

**Memo**



**Stantec**

To: Distribution  
From: George V. Sabol  
Re: Golden Eagle Park Dam – 10-year and 100-year Flood Hydrology

File: 28900095  
Date: 06 April 1999

**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

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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.

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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.

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

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

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

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

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

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

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

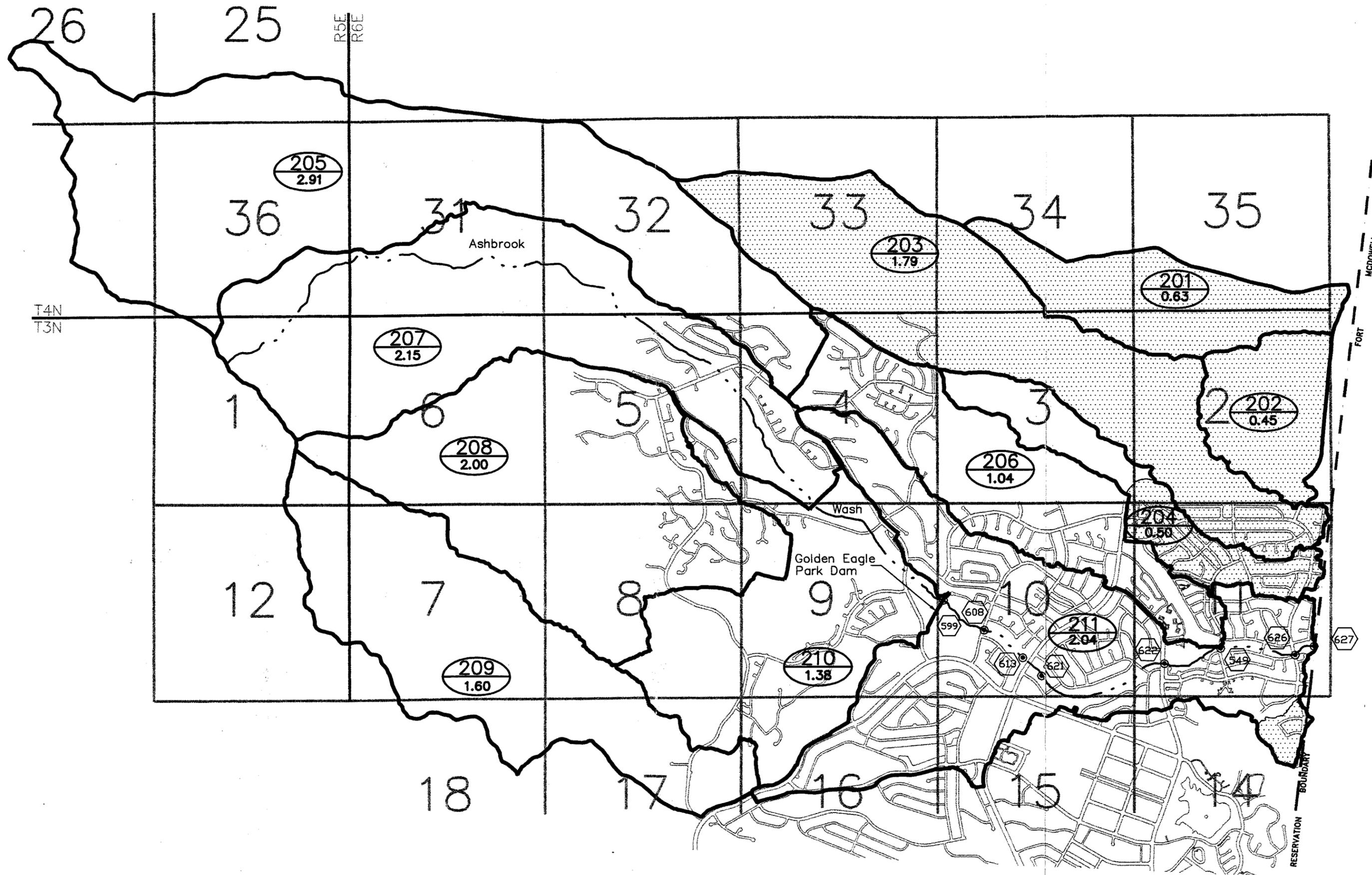
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TABLE 4

Maximum Water Surface Elevations for the Existing Dam and Alternative Modifications

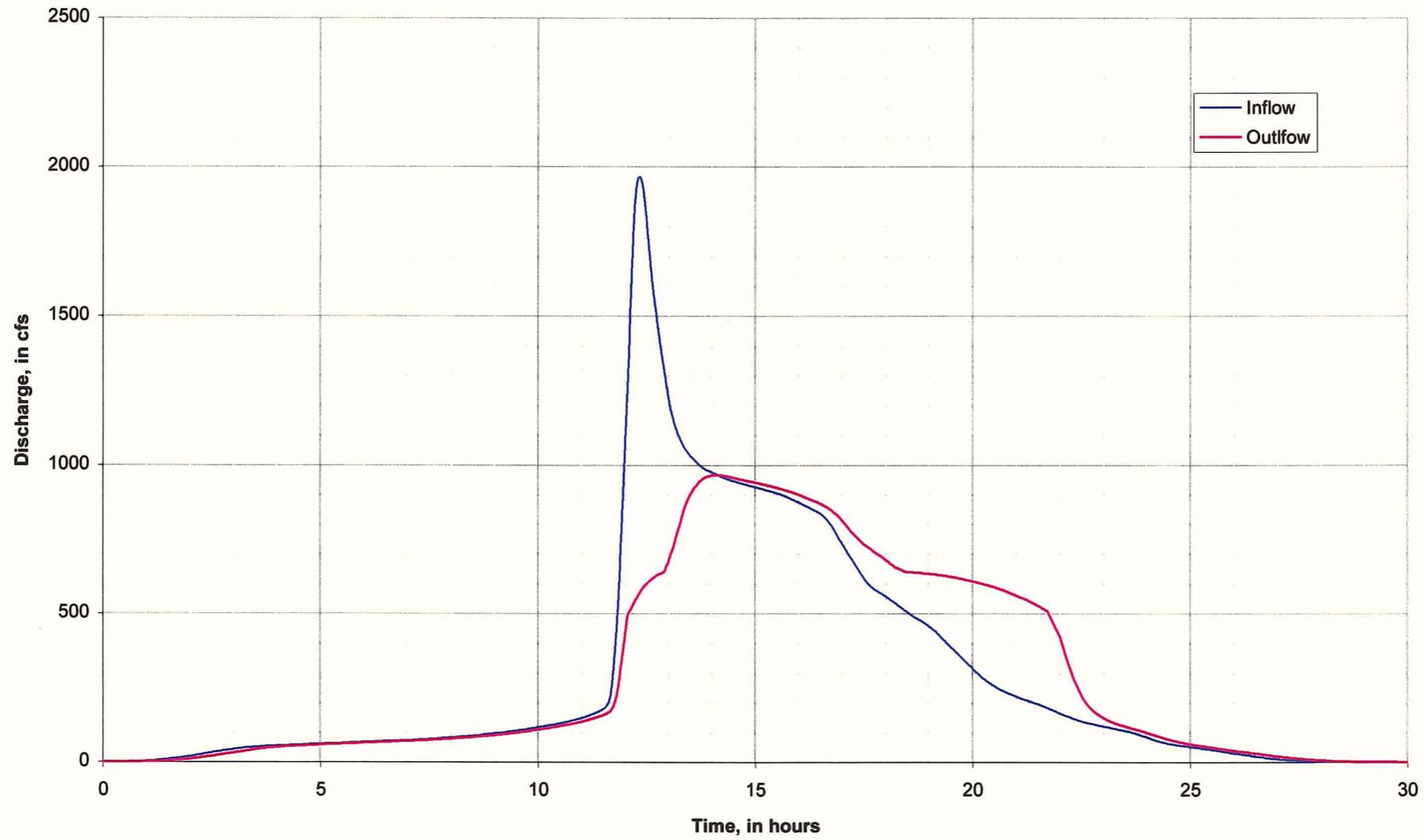
Dam Condition	Build-Out Condition	100-Year Peak Outflow		Maximum WSEL	
		24-hour cfs	6-hour cfs	24-hour feet	6-hour feet
Existing	1994	966	954	1,715.81	1,715.79
Existing	Future	1,143	1,631	1,716.04	1,716.57
Alternative A	Future	1,084	1,134	1,714.00*	1,715.58*
Alternative C	Future	1,149	1,608	1,714.86*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

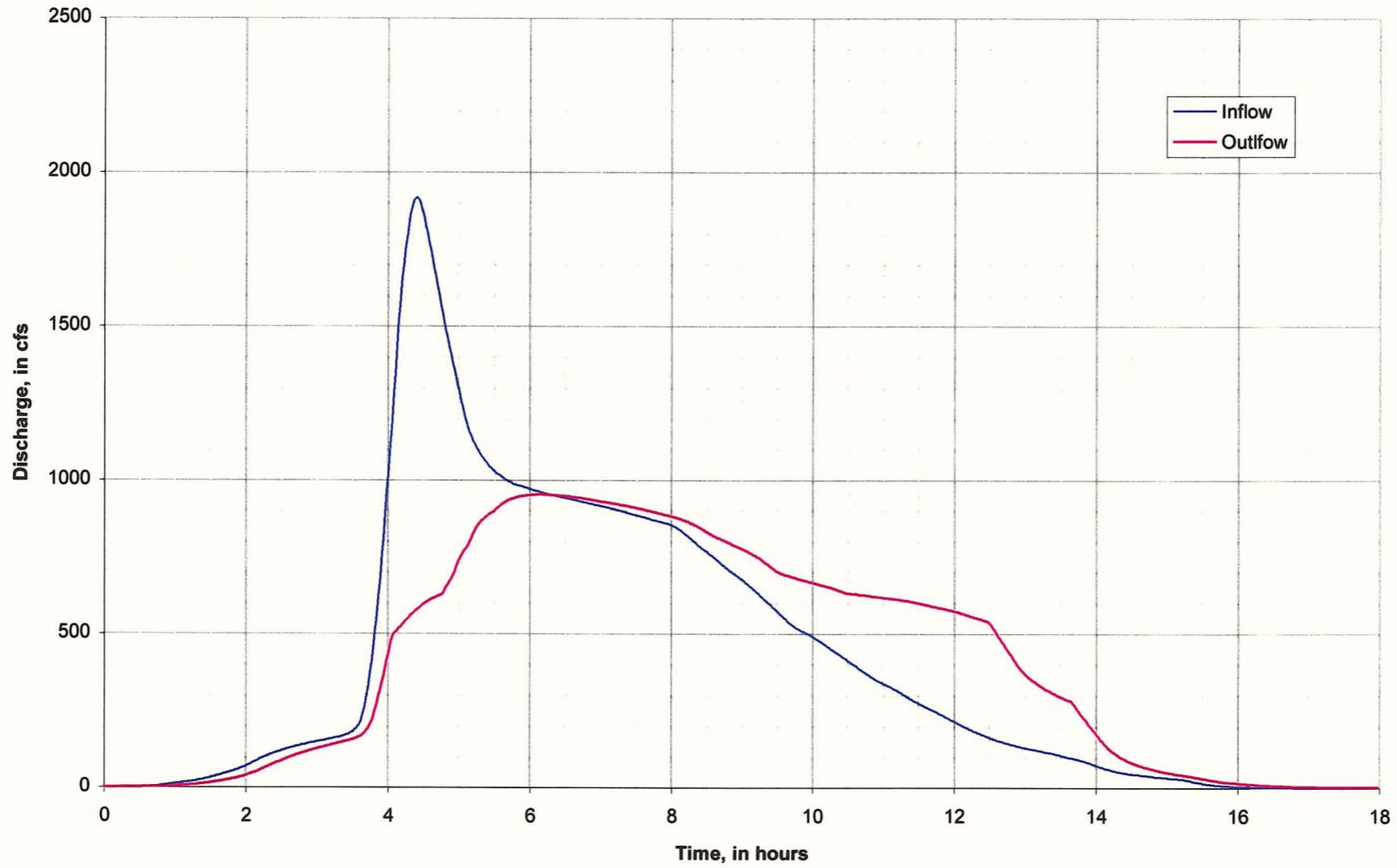


**FIGURE 1**  
**Ashbrook Wash Watershed Map**  
 Including HEC-1 Model Subbasin Identifiers and Flow Concentration Points In Ashbrook Wash below Golden Eagle Park Dam

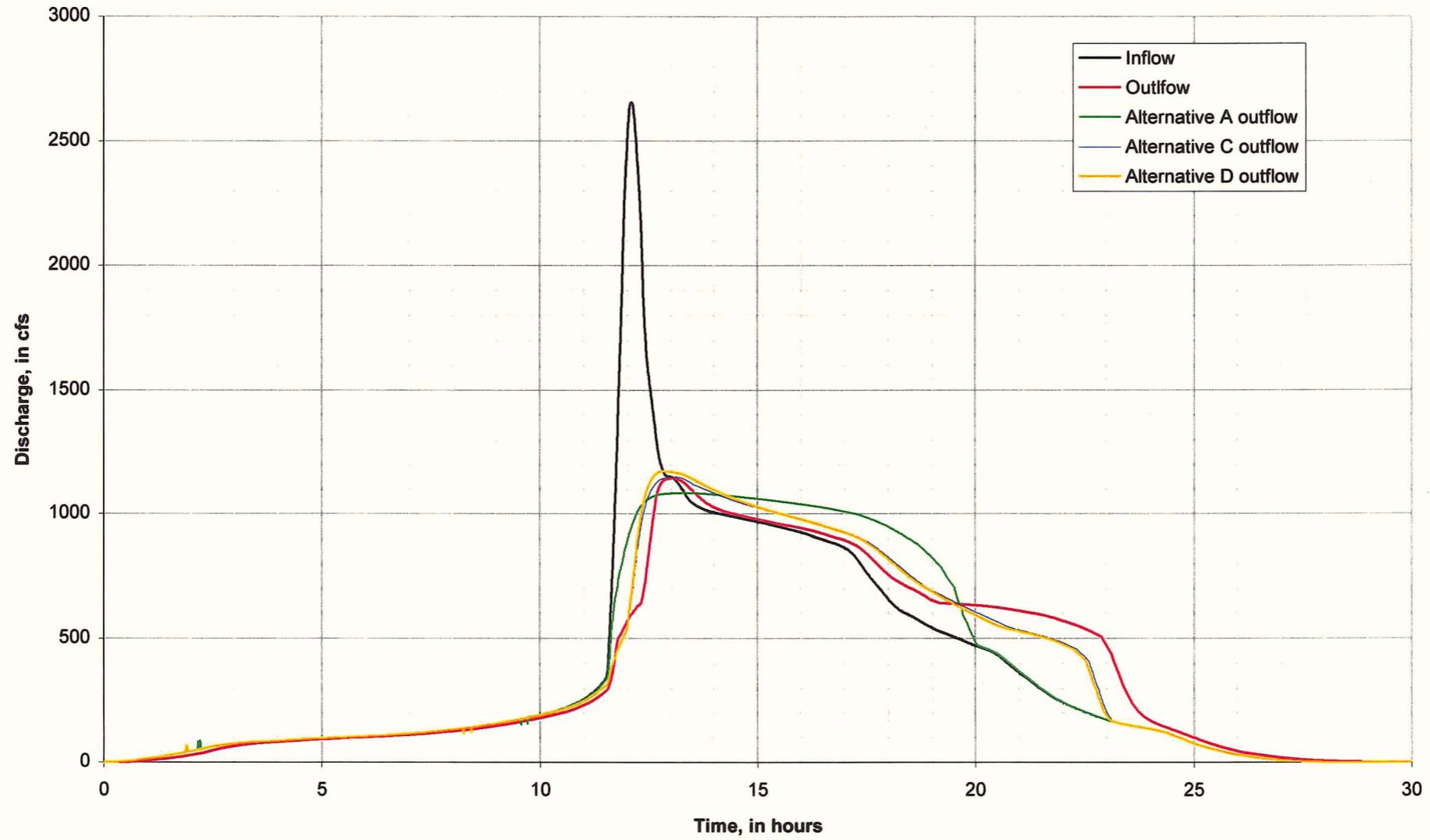
**Figure 2**  
**100-year, 24-hour 1994 conditions hydrographs for Golden Eagle Park Dam**



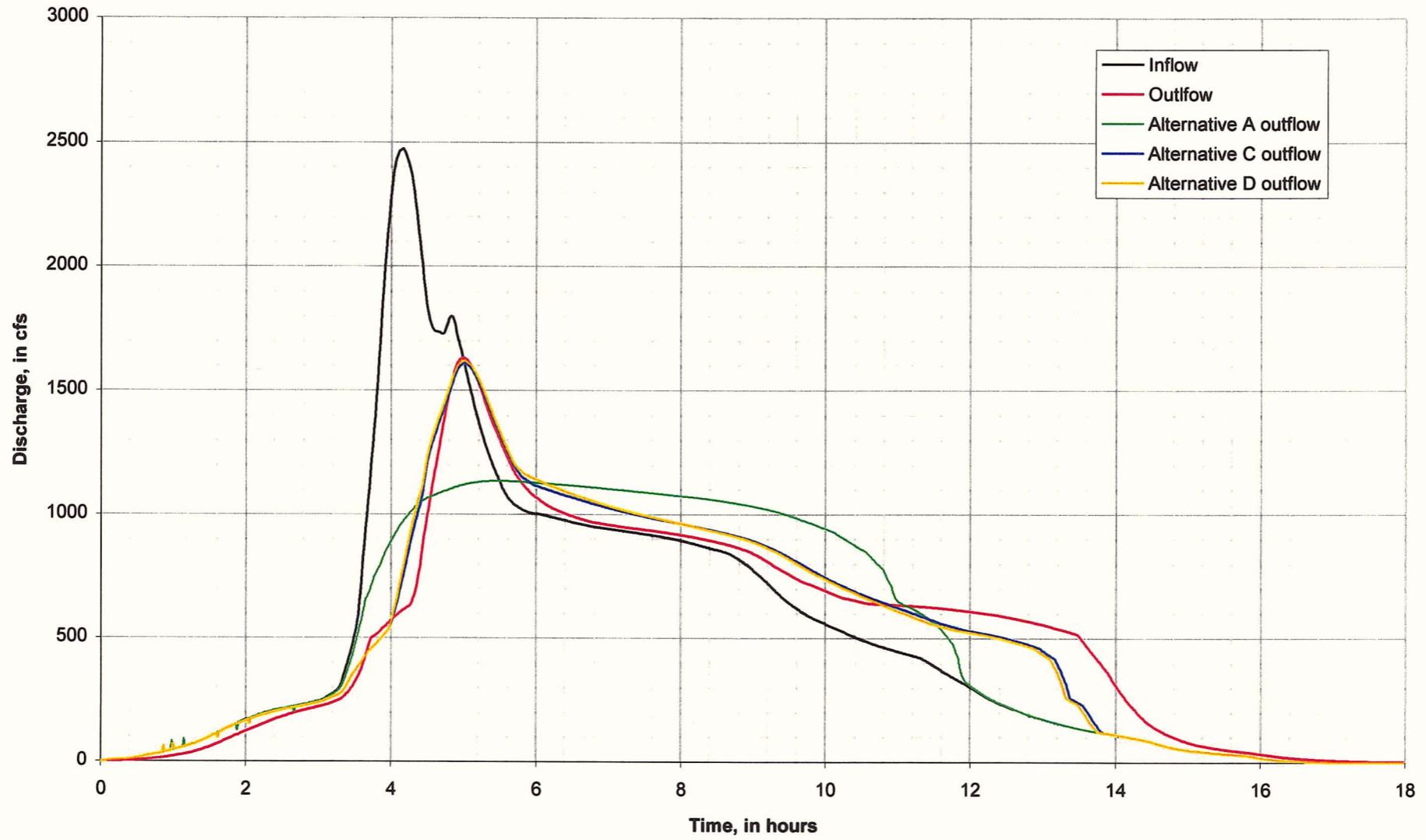
**Figure 3**  
**100-year, 6-hour 1994 conditions hydrographs for Golden Eagle Park Dam**



**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**



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