DESIGN ISSUES
&
ALTERNATIVES ANALYSIS REPORT

GOLDEN EAGLE PARK DAM
MODIFICATION PRE-DESIGN

CONTRACT NO. FCD 97-44

FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TOWN OF FOUNTAIN HILLS
FOUNTAIN HILLS UNIFIED SCHOOL DISTRICT
AND
ARIZONA DEPARTMENT OF WATER RESOURCES

REVISED: AUGUST 1999

Stantec

Stantec Consulting Inc.

Project No. 28900095

Flood Control District of Maricopa County (FCDMC)

Golden Eagle Park Dam Modification, Pre-Design

Contract FCD 97-44

Project Meeting No. 5

9:00 am, 11 May 1999
at Town Hall, Fountain Hills

Agenda

1. Comments/approval of minutes for Meeting No. 4
2. Review Action Items (see Meeting Minutes, Item #18)
3. Public Meeting No. 1
4. Ashbrook Wash floodplain impacts due to alternatives, etc.
5. Breakout potential near church lot on north terrace
6. Dam crest profile comparison
7. AEE response to ADWR comments
8. Mark-up of as-built drawings
9. Structural analysis of existing principal spillway.
10. Presentation of Alternatives Analysis
11. Selection of recommended alternative
12. Site visit #2 to continue discussion of recommended alternative
13. Next Meeting (week of 1 June)

6. Regarding Alternatives A-1 and A-2, the discharges listed for the enlarged principal spillway are exactly the same as the discharges for the original principal spillway with the only difference being the discharges from the enlarged spillway occur at lower elevations. Please verify the discharges for the enlarged spillway.

7. Regarding Alternatives C and D, please correct the discharges for the existing spillway rating curve. The discharges vary between the discharges given for Alternative B's existing spillway rating curve. Please verify which one is correct. This change is not critical to the final result but for consistency.

    - Alt C and D show 59 cfs while Alt B shows 57 cfs
    - Alt C and D show 137 cfs while Alt B shows 139 cfs

Plates

1. On Plate 5, please add the cutoff wall elevation. It was left off this plate.

2. On Plate 8, please add the floodwall elevation and correct the auxiliary box size. The plate lists its dimensions as 85' x 3' while the text and Table 2 list its dimension as 75' x 3'.

I have no more comments at this time.

Tom Renckly - FCDX

From: Warren Rosebraugh - FCDX
Sent: Monday, May 10, 1999 11:14 AM
To: Tom Renckly - FCDX
Cc: Michael Lopez - FCDX; Warren Rosebraugh - FCDX
Subject: GEPD Alternative Analysis report, dated 4/99

Tom,
Per our discussion, I have marked up several typos that can be covered in our meeting. The recommendation of Alternative E seems reasonable. The stilling basin shown in Section A should be designed with a notched end sill above grade to allow drainage and to minimize sediment build-up. A riprap apron below the basin may be desired to further reduce maintenance. The term "floodproofing", which is used several places in the report, implies a level of protection that is beyond the scope of this project. I suggest they substitute "flood protection features", or something similar. If a concrete spillway is used, a stain should be considered for aesthetic reasons, and a rough broomed finish to make it less attractive to skateboarders. If RCC is proposed for the spillway, then AGRA should be asked to comment on a material source.

Tom Renckly - FCDX

From: Bob Stevens - FCDX
Sent: Thursday, May 06, 1999 1:53 PM
To: Tom Renckly - FCDX
Cc: Bob Stevens - FCDX
Subject: Golden Eagle Park Dam

Tom, I am presenting comments which may raise a red flag to the ACOE in terms of permit processing.

Issues 1
Description of Alternatives

Avoidance and minimization of environmental impacts was not mentioned.
There was mention to impacts to park and to school but not to downstream vegetation below outlet and in reservoir (which may have already been impacted). Since during storm events the outlets receive discharge from waters of the US, the washes downstream of the outlets are waters of the US. The impacts may not be significant but it needs to be considered in the analysis. Other safety factors most likely will outweigh the environmental impacts, but we need to document it.

Additionally, any impact to the vegetation from construction in the wash will require mitigation. The new nationwide permits, which will replace the Nationwide 26 permit, will go into effect in September, 1999. The acreage limit of 3 acres for the nationwide permit may be changed to 2 acre. This may require processing of the permit for the GEP dam under an individual permit, thus allowing more public and resource agency comment.

Under Permits and Approvals
Estimates of individual acreage of impacted areas is not defined. The amount of dredge and fill material which will be generated within the reservoir as well as the wash below the outlet due to construction activities is not defined. I will need this for the application.

A table listing each alternative and the acreage of impact within the reservoir area and the outlet wash would probably suffice.

Stantec Consulting Inc.

Project No. 28900095

Flood Control District of Maricopa County (FCDMC)

Golden Eagle Park Dam Modification, Pre-Design

Contract FCD 97-44

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Warren Rosebraugh - FCDX

From: Warren Rosebraugh - FCDX
Sent: Monday, May 10, 1999 11:14 AM
To: Tom Renckly - FCDX
Cc: Michael Lopez - FCDX; Warren Rosebraugh - FCDX
Subject: GEPD Alternative Analysis report, dated 4/99

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Warren Rosebraugh - FCDX

From: Tom Renckly - FCDX
Sent: Thursday, April 22, 1999 4:55 PM
To: Bob Stevens - FCDX; Kathryn Gross- FCDX; Warren Rosebraugh - FCDX; Fred Fuller - FCDX
Cc: Tim Murphy - FCDX
Subject: Golden Eagle Park Dam Pre-design

All have been provided a copy of the Design Issues and Alternatives Analysis Report.
The preferred alternative will be selected at the next project meeting on May 11.
The Consultant will recommend Alternative E at the meeting.
Please send me any comments by May 7.

Thanks
Tom

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ARIZONA DEPARTMENT OF WATER RESOURCES

REVISED: AUGUST 1999

Registered Professional Engineer (Civil)
CERTIFICATE NO. 17928
GEORGE V. SABOL
Date Signed 24 August 99
ARIZONA, U.S.A.

Stantec

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PREFACE

The Design Issues and Alternatives Analysis Report for pre-design modifications of Golden Eagle Park Dam was submitted in April 1999. That report recommended Alternative E for modifications to the dam and spillways. Subsequently, at a project meeting on 11 May 1999, the Town of Fountain Hills requested that Alternative E be revised to reduce the magnitude and frequency of flooding to Golden Eagle Park. Additional alternative analyses resulted in the development of Alternative F. A memo on Alternative F was distributed on 21 May 1999. In June 1999, all agencies agreed that Alternative F would be selected and that alternative would be advanced to pre-design.

The April 1999 report is revised to include Alternative F. Editorial and review comments are included in this final report.

INTRODUCTION

GENERAL

Deficiency with the Golden Eagle Park Dam (GEP Dam) principal spillway and related flood hazards to the Fountain Hills High School were originally identified in the Fountain Hills (North) Floodplain Delineation Study (Contract FCD 92-04) that was performed by George V. Sabol Consulting Engineers, Inc. (GVSCE, 1994). That study identified that the principal spillway could not pass the 100-year flood without causing the emergency spillway to operate. Flow through the emergency spillway (which was originally designed to not operate for flood magnitudes less than the 100-year flood) resulted in flood hazard to the high school buildings and discharge onto and through the athletic field. That problem, which was discovered in 1994, was exacerbated in 1991 when a sewer line was placed through the principal spillway reducing the area of that spillway by 25 percent.

Deficiency with the emergency spillway, and the resultant dam safety issue was identified in a dam break study of GEP Dam and four other dams that was performed by GVSCE (1996a). That study identified that the emergency spillway could not pass a 0.5 probable maximum flood (PMF) inflow design flood without overtopping the earthen embankment of the dam. The consequences are that it is reasonable to assume that the dam could be overtopped and fail during a severe storm event. Significant property loss and hazard to the Town of Fountain Hills could result from such a failure. Subsequently, the dam was classified as unsafe, non-emergency by the Arizona Department of Water Resources (ADWR).

PURPOSE

The primary purpose of the project is to modify the dam and spillway to meet ADWR dam safety requirements. A secondary purpose is to diminish flood hazard to the Fountain Hills High School that is located immediately to the south (right abutment) of the dam and emergency spillway, and to the high school athletic field that is located immediately below the emergency spillway.

SCOPE OF REPORT

This report presents design issues that are relevant to potential modifications and the recommended modification to the earthen embankment and spillways of GEP Dam.

Some of those design issues are technical in regard to dam safety, and some issues are non-technical in regard to impacts to Golden Eagle Park, owned by the Town of Fountain Hills, and to school facilities as administered by the Fountain Hills Unified School District.

This report also presents the results of a dam modification alternatives study. Seven alternatives are presented, discussed and compared. A recommendation is provided for the preferred alternative. The alternatives are presented at similar levels of engineering and analyses so as to provide a comparable evaluation, including costs.

BACKGROUND

GENERAL

Golden Eagle Park Dam, previously known as Dam 4, is generally situated 600 feet east of Golden Eagle Boulevard, between Palisades Boulevard and Bainbridge Avenue. Fountain Hills High School is located immediately east and south of the dam. The upstream impoundment area between the dam embankment and Golden Eagle Boulevard is Golden Eagle Park with softball diamonds, tennis and volleyball courts, concession and equipment storage buildings, bathroom facilities, a playground area and parking lots. An approximate 7.13 square mile watershed comprised of natural desert, urban development and golf courses is tributary to the dam. Situated within that watershed are three other dams named Aspen Dam (Dam 6), North Heights Dam (Dam 11), and SunRidge Canyon Dam (Dam 7) which are constructed at various upstream locations west of GEP Dam.

Figure 1 is a map of the Town of Fountain Hills showing the location of GEP Dam and the three upstream dams. The land surface slope is generally from west to east and, as illustrated by Figure 1, failure of GEP Dam would cause a significant flood hazard to the densely developed area to the east (downslope) of GEP Dam.

Figure 2 is a map of the contributing watershed to GEP Dam. The location of the three upstream dams are identified as well as the 1.38 square mile drainage area to GEP Dam that is not controlled by any of the three upstream dams. That map also shows the location of the Fountain Hills High School adjacent to and downstream of GEP Dam.

DESCRIPTION OF DAM

Golden Eagle Park Dam was designed by Trico International, Inc. (Trico) and constructed by McCulloch Properties, Inc. (1970 – 1974). Construction of the dam and preparation of as-built drawings was completed in late 1974 to early 1975. GEP Dam is presently owned and maintained by the Town of Fountain Hills and the Fountain Hills Unified School District.

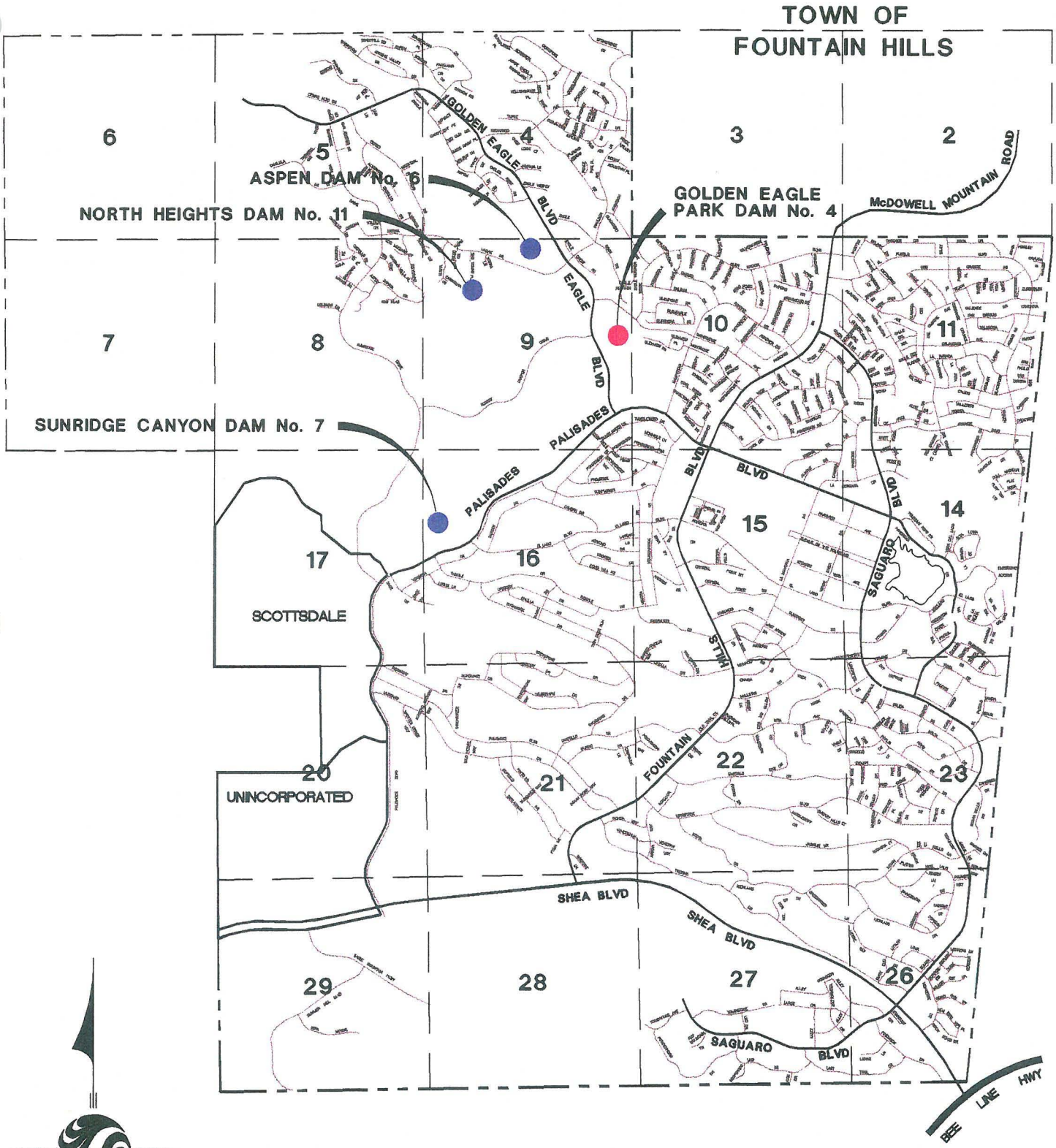

FIGURE 1
LOCATION OF GOLDEN EAGLE PARK DAM
AND THE THREE UPSTREAM DAMS
IN THE TOWN OF FOUNTAIN HILLS

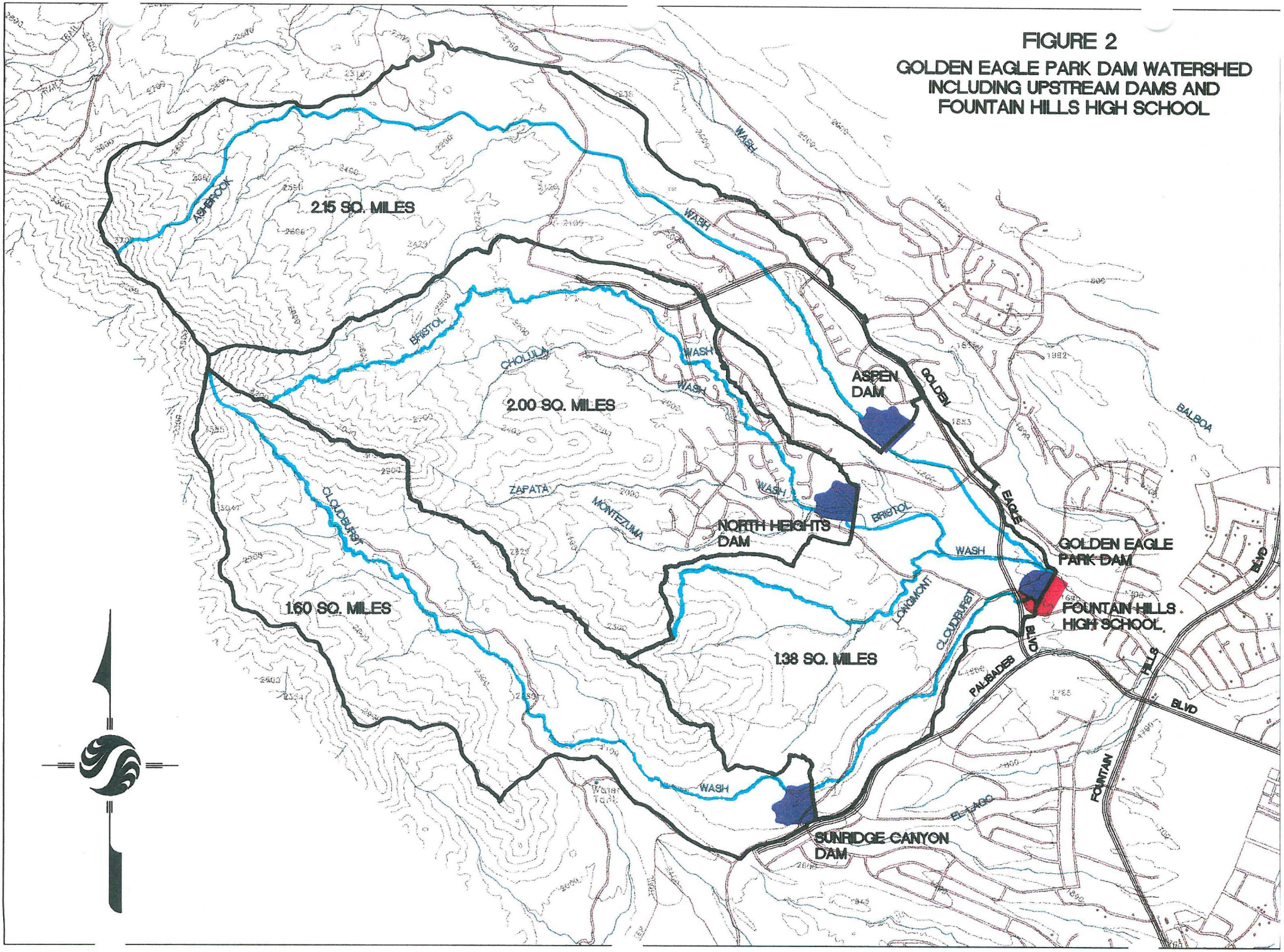

FIGURE 2

GOLDEN EAGLE PARK DAM WATERSHED INCLUDING UPSTREAM DAMS AND FOUNTAIN HILLS HIGH SCHOOL

Information concerning the physical characteristics of GEP Dam and geotechnical properties of the earthen embankment are obtained from file data of the dam's design and construction, the Phase I Inspection Reports under the National Dam Safety Program by the Arizona Water Commission (presently ADWR), the three previous GVSCE studies of GEP Dam, the recent AGRA Earth & Environmental, Inc. (AEE) studies, and field reconnaissance.

Golden Eagle Park Dam is a zoned earthen embankment with a central inner core and upstream and downstream shells. According to available information, the inner core is generally comprised of fine, high percentage clay material, while the outer zones are coarser material with higher percentages of gravel and some cobble. The dam is equipped with an uncontrolled principal spillway and an emergency spillway in the right abutment (see Figure 3 for a sketch of critical features of the dam and spillways). The principal spillway is comprised of two 60-inch reinforced concrete pipes (RCP) located at the maximum embankment section near the left abutment. The conduits discharge to a concrete stilling basin with an end sill for an energy dissipater. Wooden piles at the inlet serve as a trashrack to prevent large debris such as trees, from entering the conduit. Smaller debris is allowed to pass through the conduit. In 1991, a 14-inch ductile iron pipe (DIP) sanitary sewer line was installed at the flowline of one of the principal spillway pipes. A concrete encasement was poured around the 14-inch DIP pipeline resulting in an approximate 25 percent reduction of the principal spillway capacity (see Table 1). The impact of that modification was analyzed and reported by Anderson-Nelson, Inc., and accepted by ADWR.

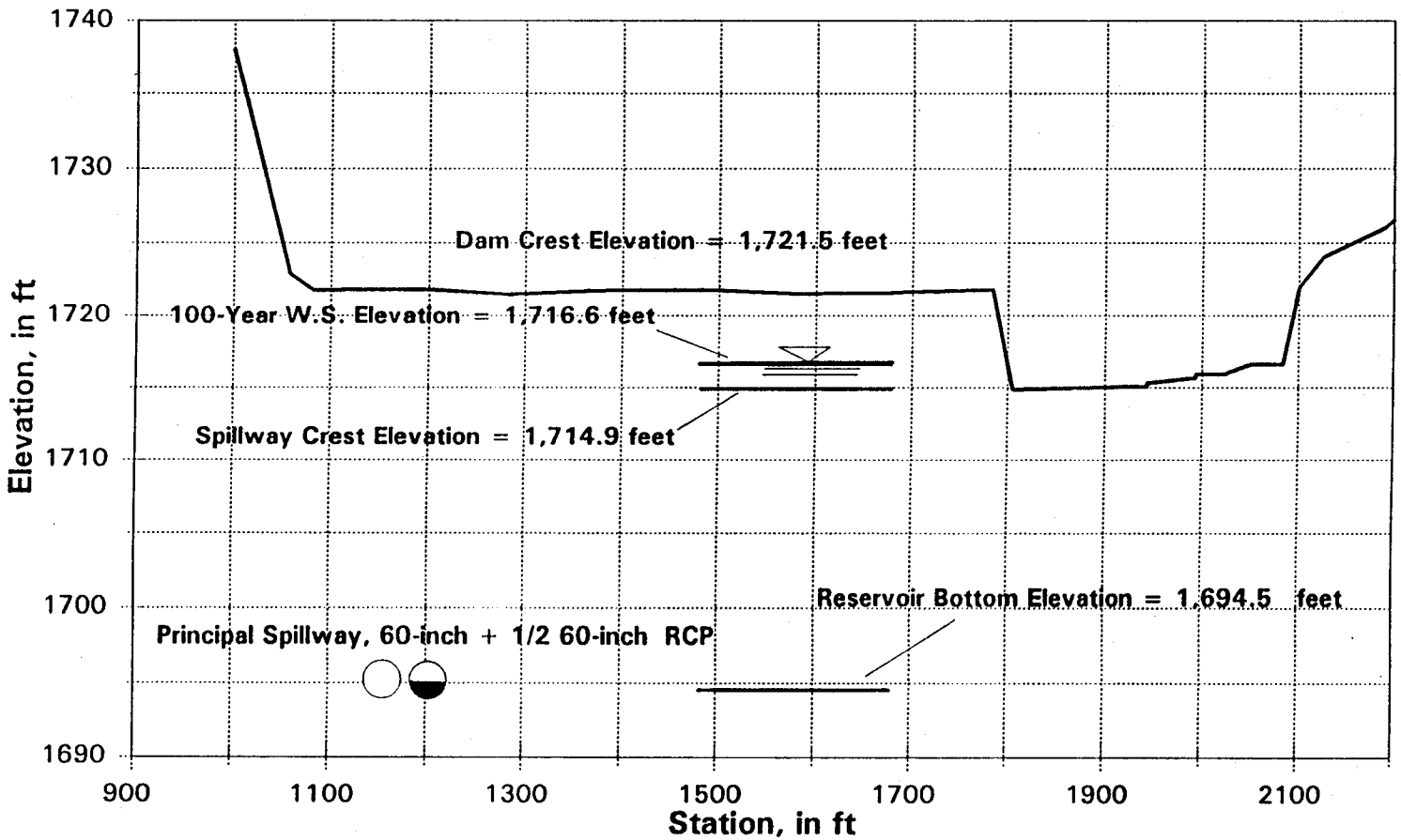

FIGURE 3
Sketch of critical features of Golden Eagle Park Dam (No. 4)

The emergency spillway is an earthen trapezoidal section with a concrete sill and is constructed at the southern (right) abutment of the dam. Flows over the emergency spillway discharge directly to the Fountain Hills High School athletic field. The less frequent, higher peak discharges will attain depths that may cause a significant portion of the flows to also spill southeasterly past the high school cafeteria and into the campus area. Table 1 summarizes the various physical characteristics of GEP Dam.

A pressure transducer type water level recorder was installed at the inlet side of the principal spillway in December 1996 by the Flood Control District of Maricopa County (FCDMC) as part of the Fountain Hills Flood Warning System. A piezometer was installed at the downstream toe of the dam in 1998 to monitor ground water levels under the dam. There are no other instrumentation or monitoring data for the dam.

TABLE 1
Pertinent Data for Existing Golden Eagle Park Dam

Item	Description
(1)	(2)
Dam Type	Zoned Earthfill
Dam Crest Length	660 Feet
Dam Slopes	1V:2H upstream; 1V:2H downstream
Dam Height (Max)	26.8 feet
Dam Crest Elevation (MSL)	1721.47 feet
Dam Crest Width	12 Feet
Drainage Area	7.13 square miles
Storage at Emergency Spillway Crest	95.8 acre-feet
Emergency Spillway Type	Unlined earth w/ concrete sill
Emergency Spillway Width	266 feet
Emergency Spillway Capacity at Dam Crest	12,750 cfs
Emergency Spillway Side Slopes	3:1
Emergency Spillway Crest Elevation	1714.86 feet
Principal Spillway	2-60 inch diameter RCP's, uncontrolled
Principal Spillway Capacity at Dam Crest	955 cfs **, 750 cfs*

*With sewer line in place

**Full capacity, no sewer line

PREVIOUS STUDIES

Three recent studies of the Fountain Hills area document flooding and dam safety issues for GEP Dam. The first is a floodplain delineation study of the northern Fountain Hills area conducted by GVSCE (1994). The results of the Fountain Hills (North) FDS indicate that for existing watershed conditions, the emergency spillway operates for about 5.3 hours with a peak discharge of about 320 cfs during the 100-year flood. Under future watershed conditions, the emergency spillway will discharge about 480 cfs during the 100-year flood and will also operate during lesser floods such as the 10-year. It is obvious from the Fountain Hills (North) FDS that the existing principal spillway of GEP Dam does not have adequate capacity to convey the 100-year flood, and in fact the 10-year flood under future conditions, without forcing flow over the emergency spillway. Operation of the emergency spillway may result in flooding of the adjacent high school campus and athletic field. That condition, especially for the more frequent floods, is undesirable.

The second study is a dam break analysis conducted by GVSCE, under contract with Anderson-Nelson, Inc., for five dams within the Town of Fountain Hills. The report documenting the results of that study is entitled; Town of Fountain Hills Dam Break Analysis for Golden Eagle Park Dam, Hesperus Wash Dam, Aspen Dam, North Heights Dam and SunRidge Dam, (GVSCE, 1996a). The purpose of the study was to prepare an Emergency Action Plan for each of the five dams, including dam break inundation mapping. The dam breach analysis indicates that GEP Dam is overtopped by about 3.9 feet during a 0.5 PMF inflow flood. The inflow design flood (IDF) used in that analysis is a result of 0.5 PMF spillway releases from Aspen Dam (Dam 6) and SunRidge Canyon Dam (Dam 7), inflow from an assumed piping breach of North Heights Dam (Dam 11) and the 0.5 PMF runoff from the intermediate 1.38 square mile subbasin between GEP Dam and the upstream dams. The assumption that North Heights Dam fails by piping, although reasonable for a dam break analysis, is considered too severe a spillway design criteria for use in designing modifications to GEP Dam. A third study, described below, estimated the 0.5 PMF spillway design flood without the assumption of a piping breach of any of the three upstream dams. The analysis without the North Heights Dam breach results in 2.39 feet of overtopping of GEP Dam. Therefore, using prudent assumptions for flood hydrology indicates that GEP Dam will be overtopped by a spillway design flood resulting in likely dam breach.

The third study is reported in the Reconnaissance Study and Alternative Evaluation for Golden Eagle Park Dam, Interim Report (GVSCE, 1996b) and the Fountain Hills ADMP, Final Report (GVSCE, 1997). The reconnaissance level study evaluated five alternatives:

Alternative No. 1 – Do nothing.

Alternative No. 2 – Remove GEP Dam.

Alternative No. 3 – Modify the upstream dams.

Alternative No. 4 – Construct an additional upstream dam.

Alternative No. 5 – Modify GEP Dam.

The reconnaissance level study recommended Alternative No. 5, and two options for modifying GEP Dam were presented.

The feasibility level design for modifications to GEP Dam and supplemental information for the recommended alternative are presented in the Final Report. The recommended modifications included enlarging the principal spillway by adding a 7-foot wide by 8-foot high box culvert parallel to the existing principal spillway and leaving that spillway in place thus avoiding the relocation of the sewer line. It was recommended that the emergency spillway be modified by increasing the crest length from its existing 266 feet to about 570 feet. The spillway crest elevation is maintained throughout the enlargement. The crest of the earthen embankment was to be raised about 1.5 feet. This proposed modification, or any modification to the dam, will require ADWR review and approval. The proposed modification provides 1.5 feet of residual freeboard which is less than the "normal" ADWR minimum of 3 feet, therefore "other considerations" would need to be made by ADWR for approval of that proposed modification, or the embankment would need to be raised an additional 1.5 feet to obtain 3 feet of residual freeboard.

AEE recently completed the dam safety inspection (AEE, 1998b) and geotechnical investigation (AEE, 1998a) for the dam. Based on those studies, it is AEE's opinion that there are no significant geotechnical deficiencies in the dam or its spillway, that the foundation and embankment of the dam are functioning properly and that the dam is safe. The geotechnical work that will be required is that associated with the planned modifications to increase the height of the dam and to modify existing spillways or to add an auxiliary spillway. Additional geotechnical investigations and reports will be undertaken after the preferred alternative is selected.

FLOODPLAIN & DAM SAFETY CONSIDERATIONS

Regulatory flooding concerns and floodplain administration in the Fountain Hills area come under the auspices of the Town of Fountain Hills and the Flood Control District of Maricopa County. Dam safety issues concerning GEP Dam come under the jurisdiction of the State of Arizona through ADWR. According to the criteria published in Guidelines for the Determination of Spillway Capacity Requirements (ADWR, May 1991), the downstream hazard potential/size classification of GEP Dam is "High Hazard/Small" with a recommended inflow design flood (IDF) of one-half the probable maximum flood (0.5 PMF). Draft rules and regulations pertaining to Dam Safety Procedures (ADWR, February 1999) also recommend the 0.5 PMF for the IDF.

Modifications to the spillways of GEP Dam will result in some impact to the upstream and downstream regulatory floodplains (100-year) of Ashbrook Wash. Upstream of GEP Dam, the inundation limits for the 100-year flood will be decreased for all alternatives. For the IDF, the upstream flood inundation is increased due to raising the embankment and elimination of embankment overtopping as would occur for the existing dam. This would require a drainage easement for all land subject to upstream flood inundation caused by the raised dam during the IDF. The status of drainage easements will be determined and appropriate drainage easements defined. This may require drainage easements extending across Golden Eagle Boulevard and into the golf course west of that road. At the south end of the emergency spillway and downstream of that spillway, the flood hazard zones for the high school campus and athletic fields that are presently delineated would be removed from that designation, if the emergency spillway no longer operated for the 100-year flood.

Downstream of GEP Dam there will be a relatively small increase in the 100-year floodplain limits dependent upon the alternative. Although the combined principal and auxiliary spillway capacity may be increased significantly, the downstream effects are relatively minor. This is because the present condition 100-year discharge is the result of limited discharge from the undersized principal spillway plus uncontrolled overflow through the existing emergency spillway. Floodplain impacts are evaluated and reported elsewhere.

Another factor that will need to be considered during the pre-design study is the impact of increased capacity of the principal spillway and possibly an auxiliary spillway on the roadway crossings of Ashbrook Wash downstream of GEP Dam. Those roadway crossings, including the new box culverts in Fountain Hills Boulevard, were

designed for discharges from the existing dam and those discharges will increase with proposed spillway modifications.

SURVEY & MAPPING

Mapping for the hydrology studies is described in the Fountain Hills (North) Floodplain Delineation Study (GVSCE, 1994). Mapping of the impoundment area is based on September 1996 aerial photography that was obtained as part of the Fountain Hills Area Drainage Master Study, (GVSCE, 1997). Surveying was conducted as part of the present study to verify elevations in the ball field areas of the 1996 map.

Field surveys were conducted during February through April 1999 to obtain data to map the area of the dam, its appurtenant structures, park facilities that are not represented in the 1996 map, and certain features in the athletic field. The map that is generated from those survey data is shown in Plate 1, and that map is used for alternative analysis and will be used for design purposes. The 1999 mapping of the dam and vicinity is integrated into the 1996 map as a composite for the impoundment area, and that map is shown in Plate 2.

DESIGN ISSUES

GENERAL

Modifications to GEP Dam are required to meet current State of Arizona dam safety regulations as administered by ADWR. This will require meeting various hydrologic, hydraulic and geotechnical standards. However, due to the nature of dam ownership and the location of the dam in an urban area containing a popular town park and school facilities, the resolution of the dam safety deficiencies takes on a more complex scope than simple achievement of minimum technical standards. Various design issues are identified that must be addressed during modifications to the dam. The following is a discussion of those design issues along with resolution, where possible at this time.

CONSIDERATION OF THE THREE UPSTREAM DAMS

Three urban flood control dams, SunRidge Canyon, North Heights and Aspen Dams, exist in the contributing drainage area upstream of GEP Dam. Those dams were designed using the same criteria as GEP Dam and were constructed during the same general time period. Those dams provide urban flood attenuation via storage. Although dam safety studies do not indicate that any of those three dams is expected to be overtopped during the inflow design flood (0.5 PMF), those dams do not necessarily meet current dam safety requirements of ADWR. Specifically, less than 3 feet of residual freeboard is available when routing the inflow design flood (IDF). Additionally, failure of one or more of the three upstream dams by piping during the GEP Dam inflow design flood would be an extremely unusual but potential event. Therefore, consideration of reasonably prudent conditions for the three upstream dams needs to be considered when analyzing and designing the modifications to GEP Dam. Considerations of the three upstream dams and the recommended approach is presented in the IDF Hydrology section. Other then the potential impact of the three upstream dams on the magnitude of the IDF for GEP Dam, there are no other interrelated design issues between those dams and GEP Dam.

IDF HYDROLOGY

The recommended selection of the IDF for GEP Dam is presented in a memorandum of 4 March 1999 (Appendix A). Two IDF's are recommended for use in designing the spillway. IDF1 assumes concurrent piping breach of North Heights Dam during the

0.5 PMF event for GEP Dam. IDF2 is based on the same 0.5 PMF event but without concurrent upstream dam break. Assumptions and documentation of the two IDF's are provided in Appendix A.

Modifications to GEP Dam are being analyzed and designed based on routing IDF2 through the modified dam and enlarged spillways while maintaining a minimum of 3 feet of residual freeboard. IDF1 is then used to check the performance of the modified dam while allowing encroachment into the 3 feet of residual freeboard.

10-YEAR & 100-YEAR FLOOD HYDROLOGY

Flood hydrology, other than IDF hydrology as previously discussed, is needed for the analysis and design of modifications to GEP Dam. The following additional flood hydrology are needed:

100-year, future condition – for design of the principal and/or auxiliary spillway, and evaluation of the impact of spillway modifications on the Ashbrook Wash floodplain.

100-year, existing condition – for evaluation of spillway modifications to the existing (1994) Fountain Hills (North) FDS and current FEMA flood insurance rate maps.

10-year, future condition – for evaluation of spillway modifications on recent roadway crossing improvements and for evaluation of more frequent flooding impacts on park facilities.

The 10-year and 100-year flood hydrology are obtained from HEC-1 models that were developed during the Fountain Hills (North) FDS (GVSCE, 1994). The flood hydrology for four alternatives (A-1, A-2, C and D) is presented in a memo of 6 April 1999 (Appendix B). Note that in Appendix B, reference to Alternative A represents both Alternatives A-1 and A-2. Alternatives B, E and F were developed after the previously referenced memo was prepared and, therefore, reference to those alternatives is not made in that memo. The watershed hydrology is identical for all seven alternatives; the only difference in the flood hydrology is attributed to the different spillway rating curves that are incorporated into the respective HEC-1 models for each alternative. The flood hydrology is used to estimate the maximum water surface elevation (MWSE) in the impoundment area upstream of the dam, and to estimate the discharges at key concentration points in Ashbrook Wash downstream of the dam. The Ashbrook Wash hydrology is subsequently used to perform the Ashbrook Wash floodplain hydraulic analyses for selected alternatives. The various

HEC-1 files that were developed for all seven alternatives are provided on a diskette that is included with the report.

ASHBROOK WASH FLOODPLAIN

Enlargement of the principal spillway or provision of an auxiliary spillway will result in changes to discharges in Ashbrook Wash downstream of GEP Dam from those in the Fountain Hills (North) FDS. Since spillway modifications could adversely impact regulatory floodplains and/or roadway crossings, those floodplain impacts are evaluated. The results of the evaluation of 100-year floodplain impacts for four alternatives (A-1, A-2, C and D) are presented in a memo of 21 April 1999 (Appendix C). Note that in Appendix C, reference to Alternative A represents both Alternative A-1 and A-2. Alternatives B, E and F were developed after the previously referenced memo was prepared and, therefore, reference to those alternatives is not made in that memo. An evaluation of the selected Alternative F is provided in Appendix F. HEC-2 models were developed for five alternatives (A-1, A-2, C, D and F) and those files are contained on a diskette that is included with the report. Flood discharges in Ashbrook Wash downstream of the dam for Alternatives B and E do not deviate significantly from discharges that are analyzed and reported for the other five alternatives. Neither Alternative B nor E are selected as the preferred alternative and therefore those HEC-2 models were not developed.

URBAN DEVELOPMENT IMPACTS IN DAM IMPOUNDMENT

There are several land development factors within the impoundment area of the dam that could influence dam and spillway modifications. Those are discussed in the following:

Park Development and Storage Capacity Relation

The Town of Fountain Hills has developed Golden Eagle Park within the storage impoundment area of the dam. That development has occurred since the dam was constructed, and for the most part, since completion of the floodplain delineation study (GVSCE, 1994). As part of this study, the park area was field surveyed for the purpose of verifying mapping (September 1996) that is used to establish the storage capacity relation for the dam. The field survey verified the adequacy of the mapping within normal mapping standards. The storage capacity was calculated based on the 1996 mapping and current (1999) field survey of the dam. That relation is shown in

Figure 4 along with the storage capacity relation from the floodplain delineation study (GVSCE, 1994). The current and previous storage capacity relations agree indicating that park development was accomplished with no significant importation or removal of soil within the park and that sedimentation of the impoundment is not a factor at this time. The current storage capacity relation is used in all flood routing analyses.

Park Development within the Approach to the Emergency Spillway

Field observation indicates that development of facilities within the park and regrading of the land surface within the approach to the emergency spillway could affect the discharge capacity of the emergency spillway. The park facilities in this area were surveyed as part of this project and the 1996 mapping was revised to represent the regraded land surface and the park facilities. Those facilities include vertical block retaining walls for volleyball courts, ramadas with picnic tables, a bridge across Cloudburst Wash within the park, a parking lot, landscaping, etc. Those facilities, constructed since the dam was built and after the 1994 floodplain delineation study could result in reduced hydraulic capacity of the emergency spillway due to flow obstructions, reduction in flow momentum, etc. An unobstructed broadcrested weir would have a discharge coefficient of about 2.6 in the weir hydraulics equation, $Q = CLH^{3/2}$. However, due to the recently constructed park facilities, a weir coefficient of 2.4 is used to analyze the discharge capacity of the existing emergency spillway, and this results in about an 8 percent discharge capacity reduction as compared to an equivalent, unobstructed spillway.

Storage Containment within the Impoundment

Breakout from the impoundment was assessed for the purpose of determining a maximum water surface elevation for the IDF. One potential breakout location is west of the school campus near Golden Eagle Boulevard. A water surface elevation in excess of 1,728 feet would cause uncontrolled runoff to breakout down Golden Eagle Boulevard to the south and from there to flow in an easterly direction through the school grounds and urban development. Such an occurrence would be a diversion of natural runoff and will be avoided. A second, potential breakout location occurs in the northern terrace of the reservoir impoundment about 340 feet west of the left abutment of the dam. At that location, a sanitary sewer was installed and the breakout is the result of the sewer trench not being filled back to natural grade. Field survey indicates that the flow line in the channel at the church property line is elevation 1,722.6 feet and that the finished floor elevation of the church building is elevation

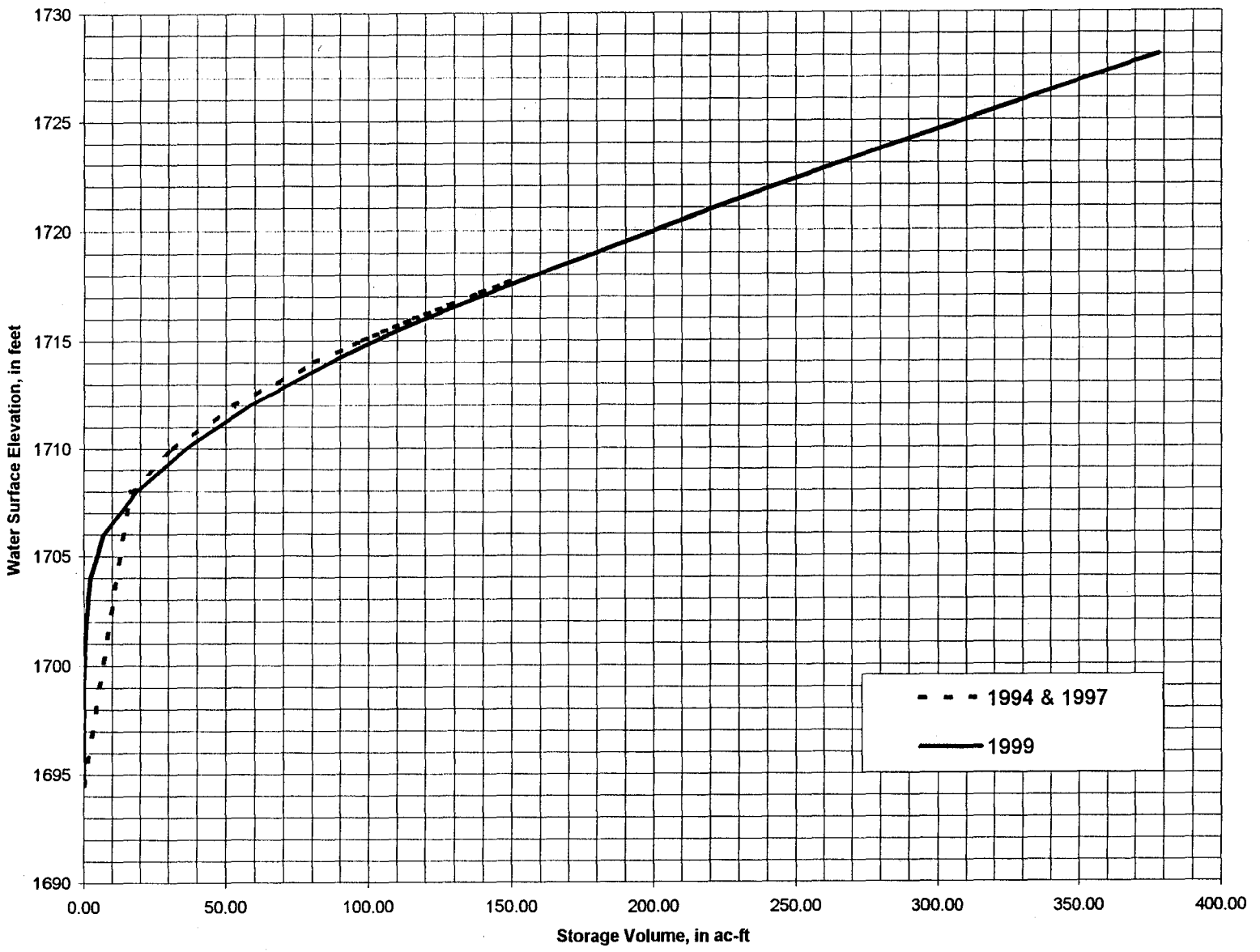

FIGURE 4
Stage vs. Volume

1,726.7 feet. A maximum water surface elevation upstream of the dam in excess of elevation 1,722.6 feet would cause breakout through that sewer alignment "notch." A land ownership map is being prepared and it is anticipated that the sewer alignment notch can be filled to avoid breakout at that location. There are no other known flood storage containment issues relative to the dam impoundment.

SCHOOL ATHLETIC FIELD DEVELOPMENT BELOW THE EMERGENCY SPILLWAY

The Fountain Hills Unified School District has constructed an athletic field, amphitheater and gymnasium within the general area downgradient of the emergency spillway. Discharge from the emergency spillway for all floods up to the 100-year flood will be eliminated by all alternatives other than Alternative B. For Alternative B, discharges through the emergency spillway will occur for all floods larger than about the 10-year flood since principal spillway capacity is not increased for that alternative. Furthermore, present and proposed flood warning for the Town of Fountain Hills will, under any reasonable circumstances, preclude likely loss of life within the school grounds due to emergency spillway discharge. However, there are property damage and spillway hydraulic factors to be considered for dam modification alternatives and these are discussed in the following:

Bleachers

Bleachers exist below the existing dam embankment on the west side of the athletic field. Presently, the emergency spillway discharges to the south of the bleachers and the bleachers are not in the direct flow path of the spillway. However, an emergency spillway expansion, as proposed by Alternatives A-1, B and F, would result in emergency spillway discharge upstream of the bleachers. Some spillway discharge would impact the backside of the bleachers, pass through and around the bleachers in route to returning those flows to Ashbrook Wash. A cross section of the bleachers and the existing embankment is shown in Figure 5. Also shown in that figure is the crest elevation of the enlarged emergency spillway as proposed by Alternatives A-1, B and F. The bleachers are about 66 feet downstream of the crest of the spillway and there is about a 5.3-foot elevation differential from the spillway crest to the back of the bleachers. Therefore, the bleachers would have no significant adverse impact on the hydraulic performance of the enlarged emergency spillway as proposed by Alternatives A-1, B and F. There could, however, be some additional complexity for Alternatives A-1, B or F in constructing an adequate energy dissipator and embankment erosion protection downstream of the spillway, if such were required, due to the proximity to

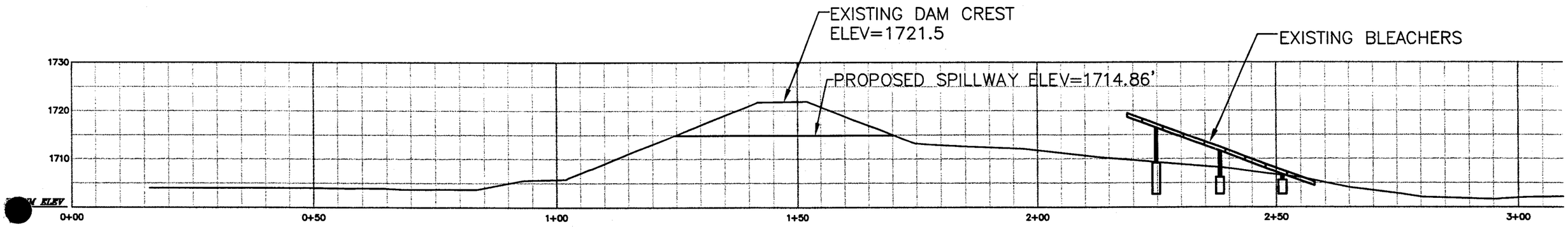

FIGURE 5

Athletic field bleachers in relation to enlarged emergency spillway of Alternative A–1

the bleachers. Relocation of the bleachers would be an additional cost to the project and a suitable new bleacher location is not feasible and would probably be objected to by the School District.

Electrical Building and Storage Building

A few relatively small facilities exist to the north of the bleachers. Those facilities would be subject to flooding in the event of spillway discharge. However, such flooding will occur only during events larger than the 100-year flood for all alternatives other than Alternative B. Potential flood protection of those facilities is viable, but might impose access restrictions to the buildings. The School District has responded that such flood protection is not desired. Selection of Alternative B would dictate more extensive consideration of flood protection for those buildings.

Gymnasium

The gymnasium is constructed near the athletic field downstream from the emergency spillway. Field survey data were obtained of the finished floor elevation of the gym and a block wall that separates the gym from the athletic field. A significant emergency spillway discharge would cause likely flooding of the gym. Discussions with the School District resulted in an understanding that the existing block wall will be raised and lengthened to provide some degree of flood protection to the gym. Such flood protection will be incorporated into the dam modification plans, and the magnitude of spillway discharge will be estimated for which the flood protection is expected to resist. It is not anticipated that the flood protection will be adequate to protect the gym from flooding during an IDF. However, for all alternatives other than Alternative B, the gym will not be subject to flooding from emergency spillway operation for events equal to or smaller than the 100-year flood. If Alternative B is selected, a more extensive analysis of flood potential for the 100-year flood would be required. Flooding of the gym from waters other than from the emergency spillway is not considered.

EMERGENCY SPILLWAY FLOODWALL

The existing emergency spillway does not contain spillway discharge from breaking out to the south through the school campus. Although such breakout will occur only with floods larger than the 100-year, it is the request of the School District to provide flood protection to the school from such infrequent, but potentially severe flooding.

The modification to the dam and spillway will contain an adequate floodwall/dike along the right side of the emergency spillway to contain spillway discharges and to eliminate breakout to the school campus.

SCHOOL SECURITY FENCE

The School District had previously installed a school security fence along the crest of the emergency spillway. It was determined that the fence could obstruct flow in the spillway, and at direction from ADWR, that fence was removed. The School District wishes to replace the fence at another location so as to provide a security fence between the school campus and the park. A memo was prepared on this issue requesting an administrative response from both ADWR and FCDMC in regard to using a breakaway type fence at this location. Response from both ADWR and FCDMC is that a fence, either breakaway or other, across the crest of the emergency spillway is not allowed. Alternative locations for the fence will be considered by the School District. One such location is on the amphitheater steps, 4 to 5 feet lower than the crest of the spillway. Effective loss of amphitheater seating capacity could be compensated by extension of amphitheater "steps" further to the north. Scour resistance of the flow alignment downstream of the emergency spillway will be evaluated during the pre-design phase. That study, including field assessment of conditions in the amphitheater, will be performed to evaluate the adequacy of the existing amphitheater to resist scour during emergency spillway operation. The results of that study may indicate the need to retrofit, rebuild or modify the amphitheater area below the spillway. Adequate scour protection is required for all alternatives.

PRINCIPAL SPILLWAY TRASHRACK

The trashrack on the inlet of the principal spillway is a timber structure. It is sized to restrict large trash such as trees, limbs and large brush. Smaller trash can enter the principal spillway conduits, and could result in clogging the 60-inch diameter conduit and/or the other half open conduit. Therefore, the existing principal spillway will be modified to include a concrete headwall and integral steel, inclined trashrack. Design of the trashrack will assume that 50 percent of the area can be clogged and not impair the capacity of the principal spillway.

SPILLWAY HYDRAULICS

Hydraulic capacity of the existing principal spillway is analyzed by use of the Hydraulic Design of Highway Culverts (Federal Highway Administration, 1985) as implemented in the HY8 program. That methodology is also used for the hydraulic analysis of the culvert-type principal or auxiliary spillways of Alternatives A-1, A-2, B, E and F. Hydraulic capacity of the existing emergency spillway is analyzed by the weir equation, $Q = CLH^{3/2}$, with C = 2.4 as previously discussed. Emergency spillway enlargement is analyzed with a C = 2.6 for the lengthened part of the spillway crest. Hydraulic capacity of the broadcrested weir for the RCC auxiliary spillway of Alternative D is analyzed with a C = 2.6. Hydraulic capacity of the concrete ogee crest spillway of Alternative C is analyzed using procedures in Design of Small Dams (USBR, 1974) and Hydraulic Design of Spillways (U.S. Army Corps of Engineers, 1995).

Spillway capacity rating curves and supporting calculations are shown for each alternative in Appendix D. Those spillway capacity relations are used in HEC-1 models to route inflow floods (10-year, 100-year, IDF2 and IDF1).

EMBANKMENT RAISE

All alternatives include a combination of increased spillway capacity and embankment raise to route the IDF through the dam while maintaining a minimum of 3 feet of residual freeboard. An upstream embankment raise is proposed for the following reasons:

- Construction access is more favorable in essentially unused land in the park rather then the athletic field.
- More extensive modifications are needed for the principal spillway with a downstream raise rather than an upstream raise.
- A downstream raise would require a retaining wall or other transition from the expanded embankment fill to the emergency spillway.
- Construction of a downstream raise may be impaired by the athletic field bleachers.

An upstream embankment raise will require relocation of the drainage channel between the embankment and the ball fields, and adequate erosion protection for the toe of the dam will be needed.

EROSION OF EMBANKMENT SLOPES

The earthen embankment of the dam has relatively minor erosion caused by rainfall running down the 1V:2H slopes. The embankment slopes are unprotected except for native vegetation and the coarse grain sizes in the outer shell zones of the embankment fill. That erosion is not considered a threat to the integrity of the embankment, however, it will be repaired by manual placement and vibratory compaction as part of the dam modifications. It is presently recommended that an upstream embankment raise be used and erosion repair will only be necessary on the downstream embankment slope. New embankment fill will be placed on the upstream slope negating the need for erosion repair. A native plant mix "hydro-seed" will be applied after construction to stabilize the embankment.

TREE AND VEGETATION CLEARING FROM EMBANKMENT

Trees (palo verde, etc.) and large brush (brittlebush, etc.) will be removed from the embankment and toes during dam modifications. The embankment will be locally recompacted, as necessary.

SANITARY SEWER LINE THROUGH PRINCIPAL SPILLWAY

The Fountain Hills Sanitary District has indicated that there are no plans to upsize or expand the sewer line that presently passes through the dam. However, ongoing studies of future sewer needs by the Sanitary District will not be completed until the end of 1999. Presently, it is planned to leave the sewer line in-place. An upstream embankment raise would extend the toe of the embankment upstream. A new principal spillway headwall and trashrack will be installed during dam modifications. This will require accommodation of the embankment raise and principal spillway improvements in relation with the sewer line and manhole. An alternative approach could involve lengthening the upstream end of the principal spillway and relocating that portion of the sewer line.

UTILITIES

Utilities and site plans have been obtained from both the Town and the School District. Irrigation lines in the park may be impacted by dam modifications. Other than the sanitary sewer line there are no affected utilities.

CONSTRUCTION STAGING AREA & TRAFFIC

The south parking lot of the park (see Plate 1) is proposed as the construction staging area. The School District has indicated that a gated access area by the gym is also available. Temporary construction easements are indicated for each alternative in Plates 3 through 9, respectively. Construction activity and vehicle traffic can be limited to relatively vacant areas of the park and athletic field, other than access across the emergency spillway area.

CONSTRUCTION SCHEDULE

The park, and to some extent, the athletic field are used throughout the year. Considering the increased student presence during the school year, the summer is the preferred construction period. It is anticipated that construction could commence in May with completion in September.

ALTERNATIVES ANALYSIS

DESCRIPTIONS OF ALTERNATIVES

General

Alternatives for modification of GEP Dam must meet the following minimum dam safety and related flooding criteria:

1. Safely route the inflow design flood (IDF2) through the impoundment and spillways while maintaining a minimum of 3 feet of residual freeboard to the embankment crest.

2. Safely route the maximum reasonable inflow design flood (IDF1) through the impoundment and spillways without resulting in overtopping of the earthen embankment such that dam breach could not reasonably be expected to occur.

3. Not constitute an increased flood hazard either upstream or downstream of the dam.

Criteria that are to be satisfied, beyond the minimum for dam safety are:

2. Route the 100-year, future condition, flood through the impoundment and spillways while meeting one of the following conditions:

   a. The emergency spillway does not operate. This limits the 100-year maximum water surface elevation (MWSEL) to no higher than 1714.8 feet.

   b. The emergency spillway operates, but flood discharges are contained to the athletic field without flooding of school buildings.

3. Avoid, or minimize to the extent practical, undesirable floodplain impacts in Ashbrook Wash from 100-year discharges from the dam.

4. Eliminate, to the extent practical, flood damage to adjacent school facilities during operation of the principal or emergency spillway.

5. Accommodate the existing sewer line through the GEP Dam principal spillway.

6. Minimize impacts to the park and to school athletic field facilities.

7. Minimize undesirable aesthetic impacts to the park and the school campus.

8. Minimize construction impacts to the use of the park and the school facilities.

9. Accommodate, to the extent practical, school campus security desires.

10. Remedy minor dam deficiencies and provide miscellaneous dam maintenance needs during the modifications to the dam.

11. Provide a cost-effective modification that achieves dam safety requirements, which also meets the ancillary needs of the Town of Fountain Hills and the Fountain Hills Unified School District.

The Alternatives that are considered viable to satisfy the criteria are briefly described in the following:

Alternative A-1: Add new principal spillway, enlarge emergency spillway, and raise dam 3.1 feet (Plate 3)

Key features of Alternative A-1:

- Leave existing principal spillway and sanitary sewer line in-place.
- Increase principal spillway capacity by adding a 6 foot by 6 foot box culvert structure.
- Expand the existing emergency spillway by adding 289 feet of spillway crest.
- Raise the earthen embankment by 3.1 feet.

Major Advantages of Alternative A-1:

- Minimum embankment raise and minimum maximum water surface elevation (MWSEL) for inflow design flood. Although other alternatives could have similar advantage by increasing emergency and/or auxiliary spillway capacities.
- Moderate cost.
- Minimizes flood inundation of park facilities for all floods up to the 100-year flood.

Major Disadvantages of Alternative A-1:

- Extensive excavation of the embankment at its maximum section near the principal spillway to construct the principal spillway enlargement. Reconstruction of the embankment will be problematic due to limited space, placement of embankment zones, and the potential need for a seepage diaphragm around the new principal spillway and possible retrofit of seepage control around the existing principal spillway.
- Extensive construction activity at the principal spillway, emergency spillway and along crest and upstream slope of embankment.
- Extensive, erosion protection on the downstream slope of the 289-foot long emergency spillway enlargement.
- Discharge of emergency spillway upstream of the bleachers.

Alternative A-2: Add new principal spillway, enlarge emergency spillway, and raise dam by 4.8 feet (Plate 4)

Key features of Alternative A-2:

- Leave existing principal spillway and sanitary sewer line in-place.
- Increase principal spillway capacity by adding a 6 foot by 6 foot box culvert structure.
- Expand the existing emergency spillway by adding 129 feet of spillway crest.
- Raise the earthen embankment by 4.8 feet.

Major Advantages of Alternative A-2:

- Requires less extensive erosion protection of the emergency spillway than Alternative A-1.
- Emergency spillway enlargement extends only partially behind the bleachers.
- Moderate Cost.
- Minimizes flood inundation of park facilities for all floods up to the 100-year flood.

Major Disadvantages of Alternative A-2:

- Extensive excavation of the embankment at its maximum section near the principal spillway to construct the principal spillway enlargement. Reconstruction of the embankment will be problematic due to limited space, placement of embankment zones, and the potential need for a seepage diaphragm around the new principal spillway and retrofit of seepage control around the existing principal spillway.
- Extensive construction activity at the principal spillway, emergency spillway and along crest and upstream slope of embankment.

Alternative B: Enlarge emergency spillway and raise dam 4.3 feet (Plate 5)

Key features of Alternative B:

- Leave existing principal spillway and sanitary sewer line in-place.
- Expand the existing emergency spillway by adding 180 feet of spillway crest.
- Raise the earthen embankment by 4.3 feet.

Major Advantages of Alternative B:

- Low cost
- No excavation of the principal spillway with related construction concerns.
- Minimal construction activity.
- Minimum aesthetic impacts.
- Negligible impacts to Ashbrook Wash compared with existing dam conditions.

Major Disadvantages of Alternative B:

- Emergency spillway operates for future condition flood events larger than about the 10-year flood causing relatively frequent flood discharges on the school athletic field.
- Maximum flood inundation of park facilities during all floods up to 100-year frequency.
- Need for positive flood protection of school facilities (cafeteria, gym, and possibly other facilities).

Alternative C: Add concrete ogee auxiliary spillway, and raise dam 4.6 feet (Plate 6)

Key features of Alternative C:

- Leave existing principal spillway and sanitary sewer line in-place.
- Do not enlarge the existing emergency spillway.
- Add a two stage auxiliary spillway. The low elevation notch functions, in conjunction with the existing principal spillway, to pass the 100-year flood. The higher elevation crest of the spillway functions, in conjunction with the existing emergency spillway, to pass the inflow design flood. An integral concrete chute would be constructed over the earthen embankment and would terminate in a concrete energy dissipator structure.
- Raise the earthen embankment by 4.6 feet.

Major Advantages of Alternative C:

- No excavation of the principal spillway with related construction concerns.
- No construction activity at emergency spillway, other than erosion protection.

Major Disadvantages of Alternative C:

- High cost.
- Complex construction of concrete ogee crest spillway with sloping sidewalls.
- Extensive concrete energy dissipator structure.
- Encroachment into school grounds for the energy dissipator.
- Visual impact of large concrete spillway chute on the embankment, and large energy dissipator.
- Excavation into earthen embankment to a maximum depth of about 14 feet to construct the auxiliary spillway.
- Frequent flood inundation of park facilities.

Alternative D: Add roller compacted concrete (RCC) auxiliary spillway and raise dam 4.6 feet (Plate 7)

Key features of Alternative D:

- Leave existing principal spillway and sanitary sewer line in-place.

- Do not enlarge the existing emergency spillway.
- Add a two stage auxiliary spillway. The low elevation notch functions, in conjunction with the existing principal spillway, to pass the 100-year flood. The higher elevation crest of the spillway functions, in conjunction with the existing emergency spillway, to pass the inflow design flood. The broadcrested spillway, stair-stepped chute, and energy dissipator structure would be constructed of RCC.
- Raise the earthen embankment by 4.6 feet.

Major Advantages of Alternative D:

- No excavation of the principal spillway with related construction concerns.
- No construction activity at emergency spillway, other than erosion protection.
- Potential improved visual impact over Alternative C due to color and texture of RCC over concrete.
- Enhanced energy dissipation on stair-stepped chute resulting in smaller energy dissipator structure at toe of embankment.

Major Disadvantages of Alternative D:

- High cost.
- Complex construction of RCC spillway, chute, sloped walls, and energy dissipator.
- Encroachment into school grounds for the energy dissipator.
- Visual impact of the large RCC structure.
- Excavation into earthen embankment to a maximum depth of about 16 feet to construct the auxiliary spillway.
- Frequent flood inundation of park facilities.

Alternative E: Add auxiliary spillway, enlarge emergency spillway and raise dam 5.0 feet (Plate 8)

Key features of Alternative E:

- Leave existing principal spillway and sanitary sewer line in-place.
- Add a concrete box culvert auxiliary spillway in the earthen embankment with an integral stair-stepped concrete chute and energy dissipator. The auxiliary

spillway, in conjunction with the existing principal spillway, passes the 100-year flood without causing the emergency spillway to operate.

- Expand the existing emergency spillway by adding 75 feet of spillway crest.
- Raise the earthen embankment by 5.0 feet.

Major Advantages of Alternative E:

- No excavation of the principal spillway with related construction concerns.
- Moderate construction at the emergency spillway.
- Least emergency spillway enlargements as compared with Alternatives A-1, A-2, B and F (Alternatives C and D do not require enlargement of the emergency spillway), and subsequently least erosion protection for all spillway enlargements being considered.
- Minor impacts to Ashbrook Wash compared with existing dam conditions.

Major Disadvantages of Alternative E:

- High cost.
- Excavation into earthen embankment to a maximum of about 11 feet to construct the auxiliary spillway.
- Visual impact of concrete chute on downstream slope of embankment.
- Some encroachment into school grounds for the energy dissipater.
- Frequent flood inundation of park facilities.

Alternative F: Add low-level auxiliary spillway, enlarge emergency spillway and raise dam 5.0 feet (Plate 9)

Key Features of Alternative F:

- Leave the existing principal spillway and sanitary sewer line in-place.
- Add a low-level auxiliary outlet through the earthen embankment. The new structure is located about 120 feet to the right (looking downstream) of the exiting principal spillway and will not require exposure of the existing structure and excavation of the embankment to the left abutment.
- Expand the existing emergency spillway by adding 120 feet of spillway crest.
- Raise the earthen embankment by 5.0 feet.

Major Advantages of Alternative F:

- No excavation of the existing principal spillway with related construction concerns.
- Moderate construction of the emergency spillway.
- Less erosion protection needed below the enlarged emergency spillway as compared to Alternatives A-1 and B, and about the same as Alternative A-2.
- Minor impacts to Ashbrook Wash compared with existing dam conditions.
- Less frequent and reduced flood inundation of park facilities.
- Moderate cost.
- Minor visual impact from either the park or athletic field.

Major Disadvantages of Alternative F:

- Extensive excavation of the embankment near its maximum section. Reconstruction of the embankment fill will be problematic due to limited space and placement of embankment zones.
- Excavation of outlet channel from the new low-level auxiliary spillway outlet to Ashbrook Wash requiring replacement of shotcrete bank protection and riprap erosion protection.

ALTERNATIVE COST ESTIMATES

Cost estimates of each alternative are made at a comparable level of analysis and design. Supporting documentation on quantities and unit rates are provided in Appendix E. Contingency of 35 percent is used for Alternatives A-1, A-2, B, E and F. Contingency of 50 percent is used for Alternatives C and D due to the increased construction complexity.

The cost of each alternative is listed below:

Alternative	Construction Cost	Contingency[2]	Mobilization, Permits, Engineering, and other	Total
	Cost Estimate[1], in $1000			
(1)	(2)	(3)	(4)	(5)
A-1	391	137	183	711
A-2	421	147	191	759
B	181	63	131	375
C	773	386	243	1,402
D	655	327	221	1,203
E	731	256	159	1,146
F	435	152	191	778

NOTES: 1 = See Appendix E for cost worksheets
2 = 35% for Alternatives A-1, A-2, B, E and F
50% for Alternatives C and D

COMPARISON OF ALTERNATIVES

General

Various measures of the hydraulic performance of each alternative (discharges through spillways, maximum water surface elevations (MWSEL), etc.) are shown in Tables 2 through 4.

All alternatives include leaving the existing principal spillway in-place. The timber trashrack would be removed and it would be replaced by a new concrete headwall and integral, inclined steel trashrack. Increased principal spillway capacity is incorporated only in Alternatives A-1 and A-2. For Alternatives C, D, E and F increased capacity for the 100-year flood is provided by an auxiliary spillway. Only Alternative B does not provide for increased principal spillway capacity or an auxiliary spillway for the 100-year flood, and only that alternative results in discharge through the emergency spillway for the 100-year flood.

TABLE 2 flow
Spillway Performance for the 100-Year, Future Condition, Flood

	Spillway Description			Peak Discharge, cfs						
				Principal Spillway		Auxiliary	Emergency Spillway			
Alternative	Principal Spillway	Emergency Spillway	Auxiliary Spillway	Existing	New	Spillway	Existing	Enlarged	Combined	MWSE
				cfs	cfs	cfs	cfs	cfs	cfs	feet
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A-1	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 289 ft	N/A	644	662	---	---	---	1306	1714.44
A-2	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 129 ft	N/A	644	662	---	---	---	1306	1714.44
B	Replace Trashrack	Expand existing spillway (L = 266 ft) by 180 ft	N/A	669	---	---	593	439	1701	1715.76
C	Replace Trashrack	No change	Concrete ogee with 100-year notch, chute and energy dissipator.	650	---	955	---	---	1605	1714.74
D	Replace Trashrack	No change	RCC broadcrested weir with stair-stepped chute and energy dissipator.	650	---	944	---	---	1594	1714.75
E	Replace Trashrack	Expand existing spillway (L = 266 ft) by 75 ft	3 ft x 80 ft box culvert at invert elevation 1712 ft	651	---	1020	---	---	1671	1714.79
F	Replace Trashrack	Expand existing spillway (L = 266 ft) by 120 ft	4 ft x 8 ft box culvert at invert elevation 1695 ft	638	---	693	---	---	1331	1714.11

TABLE 3
Spillway Performance for the Inflow Design Flood (IDF2)

	Spillway Description			Peak Discharge, cfs								
				Principal Spillway		Auxiliary	Emergency Spillway				Dam Crest	Dam
Alternative	Principal Spillway	Emergency Spillway	Auxiliary Spillway	Existing	New	Spillway	Existing	Enlarged	Combined	MWSE	Elevation	Raise
				cfs	cfs	cfs	cfs	cfs	cfs	feet	feet	feet
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A-1	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 289 ft	N/A	765	807	---	11200	13117	25889	1721.60	1724.6	3.1
A-2	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 129 ft	N/A	795	836	---	16126	7906	25663	1723.32	1726.3	4.9
B	Replace Trashrack	Expand existing spillway (L = 266 ft) by 180 ft	N/A	786	---	---	14369	10563	25718	1722.83	1725.8	4.3
C	Replace Trashrack	No change	Concrete ogee with 100-year notch, chute and energy dissipator.	790	---	9761	15107	---	25658	1723.08	1726.1	4.6
D	Replace Trashrack	No change	RCC broadcrested weir with stair-stepped chute and energy dissipator.	792	---	9836	15032	---	25660	1723.05	1726.1	4.6
E	Replace Trashrack	Expand existing spillway (L = 266 ft) by 75 ft	3 ft x 80 ft box culvert at invert elevation 1712 ft	798	---	3981	15942	4851	25572	1723.38	1726.4	4.9
F	Replace Trashrack	Expand existing spillway (L = 266 ft) by 120 ft	4 ft x 8 ft box culvert at invert elevation 1695 ft	799	---	862	16074	7909	25644	1723.45	1726.5	5.0

TABLE 4
Spillway Performance for the Maximum Reasonable Flood (IDF1)

	Spillway Description			Peak Discharge, cfs								
				Principal Spillway		Auxiliary	Emergency Spillway				Dam Crest	Free-
Alternative	Principal Spillway	Emergency Spillway	Auxiliary Spillway	Existing	New	Spillway	Existing	Enlarged	Combined	MWSE	Elevation	board
				cfs	cfs	cfs	cfs	cfs	cfs	feet	feet	feet
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A-1	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 289 ft	N/A	804	841	---	17070	20146	38861	1723.80	1724.6	0.80
A-2	Add 6 ft x 6 ft box culvert. Replace Trashrack	Expand existing spillway (L = 266 ft) by 129 ft	N/A	833	872	---	23453	12321	37479	1725.91	1726.3	0.49
B	Replace Trashrack	Expand existing spillway (L = 266 ft) by 180 ft	N/A	825	---	---	21651	15745	38221	1725.80	1725.8	0.52
C	Replace Trashrack	No change	Concrete ogee with 100-year notch, chute and energy dissipator.	830	---	13797	22832	---	37459	1725.69	1726.1	0.41
D	Replace Trashrack	No change	RCC broadcrested weir with stair-stepped chute and energy dissipator.	830	---	13999	22687	---	37516	1725.65	1726.1	0.45
E	Replace Trashrack	Expand existing spillway (L = 266 ft) by 75 ft	3 ft x 80 ft box culvert at invert elevation 1712 ft	836	---	4496	2247	7349	36930	1726.1	1726.4	0.30
F	Replace Trashrack	Expand existing spillway (L = 266 ft) by 120 ft	4 ft x 8 ft box culvert at invert elevation 1695 ft	835	---	904	23866	11758	37363	1726.04	1726.5	0.46

Cost

Cost distinguishes the alternatives into a lower cost group (Alternatives A-1, A-2, B and F), and a higher cost group (Alternatives C, D and E). The lowest cost is Alternative B, but that alternative has undesirable frequent flows through the emergency spillway and subsequent flood issues for the School District which will require additional cost for flood protection and maintenance.

10-Year and 100-Year (Future Condition) Flood Performance

100-year (future condition) peak discharges to Ashbrook Wash range from about 1,300 cfs to about 1,700 cfs (see Table 2). For comparison, the 100-year existing (1994) peak discharge is 966 cfs, and for future conditions is 1,630 cfs. Therefore, none of the alternatives result in significantly increased flood hazard for the 100-year (future condition) flood. The maximum water surface elevation (MWSEL) for the 100-year flood is lower than the emergency spillway crest for all alternatives other then Alternative B. Therefore, for those alternatives, the athletic field and adjacent school grounds will not be subject to flooding (from spillway discharges) for all events equal to or less than the 100-year flood. For Alternative B, 1,036 cfs passes over the emergency spillway (about 2 cfs/foot) at a MWSEL of 1,715.8 feet and maximum spillway depth of less than 1 foot. The gym and possibly other facilities on the athletic field should receive flood protection if Alternative B is selected. It is noted that the emergency spillway would operate for all events larger than the 10-year flood for Alternative B. That would result in some potential disruption in the use of the athletic field and potential impacts to school functions. Such flooding, although frequent, is not severe nor does it constitute a hazard to other then school facilities because of floodwarning capabilities by FCDMC and the Town.

Spillway performance, as measured by maximum water surface elevation in the storage pool upstream of the dam and peak discharges to Ashbrook Wash downstream of the dam, are provided in Table 5. That table provides those measures for the 10-year (future) and the 100-year (existing and future) condition floods.

TABLE 5
Summary of Spillway Performance for the 10-year (future) and 100-year (existing and future) Condition Floods

	GEP Dam MWSE, in feet			Peak Discharge to Ashbrook Wash, in cfs		
	10-year	100-year	100-year	10-year	100-year	100-year
Alternative	Future	Existing	Future	Future	Existing	Future
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A-1	1709.20	1711.36	1714.44	1053.00	1164.00	1306.00
A-2	1709.20	1711.36	1714.44	1053.00	1164.00	1306.00
B	N/A	N/A	1715.76	N/A	N/A	1701.00
C	N/A	N/A	1714.74	N/A	N/A	1605.00
D	N/A	N/A	1714.75	N/A	N/A	1594.00
E	1712.84	1713.69	1714.79	870.00	1148.00	1671.00
F	1708.74	1710.97	1714.11	1085.00	1189.00	1331.00

Inflow Design Flood (IDF2) Performance

All alternatives provide adequate and equal protection against the inflow design flood. The peak discharge from the dam ranges from more than 25,500 cfs to almost 26,000 cfs. The MWSE ranges from 1,721.6 feet to almost 1,723.5 feet. The lowest MWSE is for Alternative A-1, but it also requires the largest emergency spillway. The MWSE in the range shown does not adversely affect the performance of the dam or result in flood inundation of habitable structures. A MWSE greater than about 1,720 feet causes inundation across Golden Eagle Boulevard and into the adjacent golf course. Appropriate easements are required for the flood inundation limits. For all alternatives other than Alternative A-1 there would be potential breakout through the terrace notch by the church, as previously discussed. Elimination or mitigation of that breakout potential needs to be evaluated and rectified, or the MWSE lowered to below 1722.5 feet. The only significant impact of MWSE is the required raising of the earthen embankment.

Alternatives A-1, A-2, B and F result in the largest discharges (about 24,000 cfs) through the emergency spillway with consequent severe flood damage to the athletic field and appurtenant facilities. Alternative E results in slightly less (about 21,000 cfs) discharge through the emergency spillway. Alternatives C and D result in the least discharge through the emergency spillway (about 15,000 cfs). Under all alternatives, damaging emergency spillway releases would pass through the athletic field as flood water returns to Ashbrook Wash.

Ashbrook Wash Floodplain

The results of water surface elevation evaluations for Ashbrook Wash downstream of GEP Dam are provided in Appendix C for Alternatives A-1, A-2, C and D, and in Appendix F for Alternative F. Water surface elevation calculations were not performed for either Alternative B or E. The 100-year, future condition, peak discharges from GEP Dam to Ashbrook Wash are 1,701 cfs for Alternative B and 1,671 cfs for Alternative E. The floodplain analysis for Alternative C is based on 1,605 cfs from GEP Dam (see Table 5 for peak discharges for the various alternatives), therefore, the calculated water surface elevations for Alternatives B and E would be slightly higher then those for Alternative C.

The evaluation of floodplain impacts of the various alternatives is complicated by the following factors:

1. GEP Dam modifications to the principal and/or auxiliary spillways are being designed for the 100-year, future, full build-out condition in the watershed. Whereas the present regulatory floodplain analysis is based on the existing dam under 1994 watershed conditions.

2. Physical changes have occurred to Ashbrook Wash consisting of:

   a. Construction of gravel mine access road(s) across the wash downstream of the Town corporate limits.

   b. Channel modifications between El Pueblo Boulevard and the Town corporate limits.

   c. Construction of an improved (culvert) crossing at Fountain Hills Boulevard to replace the dip crossing.

   d. Vegetation clearing in the wash by the Town.

Therefore, floodplain changes to Ashbrook Wash are a result of a combination of:

1. Increased runoff due to upstream urbanization.

2. Increased discharge from GEP Dam due to increased principal spillway plus auxiliary spillway capacity (for all but Alternative B for which 100-year discharges will pass over the enlarged emergency spillway plus through the existing principal spillway).

3. Changes to Ashbrook Wash itself.

The floodplain impact of changes to GEP Dam for Alternatives A-1, A-2, C and D are provided in Appendix C (Table 1). Column 4 of that table lists water surface elevations in Ashbrook Wash using 1994 watershed conditions and the present Ashbrook Wash modifications below El Pueblo Boulevard and the new Fountain Hills Boulevard culvert crossing. Water surface elevations for similar hydrology and channel conditions are listed in column 4 for Alternatives A-1, and A-2, column 5 for Alternative C, and column 6 for Alternative D. Comparison of those water surface elevations indicates that those alternatives result in a small (generally only a few tenths

of a foot and less than 1 foot) raise in the water surface elevations in Ashbrook Wash. The conclusion being that changes to the spillway capacities of GEP Dam for those alternatives have minor impact on the present (1994) regulatory floodplain of Ashbrook Wash.

Results of water surface elevations for Alternative F are provided in Appendix F (Table 1). Comparisons between the 1994 FIS results with channel modifications (column 5) and similar conditions with Alternative F (column 6) indicate relatively small increases in water surface elevations due to that alternative, although there are a few locations where the water surface rise is as much as 1.3 feet.

Earth Embankment Raise

All alternatives require a fairly modest raise to the embankment of the dam. The minimum raise is about 3 feet for Alternative A-1. The maximum raise is about 5 feet for Alternative F. The raise for other alternatives is slightly less than 5 feet. For all alternatives, 3 feet of residual freeboard is provided. The embankment crest width is maintained at 12 feet, and an upstream embankment raise is proposed. The slope of the embankment will be maintained at a minimum of 1V:2H, pending the result of the embankment stability study. Embankment raise considerations are essentially equal for all alternatives.

IDF1 (with upstream dam break) Performance

Routing IDF1 through the dam with the proposed spillway modifications does not result in overtopping of the earthen embankment for any alternative. The residual freeboard under IDF1 is less than a foot for all cases and as little as about 0.3 feet. Considering the severity of assumptions for IDF1, this is not considered a design factor. All alternatives are considered to be essentially equivalent for IDF1 conditions.

Constructability

Alternative B has the least construction, being limited to a 5-foot raise of the embankment and a 180-foot enlargement of the emergency spillway. Alternatives C and D have the most difficult construction. For Alternative C, extensive forming will be required for the concrete ogee crest, and the low-flow spillway section and inclined side walls will be problematic to design and construct. For Alternative D, the complex geometry will require careful design and construction planning. Alternatives A-1 and A-2 are rather straightforward construction other than providing adequate seepage

treatment and potential problems dealing with the existing structure and placement of embankment zones in the embankment cut. Alternative E is rather simple construction requiring a modest cut in the top 11 feet of embankment for placement of the auxiliary spillway. Alternative E does, however, require the construction of a concrete spillway chute on the downstream face of the embankment. Alternative F is also rather simple construction, although it requires removal of embankment fill essentially to the foundation at the maximum section of the dam. However, Alternative F eliminates the concrete spillway chute of Alternative E, and results is a smaller culvert structure through the embankment.

Other Factors

Alternatives A-1 and A-2 require excavation and removal of the embankment section as illustrated in Plates 3 and 4. That excavation would extend to the dam foundation below elevation 1,695 feet. This results in an embankment cut of more than 25 feet. The top width of the embankment cut at the dam crest would be in excess of 200 feet. Essentially the entire left end of the embankment would be removed to the left abutment. Embankment fill would need to be placed in a tight construction zone with an abutment at one end and the exposed embankment cut at the other. The new principal spillway and existing principal spillway would be at the maximum depth section of the cut. Adequate seepage control would be required – possibly a seepage diaphragm and also retrofit for seepage control around the existing structure. Placement of zoned embankment material, compaction against the structure and abutment and embankment interfaces will be difficult. All reconstruction problems due to the embankment cut and exposure of foundation and abutment conditions cannot be anticipated. Such construction could result in unexpected construction costs and significant delays in project completion.

Aesthetics

Alternatives A-1, A-2, and B have minimum aesthetic impacts other than raise of the embankment and emergency spillway enlargement. The aesthetic impact of those alternatives is probably insignificant. Alternatives C and D result in large, prominent structures that will be evident from both the park and athletic field. Both have large structural energy dissipators at the toe of the dam which will be major visual items in addition to the downstream chute on the embankment. Although some aesthetic treatment can be applied (coloring concrete, rough texture of RCC, landscaping around the energy dissipator) in general, it will be difficult to avoid a visual impact.

For Alternative E, the auxiliary spillway inlet (3 feet high by 80 feet wide) will be visible from the park. The steel trashrack can be painted to blend with the embankment slope to soften the visual impact. The concrete chute on the downstream embankment slope will be visible from the athletic field but the stair-steps will break the flat concrete appearance. The energy dissipator will be a relatively small structure due to the low discharge per foot of width. For Alternative F, the auxiliary spillway is located at the base of the embankment thus lessening its visual impact from either the park or the athletic field. The downstream energy dissipater will be constructed below the existing land surface, which will diminish its line of sight from the athletic field, or from Ashbrook Wash. As with Alternative E, the trashrack can be painted to blend with the embankment.

Impacts to the Park

The major impact to the park will be encroachment of the embankment due to the upstream raise, however, that is relatively minor as seen in Plates 3 through 9. The concrete sidewalk, drainage channel and some landscaping will be affected. The emergency spillway is enlarged for Alternatives A-1, A-2, B, E and F but that will have minor impact on park facilities.

Impacts to School Grounds

The major impact will come for Alternatives C and D due to large energy dissipaters for the auxiliary spillways. Alternatives A-1, A-2, B, E and F all require expansion of the existing emergency spillway. Those expansions, other than requiring appropriate scour protection, do not adversely impact the athletic field or school grounds. However, Alternatives E and F require some regrading at Ashbrook Wash to return flow from the auxiliary spillway to the wash. All alternatives require evaluation of the scour protection that is afforded by the amphitheater steps, and adequate scour protection will need to be provided for any alternative that is selected. If additional scour protection is required with possible reconstruction of the amphitheater, options will be developed and those will be coordinated with the School District to reach a mutually agreeable solution. The major impact to the school is flood protection that will be equivalent for all but Alternative B which may require some additional flood protection of facilities in the athletic field.

Safety

By safety is meant hazard to persons due to incidental and/or unauthorized activities on the dam structures. None of the alternatives are considered to have adverse safety features. In all cases, the existing principal spillway will be equipped with a new trashrack which will also serve as an access barrier for people and animals. An outlet access barrier is not proposed but could be added if access is to be restricted from the outlet of that structure. For Alternatives E and F, a trashrack would be installed on the inlet of the auxiliary spillway, and an access barrier may be desired on the outlet to avoid unauthorized entry into that culvert structure. The stair-stepped chute of Alternative E (2-foot high steps with 4-foot runs) would enhance the safety aspect of that chute as well as be an effective hydraulic energy dissipator. Vertical walls of the chute for Alternative E may warrant an appropriate fence. Alternatives C and D are shown with inclined (1V:3H) side walls on the crest and chute to avoid high, vertical walls, however, those alternatives would be the most difficult to fence or otherwise restrict access.

RECOMMENDED ALTERNATIVE

Alternative F is recommended based on the following, as previously discussed:

- Emergency Spillway Operation – The emergency spillway operates only for inflow floods in excess of the 100-year, future condition, flood, thus reducing operation and maintenance costs for the athletic field.

- Cost – Although not the lowest cost alternative, the incremental cost over Alternative B (lowest cost) is offset by cost of additional flood protection and potential flood damage to the athletic field and ancillary facilities if Alternative B were selected. Although it is slightly more expensive than Alternatives A-1 or A-2, the additional cost is offset by construction uncertainty, potential construction delays and additional costs if excavation of the embankment and exposure of the existing principal spillway under Alternatives A-1 and A-2 produces unanticipated problems.

- Cut and Replacement of Embankment – Need for excavation of the existing embankment for construction of the auxiliary spillway does not present anticipated construction problems with the replacement of embankment fill, and eliminates uncertainties with installation of seepage control around the existing principal spillway.

- Emergency Spillway Enlargement – The emergency spillway is enlarged by only 120 feet. The spillway enlargement is conducive to extending the amphitheater steps which would be an offset against loss of amphitheater seating capacity due to relocation of the school security fence. There is no potential hydraulic interference from the bleachers downstream of the emergency spillway.

- Constructability – The alternative involves only normal construction practices of excavation, controlled placement of embankment fill, and typical concrete construction. Construction difficulty is considerably less then Alternatives A-1, A-2, C and D. Only Alternative B has lower construction difficulty. The construction difficulty is about equivalent for Alternative E.

- Aesthetics – Alternative F has minimal aesthetic impact as compared to the existing dam and other alternatives. Enlargement of the emergency spillway will not constitute a visual impact from either the park or the athletic field. There will be no appreciable change at the existing principal spillway other than removal of the existing timber trashrack and replacement by a less visual steel trashrack installed in a new concrete headwall and wing walls. The auxiliary spillway will be constructed at existing ground level and the culvert section is only 4 feet high and 8 feet wide. The trashracks on both the existing principal spillway and new auxiliary spillway can be painted to blend with the colors of the earthen embankment. The outlet and energy dissipater of the auxiliary spillway is constructed below the existing ground level and will not be readily visible from the athletic field. The effect of embankment raising is about equivalent for all alternatives

- Impacts to Park –The toe of the earthen embankment will encroach about 10 feet into the park land area. It is not expected that the existing ball field fence will need to be moved and there would be no loss of ball field outfield. Some portion of the existing concrete sidewalk may need to be relocated. The drainage channel along the toe of the dam will be relocated as necessary for embankment raising and that channel will need riprap or other erosion protection to avoid scour at the toe of the dam. The major impact is that flood inundation magnitude and frequency will be substantially reduced as compared with the existing facility and all other alternatives. This will reduce the frequency and cost of maintenance to the park after storm runoff events.

- Impacts to School Facilities – Enlargement of the emergency spillway will require extension of scour protection about 120 feet between the existing amphitheater and bleachers. The amphitheater may need to be reconstructed or fitted with adequate scour protection. Such scour protection would be required regardless of the selected alternative. If additional scour protection is needed beyond that presently provided by the amphitheater, options will be developed and the selected plan will be chosen in cooperation with the School District. It has been determined that a school security fence can be installed across the amphitheater if the fence is about 5 feet lower that the crest of the spillway. The outlet of the

auxiliary spillway and energy dissipater will be located in unused property between the athletic field and Ashbrook Wash. Fencing will be installed, as practical, to restrict access to those facilities from the athletic field.

- Impacts to Ashbrook Wash – This alternative includes the installation of a low level auxiliary spillway that, in combination with the existing principal spillway, increases discharges to Ashbrook Wash for all frequencies up to and including the 100-year flood. The floodplain impacts to Ashbrook Wash due to the modifications to the dam alone are relatively small. However, the cumulative impact due to increase urban development in the watershed and recent physical changes to Ashbrook Wash along with the modification to the dam result in water surface elevation changes that may meaningfully alter the current (1994) regulatory floodplain in a few locations and this will need to be considered as a project requirement for final design. However, similar floodplain impacts would be realized with any of the alternatives that are considered viable.

REFERENCES

1. Arizona Department of Water Resources, 1991, Guidelines for Determination of Spillway Capacity Requirements.
2. Arizona Department of Water Resources, 1999, Rules and Regulations Pertaining to Dam Safety Procedures (Draft).
3. AGRA Earth & Environmental, Inc., 1998a, Geotechnical Investigation Report, Golden Eagle Park Dam, Assignment No. 5 near Golden Eagle Boulevard and Palisades Boulevard, Fountain Hills, Arizona: for Flood Control District of Maricopa County.
4. AGRA Earth & Environmental, Inc., 1998b, Dam Safety Inspection, Golden Eagle Park Dam, Assignment No. 5 near Golden Eagle Boulevard and Palisades Boulevard, Fountain Hills, Arizona: for Flood Control District of Maricopa County.
5. George V. Sabol Consulting Engineers, Inc., 1994, Fountain Hills (North) Floodplain Delineation Study: for Flood Control District of Maricopa County, Phoenix, Arizona.
6. George V. Sabol Consulting Engineers, Inc., 1996a, Fountain Hills Dam Break Analysis for Golden Eagle Park Dam, Hesperus Dam, Aspen Dam, North Heights Dam, SunRidge Canyon Dam: for Anderson-Nelson, Inc., Phoenix, Arizona.
7. George V. Sabol Consulting Engineers, Inc., 1996b, Fountain Hills Area Drainage Master Plan, Interim Report, Reconnaissance Study and Alternative Evaluation for Golden Eagle Park Dam: for Flood Control District of Maricopa County.
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9. U.S. Army Corps of Engineers, 1995, Hydraulic Design of Spillways: EM 1110-2-1603, as published by American Society of Civil Engineers, NY, NY.
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11. Federal Highway Administration, 1985, Hydraulic Design of Highway Culverts.

APPENDIX A

IDF HYDROLOGY MEMO

Memo

Stantec

To: Tom Renckly, FCDMC
Kathryn Gross, FCDMC
Jim Leubner, Town of Fountain Hills
Rich Dobson, Ftn. Hills Unified School Dist.
Larry Lambert, ADWR

From: George Sabol

File: 28900095

Date: 04 March 1999

Re: Golden Eagle Park Dam – Selection of IDF

Background

The scope of work (3.5.1) requires selection of two inflow design floods (IDF). One IDF (IDF1) is to be based on the assumption of breach of one of the three upstream dams. The other (IDF2) is to be based on other assumptions. Those two IDF's will be used in developing and evaluating various alternatives for dam modification.

Review of Hydrology Studies

Inflow floods for Golden Eagle Park Dam (GEP Dam) were defined in previous studies by George V. Sabol Consulting Engineers, Inc. (GVSCE). Those are summarized as follows:

1. Fountain Hills (North) Floodplain Delineation Study (Fountain Hills FDS) performed by GVSCE and completed in 1994 for the Flood Control District of Maricopa County (FCD 92-04).

   100-year existing (1993) and future condition hydrographs were developed based on watershed parameters as documented in that report.

2. Town of Fountain Hills Dam Break Analysis for Golden Eagle Park Dam, Hesperus Wash Dam, Aspen Dam, North Heights Dam and Sunridge Canyon Dam performed by GVSCE and completed in 1996 for Anderson-Nelson, Inc.

   Dam break analysis of GEP Dam was performed using a 0.5 PMF inflow based on the following assumptions:

   a. Storm producing a 0.5 PMF event over the entire watershed including the watersheds to the three upstream dams.

   b. 0.5 PMF spillway releases from both Sunridge Canyon and Aspen Dams.

   c. Combined 0.5 PMF spillway release and piping breach of North Heights Dam.

3. Fountain Hills Area Drainage Master Plan (Fountain Hills ADMP) performed by GVSCE and completed in 1997 for the Flood Control District of Maricopa County (FCD 94-16).

   IDF for GEP Dam was developed based on the same hydrologic model as the dam break analysis except that concurrent breach of the North Heights Dam was not assumed.

ADWR reviewed the Fountain Hills ADMP report and provided comments regarding certain assumptions and spillway hydraulics. Based on those comments and previous GVSCE reports, the District analyzed numerous hydraulic conditions and assumptions in evaluating IDF's for GEP Dam. Those results are presented in Development of Inflow Design Floods for use in Alternatives Analysis Studies (FCDMC, January 1999).

For the present study, Stantec is to review the previous hydrology by GVSCE and the District, and to recommend the two IDF's that are to be used. This District report (January 1999) uses the hydrologic models developed by GVSCE with modifications for various additional assumptions and conditions, and the results are presented in Tables 1.1, 1.2 and 1.3 of the District report. Each table is based on the use of a weir coefficient for emergency spillway hydraulics for all four dams in the study area. Those coefficients being 3.0, 2.63 and 2.60, respectively. A summary of the various assumptions and conditions evaluated by the District is shown in Table 1.

Evaluation of the IDF results presented by the District in Tables 1.1, 1.2 and 1.3 are summarized as follows:

A. The assumption of emergency spillway weir coefficient (3.0, 2.63 or 2.60) is not sensitive to the estimated magnitude of the IDF at GEP Dam. A "C" coefficient of 2.60 is reasonable and the District's results presented in Table 1.3 are adopted.

B. The assumption of clogged principal spillways (Sunridge Canyon and Aspen Dams) (IDF1A and IDF2A) result in only a 5 - 6% increase in the IDF at GEP Dam. In view of the error and uncertainty in PMF hydrology, spillway hydraulics, and dam breach analysis, such small increases in IDF results is not considered relevant.

C. The assumption of inflow equals outflow at Sunridge Canyon Dam (IDF1B and IDF2B) results in only a 1 – 2% increase in the IDF at GEP Dam. That increase is not relevant, nor is the assumption justified.

D. The assumption that the Sunridge Canyon and Aspen Dam reservoirs are empty at the onset of the IDF storm (IDF1C) results in a 10% reduction in the IDF at GEP Dam for the with breach at North Heights Dam condition. That assumption coupled with the assumption of breach of North heights Dam due to piping (and a full reservoir) is hydrologically inconsistent, somewhat unconservative, and not in line with usual dam safety practices for upstream dams.

E. The assumption that all three reservoirs are empty at the onset of the IDF storm (IDF2C) results in a 29% reduction in the IDF at GEP Dam. That assumption is not in line with usual dam safety practices for upstream dams.

TABLE 1

Summary of assumptions and conditions analyzed by the District (January 1999)

North Heights Dam								
Assumptions	**IDF1**	**IDF1A**	**IDF1B**	**IDF1C**	**IDF2**	**IDF2A**	**IDF2B**	**IDF2C**
Piping Breach	YES	YES	YES	YES	NO	NO	NO	NO
Initial WSE	100-YEAR	100-YEAR	100-YEAR	100-YEAR	100-YEAR	100-YEAR	100-YEAR	EMPTY
Principal Spillway	CLOGGED	CLOGGED	CLOGGED	CLOGGED	OPEN	CLOGGED	CLOGGED	OPEN
Sunridge Canyon & Aspen Dams								
Assumptions	**IDF1**	**IDF1A**	**IDF1B**	**IDF1C**	**IDF2**	**IDF2A**	**IDF2B**	**IDF2C**
Breach	NO	NO	NO	NO	NO	NO	NO	NO
Initial WSE	100-YEAR	100-YEAR	100-YEAR	EMPTY	100-YEAR	100-YEAR	100-YEAR	EMPTY
Principal Spillway	OPEN	CLOGGED	CLOGGED	OPEN	OPEN	CLOGGED	CLOGGED	OPEN
Reservoir Routing at Aspen	YES	YES	YES	YES	YES	YES	YES	YES
Reservoir Routing at Sunridge	YES	YES	NO*	YES	YES	YES	NO*	YES

*Inflow to Sunridge Canyon Dam is set to equal outflow (no reservoir routing)

Recommended IDF's

Therefore, based on the results presented by the District (January 1999) and the summary and discussion presented herein, the two recommended IDF's for GEP Dam are IDF1 for the with upstream dam breach and IDF2 for no upstream dam breach. Those IDF hydrographs are shown in Figures 1 and 2, respectively.

Description of Hydrologic Models for the Recommended IDF's

A brief description of the hydrologic modeling for IDF1 and IDF2 is presented. Complete model development including parameter estimation is provided in the three previously referenced GVSCE reports.

In developing the GEP Dam IDF hydrologic models, the following were performed:

1. Watershed mapping and parameter estimation was adopted from the Fountain Hills FDS study. An HEC-1 model for future (full build-out conditions) was developed. Multiple subbasins are used in that model so as to define 100-year discharges at numerous flow concentration points for purposes of floodplain delineation.
2. Using information from the Fountain Hills FDS, an HEC-1 model was developed wherein the multiple subbasin model was converted to single basins for each of the four dams. The simplified HEC-1 model was demonstrated to reproduce 100-year discharges at the dams as compared to the more complex multiple subbasin model of the Fountain Hills FDS. Those results are reported in the 1996 dam break report.
3. Dam breach during 0.5 PMF storm events were developed for each of the four dams and those are reported in the 1996 dam break report. For GEP Dam, it was assumed that for the purpose of dam break analysis, one of the three upstream dams would fail concurrently with the 0.5 PMF event. It was determined that piping breach of North Heights Dam constituted the most severe flood at GEP Dam. The timing of the peak outflow due to piping breach was adjusted to coincide with the peak spillway outflow from North Heights Dam so as to produce the largest combined outflow hydrograph from North Heights Dam. That dam breach hydrograph is incorporated into IDF1, as recommended herein.
4. The North Heights Dam breach (QI records in IDF1) is based on the following:
    - Plugged principal spillway.

- Initial 100-year (future condition) water surface elevation with flow passing over the emergency spillway.
- Piping breach during 0.5 PMF to maximize the North Heights Dam peak discharge.

5. For the purpose of reconnaissance and feasibility level studies for GEP Dam as part of the Fountain Hills ADMP, an IDF was developed from the previous dam break modeling. The IDF does not assume that any of the three upstream dams fail during the 0.5 PMF. That assumption is consistent with IDF2, as reported herein. Background and hydrologic modeling information in regard to the development of the IDF models are presented in Appendices A and B. Appendix A is from the GVSCE (November 1996) Fountain Hills ADMP report, and it includes a watershed map, PMP estimation worksheets, and discussion of parameter estimation. Appendix B is from the GVSCE (July 1997) Fountain Hills ADMP report, and it provides the HEC-1 file that the District revised in performing its study.

6. Based on ADWR comments, the District modified the previous IDF's as prepared by GVSCE, and analyzed various conditions and assumptions as shown in Table 1. Four IDF's were defined for a with dam breach (North Heights Dam) condition, and four for a without dam breach condition.

7. As discussed, herein, Stantec reviewed the previous GVSCE and District models and recommended IDF1 (with dam breach) and IDF2 (without dam breach).

The HEC-1 files that were developed by the District in developing IDF1 and IDF2 are provided in Appendices C and D, respectively. Stantec provided additional editorial comments to the District provided files to document the development of those models. A diskette of the HEC-1 files for IDF1 and IDF2 is attached. That diskette contains the following files:

	FILE	COMMENT
A.	DAM4-PMF.IH1	HEC-1 file by GVSCE (July 1997) used to develop IDF for GEP Dam for reconnaisance and feasibility level studies. This file does not include upstream dam break, and is the file that the District modified for its studies (Jan. 1999). This file is shown in Appendix B.

	FILE	COMMENT
B.	DAM11-RT.IH1/OH1	Dam break analysis (piping breach) as developed by GVSCE (Jan. 1996) for North Heights Dam. This breach outflow hydrograph is used to develop the QI record in IDF1.
C.	DAM11P.OUT	HEC-1 file as developed by GVSCE (Jan. 1996) of the emergency spillway release from North Heights Dam prior to and concurrent with the piping breach. This hydrograph is added to the piping breach hydrograph to develop North Heights Dam QI record in IDF1.
D.	QI.xls	Spreadsheet development of QI record in IDF1.
E.	IDF1.OUT	HEC-1 file for GEP Dam IDF1 (with North Heights Dam breach). Basic HEC-1 file was originally developed by GVSCE (DAM4-PMF.IH1) and subsequently modified by the District (addition of QI record). Stantec added editorial comments to the District's file.
F.	IDF2.OUT	HEC-1 file for GEP Dam IDF2 (without upstream dam break). File was developed by GVSCE (DAM4-PMF.IH1) and used by the District in its January 1999 analysis. Stantec added editorial comments.

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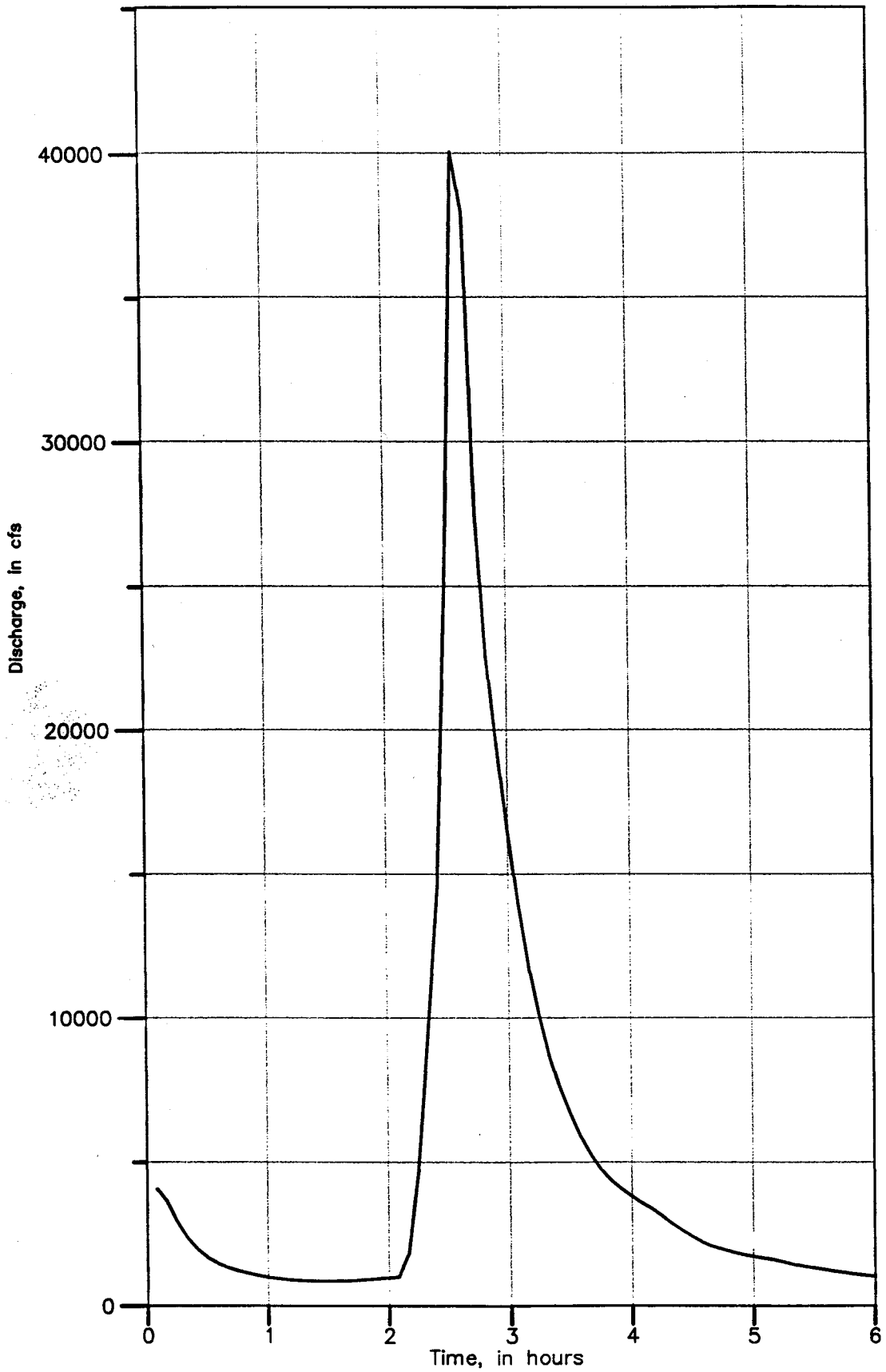


FIGURE 1

IDF1 for Golden Eagle Park Dam
With North Heights Dam Break

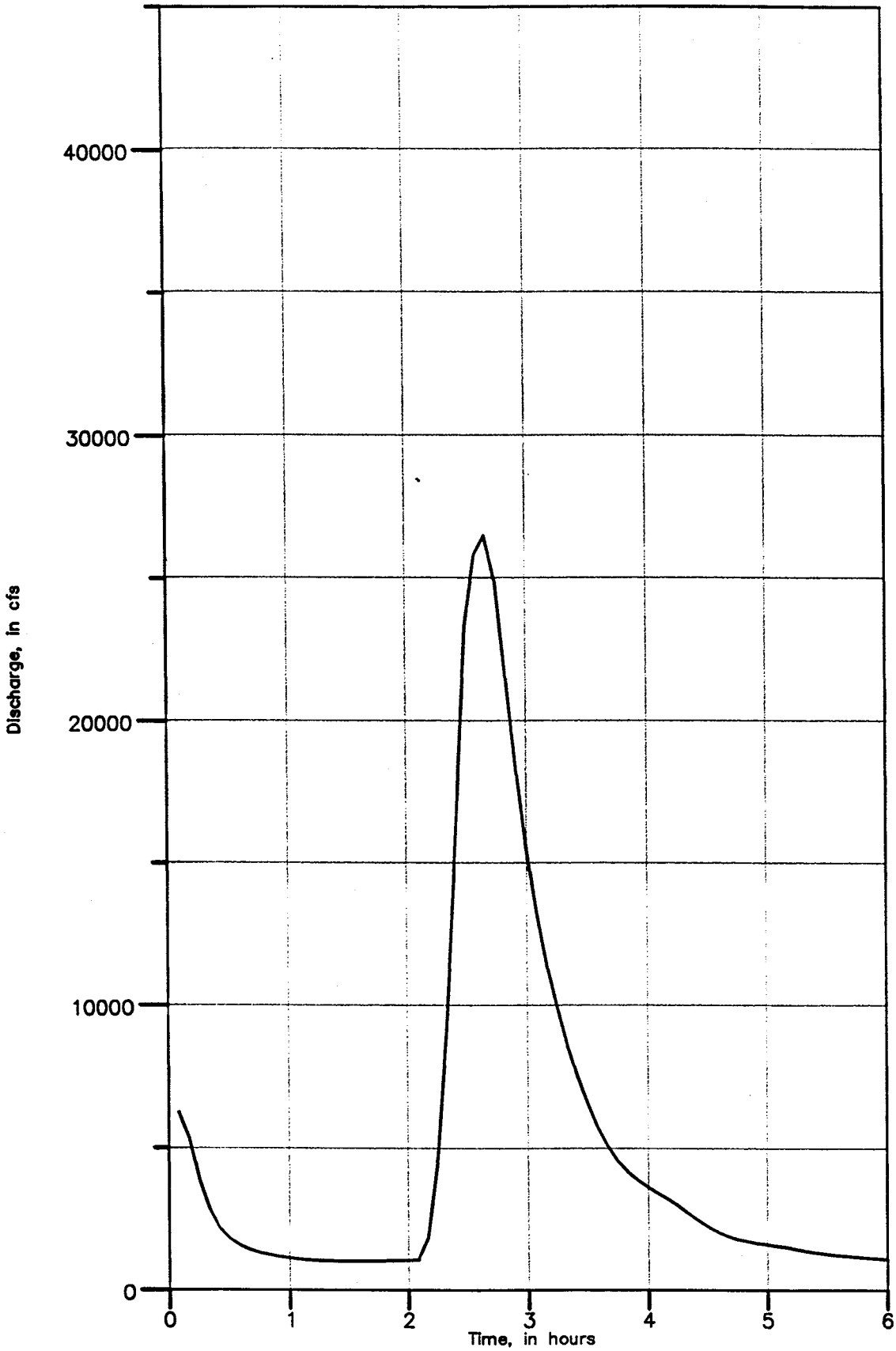


FIGURE 2

IDF2 for Golden Eagle Park Dam
Without Upstream Dam Break

Appendix A

Hydrologic model information from the Fountain Hills ADMP Report
(GVSCE, November 1996)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

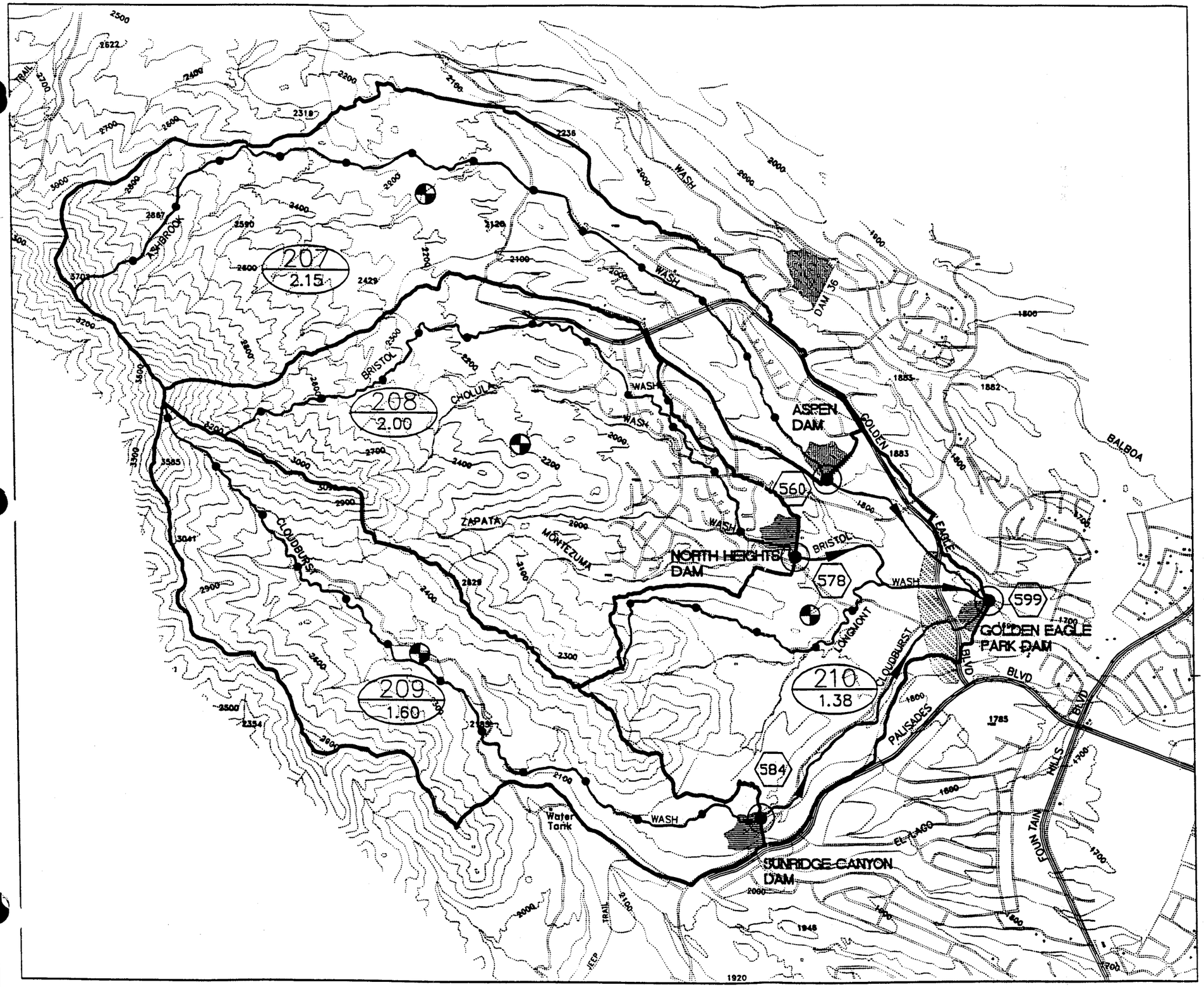
FOUNTAIN HILLS AREA DRAINAGE MASTER PLAN FCD 94-16

RECONNAISSANCE STUDY
and
ALTERNATIVE EVALUATION
for
GOLDEN EAGLE PARK DAM

INTERIM REPORT

George V. Sabol Consulting Engineers, Inc.
Scottsdale, Arizona

NOVEMBER 1996



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FOUNTAIN HILLS ADMP

F.C.D. CONTRACT NO. 94-16

LEGEND

- Major Basin ID / Area in Square Miles (207 / 2.15)
- Major Road
- HEC-1 Concentration Point (560)
- Basin Centroid
- Lag Flow Path
- HEC-1 Routing Path
- Minor Road
- Major Subbasin Boundary
- Existing Dam
- Proposed Dam

SCALE: 1"=2000'

CONTOUR INTERVAL = 100'

FIGURE 1

WATERSHED DRAINAGE MAP

George V. Sabol Consulting Engineers, Inc.

BASE TOPOGRAPHY COMPILED FROM USGS QUADRANGLE MAPS

FLOOD HYDROLOGY

Existing Hydrology Models

The existing Ftn Hills FDS HEC-1 models developed by GVSCE for the Flood Control District of Maricopa County (Contract FCD 92-04) are used and modified as required to provide inflow design hydrographs for the study alternatives. Those models were developed using the HEC-1 Flood Hydrology Program, version 4.0.1E, dated May 1991 (U.S. Army Corps of Engineers, 1991), and the methodology contained in the FCDMC Design Manual. The 100-year precipitation, distribution and areal reduction factors were obtained from the FCDMC Design Manual and modeled using JD Records. Rainfall losses were estimated using the Green and Ampt infiltration equation with an estimate for surface retention and effective imperviousness. Hydrographs were generated using Clark unit hydrograph methodology. Channel routing was accomplished using the Modified Puls method with the normal depth option. Reservoir routing through the various detention areas was accomplished using the Modified Puls method with the level pool option. The Ftn Hills FDS models were also verified by indirect methods and those verifications provided no reason to reject the modeling results. Based on a review of that modeling and the verification results, the Ftn Hills FDS watershed hydrology modeling is adopted for use in this study.

As previously referenced, the results of the Ftn Hills FDS existing condition watershed hydrology is summarized in a three volume report and the future condition hydrology is bound separately as a fourth document. Unless otherwise noted, all references made in this report to the Ftn Hills FDS watershed hydrology and/or modeling, specifically refer to the Fountain Hills North Floodplain Delineation Study, Technical Data Notebook-Hydrology, Future Conditions (GVSCE, 1994). Excerpts from that report (and others where applicable) are included herein as appendices when considered pertinent or required.

Multiple Basin Models

Major Basins 207, 208, 209 and 210 are extracted from the overall Ftn Hills FDS multiple basin model to facilitate generation of the single basin models as discussed below. A separate multiple basin model for Major Basin 210 is developed without the inclusion of the routed hydrographs from Aspen, North Heights, and SunRidge Canyon Dams, in order to provide a runoff hydrograph for development of the single basin model for this area. Printouts of the HEC-1 output files for each multiple basin model are provided in Appendix B.

Single Basin Model Generation

General

The Ftn Hills FDS hydrology models were developed for the 100-year, 6-hour and 24-hour storms. Those models include extensive detail in the form of numerous subbasins, concentration points, flowsplits, channel and storage routing. Although that level of detail is normal for the identification of peak discharges at frequent locations along a floodplain delineation reach, it results in large and tedious computer models, especially with respect to the requirements of this study. In order to simplify the 100-year hydrology modeling effort and facilitate a conversion of those models to generate 0.5 PMF inflow hydrographs, it is desirable to develop single basin hydrology models for the respective areas tributary to Aspen, North Heights, and SunRidge Canyon Dams, and the intermediate area between the upstream dams and GEPD. Those drainage basins are shown on Figure 1 and are respectively identified from the Ftn Hills FDS report as Major Basins 207, 208, 209 and 210. Single basin models of those major basins can then be more efficiently combined and routed as required for evaluation of the alternatives.

The procedure for generation of the single basin 100-year and PMF models is to first develop 100-year models that duplicate the Ftn Hills FDS multiple basin model runoff hydrographs at the desired locations (concentration points) using the methodology in the FCDMC Design Manual and parameters from the Ftn Hills FDS. The PMF models are then developed from the 100-year single basin models by replacement of the 100-year precipitation with the probable maximum precipitation (PMP) and distribution, and modification of the unit hydrograph lag parameter to reflect a PMF magnitude runoff. Those procedures are presented with more detail in the following sections.

100-Year Models

Precipitation Data - Precipitation and rainfall distributions are coded per the original Ftn Hills FDS models with appropriate areal reduction factors directly applied and the JD records removed. According to the Ftn Hills FDS results, 100-year, 6-hour storms controlled the peak discharges for the study basins. The combined inflow to GEPD, however, is controlled by the 100-year, 24-hour storm, therefore, both 6- and 24-hour single basin models are developed.

Basin Areas - Basin areas for the single basin models are estimated by summing the areas of Ftn Hills FDS subbasins encompassed by the major basin boundary. Refer to Exhibits "A" and "D" in Appendix A for detailed delineations of each subbasin and their relation to the major basin boundary. The single basin (referred to herein as study basin) boundaries are indicated on Figure 1 and correspond to the major basin boundaries of Exhibits "A" and "D". The composite areas for each study basin are summarized in Table 2. The individual subbasin areas as reported in the Ftn Hills FDS are summarized in Tables C1, C2, C3 and C4 of Appendix C, which respectively correspond to Study Basins 207, 208, 209 and 210.

Rainfall Loss Parameters - Rainfall losses are estimated by the Green and Ampt method, assuming that the watershed is fully developed. Green and Ampt rainfall loss parameters developed for the individual subbasins reported in the Ftn Hills FDS future condition hydrology report are composited for each study basin. The procedures used for compositing those values are summarized as follows:

1. **IA, RTIMP, DTHETA, Vegetative Cover** - The surface retention loss (IA), percentage of effective impervious area (RTIMP) and the antecedent volumetric soil moisture deficit (DTHETA) parameters are all estimated by area averaging the individual Ftn Hills FDS values for the subbasins encompassed by the study basin. The composite vegetative cover percentage is also estimated by area averaging the individual subbasin values.

2. **Bare Ground XKSAT** - The composite bare ground XKSAT value for each study basin is obtained by log-averaging the individual Ftn Hills FDS subbasin bare ground XKSAT values.

3. **PSIF** - The wetting front capillary suction (PSIF) is assigned based on the composite bare ground XKSAT value. That assignment is made using Figure 4.3 of the FCDMC Design Manual.

4. **Vegetation Adjusted XKSAT** - The composite bare ground XKSAT is adjusted for the effects of vegetation by the curve in Figure 4.4 of the FCDMC Design Manual. The composite vegetative cover percentage is used for that adjustment.

Table C1 in Appendix C, summarizes the Ftn Hills FDS individual parameter values for each subbasin included in Study Basin 207. Tables C2, C3 and C4 provide similar summaries for Study Basins 208, 209 and 210, respectively. The composite values for each study basin are summarized at the bottom of those tables and in Table 2. Excerpts of the supporting parameter calculation worksheets and tables from the Ftn Hills FDS hydrology report are also provided in Appendix C for reference.

TABLE 2

Summary of area and composite rainfall loss parameters for each study basin

Study Basin ID (1)	Area sq. miles (2)	Rainfall Loss Parameters: IA inches (3)	DTHETA (4)	PSIF inches (5)	Adjusted XKSAT in/hr (6)	RTIMP % (7)
207	2.149	0.17	0.31	4.90	0.29	31.55
208	2.000	0.10	0.25	4.80	0.28	50.48
209	1.603	0.13	0.28	4.62	0.32	41.50
210	1.382	0.09	0.24	5.61	0.19	24.82

Unit Hydrographs - The unit hydrographs for the single basin models are developed using the S-graph methodology outlined in the FCDMC Design Manual. The Phoenix Mountain S-graph is selected for modeling each study basin and the U.S. Army Corps of Engineers' lag equation is used. The lag equation physical parameters (except Kn) are measured from Figure 1 with guidance from the reach data summarized in the Ftn Hills FDS. Exhibits "A" and "D" were also referenced for verification of elevations and lengths. The basin hydraulic roughness value, Kn, is used as a calibration parameter in defining the unit hydrograph shape. That calibration process is accomplished by first assuming a reasonable value for Kn using the references provided in the FCDMC Design Manual and running the single basin model. The resulting runoff hydrograph from that run is then compared to the Ftn Hills FDS multiple basin runoff hydrograph at the same location, and the Kn value is adjusted accordingly. By reasonably varying the Kn value, the unit hydrograph is calibrated to produce a runoff hydrograph that closely approximates its target hydrograph from the Ftn Hills FDS multiple basin hydrology model. Table 3 summarizes the final unit hydrograph lag parameters developed for each study subbasin, including the calibrated Kn value.

TABLE 3

Summary of unit hydrograph lag parameters for each study basin for the 100-yr and PMF storms

Study Basin ID (1)	Area sq. miles (2)	Length miles (3)	Lca miles (4)	Slope ft/mi (5)	100-year Kn (6)	100-year Lag hours (7)	PMF Kn (8)	PMF Lag hours (9)
207	2.149	3.890	2.160	464.7	0.038	0.64	0.030	0.51
208	2.000	2.980	1.610	488.9	0.022	0.30	0.018	0.24
209	1.603	3.240	1.730	582.3	0.024	0.33	0.019	0.27
210	1.382	1.930	0.852	360.7	0.030	0.28	0.024	0.23

Final Results

Table 4 summarizes a comparison of the 100-year, 6-hour multiple basin versus single basin modeling results. Data reported for the Ftn Hills FDS multiple basin model is taken from the last HEC-1 operation. Table 5 provides a similar comparison of the 100-year, 24-hour results. Plots of the single basin versus Ftn Hills FDS multiple basin runoff hydrographs for each of the four study basin concentration point locations, are provided in Appendix D for inspection and comparison of the hydrograph shapes. Printouts of both sets of the HEC-1 single basin output files are also included in Appendix D. Plots and printouts for both the 100-year, 6- and 24-hour models are included.

PMF Models

Precipitation Data - The probable maximum precipitation (PMP) and temporal distribution for each study basin is estimated using the methods in Hydrometeorological Report No. 49 (HMR 49) (Hansen and others, 1984). The local, 6-hour PMP is the critical storm for all of the study basins. Worksheets for PMP estimation are provided in Appendix E.

Rainfall Loss Parameters - Rainfall loss parameters for the PMF modeling are the same as those used for the 100-year models. See Table 2 for those values.

TABLE 4

Comparison of single basin and multiple basin HEC-1 model results for the 100-year, 6-hour storm for each study basin

Study Basin ID (1)	Multiple Basin Conc. Pt ID (2)	Area sq. miles (3)	Multiple Basin Peak Discharge cfs (4)	Multiple Basin Time to Peak hours (5)	Multiple Basin Rainfall Excess inches (6)	Multiple Basin Runoff Volume acre-ft (7)	Single Basin Peak Discharge cfs (8)	Single Basin Time to Peak hours (9)	Single Basin Rainfall Excess inches (10)	Single Basin Runoff Volume acre-ft (11)
207	C560I	2.149	2,201	4.37	1.97	226	2,225	4.42	1.99	228
208	C578I	2.000	3,351	4.08	2.40	256	3,241	4.08	2.39	255
209	C584I	1.603	2,615	4.17	2.21	189	2,565	4.17	2.20	188
210	C210I	1.382	2,576	4.08	2.16	159	2,602	4.08	2.24	165

TABLE 5

Comparison of single basin and multiple basin HEC-1 model results for the 100-year, 24-hour storm for each study basin

Study Basin ID (1)	Multiple Basin Conc. Pt ID (2)	Area sq. miles (3)	Multiple Basin Peak Discharge cfs (4)	Multiple Basin Time to Peak hours (5)	Multiple Basin Rainfall Excess inches (6)	Multiple Basin Runoff Volume acre-ft (7)	Single Basin Peak Discharge cfs (8)	Single Basin Time to Peak hours (9)	Single Basin Rainfall Excess inches (10)	Single Basin Runoff Volume acre-ft (11)
207	C560I	2.149	1,871	12.33	2.14	245	2,012	12.25	2.13	244
208	C578I	2.000	3,011	12.08	2.73	291	3,049	12.08	2.71	289
209	C584I	1.603	2,166	12.17	2.44	208	2,025	12.08	2.43	208
210	C210I	1.382	2,141	12.08	2.14	157	2,121	12.08	2.13	157

Unit Hydrographs - It is documented in literature that Kn does not remain constant for all magnitudes of discharge (Cudworth, 1989). Rather, it decreases in value due to increased hydraulic efficiency associated with larger magnitude discharges. For the PMF, the Kn value is estimated as 80 percent of the 100-year Kn value, in order to account for the larger flows associated with that event. Those reduced values and resultant lag times are reported in Table 3 for each of the study basins.

Final Results - The final single basin PMF results for each study basin are presented in Table 6. Printouts of the HEC-1 model output for each PMF model are provided in Appendix E.

TABLE 6

Summary of single basin HEC-1 model results for the PMF by study basin

Study Basin (1)	HEC-1 Concentration Point (2)	Drainage Area sq. miles (3)	Single Basin PMF Results: Peak Discharge cfs (4)	Time to Peak hours (5)	Rainfall Excess inches (6)	Runoff Volume acre-feet (7)
207	C560I	2.15	17,974	2.58	12.57	1,440
208	C578I	2.00	26,969	2.33	13.28	1,416
209	C584I	1.60	20,238	2.33	13.20	1,125
210	C599I	1.38	19,580	2.33	13.22	971

Golden Eagle Park Dam Inflow Hydrographs

General

The 100-year, 6-hour, 100-year, 24-hour and PMF inflow hydrographs to Golden Eagle Park Dam and the proposed dam of Alternative No. 4, are developed by creating an HEC-1 routing model that hydrologically routes and combines each of the previously discussed single basin models. That modeling is accomplished by first reservoir routing hydrographs from Study Basins 207, 208 and 209 through each of their respective dams, channel routing those outflow hydrographs to GEPD, and combining the resultant hydrographs with the single basin hydrograph for Study Basin 210. Point precipitation

values are adjusted according to the total watershed area (7.13 square miles) that is tributary to GEPD. Storage routing methodologies and parameter estimations are summarized in the following sections.

Physical Data

Ftn Hills FDS Data - The physical data used in the routing analyses for existing facilities are taken directly from the Ftn Hills FDS, which were gathered by performing field surveys of the dams, and by extraction from the project mapping. Those data are presented in the form of stage versus storage and stage versus discharge relations for each dam, and cross section geometry for the channel reaches. In some cases, additional reservoir and channel route data are required to expand the capacities of those relations to correspond to the magnitudes of flow associated with a PMF event. Additional area data for use in the dams' stage versus storage relations are obtained by planimetering the project mapping. Additional cross section geometry information for channel routing are obtained by lateral extension of the representative cross sections on the project mapping and adding the new information to the cross section data set.

Physical Data for Alternatives - Physical data representing the proposed improvements for each alternative are taken from Plates 1 through 12, which as previously discussed, are generated using the project mapping. Ponded surface area data are obtained by use of a planimeter.

Reservoir Routes

Reservoir routing through each of the dams is accomplished using the Modified Puls, level pool option of HEC-1. Stage versus storage relations are derived using the data previously discussed, with the storage volumes estimated by the conic method. Stage versus discharge relations are developed based on the principal and emergency spillway data and the use of the following programs:

HY-8 Program - The stage versus discharge relations for the ungated principal spillway conduits are determined by use of the HY-8 computer program, version 4.1, which is based on the Federal Highway Administration's Hydraulic Design Series No. 5.

Uneven Weir Program - This program is used to analyze the emergency spillway and one dimensional dam overtopping hydraulics. The program is based on uneven weir methodology and employs weir discharge coefficient rating curves developed by the Army Corps of Engineers. The results of this program are used to generate stage versus discharge relations for the emergency spillway and dam overtopping flow segments.

The results from each of the above programs are combined to generate an overall stage versus discharge relation for the subject dam. Pre-alternative condition tabular and graphic summaries of the stage versus discharge and stage versus storage relations for each of Aspen, North Heights, SunRidge Canyon and Golden Eagle Park Dams are provided in Appendix F. Pertinent HY-8 and Uneven Weir program output are also provided in Appendix F.

Channel Routes

Channel routing is accomplished using the Modified Puls, normal depth channel option of HEC-1 and a single cross section that is considered representative of the study reach. That cross section is based on a review of the cross sections documented in the Ftn Hills FDS for that study reach, and selection of the one that best represents the routing reach. In some cases, the channel cross section is augmented, as previously discussed, to provide adequate capacity for the PMF flows. Physical data (Table G1) and cross section plots for each routing reach are provided in Appendix G. Tables G2, G3, and G4 respectively summarize the reach route hydraulic data calculated by HEC-1 for the PMF and 100-year, 6- and 24-hour models.

Final Results

Table 7 summarizes the GEPD inflow hydrograph results from the single basin hydrologic routing models for each of the 100-year, 6- and 24-hour, and PMF storms. Comparative plots of the routed single basin GEPD inflow hydrographs versus the Ftn Hills FDS multiple basin results (HEC-1 operation C599I), and HEC-1 output for each routing model and design storm, are provided in Appendix H.

TABLE 7

Summary of GEPD single basin routing model results for the 100-year, 6- and 24-hour, and PMF storms

Storm (1)	Peak Discharge cfs (2)	Time to Peak hours (3)	Rainfall Excess inches (4)	Runoff Volume acre-feet (5)
100-year, 6-hour	2,444	4.17	1.99	758
100-year, 24-hour	2,697	12.08	2.30	874
PMF	58,754	2.50	13.24	5,033

Summary and Conclusions

By inspection of the graphical hydrograph comparisons and direct comparison of modeling results, it is demonstrated that the single basin models reasonably reproduce the Ftn Hills FDS report results. Differences between results are much less than five percent in all cases, and the single basin modeling technique provides a much simpler tool for evaluation of the various alternatives, therefore, the single basin models are used for this study.

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Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage GOLDEN EAGLE PARK (# 4) Area 7.13 mi^2 (km^2)
Latitude 33° 35' Longitude 111° 45' Minimum Elevation 1706 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	78	83	85	86	88	89	90	90	91	%
7. Areal reduced PMP [steps 5 X 6].	6.6	8.5	9.3	9.9	11.5	12.4	13.0	13.2	13.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				9.9	1.6	0.9	0.6	0.2	0.5	in. (mm)
	6.6	1.9	0.8	0.6	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.5	0.9	9.9	1.6	0.6	0.2	in. (mm)
Four largest 15-min. increments [table 4.8].	6.6	1.9	0.8	0.6			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage DRAINAGE AREA ABOVE DAM #4 Area 1,38 mi^2 (km^2)
Latitude 33°35' Longitude 111°45 Minimum Elevation 1706 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.8

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	98	99	99	99	99.5	99.5	99.5	99.5	100	%
7. Areal reduced PMP [steps 5 X 6].	8.3	10.1	10.8	11.4	13.0	13.8	14.3	14.6	15.0	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.4	1.6	0.8	0.5	0.3	0.4	in. (mm)
	8.3	1.8	0.7	0.6	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.4	0.8	11.4	1.6	0.5	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	8.3	1.8	0.7	0.6			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage NORTH HEIGHTS (DAM # 11) Area 2.0 mi^2 (km^2)
Latitude 33°35' Longitude 111°45' Minimum Elevation ____ ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	135	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	94	96	96	97	97	97	98	98	98	%
7. Areal reduced PMP [steps 5 X 6].	8.0	9.8	10.5	11.2	12.7	13.5	14.1	14.4	14.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.2	1.5	0.8	0.6	0.3	0.3	in. (mm)
	8.0	1.8	0.7	0.7	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.3	0.8	11.2	1.5	0.6	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	8.0	1.8	0.7	0.7			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage ASPEN DAM - DAM # 6 Area 2.15 mi^2 (km^2)
Latitude 33°37' Longitude 111°45' Minimum Elevation 1810 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	94	96	96	96	97	97	97	98	98	%
7. Areal reduced PMP [steps 5 X 6].	8.0	9.8	10.5	11.0	12.7	13.5	14.0	14.4	14.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.0	1.7	0.8	0.5	0.4	0.3	in. (mm)
	8	1.8	0.7	0.5	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.4	0.8	11.0	1.7	0.5	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	8	1.8	0.7	0.5			in. (mm)

DAM 7 - SUNRIDGE CANYON DAM

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage SUNRIDGE CANYON (DAM #7) Area 1.6 mi^2 (km

Latitude 38°25' Longitude 111°45' Minimum Elevation ____ ft (

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm
6. Areal reduction [fig. 4.9].	91	98	98	99	99	99	[illegible]	100	100	%
7. Areal reduced PMP [steps 5 X 6].	8.2	10.0	10.7	11.4	13.0	13.8	[illegible]	14.7	15	in. (mm
8. Incremental PMP [successive subtraction in step 7].				11.4	1.6	0.8	0.6	0.2	0.3	in. (mm
	8.2	1.8	0.7	0.7	} 15-min. increments					

9. Time sequence of incremental PMP according to:

   Hourly increments [table 4.7]. 0.3 0.8 11.4 1.6 0.6 0.3 in. (mm

   Four largest 15-min. increments [table 4.8]. 8.2 1.8 0.7 0.7 in. (mm)

Appendix B

HEC-1 model for Golden Eagle Park Dam from the Fountain Hills ADMP Report
(GVSCE, July 1997)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

FOUNTAIN HILLS AREA DRAINAGE MASTER PLAN FCD 94-16

FINAL REPORT

Part A: Project Summary

Part B: Golden Eagle Park Dam, Feasibility Study

Registered Professional Engineer (Civil)
CERTIFICATE NO.
17928
GEORGE V.
SABOL
Date Signed 30 July 97
ARIZONA, U.S.A.

George V. Sabol Consulting Engineers, Inc.
Scottsdale, Arizona

JULY 1997

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              MAY   1991               *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  10/15/96  TIME  11:46:31   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748               *
*                                       *
*****************************************
```

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

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

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

1

HEC-1 INPUT

PAGE 1

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

  1           ID        FOUNTAIN HILLS ADMP
  2           ID        Model for the Computation of PMF for Dam 4      FILE NAME: DAM4-PMF.IH1
  3           ID        ****************************************************************
  4           ID        Analytical Considerations:
  5           ID            Single Basin Models
  6           ID            This model considers areal reduction method.
  7           ID        ****************************************************************
              *DIAGRAM
  8           IT       5       0       0     200
  9           IO       5
 10           IN      15
              *
 11           JD   15.00    0.01
 12           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     0.2     1.8
 13           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 14           PI   0.075   0.075   0.075   0.075
 15           JD   15.00   1.603
 16           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     0.2     1.8
 17           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 18           PI   0.075   0.075   0.075   0.075
 19           JD   14.70   2.000
 20           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     0.0     1.8
 21           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 22           PI   0.075   0.075   0.075   0.075
 23           JD   14.70   2.150
 24           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     0.0     1.8
 25           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 26           PI   0.075   0.075   0.075   0.075
 27           JD   13.70   7.150
 28           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     0.0     1.8
 29           PI     0.7     0.7   0.375   0.375   0.375   0.375    0.15    0.15    0.15    0.15
 30           PI   0.075   0.075   0.075   0.075

 31           KK   C560I
 32           KM        BASIN S207
 33           KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 34           KM        L=      3.9  Lca=      2.2   S=  464.7  Kn= .030  LAG=  30.6
 35           KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 36           BA    2.15
 37           LG     .17     .31    4.90    0.29   31.55
 38           UI    237.    523.   1170.   1651.   2163.   2377.   1509.   1274.   1082.    897.
 39           UI    699.    573.    507.    374.    299.    259.    198.    131.    119.    116.
 40           UI    111.     45.     45.     45.     45.     45.     45.     45.      0.      0.
 41           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 42           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 43           KK   C560O
 44           KM       Reservoir route at C560 (Dam 6).
 45           RS       1     ELEV 1835.36
```

```
 46          SV    0.00     7.09    34.65    75.98   135.64   191.44   208.31   226.53   246.00   266.28
 47          SV  289.00   310.81   336.00   360.88   389.00   416.30   446.00   476.39   509.00   540.78
 48          SE  1808.8 1814.00 1820.00 1826.00 1832.00 1836.00 1837.00 1838.00 1839.00 1840.00
 49          SE  1841.0 1842.00 1843.00 1844.00 1845.00 1846.00 1847.00 1848.00 1849.00 1850.00
 50          SQ       0      102      184      242      285      429     1239     2559     4265     6311
1                                          HEC-1 INPUT                                                    PAGE  2
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 51          SQ    8674    11339    14292    18440    25207    33643    43471    54561    66835    80241
             *

 52          KK  560599
 53          KM      Normal depth channel route
 54          RS       1     FLOW       -1
 55          RC   0.050    0.025    0.050   3127.0   0.0272
 56          RX  9850.4   9950.4   9974.4 10000.0 10035.5 10059.8 10080.4 10104.4
 57          RY  1772.0   1771.7   1765.3   1765.3   1765.9   1768.5   1773.3   1773.7
             *

 58          KK   C578I
 59          KM        BASIN S208
 60          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 61          KM        L=       3.0  Lca=       1.6   S=  488.9  Kn= .018  LAG=  14.2
 62          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 63          BA    2.00
 64          LG     .10      .25     4.80      .28    50.48
 65          UI    837.    3038.    4371.    2543.    1714.    1106.     677.     446.     282.     192.
 66          UI     91.      91.      91.       0.       0.       0.       0.       0.       0.       0.
 67          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
             *

 68          KK   C578O
 69          KM      Reservoir route at C578 (Dam 11).
 70          KO       5
 71          RS       1     ELEV 1812.29
 72          SV    0.00     2.77    16.38    41.49    84.39   133.00   154.47   171.00   187.43   205.00
 73          SV  223.03   242.00   261.38   282.00   302.00   324.00   345.87   370.00   394.23   419.79
 74          SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00 1815.00
 75          SE  1816.0 1817.00 1818.00 1819.00 1820.00 1821.00 1822.00 1823.00 1824.00 1825.00
 76          SQ       0      160      221      269      305      327      799     1888     3383     5222
 77          SQ    7376     9826    12563    15670    21045    28479    37392    47596    58989    71509
 78          SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00 1815.00
 79          SE  1816.0 1817.00 1818.00 1819.00 1820.00 1821.00 1822.00 1823.00 1824.00 1825.00
             *

 80          KK  578599
 81          KM      Normal depth channel route
 82          RS       1     FLOW       -1
 83          RC   0.055    0.045    0.055   3762.0 0.01624
 84          RX  9928.9   9945.0   9963.1   9990.6 10012.2 10035.4 10052.8 10069.6
 85          RY  1755.7   1746.3   1746.1   1741.7   1743.3   1743.7   1744.6   1755.7
             *

 86          KK   C584I
 87          KM        BASIN S209
 88          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 89          KM        L=       3.2  Lca=       1.7   S=  582.3  Kn= .019  LAG=  15.9
 90          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 91          BA    1.60
 92          LG     .13      .28     4.62      .32    41.50
 93          UI    515.    1951.    3289.    2104.    1510.     997.     702.     442.     308.     202.
 94          UI    154.      65.      65.      65.       0.       0.       0.       0.       0.       0.
 95          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
             *
1                                          HEC-1 INPUT                                                    PAGE  3
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 96          KK   C584O
 97          KM      Reservoir route at C584 (Dam 7).
 98          RS       1     ELEV 1926.31
 99          SV    0.00     0.60     4.30    11.27    23.74    46.29    86.65    96.00   104.90   126.25
100          SV  151.07   165.00   179.50   195.00   211.23   229.00   246.62   266.00   285.59   306.14
101          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
102          SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
103          SQ       0      163      223      272      307      333      355      363      690     2921
104          SQ    6650     9013    11702    14897    19772    25998    33315    41618    50847    60966
105          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
106          SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
             *

107          KK  584599
108          KM      Normal depth channel route
109          RS       1     FLOW       -1
110          RC   0.065    0.050    0.065   6526.0 0.02571
111          RX  9927.6   9939.8   9951.9   9985.3 10036.0 10067.5 10119.2 10188.7
```

```
112          RY  1796.3  1791.2  1788.3  1784.1  1784.9  1788.0  1790.2  1796.4
             *

113          KK    C210
114          KM        BASIN S210
115          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
116          KM        L=      1.9  Lca=        .9   S=  360.7  Kn= .024  LAG=  13.6
117          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
118          BA    1.38
119          LG     .09     .24    5.61     .19   24.82
120          UI    634.   2291.   3040.   1739.   1122.    723.    433.    286.    170.     96.
121          UI     66.     66.      0.      0.      0.      0.      0.      0.      0.      0.
122          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

123          KK   C599I
124          KO       1                                  21
125          KM     Hydrograph combine C584O + C560O + C578O + C599
126          HC       4
127          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   31        C560I
                V
                V
   43        C560O
                V
                V
   52       560599
                .
                .
   58           .        C578I
                .           V
                .           V
   68           .        C578O
                .           V
                .           V
   80           .       578599
                .           .
                .           .
   86           .           .       C584I
                .           .           V
                .           .           V
   96           .           .       C584O
                .           .           V
                .           .           V
  107           .           .      584599
                .           .           .
                .           .           .
  113           .           .           .        C210
                .           .           .          .
                .           .           .          .
  123        C599I.................................
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991           *
*            VERSION 4.0.1E         *
*                                   *
*  RUN DATE  10/15/96  TIME  11:46:31  *
*                                   *
*************************************

*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*        DAVIS, CALIFORNIA 95616    *
*            (916) 551-1748         *
*                                   *
*************************************

                    FOUNTAIN HILLS ADMP
                    Model for the Computation of PMF for Dam 4      FILE NAME: DAM4-PMF.IH1
                    ******************************************************************
                    Analytical Considerations:
                        Single Basin Models
                        This model considers areal reduction method.
                    ******************************************************************

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

  IT             HYDROGRAPH TIME DATA
```

```
          NMIN          5  MINUTES IN COMPUTATION INTERVAL
         IDATE     1    0  STARTING DATE
         ITIME        0000  STARTING TIME
            NQ         200  NUMBER OF HYDROGRAPH ORDINATES
        NDDATE     1    0  ENDING DATE
        NDTIME        1635  ENDING TIME
         ICENT          19  CENTURY MARK

     COMPUTATION INTERVAL    0.08 HOURS
          TOTAL TIME BASE   16.58 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

11 JD      INDEX STORM NO. 1
              STRM       15.00  PRECIPITATION DEPTH
              TRDA        0.01  TRANSPOSITION DRAINAGE AREA

12 PI        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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
               0.07       0.07       0.07       0.07       2.73       2.73       2.73       0.60       0.60       0.60
               0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
               0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
               0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
               0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
               0.03       0.02

15 JD      INDEX STORM NO. 2
              STRM       15.00  PRECIPITATION DEPTH
              TRDA        1.60  TRANSPOSITION DRAINAGE AREA

16 PI        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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
               0.07       0.07       0.07       0.07       2.73       2.73       2.73       0.60       0.60       0.60
               0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
               0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
               0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
               0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
               0.03       0.02

19 JD      INDEX STORM NO. 3
              STRM       14.70  PRECIPITATION DEPTH
              TRDA        2.00  TRANSPOSITION DRAINAGE AREA

20 PI        PRECIPITATION PATTERN
               0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03
               0.03       0.03       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
               0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
               0.23       0.23       0.23       0.17       0.17       0.17       0.14       0.14       0.14       0.14
               0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.04       0.04
               0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04
               0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
               0.03       0.02

23 JD      INDEX STORM NO. 4
              STRM       14.70  PRECIPITATION DEPTH
              TRDA        2.15  TRANSPOSITION DRAINAGE AREA

24 PI        PRECIPITATION PATTERN
               0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03
               0.03       0.03       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
               0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
               0.23       0.23       0.23       0.17       0.17       0.17       0.14       0.14       0.14       0.14
               0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.04       0.04
               0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04
               0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
               0.03       0.02

27 JD      INDEX STORM NO. 5
              STRM       13.70  PRECIPITATION DEPTH
              TRDA        7.15  TRANSPOSITION DRAINAGE AREA

28 PI        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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
               0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
               0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
               0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
               0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
               0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
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                    0.03       0.02

 70 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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


            **************
            *            *
123 KK      *     C599I  *
            *            *
            **************

124 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         200  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       0.083  TIME INTERVAL IN HOURS

                          Hydrograph combine C5840 + C5600 + C5780 + C599

126 HC          HYDROGRAPH COMBINATION
                      ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT C599I
TRANSPOSITION AREA 0.0 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	6634.	1		0820	101	894.	1		1230	151	250.
1		0005	2	2392.	1		0415	52	6085.	1		0825	102	888.	1		1235	152	237.
1		0010	3	2091.	1		0420	53	5555.	1		0830	103	880.	1		1240	153	226.
1		0015	4	1842.	1		0425	54	4994.	1		0835	104	873.	1		1245	154	217.
1		0020	5	1640.	1		0430	55	4438.	1		0840	105	865.	1		1250	155	210.
1		0025	6	1506.	1		0435	56	3918.	1		0845	106	857.	1		1255	156	204.
1		0030	7	1408.	1		0440	57	3456.	1		0850	107	848.	1		1300	157	199.
1		0035	8	1327.	1		0445	58	3105.	1		0855	108	838.	1		1305	158	196.
1		0040	9	1261.	1		0450	59	2850.	1		0900	109	827.	1		1310	159	192.
1		0045	10	1206.	1		0455	60	2639.	1		0905	110	814.	1		1315	160	188.
1		0050	11	1164.	1		0500	61	2463.	1		0910	111	801.	1		1320	161	183.
1		0055	12	1135.	1		0505	62	2301.	1		0915	112	785.	1		1325	162	179.
1		0100	13	1115.	1		0510	63	2118.	1		0920	113	767.	1		1330	163	174.
1		0105	14	1108.	1		0515	64	1930.	1		0925	114	745.	1		1335	164	170.
1		0110	15	1121.	1		0520	65	1775.	1		0930	115	710.	1		1340	165	166.
1		0115	16	1145.	1		0525	66	1646.	1		0935	116	673.	1		1345	166	163.
1		0120	17	1157.	1		0530	67	1529.	1		0940	117	643.	1		1350	167	159.
1		0125	18	1171.	1		0535	68	1425.	1		0945	118	618.	1		1355	168	155.
1		0130	19	1193.	1		0540	69	1348.	1		0950	119	598.	1		1400	169	152.
1		0135	20	1221.	1		0545	70	1299.	1		0955	120	580.	1		1405	170	149.
1		0140	21	1251.	1		0550	71	1259.	1		1000	121	565.	1		1410	171	145.
1		0145	22	1286.	1		0555	72	1224.	1		1005	122	552.	1		1415	172	142.
1		0150	23	1324.	1		0600	73	1195.	1		1010	123	543.	1		1420	173	139.
1		0155	24	1362.	1		0605	74	1173.	1		1015	124	535.	1		1425	174	136.
1		0200	25	1400.	1		0610	75	1146.	1		1020	125	528.	1		1430	175	134.
1		0205	26	3162.	1		0615	76	1117.	1		1025	126	521.	1		1435	176	131.
1		0210	27	9986.	1		0620	77	1097.	1		1030	127	514.	1		1440	177	128.
1		0215	28	23393.	1		0625	78	1082.	1		1035	128	508.	1		1445	178	125.
1		0220	29	43113.	1		0630	79	1070.	1		1040	129	502.	1		1450	179	123.
1		0225	30	60927.	1		0635	80	1059.	1		1045	130	496.	1		1455	180	120.
1		0230	31	65342.	1		0640	81	1050.	1		1050	131	489.	1		1500	181	118.
1		0235	32	61517.	1		0645	82	1041.	1		1055	132	483.	1		1505	182	115.
1		0240	33	55043.	1		0650	83	1032.	1		1100	133	476.	1		1510	183	113.
1		0245	34	47603.	1		0655	84	1024.	1		1105	134	470.	1		1515	184	111.
1		0250	35	39951.	1		0700	85	1015.	1		1110	135	463.	1		1520	185	108.
1		0255	36	33485.	1		0705	86	1007.	1		1115	136	456.	1		1525	186	106.
1		0300	37	28766.	1		0710	87	999.	1		1120	137	449.	1		1530	187	103.
1		0305	38	24596.	1		0715	88	992.	1		1125	138	441.	1		1535	188	98.
1		0310	39	21131.	1		0720	89	985.	1		1130	139	433.	1		1540	189	91.
1		0315	40	18187.	1		0725	90	977.	1		1135	140	425.	1		1545	190	83.
1		0320	41	15851.	1		0730	91	969.	1		1140	141	416.	1		1550	191	78.
1		0325	42	13827.	1		0735	92	961.	1		1145	142	408.	1		1555	192	73.
1		0330	43	12145.	1		0740	93	952.	1		1150	143	400.	1		1600	193	67.
1		0335	44	10840.	1		0745	94	944.	1		1155	144	393.	1		1605	194	62.

1	0340	45	9786.	1	0750	95	935.	1	1200	145	379.	1	1610	195	57.
1	0345	46	8967.	1	0755	96	927.	1	1205	146	357.	1	1615	196	52.
1	0350	47	8378.	1	0800	97	919.	1	1210	147	331.	1	1620	197	47.
1	0355	48	7888.	1	0805	98	912.	1	1215	148	306.	1	1625	198	43.
1	0400	49	7474.	1	0810	99	906.	1	1220	149	283.	1	1630	199	39.
1	0405	50	7096.	1	0815	100	900.	1	1225	150	265.	1	1635	200	35.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
65342.	2.50	(CFS)	10238.	4023.	4023.	4023.
		(INCHES)	13.351	14.498	14.498	14.498
		(AC-FT)	5077.	5513.	5513.	5513.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 1.6 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	6634.	1		0820	101	894.	1		1230	151	250.
1		0005	2	2392.	1		0415	52	6085.	1		0825	102	888.	1		1235	152	237.
1		0010	3	2091.	1		0420	53	5555.	1		0830	103	880.	1		1240	153	226.
1		0015	4	1842.	1		0425	54	4994.	1		0835	104	873.	1		1245	154	217.
1		0020	5	1640.	1		0430	55	4438.	1		0840	105	865.	1		1250	155	210.
1		0025	6	1506.	1		0435	56	3918.	1		0845	106	857.	1		1255	156	204.
1		0030	7	1408.	1		0440	57	3456.	1		0850	107	848.	1		1300	157	199.
1		0035	8	1327.	1		0445	58	3105.	1		0855	108	838.	1		1305	158	196.
1		0040	9	1261.	1		0450	59	2850.	1		0900	109	827.	1		1310	159	192.
1		0045	10	1206.	1		0455	60	2639.	1		0905	110	814.	1		1315	160	188.
1		0050	11	1164.	1		0500	61	2463.	1		0910	111	801.	1		1320	161	183.
1		0055	12	1135.	1		0505	62	2301.	1		0915	112	785.	1		1325	162	179.
1		0100	13	1115.	1		0510	63	2118.	1		0920	113	767.	1		1330	163	174.
1		0105	14	1108.	1		0515	64	1930.	1		0925	114	745.	1		1335	164	170.
1		0110	15	1121.	1		0520	65	1775.	1		0930	115	710.	1		1340	165	166.
1		0115	16	1145.	1		0525	66	1646.	1		0935	116	673.	1		1345	166	163.
1		0120	17	1157.	1		0530	67	1529.	1		0940	117	643.	1		1350	167	159.
1		0125	18	1171.	1		0535	68	1425.	1		0945	118	618.	1		1355	168	155.
1		0130	19	1193.	1		0540	69	1348.	1		0950	119	598.	1		1400	169	152.
1		0135	20	1221.	1		0545	70	1299.	1		0955	120	580.	1		1405	170	149.
1		0140	21	1251.	1		0550	71	1259.	1		1000	121	565.	1		1410	171	145.
1		0145	22	1286.	1		0555	72	1224.	1		1005	122	552.	1		1415	172	142.
1		0150	23	1324.	1		0600	73	1195.	1		1010	123	543.	1		1420	173	139.
1		0155	24	1362.	1		0605	74	1173.	1		1015	124	535.	1		1425	174	136.
1		0200	25	1400.	1		0610	75	1146.	1		1020	125	528.	1		1430	175	134.
1		0205	26	3162.	1		0615	76	1117.	1		1025	126	521.	1		1435	176	131.
1		0210	27	9986.	1		0620	77	1097.	1		1030	127	514.	1		1440	177	128.
1		0215	28	23393.	1		0625	78	1082.	1		1035	128	508.	1		1445	178	125.
1		0220	29	43113.	1		0630	79	1070.	1		1040	129	502.	1		1450	179	123.
1		0225	30	60927.	1		0635	80	1059.	1		1045	130	496.	1		1455	180	120.
1		0230	31	65342.	1		0640	81	1050.	1		1050	131	489.	1		1500	181	118.
1		0235	32	61517.	1		0645	82	1041.	1		1055	132	483.	1		1505	182	115.
1		0240	33	55043.	1		0650	83	1032.	1		1100	133	476.	1		1510	183	113.
1		0245	34	47603.	1		0655	84	1024.	1		1105	134	470.	1		1515	184	111.
1		0250	35	39951.	1		0700	85	1015.	1		1110	135	463.	1		1520	185	108.
1		0255	36	33485.	1		0705	86	1007.	1		1115	136	456.	1		1525	186	106.
1		0300	37	28766.	1		0710	87	999.	1		1120	137	449.	1		1530	187	103.
1		0305	38	24596.	1		0715	88	992.	1		1125	138	441.	1		1535	188	98.
1		0310	39	21131.	1		0720	89	985.	1		1130	139	433.	1		1540	189	91.
1		0315	40	18187.	1		0725	90	977.	1		1135	140	425.	1		1545	190	83.
1		0320	41	15851.	1		0730	91	969.	1		1140	141	416.	1		1550	191	78.
1		0325	42	13827.	1		0735	92	961.	1		1145	142	408.	1		1555	192	73.
1		0330	43	12145.	1		0740	93	952.	1		1150	143	400.	1		1600	193	67.
1		0335	44	10840.	1		0745	94	944.	1		1155	144	393.	1		1605	194	62.
1		0340	45	9786.	1		0750	95	935.	1		1200	145	379.	1		1610	195	57.
1		0345	46	8967.	1		0755	96	927.	1		1205	146	357.	1		1615	196	52.
1		0350	47	8378.	1		0800	97	919.	1		1210	147	331.	1		1620	197	47.
1		0355	48	7888.	1		0805	98	912.	1		1215	148	306.	1		1625	198	43.
1		0400	49	7474.	1		0810	99	906.	1		1220	149	283.	1		1630	199	39.
1		0405	50	7096.	1		0815	100	900.	1		1225	150	265.	1		1635	200	35.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
65342.	2.50	(CFS)	10238.	4023.	4023.	4023.
		(INCHES)	13.351	14.498	14.498	14.498

(AC-FT) 5077. 5513. 5513. 5513.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.0 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	6866.	1		0820	101	885.	1		1230	151	239.
1		0005	2	2393.	1		0415	52	6272.	1		0825	102	878.	1		1235	152	228.
1		0010	3	2098.	1		0420	53	5688.	1		0830	103	870.	1		1240	153	219.
1		0015	4	1857.	1		0425	54	5055.	1		0835	104	862.	1		1245	154	211.
1		0020	5	1662.	1		0430	55	4418.	1		0840	105	854.	1		1250	155	205.
1		0025	6	1533.	1		0435	56	3837.	1		0845	106	845.	1		1255	156	199.
1		0030	7	1441.	1		0440	57	3328.	1		0850	107	834.	1		1300	157	196.
1		0035	8	1366.	1		0445	58	2947.	1		0855	108	822.	1		1305	158	192.
1		0040	9	1306.	1		0450	59	2660.	1		0900	109	809.	1		1310	159	187.
1		0045	10	1257.	1		0455	60	2420.	1		0905	110	794.	1		1315	160	183.
1		0050	11	1218.	1		0500	61	2213.	1		0910	111	777.	1		1320	161	178.
1		0055	12	1185.	1		0505	62	2034.	1		0915	112	759.	1		1325	162	174.
1		0100	13	1159.	1		0510	63	1865.	1		0920	113	730.	1		1330	163	170.
1		0105	14	1144.	1		0515	64	1699.	1		0925	114	690.	1		1335	164	166.
1		0110	15	1149.	1		0520	65	1564.	1		0930	115	657.	1		1340	165	162.
1		0115	16	1168.	1		0525	66	1449.	1		0935	116	630.	1		1345	166	158.
1		0120	17	1190.	1		0530	67	1362.	1		0940	117	607.	1		1350	167	155.
1		0125	18	1223.	1		0535	68	1306.	1		0945	118	589.	1		1355	168	151.
1		0130	19	1263.	1		0540	69	1264.	1		0950	119	574.	1		1400	169	148.
1		0135	20	1303.	1		0545	70	1228.	1		0955	120	560.	1		1405	170	145.
1		0140	21	1343.	1		0550	71	1199.	1		1000	121	549.	1		1410	171	142.
1		0145	22	1380.	1		0555	72	1179.	1		1005	122	542.	1		1415	172	139.
1		0150	23	1416.	1		0600	73	1165.	1		1010	123	534.	1		1420	173	136.
1		0155	24	1449.	1		0605	74	1151.	1		1015	124	527.	1		1425	174	133.
1		0200	25	1481.	1		0610	75	1129.	1		1020	125	521.	1		1430	175	130.
1		0205	26	3194.	1		0615	76	1102.	1		1025	126	514.	1		1435	176	128.
1		0210	27	9901.	1		0620	77	1084.	1		1030	127	508.	1		1440	177	125.
1		0215	28	23058.	1		0625	78	1070.	1		1035	128	501.	1		1445	178	122.
1		0220	29	42115.	1		0630	79	1059.	1		1040	129	495.	1		1450	179	120.
1		0225	30	59467.	1		0635	80	1048.	1		1045	130	489.	1		1455	180	117.
1		0230	31	63996.	1		0640	81	1039.	1		1050	131	483.	1		1500	181	115.
1		0235	32	60363.	1		0645	82	1030.	1		1055	132	476.	1		1505	182	113.
1		0240	33	54212.	1		0650	83	1022.	1		1100	133	470.	1		1510	183	110.
1		0245	34	46934.	1		0655	84	1013.	1		1105	134	463.	1		1515	184	108.
1		0250	35	39384.	1		0700	85	1005.	1		1110	135	457.	1		1520	185	106.
1		0255	36	32884.	1		0705	86	997.	1		1115	136	449.	1		1525	186	103.
1		0300	37	27789.	1		0710	87	990.	1		1120	137	442.	1		1530	187	97.
1		0305	38	23307.	1		0715	88	983.	1		1125	138	434.	1		1535	188	89.
1		0310	39	19712.	1		0720	89	975.	1		1130	139	425.	1		1540	189	82.
1		0315	40	16841.	1		0725	90	967.	1		1135	140	417.	1		1545	190	77.
1		0320	41	14710.	1		0730	91	959.	1		1140	141	409.	1		1550	191	72.
1		0325	42	12886.	1		0735	92	951.	1		1145	142	401.	1		1555	192	66.
1		0330	43	11484.	1		0740	93	942.	1		1150	143	393.	1		1600	193	61.
1		0335	44	10391.	1		0745	94	933.	1		1155	144	382.	1		1605	194	56.
1		0340	45	9527.	1		0750	95	925.	1		1200	145	362.	1		1610	195	51.
1		0345	46	8874.	1		0755	96	917.	1		1205	146	337.	1		1615	196	46.
1		0350	47	8409.	1		0800	97	910.	1		1210	147	311.	1		1620	197	42.
1		0355	48	8004.	1		0805	98	904.	1		1215	148	288.	1		1625	198	38.
1		0400	49	7668.	1		0810	99	899.	1		1220	149	268.	1		1630	199	35.
1		0405	50	7335.	1		0815	100	892.	1		1225	150	253.	1		1635	200	31.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	168-HR
63996.	2.50	(CFS)	10002.	3931.	3931.	3931.
		(INCHES)	13.043	14.166	14.166	14.166
		(AC-FT)	4960.	5387.	5387.	5387.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.2 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	6866.	1		0820	101	885.	1		1230	151	239.

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0005	2	2393.	1		0415	52	6272.	1		0825	102	878.	1		1235	152	228.
1		0010	3	2098.	1		0420	53	5688.	1		0830	103	870.	1		1240	153	219.
1		0015	4	1857.	1		0425	54	5055.	1		0835	104	862.	1		1245	154	211.
1		0020	5	1662.	1		0430	55	4418.	1		0840	105	854.	1		1250	155	205.
1		0025	6	1533.	1		0435	56	3837.	1		0845	106	845.	1		1255	156	199.
1		0030	7	1441.	1		0440	57	3328.	1		0850	107	834.	1		1300	157	196.
1		0035	8	1366.	1		0445	58	2947.	1		0855	108	822.	1		1305	158	192.
1		0040	9	1306.	1		0450	59	2660.	1		0900	109	809.	1		1310	159	187.
1		0045	10	1257.	1		0455	60	2420.	1		0905	110	794.	1		1315	160	183.
1		0050	11	1218.	1		0500	61	2213.	1		0910	111	777.	1		1320	161	178.
1		0055	12	1185.	1		0505	62	2034.	1		0915	112	759.	1		1325	162	174.
1		0100	13	1159.	1		0510	63	1865.	1		0920	113	730.	1		1330	163	170.
1		0105	14	1144.	1		0515	64	1699.	1		0925	114	690.	1		1335	164	166.
1		0110	15	1149.	1		0520	65	1564.	1		0930	115	657.	1		1340	165	162.
1		0115	16	1168.	1		0525	66	1449.	1		0935	116	630.	1		1345	166	158.
1		0120	17	1190.	1		0530	67	1362.	1		0940	117	607.	1		1350	167	155.
1		0125	18	1223.	1		0535	68	1306.	1		0945	118	589.	1		1355	168	151.
1		0130	19	1263.	1		0540	69	1264.	1		0950	119	574.	1		1400	169	148.
1		0135	20	1303.	1		0545	70	1228.	1		0955	120	560.	1		1405	170	145.
1		0140	21	1343.	1		0550	71	1199.	1		1000	121	549.	1		1410	171	142.
1		0145	22	1380.	1		0555	72	1179.	1		1005	122	542.	1		1415	172	139.
1		0150	23	1416.	1		0600	73	1165.	1		1010	123	534.	1		1420	173	136.
1		0155	24	1449.	1		0605	74	1151.	1		1015	124	527.	1		1425	174	133.
1		0200	25	1481.	1		0610	75	1129.	1		1020	125	521.	1		1430	175	130.
1		0205	26	3194.	1		0615	76	1102.	1		1025	126	514.	1		1435	176	128.
1		0210	27	9901.	1		0620	77	1084.	1		1030	127	508.	1		1440	177	125.
1		0215	28	23058.	1		0625	78	1070.	1		1035	128	501.	1		1445	178	122.
1		0220	29	42115.	1		0630	79	1059.	1		1040	129	495.	1		1450	179	120.
1		0225	30	59467.	1		0635	80	1048.	1		1045	130	489.	1		1455	180	117.
1		0230	31	63996.	1		0640	81	1039.	1		1050	131	483.	1		1500	181	115.
1		0235	32	60363.	1		0645	82	1030.	1		1055	132	476.	1		1505	182	113.
1		0240	33	54212.	1		0650	83	1022.	1		1100	133	470.	1		1510	183	110.
1		0245	34	46934.	1		0655	84	1013.	1		1105	134	463.	1		1515	184	108.
1		0250	35	39384.	1		0700	85	1005.	1		1110	135	457.	1		1520	185	106.
1		0255	36	32884.	1		0705	86	997.	1		1115	136	449.	1		1525	186	103.
1		0300	37	27789.	1		0710	87	990.	1		1120	137	442.	1		1530	187	97.
1		0305	38	23307.	1		0715	88	983.	1		1125	138	434.	1		1535	188	89.
1		0310	39	19712.	1		0720	89	975.	1		1130	139	425.	1		1540	189	82.
1		0315	40	16841.	1		0725	90	967.	1		1135	140	417.	1		1545	190	77.
1		0320	41	14710.	1		0730	91	959.	1		1140	141	409.	1		1550	191	72.
1		0325	42	12886.	1		0735	92	951.	1		1145	142	401.	1		1555	192	66.
1		0330	43	11484.	1		0740	93	942.	1		1150	143	393.	1		1600	193	61.
1		0335	44	10391.	1		0745	94	933.	1		1155	144	382.	1		1605	194	56.
1		0340	45	9527.	1		0750	95	925.	1		1200	145	362.	1		1610	195	51.
1		0345	46	8874.	1		0755	96	917.	1		1205	146	337.	1		1615	196	46.
1		0350	47	8409.	1		0800	97	910.	1		1210	147	311.	1		1620	197	42.
1		0355	48	8004.	1		0805	98	904.	1		1215	148	288.	1		1625	198	38.
1		0400	49	7668.	1		0810	99	899.	1		1220	149	268.	1		1630	199	35.
1		0405	50	7335.	1		0815	100	892.	1		1225	150	253.	1		1635	200	31.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
63996.	2.50	(CFS)	10002.	3931.	3931.	3931.
		(INCHES)	13.043	14.166	14.166	14.166
		(AC-FT)	4960.	5387.	5387.	5387.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 7.2 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	5740.	1		0820	101	888.	1		1230	151	239.
1		0005	2	2391.	1		0415	52	5247.	1		0825	102	880.	1		1235	152	228.
1		0010	3	2090.	1		0420	53	4786.	1		0830	103	873.	1		1240	153	219.
1		0015	4	1839.	1		0425	54	4319.	1		0835	104	865.	1		1245	154	211.
1		0020	5	1635.	1		0430	55	3859.	1		0840	105	857.	1		1250	155	205.
1		0025	6	1500.	1		0435	56	3423.	1		0845	106	848.	1		1255	156	200.
1		0030	7	1401.	1		0440	57	3063.	1		0850	107	838.	1		1300	157	196.
1		0035	8	1319.	1		0445	58	2791.	1		0855	108	827.	1		1305	158	192.
1		0040	9	1251.	1		0450	59	2565.	1		0900	109	814.	1		1310	159	188.
1		0045	10	1196.	1		0455	60	2375.	1		0905	110	801.	1		1315	160	183.
1		0050	11	1155.	1		0500	61	2209.	1		0910	111	785.	1		1320	161	179.
1		0055	12	1127.	1		0505	62	2062.	1		0915	112	766.	1		1325	162	174.
1		0100	13	1108.	1		0510	63	1898.	1		0920	113	744.	1		1330	163	170.
1		0105	14	1101.	1		0515	64	1733.	1		0925	114	709.	1		1335	164	166.
1		0110	15	1113.	1		0520	65	1604.	1		0930	115	673.	1		1340	165	162.
1		0115	16	1134.	1		0525	66	1491.	1		0935	116	642.	1		1345	166	159.

1	0120	17	1144.	1	0530	67	1399.	1	0940	117	618.	1	1350	167	155.
1	0125	18	1150.	1	0535	68	1334.	1	0945	118	597.	1	1355	168	152.
1	0130	19	1158.	1	0540	69	1286.	1	0950	119	580.	1	1400	169	148.
1	0135	20	1171.	1	0545	70	1246.	1	0955	120	565.	1	1405	170	145.
1	0140	21	1192.	1	0550	71	1212.	1	1000	121	552.	1	1410	171	142.
1	0145	22	1214.	1	0555	72	1185.	1	1005	122	544.	1	1415	172	139.
1	0150	23	1238.	1	0600	73	1167.	1	1010	123	536.	1	1420	173	136.
1	0155	24	1267.	1	0605	74	1152.	1	1015	124	529.	1	1425	174	133.
1	0200	25	1298.	1	0610	75	1129.	1	1020	125	522.	1	1430	175	131.
1	0205	26	2898.	1	0615	76	1103.	1	1025	126	515.	1	1435	176	128.
1	0210	27	8998.	1	0620	77	1085.	1	1030	127	509.	1	1440	177	125.
1	0215	28	20729.	1	0625	78	1072.	1	1035	128	502.	1	1445	178	123.
1	0220	29	37579.	1	0630	79	1060.	1	1040	129	496.	1	1450	179	120.
1	0225	30	53555.	1	0635	80	1050.	1	1045	130	490.	1	1455	180	118.
1	0230	31	58742.	1	0640	81	1040.	1	1050	131	483.	1	1500	181	115.
1	0235	32	55827.	1	0645	82	1032.	1	1055	132	477.	1	1505	182	113.
1	0240	33	50573.	1	0650	83	1023.	1	1100	133	471.	1	1510	183	111.
1	0245	34	43762.	1	0655	84	1015.	1	1105	134	464.	1	1515	184	108.
1	0250	35	36833.	1	0700	85	1007.	1	1110	135	457.	1	1520	185	106.
1	0255	36	31126.	1	0705	86	999.	1	1115	136	450.	1	1525	186	103.
1	0300	37	26524.	1	0710	87	991.	1	1120	137	442.	1	1530	187	98.
1	0305	38	22645.	1	0715	88	984.	1	1125	138	434.	1	1535	188	90.
1	0310	39	19477.	1	0720	89	977.	1	1130	139	426.	1	1540	189	82.
1	0315	40	16714.	1	0725	90	969.	1	1135	140	418.	1	1545	190	77.
1	0320	41	14531.	1	0730	91	961.	1	1140	141	410.	1	1550	191	72.
1	0325	42	12595.	1	0735	92	952.	1	1145	142	402.	1	1555	192	67.
1	0330	43	11015.	1	0740	93	944.	1	1150	143	394.	1	1600	193	62.
1	0335	44	9741.	1	0745	94	935.	1	1155	144	382.	1	1605	194	56.
1	0340	45	8722.	1	0750	95	927.	1	1200	145	363.	1	1610	195	51.
1	0345	46	7988.	1	0755	96	919.	1	1205	146	337.	1	1615	196	47.
1	0350	47	7401.	1	0800	97	912.	1	1210	147	311.	1	1620	197	42.
1	0355	48	6907.	1	0805	98	906.	1	1215	148	288.	1	1625	198	39.
1	0400	49	6511.	1	0810	99	900.	1	1220	149	268.	1	1630	199	35.
1	0405	50	6157.	1	0815	100	894.	1	1225	150	253.	1	1635	200	32.

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW	6-HR	24-HR	72-HR	16.58-HR
58742.	2.50	(CFS)	9284.	3672.	3672.	3672.
		(INCHES)	12.106	13.234	13.234	13.234
		(AC-FT)	4604.	5032.	5032.	5032.

CUMULATIVE AREA = 7.13 SQ MI

INTERPOLATED HYDROGRAPH AT C599I

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	2557.	1		0410	51	5743.	1		0820	101	888.	1		1230	151	239.
1		0005	2	2391.	1		0415	52	5250.	1		0825	102	880.	1		1235	152	228.
1		0010	3	2090.	1		0420	53	4788.	1		0830	103	873.	1		1240	153	219.
1		0015	4	1839.	1		0425	54	4320.	1		0835	104	865.	1		1245	154	211.
1		0020	5	1635.	1		0430	55	3861.	1		0840	105	857.	1		1250	155	205.
1		0025	6	1501.	1		0435	56	3424.	1		0845	106	848.	1		1255	156	200.
1		0030	7	1401.	1		0440	57	3064.	1		0850	107	838.	1		1300	157	196.
1		0035	8	1319.	1		0445	58	2792.	1		0855	108	827.	1		1305	158	192.
1		0040	9	1252.	1		0450	59	2565.	1		0900	109	814.	1		1310	159	188.
1		0045	10	1196.	1		0455	60	2375.	1		0905	110	801.	1		1315	160	183.
1		0050	11	1155.	1		0500	61	2209.	1		0910	111	785.	1		1320	161	179.
1		0055	12	1127.	1		0505	62	2062.	1		0915	112	766.	1		1325	162	174.
1		0100	13	1109.	1		0510	63	1898.	1		0920	113	744.	1		1330	163	170.
1		0105	14	1101.	1		0515	64	1733.	1		0925	114	709.	1		1335	164	166.
1		0110	15	1113.	1		0520	65	1604.	1		0930	115	673.	1		1340	165	162.
1		0115	16	1134.	1		0525	66	1491.	1		0935	116	642.	1		1345	166	159.
1		0120	17	1144.	1		0530	67	1399.	1		0940	117	618.	1		1350	167	155.
1		0125	18	1151.	1		0535	68	1334.	1		0945	118	597.	1		1355	168	152.
1		0130	19	1158.	1		0540	69	1286.	1		0950	119	580.	1		1400	169	148.
1		0135	20	1172.	1		0545	70	1246.	1		0955	120	565.	1		1405	170	145.
1		0140	21	1192.	1		0550	71	1212.	1		1000	121	552.	1		1410	171	142.
1		0145	22	1214.	1		0555	72	1185.	1		1005	122	544.	1		1415	172	139.
1		0150	23	1239.	1		0600	73	1167.	1		1010	123	536.	1		1420	173	136.
1		0155	24	1267.	1		0605	74	1152.	1		1015	124	529.	1		1425	174	133.
1		0200	25	1298.	1		0610	75	1129.	1		1020	125	522.	1		1430	175	131.
1		0205	26	2898.	1		0615	76	1103.	1		1025	126	515.	1		1435	176	128.
1		0210	27	9000.	1		0620	77	1085.	1		1030	127	509.	1		1440	177	125.
1		0215	28	20735.	1		0625	78	1072.	1		1035	128	502.	1		1445	178	123.
1		0220	29	37590.	1		0630	79	1060.	1		1040	129	496.	1		1450	179	120.
1		0225	30	53569.	1		0635	80	1050.	1		1045	130	490.	1		1455	180	118.
1		0230	31	58754.	1		0640	81	1040.	1		1050	131	483.	1		1500	181	115.
1		0235	32	55837.	1		0645	82	1032.	1		1055	132	477.	1		1505	182	113.

1	0240	33	53581.	*	1	0650	83	1023.	*	1	1100	133	471.	*	1	1510	183	111.
1	0245	34	43769.	*	1	0655	84	1015.	*	1	1105	134	464.	*	1	1515	184	108.
1	0250	35	36839.	*	1	0700	85	1007.	*	1	1110	135	457.	*	1	1520	185	106.
1	0255	36	31131.	*	1	0705	86	999.	*	1	1115	136	450.	*	1	1525	186	103.
1	0300	37	26527.	*	1	0710	87	991.	*	1	1120	137	442.	*	1	1530	187	98.
1	0305	38	22646.	*	1	0715	88	984.	*	1	1125	138	434.	*	1	1535	188	90.
1	0310	39	19477.	*	1	0720	89	977.	*	1	1130	139	426.	*	1	1540	189	82.
1	0315	40	16714.	*	1	0725	90	969.	*	1	1135	140	418.	*	1	1545	190	77.
1	0320	41	14532.	*	1	0730	91	961.	*	1	1140	141	410.	*	1	1550	191	72.
1	0325	42	12596.	*	1	0735	92	952.	*	1	1145	142	402.	*	1	1555	192	67.
1	0330	43	11016.	*	1	0740	93	944.	*	1	1150	143	394.	*	1	1600	193	62.
1	0335	44	9743.	*	1	0745	94	935.	*	1	1155	144	382.	*	1	1605	194	56.
1	0340	45	8724.	*	1	0750	95	927.	*	1	1200	145	363.	*	1	1610	195	51.
1	0345	46	7991.	*	1	0755	96	919.	*	1	1205	146	337.	*	1	1615	196	47.
1	0350	47	7404.	*	1	0800	97	912.	*	1	1210	147	311.	*	1	1620	197	42.
1	0355	48	6910.	*	1	0805	98	906.	*	1	1215	148	288.	*	1	1625	198	39.
1	0400	49	6514.	*	1	0810	99	900.	*	1	1220	149	268.	*	1	1630	199	35.
1	0405	50	6160.	*	1	0815	100	894.	*	1	1225	150	253.	*	1	1635	200	32.
				*					*					*				

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
58754.	2.50	(CFS)	9286.	3673.	3673.	3673.
		(INCHES)	12.108	13.236	13.236	13.236
		(AC-FT)	4604.	5033.	5033.	5033.

CUMULATIVE AREA = 7.13 SQ MI

1

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	C560I	17974.	2.58	2897.	1051.	1051.	2.15		
ROUTED TO	C560O	16821.	2.67	2891.	1183.	1183.	2.15		
ROUTED TO	560599	16460.	2.67	2891.	1185.	1185.	2.15		
HYDROGRAPH AT	C578I	26969.	2.33	2850.	1033.	1033.	2.00		
ROUTED TO	C578O	26375.	2.42	2903.	1149.	1149.	2.00		
ROUTED TO	578599	24197.	2.42	2920.	1160.	1160.	2.00		
HYDROGRAPH AT	C584I	20238.	2.33	2265.	821.	821.	1.60		
ROUTED TO	C584O	20283.	2.42	2311.	899.	899.	1.60		
ROUTED TO	584599	17009.	2.50	2335.	916.	916.	1.60		
HYDROGRAPH AT	C210	19580.	2.33	1956.	708.	708.	1.38		
4 COMBINED AT	C599I	58754.	2.50	9286.	3673.	3673.	7.13		

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

Appendix C

HEC-1 File for IDF1

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*            VERSION 4.0.1E            *
*      Lahey F77L-EM/32 version 5.01   *
*        Dodson & Associates, Inc.     *
*  RUN DATE  03/02/99  TIME  16:00:49  *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

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

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

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

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

  1           ID        Golden Eagle Park Dam (FCD 97-44)
  2           ID        IDF1 Model for the Computation of IDF for Golden Eagle Park Dam
  3           ID        ****************************************************************
  4           ID        Analytical Considerations:
  5           ID            Includes Breach of North Heights Dam
  6           ID            Single Basin Model
  7           ID            This model considers areal reduction method.
  8           ID        ******************************************************************
  9           ID
 10           ID      FILE:  IDF1.DAT
 11           ID      DATE: OCTOBER 1998 (by FCDMC)
 12           ID      Modified by Stantec - February 1999
 13           ID
 14           ID     THIS MODEL WAS ALTERED BY FCDMC FROM THE ORIGINAL MODEL- GEPD-PMF.DAT
 15           ID     FROM THE GOLDEN EAGLE PARK DAM FEASIBILITY STUDY DONE BY GEORGE V.
 16           ID     SABOL CONSULTING ENGINEERS, INC. (GVSCE), JULY 1997
 17           ID
 18           ID    THE MODEL HAS THE FOLLOWING ADJUSTMENTS (BY FCDMC):FROM THE ORIGINAL
 19           ID     1.)  THE SINGLE BASIN FOR THE NORTH HEIGHTS DAM WATERSHED HAS BEEN
 20           ID          REMOVED.  IN ITS PLACE ARE QI CARDS TAKEN FROM THE DAM BREACH
 21           ID          HEC-1 FOR NORTH HEIGHTS DAM (GVSCE, JANUARY 1996).
 22           ID     2.)  BEFORE EACH WATERSHED IS ROUTED THROUGH ITS RESPECTIVE DAM,
 23           ID          HALF OF THE FLOW IS DIVERTED OUT TO REFLECT THE HALF PMF EVENT.
 24           ID          THE SAME WAS ALSO DONE ON THE WATERSHED (BASIN S210) BETWEEN THE THREE
 25           ID          UPPER DAMS AND GEPD.THE BREACH HYDROGRAPH ALREADY IS HALF PMF.
 26           ID     3.)  THE RATING CURVES FOR ASPEN AND SUNRIDGE CANYON DAMS WERE ALTERED
 27           ID          THE NEW RATING CURVES WERE DEVELOPED USING THE EQUATION Q=CLH3/2.
 28           ID          THE RATING CURVES WERE ALTERED TO MAKE THE SPILLWAY LENGTH LONG
 29           ID          ENOUGH TO PASS THE HALF PMF THROUGH THE DAM WITH THE REQUIRED
 30           ID          THREE FEET OF FREEBOARD.
 31           ID          C = 2.6
 32           ID     4.)  IN THIS MODEL THE PRINCIPLE SPILLWAYS OF ASPEN AND SUNRIDGE CANYON DAM
 33           ID          ARE UNCLOGGED.
 34           ID     5.)  THE INITIAL WATER SURFACE ELEVATION FOR EACH OF THE DAMS WAS
 35           ID          SET TO THE WSEL OF THE 100 YEAR EVENT
 36           ID     NOTE:MODIFICATIONS BY STANTEC ARE EDITORIAL ONLY.  THE ORIGINAL GVSCE MODEL
 37           ID          AND REVISIONS BY FCDMC ARE ACCEPTED.  THE ROUTING (BY FCDMC) OF THE
 38           ID          IDF1 HYDROGRAPH THROUGH THE EXISTING GEP DAM IS DELETED.
              *DIAGRAM
 39           IT       5 02JUN98             210
 40           IO       4
 41           IN      15
              *
 42           JD   15.00    0.01
 43           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.2     1.8
 44           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 45           PI   0.075   0.075   0.075   0.075
 46           JD   15.00   1.603
 47           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.2     1.8
 48           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 49           PI   0.075   0.075   0.075   0.075
 50           JD   14.70   2.000
 51           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     8.0     1.8
 52           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 53           PI   0.075   0.075   0.075   0.075
```

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

 54           JD   14.70   2.150
 55           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     8.0     1.8
 56           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 57           PI   0.075   0.075   0.075   0.075
 58           JD   13.70   7.150
 59           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.0     1.8
 60           PI     0.7     0.7   0.375   0.375   0.375   0.375    0.15    0.15    0.15    0.15
 61           PI   0.075   0.075   0.075   0.075

 62           KK   C560I
 63           KM        BASIN S207 (ASPEN DAM)
 64           KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 65           KM        L=      3.9  Lca=      2.2   S=  464.7  Kn= .030  LAG=  30.6
 66           KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 67           BA    2.15
 68           LG     .17     .31    4.90    0.29   31.55
 69           UI    237.    523.   1170.   1651.   2163.   2377.   1509.   1274.   1082.    897.
 70           UI    699.    573.    507.    374.    299.    259.    198.    181.    119.    116.
 71           UI    111.     45.     45.     45.     45.     45.     45.     45.      0.      0.
 72           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 73           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 74           KK   0.5PMF
 75           KM    THIS DIVERT IS USED TO REMOVE HALF THE FLOWS BEFORE ROUTING THROUGH
 76           KM    THE DAM
 77           DT   .5PMF
 78           DI      0      50     100   10000
 79           DQ      0      25      50    5000
              *

 80           KK   C560O
 81           KM      Reservoir route at C560 (ASPEN DAM).
 82           KM    THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
 83           KM    THE GEPD FEASIBILITY STUDY (GVSCE, 1997)
 84           KM     SEE COMMENT NUMBER 3 ABOVE
 85           RS      1    ELEV 1835.36
 86           SV   0.00    7.09   34.65   75.98  135.64  191.44  208.31  226.53  246.00  266.28
 87           SV 289.00  310.81  336.00
 88           SE 1808.8 1814.00 1820.00 1826.00 1832.00 1836.00 1837.00 1838.00 1839.00 1840.00
 89           SE 1841.0 1842.00 1843.00
 90           SQ      0     102     184     242     285     907    1913    3718    5913    8428
 91           SQ  11432   14486   17540
              *

 92           KK  560599
 93           KM      Normal depth channel route (ASPEN DAM TO GEP DAM)
 94           RS      1    FLOW      -1
 95           RC  0.050   0.025   0.050  3127.0  0.0272
 96           RX 9850.4  9950.4  9974.4 10000.0 10035.5 10059.8 10080.4 10104.4
 97           RY 1772.0  1771.7  1765.3  1765.3  1765.9  1768.5  1773.3  1773.7
              *
```

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

 98           KK  DAMFLO
 99           KM    OUTFLOW FROM DAM BREACH OF NORTH HEIGHTS DAM
100           KM    THESE OUTFLOWS WERE TAKEN FROM THE DAM BREAK ANALYSIS STUDY (GVSCE, JANUARY
101           KM    FOR THE FOUNTAIN HILLS DAMS.  THE NUMBERS WERE TAKEN FROM THE DAM BREAK MODE
102           KM    FOR GOLDEN EAGLE PARK DAM
103           IN       5
104           KO       1
105           BA    2.02
106           QI     781     493     408     353     306     267     235     210     189     172
107           QI     159     148     140     134     131     133     140     153     170     190
108           QI     212     234     254     274     292     415    1175    3086  6860.3   21573
109           QI   29206 13111.4  7068.4  6196.2  5139.0  4067.1  3127.9    2838    2412    2076
110           QI    1801    1569    1410    1275    1172    1092    1029     983     951     922
111           QI     887     841     779     707     631     560     499     460     444     429
112           QI     414     399     384     369     352     334     314     294     275     257
113           QI     241     226     212     199     187     175     163     150     138     126
114           QI     115     104      94      84      75      68      60      54      48      43
115           QI      38      34      30      27      23      21      18      16      14      12
116           QI      11      10       8       7       6       6       5       4       4       3
117           QI       3       3       2       2       2       2       1       1       1       1
118           QI       1       1       1       1       1       1       1       1       1       1
119           QI       1

120           KK  578599
121           KM      Normal depth channel route (North Heights Dam to GEP Dam)
122           RS       1    FLOW      -1
123           RC   0.055   0.045   0.055  3762.0 0.01624
124           RX  9928.9  9945.0  9963.1  9990.6 10012.2 10035.4 10052.8 10069.6
125           RY  1755.7  1746.3  1746.1  1741.7  1743.3  1743.7  1744.6  1755.7
              *

126           KK   C584I
127           KM        BASIN S209 (Sunridge Canyon Dam)
128           KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
129           KM        L=      3.2  Lca=      1.7   S=  582.3  Kn= .019  LAG=  15.9
130           KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
131           BA    1.60
132           LG     .13     .28    4.62     .32   41.50
133           UI    515.   1951.   3289.   2104.   1510.    997.    702.    442.    308.    202.
134           UI    154.     65.     65.     65.      0.      0.      0.      0.      0.      0.
135           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

136           KK   0.5PMF
137           KM    THIS DIVERT REMOVES HALF THE PMF FLOWS CREATING THE .5 PMF BEFORE
138           KM    BEING ROUTED THROUGH THE DAM
139           DT   .5PMF
140           DI       0      50     100   10000
141           DQ       0      25      50    5000
              *
```

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

 142          KK   C584O
 143          KM      Reservoir route at C584 (Sunridge Canyon Dam).
 144          KM    THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
 145          KM    THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)
 146          KM    PLEASE SEE COMMENT NUMBER 3 ABOVE
 147          RS       1    ELEV 1926.31
 148          SV    0.00    0.60    4.30   11.27   23.74   46.29   86.65   96.00  104.90  126.25
 149          SV  151.07  165.00  179.50
 150          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 151          SE  1930.0 1931.00 1932.00
 152          SQ       0     163     223     272     307     333     355     959    1762    6368
 153          SQ   12373   16175   20178
 154          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 155          SE  1930.0 1931.00 1932.00
              *

 156          KK  584599
 157          KM      Normal depth channel route (Sunridge Canyon Dam to GEP Dam)
 158          RS       1    FLOW      -1
 159          RC   0.065   0.050   0.065  6526.0 0.02571
 160          RX  9927.6  9939.8  9951.9  9985.3 10036.0 10067.5 10119.2 10188.7
 161          RY  1796.3  1791.2  1788.3  1784.1  1784.9  1788.0  1790.2  1796.4
              *

 162          KK    C210
 163          KM        BASIN S210 (GOLDEN EAGLE PARK DAM)
 164          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 165          KM        L=      1.9  Lca=       .9   S=  360.7  Kn= .024  LAG=  13.6
 166          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 167          BA    1.38
 168          LG     .09     .24    5.61     .19   24.82
 169          UI    634.   2291.   3040.   1739.   1122.    723.    433.    286.    170.     96.
 170          UI     66.     66.      0.      0.      0.      0.      0.      0.      0.      0.
 171          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 172          KK  0.5PMF
 173          KM    THIS DIVERT REMOVES HALF THE FLOWS FROM THIS AREA TO CREATE THE .5PMF
 174          DT  0.5PMF
 175          DI       0      50     100   10000
 176          DQ       0      25      50    5000
              *

 177          KK   C599I
 178          KO       1       2                      21
 179          KM      Hydrograph combine C584O + C560O + C578O + C599
 180          HC       4
 181          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

           (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  62        C560I
                .
                .
  77            .-------->   .5PMF
  74        0.5PM
                V
                V
  80        C560O
                V
                V
  92       560599
                .
                .
  98            .      DAMFLO
                .           V
                .           V
 120            .      578599
                .           .
                .           .
 126            .           .      C584I
                .           .          .
                .           .          .
 139            .           .          .-------->   .5PMF
 136            .           .      0.5PM
                .           .          V
                .           .          V
 142            .           .      C584O
                .           .          V
                .           .          V
 156            .           .     584599
                .           .          .
                .           .          .
 172            .           .          .        C210
                .           .          .          .
                .           .          .          .
 174            .           .          .          .-------->  0.5PMF
 172            .           .          .     0.5PMF
                .           .          .          .
                .           .          .          .
 177        C599I.................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              MAY   1991              *                    *    HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.0.1E             *                    *          609 SECOND STREET           *
*     Lahey F77L-EM/32 version 5.01    *                    *       DAVIS, CALIFORNIA 95616        *
*       Dodson & Associates, Inc.      *                    *           (916) 551-1748             *
* RUN DATE  03/02/99  TIME  16:00:49   *                    *                                      *
****************************************                    ****************************************
```

```
                    Golden Eagle Park Dam (FCD 97-44)
                    IDF1 Model for the Computation of IDF for Golden Eagle Park Dam
                    ******************************************************************
                    Analytical Considerations:
                        Includes Breach of North Heights Dam
                        Single Basin Model
                        This model considers areal reduction method.
                    ******************************************************************

                  FILE:  IDF1.DAT
                  DATE: OCTOBER 1998 (by FCDMC)
                  Modified by Stantec - February 1999

                 THIS MODEL WAS ALTERED BY FCDMC FROM THE ORIGINAL MODEL- GEPD-PMF.DAT
                 FROM THE GOLDEN EAGLE PARK DAM FEASIBILITY STUDY DONE BY GEORGE V.
                 SABOL CONSULTING ENGINEERS, INC. (GVSCE), JULY 1997

                THE MODEL HAS THE FOLLOWING ADJUSTMENTS (BY FCDMC):FROM THE ORIGINAL
                 1.)  THE SINGLE BASIN FOR THE NORTH HEIGHTS DAM WATERSHED HAS BEEN
                      REMOVED.  IN ITS PLACE ARE QI CARDS TAKEN FROM THE DAM BREACH
                      HEC-1 FOR NORTH HEIGHTS DAM (GVSCE, JANUARY 1996).
                 2.)  BEFORE EACH WATERSHED IS ROUTED THROUGH ITS RESPECTIVE DAM,
                      HALF OF THE FLOW IS DIVERTED OUT TO REFLECT THE HALF PMF EVENT.
                      THE SAME WAS ALSO DONE ON THE WATERSHED (BASIN S210) BETWEEN THE THREE
                      UPPER DAMS AND GEPD.THE BREACH HYDROGRAPH ALREADY IS HALF PMF.
                 3.)  THE RATING CURVES FOR ASPEN AND SUNRIDGE CANYON DAMS WERE ALTERED
                      THE NEW RATING CURVES WERE DEVELOPED USING THE EQUATION Q=CLH3/2.
                      THE RATING CURVES WERE ALTERED TO MAKE THE SPILLWAY LENGTH LONG
                      ENOUGH TO PASS THE HALF PMF THROUGH THE DAM WITH THE REQUIRED
                      THREE FEET OF FREEBOARD.
                      C = 2.6
                 4.)  IN THIS MODEL THE PRINCIPLE SPILLWAYS OF ASPEN AND SUNRIDGE CANYON DAM
                      ARE UNCLOGGED.
                 5.)  THE INITIAL WATER SURFACE ELEVATION FOR EACH OF THE DAMS WAS
                      SET TO THE WSEL OF THE 100 YEAR EVENT
                 NOTE:MODIFICATIONS BY STANTEC ARE EDITORIAL ONLY.  THE ORIGINAL GVSCE MODEL
                      AND REVISIONS BY FCDMC ARE ACCEPTED.  THE ROUTING (BY FCDMC) OF THE
                      IDF1 HYDROGRAPH THROUGH THE EXISTING GEP DAM IS DELETED.

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

 41 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN         15  TIME INTERVAL IN MINUTES
                     JXDATE     2JUN98  STARTING DATE
                     JXTIME          0  STARTING TIME

    IT          HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     2JUN98  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        210  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     2JUN98  ENDING DATE
                     NDTIME       1725  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE   17.42 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

JD      INDEX STORM NO. 1
              STRM        15.00  PRECIPITATION DEPTH
              TRDA         0.01  TRANSPOSITION DRAINAGE AREA

43 PI     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      0.07      0.07      0.07      0.07      0.07      0.07      0.07      0.07
            0.07      0.07      0.07      0.07      2.73      2.73      2.73      0.60      0.60      0.60
            0.23      0.23      0.23      0.23      0.23      0.23      0.13      0.13      0.13      0.13
            0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.05      0.05
            0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05
            0.02      0.03      0.02      0.02      0.03      0.02      0.02      0.03      0.02      0.02
            0.03      0.02

46 JD   INDEX STORM NO. 2
              STRM        15.00  PRECIPITATION DEPTH
              TRDA         1.60  TRANSPOSITION DRAINAGE AREA

47 PI     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      0.07      0.07      0.07      0.07      0.07      0.07      0.07      0.07
            0.07      0.07      0.07      0.07      2.73      2.73      2.73      0.60      0.60      0.60
            0.23      0.23      0.23      0.23      0.23      0.23      0.13      0.13      0.13      0.13
            0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.05      0.05
            0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05
            0.02      0.03      0.02      0.02      0.03      0.02      0.02      0.03      0.02      0.02
            0.03      0.02

50 JD   INDEX STORM NO. 3
              STRM        14.70  PRECIPITATION DEPTH
              TRDA         2.00  TRANSPOSITION DRAINAGE AREA

51 PI     PRECIPITATION PATTERN
            0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03
            0.03      0.03      0.07      0.07      0.07      0.07      0.07      0.07      0.07      0.07
            0.07      0.07      0.07      0.07      2.67      2.67      2.67      0.60      0.60      0.60
            0.23      0.23      0.23      0.17      0.17      0.17      0.14      0.14      0.14      0.14
            0.14      0.14      0.14      0.14      0.14      0.14      0.14      0.14      0.04      0.04
            0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
            0.02      0.03      0.02      0.02      0.03      0.02      0.02      0.03      0.02      0.02
            0.03      0.02

54 JD   INDEX STORM NO. 4
              STRM        14.70  PRECIPITATION DEPTH
              TRDA         2.15  TRANSPOSITION DRAINAGE AREA

55 PI     PRECIPITATION PATTERN
            0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03      0.03
            0.03      0.03      0.07      0.07      0.07      0.07      0.07      0.07      0.07      0.07
            0.07      0.07      0.07      0.07      2.67      2.67      2.67      0.60      0.60      0.60
            0.23      0.23      0.23      0.17      0.17      0.17      0.14      0.14      0.14      0.14
            0.14      0.14      0.14      0.14      0.14      0.14      0.14      0.14      0.04      0.04
            0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
            0.02      0.03      0.02      0.02      0.03      0.02      0.02      0.03      0.02      0.02
            0.03      0.02

58 JD   INDEX STORM NO. 5
              STRM        13.70  PRECIPITATION DEPTH
              TRDA         7.15  TRANSPOSITION DRAINAGE AREA

59 PI     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      0.07      0.07      0.07      0.07      0.07      0.07      0.07      0.07
            0.07      0.07      0.07      0.07      2.67      2.67      2.67      0.60      0.60      0.60
            0.23      0.23      0.23      0.23      0.23      0.23      0.13      0.13      0.13      0.13
            0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.13      0.05      0.05
            0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05
            0.02      0.03      0.02      0.02      0.03      0.02      0.02      0.03      0.02      0.02
            0.03      0.02
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
KK          *     C560I  *
            *            *
            **************
                                BASIN S207 (ASPEN DAM)
                                THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                                L=      3.9  Lca=      2.2   S=  464.7  Kn= .030  LAG=  30.6
                                PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

              SUBBASIN RUNOFF DATA

 67 BA          SUBBASIN CHARACTERISTICS
                      TAREA        2.15  SUBBASIN AREA

 68 LG          GREEN AND AMPT LOSS RATE
                      STRTL        0.17  STARTING LOSS
                        DTH        0.31  MOISTURE DEFICIT
                       PSIF        4.90  WETTING FRONT SUCTION
                      XKSAT        0.29  HYDRAULIC CONDUCTIVITY
                      RTIMP       31.55  PERCENT IMPERVIOUS AREA

 63 UI          INPUT UNITGRAPH,  28 ORDINATES,  VOLUME = 1.00
                    237.0     523.0    1170.0    1651.0    2163.0    2377.0    1509.0    1274.0    1082.0     897.0
                    699.0     573.0     507.0     374.0     299.0     259.0     198.0     181.0     119.0     116.0
                    111.0      45.0      45.0      45.0      45.0      45.0      45.0      45.0
                                                                   ***

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

            **************
            *            *
KK          *    0.5PM   *     F
            *            *
            **************
                                THIS DIVERT IS USED TO REMOVE HALF THE FLOWS BEFORE ROUTING THROUGH
                                THE DAM

   DT           DIVERSION
                      ISTAD       .5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

   DI              INFLOW        0.00     50.00    100.00  10000.00

   DQ       DIVERTED FLOW        0.00     25.00     50.00   5000.00
                                                                   ***

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

            **************
            *            *
 80 KK      *     C560O  *
            *            *
            **************
                                 Reservoir route at C560 (ASPEN DAM).
                                THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
                                THE GEPD FEASIBILITY STUDY (GVSCE, 1997)
                                 SEE COMMENT NUMBER 3 ABOVE

              HYDROGRAPH ROUTING DATA

 85 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC     1835.36  INITIAL CONDITION
                          X        0.00 WORKING R AND D COEFFICIENT

 86 SV            STORAGE         0.0       7.1      34.7      76.0     135.6     191.4     208.3     226.5     246.0     266.3
```

```
                                289.0     310.8     336.0

 88 SE          ELEVATION     1808.80   1814.00   1820.00   1826.00   1832.00   1836.00   1837.00   1838.00   1839.00   1840.00
                              1841.00   1842.00   1843.00

    SQ          DISCHARGE          0.      102.      184.      242.      285.      907.     1913.     3718.     5913.     8428.
                                11432.    14486.    17540.

                                                                ***

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

            **************
            *            *
 92 KK      *    560599  *
            *            *
            **************
                                Normal depth channel route (ASPEN DAM TO GEP DAM)

              HYDROGRAPH ROUTING DATA

 94 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

 95 RC          NORMAL DEPTH CHANNEL
                        ANL       0.050  LEFT OVERBANK N-VALUE
                       ANCH       0.025  MAIN CHANNEL N-VALUE
                        ANR       0.050  RIGHT OVERBANK N-VALUE
                      RLNTH       3127.  REACH LENGTH
                        SEL      0.0272  ENERGY SLOPE
                      ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                          CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
    RY        ELEVATION   1772.00   1771.70   1765.30   1765.30   1765.90   1768.50   1773.30   1773.70
 96 RX        DISTANCE    9850.40   9950.40   9974.40  10000.00  10035.50  10059.80  10080.40  10104.40

                                                                ***

                                          COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

            STORAGE       0.00      1.25      3.25      5.47      7.87     10.46     13.23     16.19     19.31     22.54
            OUTFLOW       0.00     80.98    338.67    762.45   1326.75   2026.43   2859.90   3827.44   5030.18   6405.37
          ELEVATION    1765.30   1765.74   1766.18   1766.63   1767.07   1767.51   1767.95   1768.40   1768.84   1769.28

            STORAGE      25.89     29.35     32.92     36.60     40.40     44.95     52.04     59.24     66.51     74.15
            OUTFLOW    7919.95   9571.50  11358.09  13278.22  15330.69  17050.24  19574.03  22392.59  25434.73  28542.28
          ELEVATION    1769.72   1770.16   1770.61   1771.05   1771.49   1771.93   1772.37   1772.82   1773.26   1773.70

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN     2026. TO     28542.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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

            **************
            *            *
 98 KK      *    DAMFLO  *
            *            *
            **************
                                OUTFLOW FROM DAM BREACH OF NORTH HEIGHTS DAM
                                THESE OUTFLOWS WERE TAKEN FROM THE DAM BREAK ANALYSIS STUDY (GVSCE, JANUARY
                                FOR THE FOUNTAIN HILLS DAMS.  THE NUMBERS WERE TAKEN FROM THE DAM BREAK MODE
                                FOR GOLDEN EAGLE PARK DAM

104 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
```

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                    QSCAL          0.  HYDROGRAPH PLOT SCALE

103 IN          TIME DATA FOR INPUT TIME SERIES
                     JXMIN          5  TIME INTERVAL IN MINUTES
                    JXDATE     2JUN98  STARTING DATE
                    JXTIME          0  STARTING TIME

              SUBBASIN RUNOFF DATA

105 BA          SUBBASIN CHARACTERISTICS
                     TAREA       2.02  SUBBASIN AREA

                                                    ***
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HYDROGRAPH AT DAMFLO
TRANSPOSITION AREA 0.0 SQ MI

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.
		(INCHES)	8.729	8.882	8.882	8.882
		(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

****

HYDROGRAPH AT DAMFLO
TRANSPOSITION AREA 1.6 SQ MI

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.

(INCHES)	8.729	8.882	8.882	8.882
(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

HYDROGRAPH AT DAMFLO
TRANSPOSITION AREA 2.0 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.
		(INCHES)	8.729	8.882	8.882	8.882
		(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

HYDROGRAPH AT DAMFLO
TRANSPOSITION AREA 2.2 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.
		(INCHES)	8.729	8.882	8.882	8.882
		(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

HYDROGRAPH AT DAMFLO
TRANSPOSITION AREA 7.2 SQ MI

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.
		(INCHES)	8.729	8.882	8.882	8.882
		(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

INTERPOLATED HYDROGRAPH AT DAMFLO

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	781.	2	JUN	0425	54	707.	2	JUN	0850	107	5.	2	JUN	1315	160	1.
2	JUN	0005	2	493.	2	JUN	0430	55	631.	2	JUN	0855	108	4.	2	JUN	1320	161	1.
2	JUN	0010	3	408.	2	JUN	0435	56	560.	2	JUN	0900	109	4.	2	JUN	1325	162	1.
2	JUN	0015	4	353.	2	JUN	0440	57	499.	2	JUN	0905	110	3.	2	JUN	1330	163	1.
2	JUN	0020	5	306.	2	JUN	0445	58	460.	2	JUN	0910	111	3.	2	JUN	1335	164	1.
2	JUN	0025	6	267.	2	JUN	0450	59	444.	2	JUN	0915	112	3.	2	JUN	1340	165	1.
2	JUN	0030	7	235.	2	JUN	0455	60	429.	2	JUN	0920	113	2.	2	JUN	1345	166	1.
2	JUN	0035	8	210.	2	JUN	0500	61	414.	2	JUN	0925	114	2.	2	JUN	1350	167	1.
2	JUN	0040	9	189.	2	JUN	0505	62	399.	2	JUN	0930	115	2.	2	JUN	1355	168	1.
2	JUN	0045	10	172.	2	JUN	0510	63	384.	2	JUN	0935	116	2.	2	JUN	1400	169	1.
2	JUN	0050	11	159.	2	JUN	0515	64	369.	2	JUN	0940	117	1.	2	JUN	1405	170	1.
2	JUN	0055	12	148.	2	JUN	0520	65	352.	2	JUN	0945	118	1.	2	JUN	1410	171	1.
2	JUN	0100	13	140.	2	JUN	0525	66	334.	2	JUN	0950	119	1.	2	JUN	1415	172	1.
2	JUN	0105	14	134.	2	JUN	0530	67	314.	2	JUN	0955	120	1.	2	JUN	1420	173	1.
2	JUN	0110	15	131.	2	JUN	0535	68	294.	2	JUN	1000	121	1.	2	JUN	1425	174	1.
2	JUN	0115	16	133.	2	JUN	0540	69	275.	2	JUN	1005	122	1.	2	JUN	1430	175	1.
2	JUN	0120	17	140.	2	JUN	0545	70	257.	2	JUN	1010	123	1.	2	JUN	1435	176	1.
2	JUN	0125	18	153.	2	JUN	0550	71	241.	2	JUN	1015	124	1.	2	JUN	1440	177	1.
2	JUN	0130	19	170.	2	JUN	0555	72	226.	2	JUN	1020	125	1.	2	JUN	1445	178	1.
2	JUN	0135	20	190.	2	JUN	0600	73	212.	2	JUN	1025	126	1.	2	JUN	1450	179	1.
2	JUN	0140	21	212.	2	JUN	0605	74	199.	2	JUN	1030	127	1.	2	JUN	1455	180	1.
2	JUN	0145	22	234.	2	JUN	0610	75	187.	2	JUN	1035	128	1.	2	JUN	1500	181	1.
2	JUN	0150	23	254.	2	JUN	0615	76	175.	2	JUN	1040	129	1.	2	JUN	1505	182	1.
2	JUN	0155	24	274.	2	JUN	0620	77	163.	2	JUN	1045	130	1.	2	JUN	1510	183	1.
2	JUN	0200	25	292.	2	JUN	0625	78	150.	2	JUN	1050	131	1.	2	JUN	1515	184	1.
2	JUN	0205	26	415.	2	JUN	0630	79	138.	2	JUN	1055	132	1.	2	JUN	1520	185	1.
2	JUN	0210	27	1175.	2	JUN	0635	80	126.	2	JUN	1100	133	1.	2	JUN	1525	186	1.
2	JUN	0215	28	3086.	2	JUN	0640	81	115.	2	JUN	1105	134	1.	2	JUN	1530	187	1.
2	JUN	0220	29	6860.	2	JUN	0645	82	104.	2	JUN	1110	135	1.	2	JUN	1535	188	1.
2	JUN	0225	30	21573.	2	JUN	0650	83	94.	2	JUN	1115	136	1.	2	JUN	1540	189	1.
2	JUN	0230	31	29206.	2	JUN	0655	84	84.	2	JUN	1120	137	1.	2	JUN	1545	190	1.
2	JUN	0235	32	13111.	2	JUN	0700	85	75.	2	JUN	1125	138	1.	2	JUN	1550	191	1.
2	JUN	0240	33	7068.	2	JUN	0705	86	68.	2	JUN	1130	139	1.	2	JUN	1555	192	1.
2	JUN	0245	34	6196.	2	JUN	0710	87	60.	2	JUN	1135	140	1.	2	JUN	1600	193	1.
2	JUN	0250	35	5139.	2	JUN	0715	88	54.	2	JUN	1140	141	1.	2	JUN	1605	194	1.
2	JUN	0255	36	4067.	2	JUN	0720	89	48.	2	JUN	1145	142	1.	2	JUN	1610	195	1.
2	JUN	0300	37	3128.	2	JUN	0725	90	43.	2	JUN	1150	143	1.	2	JUN	1615	196	1.
2	JUN	0305	38	2838.	2	JUN	0730	91	38.	2	JUN	1155	144	1.	2	JUN	1620	197	1.
2	JUN	0310	39	2412.	2	JUN	0735	92	34.	2	JUN	1200	145	1.	2	JUN	1625	198	1.
2	JUN	0315	40	2076.	2	JUN	0740	93	30.	2	JUN	1205	146	1.	2	JUN	1630	199	1.
2	JUN	0320	41	1801.	2	JUN	0745	94	27.	2	JUN	1210	147	1.	2	JUN	1635	200	1.
2	JUN	0325	42	1569.	2	JUN	0750	95	23.	2	JUN	1215	148	1.	2	JUN	1640	201	1.
2	JUN	0330	43	1410.	2	JUN	0755	96	21.	2	JUN	1220	149	1.	2	JUN	1645	202	1.
2	JUN	0335	44	1275.	2	JUN	0800	97	18.	2	JUN	1225	150	1.	2	JUN	1650	203	1.
2	JUN	0340	45	1172.	2	JUN	0805	98	16.	2	JUN	1230	151	1.	2	JUN	1655	204	1.
2	JUN	0345	46	1092.	2	JUN	0810	99	14.	2	JUN	1235	152	1.	2	JUN	1700	205	1.
2	JUN	0350	47	1029.	2	JUN	0815	100	12.	2	JUN	1240	153	1.	2	JUN	1705	206	1.
2	JUN	0355	48	983.	2	JUN	0820	101	11.	2	JUN	1245	154	1.	2	JUN	1710	207	1.
2	JUN	0400	49	951.	2	JUN	0825	102	10.	2	JUN	1250	155	1.	2	JUN	1715	208	1.
2	JUN	0405	50	922.	2	JUN	0830	103	8.	2	JUN	1255	156	1.	2	JUN	1720	209	1.
2	JUN	0410	51	887.	2	JUN	0835	104	7.	2	JUN	1300	157	1.	2	JUN	1725	210	1.
2	JUN	0415	52	841.	2	JUN	0840	105	6.	2	JUN	1305	158	1.					
2	JUN	0420	53	779.	2	JUN	0845	106	6.	2	JUN	1310	159	1.					

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
29206.	2.50	(CFS)	1896.	665.	665.	665.
		(INCHES)	8.729	8.882	8.882	8.882
		(AC-FT)	940.	957.	957.	957.

CUMULATIVE AREA = 2.02 SQ MI

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              **************
              *            *
0 KK          *    578599  *
              *            *
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Normal depth channel route (North Heights Dam to GEP Dam)

HYDROGRAPH ROUTING DATA

```
122 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

123 RC          NORMAL DEPTH CHANNEL
                       ANL      0.055  LEFT OVERBANK N-VALUE
                      ANCH      0.045  MAIN CHANNEL N-VALUE
                       ANR      0.055  RIGHT OVERBANK N-VALUE
                     RLNTH      3762.  REACH LENGTH
                       SEL     0.0162  ENERGY SLOPE
                     ELMAX        0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION
```

CROSS-SECTION DATA

		--- LEFT OVERBANK ---		+ ------ MAIN CHANNEL		------- +	--- RIGHT OVERBANK ---		
125 RY	ELEVATION	1755.70	1746.30	1746.10	1741.70	1743.30	1743.70	1744.60	1755.70
124 RX	DISTANCE	9928.90	9945.00	9963.10	9990.60	10012.20	10035.40	10052.80	10069.60

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.46	1.85	4.81	9.40	14.71	20.40	27.33	34.55	41.91
OUTFLOW	0.00	11.58	73.53	223.88	591.07	1135.72	1841.12	2800.82	3956.89	5289.59
ELEVATION	1741.70	1742.44	1743.17	1743.91	1744.65	1745.38	1746.12	1746.86	1747.59	1748.33
STORAGE	49.43	57.10	64.91	72.88	81.01	89.28	97.70	106.28	115.00	123.88
OUTFLOW	6789.08	8448.74	10263.80	12230.66	14346.52	16609.22	19017.04	21568.64	24262.94	27099.13
ELEVATION	1749.07	1749.80	1750.54	1751.28	1752.02	1752.75	1753.49	1754.23	1754.96	1755.70

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 19017. TO 27099.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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            **************
            *            *
126 KK      *     C584I  *
            *            *
            **************
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BASIN S209 (Sunridge Canyon Dam)
THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
L= 3.2 Lca= 1.7 S= 582.3 Kn= .019 LAG= 15.9
PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

```
131 BA          SUBBASIN CHARACTERISTICS
                     TAREA        1.60  SUBBASIN AREA

132 LG          GREEN AND AMPT LOSS RATE
                     STRTL        0.13  STARTING LOSS
                       DTH        0.28  MOISTURE DEFICIT
                      PSIF        4.62  WETTING FRONT SUCTION
                     XKSAT        0.32  HYDRAULIC CONDUCTIVITY
                     RTIMP       41.50  PERCENT IMPERVIOUS AREA

127 UI          INPUT UNITGRAPH,  14 ORDINATES,  VOLUME = 1.00
                    515.0    1951.0    3289.0    2104.0    1510.0     997.0     702.0     442.0     308.0     202.0
                    154.0      65.0      65.0      65.0
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          *            *
136 KK    *     0.5PM  *     F
          *            *
          **************
                         THIS DIVERT REMOVES HALF THE PMF FLOWS CREATING THE .5 PMF BEFORE
                         BEING ROUTED THROUGH THE DAM

    DT          DIVERSION
                     ISTAD       .5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

    DI             INFLOW        0.00     50.00    100.00  10000.00

    DQ      DIVERTED FLOW        0.00     25.00     50.00   5000.00

                                                          ***

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          **************
          *            *
142 KK    *     C584O  *
          *            *
          **************
                         Reservoir route at C584 (Sunridge Canyon Dam).
                         THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
                         THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)
                         PLEASE SEE COMMENT NUMBER 3 ABOVE

            HYDROGRAPH ROUTING DATA

147 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        ELEV  TYPE OF INITIAL CONDITION
                    RSVRIC     1926.31  INITIAL CONDITION
                         X        0.00 WORKING R AND D COEFFICIENT

SV              STORAGE          0.0       0.6       4.3      11.3      23.7      46.3      86.7      96.0     104.9     126.3
                               151.1     165.0     179.5

150 SE          ELEVATION     1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00
                              1930.00   1931.00   1932.00

152 SQ          DISCHARGE          0.      163.      223.      272.      307.      333.      355.      959.     1762.     6368.
                               12373.    16175.    20178.

154 SE          ELEVATION     1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00
                              1930.00   1931.00   1932.00

                                                          ***

                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      0.60      4.30     11.27     23.74     46.29     86.65     96.00    104.90    126.25
          OUTFLOW       0.00    163.00    223.00    272.00    307.00    333.00    355.00    959.00   1762.00   6368.00
        ELEVATION    1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00

          STORAGE     151.07    165.00    179.50
          OUTFLOW   12373.00  16175.00  20178.00
        ELEVATION    1930.00   1931.00   1932.00

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

          **************
          *            *
156 KK    *    584599  *
          *            *
          **************
                         Normal depth channel route (Sunridge Canyon Dam to GEP Dam)

            HYDROGRAPH ROUTING DATA

158 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

RC          NORMAL DEPTH CHANNEL
                  ANL      0.065  LEFT OVERBANK N-VALUE
                 ANCH      0.050  MAIN CHANNEL N-VALUE
                  ANR      0.065  RIGHT OVERBANK N-VALUE
                RLNTH      6526.  REACH LENGTH
                  SEL     0.0257  ENERGY SLOPE
                ELMAX        0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                      --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
161 RY      ELEVATION  1796.30  1791.20  1788.30  1784.10  1784.90  1788.00  1790.20  1796.40
160 RX      DISTANCE   9927.60  9939.80  9951.90  9985.30 10036.00 10067.50 10119.20 10188.70

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

        STORAGE      0.00      2.24      7.98     14.95     23.06     32.31     42.69     54.58     68.23     83.62
        OUTFLOW      0.00     33.64    220.33    562.36   1053.96   1702.52   2517.57   3657.11   5058.06   6692.23
      ELEVATION   1784.10   1784.75   1785.39   1786.04   1786.69   1787.34   1787.98   1788.63   1789.28   1789.93

        STORAGE    100.62    118.65    137.59    157.39    178.03    199.54    221.89    245.10    269.16    294.08
        OUTFLOW   8585.16  10733.76  13130.79  15770.61  18653.94  21782.37  25158.02  28783.38  32661.21  36801.66
      ELEVATION   1790.57   1791.22   1791.87   1792.52   1793.16   1793.81   1794.46   1795.10   1795.75   1796.40


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        *            *
 162 KK *     C210   *
        *            *
        **************
                          BASIN S210 (GOLDEN EAGLE PARK DAM)
                          THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                          L=      1.9  Lca=       .9   S=  360.7  Kn= .024  LAG=  13.6
                          PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

            SUBBASIN RUNOFF DATA

167 BA        SUBBASIN CHARACTERISTICS
                    TAREA        1.38  SUBBASIN AREA

168 LG        GREEN AND AMPT LOSS RATE
                    STRTL        0.09  STARTING LOSS
                      DTH        0.24  MOISTURE DEFICIT
                     PSIF        5.61  WETTING FRONT SUCTION
                    XKSAT        0.19  HYDRAULIC CONDUCTIVITY
                    RTIMP       24.82  PERCENT IMPERVIOUS AREA

163 UI        INPUT UNITGRAPH,  12 ORDINATES,  VOLUME = 1.00
                634.0    2291.0    3040.0    1739.0    1122.0     723.0     433.0     286.0     170.0      96.0
                 66.0      66.0

                                                  ***


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


        **************
        *            *
172 KK  *   0.5PMF   *
        *            *
        **************
                          THIS DIVERT REMOVES HALF THE FLOWS FROM THIS AREA TO CREATE THE .5PMF

  DT        DIVERSION
                ISTAD      0.5PMF  DIVERSION HYDROGRAPH IDENTIFICATION
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DI              INFLOW        0.00      50.00     100.00  10000.00

DQ       DIVERTED FLOW        0.00      25.00      50.00   5000.00

                                                                 ***

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

            **************
            *            *
177 KK      *     C599I  *
            *            *
            **************

178 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           2  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         210  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT       0.083  TIME INTERVAL IN HOURS

                          Hydrograph combine C5840 + C5600 + C5780 + C599

180 HC          HYDROGRAPH COMBINATION
                      ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                 ***

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                                                HYDROGRAPH AT     C599I
                                          TRANSPOSITION AREA      0.0 SQ MI

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	*	2 JUN 0425	54	2727.	*	2 JUN 0850	107	352.	*	2 JUN 1315	160	126.
2 JUN 0005	2	3648.	*	2 JUN 0430	55	2476.	*	2 JUN 0855	108	331.	*	2 JUN 1320	161	124.
2 JUN 0010	3	2909.	*	2 JUN 0435	56	2254.	*	2 JUN 0900	109	314.	*	2 JUN 1325	162	121.
2 JUN 0015	4	2363.	*	2 JUN 0440	57	2091.	*	2 JUN 0905	110	300.	*	2 JUN 1330	163	119.
2 JUN 0020	5	1962.	*	2 JUN 0445	58	1976.	*	2 JUN 0910	111	289.	*	2 JUN 1335	164	116.
2 JUN 0025	6	1678.	*	2 JUN 0450	59	1881.	*	2 JUN 0915	112	281.	*	2 JUN 1340	165	114.
2 JUN 0030	7	1469.	*	2 JUN 0455	60	1802.	*	2 JUN 0920	113	276.	*	2 JUN 1345	166	112.
2 JUN 0035	8	1323.	*	2 JUN 0500	61	1735.	*	2 JUN 0925	114	270.	*	2 JUN 1350	167	110.
2 JUN 0040	9	1210.	*	2 JUN 0505	62	1671.	*	2 JUN 0930	115	265.	*	2 JUN 1355	168	107.
2 JUN 0045	10	1121.	*	2 JUN 0510	63	1589.	*	2 JUN 0935	116	260.	*	2 JUN 1400	169	105.
2 JUN 0050	11	1053.	*	2 JUN 0515	64	1501.	*	2 JUN 0940	117	255.	*	2 JUN 1405	170	100.
2 JUN 0055	12	994.	*	2 JUN 0520	65	1430.	*	2 JUN 0945	118	251.	*	2 JUN 1410	171	92.
2 JUN 0100	13	944.	*	2 JUN 0525	66	1367.	*	2 JUN 0950	119	246.	*	2 JUN 1415	172	85.
2 JUN 0105	14	905.	*	2 JUN 0530	67	1309.	*	2 JUN 0955	120	242.	*	2 JUN 1420	173	79.
2 JUN 0110	15	884.	*	2 JUN 0535	68	1254.	*	2 JUN 1000	121	239.	*	2 JUN 1425	174	74.
2 JUN 0115	16	871.	*	2 JUN 0540	69	1201.	*	2 JUN 1005	122	235.	*	2 JUN 1430	175	69.
2 JUN 0120	17	861.	*	2 JUN 0545	70	1152.	*	2 JUN 1010	123	232.	*	2 JUN 1435	176	63.
2 JUN 0125	18	863.	*	2 JUN 0550	71	1105.	*	2 JUN 1015	124	228.	*	2 JUN 1440	177	58.
2 JUN 0130	19	876.	*	2 JUN 0555	72	1060.	*	2 JUN 1020	125	225.	*	2 JUN 1445	178	53.
2 JUN 0135	20	897.	*	2 JUN 0600	73	1018.	*	2 JUN 1025	126	222.	*	2 JUN 1450	179	48.
2 JUN 0140	21	921.	*	2 JUN 0605	74	978.	*	2 JUN 1030	127	219.	*	2 JUN 1455	180	44.
2 JUN 0145	22	948.	*	2 JUN 0610	75	938.	*	2 JUN 1035	128	217.	*	2 JUN 1500	181	40.
2 JUN 0150	23	975.	*	2 JUN 0615	76	897.	*	2 JUN 1040	129	214.	*	2 JUN 1505	182	37.
2 JUN 0155	24	1001.	*	2 JUN 0620	77	864.	*	2 JUN 1045	130	211.	*	2 JUN 1510	183	33.
2 JUN 0200	25	1034.	*	2 JUN 0625	78	831.	*	2 JUN 1050	131	209.	*	2 JUN 1515	184	30.
2 JUN 0205	26	1932.	*	2 JUN 0630	79	804.	*	2 JUN 1055	132	206.	*	2 JUN 1520	185	27.
2 JUN 0210	27	5211.	*	2 JUN 0635	80	784.	*	2 JUN 1100	133	204.	*	2 JUN 1525	186	25.
2 JUN 0215	28	10285.	*	2 JUN 0640	81	767.	*	2 JUN 1105	134	202.	*	2 JUN 1530	187	23.
2 JUN 0220	29	15886.	*	2 JUN 0645	82	751.	*	2 JUN 1110	135	199.	*	2 JUN 1535	188	21.
2 JUN 0225	30	27630.	*	2 JUN 0650	83	736.	*	2 JUN 1115	136	197.	*	2 JUN 1540	189	19.
2 JUN 0230	31	42264.	*	2 JUN 0655	84	721.	*	2 JUN 1120	137	195.	*	2 JUN 1545	190	17.
2 JUN 0235	32	40271.	*	2 JUN 0700	85	707.	*	2 JUN 1125	138	193.	*	2 JUN 1550	191	16.
2 JUN 0240	33	29538.	*	2 JUN 0705	86	694.	*	2 JUN 1130	139	191.	*	2 JUN 1555	192	14.
2 JUN 0245	34	24219.	*	2 JUN 0710	87	681.	*	2 JUN 1135	140	189.	*	2 JUN 1600	193	13.

2 JUN 0250	35	20739.	*	2 JUN 0715	88	669.	*	2 JUN 1140	141	186.	*	2 JUN 1605	194	12.
2 JUN 0255	36	17568.	*	2 JUN 0720	89	658.	*	2 JUN 1145	142	183.	*	2 JUN 1610	195	11.
2 JUN 0300	37	14842.	*	2 JUN 0725	90	647.	*	2 JUN 1150	143	180.	*	2 JUN 1615	196	10.
2 JUN 0305	38	12671.	*	2 JUN 0730	91	637.	*	2 JUN 1155	144	176.	*	2 JUN 1620	197	9.
2 JUN 0310	39	10956.	*	2 JUN 0735	92	626.	*	2 JUN 1200	145	172.	*	2 JUN 1625	198	8.
2 JUN 0315	40	9497.	*	2 JUN 0740	93	615.	*	2 JUN 1205	146	169.	*	2 JUN 1630	199	8.
2 JUN 0320	41	8337.	*	2 JUN 0745	94	604.	*	2 JUN 1210	147	165.	*	2 JUN 1635	200	7.
2 JUN 0325	42	7364.	*	2 JUN 0750	95	593.	*	2 JUN 1215	148	162.	*	2 JUN 1640	201	6.
2 JUN 0330	43	6523.	*	2 JUN 0755	96	583.	*	2 JUN 1220	149	159.	*	2 JUN 1645	202	6.
2 JUN 0335	44	5829.	*	2 JUN 0800	97	572.	*	2 JUN 1225	150	155.	*	2 JUN 1650	203	5.
2 JUN 0340	45	5241.	*	2 JUN 0805	98	559.	*	2 JUN 1230	151	152.	*	2 JUN 1655	204	5.
2 JUN 0345	46	4784.	*	2 JUN 0810	99	545.	*	2 JUN 1235	152	149.	*	2 JUN 1700	205	5.
2 JUN 0350	47	4459.	*	2 JUN 0815	100	532.	*	2 JUN 1240	153	146.	*	2 JUN 1705	206	4.
2 JUN 0355	48	4206.	*	2 JUN 0820	101	516.	*	2 JUN 1245	154	143.	*	2 JUN 1710	207	4.
2 JUN 0400	49	3977.	*	2 JUN 0825	102	498.	*	2 JUN 1250	155	140.	*	2 JUN 1715	208	4.
2 JUN 0405	50	3754.	*	2 JUN 0830	103	479.	*	2 JUN 1255	156	137.	*	2 JUN 1720	209	3.
2 JUN 0410	51	3491.	*	2 JUN 0835	104	448.	*	2 JUN 1300	157	134.	*	2 JUN 1725	210	3.
2 JUN 0415	52	3211.	*	2 JUN 0840	105	409.	*	2 JUN 1305	158	132.	*			
2 JUN 0420	53	2970.	*	2 JUN 0845	106	378.	*	2 JUN 1310	159	129.	*			
			*				*				*			

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
42264.	2.50	(CFS)	5743.	2149.	2149.	2149.
		(INCHES)	7.468	8.113	8.113	8.113
		(AC-FT)	2848.	3094.	3094.	3094.

CUMULATIVE AREA = 7.15 SQ MI

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HYDROGRAPH AT C599I
TRANSPOSITION AREA 1.6 SQ MI

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	*	2 JUN 0425	54	2727.	*	2 JUN 0850	107	352.	*	2 JUN 1315	160	126.
2 JUN 0005	2	3648.	*	2 JUN 0430	55	2476.	*	2 JUN 0855	108	331.	*	2 JUN 1320	161	124.
2 JUN 0010	3	2909.	*	2 JUN 0435	56	2254.	*	2 JUN 0900	109	314.	*	2 JUN 1325	162	121.
2 JUN 0015	4	2363.	*	2 JUN 0440	57	2091.	*	2 JUN 0905	110	300.	*	2 JUN 1330	163	119.
2 JUN 0020	5	1962.	*	2 JUN 0445	58	1976.	*	2 JUN 0910	111	289.	*	2 JUN 1335	164	116.
2 JUN 0025	6	1678.	*	2 JUN 0450	59	1881.	*	2 JUN 0915	112	281.	*	2 JUN 1340	165	114.
2 JUN 0030	7	1469.	*	2 JUN 0455	60	1802.	*	2 JUN 0920	113	276.	*	2 JUN 1345	166	112.
2 JUN 0035	8	1323.	*	2 JUN 0500	61	1735.	*	2 JUN 0925	114	270.	*	2 JUN 1350	167	110.
2 JUN 0040	9	1210.	*	2 JUN 0505	62	1671.	*	2 JUN 0930	115	265.	*	2 JUN 1355	168	107.
2 JUN 0045	10	1121.	*	2 JUN 0510	63	1589.	*	2 JUN 0935	116	260.	*	2 JUN 1400	169	105.
2 JUN 0050	11	1053.	*	2 JUN 0515	64	1501.	*	2 JUN 0940	117	255.	*	2 JUN 1405	170	100.
2 JUN 0055	12	994.	*	2 JUN 0520	65	1430.	*	2 JUN 0945	118	251.	*	2 JUN 1410	171	92.
2 JUN 0100	13	944.	*	2 JUN 0525	66	1367.	*	2 JUN 0950	119	246.	*	2 JUN 1415	172	85.
2 JUN 0105	14	905.	*	2 JUN 0530	67	1309.	*	2 JUN 0955	120	242.	*	2 JUN 1420	173	79.
2 JUN 0110	15	884.	*	2 JUN 0535	68	1254.	*	2 JUN 1000	121	239.	*	2 JUN 1425	174	74.
2 JUN 0115	16	871.	*	2 JUN 0540	69	1201.	*	2 JUN 1005	122	235.	*	2 JUN 1430	175	69.
2 JUN 0120	17	861.	*	2 JUN 0545	70	1152.	*	2 JUN 1010	123	232.	*	2 JUN 1435	176	63.
2 JUN 0125	18	863.	*	2 JUN 0550	71	1105.	*	2 JUN 1015	124	228.	*	2 JUN 1440	177	58.
2 JUN 0130	19	876.	*	2 JUN 0555	72	1060.	*	2 JUN 1020	125	225.	*	2 JUN 1445	178	53.
2 JUN 0135	20	897.	*	2 JUN 0600	73	1018.	*	2 JUN 1025	126	222.	*	2 JUN 1450	179	48.
2 JUN 0140	21	921.	*	2 JUN 0605	74	978.	*	2 JUN 1030	127	219.	*	2 JUN 1455	180	44.
2 JUN 0145	22	948.	*	2 JUN 0610	75	938.	*	2 JUN 1035	128	217.	*	2 JUN 1500	181	40.
2 JUN 0150	23	975.	*	2 JUN 0615	76	897.	*	2 JUN 1040	129	214.	*	2 JUN 1505	182	37.
2 JUN 0155	24	1001.	*	2 JUN 0620	77	864.	*	2 JUN 1045	130	211.	*	2 JUN 1510	183	33.
2 JUN 0200	25	1034.	*	2 JUN 0625	78	831.	*	2 JUN 1050	131	209.	*	2 JUN 1515	184	30.
2 JUN 0205	26	1932.	*	2 JUN 0630	79	804.	*	2 JUN 1055	132	206.	*	2 JUN 1520	185	27.
2 JUN 0210	27	5211.	*	2 JUN 0635	80	784.	*	2 JUN 1100	133	204.	*	2 JUN 1525	186	25.
2 JUN 0215	28	10285.	*	2 JUN 0640	81	767.	*	2 JUN 1105	134	202.	*	2 JUN 1530	187	23.
2 JUN 0220	29	15886.	*	2 JUN 0645	82	751.	*	2 JUN 1110	135	199.	*	2 JUN 1535	188	21.
2 JUN 0225	30	27630.	*	2 JUN 0650	83	736.	*	2 JUN 1115	136	197.	*	2 JUN 1540	189	19.
2 JUN 0230	31	42264.	*	2 JUN 0655	84	721.	*	2 JUN 1120	137	195.	*	2 JUN 1545	190	17.
2 JUN 0235	32	40271.	*	2 JUN 0700	85	707.	*	2 JUN 1125	138	193.	*	2 JUN 1550	191	16.
2 JUN 0240	33	29538.	*	2 JUN 0705	86	694.	*	2 JUN 1130	139	191.	*	2 JUN 1555	192	14.
2 JUN 0245	34	24219.	*	2 JUN 0710	87	681.	*	2 JUN 1135	140	189.	*	2 JUN 1600	193	13.
2 JUN 0250	35	20739.	*	2 JUN 0715	88	669.	*	2 JUN 1140	141	186.	*	2 JUN 1605	194	12.
2 JUN 0255	36	17568.	*	2 JUN 0720	89	658.	*	2 JUN 1145	142	183.	*	2 JUN 1610	195	11.
2 JUN 0300	37	14842.	*	2 JUN 0725	90	647.	*	2 JUN 1150	143	180.	*	2 JUN 1615	196	10.
2 JUN 0305	38	12671.	*	2 JUN 0730	91	637.	*	2 JUN 1155	144	176.	*	2 JUN 1620	197	9.

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0310	39	10956.	2 JUN 0735	92	626.	2 JUN 1200	145	172.	2 JUN 1625	198	8.
2 JUN 0315	40	9497.	2 JUN 0740	93	615.	2 JUN 1205	146	169.	2 JUN 1630	199	8.
2 JUN 0320	41	8337.	2 JUN 0745	94	604.	2 JUN 1210	147	165.	2 JUN 1635	200	7.
2 JUN 0325	42	7364.	2 JUN 0750	95	593.	2 JUN 1215	148	162.	2 JUN 1640	201	6.
2 JUN 0330	43	6523.	2 JUN 0755	96	583.	2 JUN 1220	149	159.	2 JUN 1645	202	6.
2 JUN 0335	44	5829.	2 JUN 0800	97	572.	2 JUN 1225	150	155.	2 JUN 1650	203	5.
2 JUN 0340	45	5241.	2 JUN 0805	98	559.	2 JUN 1230	151	152.	2 JUN 1655	204	5.
2 JUN 0345	46	4784.	2 JUN 0810	99	545.	2 JUN 1235	152	149.	2 JUN 1700	205	5.
2 JUN 0350	47	4459.	2 JUN 0815	100	532.	2 JUN 1240	153	146.	2 JUN 1705	206	4.
2 JUN 0355	48	4206.	2 JUN 0820	101	516.	2 JUN 1245	154	143.	2 JUN 1710	207	4.
2 JUN 0400	49	3977.	2 JUN 0825	102	498.	2 JUN 1250	155	140.	2 JUN 1715	208	4.
2 JUN 0405	50	3754.	2 JUN 0830	103	479.	2 JUN 1255	156	137.	2 JUN 1720	209	3.
2 JUN 0410	51	3491.	2 JUN 0835	104	448.	2 JUN 1300	157	134.	2 JUN 1725	210	3.
2 JUN 0415	52	3211.	2 JUN 0840	105	409.	2 JUN 1305	158	132.			
2 JUN 0420	53	2970.	2 JUN 0845	106	378.	2 JUN 1310	159	129.			

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
42264.	2.50	(CFS)	5743.	2149.	2149.	2149.
		(INCHES)	7.468	8.113	8.113	8.113
		(AC-FT)	2848.	3094.	3094.	3094.

CUMULATIVE AREA = 7.15 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.0 SQ MI

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	2 JUN 0425	54	2739.	2 JUN 0850	107	327.	2 JUN 1315	160	124.
2 JUN 0005	2	3648.	2 JUN 0430	55	2467.	2 JUN 0855	108	311.	2 JUN 1320	161	122.
2 JUN 0010	3	2912.	2 JUN 0435	56	2230.	2 JUN 0900	109	298.	2 JUN 1325	162	119.
2 JUN 0015	4	2371.	2 JUN 0440	57	2056.	2 JUN 0905	110	287.	2 JUN 1330	163	117.
2 JUN 0020	5	1972.	2 JUN 0445	58	1936.	2 JUN 0910	111	281.	2 JUN 1335	164	115.
2 JUN 0025	6	1688.	2 JUN 0450	59	1837.	2 JUN 0915	112	276.	2 JUN 1340	165	112.
2 JUN 0030	7	1481.	2 JUN 0455	60	1754.	2 JUN 0920	113	270.	2 JUN 1345	166	110.
2 JUN 0035	8	1336.	2 JUN 0500	61	1684.	2 JUN 0925	114	265.	2 JUN 1350	167	108.
2 JUN 0040	9	1224.	2 JUN 0505	62	1618.	2 JUN 0930	115	260.	2 JUN 1355	168	106.
2 JUN 0045	10	1136.	2 JUN 0510	63	1542.	2 JUN 0935	116	255.	2 JUN 1400	169	101.
2 JUN 0050	11	1068.	2 JUN 0515	64	1463.	2 JUN 0940	117	251.	2 JUN 1405	170	94.
2 JUN 0055	12	1011.	2 JUN 0520	65	1397.	2 JUN 0945	118	247.	2 JUN 1410	171	86.
2 JUN 0100	13	962.	2 JUN 0525	66	1336.	2 JUN 0950	119	243.	2 JUN 1415	172	80.
2 JUN 0105	14	922.	2 JUN 0530	67	1280.	2 JUN 0955	120	239.	2 JUN 1420	173	75.
2 JUN 0110	15	899.	2 JUN 0535	68	1226.	2 JUN 1000	121	235.	2 JUN 1425	174	70.
2 JUN 0115	16	886.	2 JUN 0540	69	1174.	2 JUN 1005	122	232.	2 JUN 1430	175	64.
2 JUN 0120	17	878.	2 JUN 0545	70	1125.	2 JUN 1010	123	229.	2 JUN 1435	176	59.
2 JUN 0125	18	884.	2 JUN 0550	71	1079.	2 JUN 1015	124	225.	2 JUN 1440	177	54.
2 JUN 0130	19	899.	2 JUN 0555	72	1035.	2 JUN 1020	125	222.	2 JUN 1445	178	49.
2 JUN 0135	20	919.	2 JUN 0600	73	995.	2 JUN 1025	126	220.	2 JUN 1450	179	45.
2 JUN 0140	21	942.	2 JUN 0605	74	955.	2 JUN 1030	127	217.	2 JUN 1455	180	41.
2 JUN 0145	22	966.	2 JUN 0610	75	916.	2 JUN 1035	128	214.	2 JUN 1500	181	37.
2 JUN 0150	23	991.	2 JUN 0615	76	880.	2 JUN 1040	129	212.	2 JUN 1505	182	34.
2 JUN 0155	24	1016.	2 JUN 0620	77	846.	2 JUN 1045	130	209.	2 JUN 1510	183	31.
2 JUN 0200	25	1047.	2 JUN 0625	78	818.	2 JUN 1050	131	207.	2 JUN 1515	184	28.
2 JUN 0205	26	1922.	2 JUN 0630	79	797.	2 JUN 1055	132	204.	2 JUN 1520	185	25.
2 JUN 0210	27	5124.	2 JUN 0635	80	779.	2 JUN 1100	133	202.	2 JUN 1525	186	23.
2 JUN 0215	28	10103.	2 JUN 0640	81	763.	2 JUN 1105	134	200.	2 JUN 1530	187	21.
2 JUN 0220	29	15643.	2 JUN 0645	82	747.	2 JUN 1110	135	198.	2 JUN 1535	188	19.
2 JUN 0225	30	27312.	2 JUN 0650	83	732.	2 JUN 1115	136	195.	2 JUN 1540	189	17.
2 JUN 0230	31	41900.	2 JUN 0655	84	717.	2 JUN 1120	137	193.	2 JUN 1545	190	16.
2 JUN 0235	32	39858.	2 JUN 0700	85	703.	2 JUN 1125	138	191.	2 JUN 1550	191	14.
2 JUN 0240	33	29183.	2 JUN 0705	86	689.	2 JUN 1130	139	189.	2 JUN 1555	192	13.
2 JUN 0245	34	23936.	2 JUN 0710	87	677.	2 JUN 1135	140	187.	2 JUN 1600	193	12.
2 JUN 0250	35	20500.	2 JUN 0715	88	665.	2 JUN 1140	141	184.	2 JUN 1605	194	11.
2 JUN 0255	36	17282.	2 JUN 0720	89	653.	2 JUN 1145	142	180.	2 JUN 1610	195	10.
2 JUN 0300	37	14453.	2 JUN 0725	90	642.	2 JUN 1150	143	176.	2 JUN 1615	196	9.
2 JUN 0305	38	12191.	2 JUN 0730	91	630.	2 JUN 1155	144	173.	2 JUN 1620	197	8.
2 JUN 0310	39	10504.	2 JUN 0735	92	619.	2 JUN 1200	145	169.	2 JUN 1625	198	8.
2 JUN 0315	40	9094.	2 JUN 0740	93	608.	2 JUN 1205	146	166.	2 JUN 1630	199	7.
2 JUN 0320	41	7987.	2 JUN 0745	94	597.	2 JUN 1210	147	162.	2 JUN 1635	200	7.
2 JUN 0325	42	7049.	2 JUN 0750	95	585.	2 JUN 1215	148	159.	2 JUN 1640	201	6.

2 JUN 0330	43	6269.	*	2 JUN 0755	96	573.	*	2 JUN 1220	149	156.	*	2 JUN 1645	202	6.
2 JUN 0335	44	5637.	*	2 JUN 0800	97	560.	*	2 JUN 1225	150	153.	*	2 JUN 1650	203	5.
2 JUN 0340	45	5116.	*	2 JUN 0805	98	546.	*	2 JUN 1230	151	150.	*	2 JUN 1655	204	5.
2 JUN 0345	46	4727.	*	2 JUN 0810	99	531.	*	2 JUN 1235	152	146.	*	2 JUN 1700	205	4.
2 JUN 0350	47	4445.	*	2 JUN 0815	100	514.	*	2 JUN 1240	153	143.	*	2 JUN 1705	206	4.
2 JUN 0355	48	4218.	*	2 JUN 0820	101	495.	*	2 JUN 1245	154	141.	*	2 JUN 1710	207	4.
2 JUN 0400	49	4015.	*	2 JUN 0825	102	473.	*	2 JUN 1250	155	138.	*	2 JUN 1715	208	3.
2 JUN 0405	50	3809.	*	2 JUN 0830	103	438.	*	2 JUN 1255	156	135.	*	2 JUN 1720	209	3.
2 JUN 0410	51	3544.	*	2 JUN 0835	104	401.	*	2 JUN 1300	157	132.	*	2 JUN 1725	210	3.
2 JUN 0415	52	3249.	*	2 JUN 0840	105	371.	*	2 JUN 1305	158	129.	*			
2 JUN 0420	53	2997.	*	2 JUN 0845	106	347.	*	2 JUN 1310	159	127.	*			
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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
41900.	2.50	(CFS)	5662.	2117.	2117.	2117.
		(INCHES)	7.362	7.993	7.993	7.993
		(AC-FT)	2807.	3048.	3048.	3048.

CUMULATIVE AREA = 7.15 SQ MI

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HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.2 SQ MI

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	*	2 JUN 0425	54	2739.	*	2 JUN 0850	107	327.	*	2 JUN 1315	160	124.
2 JUN 0005	2	3648.	*	2 JUN 0430	55	2467.	*	2 JUN 0855	108	311.	*	2 JUN 1320	161	122.
2 JUN 0010	3	2912.	*	2 JUN 0435	56	2230.	*	2 JUN 0900	109	298.	*	2 JUN 1325	162	119.
2 JUN 0015	4	2371.	*	2 JUN 0440	57	2056.	*	2 JUN 0905	110	287.	*	2 JUN 1330	163	117.
2 JUN 0020	5	1972.	*	2 JUN 0445	58	1936.	*	2 JUN 0910	111	281.	*	2 JUN 1335	164	115.
2 JUN 0025	6	1688.	*	2 JUN 0450	59	1837.	*	2 JUN 0915	112	276.	*	2 JUN 1340	165	112.
2 JUN 0030	7	1481.	*	2 JUN 0455	60	1754.	*	2 JUN 0920	113	270.	*	2 JUN 1345	166	110.
2 JUN 0035	8	1336.	*	2 JUN 0500	61	1684.	*	2 JUN 0925	114	265.	*	2 JUN 1350	167	108.
2 JUN 0040	9	1224.	*	2 JUN 0505	62	1618.	*	2 JUN 0930	115	260.	*	2 JUN 1355	168	106.
2 JUN 0045	10	1136.	*	2 JUN 0510	63	1542.	*	2 JUN 0935	116	255.	*	2 JUN 1400	169	101.
2 JUN 0050	11	1068.	*	2 JUN 0515	64	1463.	*	2 JUN 0940	117	251.	*	2 JUN 1405	170	94.
2 JUN 0055	12	1011.	*	2 JUN 0520	65	1397.	*	2 JUN 0945	118	247.	*	2 JUN 1410	171	86.
2 JUN 0100	13	962.	*	2 JUN 0525	66	1336.	*	2 JUN 0950	119	243.	*	2 JUN 1415	172	80.
2 JUN 0105	14	922.	*	2 JUN 0530	67	1280.	*	2 JUN 0955	120	239.	*	2 JUN 1420	173	75.
2 JUN 0110	15	899.	*	2 JUN 0535	68	1226.	*	2 JUN 1000	121	235.	*	2 JUN 1425	174	70.
2 JUN 0115	16	886.	*	2 JUN 0540	69	1174.	*	2 JUN 1005	122	232.	*	2 JUN 1430	175	64.
2 JUN 0120	17	878.	*	2 JUN 0545	70	1125.	*	2 JUN 1010	123	229.	*	2 JUN 1435	176	59.
2 JUN 0125	18	884.	*	2 JUN 0550	71	1079.	*	2 JUN 1015	124	225.	*	2 JUN 1440	177	54.
2 JUN 0130	19	899.	*	2 JUN 0555	72	1035.	*	2 JUN 1020	125	222.	*	2 JUN 1445	178	49.
2 JUN 0135	20	919.	*	2 JUN 0600	73	995.	*	2 JUN 1025	126	220.	*	2 JUN 1450	179	45.
2 JUN 0140	21	942.	*	2 JUN 0605	74	955.	*	2 JUN 1030	127	217.	*	2 JUN 1455	180	41.
2 JUN 0145	22	966.	*	2 JUN 0610	75	916.	*	2 JUN 1035	128	214.	*	2 JUN 1500	181	37.
2 JUN 0150	23	991.	*	2 JUN 0615	76	880.	*	2 JUN 1040	129	212.	*	2 JUN 1505	182	34.
2 JUN 0155	24	1016.	*	2 JUN 0620	77	846.	*	2 JUN 1045	130	209.	*	2 JUN 1510	183	31.
2 JUN 0200	25	1047.	*	2 JUN 0625	78	818.	*	2 JUN 1050	131	207.	*	2 JUN 1515	184	28.
2 JUN 0205	26	1922.	*	2 JUN 0630	79	797.	*	2 JUN 1055	132	204.	*	2 JUN 1520	185	25.
2 JUN 0210	27	5124.	*	2 JUN 0635	80	779.	*	2 JUN 1100	133	202.	*	2 JUN 1525	186	23.
2 JUN 0215	28	10103.	*	2 JUN 0640	81	763.	*	2 JUN 1105	134	200.	*	2 JUN 1530	187	21.
2 JUN 0220	29	15643.	*	2 JUN 0645	82	747.	*	2 JUN 1110	135	198.	*	2 JUN 1535	188	19.
2 JUN 0225	30	27312.	*	2 JUN 0650	83	732.	*	2 JUN 1115	136	195.	*	2 JUN 1540	189	17.
2 JUN 0230	31	41900.	*	2 JUN 0655	84	717.	*	2 JUN 1120	137	193.	*	2 JUN 1545	190	16.
2 JUN 0235	32	39858.	*	2 JUN 0700	85	703.	*	2 JUN 1125	138	191.	*	2 JUN 1550	191	14.
2 JUN 0240	33	29183.	*	2 JUN 0705	86	689.	*	2 JUN 1130	139	189.	*	2 JUN 1555	192	13.
2 JUN 0245	34	23936.	*	2 JUN 0710	87	677.	*	2 JUN 1135	140	187.	*	2 JUN 1600	193	12.
2 JUN 0250	35	20500.	*	2 JUN 0715	88	665.	*	2 JUN 1140	141	184.	*	2 JUN 1605	194	11.
2 JUN 0255	36	17282.	*	2 JUN 0720	89	653.	*	2 JUN 1145	142	180.	*	2 JUN 1610	195	10.
2 JUN 0300	37	14453.	*	2 JUN 0725	90	642.	*	2 JUN 1150	143	176.	*	2 JUN 1615	196	9.
2 JUN 0305	38	12191.	*	2 JUN 0730	91	630.	*	2 JUN 1155	144	173.	*	2 JUN 1620	197	8.
2 JUN 0310	39	10504.	*	2 JUN 0735	92	619.	*	2 JUN 1200	145	169.	*	2 JUN 1625	198	8.
2 JUN 0315	40	9094.	*	2 JUN 0740	93	608.	*	2 JUN 1205	146	166.	*	2 JUN 1630	199	7.
2 JUN 0320	41	7987.	*	2 JUN 0745	94	597.	*	2 JUN 1210	147	162.	*	2 JUN 1635	200	7.
2 JUN 0325	42	7049.	*	2 JUN 0750	95	585.	*	2 JUN 1215	148	159.	*	2 JUN 1640	201	6.
2 JUN 0330	43	6269.	*	2 JUN 0755	96	573.	*	2 JUN 1220	149	156.	*	2 JUN 1645	202	6.
2 JUN 0335	44	5637.	*	2 JUN 0800	97	560.	*	2 JUN 1225	150	153.	*	2 JUN 1650	203	5.
2 JUN 0340	45	5116.	*	2 JUN 0805	98	546.	*	2 JUN 1230	151	150.	*	2 JUN 1655	204	5.
2 JUN 0345	46	4727.	*	2 JUN 0810	99	531.	*	2 JUN 1235	152	146.	*	2 JUN 1700	205	4.

2 JUN 0350	47	4445.	*	2 JUN 0815	100	514.	*	2 JUN 1240	153	143.	*	2 JUN 1705	206	4.
2 JUN 0355	48	4218.	*	2 JUN 0820	101	495.	*	2 JUN 1245	154	141.	*	2 JUN 1710	207	4.
2 JUN 0400	49	4015.	*	2 JUN 0825	102	473.	*	2 JUN 1250	155	138.	*	2 JUN 1715	208	3.
2 JUN 0405	50	3809.	*	2 JUN 0830	103	438.	*	2 JUN 1255	156	135.	*	2 JUN 1720	209	3.
2 JUN 0410	51	3544.	*	2 JUN 0835	104	401.	*	2 JUN 1300	157	132.	*	2 JUN 1725	210	3.
2 JUN 0415	52	3249.	*	2 JUN 0840	105	371.	*	2 JUN 1305	158	129.	*			
2 JUN 0420	53	2997.	*	2 JUN 0845	106	347.	*	2 JUN 1310	159	127.	*			
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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
41900.	2.50	(CFS)	5662.	2117.	2117.	2117.
		(INCHES)	7.362	7.993	7.993	7.993
		(AC-FT)	2807.	3048.	3048.	3048.

CUMULATIVE AREA = 7.15 SQ MI

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HYDROGRAPH AT C599I
TRANSPOSITION AREA 7.2 SQ MI

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	*	2 JUN 0425	54	2469.	*	2 JUN 0850	107	329.	*	2 JUN 1315	160	124.
2 JUN 0005	2	3647.	*	2 JUN 0430	55	2280.	*	2 JUN 0855	108	312.	*	2 JUN 1320	161	121.
2 JUN 0010	3	2908.	*	2 JUN 0435	56	2132.	*	2 JUN 0900	109	299.	*	2 JUN 1325	162	119.
2 JUN 0015	4	2362.	*	2 JUN 0440	57	2000.	*	2 JUN 0905	110	288.	*	2 JUN 1330	163	116.
2 JUN 0020	5	1960.	*	2 JUN 0445	58	1896.	*	2 JUN 0910	111	281.	*	2 JUN 1335	164	114.
2 JUN 0025	6	1676.	*	2 JUN 0450	59	1806.	*	2 JUN 0915	112	275.	*	2 JUN 1340	165	112.
2 JUN 0030	7	1467.	*	2 JUN 0455	60	1734.	*	2 JUN 0920	113	270.	*	2 JUN 1345	166	109.
2 JUN 0035	8	1321.	*	2 JUN 0500	61	1670.	*	2 JUN 0925	114	265.	*	2 JUN 1350	167	107.
2 JUN 0040	9	1208.	*	2 JUN 0505	62	1607.	*	2 JUN 0930	115	260.	*	2 JUN 1355	168	104.
2 JUN 0045	10	1118.	*	2 JUN 0510	63	1530.	*	2 JUN 0935	116	255.	*	2 JUN 1400	169	99.
2 JUN 0050	11	1050.	*	2 JUN 0515	64	1447.	*	2 JUN 0940	117	250.	*	2 JUN 1405	170	92.
2 JUN 0055	12	991.	*	2 JUN 0520	65	1380.	*	2 JUN 0945	118	246.	*	2 JUN 1410	171	84.
2 JUN 0100	13	941.	*	2 JUN 0525	66	1320.	*	2 JUN 0950	119	242.	*	2 JUN 1415	172	79.
2 JUN 0105	14	901.	*	2 JUN 0530	67	1264.	*	2 JUN 0955	120	238.	*	2 JUN 1420	173	74.
2 JUN 0110	15	879.	*	2 JUN 0535	68	1211.	*	2 JUN 1000	121	235.	*	2 JUN 1425	174	68.
2 JUN 0115	16	865.	*	2 JUN 0540	69	1161.	*	2 JUN 1005	122	231.	*	2 JUN 1430	175	63.
2 JUN 0120	17	855.	*	2 JUN 0545	70	1113.	*	2 JUN 1010	123	228.	*	2 JUN 1435	176	58.
2 JUN 0125	18	853.	*	2 JUN 0550	71	1067.	*	2 JUN 1015	124	225.	*	2 JUN 1440	177	53.
2 JUN 0130	19	859.	*	2 JUN 0555	72	1025.	*	2 JUN 1020	125	222.	*	2 JUN 1445	178	48.
2 JUN 0135	20	873.	*	2 JUN 0600	73	984.	*	2 JUN 1025	126	219.	*	2 JUN 1450	179	44.
2 JUN 0140	21	894.	*	2 JUN 0605	74	945.	*	2 JUN 1030	127	216.	*	2 JUN 1455	180	40.
2 JUN 0145	22	919.	*	2 JUN 0610	75	909.	*	2 JUN 1035	128	214.	*	2 JUN 1500	181	36.
2 JUN 0150	23	946.	*	2 JUN 0615	76	873.	*	2 JUN 1040	129	211.	*	2 JUN 1505	182	33.
2 JUN 0155	24	972.	*	2 JUN 0620	77	841.	*	2 JUN 1045	130	208.	*	2 JUN 1510	183	30.
2 JUN 0200	25	1005.	*	2 JUN 0625	78	815.	*	2 JUN 1050	131	206.	*	2 JUN 1515	184	27.
2 JUN 0205	26	1826.	*	2 JUN 0630	79	796.	*	2 JUN 1055	132	204.	*	2 JUN 1520	185	25.
2 JUN 0210	27	4826.	*	2 JUN 0635	80	778.	*	2 JUN 1100	133	201.	*	2 JUN 1525	186	22.
2 JUN 0215	28	9464.	*	2 JUN 0640	81	762.	*	2 JUN 1105	134	199.	*	2 JUN 1530	187	20.
2 JUN 0220	29	14562.	*	2 JUN 0645	82	747.	*	2 JUN 1110	135	197.	*	2 JUN 1535	188	19.
2 JUN 0225	30	25783.	*	2 JUN 0650	83	732.	*	2 JUN 1115	136	195.	*	2 JUN 1540	189	17.
2 JUN 0230	31	40111.	*	2 JUN 0655	84	717.	*	2 JUN 1120	137	193.	*	2 JUN 1545	190	15.
2 JUN 0235	32	37985.	*	2 JUN 0700	85	703.	*	2 JUN 1125	138	191.	*	2 JUN 1550	191	14.
2 JUN 0240	33	27674.	*	2 JUN 0705	86	689.	*	2 JUN 1130	139	189.	*	2 JUN 1555	192	13.
2 JUN 0245	34	22673.	*	2 JUN 0710	87	677.	*	2 JUN 1135	140	186.	*	2 JUN 1600	193	12.
2 JUN 0250	35	19451.	*	2 JUN 0715	88	664.	*	2 JUN 1140	141	183.	*	2 JUN 1605	194	11.
2 JUN 0255	36	16481.	*	2 JUN 0720	89	653.	*	2 JUN 1145	142	179.	*	2 JUN 1610	195	10.
2 JUN 0300	37	13950.	*	2 JUN 0725	90	642.	*	2 JUN 1150	143	175.	*	2 JUN 1615	196	9.
2 JUN 0305	38	11905.	*	2 JUN 0730	91	631.	*	2 JUN 1155	144	172.	*	2 JUN 1620	197	8.
2 JUN 0310	39	10317.	*	2 JUN 0735	92	619.	*	2 JUN 1200	145	168.	*	2 JUN 1625	198	8.
2 JUN 0315	40	8927.	*	2 JUN 0740	93	608.	*	2 JUN 1205	146	165.	*	2 JUN 1630	199	7.
2 JUN 0320	41	7849.	*	2 JUN 0745	94	597.	*	2 JUN 1210	147	161.	*	2 JUN 1635	200	6.
2 JUN 0325	42	6892.	*	2 JUN 0750	95	586.	*	2 JUN 1215	148	158.	*	2 JUN 1640	201	6.
2 JUN 0330	43	6081.	*	2 JUN 0755	96	573.	*	2 JUN 1220	149	155.	*	2 JUN 1645	202	5.
2 JUN 0335	44	5400.	*	2 JUN 0800	97	560.	*	2 JUN 1225	150	152.	*	2 JUN 1650	203	5.
2 JUN 0340	45	4842.	*	2 JUN 0805	98	546.	*	2 JUN 1230	151	149.	*	2 JUN 1655	204	5.
2 JUN 0345	46	4440.	*	2 JUN 0810	99	532.	*	2 JUN 1235	152	146.	*	2 JUN 1700	205	4.
2 JUN 0350	47	4128.	*	2 JUN 0815	100	515.	*	2 JUN 1240	153	143.	*	2 JUN 1705	206	4.
2 JUN 0355	48	3862.	*	2 JUN 0820	101	496.	*	2 JUN 1245	154	140.	*	2 JUN 1710	207	4.
2 JUN 0400	49	3626.	*	2 JUN 0825	102	475.	*	2 JUN 1250	155	137.	*	2 JUN 1715	208	3.
2 JUN 0405	50	3408.	*	2 JUN 0830	103	442.	*	2 JUN 1255	156	134.	*	2 JUN 1720	209	3.

2 JUN 0410	51	3165.	*	2 JUN 0835	104	404.	*	2 JUN 1300	157	131.	*	2 JUN 1725	210	3.
2 JUN 0415	52	2905.	*	2 JUN 0840	105	373.	*	2 JUN 1305	158	129.	*			
2 JUN 0420	53	2683.	*	2 JUN 0845	106	349.	*	2 JUN 1310	159	126.	*			

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K FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
40111.	2.50	(CFS)	5407.	2029.	2029.	2029.
		(INCHES)	7.031	7.660	7.660	7.660
		(AC-FT)	2681.	2921.	2921.	2921.

CUMULATIVE AREA = 7.15 SQ MI

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INTERPOLATED HYDROGRAPH AT C599I

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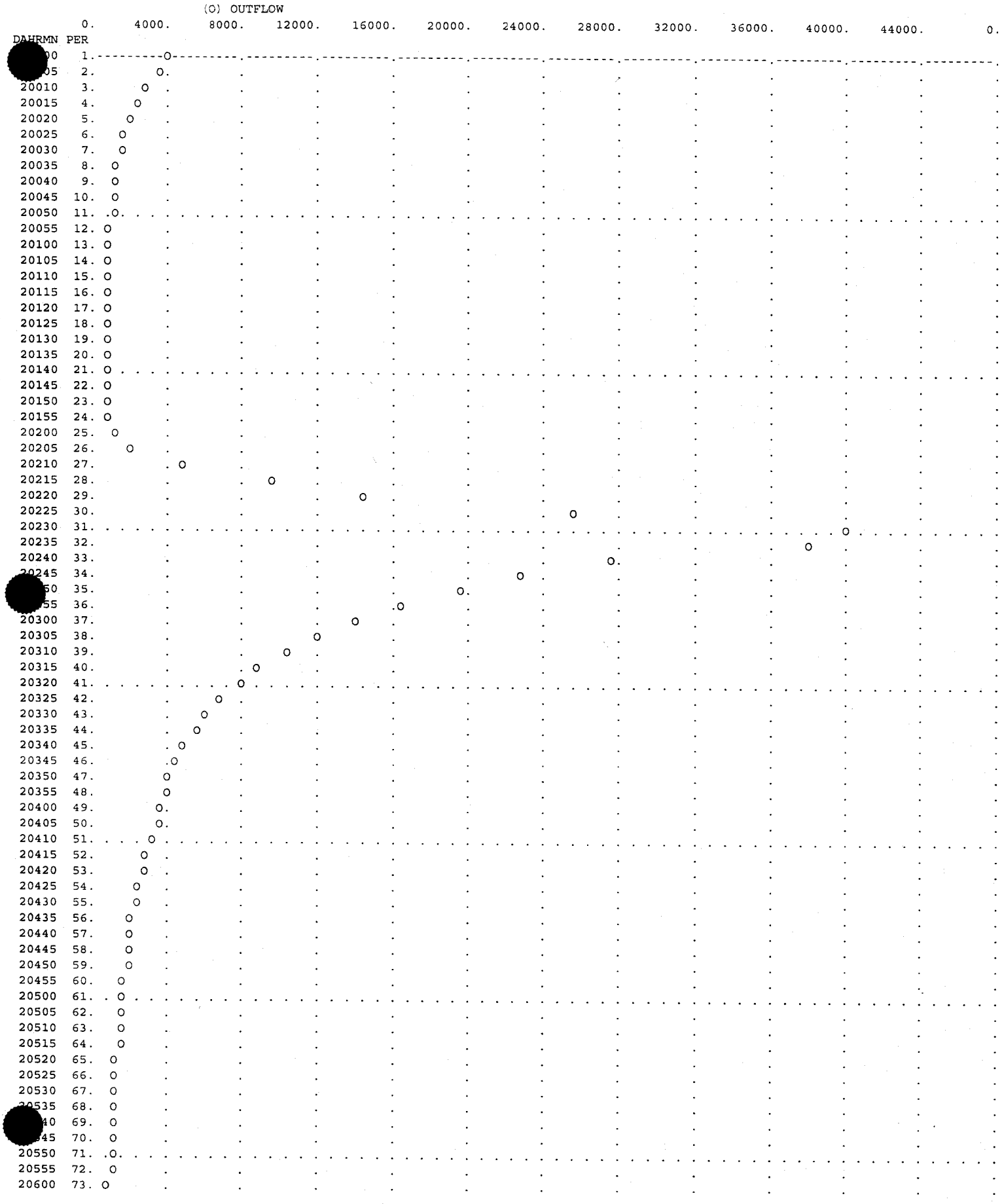
DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	4065.	*	2 JUN 0425	54	2469.	*	2 JUN 0850	107	329.	*	2 JUN 1315	160	124.
2 JUN 0005	2	3647.	*	2 JUN 0430	55	2280.	*	2 JUN 0855	108	312.	*	2 JUN 1320	161	121.
2 JUN 0010	3	2908.	*	2 JUN 0435	56	2132.	*	2 JUN 0900	109	299.	*	2 JUN 1325	162	119.
2 JUN 0015	4	2362.	*	2 JUN 0440	57	2000.	*	2 JUN 0905	110	288.	*	2 JUN 1330	163	116.
2 JUN 0020	5	1960.	*	2 JUN 0445	58	1896.	*	2 JUN 0910	111	281.	*	2 JUN 1335	164	114.
2 JUN 0025	6	1676.	*	2 JUN 0450	59	1806.	*	2 JUN 0915	112	275.	*	2 JUN 1340	165	112.
2 JUN 0030	7	1467.	*	2 JUN 0455	60	1734.	*	2 JUN 0920	113	270.	*	2 JUN 1345	166	109.
2 JUN 0035	8	1321.	*	2 JUN 0500	61	1670.	*	2 JUN 0925	114	265.	*	2 JUN 1350	167	107.
2 JUN 0040	9	1208.	*	2 JUN 0505	62	1607.	*	2 JUN 0930	115	260.	*	2 JUN 1355	168	104.
2 JUN 0045	10	1118.	*	2 JUN 0510	63	1530.	*	2 JUN 0935	116	255.	*	2 JUN 1400	169	99.
2 JUN 0050	11	1050.	*	2 JUN 0515	64	1447.	*	2 JUN 0940	117	250.	*	2 JUN 1405	170	92.
2 JUN 0055	12	991.	*	2 JUN 0520	65	1380.	*	2 JUN 0945	118	246.	*	2 JUN 1410	171	84.
2 JUN 0100	13	941.	*	2 JUN 0525	66	1320.	*	2 JUN 0950	119	242.	*	2 JUN 1415	172	79.
2 JUN 0105	14	901.	*	2 JUN 0530	67	1264.	*	2 JUN 0955	120	238.	*	2 JUN 1420	173	74.
2 JUN 0110	15	879.	*	2 JUN 0535	68	1211.	*	2 JUN 1000	121	235.	*	2 JUN 1425	174	68.
2 JUN 0115	16	865.	*	2 JUN 0540	69	1161.	*	2 JUN 1005	122	231.	*	2 JUN 1430	175	63.
2 JUN 0120	17	855.	*	2 JUN 0545	70	1113.	*	2 JUN 1010	123	228.	*	2 JUN 1435	176	58.
2 JUN 0125	18	853.	*	2 JUN 0550	71	1067.	*	2 JUN 1015	124	225.	*	2 JUN 1440	177	53.
2 JUN 0130	19	859.	*	2 JUN 0555	72	1025.	*	2 JUN 1020	125	222.	*	2 JUN 1445	178	48.
2 JUN 0135	20	873.	*	2 JUN 0600	73	984.	*	2 JUN 1025	126	219.	*	2 JUN 1450	179	44.
2 JUN 0140	21	894.	*	2 JUN 0605	74	945.	*	2 JUN 1030	127	216.	*	2 JUN 1455	180	40.
2 JUN 0145	22	919.	*	2 JUN 0610	75	909.	*	2 JUN 1035	128	214.	*	2 JUN 1500	181	36.
2 JUN 0150	23	946.	*	2 JUN 0615	76	873.	*	2 JUN 1040	129	211.	*	2 JUN 1505	182	33.
2 JUN 0155	24	972.	*	2 JUN 0620	77	841.	*	2 JUN 1045	130	208.	*	2 JUN 1510	183	30.
2 JUN 0200	25	1005.	*	2 JUN 0625	78	815.	*	2 JUN 1050	131	206.	*	2 JUN 1515	184	27.
2 JUN 0205	26	1826.	*	2 JUN 0630	79	796.	*	2 JUN 1055	132	204.	*	2 JUN 1520	185	25.
2 JUN 0210	27	4826.	*	2 JUN 0635	80	778.	*	2 JUN 1100	133	201.	*	2 JUN 1525	186	22.
2 JUN 0215	28	9464.	*	2 JUN 0640	81	762.	*	2 JUN 1105	134	199.	*	2 JUN 1530	187	20.
2 JUN 0220	29	14562.	*	2 JUN 0645	82	747.	*	2 JUN 1110	135	197.	*	2 JUN 1535	188	19.
2 JUN 0225	30	25783.	*	2 JUN 0650	83	732.	*	2 JUN 1115	136	195.	*	2 JUN 1540	189	17.
2 JUN 0230	31	40111.	*	2 JUN 0655	84	717.	*	2 JUN 1120	137	193.	*	2 JUN 1545	190	15.
2 JUN 0235	32	37985.	*	2 JUN 0700	85	703.	*	2 JUN 1125	138	191.	*	2 JUN 1550	191	14.
2 JUN 0240	33	27674.	*	2 JUN 0705	86	689.	*	2 JUN 1130	139	189.	*	2 JUN 1555	192	13.
2 JUN 0245	34	22673.	*	2 JUN 0710	87	677.	*	2 JUN 1135	140	186.	*	2 JUN 1600	193	12.
2 JUN 0250	35	19451.	*	2 JUN 0715	88	664.	*	2 JUN 1140	141	183.	*	2 JUN 1605	194	11.
2 JUN 0255	36	16481.	*	2 JUN 0720	89	653.	*	2 JUN 1145	142	179.	*	2 JUN 1610	195	10.
2 JUN 0300	37	13950.	*	2 JUN 0725	90	642.	*	2 JUN 1150	143	175.	*	2 JUN 1615	196	9.
2 JUN 0305	38	11905.	*	2 JUN 0730	91	631.	*	2 JUN 1155	144	172.	*	2 JUN 1620	197	8.
2 JUN 0310	39	10317.	*	2 JUN 0735	92	619.	*	2 JUN 1200	145	168.	*	2 JUN 1625	198	8.
2 JUN 0315	40	8927.	*	2 JUN 0740	93	608.	*	2 JUN 1205	146	165.	*	2 JUN 1630	199	7.
2 JUN 0320	41	7849.	*	2 JUN 0745	94	597.	*	2 JUN 1210	147	161.	*	2 JUN 1635	200	6.
2 JUN 0325	42	6892.	*	2 JUN 0750	95	586.	*	2 JUN 1215	148	158.	*	2 JUN 1640	201	6.
2 JUN 0330	43	6081.	*	2 JUN 0755	96	573.	*	2 JUN 1220	149	155.	*	2 JUN 1645	202	5.
2 JUN 0335	44	5400.	*	2 JUN 0800	97	560.	*	2 JUN 1225	150	152.	*	2 JUN 1650	203	5.
2 JUN 0340	45	4842.	*	2 JUN 0805	98	546.	*	2 JUN 1230	151	149.	*	2 JUN 1655	204	5.
2 JUN 0345	46	4440.	*	2 JUN 0810	99	532.	*	2 JUN 1235	152	146.	*	2 JUN 1700	205	4.
2 JUN 0350	47	4128.	*	2 JUN 0815	100	515.	*	2 JUN 1240	153	143.	*	2 JUN 1705	206	4.
2 JUN 0355	48	3862.	*	2 JUN 0820	101	496.	*	2 JUN 1245	154	140.	*	2 JUN 1710	207	4.
2 JUN 0400	49	3626.	*	2 JUN 0825	102	475.	*	2 JUN 1250	155	137.	*	2 JUN 1715	208	3.
2 JUN 0405	50	3408.	*	2 JUN 0830	103	442.	*	2 JUN 1255	156	134.	*	2 JUN 1720	209	3.
2 JUN 0410	51	3165.	*	2 JUN 0835	104	404.	*	2 JUN 1300	157	131.	*	2 JUN 1725	210	3.
2 JUN 0415	52	2905.	*	2 JUN 0840	105	373.	*	2 JUN 1305	158	129.	*			
2 JUN 0420	53	2683.	*	2 JUN 0845	106	349.	*	2 JUN 1310	159	126.	*			

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	17.42-HR
40111.	2.50	(CFS)	5407.	2029.	2029.	2029.
		(INCHES)	7.031	7.660	7.660	7.660
		(AC-FT)	2681.	2921.	2921.	2921.

CUMULATIVE AREA = 7.15 SQ MI

STATION C599I



20605 74. O
20610 75. O
20615 76. O
20620 77. O
20625 78. O
20630 79. O
20635 80. O
20640 81. O
20645 82. O
20650 83. O
20655 84. O
20700 85. O
20705 86. O
20710 87. O
20715 88. O
20720 89. O
20725 90. O
20730 91. O
20735 92. O
20740 93. O
20745 94.O
20750 95.O
20755 96.O
20800 97.O
20805 98.O
20810 99.O
20815 100.O
20820 101.O
20825 102.O
20830 103.O
20835 104.O
20840 105.O
20845 106.O
20850 107.O
20855 108.O
20900 109.O
20905 110.O
20910 111.O
20915 112.O
20920 113.O
20925 114.O
20930 115.O
20935 116.O
20940 117.O
20945 118.O
20950 119.O
20955 120.O
21000 121.O
21005 122.O
21010 123.O
21015 124.O
21020 125.O
21025 126.O
21030 127.O
21035 128.O
21040 129.O
21045 130.O
21050 131.O
21055 132.O
21100 133.O
21105 134O
21110 135O
21115 136O
21120 137O
21125 138O
21130 139O
21135 140O
21140 141O
21145 142O
21150 143O
21155 144O
21200 145O
21205 146O
21210 147O
21215 148O
21220 149O
21225 150O
21230 151O

21235 1520
21240 1530
21245 1540
21250 1550
21255 1560
21300 1570
21305 1580
21310 1590
21315 1600
21320 1610
21325 1620
21330 1630
21335 1640
21340 1650
21345 1660
21350 1670
21355 1680
21400 1690
21405 1700
21410 1710
21415 1720
21420 1730
21425 1740
21430 1750
21435 1760
21440 1770
21445 1780
21450 1790
21455 1800
21500 1810
21505 1820
21510 1830
21515 1840
21520 1850
21525 1860
21530 1870
21535 1880
21540 1890
21545 1900
21550 1910
21555 1920
21600 1930
21605 1940
21610 1950
21615 1960
21620 1970
21625 1980
21630 1990
21635 2000
21640 2010
21645 2020
21650 2030
21655 2040
21700 2050
21705 2060
21710 2070
21715 2080
21720 2090
21725 2100

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	C560I	17974.	2.58	2897.	1001.	1001.	2.15		
DIVERSION TO	.5PMF	8987.	2.58	1449.	500.	500.	2.15		
HYDROGRAPH AT	0.5PM	8987.	2.58	1449.	500.	500.	2.15		
ROUTED TO	C560O	7963.	2.67	1525.	627.	627.	2.15		
ROUTED TO	560599	7909.	2.75	1529.	631.	631.	2.15		
HYDROGRAPH AT	DAMFLO	29206.	2.50	1896.	665.	665.	2.02		
ROUTED TO	578599	25366.	2.50	1909.	673.	673.	2.02		
HYDROGRAPH AT	C584I	20238.	2.33	2265.	781.	781.	1.60		
DIVERSION TO	.5PMF	10119.	2.33	1132.	391.	391.	1.60		
HYDROGRAPH AT	0.5PM	10119.	2.33	1132.	391.	391.	1.60		
ROUTED TO	C584O	9855.	2.42	1229.	466.	466.	1.60		
ROUTED TO	584599	7907.	2.58	1293.	495.	495.	1.60		
HYDROGRAPH AT	C210	19580.	2.33	1956.	674.	674.	1.38		
DIVERSION TO	0.5PMF	9790.	2.33	978.	337.	337.	1.38		
HYDROGRAPH AT	0.5PMF	9790.	2.33	978.	337.	337.	1.38		
4 COMBINED AT	C599I	40111.	2.50	5407.	2029.	2029.	7.15		

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

Appendix D

HEC-1 file for IDF2

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*            VERSION 4.0.1E            *
*     Lahey F77L-EM/32 version 5.01    *
*       Dodson & Associates, Inc.      *
*  RUN DATE  02/18/99  TIME  14:40:32  *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

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

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

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

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

  1           ID        GOLDEN EAGLE PARK DAM (FCD 97-44)
  2           ID        IDF2 Model for the Computation of IDF for Golden Eagle Park Dam
  3           ID        ****************************************************************
  4           ID        Analytical Considerations:
  5           ID            Without Upstream Dam Breach
  6           ID            Single Basin Models
  7           ID            This model considers areal reduction method.
  8           ID        ****************************************************************
  9           ID
 10           ID    FILE: IDF2.DAT (by FCDMC)
 11           ID    DATE: OCTOBER 1998
 12           ID    MODIFIED BY STANTEC - FEBRUARY 1999
 13           ID
 14           ID    THIS MODEL WAS ALTERED BY FCDMC FROM THE ORIGINAL MODEL- GEPD-PMF.DAT
 15           ID    FROM THE GOLDEN EAGLE PARK DAM FEASIBILITY STUDY DONE BY GEORGE V.
 16           ID    SABOL CONSULTING ENGINEERS, INC. (GVSCE), JULY 1997
 17           ID
 18           ID       THIS MODEL HAS UNDERGONE THE FOLLOWING ADJUSTMENTS (BY FCDMC):
 19           ID          1.)  NORTH HEIGHTS DAM IN THIS MODEL DOES NOT BREACH
 20           ID          2.)  BEFORE THE FLOW FROM EACH WATERSHED IS ROUTED THROUGH THEIR
 21           ID               RESPECTIVE DAMS,  HALF THE FLOW IS DIVERTED OUT TO REFLECT
 22           ID               THE HALF PMF EVENT.
 23           ID               THE FLOWS FROM BETWEEN THE UPPER DAMS AND GEPD HAS ALSO BEEN
 24           ID               HALVED
 25           ID          3.)  THE RATING CURVES FOR THE DAMS WERE ALTERED USING THE
 26           ID               EQUATION Q=CLH3/2 TO INCREASE THE LENGTH OF THE SPILLWAY
 27           ID               SO THAT THE HALF PMF WILL PASS THROUGH THE SPILLWAY WITH
 28           ID               THE REQUIRED THREE FEET OF FREEBOARD
 29           ID               C = 2.6
 30           ID          4.)  THE PRINCIPLE SPILLWAYS WERE MODELED AS UNCLOGGED
 31           ID          5.)  THE INITIAL WATER SURFACE ELEVATION WAS SET TO THE
 32           ID               HEIGHT OF THE 100 YEAR EVENT WSEL
 33           ID          NOTE:MODIFICATIONS BY STANTEC ARE EDITORIAL ONLY. THE ORIGINAL GVSCE
 34           ID               MODEL AND REVISIONS BY FCDMC ARE ACCEPTED. THE ROUTING (BY FCDMC)
 35           ID               OF THE IDF2 HYDROGRAPH THROUGH THE EXISTING GEP DAM IS DELETED.
              *DIAGRAM
 36           IT       5 02JUN98             200
 37           IO       4
 38           IN      15
              *
 39           JD   15.00    0.01
 40           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.2     1.8
 41           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 42           PI   0.075   0.075   0.075   0.075
 43           JD   15.00   1.603
 44           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.2     1.8
 45           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 46           PI   0.075   0.075   0.075   0.075
 47           JD   14.70   2.000
 48           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     8.0     1.8
 49           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 50           PI   0.075   0.075   0.075   0.075
 51           JD   14.70   2.150
 52           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     8.0     1.8
 53           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
```

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

  54          PI   0.075   0.075   0.075   0.075
  55          JD   13.70   7.150
  56          PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.0     1.8
  57          PI     0.7     0.7   0.375   0.375   0.375   0.375    0.15    0.15    0.15    0.15
  58          PI   0.075   0.075   0.075   0.075

  59          KK   C560I (ASPEN DAM)
  60          KM        BASIN S207
  61          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  62          KM        L=      3.9  Lca=      2.2   S=  464.7  Kn= .030  LAG=  30.6
  63          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
  64          BA    2.15
  65          LG     .17     .31    4.90    0.29   31.55
  66          UI    237.    523.   1170.   1651.   2163.   2377.   1509.   1274.   1082.    897.
  67          UI    699.    573.    507.    374.    299.    259.    198.    181.    119.    116.
  68          UI    111.     45.     45.     45.     45.     45.     45.     45.      0.      0.
  69          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  70          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  71          KK  0.5PMF
  72          KM    THIS DIVERT IS USED TO REMOVE HALF THE FLOWS BEFORE ROUTING THROUGH
  73          KM    THE DAM
  74          DT  0.5PMF
  75          DI      0      50     100   10000
  76          DQ      0      25      50    5000
              *

  77          KK   C560O
  78          KM      Reservoir route at C560 (Aspen Dam).
  79          KM    THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD - PMF.DAT) FROM
  80          KM    THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)
  81          RS      1    ELEV 1835.36
  82          SV   0.00    7.09   34.65   75.98  135.64  191.44  208.31  226.53  246.00  266.28
  83          SV 289.00  310.81  336.00
  84          SE 1808.8 1814.00 1820.00 1826.00 1832.00 1836.00 1837.00 1838.00 1839.00 1840.00
  85          SE 1841.0 1842.00 1843.00
  86          SQ      0     102     184     242     285     907    1913    3718    5913    8428
  87          SQ  11432   14486   17540
              *

  88          KK  560599
  89          KM      Normal depth channel route (Aspen Dam to GEP Dam)
  90          RS      1    FLOW      -1
  91          RC  0.050   0.025   0.050  3127.0  0.0272
  92          RX 9850.4  9950.4  9974.4 10000.0 10035.5 10059.8 10080.4 10104.4
  93          RY 1772.0  1771.7  1765.3  1765.3  1765.9  1768.5  1773.3  1773.7
              *

  94          KK   C578I
  95          KM        BASIN S208 (NORTH HEIGHTS DAM)
  96          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  97          KM        L=      3.0  Lca=      1.6   S=  488.9  Kn= .018  LAG=  14.2
  98          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
  99          BA    2.00
 100          LG     .10     .25    4.80     .28   50.48
```

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

 101          UI    837.   3038.   4371.   2543.   1714.   1106.    677.    446.    282.    192.
 102          UI     91.     91.     91.      0.      0.      0.      0.      0.      0.      0.
 103          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 104          KK  0.5PMF
 105          KM    THIS DIVERT REMOVES HALF THE FLOWS TO REPRESENT THE .5 PMF BEFORE BEING
 106          KM    ROUTED THROUGH THE DAM
 107          DT  0.5PMF
 108          DI       0      50     100   10000
 109          DQ       0      25      50    5000
              *

 110          KK   C578O
 111          KM      Reservoir route at C578 (North Heights Dam).
 112          KM    THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
 113          KM    THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)
 114          KO       3
 115          RS       1    ELEV 1812.29
 116          SV    0.00    2.77   16.38   41.49   84.39  133.00  154.47  171.00  187.43    205.
 117          SV  223.03  242.00  261.38
 118          SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00   1815.
 119          SE  1816.0 1817.00 1818.00
 120          SQ       0     160     221     269     305     327    2323    4539    8141   12045
 121          SQ   16339   21352   26505
 122          SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00   1815.
 123          SE  1816.0 1817.00 1818.00
              *

 124          KK  578599
 125          KM      Normal depth channel route (North Heights Dam to GEP Dam)
 126          RS       1    FLOW      -1
 127          RC   0.055   0.045   0.055  3762.0 0.01624
 128          RX  9928.9  9945.0  9963.1  9990.6 10012.2 10035.4 10052.8 10069.6
 129          RY  1755.7  1746.3  1746.1  1741.7  1743.3  1743.7  1744.6  1755.7
              *

 130          KK   C584I
 131          KM        BASIN S209 (SUNRIDGE CANYON DAM)
 132          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 133          KM        L=      3.2  Lca=      1.7   S=  582.3  Kn= .019  LAG=  15.9
 134          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 135          BA    1.60
 136          LG     .13     .28    4.62     .32   41.50
 137          UI    515.   1951.   3289.   2104.   1510.    997.    702.    442.    308.    202.
 138          UI    154.     65.     65.     65.      0.      0.      0.      0.      0.      0.
 139          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 140          KK  0.5PMF
 141          KM    THIS DIVERT REMOVES HALF THE PMF FLOWS CREATING THE .5 PMF BEFORE
 142          KM    BEING ROUTED THROUGH THE DAM
 143          DT  0.5PMF
 144          DI       0      50     100   10000
 145          DQ       0      25      50    5000
              *
```

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

 146          KK   C584O
 147          KM      Reservoir route at C584. (Sunridge Canyon Dam)
 148          KM    THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
 149          KM    THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)
 150          RS       1    ELEV 1926.31
 151          SV    0.00     0.60     4.30    11.27    23.74    46.29    86.65    96.00   104.90   126.25
 152          SV  151.07   165.00   179.50
 153          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 154          SE  1930.0 1931.00 1932.00
 155          SQ       0      163      223      272      307      333      355      959     1762     6368
 156          SQ   12373    16175    20178
 157          SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 158          SE  1930.0 1931.00 1932.00
              *

 159          KK  584599
 160          KM      Normal depth channel route (Sunridge Canyon Dam to GEP Dam)
 161          RS       1    FLOW      -1
 162          RC   0.065    0.050    0.065   6526.0 0.02571
 163          RX  9927.6   9939.8   9951.9   9985.3 10036.0 10067.5 10119.2 10188.7
 164          RY  1796.3   1791.2   1788.3   1784.1  1784.9  1788.0  1790.2  1796.4
              *

 165          KK    C210
 166          KM        BASIN S210 (GOLDEN EAGLE PARK DAM)
 167          KM        THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 168          KM        L=       1.9  Lca=        .9   S=  360.7  Kn= .024  LAG=  13.6
 169          KM        PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 170          BA    1.38
 171          LG     .09      .24     5.61      .19    24.82
 172          UI    634.    2291.    3040.    1739.    1122.     723.     433.     286.     170.      96.
 173          UI     66.      66.       0.       0.       0.       0.       0.       0.       0.       0.
 174          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

 175          KK  0.5PMF
 176          KM    THIS DIVERT REMOVES HALF THE FLOWS FROM THIS AREA TO CREATE THE .5PMF
 177          DT  0.5PMF
 178          DI       0       50      100    10000
 179          DQ       0       25       50     5000
              *

 180          KK   C599I
 181          KO       1        2                        21
 182          KM      Hydrograph combine C584O + C560O + C578O + C599
 183          HC       4
 184          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

           (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  59        C560I
                .
                .
  74            .-------->  0.5PMF
  71       0.5PMF
                V
                V
  77        C560O
                V
                V
  88       560599
                .
                .
  94            .       C578I
                .           .
                .           .
 107            .           .-------->  0.5PMF
 104            .      0.5PMF
                .           V
                .           V
 110            .       C578O
                .           V
                .           V
 124            .      578599
                .           .
                .           .
 130            .           .       C584I
                .           .           .
                .           .           .
 143            .           .           .-------->  0.5PMF
 140            .           .      0.5PMF
                .           .           V
                .           .           V
 146            .           .       C584O
                .           .           V
                .           .           V
 159            .           .      584599
                .           .           .
                .           .           .
 165            .           .           .        C210
                .           .           .           .
                .           .           .           .
 177            .           .           .           .-------->  0.5PMF
 175            .           .           .      0.5PMF
                .           .           .           .
                .           .           .           .
 180       C599I.................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              MAY   1991              *                    *    HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.0.1E             *                    *          609 SECOND STREET           *
*     Lahey F77L-EM/32 version 5.01    *                    *       DAVIS, CALIFORNIA 95616        *
*        Dodson & Associates, Inc.     *                    *           (916) 551-1748             *
* RUN DATE  02/18/99  TIME  14:40:32   *                    *                                      *
****************************************                    ****************************************
```

```
GOLDEN EAGLE PARK DAM (FCD 97-44)
IDF2 Model for the Computation of IDF for Golden Eagle Park Dam
*****************************************************************
Analytical Considerations:
    Without Upstream Dam Breach
    Single Basin Models
    This model considers areal reduction method.
*****************************************************************

FILE: IDF2.DAT (by FCDMC)
DATE: OCTOBER 1998
MODIFIED BY STANTEC - FEBRUARY 1999

THIS MODEL WAS ALTERED BY FCDMC FROM THE ORIGINAL MODEL- GEPD-PMF.DAT
FROM THE GOLDEN EAGLE PARK DAM FEASIBILITY STUDY DONE BY GEORGE V.
SABOL CONSULTING ENGINEERS, INC. (GVSCE), JULY 1997

THIS MODEL HAS UNDERGONE THE FOLLOWING ADJUSTMENTS (BY FCDMC):
   1.)  NORTH HEIGHTS DAM IN THIS MODEL DOES NOT BREACH
   2.)  BEFORE THE FLOW FROM EACH WATERSHED IS ROUTED THROUGH THEIR
        RESPECTIVE DAMS,  HALF THE FLOW IS DIVERTED OUT TO REFLECT
        THE HALF PMF EVENT.
        THE FLOWS FROM BETWEEN THE UPPER DAMS AND GEPD HAS ALSO BEEN
        HALVED
   3.)  THE RATING CURVES FOR THE DAMS WERE ALTERED USING THE
        EQUATION Q=CLH3/2 TO INCREASE THE LENGTH OF THE SPILLWAY
        SO THAT THE HALF PMF WILL PASS THROUGH THE SPILLWAY WITH
        THE REQUIRED THREE FEET OF FREEBOARD
        C = 2.6
   4.)  THE PRINCIPLE SPILLWAYS WERE MODELED AS UNCLOGGED
   5.)  THE INITIAL WATER SURFACE ELEVATION WAS SET TO THE
        HEIGHT OF THE 100 YEAR EVENT WSEL
  NOTE:MODIFICATIONS BY STANTEC ARE EDITORIAL ONLY.  THE ORIGINAL GVSCE
        AND REVISIONS BY FCDMC ARE ACCEPTED.  THE ROUTING (BY FCDMC)
        OF THE IDF2 HYDROGRAPH THROUGH THE EXISTING GEP DAM IS DELETED.

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

38 IN          TIME DATA FOR INPUT TIME SERIES
                    JXMIN         15  TIME INTERVAL IN MINUTES
                   JXDATE     2JUN98  STARTING DATE
                   JXTIME          0  STARTING TIME

   IT          HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     2JUN98  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        200  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     2JUN98  ENDING DATE
                   NDTIME       1635  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL    0.08 HOURS
                   TOTAL TIME BASE   16.58 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

39 JD        INDEX STORM NO. 1
                STRM       15.00  PRECIPITATION DEPTH
                TRDA        0.01  TRANSPOSITION DRAINAGE AREA

40 PI          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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
                0.07       0.07       0.07       0.07       2.73       2.73       2.73       0.60       0.60       0.60
                0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
                0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
                0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
                0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
                0.03       0.02

43 JD        INDEX STORM NO. 2
                STRM       15.00  PRECIPITATION DEPTH
                TRDA        1.60  TRANSPOSITION DRAINAGE AREA

44 PI          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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
                0.07       0.07       0.07       0.07       2.73       2.73       2.73       0.60       0.60       0.60
                0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
                0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
                0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
                0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
                0.03       0.02

47 JD        INDEX STORM NO. 3
                STRM       14.70  PRECIPITATION DEPTH
                TRDA        2.00  TRANSPOSITION DRAINAGE AREA

48 PI          PRECIPITATION PATTERN
                0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03
                0.03       0.03       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
                0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
                0.23       0.23       0.23       0.17       0.17       0.17       0.14       0.14       0.14       0.14
                0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.04       0.04
                0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04
                0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
                0.03       0.02

51 JD        INDEX STORM NO. 4
                STRM       14.70  PRECIPITATION DEPTH
                TRDA        2.15  TRANSPOSITION DRAINAGE AREA

52 PI          PRECIPITATION PATTERN
                0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03       0.03
                0.03       0.03       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
                0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
                0.23       0.23       0.23       0.17       0.17       0.17       0.14       0.14       0.14       0.14
                0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.14       0.04       0.04
                0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04       0.04
                0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
                0.03       0.02

55 JD        INDEX STORM NO. 5
                STRM       13.70  PRECIPITATION DEPTH
                TRDA        7.15  TRANSPOSITION DRAINAGE AREA

56 PI          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       0.07       0.07       0.07       0.07       0.07       0.07       0.07       0.07
                0.07       0.07       0.07       0.07       2.67       2.67       2.67       0.60       0.60       0.60
                0.23       0.23       0.23       0.23       0.23       0.23       0.13       0.13       0.13       0.13
                0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.13       0.05       0.05
                0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05       0.05
                0.02       0.03       0.02       0.02       0.03       0.02       0.02       0.03       0.02       0.02
                0.03       0.02

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
 59 KK        *     C560I  *      (ASPEN DAM)
              *            *
              **************
                                  BASIN S207
                                  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                                  L=      3.9  Lca=      2.2   S=  464.7  Kn= .030  LAG=  30.6
                                  PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

                SUBBASIN RUNOFF DATA

 64 BA            SUBBASIN CHARACTERISTICS
                        TAREA        2.15  SUBBASIN AREA

 65 LG            GREEN AND AMPT LOSS RATE
                        STRTL        0.17  STARTING LOSS
                          DTH        0.31  MOISTURE DEFICIT
                         PSIF        4.90  WETTING FRONT SUCTION
                        XKSAT        0.29  HYDRAULIC CONDUCTIVITY
                        RTIMP       31.55  PERCENT IMPERVIOUS AREA

 60 UI            INPUT UNITGRAPH,  28 ORDINATES,  VOLUME = 1.00
                      237.0     523.0    1170.0    1651.0    2163.0    2377.0    1509.0    1274.0    1082.0     897.0
                      699.0     573.0     507.0     374.0     299.0     259.0     198.0     181.0     119.0     116.0
                      111.0      45.0      45.0      45.0      45.0      45.0      45.0      45.0

                                                                                  ***

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

              **************
              *            *
 71 KK        *    0.5PMF  *
              *            *
              **************
                                  THIS DIVERT IS USED TO REMOVE HALF THE FLOWS BEFORE ROUTING THROUGH
                                  THE DAM

    DT            DIVERSION
                        ISTAD      0.5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

    DI              INFLOW         0.00     50.00    100.00  10000.00

    DQ       DIVERTED FLOW         0.00     25.00     50.00   5000.00

                                                                                  ***

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

              **************
              *            *
 77 KK        *     C560O  *
              *            *
              **************
                                    Reservoir route at C560 (Aspen Dam).
                                  THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD - PMF.DAT) FROM
                                  THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)

                HYDROGRAPH ROUTING DATA

 81 RS            STORAGE ROUTING
                        NSTPS           1  NUMBER OF SUBREACHES
                         ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC     1835.36  INITIAL CONDITION
                            X        0.00 WORKING R AND D COEFFICIENT

 SV                STORAGE          0.0       7.1      34.7      76.0     135.6     191.4     208.3     226.5     246.0     266.3
                                  289.0     310.8     336.0

 84 SE            ELEVATION     1808.80   1814.00   1820.00   1826.00   1832.00   1836.00   1837.00   1838.00   1839.00   1840.00
                                1841.00   1842.00   1843.00
```

```
 86 SQ          DISCHARGE          0.      102.      184.      242.      285.      907.     1913.     3718.     5913.     8428.
                              11432.    14486.    17540.

                                                                  ***

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

          **************
          *            *
 88 KK    *    560599  *
          *            *
          **************
                              Normal depth channel route (Aspen Dam to GEP Dam)

            HYDROGRAPH ROUTING DATA

 90 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

 91 RC        NORMAL DEPTH CHANNEL
                      ANL       0.050  LEFT OVERBANK N-VALUE
                     ANCH       0.025  MAIN CHANNEL N-VALUE
                      ANR       0.050  RIGHT OVERBANK N-VALUE
                    RLNTH       3127.  REACH LENGTH
                      SEL      0.0272  ENERGY SLOPE
                    ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                        CROSS-SECTION DATA
                         --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
 93 RY       ELEVATION   1772.00   1771.70   1765.30   1765.30   1765.90   1768.50   1773.30   1773.70
 92 RX       DISTANCE    9850.40   9950.40   9974.40  10000.00  10035.50  10059.80  10080.40  10104.40

                                                                  ***

                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      1.25      3.25      5.47      7.87     10.46     13.23     16.19     19.31     22.54
          OUTFLOW       0.00     80.98    338.67    762.45   1326.75   2026.43   2859.90   3827.44   5030.18   6405.37
        ELEVATION    1765.30   1765.74   1766.18   1766.63   1767.07   1767.51   1767.95   1768.40   1768.84   1769.28

          STORAGE      25.89     29.35     32.92     36.60     40.40     44.95     52.04     59.24     66.51     74.15
          OUTFLOW    7919.95   9571.50  11358.09  13278.22  15330.69  17050.24  19574.03  22392.59  25434.73  28542.28
        ELEVATION    1769.72   1770.16   1770.61   1771.05   1771.49   1771.93   1772.37   1772.82   1773.26   1773.70

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN     2026. TO    28542.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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

          **************
          *            *
 94 KK    *     C578I  *
          *            *
          **************
                              BASIN S208 (NORTH HEIGHTS DAM)
                              THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                              L=      3.0  Lca=      1.6   S=  488.9  Kn= .018  LAG=  14.2
                              PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

            SUBBASIN RUNOFF DATA

 BA           SUBBASIN CHARACTERISTICS
                    TAREA        2.00  SUBBASIN AREA

100 LG        GREEN AND AMPT LOSS RATE
                    STRTL        0.10  STARTING LOSS
```

```
                    DTH        0.25  MOISTURE DEFICIT
                   PSIF        4.80  WETTING FRONT SUCTION
                  XKSAT        0.28  HYDRAULIC CONDUCTIVITY
                  RTIMP       50.48  PERCENT IMPERVIOUS AREA

UI          INPUT UNITGRAPH,  13 ORDINATES,  VOLUME = 1.00
                837.0    3038.0    4371.0    2543.0    1714.0    1106.0     677.0     446.0     282.0     192.0
                 91.0      91.0      91.0

                                                          ***

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

          **************
          *            *
104 KK    *    0.5PMF  *
          *            *
          **************
                         THIS DIVERT REMOVES HALF THE FLOWS TO REPRESENT THE .5 PMF BEFORE BEING
                         ROUTED THROUGH THE DAM

    DT          DIVERSION
                      ISTAD      0.5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

    DI             INFLOW        0.00     50.00    100.00  10000.00

    DQ      DIVERTED FLOW        0.00     25.00     50.00   5000.00

                                                          ***

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

          **************
          *            *
KK        *     C578O  *
          *            *
          **************
                           Reservoir route at C578 (North Heights Dam).
                         THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
                         THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)

114 KO      OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

          HYDROGRAPH ROUTING DATA

115 RS      STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        ELEV  TYPE OF INITIAL CONDITION
                    RSVRIC     1812.29  INITIAL CONDITION
                         X        0.00 WORKING R AND D COEFFICIENT

116 SV        STORAGE          0.0       2.8      16.4      41.5      84.4     133.0     154.5     171.0     187.4     205.0
                             223.0     242.0     261.4

118 SE      ELEVATION       1779.20   1788.00   1794.00   1800.00   1806.00   1810.50   1812.00   1813.00   1814.00   1815.00
                            1816.00   1817.00   1818.00

120 SQ      DISCHARGE           0.       160.      221.      269.      305.      327.     2323.     4539.     8141.    12045.
                            16339.    21352.    26505.

122 SE      ELEVATION       1779.20   1788.00   1794.00   1800.00   1806.00   1810.50   1812.00   1813.00   1814.00   1815.00
                            1816.00   1817.00   1818.00

                                                          ***

                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.77     16.38     41.49     84.39    133.00    154.47    171.00    187.43    205.00
          OUTFLOW       0.00    160.00    221.00    269.00    305.00    327.00   2323.00   4539.00   8141.00  12045.00
```

ELEVATION	1779.20	1788.00	1794.00	1800.00	1806.00	1810.50	1812.00	1813.00	1814.00	1815.00

STORAGE	223.03	242.00	261.38
OUTFLOW	16339.00	21352.00	26505.00
ELEVATION	1816.00	1817.00	1818.00

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

HYDROGRAPH AT STATION C578O
TRANSPOSITION AREA 0.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
13136.	2.42	(CFS)	1544.	645.	645.	645.
		(INCHES)	7.179	8.292	8.292	8.292
		(AC-FT)	766.	884.	884.	884.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	16.58-HR
210.	2.42	137.	67.	67.	67.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	16.58-HR
1815.25	2.42	1810.57	1797.46	1797.46	1797.46

CUMULATIVE AREA = 2.00 SQ MI

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

HYDROGRAPH AT STATION C578O
TRANSPOSITION AREA 1.6 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
13136.	2.42	(CFS)	1544.	645.	645.	645.
		(INCHES)	7.179	8.292	8.292	8.292
		(AC-FT)	766.	884.	884.	884.

STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	16.58-HR
210.	2.42	137.	67.	67.	67.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	16.58-HR
1815.25	2.42	1810.57	1797.46	1797.46	1797.46

CUMULATIVE AREA = 2.00 SQ MI

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

HYDROGRAPH AT STATION C578O
TRANSPOSITION AREA 2.0 SQ MI

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
12828.	2.42	(CFS)	1517.	633.	633.	633.
		(INCHES)	7.051	8.129	8.129	8.129
		(AC-FT)	752.	867.	867.	867.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	16.58-HR
208.	2.42	136.	66.	66.	66.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	16.58-HR
1815.18	2.42	1810.55	1797.20	1797.20	1797.20

CUMULATIVE AREA = 2.00 SQ MI

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

HYDROGRAPH AT STATION C578O
TRANSPOSITION AREA 2.2 SQ MI

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

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  (CFS)       (HR)                  6-HR       24-HR       72-HR     16.58-HR
  12828.      2.42       (CFS)     1517.        633.        633.         633.
                       (INCHES)    7.051       8.129       8.129        8.129
                        (AC-FT)     752.        867.        867.         867.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
  (AC-FT)       (HR)                  6-HR       24-HR       72-HR     16.58-HR
    208.        2.42                   136.        66.         66.          66.

 PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
  (FEET)        (HR)                  6-HR       24-HR       72-HR     16.58-HR
 1815.18        2.42               1810.55     1797.20     1797.20      1797.20

                         CUMULATIVE AREA =    2.00 SQ MI


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

                          HYDROGRAPH AT STATION    C5780
                        TRANSPOSITION AREA      7.2 SQ MI

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
  (CFS)         (HR)                  6-HR       24-HR       72-HR     16.58-HR
  11872.        2.42       (CFS)     1412.        596.        596.         596.
                       (INCHES)    6.565       7.655       7.655        7.655
                        (AC-FT)     700.        816.        816.         816.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
  (AC-FT)       (HR)                  6-HR       24-HR       72-HR     16.58-HR
    204.        2.42                   135.        66.         66.          66.

 PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
  (FEET)        (HR)                  6-HR       24-HR       72-HR     16.58-HR
 1814.96        2.42               1810.46     1797.25     1797.25      1797.25

                         CUMULATIVE AREA =    2.00 SQ MI

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


                         INTERPOLATED HYDROGRAPH AT    C5780

 PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
  (CFS)         (HR)                  6-HR       24-HR       72-HR     16.58-HR
  12828.        2.42       (CFS)     1517.        633.        633.         633.
                       (INCHES)    7.051       8.129       8.129        8.129
                        (AC-FT)     752.        867.        867.         867.

                         CUMULATIVE AREA =    2.00 SQ MI


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


            **************
            *            *
 124 KK     *    578599  *
            *            *
            **************
                          Normal depth channel route (North Heights Dam to GEP Dam)

              HYDROGRAPH ROUTING DATA

 126 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

 127 RC         NORMAL DEPTH CHANNEL
                        ANL       0.055  LEFT OVERBANK N-VALUE
                       ANCH       0.045  MAIN CHANNEL N-VALUE
                        ANR       0.055  RIGHT OVERBANK N-VALUE
                      RLNTH       3762.  REACH LENGTH
                        SEL      0.0162  ENERGY SLOPE
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                    ELMAX          0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                          CROSS-SECTION DATA
                              --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
129 RY        ELEVATION   1755.70   1746.30   1746.10   1741.70   1743.30   1743.70   1744.60   1755.70
    RX        DISTANCE    9928.90   9945.00   9963.10   9990.60  10012.20  10035.40  10052.80  10069.60

                                                    ***

                                          COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      0.46      1.85      4.81      9.40     14.71     20.40     27.33     34.55     41.91
          OUTFLOW       0.00     11.58     73.53    223.88    591.07   1135.72   1841.12   2800.82   3956.89   5289.59
        ELEVATION    1741.70   1742.44   1743.17   1743.91   1744.65   1745.38   1746.12   1746.86   1747.59   1748.33

          STORAGE      49.43     57.10     64.91     72.88     81.01     89.28     97.70    106.28    115.00    123.88
          OUTFLOW    6789.08   8448.74  10263.80  12230.66  14346.52  16609.22  19017.04  21568.64  24262.94  27099.13
        ELEVATION    1749.07   1749.80   1750.54   1751.28   1752.02   1752.75   1753.49   1754.23   1754.96   1755.70

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN    19017. TO    27099.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)


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


            **************
            *            *
130 KK      *     C584I  *
            *            *
            **************
                                BASIN S209 (SUNRIDGE CANYON DAM)
                                THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                                L=      3.2  Lca=      1.7   S=  582.3  Kn= .019  LAG=  15.9
                                PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

              SUBBASIN RUNOFF DATA

135 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.60  SUBBASIN AREA

136 LG          GREEN AND AMPT LOSS RATE
                      STRTL        0.13  STARTING LOSS
                        DTH        0.28  MOISTURE DEFICIT
                       PSIF        4.62  WETTING FRONT SUCTION
                      XKSAT        0.32  HYDRAULIC CONDUCTIVITY
                      RTIMP       41.50  PERCENT IMPERVIOUS AREA

131 UI          INPUT UNITGRAPH,  14 ORDINATES,  VOLUME = 1.00
                    515.0    1951.0    3289.0    2104.0    1510.0     997.0     702.0     442.0     308.0     202.0
                    154.0      65.0      65.0      65.0

                                                    ***


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


            **************
            *            *
140 KK      *    0.5PMF  *
            *            *
            **************
                                THIS DIVERT REMOVES HALF THE PMF FLOWS CREATING THE .5 PMF BEFORE
                                BEING ROUTED THROUGH THE DAM

    DT          DIVERSION
                      ISTAD      0.5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

    DI             INFLOW        0.00     50.00    100.00  10000.00

    DQ      DIVERTED FLOW        0.00     25.00     50.00   5000.00

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

          **************
          *            *
146 KK    *     C5840  *
          *            *
          **************
                          Reservoir route at C584. (Sunridge Canyon Dam)
                        THE SQ CARDS HAVE BEEN ALTERED FROM THE ORIGINAL MODEL (GEPD-PMF.DAT) FROM
                        THE GEPD FEASIBILITY STUDY (GVSCE, JULY 1997)

            HYDROGRAPH ROUTING DATA

150 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       ELEV  TYPE OF INITIAL CONDITION
                    RSVRIC    1926.31  INITIAL CONDITION
                         X       0.00 WORKING R AND D COEFFICIENT

151 SV            STORAGE        0.0       0.6       4.3      11.3      23.7      46.3      86.7      96.0     104.9     126.3
                               151.1     165.0     179.5

153 SE          ELEVATION    1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00
                             1930.00   1931.00   1932.00

155 SQ          DISCHARGE         0.      163.      223.      272.      307.      333.      355.      959.     1762.     6368.
                              12373.    16175.    20178.

157 SE          ELEVATION    1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00
                             1930.00   1931.00   1932.00

                                                        ***

                                        COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      0.60      4.30     11.27     23.74     46.29     86.65     96.00    104.90    126.25
          OUTFLOW       0.00    163.00    223.00    272.00    307.00    333.00    355.00    959.00   1762.00   6368.00
        ELEVATION    1884.80   1894.00   1900.00   1906.00   1912.00   1918.00   1924.00   1925.00   1926.00   1928.00

          STORAGE     151.07    165.00    179.50
          OUTFLOW   12373.00  16175.00  20178.00
        ELEVATION    1930.00   1931.00   1932.00


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


          **************
          *            *
159 KK    *    584599  *
          *            *
          **************
                          Normal depth channel route (Sunridge Canyon Dam to GEP Dam)

            HYDROGRAPH ROUTING DATA

161 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

162 RC          NORMAL DEPTH CHANNEL
                       ANL      0.065  LEFT OVERBANK N-VALUE
                      ANCH      0.050  MAIN CHANNEL N-VALUE
                       ANR      0.065  RIGHT OVERBANK N-VALUE
                     RLNTH      6526.  REACH LENGTH
                       SEL     0.0257  ENERGY SLOPE
                     ELMAX        0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                        CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
164 RY        ELEVATION   1796.30   1791.20   1788.30   1784.10   1784.90   1788.00   1790.20   1796.40
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163 RX        DISTANCE    9927.60   9939.80   9951.90   9985.30  10036.00  10067.50  10119.20  10188.70

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.24      7.98     14.95     23.06     32.31     42.69     54.58     68.23     83.62
          OUTFLOW       0.00     33.64    220.33    562.36   1053.96   1702.52   2517.57   3657.11   5058.06   6692.23
        ELEVATION    1784.10   1784.75   1785.39   1786.04   1786.69   1787.34   1787.98   1788.63   1789.28   1789.93

          STORAGE     100.62    118.65    137.59    157.39    178.03    199.54    221.89    245.10    269.16    294.08
          OUTFLOW    8585.16  10733.76  13130.79  15770.61  18653.94  21782.37  25158.02  28783.38  32661.21  36801.66
        ELEVATION    1790.57   1791.22   1791.87   1792.52   1793.16   1793.81   1794.46   1795.10   1795.75   1796.40


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


          **************
          *            *
165 KK    *      C210  *
          *            *
          **************
                          BASIN S210 (GOLDEN EAGLE PARK DAM)
                          THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                          L=      1.9  Lca=       .9   S=  360.7  Kn= .024  LAG=  13.6
                          PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

             SUBBASIN RUNOFF DATA

170 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.38  SUBBASIN AREA

171 LG          GREEN AND AMPT LOSS RATE
                      STRTL        0.09  STARTING LOSS
                        DTH        0.24  MOISTURE DEFICIT
                       PSIF        5.61  WETTING FRONT SUCTION
                      XKSAT        0.19  HYDRAULIC CONDUCTIVITY
                      RTIMP       24.82  PERCENT IMPERVIOUS AREA

166 UI          INPUT UNITGRAPH,  12 ORDINATES,  VOLUME = 1.00
                    634.0    2291.0    3040.0    1739.0    1122.0     723.0     433.0     286.0     170.0      96.0
                     66.0      66.0

                                                  ***


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          **************
          *            *
175 KK    *    0.5PMF  *
          *            *
          **************
                             THIS DIVERT REMOVES HALF THE FLOWS FROM THIS AREA TO CREATE THE .5PMF

    DT          DIVERSION
                      ISTAD      0.5PMF  DIVERSION HYDROGRAPH IDENTIFICATION

    DI             INFLOW        0.00     50.00    100.00  10000.00

    DQ      DIVERTED FLOW        0.00     25.00     50.00   5000.00

                                                  ***


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


          **************
          *            *
180 KK    *     C599I  *
          *            *
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181 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                      IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                       IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2        200  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT      0.083  TIME INTERVAL IN HOURS

                 Hydrograph combine C5840 + C5600 + C5780 + C599

183 HC          HYDROGRAPH COMBINATION
                      ICOMP          4  NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT C599I
TRANSPOSITION AREA 0.0 SQ MI

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
2	JUN	0000	1	6249.	2	JUN	0410	51	3440.	2	JUN	0820	101	785.	2	JUN	1230	151	159.
2	JUN	0005	2	5380.	2	JUN	0415	52	3148.	2	JUN	0825	102	768.	2	JUN	1235	152	154.
2	JUN	0010	3	3896.	2	JUN	0420	53	2871.	2	JUN	0830	103	749.	2	JUN	1240	153	150.
2	JUN	0015	4	2853.	2	JUN	0425	54	2588.	2	JUN	0835	104	718.	2	JUN	1245	154	147.
2	JUN	0020	5	2196.	2	JUN	0430	55	2313.	2	JUN	0840	105	679.	2	JUN	1250	155	143.
2	JUN	0025	6	1817.	2	JUN	0435	56	2091.	2	JUN	0845	106	647.	2	JUN	1255	156	139.
2	JUN	0030	7	1580.	2	JUN	0440	57	1933.	2	JUN	0850	107	620.	2	JUN	1300	157	136.
2	JUN	0035	8	1430.	2	JUN	0445	58	1822.	2	JUN	0855	108	599.	2	JUN	1305	158	133.
2	JUN	0040	9	1325.	2	JUN	0450	59	1739.	2	JUN	0900	109	581.	2	JUN	1310	159	130.
2	JUN	0045	10	1245.	2	JUN	0455	60	1674.	2	JUN	0905	110	566.	2	JUN	1315	160	127.
2	JUN	0050	11	1184.	2	JUN	0500	61	1621.	2	JUN	0910	111	553.	2	JUN	1320	161	124.
2	JUN	0055	12	1135.	2	JUN	0505	62	1571.	2	JUN	0915	112	544.	2	JUN	1325	162	121.
2	JUN	0100	13	1095.	2	JUN	0510	63	1504.	2	JUN	0920	113	536.	2	JUN	1330	163	119.
2	JUN	0105	14	1064.	2	JUN	0515	64	1431.	2	JUN	0925	114	528.	2	JUN	1335	164	116.
2	JUN	0110	15	1052.	2	JUN	0520	65	1375.	2	JUN	0930	115	520.	2	JUN	1340	165	114.
2	JUN	0115	16	1044.	2	JUN	0525	66	1328.	2	JUN	0935	116	513.	2	JUN	1345	166	111.
2	JUN	0120	17	1037.	2	JUN	0530	67	1287.	2	JUN	0940	117	505.	2	JUN	1350	167	109.
2	JUN	0125	18	1037.	2	JUN	0535	68	1250.	2	JUN	0945	118	498.	2	JUN	1355	168	107.
2	JUN	0130	19	1045.	2	JUN	0540	69	1215.	2	JUN	0950	119	490.	2	JUN	1400	169	104.
2	JUN	0135	20	1056.	2	JUN	0545	70	1184.	2	JUN	0955	120	483.	2	JUN	1405	170	99.
2	JUN	0140	21	1068.	2	JUN	0550	71	1154.	2	JUN	1000	121	477.	2	JUN	1410	171	92.
2	JUN	0145	22	1079.	2	JUN	0555	72	1126.	2	JUN	1005	122	470.	2	JUN	1415	172	84.
2	JUN	0150	23	1088.	2	JUN	0600	73	1099.	2	JUN	1010	123	464.	2	JUN	1420	173	78.
2	JUN	0155	24	1097.	2	JUN	0605	74	1073.	2	JUN	1015	124	458.	2	JUN	1425	174	73.
2	JUN	0200	25	1104.	2	JUN	0610	75	1042.	2	JUN	1020	125	452.	2	JUN	1430	175	68.
2	JUN	0205	26	1956.	2	JUN	0615	76	1011.	2	JUN	1025	126	445.	2	JUN	1435	176	62.
2	JUN	0210	27	5059.	2	JUN	0620	77	988.	2	JUN	1030	127	439.	2	JUN	1440	177	57.
2	JUN	0215	28	10561.	2	JUN	0625	78	965.	2	JUN	1035	128	433.	2	JUN	1445	178	52.
2	JUN	0220	29	18641.	2	JUN	0630	79	949.	2	JUN	1040	129	425.	2	JUN	1450	179	48.
2	JUN	0225	30	26592.	2	JUN	0635	80	940.	2	JUN	1045	130	418.	2	JUN	1455	180	43.
2	JUN	0230	31	29150.	2	JUN	0640	81	933.	2	JUN	1050	131	410.	2	JUN	1500	181	39.
2	JUN	0235	32	29679.	2	JUN	0645	82	928.	2	JUN	1055	132	402.	2	JUN	1505	182	36.
2	JUN	0240	33	27459.	2	JUN	0650	83	923.	2	JUN	1100	133	394.	2	JUN	1510	183	32.
2	JUN	0245	34	23698.	2	JUN	0655	84	918.	2	JUN	1105	134	387.	2	JUN	1515	184	29.
2	JUN	0250	35	19963.	2	JUN	0700	85	914.	2	JUN	1110	135	379.	2	JUN	1520	185	26.
2	JUN	0255	36	16840.	2	JUN	0705	86	909.	2	JUN	1115	136	371.	2	JUN	1525	186	24.
2	JUN	0300	37	14395.	2	JUN	0710	87	904.	2	JUN	1120	137	357.	2	JUN	1530	187	22.
2	JUN	0305	38	12328.	2	JUN	0715	88	900.	2	JUN	1125	138	334.	2	JUN	1535	188	20.
2	JUN	0310	39	10674.	2	JUN	0720	89	895.	2	JUN	1130	139	308.	2	JUN	1540	189	18.
2	JUN	0315	40	9266.	2	JUN	0725	90	890.	2	JUN	1135	140	283.	2	JUN	1545	190	16.
2	JUN	0320	41	8133.	2	JUN	0730	91	884.	2	JUN	1140	141	260.	2	JUN	1550	191	15.
2	JUN	0325	42	7174.	2	JUN	0735	92	877.	2	JUN	1145	142	242.	2	JUN	1555	192	13.
2	JUN	0330	43	6321.	2	JUN	0740	93	870.	2	JUN	1150	143	225.	2	JUN	1600	193	12.
2	JUN	0335	44	5626.	2	JUN	0745	94	862.	2	JUN	1155	144	211.	2	JUN	1605	194	11.
2	JUN	0340	45	5053.	2	JUN	0750	95	854.	2	JUN	1200	145	200.	2	JUN	1610	195	10.
2	JUN	0345	46	4631.	2	JUN	0755	96	846.	2	JUN	1205	146	189.	2	JUN	1615	196	9.
2	JUN	0350	47	4335.	2	JUN	0800	97	836.	2	JUN	1210	147	181.	2	JUN	1620	197	8.
2	JUN	0355	48	4102.	2	JUN	0805	98	825.	2	JUN	1215	148	173.	2	JUN	1625	198	7.
2	JUN	0400	49	3896.	2	JUN	0810	99	813.	2	JUN	1220	149	168.	2	JUN	1630	199	7.
2	JUN	0405	50	3693.	2	JUN	0815	100	800.	2	JUN	1225	150	163.	2	JUN	1635	200	6.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
29679.	2.58	(CFS)	5423.	2217.	2217.	2217.
		(INCHES)	7.072	7.989	7.989	7.989
		(AC-FT)	2689.	3038.	3038.	3038.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 1.6 SQ MI

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	6249.	2 JUN 0410	51	3440.	2 JUN 0820	101	785.	2 JUN 1230	151	159.
2 JUN 0005	2	5380.	2 JUN 0415	52	3148.	2 JUN 0825	102	768.	2 JUN 1235	152	154.
2 JUN 0010	3	3896.	2 JUN 0420	53	2871.	2 JUN 0830	103	749.	2 JUN 1240	153	150.
2 JUN 0015	4	2853.	2 JUN 0425	54	2588.	2 JUN 0835	104	718.	2 JUN 1245	154	147.
2 JUN 0020	5	2196.	2 JUN 0430	55	2313.	2 JUN 0840	105	679.	2 JUN 1250	155	143.
2 JUN 0025	6	1817.	2 JUN 0435	56	2091.	2 JUN 0845	106	647.	2 JUN 1255	156	139.
2 JUN 0030	7	1580.	2 JUN 0440	57	1933.	2 JUN 0850	107	620.	2 JUN 1300	157	136.
2 JUN 0035	8	1430.	2 JUN 0445	58	1822.	2 JUN 0855	108	599.	2 JUN 1305	158	133.
2 JUN 0040	9	1325.	2 JUN 0450	59	1739.	2 JUN 0900	109	581.	2 JUN 1310	159	130.
2 JUN 0045	10	1245.	2 JUN 0455	60	1674.	2 JUN 0905	110	566.	2 JUN 1315	160	127.
2 JUN 0050	11	1184.	2 JUN 0500	61	1621.	2 JUN 0910	111	553.	2 JUN 1320	161	124.
2 JUN 0055	12	1135.	2 JUN 0505	62	1571.	2 JUN 0915	112	544.	2 JUN 1325	162	121.
2 JUN 0100	13	1095.	2 JUN 0510	63	1504.	2 JUN 0920	113	536.	2 JUN 1330	163	119.
2 JUN 0105	14	1064.	2 JUN 0515	64	1431.	2 JUN 0925	114	528.	2 JUN 1335	164	116.
2 JUN 0110	15	1052.	2 JUN 0520	65	1375.	2 JUN 0930	115	520.	2 JUN 1340	165	114.
2 JUN 0115	16	1044.	2 JUN 0525	66	1328.	2 JUN 0935	116	513.	2 JUN 1345	166	111.
2 JUN 0120	17	1037.	2 JUN 0530	67	1287.	2 JUN 0940	117	505.	2 JUN 1350	167	109.
2 JUN 0125	18	1037.	2 JUN 0535	68	1250.	2 JUN 0945	118	498.	2 JUN 1355	168	107.
2 JUN 0130	19	1045.	2 JUN 0540	69	1215.	2 JUN 0950	119	490.	2 JUN 1400	169	104.
2 JUN 0135	20	1056.	2 JUN 0545	70	1184.	2 JUN 0955	120	483.	2 JUN 1405	170	99.
2 JUN 0140	21	1068.	2 JUN 0550	71	1154.	2 JUN 1000	121	477.	2 JUN 1410	171	92.
2 JUN 0145	22	1079.	2 JUN 0555	72	1126.	2 JUN 1005	122	470.	2 JUN 1415	172	84.
2 JUN 0150	23	1088.	2 JUN 0600	73	1099.	2 JUN 1010	123	464.	2 JUN 1420	173	78.
2 JUN 0155	24	1097.	2 JUN 0605	74	1073.	2 JUN 1015	124	458.	2 JUN 1425	174	73.
2 JUN 0200	25	1104.	2 JUN 0610	75	1042.	2 JUN 1020	125	452.	2 JUN 1430	175	68.
2 JUN 0205	26	1956.	2 JUN 0615	76	1011.	2 JUN 1025	126	445.	2 JUN 1435	176	62.
2 JUN 0210	27	5059.	2 JUN 0620	77	988.	2 JUN 1030	127	439.	2 JUN 1440	177	57.
2 JUN 0215	28	10561.	2 JUN 0625	78	965.	2 JUN 1035	128	433.	2 JUN 1445	178	52.
2 JUN 0220	29	18641.	2 JUN 0630	79	949.	2 JUN 1040	129	425.	2 JUN 1450	179	48.
2 JUN 0225	30	26592.	2 JUN 0635	80	940.	2 JUN 1045	130	418.	2 JUN 1455	180	43.
2 JUN 0230	31	29150.	2 JUN 0640	81	933.	2 JUN 1050	131	410.	2 JUN 1500	181	39.
2 JUN 0235	32	29679.	2 JUN 0645	82	928.	2 JUN 1055	132	402.	2 JUN 1505	182	36.
2 JUN 0240	33	27459.	2 JUN 0650	83	923.	2 JUN 1100	133	394.	2 JUN 1510	183	32.
2 JUN 0245	34	23698.	2 JUN 0655	84	918.	2 JUN 1105	134	387.	2 JUN 1515	184	29.
2 JUN 0250	35	19963.	2 JUN 0700	85	914.	2 JUN 1110	135	379.	2 JUN 1520	185	26.
2 JUN 0255	36	16840.	2 JUN 0705	86	909.	2 JUN 1115	136	371.	2 JUN 1525	186	24.
2 JUN 0300	37	14395.	2 JUN 0710	87	904.	2 JUN 1120	137	357.	2 JUN 1530	187	22.
2 JUN 0305	38	12328.	2 JUN 0715	88	900.	2 JUN 1125	138	334.	2 JUN 1535	188	20.
2 JUN 0310	39	10674.	2 JUN 0720	89	895.	2 JUN 1130	139	308.	2 JUN 1540	189	18.
2 JUN 0315	40	9266.	2 JUN 0725	90	890.	2 JUN 1135	140	283.	2 JUN 1545	190	16.
2 JUN 0320	41	8133.	2 JUN 0730	91	884.	2 JUN 1140	141	260.	2 JUN 1550	191	15.
2 JUN 0325	42	7174.	2 JUN 0735	92	877.	2 JUN 1145	142	242.	2 JUN 1555	192	13.
2 JUN 0330	43	6321.	2 JUN 0740	93	870.	2 JUN 1150	143	225.	2 JUN 1600	193	12.
2 JUN 0335	44	5626.	2 JUN 0745	94	862.	2 JUN 1155	144	211.	2 JUN 1605	194	11.
2 JUN 0340	45	5053.	2 JUN 0750	95	854.	2 JUN 1200	145	200.	2 JUN 1610	195	10.
2 JUN 0345	46	4631.	2 JUN 0755	96	846.	2 JUN 1205	146	189.	2 JUN 1615	196	9.
2 JUN 0350	47	4335.	2 JUN 0800	97	836.	2 JUN 1210	147	181.	2 JUN 1620	197	8.
2 JUN 0355	48	4102.	2 JUN 0805	98	825.	2 JUN 1215	148	173.	2 JUN 1625	198	7.
2 JUN 0400	49	3896.	2 JUN 0810	99	813.	2 JUN 1220	149	168.	2 JUN 1630	199	7.
2 JUN 0405	50	3693.	2 JUN 0815	100	800.	2 JUN 1225	150	163.	2 JUN 1635	200	6.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
29679.	2.58	(CFS)	5423.	2217.	2217.	2217.
		(INCHES)	7.072	7.989	7.989	7.989

(AC-FT) 2689. 3038. 3038. 3038.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.0 SQ MI

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	6249.	2 JUN 0410	51	3546.	2 JUN 0820	101	762.	2 JUN 1230	151	154.
2 JUN 0005	2	5381.	2 JUN 0415	52	3234.	2 JUN 0825	102	740.	2 JUN 1235	152	150.
2 JUN 0010	3	3900.	2 JUN 0420	53	2933.	2 JUN 0830	103	706.	2 JUN 1240	153	147.
2 JUN 0015	4	2863.	2 JUN 0425	54	2618.	2 JUN 0835	104	669.	2 JUN 1245	154	143.
2 JUN 0020	5	2209.	2 JUN 0430	55	2304.	2 JUN 0840	105	638.	2 JUN 1250	155	140.
2 JUN 0025	6	1829.	2 JUN 0435	56	2053.	2 JUN 0845	106	613.	2 JUN 1255	156	136.
2 JUN 0030	7	1593.	2 JUN 0440	57	1881.	2 JUN 0850	107	593.	2 JUN 1300	157	133.
2 JUN 0035	8	1443.	2 JUN 0445	58	1771.	2 JUN 0855	108	576.	2 JUN 1305	158	130.
2 JUN 0040	9	1339.	2 JUN 0450	59	1688.	2 JUN 0900	109	562.	2 JUN 1310	159	127.
2 JUN 0045	10	1260.	2 JUN 0455	60	1622.	2 JUN 0905	110	550.	2 JUN 1315	160	125.
2 JUN 0050	11	1200.	2 JUN 0500	61	1567.	2 JUN 0910	111	541.	2 JUN 1320	161	122.
2 JUN 0055	12	1152.	2 JUN 0505	62	1516.	2 JUN 0915	112	534.	2 JUN 1325	162	119.
2 JUN 0100	13	1113.	2 JUN 0510	63	1455.	2 JUN 0920	113	526.	2 JUN 1330	163	117.
2 JUN 0105	14	1083.	2 JUN 0515	64	1391.	2 JUN 0925	114	518.	2 JUN 1335	164	114.
2 JUN 0110	15	1067.	2 JUN 0520	65	1340.	2 JUN 0930	115	510.	2 JUN 1340	165	112.
2 JUN 0115	16	1060.	2 JUN 0525	66	1295.	2 JUN 0935	116	503.	2 JUN 1345	166	109.
2 JUN 0120	17	1055.	2 JUN 0530	67	1256.	2 JUN 0940	117	495.	2 JUN 1350	167	107.
2 JUN 0125	18	1059.	2 JUN 0535	68	1220.	2 JUN 0945	118	488.	2 JUN 1355	168	105.
2 JUN 0130	19	1069.	2 JUN 0540	69	1186.	2 JUN 0950	119	481.	2 JUN 1400	169	100.
2 JUN 0135	20	1079.	2 JUN 0545	70	1155.	2 JUN 0955	120	475.	2 JUN 1405	170	93.
2 JUN 0140	21	1089.	2 JUN 0550	71	1127.	2 JUN 1000	121	468.	2 JUN 1410	171	85.
2 JUN 0145	22	1098.	2 JUN 0555	72	1099.	2 JUN 1005	122	462.	2 JUN 1415	172	79.
2 JUN 0150	23	1106.	2 JUN 0600	73	1074.	2 JUN 1010	123	456.	2 JUN 1420	173	74.
2 JUN 0155	24	1112.	2 JUN 0605	74	1048.	2 JUN 1015	124	450.	2 JUN 1425	174	69.
2 JUN 0200	25	1118.	2 JUN 0610	75	1019.	2 JUN 1020	125	444.	2 JUN 1430	175	63.
2 JUN 0205	26	1947.	2 JUN 0615	76	992.	2 JUN 1025	126	437.	2 JUN 1435	176	58.
2 JUN 0210	27	5009.	2 JUN 0620	77	968.	2 JUN 1030	127	430.	2 JUN 1440	177	53.
2 JUN 0215	28	10453.	2 JUN 0625	78	950.	2 JUN 1035	128	422.	2 JUN 1445	178	48.
2 JUN 0220	29	18327.	2 JUN 0630	79	940.	2 JUN 1040	129	415.	2 JUN 1450	179	44.
2 JUN 0225	30	26000.	2 JUN 0635	80	933.	2 JUN 1045	130	407.	2 JUN 1455	180	40.
2 JUN 0230	31	28517.	2 JUN 0640	81	927.	2 JUN 1050	131	399.	2 JUN 1500	181	36.
2 JUN 0235	32	29072.	2 JUN 0645	82	922.	2 JUN 1055	132	391.	2 JUN 1505	182	33.
2 JUN 0240	33	26982.	2 JUN 0650	83	917.	2 JUN 1100	133	383.	2 JUN 1510	183	30.
2 JUN 0245	34	23334.	2 JUN 0655	84	913.	2 JUN 1105	134	376.	2 JUN 1515	184	27.
2 JUN 0250	35	19672.	2 JUN 0700	85	908.	2 JUN 1110	135	364.	2 JUN 1520	185	24.
2 JUN 0255	36	16499.	2 JUN 0705	86	903.	2 JUN 1115	136	343.	2 JUN 1525	186	22.
2 JUN 0300	37	13909.	2 JUN 0710	87	898.	2 JUN 1120	137	318.	2 JUN 1530	187	20.
2 JUN 0305	38	11686.	2 JUN 0715	88	894.	2 JUN 1125	138	293.	2 JUN 1535	188	18.
2 JUN 0310	39	10025.	2 JUN 0720	89	888.	2 JUN 1130	139	270.	2 JUN 1540	189	16.
2 JUN 0315	40	8646.	2 JUN 0725	90	882.	2 JUN 1135	140	250.	2 JUN 1545	190	15.
2 JUN 0320	41	7591.	2 JUN 0730	91	875.	2 JUN 1140	141	234.	2 JUN 1550	191	13.
2 JUN 0325	42	6707.	2 JUN 0735	92	867.	2 JUN 1145	142	219.	2 JUN 1555	192	12.
2 JUN 0330	43	5956.	2 JUN 0740	93	859.	2 JUN 1150	143	206.	2 JUN 1600	193	11.
2 JUN 0335	44	5367.	2 JUN 0745	94	851.	2 JUN 1155	144	196.	2 JUN 1605	194	10.
2 JUN 0340	45	4902.	2 JUN 0750	95	843.	2 JUN 1200	145	187.	2 JUN 1610	195	9.
2 JUN 0345	46	4572.	2 JUN 0755	96	833.	2 JUN 1205	146	179.	2 JUN 1615	196	8.
2 JUN 0350	47	4337.	2 JUN 0800	97	821.	2 JUN 1210	147	172.	2 JUN 1620	197	7.
2 JUN 0355	48	4146.	2 JUN 0805	98	809.	2 JUN 1215	148	167.	2 JUN 1625	198	7.
2 JUN 0400	49	3976.	2 JUN 0810	99	796.	2 JUN 1220	149	163.	2 JUN 1630	199	6.
2 JUN 0405	50	3798.	2 JUN 0815	100	780.	2 JUN 1225	150	158.	2 JUN 1635	200	6.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
29072.	2.58	(CFS)	5314.	2171.	2171.	2171.
		(INCHES)	6.930	7.823	7.823	7.823
		(AC-FT)	2635.	2975.	2975.	2975.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 2.2 SQ MI

MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	6249.	2 JUN 0410	51	3546.	2 JUN 0820	101	762.	2 JUN 1230	151	154.
2 JUN 0005	2	5381.	2 JUN 0415	52	3234.	2 JUN 0825	102	740.	2 JUN 1235	152	150.
2 JUN 0010	3	3900.	2 JUN 0420	53	2933.	2 JUN 0830	103	706.	2 JUN 1240	153	147.
2 JUN 0015	4	2863.	2 JUN 0425	54	2618.	2 JUN 0835	104	669.	2 JUN 1245	154	143.
2 JUN 0020	5	2209.	2 JUN 0430	55	2304.	2 JUN 0840	105	638.	2 JUN 1250	155	140.
2 JUN 0025	6	1829.	2 JUN 0435	56	2053.	2 JUN 0845	106	613.	2 JUN 1255	156	136.
2 JUN 0030	7	1593.	2 JUN 0440	57	1881.	2 JUN 0850	107	593.	2 JUN 1300	157	133.
2 JUN 0035	8	1443.	2 JUN 0445	58	1771.	2 JUN 0855	108	576.	2 JUN 1305	158	130.
2 JUN 0040	9	1339.	2 JUN 0450	59	1688.	2 JUN 0900	109	562.	2 JUN 1310	159	127.
2 JUN 0045	10	1260.	2 JUN 0455	60	1622.	2 JUN 0905	110	550.	2 JUN 1315	160	125.
2 JUN 0050	11	1200.	2 JUN 0500	61	1567.	2 JUN 0910	111	541.	2 JUN 1320	161	122.
2 JUN 0055	12	1152.	2 JUN 0505	62	1516.	2 JUN 0915	112	534.	2 JUN 1325	162	119.
2 JUN 0100	13	1113.	2 JUN 0510	63	1455.	2 JUN 0920	113	526.	2 JUN 1330	163	117.
2 JUN 0105	14	1083.	2 JUN 0515	64	1391.	2 JUN 0925	114	518.	2 JUN 1335	164	114.
2 JUN 0110	15	1067.	2 JUN 0520	65	1340.	2 JUN 0930	115	510.	2 JUN 1340	165	112.
2 JUN 0115	16	1060.	2 JUN 0525	66	1295.	2 JUN 0935	116	503.	2 JUN 1345	166	109.
2 JUN 0120	17	1055.	2 JUN 0530	67	1256.	2 JUN 0940	117	495.	2 JUN 1350	167	107.
2 JUN 0125	18	1059.	2 JUN 0535	68	1220.	2 JUN 0945	118	488.	2 JUN 1355	168	105.
2 JUN 0130	19	1069.	2 JUN 0540	69	1186.	2 JUN 0950	119	481.	2 JUN 1400	169	100.
2 JUN 0135	20	1079.	2 JUN 0545	70	1155.	2 JUN 0955	120	475.	2 JUN 1405	170	93.
2 JUN 0140	21	1089.	2 JUN 0550	71	1127.	2 JUN 1000	121	468.	2 JUN 1410	171	85.
2 JUN 0145	22	1098.	2 JUN 0555	72	1099.	2 JUN 1005	122	462.	2 JUN 1415	172	79.
2 JUN 0150	23	1106.	2 JUN 0600	73	1074.	2 JUN 1010	123	456.	2 JUN 1420	173	74.
2 JUN 0155	24	1112.	2 JUN 0605	74	1048.	2 JUN 1015	124	450.	2 JUN 1425	174	69.
2 JUN 0200	25	1118.	2 JUN 0610	75	1019.	2 JUN 1020	125	444.	2 JUN 1430	175	63.
2 JUN 0205	26	1947.	2 JUN 0615	76	992.	2 JUN 1025	126	437.	2 JUN 1435	176	58.
2 JUN 0210	27	5009.	2 JUN 0620	77	968.	2 JUN 1030	127	430.	2 JUN 1440	177	53.
2 JUN 0215	28	10453.	2 JUN 0625	78	950.	2 JUN 1035	128	422.	2 JUN 1445	178	48.
2 JUN 0220	29	18327.	2 JUN 0630	79	940.	2 JUN 1040	129	415.	2 JUN 1450	179	44.
2 JUN 0225	30	26000.	2 JUN 0635	80	933.	2 JUN 1045	130	407.	2 JUN 1455	180	40.
2 JUN 0230	31	28517.	2 JUN 0640	81	927.	2 JUN 1050	131	399.	2 JUN 1500	181	36.
2 JUN 0235	32	29072.	2 JUN 0645	82	922.	2 JUN 1055	132	391.	2 JUN 1505	182	33.
2 JUN 0240	33	26982.	2 JUN 0650	83	917.	2 JUN 1100	133	383.	2 JUN 1510	183	30.
2 JUN 0245	34	23334.	2 JUN 0655	84	913.	2 JUN 1105	134	376.	2 JUN 1515	184	27.
2 JUN 0250	35	19672.	2 JUN 0700	85	908.	2 JUN 1110	135	364.	2 JUN 1520	185	24.
2 JUN 0255	36	16499.	2 JUN 0705	86	903.	2 JUN 1115	136	343.	2 JUN 1525	186	22.
2 JUN 0300	37	13909.	2 JUN 0710	87	898.	2 JUN 1120	137	318.	2 JUN 1530	187	20.
2 JUN 0305	38	11686.	2 JUN 0715	88	894.	2 JUN 1125	138	293.	2 JUN 1535	188	18.
2 JUN 0310	39	10025.	2 JUN 0720	89	888.	2 JUN 1130	139	270.	2 JUN 1540	189	16.
2 JUN 0315	40	8646.	2 JUN 0725	90	882.	2 JUN 1135	140	250.	2 JUN 1545	190	15.
2 JUN 0320	41	7591.	2 JUN 0730	91	875.	2 JUN 1140	141	234.	2 JUN 1550	191	13.
2 JUN 0325	42	6707.	2 JUN 0735	92	867.	2 JUN 1145	142	219.	2 JUN 1555	192	12.
2 JUN 0330	43	5956.	2 JUN 0740	93	859.	2 JUN 1150	143	206.	2 JUN 1600	193	11.
2 JUN 0335	44	5367.	2 JUN 0745	94	851.	2 JUN 1155	144	196.	2 JUN 1605	194	10.
2 JUN 0340	45	4902.	2 JUN 0750	95	843.	2 JUN 1200	145	187.	2 JUN 1610	195	9.
2 JUN 0345	46	4572.	2 JUN 0755	96	833.	2 JUN 1205	146	179.	2 JUN 1615	196	8.
2 JUN 0350	47	4337.	2 JUN 0800	97	821.	2 JUN 1210	147	172.	2 JUN 1620	197	7.
2 JUN 0355	48	4146.	2 JUN 0805	98	809.	2 JUN 1215	148	167.	2 JUN 1625	198	7.
2 JUN 0400	49	3976.	2 JUN 0810	99	796.	2 JUN 1220	149	163.	2 JUN 1630	199	6.
2 JUN 0405	50	3798.	2 JUN 0815	100	780.	2 JUN 1225	150	158.	2 JUN 1635	200	6.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
29072.	2.58	(CFS)	5314.	2171.	2171.	2171.
		(INCHES)	6.930	7.823	7.823	7.823
		(AC-FT)	2635.	2975.	2975.	2975.

CUMULATIVE AREA = 7.13 SQ MI

HYDROGRAPH AT C599I
TRANSPOSITION AREA 7.2 SQ MI

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	6249.	2 JUN 0410	51	2986.	2 JUN 0820	101	764.	2 JUN 1230	151	154.
2 JUN 0005	2	5380.	2 JUN 0415	52	2720.	2 JUN 0825	102	743.	2 JUN 1235	152	150.
2 JUN 0010	3	3895.	2 JUN 0420	53	2475.	2 JUN 0830	103	710.	2 JUN 1240	153	146.
2 JUN 0015	4	2851.	2 JUN 0425	54	2242.	2 JUN 0835	104	672.	2 JUN 1245	154	142.
2 JUN 0020	5	2194.	2 JUN 0430	55	2050.	2 JUN 0840	105	641.	2 JUN 1250	155	139.
2 JUN 0025	6	1815.	2 JUN 0435	56	1908.	2 JUN 0845	106	616.	2 JUN 1255	156	136.
2 JUN 0030	7	1578.	2 JUN 0440	57	1797.	2 JUN 0850	107	595.	2 JUN 1300	157	133.
2 JUN 0035	8	1428.	2 JUN 0445	58	1714.	2 JUN 0855	108	578.	2 JUN 1305	158	130.
2 JUN 0040	9	1322.	2 JUN 0450	59	1649.	2 JUN 0900	109	563.	2 JUN 1310	159	127.
2 JUN 0045	10	1242.	2 JUN 0455	60	1597.	2 JUN 0905	110	551.	2 JUN 1315	160	124.
2 JUN 0050	11	1181.	2 JUN 0500	61	1551.	2 JUN 0910	111	543.	2 JUN 1320	161	121.
2 JUN 0055	12	1131.	2 JUN 0505	62	1504.	2 JUN 0915	112	535.	2 JUN 1325	162	119.
2 JUN 0100	13	1091.	2 JUN 0510	63	1443.	2 JUN 0920	113	527.	2 JUN 1330	163	116.
2 JUN 0105	14	1061.	2 JUN 0515	64	1376.	2 JUN 0925	114	519.	2 JUN 1335	164	114.
2 JUN 0110	15	1047.	2 JUN 0520	65	1324.	2 JUN 0930	115	511.	2 JUN 1340	165	111.
2 JUN 0115	16	1038.	2 JUN 0525	66	1280.	2 JUN 0935	116	504.	2 JUN 1345	166	109.
2 JUN 0120	17	1030.	2 JUN 0530	67	1241.	2 JUN 0940	117	497.	2 JUN 1350	167	106.
2 JUN 0125	18	1027.	2 JUN 0535	68	1206.	2 JUN 0945	118	489.	2 JUN 1355	168	104.
2 JUN 0130	19	1027.	2 JUN 0540	69	1174.	2 JUN 0950	119	483.	2 JUN 1400	169	98.
2 JUN 0135	20	1032.	2 JUN 0545	70	1144.	2 JUN 0955	120	476.	2 JUN 1405	170	91.
2 JUN 0140	21	1040.	2 JUN 0550	71	1116.	2 JUN 1000	121	469.	2 JUN 1410	171	83.
2 JUN 0145	22	1050.	2 JUN 0555	72	1089.	2 JUN 1005	122	463.	2 JUN 1415	172	78.
2 JUN 0150	23	1059.	2 JUN 0600	73	1064.	2 JUN 1010	123	457.	2 JUN 1420	173	73.
2 JUN 0155	24	1067.	2 JUN 0605	74	1039.	2 JUN 1015	124	451.	2 JUN 1425	174	67.
2 JUN 0200	25	1074.	2 JUN 0610	75	1013.	2 JUN 1020	125	445.	2 JUN 1430	175	62.
2 JUN 0205	26	1849.	2 JUN 0615	76	986.	2 JUN 1025	126	439.	2 JUN 1435	176	57.
2 JUN 0210	27	4635.	2 JUN 0620	77	963.	2 JUN 1030	127	432.	2 JUN 1440	177	52.
2 JUN 0215	28	9372.	2 JUN 0625	78	948.	2 JUN 1035	128	425.	2 JUN 1445	178	47.
2 JUN 0220	29	16208.	2 JUN 0630	79	939.	2 JUN 1040	129	417.	2 JUN 1450	179	43.
2 JUN 0225	30	23343.	2 JUN 0635	80	933.	2 JUN 1045	130	409.	2 JUN 1455	180	39.
2 JUN 0230	31	25844.	2 JUN 0640	81	927.	2 JUN 1050	131	401.	2 JUN 1500	181	35.
2 JUN 0235	32	26510.	2 JUN 0645	82	922.	2 JUN 1055	132	393.	2 JUN 1505	182	32.
2 JUN 0240	33	24920.	2 JUN 0650	83	918.	2 JUN 1100	133	386.	2 JUN 1510	183	29.
2 JUN 0245	34	21636.	2 JUN 0655	84	913.	2 JUN 1105	134	378.	2 JUN 1515	184	26.
2 JUN 0250	35	18320.	2 JUN 0700	85	908.	2 JUN 1110	135	370.	2 JUN 1520	185	24.
2 JUN 0255	36	15490.	2 JUN 0705	86	903.	2 JUN 1115	136	355.	2 JUN 1525	186	21.
2 JUN 0300	37	13276.	2 JUN 0710	87	899.	2 JUN 1120	137	331.	2 JUN 1530	187	19.
2 JUN 0305	38	11363.	2 JUN 0715	88	894.	2 JUN 1125	138	305.	2 JUN 1535	188	18.
2 JUN 0310	39	9871.	2 JUN 0720	89	889.	2 JUN 1130	139	280.	2 JUN 1540	189	16.
2 JUN 0315	40	8547.	2 JUN 0725	90	883.	2 JUN 1135	140	258.	2 JUN 1545	190	14.
2 JUN 0320	41	7506.	2 JUN 0730	91	876.	2 JUN 1140	141	240.	2 JUN 1550	191	13.
2 JUN 0325	42	6568.	2 JUN 0735	92	868.	2 JUN 1145	142	224.	2 JUN 1555	192	12.
2 JUN 0330	43	5744.	2 JUN 0740	93	860.	2 JUN 1150	143	210.	2 JUN 1600	193	11.
2 JUN 0335	44	5065.	2 JUN 0745	94	852.	2 JUN 1155	144	198.	2 JUN 1605	194	10.
2 JUN 0340	45	4537.	2 JUN 0750	95	844.	2 JUN 1200	145	188.	2 JUN 1610	195	9.
2 JUN 0345	46	4162.	2 JUN 0755	96	834.	2 JUN 1205	146	180.	2 JUN 1615	196	8.
2 JUN 0350	47	3875.	2 JUN 0800	97	823.	2 JUN 1210	147	173.	2 JUN 1620	197	7.
2 JUN 0355	48	3628.	2 JUN 0805	98	811.	2 JUN 1215	148	167.	2 JUN 1625	198	7.
2 JUN 0400	49	3415.	2 JUN 0810	99	797.	2 JUN 1220	149	163.	2 JUN 1630	199	6.
2 JUN 0405	50	3217.	2 JUN 0815	100	782.	2 JUN 1225	150	158.	2 JUN 1635	200	5.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
26510.	2.58	(CFS)	4956.	2041.	2041.	2041.
		(INCHES)	6.462	7.357	7.357	7.357
		(AC-FT)	2457.	2798.	2798.	2798.

CUMULATIVE AREA = 7.13 SQ MI

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INTERPOLATED HYDROGRAPH AT C599I

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DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
2 JUN 0000	1	6249.	2 JUN 0410	51	2987.	2 JUN 0820	101	764.	2 JUN 1230	151	154.
2 JUN 0005	2	5380.	2 JUN 0415	52	2721.	2 JUN 0825	102	743.	2 JUN 1235	152	150.
2 JUN 0010	3	3895.	2 JUN 0420	53	2477.	2 JUN 0830	103	710.	2 JUN 1240	153	146.
2 JUN 0015	4	2851.	2 JUN 0425	54	2242.	2 JUN 0835	104	672.	2 JUN 1245	154	142.
2 JUN 0020	5	2194.	2 JUN 0430	55	2051.	2 JUN 0840	105	641.	2 JUN 1250	155	139.
2 JUN 0025	6	1815.	2 JUN 0435	56	1908.	2 JUN 0845	106	616.	2 JUN 1255	156	136.
2 JUN 0030	7	1578.	2 JUN 0440	57	1797.	2 JUN 0850	107	595.	2 JUN 1300	157	133.
2 JUN 0035	8	1428.	2 JUN 0445	58	1714.	2 JUN 0855	108	578.	2 JUN 1305	158	130.

2	JUN	0040	9	1322.	*	2	JUN	0450	59	1649.	*	2	JUN	0900	109	563.	*	2	JUN	1310	159	127.
2	JUN	0045	10	1242.	*	2	JUN	0455	60	1597.	*	2	JUN	0905	110	551.	*	2	JUN	1315	160	124.
2	JUN	0050	11	1181.	*	2	JUN	0500	61	1551.	*	2	JUN	0910	111	543.	*	2	JUN	1320	161	121.
2	JUN	0055	12	1131.	*	2	JUN	0505	62	1504.	*	2	JUN	0915	112	535.	*	2	JUN	1325	162	119.
2	JUN	0100	13	1091.	*	2	JUN	0510	63	1443.	*	2	JUN	0920	113	527.	*	2	JUN	1330	163	116.
2	JUN	0105	14	1061.	*	2	JUN	0515	64	1376.	*	2	JUN	0925	114	519.	*	2	JUN	1335	164	114.
2	JUN	0110	15	1047.	*	2	JUN	0520	65	1324.	*	2	JUN	0930	115	511.	*	2	JUN	1340	165	111.
2	JUN	0115	16	1038.	*	2	JUN	0525	66	1280.	*	2	JUN	0935	116	504.	*	2	JUN	1345	166	109.
2	JUN	0120	17	1030.	*	2	JUN	0530	67	1241.	*	2	JUN	0940	117	497.	*	2	JUN	1350	167	106.
2	JUN	0125	18	1027.	*	2	JUN	0535	68	1206.	*	2	JUN	0945	118	489.	*	2	JUN	1355	168	104.
2	JUN	0130	19	1028.	*	2	JUN	0540	69	1174.	*	2	JUN	0950	119	483.	*	2	JUN	1400	169	98.
2	JUN	0135	20	1032.	*	2	JUN	0545	70	1144.	*	2	JUN	0955	120	476.	*	2	JUN	1405	170	91.
2	JUN	0140	21	1041.	*	2	JUN	0550	71	1116.	*	2	JUN	1000	121	469.	*	2	JUN	1410	171	83.
2	JUN	0145	22	1050.	*	2	JUN	0555	72	1089.	*	2	JUN	1005	122	463.	*	2	JUN	1415	172	78.
2	JUN	0150	23	1059.	*	2	JUN	0600	73	1064.	*	2	JUN	1010	123	457.	*	2	JUN	1420	173	73.
2	JUN	0155	24	1067.	*	2	JUN	0605	74	1039.	*	2	JUN	1015	124	451.	*	2	JUN	1425	174	67.
2	JUN	0200	25	1074.	*	2	JUN	0610	75	1013.	*	2	JUN	1020	125	445.	*	2	JUN	1430	175	62.
2	JUN	0205	26	1849.	*	2	JUN	0615	76	986.	*	2	JUN	1025	126	439.	*	2	JUN	1435	176	57.
2	JUN	0210	27	4636.	*	2	JUN	0620	77	963.	*	2	JUN	1030	127	432.	*	2	JUN	1440	177	52.
2	JUN	0215	28	9374.	*	2	JUN	0625	78	948.	*	2	JUN	1035	128	425.	*	2	JUN	1445	178	47.
2	JUN	0220	29	16212.	*	2	JUN	0630	79	939.	*	2	JUN	1040	129	417.	*	2	JUN	1450	179	43.
2	JUN	0225	30	23350.	*	2	JUN	0635	80	933.	*	2	JUN	1045	130	409.	*	2	JUN	1455	180	39.
2	JUN	0230	31	25850.	*	2	JUN	0640	81	927.	*	2	JUN	1050	131	401.	*	2	JUN	1500	181	35.
2	JUN	0235	32	26516.	*	2	JUN	0645	82	922.	*	2	JUN	1055	132	393.	*	2	JUN	1505	182	32.
2	JUN	0240	33	24925.	*	2	JUN	0650	83	918.	*	2	JUN	1100	133	386.	*	2	JUN	1510	183	29.
2	JUN	0245	34	21640.	*	2	JUN	0655	84	913.	*	2	JUN	1105	134	378.	*	2	JUN	1515	184	26.
2	JUN	0250	35	18324.	*	2	JUN	0700	85	908.	*	2	JUN	1110	135	370.	*	2	JUN	1520	185	24.
2	JUN	0255	36	15492.	*	2	JUN	0705	86	903.	*	2	JUN	1115	136	355.	*	2	JUN	1525	186	21.
2	JUN	0300	37	13277.	*	2	JUN	0710	87	899.	*	2	JUN	1120	137	331.	*	2	JUN	1530	187	19.
2	JUN	0305	38	11364.	*	2	JUN	0715	88	894.	*	2	JUN	1125	138	304.	*	2	JUN	1535	188	18.
2	JUN	0310	39	9872.	*	2	JUN	0720	89	889.	*	2	JUN	1130	139	280.	*	2	JUN	1540	189	16.
2	JUN	0315	40	8548.	*	2	JUN	0725	90	883.	*	2	JUN	1135	140	258.	*	2	JUN	1545	190	14.
2	JUN	0320	41	7506.	*	2	JUN	0730	91	876.	*	2	JUN	1140	141	240.	*	2	JUN	1550	191	13.
2	JUN	0325	42	6569.	*	2	JUN	0735	92	868.	*	2	JUN	1145	142	224.	*	2	JUN	1555	192	12.
2	JUN	0330	43	5744.	*	2	JUN	0740	93	860.	*	2	JUN	1150	143	210.	*	2	JUN	1600	193	11.
2	JUN	0335	44	5066.	*	2	JUN	0745	94	852.	*	2	JUN	1155	144	198.	*	2	JUN	1605	194	10.
2	JUN	0340	45	4538.	*	2	JUN	0750	95	844.	*	2	JUN	1200	145	188.	*	2	JUN	1610	195	9.
2	JUN	0345	46	4163.	*	2	JUN	0755	96	834.	*	2	JUN	1205	146	180.	*	2	JUN	1615	196	8.
2	JUN	0350	47	3877.	*	2	JUN	0800	97	823.	*	2	JUN	1210	147	173.	*	2	JUN	1620	197	7.
2	JUN	0355	48	3630.	*	2	JUN	0805	98	811.	*	2	JUN	1215	148	167.	*	2	JUN	1625	198	7.
2	JUN	0400	49	3416.	*	2	JUN	0810	99	797.	*	2	JUN	1220	149	163.	*	2	JUN	1630	199	6.
2	JUN	0405	50	3218.	*	2	JUN	0815	100	782.	*	2	JUN	1225	150	158.	*	2	JUN	1635	200	5.
					*						*						*					

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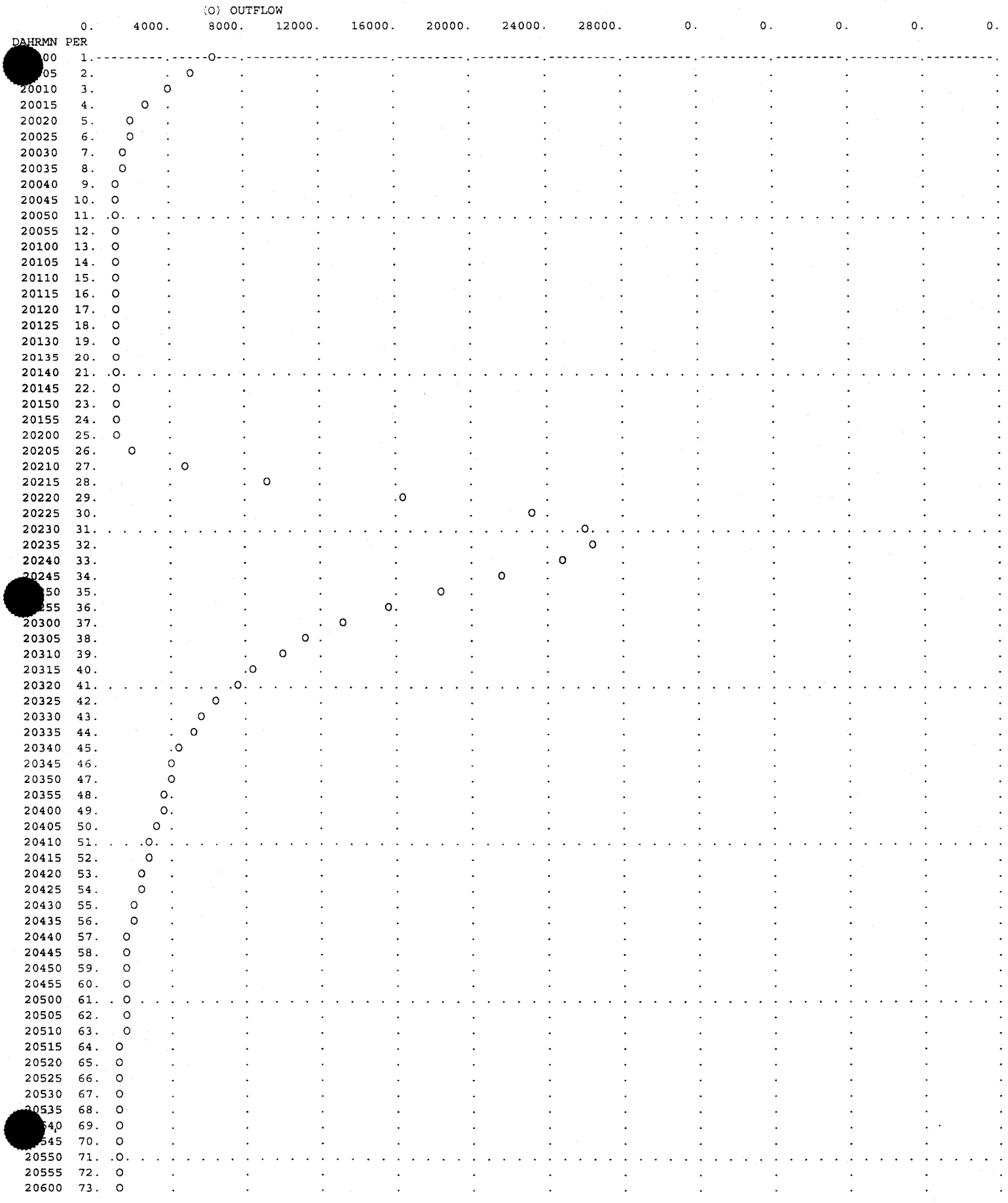
PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
26516.	2.58	(CFS)	4956.	2042.	2042.	2042.
		(INCHES)	6.463	7.358	7.358	7.358
		(AC-FT)	2458.	2798.	2798.	2798.

CUMULATIVE AREA = 7.13 SQ MI

STATION C599I



20605 74. O
20610 75. O
20615 76. O
20620 77. O
20625 78. O
20630 79. O
20635 80. O
20640 81. O
20645 82. O
20650 83. O
20655 84. O
20700 85. O
20705 86. O
20710 87. O
20715 88. O
20720 89. O
20725 90. O
20730 91. O
20735 92. O
20740 93. O
20745 94. O
20750 95. O
20755 96. O
20800 97. O
20805 98. O
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20815 100. O
20820 101. O
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20830 103. O
20835 104. O
20840 105. O
20845 106. O
20850 107.O
20855 108.O
20900 109.O
20905 110.O
20910 111.O
20915 112.O
20920 113.O
20925 114.O
20930 115.O
20935 116.O
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20950 119.O
20955 120.O
21000 121.O
21005 122.O
21010 123.O
21015 124.O
21020 125.O
21025 126.O
21030 127.O
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21125 138.O
21130 139.O
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21145 142.O
21150 143.O
21155 144O
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21205 146O
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21605 1940
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21620 1970
21625 1980
21630 1990
21635 2000

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	C560I	17974.	2.58	2897.	1051.	1051.	2.15		
DIVERSION TO	0.5PMF	8987.	2.58	1449.	525.	525.	2.15		
HYDROGRAPH AT	0.5PMF	8987.	2.58	1449.	525.	525.	2.15		
ROUTED TO	C560O	7963.	2.67	1525.	658.	658.	2.15		
ROUTED TO	560599	7909.	2.75	1529.	662.	662.	2.15		
HYDROGRAPH AT	C578I	26969.	2.33	2850.	1033.	1033.	2.00		
DIVERSION TO	0.5PMF	13484.	2.33	1425.	516.	516.	2.00		
HYDROGRAPH AT	0.5PMF	13484.	2.33	1425.	516.	516.	2.00		
ROUTED TO	C578O	12828.	2.42	1517.	633.	633.	2.00		
ROUTED TO	578599	11984.	2.50	1562.	653.	653.	2.00		
HYDROGRAPH AT	C584I	20238.	2.33	2265.	821.	821.	1.60		
DIVERSION TO	0.5PMF	10119.	2.33	1132.	410.	410.	1.60		
HYDROGRAPH AT	0.5PMF	10119.	2.33	1132.	410.	410.	1.60		
ROUTED TO	C584O	9855.	2.42	1229.	489.	489.	1.60		
ROUTED TO	584599	7907.	2.58	1293.	520.	520.	1.60		
HYDROGRAPH AT	C210	19580.	2.33	1956.	708.	708.	1.38		
DIVERSION TO	0.5PMF	9790.	2.33	978.	354.	354.	1.38		
HYDROGRAPH AT	0.5PMF	9790.	2.33	978.	354.	354.	1.38		
4 COMBINED AT	C599I	26516.	2.58	4956.	2042.	2042.	7.13		

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

APPENDIX B

10-YEAR AND 100-YEAR FLOOD MEMO

Memo

Stantec

To: Distribution

File: 28900095

From: George V. Sabol

Date: 06 April 1999

Re: Golden Eagle Park Dam – 10-year and 100-year Flood Hydrology

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Background

The Golden Eagle Park Dam (GEP Dam) – Modification Pre-Design Study (FCD 97-44) requires the development of 10-year and 100-year flood hydrology for the purpose of spillway sizing and evaluation of floodplain impacts to Ashbrook Wash. This memo presents the HEC-1 models that were developed for project purposes. Hydrology model results are presented for the Alternatives (A, C and D) that are considered.

Both "existing" and "future" watershed conditions are needed for spillway sizing and floodplain impact analyses. For the purposes of this memo, the following are defined: Existing – When used in connection with flood hydrology or Ashbrook Wash floodplain analyses, means conditions as of 1994 when the Fountain Hills (North) Floodplain Delineation Study was performed. That distinction to existing is made so that comparisons can be made to the "existing" FEMA flood insurance study results. Future – Means fully built-out watershed conditions.

The following hydrologic models are developed:

100-year, future condition

- For principal and auxiliary spillway sizing.
- For Ashbrook Wash floodplain impacts analysis.

100-year, existing (1994)

- For Ashbrook Wash floodplain impacts analyses.

10-year, future

- For Ashbrook Wash roadway crossings and floodplain impacts analyses.

General

Hydrologic models are prepared for the Ashbrook Wash watershed to provide peak discharges at key locations downstream of GEP Dam. The results of the models

reflect proposed modifications to the principle spillway for Alternative A, and addition of an auxiliary spillway for Alternatives C and D. The potential impact of Alternatives to flood discharges in Ashbrook Wash downstream of GEP Dam are compared to the existing condition (1994) discharges and are presented in this document.

Previous Studies

Base watershed models were developed by George V. Sabol Consulting Engineers, Inc. (GVSCE) as part of the Fountain Hills (North) Floodplain Delineation Study (FDS). The study was completed in 1994 for the Flood Control District of Maricopa County (FCD 92-04). Hydrologic modeling was performed using methodologies set forth in the Drainage Design Manual for Maricopa County, Volume I, Hydrology 1992. The 100-year, 6- and 24-hour and 10-year, 6- and 24-hour storms were modeled for the entire watershed. In addition, both existing (1994) and full build-out (future) development conditions were considered for each storm event. The existing condition models represents the effects of development in the watershed at the start of FDS. This condition is herein referred to as the 1994 conditions. For a detailed description of the development of the hydrologic parameters, refer to the Fountain Hills (North) Floodplain Delineation Study, Technical Data Notebook (GVSCE, 1994).

For the purposes of this project, only the portions of the FDS watershed which contribute runoff to Ashbrook Wash are used in this analysis. These areas are shown in Figure 1 in relation to Ashbrook Wash and GEP Dam. The stipled areas represent the areas of the FDS which do not contribute runoff to Ashbrook Wash. The input and output files for the models are provided on diskette as Appendix A and are described below.

EX100-24.*: 1994 conditions model for the 100-year, 24-hour storm. Used to estimate peak discharges for FEMA flood insurance (floodplain/floodway delineation) purposes.

EX100-6.*: 1994 conditions model for the 100-year, 6-hour storm. Used to estimate peak discharges for FEMA flood insurance (floodplain/floodway delineation) purposes.

FU100-24.*: Future conditions model for the 100-year, 24-hour storm. Used to estimate the impacts to the floodplain under fully developed conditions, and for spillway sizing

FU100-6.*: Future condition model for the 100-year, 6-hour storm. Used to estimate the impacts to the floodplain under fully developed conditions, and for spillway sizing.

FU10-24.*: Future condition model for the 10-year, 24-hour storm. Used for evaluating road crossings, and floodplain impacts.

FU100-6.*: Future condition model for the 10-year, 5-hour storm. Used for evaluating road crossings, and floodplain impacts.

Model Results

HEC-1 models are developed for each Alternative (A, C and D) modification to GEP Dam. The stage-storage-discharge relations for each Alternative are coded into the HEC-1 models described previously. The results of these models are summarized in Tables 1 through 3. The values listed in each of the tables is the larger of the peak discharges from either the 6- or 24-hour storms. This combination of peak discharges from the two storm durations is performed so as to be consistent with what is reported as the controlling peak discharge in the FDS. The input and output files for the modified GEP Dam models are provided on diskette as Appendix B. Figures 2 and 3 show the 100-year, 24-hour and 100-year, 6-hour 1994 condition inflow and outflow hydrographs at GEP Dam respectively. The future condition inflow and outflow (for the existing dam) hydrographs are shown in Figures 4 and 5 along with the outflow hydrographs for each Alternative (A, C and D). Table 4 lists the maximum water surface elevation for the existing and Alternative modifications for 1994 and future conditions for both the 6- and 24-hour storms.

Reference: GOLDEN EAGLE PARK DAM – 10-YEAR AND 100-YEAR FLOOD HYDROLOGY

TABLE 1
Comparison of 100-Year Peak Discharges for 1994 Conditions

		Modified GEP Dam		
Concentration Point	FDS Model cfs	Alt. A cfs	Alt. C cfs	Alt. D cfs
C5590	966[a]	1,029[b]	1,018[b]	1,042[b]
C608	972[a]	1,087[b]	1,027[b]	1,054[b]
C613	972[a]	1,102[b]	1,027[b]	1,053[b]
C621	1,184[b]	1,464[a]	1,234[b]	1,269[b]
C622R	1,384[a]	1,647[a]	1,400[b]	1,400[b]
C622	2,053[a]	2,333[a]	2,098[a]	2,098[a]
C549R	2,112[a]	2,396[a]	2,154[a]	2,154[a]
C549	3,095[a]	3,375[a]	3,132[a]	3,132[a]
C626	3,180[a]	3,458[a]	3,219[a]	3,219[a]
C627	3,187[a]	3,465[a]	3,226[a]	3,226[a]

NOTES: a 100-year, 24-hour peak discharge

b 100-year, 6-hour peak discharge

Reference: GOLDEN EAGLE PARK DAM – 10-YEAR AND 100-YEAR FLOOD HYDROLOGY

TABLE 2
Comparison of 100-Year Peak Discharges for Future Conditions

		Modified GEP Dam		
Concentration Point	FDS Model cfs	Alt. A cfs	Alt. C cfs	Alt. D cfs
C5590	1,631[b]	1,134[b]	1,608[b]	1,620[b]
C608	1,642[b]	1,260[a]	1,618[b]	1,631[b]
C613	1,639[b]	1,303[a]	1,616[b]	1,625[b]
C621	1,866[b]	1,794[a]	1,841[b]	1,858[b]
C622R	1,877[b]	2,057[a]	1,855[b]	1,873[b]
C622	2,697[a]	2,991[a]	2,663[a]	2,663[a]
C549R	2,760[a]	3,058[a]	2,728[a]	2,728[a]
C549	4,013[a]	4,308[a]	3,981[a]	3,981[a]
C626	4,117[a]	4,414[a]	4,088[a]	4,088[a]
C627	4,130[a]	4,427[a]	4,101[a]	4,101[a]

NOTES: a 100-year, 24-hour peak discharge
b 100-year, 6-hour peak discharge

TABLE 3
Comparison of 10-Year Peak Discharges for Future Conditions

		Modified GEP Dam		
Concentration Point	FDS Model cfs	Alt. A cfs	Alt. C cfs	Alt. D cfs
C5590	770[a]	940[b]	841[a]	850[a]
C608	772[a]	1,001[a]	846[a]	855[a]
C613	772[a]	1,026[a]	846[a]	856[a]
C621	1,073[a]	1,325[a]	1,045[a]	1,045[a]
C622R	1,208[a]	1,480[a]	1,194[a]	1,194[a]
C622	1,731[a]	2,008[a]	1,723[a]	1,723[a]
C549R	1,757[a]	2,041[a]	1,753[a]	1,753[a]
C549	2,432[a]	2,716[a]	2,431[a]	2,431[a]
C626	2,481[a]	2,765[a]	2,485[a]	2,485[a]
C627	2,484[a]	2,768[a]	2,488[a]	2,488[a]

NOTES: a 100-year, 24-hour peak discharge
b 100-year, 6-hour peak discharge

Reference: GOLDEN EAGLE PARK DAM – 10-YEAR AND 100-YEAR FLOOD HYDROLOGY

TABLE 4

Maximum Water Surface Elevations for the Existing Dam and Alternative Modifications

		100-Year Peak Outflow		Maximum WSEL	
Dam Condition	Build-Out Condition	24-hour cfs	6-hour cfs	24-hour feet	6-hour feet
Existing	1994	966	954	1,715.81	1,715.79
Existing	Future	1,143	1,631	1,716.04	1,716.57
Alternative A	Future	1,084	1,134	1,714.00*	1,715.58*
Alternative C	Future	1,149	1,608	1,714.86*	1,715.43*
Alternative D	Future	1,171	1,620	1,714.66*	1,715.37*

*Alternatives A, C and D are presently sized for the 100-year, 24-hour storm. Alternative refinement will be made to maintain the Maximum WSEL to below 1714.86 feet for the 100-year, 6-hour storm.

Figure 2
100-year, 24-hour 1994 conditions hydrographs for Golden Eagle Park Dam

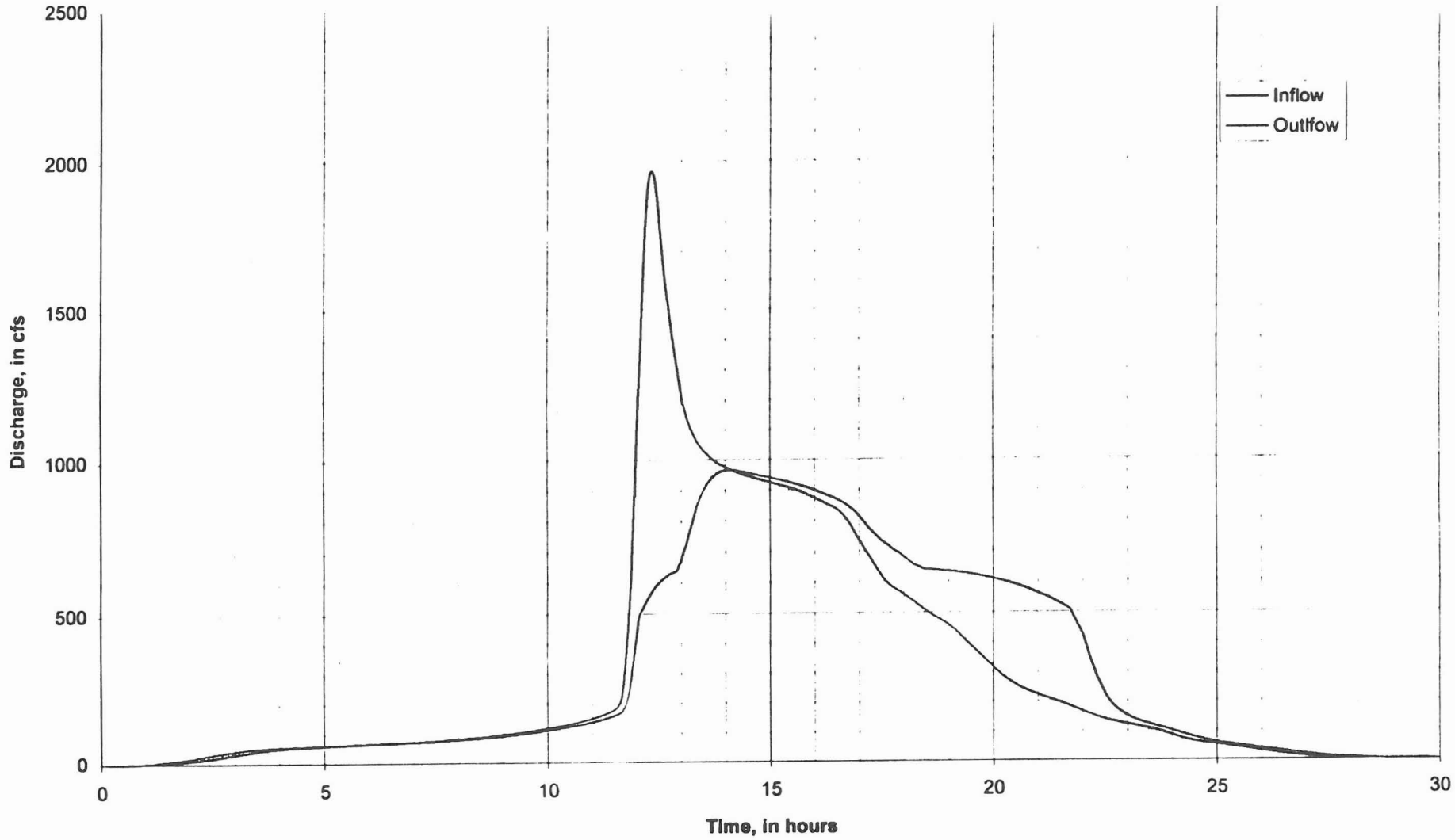


Figure 3

100-year, 6-hour 1994 conditions hydrographs for Golden Eagle Park Dam

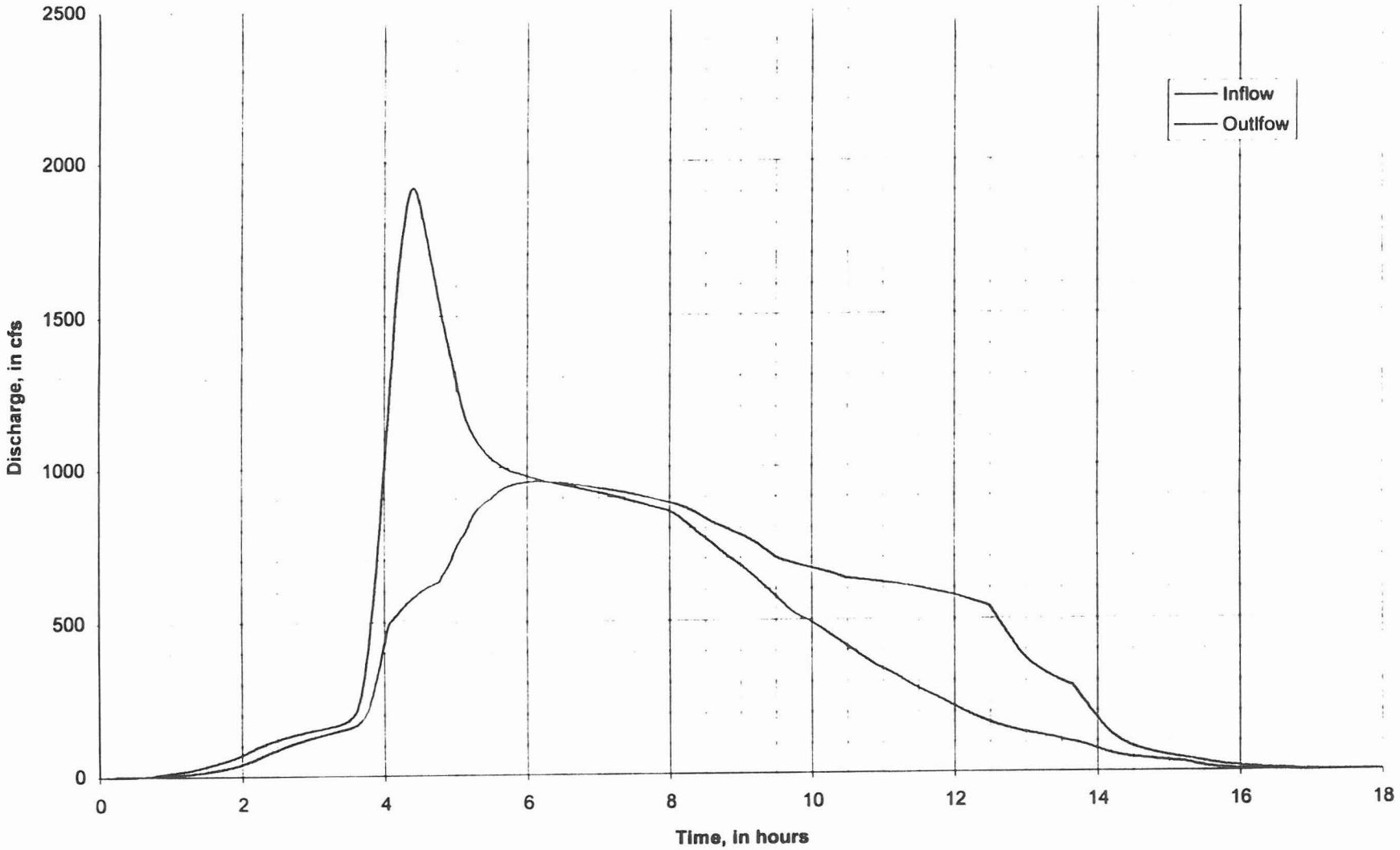


Figure 4
100-year, 24-hour future conditions hydrographs for Golden Eagle Park Dam

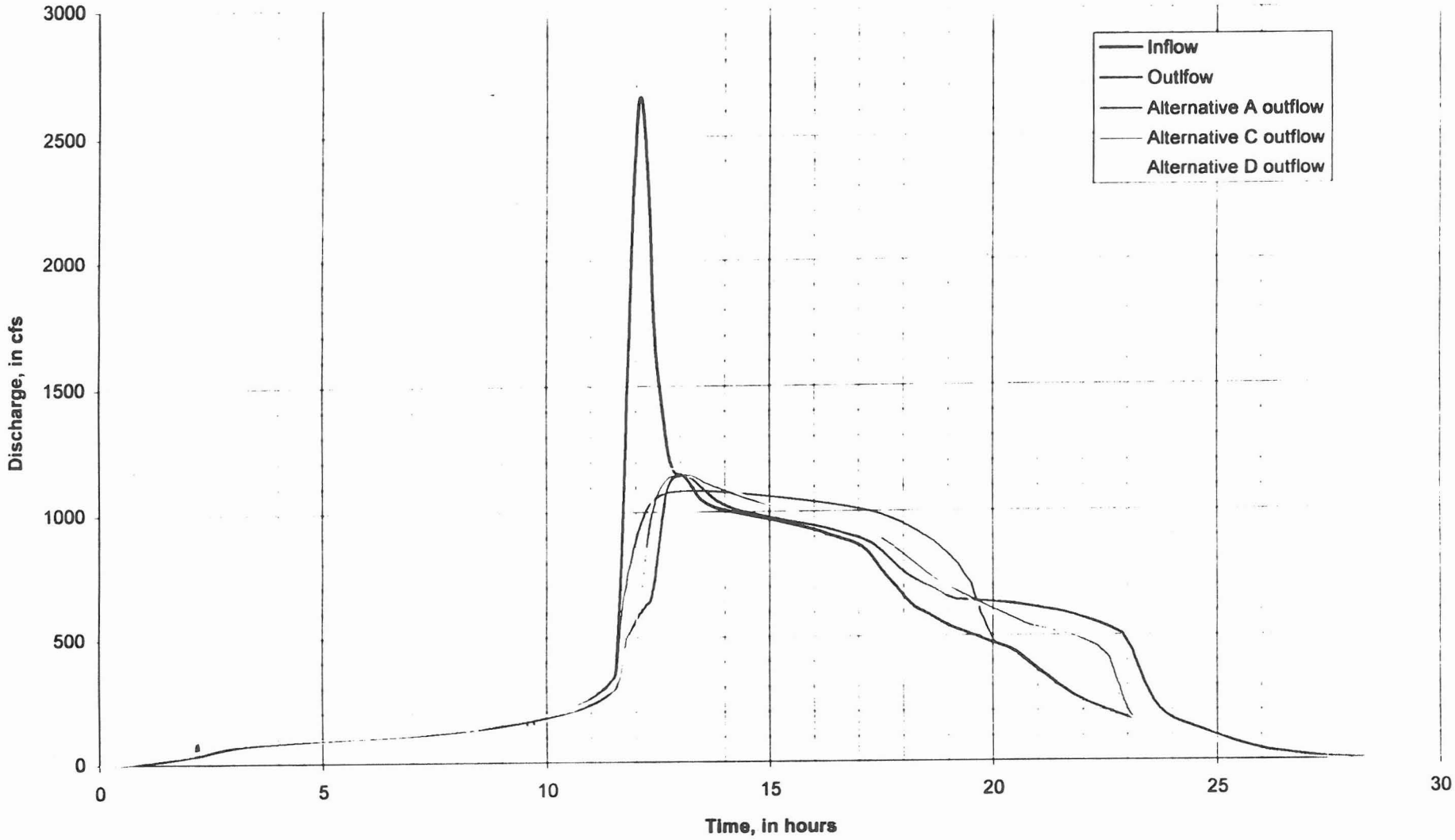
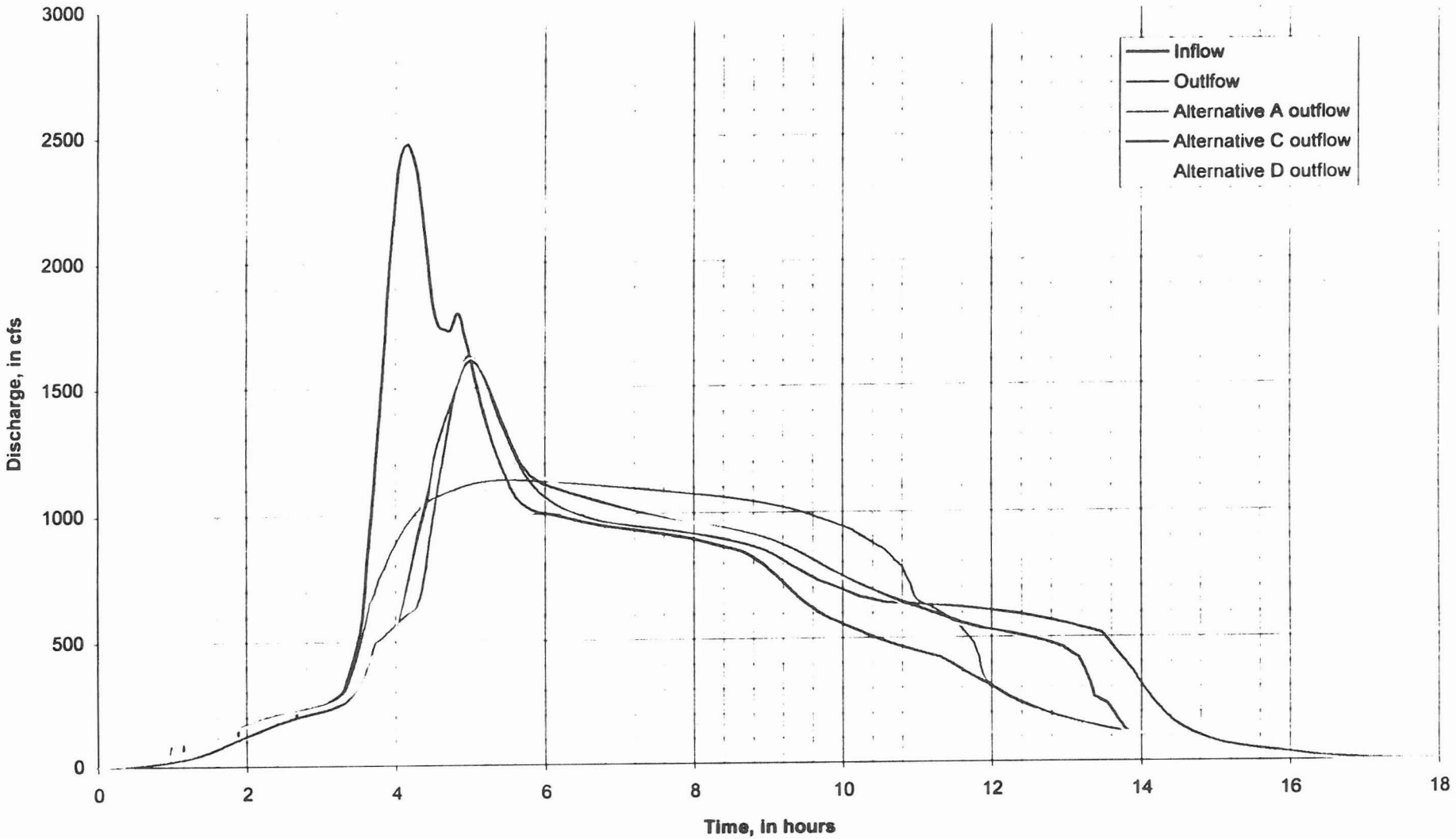


Figure 5

100-year, 6-hour future conditions hydrographs for Golden Eagle Park Dam



Reference: GOLDEN EAGLE PARK DAM – 10-YEAR AND 100-YEAR FLOOD HYDROLOGY

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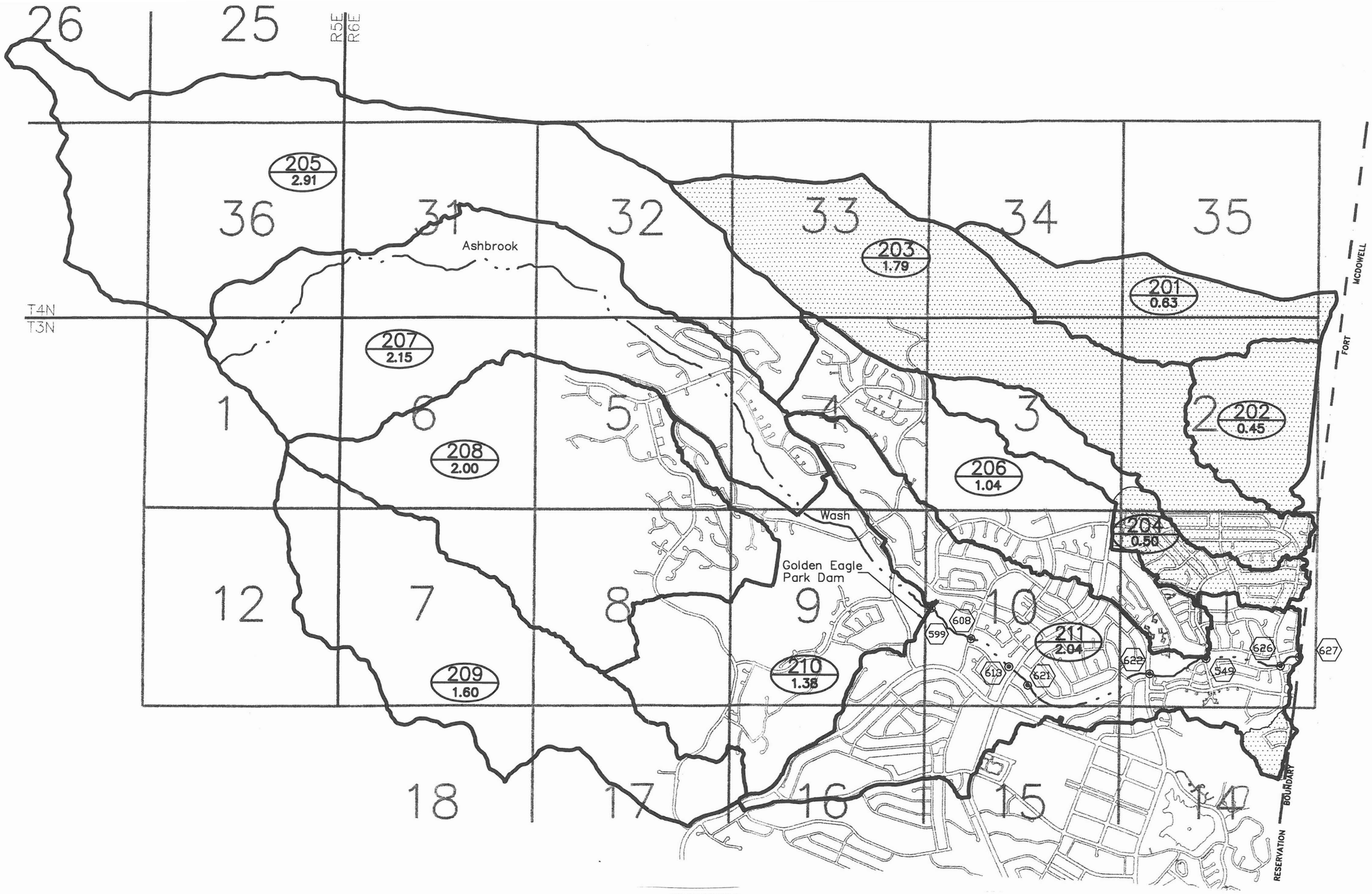

FIGURE 1
Ashbrook Wash Watershed Map
Including HEC-1 Model Subbasin Identifiers and Flow Concentration Points In Ashbrook Wash below Golden Eagle Park Dam

APPENDIX C

ASHBROOK WASH HYDRAULICS MEMO

Memo

Stantec

To: Distribution

File: 28900095

From: George V. Sabol

Date: 21 April 1999

Re: Golden Eagle Park Dam – 10-Year and 100-Year Ashbrook Wash Floodplain Impact Analysis

---

General

The Golden Eagle Park Dam (GEP Dam) – Modification Pre-Design Study requires the evaluation of floodplain impacts to Ashbrook Wash. This memo presents the HEC-2 models that were developed for project purposes. Hydraulic model results are presented for Alternatives A, C and D. Results for Alternatives B and E are similar to the results that are shown.

Previous Studies

The base hydraulic model was developed by George V. Sabol Consulting Engineers, Inc. (GVSCE) as part of the Fountain Hills (North) Floodplain Delineation Study (FDS). That study was completed in 1994 for the Flood Control District of Maricopa County (FCD 92-04).

Since the completion of the FDS, the hydraulic conditions in Ashbrook Wash have changed at two locations. The first is the installation of a culvert crossing for Fountain Hills Boulevard. The design of the culvert was performed by Stanley Consultants, Inc., June 1995. This new crossing impacts the existing hydraulic model at cross sections 3.190 through 3.246. The second change in conditions is downstream of El Pueblo Boulevard to the study limits at cross sections 1.521 through 1.605. The channel geometry in this reach was modified due to the construction of a sewer lift station. The channel geometry modifications were incorporated into the base HEC-2 model in January 1999 for a separate project for the Fountain Hills Sanitary District. Both of these modifications have been incorporated into a new HEC-2 model.

Model Results

HEC-2 models are developed to evaluate the floodplain impacts to Ashbrook Wash for Alternatives A, C and D for the following hydrologic conditions:

- 100-year 1994 conditions
- 100-year future conditions
- 10-year future conditions

10-year and 100-year existing conditions (1994) peak discharges are obtained from the Fountain Hills (North) FDS. 10-year and 100-year future conditions peak discharges are reported in a separate memo (6 April 1999). Future condition discharges are a function of routing through the appropriate alternative for modifications to GEP Dam.

This memo presents tabulated water surface elevations for cross sections in the various HEC-2 models. Due to model changes (new Fountain Hills Boulevard culvert and downstream of El Pueblo Boulevard) not all the same cross sections are used in all models. The table of results show a dash where a particular cross section is not used. Table 1 shows result comparisons for the 100-year flood, and Table 2 for the 10-year flood.

The entries in Table 1 are:

Column	Description
1	River mile stationing of cross sections.
2	Water surface elevation (WSEL) for the Fountain Hills (North) FDS for 1994 conditions (hydrology and Ashbrook Wash conditions)
3	WSEL using 1994 hydrology and the modified HEC-2 model for the new culvert and current channel geometry below El Pueblo Boulevard.
4, 5 and 6	WSEL for Alternatives A, C and D using the modified HEC-2 model and 1994 hydrology.
7, 8 and 9	WSEL for Alternatives A, C and D using the modified HEC-2 model and future condition 100-year peak discharges.

The entries in Table 2 are:

Column	Description
1	River mile stationing of cross sections.
2	WSEL using the 1994 HEC-2 model and 1994 hydrology
3	WSEL using the 1994 HEC-2 model and future condition hydrology
4	WSEL using the modified HEC-2 model, with the existing dam, and future condition hydrology.
5, 6 and 7	WSEL for Alternatives A, C and D using the modified HEC-2 model and future condition hydrology.

TABLE 1

Comparison of water surface elevations downstream of Golden Eagle Park Dam for both 100-year 1994 condition and future condition peak discharges

	Water Surface Elevations, in Feet							
			Dam Alternatives Under 1994 Condition Peak Discharges with Channel Modifications			Dam Alternatives Under Future Condition Peak Discharges with Channel Modifications		
River Mile	1994 FDS	1994 FDS with Channel Modifications	Alt A	Alt C	Alt D	Alt A	Alt C	Alt D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.521	1503.74	--	--	--	--	--	--	--
1.523	1503.95	--	--	--	--	--	--	--
1.525	1504.15	--	--	--	--	--	--	--
1.527	1504.35	1511.38	1511.38	1511.38	1511.38	1511.38	1511.38	1511.38
1.529	--	1511.77	1511.84	1511.78	1511.78	1512.16	1512.04	1512.04
1.577	1508.89	1512.00	1512.11	1512.02	1512.02	1512.54	1512.38	1512.38
1.602	1510.71	1512.03	1512.14	1512.04	1512.04	1512.58	1512.42	1512.42
1.605	--	1512.10	1512.28	1512.13	1512.13	1512.85	1512.66	1512.66
1.636	1515.78	1515.13	1515.29	1515.15	1515.15	1515.82	1515.64	1515.64
1.686	1520.00	1518.11	1518.24	1518.13	1518.13	1518.64	1518.51	1518.51
1.727	1523.36	1522.16	1522.29	1522.18	1522.18	1522.70	1522.56	1522.56
1.855	1534.45	1533.54	1533.69	1533.56	1533.56	1534.12	1534.01	1534.01
1.980	1545.68	1546.65	1546.87	1546.68	1546.68	1547.59	1547.33	1547.33
2.071	1554.72	1554.16	1554.38	1554.19	1554.19	1555.08	1554.86	1554.86
2.095	1557.04	1557.11	1557.31	1557.14	1557.14	1557.94	1557.73	1557.73
2.200	1564.92	1564.88	1565.13	1564.92	1564.92	1565.73	1565.48	1565.48
2.279	1568.90	1568.92	1569.20	1568.97	1568.97	1569.77	1569.48	1569.48
2.304	1570.39	1570.39	1570.67	1570.43	1570.43	1571.26	1570.97	1570.97
2.382	1575.26	1575.25	1575.53	1575.29	1575.29	1576.14	1575.85	1575.85
2.405	1581.00	1581.01	1582.08	1581.11	1581.11	1582.08	1582.09	1582.09
2.428	1586.54	1586.57	1586.78	1586.59	1586.59	1587.20	1586.99	1586.99
2.448	1586.77	1586.80	1587.04	1586.82	1586.82	1587.54	1587.29	1587.29
2.494	1587.05	1587.07	1587.34	1587.10	1587.10	1587.89	1587.62	1587.62
2.529	1588.83	1588.83	1589.44	1588.88	1588.88	1589.97	1590.02	1590.02
2.545	1594.25	1594.25	1594.60	1594.27	1594.27	1595.09	1594.87	1594.91
2.558	1594.45	1594.45	1594.82	1594.47	1594.47	1595.35	1595.11	1595.15
2.670	1596.35	1596.35	1596.81	1596.36	1596.36	1597.59	1597.23	1597.26
2.785	1606.41	1606.41	1606.71	1606.44	1606.44	1607.11	1606.91	1606.94
2.807	1607.51	1607.51	1607.94	1607.54	1607.54	1608.54	1608.25	1608.28
2.899	1612.70	1612.70	1612.97	1612.72	1612.72	1613.37	1613.18	1613.19
3.008	1621.95	1621.95	1622.29	1621.98	1621.98	1622.74	1622.52	1622.54
3.121	1631.31	1631.31	1631.66	1631.33	1631.33	1632.17	1631.93	1631.95
3.190	--	1637.73	1638.10	1637.78	1637.82	1638.54	1638.46	1638.48
3.208	1639.50	--	--	--	--	--	--	--
3.210	--	1640.01	1640.49	1640.11	1640.18	1640.97	1641.01	1641.01
3.236	--	1641.96	1642.81	1642.12	1642.23	1643.76	1643.89	1643.94
3.241	1644.41	--	--	--	--	--	--	--
3.246	--	1643.93	1644.58	1643.98	1644.01	1645.86	1646.04	1646.10
3.323	1653.50	1653.47	1653.14	1653.55	1653.58	1652.83	1653.10	1653.10
3.421	1662.91	1662.93	1663.47	1663.02	1663.05	1664.05	1664.48	1664.49
3.487	1669.49	1669.47	1669.67	1669.57	1669.59	1669.97	1670.48	1670.50
3.519	1674.04	1674.04	1674.30	1674.17	1674.22	1674.66	1675.38	1675.40
3.531	1678.39	1678.40	1678.79	1678.59	1678.68	1679.36	1680.46	1680.50
3.544	1678.86	1678.87	1679.30	1679.08	1679.18	1679.92	1681.13	1681.17
3.621	1682.15	1682.07	1682.24	1682.13	1682.17	1682.40	1682.78	1682.79
3.701	1689.04	1689.12	1689.22	1689.17	1689.20	1689.43	1689.78	1689.79
3.764	1693.18	1693.13	1693.30	1693.20	1693.23	1693.50	1693.90	1693.92

TABLE 2

Comparison of water surface elevations downstream of Golden Eagle Park Dam for both 10-year 1994 condition and future condition peak discharges

	Water Surface Elevations, in Feet					
	Existing Dam			Dam Alternatives		
				Future Conditions with Channel Modifications		
River Mile	1994 Conditions	Future Conditions	Future Conditions with Channel Modifications	Alt A	Alt C	Alt D
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.521	1502.37	1503.19	--	--	--	--
1.523	1502.57	1503.38	--	--	--	--
1.525	1502.76	1503.58	--	--	--	--
1.527	1502.96	1503.78	1511.38	1511.38	1511.38	1511.38
1.529	---	--	1511.61	1511.67	1511.61	1511.61
1.577	1507.26	1508.21	1511.76	1511.85	1511.76	1511.76
1.602	1509.54	1510.21	1511.78	1511.87	1511.78	1511.78
1.605	---	--	1511.65	1511.85	1511.65	1511.65
1.636	1514.76	1515.35	1514.70	1514.88	1514.70	1514.70
1.686	1518.81	1519.52	1517.87	1517.92	1517.88	1517.88
1.727	1522.38	1522.94	1521.82	1521.96	1521.82	1521.82
1.855	1533.30	1533.98	1533.23	1533.34	1533.23	1533.23
1.980	1544.36	1545.13	1545.96	1546.27	1545.96	1545.96
2.071	1553.26	1554.12	1553.61	1553.83	1553.62	1553.62
2.095	1555.63	1556.47	1556.58	1556.81	1556.58	1556.58
2.200	1563.70	1564.50	1564.44	1564.72	1564.44	1564.44
2.279	1567.75	1568.55	1568.58	1568.88	1568.57	1568.57
2.304	1569.22	1570.02	1570.02	1570.32	1570.02	1570.02
2.382	1574.11	1574.91	1574.91	1575.20	1574.90	1574.90
2.405	1578.98	1580.25	1580.26	1580.90	1580.24	1580.24
2.428	1585.47	1586.26	1586.26	1586.53	1586.27	1586.27
2.448	1585.59	1586.45	1586.45	1586.75	1586.46	1586.46
2.494	1585.78	1586.70	1586.70	1587.02	1586.70	1586.70
2.529	1587.22	1588.36	1588.36	1589.09	1588.30	1588.30
2.545	1593.25	1593.95	1593.95	1594.36	1593.94	1593.94
2.558	1593.37	1594.13	1594.13	1594.57	1594.12	1594.12
2.670	1595.78	1596.18	1596.18	1596.44	1596.16	1596.16
2.785	1605.36	1606.11	1606.11	1606.57	1606.09	1606.09
2.807	1606.37	1607.17	1607.17	1607.68	1607.15	1607.15
2.899	1612.17	1612.54	1612.54	1612.78	1612.52	1612.52
3.008	1621.11	1621.71	1621.71	1622.09	1621.69	1621.69
3.121	1630.38	1631.05	1631.05	1631.44	1631.03	1631.03
3.190	---	--	1637.54	1637.90	1637.51	1637.51
3.208	1638.92	1639.33	--	--	--	--
3.210	---	--	1639.81	1640.27	1639.76	1639.76
3.236	---	--	1641.62	1642.40	1641.53	1641.53
3.241	1643.72	1644.25	--	--	--	--
3.246	---	--	1643.81	1644.06	1643.78	1643.78
3.323	1652.97	1653.22	1653.21	1653.57	1653.30	1653.31
3.421	1662.37	1662.59	1662.61	1663.00	1662.75	1662.77
3.487	1668.97	1669.22	1669.21	1669.53	1669.30	1669.31
3.519	1673.20	1673.58	1673.58	1674.11	1673.76	1673.78
3.531	1677.10	1677.67	1677.67	1678.50	1677.95	1677.98
3.544	1677.46	1678.08	1678.08	1678.98	1678.38	1678.41
3.621	1681.35	1681.82	1681.82	1682.10	1681.91	1681.93
3.701	1688.58	1688.83	1688.83	1689.15	1688.96	1688.97
3.764	1692.67	1692.88	1692.88	1693.16	1692.96	1692.97

There are no adverse impacts to the Ashbrook Wash floodplain due to the alternatives. Future condition hydrology and channel modifications do result in some relatively small floodplain water surface elevation changes as compared to the 1994 FDS.

Comparison of overtopping roadway depths at crossings of Ashbrook Wash are listed below:

10-Year, Future Conditions

		Overtopping Depth, in feet			
			Alternative		
River Mile	Roadway	1994 FDS	A	C	D
(1)	(2)	(3)	(4)	(5)	(6)
2.428	Saguaro Blvd.[1]	1.4	2.4	2.1	2.1
2.545	Bayfield Dr.[1]	0.8	1.9	1.4	1.4
3.326	Fountain Hills Blvd.[2]	---[4]	0	0	0
3.531	Hampstead Dr.[3]	0	0	0	0

100-Year, Future Conditions

		Overtopping Depth, in feet			
			Alternative		
River Mile	Roadway	1994 FDS	A	C	D
(1)	(2)	(3)	(4)	(5)	(6)
2.428	Saguaro Blvd.[1]	2.4	3.1	2.9	2.9
2.545	Bayfield Dr.[1]	1.8	2.6	2.4	2.4
3.326	Fountain Hills Blvd.[2]	---[4]	0	0	0
3.531	Hampstead Dr.[3]	0	0	0	0

NOTES:
1 (3) 60-inch CMP
2 (2) 12-ft by 8-ft CBC (Install after the 1994 FDS)
3 (3) 10-ft by 7-ft CBC
4 Dip-crossing prior to installation of CBC

Reference: GOLDEN EAGLE PARK DAM – 10-YEAR AND 100-YEAR FLOODPLAIN IMPACT ANALYSIS

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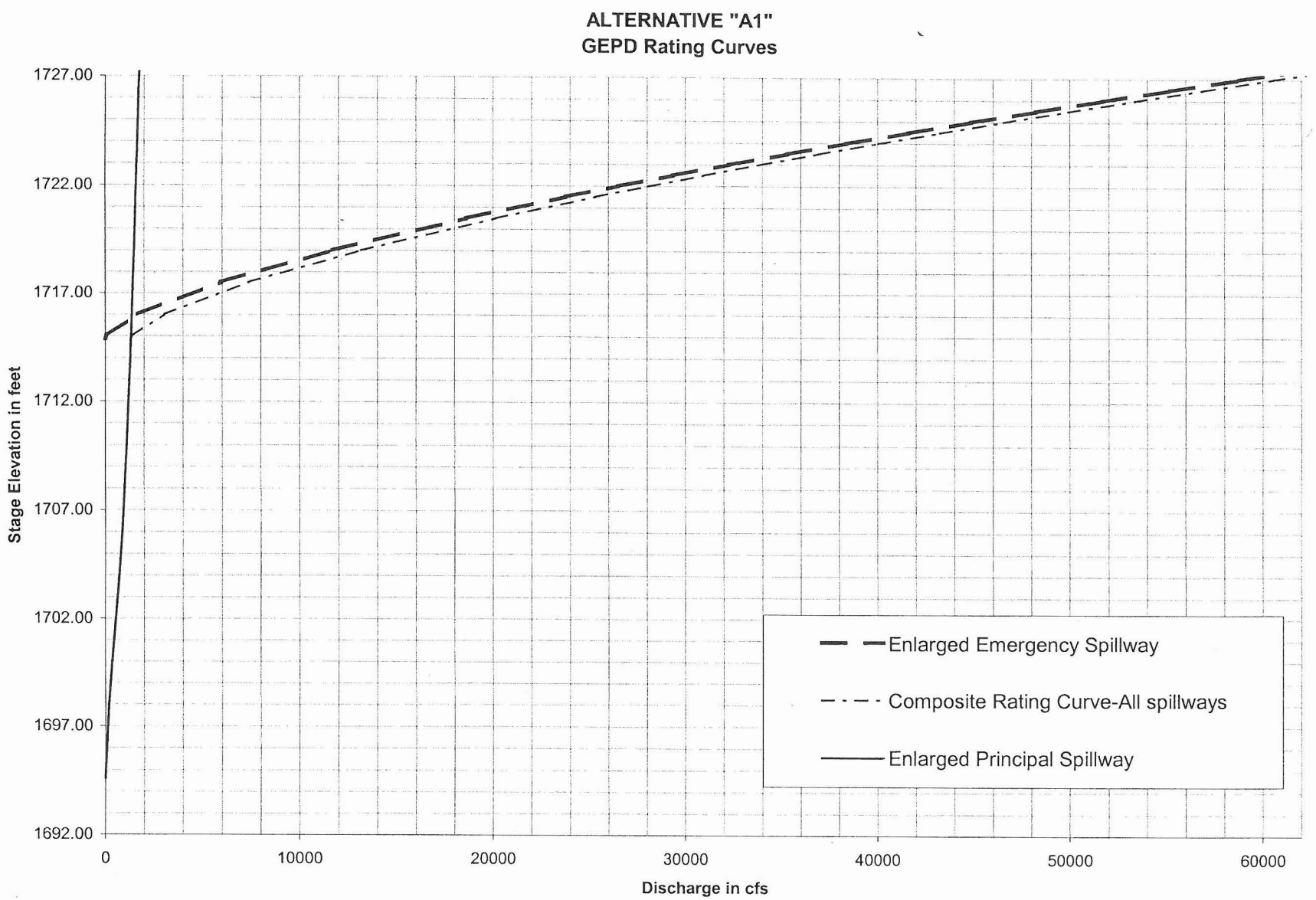
APPENDIX D

SPILLWAY CAPACITY RATING TABLES AND CURVES


ALTERNATIVE "A1"
GEPD Rating Curves
Stage Elevation in feet
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1722.00
1717.00
1712.00
1707.00
1702.00
1697.00
1692.00
0
10000
20000
30000
40000
50000
60000
Discharge in cfs
Enlarged Emergency Spillway
Composite Rating Curve-All spillways
Enlarged Principal Spillway

ALTERNATIVE "A1"
Composite Rating Curve

Elev. (ft)	Total Discharge Through Spillways and Over Top of Prop. Dam Q (cfs)
1694.60	0
1696.00	72
1698.00	175
1700.00	346
1702.00	544
1704.00	716
1706.00	867
1708.00	986
1710.00	1098
1712.00	1195
1714.00	1289
1714.50	1308
1714.86	1322
1715.00	1401
1716.00	3058
1717.50	7386
1719.00	13190
1720.50	20150
1721.50	25348
1722.00	28100
1722.50	30951
1723.00	33895
1723.50	36931
1724.00	40055
1724.50	43263
1725.00	46848
1725.50	50918
1726.00	55302
1726.50	59949
1727.00	64830
1727.50	69927
1728.00	75225
1728.50	80713
1729.00	86381
1729.50	92222
1730.00	98230

Alternative A1
Enlarged Principal Spillway
(existing plus proposed)

Existing 60" RCP, Existing (partial
HY8 Output (GED_6X6.INP)
Actual Curve

Elev. (ft)	Q (cfs)
1694.60	0
1698.75	214
1700.77	427
1703.02	641
1705.79	854
1709.37	1068
1713.79	1281
1719.31	1495
1723.85	1647
1733.53	1922
1735.00	1958
1735.20	2135

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	72
1698.00	175
1700.00	346
1702.00	544
1704.00	716
1706.00	867
1708.00	986
1710.00	1098
1712.00	1195
1714.00	1289
1714.50	1308
1714.86	1322
1715.00	1328
1716.00	1366
1717.50	1424
1719.00	1483
1720.50	1534
1721.50	1568
1722.00	1585
1722.50	1602
1723.00	1618
1723.50	1635
1724.00	1651
1724.50	1665
1725.00	1680
1725.50	1694
1726.00	1708
1726.50	1722
1727.00	1736
1727.50	1751
1728.00	1765
1728.50	1779
1729.00	1793
1729.50	1807
1730.00	1821

Alterr. A1
Existing Emergency Spillway

L_e = 266.0 Feet
C = 2.4

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

Altern. A1
Enlarged Emergency Spillway

L_{ee} = 289.0 Feet
C = 2.6

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	39
1716.00	915
1717.50	3,223
1719.00	6,330
1720.50	10,064
1721.50	12,857
1722.00	14,336
1722.50	15,868
1723.00	17,450
1723.50	19,083
1724.00	20,763
1724.50	22,490
1725.00	24,262
1725.50	26,079
1726.00	27,938
1726.50	29,840
1727.00	31,783
1727.50	33,767
1728.00	35,790
1728.50	37,852
1729.00	39,953
1729.50	42,090
1730.00	44,265

Alterr e A1
Overtopping GEPD

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	293
1725.50	989
1726.00	1919
1726.50	3034
1727.00	4307
1727.50	5721
1728.00	7262
1728.50	8921
1729.00	10691
1729.50	12564
1730.00	14536

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:15:12

FILE DATE: 05-14-1999
FILE NAME: EX-PRNC

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

EXISTING PRINCIPAL

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1694.51	1693.24	105.01	1 RCP	5.00	5.00	.013	CONVENTIONAL
2	1696.56	1695.10	105.01	1 IRCP	4.91	3.00	.013	CONVENTIONAL
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: EX-PRNC DATE: 05-14-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1694.51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1697.90	90.0	69.0	20.9	0.0	0.0	0.0	0.0	0.00	6
1699.32	180.0	119.8	60.1	0.0	0.0	0.0	0.0	0.00	4
1700.94	270.0	173.3	96.8	0.0	0.0	0.0	0.0	0.00	4
1703.11	360.0	227.1	132.9	0.0	0.0	0.0	0.0	0.00	4
1705.95	450.0	281.2	169.0	0.0	0.0	0.0	0.0	0.00	4
1707.85	500.0	311.9	188.1	0.0	0.0	0.0	0.0	0.00	3
1713.69	630.0	392.3	237.8	0.0	0.0	0.0	0.0	0.00	7
1718.51	720.0	448.1	272.0	0.0	0.0	0.0	0.0	0.00	6
1724.16	810.0	502.8	307.3	0.0	0.0	0.0	0.0	0.00	7
1730.97	900.0	555.0	345.0	0.0	0.0	0.0	0.0	0.00	8
1735.00	945.4	579.8	365.5	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: EX-PRNC DATE: 05-14-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1694.51	0.000	0.00	0.00	0.00
1697.90	-0.002	90.00	0.10	0.11
1699.32	-0.002	180.00	0.17	0.09
1700.94	0.001	270.00	-0.03	-0.01
1703.11	0.001	360.00	-0.04	-0.01
1705.95	0.005	450.00	-0.14	-0.03
1707.85	0.002	500.00	-0.06	-0.01
1713.69	0.002	630.00	-0.04	-0.01
1718.51	0.003	720.00	-0.06	-0.01
1724.16	0.000	810.00	0.00	0.00
1730.97	0.001	900.00	-0.02	-0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

Stantec

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:15:12 FILE NAME: EX-PRNC

PERFORMANCE CURVE FOR CULVERT 1 - 1(5.00 (ft) BY 5.00 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1694.51	0.00	-1.27	0-NF	0.00	0.00	0.00	-0.09	0.00	0.00
68.98	1697.90	3.39	2.78	1-S2n	1.66	2.33	1.76	0.66	11.12	2.90
119.75	1699.31	4.80	3.95	1-S2n	2.25	3.12	2.42	1.03	12.72	3.69
173.27	1700.94	6.43	5.54	5-S2n	2.80	3.76	3.03	1.32	13.93	4.23
227.13	1703.11	8.60	7.52	5-S2n	3.36	4.23	3.60	1.56	15.02	4.64
281.16	1705.94	11.43	9.94	5-S2n	4.01	4.63	4.19	1.78	16.04	4.98
311.94	1707.85	13.34	11.44	2-M2c	5.00	4.86	4.86	1.90	16.11	5.15
392.28	1713.69	19.18	16.18	6-FFc	5.00	5.00	5.00	2.16	19.98	5.53
448.08	1718.51	24.00	19.97	6-FFc	5.00	5.00	5.00	2.33	22.82	5.76
502.75	1724.15	29.64	24.18	6-FFc	5.00	5.00	5.00	2.49	25.61	5.97
554.98	1730.97	36.46	28.65	6-FFc	5.00	5.00	5.00	2.65	28.27	6.16

El. inlet face invert 1694.51 ft El. outlet invert 1693.24 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

** SITE DATA ***** CULVERT INVERT **********

INLET STATION	949.00 ft
INLET ELEVATION	1694.51 ft
OUTLET STATION	1054.00 ft
OUTLET ELEVATION	1693.24 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0121
CULVERT LENGTH ALONG SLOPE	105.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	5.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:15:12 FILE NAME: EX-PRNC

PERFORMANCE CURVE FOR CULVERT 2 - 1(4.91 (ft) BY 3.00 (ft)) IRCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1696.56	0.00	-1.46	0-NF	0.00	0.00	0.00	-1.95	0.00	0.00
20.92	1697.90	1.34	0.55	1-S2n	0.53	0.83	0.43	-1.20	10.12	2.90
60.08	1699.32	2.76	1.67	1-S2n	1.09	1.63	1.13	-0.83	10.85	3.69
96.76	1700.93	4.37	3.24	5-S2n	1.55	2.20	1.64	-0.54	12.31	4.23
132.91	1703.10	6.54	5.29	5-S2n	2.05	2.57	2.14	-0.30	13.42	4.64
168.97	1705.95	9.39	7.80	2-M2c	3.00	2.88	2.88	-0.08	14.21	4.98
188.12	1707.84	11.28	9.48	6-FFc	3.00	3.00	3.00	0.04	15.59	5.15
237.76	1713.69	17.13	14.22	6-FFc	3.00	3.00	3.00	0.30	19.70	5.53
271.98	1718.51	21.95	18.13	6-FFc	3.00	3.00	3.00	0.47	22.54	5.76
307.25	1724.16	27.60	22.71	6-FFc	3.00	3.00	3.00	0.63	25.46	5.97
345.03	1730.97	34.41	28.24	6-FFc	3.00	3.00	3.00	0.79	28.59	6.16

El. inlet face invert 1696.56 ft El. outlet invert 1695.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	949.00 ft
INLET ELEVATION	1696.56 ft
OUTLET STATION	1054.00 ft
OUTLET ELEVATION	1695.10 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0139
CULVERT LENGTH ALONG SLOPE	105.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	USER DEFINED
BARREL SPAN	4.91 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013 FOR SIDES AND TOP
	0.015 FOR BOTTOM
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:15:12

FILE DATE: 05-14-1999
FILE NAME: EX-PRNC

***** USER DEFINED CULVERT CROSS-SECTION - CULVERT # 2

COORDINATE NUMBER	X (ft)	Y-TOP (ft)	Y-BOTTOM (ft)
1	0.00	0.96	0.04
2	0.10	1.33	0.00
3	0.60	2.17	0.00
4	1.10	2.60	0.00
5	1.60	2.85	0.00
6	2.46	3.00	0.00
7	3.31	2.85	0.00
8	3.81	2.60	0.00
9	4.31	2.17	0.00
10	4.81	1.33	0.00
11	4.91	0.96	0.40

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:15:12

FILE DATE: 05-14-1999
FILE NAME: EX-PRNC

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH	37.00 ft
SIDE SLOPE H/V (X:1)	6.0
CHANNEL SLOPE V/H (ft/ft)	0.016
MANNING'S n (.01-0.1)	0.050
CHANNEL INVERT ELEVATION	1693.15 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1693.24 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1693.15	0.000	0.00	0.00	0.00
90.00	1693.90	0.592	0.75	2.90	0.76
180.00	1694.27	0.616	1.12	3.69	1.13
270.00	1694.56	0.628	1.41	4.23	1.42
360.00	1694.80	0.636	1.65	4.64	1.67
450.00	1695.02	0.642	1.87	4.98	1.89
500.00	1695.14	0.644	1.98	5.15	2.01
630.00	1695.40	0.649	2.25	5.53	2.28
720.00	1695.57	0.652	2.42	5.76	2.45
810.00	1695.73	0.655	2.58	5.97	2.61
900.00	1695.89	0.657	2.73	6.16	2.76

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	25.00 ft
CREST LENGTH	700.00 ft
OVERTOPPING CREST ELEVATION	1735.00 ft

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:14:16

FILE DATE: 05-14-1999
FILE NAME: GED_6X6

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

ALT #A1 & #A2

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1694.51	1693.24	105.01	1 RCP	5.00	5.00	.013	CONVENTIONAL
2	1696.56	1695.10	105.01	1 IRCP	4.91	3.00	.013	CONVENTIONAL
3	1696.00	1693.20	99.04	1 RCB	6.00	6.00	.015	CONVENTIONAL
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: GED_6X6 DATE: 05-14-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1694.51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1698.75	213.5	99.1	42.3	72.0	0.0	0.0	0.0	0.00	7
1700.77	427.0	168.2	93.1	165.7	0.0	0.0	0.0	0.00	4
1703.02	640.5	225.1	131.7	284.2	0.0	0.0	0.0	0.00	4
1705.79	854.0	278.4	167.1	409.0	0.0	0.0	0.0	0.00	4
1709.37	1067.5	334.6	202.3	531.0	0.0	0.0	0.0	0.00	5
1713.79	1281.0	393.6	238.5	648.9	0.0	0.0	0.0	0.00	7
1719.31	1494.5	456.4	277.3	760.9	0.0	0.0	0.0	0.00	7
1723.85	1647.0	500.1	305.4	841.6	0.0	0.0	0.0	0.00	6
1733.53	1921.5	571.2	358.2	992.1	0.0	0.0	0.0	0.00	11
1735.20	2135.0	581.0	366.5	1015.7	0.0	0.0	0.0	159.83	7
1735.00	1958.3	579.9	365.5	1012.9	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: GED_6X6 DATE: 05-14-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1694.51	0.000	0.00	0.00	0.00
1698.75	0.000	213.50	0.05	0.02
1700.77	0.001	427.00	-0.07	-0.02
1703.02	0.005	640.50	-0.48	-0.07
1705.79	0.008	854.00	-0.54	-0.06
1709.37	0.006	1067.50	-0.35	-0.03
1713.79	0.000	1281.00	0.00	0.00
1719.31	0.003	1494.50	-0.12	-0.01
1723.85	0.003	1647.00	-0.10	-0.01
1733.53	0.001	1921.50	-0.04	-0.00
1735.20	-0.007	2135.00	11.95	0.56

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

Stantec

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:14:16 FILE NAME: GED_6X6

PERFORMANCE CURVE FOR CULVERT 1 - 1(5.00 (ft) BY 5.00 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1694.51	0.00	-1.27	0-NF	0.00	0.00	0.00	-0.09	0.00	0.00
99.06	1698.75	4.24	3.44	1-S2n	2.02	2.82	2.26	1.14	11.47	3.91
168.20	1700.76	6.25	5.37	5-S2n	2.75	3.70	3.12	1.73	13.05	4.90
225.14	1703.01	8.50	7.44	5-S2n	3.34	4.22	3.82	2.19	14.03	5.56
278.42	1705.78	11.27	9.81	5-S2n	3.97	4.61	4.51	2.57	14.92	6.07
334.60	1709.37	14.86	12.79	6-FFc	5.00	5.00	5.00	2.91	17.04	6.48
393.58	1713.79	19.28	16.26	6-FFc	5.00	5.00	5.00	3.21	20.04	6.84
456.42	1719.30	24.79	20.59	6-FFc	5.00	5.00	5.00	3.49	23.25	7.15
500.08	1723.84	29.33	23.96	6-FFc	5.00	5.00	5.00	3.67	25.47	7.35
571.19	1733.52	39.01	30.13	6-FFc	5.00	5.00	5.00	3.98	29.09	7.68
580.99	1735.19	40.68	31.04	6-FFc	5.00	5.00	5.00	4.21	29.59	7.91

El. inlet face invert 1694.51 ft El. outlet invert 1693.24 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

** SITE DATA ***** CULVERT INVERT **********

INLET STATION	949.00 ft
INLET ELEVATION	1694.51 ft
OUTLET STATION	1054.00 ft
OUTLET ELEVATION	1693.24 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0121
CULVERT LENGTH ALONG SLOPE	105.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	5.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:14:16 FILE NAME: GED_6X6

PERFORMANCE CURVE FOR CULVERT 2 - 1(4.91 (ft) BY 3.00 (ft)) IRCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1696.56	0.00	-1.46	0-NF	0.00	0.00	0.00	-1.95	0.00	0.00
42.35	1698.74	2.18	1.13	1-S2n	0.86	1.31	0.96	-0.72	9.05	3.91
93.12	1700.76	4.20	3.25	5-S2n	1.50	2.16	1.73	-0.13	11.32	4.90
131.69	1703.01	6.45	5.58	5-S2n	2.04	2.56	2.36	0.33	12.36	5.56
167.14	1705.78	9.22	8.32	2-M2c	3.00	2.86	2.86	0.71	14.08	6.07
202.28	1709.37	12.81	11.59	6-FFc	3.00	3.00	3.00	1.05	16.76	6.48
238.53	1713.79	17.23	15.51	6-FFc	3.00	3.00	3.00	1.35	19.76	6.84
277.25	1719.31	22.75	20.42	6-FFc	3.00	3.00	3.00	1.63	22.97	7.15
305.42	1723.85	27.29	24.45	6-FFc	3.00	3.00	3.00	1.81	25.31	7.35
358.21	1733.53	36.97	33.05	6-FFc	3.00	3.00	3.00	2.12	29.68	7.68
366.53	1735.20	38.64	34.54	6-FFc	3.00	3.00	3.00	2.35	30.37	7.91

El. inlet face invert 1696.56 ft El. outlet invert 1695.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

** SITE DATA ***** CULVERT INVERT **********

INLET STATION	949.00 ft
INLET ELEVATION	1696.56 ft
OUTLET STATION	1054.00 ft
OUTLET ELEVATION	1695.10 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0139
CULVERT LENGTH ALONG SLOPE	105.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	USER DEFINED
BARREL SPAN	4.91 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013 FOR SIDES AND TOP
	0.015 FOR BOTTOM
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	HEADWALL
INLET DEPRESSION	NONE

CU ENT DATE: 05-24-1999
CU ENT TIME: 10:14:16

FILE DATE: 05-14-1999
FILE NAME: GED_6X6

***** USER DEFINED CULVERT CROSS-SECTION - CULVERT # 2

COORDINATE NUMBER	X (ft)	Y-TOP (ft)	Y-BOTTOM (ft)
1	0.00	0.96	0.04
2	0.10	1.33	0.00
3	0.60	2.17	0.00
4	1.10	2.60	0.00
5	1.60	2.85	0.00
6	2.46	3.00	0.00
7	3.31	2.85	0.00
8	3.81	2.60	0.00
9	4.31	2.17	0.00
10	4.81	1.33	0.00
11	4.91	0.96	0.40

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:14:16 FILE NAME: GED_6X6

PERFORMANCE CURVE FOR CULVERT 3 - 1(6.00 (ft) BY 6.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1696.00	0.00	-2.80	0-NF	0.00	0.00	0.00	-0.05	0.00	0.00
72.04	1698.76	2.75	1.14	1-S2n	0.89	1.65	0.85	1.18	14.10	3.91
165.74	1700.78	4.78	2.26	1-S2n	1.60	2.88	1.78	1.77	15.53	4.90
284.16	1703.02	7.02	4.08	1-S2n	2.36	4.12	2.70	2.23	17.52	5.56
408.98	1705.79	9.79	6.59	5-S2n	3.08	5.26	3.61	2.61	18.90	6.07
530.98	1709.37	13.37	9.54	6-FFc	3.76	6.00	3.76	2.95	23.51	6.48
648.90	1713.79	17.79	12.67	6-FFc	4.40	6.00	4.40	3.25	24.57	6.84
760.94	1719.31	23.31	16.22	6-FFc	4.99	6.00	4.99	3.53	25.39	7.15
841.61	1723.85	27.85	19.12	6-FFc	6.00	6.00	4.99	3.71	28.08	7.35
992.14	1733.53	37.53	25.33	6-FFc	6.00	6.00	4.99	4.02	33.11	7.68
1015.70	1735.19	39.19	26.39	6-FFc	6.00	6.00	4.99	4.25	33.89	7.91

El. inlet face invert 1696.00 ft El. outlet invert 1693.20 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION                          950.00 ft
      INLET ELEVATION                       1696.00 ft
      OUTLET STATION                        1049.00 ft
      OUTLET ELEVATION                      1693.20 ft
      NUMBER OF BARRELS                        1
      SLOPE (V/H)                              0.0283
      CULVERT LENGTH ALONG SLOPE              99.04 ft

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          BOX
      BARREL SPAN             6.00 ft
      BARREL RISE             6.00 ft
      BARREL MATERIAL       CONCRETE
      BARREL MANNING'S n    0.015
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   SQUARE EDGE  (90-45 DEG.)
      INLET DEPRESSION      NONE
```

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:14:16

FILE DATE: 05-14-1999
FILE NAME: GED_6X6

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

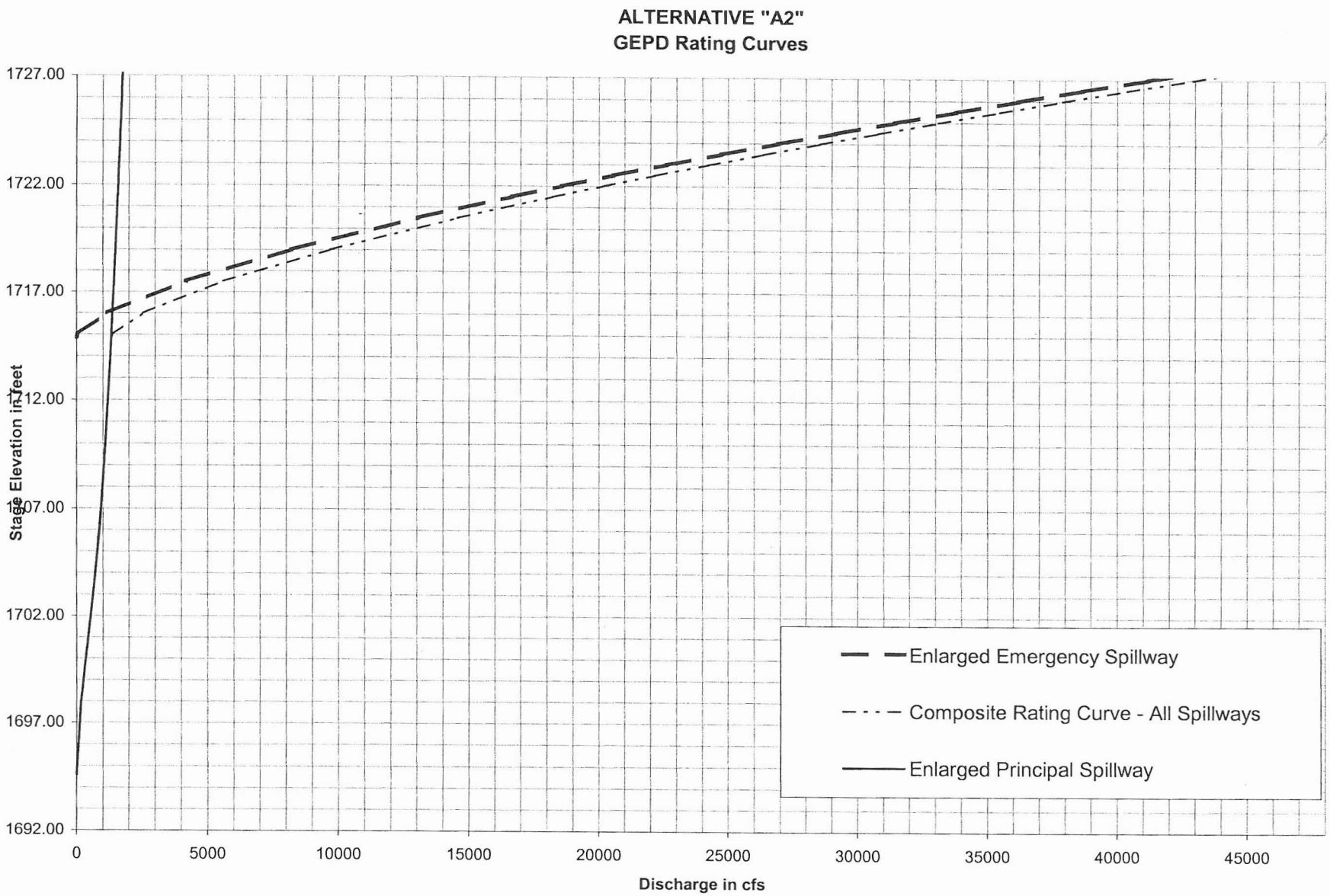
BOTTOM WIDTH	37.00 ft
SIDE SLOPE H/V (X:1)	6.0
CHANNEL SLOPE V/H (ft/ft)	0.016
MANNING'S n (.01-0.1)	0.050
CHANNEL INVERT ELEVATION	1693.15 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1693.24 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1693.15	0.000	0.00	0.00	0.00
213.50	1694.38	0.621	1.23	3.91	1.24
427.00	1694.97	0.640	1.82	4.90	1.84
640.50	1695.43	0.650	2.28	5.56	2.30
854.00	1695.81	0.656	2.66	6.07	2.69
1067.50	1696.15	0.660	3.00	6.48	3.03
1281.00	1696.45	0.663	3.30	6.84	3.34
1494.50	1696.73	0.666	3.58	7.15	3.62
1647.00	1696.91	0.668	3.76	7.35	3.80
1921.50	1697.22	0.670	4.07	7.68	4.12
2135.00	1697.45	0.672	4.30	7.91	4.35

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	25.00 ft
CREST LENGTH	700.00 ft
OVERTOPPING CREST ELEVATION	1735.00 ft


ALTERNATIVE "A2"
GEPD Rating Curves
1727.00
1722.00
1717.00
1712.00
1707.00
1702.00
1697.00
1692.00
Stage Elevation in feet
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Discharge in cfs
Enlarged Emergency Spillway
Composite Rating Curve - All Spillways
Enlarged Principal Spillway

ALTERNATIVE "A2"
Composite Rating Curve

Elev. (ft)	Total Discharge Through Spillways and Over Top of Prop. Dam Q (cfs)
1694.60	0
1696.00	72
1698.00	175
1700.00	346
1702.00	544
1704.00	716
1706.00	867
1708.00	986
1710.00	1098
1712.00	1195
1714.00	1289
1714.50	1308
1714.86	1322
1715.00	1379
1716.00	2552
1717.50	5602
1719.00	9685
1720.50	14578
1721.50	18230
1722.00	20164
1722.50	22166
1723.00	24234
1723.50	26366
1724.00	28560
1724.50	30812
1725.00	33123
1725.50	35491
1726.00	37915
1726.50	40532
1727.00	43826
1727.50	47531
1728.00	51552
1728.50	55846
1729.00	60384
1729.50	65147
1730.00	70118

Alternative A-2
Enlarged Principal Spillway
(existing plus proposed)

Elev. (ft)	Q (cfs)
1694.60	0
1698.75	214
1700.77	427
1703.02	641
1705.79	854
1709.37	1068
1713.79	1281
1719.31	1495
1723.85	1647
1733.53	1922
1735.00	1958
1735.20	2135

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	72
1698.00	175
1700.00	346
1702.00	544
1704.00	716
1706.00	867
1708.00	986
1710.00	1098
1712.00	1195
1714.00	1289
1714.50	1308
1714.86	1322
1715.00	1328
1716.00	1366
1717.50	1424
1719.00	1483
1720.50	1534
1721.50	1568
1722.00	1585
1722.50	1602
1723.00	1618
1723.50	1635
1724.00	1651
1724.50	1665
1725.00	1680
1725.50	1694
1726.00	1708
1726.50	1722
1727.00	1736
1727.50	1751
1728.00	1765
1728.50	1779
1729.00	1793
1729.50	1807
1730.00	1821

Altern . A2
Enlarged Emergency Spillway

ENLARGED EMERGENCY SPILLWAY RATI

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

L_{ee} = 129.0 Feet
C = 2.6

Enter W

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	18
1716.00	408
1717.50	1,439
1719.00	2,825
1720.50	4,492
1721.50	5,739
1722.00	6,399
1722.50	7,083
1723.00	7,789
1723.50	8,518
1724.00	9,268
1724.50	10,039
1725.00	10,830
1725.50	11,641
1726.00	12,471
1726.50	13,320
1727.00	14,187
1727.50	15,072
1728.00	15,976
1728.50	16,896
1729.00	17,834
1729.50	18,788
1730.00	19,758

Alterr. A2
Existing Emergency Spillway

L_e = 266.0 Feet
C = 2.4

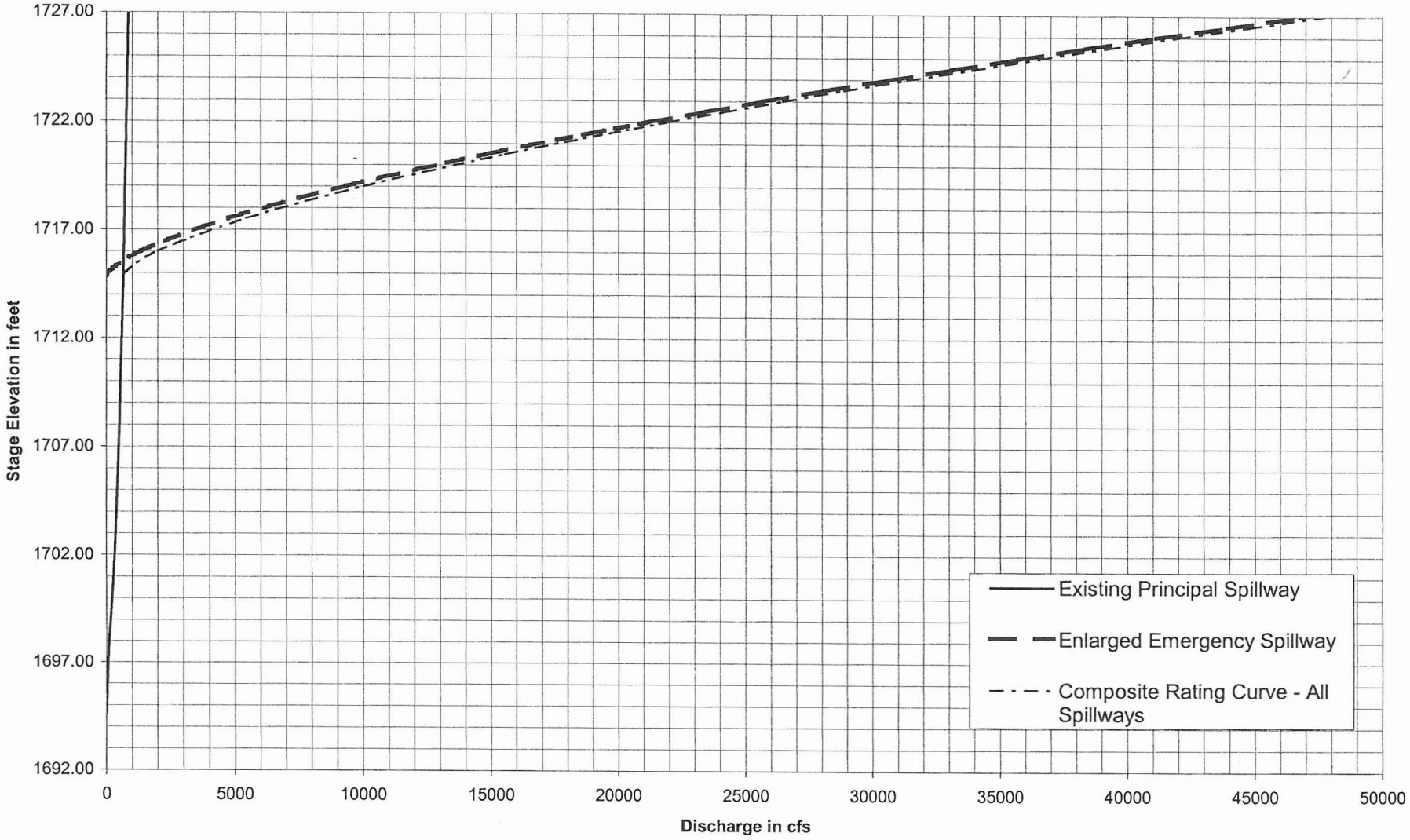
Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

Altern. ; A2
Overtopping GEPD

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	0
1726.50	137
1727.00	899
1727.50	2019
1728.00	3404
1728.50	5011
1729.00	6814
1729.50	8791
1730.00	10930

ALTERNATIVE "B"
GEPD Rating Curves



ALTERNATIVE "B"
Composite Rating Curve

Elev (ft)	Total Discharge Through Spillways and Over Top of Prop. Dam Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	712
1716.00	2,020
1717.50	5,447
1719.00	10,048
1720.50	15,571
1721.50	19,698
1722.00	21,884
1722.50	24,148
1723.00	26,487
1723.50	28,898
1724.00	31,380
1724.50	33,930
1725.00	36,546
1725.50	39,227
1726.00	42,100
1726.50	45,620
1727.00	49,534
1727.50	53,756
1728.00	58,244
1728.50	62,972
1729.00	67,920
1729.50	73,073
1730.00	78,421

Alternative B
Existing Principal Spillway

Existing 60" RCP, Existing (partially filled) RC
HY8 Output (EX-PRNC.INP)
Actual Curve

Elev. (ft)	Q (cfs)
1694.60	0
1697.90	90
1699.32	180
1700.94	270
1703.11	360
1705.95	450
1707.85	500
1713.69	630
1718.51	720
1724.16	810
1730.97	900
1735.00	945

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	654
1716.00	673
1717.50	701
1719.00	728
1720.50	752
1721.50	768
1722.00	776
1722.50	784
1723.00	792
1723.50	799
1724.00	807
1724.50	814
1725.00	821
1725.50	828
1726.00	834
1726.50	841
1727.00	848
1727.50	854
1728.00	861
1728.50	867
1729.00	874
1729.50	881
1730.00	887

EXISTING EMERGENCY SPILLWAY RATIN

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

L_e = 266.0 Feet
C = 2.4

Enter W

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

ENLARGED EMERGENCY SPILLWAY RATING CURVE

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

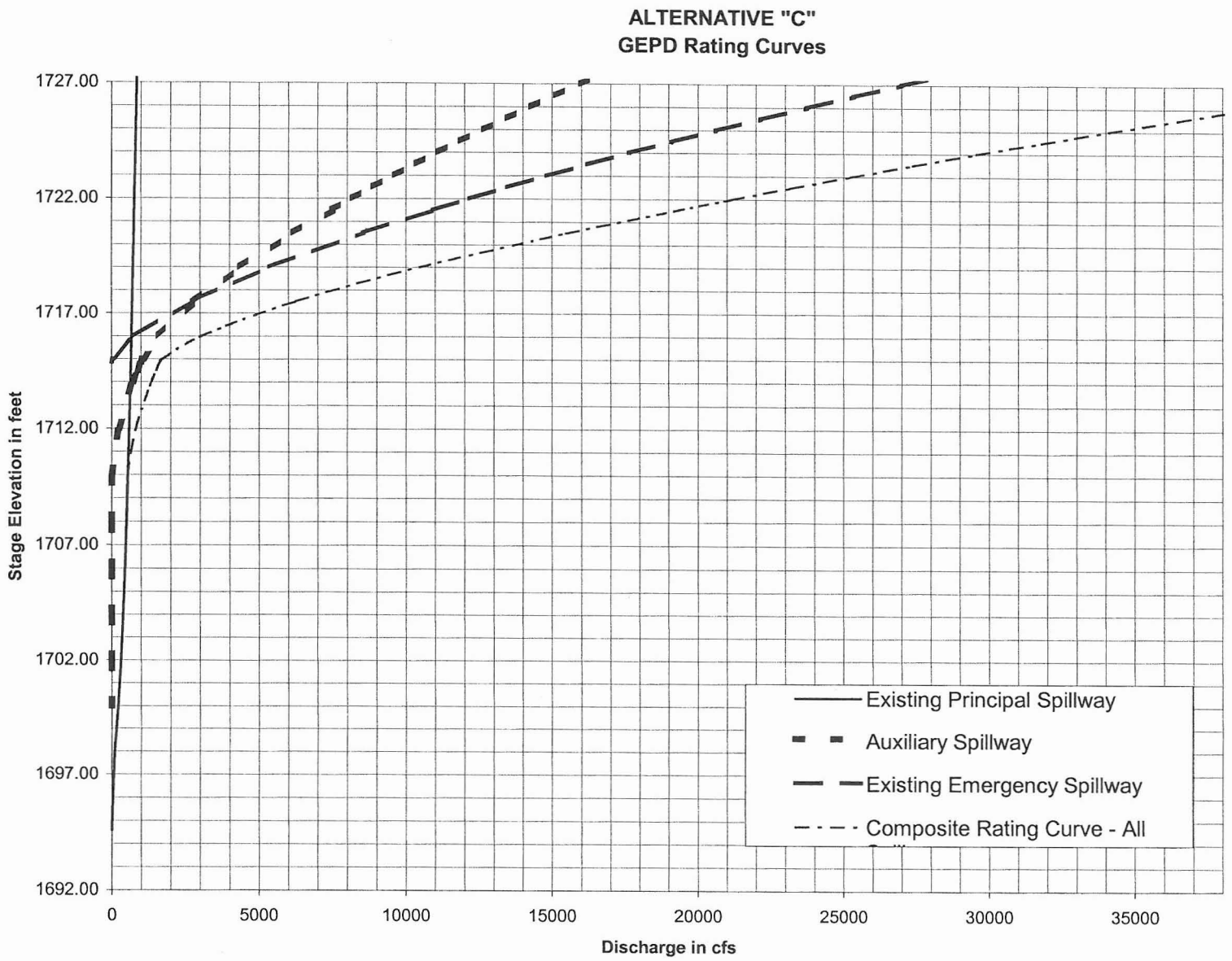
L_{ee} = 180.0 Feet
C = 2.6

Enter Water Surface
Approxima

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	25
1716.00	570
1717.50	2,007
1719.00	3,942
1720.50	6,269
1721.50	8,008
1722.00	8,929
1722.50	9,883
1723.00	10,869
1723.50	11,885
1724.00	12,932
1724.50	14,008
1725.00	15,111
1725.50	16,243
1726.00	17,401
1726.50	18,586
1727.00	19,796
1727.50	21,031
1728.00	22,291
1728.50	23,576
1729.00	24,884
1729.50	26,215
1730.00	27,570

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	128
1726.50	841
1727.00	1887
1727.50	3182
1728.00	4684
1728.50	6369
1729.00	8217
1729.50	10217
1730.00	12356


ALTERNATIVE "C"
GEPD Rating Curves
Stage Elevation in feet
1727.00
1722.00
1717.00
1712.00
1707.00
1702.00
1697.00
1692.00
0
5000
10000
15000
20000
25000
30000
35000
Discharge in cfs
Existing Principal Spillway
Auxiliary Spillway
Existing Emergency Spillway
Composite Rating Curve - All

Alternative C
Composite Rating Curve

Elev. (ft)	(Overtopping) Proposed Dam All Spillways Combined Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	**828**
1714.00	**1,359**
1714.50	**1,522**
1714.86	**1,647**
1715.00	1,740
1716.00	**3,067**
1717.50	6,263
1719.00	**10,478**
1720.50	15,490
1721.50	**19,196**
1722.00	21,156
1722.50	**23,179**
1723.00	25,260
1723.50	27,395
1724.00	**29,579**
1724.50	31,807
1725.00	34,112
1725.50	36,469
1726.00	**38,879**
1726.50	41,711
1727.00	45,101
1727.50	48,835
1728.00	**52,852**
1728.50	57,116
1729.00	61,605
1729.50	66,301
1730.00	71,192

Alternative C
Existing Principal Spillway

Elev. (ft)	Q (cfs)
1694.60	0
1697.90	90
1699.32	180
1700.94	270
1703.11	360
1705.95	450
1707.85	500
1713.69	630
1718.51	720
1724.16	810
1730.97	900
1735.00	945

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	654
1716.00	673
1717.50	701
1719.00	728
1720.50	752
1721.50	768
1722.00	776
1722.50	784
1723.00	792
1723.50	799
1724.00	807
1724.50	814
1725.00	821
1725.50	828
1726.00	834
1726.50	841
1727.00	848
1727.50	854
1728.00	861
1728.50	867
1729.00	874
1729.50	881
1730.00	887

EXISTING EMERGENCY SPILLWAY RATING CURVE

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

L_e = 266.0 Feet
C = 2.4

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

AUXILIARY PRIMARY OGEE SPILLWAY RATING CURVE

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

E_{OGEE} =	1705.00'	OGEE Aproach Apron Invert Elevation
E_{A1} =	1710.00'	Auxiliary Primary Spillway Crest Elevation
E_E =	1714.86'	Existing Emergency Spillway Crest Elevation
H_{O1} =	4.86'	Design Head, $H_O = E_E - E_{A1}$; *Use for first trial.
H_{O2} =	4.80'	Design Head, $HEC1_{24\text{-}yr\text{-}WSEL}$ - EA1 ; *Use for all trials after the first.
P =	5.00'	At Design Head
P/H_0 =	1.04'	
C_0 =	3.850	From DSD, fig 249
Q =	2,474 cfs	100-year Peak Inflow Upstream of GEPD
$LA1_{AUTO}$ =	60.0'	$L_A = Q_{100\text{-}YR}/C_O H_O^{3/2}$
$HEC1_{100\text{-}yr\text{-}WSEL}$ =	1714.80'	Enter a Desired HEC1, 100-yr WSEL
HEC1100-yr-WSEL =	1714.75'	Enter the HEC1 WSEL from Trial # above Trial #1
$LA1_{MANUAL}$ =	24.00'	

$H_{0assumed}$	H_{OHEC1}	Delta	
4.80'	4.75'	0.05'	**OK**

Use H_{O1} or H_{O2} (Trial #1 or Trial #2?): 2

Use LA_{Auto} or LA_{Manual}: **manual** ("Auto" or "Manual")

P (ft)	H_e (ft)	H_0 (ft)	H_e/H_O (ft)	fig 250 DSD C/C0	C	Elev. (ft)	Q (cfs)	
5.00'	0.0	4.80'	0.00	0.80	3.08	1700.00	0	
5.00'	0.0	4.80'	0.00	0.80	3.08	1702.00	0	
5.00'	0.0	4.80'	0.00	0.80	3.08	1704.00	0	
5.00'	0.0	4.80'	0.00	0.80	3.08	1706.00	0	
5.00'	0.0	4.80'	0.00	0.80	3.08	1708.00	0	
5.00'	0.0	4.80'	0.00	0.80	3.08	1710.00	0	
5.00'	2.0	4.80'	0.42	0.90	3.47	1712.00	235	
5.00'	4.0	4.80'	0.83	0.98	3.77	1714.00	723	
5.00'	4.5	4.80'	0.94	0.99	3.83	1714.50	877	
5.00'	4.9	4.80'	1.01	1.00	3.87	1714.86	995	
5.00'	5.0	4.80'	1.04	1.01	3.88	1715.00	1042	
5.00'	6.0	4.80'	1.25	1.03	3.98	1716.00	1405	
5.00'	7.5	4.80'	1.56	1.06	4.09	1717.50	2017	
5.00'	9.0	4.80'	1.88	1.08	4.16	1719.00	2693	
5.00'	10.5	4.80'	2.19	1.08	4.17	1720.50	3407	
5.00'	11.5	4.80'	2.40	1.08	4.16	1721.50	3892	
5.00'	12.0	4.80'	2.50	1.08	4.16	1722.00	4148	Check Figure 250 in DSD When He/HO > 2.48
5.00'	12.5	4.80'	2.60	1.08	4.16	1722.50	4410	Check Figure 250 in DSD When He/HO > 2.48
5.00'	13.0	4.80'	2.71	1.08	4.16	1723.00	4677	Check Figure 250 in DSD When He/HO > 2.48
5.00'	13.5	4.80'	2.81	1.08	4.16	1723.50	4950	Check Figure 250 in DSD When He/HO > 2.48
5.00'	14.0	4.80'	2.92	1.08	4.16	1724.00	5227	Check Figure 250 in DSD When He/HO > 2.48
5.00'	14.5	4.80'	3.02	1.08	4.16	1724.50	5510	Check Figure 250 in DSD When He/HO > 2.48
5.00'	15.0	4.80'	3.13	1.08	4.16	1725.00	5797	Check Figure 250 in DSD When He/HO > 2.48
5.00'	15.5	4.80'	3.23	1.08	4.16	1725.50	6090	Check Figure 250 in DSD When He/HO > 2.48
5.00'	16.0	4.80'	3.33	1.08	4.16	1726.00	6387	Check Figure 250 in DSD When He/HO > 2.48
5.00'	16.5	4.80'	3.44	1.08	4.16	1726.50	6688	Check Figure 250 in DSD When He/HO > 2.48
5.00'	17.0	4.80'	3.54	1.08	4.16	1727.00	6995	Check Figure 250 in DSD When He/HO > 2.48
5.00'	17.5	4.80'	3.65	1.08	4.16	1727.50	7306	Check Figure 250 in DSD When He/HO > 2.48
5.00'	18.0	4.80'	3.75	1.08	4.16	1728.00	7621	Check Figure 250 in DSD When He/HO > 2.48
5.00'	18.5	4.80'	3.85	1.08	4.16	1728.50	7941	Check Figure 250 in DSD When He/HO > 2.48
5.00'	19.0	4.80'	3.96	1.08	4.16	1729.00	8265	Check Figure 250 in DSD When He/HO > 2.48
5.00'	19.5	4.80'	4.06	1.08	4.16	1729.50	8593	Check Figure 250 in DSD When He/HO > 2.48
5.00'	20.0	4.80'	4.17	1.08	4.16	1730.00	8926	Check Figure 250 in DSD When He/HO > 2.48

	IDF2
Enter Water Surface Elevation:	1723.08'
Approximate Outflow:	4,721 cfs

	IDF1
Enter Water Surface Elevation:	1725.69'
Approximate Outflow:	6,203 cfs

Alternative C
Secondary OGEE
Spillway

AUXILIARY SECONDARY OGEE SPILLWAY RATING CURVE

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

E_{OGEE} =	1705.00'	OGEE Aproach Apron Invert Elevation				
E_{A2} =	1714.85'	Auxiliary Secondary Spillway Crest Elevation				
E_E =	1714.86'	Existing Emergency Spillway Crest Elevation				
H_{O1} =	0.01'	Design Head, $H_O = E_E - E_{A2}$; *Use for first trial.	$H_{Oassumed}$	H_{OHEC1}	Delta	
H_{O2} =	4.00'	Design Head, $HEC1_{24\text{-}yr\text{-}WSEL}$ - EA2; *Use for all trials after the first.	4.00'	3.92'	0.08'	OK
P =	9.85'	At Design Head				
P/H_0 =	2.46'					
C_0 =	3.940	From DSD, fig 249				
Q =	2,474 cfs	100-year Peak Inflow Upstream of GEPD				
$LA2_{AUTO}$ =	627919.0'	$L_A = Q_{100\text{-}YR}/C_O H_O^{3/2}$				
$HEC1_{100\text{-}yr\text{-}WSEL}$ =	1718.85'	Enter a Desired HEC1, 100-yr WSEL				
HEC1100-yr-WSEL =	1718.77'	Enter the HEC1 WSEL from Trial # above Trial #1				
$LA2_{MANUAL}$ =	25.00'					

Use H_{O1} or H_{O2} (Trial #1 or Trial #2?): 2 Use LA_{Auto} or LA_{Manual}: **Manual** ("Auto" or "Manual")

P (ft)	H_e (ft)	H_0 (ft)	H_e/H_O (ft)	fig 250 DSD C/C0	C	Elev. (ft)	Q (cfs)	Qtotal (cfs)	
9.85'	0.0	4.00'	0.00	0.80	3.16	1700.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1702.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1704.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1706.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1708.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1710.00	0	0	
9.85'	0.0	4.00'	0.00	0.80	3.16	1712.00	0	235	
9.85'	0.0	4.00'	0.00	0.80	3.16	1714.00	0	723	
9.85'	0.0	4.00'	0.00	0.80	3.16	1714.50	0	877	
9.85'	0.0	4.00'	0.00	0.80	3.16	1714.86	0	995	
9.85'	0.2	4.00'	0.04	0.81	3.19	1715.00	9	1052	
9.85'	1.2	4.00'	0.29	0.87	3.43	1716.00	212	1617	
9.85'	2.7	4.00'	0.66	0.95	3.74	1717.50	806	2824	
9.85'	4.2	4.00'	1.04	1.01	3.97	1719.00	1679	4372	
9.85'	5.7	4.00'	1.41	1.05	4.14	1720.50	2780	6187	
9.85'	6.7	4.00'	1.66	1.07	4.21	1721.50	3613	7505	
9.85'	7.2	4.00'	1.79	1.08	4.24	1722.00	4053	8201	
9.85'	7.7	4.00'	1.91	1.08	4.26	1722.50	4504	8914	
9.85'	8.2	4.00'	2.04	1.08	4.27	1723.00	4965	9642	
9.85'	8.7	4.00'	2.16	1.08	4.27	1723.50	5432	10382	
9.85'	9.2	4.00'	2.29	1.08	4.27	1724.00	5903	11131	
9.85'	9.7	4.00'	2.41	1.08	4.25	1724.50	6375	11885	
9.85'	10.2	4.00'	2.54	1.08	4.26	1725.00	6880	12677	Check Figure 250 in DSD When He/HO > 2.48
9.85'	10.7	4.00'	2.66	1.08	4.26	1725.50	7395	13484	Check Figure 250 in DSD When He/HO > 2.48
9.85'	11.2	4.00'	2.79	1.08	4.26	1726.00	7921	14308	Check Figure 250 in DSD When He/HO > 2.48
9.85'	11.7	4.00'	2.91	1.08	4.26	1726.50	8460	15149	Check Figure 250 in DSD When He/HO > 2.48
9.85'	12.2	4.00'	3.04	1.08	4.26	1727.00	9011	16005	Check Figure 250 in DSD When He/HO > 2.48
9.85'	12.7	4.00'	3.16	1.08	4.26	1727.50	9573	16878	Check Figure 250 in DSD When He/HO > 2.48
9.85'	13.2	4.00'	3.29	1.08	4.26	1728.00	10146	17766	Check Figure 250 in DSD When He/HO > 2.48
9.85'	13.7	4.00'	3.41	1.08	4.26	1728.50	10730	18670	Check Figure 250 in DSD When He/HO > 2.48
9.85'	14.2	4.00'	3.54	1.08	4.26	1729.00	11325	19589	Check Figure 250 in DSD When He/HO > 2.48
9.85'	14.7	4.00'	3.66	1.08	4.26	1729.50	11930	20523	Check Figure 250 in DSD When He/HO > 2.48
9.85'	15.2	4.00'	3.79	1.08	4.26	1730.00	12546	21472	Check Figure 250 in DSD When He/HO > 2.48

IDF2
Enter Water Surface Elevation: 1723.08'
Approximate Outflow: 9,761 cfs

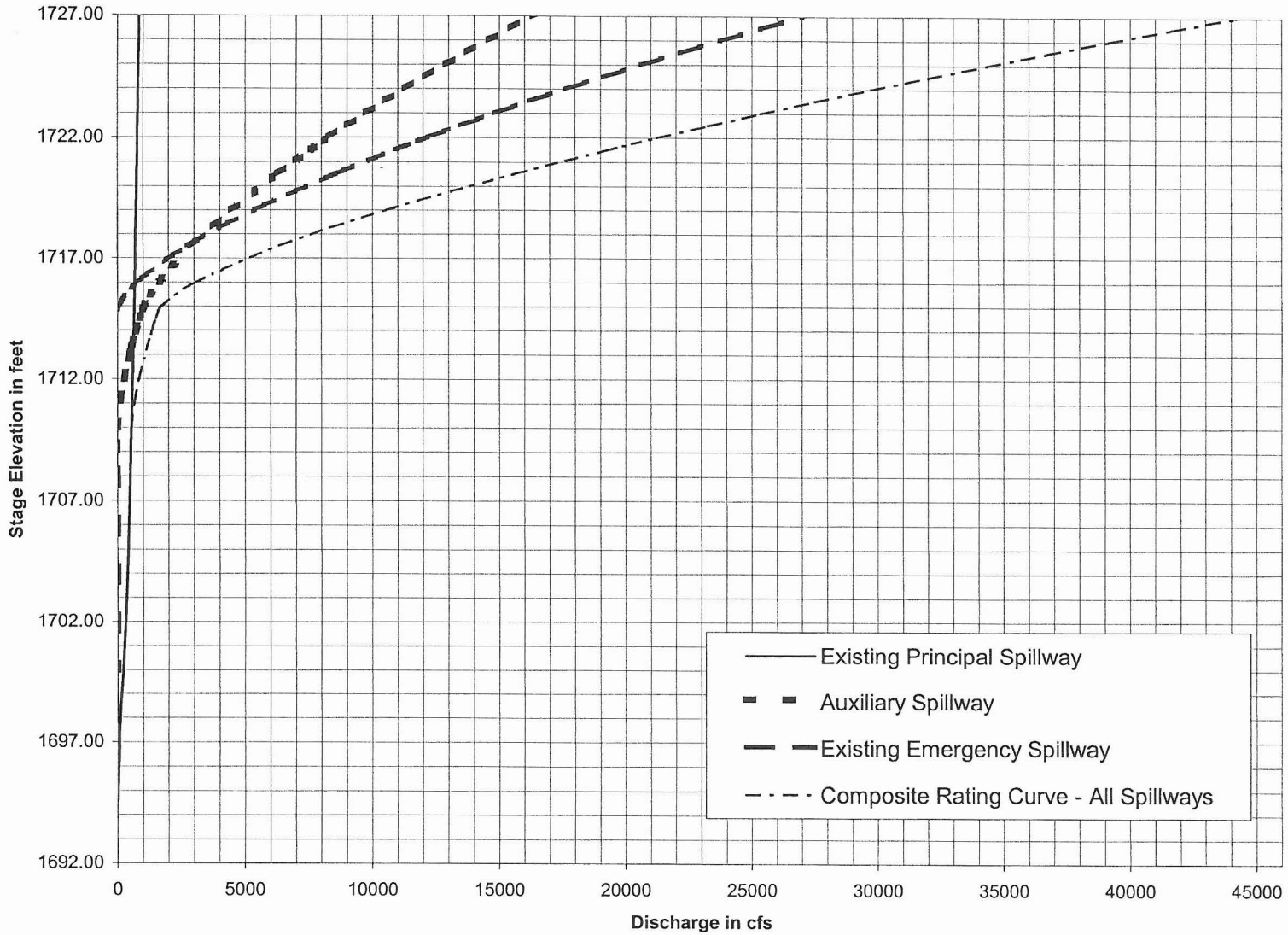
IDF1
Enter Water Surface Elevation: 1725.69'
Approximate Outflow: 13,797 cfs

Alterr[illegible]e C
Overtopping GEPD

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	0
1726.50	369
1727.00	1244
1727.50	2414
1728.00	3817
1728.50	5419
1729.00	7198
1729.50	9137
1730.00	11225

ALTERNATIVE "D"
GEPD Rating Curves



Alternative D
Composite Rating Curve

Elev. (ft)	(Overtopping) Proposed Dam All Spillways Combined Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	**850**
1714.00	**1,364**
1714.50	**1,514**
1714.86	**1,630**
1715.00	1,726
1716.00	**3,095**
1717.50	6,347
1719.00	**10,577**
1720.50	15,583
1721.50	**19,298**
1722.00	21,259
1722.50	**23,286**
1723.00	25,378
1723.50	27,531
1724.00	**29,745**
1724.50	32,016
1725.00	34,344
1725.50	36,728
1726.00	**39,166**
1726.50	42,043
1727.00	45,501
1727.50	49,317
1728.00	**53,427**
1728.50	57,795
1729.00	62,395
1729.50	67,210
1730.00	72,227

Alternative D
Existing Principal Spillway

Elev. (ft)	Q (cfs)
1694.60	0
1697.90	90
1699.32	180
1700.94	270
1703.11	360
1705.95	450
1707.85	500
1713.69	630
1718.51	720
1724.16	810
1730.97	900
1735.00	945

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	654
1716.00	673
1717.50	701
1719.00	728
1720.50	752
1721.50	768
1722.00	776
1722.50	784
1723.00	792
1723.50	799
1724.00	807
1724.50	814
1725.00	821
1725.50	828
1726.00	834
1726.50	841
1727.00	848
1727.50	854
1728.00	861
1728.50	867
1729.00	874
1729.50	881
1730.00	887

EXISTING EMERGENCY SPILLWAY RATING CURVE

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

L_e = 266.0 Feet
C = 2.4

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

Alternative D
Auxiliary Spillway

AUXILIARY EMERGENCY SPILLWAY RATING CURVE

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

	IDF2		IDF1
Enter Water Surface Elevation:	1723.05'	Enter Water Surface Elevation:	1725.65'
Approximate Outflow:	9,836 cfs	Approximate Outflow:	13,999 cfs

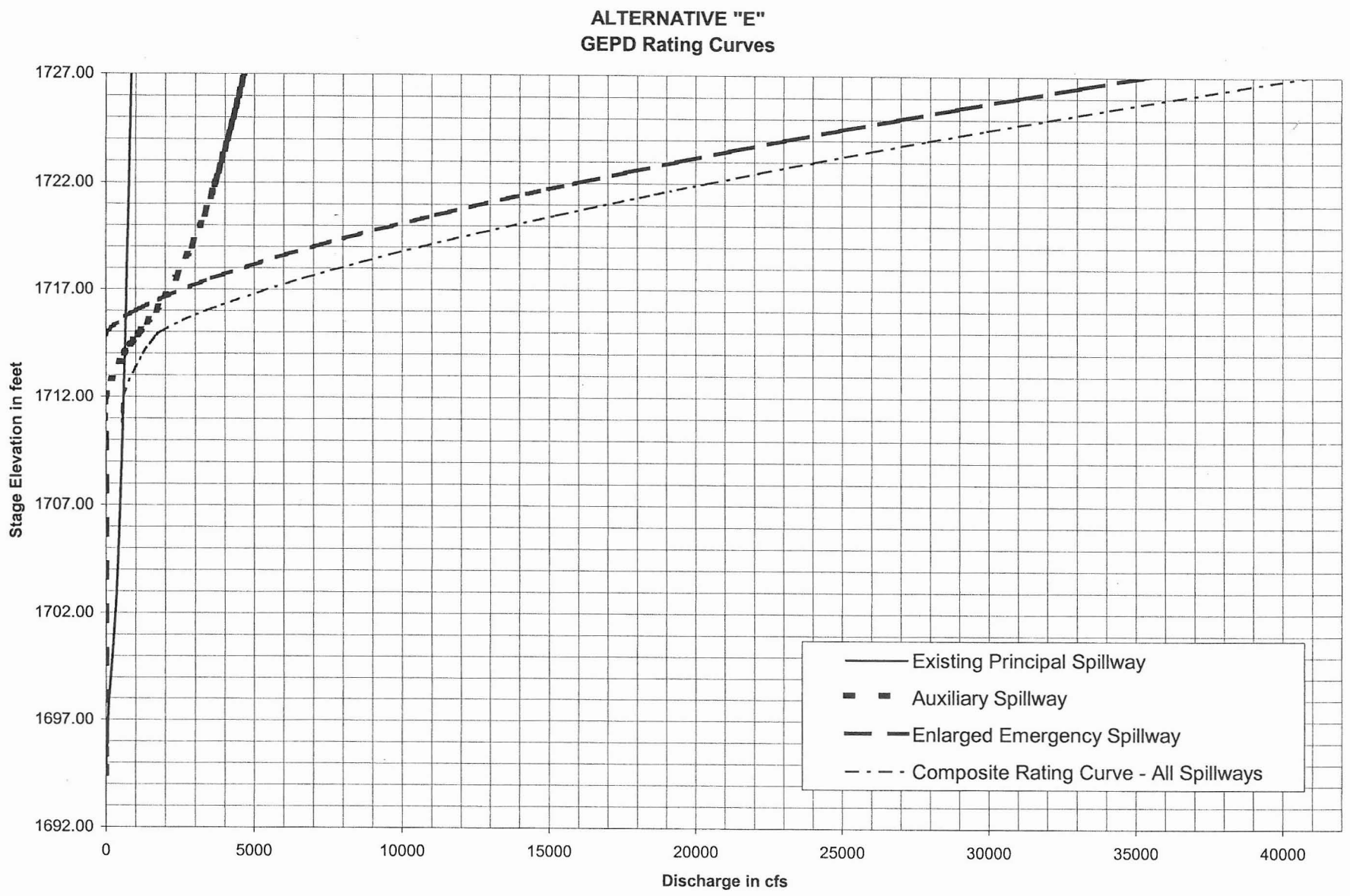
E_{A1} = 1710.00' Auxiliary Spillway Crest Elevation
L_{A1} = 35.0'
C = 2.6

E_{A2} = 1714.80' Auxiliary Spillway Secondary Crest Elevation
L_{A2} = 45.0'
C = 2.6

Elev. (ft)	Q (cfs)	Elev. (ft)	Q (cfs)	COMPOSITE Elev. (ft)	COMPOSITE Q (cfs)
1700.00	0	1700.00	0	1700.00	0
1702.00	0	1702.00	0	1702.00	0
1704.00	0	1704.00	0	1704.00	0
1706.00	0	1706.00	0	1706.00	0
1708.00	0	1708.00	0	1708.00	0
1710.00	0	1710.00	0	1710.00	0
1712.00	257	1712.00	0	1712.00	257
1714.00	728	1714.00	0	1714.00	728
1714.50	869	1714.50	0	1714.50	869
1714.86	975	1714.86	2	1714.86	978
1715.00	1017	1715.00	10	1715.00	1038
1716.00	1337	1716.00	154	1716.00	1645
1717.50	1869	1717.50	519	1717.50	2907
1719.00	2457	1719.00	1007	1719.00	4471
1720.50	3096	1720.50	1592	1720.50	6281
1721.50	3549	1721.50	2029	1721.50	7607
1722.00	3783	1722.00	2260	1722.00	8304
1722.50	4022	1722.50	2500	1722.50	9021
1723.00	4265	1723.00	2747	1723.00	9760
1723.50	4514	1723.50	3002	1723.50	10519
1724.00	4767	1724.00	3265	1724.00	11297
1724.50	5025	1724.50	3535	1724.50	12094
1725.00	5287	1725.00	3811	1725.00	12909
1725.50	5553	1725.50	4095	1725.50	13743
1726.00	5824	1726.00	4385	1726.00	14595
1726.50	6099	1726.50	4682	1726.50	15464
1727.00	6378	1727.00	4986	1727.00	16350
1727.50	6662	1727.50	5295	1727.50	17253
1728.00	6949	1728.00	5611	1728.00	18172
1728.50	7241	1728.50	5933	1728.50	19107
1729.00	7537	1729.00	6261	1729.00	20058
1729.50	7836	1729.50	6594	1729.50	21024
1730.00	8139	1730.00	6933	1730.00	22006

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	0
1726.50	385
1727.00	1300
1727.50	2522
1728.00	3987
1728.50	5660
1729.00	7519
1729.50	9545
1730.00	11726


ALTERNATIVE "E"
GEPD Rating Curves
Stage Elevation in feet
1727.00
1722.00
1717.00
1712.00
1707.00
1702.00
1697.00
1692.00
0
5000
10000
15000
20000
25000
30000
35000
40000
Discharge in cfs
Existing Principal Spillway
Auxiliary Spillway
Enlarged Emergency Spillway
Composite Rating Curve - All Spillways

ALTERNATIVE "E"
Composite Rating Curve

Elev. (ft)	Total Discharge Through Spillways and Over Top of Prop. Dam Q (cfs)
1694.50	**0**
1696.00	**38**
1698.00	**96**
1700.00	**218**
1702.00	**314**
1704.00	**388**
1706.00	**451**
1708.00	**503**
1710.00	**548**
1712.00	**592**
1714.00	**1252**
1714.50	**1514**
1714.86	**1712**
1715.00	1843
1716.00	**3391**
1717.50	6639
1719.00	**10635**
1720.50	15238
1721.50	**18606**
1722.00	20362
1722.50	**22176**
1723.00	24046
1723.50	25970
1724.00	**27936**
1724.50	29953
1725.00	32020
1725.50	34135
1726.00	**36299**
1726.50	38556
1727.00	41541
1727.50	45007
1728.00	**48826**
1728.50	52942
1729.00	57323
1729.50	61943
1730.00	66767

EXISTING PRINCIPAL SPILLWAY RATING

Existing 60" RCP, Existing (partially filled) RC
HY8 Output (EX-PRNC.INP)
Actual Curve

Elev. (ft)	Q (cfs)
1694.60	0
1697.90	90
1699.32	180
1700.94	270
1703.11	360
1705.95	450
1707.85	500
1713.69	630
1718.51	720
1724.16	810
1730.97	900
1735.00	945

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	654
1716.00	673
1717.50	701
1719.00	728
1720.50	752
1721.50	768
1722.00	776
1722.50	784
1723.00	792
1723.50	799
1724.00	807
1724.50	814
1725.00	821
1725.50	828
1726.00	834
1726.50	841
1727.00	848
1727.50	854
1728.00	861
1728.50	867
1729.00	874
1729.50	881
1730.00	887

Alternative E
Auxiliary Apillway

PROPOSED AUXILIARY SPILLW

*USE INLET CONTROL! (80' x 3'

Elev. (ft)	Q (cfs)
1712	0
1713.77	500
1714.76	1000
1715.59	1500
1716.6	2000
1717.84	2500
1719.34	3000
1721.13	3500
1723.47	4000
1726.12	4500
1729.08	5000
1735.00	5874

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.50	0
1696.00	0
1698.00	0
1700.00	0
1702.00	0
1704.00	0
1706.00	0
1708.00	0
1710.00	0
1712.00	0
1714.00	616
1714.50	869
1714.86	1060
1715.00	1145
1716.00	1703
1717.50	2363
1719.00	2887
1720.50	3324
1721.50	3579
1722.00	3686
1722.50	3793
1723.00	3900
1723.50	4006
1724.00	4100
1724.50	4194
1725.00	4289
1725.50	4383
1726.00	4477
1726.50	4564
1727.00	4649
1727.50	4733
1728.00	4818
1728.50	4902
1729.00	4986
1729.50	5071
1730.00	5136

Alternative $E
Existing Emergency Spillway

EXISTING EMERGENCY SPILLW

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

L_e = 266.0 Feet
C = 2.4

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

Alternative E
Enlarged Emergency Spillway

ENLARGED EMERGENCY SPILLWAY RATI

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

L_{ee} = 75.0 Feet
C = 2.6

Enter W

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	10
1716.00	237
1717.50	836
1719.00	1,643
1720.50	2,612
1721.50	3,336
1722.00	3,720
1722.50	4,118
1723.00	4,529
1723.50	4,952
1724.00	5,388
1724.50	5,836
1725.00	6,296
1725.50	6,768
1726.00	7,250
1726.50	7,744
1727.00	8,248
1727.50	8,763
1728.00	9,288
1728.50	9,823
1729.00	10,368
1729.50	10,923
1730.00	11,487

Alternative E
Overtopping GEPD

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	0
1726.50	54
1727.00	793
1727.50	1967
1728.00	3451
1728.50	5190
1729.00	7150
1729.50	9308
1730.00	11649

CURRENT DATE: 05-24-1999
CURRENT TIME: 14:26:18

FILE DATE: 05-24-1999
FILE NAME: GEPD-E

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

ALTERNATIVE E

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1712.00	1711.99	70.00	1 RCB	80.00	3.00	.015	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: GEPD-E DATE: 05-24-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1712.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1713.77	500.0	500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1714.76	1000.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1715.59	1500.0	1500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1716.60	2000.0	2000.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1717.84	2500.0	2500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1719.34	3000.0	3000.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1721.13	3500.0	3500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1723.47	4000.0	4000.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1726.12	4500.0	4500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1729.08	5000.0	5000.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1735.00	5874.3	5874.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: GEPD-E DATE: 05-24-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1712.00	0.000	0.00	0.00	0.00
1713.77	0.000	500.00	0.00	0.00
1714.76	0.000	1000.00	0.00	0.00
1715.59	0.000	1500.00	0.00	0.00
1716.60	0.000	2000.00	0.00	0.00
1717.84	0.000	2500.00	0.00	0.00
1719.34	0.000	3000.00	0.00	0.00
1721.13	0.000	3500.00	0.00	0.00
1723.47	0.000	4000.00	0.00	0.00
1726.12	0.000	4500.00	0.00	0.00
1729.08	0.000	5000.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 05-24-1999 FILE DATE: 05-24-1999
CURRENT TIME: 14:26:18 FILE NAME: GEPD-E

PERFORMANCE CURVE FOR CULVERT 1 - 1(80.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1712.00	0.00	-0.01	0-NF	0.00	0.00	0.00	-18.62	0.00	0.00
500.00	1713.77	1.69	1.77	2-M2c	3.00	1.07	1.07	-14.98	5.85	4.44
1000.00	1714.76	2.64	2.76	2-M2c	3.00	1.70	1.70	-13.41	7.37	5.39
1500.00	1715.59	3.56	3.59	2-M2c	3.00	2.22	2.22	-12.25	8.43	6.02
2000.00	1716.60	4.60	4.48	2-M2c	3.00	2.69	2.69	-11.29	9.28	6.50
2500.00	1717.84	5.84	5.48	6-FFc	3.00	3.00	2.69	-10.46	11.60	6.89
3000.00	1719.34	7.34	6.58	6-FFc	3.00	3.00	2.69	-9.73	13.92	7.23
3500.00	1721.13	9.13	7.88	6-FFc	3.00	3.00	2.69	-9.06	16.24	7.53
4000.00	1723.47	11.47	9.37	6-FFc	3.00	3.00	2.69	-8.45	18.57	7.79
4500.00	1726.12	14.12	11.07	6-FFc	3.00	3.00	2.69	-7.89	20.89	8.03
5000.00	1729.08	17.08	12.96	6-FFc	3.00	3.00	2.69	-7.36	23.21	8.25

El. inlet face invert 1712.00 ft El. outlet invert 1711.99 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	1000.00 ft
INLET ELEVATION	1712.00 ft
OUTLET STATION	1070.00 ft
OUTLET ELEVATION	1711.99 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0001
CULVERT LENGTH ALONG SLOPE	70.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	80.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.015
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	1:1 BEVEL
INLET DEPRESSION	NONE

CURRENT DATE: 05-24-1999
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TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

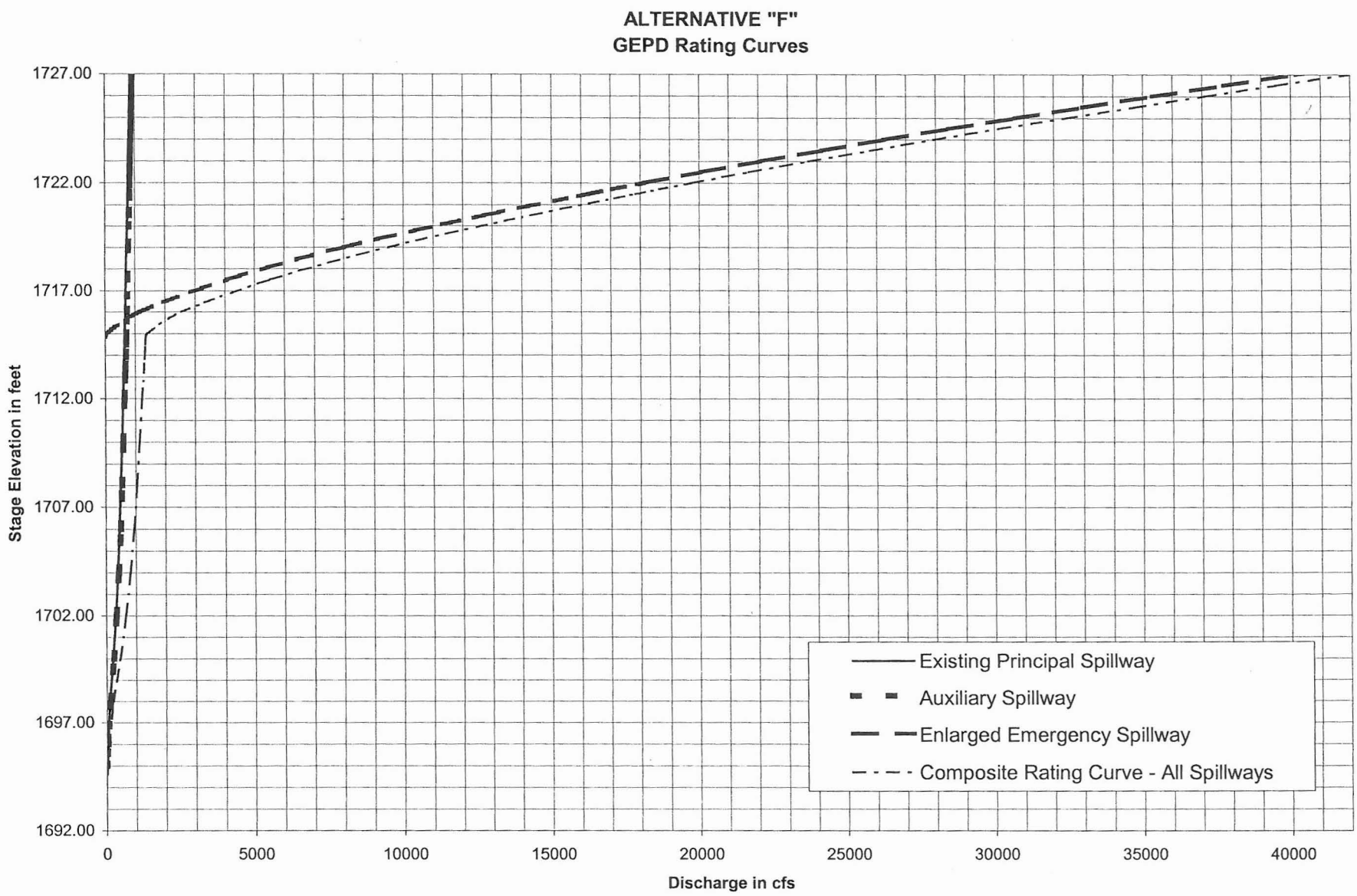
BOTTOM WIDTH	20.00 ft
SIDE SLOPE H/V (X:1)	3.0
CHANNEL SLOPE V/H (ft/ft)	0.005
MANNING'S n (.01-0.1)	0.045
CHANNEL INVERT ELEVATION	1693.37 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1711.99 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1693.37	0.000	0.00	0.00	0.00
500.00	1697.01	0.410	3.64	4.44	1.14
1000.00	1698.58	0.416	5.21	5.39	1.63
1500.00	1699.74	0.420	6.37	6.02	1.99
2000.00	1700.70	0.423	7.33	6.50	2.29
2500.00	1701.53	0.425	8.16	6.89	2.55
3000.00	1702.26	0.427	8.89	7.23	2.77
3500.00	1702.93	0.429	9.56	7.53	2.98
4000.00	1703.54	0.431	10.17	7.79	3.17
4500.00	1704.10	0.432	10.73	8.03	3.35
5000.00	1704.63	0.433	11.26	8.25	3.51

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	12.00 ft
CREST LENGTH	700.00 ft
OVERTOPPING CREST ELEVATION	1735.00 ft


ALTERNATIVE "F"
GEPD Rating Curves
Stage Elevation in feet
1727.00
1722.00
1717.00
1712.00
1707.00
1702.00
1697.00
1692.00
0
5000
10000
15000
20000
25000
30000
35000
40000
Discharge in cfs
Existing Principal Spillway
Auxiliary Spillway
Enlarged Emergency Spillway
Composite Rating Curve - All Spillways

ALTERNATIVE "F"
Composite Rating Curve

Elev. (ft)	Total Discharge Through Spillways and Over Top of Prop. Dam Q (cfs)
1695.00	**0**
1696.00	**77**
1698.00	**223**
1700.00	**461**
1702.00	**659**
1704.00	**816**
1706.00	**951**
1708.00	**1051**
1710.00	**1144**
1712.00	**1237**
1714.00	**1327**
1714.50	**1346**
1714.86	**1360**
1715.00	1415
1716.00	**2560**
1717.50	5537
1719.00	**9521**
1720.50	14294
1721.50	**17858**
1722.00	19746
1722.50	**21700**
1723.00	23718
1723.50	25799
1724.00	**27941**
1724.50	30141
1725.00	32396
1725.50	34708
1726.00	**37075**
1726.50	39494
1727.00	42528
1727.50	46077
1728.00	**49980**
1728.50	54176
1729.00	58633
1729.50	63325
1730.00	68236

Alternative F
Existing Principal Spillway

Interpolated Curve

Elev. (ft)	Q (cfs)
1694.60	0
1696.00	38
1698.00	96
1700.00	218
1702.00	314
1704.00	388
1706.00	451
1708.00	503
1710.00	548
1712.00	592
1714.00	636
1714.50	645
1714.86	652
1715.00	654
1716.00	673
1717.50	701
1719.00	728
1720.50	752
1721.50	768
1722.00	776
1722.50	784
1723.00	792
1723.50	799
1724.00	807
1724.50	814
1725.00	821
1725.50	828
1726.00	834
1726.50	841
1727.00	848
1727.50	854
1728.00	861
1728.50	867
1729.00	874
1729.50	881
1730.00	887

Alternative F
Auxiliary 8'X4' RCB

Interpolated Curve

Elev. (ft)	Q (cfs)
1695.00	0
1696.00	39
1698.00	127
1700.00	243
1702.00	345
1704.00	427
1706.00	499
1708.00	548
1710.00	596
1712.00	645
1714.00	692
1714.50	701
1714.86	708
1715.00	711
1716.00	730
1717.50	759
1719.00	787
1720.50	812
1721.50	829
1722.00	838
1722.50	846
1723.00	855
1723.50	863
1724.00	872
1724.50	880
1725.00	888
1725.50	895
1726.00	903
1726.50	910
1727.00	918
1727.50	926
1728.00	933
1728.50	941
1729.00	948
1729.50	956
1730.00	963

Alternative F
Existing Emergency Spillway

EXISTING EMERGENCY SPILLW

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

L_e = 266.0 Feet
C = 2.4

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	33
1716.00	777
1717.50	2,738
1719.00	5,378
1720.50	8,551
1721.50	10,923
1722.00	12,180
1722.50	13,481
1723.00	14,826
1723.50	16,213
1724.00	17,641
1724.50	19,108
1725.00	20,613
1725.50	22,157
1726.00	23,737
1726.50	25,353
1727.00	27,004
1727.50	28,689
1728.00	30,408
1728.50	32,160
1729.00	33,944
1729.50	35,761
1730.00	37,608

Alternative F
Enlarged Emergency Spillway

ENLARGED EMERGE

WEIR EQUATION: Q =

L_{ee} = 120.0
C = 2.6

Elev. (ft)	Q (cfs)
1714.86	0.0
1715.00	16
1716.00	380
1717.50	1,338
1719.00	2,628
1720.50	4,179
1721.50	5,338
1722.00	5,953
1722.50	6,589
1723.00	7,246
1723.50	7,924
1724.00	8,621
1724.50	9,338
1725.00	10,074
1725.50	10,828
1726.00	11,601
1726.50	12,390
1727.00	13,197
1727.50	14,021
1728.00	14,861
1728.50	15,717
1729.00	16,589
1729.50	17,477
1730.00	18,380

Alternative F
Overtopping GEPD

PROPOSED DAM

Elev. (ft)	[1]Q (cfs)
1714.86	0
1715.00	0
1716.00	0
1717.50	0
1719.00	0
1720.50	0
1721.50	0
1722.00	0
1722.50	0
1723.00	0
1723.50	0
1724.00	0
1724.50	0
1725.00	0
1725.50	0
1726.00	0
1726.50	0
1727.00	561
1727.50	1588
1728.00	2917
1728.50	4491
1729.00	6277
1729.50	8251
1730.00	10397

CURRENT DATE: 05-24-1999
CURRENT TIME: 10:26:51

FILE DATE: 05-14-1999
FILE NAME: GEPD-E

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

ALT #F

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1695.00	1693.95	105.01	1 RCB	8.00	4.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: GEPD-E DATE: 05-14-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1695.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1697.51	98.0	98.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1699.17	196.0	196.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1700.90	294.0	294.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1703.03	392.0	392.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1705.71	490.0	490.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1706.02	500.0	500.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1713.71	686.0	686.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1718.82	784.0	784.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1724.62	882.0	882.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1731.09	980.0	980.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1735.00	1034.6	1034.6	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: GEPD-E DATE: 05-14-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1695.00	0.000	0.00	0.00	0.00
1697.51	0.000	98.00	0.00	0.00
1699.17	0.000	196.00	0.00	0.00
1700.90	0.000	294.00	0.00	0.00
1703.03	0.000	392.00	0.00	0.00
1705.71	0.000	490.00	0.00	0.00
1706.02	0.000	500.00	0.00	0.00
1713.71	0.000	686.00	0.00	0.00
1718.82	0.000	784.00	0.00	0.00
1724.62	0.000	882.00	0.00	0.00
1731.09	0.000	980.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

Stantec

CURRENT DATE: 05-24-1999 FILE DATE: 05-14-1999
CURRENT TIME: 10:26:51 FILE NAME: GEPD-E

PERFORMANCE CURVE FOR CULVERT 1 - 1(8.00 (ft) BY 4.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1695.00	0.00	-1.05	0-NF	0.00	0.00	0.00	-0.05	0.00	0.00
98.00	1697.51	2.51	2.01	1-S2n	1.15	1.67	1.20	0.07	10.18	11.27
196.00	1699.17	4.17	3.18	1-S2n	1.83	2.66	1.99	0.13	12.33	14.85
294.00	1700.90	5.90	4.72	5-S2n	2.43	3.48	2.68	0.17	13.70	17.43
392.00	1703.03	8.03	6.56	6-FFc	2.99	4.00	2.99	0.22	16.40	19.53
490.00	1705.71	10.71	8.60	6-FFc	3.52	4.00	3.52	0.25	17.40	21.33
500.00	1706.02	11.02	8.83	6-FFc	3.57	4.00	3.57	0.26	17.49	21.50
686.00	1713.71	18.71	14.02	6-FFc	4.00	4.00	3.57	0.32	24.00	24.35
784.00	1718.82	23.82	17.40	6-FFc	4.00	4.00	3.57	0.35	27.43	25.66
882.00	1724.62	29.62	21.24	6-FFc	4.00	4.00	3.57	0.38	30.86	26.88
980.00	1731.09	36.09	25.53	6-FFc	4.00	4.00	3.57	0.41	34.29	28.01

El. inlet face invert 1695.00 ft El. outlet invert 1693.95 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
** ** SITE DATA ***** CULVERT INVERT **************
      INLET STATION                          1000.00 ft
      INLET ELEVATION                        1695.00 ft
      OUTLET STATION                         1105.00 ft
      OUTLET ELEVATION                       1693.95 ft
      NUMBER OF BARRELS                         1
      SLOPE (V/H)                               0.0100
      CULVERT LENGTH ALONG SLOPE              105.01 ft

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          BOX
      BARREL SPAN             8.00 ft
      BARREL RISE             4.00 ft
      BARREL MATERIAL       CONCRETE
      BARREL MANNING'S n    0.013
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   1:1 BEVEL (45 DEG. FLARE)
      INLET DEPRESSION      NONE
```

CURRENT DATE: 05-24-1999
C ENT TIME: 10:26:51

FILE DATE: 05-14-1999
FILE NAME: GEPD-E

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH	75.00 ft
SIDE SLOPE H/V (X:1)	3.0
CHANNEL SLOPE V/H (ft/ft)	0.500
MANNING'S n (.01-0.1)	0.022
CHANNEL INVERT ELEVATION	1693.90 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1693.95 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1693.90	0.000	0.00	0.00	0.00
98.00	1694.02	5.849	0.11	11.27	3.60
196.00	1694.07	6.258	0.17	14.85	5.45
294.00	1694.12	6.508	0.22	17.43	6.95
392.00	1694.17	6.690	0.27	19.53	8.26
490.00	1694.20	6.834	0.30	21.33	9.44
500.00	1694.21	6.847	0.31	21.50	9.56
686.00	1694.27	7.054	0.37	24.35	11.55
784.00	1694.30	7.142	0.40	25.66	12.51
882.00	1694.33	7.221	0.43	26.88	13.42
980.00	1694.36	7.292	0.46	28.01	14.30

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	16.00 ft
CREST LENGTH	700.00 ft
OVERTOPPING CREST ELEVATION	1735.00 ft

APPENDIX E

COST ESTIMATE WORK SHEETS

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative A_1

Lengthen emergency spillway 289', add floodwall along school, raise dam 3' and add a 6'x4' RCB to the existing principal spillway.

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
[4]6'X4' RCB principal outlet	117	LF	$177.00	$20,709.00
[1]Headwall and apron for proposed principal outlet	1	EA	$12,400.00	$12,400.00
[2,6]Embankment	10119	CY	$8.00	$80,952.00
[6,2]Embankment (imported)	5743	CY	$12.00	$68,911.84
[5]Excavation	10119	CY	$8.00	$80,952.00
2' Stripping	2114	CY	$8.00	$16,910.49
Construct concrete sill	289	LF	$20.00	$5,780.00
Construct headwall and trashrack at principal inlet	1	EA	$30,000.00	$30,000.00
[3]Riprap, dumped (at bottom of emergency spillway)	2138	CY	$35.00	$74,828.83
CONSTRUCTION SUBTOTAL				$391,444.17
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$19,572.21	$19,572.21
Construction water & dust control	2%	LS	$7,828.88	$7,828.88
Construction inspection, material testing, quality control	1	LS	$50,000.00	$50,000.00
Materials lab testing and reports	1	LS	$20,000.00	$20,000.00
Dewatering	1%	LS	$3,914.44	$3,914.44
Diversion and care of stream during construction	5%	LS	$19,572.21	$19,572.21
NPDES/SWPPP Permit	5%	LS	$19,572.21	$19,572.21
Mobilization	7%	LS	$27,401.09	$27,401.09
Contingency	35%	LS	$137,005.46	$137,005.46
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$319,866.50
TOTAL				$711,310.67

1. This lump sum was derived from GVSCE-Cost.xls, cells F14:F17 of page "Alt 1". Since this is not a high % of total, the same #'s were used for the 6'x4' RCB - This needs to be refined in future estimates.
2. This quantity does not account for any filter (sand). It includes the replacement of material excavated at the principal spillway.
3. Does not include rip-rap at proposed principal spillway outlet.
4. Doesn't include sand diaphram
5. Includes excavation required to construct new principal outlet box culvert
6. Includes backfill required to fill over the new principal outlet box culvert

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative A_2

Lengthen emergency spillway 129', add floodwall along school, raise dam 4.8' and add a 6'x4' RCB to the existing principal spillway.

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
[4]6'X4' RCB principal outlet	136	LF	$177.00	$24,072.00
[1]Headwall and apron for proposed principal outlet	1	EA	$12,400.00	$12,400.00
[6,2]Embankment	8997	CY	$8.00	$71,976.00
[6,2]Embankment (imported)	12424	CY	$12.00	$149,085.82
[5]Excavation	8997	CY	$8.00	$71,976.00
2' Stripping	2788	CY	$8.00	$22,307.90
Construct concrete sill	129	LF	$20.00	$2,580.00
Construct headwall and trashrack at principal inlet	1	EA	$30,000.00	$30,000.00
[3]Riprap, dumped (at bottom of emergency spillway)	1049	CY	$35.00	$36,713.83
CONSTRUCTION SUBTOTAL				$421,111.56
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$21,055.58	$21,055.58
Construction water & dust control	2%	LS	$8,422.23	$8,422.23
Construction inspection, material testing, quality control	1	LS	$50,000.00	$50,000.00
Materials lab testing and reports	1	LS	$20,000.00	$20,000.00
Dewatering	1%	LS	$4,211.12	$4,211.12
Diversion and care of stream during construction	5%	LS	$21,055.58	$21,055.58
NPDES/SWPPP Permit	5%	LS	$21,055.58	$21,055.58
Mobilization	7%	LS	$29,477.81	$29,477.81
Contingency	35%	LS	$147,389.04	$147,389.04
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$337,666.93
			TOTAL	$758,778.49

1. This lump sum was derived from GVSCE-Cost.xls, cells F14:F17 of page "Alt 1". Since this is not a high % of total, the same #'s were used for the 6'x4' RCB - This needs to be refined in future estimates.
2. This quantity does not account for any filter (sand). It includes the replacement of material excavated at the principal spillway.
3. Does not include rip-rap at proposed principal spillway outlet.
4. Doesn't include sand diaphram
5. Includes excavation required to construct new principal outlet box culvert
6. Includes backfill required to fill over the new principal outlet box culvert

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative B

Lengthen emergency spillway 180'. Add floodwall along school, raise dam 4.3'

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Headwall and apron for proposed principal outlet	N/A	EA	$12,400.00	$0.00
[1]Embankment	1262	CY	$8.00	$10,096.00
[1]Embankment (imported)	10193	CY	$12.00	$122,316.48
Excavation	1262	CY	$8.00	$10,096.00
2' Stripping	2544	CY	$8.00	$20,351.49
Construct concrete sill	180	LF	$20.00	$3,600.00
Construct headwall and trashrack at principal inlet	1	EA	$15,000.00	$15,000.00
CONSTRUCTION SUBTOTAL				$181,459.97
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$9,073.00	$9,073.00
Construction water & dust control	2%	LS	$3,629.20	$3,629.20
Construction inspection, material testing, quality control	1	LS	$50,000.00	$50,000.00
Materials lab testing and reports	1	LS	$20,000.00	$20,000.00
Dewatering	1%	LS	$1,814.60	$1,814.60
Diversion and care of stream during construction	5%	LS	$9,073.00	$9,073.00
NPDES/SWPPP Permit	5%	LS	$9,073.00	$9,073.00
Mobilization	7%	LS	$12,702.20	$12,702.20
Contingency	35%	LS	$63,510.99	$63,510.99
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$193,875.98
			TOTAL	$375,335.95

1.This quantity does not account for any filter (sand). It includes the replacement of material excavated at the principal spillway.

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative C

No change to emergency spillway. Add floodwall along school, raise dam 4.6' and add an auxiliary OGEE spillway.

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Embankment	1587	CY	$8.00	$12,697.24
[1]Embankment (imported)	12131	CY	$12.00	$145,570.26
Spillway Excavation (includes exc. Required to place conc.)	1587	CY	$8.00	$12,697.24
2' Stripping	2958	CY	$8.00	$23,664.00
[2]2' Thick Concrete OGEE auxiliary spillway plus chute	819	CY	$285.00	$233,415.00
[2]112' Long concrete type I stilling basin (3' deep with 2' wide end sill) - concrete, structura	1157	CY	$285.00	$329,745.00
Construct headwall and trashrack at principal inlet	1	EA	$15,000.00	$15,000.00
CONSTRUCTION SUBTOTAL				$772,788.75
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$38,639.44	$38,639.44
Construction water & dust control	2%	LS	$15,455.77	$15,455.77
Construction inspection, material testing, quality control	1	LS	$40,000.00	$40,000.00
Materials lab testing and reports	1	LS	$10,000.00	$10,000.00
Dewatering	1%	LS	$7,727.89	$7,727.89
Diversion and care of stream during construction	3%	LS	$23,183.66	$23,183.66
NPDES/SWPPP Permit	5%	LS	$38,639.44	$38,639.44
Mobilization	7%	LS	$54,095.21	$54,095.21
Contingency	50%	LS	$386,394.37	$386,394.37
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$629,135.79
			TOTAL	$1,401,924.53

1.This quantity does not account for any filter (sand). It includes the replacement of material excavated at the principal spillway

2. Unit price includes steel and concrete

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative D

No change to emergency spillway. Add floodwall along school, raise dam 4.6' and add an auxiliary RCC spillway.

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Embankment	7426	CY	$8.00	$59,408.89
[1] Embankment (imported)	5927	CY	$12.00	$71,122.79
Spillway excavation (includes 3408 CY from V_{RCC} & 1924 CY from V_{RCC} of stilling ba	7426	CY	$8.00	$59,408.89
2' Stripping	2911	CY	$8.00	$23,288.00
4' Thick RCC auxiliary spillway plus chute - RCC	3408	CY	$80.00	$272,648.89
38' Long RCC type I stilling basin (3' deep with 8' wide end sill) - RCC	1924	CY	$80.00	$153,920.00
Construct headwall and trashrack at principal inlet	1	EA	$15,000.00	$15,000.00
CONSTRUCTION SUBTOTAL				$654,797.46
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$32,739.87	$32,739.87
Construction water & dust control	2%	LS	$13,095.95	$13,095.95
Construction inspection, material testing, quality control	1	LS	$40,000.00	$40,000.00
Materials lab testing and reports	1	LS	$15,000.00	$15,000.00
Dewatering	1%	LS	$6,547.97	$6,547.97
Diversion and care of stream during construction	3%	LS	$19,643.92	$19,643.92
NPDES/SWPPP Permit	5%	LS	$32,739.87	$32,739.87
Mobilization	7%	LS	$45,835.82	$45,835.82
Contingency	50%	LS	$327,398.73	$327,398.73
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$548,002.15
			TOTAL	$1,202,799.61

1.This quantity does not account for any filter (sand). It includes the replacement of material excavated at the principal spillw

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative E

Lengthen emergency spillway 75', add floodwall along school, raise dam 5' and add a 80'X3' RCB auxiliary spillway

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
[1,4]85'X3' RCB auxiliary spillway	60	LF	$2,560.00	$153,600.00
[5]Embankment	3457	CY	$8.00	$27,654.52
[5]Embankment (imported)	10667	CY	$12.00	$127,998.57
Excavation (includes excavation required for spillway placement)	3457	CY	$8.00	$27,654.52
2' Stripping	2765	CY	$8.00	$22,120.00
[2]2' Thick Concrete auxiliary spillway plus chute	712	CY	$285.00	$202,920.00
30' Long type I stilling basin	220	EA	$285.00	$62,700.00
Construct headwall and trashrack at principal inlet	1	EA	$15,000.00	$15,000.00
Construct headwall and trashrack at auxiliary spillway inlet	1	EA	$25,000.00	$25,000.00
[3]Riprap, dumped (at bottom of emergency spillway)	719	CY	$35.00	$25,172.78
CONSTRUCTION SUBTOTAL				$721,322.39
Construction Engineering		LS		
Construction Staking and As-Builts		LS		
Construction water & dust control		LS		
Construction inspection, material testing, quality control		LS		
Materials lab testing and reports		LS		
Dewatering		LS		
Diversion and care of stream during construction		LS		
NPDES/SWPPP Permit		LS		
Mobilization		LS		
Lump sum for above items		LS		$159,000.00
Contingency	35%	LS	$252,462.84	$252,462.84
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$411,462.84
			TOTAL	$1,132,785.23

1. **Assumes 8.0-10'x3' RCB's make up total structure**
2. **Unit price includes steel and concrete excavated at the principal spillway.**
3. **Does not include rip-rap at proposed principal spillway outlet.**
4. **Doesn't include sand diaphram**
5. **Includes backfill required to fill over the new auxiliary outlet box culvert**

GEPD Dam & Spillway Preliminary Cost Estimate

Engineers Estimate

Alternative F

Lengthen emergency spillway 120', add floodwall along school, raise dam 5' and add an 8'X4' RCB auxiliary spillway

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
[3]8'X4' RCB auxiliary spillway	136	LF	$287.00	$39,032.00
[1]Headwall and apron for proposed principal outlet	1	EA	$12,400.00	$12,400.00
[4]Embankment	6641	CY	$8.00	$53,128.00
[4]Embankment (imported)	13567	CY	$12.00	$162,798.97
Excavation	6641	CY	$8.00	$53,128.00
2' Stripping	2818	CY	$8.00	$22,541.70
Construct concrete sill	120	LF	$20.00	$2,400.00
Construct headwall and trashrack at principal inlet	2	EA	$15,000.00	$30,000.00
[2]Riprap, dumped (at bottom of emergency spillway)	810	CY	$35.00	$28,353.89
CONSTRUCTION SUBTOTAL				$435,284.56
Construction Engineering	1	LS	$15,000.00	$15,000.00
Construction Staking and As-Builts	5%	LS	$21,055.58	$21,055.58
Construction water & dust control	2%	LS	$8,422.23	$8,422.23
Construction inspection, material testing, quality control	1	LS	$50,000.00	$50,000.00
Materials lab testing and reports	1	LS	$20,000.00	$20,000.00
Dewatering	1%	LS	$4,211.12	$4,211.12
Diversion and care of stream during construction	5%	LS	$21,055.58	$21,055.58
NPDES/SWPPP Permit	5%	LS	$21,055.58	$21,055.58
Mobilization	7%	LS	$29,477.81	$29,477.81
Contingency	35%	LS	$152,349.60	$152,349.60
MOBILIZATION, PERMITS AND ENGINEERING SUBTOTAL				$342,627.50
			TOTAL	$777,912.05

1.This lump sum was derived from GVSCE-Cost.xls, cells F14:F17 of page "Alt 1". Since this is not a high % of total, the same #'s were used for the 6'x4' RCB - This needs to be refined in future estimates.

2. Does not include rip-rap at proposed principal spillway outlet.

3. Doesn't include sand diaphram

4. Includes backfill required to fill over the new auxiliary outlet box culvert

APPENDIX F

Ashbrook Wash Hydraulics for Alternative F

Ashbrook Wash Floodplain Analysis for Alternative F of proposed modifications to GEP Dam

Floodplain analysis of Ashbrook Wash downstream of GEP Dam was performed for the recommended Alternative F. Results are presented for 100-year discharges in Table 1, and for 10-year discharges in Table 2. Table 3 presents the discharges at concentration points in the HEC-2 models for the various water surface profile calculations. The discharges are based on HEC-1 model analysis. All HEC-1 and HEC-2 models are provided in Appendix G of the report.

The hydrology is based on HEC-1 modeling as performed for the Fountain Hills (North) FDS. The base model for the floodplain analyses is the HEC-2 model from the Fountain Hills (North) FDS.

Table 1 contains the following:

Column 1 — River mile as reported in the Fountain Hills (North) FDS model. Additional sections are added where changes are incorporated to the model.

Columns 2, 3 and 4 are for conditions with the existing dam. Columns 5, 6 and 7 are for conditions with Alternative F modifications to the dam.

Column 2 — Water surface elevations as reported for the Fountain Hills (North) FDS (1994 conditions).

Column 5 — Similar model as reported in Column 2 except with discharges resulting from Alternative F.

Column 3 — Water surface elevations with the existing dam using 1994 watershed conditions and recent channel modifications.

Column 6 — Similar model as reported in Column 3 except with discharges resulting from Alternative F.

Column 4 — Water surface elevations with the existing dam using future (full build-out) conditions and recent channel modifications.

Column 7 — Similar model as reported in Column 4 except with discharges resulting from Alternative F.

Table 2 contains the following:

Column 1	River mile (same as for Table 1).
Column 2	Water surface elevations as per the Fountain Hills (North) FDS model.
Column 3	Water surface elevations for the existing dam using 1994 watershed conditions and recent channel modifications.
Column 4	Water surface elevations for the existing dam using future (full build-out) conditions and recent channel modifications.
Column 5	Similar model as reported in Column 4 except with discharges resulting from Alternative F.

TABLE 1

Comparison of 100-year water surface elevations in Ashbrook Wash downstream of Golden Eagle Park Dam

	Water Surface Elevations, in feet					
	Existing Dam			Alternative F		
River Mile	1994 FIS Conditions	1994 Watershed Conditions with Channel Modifications	Future Watershed Conditions with Channel Modifications	1994 FIS Conditions	1994 Watershed Conditions with Channel Modifications	Future Watershed Conditions with Channel Modifications
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.521	1503.74	--	--	1504.05	--	--
1.523	1503.95	--	--	1504.26	--	--
1.525	1504.15	--	--	1504.46	--	--
1.527	1504.35	1511.38	1511.38	1504.67	1511.38	1511.38
1.529	--	1511.77	1512.05	--	1511.88	1512.24
1.577	1508.89	1512.00	1512.40	1509.26	1512.16	1512.64
1.602	1510.71	1512.03	1512.43	1511.00	1512.19	1512.68
1.605	--	1512.10	1512.68	--	1512.36	1512.96
1.636	1515.78	1515.13	1515.66	1516.00	1515.36	1515.92
1.686	1520.00	1518.11	1518.52	1520.26	1518.29	1518.72
1.727	1523.36	1522.16	1522.57	1523.58	1522.34	1522.78
1.855	1534.45	1533.54	1534.02	1534.71	1533.75	1534.25
1.980	1545.68	1546.65	1547.36	1545.98	1546.97	1547.69
2.071	1554.72	1554.16	1554.88	1555.04	1554.48	1555.23
2.095	1557.04	1557.11	1557.75	1557.35	1557.40	1558.06
2.200	1564.92	1564.88	1565.51	1565.26	1565.23	1565.87
2.279	1568.90	1568.92	1569.51	1569.30	1569.31	1569.93
2.304	1570.39	1570.39	1571.00	1570.78	1570.78	1571.42
2.382	1575.26	1575.25	1575.88	1575.65	1575.64	1576.30
2.405	1581.00	1581.01	1582.15	1582.05	1582.04	1582.02
2.428	1586.54	1586.57	1587.02	1586.85	1586.84	1587.31
2.448	1586.77	1586.80	1587.33	1587.13	1587.11	1587.67
2.494	1587.05	1587.07	1587.66	1587.44	1587.43	1588.04
2.529	1588.83	1588.83	1590.05	1589.99	1589.98	1589.96
2.545	1594.25	1594.25	1594.89	1594.80	1594.83	1595.34
2.558	1594.45	1594.45	1595.14	1595.04	1595.06	1595.60
2.670	1596.35	1596.35	1597.27	1597.16	1597.15	1597.90
2.785	1606.41	1606.41	1606.94	1606.87	1606.87	1607.30
2.807	1607.51	1607.51	1608.28	1608.19	1608.19	1608.81
2.899	1612.70	1612.70	1613.20	1613.14	1613.14	1613.55
3.008	1621.95	1621.95	1622.55	1622.48	1622.48	1622.94
3.121	1631.31	1631.31	1631.96	1631.88	1631.88	1632.39
3.190	--	1637.73	1638.49	--	1638.30	1638.75
3.208	1639.50	--	--	1640.03	--	--
3.210	--	1640.01	1641.01	--	1640.76	1641.03
3.236	--	1641.96	1643.96	--	1643.30	1644.46
3.241	1644.41	--	--	1645.03	--	--
3.246	--	1643.93	1646.13	--	1645.27	1646.60
3.323	1653.50	1653.47	1653.12	1653.98	1652.82	1652.99
3.421	1662.91	1662.93	1664.51	1663.27	1664.02	1664.30
3.487	1669.49	1669.47	1670.52	1669.98	1669.99	1670.21
3.519	1674.04	1674.04	1675.42	1674.68	1674.68	1675.04
3.531	1678.39	1678.40	1680.53	1679.39	1679.39	1679.94
3.544	1678.86	1678.87	1681.20	1679.95	1679.95	1680.56
3.621	1682.15	1682.07	1682.80	1682.41	1682.41	1682.60
3.701	1689.04	1689.12	1689.80	1689.44	1689.44	1689.61
3.764	1693.18	1693.13	1693.93	1693.51	1693.51	1693.71

TABLE 2

Comparison of 10-year water surface elevations in Ashbrook Wash downstream of Golden Eagle Park Dam

	Water Surface Elevations, in feet			
	Existing Dam			Alternative F
River Mile (1)	1994 FIS Conditions (2)	Future Watershed Conditions (3)	Future Watershed Conditions with Channel Modifications (4)	Future Watershed Conditions with Channel Modifications (5)
1.521	1502.37	1503.19	--	--
1.523	1502.57	1503.38	--	--
1.525	1502.76	1503.58	--	--
1.527	1502.96	1503.78	1511.38	1511.38
1.529	---	--	1511.61	1511.70
1.577	1507.26	1508.21	1511.76	1511.90
1.602	1509.54	1510.21	1511.78	1511.93
1.605	---	--	1511.65	1511.94
1.636	1514.76	1515.35	1514.70	1514.97
1.686	1518.81	1519.52	1517.87	1517.99
1.727	1522.38	1522.94	1521.82	1522.03
1.855	1533.30	1533.98	1533.23	1533.47
1.980	1544.36	1545.13	1545.96	1546.36
2.071	1553.26	1554.12	1553.61	1553.98
2.095	1555.63	1556.47	1556.58	1556.92
2.200	1563.70	1564.50	1564.44	1564.86
2.279	1567.75	1568.55	1568.58	1569.03
2.304	1569.22	1570.02	1570.02	1570.47
2.382	1574.11	1574.91	1574.91	1575.34
2.405	1578.98	1580.25	1580.26	1581.22
2.428	1585.47	1586.26	1586.26	1586.61
2.448	1585.59	1586.45	1586.45	1586.85
2.494	1585.78	1586.70	1586.70	1587.15
2.529	1587.22	1588.36	1588.36	1589.38
2.545	1593.25	1593.95	1593.95	1594.60
2.558	1593.37	1594.13	1594.13	1594.81
2.670	1595.78	1596.18	1596.18	1596.74
2.785	1605.36	1606.11	1606.11	1606.70
2.807	1606.37	1607.17	1607.17	1607.90
2.899	1612.17	1612.54	1612.54	1612.94
3.008	1621.11	1621.71	1621.71	1622.26
3.121	1630.38	1631.05	1631.05	1631.63
3.190	---	--	1637.54	1638.09
3.208	1638.92	1639.33	--	--
3.210	---	--	1639.81	1640.52
3.236	---	--	1641.62	1642.84
3.241	1643.72	1644.25	--	--
3.246	---	--	1643.81	1644.62
3.323	1652.97	1653.22	1653.21	1653.20
3.421	1662.37	1662.59	1662.61	1663.61
3.487	1668.97	1669.22	1669.21	1669.83
3.519	1673.20	1673.58	1673.58	1674.46
3.531	1677.10	1677.67	1677.67	1679.04
3.544	1677.46	1678.08	1678.08	1679.57
3.621	1681.35	1681.82	1681.82	1682.32
3.701	1688.58	1688.83	1688.83	1689.30
3.764	1692.67	1692.88	1692.88	1693.39

TABLE 3

Controlling peak discharges at key concentration points downstream of GEP Dam

	Existing Dam			Alternative F		
Conc. Point	100-year, 1994 Conditions cfs	100-yr, Future Conditions cfs	10-yr, Future Conditions cfs	100-year, 1994 Conditions cfs	100-yr, Future Conditions cfs	10-yr, Future Conditions cfs
C5990	966[a]	1631[b]	770[a]	1195[b]	1329[b]	1091[b]
C608	972[a]	1642[b]	772[a]	1269[b]	1445[a]	1162[a]
C613	972[a]	1639[b]	772[a]	1282[b]	1489[a]	1182[a]
C621	1184[b]	1866[b]	1073[a]	1633[b]	1979[a]	1473[a]
C622R	1384[a]	1877[b]	1208[a]	1814[b]	2255[a]	1622[a]
C622R	2053[a]	2697[a]	1731[a]	2448[a]	3192[a]	2148[a]
C549R	2112[a]	2760[a]	1757[a]	2512[a]	3250[a]	2180[a]
C549R	3095[a]	4013[a]	2432[a]	3503[a]	4504[a]	2861[a]
C626	3180[a]	4117[a]	2481[a]	3591[a]	4609[a]	2917[a]
C627	3187[a]	4130[a]	2484[a]	3598[a]	4621[a]	2920[a]

NOTES: a: 100-year, 24-hour discharge
b: 100-year, 6hour discharge

APPENDIX G

DISKETTES WITH HEC-1 AND HEC-2 FILES

Contents of the Hydrology diskette
Golden Eagle Park Dam HEC-2 Models

The files included on this diskette are for the modified models of the Golden Eagle Park Dam. The files include four alternatives, A, C, D and F. Each alternative is modeled using a different storm duration, return period, and build-out condition. The following describes the different models.

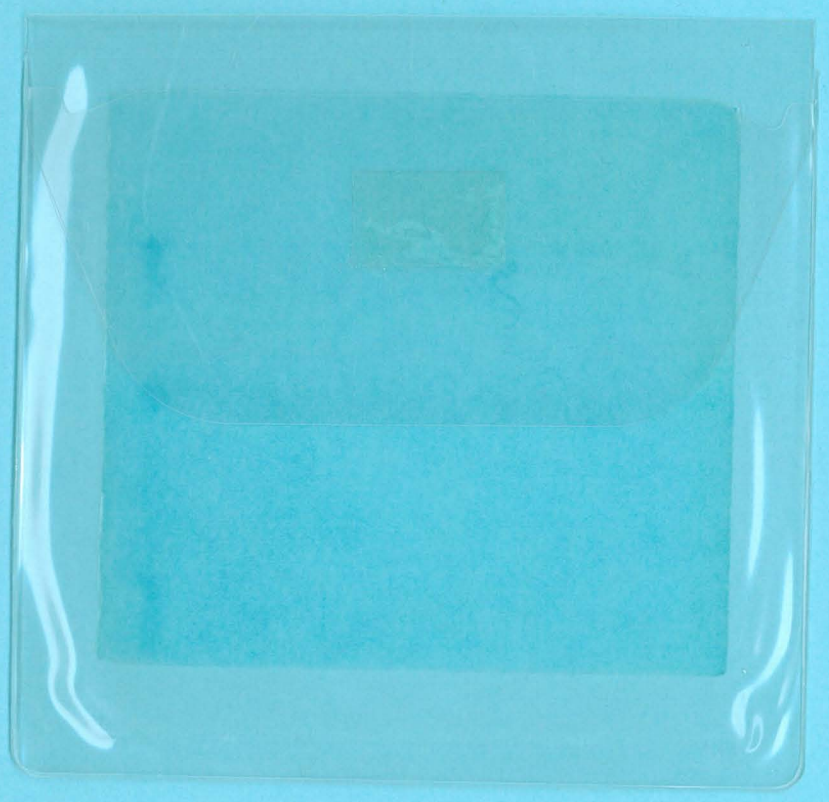
-1	100-year, 24-hour 1994 Condition
-2	100-year, 6-hour 1994 Condition
-3	100-year, 24-hour Future Condition
-4	100-year, 6-hour Future Condition
-5	10-year, 24-hour Future Condition
-6	10-year, 6-hour Future Condition

In addition, the inflow design flood for each alternative is included. These HEC-1 have the following nomenclature:

A-idf1.* for Alternative A and the pmf design flood. .5 + Dam Breach
a-idf2.* for Alternative A and the .5pmf design flood

Also included on the disk are the original Fountain Hills FDS HEC-1 models. The following is a description of these models.

ex100-6.*	Existing watershed conditions for the 100-year, 6-hour event.
ex100-24.*	Existing watershed conditions for the 100-year, 24-hour event.
ex10-6.*	Existing watershed conditions for the 10-year, 6-hour event.
ex10-24.*	Existing watershed conditions for the 10-year, 24-hour event.
fu100-6.*	Future full build out watershed conditions for the 100-year, 6-hour event.
fu100-6.*	Future full build out watershed conditions for the 100-year, 24-hour event.



Contents of Hydraulics Diskette
Golden Eagle Park Dam HEC-2 Models

Six different models are used in the analysis of the hydraulic conditions in Ashbrook Wash downstream of Golden Eagle Park Dam. These models are as follows:

(1) AS.*
This model is the original FDS model for Ashbrook Wash.

(2) Ex-dam.*
This model is the original FDS model for Ashbrook Wash truncated at Golden Eagle Park Dam. Four profiles are modeled which reflect the existing dam outflows for the following hydrologic conditions:

100-year existing (1994 FIS) conditions
100-year future (full build-out) conditions
10-year existing (1994 FIS) conditions
10-year future (full build-out) conditions

A fifth profile models the 100-year existing (1994 FIS) condition outflow from the dam under the proposed Alternative F.

(3) Mod-1994.*
This model is the truncated model from (2) with two modifications to the channel. The first is a new box culvert at Fountain Hills Blvd. and the second is channel re-grading and vegetation clearing downstream of El Pueblo Blvd. Four profiles are modeled which reflect the 100-year existing (1994 FIS) conditions discharges for dam modification Alternatives A, C, D and F.

(4) Mod-chnl.*
This model is the truncated model with the channel improvements from (3). Three profiles are modeled which reflect outflows from the existing dam for the following hydrologic conditions:

100-year existing (1994 FIS) conditions
100-year future (full build-out) conditions
10-year future (full build-out) conditions

(5) ModFu100.*
This model is the truncated model with the channel improvements from (3). Four profiles are modeled which reflect the 100-year future (full build-out) conditions discharges for dam modification
Alternatives A, C, D and F.

(6) Mod-Fu10.*
This model is the same as (5) except for the 10-year discharges.

GOLDEN EAGLE PARK DAM

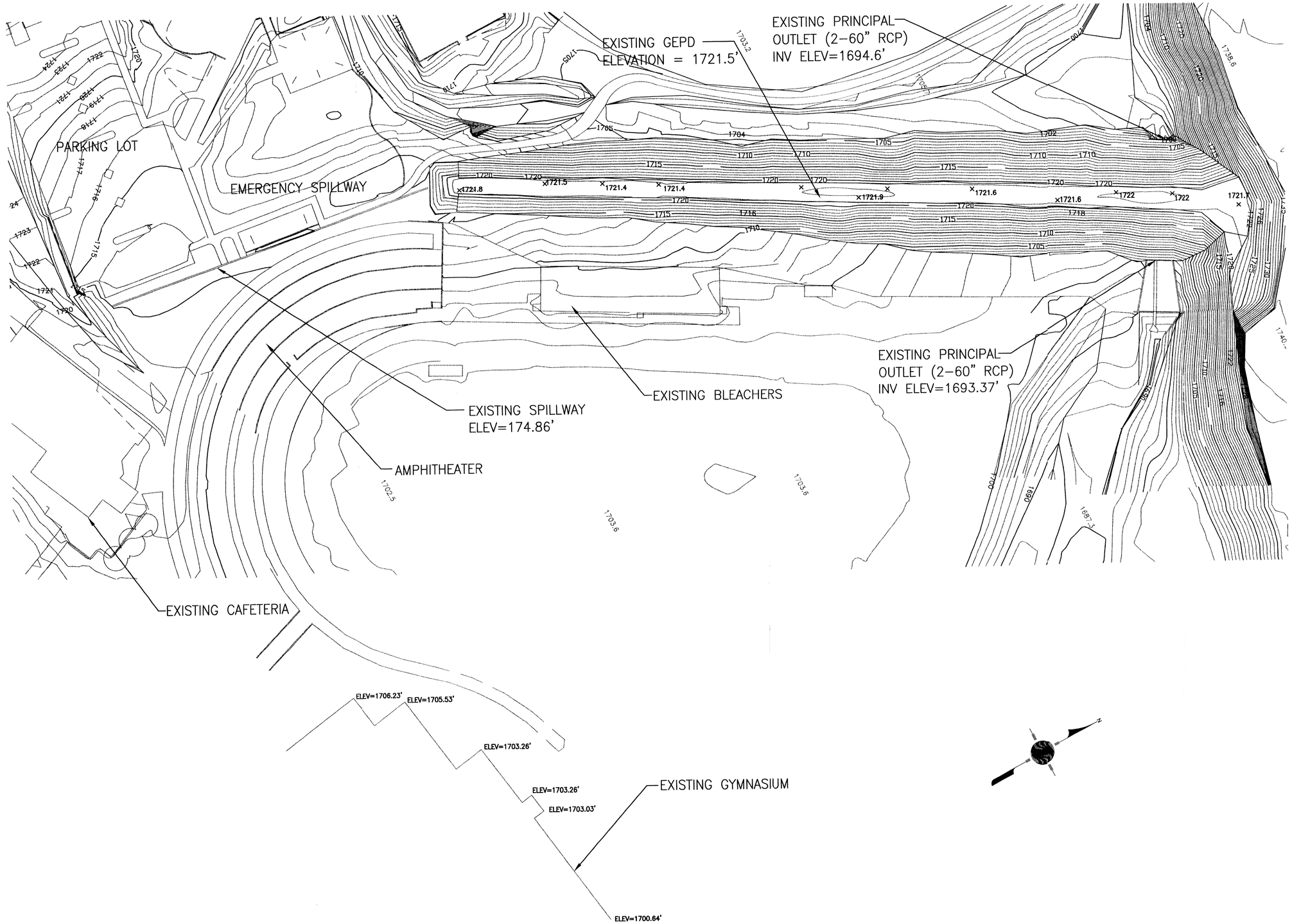


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PLATE 1

GOLDEN EAGLE PARK DAM
& APPURTENANT STRUCTURES
Phoenix, Arizona

Title

Project No. 28900095

Scale 1"=40'

Drawing No.

Sheet of

Revision 0

ORIGINAL SHEET - D

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GOLDEN EAGLE PARK DAM

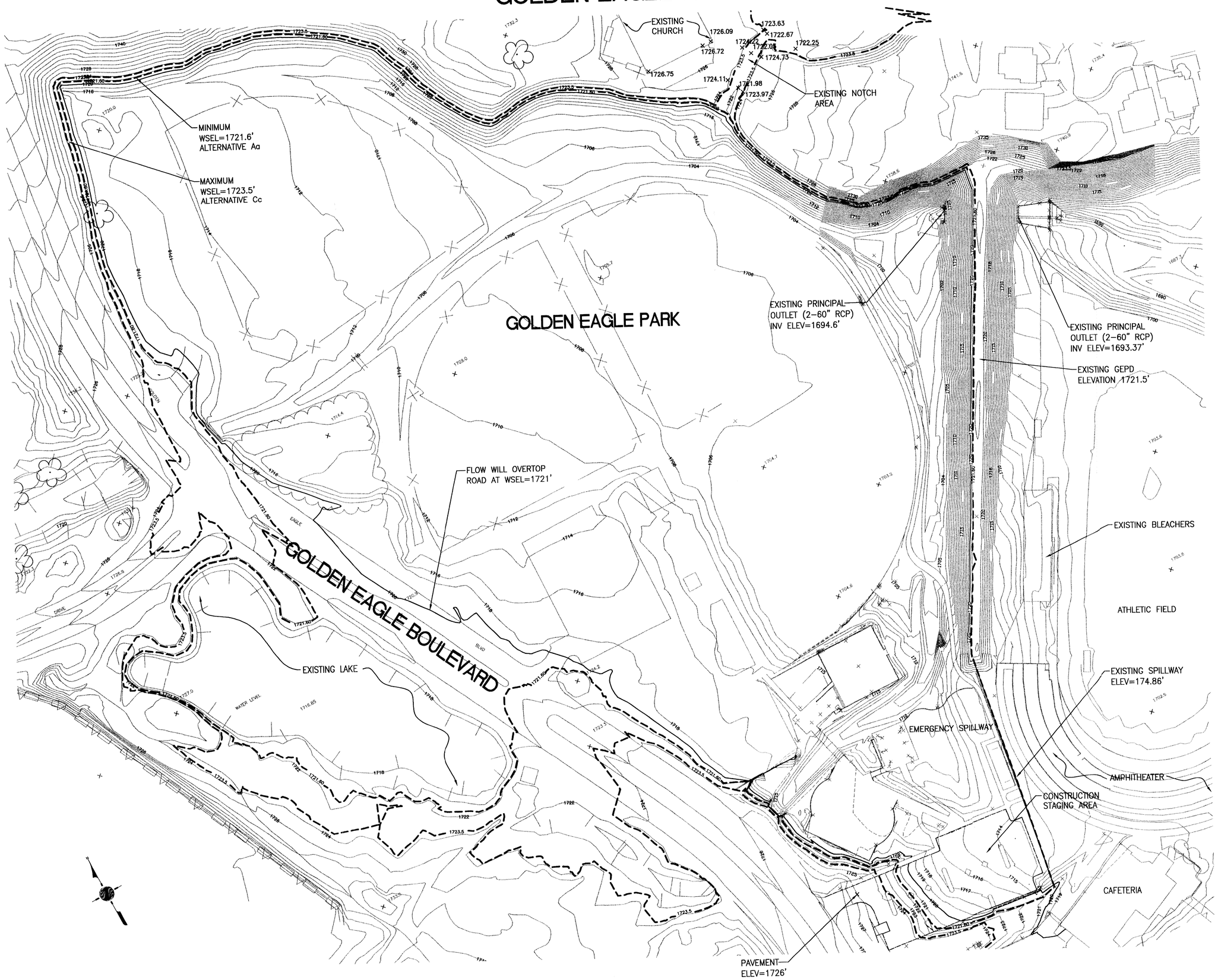

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PLATE 2

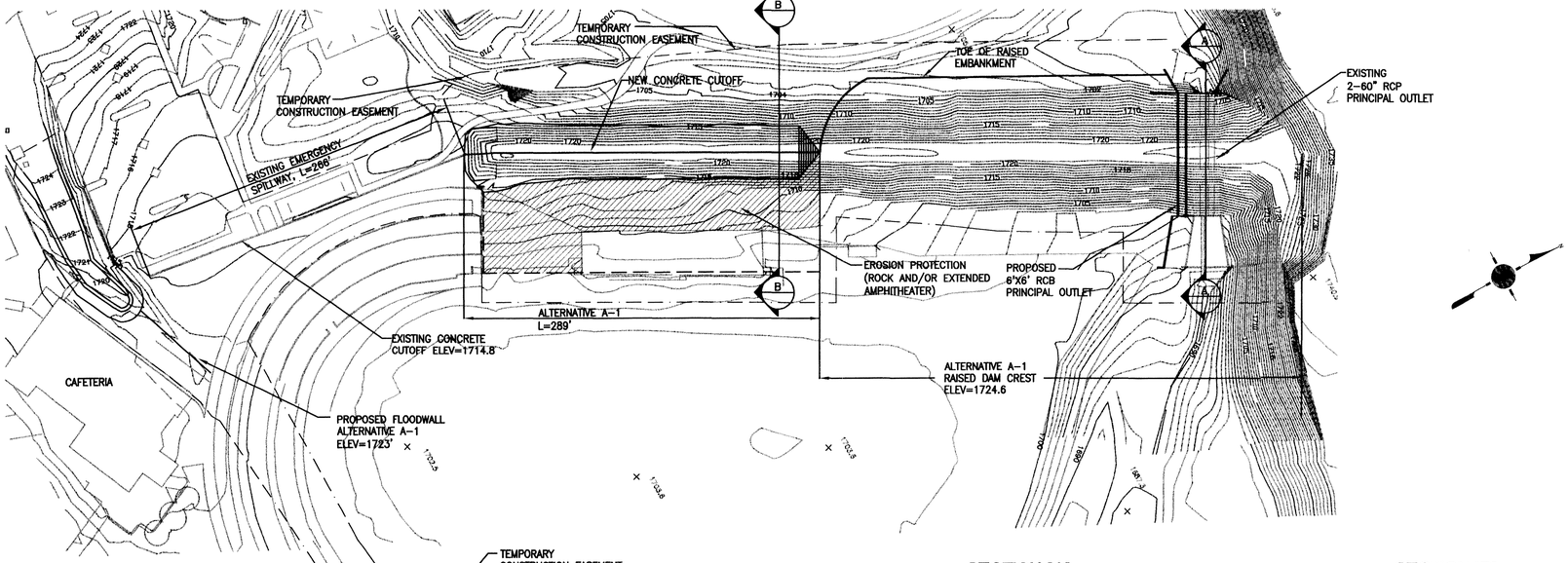
GOLDEN EAGLE PARK DAM
Impoundment Area & Related Facilities
Phoenix, Arizona

Title

Project No.	Scale
28900095	1" = 60'

Drawing No.	Sheet	Revision
	of	0

GOLDEN EAGLE PARK DAM
ALTERNATIVE "A-1"



PROPOSED IMPROVEMENTS:

LENGTHEN THE EXISTING EMERGENCY SPILLWAY 289'

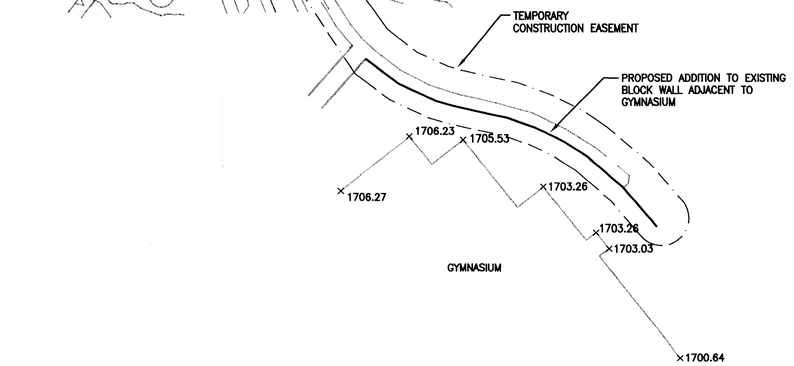
INSTALL A 6'X6' RCB PRINCIPAL OUTLET ADJACENT AND SOUTH OF THE EXISTING 2-60" RCP

RAISE DAM 3.1' TO ELEV=1724.6 MWSEL=1721.6

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM



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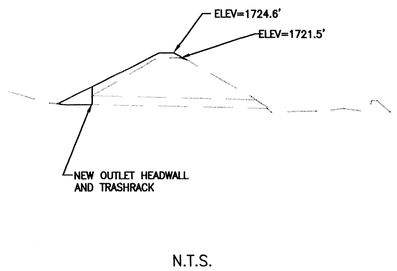

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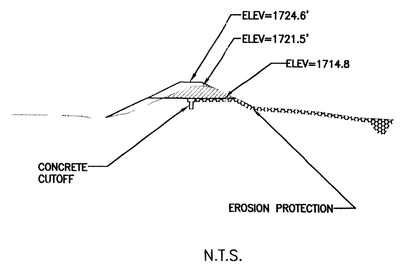

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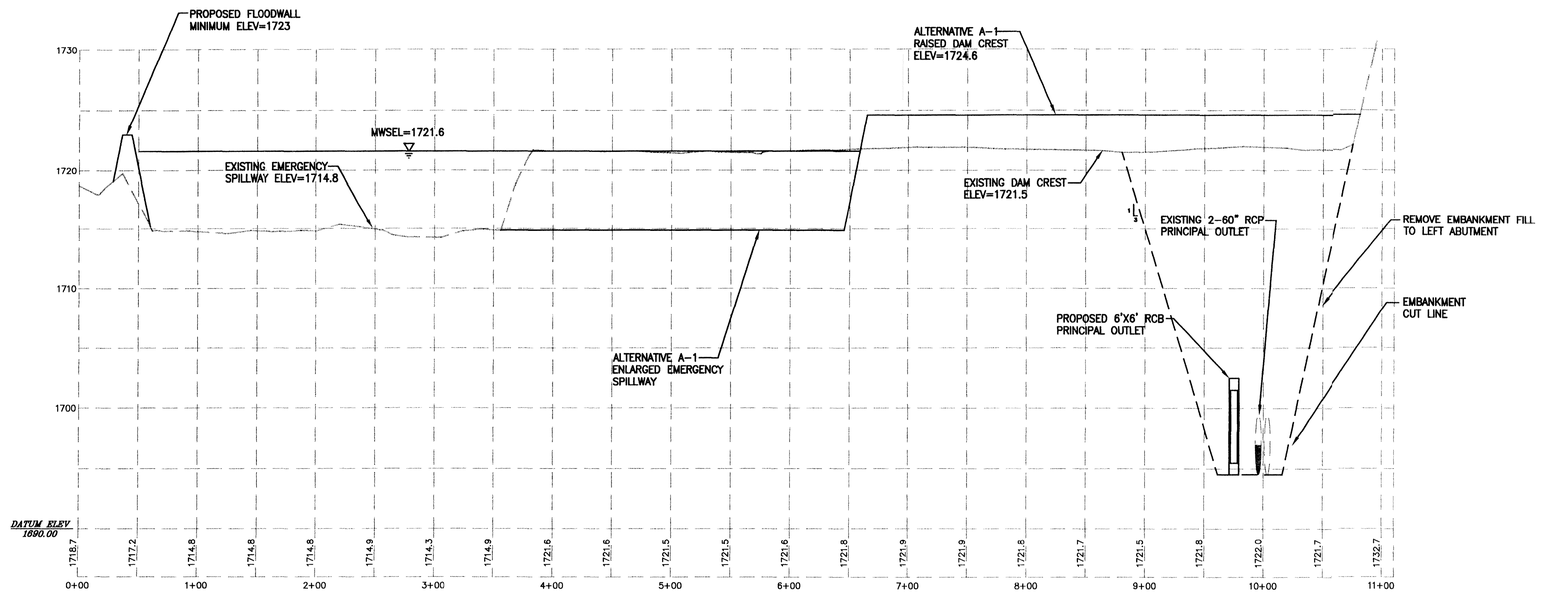

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PLATE 3

GOLDEN EAGLE PARK DAM
ALTERNATIVE "A-1"

Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

Sheet of

Revision 0

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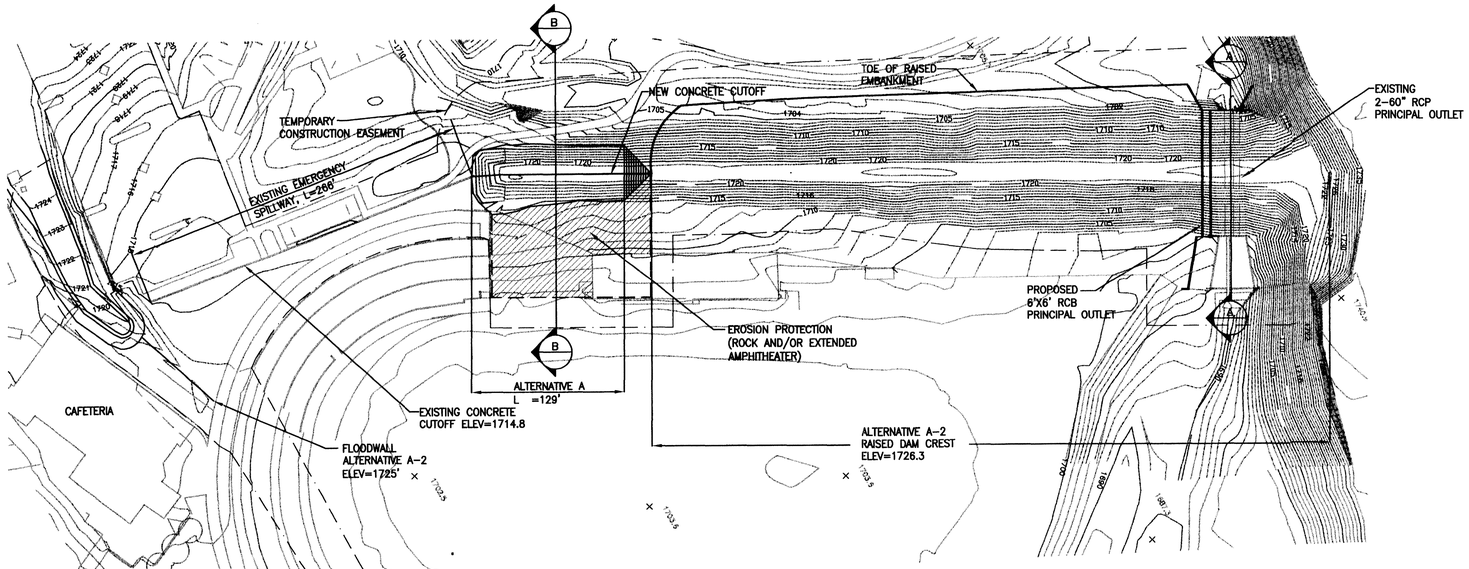
GOLDEN EAGLE PARK DAM
ALTERNATIVE "A-2"



PROPOSED IMPROVEMENTS:

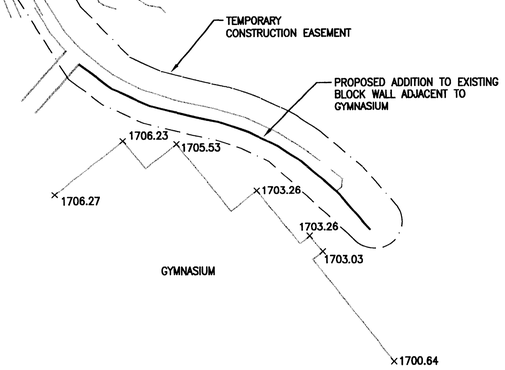
LENGTHEN THE EXISTING EMERGENCY SPILLWAY 129'

INSTALL A 6'X6' RCB PRINCIPAL OUTLET ADJACENT AND SOUTH OF THE EXISTING 2-60" RCP

DAM RAISE 4.8'
TO ELEV=1726.3
MWSEL=1723.3

BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM



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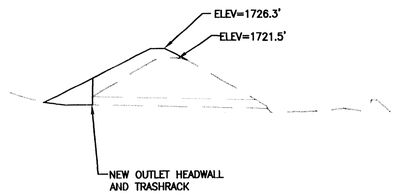

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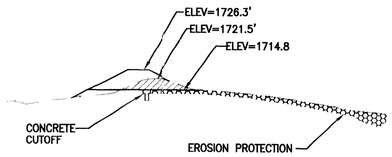

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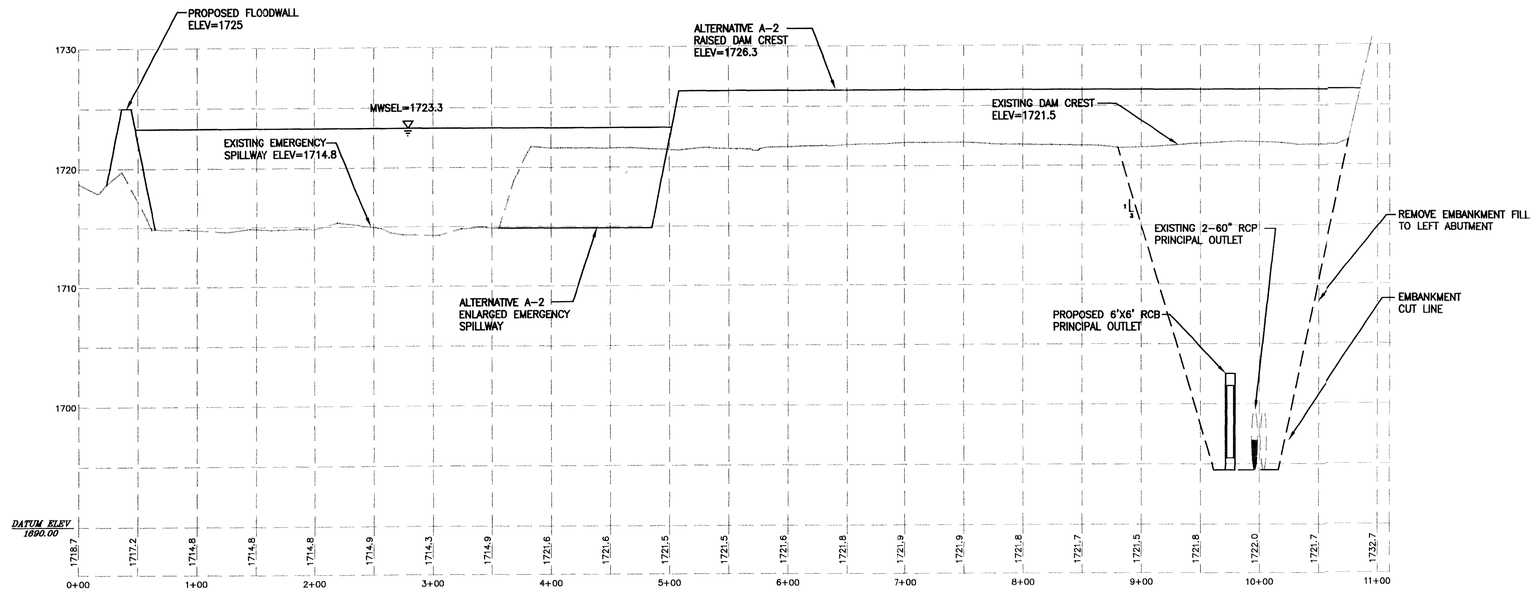

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PLATE 4

GOLDEN EAGLE PARK DAM
ALTERNATIVE "A-2"
Phoenix, Arizona

Title

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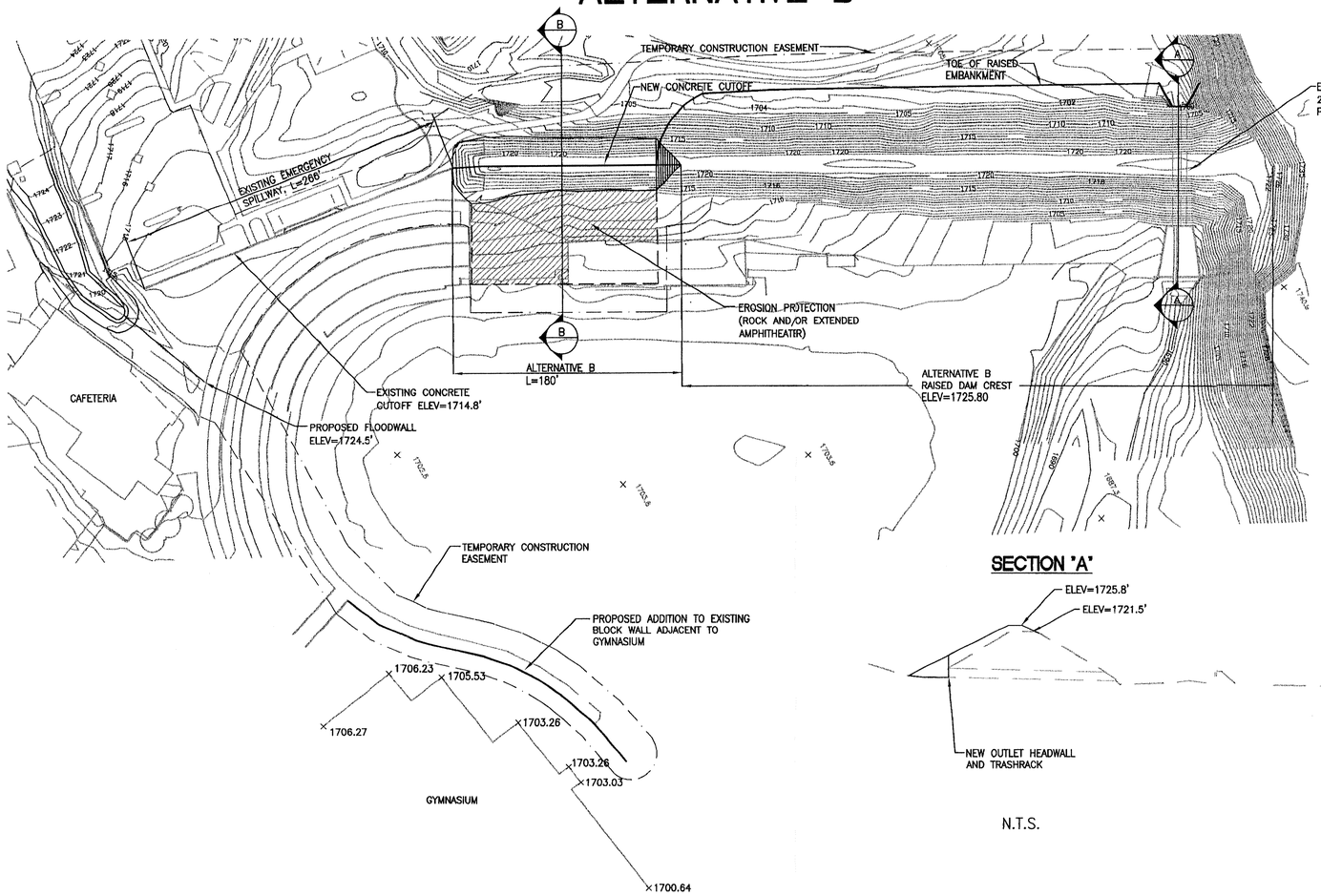
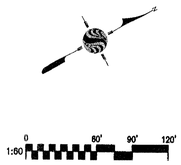
April 21, 1999, 0222 PM

GOLDEN EAGLE PARK DAM

ALTERNATIVE "B"





PROPOSED IMPROVEMENTS:

LENGTHEN THE EXISTING EMERGENCY SPILLWAY 180'

RAISE DAM 4.3' TO ELEV=1725.8 MWSEL=1722.8

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

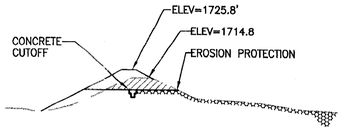
BUILD A FLOODWALL ADJACENT TO CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM

SECTION "A"

N.T.S.

SECTION "B"



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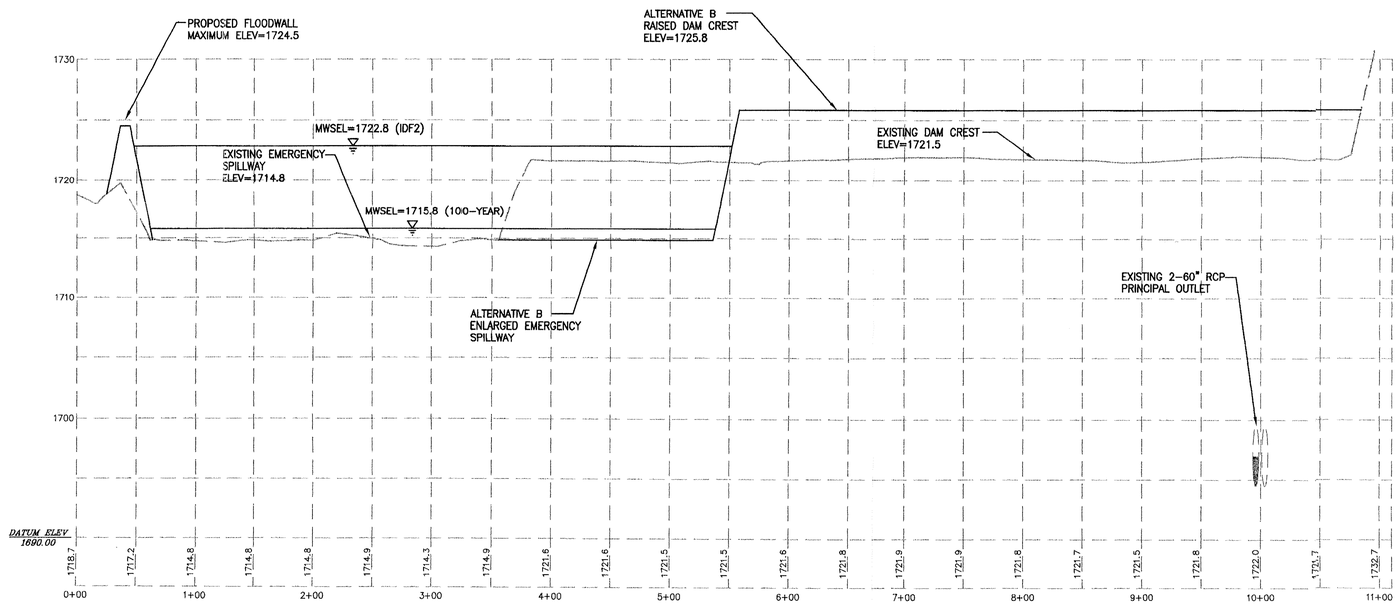

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PLATE 5

GOLDEN EAGLE PARK DAM
ALTERNATIVE "B"
Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

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Revision 0

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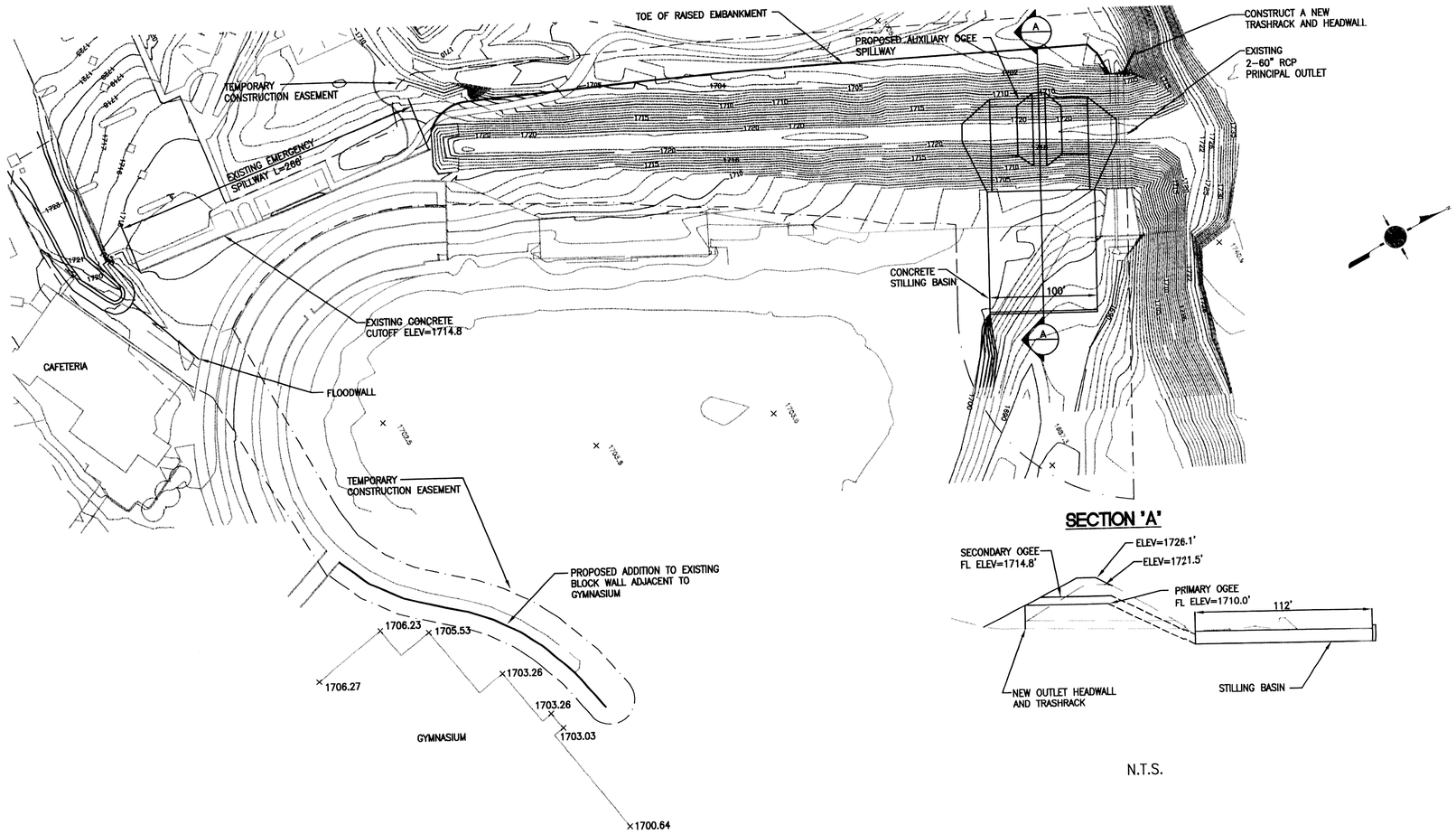
GOLDEN EAGLE PARK DAM

ALTERNATIVE "C"



N.T.S.

PROPOSED IMPROVEMENTS:

CONSTRUCT AN AUXILIARY OGEE CREST SPILLWAY
PRIMARY CREST ELEV=1710
SECONDARY CREST ELEV=1714.8

DAM RAISE 4.6'
TO ELEV=1726.1
MWSEL=1723.1

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM

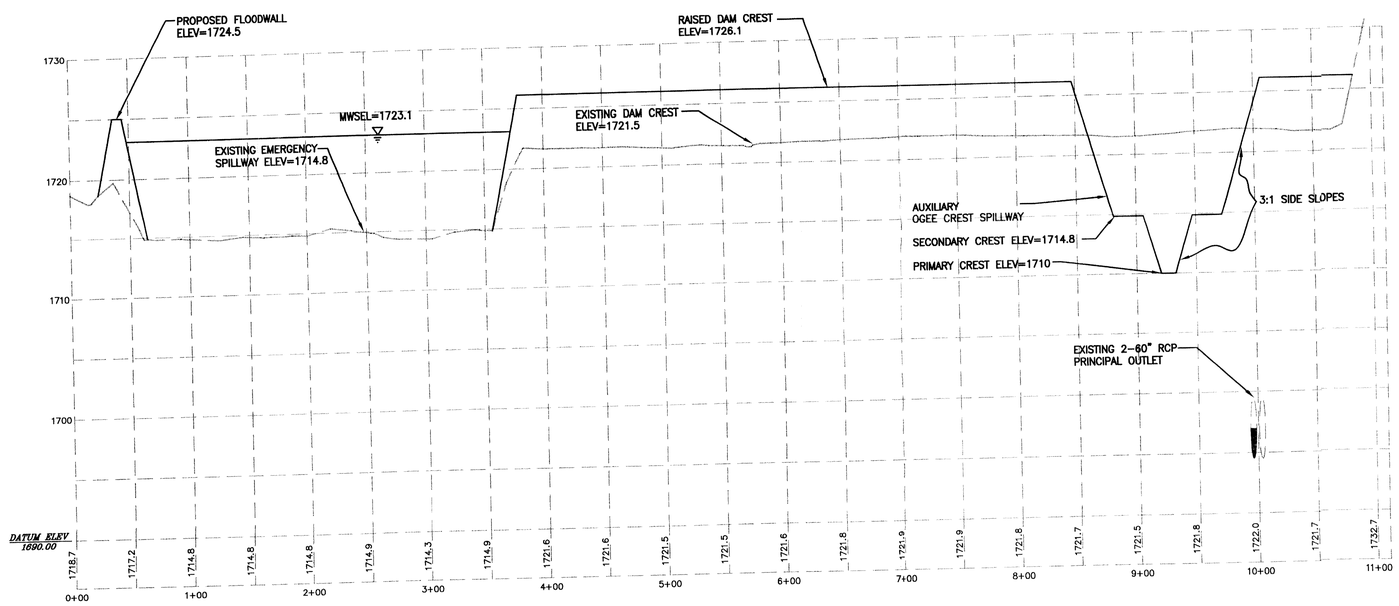


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PLATE 6

GOLDEN EAGLE PARK DAM
ALTERNATIVE "C"
Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

Sheet of

Revision 0

ORIGINAL SHEET - D

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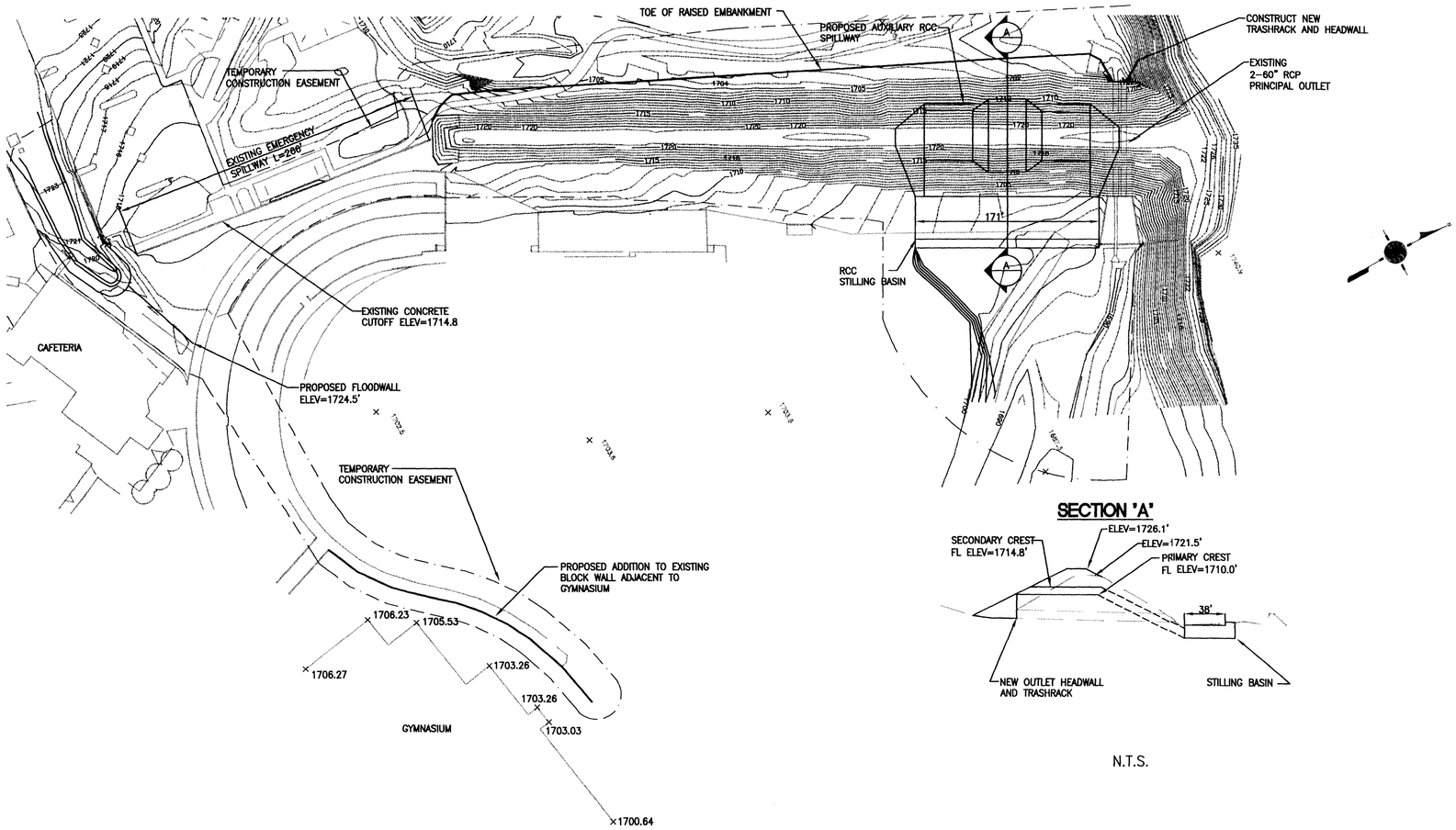
GOLDEN EAGLE PARK DAM

ALTERNATIVE "D"



N.T.S.

PROPOSED IMPROVEMENTS:

CONSTRUCT AN AUXILIARY RCC CREST SPILLWAY
PRIMARY CREST ELEV=1710
SECONDARY CREST ELEV=1714.8

DAM RAISE 4.6'
TO ELEV=1726.1
MWSEL=1723.1

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM

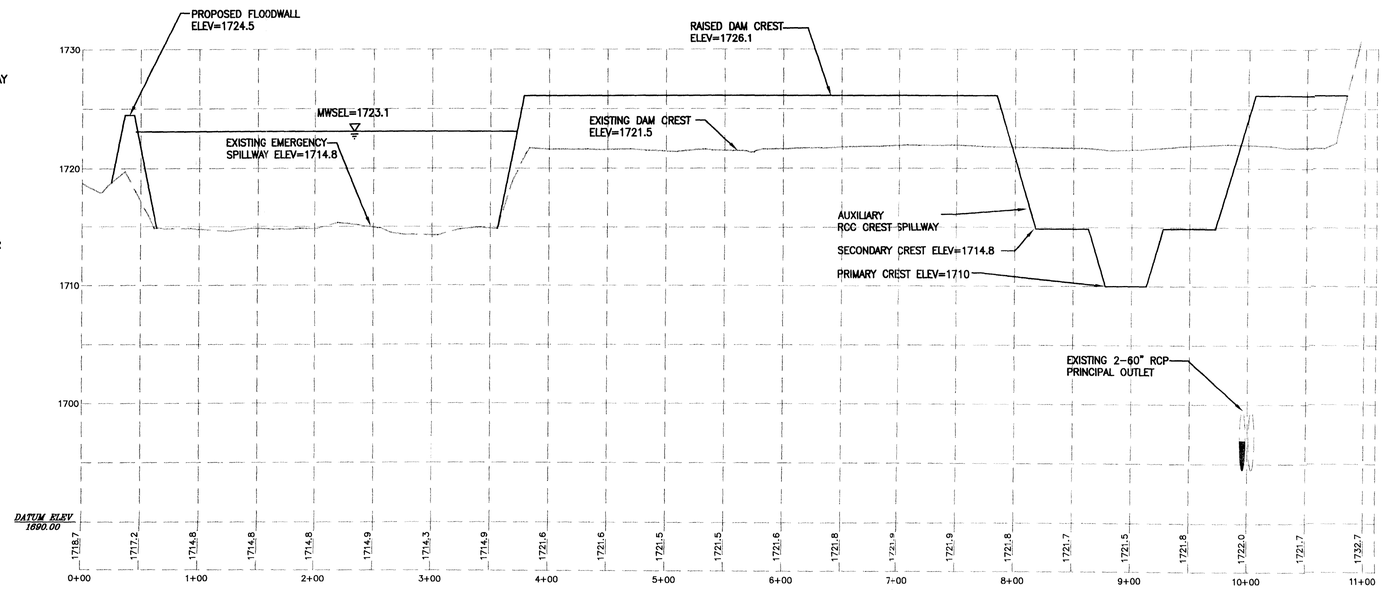


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PLATE 7

GOLDEN EAGLE PARK DAM
ALTERNATIVE "D"
Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

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Revision 0

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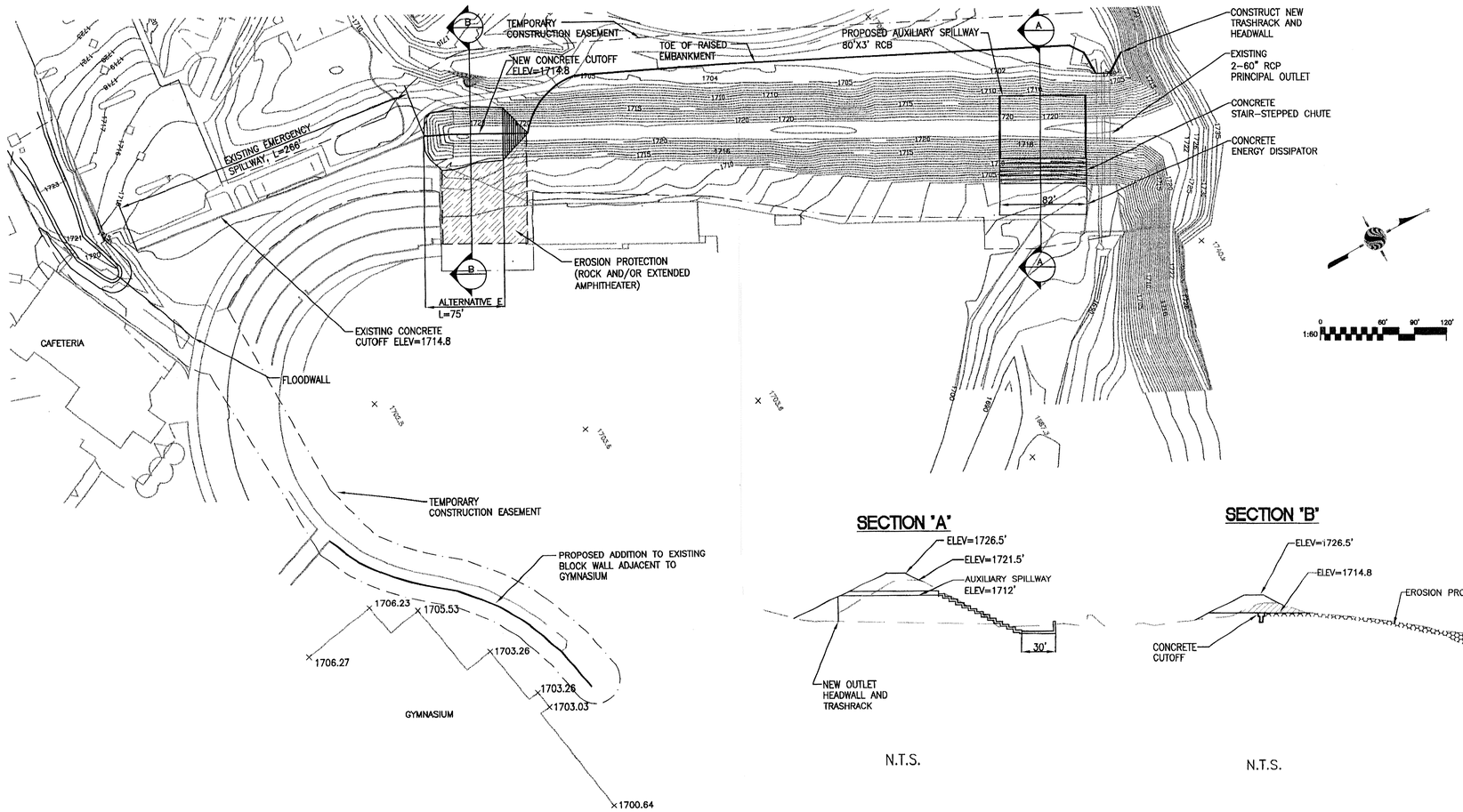
GOLDEN EAGLE PARK DAM

ALTERNATIVE "E"



PROPOSED IMPROVEMENTS:

LENGTHEN THE EXISTING EMERGENCY SPILLWAY 75'

CONSTRUCT AN AUXILIARY SPILLWAY 85'X3' RCB INV ELEV=1712

RAISE DAM 5.0' TO ELEV=1728.5 MWSEL=1723.5

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

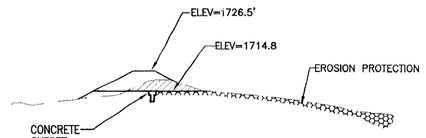
BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM

SECTION "A"

N.T.S.

SECTION "B"



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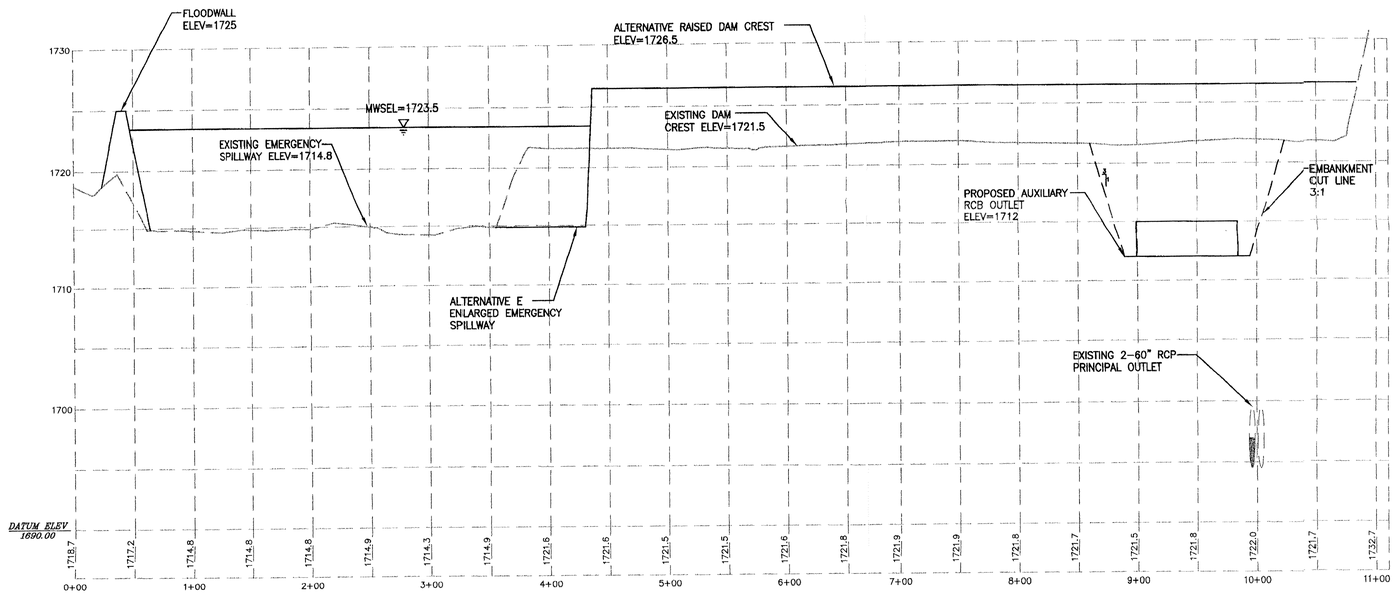

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Dwn.	Chkd.	Dsgn.	Date

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PLATE 8

GOLDEN EAGLE PARK DAM
ALTERNATIVE "E"
Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

Sheet of

Revision 0

ORIGINAL SHEET - D

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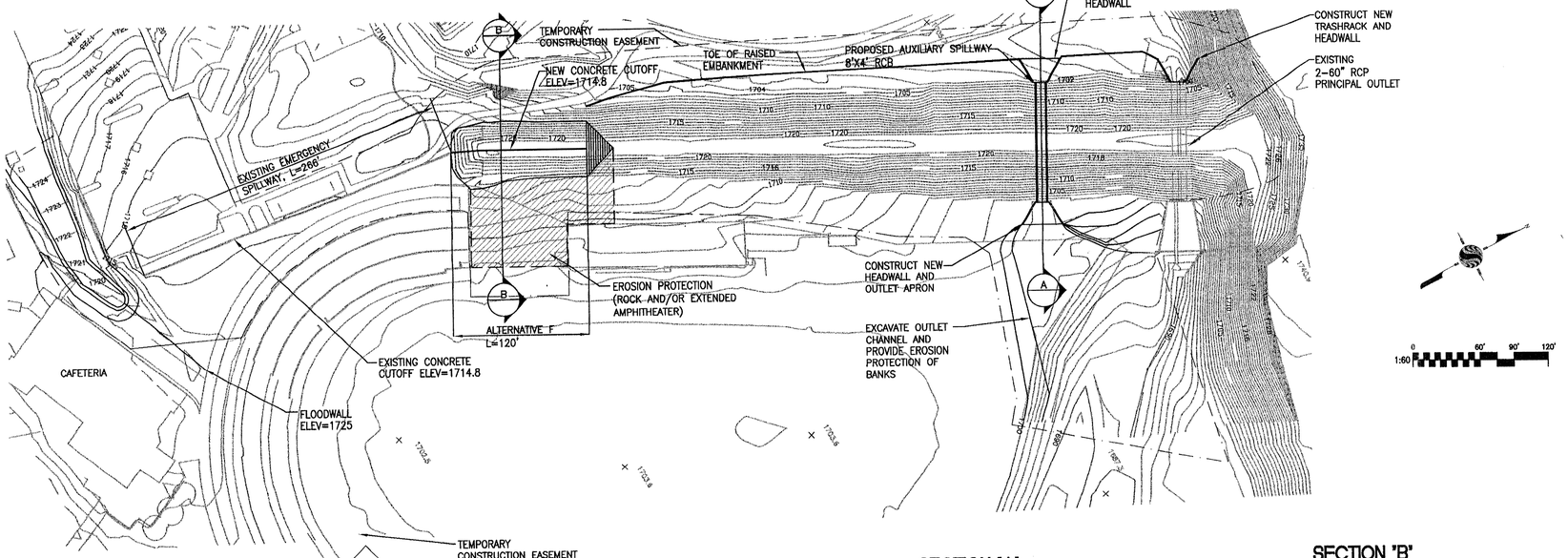
June 23 1999, 07:49 AM

GOLDEN EAGLE PARK DAM

ALTERNATIVE "F"



PROPOSED IMPROVEMENTS:

LENGTHEN THE EXISTING EMERGENCY SPILLWAY 120'

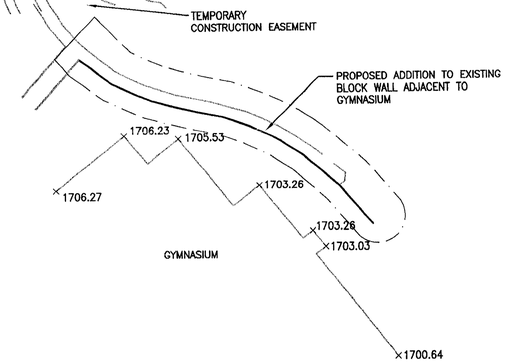
CONSTRUCT AN AUXILIARY SPILLWAY 8'X4' RCB INV ELEV=1695

RAISE DAM 5.0' TO ELEV=1726.5 MWSEL=1723.5

REPLACE HEADWALL AND TRASHRACK ON PRINCIPAL OUTLET

BUILD A FLOODWALL ADJACENT TO THE CAFETERIA

RAISE AND EXTEND EXISTING BLOCK WALL FOR FLOODPROOFING OF THE GYMNASIUM



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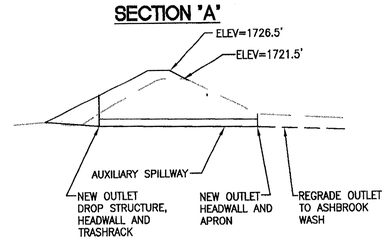

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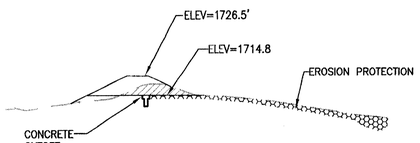

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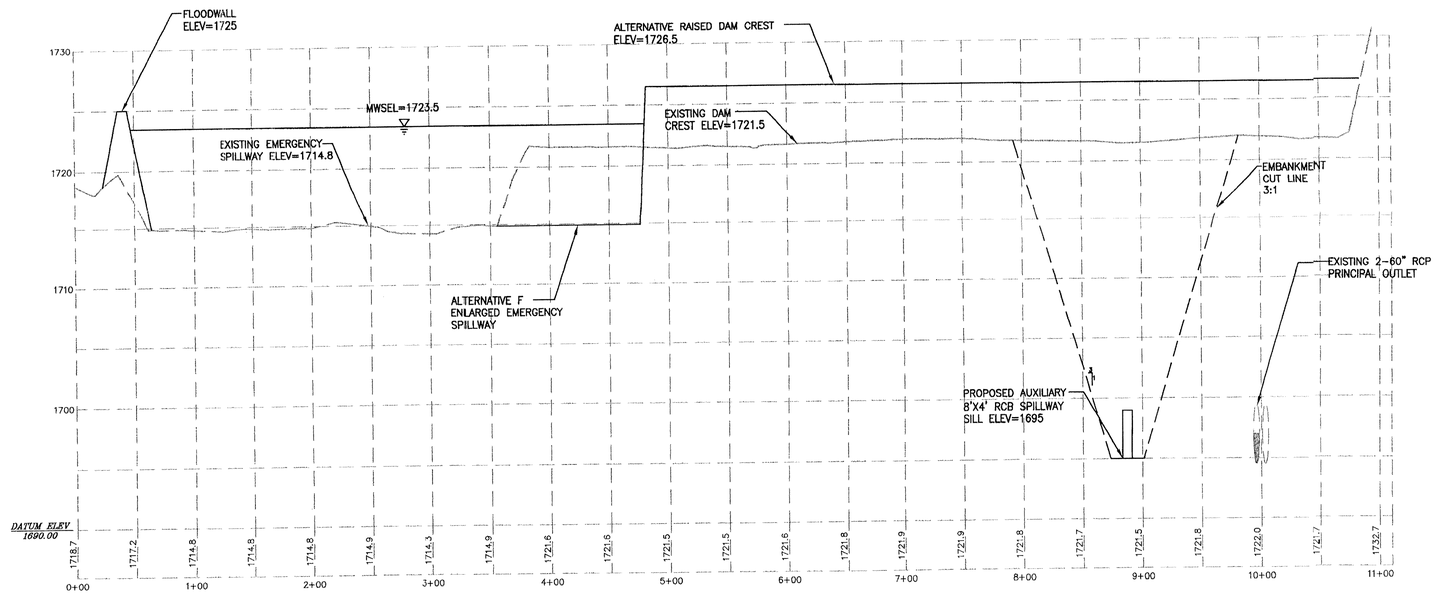

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PLATE 9

GOLDEN EAGLE PARK DAM
ALTERNATIVE "F"

Phoenix, Arizona

Title

Project No. 28900095

Scale 1" = 60'

Drawing No.

Sheet of

Revision 0

ORIGINAL SHEET - D

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