ADDENDUM 6 TO APPENDIX VI-3

DESIGN AND CALCULATION DATA FOR DITCH 31

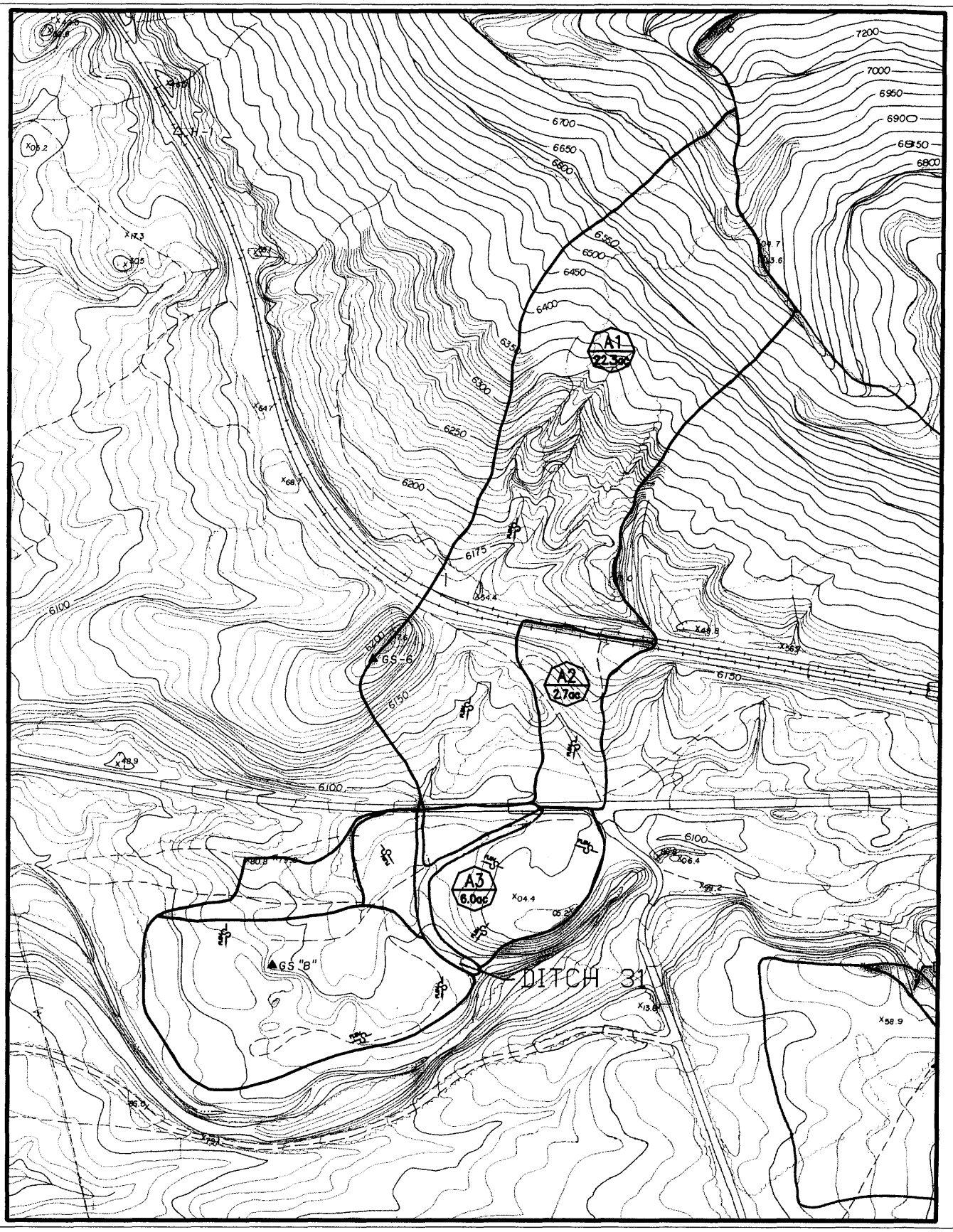
September 15, 2006

The following addendum contains the modifications to the drainage strategy for the Mining and Reclamation Plan. This addendum includes the calculation sheets associated with the design of Ditch 31. Ditch 31 will collect drainage from portions of Watersheds A1, A2, and A3 as part of the reclamation plan for a portion of the refuse pile area. Ditch 31 will be remain following final reclamation activities for the site.

FILE IN Expandable 09142006
Refer to Record No. 0173
in C0070013, 2006, Incoming
for additional information

Historically, Bermed Channel 31 has been designed for the 10 year-6 hour event and only for the flow from Watershed 30. However, Watersheds A1, A2, and A3 provide flow to this structure (see Figure 1). Additionally, as this structure is to remain as a permanent diversion, the channel should be designed for the 100 year- 6 hour event. Therefore, the attached calculations provide the peak flows for Watersheds A1, A2, and A3 for the 100 year-6 hour event. Also, the design calculations for channel sizing are based on the total flow from all three watersheds. Riprap has been sized for the increased flow velocity.

Based on these calculations, the proposed channel modifications, should be able to convey the flow events that are occurring within the channel.



0' 400'

FIGURE 1. WATERSHED DRAINAGE AREAS

Table 1

Ditch 31 Watersheds
Determination of Time of Concentration

WS ID	WS Area (ac)	Max. Elev. (ft)	Min. Elev. (ft)	WS Slope (%)	Hyd Len (ft)	Curve Number	WS Lag (hr)	TC (hr)
A1	22.3	7030	6095	37.85	2470	75	0.124	0.21
A2	2.7	6160	6105	7.33	750	75	0.108	0.18
A3	6.0	6105	6065	4.49	890	82	0.128	0.21

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
WATERSHED A1

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type II	Area = 22.30 acres
Depth = 1.90 inches	CN = 75.00
Duration = 6.0 hrs	Time conc.= 0.21 hrs

OUTPUT SUMMARY

Runoff depth:	0.333 inches
Initial abstr:	0.667 inches
Peak flow:	11.78 cfs (0.524 iph)
at time:	3.136 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
WATERSHED A2

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type II	Area = 2.70 acres
Depth = 1.90 inches	CN = 75.00
Duration = 6.0 hrs	Time conc.= 0.18 hrs

OUTPUT SUMMARY

Runoff depth:	0.333 inches
Initial abstr:	0.667 inches
Peak flow:	1.60 cfs (0.588 iph)
at time:	3.120 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

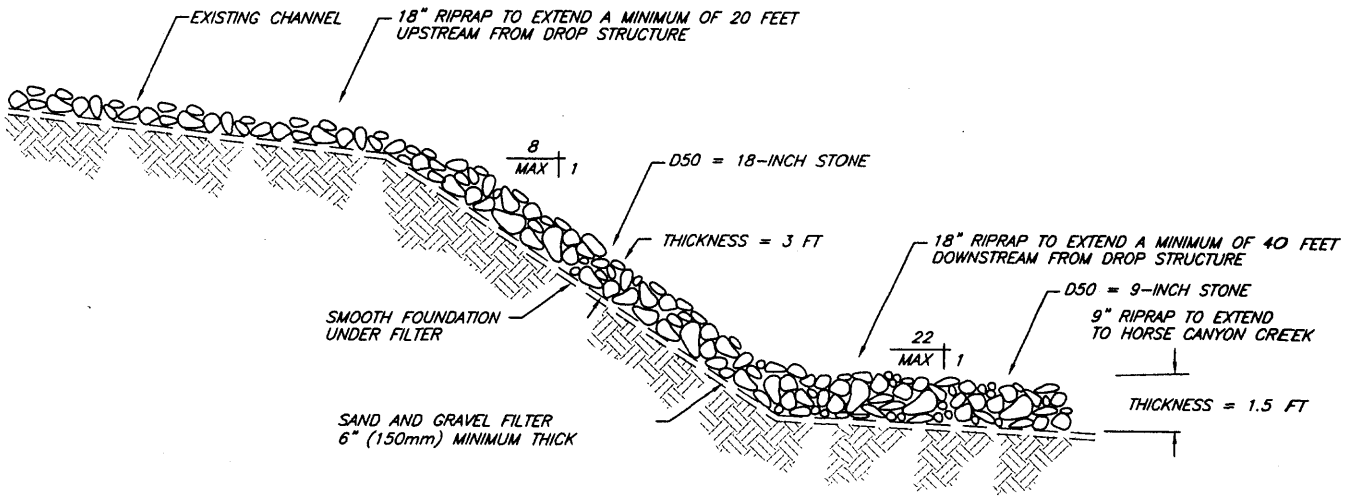
Watershed I.D.:
WATERSHED A3

INPUT SUMMARY

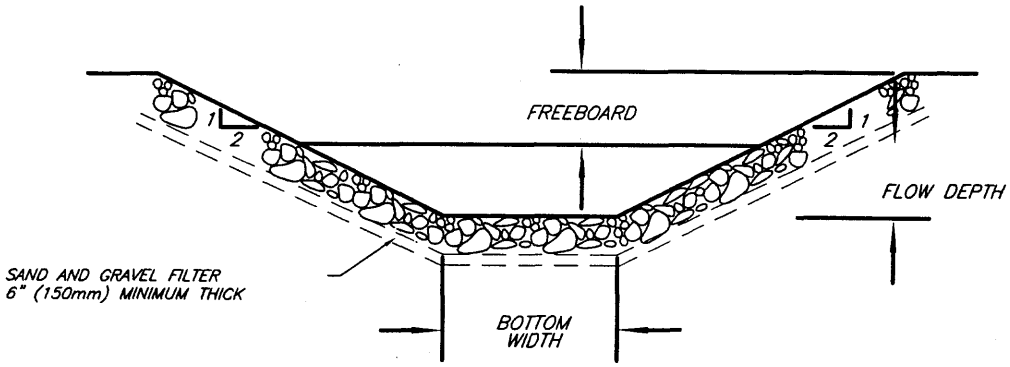
STORM :	WATERSHED :
Dist.= SCS Type II	Area = 6.00 acres
Depth = 1.90 inches	CN = 82.00
Duration = 6.0 hrs	Time conc.= 0.21 hrs

OUTPUT SUMMARY

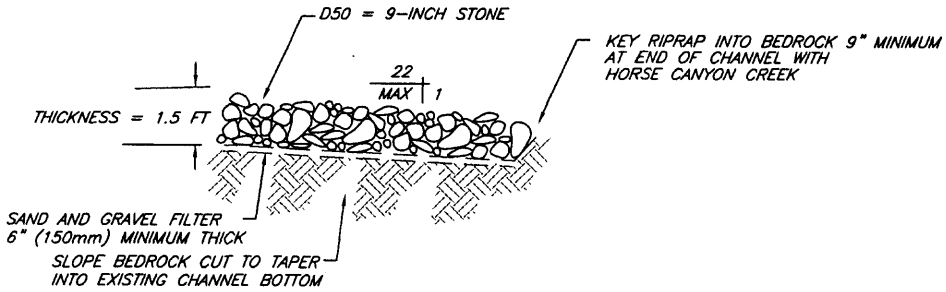
Runoff depth:	0.584 inches
Initial abstr:	0.439 inches
Peak flow:	6.94 cfs (1.148 iph)
at time:	3.136 hrs



TYPICAL SECTION



TYPICAL TRAPEZOIDAL CHANNEL SECTION



TYPICAL OUTLET SECTION

FIGURE 2. TYPICAL DROP STRUCTURE DETAIL

Channel Report

Hydraflow Express by Intelisolve

Wednesday, Sep 13 2006, 8:25 PM

Ditch 31 - Min

Trapezoidal

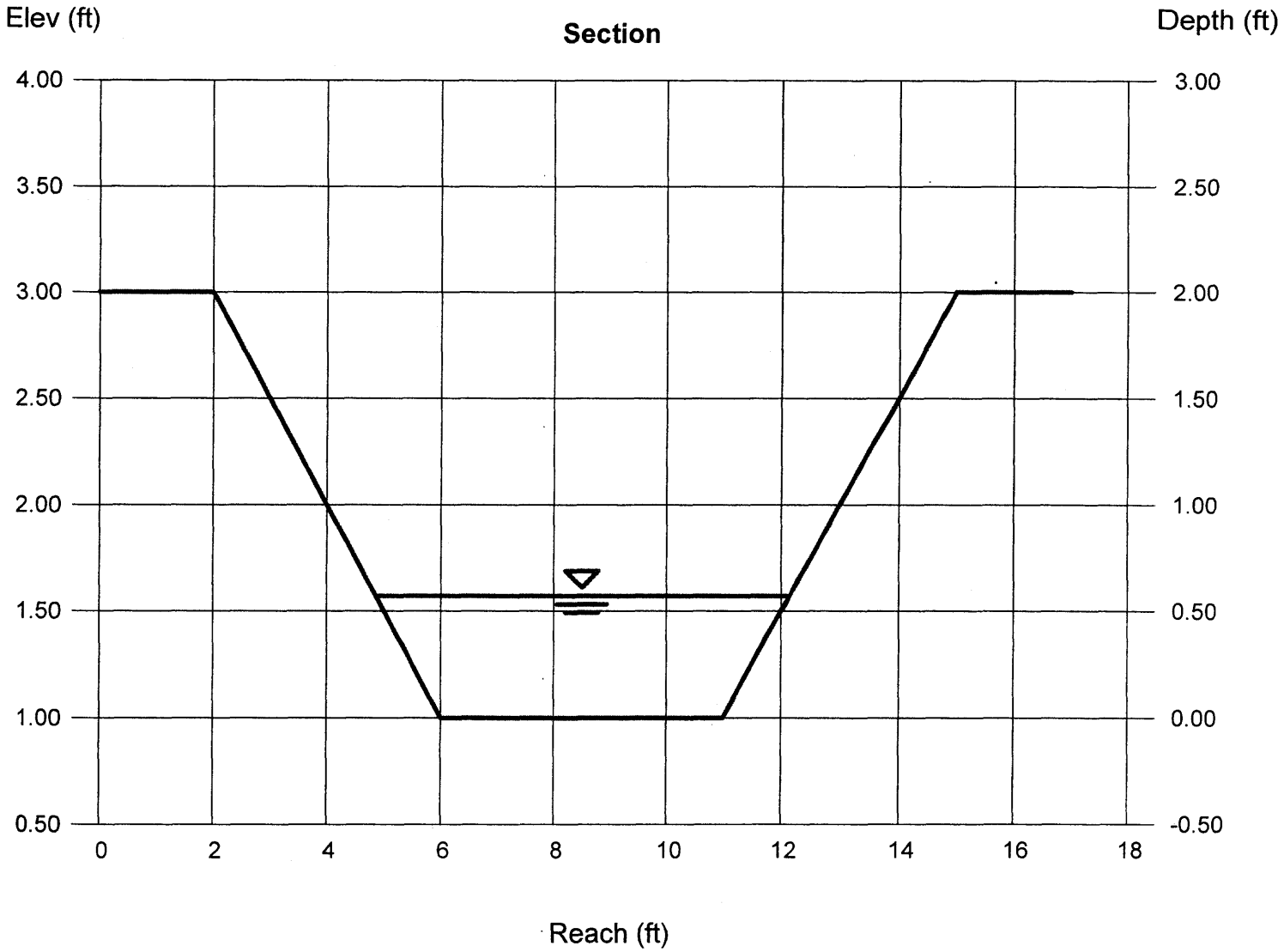
Botom Width (ft)	= 5.00
Side Slope (z:1)	= 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 20.32

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 20.32
Area (sqft)	= 3.50
Velocity (ft/s)	= 5.81
Wetted Perim (ft)	= 7.55
Crit Depth, Yc (ft)	= 0.73
Top Width (ft)	= 7.28
EGL (ft)	= 1.09



Channel Report

Hydraflow Express by Intelisolve | Wednesday, Sep 13 2006, 8:26 PM

Ditch 31 - Max

Trapezoidal

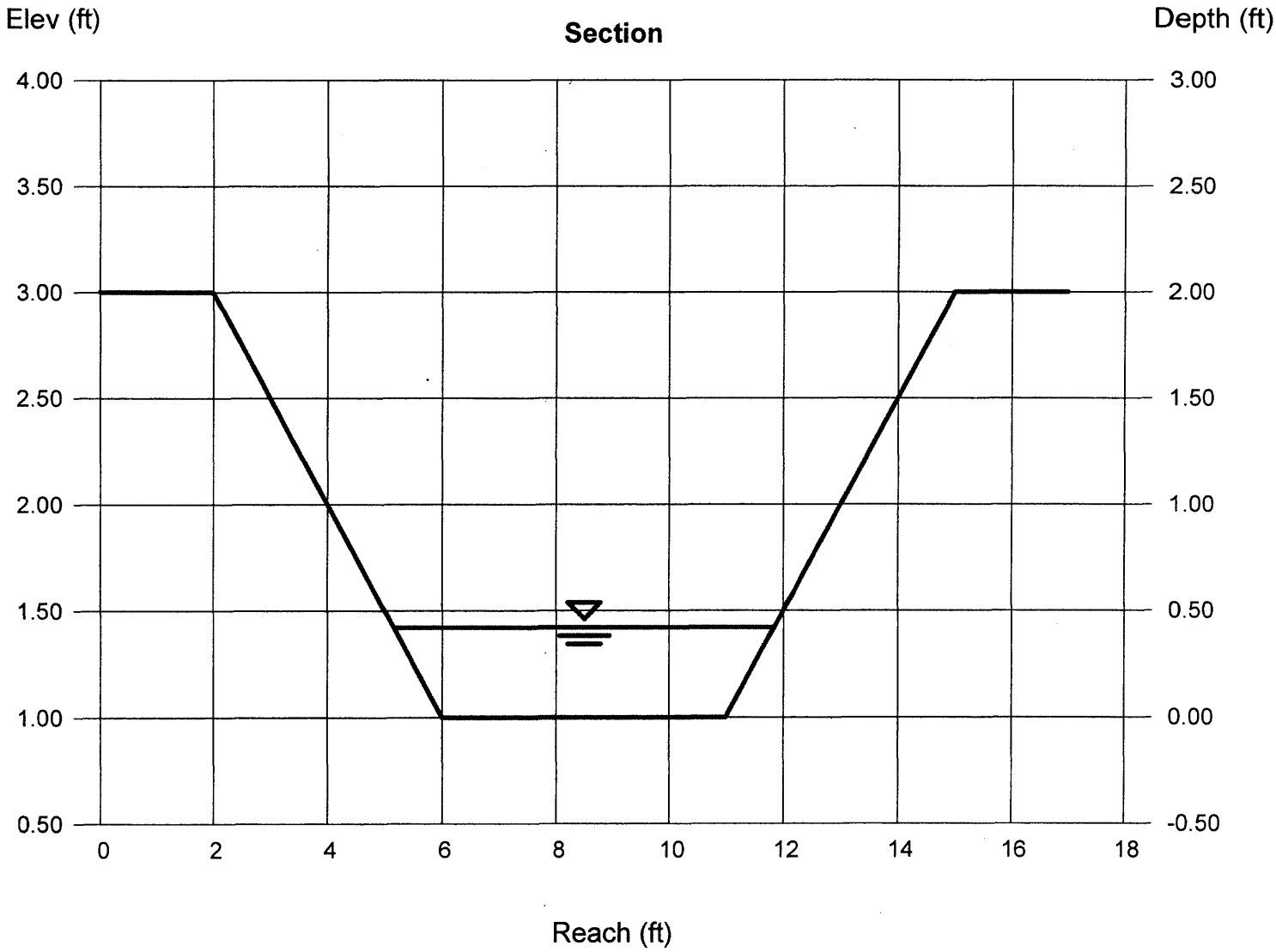
Botom Width (ft)	= 5.00
Side Slope (z:1)	= 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 12.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 20.32

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 20.32
Area (sqft)	= 2.45
Velocity (ft/s)	= 8.28
Wetted Perim (ft)	= 6.88
Crit Depth, Yc (ft)	= 0.73
Top Width (ft)	= 6.68
EGL (ft)	= 1.49



Riprap Sizing
Based on Isbash Curve from
Army Corps of Engineers
EM 1110-2-1601
1-Jul-70
Hydraulic Design of Flood Control Channels

Channel Segment	Channel Width (ft)	Channel Depth (ft)	Channel Sideslope (xH:1V)	Flow* Velocity (fps)	Weight of Stone** (lbs)	Equivalent Diameter of Stone*** (inches)	Riprap D50 (ft)	Riprap D15 (ft)	Riprap D100 (ft)	Thickness of Stone (ft)
Existing Channel	5	2	2	5.8	0.9	6.64	0.75	0.2	1.5	1.5
Drop Section	5	2	2	8.3	8.0	13.60	1.5	0.3	3.0	3
Lower Section	5	2	2	5.8	0.9	6.64	0.75	0.2	1.5	1.5

* Flow velocity developed from Hydraflow Express output for various channel segments.

** Weight of stone = 2.44X10-5*V^6

*** Equivalent Stone Diameter = ((6*W)/(PI*165))^1/3