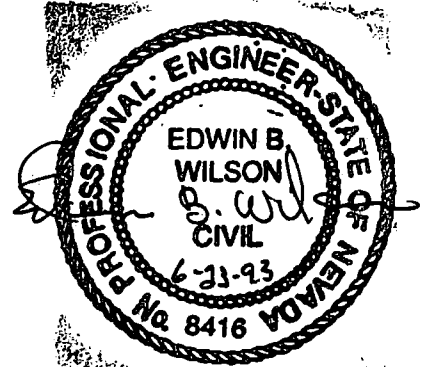


*Whites Creek Detention Facility  
Feasibility Study*  
Washoe County, Nevada

*Prepared for:*

Nevada Department of Transportation  
1263 South Stewart  
Carson City, Nevada



Nimbus Job # 9302

Revised June 1993



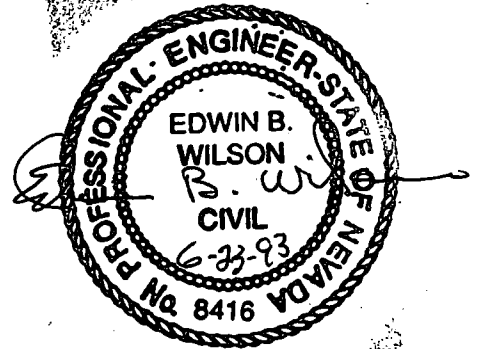
**Nimbus Engineers**  
3710 Grant Dr., Reno, NV 89509  
(702) 689-8630

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### Appendix

Harding Lawson Letter  
 HEC-1 Hydrologic Model  
 Whites Creek Split Flow Analysis  
 Split Flow Work Map



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## 1.0 Introduction

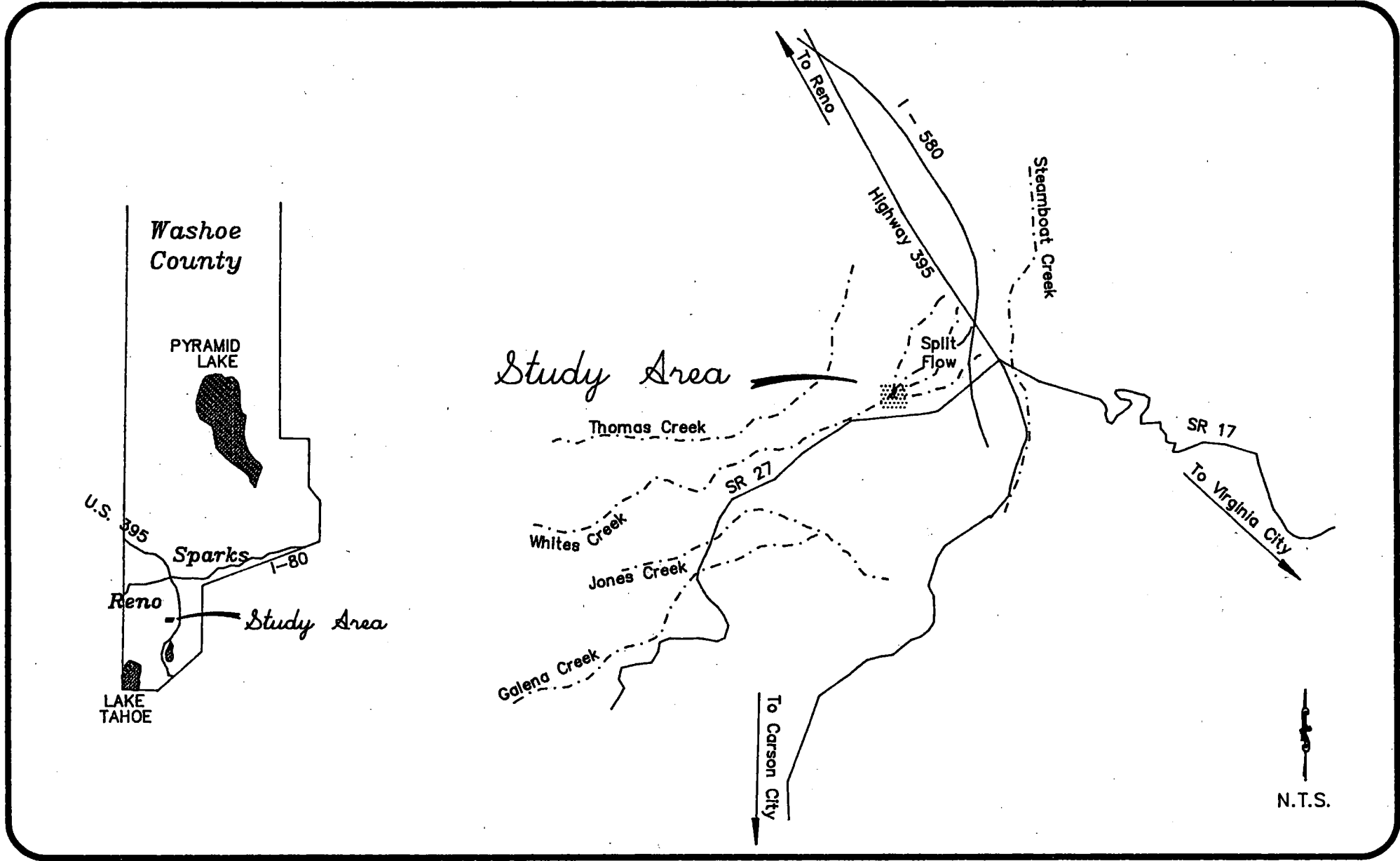
This study was prepared for the Nevada Department of Transportation (NDOT) under Agreement No. P107-93-010. The scope of the study was to evaluate the benefits of a detention basin on White's Creek in the South Truckee Meadows. NDOT is currently designing an elevated freeway extension of US 395/I 580 which will cross all four branches of White's Creek. Washoe County has prepared a concept level Flood Control Master Plan which proposes a detention basin on White's Creek which will mitigate the flood hazard to existing and future development. This study was authorized to prepare technical data, i.e. existing peak flows and approximate flood limits and to apply that data in the evaluation of the effectiveness of a detention facility. Preliminary meetings were held between NDOT and Washoe County to discuss the possibility of a joint project. NDOT would contribute the savings realized from the reduced sizes of drainage structures to the construction costs of the potential basin. The location of the proposed project is shown on Figure 1.

The proposed elevated freeway extension is located in the designated floodplain of Whites Creek. The regulatory floodplain shown for this area indicates that Whites Creek diverges into four distinct branches in Section 30, Township 17N, Range 18E which is approximately 2 miles upstream of the proposed freeway alignment. One of the alternative solutions for collecting and conveying the peak 100-Year flows under the proposed freeway, which is being reviewed, is a detention basin upstream. A detention basin could reduce the peak flow to a flow more easily managed, possibly to a single structure location instead of four separate locations.

This analysis was prepared to establish an acceptable peak discharge and runoff hydrograph suitable for a preliminary detention basin feasibility analysis. Much of the information in this report has been based on a previous feasibility study by Nimbus Engineers for a detention facility at Huffaker Narrows (Reference 5). Whites Creek was analyzed in that study as a contributing watershed. Substantial revision was necessary to incorporate additional concentration points and to include a higher level of detail in the analysis.

## 2.0 Physical Description

Whites Creek originates in the Sierra Nevada Range and flows to the East into Steamboat Creek (See Figure 2). Approximately 2 miles upstream of Virginia Street, the watercourse diverges into four smaller channels. These channels travel east as wide, shallow flow across South Virginia then reunite and flow north towards the Double Diamond Ranch. Because of the wide and shallow characteristics of the flood flows, collection and management of the flood flows would be difficult.

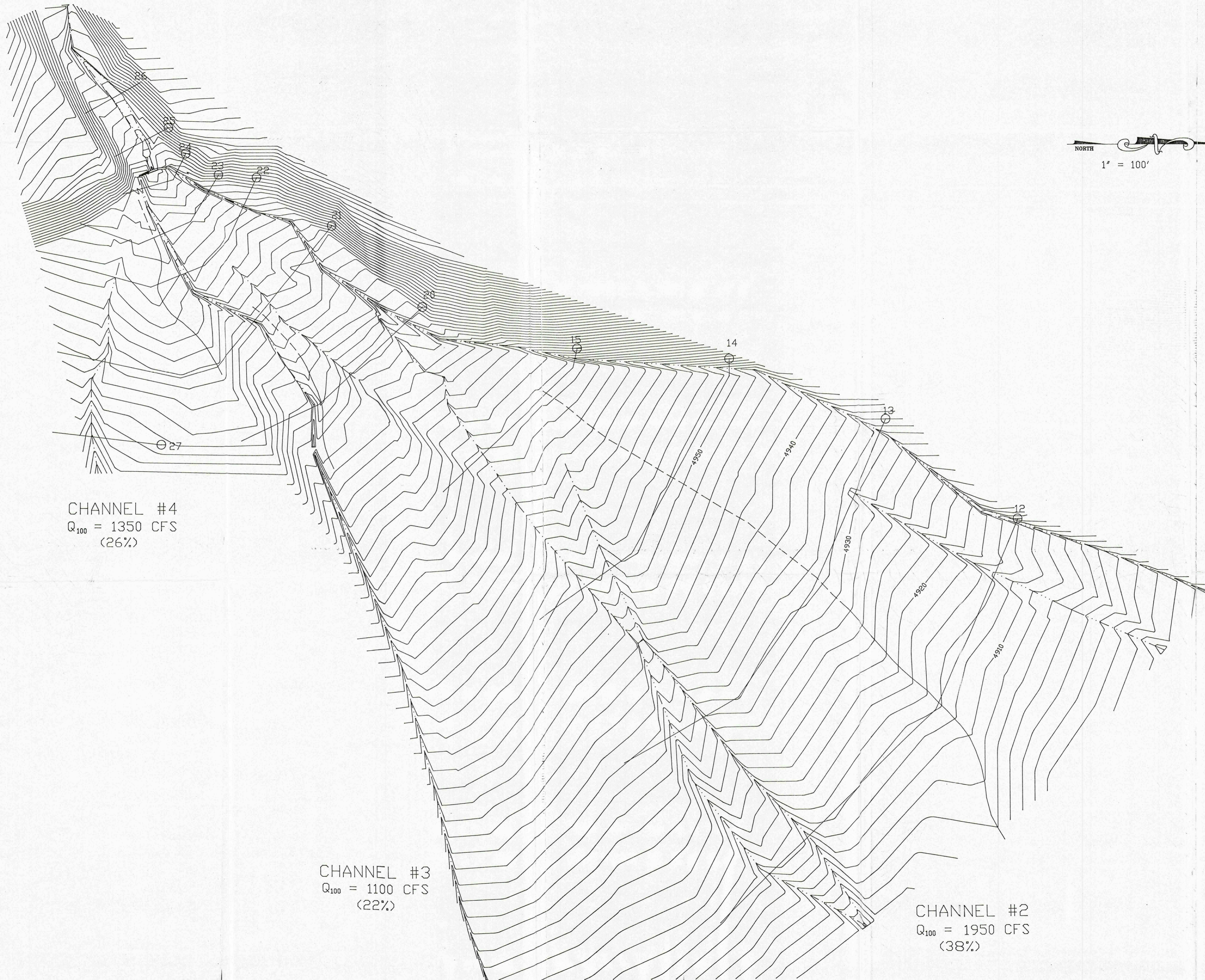


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Figure 1  
Vicinity Map

Job No. : 9302

Date : June 1993



NORTH  
1" = 100'

CHANNEL #4  
Q<sub>100</sub> = 1350 CFS  
(26%)

CHANNEL #1  
Q<sub>100</sub> = 700 CFS  
(14%)

CHANNEL #3  
Q<sub>100</sub> = 1100 CFS  
(22%)

CHANNEL #2  
Q<sub>100</sub> = 1950 CFS  
(38%)

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SPLIT FLOW  
WORK MAP

Fema Contract # :

Nimbus Job # :  
9301

Date :  
March 1993

Scale :

Drawing Name :  
301white.dwg

Sheet # :  
of

The contributing watershed extends to an elevation of over 10,600 feet. The diffidence is at an elevation of approximately 5,000 feet. The basin is vegetated mainly with pine trees and mahogany brush in the upper subbasins and sagebrush, pasture and residential areas in the lower subbasins. Approximately 16 square miles contribute runoff to the proposed freeway and approximately 9 square miles of the watershed is upstream of the proposed detention facility site.

### **3.0 Preliminary Soils & Geologic Analysis**

Harding Lawson & Associates was retained by Nimbus (with NDOT approval) to review and research existing available data concerning geologic constraints and soils conditions. They were unable to do new field sampling or investigation because right-of-entry onto private property could not be obtained within the specified schedule. Their investigation was limited to a literature search and a site investigation on the public property. Several sites were selected for their evaluation. Their verbal recommendations were: 1) that the facility be placed at grade due to active faults in the area, 2) that the facility be used for flood control only not as reservoir storage and 3) that the preferred site based upon information available be near the diffidence or further downstream.

### **4.0 Hydrologic Analysis**

The SCS methods were used in the Corps of Engineers hydrologic computer model (HEC-1) to estimate the 100-Year discharges for all the contributing areas. The 100-Year event is an event with a one percent chance of occurring in any given year.

The following parameters were used within the models to calculate runoff:

- 1) Basin area in square miles.
- 2) Runoff curve number, which relates how much rainfall will become runoff for a given basin. The number is based upon soil type, relative soil moisture content, impervious areas, vegetation type and cover density.
- 3) Rainfall depth, duration, and distribution.
- 4) Basin lag time, which is defined as the time from the center of mass of rainfall excess to the peak discharge, expressed in hours.
- 6) Hydrograph routing parameters.

Table 1 on page 7 presents the parameters for each basin which were selected for this study.

### **Basin Area**

The watershed boundaries were identified using USGS quadrangle maps (Reference 14) and field inspection. The area of each contributing drainage area was measured from the maps.

### **Curve Numbers**

To estimate a curve number, the types of soil within the basin must be identified by a hydrologic group. Soils are classified by the SCS into four hydrologic soil groups; A, B, C and D. Group A soils have a rapid infiltration rate and include very porous soils such as sandy soils. Group D soils have a very slow infiltration rate which results in a larger percentage of the rainfall expressed as runoff. For this study, the soil groups determined in the Huffaker study were reevaluated with more detail which resulted in a larger percentage of more porous soils and consequently lower curve numbers.

Types of soils and their respective hydrologic groups were identified using the SCS Soil Survey for Washoe County (Reference 6).

Relative soil moisture content is described in the SCS methodology by a term identified as "antecedent moisture condition" (AMC). Three different relative conditions are described by the SCS: AMC I, II and III. AMC I is an extremely dry condition where soil moisture has been depleted and infiltration rates for the soil are near their maximum, and AMC III is a saturated condition. AMC II is an average condition. This condition is the standard used for hydrologic analysis in the Western States and was used in selecting the appropriate table of curve numbers.

Vegetation and cover density for the drainage areas were determined from field inspection and United States Forest Service (USFS) color aerial photos.

Using the above mentioned information, curve numbers were selected using the tables in SCS TR-55 and NEH-4 (References 7 and 8). As a basin is typically comprised of multiple hydrologic soil groups, cover densities, and vegetative cover; a weighted average of these parameters was calculated to determine a composite curve number for each basin.

## **Rainfall**

A SCS Type II storm was selected for this modeling effort after discussions with NDOT and Washoe County. It was the consensus during the discussion that there is a high likelihood of a thunderstorm being the most severe event due to the shape of the watershed and the historic high flows on adjacent Galena Creek. This distribution is a dimensionless temporal distribution developed by the SCS using regional averages.

The 100-Year, 24 Hour point rainfall depths used in the HEC-1 models were obtained from NOAA Atlas 2, Volume VII - Nevada (Reference 13). As the watershed area above the proposed site is less than 10 square miles, areal reduction of the rainfall was neglected.

## **Basin Lag**

Basin travel time, or time of concentration, is the time it takes for water to reach the outlet from the hydraulic most distant point in the basin. Travel times were developed using the Upland Method described in NEH-4. This method estimates flow velocity based on channel slope and ground cover.

Due to the variability of the channel characteristics, all travel times were calculated on a reach by reach analysis. The resulting travel times were then multiplied by the empirical factor of 0.6 (NEH-4) to obtain the subbasin lag time.

## **Routing**

Channel routing and overland flow routing were performed with the Muskingum method. The parameters for the reaches modeled with the Muskingum method were estimated using channel and overbank characteristics, lengths, slopes and typical roughness. Manning's equation and the Upland Method were used to estimate flow velocity, and the guidelines included in the HEC-1 manual were used to estimate values for  $k$ ,  $t$ , and  $x$  (Reference 10).

Routing through the proposed detention basin was done with the Modified Puls Method in the HEC-1 model.

The following table presents selected subbasin parameters developed.

<p style="text-align: center;"><b>TABLE 1</b></p> <p style="text-align: center;"><b>WHITES CREEK</b></p> <p style="text-align: center;"><b>SUBBASIN PARAMETERS</b></p>				
Subbasin	Area sq. mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in.
W1R	1.36	63	0.21	5.50
W2R	0.84	65	0.17	5.40
W3R	1.38	65	0.23	5.25
W4R	1.47	57	0.27	5.00
W5R	1.27	58	0.28	4.80
W6R	1.43	57	0.44	4.10
W7R	0.85	68	0.17	3.40
W8R	0.75	65	0.29	3.00
W9R	2.39	69	0.51	2.80
W10R	0.30	55	0.32	2.80
W11R	0.32	75	0.27	2.70
W12R	0.60	61	0.45	2.80
W13R	2.00	61	0.52	2.80
W14R	0.18	77	0.26	2.70
W15R	0.21	79	0.21	2.70
W16R	0.11	81	0.21	2.70
W17R	0.58	67	0.31	2.80
W18R	0.85	80	1.33	2.70
W19R	0.33	60	0.22	2.75
W20R	0.22	61	0.22	2.73

## **Diversions**

As mentioned earlier, Whites Creek diverges into four less defined channels as the creek exits the steeper portion of the watershed. Individually, these channels do not have the capacity to convey the 100-Year discharge (Approximately 5100 cfs). A small diversion structure has been built which directs low flows into channels #1 and #3. Due to the constant water supply, these two channels are heavily vegetated with brush and willow trees and appear to be quite stable. The other two channels remain dry until flood events and are cleaner channels with silty, gravelly bottoms and vegetated with sagebrush in the overbanks.

The small capacity of the channels and dense vegetation at the difffluence made the determination of a flow distribution difficult. For this analysis, the assumption was made that the channels would not significantly degrade or migrate and that flood debris would not significantly redirect flows. Nimbus realizes these conditions could occur to some degree but also feels that with the weight of that uncertainty the results of this analysis are reasonable to use as design flows for this project.

A previous study by SEA Engineering (1980) estimated the percent of flow in each channel, however, a copy of that report has not been located. It is not known how the distribution was determined, but it is understood the report states that 75% of the total flow is contained within channel #1, and the remaining 25% is equally distributed among the other three channels (channels #2, 3 and 4).

Nimbus estimated the distribution of flows using a ratio of available conveyance. Survey data was collected around this difffluence to supplement existing topography. Using this data, cross section geometries and slopes were coded into the U.S. Army Corps of Engineers' water surface program, HEC-2 (Reference 9). This program estimates a water surface elevation based on standard hydraulic equations. All the information used to develop the distribution, including cross sections, and a workmap showing topography and cross section layout is included in the appendix.

Using the detailed output from the HEC-2 model, a flow distribution within each section was determined and consequently a channel capacity. The model was refined until producing a consistent distribution within itself (i.e. the distribution within a cross section should be similar to the adjacent upstream and downstream section).

Split flow also occurs approximately 8,000 feet downstream of this difffluence. Channels #2 and 3 commingle for a distance then diverge again. The distribution of flow between the channels was determined in a similar manner resulting in an equal split.

Additionally, a third flow split occurs near channel #1 and Zolezzi Lane. The amount of split flow is controlled by inadequate channel capacity upstream of Zolezzi Lane.

The capacity of the channel was determined with Manning's Equation. Flows over this amount were diverted east along Zolezzi Lane towards Virginia Street. The information used to determine these split flow estimations are also included in the appendix.

The following table presents the 100-Year values computed.

<b>TABLE 2</b> <b>WHITES CREEK</b> <b>SUMMARY OF DISCHARGES</b>	
Concentration Point	100-Year Discharge CFS
@ Diffluence	5100
Channel #1B @ Proposed I-580	170
Channel #1 & #2 @ Proposed I-580	1850
Channel #3 @ Proposed I-580	1350
Channel #4 @ Proposed I-580	1550
@ CP DD (Southern Property Line of Double Diamond Ranch)	4450

In order to prepare a basin design, a hydrograph was also developed during this analysis. The total volume of runoff was calculated to be 593 acre feet with a peak flow of 5100 cfs as noted in Table 2. The goal of the project was to reduce the peak flow to 1000 cfs. As illustrated in the design hydrograph shown in Figure 3, 230 acre feet must be stored.

### 5.0 Proposed Detention Basin

The analysis for the basin feasibility was developed based on several variables including hydraulic and hydrologic efficiencies of the sites, topographic and geologic considerations, land value and identifiable benefits to the lower reaches of the watershed; consideration was also given to the project's construction schedule. The impacts of time required for permit application, review and approval from the Federal Government and Corps of Engineers were considered as major constraints.

Because of the diversion into four less defined channels at the diffluence, which is located in Section 30, Township 17N, Range 18E, the possible basin locations were

determined to be in the area of the diffidence for maximum benefit. A location further upstream was reviewed; however, because of the large number of recent active faults in that area and verbal information received from Harding Lawson, further investigation was abandoned.

Three alternative locations in Section 30 were analyzed. Alternative #1 was located immediately upstream and generally northeast of the diffidence. The natural gradient of the area ranged from approximately 7% to 12.5%. The preliminary analysis indicated that the total storage capacity of 230 acre feet would require at least 5 individual basins in order to control the size of the cut slope in the storage area. This alternative would require approximately 47 acres of land for construction of the basin site.

Alternative #2 was located at the diffidence and incorporated the existing county park area as well as approximately 32 additional acres to the south and east of the diffidence. The basin would utilize a multi-level structure in order to minimize the embankment required for the storage.

The third alternative was located north and east of the diffidence and would require approximately 35 acres. Both the areas for Alternatives #2 and #3 have natural slopes of approximately 6% and will require at least 4 separate basins to accommodate the required 230 acre feet of storage.

The targeted peak 100-Year flow of 1000 cfs from the basin was established by hydrograph comparison to optimize the ratio between the storage requirements and the discharge rate. The 1000 cfs discharge and the 230 acre-feet of storage appears to achieve the optimum benefit. A 50% further reduction in discharge, to approximately 500 cfs total, would require a minimum of an additional 50% of storage or 350+ acre feet total volume. The attenuated peak flows from the basins, for the purposes of this study, were divided into each of the four existing downstream channels. The diverted flow quantities were based on the percentages of the natural peak flow splits under existing conditions. Other discharge scenarios are possible and can be evaluated in more in-depth studies.

Based on discussions with Washoe County and review of the assessors valuations of the properties, it appears that Alternative #3 would require the least costly right-of-way. Alternative #2 would equal Alternative #1 for land costs in excess of 25% more than Alternative #3.

The estimated construction costs of each alternative were nearly equal. The excavation required for the basins is approximately 1 million cubic yards. The Nevada Department of Transportation has indicated if the material is suitable, it may be used as embankment material for the freeway. Preliminary indications are that the material can be utilized.

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ESTIMATED OUTFLOW CURVE  
 1000 CFS MAXIMUM  
 ESTIMATED OUTFLOW CURVE  
 500 CFS MAXIMUM

**Figure 3**  
**Design Hydrograph**



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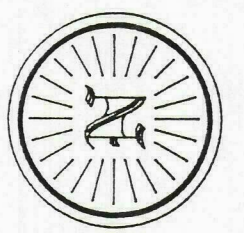
Job No. : 9302

Date : June 1993



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Figure 4  
 Detention Basin Configuration

Nimbus Job # :	9302
Date :	April 1993
Scale :	1" = 100'
Drawing Name :	302DET.DWG
Sheet # :	of

The basin slopes shown on Figure 4 vary from 2:1 (horizontal to vertical) to 3:1. It is assumed (prior to further study) that these cut slopes will be stable. All embankments are designed at 3:1 slopes and will have a minimum of 3 foot of freeboard above the emergency spillway elevation.

After careful review of the preliminary information, it is Nimbus Engineers' opinion that Alternative #3 shown on Figure 4 is the most favorable and cost effective detention basin site. If the project proceeds into the final design and property acquisition stage, not only will property purchases be included in the acquisition, but also access and drainage easements. The easements will be necessary for basin management and accessibility and for minimal disruption of private property during the construction as well as the operation and maintenance of the basin.

### **6.0 Conclusions and Recommendations**

Based on the results of this analysis, a detention facility is a feasible option for controlling flood waters within the White's Creek basin. An approximate thirty-five acres of right-of-way will be required to reduce peak 100-Year flows from 5000 to 1000 cfs. Further reduction can take place with additional area and excavation; however, it does not appear that it would be cost effective.

As a function of the basin feasibility, NDOT has indicated that if the basin excavated material meets their specifications it would be used in the embankment of the freeway extension. Sampling and materials testing should be required as one of the first major tasks, if the basin concept is adopted and approved for further design. If the material meets or exceeds NDOT's requirements, the cost benefit is there to further pursue the basin concept. Depending upon the cost effectiveness of the excavation scheme, a larger basin to further reduce flows may be appropriate to consider in final design.

The additional benefits to be realized from the construction of the basin as presented is:

1. Substantially reduced number and size of drainage structures required to convey the White's Creek flows under the US 395/I-580 extension.
2. Public and private properties downstream of the basin location would be protected from the 100-Year floods especially those properties adjacent to South Virginia Street. Under existing conditions, these properties are potentially subject to sheet flows up to 3 feet deep.
3. The attenuated flows would substantially reduce the size of future drainage structures across developable land between the freeway and Steamboat Creek.

4. The attenuated flows would protect properties along Zolezzi Lane which are subject to flows from diversion channel #1.
5. The homes in the Homestead Lot area directly below the diffidence of White's Creek virtually stand in the mouth of the canyon. The proposed basin is the only practical solution to their flood hazard potential. Without the basin, their probability of severe flood damage is equal to the probability of a 25-Year event, or in some cases a less frequent storm.

As information was developed, joint meetings were held with NDOT and Washoe County staff. Informal meetings were also held with other interested parties including developers (and their representatives) of properties which would benefit from the construction and two Washoe County Commissioners. The County staff and commissioners requested that the information be presented at a public hearing during a regularly scheduled commission meeting and at the Citizens Advisory Board (CAB). The decision to proceed was made with the next step in the process being the public presentation.

A presentation of the study findings was made as an agenda item on the CAB regularly scheduled meeting April 22, 1993. The citizens and home owners present at that meeting demonstrated no support for the basin. The flood potential of the area below the diffidence did not seem to be a real threat to any of those present. The CAB voted to oppose the project at the public hearing at the County Commissioner's meeting. At the County Commissioner's meeting of Tuesday, April 27, 1993 the commissioners voted to reject NDOT's offer.

Based on the public and political reception of the plan, the concept was abandoned and the NDOT design for the US 395/I-580 extension will proceed without the benefit of the basin alternative.

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## **7.0 References (cont.)**

14. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 10, 20, and 40 feet: Mount Rose NE (1982) Steamboat (1982) Mount Rose NW (1982) Mount Rose (1982), Nevada.
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16. U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Bridge Division, Hydraulic Branch, Hydraulic Charts for the Selection of Highway Culverts, Hydraulic Engineering Circular No. 5, June 1980.

*HEC-1 Model*

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# HYDROLOGIC ENGINEERING CENTER    #
#   609 SECOND STREET              #
#   DAVIS, CALIFORNIA 95616        #
#   (916) 756-1104                 #
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1

HEC-1 INPUT

PAGE 1

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4         ID   100-Year, 24 hour model
5         ID   This model was taken from file : 301WHITE.DAT
6         ID
7         ID
8         ID   Revisions include :
9         ID   1) Hypothetical rainfall distribution from NOAA (PH) replaced w/ Type II
10        ID   - 15 minute time interval Type II
11        ID   2) Rainfall Pt. values taken from Huffaker Detailed Parameters notebook
12        ID   3) Revised Curve Numbers based on detailed soils analysis
13        ID   4) Subbasins W7 & W8 revised for CP at Difffluence
14        ID   5) Add detention modeling
15        ID
16        ID   Legend :
17        ID   W(No.)R = Subbasin
18        ID   CP XX = Combine flows at point XX
19        ID   RT XX = Route to CP XX
20        ID   DV XX = Divert hydrograph XX
21        ID   DR XX = Recall hydrograph XX
22        ID   XX = Street and Channel #, where applicable
23        ID   V = Virginia, I = Zolezzi, F = 580 (Freeway), W = Wedge
24        ID
25        ID
26        ID   5

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 78 KK W6R Whites Creek No. 6  
 79 BA 1.43  
 80 PB 4.1  
 81 LS 57  
 82 UD 0.44  
 83 KK W6+CH Combine W6 and channel  
 84 HC 2  
 85 KK RT-D Route to pt D  
 86 RM 1 0.122 0.4

HEC-1 INPUT

PAGE 3

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

87 KK W7R Whites Creek No. 7  
 88 BA 0.85  
 89 PB 3.4  
 90 LS 68  
 91 UD 0.17  
 92 KK W7+CH Combine W7 and channel  
 93 HC 2  
 94 KK RT-DIF Route flows to Difffluence  
 95 RM 1 0.104 0.4  
 96 KK W8R Whites Creek No. 8  
 97 BA 0.75  
 98 PB 3.0  
 99 LS 65  
 100 UD 0.29  
 101 KK CP DIF Combine flows at Difffluence  
 102 KO 0 2  
 103 HC 2  
 104 KK ST DEB Route flows through Debris Basin  
 105 RS 1 FLOW 0 0  
 106 SA 0.67 1.33  
 107 SE 4950 4960  
 108 SS 4955 155 3 1.5  
 109 KK DV SP Divert Flows into South Pond  
 † Main Pond (MP) flow are diverted  
 110 DT MP  
 111 DI 0 5100  
 112 DQ 0 4200  
 113 KK ST SP Route Flows through South Pond  
 114 RS 1 FLOW 0 0  
 † Values for El. 4960 are estimated  
 115 SA 2.8 4.0 4.8  
 116 SE 4940 4952 4960  
 † Outflow is a 4' x 3.0' RCB  
 117 SL 4941.5 12 0.8 0.5  
 118 SS 4955 200 3 1.5  
 119 KK DR MP Recall Main Pond Flows (MP)  
 120 DR MP  
 121 KK ST MP Route flows through Main Pond  
 122 RS 1 FLOW 0 0

\* Values for El. 4930 are estimated

123	SA	7.6	11.25	12.2	
124	SE	4905	4925	4930	
125	SL	4906.5	21	0.8	0.5
126	SS	4925	200	3	1.5

HEC-1 INPUT

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

127	KK	DV NP	Divert flows into Channels 2 and 3, Flows into North Pond remain		
128	KM		2 and 3 are orifice flow (SL), weir flows into NP (SS)		
129	DT	2&3			
130	DI	0	575	1500	
131	DQ	0	575	580	

132	KK	ST NP	Route flows through North Pond		
133	RS	1	FLOW	0	0

\* Values for El. 4915 are estimated

134	SA	2.92	3.95	4.2	
135	SE	4900	4912	4915	
136	SL	4901.5	9	0.8	0.5
137	SS	4914.5	200	3	1.5
138	ZZ				

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.	(V) ROUTING	(---) DIVERSION OR PUMP FLOW
	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
29	W1R	
44	W2R	
49	W1+W2.....	
	V	
51	RT-A	
53	W3R	
	V	
58	RT-A	
60	W4R	
65	W1234.....	
	V	
67	RT-B	
69	W5R	
74	W5+CH.....	
	V	
76	RT-C	

```

78      .      W6R
      .
      .
83      W6+CH.....
      V
      V
85      RT-D
      .
      .
87      .      W7R
      .
      .
92      W7+CH.....
      V
      V
94      RT-DIF
      .
      .
96      .      W8R
      .
      .
101     CP DIF.....
      V
      V
104     ST DEB
      .
      .
110     .----->    MP
109     DV SP
      V
      V
113     ST SP
      .
      .
120     .      .<-----    MP
119     .      DR MP
      .      V
      .      V
121     .      ST MP
      .
      .
129     .      .----->    2&3
127     .      DV NP
      .      V
      .      V
132     .      ST NP

```

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
$
$ FLOOD HYDROGRAPH PACKAGE (HEC-1) $
$ SEPTMBER 1990 $
$ VERSION 4.0 $
$ RUN DATE 03/31/1993 TIME 10:45:43 $
$
*****

```

```

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

```

100-Year, 24 hour model  
This model was taken from file : 301WHITE.DAT

Revisions include :

- 1) Hypothetical rainfall distribution from NOAA (PH) replaced w/ Type II - 15 minute time interval Type II
- 2) Rainfall Pt. values taken from Huffaker Detailed Parameters notebook
- 3) Revised Curve Numbers based on detailed soils analysis
- 4) Subbasins W7 & W8 revised for CP at Difffluence
- 5) Add detention modeling

Legend :

W(No.)R = Subbasin  
CP XX = Combine flows at point XX  
RT XX = Route to CP XX  
DV XX = Divert hydrograph XX  
DR XX = Recall hydrograph XX  
XX = Street and Channel #, where applicable  
V = Virginia, I = Zolezzi, F = 580 (Freeway), W = Wedge

27 IO            OUTPUT CONTROL VARIABLES  
                  IPRNT            3    PRINT CONTROL  
                  IPLT            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            289    NUMBER OF HYDROGRAPH ORDINATES  
                  NDDATE            2    0    ENDING DATE  
                  NDTIME            0000    ENDING TIME  
                  ICENT            19    CENTURY MARK

                  COMPUTATION INTERVAL    .08 HOURS  
                  TOTAL TIME BASE    24.00 HOURS

ENGLISH UNITS

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

\*\*\*\*\*

29 KK            \*\*\*\*\*  
                  +            +  
                  +            WIR    +            Whites Creek I  
                  +            +  
                  \*\*\*\*\*

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

SUBBASIN RUNOFF DATA





UNIT HYDROGRAPH  
12 END-OF-PERIOD ORDINATES

583. 1765. 1813. 1137. 570. 305. 161. 84. 45. 24.  
14. 5.

\*\*\* \*\*

HYDROGRAPH AT STATION WZR

TOTAL RAINFALL = 5.40, TOTAL LOSS = 3.47, TOTAL EXCESS = 1.93

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
1095.	12.08	142.	43.	43.	43.
		(INCHES) 1.571	1.924	1.924	1.924
		(AC-FT) 70.	86.	86.	86.

CUMULATIVE AREA = .84 SQ MI

\*\*\*\*\*

49 KK # W1+W2 # Combine W1 and W2  
# #  
\*\*\*\*\*

50 HC HYDROGRAPH COMBINATION  
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\* \*\*

HYDROGRAPH AT STATION W1+W2

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
2574.	12:08	361.	110.	110.	110.
		(INCHES) 1.524	1.867	1.867	1.867
		(AC-FT) 179.	219.	219.	219.

CUMULATIVE AREA = 2.20 SQ MI

\*\*\*\*\*

51 KK # RT-A # Route to pt A  
# #  
\*\*\*\*\*

HYDROGRAPH ROUTING DATA



.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

56 LS SCS LOSS RATE  
 STRTL 1.08 INITIAL ABSTRACTION  
 CRVNR 65.00 CURVE NUMBER  
 RTIMP .00 PERCENT IMPERVIOUS AREA

57 UD SCS DIMENSIONLESS UNITGRAPH  
 TLAG .23 LAG

\*\*\*

UNIT HYDROGRAPH  
 16 END-OF-PERIOD ORDINATES

486.	1672.	2434.	2235.	1569.	897.	555.	334.	203.	123.
75.	46.	28.	18.	10.	2.				

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION W3R

TOTAL RAINFALL = 5.25, TOTAL LOSS = 3.43, TOTAL EXCESS = 1.82

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
+ 1442.	12.17	220.	67.	67.	67.
	(INCHES)	1.485	1.819	1.819	1.819
	(AC-FT)	109.	134.	134.	134.

CUMULATIVE AREA = 1.38 SQ MI

\*\*\*\*\*

58 KK RT-A Route to pt A

HYDROGRAPH ROUTING DATA

59 RM MUSKINGUM ROUTING  
 NSTPS 1 NUMBER OF SUBREACHES  
 AMSKK .09 MUSKINGUM K  
 X .40 MUSKINGUM X

\*\*\*

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION RT-A

PEAK FLOW      TIME                    MAXIMUM AVERAGE FLOW



64 UD

SCS DIMENSIONLESS UNITGRAPH  
FLAG .27 LAG

\*\*\*

UNIT HYDROGRAPH  
18 END-OF-PERIOD ORDINATES

366.	1222.	2123.	2264.	1893.	1267.	791.	523.	332.	219.
140.	90.	59.	38.	25.	17.	10.	4.		

\*\*\*            \*\*\*            \*\*\*            \*\*\*            \*\*\*

HYDROGRAPH AT STATION W4R

TOTAL RAINFALL = 5.00, TOTAL LOSS = 3.90, TOTAL EXCESS = 1.10

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
758.	12.17	138.	44.	44.	44.
		(INCHES) .875	1.101	1.101	1.101
		(AC-FT) 69.	86.	86.	86.

CUMULATIVE AREA = 1.47 SQ MI

\*\*\*\*\*

65 KK

\*\*\*\*\*  
\*            \*  
\*    W1234   \*  
\*            \*  
\*\*\*\*\*

Combine W1-W4

66 HC

HYDROGRAPH COMBINATION

ICOMP            3 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\*            \*\*\*            \*\*\*            \*\*\*            \*\*\*

HYDROGRAPH AT STATION W1234

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
4553.	12.25	719.	221.	221.	221.
		(INCHES) 1.323	1.629	1.629	1.629
		(AC-FT) 356.	439.	439.	439.

CUMULATIVE AREA = 5.05 SQ MI

\*\*\*\*\*

47 YV

\*\*\*\*\*  
\*            \*  
\*    RT-R   \*  
\*            \*

Route to pt R



.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

72 LS SCS LOSS RATE  
 STRTL 1.45 INITIAL ABSTRACTION  
 CRVNBR 58.00 CURVE NUMBER  
 RTIMP .00 PERCENT IMPERVIOUS AREA

73 UD SCS DIMENSIONLESS UNITGRAPH  
 TLAG .28 LAG

\*\*\*

UNIT HYDROGRAPH  
 19 END-OF-PERIOD ORDINATES

292.	963.	1728.	1902.	1648.	1174.	729.	484.	320.	208.
137.	89.	59.	39.	25.	18.	12.	6.	1.	

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    WSR

TOTAL RAINFALL = 4.80, TOTAL LOSS = 3.74, TOTAL EXCESS = 1.06

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
+ 609.	12.25	115.	36.	36.	36.
	(INCHES)	.840	1.057	1.057	1.057
	(AC-FT)	57.	72.	72.	72.

CUMULATIVE AREA = 1.27 SQ MI

\*\*\* \*\*\*

74 KK                    W5+CH                    Combine W5 and channel

75 HC                    HYDROGRAPH COMBINATION  
 ICOMP                    2    NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    W5+CH

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
5138.	12.25	833.	257.	257.	257.
		(INCHES) 1.226	1.513	1.513	1.513
		(AC-FT) 413.	510.	510.	510.

CUMULATIVE AREA = 6.32 SQ MI

\*\*\*\*\*

```

*****
#
76 KK # RT-C # Route to pt C
#
*****

```

HYDROGRAPH ROUTING DATA

```

77 RM MUSKINGUM ROUTING
      NSTPS      2 NUMBER OF SUBREACHES
      AMSKK      .19 MUSKINGUM K
      X          .40 MUSKINGUM X

```

\*\*\*

HYDROGRAPH AT STATION RT-C

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
4855.	12.50	833.	256.	256.	256.
		(INCHES) 1.225	1.507	1.507	1.507
		(AC-FT) 413.	508.	508.	508.

CUMULATIVE AREA = 6.32 SQ MI

\*\*\*\*\*

```

*****
#
78 KK # W6R # Whites Creek No. 6
#
*****

```

SUBBASIN RUNOFF DATA

```

79 BA SUBBASIN CHARACTERISTICS
      TAREA      1.43 SUBBASIN AREA

```

PRECIPITATION DATA

```

80 PB STORM      4.10 BASIN TOTAL PRECIPITATION

```



\*\*\*\*\*

83 KK W6+CH Combine W6 and channel

84 HC HYDROGRAPH COMBINATION ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

HYDROGRAPH AT STATION W6+CH

Table with columns: PEAK FLOW (CFS), TIME (HR), MAXIMUM AVERAGE FLOW (6-HR, 24-HR, 72-HR, 24.00-HR). Values include 5132.0 CFS peak flow and 7.75 SQ MI cumulative area.

\*\*\*\*\*

85 KK RT-D Route to pt D

HYDROGRAPH ROUTING DATA

86 RM MUSKINGUM ROUTING NSTPS 1 NUMBER OF SUBREACHES AMSKK .12 MUSKINGUM K X .40 MUSKINGUM X

\*\*\*\*\* WARNING \*\*\*\*\* POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH RT-D. REDUCE NSTPS OR DECREASE YOUR COMPUTATION INTERVAL (FIRST FIELD OF THE IT RECORD).

\*\*\*

HYDROGRAPH AT STATION RT-D

Table with columns: PEAK FLOW (CFS), TIME (HR), MAXIMUM AVERAGE FLOW (6-HR, 24-HR, 72-HR, 24.00-HR). Values include 5055.0 CFS peak flow and 7.75 SQ MI cumulative area.



\*\*\* \*\*

HYDROGRAPH AT STATION W7R

TOTAL RAINFALL = 3.40, TOTAL LOSS = 2.56, TOTAL EXCESS = .84

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
452.	12.08	62.	19.	19.	19.
		(INCHES) .677	.843	.843	.843
		(AC-FT) 31.	38.	38.	38.

CUMULATIVE AREA = .85 SQ MI

\*\*\*\*\*

92 KK \$ W7+CH \$ Combine W7 and channel  
 \$ \$  
 \*\*\*\*\*

93 HC HYDROGRAPH COMBINATION  
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\* \*\*

HYDROGRAPH AT STATION W7+CH

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
5163.	12.58	967.	300.	300.	300.
		(INCHES) 1.046	1.296	1.296	1.296
		(AC-FT) 480.	594.	594.	594.

CUMULATIVE AREA = 8.60 SQ MI

\*\*\*\*\*

94 KK \$ RT-DIF \$ Route flows to Difffluence  
 \$ \$  
 \*\*\*\*\*

HYDROGRAPH ROUTING DATA

95 RM MUSKINGUM ROUTING  
 NSTPS 1 NUMBER OF SUBREACHES  
 AMSKK .10 MUSKINGUM K  
 X .40 MUSKINGUM X



.00 .00 .00 .00 .00

99 LS SCS LOSS RATE  
STRTL 1.08 INITIAL ABSTRACTION  
CRVNBR 65.00 CURVE NUMBER  
RTIMP .00 PERCENT IMPERVIOUS AREA

100 UD SCS DIMENSIONLESS UNITGRAPH  
TLAG .29 LAG

\*\*\*

UNIT HYDROGRAPH  
19 END-OF-PERIOD ORDINATES

160. 520. 962. 1094. 975. 734. 458. 302. 206. 136.  
90. 59. 40. 27. 17. 12. 8. 5. 2.

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION WBR

TOTAL RAINFALL = 3.00, TOTAL LOSS = 2.49, TOTAL EXCESS = .51

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	24.00-HR	
151.	12.25	31.	10.	10.	10.	
		(INCHES)	.390	.504	.504	.504
		(AC-FT)	16.	20.	20.	20.

CUMULATIVE AREA = .75 SQ MI

\*\*\*\*\*

101 KK CP DIF Combine flows at Difffluence

102 KO OUTPUT CONTROL VARIABLES  
IPRNT 3 PRINT CONTROL  
IPLT 2 PLOT CONTROL  
QSCAL 0. HYDROGRAPH PLOT SCALE

103 HC HYDROGRAPH COMBINATION  
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION CP DIF

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW				
		6-HR	24-HR	72-HR	24.00-HR	
5115.	12.67	998.	309.	309.	309.	
		(INCHES)	.992	1.229	1.229	1.229
		(AC-FT)	495.	613.	613.	613.



10450 590  
10455 600  
10500 610  
10505 620  
10510 630  
10515 640  
10520 650  
10525 660  
10530 670  
10535 680  
10540 690  
10545 700  
10550 710  
10555 720  
10600 730  
10605 740  
10610 750  
10615 760  
10620 770  
10625 780  
10630 790  
10635 800  
10640 810  
10645 820  
10650 830  
10655 840  
10700 850  
10705 860  
10710 870  
10715 880  
10720 890  
10725 900  
10730 910  
10735 920  
10740 930  
10745 940  
10750 950  
10755 960  
10800 970  
10805 980  
10810 990  
10815 1000  
10820 1010  
10825 1020  
10830 1030  
10835 1040  
10840 1050  
10845 1060  
10850 1070  
10855 1080  
10900 1090  
10905 1100  
10910 1110  
10915 1120  
10920 1130  
10925 1140  
10930 1150  
10935 1160  
10940 1170  
10945 1180  
10950 1190  
10955 1200  
11000 1210  
11005 1220  
11010 1230  
11015 1240









MP DIVERSION HYDROGRAPH IDENTIFICATION

DI INFLOW .00 5100.00  
 DQ DIVERTED FLOW .00 4200.00

\*\*\*

\*\*\*      \*\*\*      \*\*\*      \*\*\*      \*\*\*

DIVERSION HYDROGRAPH      MP

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.00-HR
+ 4193.	12.67	822.	254.	254.	254.	
		(INCHES) .817	1.011	1.011	1.011	
		(AC-FT) 408.	504.	504.	504.	

CUMULATIVE AREA = 9.35 SQ MI

\*\*\*      \*\*\*      \*\*\*      \*\*\*      \*\*\*

HYDROGRAPH AT STATION      DV SP

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.00-HR
+ 899.	12.67	176.	54.	54.	54.	
		(INCHES) .175	.217	.217	.217	
		(AC-FT) 87.	108.	108.	108.	

CUMULATIVE AREA = 9.35 SQ MI

\*\*\*\*\*

113 KK      ST SP      Route Flows through South Pond

HYDROGRAPH ROUTING DATA

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

115 SA      AREA      2.8      4.0      4.8

116 SE      ELEVATION      4940.00      4952.00      4960.00

117 SL      LOW-LEVEL OUTLET  
 ELEV      4941.50      ELEVATION AT CENTER OF OUTLET  
 CAREA      12.00      CROSS-SECTIONAL AREA  
 COOL      .80      COEFFICIENT  
 FYPI      50      EXPONENT OF HEAD

118 SS

SPILLWAY

CREL 4955.00 SPILLWAY CREST ELEVATION  
 SPWID 200.00 SPILLWAY WIDTH  
 COGW 3.00 WEIR COEFFICIENT  
 EXPW 1.50 EXPONENT OF HEAD

\*\*\*

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	40.59	75.74
ELEVATION	4940.00	4952.00	4960.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	107.72	118.18	130.88	146.64	166.71	193.15	229.56	282.89
ELEVATION	4940.00	4941.50	4943.46	4943.86	4944.39	4945.13	4946.19	4947.79	4950.39	4955.00
OUTFLOW	291.13	342.18	475.44	730.70	1147.65	1765.37	2623.93	3763.00	5221.36	7039.36
ELEVATION	4955.05	4955.21	4955.46	4955.81	4956.26	4956.81	4957.46	4958.21	4959.05	4960.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	4.30	10.24	11.49	13.19	15.59	19.13	24.71	34.29	40.59
OUTFLOW	.00	.00	107.72	118.18	130.88	146.64	166.71	193.15	229.56	249.48
ELEVATION	4940.00	4941.50	4943.46	4943.86	4944.39	4945.13	4946.19	4947.79	4950.39	4952.00
STORAGE	53.02	53.26	53.92	55.01	56.54	58.52	60.96	63.88	67.31	71.25
OUTFLOW	282.89	291.13	342.18	475.44	730.70	1147.65	1765.37	2623.93	3763.00	5221.36
ELEVATION	4955.00	4955.05	4955.21	4955.46	4955.81	4956.26	4956.81	4957.46	4958.21	4959.05
STORAGE	75.74									
OUTFLOW	7039.36									
ELEVATION	4960.00									

\*\*\* WARNING \*\*\* MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 1765. TO 7039.  
 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.)

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION ST SP

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.00-HR
+ (CFS)	(HR)	(CFS)				
+ 245.	13.42	171.	53.	53.	53.	
		(INCHES)	.170	.212	.212	.212
		(AC-FT)	85.	106.	106.	106.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.00-HR
+ (AC-FT)	(HR)					
+ 39.	13.42	23.	9.	9.	9.	
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.00-HR
+ (FEET)	(HR)					
+ 4951.66	13.42	4947.03	4943.08	4943.08	4943.08	

CUMULATIVE AREA = 9.35 SQ MI

\*\*\* \*\*

119 KK DR MP Recall Main Pond Flows (MP)

120 DR RETRIEVE DIVERSION HYDROGRAPH
ISTAD MP DIVERSION HYDROGRAPH IDENTIFICATION

Table with 6 columns: PEAK FLOW (CFS), TIME (HR), HYDROGRAPH AT STATION, DR MP, MAXIMUM AVERAGE FLOW (6-HR, 24-HR, 72-HR, 24.00-HR). Values include 4193.12.67, 822.254.254.254, .817 1.011 1.011 1.011, 408.504.504.504.

CUMULATIVE AREA = .00 SQ MI

\*\*\* \*\*

121 KK ST MP Route flows through Main Pond

HYDROGRAPH ROUTING DATA

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

123 SA AREA 7.6 11.3 12.2

124 SE ELEVATION 4905.00 4925.00 4930.00

125 SL LOW-LEVEL OUTLET
ELEV 4906.50 ELEVATION AT CENTER OF OUTLET
CAREA 21.00 CROSS-SECTIONAL AREA
COOL .80 COEFFICIENT
EXPL .50 EXPONENT OF HEAD

126 SS SPILLWAY
CREL 4925.00 SPILLWAY CREST ELEVATION
SPWID 200.00 SPILLWAY WIDTH
COQW 3.00 WEIR COEFFICIENT
EXPW 1.50 EXPONENT OF HEAD



DI	INFLOW	.00	575.00	1500.00
DD	DIVERTED FLOW	.00	575.00	580.00

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DIVERSION HYDROGRAPH      2&3

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.00-HR
+ 579.	13.33	538.	218.	218.	218.	218.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	267.	433.	433.	433.

CUMULATIVE AREA = .00 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION      DV NP

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.00-HR
+ 729.	13.33	83.	21.	21.	21.	21.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	41.	41.	41.	41.

CUMULATIVE AREA = .00 SQ MI

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132 KK | ST NP | Route flows through North Pond
|
|
*****

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HYDROGRAPH ROUTING DATA

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

134 SA	AREA	2.9	4.0	4.2
--------	------	-----	-----	-----

135 SE	ELEVATION	4900.00	4912.00	4915.00
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136 SL	LOW-LEVEL OUTLET			
	ELEVL	4901.50	ELEVATION AT CENTER OF OUTLET	
	CAREA	9.00	CROSS-SECTIONAL AREA	
	COQL	.80	COEFFICIENT	
	EXPL	.50	EXPONENT OF HEAD	

SPILLWAY

CREL	4914.50	SPILLWAY CREST ELEVATION
SPWID	200.00	SPILLWAY WIDTH
COBW	3.00	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

\*\*\*

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	41.06	53.29
ELEVATION	4900.00	4912.00	4915.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	75.37	82.93	92.17	103.73	118.61	138.48	166.33	208.20
ELEVATION	4900.00	4901.50	4903.20	4903.56	4904.05	4904.73	4905.72	4907.25	4909.80	4914.50
OUTFLOW	208.55	210.33	214.86	223.21	236.68	256.67	284.08	320.28	366.79	424.30
ELEVATION	4914.51	4914.52	4914.55	4914.58	4914.63	4914.68	4914.75	4914.82	4914.91	4915.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	4.47	9.77	10.91	12.48	14.71	18.03	23.33	32.58	41.06
OUTFLOW	.00	.00	75.37	82.93	92.17	103.73	118.61	138.48	166.33	187.11
ELEVATION	4900.00	4901.50	4903.20	4903.56	4904.05	4904.73	4905.72	4907.25	4909.80	4912.00
STORAGE	51.20	51.29	51.40	51.54	51.73	51.96	52.23	52.54	52.89	53.29
OUTFLOW	208.20	210.33	214.86	223.21	236.68	256.67	284.08	320.28	366.79	424.30
ELEVATION	4914.50	4914.52	4914.55	4914.58	4914.63	4914.68	4914.75	4914.82	4914.91	4915.00

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HYDROGRAPH AT STATION ST NP

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.00-HR
+ (CFS)	(HR)				
+ 165.	14.08	(CFS)			
		83.	21.	21.	21.
		(INCHES)	.000	.000	.000
		(AC-FT)	41.	41.	41.
PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.00-HR
+ (AC-FT)	(HR)				
+ 32.	14.08	15.	7.	7.	7.
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.00-HR
+ (FEET)	(HR)				
+ 4909.63	14.08	4904.67	4902.29	4902.29	4902.29

CUMULATIVE AREA = .00 SQ MI

1

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			

+	HYDROGRAPH AT	W1R	1479.	12.08	219.	67.	67.	1.36
+	HYDROGRAPH AT	W2R	1095.	12.08	142.	43.	43.	.84
+	2 COMBINED AT	W1+W2	2574.	12.08	361.	110.	110.	2.20
+	ROUTED TO	RT-A	2397.	12.25	360.	110.	110.	2.20
+	HYDROGRAPH AT	W3R	1442.	12.17	220.	67.	67.	1.38
+	ROUTED TO	RT-A	1416.	12.25	220.	67.	67.	1.38
+	HYDROGRAPH AT	W4R	758.	12.17	138.	44.	44.	1.47
+	3 COMBINED AT	W1234	4553.	12.25	719.	221.	221.	5.05
+	ROUTED TO	RT-B	4529.	12.25	719.	221.	221.	5.05
+	HYDROGRAPH AT	W5R	609.	12.25	115.	36.	36.	1.27
+	2 COMBINED AT	W5+CH	5138.	12.25	833.	257.	257.	6.32
+	ROUTED TO	RT-C	4855.	12.50	833.	256.	256.	6.32
+	HYDROGRAPH AT	W6R	284.	12.42	78.	25.	25.	1.43
+	2 COMBINED AT	W6+CH	5132.	12.50	910.	281.	281.	7.75
+	ROUTED TO	RT-D	5055.	12.58	910.	280.	280.	7.75
+	HYDROGRAPH AT	W7R	452.	12.08	62.	19.	19.	.85
+	2 COMBINED AT	W7+CH	5163.	12.58	967.	300.	300.	8.60
+	ROUTED TO	RT-DIF	5043.	12.67	967.	299.	299.	8.60
+	HYDROGRAPH AT	W8R	151.	12.25	31.	10.	10.	.75
+	2 COMBINED AT	CP DIF	5115.	12.67	998.	309.	309.	9.35
+	ROUTED TO	ST DEB	5092.	12.67	998.	309.	309.	9.35
+	DIVERSION TO	HP	4193.	12.67	922.	254.	254.	9.35

4959.93 12.67

HYDROGRAPH AT	DV SP	899.	12.67	176.	54.	54.	9.35		
ROUTED TO	ST SP	245.	13.42	171.	53.	53.	9.35	4951.66	13.42
HYDROGRAPH AT	DR MP	4193.	12.67	822.	254.	254.	.00		
ROUTED TO	ST MP	1308.	13.33	621.	239.	239.	.00	4926.11	13.33
DIVERSION TO	2&3	579.	13.33	538.	218.	218.	.00		
HYDROGRAPH AT	DV NP	729.	13.33	83.	21.	21.	.00		
ROUTED TO	ST NP	165.	14.08	83.	21.	21.	.00	4909.63	14.08

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

*Whites Creek  
Split Flow Analysis*



# Nimbus Engineers

3710 Grant Dr., Suite D • Reno, NV 89509  
Mail: P.O. Box 10220 • Reno, NV 89510  
(702) 689-8630

JOB \_\_\_\_\_

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

## SPUT Flow Summary

3/16/93

CHANNEL

Q

q/o

1

700

14

2

1950

38

3

1100

22

4

1350

26

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*****
* HEC-2 WATER SURFACE PROFILES *
*                               *
* Version 4.6.0: February 1991 *
*                               *
* RUN DATE 14MAR93 TIME 13:34:38 *
*****

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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616-4687 *
* (916) 756-1104 *
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14MAR93 13:34:38

PAGE 1

THIS RUN EXECUTED 14MAR93 13:34:38

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*****
HEC-2 WATER SURFACE PROFILES
Version 4.6.0: February 1991
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T1 Whites Creek Flow Distribution at Difffluence
T2 Nimbus Job # : 9301 Filename : 301whn.dat
T3 Whites Creek

```

J1	ICHECK	ING	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FG
	0	2	0	0	0.06	0	0	0	4913	
J2	NPROF	IPLDT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIN	ITRACE
	1	0	-1							15

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

150

NC	.05	.05	.07	.3	.5					
BT	1	700								
ET		7.1				980	1450			
X1	12	35	1001.68	1013.56	0	0	0			
GR	4915.9	980.00	4912.4	1001.68	4910.28	1004.66	4909.93	1009.77	4911.96	1012.75
GR	4912.4	1013.56	4913.37	1082.67	4914.30	1103.60	4913.80	1115.71	4911.8	1132.04
GR	4911.8	1142.31	4914.54	1150.55	4914.39	1201.56	4912.77	1340.64	4913.38	1411.86
GR	4914.5	1450.79	4914.08	1465.06	4913.78	1493.79	4913.19	1531.46	4914.16	1749.56
GR	4914.7	1800.20	4913.63	1836.47	4913.17	1846.97	4909.38	1869.79	4909.18	1870.23
GR	4912.2	1885.87	4912.30	1886.21	4912.63	1919.29	4912.64	1962.82	4909.85	1989.73
GR	4910.2	1991.32	4913.19	2010.10	4913.03	2030.28	4914.29	2138.77	4914.24	2145.94

ET		7.1				980	1350			
X1	13	31	1000.00	1040.86	390	370	390			
GR	4934.2	980.00	4932.22	1000.00	4929.02	1030.66	4931.20	1040.86	4931.11	1075.55

1

0

-1

15

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

150

NC	.05	.05	.07	.3	.5					
BT	1	700								
ET		7.1				980	1450			
X1	12	35	1001.68	1013.56	0	0	0			
GR	4915.9	980.00	4912.4	1001.68	4910.28	1004.66	4909.93	1009.77	4911.96	1012.75
GR	4912.4	1013.56	4913.37	1082.67	4914.30	1103.60	4913.80	1115.71	4911.8	1132.04
GR	4911.8	1142.31	4914.54	1150.55	4914.39	1201.56	4912.77	1340.64	4913.38	1411.86
GR	4914.5	1450.79	4914.08	1465.06	4913.78	1493.79	4913.19	1531.46	4914.16	1749.56
GR	4914.7	1800.20	4913.63	1836.47	4913.17	1846.97	4909.38	1869.79	4909.18	1870.23
GR	4912.2	1885.87	4912.30	1886.21	4912.63	1919.29	4912.64	1962.82	4909.85	1989.73
GR	4910.2	1991.32	4913.19	2010.10	4913.03	2030.28	4914.29	2138.77	4914.24	2145.94

ET		7.1				980	1350			
X1	13	31	1000.00	1040.86	390	370	390			
GR	4934.2	980.00	4932.22	1000.00	4929.02	1030.66	4931.20	1040.86	4931.11	1075.55
GR	4931.0	1076.95	4930.62	1146.28	4928.21	1158.95	4928.03	1161.17	4931.04	1180.02
GR	4931.0	1180.89	4931.98	1272.95	4933.10	1346.72	4932.44	1394.68	4932.33	1433.94
GR	4931.5	1466.29	4931.65	1569.55	4932.23	1685.14	4932.29	1687.24	4930.54	1742.37
GR	4930.1	1769.49	4928.52	1773.23	4927.62	1776.53	4929.00	1781.10	4931.23	1823.78
GR	4931.3	1828.77	4928.35	1852.84	4932.28	1878.97	4933.00	1880.15	4933.67	1926.47
GR	4934.1	1981.93								

BT	1	2650								
X1	14	20	1008.10	1030.03	390	370	390			
GR	4953.3	1000.00	4950.17	1008.10	4948.19	1012.85	4951.50	1030.03	4951.41	1180.42
GR	4952.1	1325.22	4952.57	1458.19	4952.60	1460.93	4952.29	1473.10	4952.21	1496.10
GR	4952.1	1502.47	4951.85	1503.21	4949.06	1533.29	4950.77	1562.98	4950.61	1565.84
GR	4948.5	1600.27	4948.95	1601.05	4951.00	1614.66	4951.56	1661.72	4953.15	1728.78

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PAGE 2

X1	15	22	1005.51	1033.59	310	375	310			
GR	4973.6	1000.00	4971.97	1005.25	4971.88	1005.51	4966.78	1019.60	4965.52	1022.92
GR	4965.6	1023.04	4968.41	1028.18	4971.49	1033.59	4971.36	1039.01	4971.21	1044.21
GR	4971.1	1112.28	4971.09	1139.08	4970.75	1149.22	4970.82	1229.73	4971.57	1264.80
GR	4970.8	1283.33	4969.40	1322.64	4968.66	1326.64	4969.35	1329.72	4969.20	1369.90
GR	4971.9	1383.49	4974.82	1448.16						

NH	4	.07	1056.32	.05	1318.63	.07	1349.40	.05	1525.75	
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QT	1	2650								
ET		7.1				1000		1300		

600 IN CHANNEL 1. 2050 IN CHANNEL 2

X1	20	39	1037.02	1056.32	390	330	390			
GR	4994.5	1000	4990.21	1014.26	4990.13	1029.96	4990.14	1037.02	4988.45	1041.13
GR	4986.7	1047.08	4986.99	1048.66	4987.06	1050.61	4988.69	1056.32	4988.73	1063.55
GR	4988.5	1078.43	4987.53	1082.51	4986.85	1090.25	4987.63	1093.63	4988.67	1099.25
GR	4988.9	1132.84	4989.21	1145.49	4989.02	1172.77	4988.55	1220.59	4987.93	1227.01
GR	4987.9	1228.66	4988.44	1234.11	4991.35	1250.25	4994.23	1318.63	4994.46	1319.86
GR	4994.3	1323.31	4992.99	1328.85	4990.10	1339.05	4989.90	1339.39	4989.61	1343.37
GR	4993.2	1349.19	4993.37	1349.40	4993.57	1397.81	4993.58	1402.52	4996.67	1423.75
GR	5003.3	1478.35	5003.67	1486.26	5003.89	1524.91	5003.88	1525.75		
NH	5	.05	1056.31	.07	1082.83	.05	1274.63	.07	1290.54	.05
NH	1741.9									
QT	1	3750								
ET		7.1				1000		1400		

1100 CFS DIVERTED INTO CHANNEL #3

X1	21	44	1056.31	1082.83	270	230	260			
GR	5011.4	1000.00	5004.56	1021.43	5004.90	1056.31	5004.57	1068.32	5003.79	1069.58
GR	5002.3	1073.80	5002.22	1074.80	5003.35	1077.80	5003.29	1079.37	5005.26	1082.83
GR	5003.5	1127.70	5004.89	1144.07	5006.98	1161.03	5006.47	1183.42	5004.98	1223.19
GR	5004.5	1226.83	5004.17	1227.80	5004.68	1235.35	5005.07	1238.59	5004.98	1265.31
GR	5005.0	1274.63	5002.22	1280.96	5001.84	1282.34	5001.82	1282.90	5002.16	1282.94
GR	5002.2	1283.66	5004.91	1290.54	5004.94	1292.00	5004.82	1293.18	5004.81	1346.38
GR	5006.2	1362.51	5009.94	1405.72	5009.63	1415.66	5009.49	1460.64	5009.48	1496.72
GR	5009.5	1502.33	5009.50	1585.67	5008.26	1663.51	5006.26	1674.12	5005.57	1681.50
GR	5007.7	1695.18	5008.15	1701.96	5007.72	1716.09	5007.55	1741.9		

1350 CFS DIVERTED INTO CHANNEL #4

NH	3	.07	1075.96	.05	1274.03	.07	1620.90			
QT	1	3750								
ET		7.1					1000	1332.47		
X1	22	36	1067.43	1075.96	195	195	195			
GR	5028.5	1000.00	5024.66	1015.48	5021.29	1027.20	5017.34	1057.84	5016.36	1067.43
GR	5015.6	1068.23	5013.83	1071.46	5013.92	1072.17	5014.99	1073.51	5016.76	1075.96
GR	5015.7	1106.10	5014.54	1128.70	5015.09	1144.05	5015.46	1153.61	5015.45	1154.29
GR	5015.6	1174.60	5015.71	1179.70	5015.67	1226.35	5015.81	1235.11	5017.18	1274.03
GR	5015.9	1275.84	5014.06	1281.65	5014.17	1286.43	5014.13	1288.28	5016.02	1292.39

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GR	5017.9	1294.76	5019.16	1332.47	5018.68	1365.84	5018.63	1385.50	5017.48	1429.35
GR	5016.4	1444.81	5015.98	1448.52	5016.78	1471.48	5017.10	1474.40	5017.44	1602.55
GR	5017.4	1620.90								
NH	4	.07	1050.49	.05	1183.88	.07	1200.7	.05	1388.51	
QT	1	5100								
X1	23	28	1038.89	1050.49	85	100	85			
GR	5028.8	1000.00	5023.32	1018.36	5022.13	1027.56	5021.04	1038.89	5018.03	1042.17
GR	5017.8	1042.6	5018.11	1045.31	5022.22	1050.49	5022.35	1050.67	5022.20	1056.00
GR	5022.3	1059.15	5021.59	1093.46	5022.00	1102.99	5020.12	1121.26	5020.11	1123.31
GR	5021.1	1183.88	5020.34	1186.86	5018.86	1188.98	5018.91	1191.37	5019.04	1196.50
GR	5021.0	1200.70	5021.71	1201.85	5021.82	1245.53	5020.93	1260.89	5021.49	1275.33
GR	5022.0	1300.77	5022.26	1340.69	5024.22	1388.51				
NH	3	.07	1059.51	.05	1121.30	.07	1190.18			
X1	24	24	1037.24	1059.51	80	110	80			
GR	5035.6	1000.00	5033.90	1005.29	5029.43	1021.29	5027.32	1034.94	5027.48	1035.35

GR	5027.1	1037.24	5024.48	1043.54	5023.75	1044.25	5023.93	1048.00	5024.02	1048.55
GR	5026.3	1058.55	5027.10	1059.51	5026.96	1065.05	5027.00	1066.78	5029.59	1096.92
GR	5028.7	1121.30	5023.98	1141.34	5023.53	1144.53	5025.21	1150.90	5023.86	1155.66
GR	5026.2	1165.54	5028.20	1169.18	5030.06	1175.66	5034.05	1190.18		
NC	.07	.07	.07							
X1	25	16	1053.57	1069.63	100	100	100			
GR	5046.1	1000.00	5038.11	1025.93	5036.64	1030.79	5036.51	1031.23	5036.58	1046.84
GR	5036.4	1047.18	5033.61	1053.57	5032.66	1060.04	5032.37	1066.70	5032.36	1066.89
GR	5033.0	1069.00	5033.12	1069.63	5033.13	1069.64	5033.13	1069.95	5033.50	1118.76
GR	5042.7	1136.15								
X1	26	15	1046.49	1076.04	100	100	100			
GR	5055.0	1000.00	5045.86	1027.54	5044.48	1032.90	5040.48	1046.49	5040.13	1046.55
GR	5038.8	1049.93	5038.77	1071.96	5038.76	1072.59	5038.76	1072.60	5039.08	1072.86
GR	5041.6	1075.12	5041.55	1076.04	5040.54	1122.38	5040.73	1122.87	5048.66	1142.15

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SECNO	DEPTH	CWSEL	CRINS	WSELK	EG	HV	HL	DLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	ARQB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	MTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

\*PROF 1

CCHV= .300 CEHV= .500

\*SECNO 12.000

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=	980.0	1450.0	TYPE=	1	TARGET=	470.000				
12.000	4.33	4913.51	4913.51	.00	4913.83	.32	.00	.00	4912.40	
700.0	12.2	203.1	484.6	3.8	32.6	131.7	.0	.0	4912.40	
.00	3.22	6.24	3.68	.050	.070	.050	.000	4909.18	994.81	
.026174	0.	0.	0.	0	12	0	.00	259.39	1416.32	

FLOW DISTRIBUTION FOR SECNO= 12.00 CWSEL= 4913.51

STA=	995.	1002.	1014.	1083.	1086.	1132.	1142.	1147.	1341.	1412.	1416.
PER Q=	1.7	29.0	21.6	.0	7.3	17.2	2.6	8.3	12.1	.0	
AREA=	3.8	32.6	43.1	.2	11.9	17.5	4.4	23.4	30.9	.3	
VEL=	3.2	6.2	3.5	.8	4.3	6.9	4.2	2.5	2.8	.8	
DEPTH=	.6	2.7	.6	.1	.3	1.7	.9	.1	.4	.1	

\*SECNO 13.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=	980.0	1350.0	TYPE=	1	TARGET=	370.000				
13.000	3.68	4931.30	4931.30	.00	4931.69	.39	9.42	.03	4932.22	
700.0	.0	133.1	566.9	.0	36.9	107.5	1.3	2.0	4931.20	
.02	.00	3.60	5.27	.000	.070	.050	.000	4927.62	1008.85	
.024136	390.	390.	370.	16	9	0	.00	199.93	1208.78	

FLOW DISTRIBUTION FOR SECNO= 13.00 CWSEL= 4931.30

STA=	1009.	1041.	1074.	1077.	1146.	1159.	1161.	1180.	1181.	1209.
------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

PER Q=	19.0	.9	.1	13.8	23.7	10.0	31.7	.1	.8
AREA=	36.9	4.9	.3	33.8	23.8	7.1	33.2	.2	4.1
VEL=	3.6	1.3	1.8	2.9	7.0	10.0	6.7	2.0	1.3
DEPTH=	1.2	.1	.2	.5	1.9	3.2	1.8	.3	.1

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SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	GLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

\*SECNO 14.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL.CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

14.000	3.84	4952.03	4952.03	.00	4952.56	.53	9.44	.07	4950.17
2650.0	19.5	299.6	2330.9	4.5	51.2	398.7	3.9	4.9	4951.50
.04	4.34	5.85	5.85	.050	.070	.050	.000	4948.19	1003.27
.025636	390.	390.	370.	20	8	0	.00	487.29	1681.74

FLOW DISTRIBUTION FOR SECNO= 14.00 CWSEL= 4952.03

STA=	1003.	1008.	1030.	1180.	1311.	1533.	1563.	1600.	1615.	1662.	1682.
PER Q=	.7	11.3	10.9	3.4	11.5	18.6	28.9	9.0	5.3	.3	
AREA=	4.5	51.2	87.2	40.9	47.5	62.9	89.2	30.6	35.5	4.8	
VEL=	4.3	5.9	3.3	2.2	6.4	7.8	8.6	7.8	3.9	1.8	
DEPTH=	.9	2.3	.6	.3	.2	2.1	2.4	2.1	.8	.2	

\*SECNO 15.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

15.000	6.13	4971.65	4971.65	.00	4972.25	.60	9.57	.03	4971.88
2650.0	.0	591.4	2058.6	.0	84.9	344.4	7.6	8.6	4971.49
.06	.00	6.97	5.98	.000	.070	.050	.000	4965.52	1006.14
.027008	310.	310.	375.	19	22	0	.00	376.11	1382.25

FLOW DISTRIBUTION FOR SECNO= 15.00 CWSEL= 4971.65

STA=	1006.	1034.	1112.	1230.	1323.	1327.	1370.	1382.
PER Q=	22.3	4.2	14.7	17.8	3.6	34.2	3.2	
AREA=	84.9	37.0	92.3	85.8	10.5	103.7	15.1	
VEL=	7.0	3.0	4.2	5.5	9.2	8.7	5.5	
DEPTH=	3.1	.5	.8	.9	2.6	2.4	1.2	

1490 NH CARD USED

\*SECNO 20.000

7185 MINIMUM SPECIFIC ENERGY

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SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	GLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1000.0 1300.0 TYPE= 1 TARGET= 300.000  
 20.000 3.64 4990.34 4990.34 .00 4991.20 .86 9.80 .13 4990.14  
 2650.0 4.7 305.2 2340.1 4.1 46.7 308.9 10.7 10.9 4988.69  
 .07 1.17 6.53 7.57 .070 .070 .050 .000 4986.70 1013.84  
 .030817 390. 390. 330. 14 14 0 .00 230.78 1244.63

FLOW DISTRIBUTION FOR SECNO= 20.00 CWSSEL= 4990.34

STA= 1014. 1037. 1056. 1064. 1078. 1083. 1090. 1094. 1099. 1133. 1145. 1173. 1221.  
 PER Q= .2 11.5 3.2 7.2 3.2 10.3 4.3 4.0 13.7 3.8 7.5 19.6  
 AREA= 4.0 46.7 11.8 25.6 9.5 24.3 10.5 12.3 52.1 16.2 33.3 74.2  
 VEL= 1.2 6.5 7.2 7.5 9.0 11.2 10.9 8.7 7.0 6.2 6.0 7.0  
 DEPTH= .2 2.4 1.6 1.7 2.3 3.1 3.1 2.2 1.6 1.3 1.2 1.6

STA= 1221. 1227. 1234. 1245.  
 PER Q= 4.3 5.3 1.9  
 AREA= 13.5 15.8 10.0  
 VEL= 8.5 8.9 5.0  
 DEPTH= 2.1 2.2 .9

1490 NH CARD USED  
 #SECNO 21.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY  
 3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1000.0 1400.0 TYPE= 1 TARGET= 400.000  
 21.000 4.56 5006.38 5006.38 .00 5007.21 .83 7.52 .01 5004.90  
 3750.0 457.4 424.6 2868.0 62.8 63.6 387.8 13.1 12.4 5005.26  
 .08 7.29 6.67 7.40 .050 .070 .053 .000 5001.82 1015.73  
 .032670 270. 260. 230. 18 11 0 .00 319.24 1364.60

FLOW DISTRIBUTION FOR SECNO= 21.00 CWSSEL= 5006.38

STA= 1016. 1056. 1083. 1128. 1144. 1223. 1235. 1265. 1281. 1284. 1291. 1346. 1365.  
 PER Q= 12.2 11.3 20.4 8.6 4.0 4.9 7.3 5.7 3.1 3.8 16.8 1.9  
 AREA= 62.8 63.6 89.8 35.8 35.2 22.7 41.1 30.5 11.8 19.4 87.2 14.3  
 VEL= 7.3 6.7 8.5 9.0 4.3 8.1 6.6 6.9 10.0 7.3 7.2 4.9  
 DEPTH= 1.5 2.4 2.0 2.2 .4 1.9 1.4 1.9 4.4 2.8 1.6 .8

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SECNO	DEPTH	CWSSEL	CRISW	WSELK	EG	HV	HL	QLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XLN	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1490 NH CARD USED  
 #SECNO 22.000

3280 CROSS SECTION 22.00 EXTENDED .35 FEET

7185 MINIMUM SPECIFIC ENERGY  
 3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 1000.0 1332.5 TYPE= 1 TARGET= 332.470  
 22.000 3.92 5017.75 5017.75 .00 5018.72 .96 5.83 .07 5016.36  
 3750.0 29.1 138.8 3582.1 9.3 23.0 449.4 15.3 13.7 5016.76

.08	3.13	6.04	7.97	.070	.070	.052	.000	5013.83	1054.65
.027506	195.	195.	195.	16	14	0	.00	239.92	1294.57

FLOW DISTRIBUTION FOR SECNO= 22.00 CWSSEL= 5017.75

STA=	1055.	1067.	1076.	1106.	1129.	1144.	1154.	1175.	1226.	1235.	1274.	1282.	1286.
PER Q=	.8	3.7	8.0	14.9	12.1	5.7	10.5	22.8	3.7	7.5	3.1	3.9	
AREA=	9.3	23.0	45.8	59.5	45.1	23.7	46.8	106.8	17.6	48.9	18.3	17.4	
VEL=	3.1	6.0	6.5	9.4	10.1	9.0	8.4	8.0	7.9	5.7	6.3	8.3	
DEPTH=	.7	2.7	1.5	2.6	2.9	2.5	2.2	2.1	2.0	1.3	2.4	3.6	

STA=	1286.	1292.	1295.
PER Q=	3.3	.1	
AREA=	17.7	1.9	
VEL=	7.1	2.7	
DEPTH=	3.0	.9	

1490 NH CARD USED

#SECNO 23.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

23.000	5.52	5023.32	5023.32	.00	5024.30	.98	2.84	.01	5021.04
5100.0	117.1	361.5	4621.4	25.0	45.6	576.1	16.6	14.3	5022.22
.09	4.68	7.93	8.02	.070	.070	.052	.000	5017.80	1018.39
.029711	85.	85.	100.	15	14	0	.00	348.06	1366.45

FLOW DISTRIBUTION FOR SECNO= 23.00 CWSSEL= 5023.32

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SECNO	DEPTH	CWSSEL	CRISW	WSELK	EG	HV	HL	GLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

STA=	1018.	1039.	1050.	1093.	1121.	1184.	1191.	1197.	1246.	1261.	1275.	1301.	1341.
PER Q=	2.3	7.1	6.8	9.0	33.5	4.3	4.3	11.5	4.7	5.0	5.4	5.3	
AREA=	25.0	45.6	56.1	55.7	170.8	26.2	22.3	83.8	29.8	30.4	40.0	47.3	
VEL=	4.7	7.9	6.2	8.3	10.0	8.3	9.7	7.0	8.0	8.4	6.9	5.7	
DEPTH=	1.2	3.9	1.3	2.0	2.7	3.5	4.3	1.7	1.9	2.1	1.6	1.2	

STA=	1341.	1366.
PER Q=	.9	
AREA=	13.6	
VEL=	3.3	
DEPTH=	.5	

1490 NH CARD USED

#SECNO 24.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL.CWSSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

24.000	6.80	5030.33	5030.33	.00	5031.98	1.65	3.28	.33	5027.10
5100.0	218.7	1298.6	3582.7	35.0	116.0	352.2	17.9	14.9	5027.10
.09	6.24	11.20	10.17	.070	.070	.064	.000	5023.53	1018.08
.033405	80.	80.	110.	20	11	0	.00	158.56	1176.63

FLOW DISTRIBUTION FOR SECNO= 24.00 CWSSEL= 5030.33

STA=	1018.	1035.	1037.	1060.	1065.	1097.	1121.	1141.	1145.	1151.	1156.	1166.	1177.
PER Q=	3.2	1.1	25.5	4.3	11.8	3.4	15.0	5.6	9.3	6.6	11.9	2.3	
AREA=	28.1	6.9	116.0	18.3	67.1	28.8	79.9	21.0	38.0	27.6	52.3	19.3	
VEL=	5.8	8.0	11.2	12.0	9.0	6.1	9.6	13.5	12.5	12.2	11.6	6.2	
DEPTH=	1.7	3.0	5.2	3.3	2.1	1.2	4.0	6.6	6.0	5.8	5.3	1.7	

\*SECNO 25.000

3685 20 TRIALS ATTEMPTED WSEL.CWSSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

25.000	6.31	5038.67	5038.67	.00	5040.82	2.15	3.46	.25	5033.61
5100.0	471.2	1220.1	3408.8	65.0	94.1	288.3	19.0	15.2	5033.12
.09	7.25	12.96	11.82	.070	.070	.070	.000	5032.36	1024.12
.033784	100.	100.	100.	20	11	0	.00	104.41	1128.53

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SECNO	DEPTH	CWSSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 25.00 CWSSEL= 5038.67

STA=	1024.	1026.	1031.	1031.	1047.	1047.	1054.	1070.	1070.	1119.	1129.
PER Q=	.0	.6	.1	4.3	.1	4.1	23.9	.4	63.0	3.4	
AREA=	.5	6.3	.9	33.1	.7	23.4	94.1	1.7	261.3	25.2	
VEL=	1.7	4.6	6.4	6.6	6.2	9.0	13.0	12.6	12.3	7.0	
DEPTH=	.3	1.3	2.1	2.1	2.2	3.7	5.9	5.4	5.4	2.6	

\*SECNO 26.000

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

26.000	6.56	5045.32	5045.32	.00	5047.46	2.14	3.64	.00	5040.48
5100.0	310.8	2459.0	2330.2	40.0	184.6	226.0	20.1	15.5	5041.55
.09	7.77	13.32	10.31	.070	.070	.070	.000	5038.76	1029.64
.037049	100.	100.	100.	10	8	0	.00	104.39	1134.03

FLOW DISTRIBUTION FOR SECNO= 26.00 CWSSEL= 5045.32

STA=	1030.	1033.	1046.	1076.	1122.	1123.	1134.
PER Q=	.1	6.0	48.2	41.8	.5	3.4	
AREA=	1.4	38.6	184.6	198.1	2.3	25.6	
VEL=	2.2	8.0	13.3	10.8	10.9	6.7	
DEPTH=	.4	2.8	6.2	4.3	4.7	2.3	

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THIS RUN EXECUTED 14MAR93 13:34:48

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HEC-2 WATER SURFACE PROFILES

Version 4.6.0: February 1991

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NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Whites Creek

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	101KS	VCH	AREA	.01K
*	12.000	.00	.00	.00	4909.18	700.00	4913.51	4913.51	4913.83	261.74	6.24	168.06	43.27
*	13.000	390.00	.00	.00	4927.62	700.00	4931.30	4931.30	4931.69	241.36	3.60	144.44	45.06
*	14.000	390.00	.00	.00	4948.19	2650.00	4952.03	4952.03	4952.56	256.36	5.85	454.37	165.51
*	15.000	310.00	.00	.00	4965.52	2650.00	4971.65	4971.65	4972.25	270.08	6.97	429.30	161.25
*	20.000	390.00	.00	.00	4986.70	2650.00	4990.34	4990.34	4991.20	308.17	6.53	359.72	150.96
*	21.000	260.00	.00	.00	5001.82	3750.00	5006.38	5006.38	5007.21	326.70	6.67	514.21	207.47
*	22.000	195.00	.00	.00	5013.83	3750.00	5017.75	5017.75	5018.72	275.06	6.04	481.64	226.11
*	23.000	85.00	.00	.00	5017.80	5100.00	5023.32	5023.32	5024.30	297.11	7.93	646.68	295.88
*	24.000	80.00	.00	.00	5023.53	5100.00	5030.33	5030.33	5031.98	334.05	11.20	503.19	279.04
*	25.000	100.00	.00	.00	5032.36	5100.00	5038.67	5038.67	5040.82	357.84	12.96	447.49	269.61
*	26.000	100.00	.00	.00	5038.76	5100.00	5045.32	5045.32	5047.46	370.49	13.32	450.63	264.96

1

14MAR93 13:34:38

PAGE 11

Whites Creek

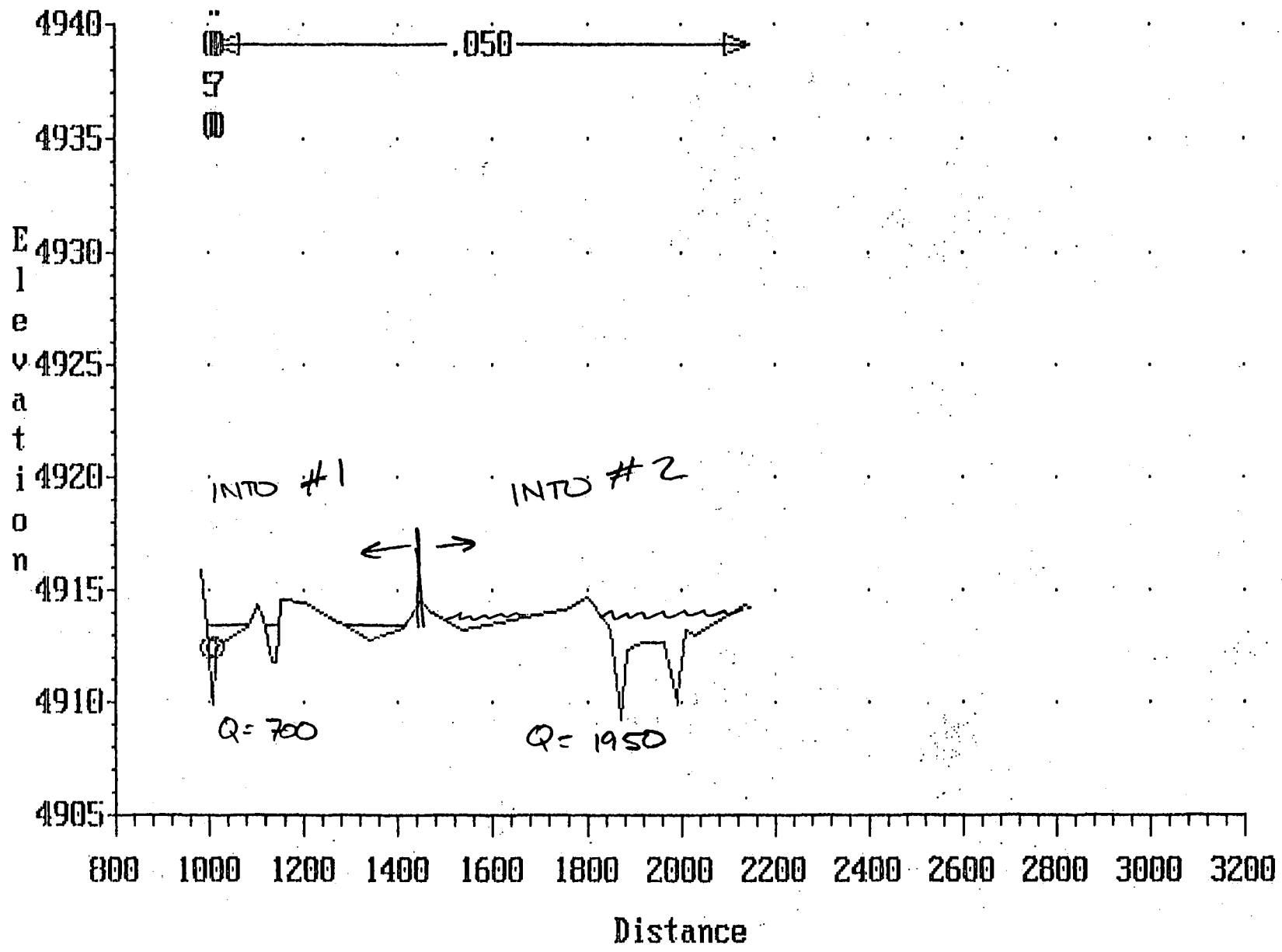
SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	12.000	700.00	4913.51	.00	.00	.00	259.39	.00
*	13.000	700.00	4931.30	.00	17.79	.00	199.93	390.00
*	14.000	2650.00	4952.03	.00	20.74	.00	487.29	390.00
*	15.000	2650.00	4971.65	.00	19.62	.00	376.11	310.00
*	20.000	2650.00	4990.34	.00	18.68	.00	230.78	390.00
*	21.000	3750.00	5006.38	.00	16.04	.00	319.24	260.00
*	22.000	3750.00	5017.75	.00	11.37	.00	239.92	195.00
*	23.000	5100.00	5023.32	.00	5.56	.00	348.06	85.00
*	24.000	5100.00	5030.33	.00	7.01	.00	158.56	80.00
*	25.000	5100.00	5038.67	.00	8.34	.00	104.41	100.00
*	26.000	5100.00	5045.32	.00	6.65	.00	104.39	100.00

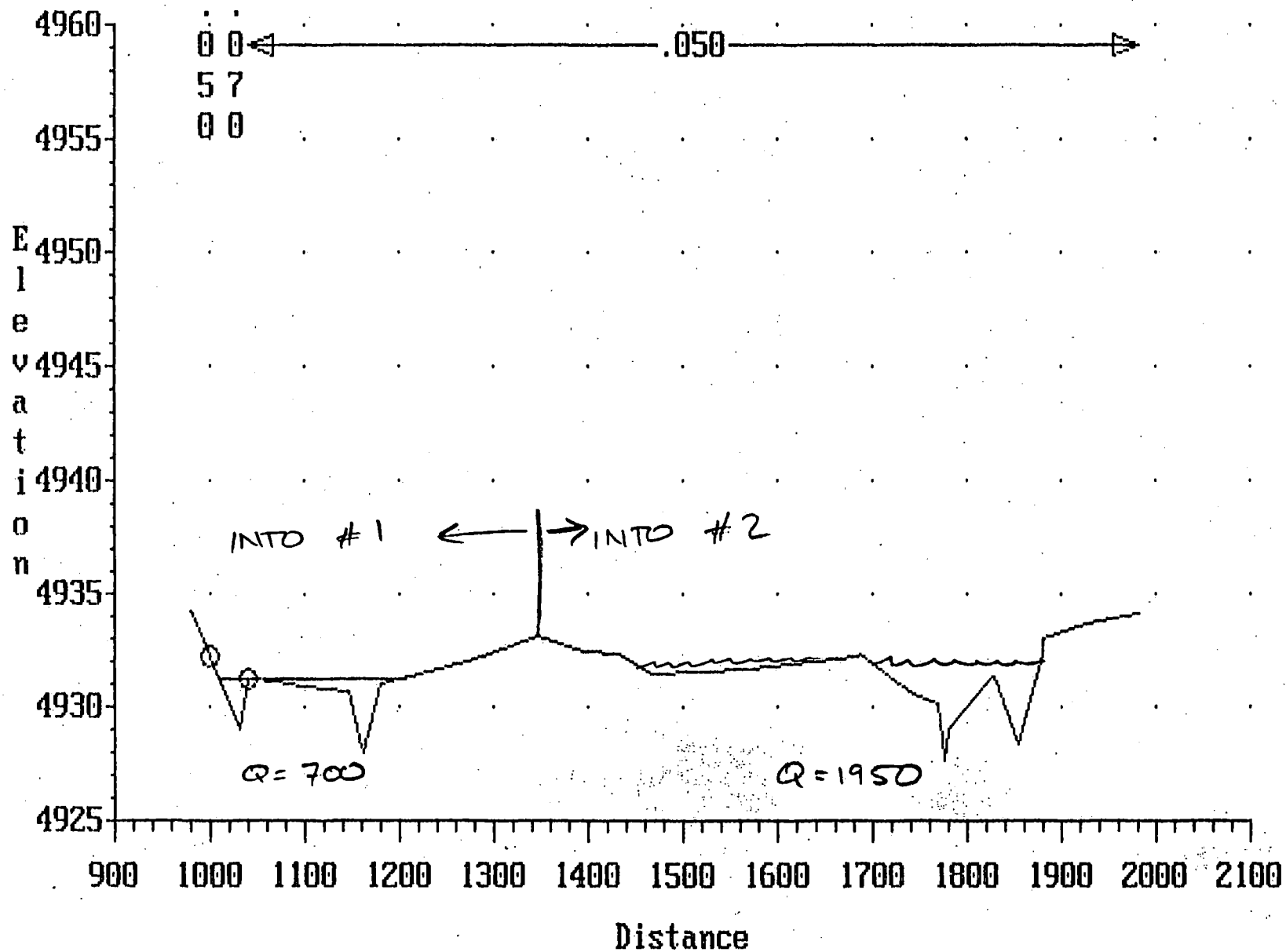
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CAUTION SECNO=	13.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	13.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	14.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	14.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	14.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=	15.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
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CAUTION SECNO=	20.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	20.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	21.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	21.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	22.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	22.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	23.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	23.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	24.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	24.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	24.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=	25.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	25.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=	25.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
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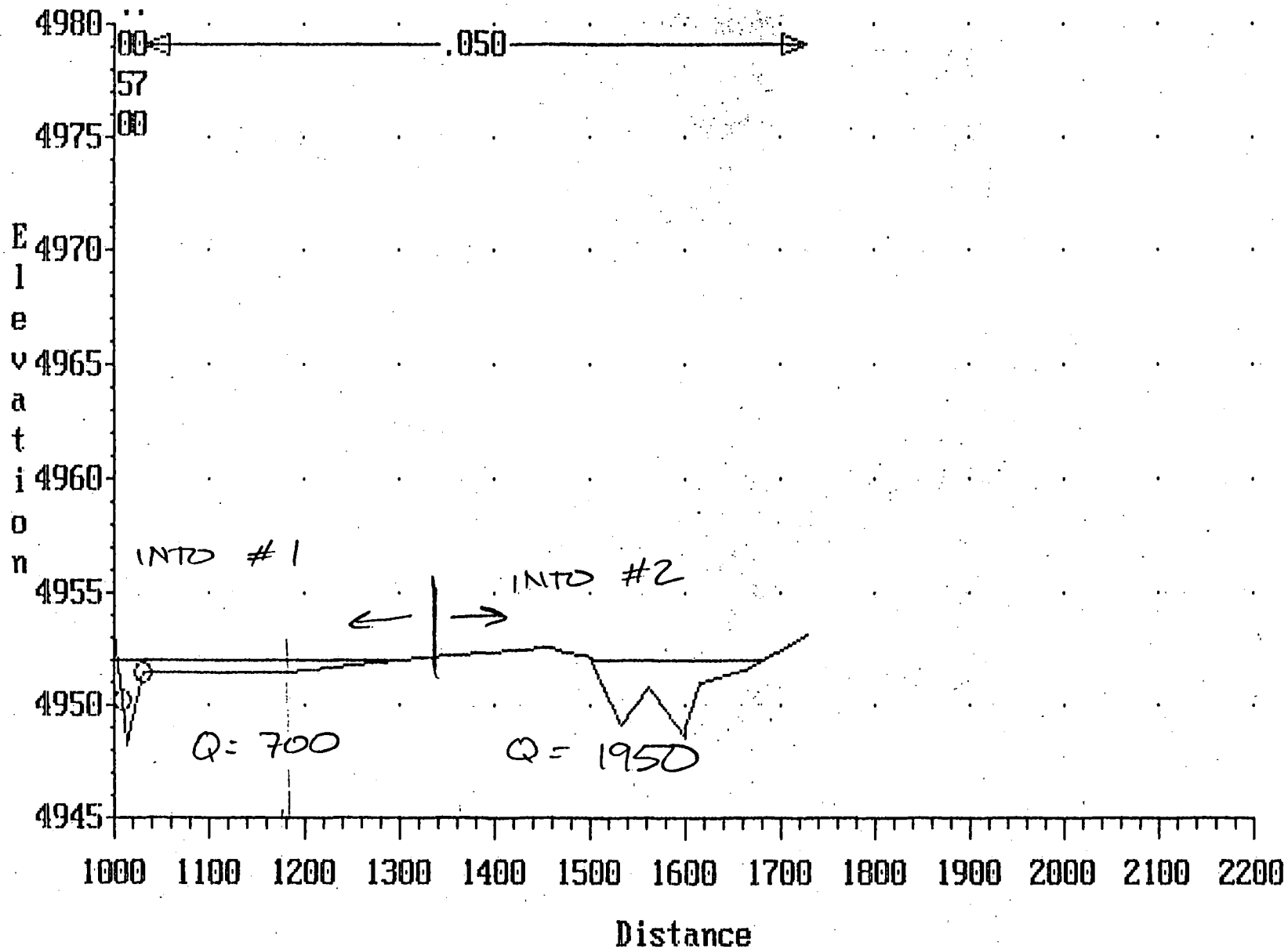
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Cross-section 12.000



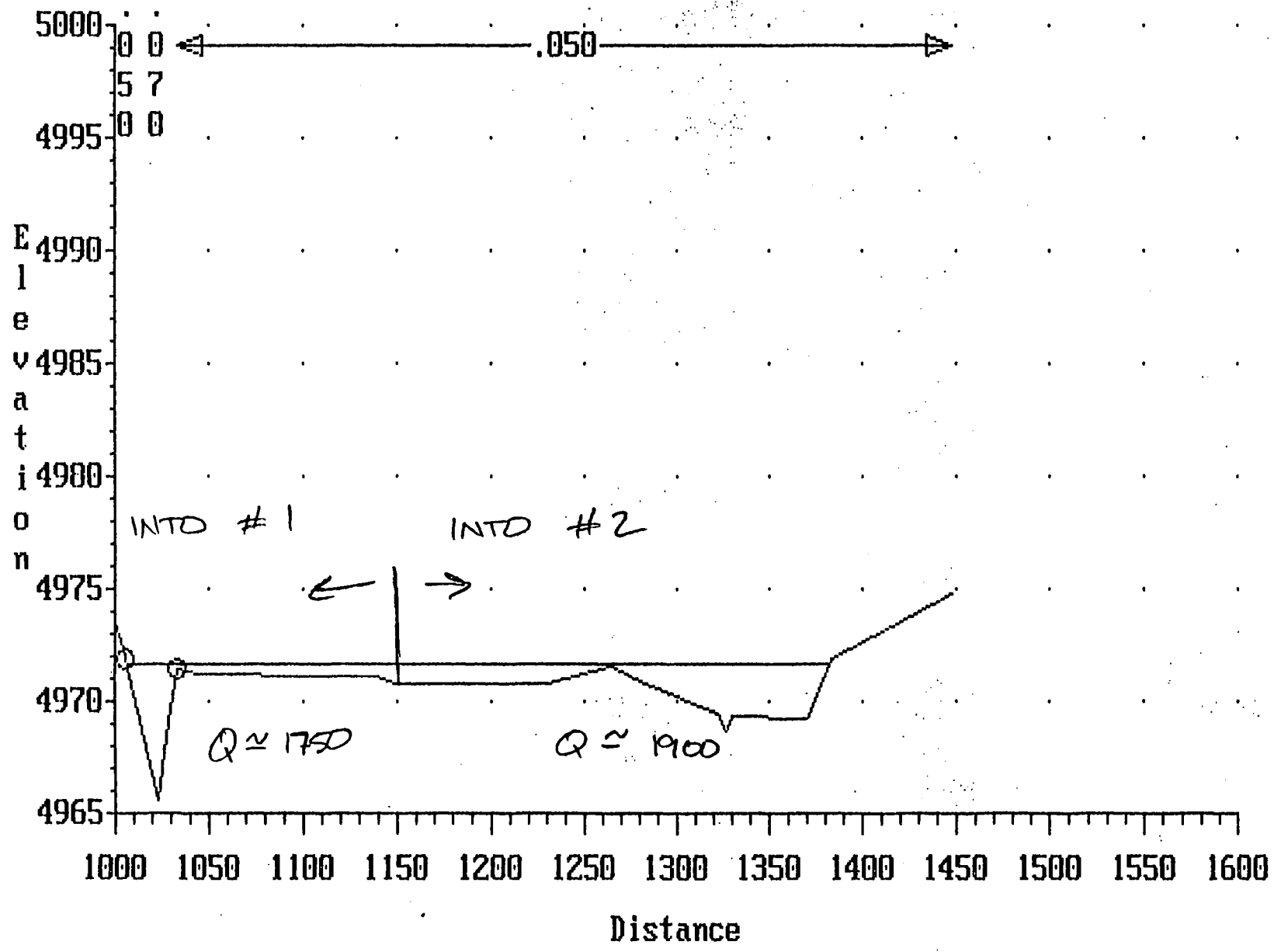
Whites Creek  
Cross-section 13.000



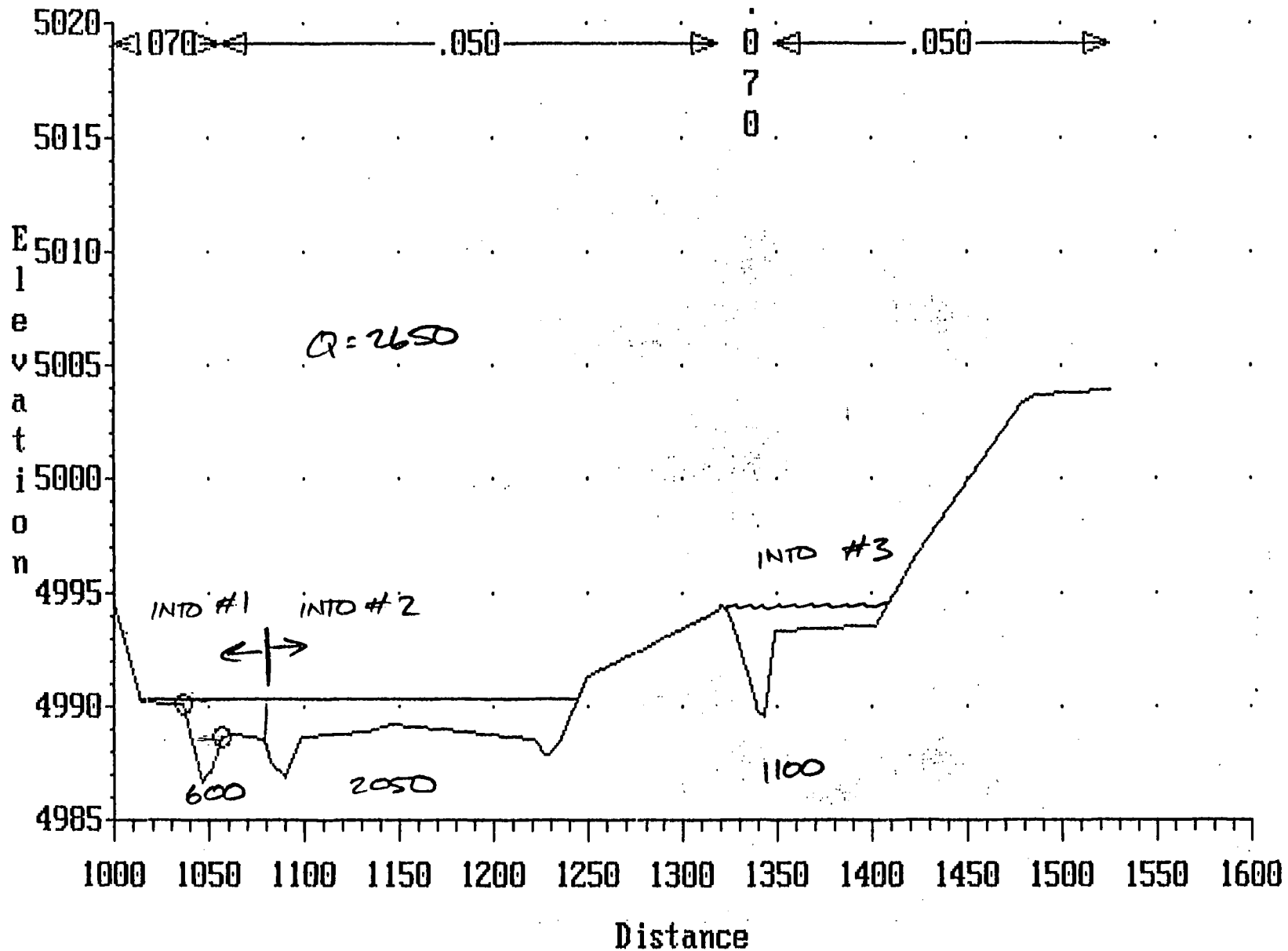
♥ Whites Creek ♥  
Cross-section 14.000



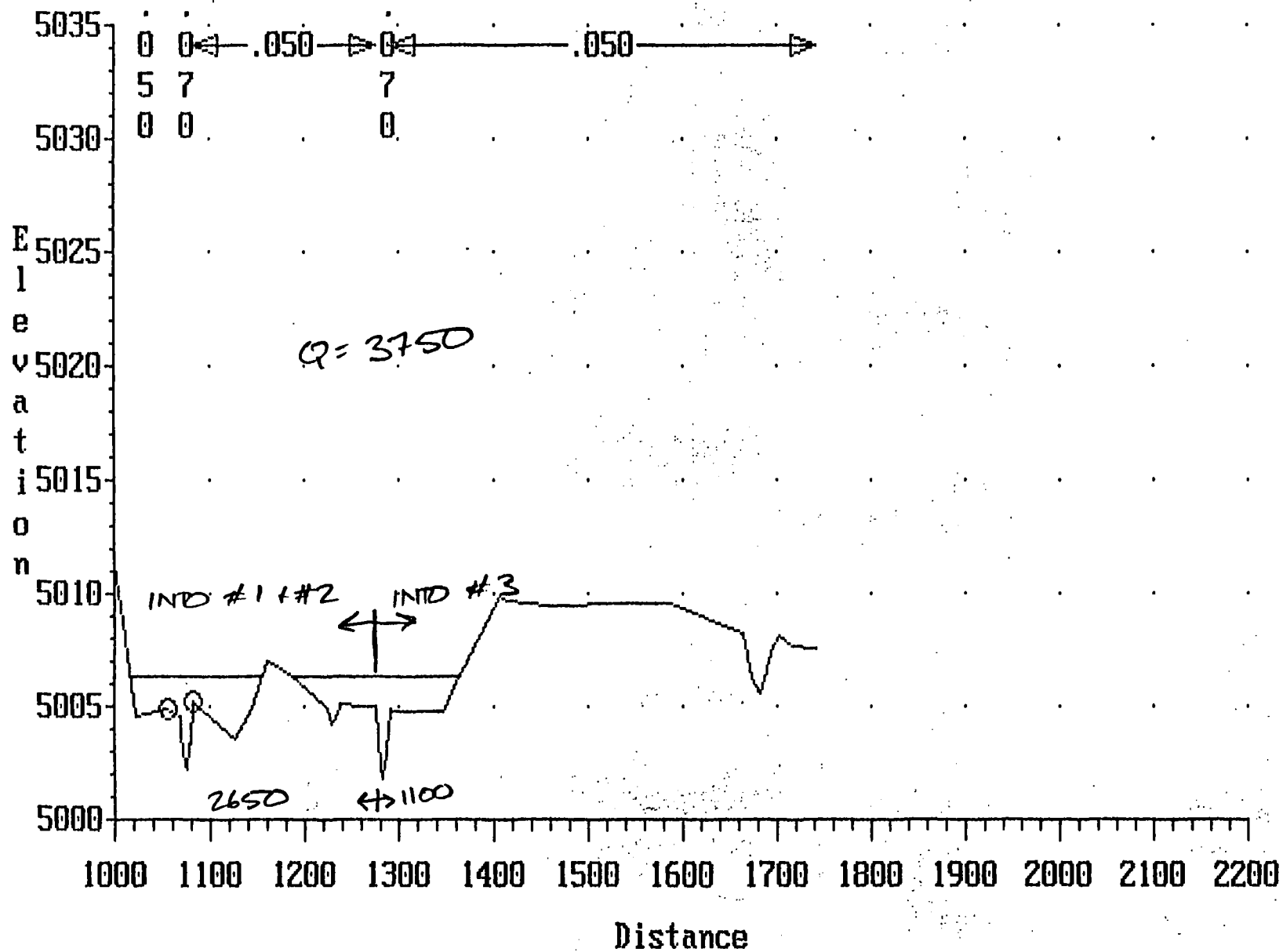
Whites Creek  
Cross-section 15.000



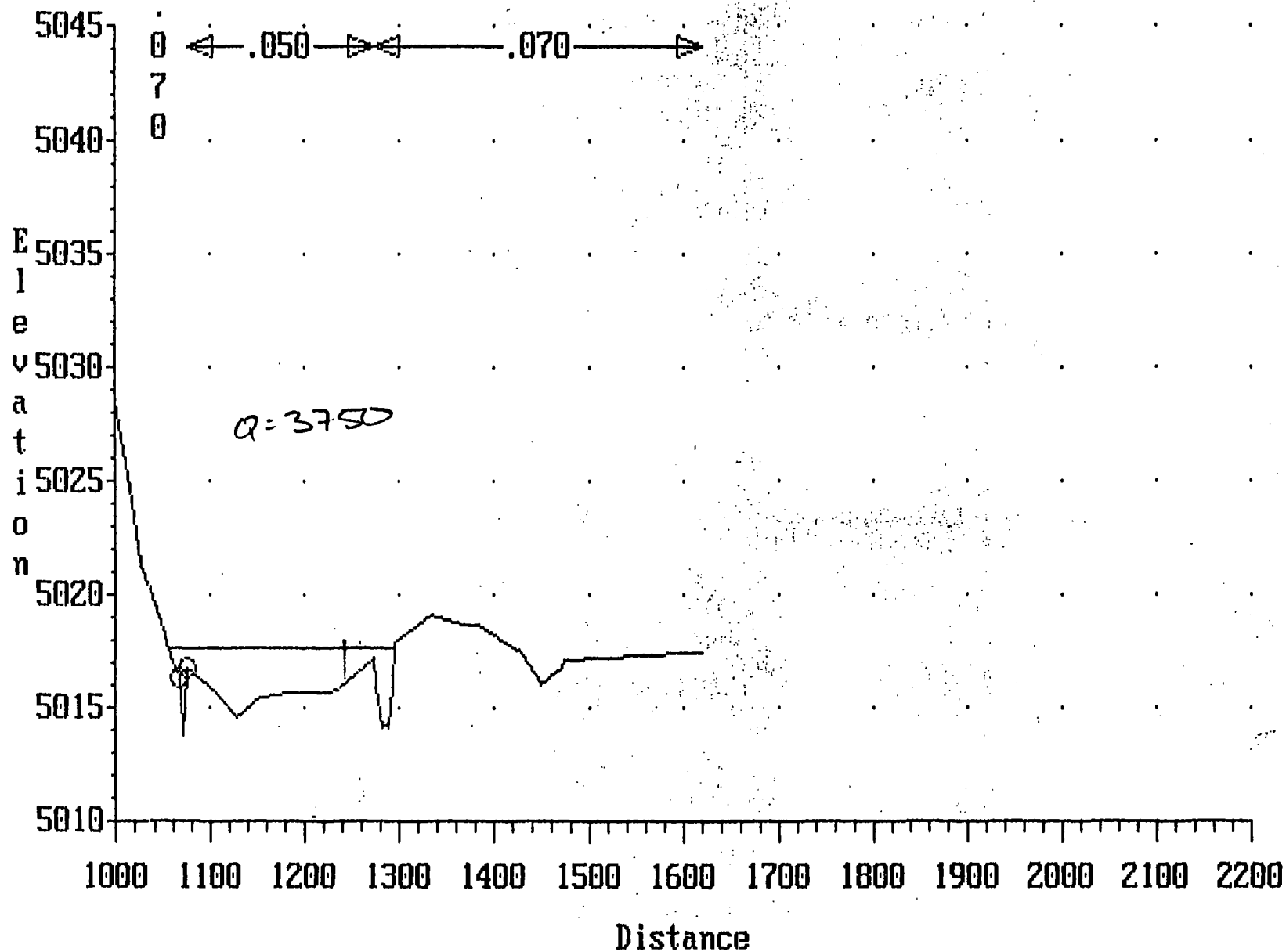
Whites Creek  
Cross-section 20.000



♥ Whites Creek ♥  
 Cross-section 21.000

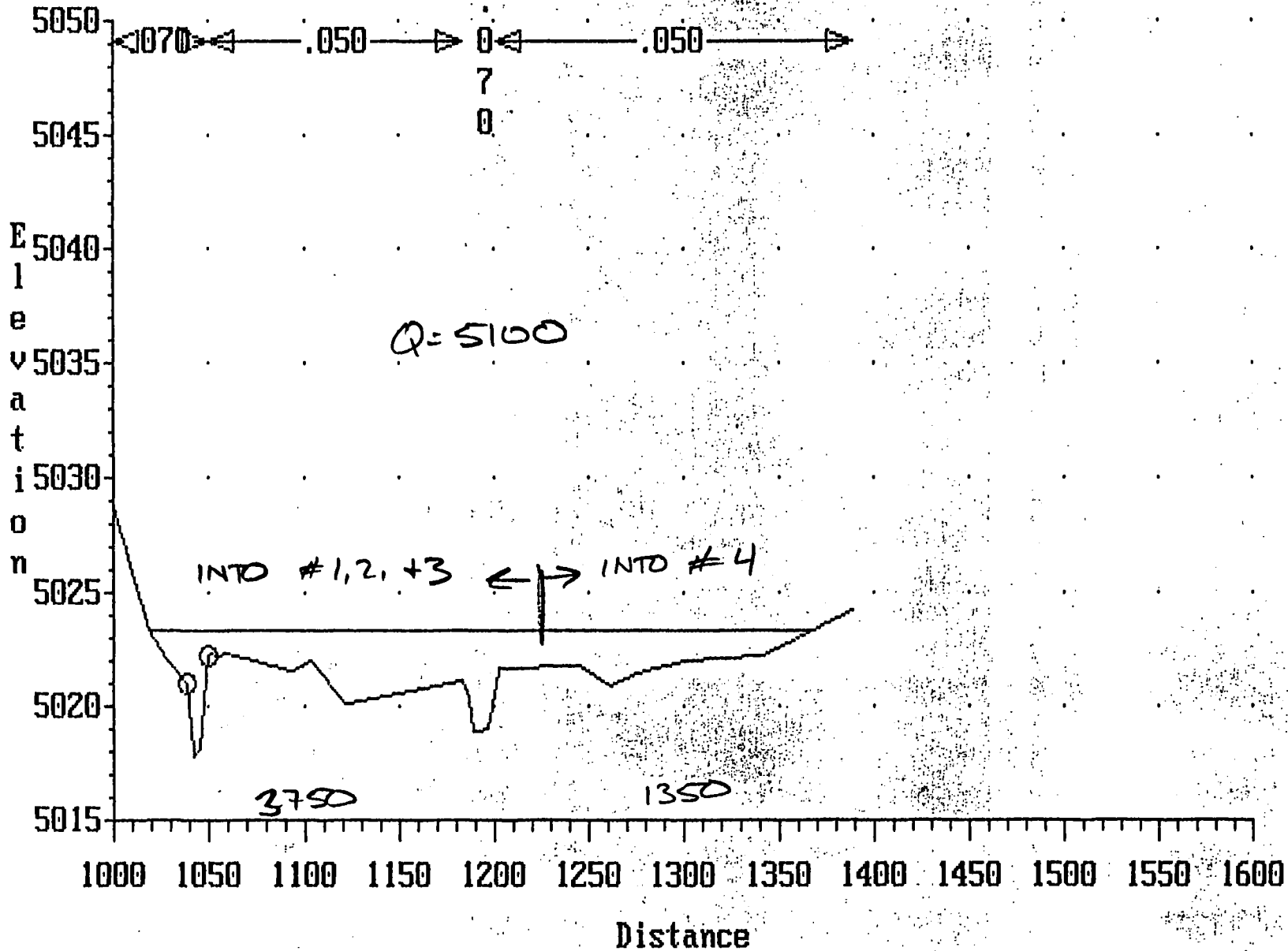


♥ Whites Creek ♥  
Cross-section 22.000

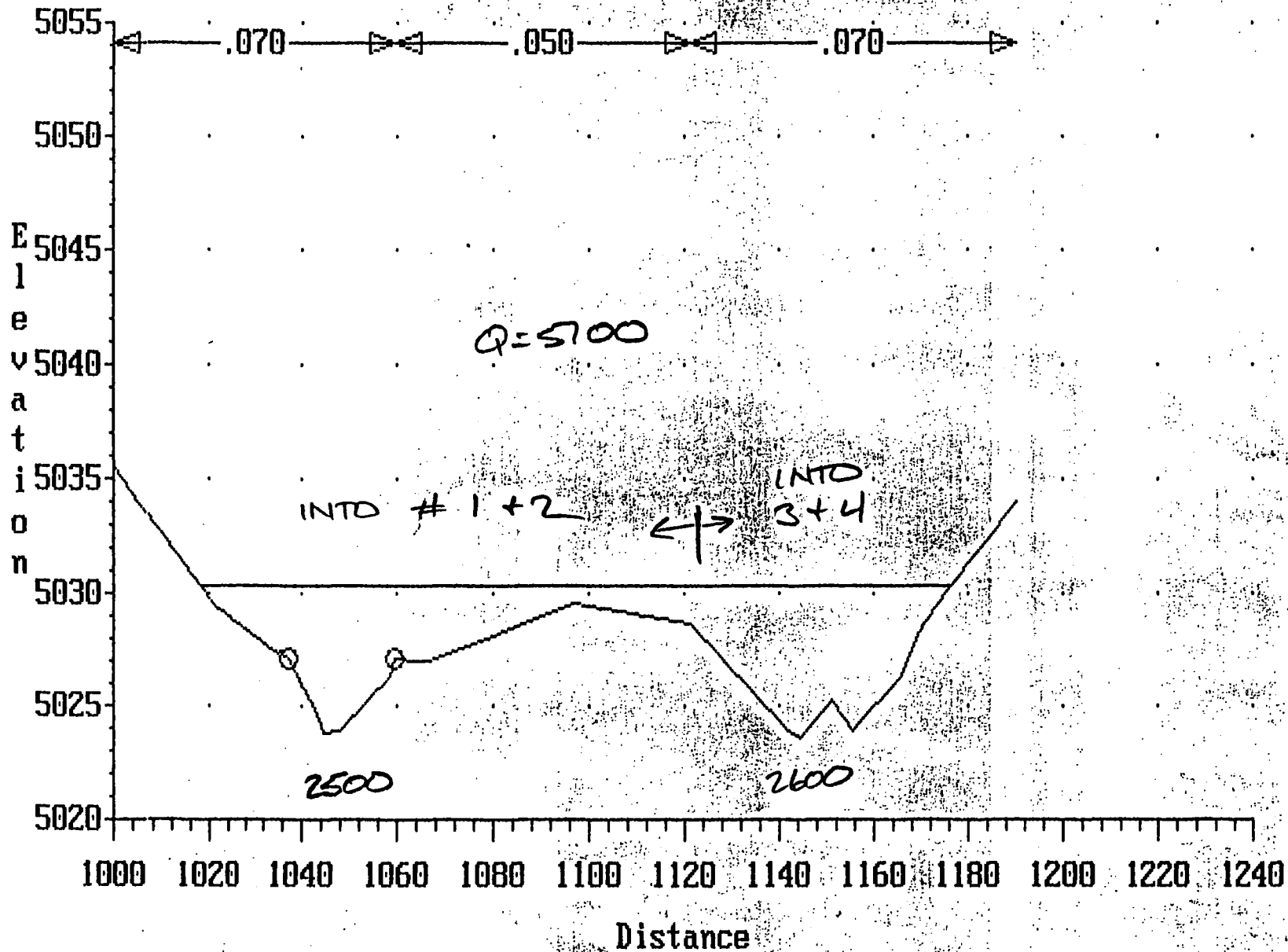


Whites Creek

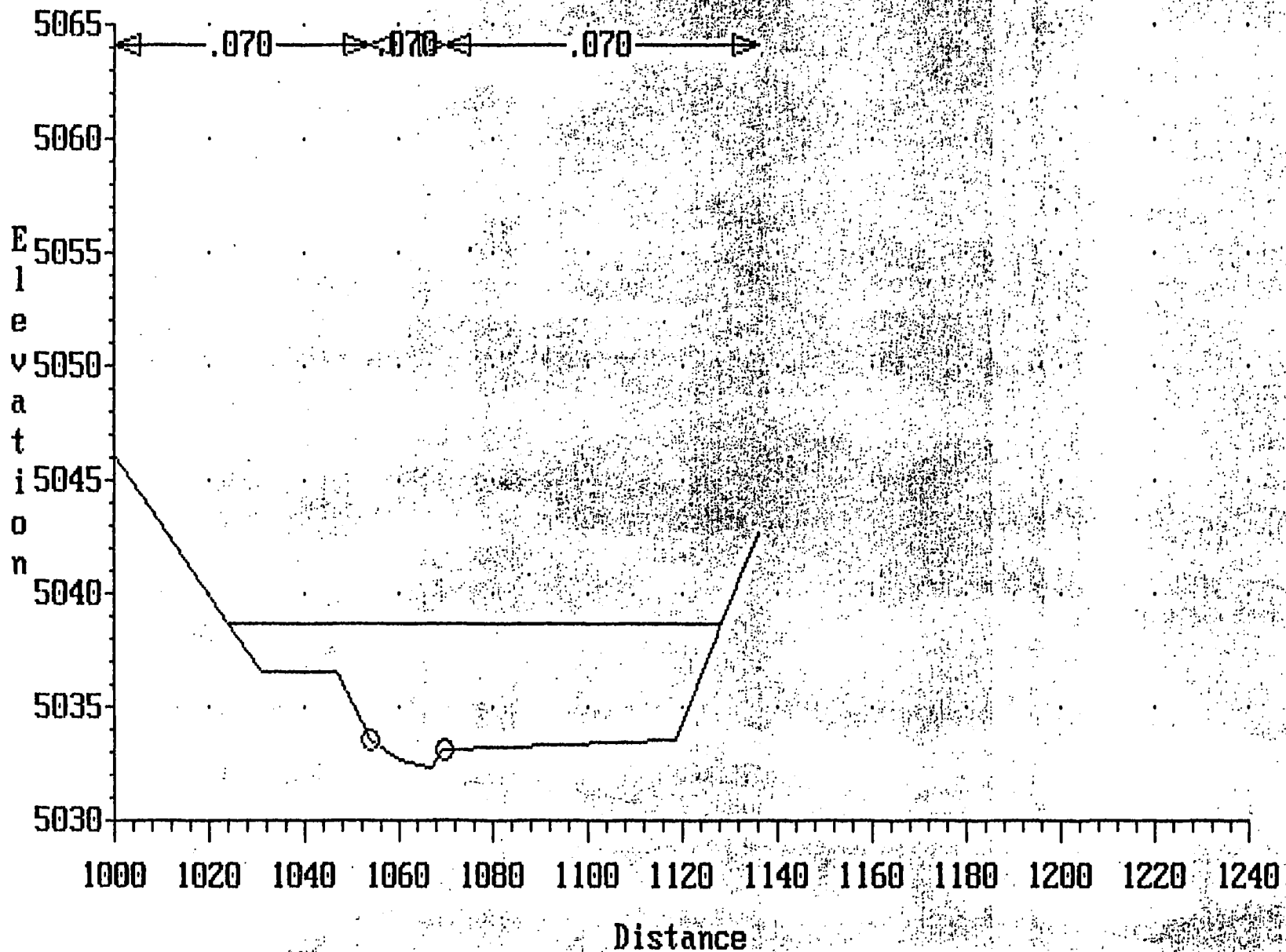
Cross-section 23.000



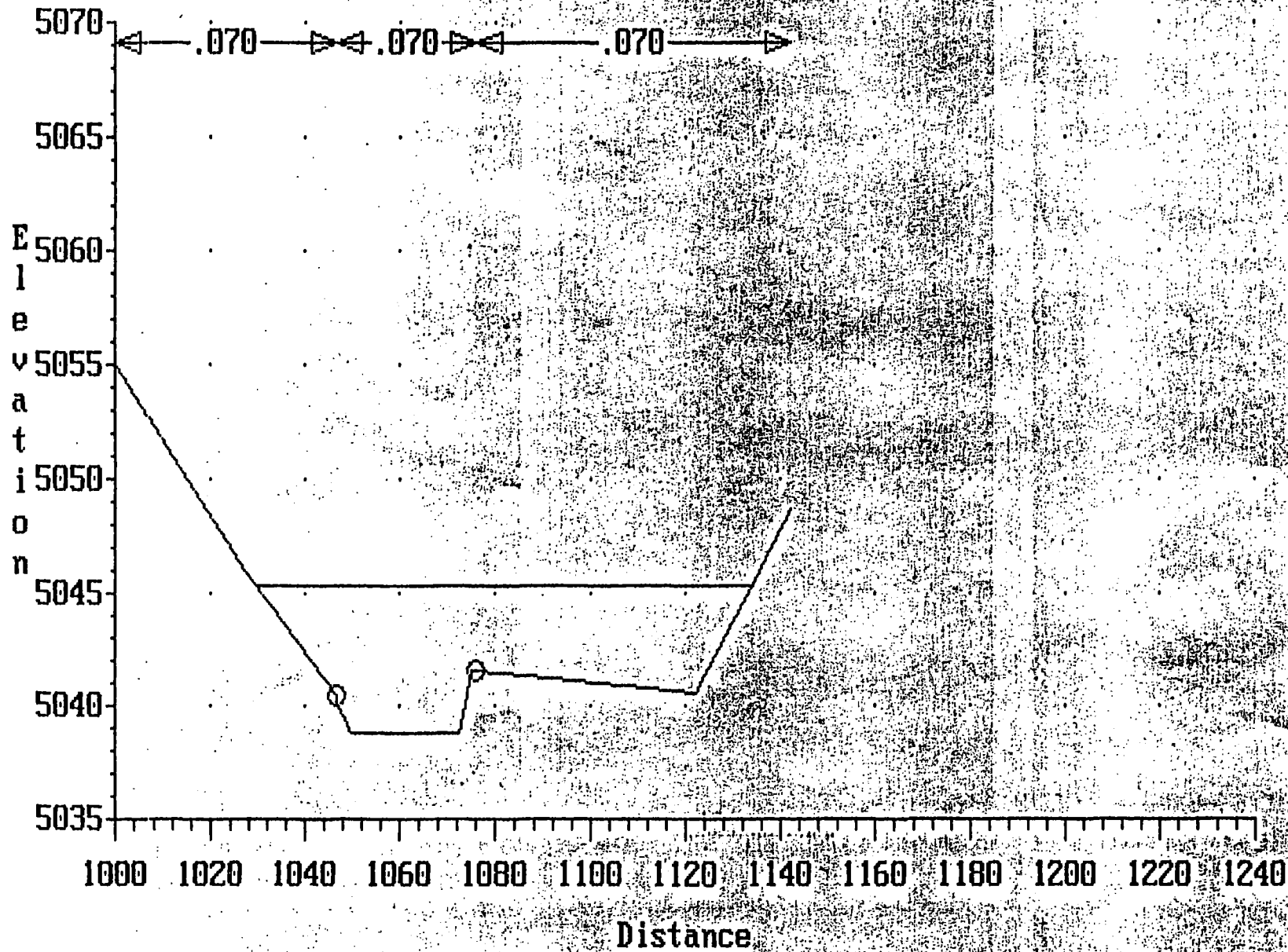
♥ Whites Creek ♥  
Cross-section 24.000

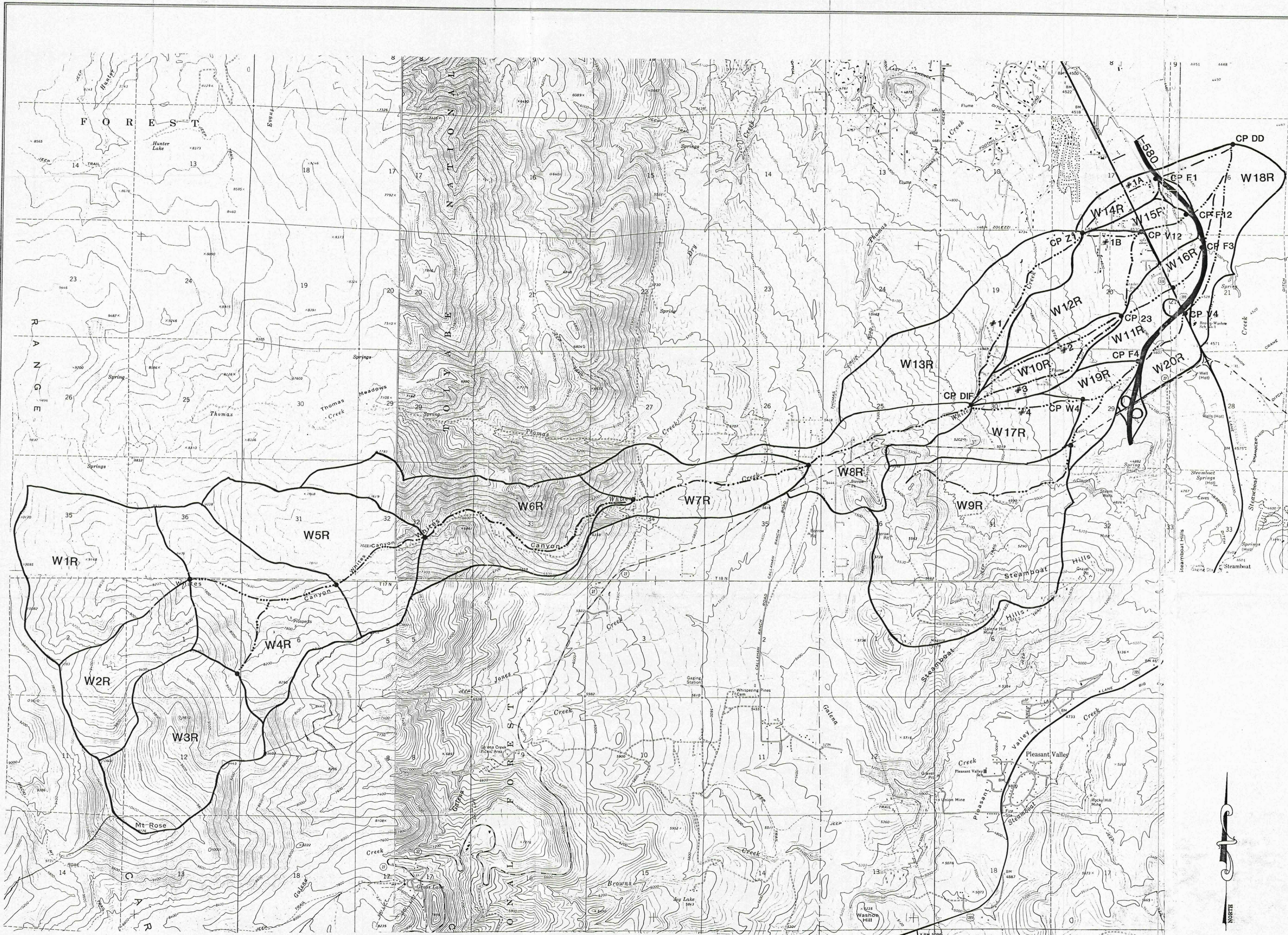


♥ Whites Creek ♥  
Cross-section 25.000



♥ Whites Creek ♥  
Cross-section 26.000





SEAL:

Nimbus Engineers

3710 Grant Dr., Reno, NV 89509  
Mail : P.O. Box 10220, Reno, NV 89510 (702) 689-8630

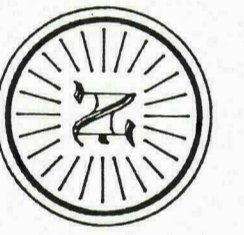


Figure 2

WATERSHED MAP  
WHITES CREEK  
WASHOE COUNTY, NEVADA

Nimbus Job # : 9302

Date : April 1993

Scale : 1" = 2000'

Drawing Name : 302bor.dwg

Sheet # :

of

# Flow Distribution for Channels 2 & 3

```
*****  
* HEC-2 WATER SURFACE PROFILES *  
* * * * *  
* Version 4.6.0; February 1991 *  
* * * * *  
* RUN DATE 25MAR93 TIME 11:48:14 *  
*****
```

```
*****  
* U.S. ARMY CORPS OF ENGINEERS *  
* HYDROLOGIC ENGINEERING CENTER *  
* 609 SECOND STREET, SUITE D *  
* DAVIS, CALIFORNIA 95616-4687 *  
* (916) 756-1104 *  
*****
```

```
      X   X XXXXXXXX YYYYY      YXXXX  
      X   X X      X   X      X   X  
      X   X X      X           X  
XXXXXXX XXXX X           XXXXX XXXXX  
      X   X X      Y           X  
      X   X X      X   X      X  
      X   X XXXXXXXX XXXXX      XXXXXXXX
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THIS RUN EXECUTED 25MAR93 11:48:14

\*\*\*\*\*  
HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991  
\*\*\*\*\*

T1  
T2 By : Nimbus Engineers, Reno,NV Nimbus Job # : 9301  
T3 Whites Creek File Name: 301wh2.dat  
Whites Creek flow distribution for Channels #2 & #3

J1	ICHECK	ING	NINW	IDIR	STRT	METRIC	HVINS	Q	WSEL	FB
	0	2	0	0	.0354	0	0	0	4630	0
J2	NPROF	IPLDT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1							15

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

	150	38	43	13	14	15	26	1	53	54
	4	25								
NC	.035	.035	.035	.3	.5					
QT	1	3000								
X1	1	20	2330	2585		0	0			
X4	2	4627	2360	4628	2585					
GR	4640	1000	4635	1100	4632.5	1165	4630	1250	4628	1340
GR	4629	1460	4628.5	1550	4628	1610	4627	1745	4628.5	1900
GR	4627	2000	4628	2055	4629.5	2115	4627.5	2185	4630	2275
GR	4631	2305	4630	2330	4627.5	2450	4630	2740	4629	2937
X1	2	16	2155	2390	270	330	250			
GR	4655	1000	4640	1145	4637	1240	4635	1320	4633.5	1360
GR	4636	1460	4636	1790	4637.5	1920	4636.5	1970	4635	2005
GR	4635	2070	4637.5	2155	4635	2245	4637.5	2390	4640	2675
GR	4640.5	2915								
X1	3	14	1790	1935	580	640	600			
X4	1	4659.5	2200							
GR	4671.5	1000	4665	1055	4660	1090	4662.5	1150	4658	1260
GR	4659.5	1470	4661	1535	4660	1570	4658.5	1590	4659	1630
GR	4659.5	1790	4656.5	1855	4659	1935	4662	2390		

25MAR93

11:48:14

PAGE 2

X1	4	17	1640	1885	510	555	550			
X4	1	4680	1640							
GR	4689	1000	4685	1105	4681	1130	4685.5	1190	4682.5	1255
GR	4678	1340	4682	1480	4679.5	1528	4682	1550	4681	1570
GR	4682.5	1600	4679.8	1670	4680.2	1740	4679.5	1775	4681.5	1885
GR	4685	2050	4681.5	2188						

SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICDNT	CORAR	TOPWID	ENDST

\*PROF 1

CCHV= .300 CEHV= .500

\*SECNO 1.000

3265 DIVIDED FLOW

3720 CRITICAL DEPTH ASSUMED

1.000	1.43	4628.43	4628.43	4630.00	4628.79	.36	.00	.00	4630.00
3000.0	1909.1	1076.2	14.7	412.0	208.5	7.2	.0	.0	4628.00
.00	4.63	5.16	2.03	.035	.035	.035	.000	4627.00	1320.60
.017770	0.	0.	0.	0	14	0	.00	912.26	2618.41

FLOW DISTRIBUTION FOR SECNO= 1.00 CWSEL= 4628.43

STA=	1321.	1340.	1392.	1610.	1745.	1893.	2000.	2055.	2072.	2185.	2219.	2585.	2618.
PER Q=	.3	.8	.8	22.6	16.0	10.3	9.2	.3	1.7	1.8	35.9	.5	
AREA=	4.2	11.2	11.2	125.7	105.8	68.3	51.2	3.7	15.2	15.6	208.5	7.2	
VEL=	2.0	2.0	2.0	5.4	4.5	4.5	5.4	2.0	3.4	3.4	5.2	2.0	
DEPTH=	.2	.2	.1	.9	.7	.6	.9	.2	.1	.5	.9	.2	

\*SECNO 2.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

2.000	2.81	4636.31	4636.31	.00	4636.72	.41	4.04	.02	4637.50
3000.0	2704.5	295.5	.0	512.2	80.4	.0	3.7	5.3	4637.50
.01	5.28	3.67	.00	.035	.035	.000	.000	4633.50	1267.68
.013197	270.	250.	330.	11	17	0	.00	811.99	2320.87

FLOW DISTRIBUTION FOR SECNO= 2.00 CWSEL= 4636.31

STA=	1268.	1320.	1360.	1460.	1790.	1817.	2005.	2070.	2114.	2390.
PER Q=	4.2	21.6	34.0	7.5	.2	2.4	16.5	3.6	9.9	
AREA=	34.2	82.3	155.8	101.7	4.1	20.0	85.0	29.1	80.4	
VEL=	3.7	7.9	6.6	2.2	1.4	3.7	5.8	3.7	3.7	
DEPTH=	.7	2.1	1.6	.3	.2	.1	1.3	.7	.7	

SECNO	DEPTH	CWSEL	CRWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

\*SECNO 3.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL  
 3693 PROBABLE MINIMUM SPECIFIC ENERGY  
 3720 CRITICAL DEPTH ASSUMED

3.000	3.16	4659.66	4659.66	.00	4660.04	.38	6.52	.01	4659.50
3000.0	1171.0	1584.2	244.7	334.8	260.2	108.7	12.5	16.9	4659.00
.05	3.50	6.09	2.25	.035	.035	.035	.000	4656.50	1219.50
.009436	580.	600.	640.	20	8	0	.00	894.63	2211.91

FLOW DISTRIBUTION FOR SECNO= 3.00 CWSEL= 4659.66

STA=	1220.	1260.	1470.	1477.	1590.	1630.	1790.	1935.	2200.	2212.
PER Q=	4.1	24.5	.0	.8	4.7	4.9	52.8	8.1	.0	
AREA=	33.5	190.4	.5	8.9	36.3	65.1	260.2	107.8	.9	
VEL=	3.6	3.9	.8	2.9	3.9	2.3	6.1	2.3	.8	
DEPTH=	.8	.9	.1	.1	.9	.4	1.8	.4	.1	

\*SECNO 4.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL  
 3693 PROBABLE MINIMUM SPECIFIC ENERGY  
 3720 CRITICAL DEPTH ASSUMED

4.000	3.04	4681.04	4681.04	.00	4681.61	.57	6.25	.09	4680.00
3000.0	1898.9	1101.1	.0	291.1	214.1	.0	19.9	25.1	4681.50
.07	6.52	5.14	.00	.035	.035	.000	.000	4678.00	1129.74
.015196	510.	550.	555.	20	11	0	.00	445.88	1859.76

FLOW DISTRIBUTION FOR SECNO= 4.00 CWSEL= 4681.04

STA=	1130.	1340.	1446.	1528.	1542.	1640.	1885.
PER Q=	20.1	37.3	3.3	1.5	1.0	36.7	
AREA=	87.3	161.8	22.8	10.4	8.7	214.1	
VEL=	6.9	6.9	4.4	4.4	3.4	5.1	
DEPTH=	.4	1.5	.3	.8	.1	1.0	

THIS RUN EXECUTED 25MAR93 11:48:17

\*\*\*\*\*  
 HEC-2 WATER SURFACE PROFILES  
 Version 4.6.0; February 1991  
 \*\*\*\*\*

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Whites Creek

SUMMARY PRINTOUT

SECNO	Q	QLOB	QCH	QROB	VCH	CWSEL	SSTA	ENDST	TOPWID	AREA
* 1.000	3000.00	1909.10	1076.24	14.66	5.16	4628.43	1320.60	2618.41	912.26	627.71
* 2.000	3000.00	2704.49	295.51	.00	3.67	4636.31	1267.68	2320.87	811.99	592.65
* 3.000	3000.00	1171.03	1584.24	244.74	6.09	4659.66	1219.50	2211.91	894.63	703.71
* 4.000	3000.00	1898.89	1101.11	.00	5.14	4681.04	1129.74	1859.76	445.88	505.23

Whites Creek

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	1.000	.00	.00	.00	4627.00	3000.00	4628.43	4628.43	4628.79	177.70	5.16	627.71	225.05
*	2.000	250.00	.00	.00	4633.50	3000.00	4636.31	4636.31	4636.72	131.97	3.67	592.65	261.15
*	3.000	600.00	.00	.00	4656.50	3000.00	4659.66	4659.66	4660.04	94.36	6.09	703.71	308.83
*	4.000	550.00	.00	.00	4678.00	3000.00	4681.04	4681.04	4681.61	151.96	5.14	505.23	243.36

Whites Creek

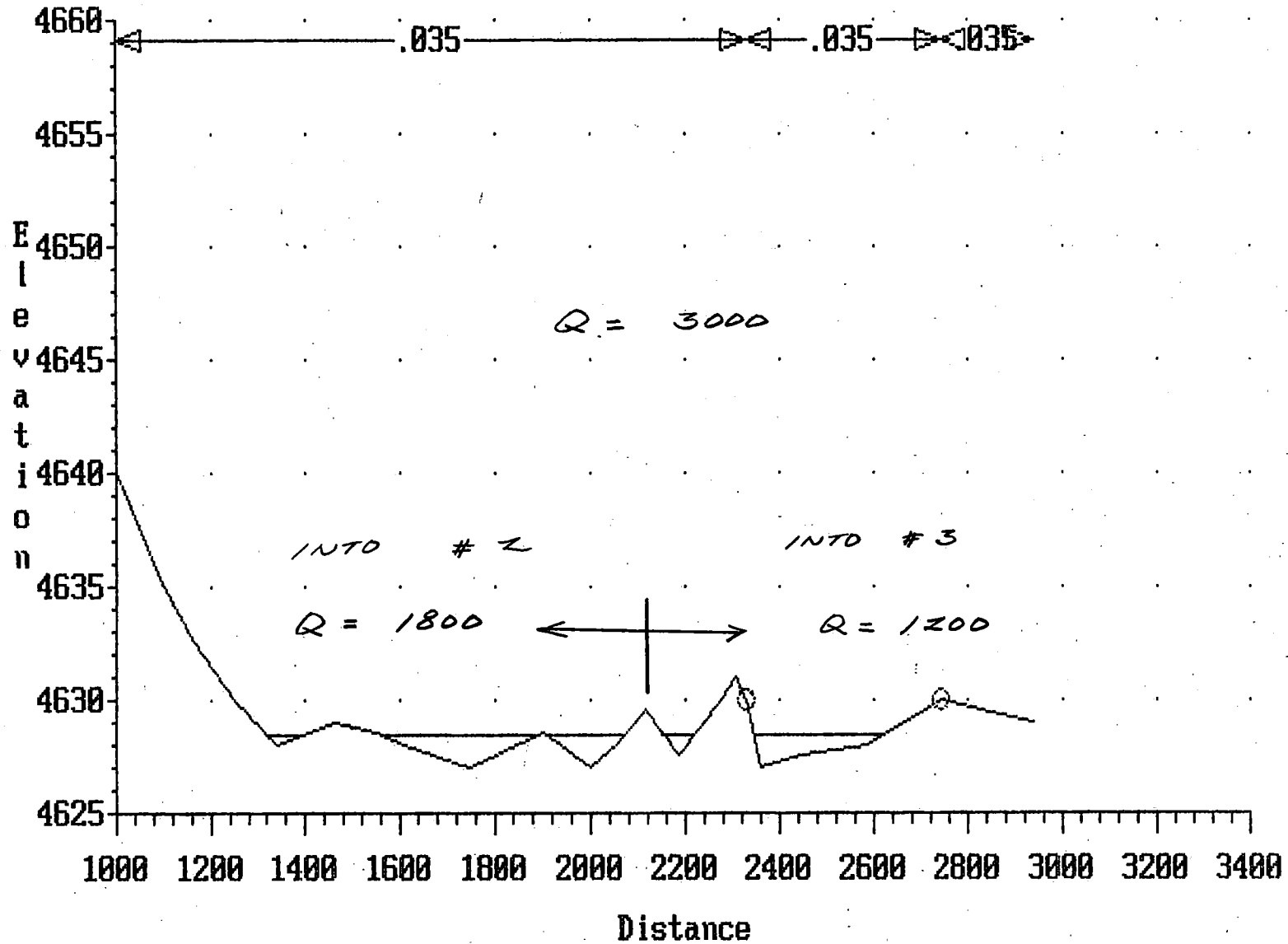
SUMMARY PRINTOUT TABLE 150

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*	1.000	3000.00	4628.43	.00	.00	-1.57	912.26	.00
*	2.000	3000.00	4636.31	.00	7.88	.00	811.99	250.00
*	3.000	3000.00	4659.66	.00	23.35	.00	894.63	600.00
*	4.000	3000.00	4681.04	.00	21.38	.00	445.88	550.00

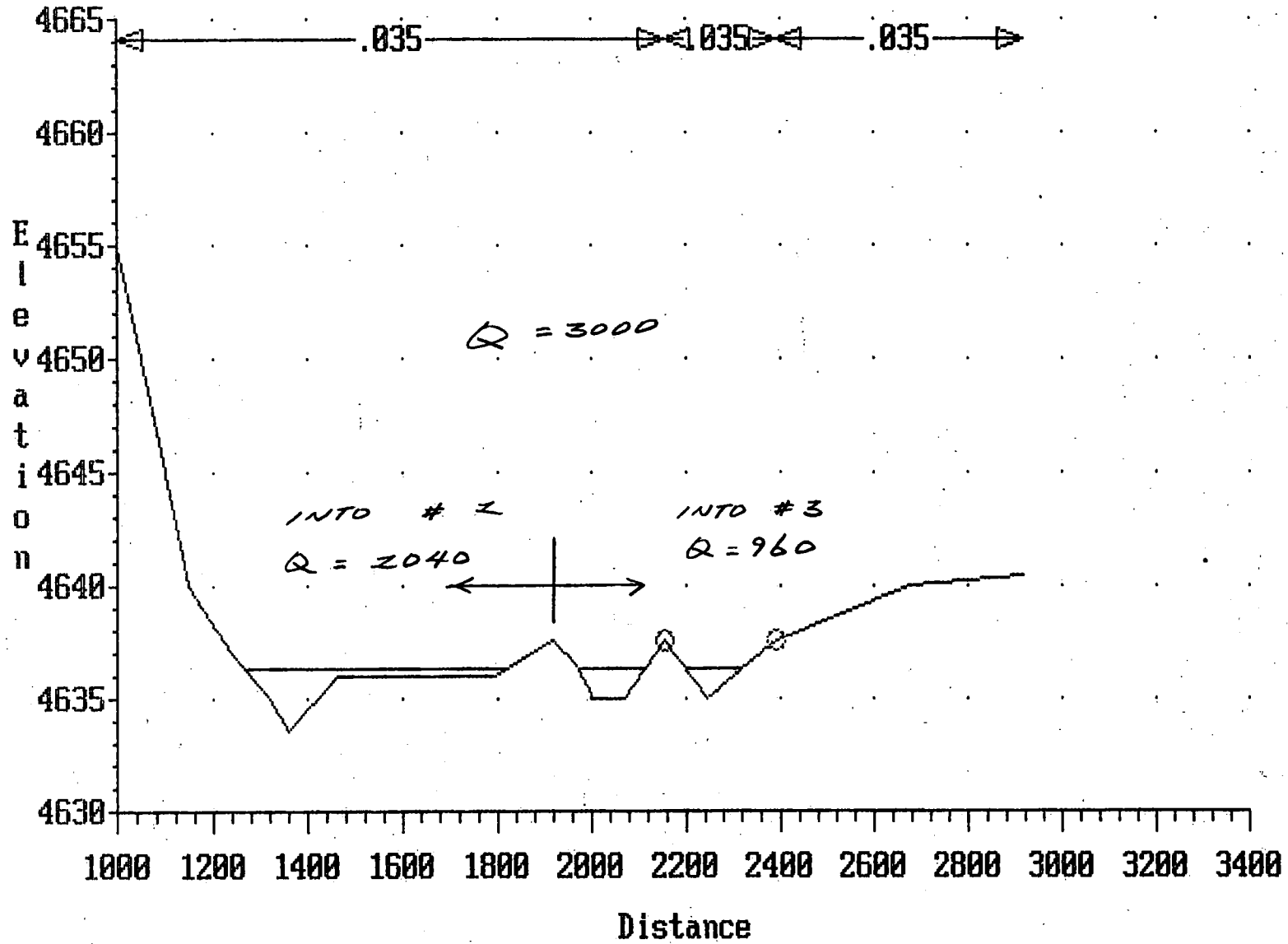
## SUMMARY OF ERRORS AND SPECIAL NOTES

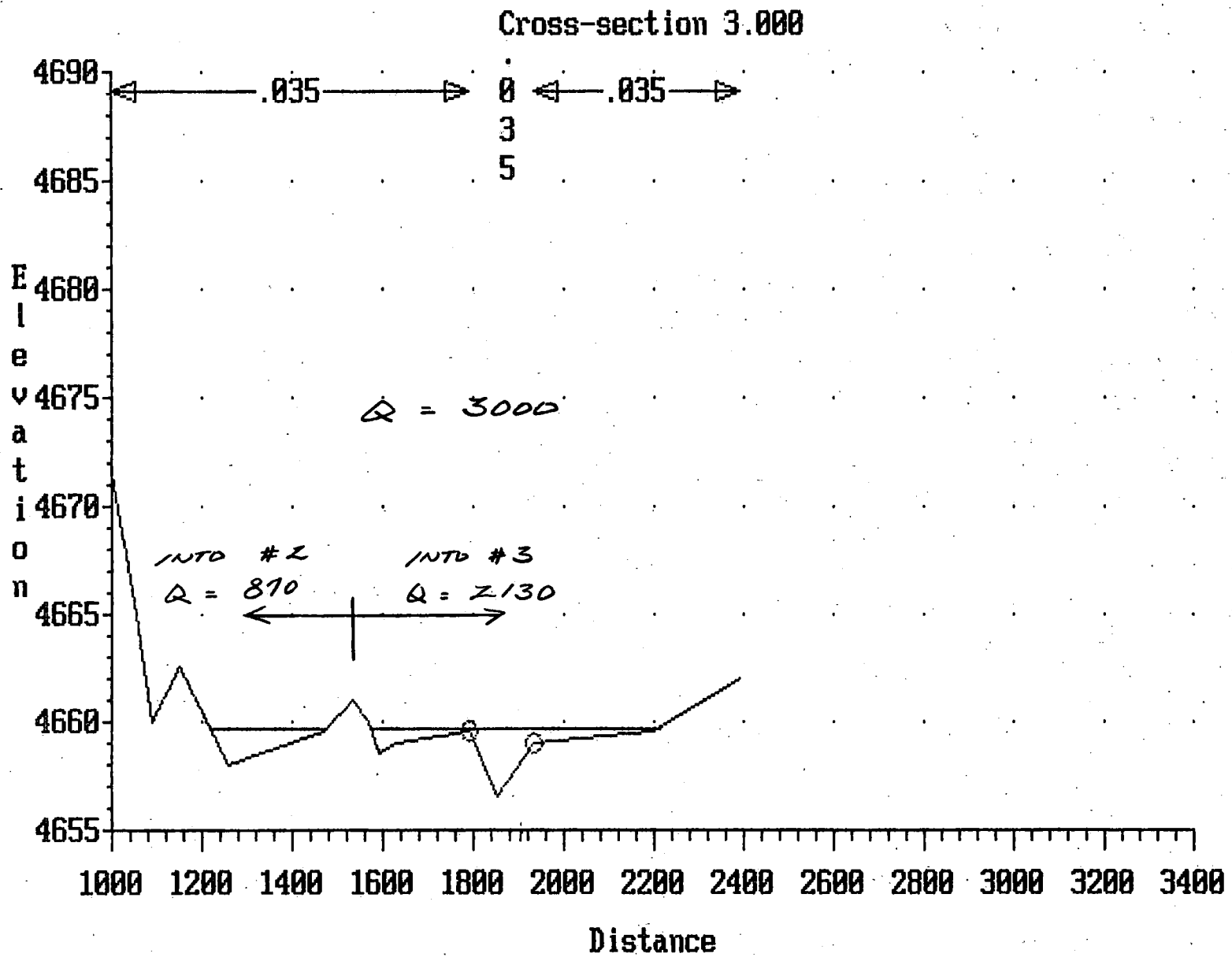
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CAUTION SECNO= 2.000 PROFILE= 1 CRITICAL DEPTH ASSUMED  
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CAUTION SECNO= 3.000 PROFILE= 1 CRITICAL DEPTH ASSUMED  
CAUTION SECNO= 3.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY  
CAUTION SECNO= 3.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL  
CAUTION SECNO= 4.000 PROFILE= 1 CRITICAL DEPTH ASSUMED  
CAUTION SECNO= 4.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY  
CAUTION SECNO= 4.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

Cross-section 1.000

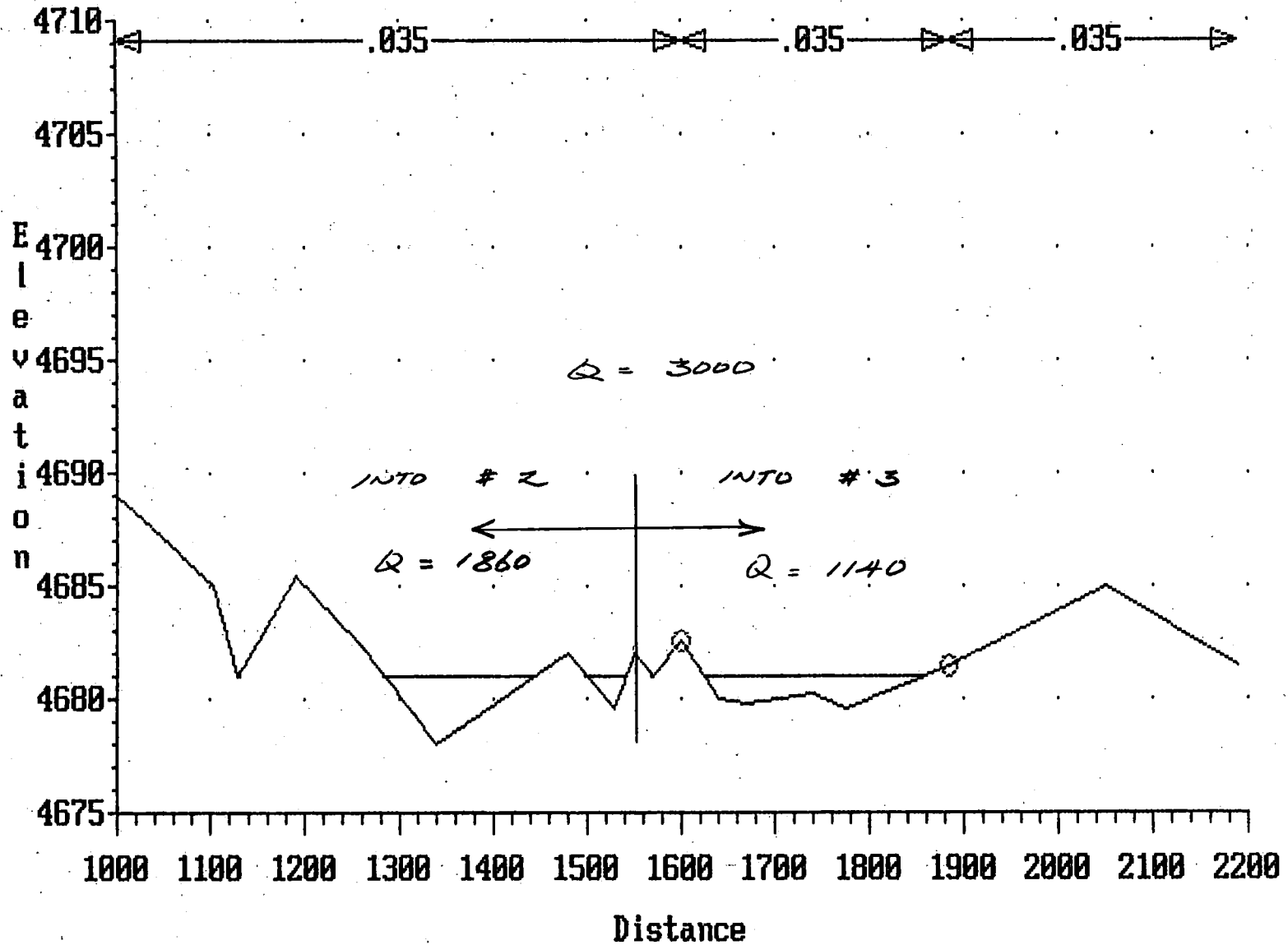


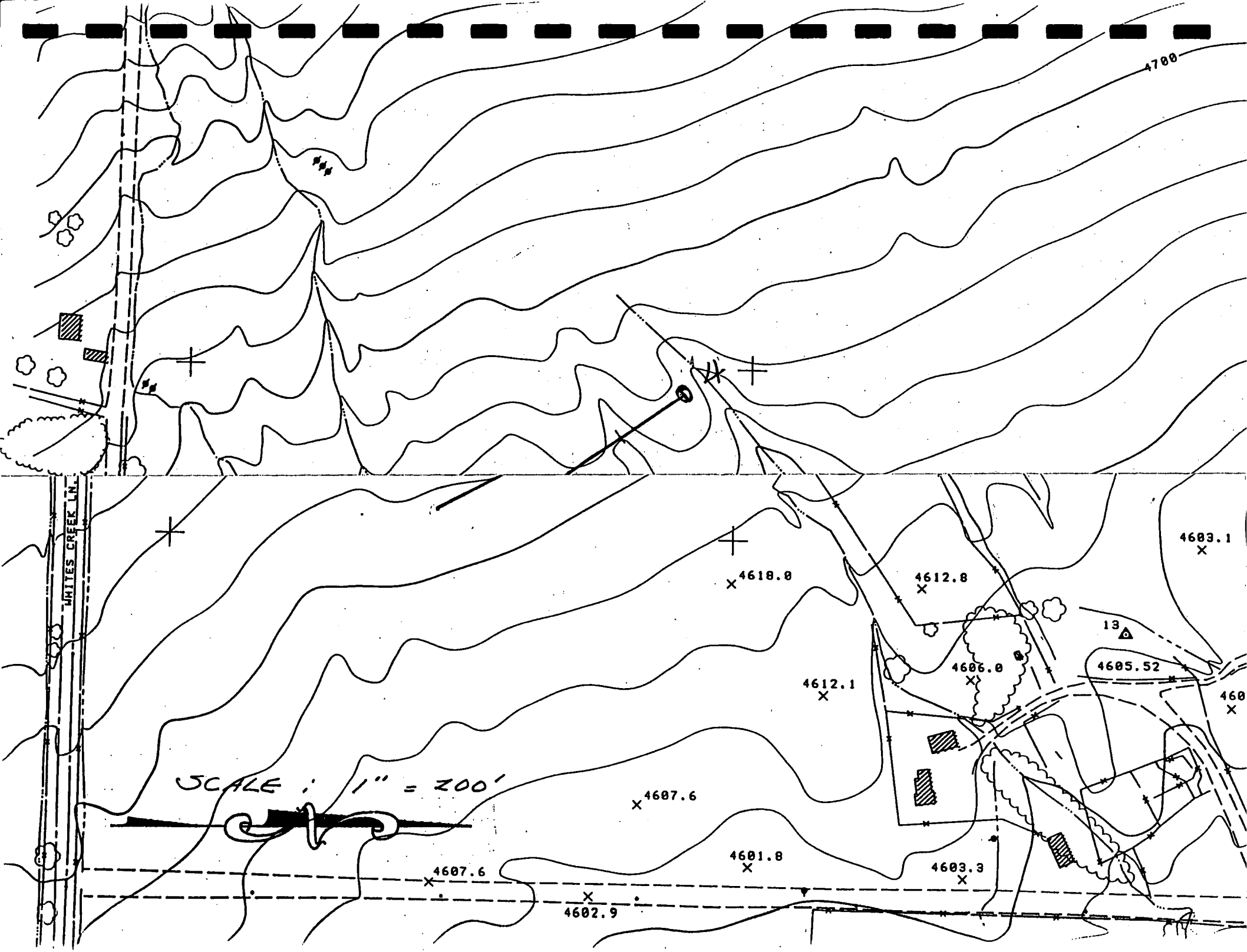
Cross-section 2.000





Cross-section 4.000





4700

WHITES CREEK LN.

SCALE : 1" = 200'

4683.1  
X

X 4618.0

4612.8  
X

13  
▲

4612.1  
X

4606.0  
X

4605.52

460  
X

X 4607.6

4601.8  
X

4603.3  
X

4607.6  
X

X 4602.9



# Nimbus Engineers

3710 Grant Dr., Suite D • Reno, NV 89509  
Mail: P.O. Box 10220 • Reno, NV 89510  
(702) 689-8630

JOB \_\_\_\_\_

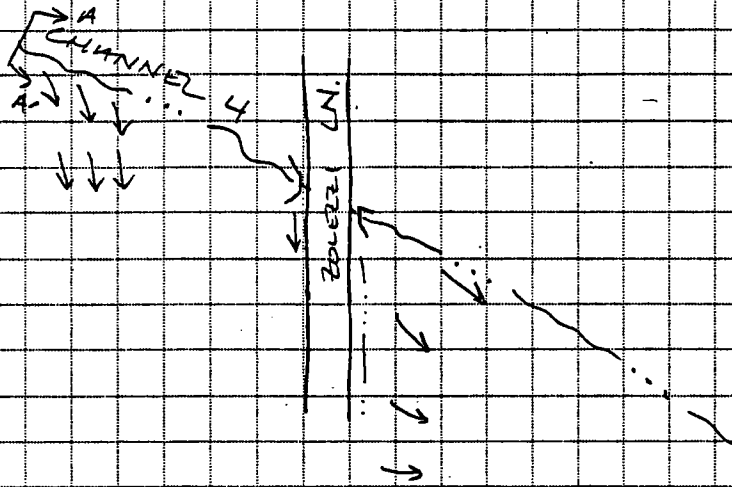
SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_

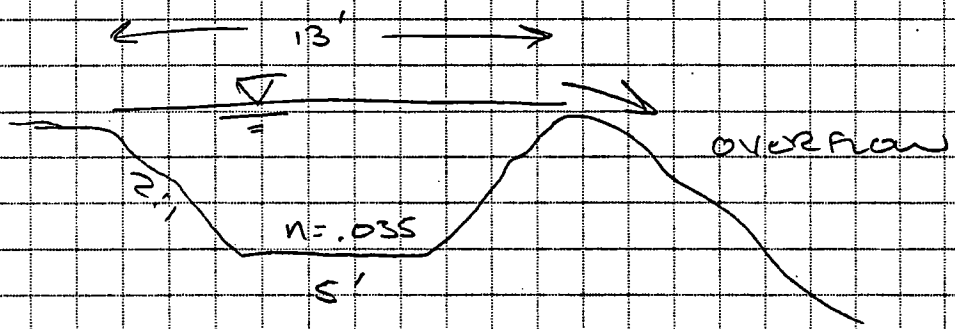
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

## DRY CREEK NEAR ZOLEZZI LN



### SECTION A-A'



$S = 0.03$

$Q = 150 \text{ cfs}$  TO  $6' \times 4'$  (BOX CAN HANDLE)

ABOVE THIS AMOUNT FLOWS TO  
INTERSECTION OF ZOLEZZI + SO.  
VIRGINIA ST.

TRAPEZOIDAL CHANNEL ANALYSIS  
 RATING CURVE COMPUTATION

March 22, 1993  
 Whites Creek  
 Channel #1 near Tolazzi Lane

=====

PROGRAM INPUT DATA:	
DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot).....	0.0300
Manning's Roughness Coefficient (n-value).....	0.0350
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)....	2.00
Channel Bottom Width (feet).....	5.0

=====

PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)
1.5	89.7	7.48	1.261	0.868	2.368	12.0	11.0
1.6	101.5	7.74	1.271	0.930	2.530	13.1	11.4
1.7	114.1	7.99	1.280	0.992	2.692	14.3	11.8
1.8	127.6	8.24	1.289	1.054	2.854	15.5	12.2
1.9	141.8	8.48	1.298	1.117	3.017	16.7	12.6
2.0	156.9	8.72	1.306	1.180	3.180	18.0	13.0
2.1	172.9	8.95	1.313	1.244	3.344	19.3	13.4
2.2	189.7	9.18	1.321	1.307	3.507	20.7	13.8
2.3	207.5	9.40	1.328	1.371	3.671	22.1	14.2
2.4	226.1	9.61	1.335	1.435	3.835	23.5	14.5

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TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1996  
 Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092  
 (713) 695-8322. A manual with equations & flow chart is available.

# *APPENDIX*



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June 3, 1993

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NIMBUS ENGINEERS

Nimbus Engineers  
3710 Grant Drive  
Reno, Nevada 89509

Attention: Ms. Peggy Bowker

Gentlemen:

**PRELIMINARY GEOTECHNICAL RECONNAISSANCE  
WHITE'S CREEK RETENTION FACILITY  
WASHOE COUNTY, NEVADA**

**Introduction**

Harding Lawson Associates (HLA) is pleased to present this letter summarizing field activities performed to date for the subject project. In general, the project consists of the construction of a storage retention facility (no embankment construction). Excavated material, if suitable, may be used for embankment construction of Nevada Department of Transportation (NDOT) highway projects. Excavation depths may extend to 30 feet below ground surface (bgs). The project will also include miscellaneous headwork structures and diversion channels.

**Scope of Services**

HLA's scope of services summarized in this letter report, for the project were limited to the following:

- conducting a literature search and review, utilizing available geological, topographical and orthographical data from existing published and unpublished sources;
- conducting a preliminary site reconnaissance to field check surface conditions at the site and to verify findings of the literature search; and
- attending meetings with Nimbus Engineers to present preliminary information.

**Geologic Reconnaissance and Literature Search**

A literature search and review was conducted for the site. The search focused on available geotechnical, topographical and orthographical data from published and unpublished sources. A list of references obtained and reviewed is provided in the attached bibliography.

In addition to the literature search, a site reconnaissance of the site was conducted. The site reconnaissance was conducted to field check surface conditions and to

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Nimbus Engineers  
Ms. Peggy Bowker  
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Harding Lawson Associates

verify findings of the literature search. The geotechnical factors studied included: geologic hazards, including evidence of faulting, and suitability of material to be excavated for use as embankment material.

Data obtained during the literature review indicated the presence of a Holocene fault (younger than 11,000 years) crossing the northern portion of the site. Holocene faults are considered by the United States Geological Survey (USGS) to be active faults.

During the site visit, HLA's field engineer verified the location of the fault; however, the fault scarp is located on the northern portion of the site and is not considered to be a detriment to the detention ponding facilities. Additionally, HLA examined surface soils to determine the suitability of material to be excavated. The surface soils consist of sands with silt, gravel and cobbles, and sandy silts with gravel and cobbles.

We trust this provides the information you require at this time. If you have any questions, please do not hesitate to call the undersigned.

Yours very truly,

HARDING LAWSON ASSOCIATES



Mary E. Wells, P.E.  
Project Engineer

MEW/rs/23697.103

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