.5
1	0405	50	18.	36.4	2143.2	*	2	0505	350	23.	89.9	2150.1	*	3	0605	650	19.	45.8	2144.5
1	0410	51	20.	47.1	2144.7	*	2	0510	351	23.	89.7	2150.1	*	3	0610	651	19.	45.6	2144.5
1	0415	52	21.	58.9	2146.2	*	2	0515	352	23.	89.6	2150.1	*	3	0615	652	19.	45.5	2144.5
1	0420	53	22.	70.8	2147.7	*	2	0520	353	23.	89.4	2150.0	*	3	0620	653	19.	45.4	2144.5
1	0425	54	23.	82.0	2149.1	*	2	0525	354	23.	89.3	2150.0	*	3	0625	654	19.	45.2	2144.4
1	0430	55	24.	92.3	2150.3	*	2	0530	355	23.	89.1	2150.0	*	3	0630	655	19.	45.1	2144.4
1	0435	56	26.	101.3	2151.3	*	2	0535	356	23.	88.9	2150.0	*	3	0635	656	19.	45.0	2144.4
1	0440	57	27.	109.1	2152.1	*	2	0540	357	23.	88.8	2150.0	*	3	0640	657	19.	44.8	2144.4
1	0445	58	28.	115.7	2152.8	*	2	0545	358	23.	88.6	2149.9	*	3	0645	658	19.	44.7	2144.4
1	0450	59	29.	121.2	2153.3	*	2	0550	359	23.	88.5	2149.9	*	3	0650	659	19.	44.6	2144.4
1	0455	60	29.	125.8	2153.7	*	2	0555	360	23.	88.3	2149.9	*	3	0655	660	19.	44.4	2144.3
1	0500	61	30.	129.7	2154.1	*	2	0600	361	23.	88.1	2149.9	*	3	0700	661	19.	44.3	2144.3
1	0505	62	30.	132.8	2154.4	*	2	0605	362	23.	88.0	2149.9	*	3	0705	662	19.	44.2	2144.3
1	0510	63	31.	135.5	2154.7	*	2	0610	363	23.	87.8	2149.8	*	3	0710	663	19.	44.0	2144.3
1	0515	64	31.	137.7	2154.9	*	2	0615	364	23.	87.7	2149.8	*	3	0715	664	19.	43.9	2144.3
1	0520	65	39.	139.4	2155.0	*	2	0620	365	23.	87.5	2149.8	*	3	0720	665	19.	43.8	2144.3
1	0525	66	71.	140.8	2155.2	*	2	0625	366	23.	87.3	2149.8	*	3	0725	666	19.	43.6	2144.2
1	0530	67	92.	141.7	2155.2	*	2	0630	367	23.	87.2	2149.8	*	3	0730	667	19.	43.5	2144.2
1	0535	68	106.	142.3	2155.3	*	2	0635	368	23.	87.0	2149.7	*	3	0735	668	19.	43.4	2144.2
1	0540	69	114.	142.6	2155.3	*	2	0640	369	23.	86.9	2149.7	*	3	0740	669	19.	43.2	2144.2
1	0545	70	117.	142.7	2155.3	*	2	0645	370	23.	86.7	2149.7	*	3	0745	670	19.	43.1	2144.2
1	0550	71	118.	142.8	2155.3	*	2	0650	371	23.	86.5	2149.7	*	3	0750	671	19.	43.0	2144.2
1	0555	72	116.	142.7	2155.3	*	2	0655	372	23.	86.4	2149.7	*	3	0755	672	19.	42.8	2144.1
1	0600	73	113.	142.5	2155.3	*	2	0700	373	23.	86.2	2149.6	*	3	0800	673	19.	42.7	2144.1
1	0605	74	108.	142.4	2155.3	*	2	0705	374	23.	86.1	2149.6	*	3	0805	674	19.	42.6	2144.1
1	0610	75	103.	142.1	2155.3	*	2	0710	375	23.	85.9	2149.6	*	3	0810	675	19.	42.5	2144.1
1	0615	76	98.	141.9	2155.3	*	2	0715	376	23.	85.7	2149.6	*	3	0815	676	19.	42.3	2144.1
1	0620	77	91.	141.6	2155.2	*	2	0720	377	23.	85.6	2149.6	*	3	0820	677	19.	42.2	2144.1
1	0625	78	85.	141.4	2155.2	*	2	0725	378	23.	85.4	2149.5	*	3	0825	678	19.	42.1	2144.0
1	0630	79	78.	141.1	2155.2	*	2	0730	379	23.	85.3	2149.5	*	3	0830	679	19.	41.9	2144.0
1	0635	80	72.	140.8	2155.2	*	2	0735	380	23.	85.1	2149.5	*	3	0835	680	19.	41.8	2144.0
1	0640	81	65.	140.5	2155.1	*	2	0740	381	23.	85.0	2149.5	*	3	0840	681	19.	41.7	2144.0
1	0645	82	59.	140.3	2155.1	*	2	0745	382	23.	84.8	2149.5	*	3	0845	682	19.	41.5	2144.0
1	0650	83	54.	140.0	2155.1	*	2	0750	383	23.	84.6	2149.4	*	3	0850	683	19.	41.4	2143.9
1	0655	84	48.	139.8	2155.1	*	2	0755	384	23.	84.5	2149.4	*	3	0855	684	19.	41.3	2143.9
1	0700	85	44.	139.6	2155.0	*	2	0800	385	23.	84.3	2149.4	*	3	0900	685	19.	41.1	2143.9
1	0705	86	39.	139.4	2155.0	*	2	0805	386	23.	84.2	2149.4	*	3	0905	686	19.	41.0	2143.9
1	0710	87	35.	139.3	2155.0	*	2	0810	387	23.	84.0	2149.4	*	3	0910	687	19.	40.9	2143.9
1	0715	88	31.	139.1	2155.0	*	2	0815	388	23.	83.9	2149.3	*	3	0915	688	19.	40.7	2143.8
1	0720	89	31.	139.0	2155.0	*	2	0820	389	23.	83.7	2149.3	*	3	0920	689	19.	40.6	2143.8
1	0725	90	31.	138.8	2155.0	*	2	0825	390	23.	83.5	2149.3	*	3	0925	690	19.	40.5	2143.8
1	0730	91	31.	138.6	2155.0	*	2	0830	391	23.	83.4	2149.3	*	3	0930	691	19.	40.4	2143.8
1	0735	92	31.	138.4	2154.9	*	2	0835	392	23.	83.2	2149.3	*	3	0935	692	19.	40.2	2143.8
1	0740	93	31.	138.3	2154.9	*	2	0840	393	23.	83.1	2149.2	*	3	0940	693	19.	40.1	2143.7

1	0745	94	31.	138.1	2154.9	* 2	0845	394	23.	82.9	2149.2	* 3	0945	694	19.	40.0	2143.7
1	0750	95	31.	137.9	2154.9	* 2	0850	395	23.	82.8	2149.2	* 3	0950	695	19.	39.8	2143.7
1	0755	96	31.	137.7	2154.9	* 2	0855	396	23.	82.6	2149.2	* 3	0955	696	19.	39.7	2143.7
1	0800	97	31.	137.5	2154.8	* 2	0900	397	23.	82.4	2149.2	* 3	1000	697	19.	39.6	2143.7
1	0805	98	31.	137.3	2154.8	* 2	0905	398	23.	82.3	2149.1	* 3	1005	698	19.	39.5	2143.6
1	0810	99	31.	137.1	2154.8	* 2	0910	399	23.	82.1	2149.1	* 3	1010	699	19.	39.3	2143.6
1	0815	100	31.	136.9	2154.8	* 2	0915	400	23.	82.0	2149.1	* 3	1015	700	19.	39.2	2143.6
1	0820	101	31.	136.7	2154.8	* 2	0920	401	23.	81.8	2149.1	* 3	1020	701	19.	39.1	2143.6
1	0825	102	31.	136.5	2154.8	* 2	0925	402	23.	81.7	2149.1	* 3	1025	702	18.	38.9	2143.6
1	0830	103	31.	136.3	2154.7	* 2	0930	403	23.	81.5	2149.0	* 3	1030	703	18.	38.8	2143.5
1	0835	104	31.	136.1	2154.7	* 2	0935	404	23.	81.3	2149.0	* 3	1035	704	18.	38.7	2143.5
1	0840	105	31.	135.9	2154.7	* 2	0940	405	23.	81.2	2149.0	* 3	1040	705	18.	38.6	2143.5
1	0845	106	31.	135.7	2154.7	* 2	0945	406	23.	81.0	2149.0	* 3	1045	706	18.	38.4	2143.5
1	0850	107	31.	135.4	2154.7	* 2	0950	407	23.	80.9	2149.0	* 3	1050	707	18.	38.3	2143.5
1	0855	108	30.	135.2	2154.6	* 2	0955	408	23.	80.7	2148.9	* 3	1055	708	18.	38.2	2143.4
1	0900	109	30.	135.0	2154.6	* 2	1000	409	23.	80.6	2148.9	* 3	1100	709	18.	38.1	2143.4
1	0905	110	30.	134.8	2154.6	* 2	1005	410	23.	80.4	2148.9	* 3	1105	710	18.	37.9	2143.4
1	0910	111	30.	134.6	2154.6	* 2	1010	411	23.	80.3	2148.9	* 3	1110	711	18.	37.8	2143.4
1	0915	112	30.	134.4	2154.6	* 2	1015	412	23.	80.1	2148.9	* 3	1115	712	18.	37.7	2143.4
1	0920	113	30.	134.2	2154.5	* 2	1020	413	22.	80.0	2148.8	* 3	1120	713	18.	37.6	2143.3
1	0925	114	30.	134.0	2154.5	* 2	1025	414	22.	79.8	2148.8	* 3	1125	714	18.	37.4	2143.3
1	0930	115	30.	133.8	2154.5	* 2	1030	415	22.	79.6	2148.8	* 3	1130	715	18.	37.3	2143.3
1	0935	116	30.	133.6	2154.5	* 2	1035	416	22.	79.5	2148.8	* 3	1135	716	18.	37.2	2143.3
1	0940	117	30.	133.4	2154.5	* 2	1040	417	22.	79.3	2148.8	* 3	1140	717	18.	37.1	2143.3
1	0945	118	30.	133.1	2154.4	* 2	1045	418	22.	79.2	2148.7	* 3	1145	718	18.	36.9	2143.2
1	0950	119	30.	132.9	2154.4	* 2	1050	419	22.	79.0	2148.7	* 3	1150	719	18.	36.8	2143.2
1	0955	120	30.	132.7	2154.4	* 2	1055	420	22.	78.9	2148.7	* 3	1155	720	18.	36.7	2143.2
1	1000	121	30.	132.5	2154.4	* 2	1100	421	22.	78.7	2148.7	* 3	1200	721	18.	36.6	2143.2
1	1005	122	30.	132.3	2154.4	* 2	1105	422	22.	78.6	2148.7	* 3	1205	722	18.	36.4	2143.2
1	1010	123	30.	132.1	2154.3	* 2	1110	423	22.	78.4	2148.6	* 3	1210	723	18.	36.3	2143.1
1	1015	124	30.	131.9	2154.3	* 2	1115	424	22.	78.3	2148.6	* 3	1215	724	18.	36.2	2143.1
1	1020	125	30.	131.7	2154.3	* 2	1120	425	22.	78.1	2148.6	* 3	1220	725	18.	36.1	2143.1
1	1025	126	30.	131.5	2154.3	* 2	1125	426	22.	77.9	2148.6	* 3	1225	726	18.	35.9	2143.1
1	1030	127	30.	131.3	2154.3	* 2	1130	427	22.	77.8	2148.6	* 3	1230	727	18.	35.8	2143.1
1	1035	128	30.	131.1	2154.2	* 2	1135	428	22.	77.6	2148.6	* 3	1235	728	18.	35.7	2143.0
1	1040	129	30.	130.9	2154.2	* 2	1140	429	22.	77.5	2148.5	* 3	1240	729	18.	35.6	2143.0
1	1045	130	30.	130.7	2154.2	* 2	1145	430	22.	77.3	2148.5	* 3	1245	730	18.	35.5	2143.0
1	1050	131	30.	130.5	2154.2	* 2	1150	431	22.	77.2	2148.5	* 3	1250	731	18.	35.3	2143.0
1	1055	132	30.	130.2	2154.2	* 2	1155	432	22.	77.0	2148.5	* 3	1255	732	18.	35.2	2143.0
1	1100	133	30.	130.0	2154.1	* 2	1200	433	22.	76.9	2148.5	* 3	1300	733	18.	35.1	2142.9
1	1105	134	30.	129.8	2154.1	* 2	1205	434	22.	76.7	2148.4	* 3	1305	734	18.	35.0	2142.9
1	1110	135	30.	129.6	2154.1	* 2	1210	435	22.	76.6	2148.4	* 3	1310	735	18.	34.8	2142.9
1	1115	136	30.	129.4	2154.1	* 2	1215	436	22.	76.4	2148.4	* 3	1315	736	18.	34.7	2142.9
1	1120	137	30.	129.2	2154.1	* 2	1220	437	22.	76.3	2148.4	* 3	1320	737	18.	34.6	2142.9
1	1125	138	30.	129.0	2154.0	* 2	1225	438	22.	76.1	2148.4	* 3	1325	738	17.	34.5	2142.8
1	1130	139	30.	128.8	2154.0	* 2	1230	439	22.	76.0	2148.3	* 3	1330	739	17.	34.4	2142.8
1	1135	140	30.	128.6	2154.0	* 2	1235	440	22.	75.8	2148.3	* 3	1335	740	17.	34.2	2142.8
1	1140	141	30.	128.4	2154.0	* 2	1240	441	22.	75.7	2148.3	* 3	1340	741	17.	34.1	2142.8
1	1145	142	30.	128.2	2154.0	* 2	1245	442	22.	75.5	2148.3	* 3	1345	742	17.	34.0	2142.8
1	1150	143	30.	128.0	2154.0	* 2	1250	443	22.	75.3	2148.3	* 3	1350	743	17.	33.9	2142.7
1	1155	144	30.	127.8	2153.9	* 2	1255	444	22.	75.2	2148.2	* 3	1355	744	17.	33.8	2142.7
1	1200	145	30.	127.6	2153.9	* 2	1300	445	22.	75.0	2148.2	* 3	1400	745	17.	33.6	2142.7
1	1205	146	30.	127.4	2153.9	* 2	1305	446	22.	74.9	2148.2	* 3	1405	746	17.	33.5	2142.7
1	1210	147	30.	127.2	2153.9	* 2	1310	447	22.	74.7	2148.2	* 3	1410	747	17.	33.4	2142.7
1	1215	148	30.	127.0	2153.9	* 2	1315	448	22.	74.6	2148.2	* 3	1415	748	17.	33.3	2142.7
1	1220	149	30.	126.8	2153.8	* 2	1320	449	22.	74.4	2148.1	* 3	1420	749	17.	33.2	2142.6
1	1225	150	30.	126.6	2153.8	* 2	1325	450	22.	74.3	2148.1	* 3	1425	750	17.	33.1	2142.6
1	1230	151	30.	126.4	2153.8	* 2	1330	451	22.	74.1	2148.1	* 3	1430	751	17.	32.9	2142.6
1	1235	152	29.	126.2	2153.8	* 2	1335	452	22.	74.0	2148.1	* 3	1435	752	17.	32.8	2142.6
1	1240	153	29.	126.0	2153.8	* 2	1340	453	22.	73.8	2148.1	* 3	1440	753	17.	32.7	2142.6
1	1245	154	29.	125.7	2153.7	* 2	1345	454	22.	73.7	2148.0	* 3	1445	754	17.	32.6	2142.5
1	1250	155	29.	125.5	2153.7	* 2	1350	455	22.	73.5	2148.0	* 3	1450	755	17.	32.5	2142.5
1	1255	156	29.	125.3	2153.7	* 2	1355	456	22.	73.4	2148.0	* 3	1455	756	17.	32.3	2142.5
1	1300	157	29.	125.1	2153.7	* 2	1400	457	22.	73.2	2148.0	* 3	1500	757	17.	32.2	2142.5
1	1305	158	29.	124.9	2153.7	* 2	1405	458	22.	73.1	2148.0	* 3	1505	758	17.	32.1	2142.5
1	1310	159	29.	124.7	2153.6	* 2	1410	459	22.	72.9	2148.0	* 3	1510	759	17.	32.0	2142.4

1	1845	226	27.	111.6	2152.3	*	2	1945	526	21.	63.0	2146.7	*	3	2045	826	15.	24.6	2141.3
1	1850	227	27.	111.4	2152.3	*	2	1950	527	21.	62.9	2146.7	*	3	2050	827	15.	24.5	2141.3
1	1855	228	27.	111.2	2152.3	*	2	1955	528	21.	62.7	2146.7	*	3	2055	828	15.	24.4	2141.2
1	1900	229	27.	111.0	2152.3	*	2	2000	529	21.	62.6	2146.6	*	3	2100	829	15.	24.3	2141.2
1	1905	230	27.	110.8	2152.3	*	2	2005	530	21.	62.5	2146.6	*	3	2105	830	15.	24.2	2141.2
1	1910	231	27.	110.6	2152.2	*	2	2010	531	21.	62.3	2146.6	*	3	2110	831	15.	24.1	2141.2
1	1915	232	27.	110.5	2152.2	*	2	2015	532	21.	62.2	2146.6	*	3	2115	832	15.	23.9	2141.2
1	1920	233	27.	110.3	2152.2	*	2	2020	533	21.	62.0	2146.6	*	3	2120	833	15.	23.8	2141.2
1	1925	234	27.	110.1	2152.2	*	2	2025	534	21.	61.9	2146.6	*	3	2125	834	15.	23.7	2141.1
1	1930	235	27.	109.9	2152.2	*	2	2030	535	21.	61.7	2146.5	*	3	2130	835	15.	23.6	2141.1
1	1935	236	27.	109.7	2152.1	*	2	2035	536	21.	61.6	2146.5	*	3	2135	836	15.	23.5	2141.1
1	1940	237	27.	109.5	2152.1	*	2	2040	537	21.	61.5	2146.5	*	3	2140	837	15.	23.4	2141.1
1	1945	238	27.	109.3	2152.1	*	2	2045	538	21.	61.3	2146.5	*	3	2145	838	15.	23.3	2141.1
1	1950	239	27.	109.2	2152.1	*	2	2050	539	21.	61.2	2146.5	*	3	2150	839	15.	23.2	2141.1
1	1955	240	27.	109.0	2152.1	*	2	2055	540	21.	61.0	2146.4	*	3	2155	840	15.	23.1	2141.0
1	2000	241	27.	108.8	2152.0	*	2	2100	541	21.	60.9	2146.4	*	3	2200	841	15.	23.0	2141.0
1	2005	242	27.	108.6	2152.0	*	2	2105	542	21.	60.7	2146.4	*	3	2205	842	15.	22.9	2141.0
1	2010	243	27.	108.4	2152.0	*	2	2110	543	21.	60.6	2146.4	*	3	2210	843	15.	22.8	2141.0
1	2015	244	27.	108.2	2152.0	*	2	2115	544	21.	60.5	2146.4	*	3	2215	844	15.	22.7	2141.0
1	2020	245	27.	108.0	2152.0	*	2	2120	545	21.	60.3	2146.4	*	3	2220	845	15.	22.6	2141.0
1	2025	246	27.	107.9	2152.0	*	2	2125	546	21.	60.2	2146.3	*	3	2225	846	15.	22.5	2140.9
1	2030	247	27.	107.7	2151.9	*	2	2130	547	21.	60.0	2146.3	*	3	2230	847	15.	22.4	2140.9
1	2035	248	27.	107.5	2151.9	*	2	2135	548	21.	59.9	2146.3	*	3	2235	848	15.	22.3	2140.9
1	2040	249	27.	107.3	2151.9	*	2	2140	549	21.	59.7	2146.3	*	3	2240	849	15.	22.2	2140.9
1	2045	250	27.	107.1	2151.9	*	2	2145	550	21.	59.6	2146.3	*	3	2245	850	15.	22.1	2140.9
1	2050	251	27.	106.9	2151.9	*	2	2150	551	21.	59.5	2146.2	*	3	2250	851	15.	22.0	2140.9
1	2055	252	27.	106.8	2151.8	*	2	2155	552	21.	59.3	2146.2	*	3	2255	852	15.	21.9	2140.8
1	2100	253	27.	106.6	2151.8	*	2	2200	553	21.	59.2	2146.2	*	3	2300	853	15.	21.8	2140.8
1	2105	254	26.	106.4	2151.8	*	2	2205	554	21.	59.0	2146.2	*	3	2305	854	15.	21.7	2140.8
1	2110	255	26.	106.2	2151.8	*	2	2210	555	21.	58.9	2146.2	*	3	2310	855	15.	21.6	2140.8
1	2115	256	26.	106.0	2151.8	*	2	2215	556	21.	58.7	2146.2	*	3	2315	856	15.	21.5	2140.8
1	2120	257	26.	105.8	2151.7	*	2	2220	557	21.	58.6	2146.1	*	3	2320	857	15.	21.4	2140.8
1	2125	258	26.	105.7	2151.7	*	2	2225	558	21.	58.5	2146.1	*	3	2325	858	15.	21.3	2140.7
1	2130	259	26.	105.5	2151.7	*	2	2230	559	21.	58.3	2146.1	*	3	2330	859	15.	21.2	2140.7
1	2135	260	26.	105.3	2151.7	*	2	2235	560	21.	58.2	2146.1	*	3	2335	860	14.	21.1	2140.7
1	2140	261	26.	105.1	2151.7	*	2	2240	561	21.	58.0	2146.1	*	3	2340	861	14.	21.0	2140.7
1	2145	262	26.	104.9	2151.6	*	2	2245	562	21.	57.9	2146.0	*	3	2345	862	14.	20.9	2140.7
1	2150	263	26.	104.8	2151.6	*	2	2250	563	21.	57.7	2146.0	*	3	2350	863	14.	20.8	2140.7
1	2155	264	26.	104.6	2151.6	*	2	2255	564	21.	57.6	2146.0	*	3	2355	864	14.	20.7	2140.6
1	2200	265	26.	104.4	2151.6	*	2	2300	565	20.	57.5	2146.0	*	4	0000	865	14.	20.6	2140.6
1	2205	266	26.	104.2	2151.6	*	2	2305	566	20.	57.3	2146.0	*	4	0005	866	14.	20.5	2140.6
1	2210	267	26.	104.0	2151.6	*	2	2310	567	20.	57.2	2146.0	*	4	0010	867	14.	20.4	2140.6
1	2215	268	26.	103.9	2151.5	*	2	2315	568	20.	57.0	2145.9	*	4	0015	868	14.	20.3	2140.6
1	2220	269	26.	103.7	2151.5	*	2	2320	569	20.	56.9	2145.9	*	4	0020	869	14.	20.2	2140.6
1	2225	270	26.	103.5	2151.5	*	2	2325	570	20.	56.8	2145.9	*	4	0025	870	14.	20.1	2140.6
1	2230	271	26.	103.3	2151.5	*	2	2330	571	20.	56.6	2145.9	*	4	0030	871	14.	20.0	2140.5
1	2235	272	26.	103.1	2151.5	*	2	2335	572	20.	56.5	2145.9	*	4	0035	872	14.	19.9	2140.5
1	2240	273	26.	103.0	2151.4	*	2	2340	573	20.	56.3	2145.9	*	4	0040	873	14.	19.8	2140.5
1	2245	274	26.	102.8	2151.4	*	2	2345	574	20.	56.2	2145.8	*	4	0045	874	14.	19.7	2140.5
1	2250	275	26.	102.6	2151.4	*	2	2350	575	20.	56.1	2145.8	*	4	0050	875	14.	19.6	2140.5
1	2255	276	26.	102.4	2151.4	*	2	2355	576	20.	55.9	2145.8	*	4	0055	876	14.	19.5	2140.5
1	2300	277	26.	102.3	2151.4	*	3	0000	577	20.	55.8	2145.8	*	4	0100	877	14.	19.4	2140.4
1	2305	278	26.	102.1	2151.4	*	3	0005	578	20.	55.6	2145.8	*	4	0105	878	14.	19.3	2140.4
1	2310	279	26.	101.9	2151.3	*	3	0010	579	20.	55.5	2145.7	*	4	0110	879	14.	19.2	2140.4
1	2315	280	26.	101.7	2151.3	*	3	0015	580	20.	55.4	2145.7	*	4	0115	880	14.	19.1	2140.4
1	2320	281	26.	101.5	2151.3	*	3	0020	581	20.	55.2	2145.7	*	4	0120	881	14.	19.0	2140.4
1	2325	282	26.	101.4	2151.3	*	3	0025	582	20.	55.1	2145.7	*	4	0125	882	14.	18.9	2140.4
1	2330	283	26.	101.2	2151.3	*	3	0030	583	20.	54.9	2145.7	*	4	0130	883	14.	18.8	2140.4
1	2335	284	25.	101.0	2151.2	*	3	0035	584	20.	54.8	2145.7	*	4	0135	884	14.	18.7	2140.3
1	2340	285	25.	100.8	2151.2	*	3	0040	585	20.	54.7	2145.6	*	4	0140	885	14.	18.6	2140.3
1	2345	286	25.	100.7	2151.2	*	3	0045	586	20.	54.5	2145.6	*	4	0145	886	14.	18.5	2140.3
1	2350	287	25.	100.5	2151.2	*	3	0050	587	20.	54.4	2145.6	*	4	0150	887	14.	18.5	2140.3
1	2355	288	25.	100.3	2151.2	*	3	0055	588	20.	54.2	2145.6	*	4	0155	888	14.	18.4	2140.3
2	0000	289	25.	100.1	2151.2	*	3	0100	589	20.	54.1	2145.6	*	4	0200	889	14.	18.3	2140.3
2	0005	290	25.	100.0	2151.1	*	3	0105	590	20.	54.0	2145.6	*	4	0205	890	14.	18.2	2140.2
2	0010	291	25.	99.8	2151.1	*	3	0110	591	20.	53.8	2145.5	*	4	0210	891	14.	18.1	2140.2

2	0015	292	25.	99.6	2151.1	* 3	0115	592	20.	53.7	2145.5	* 4	0215	892	14.	18.0	2140.2
2	0020	293	25.	99.4	2151.1	* 3	0120	593	20.	53.5	2145.5	* 4	0220	893	14.	17.9	2140.2
2	0025	294	25.	99.3	2151.1	* 3	0125	594	20.	53.4	2145.5	* 4	0225	894	14.	17.8	2140.2
2	0030	295	25.	99.1	2151.0	* 3	0130	595	20.	53.3	2145.5	* 4	0230	895	14.	17.7	2140.2
2	0035	296	25.	98.9	2151.0	* 3	0135	596	20.	53.1	2145.4	* 4	0235	896	14.	17.6	2140.2
2	0040	297	25.	98.8	2151.0	* 3	0140	597	20.	53.0	2145.4	* 4	0240	897	14.	17.5	2140.1
2	0045	298	25.	98.6	2151.0	* 3	0145	598	20.	52.9	2145.4	* 4	0245	898	14.	17.4	2140.1
2	0050	299	25.	98.4	2151.0	* 3	0150	599	20.	52.7	2145.4	* 4	0250	899	14.	17.3	2140.1
2	0055	300	25.	98.2	2151.0	* 3	0155	600	20.	52.6	2145.4	* 4	0255	900	14.	17.2	2140.1

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW		
118.	5.83	(CFS)	47.	24-HR	72-HR	74.92-HR
		(INCHES)	0.350	32.	23.	23.
		(AC-FT)	23.	0.957	2.101	2.125
				63.	139.	141.

PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	MAXIMUM AVERAGE STORAGE		
143.	5.83		137.	24-HR	72-HR	74.92-HR
				117.	72.	70.

PEAK STAGE (FEET)	TIME (HR)		6-HR	MAXIMUM AVERAGE STAGE		
2155.33	5.83		2154.78	24-HR	72-HR	74.92-HR
				2152.80	2147.52	2147.09

CUMULATIVE AREA = 1.24 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	SAC230	1078.	4.17	178.	45.	15.	0.72		
HYDROGRAPH AT	SAC235	532.	4.25	100.	25.	8.	0.38		
2 COMBINED AT	ADD	1608.	4.17	278.	70.	23.	1.10		
ROUTED TO	ROUTE	1552.	4.25	277.	70.	23.	1.10	13.22	
HYDROGRAPH AT	CAS240	275.	4.08	35.	9.	3.	0.14		
2 COMBINED AT	DAMIN	1769.	4.25	312.	79.	26.	1.24		
ROUTED TO	DAMOUT	118.	5.83	47.	32.	23.	1.24	2155.33	

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

Attachment B
Construction Quality Assurance Plan

Construction Quality Assurance Plan

Casandro Wash Dam

Introduction

This Construction Quality Assurance (CQA) Plan describes the procedures for the inspection of the soil and concrete components of the Casandro Wash Dam project. Preparation of this plan has been under the direction of a registered civil engineer. The CQA plan outlines the specific field and laboratory testing and monitoring procedures required to demonstrate that this project is constructed in accordance with approved plans and specifications.

Purpose and Scope

The CQA plan has been developed to detail: (1) qualifications, responsibilities, and organization of the inspection personnel, (2) construction inspection activities, (3) field and laboratory test with discussions on design and construction considerations, sampling frequency and procedures, sampling locations, pass/fail criteria and action on failing test, (4) project meetings including preconstruction, progress, and deficiency, and (5) daily, monthly, acceptance, and final documentation. The CQA plan will also assist in identifying and defining problems that may occur during construction and providing procedures for correcting these problems before construction is complete. At completion of the work, a construction final certification will be prepared to document that the materials and construction processes complied with the approved design.

Personnel Qualifications and Responsibilities

The CQA plan will be implemented by inspection personnel who will be onsite during construction activities. The Resident Engineer will lead the CQA activities. He will be onsite as required to monitor that procedures and testing is being performed in accordance with this plan. Personnel qualifications and responsibilities are described below.

Resident Engineer

The resident engineer will have formal academic training in engineering, engineering geology, or a closely related discipline and will be a registered civil engineer in the State of Arizona. The resident engineer should have practical technical and managerial experience to properly implement the CQA plan. The resident engineer must be able to communicate effectively with the inspection personnel, design engineers, and the contractor to facilitate a clear understanding of the construction activities and the CQA plan. The resident inspector should have direct knowledge of the design philosophies of the project.

The resident engineer will be responsible for monitoring the implementation of the plan and for inspection, construction observations, sampling, and testing. He will coordinate these activities with the District's onsite construction manager.

The resident engineer's major duties and responsibilities will be to:

- Be knowledgeable concerning all design plans and specifications.
- Educate CQA inspection personnel on CQA requirements and procedures pertaining to the construction of the dam.
- Prepare a schedule of CQA inspection activities and coordinate necessary CQA personnel to conduct inspections.
- Review and interpret data and reports prepared by CQA inspection personnel.
- Identify and recommend work that should either be accepted or rejected based on observations and/or test results. (The resident engineer may require special testing, inspection, or approval in areas of questionable quality or deviation from the approved design.)

CH2M HILL's resident engineer will be David Allard, P.E.

CQA Inspection Personnel

CQA inspection personnel will have formal training and practical experience in inspecting and testing work relative to the construction of embankment dam and concrete structures including construction and recording inspection activities, preparing daily reports and performing field testing.

The CQA personnel will perform various tests and observations during construction such as:

- Monitoring that all testing equipment is properly calibrated on a regular basis and that the calibration is documented.
- Accurately recording all test data and organizing it in a manner that allows easy reference.
- Reporting observations and test results as the work progresses.

The supporting CQA inspection personnel will work under the supervision and guidance of the resident engineer. Inspection personnel will perform onsite construction inspections and determine if the work meets the approved plans and specifications. Field

tests and visual inspections will be used to evaluate construction practices. If CQA personnel observe poor construction practices, the resident engineer will be notified immediately. CQA inspection personnel will be responsible for verifying that all testing is conducted in accordance with American Society for Testing Materials (ASTM) standards or other specified test methods and that the proper test equipment is used. The results of all inspections, including work that is unacceptable, will be reported to the resident engineer.

The CQA inspection personnel will include:

- Bob Bleazard/CH2M HILL
- District Construction Inspection Personnel
- District's Material Testing Subcontractor
- Collins-Pina - Surveying

Meetings

Meetings will be held throughout construction to enhance communication among the District, CQA inspection personnel, and the contractor. These meetings will aid the organizations involved in construction activities to become familiar with facility design, construction procedures, and recent design changes, if any.

Meetings to be conducted during construction activities will be:

- Preconstruction meeting
- Progress meetings
- Problem or work deficiency meetings (as needed)

Preconstruction Meeting

A preconstruction meeting will be held before construction activities begin. This meeting will be attended by the District's construction manager, the resident engineer, CQA inspection personnel, and the contractor. Representatives from the Department of Water Resources (ADWR) will also be invited. The purpose of the meeting will be to resolve uncertainties regarding facility design, the CQA plan, and construction procedures. The District's construction manager will record and distribute minutes of the meetings. This meeting will cover the following:

- Each party will be supplied with all relevant CQA documents and supporting information.
- The CQA plan will be explained with respect to design criteria, plans, and specifications.

- Any changes to the CQA plan that are needed to meet or exceed the specified design will be identified.
- Each party's responsibilities will be reviewed and discussed, with communication lines identified.
- Protocol for field observations and field tests will be explained.
- Protocol for all organizations for handling construction deficiencies, repair work, and retesting will be explained.
- Protocol for document reporting, handling, distribution, and storage during construction will be explained.
- Procedures to protect construction materials from adverse effects of weather during storage will be explained.

Progress Meetings

Progress meetings will be attended by the contractor and CQA inspection personnel, and will be held to review activities or progress, discuss present and future work, and discuss any current or potential construction problems. The District's construction manager and the resident engineer will attend progress meetings as required. The progress meetings should be held informally on a daily basis with a formal meeting every week. Either the District's construction manager or CQA inspection personnel will record minutes of the meetings.

Weekly progress meeting will discuss such items as:

- Construction schedule status
- Critical submittals
- Material and equipment procurement
- Coordination issues
- Change orders
- Inspection and testing

Problem or Work Deficiency Meetings

When a problem or deficiency is occurring or likely to occur, special meetings will be held to deal with it instead of waiting for the weekly progress meeting. These meetings will be attended by CQA personnel and the construction contractor. If necessary, the owner may also attend. The purpose of these meetings is to identify a problem or deficiency in the construction work, review alternative solutions, and select and implement a plan to resolve the problem or deficiency. The construction manager, resident engineer or CQA inspection personnel will record and distribute minutes of the meeting.

Inspection Activities

Inspection activities will be performed by the CQA team throughout the project. These activities are divided into several key areas. Prior to the start of construction, the resident engineer will conduct a preconstruction training and information session with the CQA personnel to familiarize them with the design, inspection policies, and procedures.

Materials Testing

The District will subcontract with a materials testing firm to provide full-time material testing and inspection services for the Casandro Wash project. The number of field testing staff required will be adjusted as necessary to satisfy project requirements, however, normally one or two full-time technicians will be required. The frequency of material testing services to be performed is discussed in subsequent sections. The resident engineer will be responsible for the general direction, methods, and review of QA testing activities.

Survey Control

The surveying subcontractor for quality assurance (QA) verification of project survey control will be Collins-Pina Consulting Engineers of Phoenix, Arizona. Collins-Pina served as the project surveyor during design phases of the project and verified the base mapping for the project. During the construction period Collins-Pina will be responsible for performing the following survey activities:

- Verify the contractor's control points used for project layout.
- Performing spot checks of foundation subgrade elevation, embankment alignment and elevation, and structure locations and elevations.
- Perform spot check verification of cross-section surveys for measurement and payment.

QA services provided by Collins-Pina will be performed on an as-needed basis. It is generally anticipated that they will provide QA services several times a month, or more often during key periods of project construction such as initial control line survey layouts or final embankment foundation construction. Collin-Pina's surveying will be performed to the same standards and record-keeping requirements as required for the contractor's surveying work.

Key Inspection Items

General

The most critical times for inspection is during the initial stages of a given work activity and prior to initiating the next phase of construction work. Inspections at these critical time periods allow calibration of proper construction methods, verification of finished project characteristics and requirements, and provides resolution of errors and problems at an early stage prior to the problem area being covered over. The following paragraphs summarize items considered to be construction work activities/phases that require a high level of inspection and observation. Many of these key inspection items will also require inspection by ADWR. The resident engineer will attempt to provide at least 5 days advance notice of critical construction activities requiring ADWR inspection.

Embankment Foundation and Observation of Geologic Conditions

Based on geotechnical studies completed by CH2M HILL, no geologic or geotechnical conditions were identified that would preclude the project or impair the operations of the facilities as designed. Nonetheless, geologic materials are inherently variable in composition, horizontal and vertical extent, and engineering characteristics. Even the most reasonably thorough of geotechnical investigations cannot definitively identify and characterize subsurface conditions. For this reason, during final excavation of the embankment foundation and prior to preparing the foundation for embankment fill placement, inspection of the foundation should include observations for the presence of the following conditions:

- Animal burrows or other voids.
- Soft subgrade soils and deposits of collapse susceptible soils.
- Permeable sand zones.
- Overly disturbed foundation soils.
- Other features deleterious to the function of the Casandro Wash Dam.

If any of the aforementioned conditions are encountered during foundation inspection, the project resident engineer will determine appropriate corrective measures to be performed to remedy problem conditions. Initial foundation inspection activities will be coordinated with ADWR. Foundation conditions that require significant corrective measure to remedy will be brought to the attention of the District and ADWR for approval.

To determine that adequate foundation conditions exist prior to embankment construction, the following foundation acceptance criteria will be established.

Dam Embankments. The resident engineer will determine the relative compaction of the soils from the ground surface to a depth of 6 inches. Spacing of the tests will

be a grid with intervals of approximately 100 feet. The desired foundation material is a slightly cemented silty sand. Samples of the material will be taken at each compaction test location and approximately 50 percent of the samples will be tested for gradation. Areas with relative compaction of at least 95 percent (ASTM D698) containing silty sand will be deemed acceptable provided no undesirable conditions are present. If any areas have clean sand, the resident engineer will consider whether additional excavation is appropriate. The sandy areas will generally not exhibit any cohesion and will readily pass water. Although no permeability tests are anticipated, the resident engineer has the discretion to perform additional field and laboratory tests as deemed appropriate to establish that the foundation is suitable.

If extensive non-cemented sandy soil is found, an evaluation will be made to determine if its presence will be detrimental to the embankment. Elements that will be considered include height of overlying embankment, settlement potential, length of seepage path, duration of seepage, permeability, location relative to chimney drain, and potential alternatives for reconfiguring the embankment. The resident engineer and the District will perform the evaluations and make a determination on the best course of action.

Reservoir Perimeter Embankments. The resident engineer will determine the relative compaction from the excavated surface to 6 inches below the excavated surface at selected points around the reservoir. Test spacing will be about every 100 to 200 feet. If the soil has at least 90 percent relative compaction it will be considered dense soil suitable for the perimeter embankments. Soil which is not dense shall be removed to a depth acceptable to the resident engineer.

Field notes of foundation inspections and geologic observations will be entered into the permanent construction record. Field notes will include written description of conditions, maps and sketches, sampling and testing data, photographs or video tapes, corrective treatments or field design change recommendations where applicable, and other pertinent information and records.

An inspection item of ADWR will be to observe the final depth of the cut-off trench excavation and foundation preparation prior to placement of embankment material. ADWR will be notified of the anticipated start dates of cut-off excavation and embankment foundation preparation.

Embankment

The required embankment material types, characteristics, engineering properties, and source considerations are described in the project specifications. The Contractor will be responsible for obtaining the specified materials from required excavations and imported sources, and placing the fill materials in the embankment, in accordance with the District and ADWR approved Contract Documents. The goal of the embankment placement specifications is to produce, for each zone, a relatively homogeneous fill with the appropriate and consistent strength, compressibility, and permeability characteristics. Final acceptance of fill materials will be based on QA test results of in-place materials after completion of all specified placement requirements, unless otherwise specified.

Visual observations will be used to identify quality or consistency problems and determine suspect areas needing additional QA testing. Embankment inspection will be completed by the resident staff and will include the following activities:

- Verify that a good bond is achieved between the prepared foundation and embankment during fill operations.
- Observation of fill and backfill placement procedures to verify substantial conformance with the specifications.
- Determination if both performance and method compaction requirements are being satisfied.
- Summarize the contractor's material sources, material utilization and placement locations, and construction equipment and methods.
- Periodic observation and sampling of contractor's imported fill sources, borrow sources, and processed fill stockpiles.
- Photographing the embankment during the various stages of construction.

The frequency of resident engineer QA testing of embankment fill materials is summarized in Table 1.

A key inspection item of ADWR will be to observe the initial fill placement used to evaluate the method specification for placing fill materials (Zones 1 and 2). ADWR will be notified in advance of the contractor's proposed date for beginning fill placement. ADWR is also interested in inspecting the initial construction of the chimney drain (Zone 2) material.

Sewer Pipeline

During the construction of the sewer pipeline the following inspections will be completed:

- Conduct foundation inspection and observe geologic conditions as described previously for the embankment foundation. This is necessary to verify that adequate structural support of the sewer pipeline is provided due to the overlying embankment loads, and confirm that there are no discontinuities or other geologic features that would allow seepage along the pipeline structure.
- Confirm that in-place foundation materials along the sewer pipeline alignment are protected against deterioration.

- Inspection of piping and fittings, and review of required shop drawing submittals.
- Observation of installation, including trenching, laying of pipe, temporary pipe support, and concrete slurry encasement.
- Observation of specified pressure tests for the completed pipeline.
- Photographing the progress of sewer pipeline construction for documentation purposes.

ADWR also requires inspection and approval of the pipeline installation.

Primary Outlet Structure

During the construction of the dam outlet structure the following inspections will be completed:

- Confirm that inplace embankment materials exposed during excavation for the outlet structure are protected against deterioration.
- Inspection of piping and fittings, review of required shop drawing submittals, and review of pipe installation procedures, including laying of pipe, temporary pipe support, and concrete slurry backfill.
- Observe trenching operations.
- Observation of specified leakage tests for the completed pipeline.
- Provide field quality assurance testing on concrete structures in accordance with the recommended methods and frequencies listed in ACI 301-89, Chapter 17 and in accordance with Table 2.
- Provide field quality assurance testing of the Zone 2 backfill around the outlet structure in accordance with Table 1.
- Photographing the progress of primary outlet structure construction for documentation purposes.

ADWR will want to inspect the construction of the primary dam outlet structure. The resident engineer will notify ADWR of the timeframe for the following key construction activities:

- Completion of final foundation preparation for structures.

- Initial placement, concrete slurry, and Zone 2 backfill of outlet structure.
- Significant concrete pour events.

Emergency Spillway and Stilling Basin

During the construction of the emergency spillway and stilling basin, the following observations and inspections will be completed:

- Conduct foundation inspection for the stilling basin foundation and observe geologic conditions as described previously for the embankment foundation.
- Confirm that in-place embankment materials exposed during excavation for the spillway structure are protected against deterioration.
- Installation of the underdrain piping system.
- Provide quality assurance testing of Zone 2 material in accordance with the frequency provided in Table 1.
- Provide field quality assurance testing on concrete structures in accordance with the recommended methods and frequencies listed in ACI 301-89, Chapter 17 and in accordance with Table 2.
- Photographing the progress of emergency spillway and stilling basin construction for documentation purposes.

Placement of fills to create the crest of the emergency spillway should be conducted as described by the embankment inspection guidelines as applicable.

ADWR will want to observe the construction of the emergency spillway. The resident engineer will notify ADWR of the timeframe for the following key construction activities:

- Installation of the underdrain system.
- Initial placement of Zone 2 fill for emergency spillway .
- Significant concrete pour events.

Construction Records and Documentation

Daily Activity Reports

Daily activity reports will be recorded by CQA inspection staff. Daily reports will be recorded either on pre-prepared forms or hard-bound field books. The daily activity reports will record and document all pertinent information including dates, times, weather conditions, contractor's operations, observation of geologic conditions, construction problems and remedies, communications between individuals, QA testing, etc. All references to work being completed should record the following location information:

- Facility title as described on the drawings (for example: Outlet Pipe, Dam Embankment, etc.)
- Control line and station location
- Offset direction (left or right) looking up-station
- Offset distance
- Elevation
- Material or feature as described on the drawings (for example: Zone 2 fill, sewer pipe, etc.)

The actual format and responsibilities for the daily activity record will be developed in the field during initial stages of the project.

Inspection Data Sheets

All field observations and field testing will be recorded on inspection data sheets. These sheets will be used to formulate the daily summary reports. All field testing will follow ASTM or other specified test procedures and methods of data recording. Observations in the field may be in the form of notes, charts, drawings or sketches, photographs, or any combination of the above. The inspection data sheets will contain the following information:

- Date, name of project, and location.
- Description and title of the inspection activity.
- Time the activity was performed.
- Location of the inspection activity.

- Weather and site conditions.
- Standard test method used or type of inspection activity.
- Test equipment used.
- Record of observation and test data, with all calculations completed and checked.
- Construction methods and equipment origin material and general description of conditions.
- Comparison of test results and observations with specification requirements.
- Names and titles of all persons involved in the inspection activity.
- Record of materials and workmanship that do not meet specified design and corrective action measures and results taken.
- Signature of appropriate inspection personnel.

Monthly Progress Reports

A monthly progress report will be prepared by the resident engineer. This report will include the following information:

- Summary of construction activities and progress during the previous 30-days
- Schedule status
- Summary of problems encountered during construction, method of resolving problems, and field change order status
- Identification of potential claim issues
- Summary of all QA test results by CH2M HILL and select quality control tests by the Contractor (such as conduit leakage tests, etc.)
- Monthly progress photographs

A copy of this report will be issued to the District at the end of each month during the construction period.

Onsite Records

A copy of all project construction records will be maintained by the Resident Engineer in CH2M HILL's project office for the duration of the project. These project records will be maintained in files which will be open for ADWR review.

Change Orders

One of the major responsibilities of the resident field staff will be to observe actual site conditions during the progress of construction work to determine whether design changes are necessary to accommodate unforeseen site conditions. Changes in the work that deviate from the approved Contract Documents, whether initiated by the Owner, Engineer, or Contractor, and that have an substantive impact on the design of facilities that are jurisdictional to ADWR, must be reviewed and approved by ADWR prior to implementation of the changes in the construction work. In an attempt to reduce delays in the construction work, the resident engineer will notify ADWR of forthcoming change orders by phone or facsimile prior to formal submittal of the change order request. No change will be executed until approved by the ADWR, the Districts and CH2M HILL's Engineer of Record.

Table 1
Minimum Construction Testing Frequency for Materials and Construction Quality Evaluation

Components	Tests						
	Compaction Curves (ASTM D698)	Particles Size (ASTM D422)	Moisture Content (ASTM D3017, D2216)	In-place Density (ASTM D1556, D2922)	Field Description (ASTM D2488)	Lift Thickness (Measurement)	Laboratory Permeability
Embankment Foundation	10% of in-place density test	50% of in-place density test	Test on 100-foot grid spacing	Test on 100-foot grid spacing	Ongoing	Not Applicable	As needed
Embankment Zone 1	One per 5,000 CY or change in material Minimum of 3 tests	One per 5,000 CY or change in material Minimum of 3 tests	One per 500 CY 10% of test to be ASTM D2216	One per 500 CY 10% of test to be sand cone	One per 500 CY	100-foot grid	As needed
Embankment Zone 2	One per 1,000 CY Minimum of 3 tests	One per 1,000 CY Minimum of 3 tests	One per 100 CY 10% of test to be ASTM D2216	One per 100 CY 10% of test to be sand cone	One per 100 CY	100-foot spacing	One per 1,000 CY Minimum of 2 tests
Reservoir Perimeter Embankments	One per 5,000 CY or material change Minimum of 2 tests	One per 5,000 CY or material change Minimum of 2 tests	One per 1,000 CY 10% of test to be ASTM D2216	One per 1,000 CY 10% of test to be sand cone	One per 1,000 CY	100-foot grid	None required

Table 2
Minimum Construction Testing Frequency for Material Quality Evaluation

Tests	Concrete Structure	Concrete Slurry Backfill	Non-Shrink Grout ^b
Slump test ASTM C193	1 per Truck Load	N/A	N/A
Air Content ASTM C231	1 per Truck Load	N/A	N/A
Concrete Strength ASTM C39 ^a	Minimum of 1 per Day 1 per 150 CY 1 per 5000 sf of Slab or Wall Area	Minimum of 1 per Day	N/A

Notes:

^a Collect samples in accordance with ASTM C172. Cure in accordance with ASTM C31.

^b Quality assurance test as specifies in Section 732.2, frequency as determined by the resident engineer.

Attachment C

Calculations

- 1. Allowable Spillway Crack Width**
- 2. Field Permeability**
- 3. Filter Zone (Zone 2) Material**
- 4. Stilling Basin Sliding Resistance**
- 5. Active Soil Pressure**
- 6. Underdrain Flow Capacity**
- 7. Finger Drain Capacity**
- 8. Revised Spillway Wall Structural Design**
- 9. Slope Stability Chart (Davis)**



SUBJECT CASANDRO WASH DAM
FILTER DESIGN

BY D. ALVARO DATE 6/12/85
 SHEET NO. 1 OF 1
 PROJECT NO. SW 35441-GT-40

CHECK PERMEABILITY OF SPEC FILTER

DIS OF FILTER

FINE 1.1 mm $C_u = \frac{D_{60}}{D_{10}} = \frac{5.5}{1.0} = 5.5$

COARSE 6.2 mm $C_u = \frac{19}{5.5} = 3.5$

FROM SCS TEST RESULTS US. Dept of Agriculture "PERMEABILITY OF
 SELECTED CLEAN SANDS AND GRAVELS" SOIL MECHANICS NOTE NO 9, SCS DEC 1978

FOR FINE FILTER $K = 0.2 - 0.3 \text{ cm/sec} \times 0.3937 \frac{\text{in}}{\text{cm}} \times \frac{60 \text{ sec}}{\text{min}} = 4.7 \frac{\text{in}}{\text{min}}$

FOR COARSE FILTER $K = 8.1 - 9.5 \text{ cm/sec} = 191 \text{ FE/min}$

$K = 0.35 (\text{DIS})^2$ BASIC PROPERTIES OF SAND & GRAVEL FILTERS Sherard,
 DUNNIGAN & TALBOT ASCE JOURNAL OF GEOTECHNICAL ENGINEERING JUNE 1984

FINE $K = 0.35 \times (1.1 \text{ mm})^2 = 0.4 \text{ cm/sec} = 9.49 \frac{\text{in}}{\text{min}}$

COARSE $K = 0.35 \times (6.2 \text{ mm})^2 = 13.45 \text{ cm/sec} = 318 \frac{\text{in}}{\text{min}}$

CALCULATE MAX SPILLWAY CRACK WIDTH ALLOWABLE

FOR FILTERS ADJACENT TO SLOTTED OPENINGS

$\frac{D_{50} \text{ FILTER}}{\text{SLOT WIDTH}} \geq 1.2$ EQ 5 APPENDIX B - FILTER DESIGN

ENGINEERING & DESIGN EARTH & ROCK FILL DAMS
 GENERAL DESIGN & CONSTRUCTION CONSIDERATIONS
 C. O. E. MAY 1982

$\frac{D_{50} \text{ FILTER}}{1.2} \geq \text{SLOT WIDTH}$

$\frac{D_{50} \text{ FINE FILTER}}{1.2} = \frac{4 \text{ mm}}{1.2} = 3.3 \text{ mm} = 3 \text{ mm} \approx \underline{\underline{\frac{1}{8} \text{ inch}}}$

DIS FINE FILTER = 1.3 mm = $\frac{1}{16} \text{ inch}$

AVG DIS = 3 mm = $\frac{1}{8} \text{ inch}$

Table of Hydraulic Conductivity for Each Borehole				
Borehole	K (EM)	K (L&W)	Ratio	
	K(EM)/K(L&W)			
B-1	1.2E-03	1.1E-04	11.27	
B-2	6.9E-04	6.1E-05	11.37	
B-3	1.9E-03	1.7E-04	11.26	
B-5	1.6E-03	1.4E-04	11.29	
B-8	7.9E-04	7.0E-05	11.36	
B-9	2.6E-04	2.3E-05	11.43	
B-10	3.3E-04	2.9E-05	11.44	
Average	9.7E-04	8.6E-05	11.31	

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K	
								Earth Manual	Case G, L= Wetted Zone
								(cm/sec)	
B-1	2165	101.5	5.5	0	16.5	2148.5	85.0		
			6.0	30	20.0	2145.0	81.5	1.7E-03	1.5E-04
			7.0	90	27.0	2138.0	74.5	1.9E-03	1.7E-04
Top of cemented sand at Elevation			7.5	120	29.5	2135.5	72.0	1.6E-03	1.4E-04
	2120		8.0	150	31.5	2133.5	70.0	1.3E-03	1.2E-04
			8.5	180	33.5	2131.5	68.0	1.4E-03	1.2E-04
			9.0	210	35.0	2130.0	66.5	1.1E-03	9.8E-05
			9.5	240	36.0	2129.0	65.5	7.7E-04	6.8E-05
			10.0	270	37.2	2127.8	64.3	9.5E-04	8.4E-05
			10.5	300	38.0	2127.0	63.5	6.6E-04	5.8E-05
			11.0	330	39.4	2125.6	62.1	1.2E-03	1.0E-04
			11.5	360	40.6	2124.4	60.9	1.1E-03	9.3E-05
			12.5	420	41.1	2123.9	60.4	2.3E-04	2.0E-05
			13.0	450	43.0	2122.0	58.5	1.7E-03	1.6E-04
Ave.hydraulic conductivity for borehold wetted zone								1.2E-03	1.1E-04
Ratio of K's								11.27	
Hydraulic conductivity computed as:									
Earth manual fomula (3), page 592: $K = (0.508(\text{asinh}(h/r)-1)*Q/2\pi)/h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K (\text{horizontal}) = ((d^2*\ln(2L/D))/(8*L*T))*\ln(H1/H2)$, where $d = D$									

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
								Computed K	
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Earth Manual	Case G, L= Wetted Zone (cm/sec)
B-2	2160	101.5	49.0	0	14.5	2145.5	87.0		
			49.8	45	17.0	2143.0	84.5	7.9E-04	7.0E-05
			50.5	90	19.8	2140.2	81.7	9.4E-04	8.3E-05
Top of cemented sand at Elevation			51.0	120	22.0	2138.0	79.5	1.2E-03	1.0E-04
	2115		51.5	150	23.3	2136.7	78.2	7.3E-04	6.4E-05
			52.0	180	24.0	2136.0	77.5	4.0E-04	3.5E-05
			52.5	210	25.9	2134.1	75.6	1.1E-03	9.8E-05
			53.0	240	26.9	2133.1	74.6	6.1E-04	5.4E-05
			53.5	270	28.0	2132.0	73.5	6.9E-04	6.1E-05
			54.0	300	29.0	2131.0	72.5	6.5E-04	5.7E-05
			54.5	330	30.5	2129.5	71.0	9.9E-04	8.7E-05
			55.0	360	31.4	2128.6	70.1	6.2E-04	5.4E-05
			55.5	390	32.0	2128.0	69.5	4.2E-04	3.7E-05
			56.0	420	32.5	2127.5	69.0	3.6E-04	3.1E-05
			56.5	450	33.3	2126.7	68.2	5.8E-04	5.1E-05
			57.0	480	34.8	2125.2	66.7	1.1E-03	9.8E-05
			57.5	510	35	2125.0	66.5	1.5E-04	1.3E-05
			58.0	540	36	2124.0	65.5	7.7E-04	6.8E-05
			58.5	570	36.8	2123.2	64.7	6.4E-04	5.6E-05
			59.0	600	37.6	2122.4	63.9	6.5E-04	5.7E-05
			59.5	630	38.3	2121.7	63.2	5.8E-04	5.1E-05
			60.0	660	39	2121.0	62.5	5.9E-04	5.2E-05
Ave.hydraulic conductivity for borehold wetted zone								6.9E-04	6.1E-05
Hydraulic conductivity computed as:				Ratio of K's				11.37	
Earth manual formula (3), page 592: $K = (0.508(\text{asinh}(h/r) - 1) * Q / 2\pi) / h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K (\text{horizontal}) = ((d^2 * \ln(2L/D)) / (8 * L * T)) * \ln(H1/H2)$, where $d = D$									

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
								Computed K	
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Earth Manual	Case G, L= Wetted Zone
								(cm/sec)	
B-3	2140	51.5	57.0	0	9.0	2131.0	42.5		
			57.5	30	10.7	2129.3	40.8	2.9E-03	2.6E-04
			58.0	60	11.7	2128.3	39.8	1.9E-03	1.6E-04
Top of cemented sand at			58.5	90	12.8	2127.2	38.7	2.1E-03	1.9E-04
Elevation		2128	59.0	120	13.6	2126.4	37.9	1.6E-03	1.4E-04
			59.5	150	14.4	2125.6	37.1	1.7E-03	1.5E-04
			60.0	180	15.4	2124.6	36.1	2.2E-03	2.0E-04
			60.5	210	16.3	2123.7	35.2	2.1E-03	1.8E-04
			61.0	240	17.0	2123.0	34.5	1.7E-03	1.5E-04
			61.5	270	17.3	2122.7	34.2	7.5E-04	6.6E-05
			62.0	300	18.5	2121.5	33.0	3.1E-03	2.7E-04
			62.5	330	19.9	2120.1	31.6	3.8E-03	3.4E-04
			63.0	360	20.0	2120.0	31.5	2.9E-04	2.6E-05
			63.5	390	20.5	2119.5	31.0	1.5E-03	1.3E-04
			64.0	420	21.0	2119.0	30.5	1.5E-03	1.3E-04
			64.5	450	21.5	2118.5	30.0	1.6E-03	1.4E-04
			65.0	480	22.2	2117.8	29.3	2.2E-03	2.0E-04
			65.5	510	22.9	2117.1	28.6	2.3E-03	2.1E-04
			66.0	540	23.4	2116.6	28.1	1.7E-03	1.5E-04
			66.5	570	24	2116.0	27.5	2.2E-03	1.9E-04
			67.0	600	24.4	2115.6	27.1	1.5E-03	1.3E-04
Ave.hydraulic conductivity for borehold wetted zone								1.9E-03	1.7E-04
Ratio of K's								11.26	
Hydraulic conductivity computed as:									
Earth manual formula (3), page 592: $K = (0.508(\operatorname{asinh}(h/r)-1)*Q/2\pi)/h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K \text{ (horizontal)} = ((d^2 \ln(2L/D))/(8*L*T)) * \ln(H1/H2)$, where $d = D$									

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
Testpit	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K, Case C (cm/sec)	Computed K, Case G (cm/sec)
TP-9	2140	5	0.0	0	2.05	2138.0	2.95		
			6.0	360	2.10	2137.9	2.90	5.7E-04	-2.8E-06
			25.0	1500	2.20	2137.8	2.80	3.9E-04	-1.9E-06
Top of cemented sand at			48.0	2880	2.30	2137.7	2.70	3.8E-04	-1.7E-06
Elevation	2141		82.0	4920	2.40	2137.6	2.60	3.0E-04	-1.3E-06
			132.0	7920	2.50	2137.5	2.50	2.4E-04	-1.0E-06
			255.0	15300	2.70	2137.3	2.30	2.2E-04	-9.4E-07
Ave.hydraulic conductivity for borehold wetted zone								3.5E-04	-1.6E-06
Ration of K's								-217.84	

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
								Computed K	
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Earth Manual (cm/sec)	Case G, L= Wetted Zone
B-5	2140	51.5	56.0	0	14.1	2125.9	37.4		
			56.5	30	15.2	2124.8	36.3	2.4E-03	2.1E-04
			57.0	60	16.3	2123.7	35.2	2.5E-03	2.2E-04
Top of cemented sand at			57.5	90	16.9	2123.1	34.6	1.5E-03	1.3E-04
Elevation		2134	58.0	120	17.7	2122.3	33.8	2.0E-03	1.8E-04
			58.5	150	18.4	2121.6	33.1	1.8E-03	1.6E-04
			59.0	180	19.1	2120.9	32.4	1.9E-03	1.7E-04
			59.5	210	19.7	2120.3	31.8	1.7E-03	1.5E-04
			60.0	240	20.4	2119.6	31.1	2.0E-03	1.8E-04
			60.5	270	21.0	2119.0	30.5	1.8E-03	1.6E-04
			61.0	300	21.5	2118.5	30.0	1.6E-03	1.4E-04
			61.5	330	21.9	2118.1	29.6	1.3E-03	1.1E-04
			62.0	360	22.3	2117.7	29.2	1.3E-03	1.2E-04
			62.5	390	22.7	2117.3	28.8	1.3E-03	1.2E-04
			63.0	420	23.1	2116.9	28.4	1.4E-03	1.2E-04
			63.5	450	23.6	2116.4	27.9	1.8E-03	1.6E-04
			64.0	480	23.8	2116.2	27.7	7.3E-04	6.4E-05
			64.5	510	24.2	2115.8	27.3	1.5E-03	1.3E-04
			65.5	570	24.4	2115.6	27.1	3.8E-04	3.3E-05
			66.0	600	24.7	2115.3	26.8	1.2E-03	1.0E-04
			66.5	630	25.1	2114.9	26.4	1.6E-03	1.4E-04
			67.0	660	25.5	2114.5	26.0	1.6E-03	1.4E-04
Ave.hydraulic conductivity for borehold wetted zone								1.6E-03	1.4E-04
Hydraulic conductivity computed as:				Ration of K's				11.29	
Earth manual formula (3), page 592: $K = (0.508(\text{asinh}(h/r)-1)*Q/2\pi)/h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K (\text{horizontal}) = ((d^2*\ln(2L/D))/(8*L*T))*\ln(H1/H2)$, where d = D									

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K	
								Earth Manual	Case G, L= Wetted Zone (cm/sec)
B-8	2140	51.5	32.5	0	7.2	2132.8	44.3		
			33.0	30	8.2	2131.8	43.3	1.6E-03	1.4E-04
			33.5	60	8.3	2131.7	43.2	1.7E-04	1.5E-05
Top of cemented sand at Elevation			34.0	90	8.9	2131.1	42.6	1.0E-03	8.9E-05
		2132	34.5	120	9.6	2130.4	41.9	1.2E-03	1.1E-04
			35.0	150	10.1	2129.9	41.4	8.9E-04	7.8E-05
			35.5	180	10.6	2129.4	40.9	9.1E-04	8.0E-05
			36.0	210	11.0	2129.0	40.5	7.4E-04	6.5E-05
			36.5	240	11.5	2128.5	40.0	9.4E-04	8.3E-05
			37.0	270	11.8	2128.2	39.7	5.8E-04	5.1E-05
			37.5	300	12.2	2127.8	39.3	7.8E-04	6.9E-05
			38.0	330	12.5	2127.5	39.0	6.0E-04	5.2E-05
			38.5	360	12.9	2127.1	38.6	8.1E-04	7.1E-05
			39.0	390	13.2	2126.8	38.3	6.2E-04	5.4E-05
			39.5	420	13.6	2126.4	37.9	8.3E-04	7.3E-05
			40.0	450	13.9	2126.1	37.6	6.4E-04	5.6E-05
			40.5	480	14.3	2125.7	37.2	8.6E-04	7.6E-05
			41.0	510	14.6	2125.4	36.9	6.6E-04	5.8E-05
			41.5	540	15	2125.0	36.5	8.9E-04	7.8E-05
			42.0	570	15.3	2124.7	36.2	6.8E-04	6.0E-05
			42.5	600	15.5	2124.5	36.0	4.6E-04	4.0E-05
Ave.hydraulic conductivity for borehold wetted zone								7.9E-04	7.0E-05
Ration of K's								11.36	
Hydraulic conductivity computed as:									
Earth manual formula (3), page 592: $K = (0.508(\operatorname{asinh}(h/r)-1)*Q/2\pi)/h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K (\text{horizontal}) = ((d^2 \ln(2L/D))/(8*L*T)) * \ln(H1/H2)$, where $d = D$									

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K	
								Earth Manual	Case G, L= Wetted Zone (cm/sec)
B-9	2150	101.5	39.5	0	10.0	2140.0	91.5		
			40.0	30	11.0	2139.0	90.5	4.3E-04	3.8E-05
			40.5	60	12.2	2137.8	89.3	5.3E-04	4.7E-05
Top of cemented sand at			41.0	90	13.4	2136.6	88.1	5.4E-04	4.8E-05
Elevation		2138	41.5	120	14.5	2135.5	87.0	5.1E-04	4.5E-05
			42.0	150	15.3	2134.7	86.2	3.8E-04	3.3E-05
			42.5	180	16.1	2133.9	85.4	3.9E-04	3.4E-05
			43.0	210	16.8	2133.2	84.7	3.4E-04	3.0E-05
			43.5	240	17.1	2132.9	84.4	1.5E-04	1.3E-05
			44.0	270	17.5	2132.5	84.0	2.0E-04	1.8E-05
			44.5	300	18.1	2131.9	83.4	3.0E-04	2.7E-05
			45.0	330	18.8	2131.2	82.7	3.6E-04	3.1E-05
			45.5	360	19.2	2130.8	82.3	2.1E-04	1.8E-05
			46.0	390	19.6	2130.4	81.9	2.1E-04	1.8E-05
			46.5	420	19.9	2130.1	81.6	1.6E-04	1.4E-05
			47.0	450	20.2	2129.8	81.3	1.6E-04	1.4E-05
			47.5	480	20.4	2129.6	81.1	1.1E-04	9.4E-06
			48.0	510	20.6	2129.4	80.9	1.1E-04	9.4E-06
			48.5	540	20.9	2129.1	80.6	1.6E-04	1.4E-05
			49.0	570	21.1	2128.9	80.4	1.1E-04	9.5E-06
			49.5	600	21.3	2128.7	80.2	1.1E-04	9.6E-06
			102	3750	28.1	2121.9	73.4	3.6E-05	3.2E-06
Ave.hydraulic conductivity for borehold wetted zone								2.6E-04	2.3E-05
Hydraulic conductivity computed as:				Ratio of K's				11.43	
Earth manual formula (3), page 592: $K = (0.508(\text{asinh}(h/r)-1)*Q/2\pi)/h^2$									
Case G from Lambe and Whitman with L=wetted zone for each time increment:									
$K (\text{horizontal}) = ((d^2*\ln(2L/D))/(8*L*T))*\ln(H1/H2)$, where $d = D$									

Date smth

Falling Head Field Test Data and Estimate of Hydraulic Conductivity											
Borehole	Surface Elevation	Depth of Boring (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K			
								Earth Manual	Case G, L= Wetted Zone		
								cm/sec			
B-10	2165	101.5	29.0	0	10.6	2154.4	90.9				
			29.5	30	11.8	2153.2	89.7	5.3E-04	4.6E-05		
			30.0	60	12.7	2152.3	88.8	4.1E-04	3.5E-05		
			Top of cemented sand at		30.5	90	13.6	2151.4	87.9	4.1E-04	3.6E-05
			Elevation	2140	31.0	120	14.3	2150.7	87.2	3.3E-04	2.9E-05
					31.5	150	15.2	2149.8	86.3	4.3E-04	3.7E-05
					32.0	180	16.0	2149.0	85.5	3.9E-04	3.4E-05
					32.5	210	16.7	2148.3	84.8	3.4E-04	3.0E-05
					33.0	240	17.4	2147.6	84.1	3.5E-04	3.0E-05
					33.5	270	18.0	2147.0	83.5	3.0E-04	2.7E-05
					34.0	300	18.7	2146.3	82.8	3.6E-04	3.1E-05
					34.5	330	19.2	2145.8	82.3	2.6E-04	2.3E-05
					35.0	360	19.7	2145.3	81.8	2.6E-04	2.3E-05
					35.5	390	20.3	2144.7	81.2	3.2E-04	2.8E-05
					36.0	420	20.9	2144.1	80.6	3.2E-04	2.8E-05
					36.5	450	21.4	2143.6	80.1	2.7E-04	2.4E-05
					37.0	480	21.9	2143.1	79.6	2.8E-04	2.4E-05
		37.5	510	22.4	2142.6	79.1	2.8E-04	2.4E-05			
		38.0	540	22.9	2142.1	78.6	2.8E-04	2.5E-05			
		38.5	570	23.3	2141.7	78.2	2.3E-04	2.0E-05			
		39.0	600	23.7	2141.3	77.8	2.3E-04	2.0E-05			
Ave.hydraulic conductivity for borehold wetted zone								3.3E-04	2.9E-05		
Ration of K's								11.44			
Hydraulic conductivity computed as:											
Earth manual formula (3), page 592: $K = (0.508(\text{asinh}(h/r)-1)*Q/2\pi)/h^2$											
Case G from Lambe and Whitman with L=wetted zone for each time increment:											
$K (\text{horizontal}) = ((d^2*\ln(2L/D))/(8*L*T))*\ln(H1/H2)$, where $d = D$											

Falling Head Field Test Data and Estimate of Hydraulic Conductivity									
Testpit	Surface Elevation	Depth of Test Pit (ft)	Time (min)	Elapsed Time (sec)	Depth to water (ft)	Elevation of water (msl)	Depth of water (ft)	Computed K, Case C (cm/sec)	Computed K, Case G (cm/sec)
TP-8	2138	16	44.5	0	13.60	2124.4	2.40		
			59.5	900	14.20	2125.8	1.80	-2.2E-03	
Top of cemented sand at Elevation			60.0	930	14.25	2123.8	1.75	-1.6E-02	
Not encountered			68.8	1455	14.45	2123.6	1.55	-4.1E-03	
Added 500 gallons water									
			13.8	0	12.90	2125.1	3.10		
			14.8	60	13.00	2125.0	3.00	-8.4E-04	
			19.0	315	13.30	2124.7	2.70	-8.8E-04	
			53.0	2355	15.90	2122.1	0.10	-2.2E-03	
Added 500 gallons water									
			16.0	0	11.50	2126.5	4.50		
			24.0	480	12.05	2126.0	3.95	1.0E-03	
			25.0	540	12.10	2125.9	3.90	5.3E-04	
			26.0	600	12.15	2125.9	3.85	4.9E-04	
			27.0	660	12.20	2125.8	3.80	4.6E-04	
			28.0	720	12.25	2125.8	3.75	4.3E-04	
			29.5	810	12.30	2125.7	3.70	2.6E-04	
			32.2	970	12.40	2125.6	3.60	2.6E-04	
			35.0	1140	12.50	2125.5	3.50	1.8E-04	
			45.8	1785	12.80	2125.2	3.20	8.9E-05	
			58.0	2520	13.00	2125.0	3.00	-8.0E-05	
Hydraulic conductivity computed as:									
$K = (2 \cdot 6 + 2 \cdot 3) \cdot (12 \cdot 2.54) / (11 \cdot (t_2 - t_1)) \cdot \ln(H_1 / H_2)$									
Case C from Lambe and Whitman, page 284, K for borehole with flush bottom in homogenous soil.									



Develop Chimney Drain Filter Gradation
 Use SCS Criteria
 Part 663 National Engineering Handbook
 Chapter 26 Gradation Design of Sand & Gravel Filters

1. Plot Gradation Curve (See Attached Plots)

Sieve	Percent Passing	
	<u>Coarsest</u>	<u>Finest</u>
# 4	38	91
# 10	28	77
# 16	21	60
# 30	15	40
# 50	10	33
# 100	5	25
# 200	4	20

2. Material Contains Particles > #4 sieve

3. Regrade Material

Correction Factor

Finest $100 / 38 = 2.63$

Coarsest $100 / 91 = 1.10$

Sieve	Percent Passing	
	<u>Coarsest</u>	<u>Finest</u>
# 4	100	100
# 10	74	85 ^{81.7}
# 16	55	66
# 30	39	44
# 50	26	36
# 100	13	28
# 200	11	22

4. BASE SOIL CATEGORY TABLE 26-1
- COURSEST CATEGORY 4 SAND & GRAVEL
- FINEST CATEGORY 3 SILTY & CLAYEY SAND & GRAVEL

5. MAXIMUM D_{15} FOR FILTER CRITERIA - USE FINEST BASE SOIL
TABLE 26-2

CATEGORY 4 $\leq 4 \times d_{85}$ OF BASE SOIL AFTER REGRADES

$$d_{85} = 2.00 \text{ mm}$$

$$d_{15 \text{ max}} \leq 4 \times 2.00 \text{ mm} = \underline{8 \text{ mm}}$$

6. MINIMUM D_{15} FOR PERMEABILITY REQUIREMENTS - USE COARSEST
SAMPLE BEFORE REGRADES
TABLE 26-3

$$\geq 4 \times d_{15}$$

d_{15} COARSEST SAMPLE BEFORE REGRADES 0.6 mm

$$4 \times 0.6 \text{ mm} = 2.4 \text{ mm}$$

$$d_{15 \text{ min}} = \underline{2.4 \text{ mm}}$$

7. CHECK WIDTH OF FILTER BORD

$$\frac{D_{15 \text{ max}}}{D_{15 \text{ min}}} = \frac{8 \text{ mm}}{2.4 \text{ mm}} = 3.3 \leq 5 \quad \text{OK}$$

8. CALCULATE MAX D10 SIZE

$$D_{10} = D_{15} \div 1.2 = 8 \text{ mm} \div 1.2 = 6.7 \text{ mm}$$

$$D_{60 \text{ max}} = D_{10} \times 6 = 6.7 \times 6 = 40.0$$

$$D_{60 \text{ min}} = D_{60 \text{ max}} \div 5 = 40 \div 5 = \underline{8 \text{ mm}}$$

9. Determine Min D₅ & Max D₁₀₀

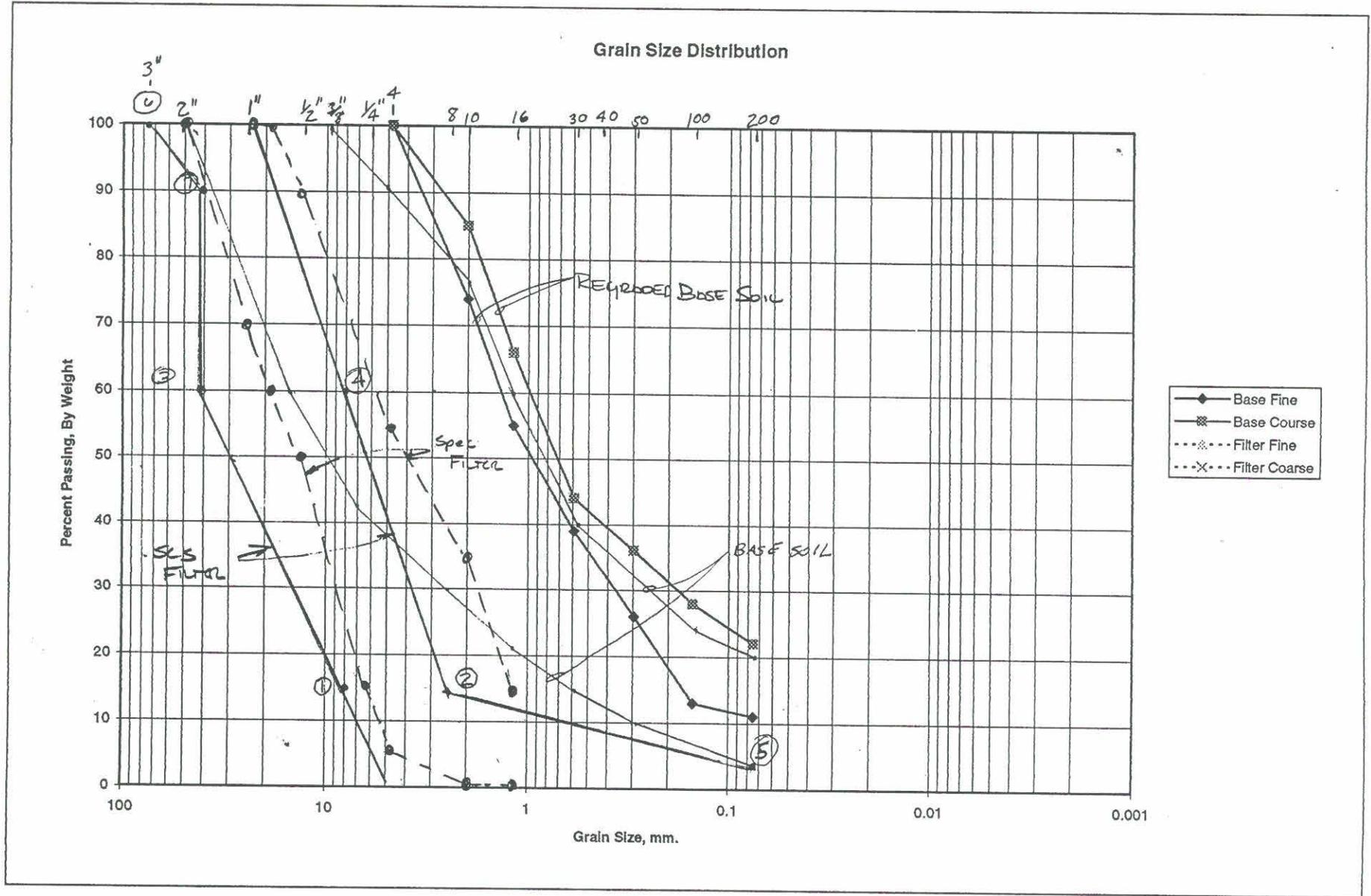
$$\text{Min } D_5 = 200 \text{ sieve } 0.075$$

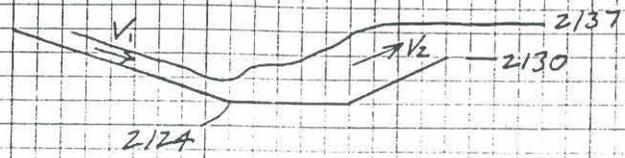
$$\text{Max } D_{100} = 3''$$

10 Calculate Min D₁₀ = min D₁₅ ÷ 1.2 = 2.4 ÷ 1.2 = 2.0 mm

Max D₉₀ From Table 26.6

For min D₁₀ = 2.0 mm, Max D₉₀ = 40 mm.





GOAL: ESTIMATE FORCE ON STILLING BASIN AND CHECK SLIDING STABILITY W/ NO D.S. RIPRAP, COMPLETE SCOUR.

$Q_{2 PMF} = 5400 \text{ cfs}$

SPILLWAY CREST EL 2155 WS = 2162 ±
 STILLING BASIN FLOOR 2124 WS = 2127 ± @ V1

TOTAL HEAD = 2162 - 2127 = 35'

$V = \sqrt{2gh} = (\sqrt{2(32.2)35})^2 = 47 \text{ fps}$

ASSUME $V_{1 \text{ ACTUAL}} = 90\% V_T = 43 \text{ fps}$

$Q = VA$

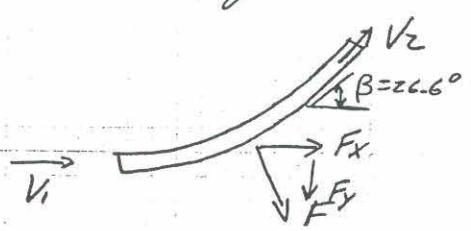
$A_1 = Wd_1 = .80' d_1$

$V_1 = \frac{Q}{A_1} = \frac{5400}{.80 d_1} = 43 \text{ fps } d_1 = 1.6 \text{ ft.}$

ASSUME SLOPED END OF STILLING BASIN CAN BE MODELLED AS A DEFLECTOR BLADE.

$V_2 = \frac{Q}{A_2} = \frac{5400}{80 \times 7} = 9.6 \text{ fps.}$

Reference: Elementary FLUID MECHANICS by JOHN VENNARD 1961 page 194.



$\Sigma F_x = Q\rho(V_2 \cos \beta - V_1)$

$\Sigma F_y = Q\rho(V_2 \sin \beta - 0)$

$\rho g = \gamma \quad \rho = \frac{62.4}{32.2} = 2.16 \frac{\text{sec}^2}{\text{ft}^4}$

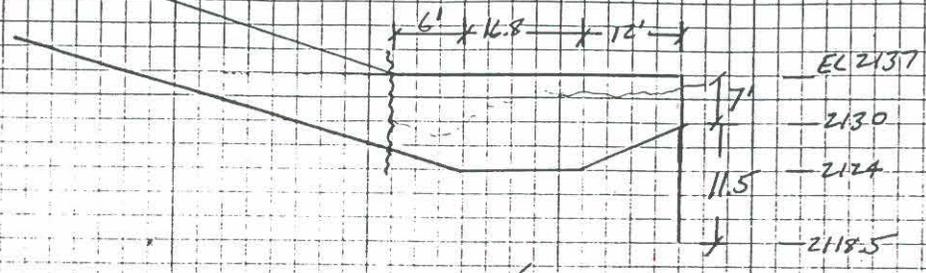
$F_x = Q\rho(V_2 \cos \beta - V_1)$

$F_x = 5400(2)(9.6 \cos 26.6 - 43) = 371,694 \text{ lb}$

$F_y = Q\rho(V_2 \sin \beta) = 5400(2)(4.298) = 46,424 \text{ lb}$



APPROXIMATE STABILITY ANALYSIS



WEIGHT WATER $\approx (2130 - 2124) \frac{(16.8 + 16.8 + 18)}{2} 80 (62.4) = 772,761 \text{ lb.}$

CONCRETE FLOOR $1.5 \times (6 + 12 + 17) 150 \times 80 = 630,000 \text{ lb.}$

CUTOFF WALL $11.5 \times 80 \times 150 \times 1.5 = 207,000 \text{ lb.}$

INITIALLY IGNORE END WALLS & THRUST BLOCKS.

WEIGHT OF CONCRETE + WATER

$772,761 + 630,000 + 207,000 = 1,609,761 \text{ lb.}$

ASSUME UNDERDRAIN SYSTEM WORKING W/ DRAIN @ EL 2126.5

UPLIFT $\pm (2126.5 - 2122.5) 62.4 (80) (6 + 16.8 + 10) = 654,950 \text{ lb.}$

NET DOWN FORCE = DYNAMIC FORCE + WATER + CONCRETE - UPLIFT
 $= 46,424 + 1,609,761 - 654,950 = 1,001,235 \text{ lb.}$

USE COEFFICIENT OF FRICTION FOR 30° - CONSERVATION
 $\tan 30 = 0.577$

Reduce for partial smooth concrete to 0.50

HORIZONTAL RESISTING FORCE F_{XR}

$F_{XR} = 1,001,235 (.5) = 500,618 \text{ lb.}$

$FS = \frac{\text{RESISTING FRICTION}}{\text{DRIVING WATER FORCE}} = \frac{500,618}{371,694} = 1.35 \text{ OK}$

IF UNDERDRAIN COMPLETELY INEFFECTIVE IGNORE WATER WEIGHT.

NET DOWN FORCE = $630,000 + 207,000 = 837,000 \text{ lb.}$

$FS = \frac{837,000 (.5)}{371,694} = 1.12 \text{ OK}$

4th edition
elementary
**FLUID
MECHANICS**

JOHN K. VENNARD
Professor of Fluid Mechanics, Stanford University

New York · London, John Wiley & Sons, Inc.

ILLUSTRATIVE PROBLEM

The engine of an airplane flying through still air (specific weight 0.0765 lb/cuft) at 200 mph (293 fps) delivers 1500 hp to an ideal propeller 10 ft in diameter. Calculate slipstream velocity, velocity through the propeller disk, and the diameter of the slipstream ahead of and behind the propeller. Also calculate thrust and efficiency.

Solution.

$$P_i = 1500 \times 550 = \frac{\pi}{4} (10)^2 \left(\frac{V_4 + 293}{2} \right) \frac{0.0765}{32.2} \left(\frac{V_4^2 - 293^2}{2} \right);$$

$$V_4 = 338 \text{ fps} \quad (127)$$

$$V = (338 + 293)/2 = 315.5 \text{ fps}, \quad Q = 24,800 \text{ cfs} \quad (125)$$

$$A_1 = 24,800/293 = 84.7 \text{ sqft}, \quad d_1 = 10.4 \text{ ft}$$

$$A_4 = 24,800/338 = 73.3 \text{ sqft}, \quad d_4 = 9.67 \text{ ft}$$

$$F = 24,800(0.0765/32.2)(338 - 293) = 2610 \text{ lb} \quad (122)$$

$$\eta = \frac{2610 \times 293}{1500 \times 550} = 92.7\% \quad \text{or} \quad \eta = \frac{293}{315.5} = 92.7\% \quad (128)$$

50. Deflectors and Blades—The Impulse Turbine. When a free jet is deflected by a blade surface, a change of momentum occurs and a force is exerted on the blade. If the blade is allowed to move, this force will act through a distance, and power may be derived from the moving blade; this is the basic principle of the impulse turbine.

The jet of Fig. 80 is deflected by a fixed blade and may be assumed to be in a horizontal plane.¹⁴ With the control surface drawn around the region of momentum change, it is seen at once that the force exerted by the blade is the only force acting on the fluid. Therefore, from equations 102 and 103,

$$\Sigma F_x = -F_x = Q\rho(V_2 \cos \beta - V_1) \quad (131)$$

$$\Sigma F_y = F_y = Q\rho(V_2 \sin \beta - 0) \quad (132)$$

If this blade now moves (Fig. 81) with velocity u in the same direction as the original jet, the jet is no longer deflected through an angle β since the leaving velocity, V_2 , is now the resultant of the blade velocity and the velocity of the fluid over the blade. The velocity, v , of fluid relative to the blade is obviously $(V_1 - u)$, and if friction is neglected this relative velocity is the same at the entrance

¹⁴ The difference in elevation between beginning and end of blade is usually negligible in practical blade problems.

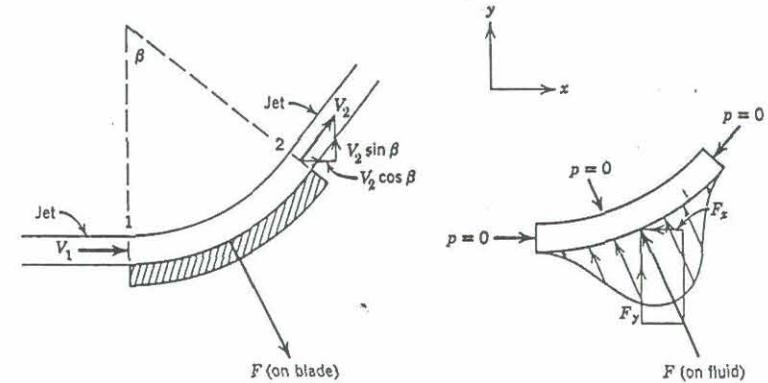


FIG. 80

and exit of the blade system; therefore, as the jet leaves the blade, it has an absolute velocity, V_2 , equal to the vector sum of u and $(V_1 - u)$. Then, from Fig. 81 and equations 102 and 103,

$$\Sigma F_x = -F_x = Q\rho(V_{2x} - V_{1x}) = -Q\rho(V_1 - u)(1 - \cos \beta) \quad (133)$$

$$\Sigma F_y = F_y = Q\rho(V_{2y} - V_{1y}) = Q\rho(V_1 - u) \sin \beta \quad (134)$$

Engineers frequently prefer to treat such problems with the relative velocities v_1 and v_2 , both of which are equal to $(V_1 - u)$, thus reducing the problem to that of the stopped blade of Fig. 80; the validity of this may be seen from the velocity triangles and by noting that the substitution of $(V_1 - u)$ for V_1 and V_2 in equations 131 and 132 will yield equations 133 and 134, respectively.

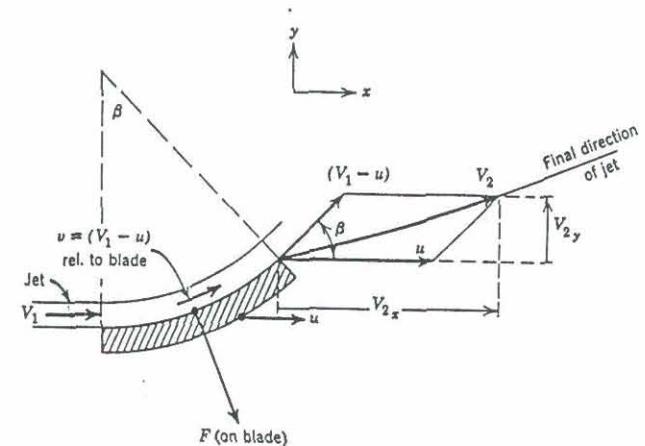


FIG. 81



Spillway Entrance Walls

Use saturated active pressure.

$$\gamma_{SAT} = 130 \text{ pcf} \pm$$

$$\gamma_b = 130 - 62 = 68 \text{ pcf}$$

$$\phi = 35^\circ$$

$$K_A = 1 - \sin \phi = 0.43$$

$$K_A = 68(.43) + 62.4 = 91.6 \text{ say } 90 \text{ pcf.}$$

Spillway chute and stilling basin

Use moist drained active pressure

$$K_A = 130(.43) = 56 \Rightarrow \text{use } 60 \text{ pcf.}$$



SUBJECT STILLING BASIN
UNDERDRAIN SYSTEM
PIPE SPACING / CAPACITY

BY J. Livingston DATE 5/5/95
 SHEET 1 OF 1
 PROJECT NO. SWW35441.P5.

FROM FLOW NET TOTAL SEEPAGE IS 7 gpm FOR
 $k = 10^{-3} \text{ cm/sec}$, FOR NATIVE SOIL

PROVIDE 1' OF ZONE 2 MAT'L WHICH HAS
 HYDRAULIC CAPACITY MUCH LARGER THAN
 UNDERLYING MATERIAL

$$k \text{ OF ZONE 2} = 1' / \text{min} = 0.5 \text{ cm/sec}$$

\therefore ZONE 2 MAT'L IS $\frac{0.5}{10^{-3}} = 508$ TIMES MORE PERMEABLE

PIPES UNDER STILLING BASIN SLAB WILL BE
 PROVIDED TO RELIEVE PRESSURES.

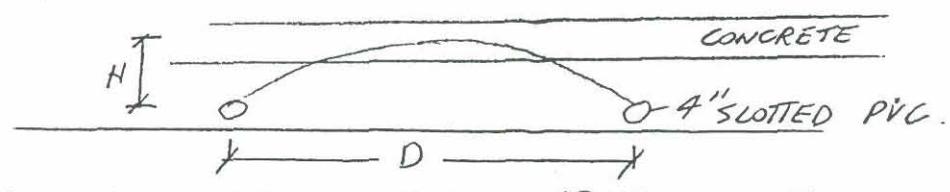
PIPE HYDRAULIC CAPACITY IS HIGH BUT
 ALLOWABLE HEAD ABOVE DRAIN OUTLET
 SHOULD BE MINIMIZED.

SAY 0.1' EXCESS HEAD FLOW OUT OF
 PIPE IS 10-20 gpm.

PROVIDE 2 pipes - one on each wall for redundancy
 IF HEAD BUILDS UP ABOVE OUTLET PIPE
 FLOW WILL INCREASE SIGNIFICANTLY.

PROVIDE PIPES SPACED EVENLY UNDER
 SLAB TO EQUALIZE PRESSURES.

SPACING SAY 18-20'



USING NAVFAC-DM 7.1 1982 p 278.

$$k_{\text{SUBSOIL}} = 1 (10^{-3}) \text{ cm/sec} = 2 (10^{-3}) \text{ ft/min}$$

$$k_{\text{FILTER}} = 1 \text{ ft/min.}$$

$$D/H = 130 \quad H = 1' \therefore D = 130'$$

$$\text{FS. SPACING} = \frac{130}{20} = 6.5 \quad \text{THESE PIPES ARE NOT}$$

COSTLY AND WILL PROVIDE FLOW EQUALIZATION.

Hydraulic Capacity of Finger DRAINS

Zone 2 $k = 1 \text{ FT}/\text{min}$

LENGTH 90 FT. AREA $10 \times 2 = 20 \text{ FT}^2$

$$Q = k i A$$

$$i = \frac{\Delta H}{L} = \frac{2}{90} = .022$$

$$Q = \frac{1 \text{ FT}}{\text{min}} \cdot .022 (20 \text{ FT}^2) = .44 \text{ FT}^3/\text{min}$$

For 4 drains $Q = 1.76 \text{ FT}^3/\text{min} = 13.1 \text{ gpm.}$

if head increased to 10'

$$i = \frac{10}{90} = .111$$

$$Q = \frac{13.1 (.111)}{.022} = 66 \text{ gpm.}$$

if Area increased to $10 \times 3 = 30 \text{ FT}^2$

$$Q = \frac{66 \cdot 30}{20} = 99 \text{ gpm}$$

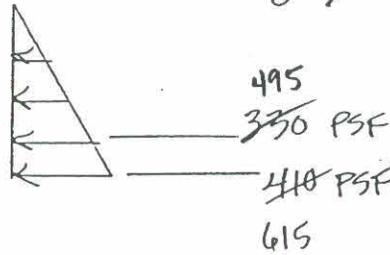
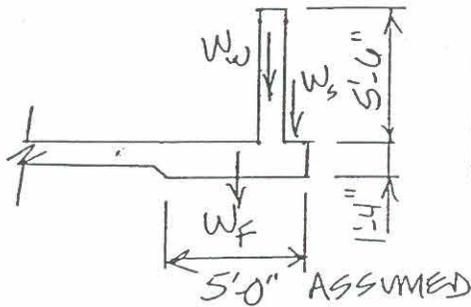
Will take seepage about 10 days to get thru dam.
Lake should not have water behind it that long.

Have contractor verify permeability of Zone 2 material.

Use $10 \times 3'$ For finger drains

BACKFILL HT VARIES FROM 11' TO 0'. CHECK SECTION @ MID HT

$\gamma_e = \frac{90}{60} \text{ PCF (UNDRAINED)}$



MODIFIED
6/9/95
myc

$$M_{OT} = \frac{0.410 (6.83^2)}{6} = 3.19 \text{ k/ft}$$

COMPONENT	WT	x	WT · x
W_w	$(1)(5.5)(1.50) = 0.82 \text{ k/ft}$	3.5	2.87
W_f	$(1.33)(5.0)(1.50) = 1.00 \text{ k/ft}$	2.5	2.50
W_s	$(1)(5.5)(1.28) = 0.66 \text{ k/ft}$	4.5	2.97

$\Sigma = 2.48$

NOTE: SLIDING & OVERTURNING NOT REALLY AN ISSUE SINCE LOADING IS EQUAL ON BOTH SIDES.

$SF = \frac{8.34}{4.78 \cdot 3.19} = 2.61 \text{ OK}$

$\bar{x} = \frac{8.34}{2.48} = 3.36'$; $e = 3.36 - \frac{5.0}{2} = 0.86'$

$S = \frac{1(5^2)}{6} = 4.17 \text{ FT}^3$

$q = \frac{P}{A} \pm \frac{M}{S}$

$= \frac{2.48}{5.0} \pm \frac{3.19 - 2.48(0.86)}{4.17} = \left\{ \begin{array}{l} 750 \text{ PSF} \\ 250 \text{ PSF} \end{array} \right.$



AT BASE OF WALL:

$$M = \frac{.50 \cdot \overset{HT \times .060}{.0033} (5.5^2)}{6} = \frac{2.52}{1.66} \text{ k/ft}$$

$$d = 12" - 2" \text{ CLR} - \frac{\overset{\#6 \text{ ASSUMED}}{0.88}}{2} = 9.56"$$

$$a = 1.28 \quad (12" \text{ SPACING ASSUMED } \therefore f_s = 18 \text{ ksi})$$

$$A_s = \frac{2.52}{1.28(9.56)} = \frac{0.21}{.122} \text{ IN}^2/\text{FT} \quad \text{USE } \#5 @ 12 \text{ MIN} \quad \text{OK}$$

(TEMP. STEEL = $0.0033(12^2) = 0.48 \text{ IN}^2/\text{FT}$
 OR $0.24 \text{ IN}^2/\text{FT}$ EA FACE)

DETERMINE WALL HT WHERE #5 @ 12 IS ADEQUATE:

$$M = A_s \cdot a \cdot d$$

$$= 0.31(1.36)(9.56) = 4.03 \text{ k/ft}$$

↑ #5 @ 19 ksi

$$HT = \left[\frac{6(4.03)}{.060 \text{ kcf} \cdot .090} \right]^{1/3} = 6.45 \text{ ' SAY } 7'-3" \pm$$

6'-6"

DETERMINE WALL HT WHERE #6 @ 12 IS ADEQUATE:

$$M = 0.44(1.28)(9.56) = 5.38 \text{ k/ft}$$

↑ #6 @ 18 ksi

VOID

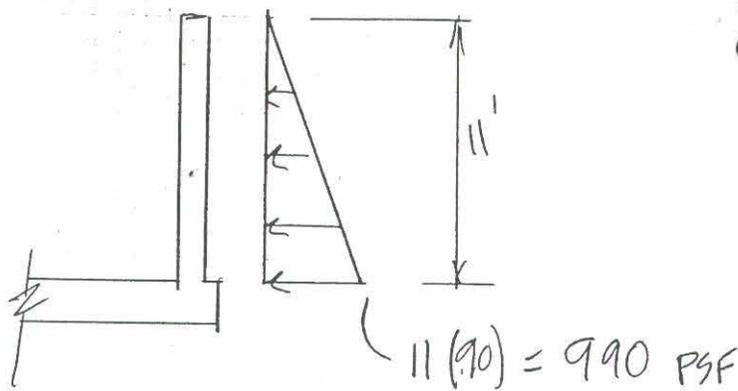
SEE NEW SHEET 4A

$$HT = \left[\frac{6(5.38)}{0.060 \text{ kcf}} \right]^{1/3} = 8.13' \text{ SAY } 8'-0"$$

∴ TRANSITION FROM #6 @ 6 TO #5 @ 12 DIRECTLY



CHECK FULL HT WALL (11') FOR UNDRAINED CONDITION



$\gamma_e = 90 \text{ PCF}$

$$M_{\text{BASE}} = \frac{(0.990)(11^2)}{6} = 19.97 \text{ k/ft}$$

$$d = 12'' - 2'' \text{ CLR} - \frac{1.13}{2} = 9.44 \text{ in}$$

#8 ASSUMED

$a = 1.59$ (6" SPACING ASSUMED $\therefore f_s = 22 \text{ ksi}$)

$$A_s = \frac{19.97}{1.59(9.44)} = 1.33 \text{ IN}^2/\text{FT} \therefore \frac{\#8 @ 6}{(1.58 \text{ IN}^2/\text{FT})}$$

FOOTING STEEL

#8

$$d = 16'' - 3'' \text{ CLR} - \frac{1.13}{2} = 12.44''$$

$$A_s = \frac{19.97 \leftarrow M @ \text{BASE OF WALL}}{(1.59)(12.44)} = 1.01 \text{ IN}^2$$

STABILITY ANALYSIS

13.45

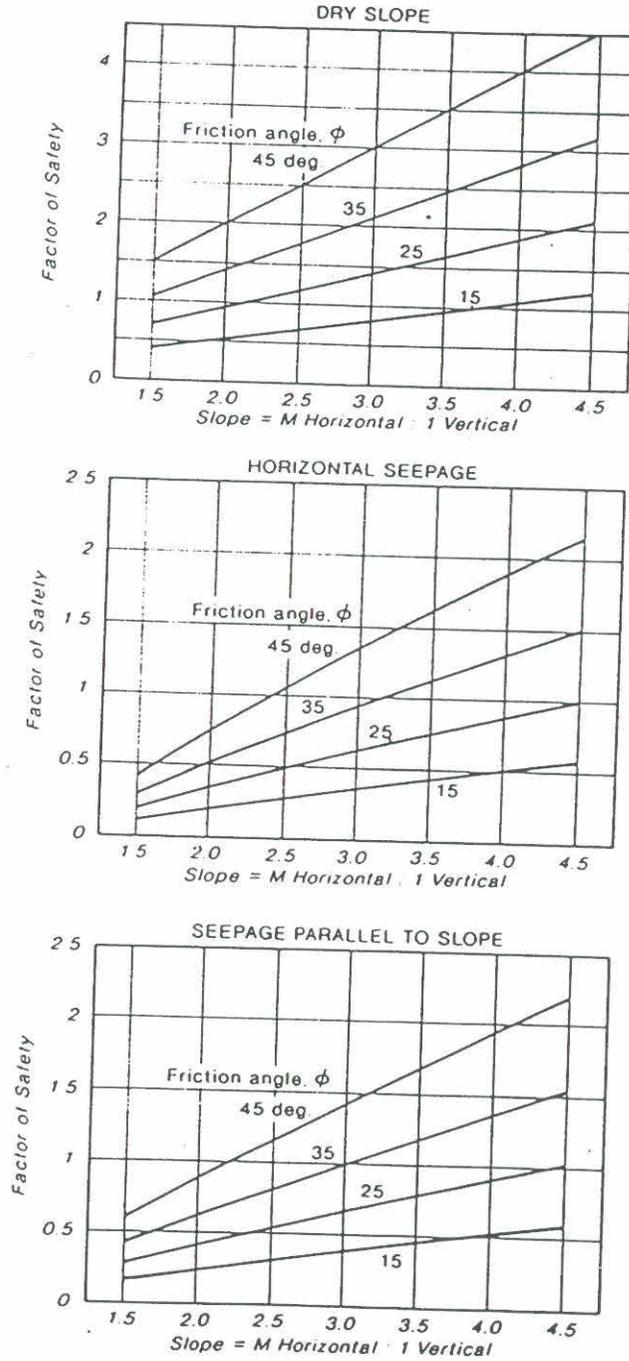
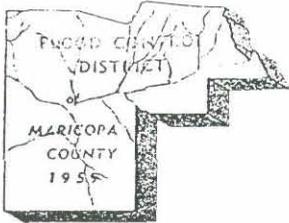


FIGURE 21 Infinite slope analysis.

Attachment D

Comments



FLOOD CONTROL DISTRICT

of

Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009

Telephone (602) 506-1501

Fax (602) 506-4601

TT (602) 506-5859

John Livingston/1990
or
BOARD OF DIRECTORS
Betsey Bayless
John T. Katsenes
Ed King
Tom Rawles
Mary Rose Garrido Wilcox

APR 26 1995

— RECEIVED —

APR 26 1995

CH2M HILL/PHOENIX

Steven Walker, P.E.
CH2M Hill
1620 West Fountainhead Parkway, Suite 550
Tempe, Arizona 85285

Subject: Casandro Wash Dam, Contract FCD 93-14
90% Submittal Comments

Dear Mr. Walker:

The review of your 90% Submittal has been completed since March 3, but has not been returned to you pending comments from the Arizona Department of Water Resources. In order to have this project advertised and bids opened this fiscal year, we need to move forward with revisions. I am hoping that ADWR follows up quickly with any comments.

Following is a list of some of the comments. Along with these comments, a half-size copy of the plans and a copy of the project Special Provisions which includes comments is being transmitted; return all review sets with your next submittal. Please review the comments and call to arrange a meeting to discuss this review.

GENERAL COMMENTS

Plans

Cover Sheet

1. Add an Approval Block for the Town of Wickenburg (see plans).
2. Tom Rawles is the Board Chairman.

Sheet 2

1. Project Notes, note 2, the Public Works Director's first name is Tony.

Sheet 3

1. Increase the line wt of the District's R/W so that it stands out.

Sheet 4

1. Show a sewer easement for the relocated sewer line.
2. Increase the line wt of the District's R/W so that it stands out.

Letter to Steven Walker, P.E.

Subject: Casandro Wash Dam, Contract FCED 93-14

Page 2

Sheet 5

1. Remove the grid behind the table and notes for clarity.
2. The Chimney Drain sides are shown vertical adjacent to the spillway; is this necessary?

Sheet 6

1. Is it necessary to have the Chimney Drain above elev. 2154.5 (see Geotech Report)?
2. Cross reference the location in the CSP's where the specs for the zones can be found.
3. Include 2 more PVC Drains and have them drain on the DS face not into the stilling basin.

Sheet 7

1. Use concrete slurry for backfill for the entire length of the principal spillway.

Sheet 8

1. The PVC size is called out as 8" on a previous sheet; which is correct?
2. Bury the rip rap 1' underneath the wash invert at the DS end of the stilling basin.

Sheet 11

1. Lower the location of the instrument conduit to the floor of the structure.

Sheet 13

1. Remove the sump as shown in section 107.

Sheet 15

1. Can't the bench in the trench, Detail 12, be eliminated and the basin drain pipe be placed in the same trench as the sewerline?

Bidding Schedule

1. Include a Precipitation/Pressure Transducer Package: Nova Lynx Model 5090/5054 or approved equipment. 1 each @ \$5,000.
2. Include an item for the "Vented cable for the Pressure Transducer: Nova Lynx Model 505011PTKC or approved equivalent. xLF @ \$3.00/LF.

Special Provisions

(See the attached markups)

Please call within one week of receipt of these comments to schedule a comment review meeting. Be prepared to discuss the comments that you question. I have attached a copy of the project schedule sent to ADWR, that will allow us to advertise and open bids by the end of June. Please let me know if you see a problem meeting this schedule.

Letter to Steven Walker, P.E.
Subject: Casandro Wash Dam, Contract FCED 93-14
Page 3

If you have any questions, please call me at 506-8742. I will forward any comments I receive from ADWR as soon as I get them.

Sincerely,

A handwritten signature in cursive script that reads "Michael A. Lopez". The signature is written in black ink and is positioned above the printed name.

Michael A. Lopez, P.E.
Project Manager

Attachments

0A345 - WICKENBURG DAM
 Casandro Wash Dam Michael Lopez FCD 93-14

ID	Name	Duration	94	Qtr 3, 1994				Qtr 4, 1994			Qtr 1, 1995			Qtr 2, 1995			Qtr 3, 1995			Qt	
			Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		
41	Civil Design	359d	[Solid bar from Jun 94 to May 95]																		
42	Kickoff Meeting	0d																			
43	Value Engineering Meeting	0d																			
44	DCR/25% Plans & Specs	20.8w	6/100																		
45	50 % Plans and Specs	14.8w	77/20 - 10/311																		
46	90 % Plans and Specs	8.8w	112/6 - 2/33																		
47	Final Plans and Specs	4ew	4/24 - 5/22																		
48																					
49	FCDMC Reviews	191d	[Solid bar from Jun 94 to Mar 95]																		
50	DCR Review	1.29ew	3 - 7/199																		
51	50% Review	1.19ew	111/1 - 12/55																		
52	90% Review	1ew	22/6 - 3/66																		
53																					
54	ADWR preliminary review	10w	2/13 - 4/21																		
55	ADWR final review	3w	5/22 - 6/9																		
56																					
57	PACKAGE CONSTRUCTION DOCS.	45d	5/22 - 6/9																		
58	Compile Specs and Bid Package	1w	5/22 - 5/26																		
59	Reproduce Bid Package	2w	5/22 - 6/2																		
60	Advertise	4w	6/5 - 6/30																		
61	Open bids	0d	6/30 - 6/30																		
62	Prepare cst contract	3w	7/3 - 7/21																		
63	CONSTRUCTION AWARD	0d	7/21 - 7/21																		

State of Arizona
DEPARTMENT OF WATER RESOURCES

Engineering Division, 2nd Floor
500 North Third Street
Phoenix, AZ 85004-3904
LETTER OF TRANSMITTAL

RECEIVED

APR 27 1995



CH2M HILL/PHOENIX

To: FLOOD CONTROL DISTRICT M.C.

Date: 4-27-95

File Name: 07-65

Attention: MIKE LOPEZ

CASANDRO WASH DAM

Greetings:

We are sending you the following items by: FAX # 506-4601

- Drawings
- Prints
- Plans
- Samples
- Copy of Letter
- Change Order
- Specifications
- Other PROJECT DOCUMENTS REVIEW COMMENT LETTER

Copies	Date	Description
		<u>TOTAL PAGES 28</u>

These are transmitted as checked below:

- For approval
- Approved as submitted
- For instruction
- For your use
- Approved as noted
- Resubmit copies for approval
- As requested
- Returned for corrections
- Return corrected prints
- For review & comment

Remarks PLEASE CALL IF YOU HAVE QUESTIONS.

Copy To: CH2M HILL
ATTN: STEVE WALKER
FAX # 966-9450

Signed: [Signature]
Engineering Division
(602)417-2445

The engineer was also told on April 7th that when routing the Inflow Design Flood (IDF) through the reservoir to assess the adequacy of the emergency spillway, it is ADWR's normal procedure to assume that the outlet works is obstructed and does not contribute to discharging the flood. In most cases the outlet works capacity is very small in comparison to the spillway capacity, so this assumption usually does not significantly alter routing results. It does, however, give the reviewer a clear understanding of the maximum flow that is being passed through the spillway. Unfortunately, the HEC-1 model included the discharge of the outlet works with that of the spillway in routing the IDF through the project. To comply with ADWR's needs, the HEC-1 model should be revised and rerun. Revise Plan Sheet 2 as required. We request that detailed discharge tables be included in an Operating Manual for operational purposes. Provide a copy of the Operating Manual. We also request that recordings be made of the flow depth in the spillway at the ogee crest and upstream of the crest to delineate the depth of water in the entrance channel during overflow conditions; report the recordings in an annual report for the dam, which summarizes the activities at the dam for the year.

5. The outlet pipe and other pipes located in or below the dam foot print require full and or partial encasement with concrete and a downstream filter/drain section.

The engineer indicated the outlet pipe is fully encased upstream of the filter/drain and backfilled downstream of the filter/drain using filter material. ADWR indicated concern about achieving adequate compaction below the spring-line of the pipe and indicated that typically encasement is required up to the spring-line of pipes in the dam embankment. The owner indicated they preferred full encasement with concrete within the dam foot-print. The engineer indicated they felt the present design was safe but would make this revision and add a filter drain layer along the pipe to protect against material losses if the encasement cracks. ADWR concurred with the concept of these revisions and indicated that the present preference for constructing pipes through dams was to use SCS filter/drain criteria instead of seepage collars.

Update Comments: The design requirements for pipes located in the foot-print of the dam are discussed in the detailed review comments on the Special Provisions included with this review letter.

6. An Emergency Action Plan is required with the Application and additional information is required as part of the Dam Break analyses and report discussions.

During the meeting, the owner indicated they have contacted the County Department of Emergency Management and that this group would require about 30 days to do the plan once they were given the dam break analyses. ADWR indicated the location for the analyses cross sections should be shown on the map, as well as the arrival time, flow depth, and flow quantity at each section.

FCDMC was provided a separate copy of additional ADWR comments on Casandro Wash Dam Break Analysis Technical Memorandum (dated 1/10/95). These comments are provided below:

ARIZONA DEPARTMENT OF WATER RESOURCES

Dam Safety and Flood Mitigation Section

500 North 3rd Street, Phoenix, Arizona 85004

Telephone (602) 417-2445

Fax (602) 417-2401

April 27, 1995



FIFE SYMINGTON
Governor

RITA P. PEARSON
Director

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Attention: Mr. Michael Lopez
Project Coordinator

Subject: Casandro Wash Dam (07.65)
Application Review Comments

Dear Mr. Lopez:

As you are aware we are making every effort to complete our detailed review of your application and the following accompanying documents in a timely manner:

1. Plans for the Construction of Casandro Wash Dam (Preliminary 90% Submittal), dated February 3, 1995, by CH2M HILL.
2. Construction Special Provisions for Casandro Wash Dam (90% Design Review), dated February, 1995, by CH2M HILL.
3. Casandro Wash Dam, Final Design Report, dated February, 1995, by CH2M HILL.
4. Geotechnical Report, Volume 1, Field and Laboratory Data, dated February, 1995 by CH2M HILL.
5. Geotechnical Report, Volume 2, Analysis and Recommendation, dated February, 1995, by CH2M HILL.
6. Casandro Wash Dam Break Analysis Technical Memorandum, dated 1/10/95, by CH2M HILL.
7. Hydrologic Analysis for Casandro Wash Dam (Preliminary, dated January, 1994, by the Flood Control District of Maricopa County.

Although we have not completed our review, we understand your schedule is critical and that it is imperative that your design engineer begin completion of the final documents. We understand that your engineer will be completing portions of the documents and submitting them for ADWR final review during the next month in an effort to receive your approved application as soon as possible. Therefore, as you have requested we are forwarding all of

our comments which we have developed at this time. We anticipate completing our detailed review of the 90% documents on approximately May 1, 1995, and will provide you the additional comments as soon as possible after that time. Please be aware that it is likely that some additional comments will be developed during your completion of the 100% documents as well as during our review of the final submittal required for approval of your application. We will provide these comments in a timely manner as they are developed.

In summary, the comments we are providing at this time do not appear to require any significant redesign of the proposed dam project. Although we previously questioned the specifics of the spillway analyses and indicated we believe the actual residual freeboard is somewhat less than the three feet indicated in the design report, we are of the opinion that the spillway as presently designed results in a satisfactory dam design.

INITIAL REVIEW COMMENTS, MEETINGS AND DISCUSSIONS

As you are aware ADWR provided initial comments on the documents to you in the ADWR letter dated March 13, 1995. This letter was followed by a meeting on April 4, 1995, with representatives of the owner, Flood Control District of Maricopa County (FCDMC), and the design engineering firm, CH2M HILL. We have listed below the items of the meeting agenda with a brief summary of discussion and our understanding of what action was discussed in response to each comment. We will consider any alternate means of complying with the initial comments that you may have developed since the meeting. We have also included updated comment information developed since this meeting where it is applicable.

1. Specific subsurface information is not presented for the left portion of the dam foundation.

The owner and engineer agreed with this. The engineer indicated they believed the available information could reasonably be extrapolated into this area. ADWR indicated this was possible but that there was some risk to schedules and costs if the excavation differed significantly from the extrapolation. The owner and engineer indicated they would review this item.

Update Comments: The owner is proceeding to obtain additional subsurface information in the left portion of the dam and will provide this information as it is developed. The drilling is scheduled for April 27 and 28, 1995.

2. A site geology map is not presented; additionally, the geologic formations present at the site are not correlated with the boring log information, the profile of the dam, or with respect to the intended depth of excavation for the dam foundation to adequately support the dam and the concrete spillway.

The engineer indicated the geology consists of older cemented alluvium and recent loose alluvium and that they did not believe the geology was essential to determining the depth of excavation. Discussion indicated the engineering intent is to remove all of the recent alluvium and any loose areas in the older alluvium to support the dam on dense and very

dense materials. The engineer will review data and develop an acceptance criteria (such as ??% Maximum Density). ADWR indicated this should also be considered in the context of the geology, since it would be inappropriate to found the dam on dense recent alluvium which may be underlain by additional loose and/or permeable materials. ADWR indicated that some additional discussion about acceptable foundation criteria was appropriate in the design report. Additionally, ADWR indicated that, although a site geology map may not be essential, the geologic interpretation of the subsurface information should be shown on the boring logs and the subsurface profile of the dam in the construction drawings.

Update Comments: ADWR review of the boring log blow count data indicates that both abutments have dense to very dense materials at a depth on the order of 25 feet. The lack of geologic information on the logs hinders estimating the depth to the older alluvium and thus, it is not known whether the lower density materials occur in the upper or lower alluvium. Based on the excavation criteria provided by the engineer, these materials would have to be removed. The profile on the Plans (Sheet 5), however, does not indicate this extent of excavation; what criteria was used during the design for estimating the depth of excavation in the abutments and what criteria will be used in the field during construction? These same questions apply to the depth of excavation projected for the entire dam foot-print. Additionally, the subsurface information and estimated excavation depth must be updated to reflect the results of the additional drilling which will be performed in the area of the left abutment.

3. ADWR requested the return of the previously reviewed and annotated copy of the hydrology report to facilitate our review of the Application.

This report was provided to ADWR by the owner during the meeting.

Update Comments: The hydrologic analysis, using the watershed parameters adopted by FCDMC for Casandro Wash and adjustments for PMF-1/2 PMF conditions, produced acceptable values for the 1/2 PMF Spillway Design Flood discharge and runoff volume.

4. The outlet analyses data needs clarification and the outlet and spillway stage/discharge relationships should be input separately to HEC-1.

ADWR agreed to clarify this comment and provide details to the engineer.

Update Comments: ADWR met with the engineer on April 7, 1995, and provided specific examples of inconsistencies in the design report with respect to the outlet works and requested clarification in the final design report. One additional example which was not specifically discussed on April 7th is that the Final Design Report indicates that HEC-1 was used to calculate the rating curve for the outlet (orifice coefficient = 0.6, inlet elevation = 2135) inferring the use of an "SL" card in the HEC-1 data set. However, the HEC-1 data set provided to ADWR did not include an "SL" card; instead a combination rating curve for the outlet and the spillway was provided using "SQ" and "SE" cards.

- 1) *The general format of the Technical Memorandum could be improved by clearly identifying each of the appendices (JEF calculations sheets, FHWA analysis results, HEC-1 input and output files, etc...). Eliminate extraneous or unnecessary information (an unrelated map for a different study area immediately precedes the Casandro Wash Inundation Map; some of the printouts near the end of the Technical Memorandum are unreadable due to font sizing; etc...).*
- 2) *The Location Map and Inundation Limits Map should be relocated to pages 4 & 5 of the technical memorandum.*
- 3) *The Inundation Limits Map should contain the following information:*
 - a) *Identification of Casandro Wash Dam.*
 - b) *Location and identification of US 60 and ATSF railroad grades.*
 - c) *Location and identification of reaches 1 to 4. Information associated with these cross sections should include the arrival time of the flood wave, the arrival time of the flood wave peak, and the maximum estimated water surface and flow depth.*
 - d) *State which plan the inundation map corresponds to (plan 1, 2, 3 or 4).*
- 4) *An assumption is made that the breach occurs when ponding in the reservoir reaches the spillway crest. Is this the most conservative assumption? Suggest performing one additional HEC-1 trial assuming failure occurs when water is flowing over the emergency spillway and the reservoir has reached the maximum estimated storage capacity (203 acre feet @ elevation 2160.15). Assume the same breach characteristics used for Plan 1.*
- 5) *In Table 1, the "Avg. change in WSEL" is confusing and inaccurate (compare w/ JEF notes between pages 9 & 10). Recommend eliminating this information or providing further clarification.*
- 6) *The following changes to the input file are recommended:*
 - a) *Line 4: Change 10 to 3 (print input data, intermediate & master summaries).*
 - b) *Lines 59, 70, 73, 76, 81, 87, 89, 91, 95, 101, 103, 105, 109, 115, 117, 119, 123, 129, 131 & 133: Add "2" to column 2 of these lines (plot the computed hydrographs).*
 - c) *Include a hard copy of the output file in the Technical Memorandum and provide the input file to ADWR on a 3.5" diskette.*

Update Comments: We understand that the Department of Emergency Management is presently preparing the EAP and may complete this by the third week in May. We also understand that the engineer is proceeding to address these comments on the EAP and that they will be finalized shortly and forwarded to ADWR for review.

7. *An instrumentation and monitoring plan is required with the Application.*

The engineer indicated that they have shown the recommended locations for settlement monitoring pins on the construction drawings and that no internal instrumentation is

believed required for the dam. ADWR indicated that the required initial baseline monitoring and operations monitoring need to be delineated for the dam. The owner indicated that it may be appropriate to do a separate document for O&M to provide to operations personnel. ADWR indicated the document should include provisions for general dam safety monitoring, specific monitoring and data reporting for the spillway each time it overflows; we request that the monitoring of the spillway slab include hammer sounding of the concrete areas to investigate for the presence of any foundation support problems. ADWR noted that the County typically provides an annual report on their dams and ADWR is requesting this for this new dam.

8. Additional detail is required in each section of the QA/QC portions of the Special Provisions delineating the types of tests and the number of tests to adequately monitor the acceptability of the various products being constructed at the dam.

* *The engineer indicated that the contractor will not be doing any testing and thus, the testing has not been included in the Special Provisions. ADWR indicated that the types and number of tests for QA/QC must be delineated in one of the project documents so that it is understood what is required prior to ADWR approval of the application.*

The owner indicated that perhaps a separate QA/AC Plan would be appropriate for the project.

The engineer indicated that MAG Specifications applied in general and that the Special Provisions were prepared where required for specific aspects relating to dam construction.

The owner indicated that they would do construction management and would hire a testing firm to do required testing. Additionally, the engineer would provide inspection services for specialized areas such as the foundation excavation and Quality Assurance on the overall construction of the dam to comply with the intent of the design.

* *ADWR indicated they preferred to have these aspects of the QA/QC delineated in a project documents. Additionally, the Engineer of Record must submit the As-Built Drawings and include testing and other aspects of the construction in a Construction Report at the end of construction.*

Update Comments: The QA/QC requirements are discussed in the detailed review comments on the Special Provisions included with this review letter. The QA/QC requirements may be included in the Special Provisions or in a separate Project documents.

9. A current project schedule is requested which delineates an estimated ADWR review period for the Application continuing through May 31, 1995. This time duration does not include an estimate of the time required for the engineer to revise submittals based upon ADWR comments. The schedule should include your best estimate of the engineer's response time as well as other tasks to be completed by the owner and the engineer prior to initiating construction.

The owner indicated they would prepare a schedule. They indicated they would not likely issue a Request For Bids until ADWR had approved the application.

Update Comments: A schedule was provided to ADWR by FCDMC on April 12, 1995.

10. Additional Misc. Items

a. ADWR is concerned about maintaining the integrity of a spillway constructed over a dam embankment and will require that the design of the spillway specifically provide backup measures to minimize the potential for loss of support due to piping of underlying materials through joints or cracks in the concrete.

The engineer indicated they believe they have designed for this appropriately and requested ADWR to evaluate the present design. They also indicated that the spillway is not expected to operate except for isolated short durations and that the design economics do not allow for significant additional costs. Additionally, the spillway can be monitored after each overflow and repaired if any problems develop.

Update Comments: Review of the drawings and the specifications indicates that the present design appears acceptable providing the structures perform as anticipated. The Zone 2 filter/drain material and subdrain pipe systems appear to be located appropriately to minimize the potential for build-up of excess head below the downstream structures and to minimize the potential for piping and undermining of these structures. The safety of the design is, however, dependent upon 1. the rate of drainage from below the structures and 2. the filtering capability of the Zone 2 material with respect to the Zone 1 material and also at any cracks which may occur in the slabs or at structure joints. Thus, the material must operate as a filter and drain as well as match a maximum acceptable width of crack in the concrete structures. The criteria for the filter/drain is discussed in the detailed comments for the Special Provisions provided with this review letter. Additionally, the maximum acceptable crack width for the concrete structures should be designated by the engineer and maintenance established to repair all cracks which exceed the allowable width. Additional comments on the drain systems are provided with the detailed comments for the Plans and the Final Design Report included with this review letter.

b. ADWR will require that all alluvial soils, and any other soils which could experience settlement, be excavated from the foot-print of the dam and from any adjacent zone(s) where settlement would adversely affect the integrity of the dam or the concrete spillway.

The owner and engineer agreed that it is the intent of the design to remove all recent alluvial soils and loose older alluvial soils from the dam foundation.

Update Comments: ADWR review of the Final Design Report indicates the discussion is clear on this point. However, ADWR believes that it may be difficult in some areas to delineate between these two materials and that development of a specific relative density criteria will assist in the determination of an acceptable foundation level for

the dam. Additionally, ADWR believes that a criteria should be developed for the definition and removal of clean granular deposits which may occur in the older alluvium. Specific comments have been provided with our detailed comments on the Special Provisions included with this review letter.

- c. A current copy of MAG Specifications is requested to be submitted with the Application since these specifications are included as part of the construction requirements.

The owner indicated that a copy would be provided.

Update Comments: A copy of the MAG Specifications (1992 with 1993 revisions) was delivered to ADWR on April 19, 1995.

- d. Provide a discussion regarding the interpretation and use in the dam design of the field permeability test data included in Appendix C, Vol. 1, Geotechnical Report.

The engineer indicated the permeability tests were all performed in the older cemented alluvial materials and that the data was incorporated in the seepage analysis for the dam.

Update Comments: During the review of the documents, we were not able to locate a discussion regarding the type of materials tested or the use of the permeabilities estimated from the data for each of the field tests. Provide clarifying discussion.

- e. Final sets of documents are required for ADWR approval of the application.

ADWR indicated that a minimum of three sets of drawings were required for final approval and that one set was for ADWR records, one for the owner's records and one for ADWR field monitoring. The set for ADWR field monitoring could be a half-size set. It was agreed that initial sets of documents for the dam should be stamped Preliminary Not for Construction to avoid confusion with the set which is Approved for Construction by ADWR.

- f. What is the orientation and construction being used for the sewer pipe realignment?

The engineer indicated the sewer pipe is located in the foundation materials below the dam foot-print and that the pipe is encased in slurry concrete to 6" above the pipe and that common backfill would be placed above this level to the base of the dam foundation. The owner indicated they were planning on using concrete slurry for the full trench depth. ADWR agreed with this revision to obtain integral contact between the slurry back fill and the natural side-ditch materials.

11. Spillway Analysis Discussions.

The engineer indicated that they believed they had appropriately calculated the reservoir level using the USBR, USCOE, and Chow references and that use of HEC-2 was not

appropriate since, among other things, this still required the input of coefficients for contraction which is the present area of disagreement. The engineer requested consideration of the use of a third party expert to review the analyses and to make a final determination. ADWR indicated they would consider this approach.

Update Comments: ADWR has discussed the spillway design for ogee spillways with personnel at the US Bureau of Reclamation and the US Corps of Engineers. Based upon these discussions, it appears that the engineer is applying the coefficient of discharge for the ogee section, in conjunction with entrance and channel head losses, to determine the reservoir level in an accepted manner. Although, we believe some aspects of the analysis remain unresolved, the order of magnitude of the difference in the calculated reservoir level is relatively small and the freeboard of 3 feet included in the design is anticipated to be acceptable to prevent any over-topping of the dam during the occurrence of the 0.5 Probable Maximum Flood used as the Spillway Design Flood.

REVIEW COMMENTS ON THE SPECIAL PROVISIONS

The following comments and indicated modifications to the Special Provisions are believed warranted to enhance the overall construction and safety of the proposed dam. Wording, where we have provided it, is not a specific requirement; the wording is provided to indicate the intent of the modification required by ADWR for consideration and appropriate revision by the design engineer to meet the design requirements for performance and dam safety. We have also provided some editorial comments on various items observed during our review of the text and have included these for your consideration. Incorporate any additional revisions required to the Special Provisions as a result of ADWR review comments on other project documents.

Subsection 201.5 - Payment for Clearing and Grubbing

ADWR **SP 2, Title:** Other "Payment" subsections do not include the section title; check other subsections for consistency. *ADWR*

ADWR **SP 2, Paragraph 1:** It is not clear that the bold "ITEM 201 ..." is the bid item; we suggest adding the word "BID" to the front of all bid items listed in the Payment subsections.

Subsection 204.3 - Dam Foundation Excavation

ADWR **SP 4, Paragraph 1:** The text indicates the Engineer will determine acceptable foundation; add some additional clarification by revising the text as follows "The intent is to excavate to a dense, firm foundation over the full foot-print of the dam through full removal of the recent alluvial stream channel deposits and any loose or otherwise unacceptable older alluvial deposits. The exact depths will be field-determined ...".

Include a specific criteria such as relative compaction to classify acceptable dam foundation

material to assist identification of these materials once the older alluvial materials are exposed in the excavation.

Zones of clean sand or gravel (material with less than 5% by weight passing the No. 200 sieve) exposed in the foundation excavation should be removed as it is expected the material permeability will exceed $1 \times 10E-3$ cm/sec.

ADD

SP 5, Paragraph 1: At the end of the paragraph add the following sentence: "The dam foundation must be also be inspected and approved by a representative of the Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit, prior to proceeding with the work described in Subsection 204.6".

Subsection 204.6 - Foundation Preparation

DOO

SP 5, Paragraph 1: In the first sentence, after "...fills" add: "to the satisfaction of the Engineer and the representative of the Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit,"

DOO

SP 5, Paragraph 1: The requirement for compaction to 95% relative density should include the applicable ASTM standard (presumably ASTM D698).

Will Delete



SP 5, Paragraph 2: The last two sentences refer to foundation excavation and should be deleted. We prefer to see all of the foundation excavation completed prior to beginning fill placement and believe that this may be easily accomplished at the site.

A Quality Assurance requirement should be added to the specifications and referenced here (see General comments).

Subsection 210.1 - Local Borrow

ADDED

SP 7, Paragraph 4: Include a statement at the end of the paragraph that "The materials to be used as fill will be excavated from local borrow by routing equipment or other means, as approved by the Engineer, to meet the material requirements in Section 211 - Fill Construction."

SECTION 211 - FILL CONSTRUCTION

Subsection 211.1 - Description

DOO

SP 9, Paragraph 6: Modify the Zone 1 material "... with at least 3 percent by weight passing No. 200 sieve." to "5 percent..." as we anticipate that a material with less than 5 percent of the No. 200 sieve will have a permeability greater than $1 \times 10E-3$ cm/sec.

OK

SP 9, Paragraph 7: Confirm that the Zone 2 material complies with the technical requirements for filter and drain material issued by the Natural Resource Conservation

DOO

Service (NRCS, previously SCS) using Part 633, National Engineering Handbook, Chapter 26, Gradation Design of Sand and Gravel Filters and provide ADWR a copy of the calculations. Also confirm that the Zone 2 material is correctly matched to the slot size of the slotted drain pipe in all instances; provide this information with the calculations. Based on the provided drain capacity calculations, we believe every effort should be made to provide a filter/drain material having a minimum permeability of 1 ft/min. Providing the presently specified Zone 2 material complies with the NRCS criteria, we believe Sieve Size "No. 50" should be modified to "No. 30" and add "Sieve Size No. 200 with 0 Percent Passing by Weight" as we believe the finer end of the specified filter/drain should be modified to obtain a minimum permeability of 1 ft/min. *

SP 10, Paragraph 1: Modify the Zone 2 Uniformity Coefficient to comply with the NRCS criteria, if required, and add any required additional criteria. N.F.

Subsection 211.2 - Placing

SP 10, Paragraph 2: The text indicates the excess embankment for the detention basin fills does not have to be removed; it would seem they should be removed to provide the volume of detention indicated on the Area/Volume curves for the basin.

SP 10, Paragraph 4: Due to the critical nature and relatively thin width of 4 feet for the embankment chimney drain, add to the end of the second sentence "...forms, or placement methods required, except that the Zone 2 material will be placed in the embankment chimney drain using bins, boxes or forms to maintain the minimum width required of 4 feet and to minimize contamination of the Zone 2 material with other materials. Zone 2 materials in the chimney drain will be maintained a minimum of 3 inches above the adjacent Zone 1 material prior to compaction. The contractor shall pull-up or remove placement bins, boxes, or forms prior to compacting the next lift of Zone 2 materials in the chimney drain.". Also revise sentence three from "... specified width ... or minus 6 inches from ..." to "...minus 0 inches ... on the plans." and add a new sentence four "During construction the location of the centerline of the chimney drain shall be established and maintained by the contractor for location and drain width reference." ?

Additional considerations for the Zone 2 material should be added to the specifications, including a. avoiding segregation and contamination when material is moved from stock piles, b. avoiding contamination with other materials at all locations, c. protection of materials in-place, and d. special consideration where traffic is required to cross the chimney drain or other Zone 2 materials.

Subsection 211.3 - Compacting

SP 12, Paragraph 3: A static roller weight of at least 8,000 pounds is required for compaction of Zone 2 material. Is a roller of this size compatible with the narrow width of the chimney drain or should some other requirement be incorporated as required for the chimney drain? *

SP 14, Paragraph 1, Compaction of Zone 1: The relative compaction requirement is in *

accordance with ASTM D698. The definition of Zone 1 fill material (Subsection 211.1, page SP 9) allows material to be used that could be too coarse grained to use ASTM D698 (30% or more retained on the 3/4-inch sieve) as a guideline for compaction control. If these coarse-grained materials are used, what is the alternative compaction control to ASTM D698? 7 *

SP 14, Paragraph 2, Compaction of Zone 1: The last sentence indicates that the average of the most recent five compaction tests in the same area be at least 98%. Clarify what is meant by the "same area".

SP 14, Last Paragraph: Foundation stabilization rock is specified; where is this material used in the construction and what is its purpose? *is this meant*

Subsection 211.4 - Tests

SP 15, Paragraph 1: The text indicates the engineer will make independent test for acceptance of the completed portions of the work. ADWR prefers to have the types of tests and the minimum number of tests detailed in the project documents to avoid future misunderstandings; include a Quality Assurance requirement to the specifications and reference it here; see General Comments for the types and numbers of tests preferred. GA

SP 15, Samples: We recommend that several samples of the Zone 2 material should be obtained by the engineer from stockpiles during the processing and tested in the laboratory to confirm the Contractors testing as a QA function; testing should include gradation and laboratory permeability to confirm the material complies with the minimum design requirements prior to transport to the site. GA

SP 16, In-Place Density Tests: The nuclear gage tests for density and moisture must be confirmed periodically using sand cone and oven moisture content; delineate the frequency of test confirmation in the Quality Assurance section. We prefer that you delete "Alternative methods of density and moisture content determination may be used at the discretion of the Engineer", unless it is clarified that any alternatives must be approved by ADWR. Also specify the relative testing locations and minimum frequency for all materials in a Quality Assurance section which is to be used by the engineer; you may indicate that "additional testing locations and frequency shall be at the discretion of the Engineer". GA

Subsection 211.6 - Payment

SP 16, Title: Should the title be Measurement and Payment? Check other subsection titles for correctness.

SP 16, Paragraph 1: The text does not discuss measurement. Additionally, the text discusses payment for the earth dam embankment and does not discuss perimeter or detention basin fills. Both of these fills appear to be included in the bid ITEM 211-1-FILL CONSTRUCTION (ZONE 1 MATERIAL); revise as appropriate.

Subsection 220.4 - Plain Riprap

chrg

SP 16, Paragraph 1: In the first sentence, the first "with" should be "within".

SECTION 301 - SUBGRADE PREPARATION

Subsection 301.1 - Description

✓

SP 17, Paragraph 1: In the first paragraph, include a reference to Section 204 for dam foundation preparation; Section 211 does not appear to be applicable.

Subsection 301.2 - Preparation of Subgrade

*see
Revise
Somewhat*

SP 17, Paragraph 1: It seems that all references to subgrade preparation included in SECTION 204 such as Subsection 204.6 - Foundation Preparation should be moved to Subsection 301.2 to avoid confusion regarding what items are included as subgrade preparation; it appears that measurement and payment for all subgrade preparation is referred to in SECTION 301.

SECTION 350 - REMOVAL OF EXISTING IMPROVEMENTS

Subsection 350.2 - Construction Methods

Yes

SP 18, Paragraph 1: Reference concrete slurry to Subsection 615.9 - Backfilling. Clarify the intent and method of placing Zone 1 fill over the soft slurry backfill, as well as the intent and method of scarifying of the sides of the trench and the mixing with the backfill. Is this text in conflict with ADWR requirement that all trenches excavated in the dam foundation materials should be completely backfilled to the level of the dam foundation with concrete slurry?

will be all correct

Yes

SP 19, Paragraph 2: All existing sewer line should be removed from the dam foundation area and abandoned by backfilling the trench with slurry, if located within the dam foundation materials.

203

SECTION 405 - MONUMENTS

Subsection 405.1 - Description

Fix

SP 19, Paragraph 1: The text indicates the installation will be Type D; are "survey monuments" equivalent to "Settlement Monuments" required in the Plans, which are shown as Type A and Type B. Is the contractor required to set any Control Points delineated on Plan Sheet 3? Revise if required.

Subsection 405.5 - Payment

✓ SP 19, Paragraph 1: The text refers to bid ITEM 405 as relating to MAG 120-2, Type B; revise if required.

SECTION 505 - CONCRETE STRUCTURES

✓ This section should reference a Quality Assurance section for testing of concrete and related materials; see General Comments.

SECTION 515 - STEEL STRUCTURES

Subsections 515.1 and 515.2.1

✓ SP 29, Paragraphs 1 each Subsection: Reference is to "settlement markers" whereas Subsection 515.7 indicates bid ITEM 515 is for sedimentation markers; clarify the apparent conflict.

✓ Subsection 515.5 - Painting

✓ SP 29, Title: The dash is left out of the title; check all titles and format.

SECTION 601 - TRENCH EXCAVATION, BACKFILLING AND COMPACTION

* This section does not discuss the types of bedding or backfill to be used nor does it cross reference other sections. Is the intent to discuss each specific type of pipe, bedding type, and backfill type in separate sections of the Special Provisions? If so, cross check each section to confirm that this is done. *all comment*

Subsection 601.2.1 - General

And SP 30, Paragraph 2: Include a sentence that "The trench excavation in the dam foundation and in the dam embankment must be approved by a representative of Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit prior to placing the pipe and beginning any backfill."

Subsection 601.4.4 - Compaction Densities

* SP 30, Paragraph 1: Include a section in the specifications relating to Quality Assurance and include text which indicates "With regard to the application of the correction for oversize material, whichever method is used the uncorrected maximum density and material curve must be shown for each test." Reference the Quality Assurance section; See General Comments. *all*

The discussion of the correction for oversize material may not have been discussed in other subsections related to compaction densities. Cross check these sections and include where applicable.

SECTION 615 - SEWERLINE CONSTRUCTION

Subsection 615.9 - Backfilling

SP 31, Paragraph 1: In the first sentence, after ASTM C150 add "Type II or ASTM C595 Type 1P(MS)".

OK The encasement mix design does not conform to the recommended design in MAG 725.1, Table 725, which shows the recommended minimum requirement for encasement as Class C concrete. Class C has a minimum cement content of 420 lbs. per cu. yd. and a compressive strength of 2000 psi at 28 days. Modify the mix design to conform to MAG 725.1.

What additives, if any, should be added to the slurry mix to prevent segregation of sands in the slurry?

OK SP 31, Paragraph 2: Include text indicating "Trench located within the dam foundation or dam embankment must be approved by a representative of Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit prior to placing the pipe and beginning backfill."

OK The text does not indicate the limits of the pipe which must be backfilled with concrete slurry; should this be included or should a reference be made to the Construction Plans with regard to the limits for specific types of backfill?

OK SP 31, Paragraph 3: The requirement for backfilling over the concrete encasement should include a minimum waiting period of several days before backfilling is allowed. Also, where pipes are partially encased or have a shallow encasement cover, at least two feet of manually-compacted backfill should be placed over the concrete encasement before heavy compaction equipment is allowed to be used. Fill material that is to be manually compacted should be placed in loose lifts no more than six-to-eight inches thick. Provide specific criteria indicating when heavy compaction equipment and construction traffic is allowed for both the condition where the trench is fully backfilled with concrete slurry and where the concrete slurry is placed to a specified thickness above the pipe.

* SP 31, Paragraph 4: Granular bedding and Zone 1 material is discussed and thus Section 601 should be cross referenced under Subsection 615.1 - Description. Clarify what is actually required by the text in the second sentence which indicates "Particular attention must be given ... to ensure firm support is obtained ..." and how this will be measured in the field.

A section on Quality Assurance should be added to the specifications and referenced here for concrete slurry; see General Comments.

Subsection 615.13 - Measurement and Payment

* It appears the text should indicate the payment is "installed and backfilled complete". Check other Measurement and Payment subsections for similar gaps in text.

SECTION 618 - STORM DRAIN CONSTRUCTION**Subsection 618.1 - Description**

SP 32, Paragraph 1: Referring to construction of the 36-inch outlet pipe as storm drain construction seems confusing and makes it difficult to locate this part of work using the contents of the Special Provisions. 4-5

Subsection 618.2 - Materials

OK SP 33, Paragraph 1: It seems the concrete for thrust blocks should be completed in accordance with Section 505.

OK SP 33, Paragraphs 2 through 6: The information in these paragraphs includes discussion of construction approach, pipe joints, and backfilling; insert appropriate information in new subsections with the appropriate heading as provided in other sections.

OK SP 33, Paragraph 2: Insert after the last sentence the text "The completed trench must also be approved by a representative of Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit prior to placing the concrete thrust blocks, concrete blocks for pipe support, and pipe, as well as prior to beginning backfill."

OK SP 33, Paragraph 3: This paragraph on granular pipe bedding is not applicable if the pipe is being fully encased with concrete slurry. OK

OK SP 33, Paragraph 5: The concrete slurry is discussed for the pipe base and pipe zone whereas we understand FCDMC desires the full depth of trench to be backfilled with concrete slurry.

OK SP 33, Paragraph 6: Clarify the last sentence: "Take care to thoroughly mix the slurry into the walls of the trench and remove any voids."

Subsection 618.2.1 - Testing

OK SP 33, Title: The heading number conflicts with Subsection 618.2 - Materials and should be renumbered correctly.

Subsection 618.6 - Payment

SP 34, Paragraph 1: The text references the stilling basin drain pipe and list bid ITEM 618-2 - PVC DRAIN PIPE 98-INCH) which has a quantity of 365 feet. There is not clear

OK
reference to the construction of the 8-inch drain pipe in SECTION 618. Clarify the text as required for construction of the 8" drain. Additionally, check whether there is any confusion with the work included in bid ITEM 635-1 - DRAIN PIPE SYSTEMS (4-INCH) and bid ITEM 635-2 - DRAIN PIPE SYSTEMS (12-INCH) discussed in SECTION 635 - DRAIN PIPE AND GEONET; text on page SP 36, Subsection 635.1 - Description indicates "This section covers the work necessary for construction of the horizontal drains under the stilling basin and ... chimney drain, complete.". Unless there is a controlling reason, it would appear reasonable to include all drain pipe work in SECTION 635.

SECTION 625 - MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS

Subsection 625.3 - Construction Methods

SP 34, 35 and 36: Information in this subsection could be put into subsections such as backfill and joints, such as included for other sections.

SECTION 635 - DRAIN PIPE AND GEONET

SP 36, Title: The word "SECTION" is left out preceding "635".

Subsection 635.1 - Description

Refer to comments above for Subsection 618.6.

Subsection 635.3 - Drain Pipe

OK
SP 37, Paragraph 1: The text refers to "4- and 8-inch ... as required"; whereas Subsection 635.6 - Measurement and Payment refers to bid ITEM 635-2 - drain pipe system (12-inch). There is also possible confusion on Sheet 8 versus Sheets 5, 6, and 15 of the Plans related to 4-, 8- and 12-inch drain pipe materials.

Subsection 635.4 - Geonet

OK
SP 37, Paragraph 1: The first sentence appears to describe the geonet incorrectly.

Clarify the specific locations where geonet is called for on the Plans.

Subsection 635.5 - Installation

SP 37, Paragraph 1: Use of the term "slice" should be replaced with a clear statement of what is required as the product or some words to the effect that backfill shall be hand placed carefully against the pipe below the springline of the pipe to provide full support without the occurrence of voids or segregated materials.

SP 37, Paragraph 2: Modify the second sentence from "Flatten excavation slopes ... to

prevent disturbance of completed ... material." to "Flatten trench excavation slopes if necessary to maintain undisturbed Zone 1 material in the sides of the trench." Additionally, add text indicating "The completed trench must be approved by the Engineer and a representative of the Arizona Department of Water Resources, Dam Safety and Flood Engineering Unit prior to setting the pipe and placing the backfill."

Clarify where concrete encasement of the drain pipe is required and indicated on the Plans. If concrete slurry is required, reference SECTION 615.

SP 37, Paragraph 3: The text discusses compaction of "Zone 2 material as required for slotted pipe in the chimney drain."; does this refer to paragraph 1 or SECTION 211? If it is paragraph 1, perhaps inserting the words "as described above" will clarify the reference.

Subsection 725.2 - Portland Cement

SP 40, Paragraph 1: Delete "Type 1P or", and after "Type II", add "or ASTM C595 Type 1P(MS)".

A section on Quality Assurance testing should be added to this section to be performed by the Engineer during the work; see General Comments.

Subsection 732.2 - Nonshrink Grout

SP 43, Paragraph 1: A section on Quality Assurance testing should be added to this section to be performed by the Engineer during the work; see General Comments.

SECTION 796 - PLASTIC WATER STOP

Subsection 796.1 - General

SP 49, Paragraph 4: The text appears to refer to Subsection 788.2.5 - Manual Handwheel Operator and Stem and should be moved and/or possibly modified or deleted.

General Comments on the Special Provisions

- yes
- A. All pipes which penetrate the dam foundation or dam embankment and which are not fully encased in concrete slurry must comply with NRCS criteria for construction of downstream filter/drain sections around pipes which penetrate an earthen dam embankment. Identify all locations where this occurs on the Plans and provide supporting calculations for the downstream filter/drain section.
- yes
- B. A new section should be added to the specifications that details a testing program performed by the Engineer (Quality Assurance) for acceptance of the contractor's work.

The QA program should be specific and include the following:

1. Observation and documentation of the contractor's workmanship and quality control testing.
2. Review of contractor's quality control test results.
3. Independent testing of earthwork materials and workmanship.
4. Independent testing of concrete materials and workmanship.

C. The testing of earthwork materials and workmanship by the Engineer should include testing frequency and standards used. These tests include but are not necessarily limited to the following:

1. At least one ASTM D422 Particle Size Analysis test for each type of fill material used.
2. At least one ASTM D698 Moisture-Density Relationship test for each type of fill material used.
3. At least one ASTM D1556 or ASTM D2922 In-Place Density test, and one ASTM D3017 or ASTM D2216 In-Place Moisture test for each specified area (such as 5000 square feet) of the embankment foundation.
4. At least one ASTM D1556 or ASTM D2933 In-Place Density test, and one ASTM D3017 or ASTM D2216 In-Place Moisture test for every specified number of cubic yards (such as 500 cubic yards) of fill material placed. Trench backfill and backfill around structures should be tested more frequently.
5. If nuclear methods are used for in-place density tests, at least one ASTM D1556 In-Place Sand Cone test for every ten ASTM D2922 tests for correlation checks.
6. If nuclear methods are used for in-place moisture tests, at least one ASTM D2216 Laboratory Moisture Content test for every ten ASTM D3017 tests for correlation checks.
7. At least one ASTM D422 Particle Size Analysis test for every specified number of cubic yards (such as 100 cubic yards) of in-place Zone 2 material. Additionally, the minimum required permeability should be confirmed by laboratory testing of samples of in-place Zone 2 material for every specified number of cubic yards (such as 500 cubic yards).

D. The testing of concrete materials and workmanship by the Engineer should include testing frequency and standards used. These tests include but are not necessarily limited to the following:

1. Making and testing concrete test cylinders. Number and frequency of taking concrete cylinders should be specified. Testing should be in accordance with ASTM C39 at a testing facility chosen by the Engineer.
 2. Perform one slump test (ASTM C143) at specified frequency, such as every truckload of concrete.
 3. Perform one air content test (ASTM C231) at a specified frequency, such as every truckload of concrete.
 4. Making and testing of samples of concrete slurry and nonshrink grout.
- E. The results of the site and laboratory tests must be submitted along with copies of daily field reports summarizing the construction activities. The daily reports should specifically discuss completed work approved by the engineer, as well as actions taken to remediate work which initially did not meet minimum specifications. Construction field reports should be submitted daily or weekly, depending on the rate of progress. a7
- F. Whether the oversize material correction for compaction tests is made to the material maximum density or the test results, the uncorrected maximum density and material curve must be shown for each test and included in the field reports. a7
- G. All testing results are required as part of the Construction Report, which must be submitted after completion of construction. a7
- H. We suggest that monitoring of the sewer line be incorporated into the O & M plan during periods of flood water detention to detect leakage of reservoir flood water into the sewer line, if any seals are not water tight on the sewer or manholes located within the limits of the flood pool. Detent

REVIEW COMMENTS ON THE CONSTRUCTION DRAWINGS

Miscellaneous Comments:

1. Incorporate any additional revisions to the Plans where required as a result of ADWR comments on other project documents.
2. What is the engineer's intent to control upstream and downstream slope erosion on the dam embankment for the protection of the dam crest? Erosion is likely during retention periods as well as resulting from runoff of precipitation. The grading near the abutments should be sloped to avoid concentrated flow in the groin areas of the dam, both upstream and downstream; erosion protection should be provided if concentrated flow is anticipated. Erosion protection of the detention basin side slopes is also recommended where concentrated flows are likely to enter the detention basin from off-site areas.

Specific Drawing Comments:**1. Sheet 3:**

- OK a. The Station is shown for begin dam but one is not shown for end dam.

2. Sheet 4:

- OK a. The symbols for the Settlement Markers appear to be reversed for Type A and B.

3. Sheet 6:

- OK a. Note 4 should also refer to Section 204 of the Special Provisions for dam foundation preparation.
- OK b. The chimney drain pipe is shown as " 8"-Dia. " whereas it is shown on Sheet 8 as " 12"-Dia. "

3. Sheet 7:

- OK a. The 36-inch RCP should also be concrete encased downstream of the chimney drain as well as upstream of the chimney drain.
- OK b. Detail 11: This detail shows 6-inch minimum trench clearance on each side of the 36-inch RCP. This clearance provides inadequate working space for pipe placement and clean up in the trench before placing backfill. Clearance should be at least 12 inches on each side of the pipe. The USBR in "Design of Small Dams" recommends at least 18 inches of working space on each side of a pipe laid in a trench.

4. Sheet 8:

- OK a. In the Plan view, the chimney drain pipe and chimney drain outlet pipes are shown as 12-inch PVC. This conflicts with Sheets 5, 6 and 15 which show these pipes as 8-inch PVC.
- Disturb b. The six-ft. chain link fence across the upstream end of the spillway apron should be removed and the spillway fence extended down the upstream face of the dam in the manner of the spillway fence at Sunset Dam. This will place the top of the chain link fence below the elevation of the spillway apron and avoid the need of a break-away fence section across the spillway entrance.

5. Sheet 10:

- OK a. Detail 103: Indicate an animal guard over the outlet end of the 4" PVC subdrain pipe.

- of*
- b. Section FF: Geocomposite drain material is called for whereas the Special Provisions calls for Geonet.

6. Sheet 11:

- a. Potential differential settlement between the outlet pipe and the intake structure should be considered and details modified, if required.
- b. Review the details for location of concrete slurry backfill and add where appropriate.
- c. The flow at the inlet will be very turbulent when the slide gate is opened; review this condition and modify the entrance, if required. As opposed to the concrete transition shown in Section HH with the flat shelf on each side of the inlet structure, would it be beneficial to transition the concrete fill smoothly up to the top of the side wall of the inlet structure? Is this sufficient?

7. Sheet 12:

- a. Section JJ: The labels for sections KK and LL are reversed.
- b. Section JJ: Review the lateral extent of the Zone 2 material below the outlet discharge structure; it appears the Zone 2 material should end at the upstream end of the outlet discharge structure. Additionally, review the detail for the termination of the slurry concrete encasement of the 36" RCP outlet pipe; it appears that the pipe encasement should extend downstream to the outlet discharge structure
- c. Potential differential settlement between the outlet pipe and the outlet pipe structure should be considered and details modified, if required.

8. Sheet 13:

- end sump*
- a. Detail 107: The eight-inch drain pipe penetrates the stilling basin wall at an elevation which is above the invert elevation of the sump. Is this the designer's intent? What is the purpose of the sump?

9. Sheet 15:

- a. Section Q: Clarify the intended boundary for the inside limit line for the 12-in. (Typ) dimension.
- b. Section R: Clarify the intended boundary for the inside limit line for the 6-in. (Typ) dimension. The 6" clearance seems too small for access of compaction equipment.
- c. Detail 1: Cut a typical section for the perforated section of the chimney drain

pipe and trench and include it on this sheet.

- d. Detail 2: The chimney drain will not be free draining at this section; review the acceptability of reversing the dropped section of chimney drain to be located above the outlet pipe, or lowering the entire drain; other alternatives which allow full drainage of the pipe by gravity may also be acceptable.

10. Sheet 21:

- a. Detail 7: The concrete slurry encasement should extend to the base of the dam foundation; a minimum cover and curing time period criteria should be indicated before access is allowed for heavy compaction and construction equipment.
- b. Detail 8: The Plan indicates Detail 8 for trench backfill associated with the abandonment of the sewer only applies to the first 50 feet downstream from the capped section of sewer pipe. Detail 8 should apply for all sections of the abandoned sewer trench located in the foot-print of the dam.
- c. Sheet Title: Stilling Basin is misspelled.

REVIEW COMMENTS ON THE FINAL DESIGN REPORT

1. Incorporate any additional revisions to the Plans where required as a result of ADWR comments on other project documents. We have not reviewed the report for editorial comments or designated each specific section which will require revision to accommodate all review comments.
2. Executive Summary, Page ii, Paragraph 1: The text indicates the dam should be " ... founded on cemented or very dense sand." encountered below the recent alluvial deposits. Define foundation criteria as previously discussed.
3. Test Pits, Page 3-3, Paragraph 1: The text indicates that the test pits were 5' to 18' deep whereas the third paragraph indicates the maximum depth of the test pits was 20'.
4. Test Pits, Page 3-3, Paragraph 3: The text indicates that the depth to cemented layer varied up to 16' whereas the next sentence indicates that the cemented layer was not even encountered in some test pits which extended to 20'.
5. Infiltration Testing, Page 3-4 and 3-5: The text does not discuss the type(s) of materials represented by the testing or what permeability characteristics were assigned to the materials.
6. Dam Type, Page 3-6: Expand on the desirability of the chimney drain in the embankment. Is it required to control the phreatic surface below the spillway chute and/or is it required to control any potential piping of the embankment associated with embankment cracking?

7. Table 3-2, Page 3-7: The table does not contain all of the results of the laboratory tests performed for the project which are included in the Geotechnical Report, Volume 1. This is true for the same table included in the Geotechnical Report.
8. Dam Construction, Page 3-9: The discussion relates to the results of the slope stability calculations provided in the Geotechnical Report, Volume 2. Refer to comments provided in this review letter for the Geotechnical Report.
9. Dam and Spillway, Page 6-1, Third Bullet Item: Clarify the indicated 6-foot of over excavation for the foundation.
10. Appendix B, Landscaping: Seed mix for the dam embankment should not include any deep rooted species; the text does not specifically indicate this as a criteria; review the mix and revise if required.
11. Appendix C, Computations, Hydrology: Refer to INITIAL REVIEW COMMENTS, MEETINGS AND DISCUSSIONS, Item 3.
12. Appendix C, Computations, Spillway: Refer to INITIAL REVIEW COMMENTS, MEETINGS AND DISCUSSIONS, Items 4 and 11.
13. Appendix C, Computations, Structural Calculations:

a. Spillway Side Walls:

The calculations indicate 2 inches of cover against earth whereas ACI Code, Section 7.7.1 requires three inches of cover for "Concrete cast against and permanently exposed to earth ...". Our review indicates a larger area of reinforcing steel is required if the wall thickness is maintained and the three inches of cover is provided. Review all wall calculations and revise as required; provide a copy of the calculations.

It is not clear from the design computations on Page 1 and the corresponding wall Section DD on Plan Sheet 9 whether the slab and the side walls will built as a single structural unit. If there is a joint provided between the wall and the slab, we question including the weight of the concrete slab (wf) as one of the components of the resisting moment. Clarify and revise, if required.

The design assumes drained conditions and a subdrain system is included. Calculations were not provided for the drain outlet spacing, thickness of drain material, and capacity of system; provide a copy of the calculations.

Only two expansion joints are shown for the spillway; is this sufficient for the dimensions as designed? Review all structures for expansion joints and revise, if required.

b. Entrance Apron Side Walls:

The design assumes drained conditions; however, a subdrain system is not provided. We believe the walls will not drain at the same rate as the water level recedes in the spillway. Thus, we require a reasonable hydrostatic loading condition be used in the design of the walls.

c. Stilling Basin:

What is factor of safety against sliding during spillway operation with scour at downstream toe; provide calculations.

Computation for the design of the 13-foot-high side wall (Section EE, Plan Sheet 10) was not furnished; provide a copy of the calculations.

The design assumes drained conditions and a subdrain system is included. Calculations were not provided for the drain outlet spacing or thickness of drain material; provide a copy of the calculations.

The subdrain system is not free draining and results in several feet of uplift against the base of the stilling basin. We are concerned about plugging of the drain and recommend the drains be extended to a manhole structure to maintain gravity flow.

d. Geotechnical Data:

The text indicates an active pressure of 60 pcf per foot of depth whereas the value appears to be at-rest pressure.

The text indicates the soil unit weight is 115 pcf; we note this is a dry unit weight.

e. Miscellaneous:

Provide overburden loading and factor of safety calculations for the 8" diameter PVC pipe outlets from the chimney drain.

We are continuing our review of the structural calculations and will provide any additional comments as soon as possible.

REVIEW COMMENTS ON THE GEOTECHNICAL REPORT (VOLUME 1 AND 2)

1. Incorporate any additional revisions to the Report where required as a result of ADWR comments on other project documents. We have not reviewed the report for editorial comments or designated each specific section which will require revision to accomodate all review comments.

VOLUME 1:**1. Table 3-2:**

This table does not include all the testing results provided in this volume; revise as required.

The soil classifications do not appear to incorporate the information provided by the grain size tests; revise as required.

2. Test Pit Logs and Boring Logs:

The logs do not contain geological information regarding the contact between the upper and lower alluviums; add this information.

What method was used to obtain the elevation shown on the logs?

3. Triaxial Shear Testing Results:

The Mohr Failure Envelope for the CU-PP triaxial test on a soil sample from TP-15, B1 does not include the effective stress envelope; provide both the total stress and effective stress envelopes based upon using the ratio of Sigma 1 to Sigma 3 to determine the maximum strength for each confining pressure. Use this ratio for the UU triaxial tests as well.

VOLUME 2:**1. Seismicity:**

Our review indicates the value of 0.1 g selected for a local peak design acceleration is acceptable.

2. Slope Stability Analysis:

Provide additional discussion regarding each case analyzed and the selection of the strength parameters used. In particular, review the strengths used for the seismic and rapid drawdown cases. It appears the effective stress strength of 40 degrees was used in each analysis whereas Earth Dams and Reservoirs, Technical Release No. 60, USDA, SCS (Revised Oct. 1985) indicates limiting strengths should be used.

The selection of strength did not appear to consider the CU-PP or UU triaxial test results; review the data and provide justification or revise as required.

3. Seepage Analysis and Chimney Drain Gradation:

Refer to comments on the seepage analysis and filter/drain design criteria provided in this review letter for the Special Provisions.

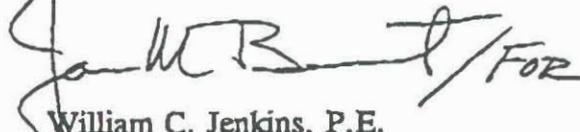
4. Embankment Settlement:

✓_{0.412} The analysis uses elastic theory; does it consider data reported for dam embankments which may suggest somewhat larger settlement may result? Review and comment. The text recommends an overbuild of 6 inches; this does not appear to have been incorporated in the final design Plans; review and comment.

We are completing our review comments on the Geotechnical Report (Vol. 1 And 2) and will forward any additional comments as soon as possible.

We look forward to receiving your revised documents and will complete our review and comments on the final documents as soon as possible after we receive them. Mr. Jon Benoist of the Safety of Dams and Flood Engineering Section has primary responsibility for review of your project. You may contact him at (602) 417-2400(ex 7191) if you have any questions.

Sincerely,



William C. Jenkins, P.E.

Chief

Dam Safety & Flood Engineering Unit

cc: Mr. Steve Walker, CH2M HILL

ARIZONA DEPARTMENT OF WATER RESOURCES

Dam Safety and Flood Mitigation Section

500 North 3rd Street, Phoenix, Arizona 85004

Telephone (602) 417-2445

Fax (602) 417-2401

May 2, 1995



PIFE SYMINGTON
Governor

RITA P. PEARSON
Director

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Attention: Mr. Michael Lopez
Project Coordinator

Subject: Casandro Wash Dam (07.65) *90% Design Review*
Application Review Comments

Dear Mr. Lopez:

The review comments provided in this letter are follow up to the comments provided in the ADWR letter dated April 27, 1995. This completes our review comments on the project documents that we have received to date. These comments should be taken in the same context as those of April 27.

REVIEW COMMENTS ON THE SPECIAL PROVISIONS

Subsection 640.6 - Sediment Control

SP 40, Paragraph 1: Identify where Division 1, GENERAL REQUIREMENTS is included in the Project Documents.-

REVIEW COMMENTS ON THE CONSTRUCTION DRAWINGS

Specific Drawing Comments:

1. Sheet 13:

- a. Section 110: Revise the top rebar overlap detail to match the lower rebar detail.

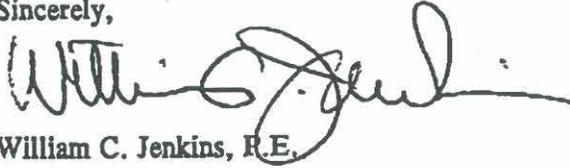
REVIEW COMMENTS ON THE FINAL DESIGN REPORT

1. Hydraulic Structures Design

- a. Detention Basin Outlet, Page 2-11: The capacity of the 2' x 2' gated outlet is not discussed with regard to dimensions or capacity. This information should be included in the report and appropriate discharge guidelines included for operations.

We look forward to receiving your revised documents and will complete our review and comments on these final documents as soon as possible after we receive them. Mr. Jon Benoist of the Safety of Dams and Flood Engineering Unit has primary responsibility for review of your project. You may contact him at (602) 417-2400(ex 7191), if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "William C. Jenkins". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

William C. Jenkins, R.E.
Chief
Dam Safety & Flood Engineering Unit

cc: Mr. Steve Walker, CH2M HILL

ARIZONA DEPARTMENT OF WATER RESOURCES

Dam Safety and Flood Mitigation Section

500 North 3rd Street, Phoenix, Arizona 85004

Telephone (602) 417-2445

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May 16, 1995

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Attention: Mr. Michael Lopez
Project Coordinator

Subject: Casandro Wash Dam (07.65)
Application Review Comments

Dear Mr. Lopez:

The review comments provided in this letter are follow up to the comments provided in the ADWR letters dated April 27 and May 2, 1995. Although we believed our review of the project documents that we have received to date was completed with our letter of May 2, revisiting the documents has prompted the additional comments included in this letter. These comments should be taken in the same context as those of April 27 and May 2, 1995.

REVIEW COMMENTS ON THE SPECIAL PROVISIONS

SECTION 505 - CONCRETE STRUCTURES

Subsection 505.6 - Placing Concrete

Paragraph 4 (SP 25): The next to the last sentence indicates "provide intermediate construction joints at maximum spacing of 40 feet." Provide information supporting distances greater than about 30 feet.

SECTION 601 - TRENCH EXCAVATION, BACKFILLING AND COMPACTION

Subsection 601.2.1 - General

Paragraph 1 (SP 30): Modify the last sentence to indicate "... with bedding of the type specified; slurry backfill will be used to correct overexcavation where slurry backfill is specified."

Paragraph 2 (SP 30): Modify the first sentence to indicate "For all pipe crossings within the dam foot-print, ..."

SECTION 615 - SEWERLINE CONSTRUCTION

Subsection 615.1 - Description

Paragraph 1 (SP 30): Reference the "12-inch diameter" of the DIP.

DAVE ALLAN — RECEIVED —

MAY 19 1995

CH2M HILL PHOENIX



PIFE SYMINGTON
Governor

RITA P. PEARSON
Director

SECTION 618 - STORM DRAIN CONSTRUCTION

Subsection 618.2 - Materials

Paragraph 1 (SP 32): The first sentence indicates the "Reinforced concrete pipe shall be in accordance with Section 735.". Referring to Section 735 indicates that this RCP pipe appears to be typically used for non-pressurized flow conditions. Confirm that this type of pipe is appropriate as the principal spillway outlet conduit at Casandro Wash Dam: that the pipe and gaskets will function adequately when pressure tested and that adverse pressures will not result in the outlet during operation, including when the 2' x 2' gate is fully open. Also confirm that maximum cover limits for the class of pipe are not exceeded.

Subsection 618.3 - Construction Methods

Move this subsection to follow Subsection 618.2.1 - Testing.

Paragraph 3 (SP 33): Delete this paragraph since granular pipe bedding will not be used for construction of the 36-inch RCP specified for the principal spillway outlet; all material placed in the clean trench will be slurry backfill.

Paragraph 4 (SP 33): Specify that interior joints "greater than 3/8-inch" are to be sealed and filled after water testing.

Subsection 618.2.1 - Testing

Paragraph 1 & 2 (SP 33) and Paragraph 4 (SP 34): These paragraphs may be more appropriate in SECTION 735 - REINFORCED CONCRETE PIPE.

SECTION 735 - REINFORCED CONCRETE PIPE

Should the diameter of the pipe be referenced in this section?

Subsection 735.4 - Materials

Paragraph 1 (SP 44): ASTM C76 references several classes of pipe with a different Wall B design and D-Load for each class of pipe. The D-Load is not included in the Special Provisions. The Final Design Report, Page 6-6, indicates a D-Load of 18,000 lbs/foot which does not appear to correspond to any pipe class shown in ASTM C76; is the intent to require a special design? Clarify and insert the required D-Load into the Special Provisions. Also clarify the D-Load to be used in the design in relationship to anticipated loading conditions, including cover and/or traffic.

FLY ASH (SP 45): This heading is the only heading in this subsection except for "Concrete Pipe Joints" (SP 46); each heading is constructed differently and disrupts the organization of the subsection.

Concrete Pipe Joints (SP 46): This paragraph indicates "Free movement of water through the pipe joint or pipe wall will be grounds for rejection of the pipe." Specify what is considered to be "free movement"; also clarify testing to be completed at the point of manufacture and in the field. Field testing should be described in Subsection 618.2.1 - Testing.

SECTION 740 - DUCTILE IRON PIPE

Should the 12-inch diameter of the pipe be referenced in this section?

Subsection 740.2 - Materials

The Final Design Report indicates that DIP is typically used by many MAG communities for sanitary sewer pipe. Accepting this statement, we were not able to find a MAG specification for this type of pipe in use as a sanitary sewer pipe; clarify. Additionally, we need a copy of applicable ANSI and AWWA specifications quoted in the Special Provisions.

Paragraph 3 (SP 46): The second sentence indicates a "Thickness Class 50 shall be used.", where as Page 6-5 of the Final Design Report indicates a "Class 51"; clarify. Also confirm that the pipe complies with the D-Load of 18,000 lbs/foot, indicated on page 6-5 of the Final Design Report; clarify the D-Load to be used in design of the pipe in relationship to anticipated loading conditions, including cover and/or traffic.

REVIEW COMMENTS ON THE CONSTRUCTION DRAWINGS

1. Sheets 5, 6 and 15:

- a. The following comments are made with regard to the 8" diameter internal drain laterals and outlets for the Chimney Drain:
 - i. A plan view of the internal drain is not provided; we recognize this may not be essential for intent of construction but it is preferred by ADWR to avoid misunderstandings during construction; an as-built plan of the drain will be required upon completion of construction.
 - ii. The internal drain does not include provisions for clean-out access in the event the laterals or the outlets collapse or become plugged.
 - iii. The internal drain is located at the elevation of the existing grade and exits into the spillway chute several feet above the bottom of the stilling basin; clarify design intent.
 - iv. The internal drain pipe is specified to be PVC. Provide information supporting the long term use of this type of pipe in a dam embankment; we are concerned that since the pipe is located deep inside the dam, it would be very difficult and costly to replace if it were to become plugged or lose strength with time and collapse. Other materials such as HDPE or AC pipes may be more easily justified for long term use in the dam. We note that MAG Specification 605, Subdrainage does not include plastic pipe.
 - v. We note that MAG Specification 605, Subdrainage includes a performance test. The Special Provisions should include reasonable specifications for cleaning and testing of the internal drain system prior to backfilling of the pipe.
 - vi. The internal drain outlet section of solid pipe is separated from the perforated laterals by a four-foot section of concrete slurry acting as a plug in the trench (Sheet

15, Detail 1). The plug forces the seepage from the chimney drain into the solid outlet pipes and prevents drainage along the side of the drain outlet pipe. This layout prevents drainage of the chimney drain in the event the outlet pipe fails.

- vii. Clarify the design intent and assess the safety of the dam if the internal drain were to fail: what is the factor of safety for stability if a full phreatic surface were to become established in the downstream embankment. Review the drawings for the internal drain constructed for the Sunset FRS and evaluate whether deletion of the concrete plug along with an increase in the cross section of the filter/drain material adjacent to the outlet pipe provides additional warranted benefit and confidence in the long term performance of the internal drain.

2. Sheet 10:

- a. Stilling Basin Section FF: Based on Wall Section EE, the rebar in the bottom slab of the stilling basin is #8@6" top and bottom; confirm that this is the design and clarify on the drawing if required. The rebar is not specifically shown for the slab in the downstream ramp of the stilling basin; clarify on the drawing. Additionally, review the drawings for the steel layout in the Sunset FRS stilling basin and evaluate whether the large amount of steel placed in the top of the basin slab is warranted for Casandro Wash Dam.

We look forward to receiving your revised documents and will complete our review and comments on these final documents as soon as possible after we receive them. Mr. Jon Benoist of the Safety of Dams and Flood Engineering Unit has primary responsibility for review of your project. You may contact him at (602) 417-2400(ex 7191), if you have any questions.

Sincerely,



William C. Jenkins, P.E.

Chief

Dam Safety & Flood Engineering Unit

cc: Mr. Steve Walker, CH2M HILL