Valley Camp of Utah

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Belina Haul Road Reclamation Plan

January 1987

BELINA HAUL ROAD RECLAMATION PLAN

Valley Camp
- ACT 007-001

Prepared For

Valley Camp of Utah, Inc.
Helper, Utah

Prepared By

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Boise, Idaho

January, 1987

0842h/1

ENGINEERING CERTIFICATION

I, J. Carl Dille, have reviewed Section 2 and 3 and the following Tables, Figures and Exhibits in the Belina Haul Road Reclamation Plan.

REGISTERED PROFESSIONAL ENGINEER
No. 5538
J. CARL DILLE
STATE OF UTAH

J. Carl Dille, P.E.

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SECTION 1.0 - INTRODUCTION

1.1 General

The following reclamation plan is for Valley Camp of Utah's Belina Haul Road which supports their coal mining operation located on Whiskey Creek in Carbon County, Central Utah.

The haul road is constructed on a cut/fill bench having a total road width of thirty-four feet with very steep natural slopes above and below the road. These two facts create several unique problems when considering reclamation of the road.

This reclamation plan addresses the removal of the road surface materials and associated structures and the recontouring of the area to facilitate the return of the disturbed lands to its pre-mining land use of limited rangeland and wildlife habitat.

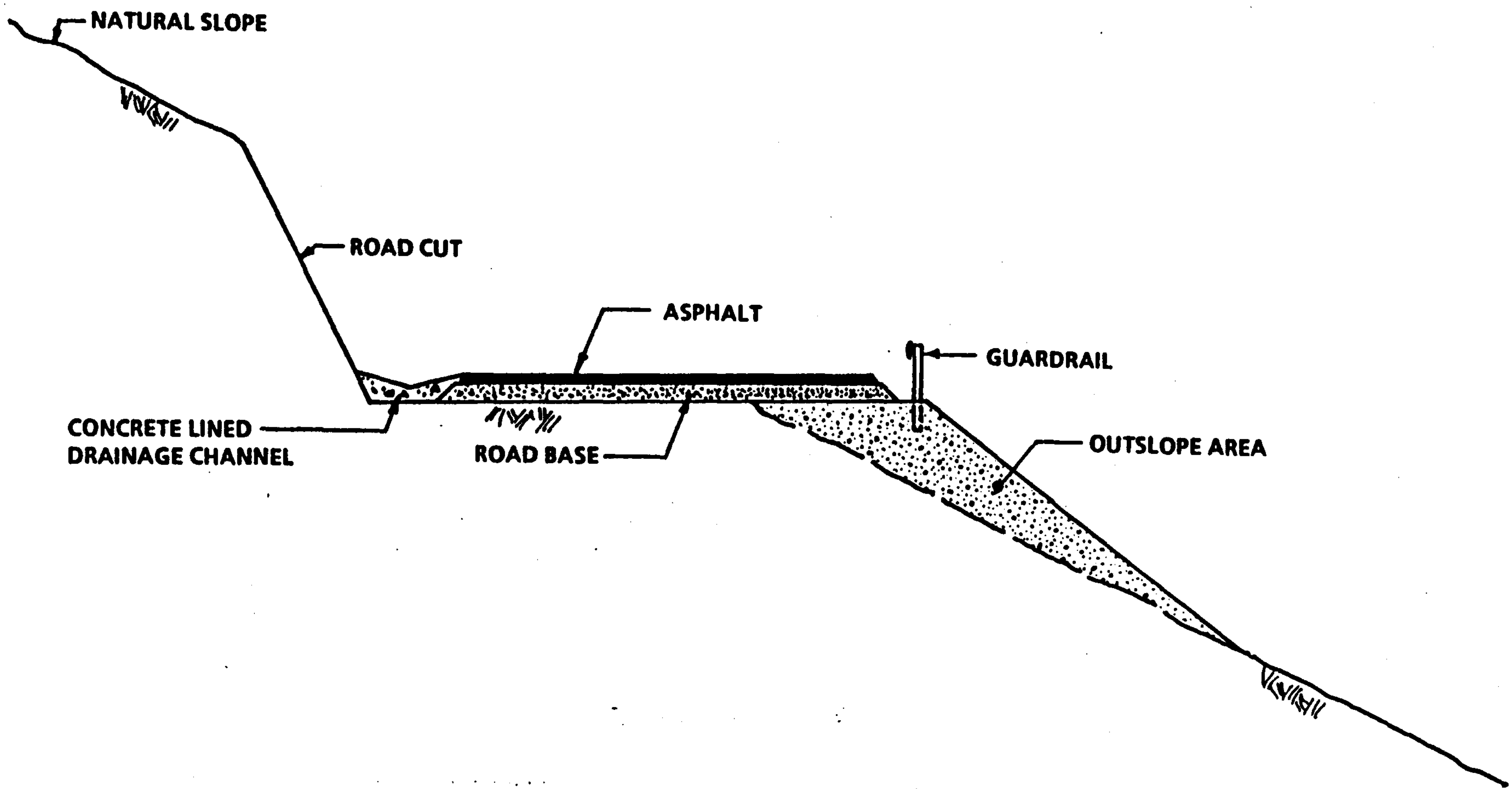
1.2 Objectives

The objectives of this reclamation plan are to eliminate the permanent road surface and support structures and return the disturbed land to a condition capable of supporting the pre-mine land use of limited rangeland and wildlife habitat. These objectives will be obtained by recontouring the road surface to re-establish a drainage pattern comparable to pre-mining conditions; by replacing the soil medium and re-establishing an effective permanent vegetation cover.

The affective area consists of a strip of land approximately 100 feet wide and 1.5 miles long. Although the right-of-way (ROW) is approximately 100 feet wide, this reclamation plan will only address the road surface (34 feet wide); the outslope areas having questionable slope stability and the area to be re-disturbed to re-establish the natural drainages. Figure 1-1 is a typical cross section illustrating the construction of the Belina Haul Road. Approximately ten acres will require recontouring and/or reclamation activities. The majority of the road outslope areas are considered stable as final reclamation, as discussed in Section 2.0, and therefore will not be disturbed. Determination of slope stability is discussed in detail in Section 2.0. The results of a limited geotechnical evaluation concerning the road outslopes and drainage fills are shown in Table 2.1. Only the potentially unstable slopes and their corresponding station location are shown on this table. These station locations were determined from plan and profile sheets showing the general road location and grade. Survey station locations were shown on the map beginning at the mine portal going towards the Eccles Canyon intersection and ending at Station 83+52.

Reclamation activities will be conducted in a manner that will minimize the potential adverse impacts to the air, water, vegetation, wildlife, and general aesthetics of the area. This proposed reclamation plan will establish a permanent, diversified vegetation cover capable of self-regeneration and soil stabilization that will support the post-mining land use of limited rangeland and wildlife habitat.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL HAUL ROAD CROSS SECTION
Figure 1-1



SECTION 2 - GEOTECHNICAL INVESTIGATION

2.1 General

The geotechnical investigation for the Belina Haul Road was performed in three phases. Phase I was a site evaluation of the natural talus in the local region. Phase II identified the areas considered to be critical. Phase III was the slope stability analysis for typical sections of the road before and after reclamation. Conclusions were then based upon all three phases.

Soils in this region are considered young and primarily consist of weathered rock high in quartz. The Unified Soil Classification System would consider this material as SP since it is gravelly sand which is poorly graded and has very few fines. This type of soil has essentially no cohesion; therefore, it is considered a pure phi (Ø) soil which will control the type of slope failures and geometry of the natural talus slopes.

2.2 Natural Talus Evaluation

Natural talus slopes in the haul road area widely vary between 30 percent to over 100 percent. By considering the friction angling (Ø) of the soil to be constant across the region, the depth to bedrock will control the natural talus slope stability. Shallow soils are stable at greater slopes than deep soils. The length of run also plays a major role in the stability of the slopes. The natural talus in the region was self-stabilizing due to small failures creating a terracing effect across the hillside. The stabilizing of the natural talus slopes is still occurring and numerous natural slope failures may be seen around the vicinity of the Belina Haul Road. The friction angle of the talus was derived from the geometry of a recent natural slope failure. This failure analysis produced a friction angle equal to 31°. This value is very typical for SP classified soils.

2.3 Critical Fill Areas

Critical fill areas are defined for this discussion as areas which have localized evidence of recent slope failures, slopes which exceed the friction angle of the soil, or slopes that have similar characteristics of recent failures in the region, such as deep soil horizons. These critical areas are listed in Table 2.1:

TABLE 2.1

POTENTIALLY UNSTABLE SLOPES* $\phi = 31^\circ \simeq 60\%$

AREA	Station Location	Linear Distance	Slope Pre-Construction	Slope Post-Construction
1	21+10 to 22+70	160'	63% 1.6:1	70%
2	24+06 to 29+34	520'	63%	72%
3	30+40 to 32+00	160'	55% 1.8:1	68%
4	37+18 to 44+00	682'	63%	70%
5	51+17 to 52+75	158'	65%	75% 1.3:1
6	61+00 to 64+12	312'	70% 1.43:1	80%
7	73+00 to 75+60	260'	84%	128% 0.8:1
8	77+18 to 82+46	528'	84% 1.19:1	143% 0.7:1

TOTAL = 2,780 Feet

*Typical Geometries for each one of these reaches are illustrated in Figures 2.1 to 2.8.

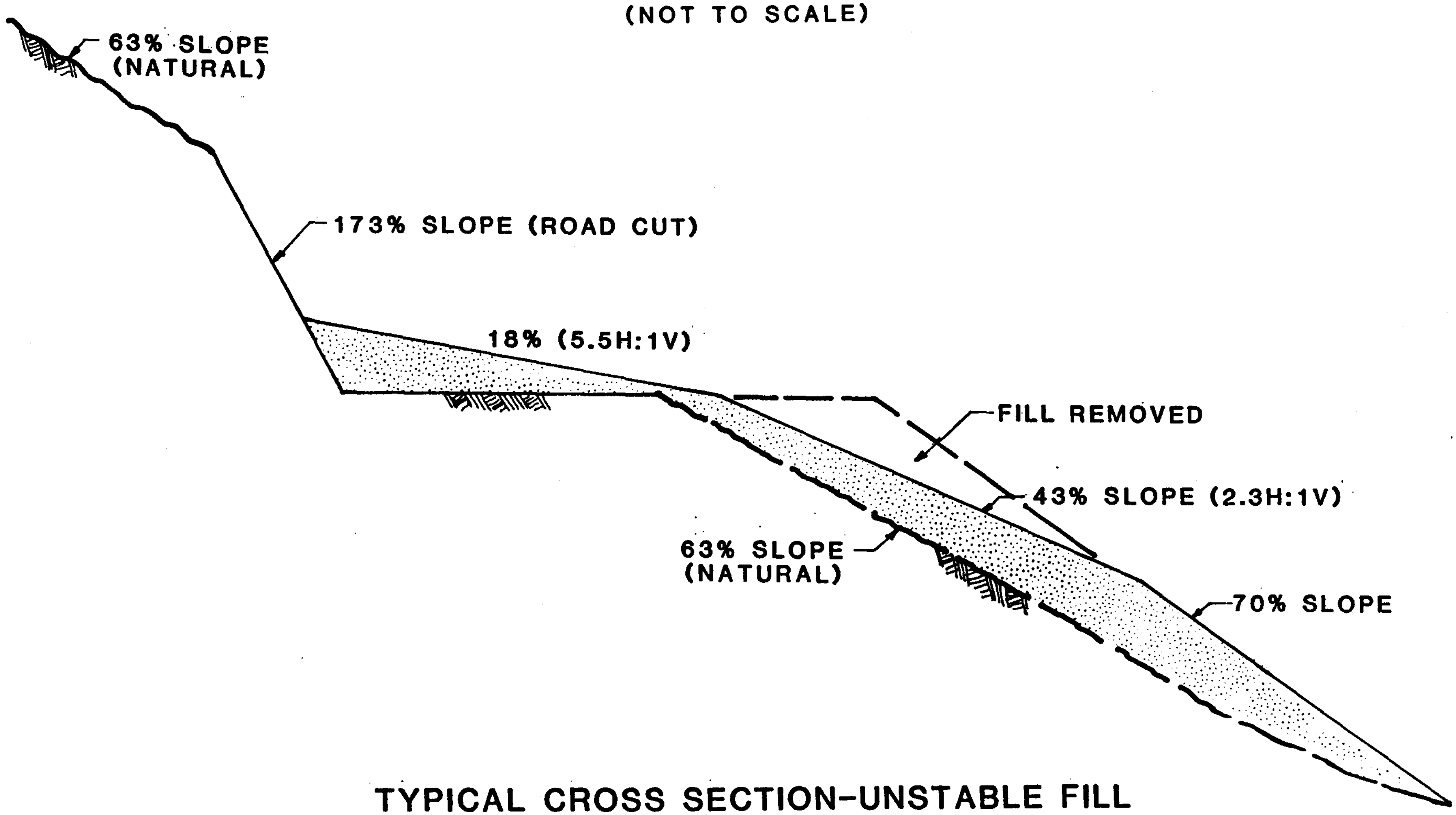
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-1

(NOT TO SCALE)



TYPICAL CROSS SECTION–UNSTABLE FILL

STA 21 + 10 TO 22 + 70

AREA 1

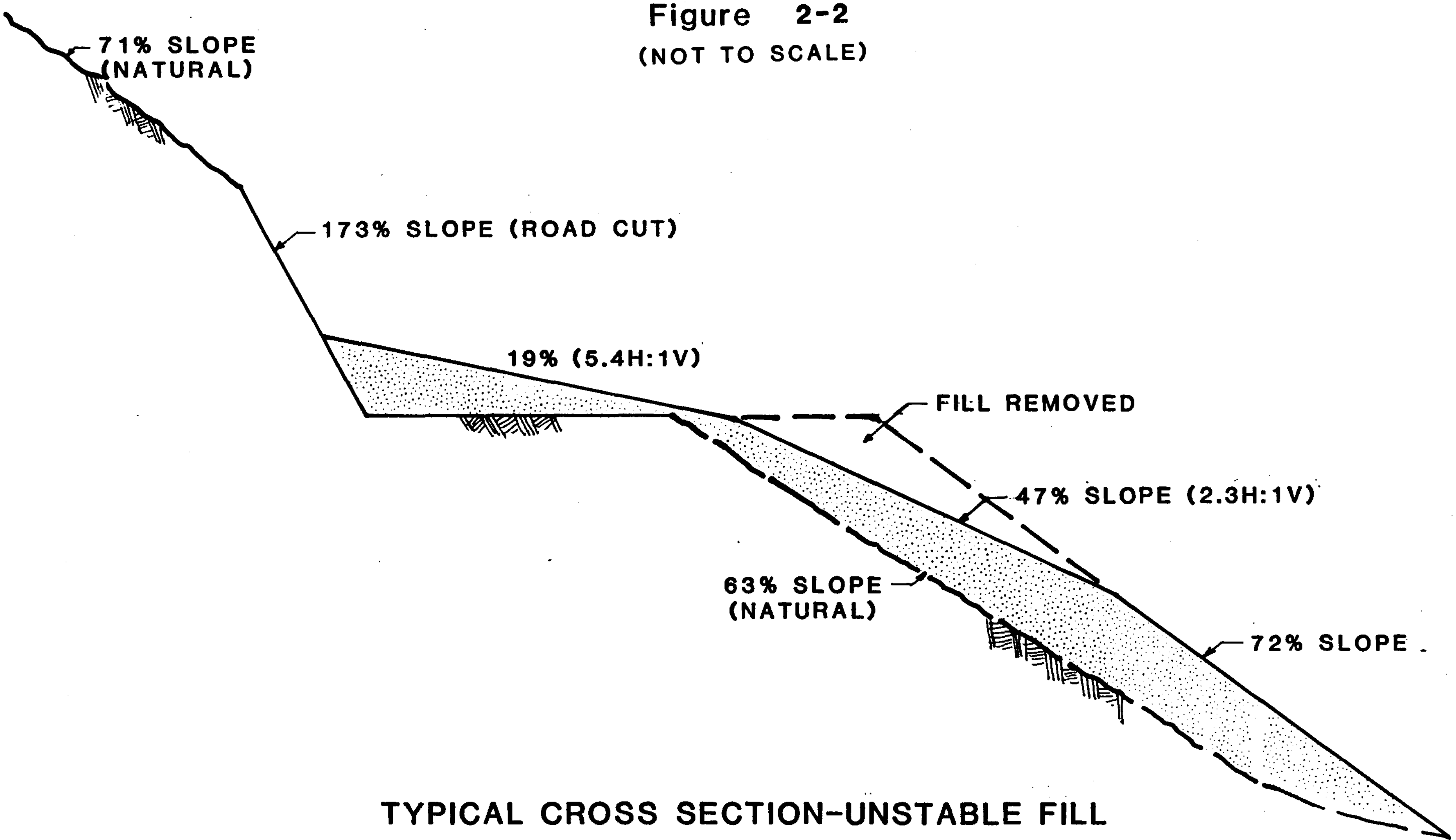
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-2

(NOT TO SCALE)



TYPICAL CROSS SECTION-UNSTABLE FILL

STA. 24 + 06 TO 29 + 34

AREA 2

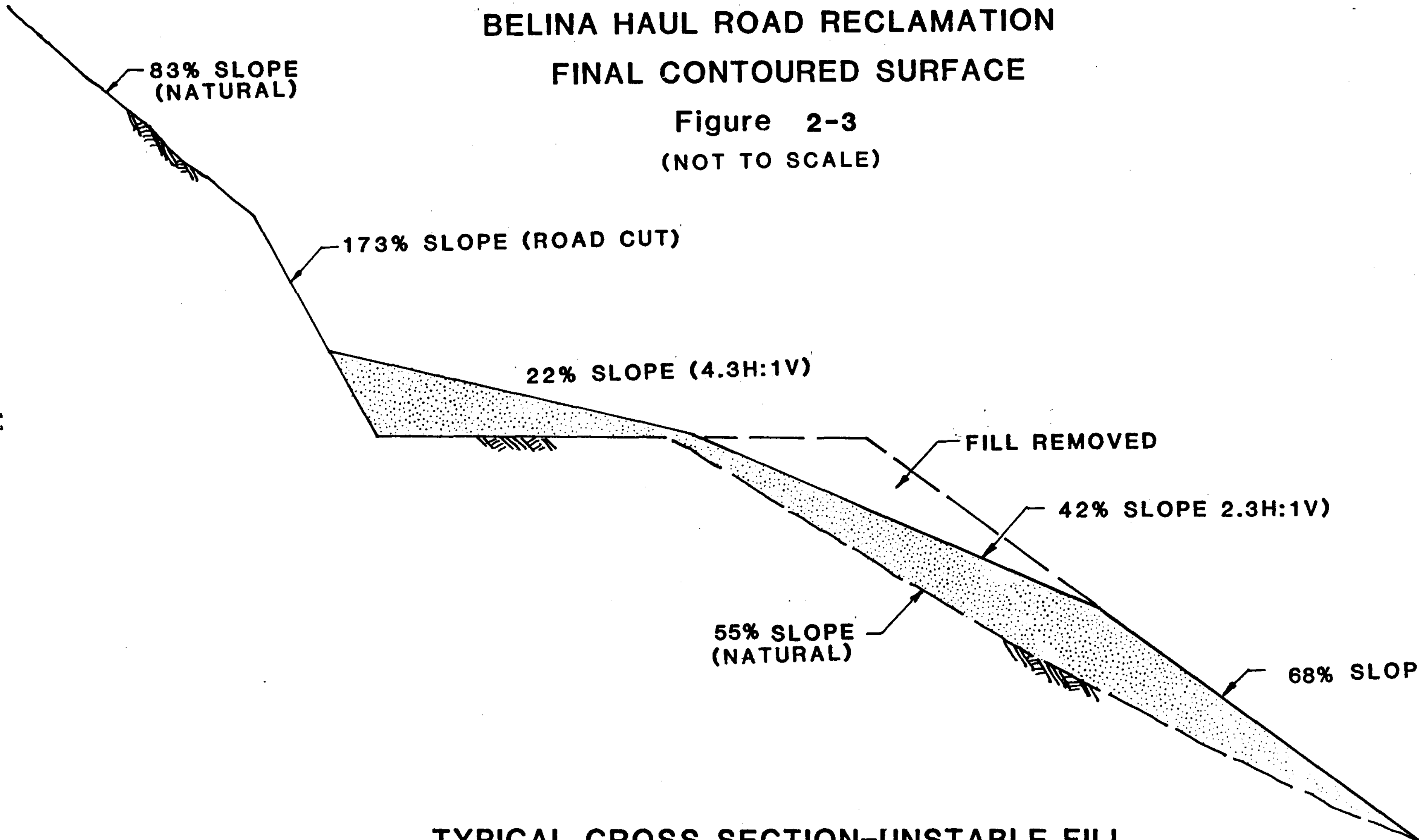
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-3

(NOT TO SCALE)



TYPICAL CROSS SECTION–UNSTABLE FILL

STA. 30 + 40 TO 32 + 00

AREA 3

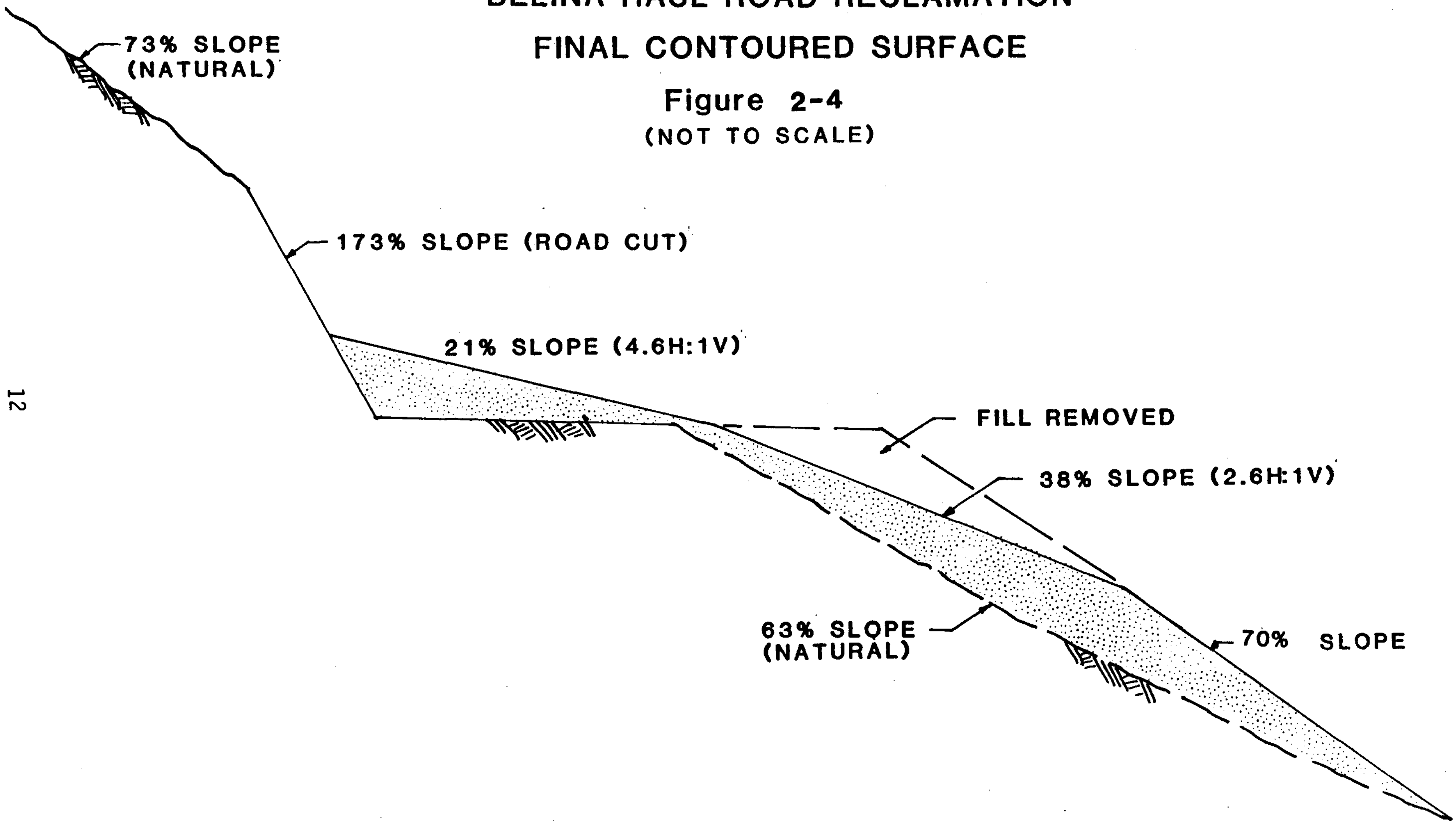
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-4

(NOT TO SCALE)



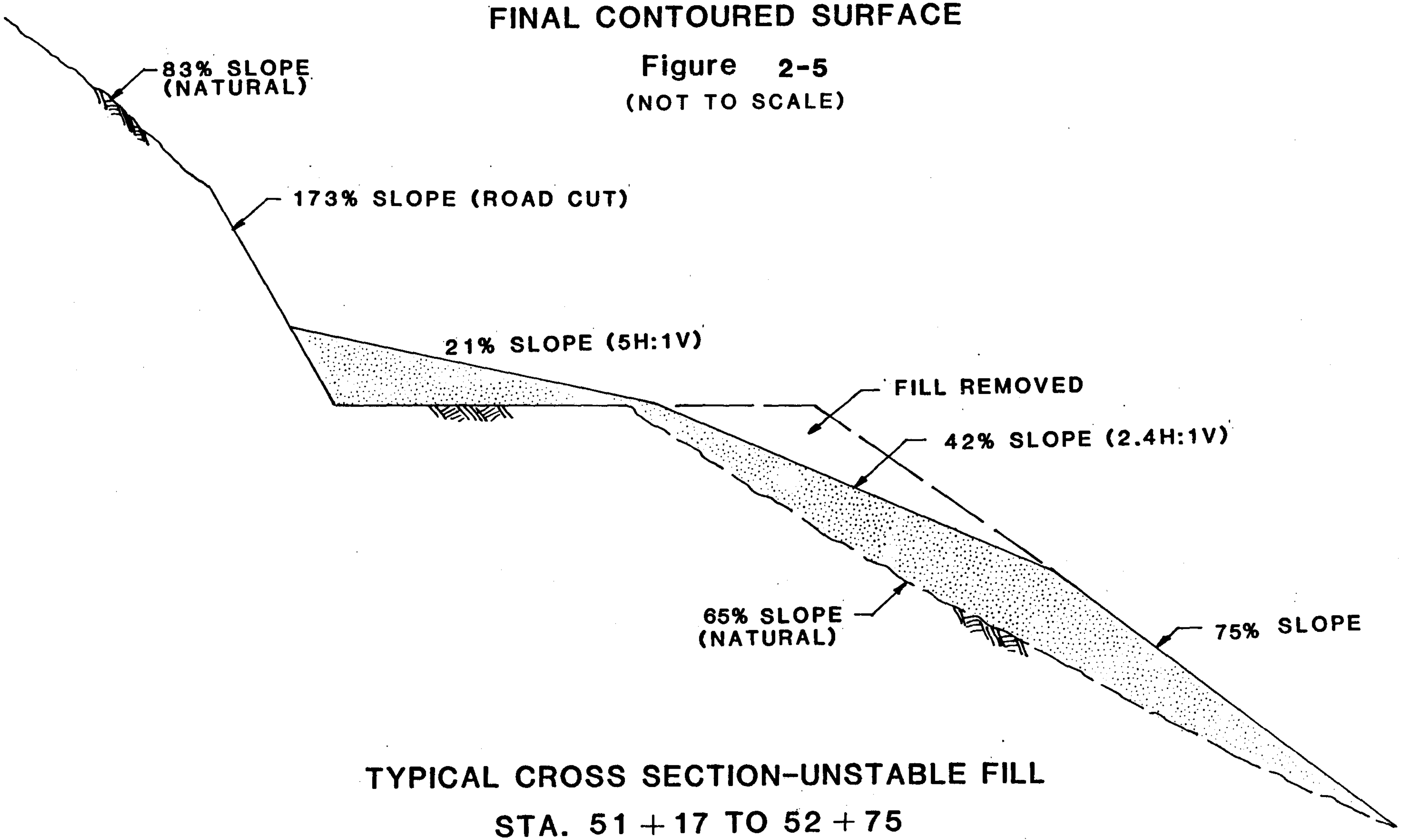
TYPICAL CROSS SECTION–UNSTABLE FILL

STA. 37 + 18 TO 44 + 00

AREA 4

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
FINAL CONTOURED SURFACE

Figure 2-5
(NOT TO SCALE)



TYPICAL CROSS SECTION-UNSTABLE FILL

STA. 51 + 17 TO 52 + 75

AREA 5

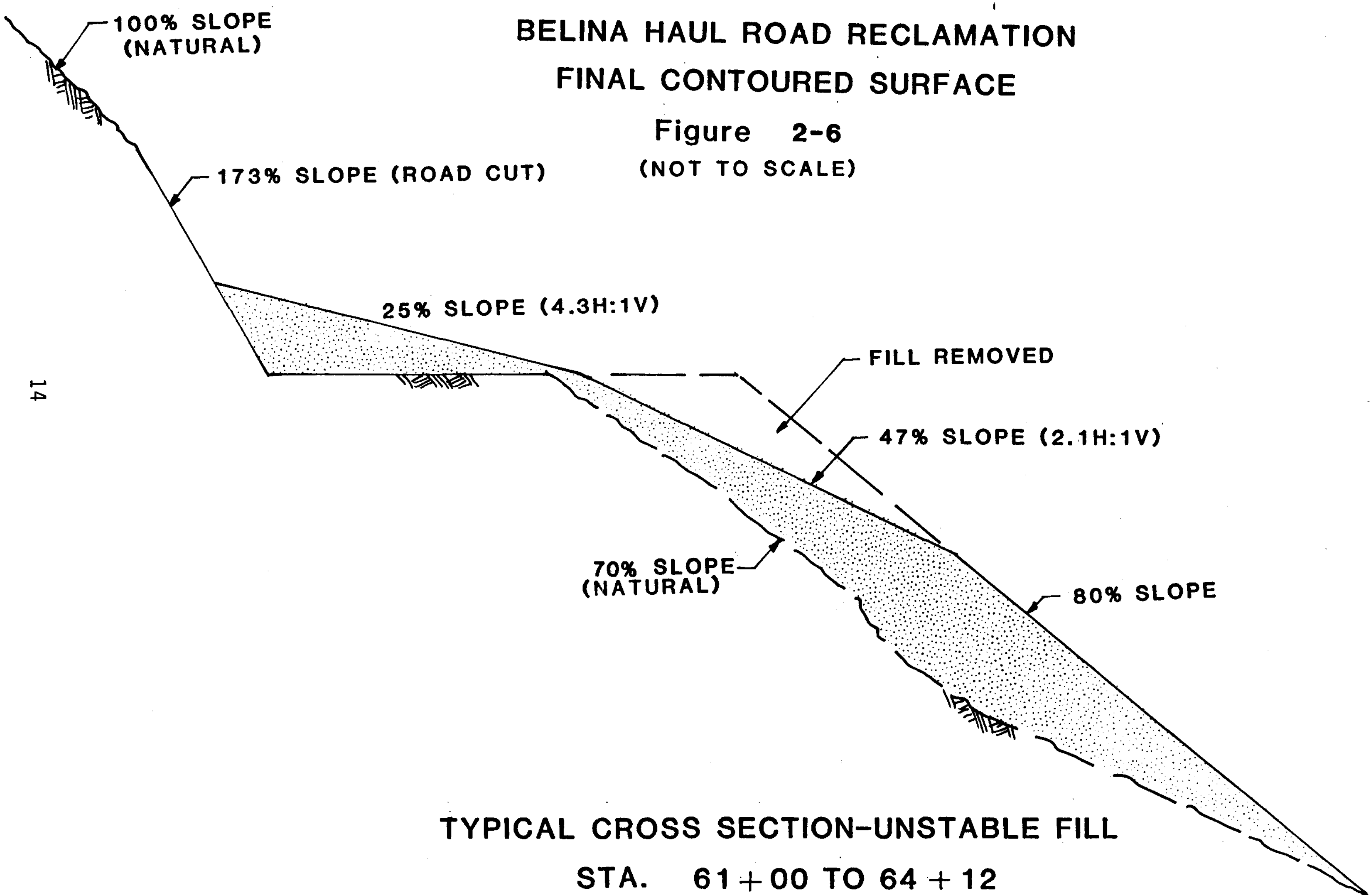
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-6

(NOT TO SCALE)



TYPICAL CROSS SECTION-UNSTABLE FILL

STA. 61+00 TO 64+12

AREA 6

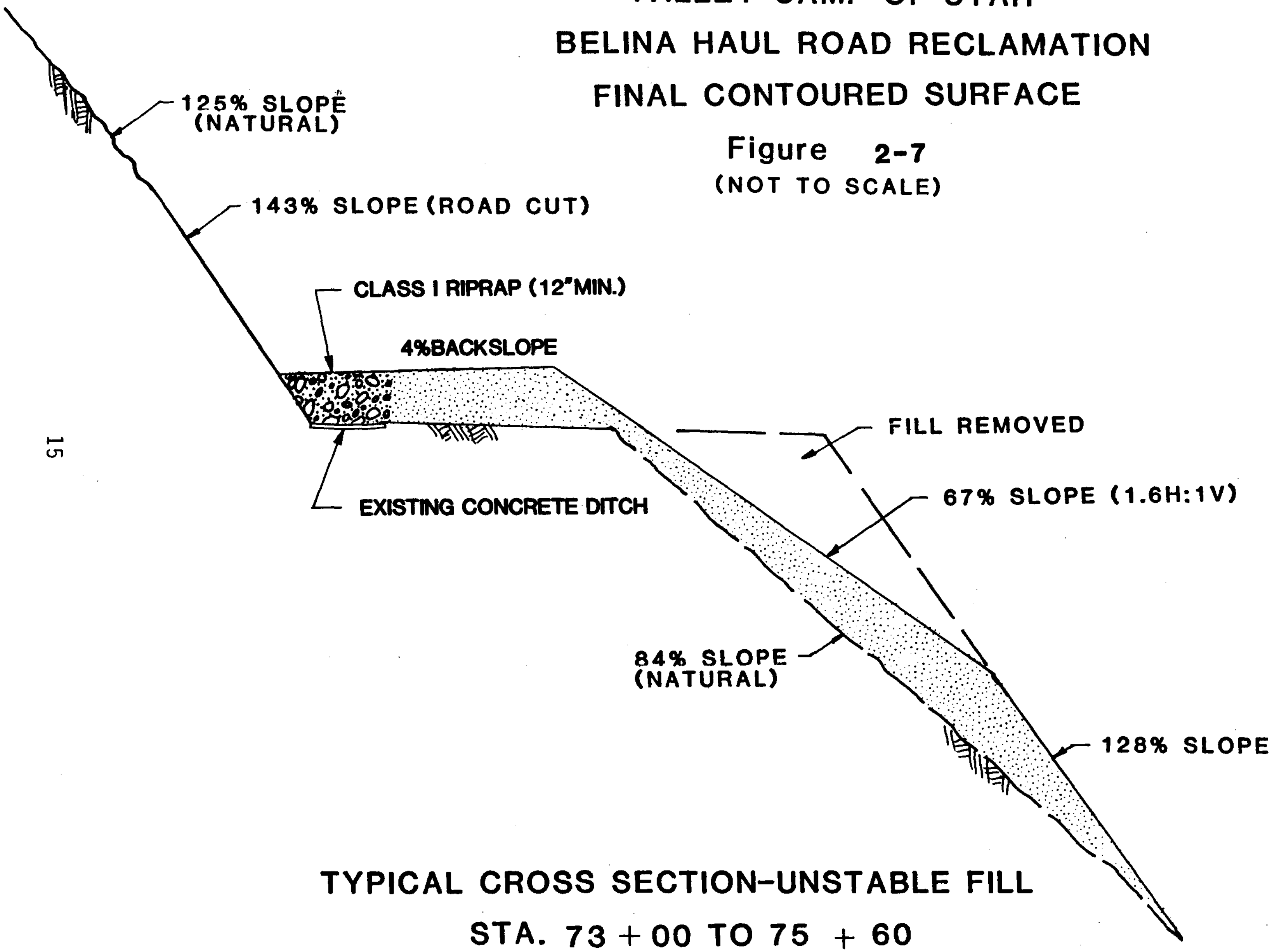
VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

FINAL CONTOURED SURFACE

Figure 2-7

(NOT TO SCALE)

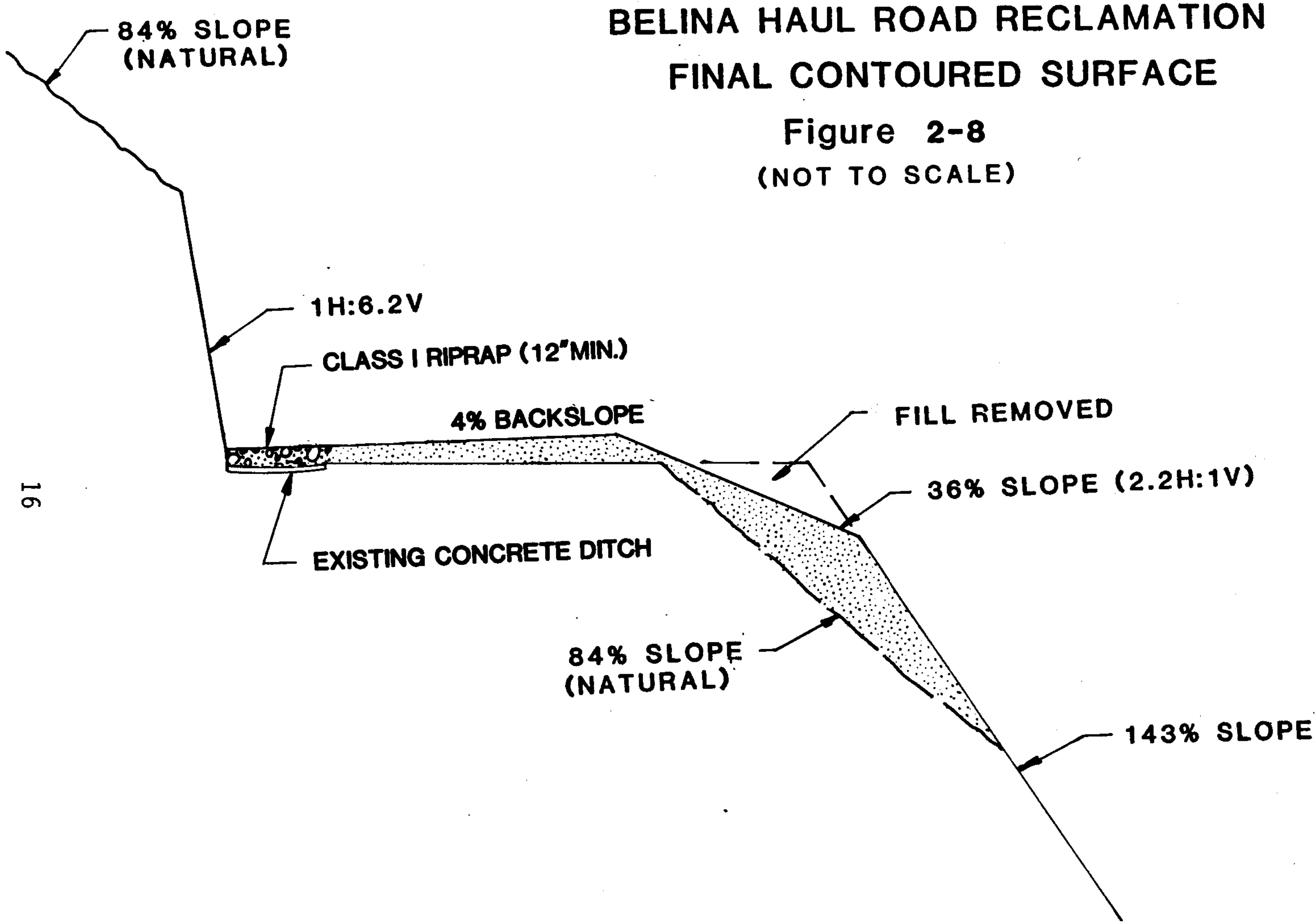


TYPICAL CROSS SECTION–UNSTABLE FILL

STA. 73 + 00 TO 75 + 60

AREA 7

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
FINAL CONTOURED SURFACE
Figure 2-8
(NOT TO SCALE)



TYPICAL CROSS SECTION-UNSTABLE FILL
STA. 77 + 18 TO 82 + 46
AREA 8

The Bowel Crossing has not been considered to be a critical fill area due to the reclamation plans in this reach. By removing the top portion of the fill, this region does not present a slope stability problem and should remain stable.

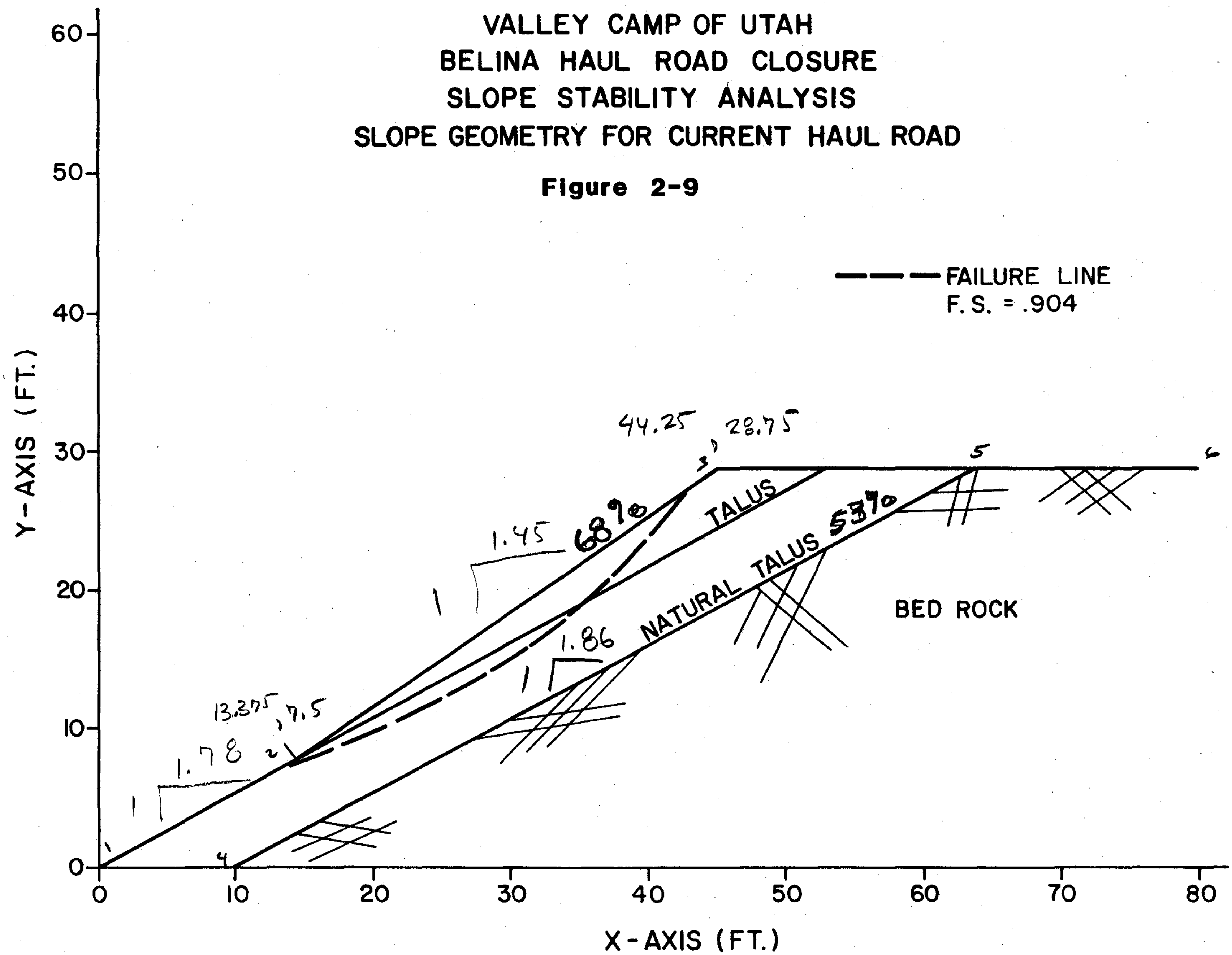
2.4 Methods and Results of the Slope Stability Analyses

The slope stability analysis was performed using the computer model STABL 5. Typical geometries before and after reclamation of the Belina Haul Road are illustrated in Figures 2.9 and 2.10. The natural talus slope used for model input was set equal to 53 percent and the talus slope to 68 percent. The reclamation slope was based upon the capability of a backhoe to reach downslope 25 feet. The soil density was assumed to be 100 pounds per cubic foot with a phi value of 31°.

The factor of safety for the talus on the current haul road was estimated to be .904, which is reasonable since the talus' phi value input is 31° and no adjustment was made for the irregular bedrock formation. The factor of safety after reclamation was estimated to be 1.08, which increases the factor of safety from the original haul road geometry by 19 percent. This increases the factor of safety to be greater than most of the natural talus since many of the natural slopes are unstable. Most natural talus slopes in the region have a factor of safety equal to 1.00 for their given geometry. Note that the failure plane configuration produced by the model shows shallow, circular failures which are predominant in this region. The very steep slopes noted in this study were made up of coarser sands and gravels which have considerably higher friction angles than the soil used for the typical section modeling. This non-homogeneity is common in young, shallow soils with some deviation in parent material and weathering exposure.

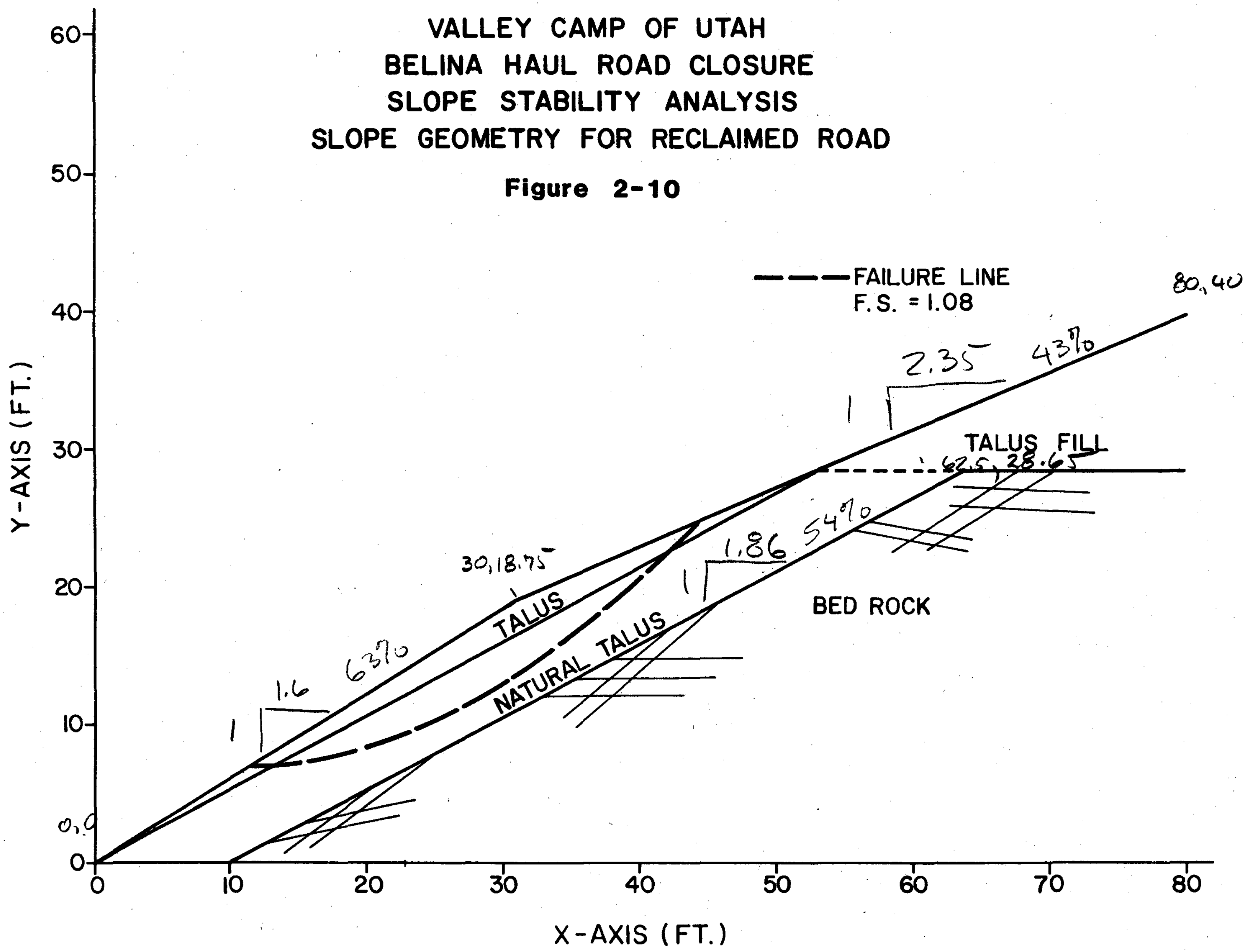
VALLEY CAMP OF UTAH
BELINA HAUL ROAD CLOSURE
SLOPE STABILITY ANALYSIS
SLOPE GEOMETRY FOR CURRENT HAUL ROAD

Figure 2-9



VALLEY CAMP OF UTAH
BELINA HAUL ROAD CLOSURE
SLOPE STABILITY ANALYSIS
SLOPE GEOMETRY FOR RECLAIMED ROAD

Figure 2-10



SECTION 3.0 SURFACE HYDROLOGY/HYDRAULICS

3.1 General

Surface water runoff was determined for the seven small drainages on the Belina Haul Road using the Soil Conservation Service (SCS) curve number method and the TR-20 Computer Program. Once flows were determined for each of the drainages, typical channels were developed and the velocity was determined so that the riprap sizing could be developed. Also included as part of the surface water design are the water bars to be constructed along the recontoured road.

3.2 Design Flows

The design storm for the seven drainages shown on Exhibit 3-1 was the 100 year, 24 hour, which has a rainfall amount of 3.65 inches. This is based on information developed for the Clear Creek Summit, Utah. Table 3-1 shows the precipitation depths versus return period for the Clear Creek Summit Site. The flows were developed based on a Type II rainfall distribution and are shown in Table 3-1.

The major parameters used in determining the runoff with the TR-20 model are the drainage area, time of concentration and CN. The time of concentration is defined as the time required for water to travel from the most hydraulic point of the watershed to the point of interest. It is computed by adding together the time for various segments of the conveyance system. For the mountainous drainage along the Belina Haul Road the time was estimated following the steps outlined in the SCS TR-55 publication and consist of three parts, sheet flow, shallow concentrated flow and open channel flow. The time of travel for each segment was computed and added together to determine the time of concentration for the drainage.

TABLE 3-1

Estimated precipitation depths for various return periods and durations at Clear Creek, Summit, Utah (from Richardson (1971).

DURATION

RETURN PERIOD (years)	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.10	.16	.20	.28	.35	.46	.57	.84	1.08	1.33
2	.12	.19	.25	.34	.43	.57	.70	1.04	1.34	1.65
5	.16	.24	.31	.43	.54	.72	.90	1.34	1.73	2.14
10	.19	.29	.37	.51	.65	.86	1.06	1.55	1.99	2.45
25	.24	.38	.48	.66	.84	1.08	1.31	1.88	2.39	2.92
50	.25	.38	.48	.67	.85	1.13	1.40	2.07	2.67	3.29
100	.27	.42	.53	.73	.93	1.24	1.54	2.29	2.96	3.65

Runoff curve number (CN) are based on hydrologic soil group, cover type, and antecedent moisten condition of the soil. The soils and vegetation maps from Valley Camps' approved mining permit application (UT-0013) were used to determine the CN value for each of the drainages. The USFS has recently completed classifying their lands and assigning CN values and was contacted to see how values compared. In general the values computed for the haul road agreed quite closely and were slightly higher giving a more conservative estimate of the flow and were judged to be reasonable for forest lands. Table 3-2 below shows the date used to compute the design flows for each of the drainages.

TABLE 3.2

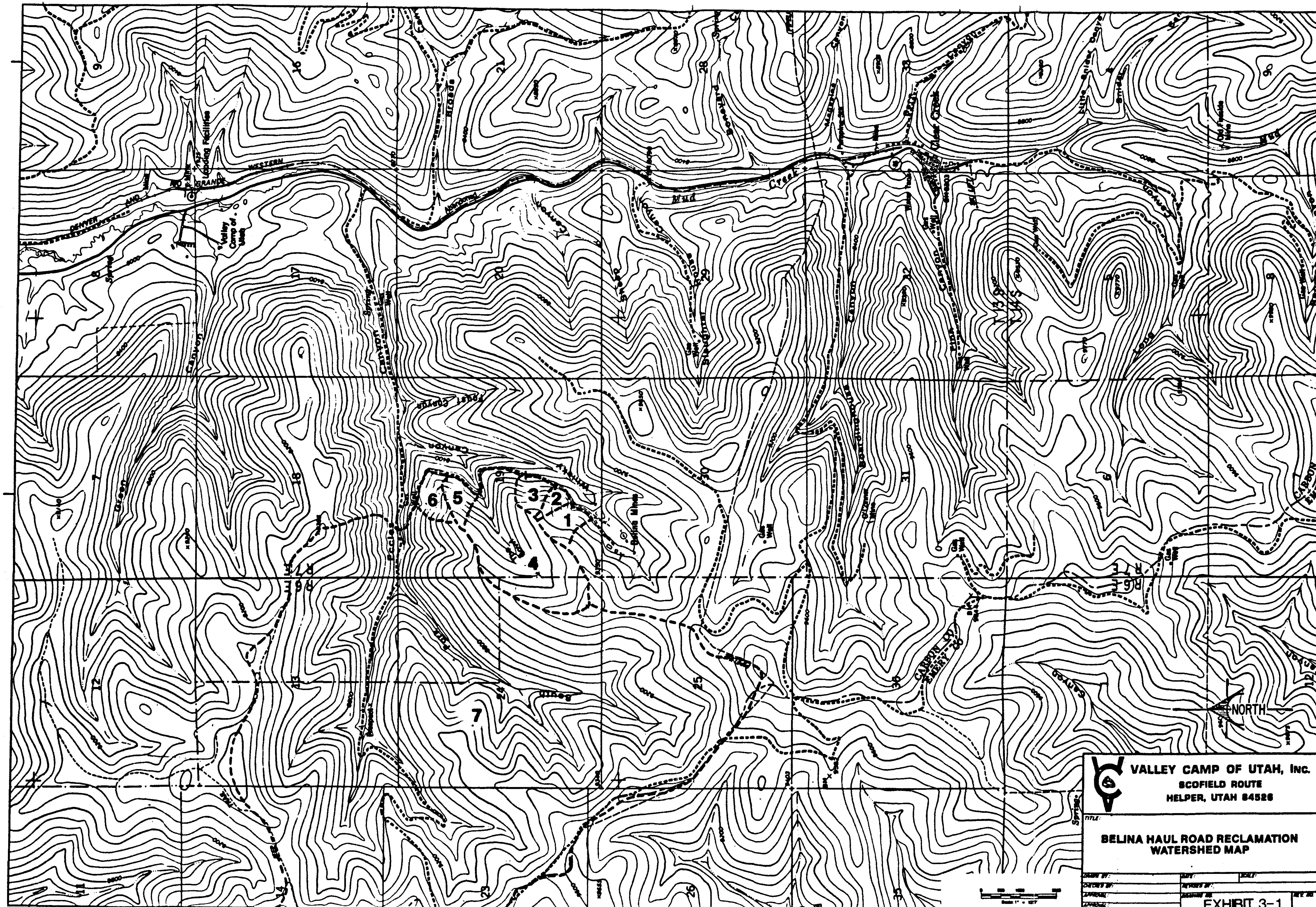
WATERSHED SIZE AND FLOW CHARACTERISTICS

Watershed #	CN	tc hrs.	Area, AC	Q cfs
1	60	.49	18.8	6.7
2	60	.35	9.6	4.3
3	60	.74	11.8	3.2
4 (Bowl Crossing)	60	.71	147.8	44.0
5	60	.71	14.2	4.0
6	60	.56	25.0	8.3
7 (Eccles Creek)	60	1.37	2087.0	378.

3.3 Channel Design

It is proposed in the reclamation plan that the existing culverts be removed and the ephemeral channels reestablished at their original slope and be protected with riprap. Figure 3.1 shows a typical section through the road after regrading and contouring and the various hydraulic data.

The slope will vary from about 15 percent across the road to a maximum of 65-70 percent along the slope face. To replace the culverts on five of the smallest drainages, a small "V" ditch will



NORTH
DENVER AND RIO GRANDE WESTERN
Loading Facilities
Valley Camp of Utah
Mud Creek
Belina Mines
1
2
3
4
5
6
7
CARBON CO
EMERY CO
VALLEY CAMP OF UTAH, Inc.
SCOFIELD ROUTE
HELPER, UTAH 84526
TITLE:
BELINA HAUL ROAD RECLAMATION
WATERSHED MAP
EXHIBIT 3-1

be constructed to carry the flow from each of the small drainages through the road sections. These small ditches will be protected with riprap and a typical section is shown on Figure 3-1.

Velocities were computed using the Manning's equation. The channel roughness coefficient, n, was estimated based on values for small mountain streams where the depth of flow is small when compared to the size of bed material. In Open-Channel Hydraulics, Chow suggested n values range from .040 to .070 for small, steep mountain streams with cobbles and boulders. Values were also determined from the paper Two Approaches for Estimation of Manning's n in Mountain Streams, by Weache, et al. at the Wyoming Water Research Center. Based on their method, n is estimated to range from .065 to .085. A value of .06 was used in all of the computation. It was felt that the turbulence would be very high since the average depth of flow would range from .5 feet to 1.0 feet and the riprap size would range from 1.0 feet to 2.0 feet.

While this value is higher than those typically used, (.035 - .045), it is felt justified because the depth of flow is much greater than the stone size and this is not the case for the Belina Haul Road drainages.

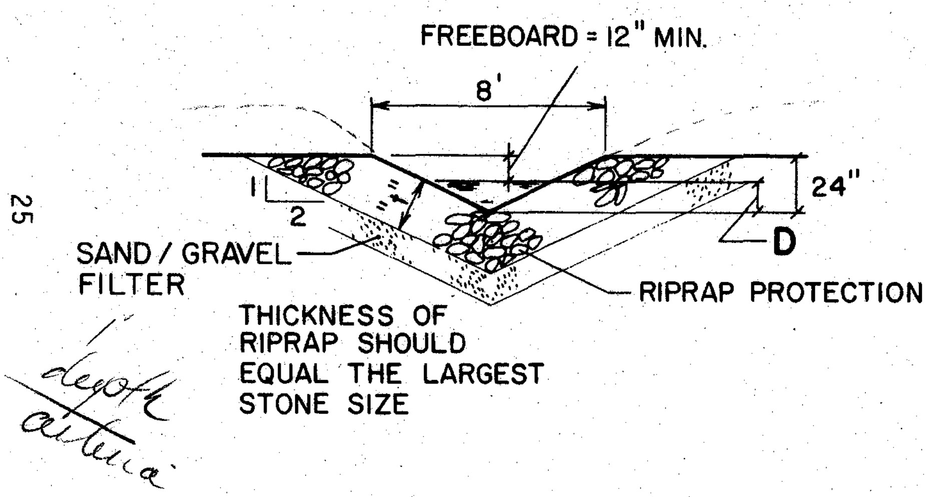
3.3.1 Small Drainages

locations

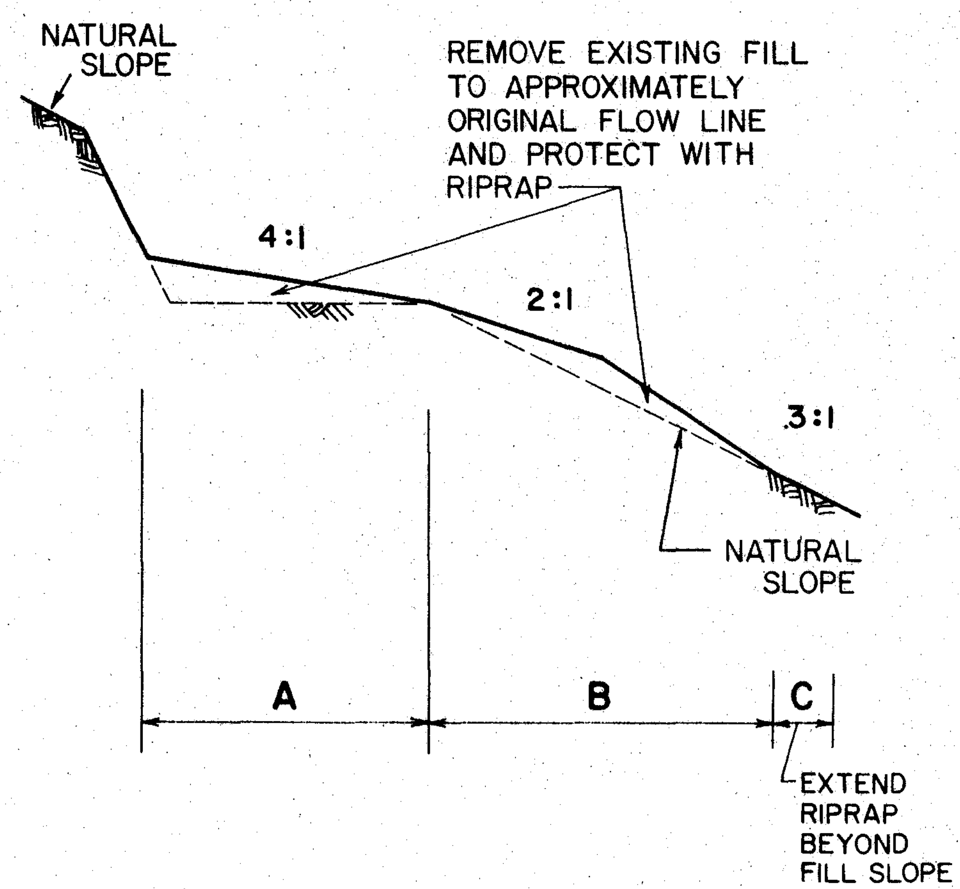
Flows vary from 3.2 to 8.3 cfs for the five smallest drainages. The small "V" ditches were designed based on the maximum flow of 8.3 cfs. This will provide a conservative design and will standardize them making construction easier. The velocity will vary from about 4 feet per second for the 15 percent slope to about 10 ft/sec. on the steeper slope of 70 percent. Details for each of the crossings are shown on Figure 3-1.

same as large crossings

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
SMALL DRAINAGE
HYDRAULIC DATA
Figure 3–1



TYPICAL "V" DITCH
FOR SMALL DRAINAGES



TYPICAL STREAM CROSSING
FOR SMALL DRAINAGES

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
SMALL DRAINAGE
HYDRAULIC DATA
Figure 3–1a

AREA	DRAINAGE	CHANNEL SLOPE	Q in cfs.	*D Depth Ft.	VELOCITY Ft./Sec.	RIPRAP CLASS
	1	15%	6.7	.85	5	I
	2	15%	4.3	.70	4	I
*A	3	15%	3.2	.65	4	I
	5	15%	4.0	.70	4	I
	6	15%	8.3	.90	5	I
	1	63%	6.7	.65	9	II
	2	63%	4.3	.55	8	II
*B	3	55%	3.2	.50	7	II
	5	70%	4.0	.50	8	II
	6	70%	8.3	.70	10	II
*C	ALL					II

*SEE FIGURE 3-1
FOR LOCATION

3.3.2 Bowl Crossing

Design of the channel for the Bowl Crossing drainage (Area 4) was done in a similar manner. The 100 year design flood is estimated at 44 cfs. It is proposed that a small overland flow channel be constructed through the rock fill after the soil fill has been removed, (See Section 4.3.1) which will have a bottom width of four feet. Figure 3-2 shows a typical section through the fill. The existing culvert will remain in place and will carry the smaller flows. The new overland flow channel will carry the flood flows for the more infrequent storms and also if the culvert should become clogged. The velocity in the new channel will vary from 8 ft/sec. across the rock fill where the slope is about 15 percent to 13 ft/sec. down the steeper natural slope. Details of the channel and hydraulic data are shown on Figure 3-2.

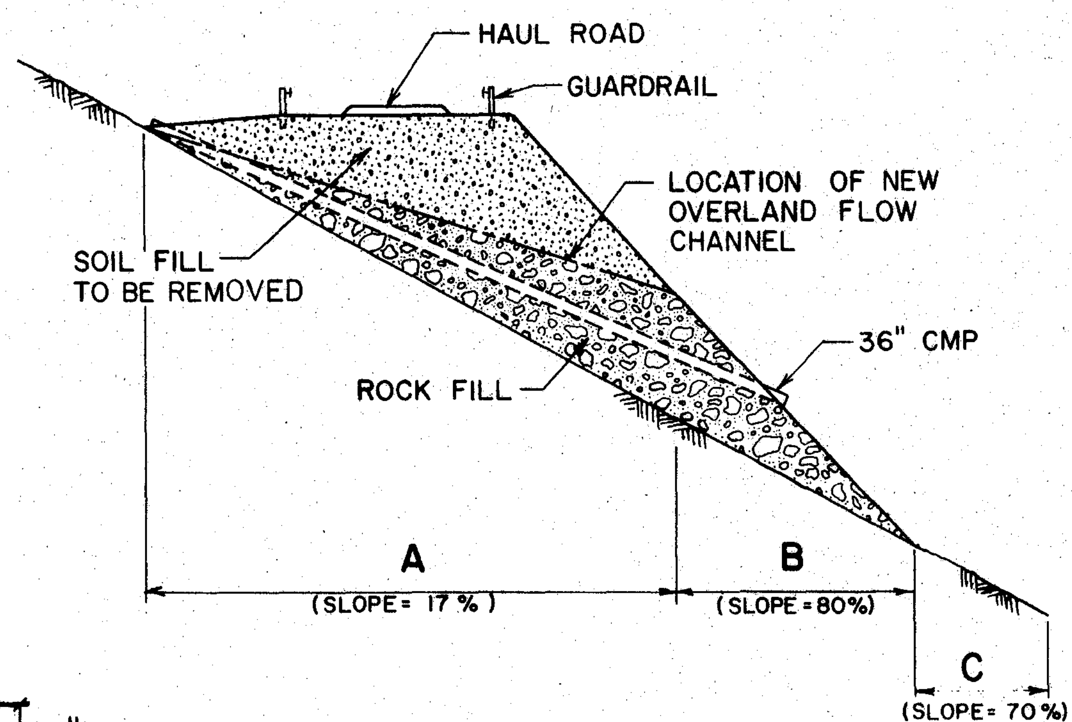
The design for Eccles Creek drainage is covered in Section 3.5.

3.4 Riprap Design

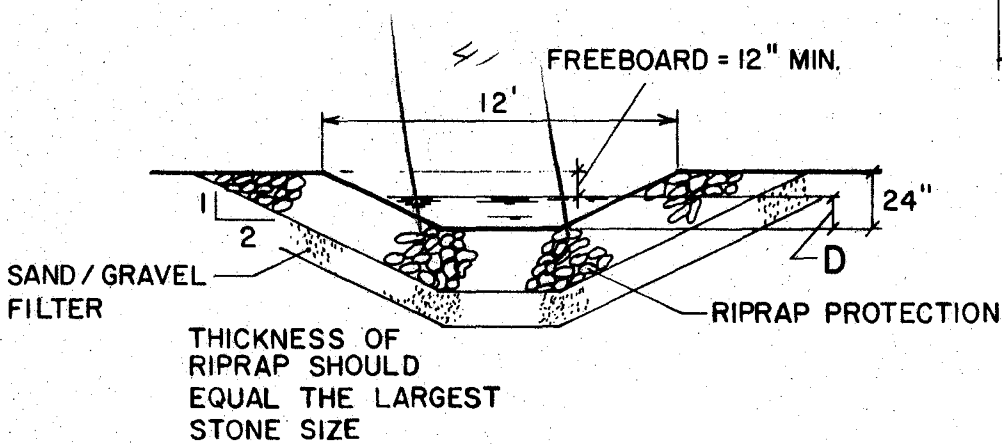
Rirrap sizing was selected based on the above velocities using USBR Engineering Monograph #25 and FHWA Hydraulic Engineering Circular #11. The d_{50} size is four inches on the flatter slopes (Class I) and is nine inches on the steeper slopes (Class II). Gradation for the different classes of riprap are shown in the Table 3.3.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
BOWL CROSSING
HYDRAULIC DATA
Figure 3-2

AREA	D Depth Ft.	VELOCITY Ft./Sec.	RIPRAP CLASS
A	1.0	8	II
B	.70	13	II
C	.70	13	II



SECTION THRU BOWL CROSSING



TYPICAL DITCH FOR BOWL CROSSING
DESIGN Q=44 cfs.

TABLE 3.3

RIPRAP DESIGN

Class	Max.	Size, In d_{50}	Min.
I	8	4	1 1/2
II	24	18	6
III	36	24	8

Riprap should be reasonably well graded from the maximum size down to the minimum. The concrete removed from the project will be used as part of the riprap protection and will be broken so as not to be larger than the d_{50} size and will not makeup more than 15 percent of the volume. The riprap will extend beyond the toe of the fill slopes a minimum of five feet to provide energy dissipation at the termination of the riprap channels, the energy dissipator will be small mounds of riprap approximately 18"-24" high to help spread the flows out and reduce erosion.

NO Rebar

OK

Design criteria for energy dissipators

A filter blanket will be constructed and placed between the riprap and the native material. The filter will be constructed of a well-graded gravel with a minimum size of about 3/16" up to a maximum required by the riprap class and is shown below in Table 3.4.

TABLE 3.4

RIPRAP FILTER DESIGN

RIPRAP CLASS	MAX, in	MIN, in	THICKNESS, in
I	*		
II	4	3/16	9
III	6	3/16	9

*Not required; native material acceptable

3.4.1 Small Drainages

The existing native material appears to be sandy gravelly material based on field inspections. The gradation is estimated to be from 3 inches down to less than 1/8" with a d_{50} size of about 3/8". This material will meet the requirements for a filter material for the Class I riprap, since the d_{15} Riprap/d_{85} Base is less than 5.

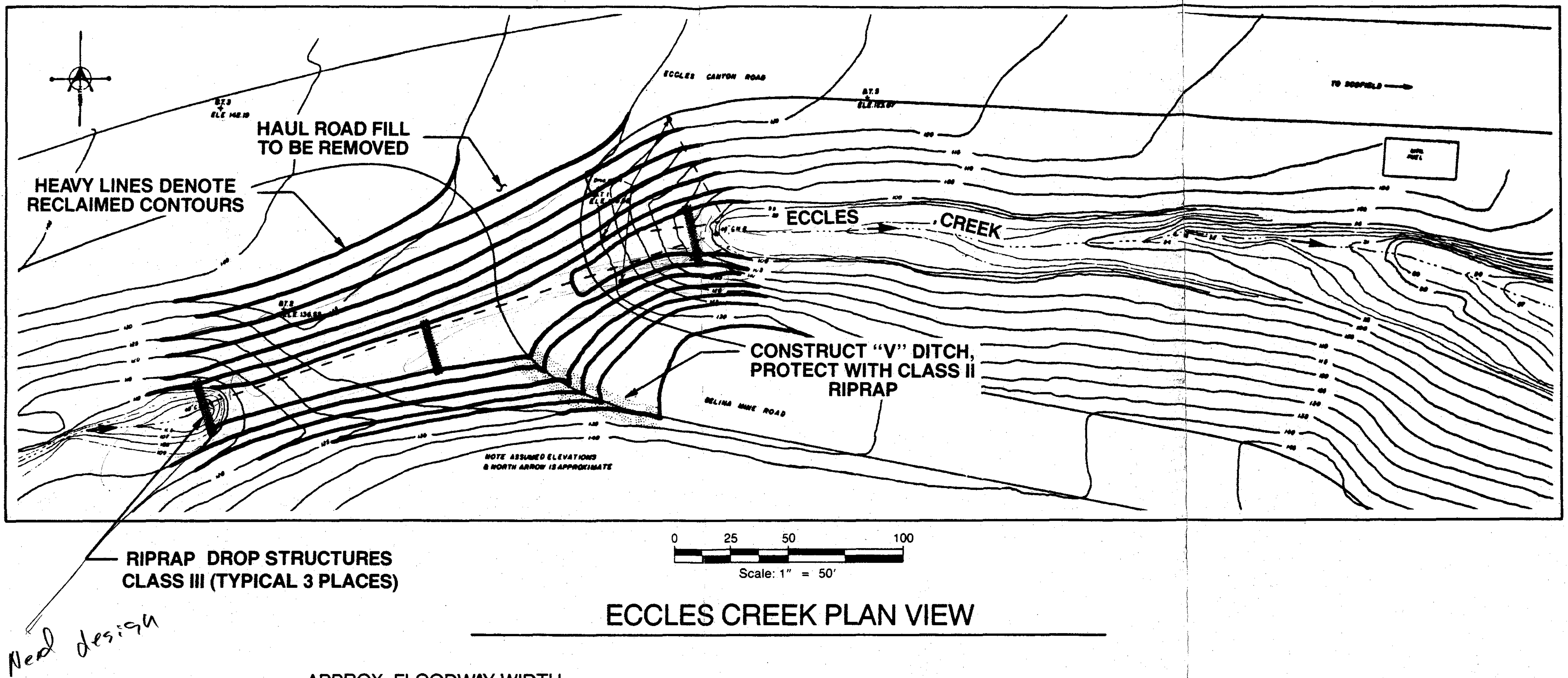
3.4.2 Bowl Crossing

Based on field observations and discussions with the mining operation people, it appears that the blast rock in the Bowl crossing fill has a maximum size of 18 inches to 36 inches. This would provide adequate protection based on the above velocities. If, when the soil fill is removed and the channel is constructed, it is determined that the actual blast rock is not large enough, additional riprap protection (Class III) will be provided.

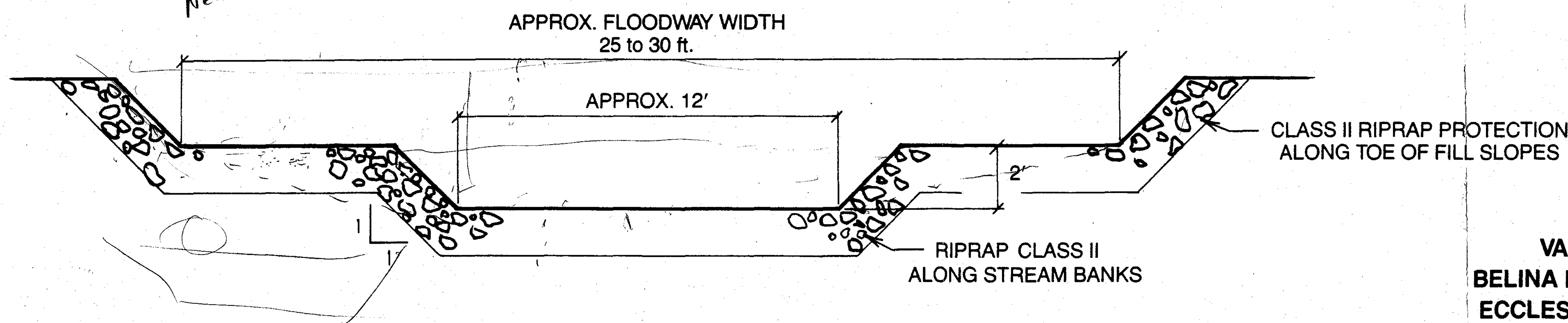
After excavating the soil fill at the Bowl Crossing the base material will be examined to determine if it meets the filter criteria. If it does not, a filter will be constructed meeting the gradation shown in Table 3-4.

3.5 Eccles Creek

The drainage above the Belina Haul in Eccles Creek is the largest with an area of 2,047 acres. The 100 year 24 hour storm is estimated to be about 378 cfs. The channel slope in this area is estimated to be 2 - 2.5 percent. This channel will have a low flow section with a width of 12 feet. The velocity for the 100 year storm will be approximately 6.6 feet per second with depth varying from about 1.5 feet in the floodway to 3.5 feet in the main channel. A Manning's n of .060 was used in computing the flow depth and velocities for Eccles Creek. Based on this velocity and depth of flow, the Class II (24 inch)



ECCLES CREEK PLAN VIEW



TYPICAL SECTION THROUGH ECCLES CREEK

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
ECCLES CREEK CHANNEL DESIGN
PLAN AND SECTION
Figure 3–3

riprap will be required. The channel will be constructed with similar geometry to the recently reconstructed channel below the Belina Haul Road turnout. A typical section through this channel is shown in Figure 3-3. The design of this channel will be similar to the recently completed channel reconstruction just downstream. This will maintain continuity in the channel design. The channel will include several drop structures to maintain a reasonable stream gradient of 2.5 percent or less. These drop structures will be constructed of large rock so that they will maintain a natural appearance. Figure 3-3 shows a plan view of the proposed new alignment after the fill is removed.

The velocity and depth were also computed for the average annual flow to evaluate the effects on fish passage, and are presented in Table 3.3. The average annual flow is estimated to be about 28 cfs. This flow was computed using the USGS report, "Methods for Estimating Peak Discharges and Flood Boundaries of Streams in Utah", WRI 83-4129. In addition to the average annual flow, depths and velocities were computed for several other flows.

TABLE 3.3

ECCLES CREEK CHANNEL HYDRAULICS

Discharge, cfs	Depth,Ft.	Velocity, Ft./Sec.	Channel Slope %
15	.55	2.2	2.0
20	.65	2.5	2.0
28*	.80	2.8	2.0
30	.85	2.9	2.0

*Average annual flow

These are within the reported sustainable swimming speed for trout, which is two to six feet per second as reported in Fisheries Handbook, by Milo C. Bell, 1986. These velocities were not related to depth of flow in Milo C. Bell's report.

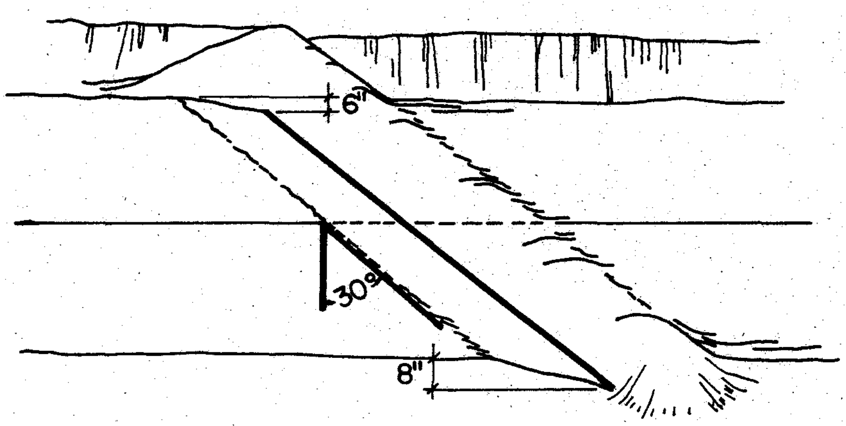
3.6 Concrete Ditch: Sta 71+00 to 82+00

A riprap ditch will be constructed at the base of the cut slope from about Sta. 71+00 to Sta. 82+00 where the haul road intersects Eccles Creek as shown on Figure 2-7 and Figure 2-8. Class I riprap will be placed over the existing concrete ditch with a minimum depth of about 12 inches. The reclaimed back slope of the road surface will contain the design flows. The last 100 feet of this ditch has a slope of about 35 percent where it drops down into Eccles Creek. This reach will be constructed similar to those in Figure 3-1. The ditch will have side slopes of 2H:1V and be protected with Class II riprap.

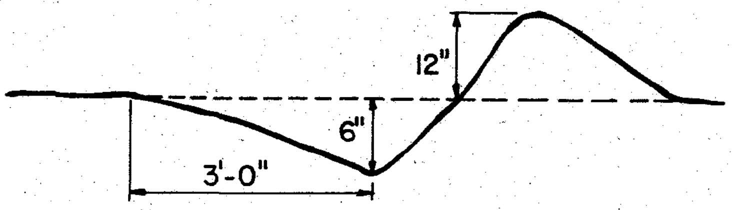
3.7 Water Control Bars

Water control bars will be constructed to reduce erosion of the recontoured haulroad. Figure 3-4 shows a typical waterbar. These structures will be spaced approximately 100 feet apart along the road. Waterbars will be placed more frequently if, during the final reclamation work it is determined they would be necessary to control runoff. Class I riprap protection will be included in the construction of the water control bars. The riprap will be placed at the point where the flow breaks over the edge of the old road bed.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL WATERBAR
DETAILS
Figure 3-4



PLAN



SECTION

SECTION 4.0 - RECLAMATION PROCEDURES

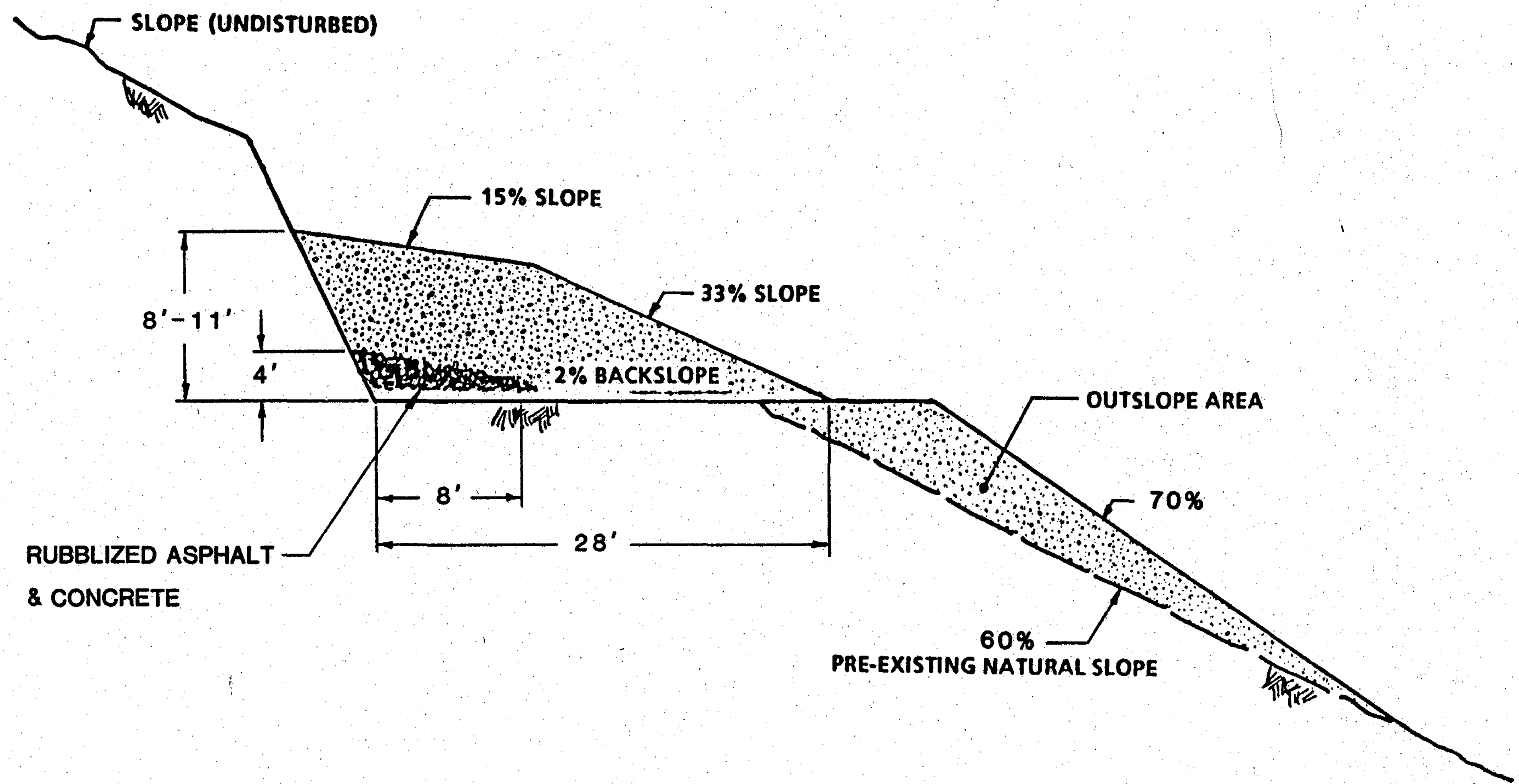
4.1 Road Surface Removal

Reclamation of the road will begin with the removal of the asphaltic concrete road surface and the Portland cement concrete lining of the water control ditch which is located at the toe of the road cut slope. A portion of the cement concrete ditch (from station 71+00 to station 82+00) will be left in place and backfilled with riprap, as discussed in Section 3.6. After the road surface is reclaimed and the recontoured surface sloped back towards the hill at approximately four percent, this water control structure will convey water to Eccles Creek. Leaving this portion of the concrete ditch in place will minimize infiltration to the fractured rock hillside, thereby lessening the chance of slope failure. This water control structure will be monitored for bond release for the same period as the rest of the reclamation. The cement concrete lining will be rubblized to eliminate any slippage surface when it and the asphaltic concrete and fill material are placed for disposal. The larger pieces of cement concrete will be salvaged and used as riprap if they meet the specifications for riprap discussed in Section 3.4.

The asphaltic concrete will then be broken and will be placed against tne toe of the cut slope over the previously placed broken Portland cement concrete. The asphaltic concrete will be piled approximately four feet deep adjacent to the cut slope and graded to ground level seven to eight feet out from the toe of the slope (Figure 4-1). There are approximately 3,500 in place cubic yards of asphaltic concrete to dispose of. To insure a competent fill and prevent piping, the asphaltic concrete will be placed in an engineered manner and compacted. The asphalt will be broken by ripping it with the

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL CROSS SECTION - STABLE FILL
FINAL CONTOURED SURFACE
Figure 4-1

(NOT TO SCALE)



scarifiers on a motor grader or equivalent machine. The scarifiers are approximately 17-20 inches apart. It is expected, therefore, that their use will create pieces of asphalt less than two-feet square. If necessary a dozer will be walked over the ripped asphalt to further reduce the size. The rubblized asphalt will then be bladed to the toe of the cut slope by a motor grader or equivalent equipment. The asphalt will be compacted in one foot lifts. Once the asphaltic concrete surface has been removed, the gravel road base material will be ripped or disked to eliminate compaction and to promote water infiltration and root penetration.

After the asphalt is placed and compacted it will be covered with soil removed from the out slope fill portions of the road, to a sufficient depth to prevent it from being exposed to the atmosphere. The surface of the replaced soil will be contoured as shown in Figure 4-1 to reestablish a drainage pattern similar to that which was present prior to mining.

4.2 Corrugated Metal Pipe Removal

Seven of the eight corrugated metal pipe (CMP) culverts buried in the Belina haul road will be removed during reclamation. These channels, which include Eccles Creek, will be cleared of fill material, recontoured and riprapped as necessary to prevent excessive erosion. The riprap material will consist of large competent rock and/or broken pieces of cement concrete as discussed in Section 3.4 of this report. The removed CMP will be salvaged if possible, or disposed of in a section of the underground mine workings as detailed in Section 784.13 of Valley Camp's approved Mining and Reclamation Plan, Permit Number UT0013.

No

The remaining CMP is the large culvert through the fill in the Bowl. As agreed to during a site visit with UDOGM personnel, this CMP will be left in place unplugged. The reconstruction of a channel through the fill will provide a significant overflow safety factor in the unlikely event that the CMP would become dammed or plugged.

NO

Bullshit

4.3 Recontouring

The recontoured areas will be developed by placing soil material excavated from two major fill areas (the Bowl crossing and the Eccles Creek crossing) on the "cut" portions of the road against the cut slopes as buttress fills. Additionally, portions of the road outslope fill areas are considered to be of questionable stability and will therefore also be excavated and placed in the buttress fills. Approximately 30,000 to 35,000 cubic yards of material will be excavated and placed during this recontouring effort. Drainage crossovers will be constructed across this recontoured surface to shorten the slope length and prevent excessive erosion (refer to Section 3.6 for details). These cutouts or crossovers will be riprapped to prevent the development of rills and gullies.

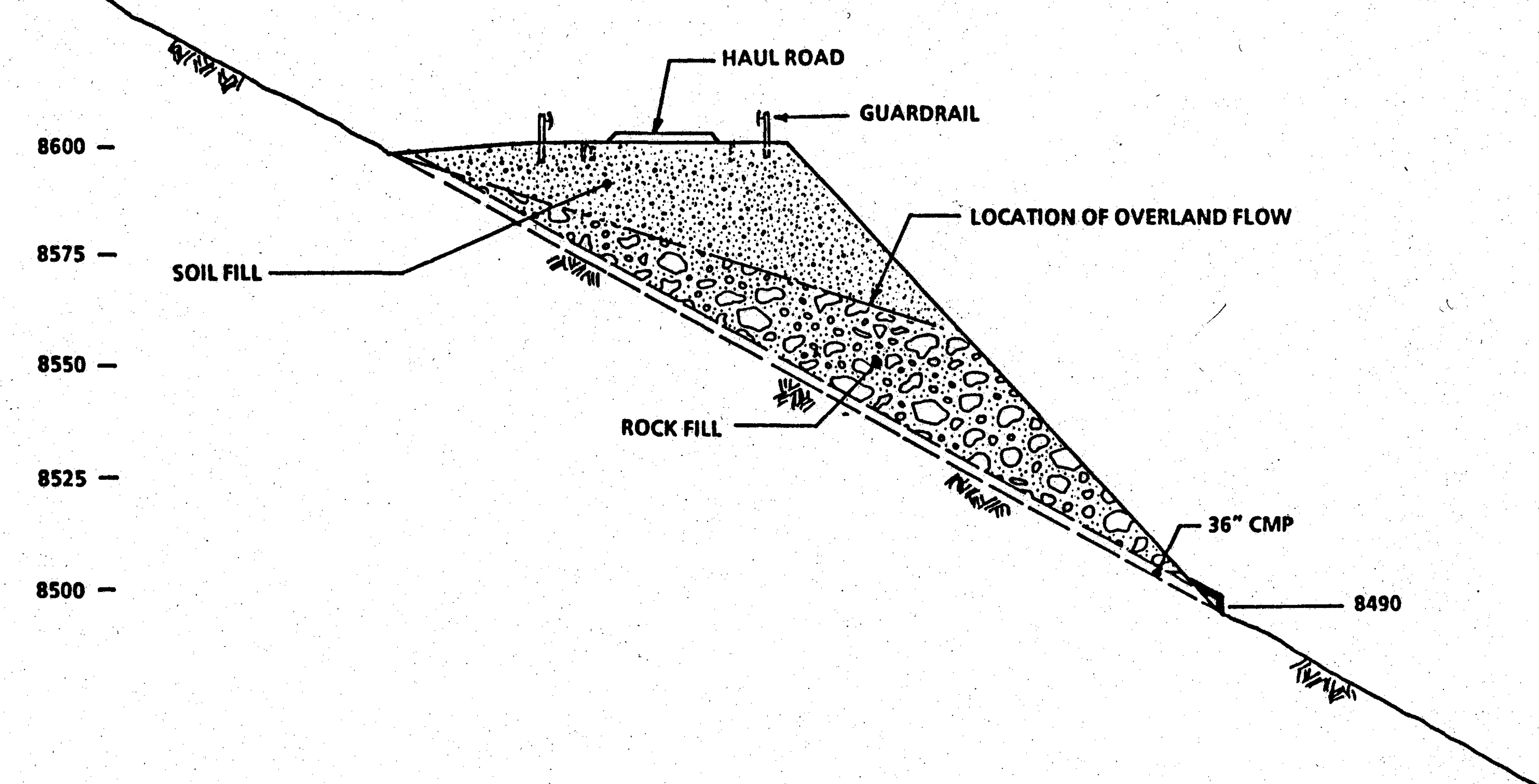
The reclaimed surface of the haul road will in most cases, slope to the outside. In some cases, however, it will slope back to the hill. Approximately the first 1,100 feet of the road, (from station 82+00 to station 71+00 on the CEI, 9/83 drawings) has a very steep outslope (approaching 120 percent) toward Eccles Creek. To keep water off of the face of this area and protect Eccles Creek the recontoured surface will pitch into the hill at approximately four percent (Figure 2.8). Runoff will be collected in a riprapped ditch constructed at the base of the road cut slope and will be conveyed down the hill and released to Eccles Creek approximately at the haul road/creek junction. The design of this ditch is addressed in Section 3.5 of this report.

4.3.1 Bowl Crossing

The largest fill is located near the midpoint of the haul road. It consists of blast rock on the bottom and soil on the top. The soil portion (approximately 15,000 yd^3) will be excavated and an overland channel will be developed through the remaining rock. The CMP will be left in place unplugged. This new drainage will be a permanent

Bullet

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
THE BOWL CROSSING
Figure 4-2
(NOT TO SCALE)



structure constructed from competent rock which meets riprap specifications. In addition, energy dissipaters will be utilized, if necessary, to control the flow of water until it reaches the natural drainage channel. Figure 4.2 is a cross section showing the present road surface, fill slopes, and the projected location of the overland flow channel.

4.3.2 Eccles Creek Crossing

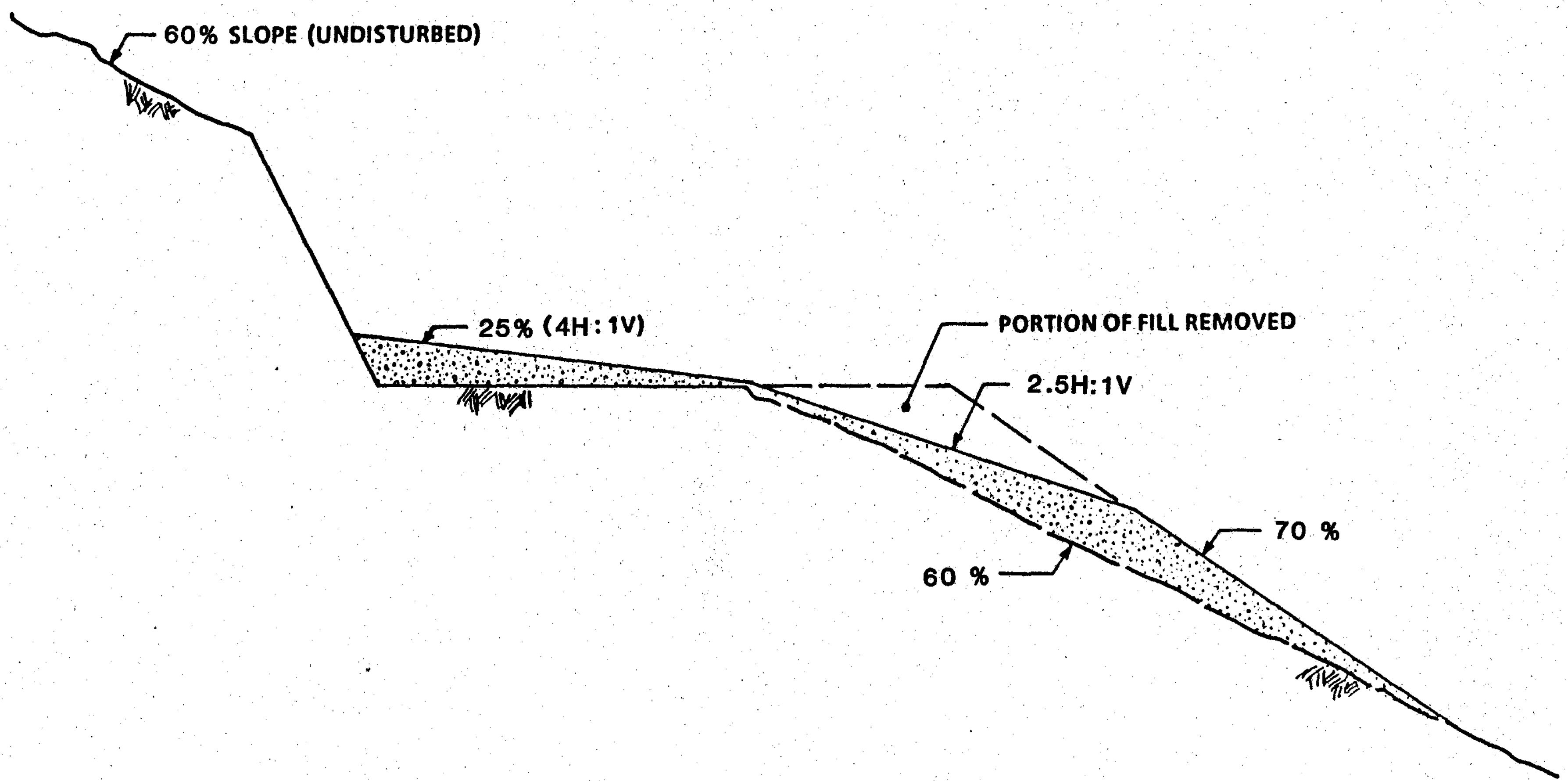
The second major fill is located at the intersection of the Belina Haul Road and the Eccles Canyon Road. This fill consists primarily of blast rock from the development of the first section of the haul road and is covered with soil. Again, only the soil portion will be removed. The remaining rock will be used as riprap for the rehabilitation of Eccles Creek, provided it meets riprap specifications. Any unused rock will be disposed of as discussed in Section 784.13 of Valley Camp's approved mining and reclamation plan (UT 0013). The corrugated metal pipe will be removed and disposed of similarily. These activities will allow Eccles Creek to return to its natural channel.

4.3.3 Unstable Fill Slopes

The third area from which backfill material will be obtained is from the portions of the outslope road fills that have been determined to be potentially unstable (Table 2.1). A sufficient quantity of fill will be removed from each of these fill slopes to reduce the potential of the slope failing. To initiate reclamation of these fill slopes, the guard rails will be removed and the support post and metal rails will be salvaged or disposed of.

The excavated material (Figure 4.3) will be removed using a backhoe or a similar machine to reach down the slope to retrieve material. As a result of this operation, the road edge will be cut back toward the

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL CROSS SECTION - UNSTABLE FILL
FINAL CONTOURED SURFACE
Figure 4-3
(NOT TO SCALE)



toe of the cut slope ten to fifteen feet. With the removal of this material the final surface will have an approximate slope of 2.5H:1V. The excavated material will be placed on the remaining road surface thereby creating an outslope of approximately 4H:1V.

The quantity of fill material estimated to be removed from the various sources and the estimate of the storage capacity that can be developed from utilizing the road surface is given in Table 4.1.

TABLE 4.1

VALLEY CAMP OF UTAH

BELINA HAUL ROAD RECLAMATION

SOIL DISPOSAL VOLUMETRICS

Fill Material To Remove:

o Eccles Creek Fill	4,000 $yd^3\pm$
o The Bowl Crossing Fill	15,000 $yd^3\pm$
o Haul Road Outslopes	6,000 $yd^3\pm$
o Remaining CMP Removal	1,500 $yd^3\pm$
o Asphaltic Concrete and Broken Cement Concrete	5,000 $yd^3\pm$
GRAND TOTAL	31,500 yd^3+

Storage Capacity:

o Haul Road with Stable Outslopes (3,470 feet)	25,000 $yd^3\pm$
o Haul Road with Portion of Outslopes Removed (2,780 feet)	6,000 $yd^3\pm$
o Backslope Section of Road (1,250 feet)	3,000 $yd^3\pm$
GRAND TOTAL	34,000 yd^3+

4.4 Topsoiling

During the construction of the haul road the overlaying topsoil and subsoils were excavated and stockpiled where possible, sidecast or used as fill. During the reclamation of the haul road some of the material which was sidecast and/or used for fill material will be excavated and used to recontour the road. The suitability of this material as a growth medium is evidenced by the vegetation currently growing on it and in fact very similar material has already been approved for use as topsoil at this mine by the Utah Division of Oil Gas and Mining. Prior to using this material as topsoil however, it will be analyzed for pH, texture, electrical conductivity, calcium, magnesium, sodium, organic matter, phosphorous and potassium. Because this material is a mixture of topsoil and subsoil and because no segregated topsoil stockpiles exist at this mine "topsoil" will not be placed on the regraded surface.

4.5 Seed Bed Preparation

The soil removed from the large fills will be replaced using dozers and scrapers. Soil removal from the potentially unstable outslopes will be accomplished using a backhoe or similar equipment. The soil replaced by scrapers and dozers will be scarified to a depth sufficient to allow root penetration whereas the soil placed by the backhoe will not require loosening since it will be subject only to limited packing. The final recontoured surface will then be disked or tracked on the contour prior to seeding.

4.6 Seeding

Seeding will follow the procedures and seed mixes outlined in Valley Camp's approved Mining and Reclamation plan, Permit Number UT 0013.

Areas of the haul road outslopes and cut slopes which will not be disturbed by reclamation activities will be subjected to a statistically valid vegetation survey at the time to determine the adequacy of the existing vegetation when compared to reference areas identified in Mining Permit Number UT-0013. If it is determined necessary, these undisturbed areas will be interseeded or interplanted with shrubs.

4.7 Fertilizing

A chemical analysis will be performed on samples of the soil which will indicate the nutrients and amounts necessary for proper plant growth. Fertilizer will be applied either just prior to or immediately following seeding.

4.8 Mulching

Mulch will be applied at approximately 2,000 pounds per acre, depending on the material of choice, and will follow application of the seed and fertilizer. The mulch will be straw or any of the other commonly used mulch materials. At the time of reclamation, where it is deemed necessary, a tackifying agent or some other means will be used to hold the mulch in place.

4.9 Erosion Control and Maintenance

During reclamation activities, interim erosion control measures such as filter fabric and straw bales will be used to control water flow. Once a drainage channel is established, these interim structures will be removed and the disturbed areas will be seeded, fertilized and mulched. At the conclusion of reclamation activities, runoff will be slowed by the proper placing of straw bales, filter fabric fences, riprap or mulch, in potential problem areas. If runoff channels develop in excess of nine inches, the most applicable erosion control technique will be selected. For example, small erosion channels will be blocked with a filter fabric fence, a straw bale or some other material to slow the water and allow vegetation to establish.

4.10 Revegetation

The revegetated area will be monitored closely to ensure that a diverse, permanent vegetation cover capable of self-regeneration is developed. Revegetation success of the newly reclaimed haul road areas will be determined by following the techniques developed in Section 817.116 of Valley Camp's approved mining and reclamation plan, Permit Number UT-0013.

4.11 Reclamation Costs

Reclamation costs are summarized by task for the purpose of bonding costs. These cost estimates are made with the knowledge that the efficiency of workers and machinery may far exceed the normal rate because of the very limited work space, and the difficulty in scheduling of crews. The reclamation cost estimates are given in Table 4.2.

TABLE 4.2

RECLAMATION COST ESTIMATES

Remove Concrete and Asphaltic Concrete:			
Rip Portland Cement Concrete and Breakup Asphaltic Concrete			$ 3,500
Remove and Place Asphaltic Concrete (40 hrs. @ $87.50/hr.)			2,800
Compact Asphaltic Concrete			1,600
Break and Remove Concrete Ditch			6,500
Rip/Scarify Road Base Material (65 acres) (8 hrs. @ $75.00/hr.)			600
Remove corrugated Metal Pipes			8,000
Remove and Dispose Guard Rails, Posts, and Signs			5,800
Remove and Place Fill Material:			
20,000 yd^3 (Intersecting Drainage Fills)			50,000
7,000 yd^3 (Road Outslope Fills) (80 hrs. @ $100/hr.)			8,000
Recontour Road Surface:			
10.0 Acres ± (80 hrs. @ $100.00/hr.			8,000
Construct Riprap Drainage Channels:			
8 each (@ 200 feet each)			32,000
Redistribute Topsoil Substitute (10 Acres x 6" Deep):			
8,100 yd^3 ± (@$2.50/yd.)			20,000
Seedbed Preparation (Scarification, Disking, Harrowing)			1,000
Fertilizing, Seeding, and Mulching:			
Seed:	(10 acres @ 24.0 lbs/acre @ $15.00/P.L.S. lb.)	$3,600	
Fertilizer:	(10.0 acres @ $425.00/acre)	$4,250	
Mulching:	(10.0 acres @ $500.000/acre	$5,000	
Equipment and Labor:		$2,000	
Total			14,850
Monitoring			1,000
	TOTAL		$163,650
	10% Mobilization and Demobilization		16,365
	15% Profit and Administration		24,548
	Maintenance-10 Acres @ $100.00/ac/yr.		1,000
	TOTAL BONDING COST		$205,563