CEDAR CREEK ASSOCIATES

Regulatory Compliance and Resource Specialists

P.O. Box 9557 • 916 Willshire Ave. • Fort Collins, Colorado 80525

Seep and Spring Inventory

and

Proposed Seep and Spring Monitoring Program

Submitted to

Valley Camp of Utah, Inc.
Helper, Utah

Submitted by

Cedar Creek Associates
Fort Collins, Colorado

November 30, 1984

INVENTORY

On October 16, 1984, Cedar Creek Associates initiated field studies to inventory seeps and springs and characterize associated wetland vegetation on Valley Camp of Utah, Inc.'s mine permit area. The purpose of this inventory and the subsequent proposed monitoring program was to satisfy the requirements of Condition No. 7 imposed on Valley Camp of Utah, Inc.'s mine permit application. The following sections describe the methods employed to inventory seeps and springs, provide the results of the inventory, and propose a program to monitor seeps and springs on the permit area.

METHODOLOGY

To provide information on the size, source, and amount of water; vegetation present; photo-documentation; and an evaluation of wildlife utilization of each seep and spring, Cedar Creek personnel attempted to visit each of the 73 permit area springs during mid-October, 1984. However, only 18 springs were inventoried as a result of an unseasonably heavy snowstorm on October 17, 1984. This snowstorm and subsequent cold weather and snowstorms precluded completing the inventory in 1984. Springs inventoried included all those occurring in Sections 24 and 25 within the northern portion of the permit area, except for six springs in the SE 1/4 of Section 25 (see Plate 1, Valley Camp of Utah, Inc. permit application).

Standardized data sheets were completed for each spring visited. Information provided on these data sheets included location; slope; aspect; the size of the area around the spring supporting wetland, riparian, or other indicator species of vegetation; and vegetation species present. Where possible, information on the vigor and percent cover of vegetation stratum was recorded. In most cases (particularly for herbaceous species) data on vigor and percent cover could not be provided because of snow cover and decadent or dormant vegetation.

Other data recorded included source and flow of each spring, pertinent wildlife observations, and comments on wildlife habitat. Wildlife observations were limited due to the season in which the inventory occurred. The quantity of flow for each spring was obtained, where possible, by timing the filling a container of known capacity and then converting to gallons per

minute of discharge. The source of each spring was determined from hydrology information presented in the permit application.

As a final inventory procedure, a photograph of each spring site and an additional photograph of the surrounding vegetation community was taken for each spring visited. The frame number of each picture and camera orientation was noted on each data sheet.

RESULTS

Although only 18 springs were inventoried, it was determined that this was a sufficient number visited to adequately characterize the majority of the springs on the permit area and to propose an appropriate monitoring program. In addition, all springs had been previously visited and characterized by Vaughn Hansen Associates (Ground water Hydrology Report, mine permit application). Data sheets completed for the 18 springs inventoried are provided in Appendix 1.

Flows in the majority of the springs are low (less than 10 gpm), and Vaughn Hansen Associates (Ground Water Hydrology Report, mine permit application) concluded from variation in flows (from spring to summer) and geological information that "much, if not all, of the water found in a given spring originates in the small surface depression or basin immediately adjacent to the spring." Wetland habitat supported by these springs is represented primarily by small isolated stands of annual forbs and perennial grasses adapted to growing in close proximity to moist situations. Since wetland habitat supported by these springs is limited or nonexistent, the major value of these springs to most wildlife is their use as a local source of water and their contribution to total streamflow in associated drainages. In addition, springs in the permit area are relatively abundant (average of one for every 37 acres, excluding perennial streams), and travel distances between water sources are relatively short for most wildlife and livestock that utilize the area.

PROPOSED MONITORING PLAN

Based on the preliminary findings, Valley Camp of Utah, Inc. will commit, pursuant to OSM approval, to monitoring a representative sample of springs on a yearly basis. Monitoring will occur in late summer to coincide with low flow periods since low flow is the most limiting factor controlling the extent and vigor of associated wetland vegetation. Approximately 15 control and 15 potentially affected springs will be monitored each year. Control springs will be chosen from areas under which mining will not occur, while potentially affected springs will be monitored in areas under which mining will occur or has occurred. Other criteria to be used for selection of control springs will be similarity in source (formation), amount of flow, slope, aspect, and vegetation to the potentially affected springs. Control springs will be monitored in conjunction with the potentially affected springs so that potential mining related impacts to springs can be discerned from yearly fluctuations in springflow attributable to climatic variation. Monitoring at each spring will consist of measurement of flow present and photo-documentation of associated wetland vegetation. In order to maintain consistency in the specific area to be photographed from year to year, a permanent stake will be placed to mark the photo station at each spring. During the first year of monitoring the height of the camera from the ground and compass direction (degrees) of the camera orientation will be recorded. This height and camera orientation will be repeated from year to year for each spring. A chalkboard with the date and spring number will be placed in each photograph for identification purposes.

At the end of each year of monitoring, Valley Camp of Utah, Inc. will submit a summary of the results to the OSM.

Appendix 1

Spring Inventory Data Sheets and Photos

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-17 Date: 10/16/84 Time: 10:00 am

Observers: Viert/Phelan Elevation: 9,440'

Legal Description: NW 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 200' X 125' Acreage: 0.57

Slope (Est.): 20% Aspect: NW

USFWS Classification: Non-applicable (N/A)

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Ribes sp., *Sambucus* sp.	N/A	<5%	N/A
Herbaceous			
Rudbeckia laciniata, *Geranium* sp. *Festuca* sp., *Carex* spp., *Poa* sp.	N/A	? (snow cover)	N/A

Adjacent Communities Spruce fir forest

Comments: Photo No and Orientation: 1-1 146° seep, 1-2 Adj. 40°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): None flowing - frozen

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		snowshow hare tracks
Birds		
Reptiles and Amphibians		

Habitat Considerations

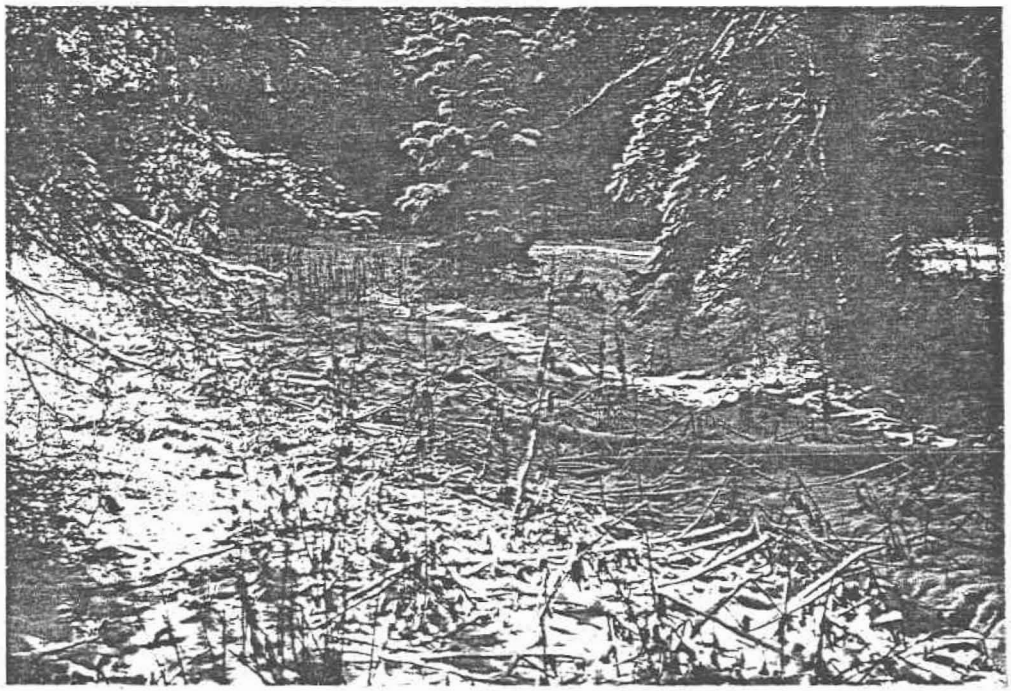
Sambucus - good mule deer browse; no significant wetland vegetation

Comments: open meadow in spruce-fir firest; 2-3 inches snow cover

Photo Log

Area Photo

Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-2 Date: 10/16/84 Time: 10:30 am

Observers: Viert/Phelan Elevation: 9,400'

Legal Description: NE 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 30' W X 120' L Acreage: 0.08

Slope (Est.): 40% Aspect: N

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Ribes sp., *Sambucus* sp.	N/A	< 5%	N/A
Herbaceous			
Geranium sp., *Veratrum* sp., *Carex* spp., *Equisetum* sp.	N/A	? (snow cover)	N/A

Adjacent Communities Spruce fir forest

Comments: Photo Nos. & Orientation: 1-3 Site 100°; 1-4 Adj. 295°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 2

Comments: Flowing

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations No significant wetland vegetation, open grass/ forb meadow in spruce/fir forest

Comments: 3-4 inches snow cover

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-8 Date: 10/16/84 Time: 11:07 am

Observers: Phelan/Viert Elevation: 9,400'

Legal Description: NE 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 75' X 50' Acreage: 0.09

Slope (Est.): 25% Aspect: N

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Sambucus sp., *Ribes* sp.	N/A	10%	N/A
Herbaceous			
Veratrum sp., *Stipa* sp., *Festuca* sp., *Agropyron* sp.	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir forest

Comments: Photo Nos. & Orientation: 1-7 Site 120°; 1-8 adj. 45°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): .25 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		elk tracks
Birds		
Reptiles and Amphibians		

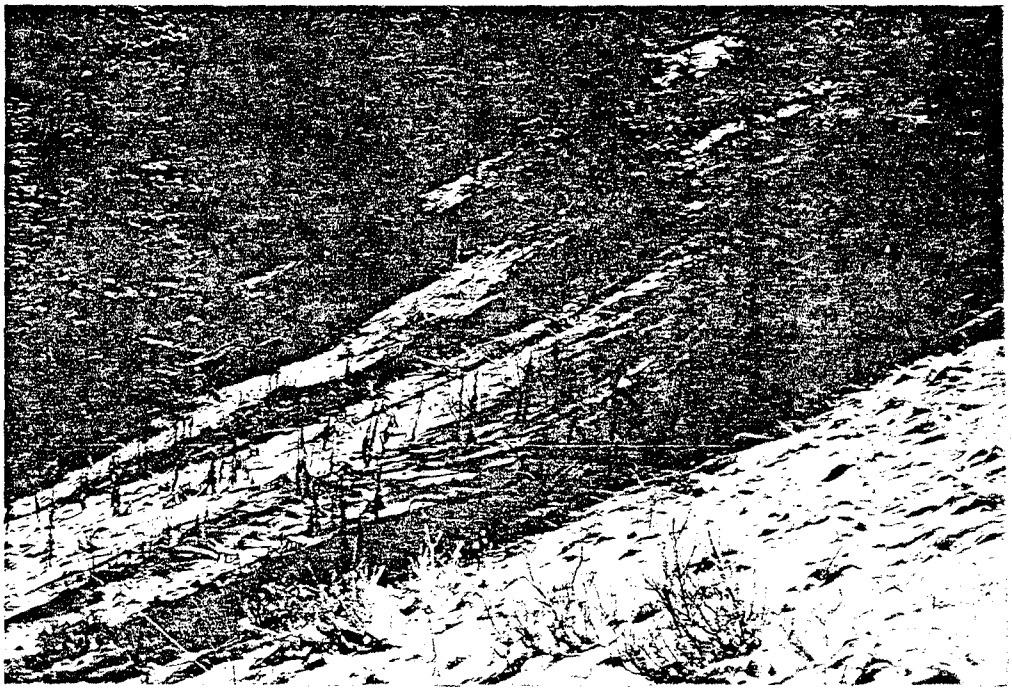
Habitat Considerations No significant wetland vegetation, Sambucus moderately browsed

Comments: 3-4" snow

Photo Log

Area Photo

Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-9 Date: 10/16/84 Time: 11:18 am

Observers: Phelan & Viert Elevation: 9400'

Legal Description: NE 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 50' dia. Acreage: 0.04

Slope (Est.): 25% Aspect: N

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
Shrubs			
Ribes sp.	N/A	<5%	N/A
Herbaceous			
Veratrum, sp., Festuca sp. Agropyron sp., Rudbeckia laciniata, Carex spp.	N/A	? (snow cover)	N/A

Adjacent Communities spruce/fir forest

Comments: Photo Orientation & Nos: Site 1-9 140°; adj. 1-10 350°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): .25 gpm

Comments: slump evident

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		elk tracks
Birds		
Reptiles and Amphibians		

Habitat Considerations

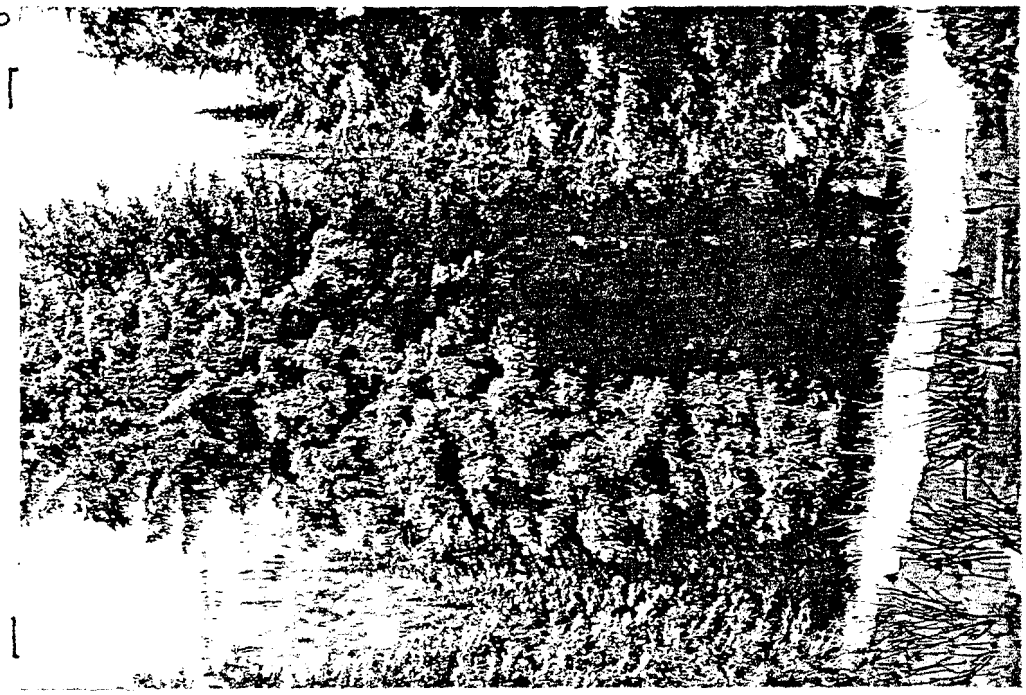
No significant wetland vegetation

Comments: Small clearing in spruce/fir community

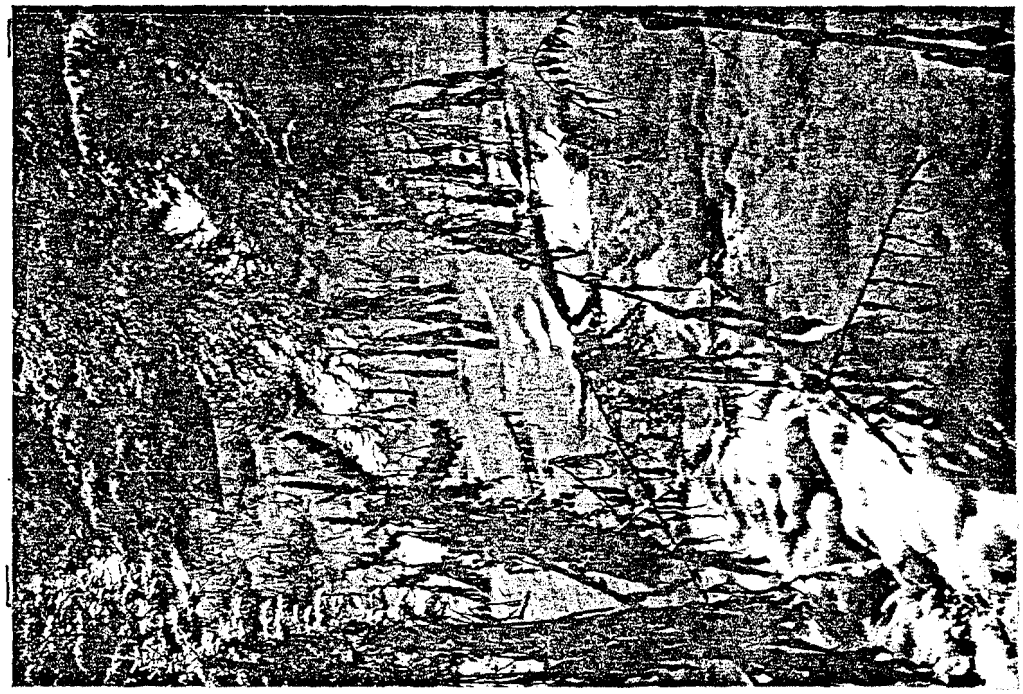
2-4 in. snow

Photo Log

Area Photo



Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-3, 25-10* Date: 10/16/84 Time: 11:28 am

Observers: Phelan/Viert Elevation: 9,440'

Legal Description: NE 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 100' X 400' Acreage: 0.92

Slope (Est.): 20% Aspect: N

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Sambucus sp., *Ribes* sp.	N/A	15%	N/A
Herbaceous			
Veratrum sp., *Stipa* sp., *Festuca* sp., *Agropyron* sp.	N/A	? (snow cover)	N/A

Adjacent Communities spruce/fir-aspen

Comments: Photo Nos. and orientation: Site 1-11 175°; adj. 1-12 20°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 1 gpm

Comments: * springs connected by surface flow.

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Hairy woodpecker		
Reptiles and Amphibians		

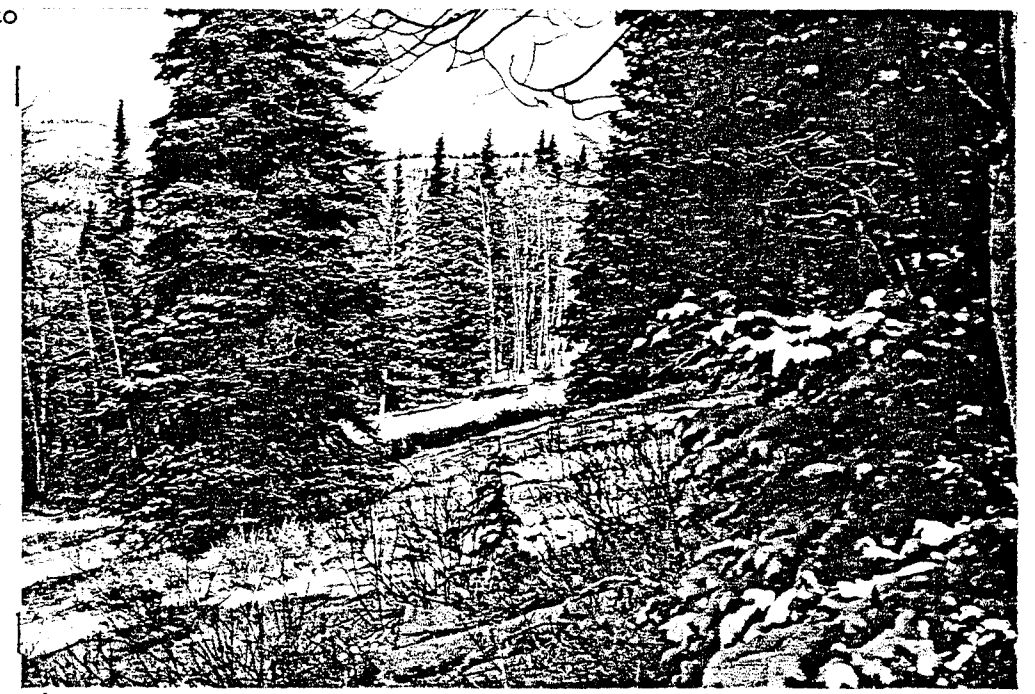
Habitat Considerations

No significant wetland vegetation

Comments: open meadow bordered by spruce/fir and aspen communities, 2-4 in. snow.

Photo Log

Area Photo



Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-4 Date: 10/16/84 Time: 11:52 am

Observers: Phelan, Viert Elevation: 9,400'

Legal Description: NE 1/4, SW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 50' X 75' Acreage: 0.09

Slope (Est.): 20% Aspect: N

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Ribes sp., *Sambucus* sp.	N/A	15%	N/A
Herbaceous			
Festuca sp., *Carex* spp., *Agropyron* sp.	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir, Aspen mixture (Open)

Comments: Photo Nos. and orientation: Site 1-13 212°; Adj 1-14 30°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): None

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		elk tracks
		mule deer tracks
Birds		
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation, Sambucus moderately browsed

Comments: open shrub meadow border by spruce/fir and aspen, 2-4 in. snow

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-5 Date: 10/16/84 Time: 12:05 pm

Observers: Phelan, Viert Elevation: 9,160'

Legal Description: SE 1/4, NW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 25' dia + (80' X 100') Acreage: 0.20

Slope (Est.): 25% Aspect: W-NW

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
1) None			
2) Sambucus sp., Ribes sp.	N/A	15%	N/A
Herbaceous			
1) Veratrum sp., Rudbeckia laciniata, Carex spp.	N/A	? (snow cover)	N/A
2) Festuca sp., Agropyron sp., Rudbeckia lacinata, Stipa sp., Carex spp.	N/A	? (snow cover)	N/A

Adjacent Communities spruce/fir forest

Comments: Photo Nos. and orientation: Site 1-15, 175°; adj. 1-16 295° (2nd spring on right hand side of this photo), very sparse vegetation

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 2 gpm

Comments: Spring continuous by surface flow with another 100 feet to north

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

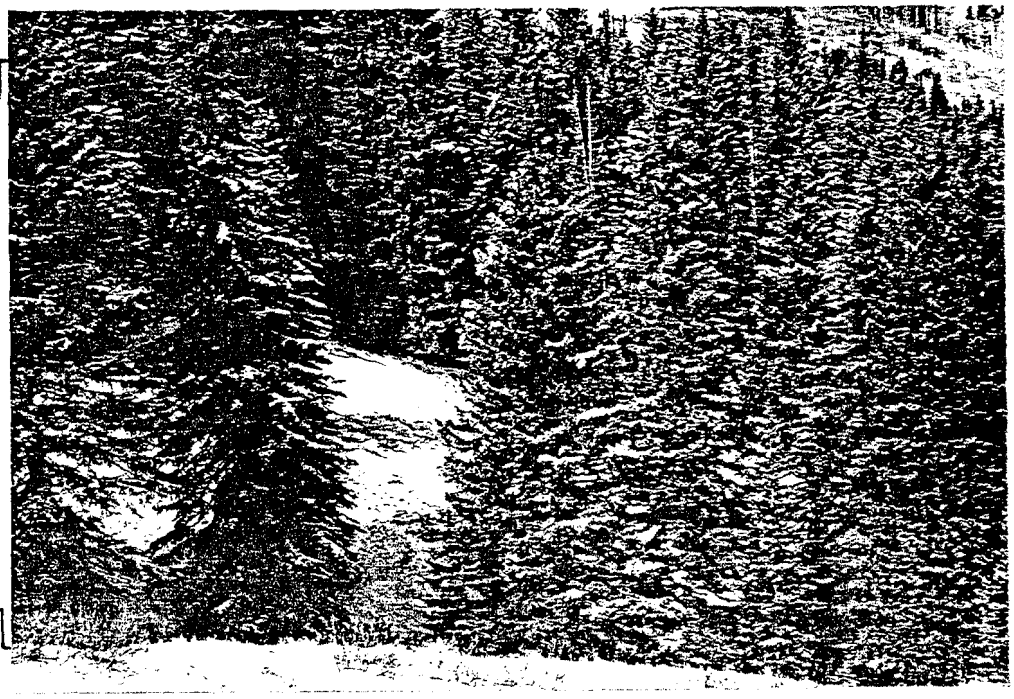
Habitat Considerations

No significant wetland vegetation

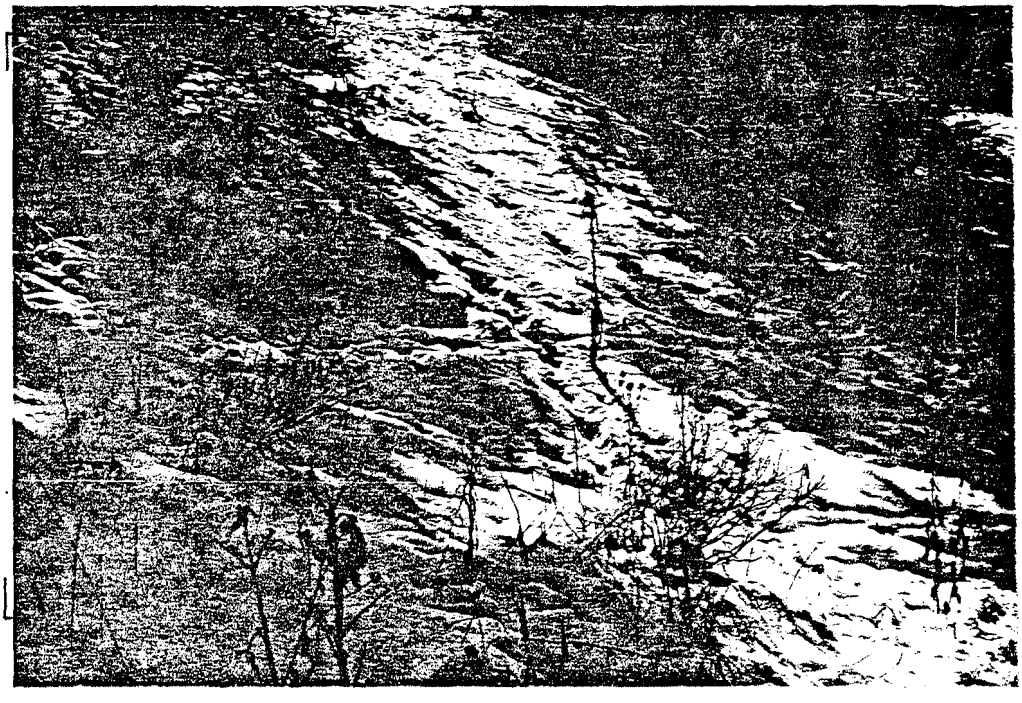
Comments: small clearing in spruce fir community
2-4 in. snow

Photo Log

Area Photo



Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-6 Date: 10/16/84 Time: 12:49 pm

Observers: Phelan, Viert Elevation: 9,100'

Legal Description: SE 1/4, NW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 20' X 50' Acreage: 0.02

Slope (Est.): 30% Aspect: W

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
10 2-3 ft. *Pseudotsuga menziesii*	good	< 1%	N/A
Shrubs			
None			
Herbaceous			
mostly grass - *Carex* sp. & *Koeleria* sp.	N/A	? (snow cover)	N/A

Adjacent Communities spruce/fir forest

Comments: Photo Nos. & orientation: Site 1-18, 130°; Adj. 1-19, 220°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 6 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		Mt. chickadee
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation

Comments: spring area crossed by down timber, 3-4 inches snow cover

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-7 Date: 10/16/84 Time: 1:20 pm

Observers: Phelan, Viert Elevation: 8,960'

Legal Description: NE 1/4, NW 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 20' X 50' Acreage: 0.02

Slope (Est.): 45% Aspect: NW

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Ribes sp.	N/A	<1%	N/A
Herbaceous			
Misc. perennial grasses & annual forbs	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir forest

Comments: Photo Nos. & orientation: Site 1-20, 125°; Adj. 1-21, 25°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 4 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation

Comments: 3-4 in. snow cover

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 24-10 Date: 10/16/84 Time: 1:34 pm

Observers: Phelan/Viert Elevation: 8840'

Legal Description: SE 1/4, SW 1/4, Sec. 24, T 13S, R 6 E

Dimensions: 10' X 10' Acreage: < 0.01

Slope (Est.): 35% Aspect: NE

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
None			
Herbaceous			
mixed perennial grasses & annual forbs	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir-Aspen mix

Comments: Photo orientation & Nos.: Site 1-22, 130°; Adj. 1-23, 20°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 2 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations

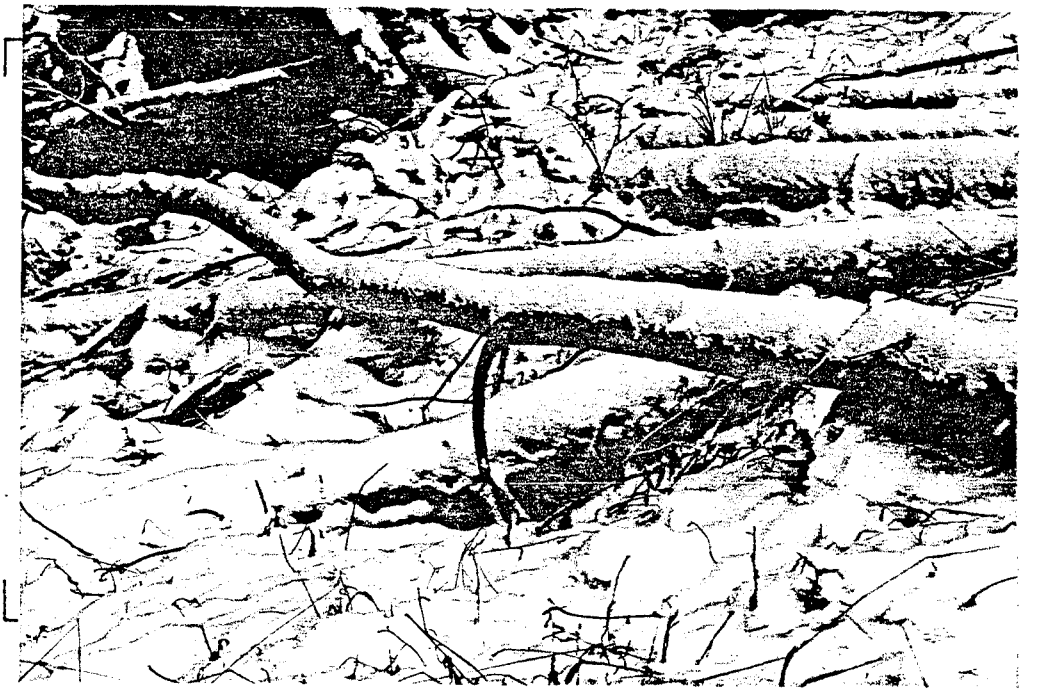
No significant wetland vegetation

Comments: spring area covered partially by downed timber; within 25 yards of South Fork drainage, 3-4 in. snow cover

Photo Log

Area Photo

Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 24-11 Date: 10/16/84 Time: 1:46 pm

Observers: Phelan, Viert Elevation: 8,800'

Legal Description: SE 1/4, SW 1/4, Sec. 24, T 13S, R 6 E

Dimensions: 10' X 30' Acreage: 0.01

Slope (Est.): 50% Aspect: ENE

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
Shrubs			
Sambucus sp.	N/A	< 1%	N/A
Herbaceous			
Agropyron spicatum, *Carex* spp. *Rudbeckia laciniata*	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir-Aspen mix

Comments: Photo Nos. & orientation: Site 1-24, 350°; Adj. 1-25, 290°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): < 1 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		vole runways in grass
Birds		
Reptiles and Amphibians		

Habitat Considerations

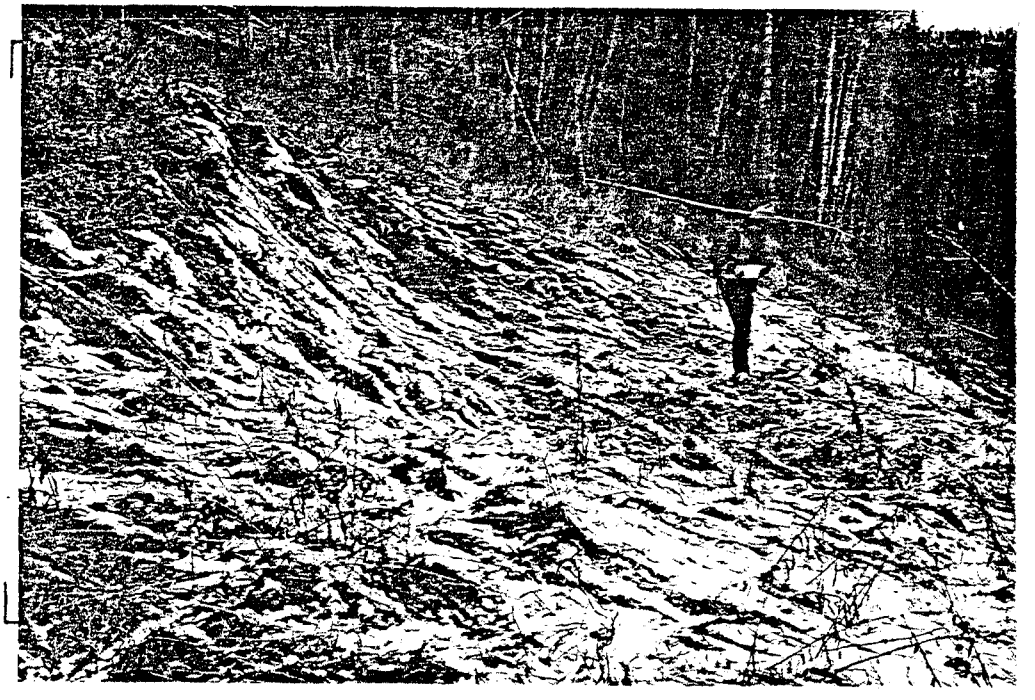
No significant wetland vegetation

Comments: open meadow bordered by spruce fir & aspen, within 20 yards of South Fork drainage, 0-2 in. snow cover

Photo Log

Area Photo

Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 24-12 Date: 10/16/84 Time: 1:53 pm

Observers: Phelan, Viert Elevation: 8,760'

Legal Description: SE 1/4, SW 1/4, Sec. 24, T 13S, R 6 E

Dimensions: 5' X 20' Acreage: < 0.01

Slope (Est.): 50% Aspect: ENE

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
None			
Herbaceous			
Poa pratensis, moss	N/A	? (snow cover)	N/A

Adjacent Communities Spruce/fir-Aspen mix

Comments: Photo Nos. and orientation: Site 1-26, 210°; Adj. 1-27, 260°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 1 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations

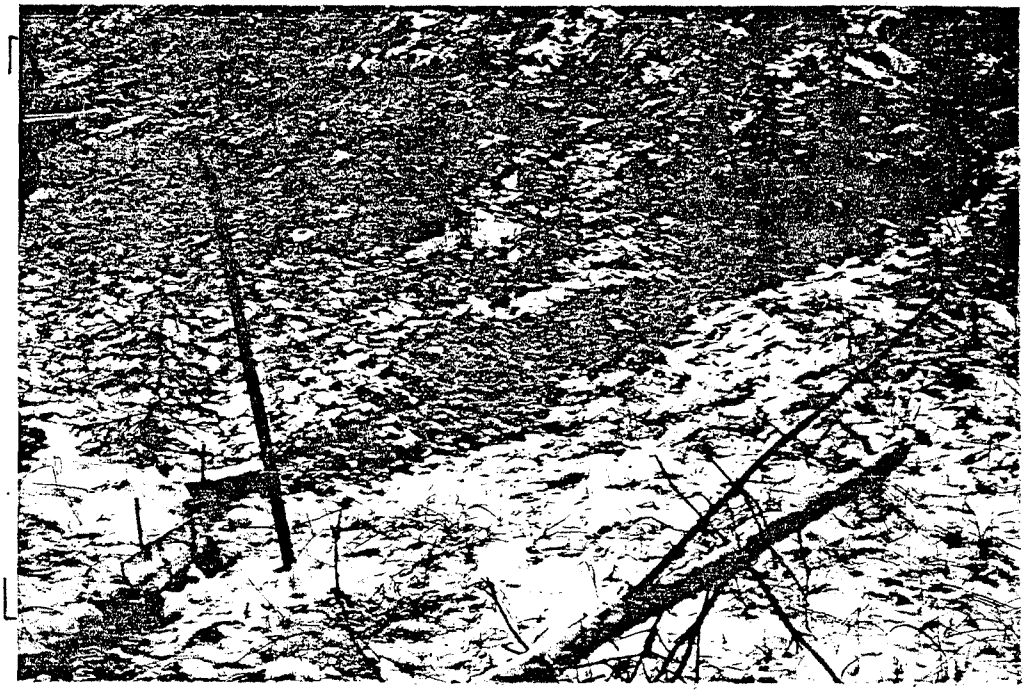
No significant wetland vegetation

Comments: meadow adjacent to South Fork drainage, 0-1 in. snow

Photo Log

Area Photo

Site Photo



CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 24-1 Date: 10/16/84 Time: 3:41 pm

Observers: Phelan, Viert Elevation: 9,160'

Legal Description: NE 1/4, SE 1/4, Sec. 24, T 13S, R 6 E

Dimensions: 30' X 50' Acreage: 0.03

Slope (Est.): 20% Aspect: ESE

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Sambucus sp.	N/A	1%	N/A
Herbaceous			
Veratrum sp., *Festuca* sp., *Poa pratensis*, *Wyethia* sp.	N/A	? (snow cover)	N/A

Adjacent Communities Aspen

Comments: Photo Nos. & orientation: Site 1-28, 350°; Adj. 1-29, 40°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 1 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		elk pellets & tracks
Birds		
Reptiles and Amphibians		

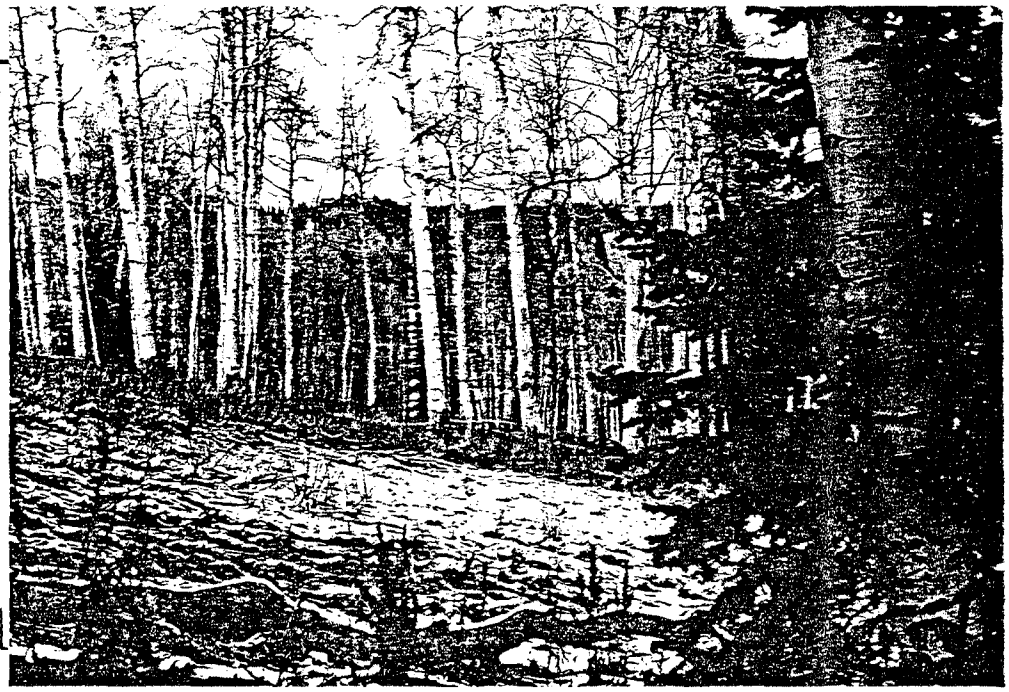
Habitat Considerations

No significant wetland vegetation

Comments: open meadow on south facing aspen hillside, good elk habitat, elk tracks & pellets common, 0-1 in. snow cover

Photo Log

Area Photo



Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-11 Date: 10/16/84 Time: 4:07 pm

Observers: Phelan, Viert Elevation: 9,240

Legal Description: NW 1/4, NE 1/4, Sec. 25, T 13S, R 6 E

Dimensions: (30' X 60') + (10' X 40') Acreage: 0.06

Slope (Est.): 40% Aspect: WSW

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Sambucus sp.	N/A	<1%	N/A
Herbaceous			
Veratrum sp., *Rudbeckia laciniata*, *Stipa* sp. *Poa* sp., *Agropyron* sp., misc annual forbs	N/A	80%	N/A

Adjacent Communities Aspen, big sagebrush/rabbitbrush

Comments: Photo Nos. & orientation: Site 1-30, 75°; Site & Adj 1-31, 210°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 1 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
		vole runways in grass
Birds		
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation

Comments: Open forb/grass meadow on sagebrush/rabbitbrush hillside, also small open stands of aspen

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-12 Date: 10/16/84 Time: 4:25 pm

Observers: Phelan, Viert Elevation: 9,180'

Legal Description: NW 1/4, NE 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 30' dia. Acreage: 0.02

Slope (Est.): 45% Aspect: W

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
Artemisia tridentata, *Chrysothamnus* sp., *Symphoricarpos occidentalis*	good	30%	N/A
Herbaceous			
Rudbeckia laciniata, *Poa* sp., *Stipa* sp., misc. annual forbs, *Wyethia* sp.	N/A	20%	N/A

Adjacent Communities Big Sagebrush/Rabbitbrush

Comments: Photo Nos. & orientation: Site 1-32, 300°; Adj. 360°, 1-33

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): No flow

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation

Comments:

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-13 Date: 10/16/84 Time: 4:40 pm

Observers: Phelan, Viert Elevation: 9,280'

Legal Description: NE 1/4, NE 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 10' X 120' Acreage: 0.03

Slope (Est.): 45% Aspect: E

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
None			
Herbaceous			
Veratrum sp., *Rudbeckia laciniata*, *Poa* sp., *Cirsium* sp., *Agropyron* sp., *Carex* spp.	N/A	40%	N/A

Adjacent Communities forb/meadow

Comments: Photo Nos. & orientation: Site 1-34, 310°; Adj. 1-35, 0°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): 0.25 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
Birds		
Reptiles and Amphibians		

Habitat Considerations

No significant wetland vegetation

Comments: grasses heavily grazed

Photo Log

Area Photo

Site Photo

CEDAR CREEK ASSOCIATES

SEEP AND SPRING INVENTORY
VALLEY CAMP OF UTAH, INC.

General Information

Seep, Spring Identification: 25-14 Date: 10/16/84 Time: 5:14 pm

Observers: Phelan, Viert Elevation: 9,280'

Legal Description: SE 1/4, NE 1/4, Sec. 25, T 13S, R 6 E

Dimensions: 15' X 100' Acreage: 0.03

Slope (Est.): 50% Aspect: ESE

USFWS Classification: Non-applicable

Vegetation Information

Species	Vigor	% Cover (Est.)	Importance
Trees			
None			
Shrubs			
None			
Herbaceous			
Veratrum sp., *Poa* sp., *Agropyron* sp., mixed annual forbs & perennial grasses	N/A	50%	N/A

Adjacent Communities Forb meadow & Aspen

Comments: Photo Nos. & orientation: Site 1-36, 230°; Adj. 1-37, 10°

Hydrology Information

Source of water: Blackhawk Formation

Quantity of water (gal/min): < 0.25 gpm

Comments:

Wildlife Information

	Species Observed	Species Sign Observed
Mammals		
	2 mule deer does bedded down near spring	elk pellets
Birds		
Reptiles and Amphibians		

Habitat Considerations

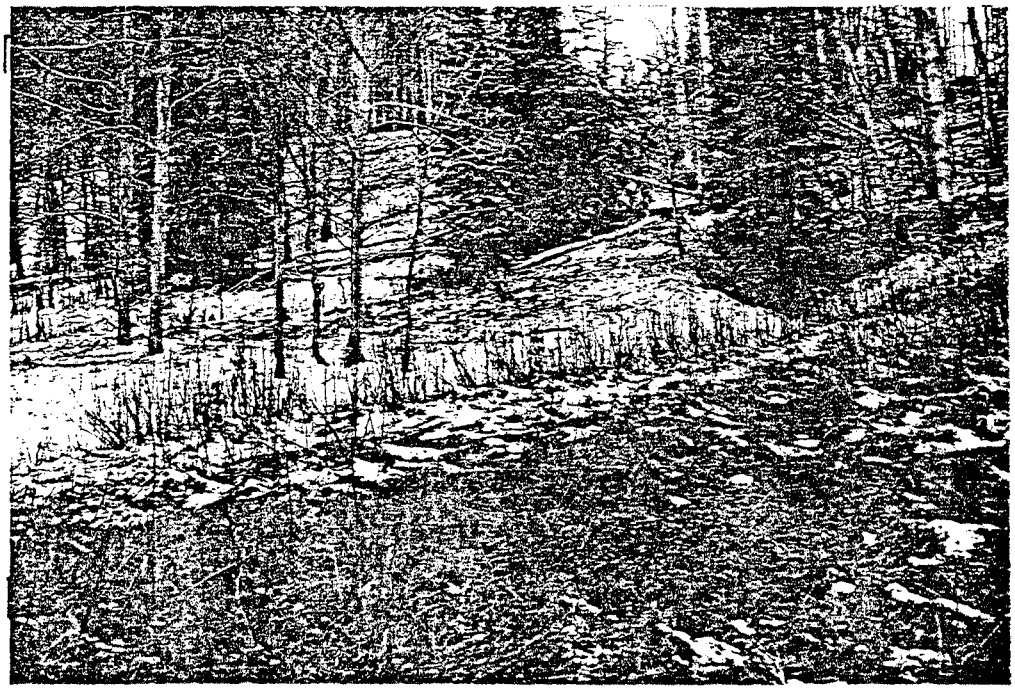
No significant wetland vegetation

Comments: Good elk habitat -- forb meadow on open aspen hillside

Photo Log

Area Photo

Site Photo



CONDITION NO. 9

Within 180 days of the effective date of this permit, Valley Camp of Utah, Inc. shall submit to the regulatory authority, for review and approval, a detailed reclamation plan to restore the Belina haulroad in accordance with UMC 817.156. This plan must address, at a minimum, removal and disposal from fill slopes vegetative cover that would interfere with backfilling and grading operations, slope stability, backfilling and grading, topsoil handling, disposal of concrete and asphalt, removal of culverts and reestablishment of natural drainages, sediment-control measures, and revegetation of the road surfaces and adjacent slopes.

RESPONSE

With the assistance of Morrison-Knudsen Company, Inc., a detailed reclamation plan for the Belina Mines haulroad has been prepared and is attached.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION

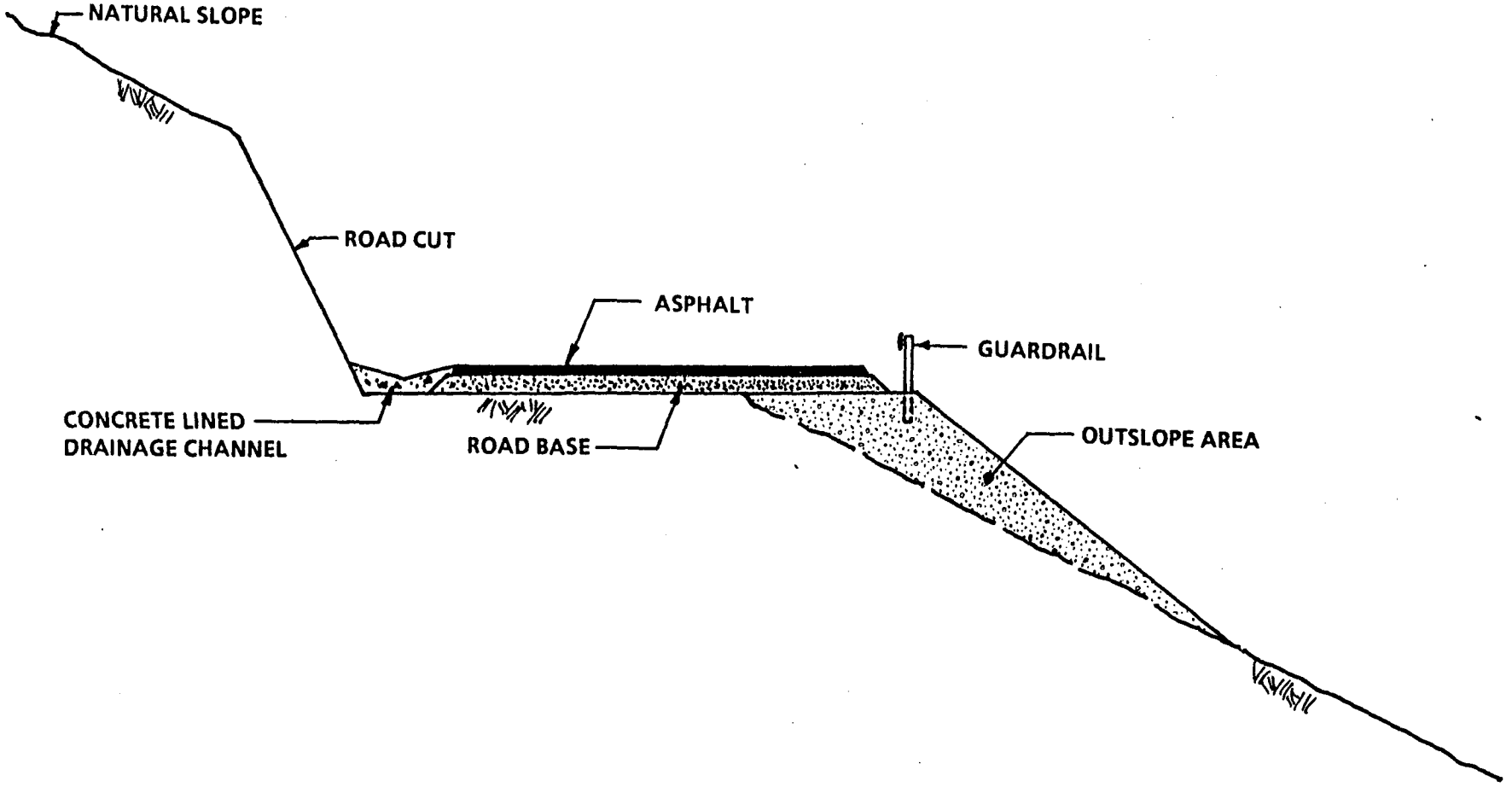
Objectives

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 can be obtained by recontouring the road surface to re-establish a drainage pattern similar to pre-mining conditions and by replacing the soil medium and re-establishing an effective vegetation cover.

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

The affected areas consist of a strip of land approximately 100 to 200 feet wide and 1.5± miles long. Although the right-of-way (ROW) is up to 200 feet ± wide, this reclamation plan will only be concerned with the road surface (34 feet wide) and outslope areas having questionable slope stability when considered as final reclamation. Figure 1 is a typical cross section illustrating the construction of the Belina Haul Road. Approximately 10-12 acres will require recontouring and/or reclamation activities. The majority of the road outslope areas are considered stable as final reclamation and therefore will not be disturbed. The results of a limited geotechnical evaluation concerning the road outslopes and drainage fills are shown in this plan as Table 1. Only the most questionable slopes and their corresponding station location are shown on this table. These station locations were determined from the preconstruction engineered drawings based on odometer readings starting at the Eccles Canyon/Belina Haul Road intersection and moving towards the mine.

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



In an effort to minimize disturbances of previously revegetated slopes, the more stable outslopes will not be disturbed. To remove the vegetation and recontour all of the outslopes would potentially create more adverse impacts to the environment than if the more stable slopes were left in their present state of reclamation.

BELINA MINE HAUL ROAD RECLAMATION
POTENTIALLY UNSTABLE FILL LOCATIONS
TABLE 1

From	To	Linear Distribution	Preconstruction Slope
Sideslopes			
82+46	77+18	528'	28°
64+12	61+48	260'	24°
60+40	55+90	450'	24°
52+75	51+17	150'	24°
41+40	37+18	420"	24°
32+00	30+40	160'	28°
29+34	24+06	520'	24°
22+70	21+10	160'	26°
Drainage Crossing Fills			
83+52	82+46 (Eccles Canyon Intersection)	100'	--
51+09	48+09 (Bowl Crossing)	300'	--

Reclamation Procedures

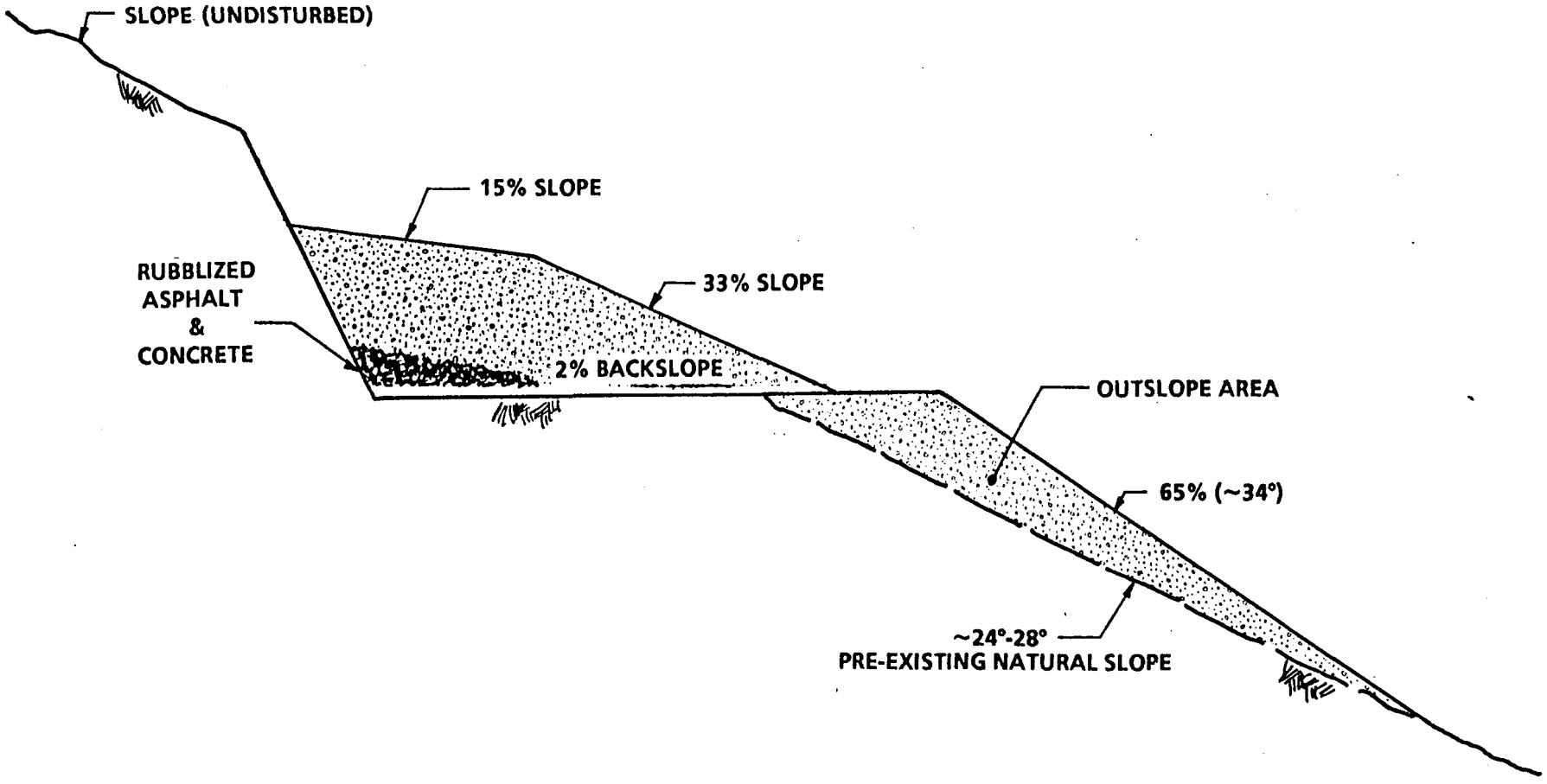
Road Surface Removal:

Reclamation of the road will begin with the removal of the asphaltic concrete road surface and the Portland cement concrete lining the water control channel located on the inside of the road at the toe of the cut slope. The Portland cement concrete lining will be rubblized to eliminate any slippage surface when the Portland cement concrete, asphaltic concrete, and fill material are placed for disposal. The larger pieces of Portland cement concrete will be salvaged and used as riprap in the water control channels.

The asphaltic concrete will then be broken by ripping and will be placed against the toe of the cut slope over the previously placed broken Portland cement concrete. The asphaltic concrete will be piled approximately 4 feet deep adjacent to the cut slope and graded to ground level 7 to 8 feet out from the toe of the slope (Figure 2). There are approximately 3,500 cubic yards of asphaltic concrete to dispose of. To insure a competent fill and that piping of the disposed fill material does not occur, the asphaltic concrete will be placed in an engineered manner and compacted. This will begin the development of a two level outslope which will re-establish a drainage pattern similar to that which was present prior to mining. 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.

All corrugated metal pipe (CMP) crossings associated with minor fills will be removed to establish the final drainage channels. These ephemeral channels will be riprapped as necessary to prevent excessive erosion. In addition, the road surface will be recontoured and topsoiled to establish a vegetative cover. The riprap material will consist of large competent rock and/or broken pieces of concrete. The CMP will be sold for reuse; or if their condition does not allow them to be reused, they will be disposed of in a section of the underground mine workings that have been designated and approved for non-coal waste disposal.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL CROSS SECTION - STABLE FILL
FINAL CONTOURED SURFACE
Figure 2



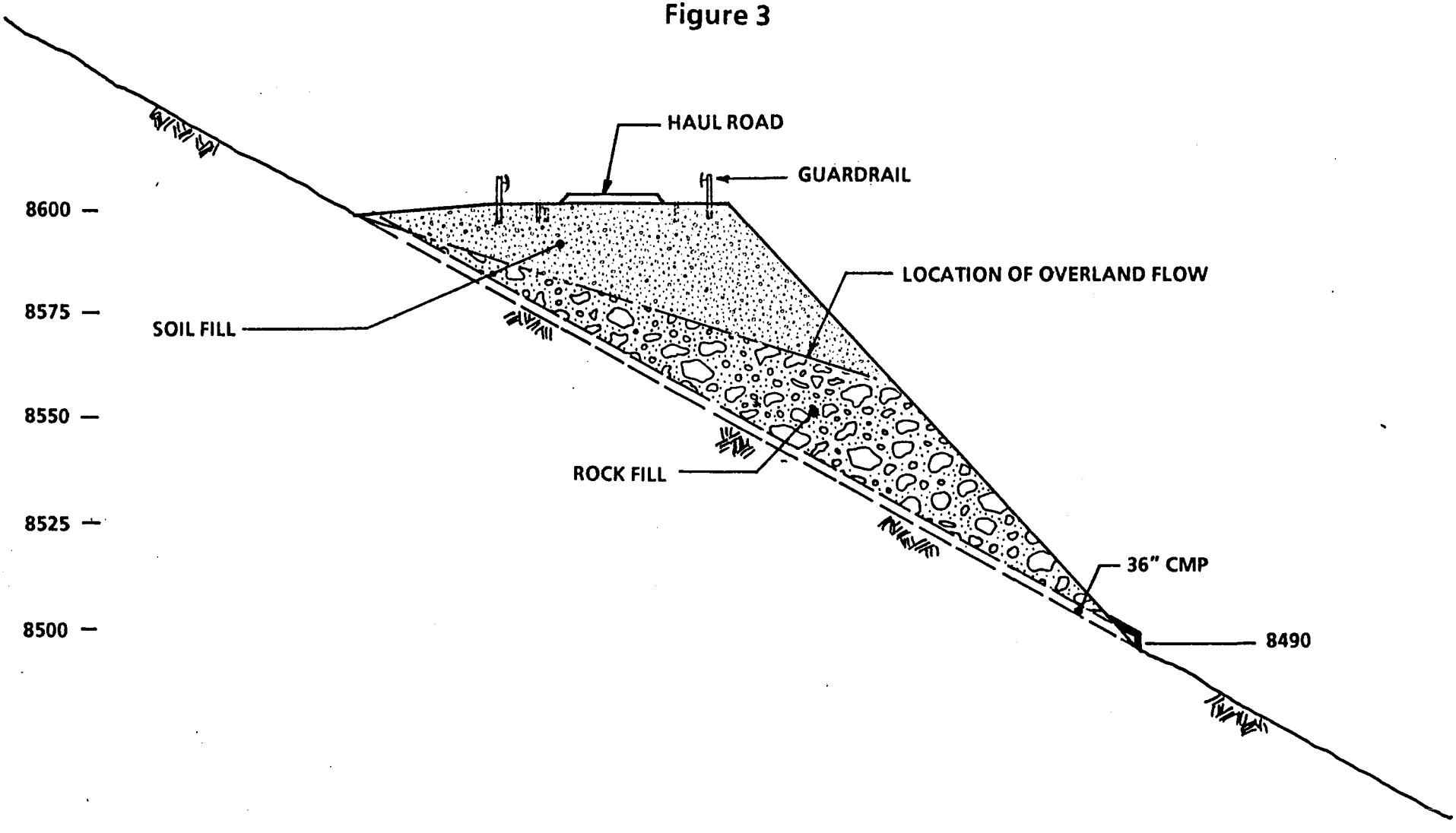
Recontouring:

The final haul road surface will be recontoured so that the final drainage is away from the cut slope but not so steep as to create excessive erosion. Drainage crossovers will be constructed across the recontoured road surface to shorten the slope length and thereby prevent excessive erosion. These cutouts or crossovers will be riprapped to prevent the development of rills and gullies. The new contoured surface will be developed by disposing of the soil portions of two major fills as a buttress fill against the cut slope. The largest fill is located at Station 48.15 as shown on the haul road engineer drawings and the second fill is located at the intersection of the Belina Haul Road and the Eccles Canyon Road. In addition, portions of the road outslope areas are considered to be of questionable stability. Using this soil and material from all other sources, it is estimated that between 30,000 and 35,000 cubic yards of fill material will be removed and placed on the reclaimed road surface.

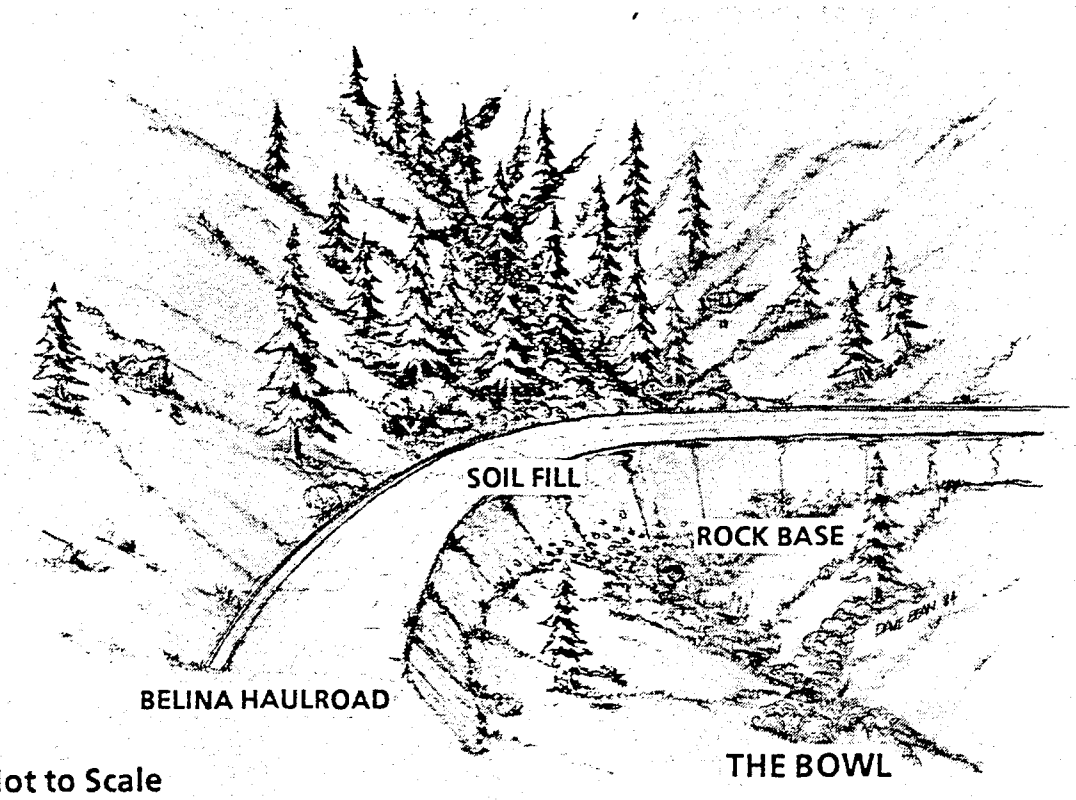
The largest fill is located near midpoint of the haul road. It consists of blast rock on the bottom and soil fill on the top. The reclamation plan for this fill is to remove the soil portion of the fill and develop an overland flow over the remaining rock fill. The CMP will remain in place but will be plugged. This new drainage will be constructed from competent rock and therefore would be a permanent structure. In addition, energy dissipaters will be utilized, if necessary, to help control the flow of water until it reaches the natural undisturbed drainage channel. Figure 3 is a cross section showing the present road surface, fill slopes, and the projected location of the overland flow channel. Figure 4 pictorially illustrates the implementation of the overland flow channel.

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. Again, only the soil portion of the fill will be used for backfilling and recontouring of the haul road. The remaining rock fill material will be spread out along the banks of Eccles Creek and used to riprap the sides of the drainage. The corrugated metal pipe will be removed and disposed of as previously discussed and the stream channel returned to its natural location.

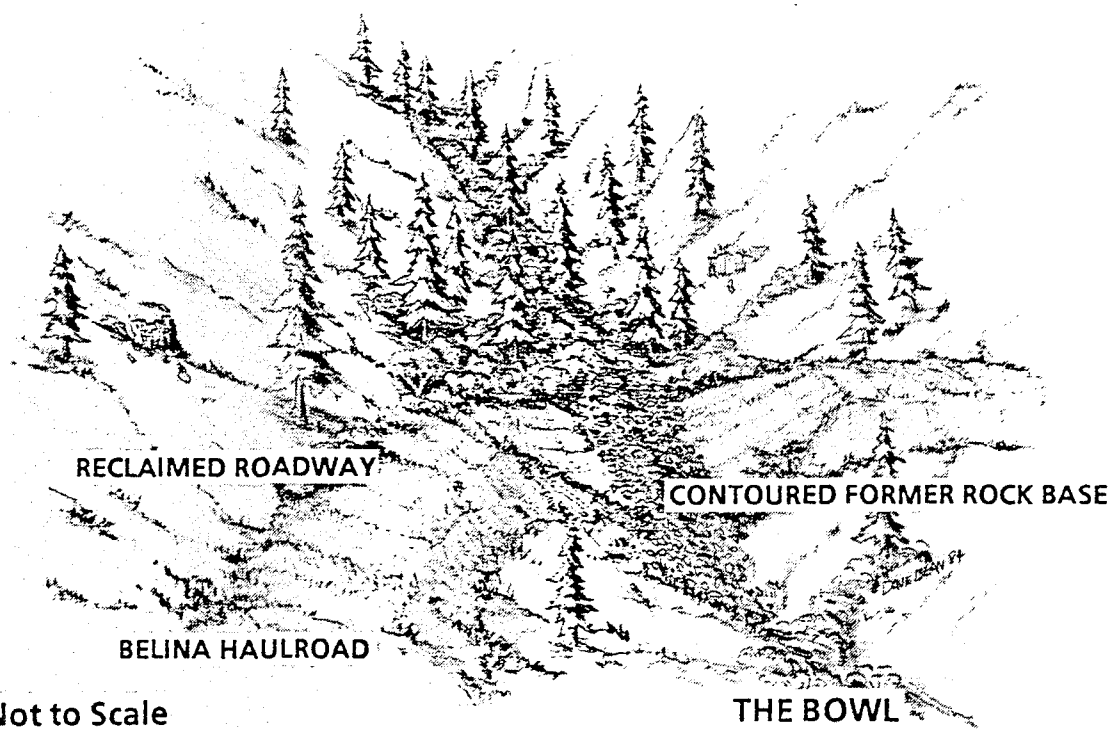
VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
THE BOWL CROSSING
Figure 3



4 JANUARY 1985



BEFORE RECLAMATION



AFTER RECLAMATION

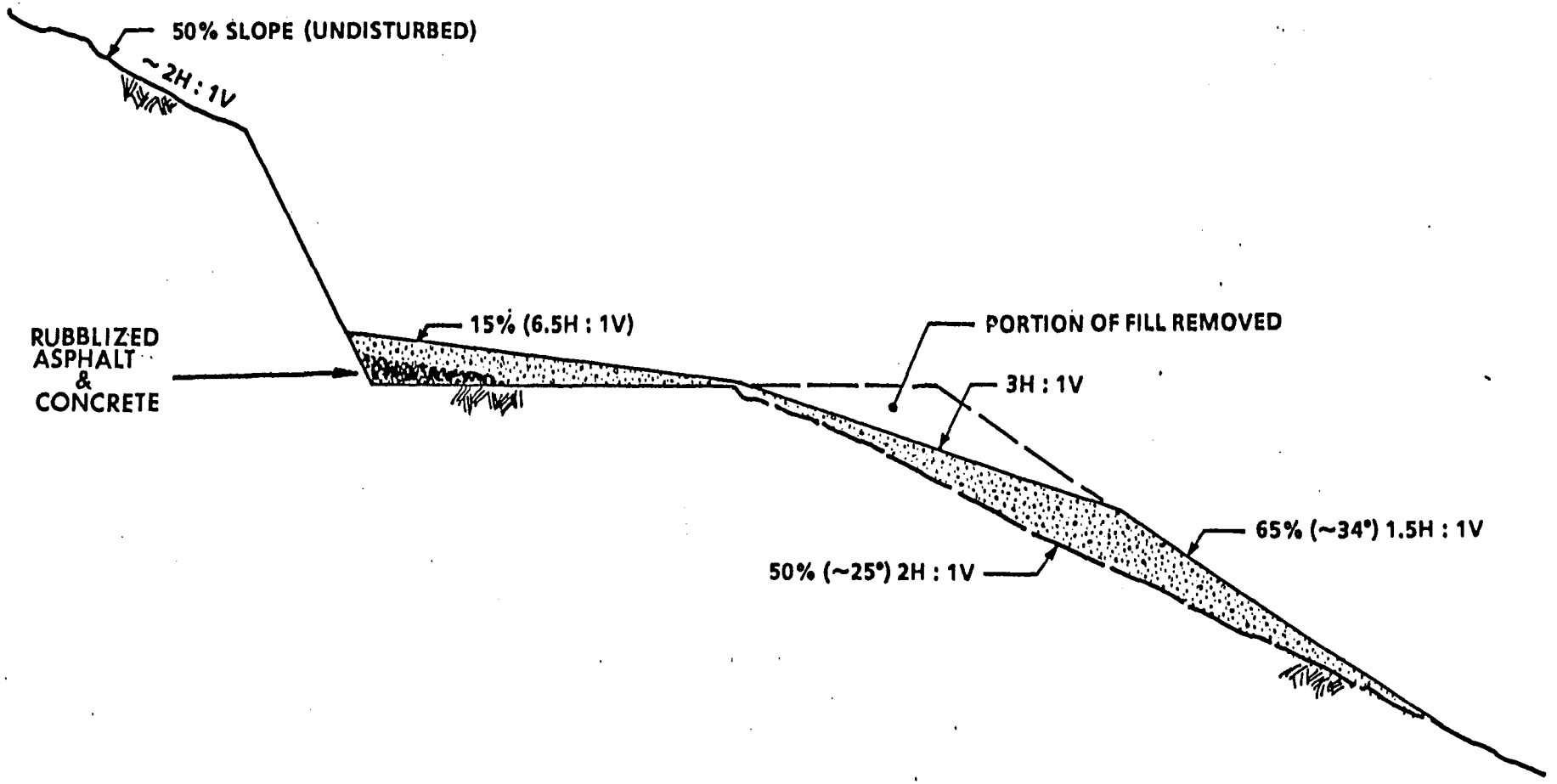
VALLEY CAMP OF UTAH
MAJOR FILL RECLAMATION
Figure 4

The third area from which backfill material will be obtained will be from the portions of the sideslope road fills that have been determined to be most unstable (Table 1). Sufficient quantities of fill will be removed (approximately 1/4 to 1/3 of the fill by volume) from each of these fill slopes to reduce the potential of severe environmental harm should a failure occur. To initiate reclamation of these fill slopes the guardrails will be removed. The support post and metal rails will be sold for reuse or be disposed of in the underground workings designated and approved for disposal of non-coal waste.

The fill material (Figure 5) will be removed using a large backhoe or a similar machine to reach over the edge of the fill and retrieve the material. The backhoe will reach down the slope approximately twenty-five feet to begin retrieving material. As an end result, the road surface will be cut back from the edge of the fill towards the toe of the cut slope approximately 15 feet. The final surface remaining as a result of removing this fill material will have an approximate 3H:1V slope. Part of the fill material removed will be placed on the remaining road surface thereby creating an outslope of approximately 6.5H:1V and reestablishing natural drainage patterns.

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 on Table 2.

VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
TYPICAL CROSS SECTION - UNSTABLE FILL
FINAL CONTOURED SURFACE
Figure 5



VALLEY CAMP OF UTAH
BELINA HAUL ROAD RECLAMATION
DISPOSAL VOLUMETRICS
TABLE 2

Fill material to remove:		
o Eccles Creek fill		5,000 yd^3±
o The Bowl Crossing fill		12,000 yd^3±
o Haul road outslopes		10,000 yd^3±
	Subtotal	27,000 yd^3±
Additional material to remove:		
o Asphaltic concrete and broken cement concrete		5,000 yd^3±
	GRAND TOTAL	32,000 yd^3±
Storage capacity:		
Haul road with stable outslopes (4,924')		32,400 yd^3±
Haul road with portion of outslopes removed (2,670')		2,500 yd^3±
	GRAND TOTAL	34,900 yd^3±

Topsoiling

Once all of the fill material has been placed and the recontouring completed, a 6-inch deep layer of topsoil will be distributed over the recontoured surface. This material will be the topsoil substitute that has been identified, approved, and stored near the facilities site. A total of 10,000 cubic yards ± of soil will be needed to cover the affected area which will leave a sufficient quantity of soil available for reclaiming the facilities site and the Belina Portals 1 and 2. The topsoil substitute material will be placed using scrapers and dozers. After the topsoiling is completed, the area will be ripped and/or disked to eliminate any compaction in the root zone. Scarification to a depth of 1 Foot will assure that there are no excessively compacted areas nor any slip zones between the fill and topsoil substitute materials. Following disking, the area will be harrowed to prepare a firm but not compacted seedbed.

Seeding/Fertilizing

The species selected for revegetating the haul road area were chosen for their adaptation to the climate, soils, aspect, their ability to stabilize the soil and their contribution towards meeting the needs of the post-mining land use. Table 3 is a list of species that can potentially be used to revegetate the disturbed lands. Table 3-A is a typical specie mix used to determine actual pounds per acre to be seeded. The recommended seeding rate for drill seeding is 22 pure live seeds per square foot. As seeding will be conducted via a hydroseeder (broadcast), this rate will be doubled. Time of seeding will be in the fall just prior to snowfall. Shrubs and trees will be hand planted. The planting rate for these species will be at one meter intervals in selected areas at a rate of 100 transplants per acre. Clumping of the shrubs and trees in this manner is meant to influence the use of the revegetated areas by wildlife species by increasing cover and edge effect.

Fertilizing will be conducted at the same time as seeding. Chemical analysis of the soil will indicate which nutrients are deficient and the amount that should be applied. Nitrogen, phosphorus, and potassium are the three major nutrients required with nitrogen being the most commonly applied nutrient. These nutrients will be mixed into the seed slurry at a rate dependent on the soil analysis.

REVEGETATION SPECIES

TABLE 3

Scientific Name	Common Name	Seeds Per Pound
Agropyron smithii	Western wheatgrass	126,000
Agropyron dasystachyum	Thickspike wheatgrass	186,000
Agropyron riparium	Streambank wheatgrass	160,000
Agropyron spicatum	Blue bunch wheatgrass	117,000
Bromus carinatus	Mountain brome	150,000
Elymus cinereus	Great Basin wildrye	95,000
Poa pratensis	Kentucky Bluegrass	2,160,000
Archillea millefolium	Yarrow	4,123,000
Lathryus Leucanthus	Aspen Peavine	50,000*
Lupinus alpestris	Mountain lupine	12,500
Osmorhiza chilensis	Sweetroot (spreading)	50,000*
Penstemon eatoni	Eaton penstremon	600,000
Melilotus officinalis	Yellow sweetclover	260,000
Cercocarpus montanus	Mountain mahogany	59,000 (Seeding & transplants)
Amelanchier alnifolia	Serviceberry	45,000
Symphoricarpos oreophilus	Roundleaf snowberry	54,000
Cowania mexicana	Stansbury cliffrose	64,000
Salix rigida	Yellow willow (banks and ripraps)(Transplants only)	
Picea pungens	Spruce (Transplants only)	
Populus tremuloides	Aspen (Transplants only)	
Abies concolor	White fir (Transplants only)	

*Estimated

**Live transplants will be planted at a rate of 100 plants/acre.

***Seed mixture will consist of 60-70 percent grasses.
10-20 percent forbs and 10-20 percent woody plants.

TYPICAL SPECIES LIST
SEEDING RATE
TABLE 3-A

Scientific Name	Common Name	% of Mix	(PLS) Seeds Per Pound	(PLS) lbs/Acre
Agropyron smithii	Western wheatgrass	17.5	126,000	1.33
Agropyron riparium	Streambank wheatgrass	17.5	160,000	1.05
Bromus carinatus	Mountain brome	17.5	150,000	1.10
Poa pratensis	Kentucky bluegrass	17.5	2,160,000	0.10
Lupinus alpestris	Mountain lupine	6.7	12,500	5.14
Osmorhiza chilensis	Sweetroot	6.7	50,000	1.28
Melilotus officinalis	Yellow sweetclover	6.7	260,000	0.25
Cercocarpus montanus	Mountain mahogany	5.0	59,000	0.81
Amelanchier alnifolia	Serviceberry	5.0	45,000	1.06
		*Total PLS lbs. =		12.12 PLS Pounds
Picea pungens	Spruce	15 Transplants/Ac		
Populas tremuloides	Aspen	15 Transplants/Ac		
Cercocarpus montanus	Mountain mahogany	10 Transplants/Ac		
Amelanchier alnifolia	Serviceberry	10 Transplants/Ac		

*Seeding rate is based on 22 seeds/ft^2 (PLS) with drill seeding. Broadcast seeding will be utilized; therefore, the seeding rate will be doubled to 24.24 lbs/ac. This seeding rate is specific to this mixture. The actual mixture may vary due to availability, etc., and therefore the seeding rate would vary dependent on actual species used in seed mixture.

Mulching

The mulch will also be applied as hydromulch. This is done as a separate operation to ensure that the seed is able to make good soil contact so that when germination occurs the root system can penetrate the soil and not into air or organic matter as might be the case if the mulch and seed were applied together. Mulch will be applied at a rate of 2,000 lbs (long fiber) per acre. A tackifying agent will be included to ensure that the mulch remains in place thereby preventing erosion until the vegetation is established.

Maintenance and Monitoring

The revegetated area will be monitored closely to ensure that a diverse, permanent vegetation cover capable of self-regeneration is developed. Interseeding of small areas will be done by hand as needed to maintain the necessary cover. Severe erosion will be checked and repaired to ensure that no large rills or gullies develop.

Vegetative analysis will be conducted to ensure that the revegetated area meet the requirements of bond release.

Reclamation Costs

Clearing and grubbing	$ 3,000
Remove concrete and asphaltic concrete:	
Rip Portland cement concrete and asphaltic concrete	5,000
Remove asphaltic concrete	9,600
Compact asphaltic concrete	4,400
Rip/scarify road base material	6,000
Remove corrugated metal pipes	4,000
Remove and Dispose Guardrails, Posts, and Signs	4,000
Remove and place fill material	
17,000 yd^3 (intersecting drainage fills)	
10,000 yd^3 (road outslope fills)	63,000
Recontour road surface	
10.0 acres±	13,200
Construct riprap drainage channels	
8 ea. @200 ft. ea.	64,000
Redistribute topsoil substitute	
10,000 yd^3±	22,500
Seedbed Preparation (scarification, disking, harrowing) 5 days @$960 ea.	4,800
Fertilizing, seeding, and mulching:	
Seed: 24.0 lbs/ac @$150/acre = 2,400	
Fertilizer: 10.0 ac @$425/acre = 4,250	
Mulching: 10.0 ac @$500/acre = 5,000	
Equipment and Labor: $5,000	16,650
SUB-TOTAL	$220,150
10% mobilization and demobilization	22,015
15% profit and administration	36,325
Maintenance-10 yrs @$100/ac/yr	12,000
TOTAL BONDING COST	$290,490

VALLEY CAMP
BELINA MINES

2 October 1984

DUE NOV 13

000002

CONDITION NO. 1

Surface Water Monitoring: Valley Camp must revise and submit to the regulatory authority for approval its surface water monitoring schedule within sixty (60) days of the effective date of this permit. Surface water monitoring shall be performed at stations VC-1, VC-2, VC-4, VC-5, VC-10, VC-11, and VC-12. Streams will be monitored monthly during the period from April through July and late September or early October. The monthly monitoring of streams shall include measurements of stream flow and water quality parameters according to the abbreviated water quality parameter list (i.e. sodium, calcium, magnesium, potassium, sulfate, bicarbonate, carbonate, chloride, total dissolved solids, total suspended solids, pH, field-specific electrical conductance, and field temperature). Measurements of turbidity may be substituted for the measurement of total suspended solids following the development of an adequate site-specific relationship between the two parameters. Twice a year, the full suite of water quality parameters (according to the UDOGM guidelines) will be analyzed. The samples can correspond to one of the monthly high flows (May or June) and the low flow (September or October). A corresponding flow measurement will be taken at the same time that any water quality samples are collected.

Ground Water (Springs): Each spring that is included in the monitoring network will be monitored during the same period as surface water. These springs are S24-12, S25-13, S36-17, S36-23, S36-19, S31-13, and S7-11. During the monthly monitoring period, measurements of flow, pH, specific electrical conductance (EC), and temperature shall be made. Also a water sample shall be analyzed according to the abbreviated schedule mentioned previously, excluding total suspended solids. Twice a year (spring and fall) a flow measurement shall be made and a water quality sample taken. The sample shall be analyzed according to the complete suite of parameters listed in the UDOGM guidelines. Data shall be submitted quarterly to UDOGM and an annual analysis and summary of the data shall be provided. Spring depletion curves shall be developed for each monitoring point to establish baseline conditions. This may require determining the flow rate more frequently during the first year (possible weekly).

Data Reports: The data collected shall be sent to UDOGM on a quarterly basis and shall include data collected from this permit condition and Condition No. 3. The annual report shall contain a summary of the quarterly data and analytical interpretations. The first annual report shall contain the baseline conditions and the spring depletion curves. Recommendations for changes in the monitoring plan shall be presented for approval by UDOGM. These changes must be supported by data analysis and sound hydrologic reasoning.

RESPONSE

Surface Water Monitoring: The revised surface water monitoring program will consist of monitoring stations VC-1, VC-2, VC-4, VC-5, VC-10, VC-11, and VC-12. (See Figure 1 attached). These stations will be monitored monthly during the period from April through July and again, late September or early October. The monthly monitoring of streams shall include measurements of stream flow and water quality parameters according to the abbreviated parameter list in Table 1.

Table 1. Abbreviated Water Quality Analytical Schedule

Field Measurements

Flow
pH
Specific Conductance at 25° C
Water Temperature
Air Temperature

Laboratory Measurements

Bicarbonate	Potassium
Calcium	Sodium
Chloride	Sulfate
Magnesium	Suspended Solids (1)
	Total Dissolved Solids

NOTE:
(1) Surface water only

Twice a year, a comprehensive suite of water quality parameters will be monitored. The list of comprehensive parameters has been developed from UDOGM guidelines, minus those parameters shown to be less than standard limitations developed by the State Department of Health for designated uses. A description of parameters deleted from this list is described in Table 3. The comprehensive samples will correspond to one of the monthly high flow and low flow monitorings. A corresponding flow measurement will be taken at the time that all water quality samples are collected. A list of the comprehensive parameters is found in Table 2.

Table 2. Comprehensive Water Quality Analytical Schedule

Field Measurements

Flow
pH
Specific Conductance at 25°C
Water Temperature
Air Temperature

Laboratory Measurements

Total Suspended Solids (1)
Total Combustible Solids (1,2)
Total Dissolved Solids
Total Hardness
Aluminum, Total
Bicarbonate
Cadmium, Total
Calcium, Total
Chloride
Copper, Total
Iron-Total (1)
Iron-Dissolved (3)
Lead, Total
Magnesium
Manganese, Total
Molybdenum, Total
Nickel, Total
Ammonia
Nitrate
Nitrite
Potassium
Total Phosphate (1)
Dissolved Phosphate (3)
Selenium
Sodium
Sulfate
Sulfide
Zinc

NOTE:
(1) Surface water only.
(2) Only if visible coal fines, oil or grease.
(3) Ground water only.

Ground Water Monitoring: Each spring that is included in the monitoring network will be monitored during the same period as the surface water. As designated by OSM in Condition No. 1, these springs are: S24-12, S25-13, S36-17, S36-23, S36-19, S31-13, and S7-11 (Figure 1). The springs will be monitored monthly according to Table 1 and biannually according to Table 2.

It must be pointed out that access to these springs has been limited for many years, until late June. In such instances, monitoring will begin as soon as weather condition allow.

Data Reports: The data collected shall be sent to the regulatory authority on a quarterly basis.

Spring depletion curves for these springs have been prepared from data acquired in 1980 and 1981. Modification of these charts, if required, will be done based upon the first full year's monitoring data, and such curves will be submitted with the first annual report.

Deletion of Parameters: It is recommended that the following parameters be dropped from UDOGM list of parameters. The UDOGM guidelines state that after a year's baseline data have been collected, some of the parameters may be deleted after review by DOGM. Vaughn Hansen Associates, Inc. has been involved in the collection of water quality data for Valley Camp of Utah, Inc. since 1977. A review of the data has been conducted, and the following parameters have consistently been less than maximum concentration standards for specific uses as determined by the State Department of Health: Arsenic Barium, Boron, Carbonate, Chromium, Fluoride, and Mercury.

Table 3 lists the parameters, stream classifications which apply to the area, the most critical standard, number of samples collected, number of samples in excess of the standard, and the highest concentration observed. All of the stations to be monitored have more than one (1) year of baseline data and further baseline data collection should not be required.

Table 3. Parameters to be deleted

Parameter	Classification 1C	3A	4	Standard	No. of Samples	No. of Excess	Highest Values
Arsenic	X	-	-	0.05	286	0	0.040
Barium	X	-	-	1	243	0	0.85
Boron	-	-	X	0.75	226	0	0.55
Carbonate	-	-	-	-	95		<0.01
Chromium	X	-	-	0.05	246	0	0.026
Fluoride	X	-	-	1.4 - 2.4	272	0	0.55
Mercury	-	X	-	0.0005	241	0	0.0003

CONDITION 3

Within sixty (60) days of the effective date of this permit, Valley Camp of Utah, Inc. shall develop an in-mine ground water monitoring program. This monitoring program shall be submitted for approval by the regulatory authority.

The results of the monitoring program (data analysis) shall be reported on an annual basis and shall include a map of all points and/or areas of defined measurable flow [greater than one (1) gpm], as well as an indication of the geologic source of the flow (channel sandstone, fault, fracture, lineament system, etc.). The map shall also show the location of in-mine sumps used to collect water, as well as updated information on the geologic structures (faults, dikes, fractures, channel sandstones, etc.) encountered in the mine as a result of extended mining into Federal Leases U-017354 and U-044076. The report shall also contain a discussion of the quantity, quality, and source of the water encountered. When new points or areas of measurable flow are first encountered, flow data and field water quality parameters shall be measured monthly until the inflow stabilizes. After stabilization, sampling shall be conducted on a quarterly basis. Field water quality parameters shall, at a minimun, consist of: pH, temperature, and electrical conductance. A relationship shall be developed between electrical conductance and total dissolved solids from the quarterly monitoring.

Quarterly, sampling for the abbreviated water quality parameters list shall be completed. The abbreviated water quality analytical schedule shall, at a minimum, consist of the laboratory measurements for: sodium, potassium, calcium, magnesium, iron (total), chloride, bicarbonate, sulfate, carbonate, pH, and TDS, as well as the field parameters. A cation/anion balance shall be calculated on sufficient quarterly samples (approximately 10%) to assure accuracy of the laboratory data.

Semi-annually, and at the approximate same time each year, (corresponding to two of the quarterly samples) a comprehensive water quality analytical schedule for the samples shall be completed. The full suite of parameters to be analyzed shall include those recommended in the UDOGM guidelines for establishment of a surface and ground water monitoring program. If the number of measuring points becomes excessive, the applicant may request a modification of the number of sampling sites from the regulatory authority.

In addition to the in-mine monitoring of ground water flow, the applicant must account for all groundwater consumption (evaporation and other losses) and transfers of water in and out of the mine.

RESPONSE

The in-mine ground water monitoring program will consist of

monitoring ground water inflow to the Belina Mines in the form of roof drippers, and the consumption of ground water through evaporation, shipping and mine discharge.

As flows into the mine in excess of one (1) gpm are encountered, monitoring will begin and will continue until the flows diminish to less than one (1) gpm, or until such time as the regulatory authority approves discontinuance or alteration of the site.

The results of the monitoring program will be reported on an annual basis and will include a map of all points and/or areas of defined measureable flow (greater than one (1) gpm), as well as an indication of the geologic source of the flow (channel sandstone, fault, fracture, lineament system, etc.). The map will show the location of in-mine sumps used to collect water, as well as updated information on the geologic structures (faults, dikes, fractures, channel sandstones, etc.) encountered in the mine. The report will also contain a discussion of the quantity, quality, and source of the water encountered.

The annual report will be submitted to the regulatory authority within 90 days after the end of the reporting year and will not include any information (i.e., analysis certificates) previously submitted.

Included as part of this report will be estimates of groundwater consumption based upon ventilation and coal analysis records.

When new points or areas of measureable flow are first encountered, flow data and field water quality parameters will be measured monthly until the flow stabilizes. After stabilization, sampling will be conducted on a quarterly basis. The quarterly sampling will consist of those parameters found in Table 1. A semi-annual sample will be collected from each monitoring site with a flow greater than one (1) gpm. The sample will be analyzed according to the list of parameters found in Table 2. If the number of measuring points is excessive, a request for modification of the number of sampling sites will be submitted to the regulatory authority.

Table 1. Quarterly Schedule

Field Measurements

Flow
pH
Specific Conductance at 25° C
Water Temperature
Air Temperature

Laboratory Measurements

Bicarbonate	Potassium
Calcium	Sodium
Chloride	Sulfate
Magnesium	Iron (Total)
	Total Dissolved Solids

Table 2. Semi-Annual Schedule

Field Measurements

Flow
pH
Specific Conductance at 25° C
Water Temperature
Air Temperature

Laboratory Measurements

Total Dissolved Solids	Molybdenum, Total
Total Hardness	Nickel, Total
Aluminum, Total	Ammonia
Bicarbonate	Nitrate
Cadmium, Total	Nitrite
Calcium, Total	Potassium
Chloride	Dissolved Phosphate
Copper, Total	Selenium
Iron-Dissolved	Sodium
Lead, Total	Sulfate
Magnesium	Sulfide
Manganese, Total	Zinc

Deletion of Parameters:

It is recommended that the following parameters be dropped from UDOGM list of parameters. The UDOGM guidelines state that after a year's baseline data has been collected, some of the parameters may be deleted after review by DOGM. Vaughn Hansen Associates, Inc. has been involved in the collection of water quality data for Valley Camp of Utah, Inc. since 1977. A review of the data has been conducted and the following parameters have consistently been less than maximum concentration standards for specific uses as determined by the State Department of Health: Arsenic, Barium, Boron, Carbonate, Chromium, Fluoride, and Mercury. Table 3 lists the parameters, stream classifications which apply to the area, the most critical standard, number of samples collected, number of samples in excess of the standard, and the highest concentration observed. All of the stations to be monitored have more than one (1) year of baseline data and further baseline data collection should not be required.

Table 3. Parameters to be deleted.

Parameter	Classification 1C	3A	4	Standard	No. of Samples	No. of Excess	Highest Values
Arsenic	X	-	-	0.05	286	0	0.040
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Boron	-	-	X	0.75	226	0	0.55
Carbonate	-	-	-	-	95		"0.01
Chromium	X	-	-	0.05	246	0	0.026
Fluoride	X	-	-	1.4 - 2.4	272	0	0.55
Mercury	-	X	-	0.0005	241	0	0.0003

"stands for less than.

Mine water discharge will continue to be monitored according to the approved N.P.D.E.S. permit.

CONDITION NO. 4

Within sixty (60) days of the effective date of this permit, Valley Camp of Utah, Inc., shall revise and submit to the regulatory authority for approval, the subsidence monitoring program to include the intermittent streams in the permit area. The applicant shall commit to restore the original stream channels of intermittent streams within the permit area that may be disturbed by underground coal mining activities, including surface subsidence effects.

RESPONSE

In Section UMC 784.20 of Valley Camp's January 4, 1984, submittal, the permittee committed to a restricted mining plan which insured leaving support pillars under perennial streams located within the mine plan area. As a result of this commitment, no subsidence was expected to occur in these areas, and these stream areas were not included as part of our annual subsidence pedestrian survey. In light of the most recent development pertaining to the reclassification of these streams from perennial to intermittent, and the subsequent approval for full coal extraction under the streams, subsidence in these areas may now be expected. In order to determine and document the existence and effects of subsidence in these areas, the annual pedestrian subsidence survey will be expanded to include the intermittent streams where mining occurs beneath these streams within the year following the last such survey.

Results of this survey will be included as part of the regular subsidence reporting process.

In the event subsidence is observed in these intermittent stream drainages, the operator will, as a result of consultation with the regulatory authority, develop a plan to repair damages resulting from subsidence.

These plans will be considerate of only damage directly related to the mining operations and will be implemented in the most cost effective and environmentally desirable methods of reclamation for these channels.

CONDITION NO. 5

Within sixty (60) days of the effective date of this permit, Valley Camp of Utah, Inc. shall provide to the regulatory authority for approval, a plan to redistribute substitute topsoil material at a uniform thickness over all disturbed areas to be reclaimed, taking into consideration the total volumes of substitute topsoil materials available at all substitute topsoil material sources.

RESPONSE

Previous commitments by the operator insure that, during reclamation activities, the operator will clean up as much of the coal contaminated surface soil as possible. This process will, in many places expose soil, which in all probability, would be acceptable as substitute topsoil. In certain other areas, this exposed material would, in fact, be topsoil, upon which some of the auxiliary structures had been constructed. In these areas, it would appear as foolishness to require an additional six (6) inches of material (substitute topsoil) to be spread over material of equal or superior quality.

In addition, fourteen (14) acres of the total disturbed forty-six (46) acres, comprising both the Belina and Utah No. 2 areas, have already had six (6) inches of topsoil spread on them. In these areas, also, it would seem unnecessary to require an additional six (6) inches of substitute topsoil to be placed on there simply to acquire uniformity in topsoil applications.

In consideration of the above, and the regulatory requirements designed to obtain the best possible reclamation results, the following substitute topsoil application plan is presented.

1. In conjunction with Condition No. 6, field site study trials, two (2) different depths of substitute topsoil will be tested, six (6) inches and three (3) inches.

2. Unless otherwise approved, a minimum of three (3) inches of either topsoil or substitute topsoil will be distributed over all disturbed areas.

3. In areas where topsoil has previously been respread and final reclamation activities do not require further disturbance, no additional topsoil distribution will take place.

4. A minimum of three (3) inches of substitute topsoil will be placed upon all areas not previously reclaimed, (i.e., mine pads, stockpile areas, and access

roads within the complexes). Once these areas have been cleaned and/or prepared to receive substitute topsoil, soil samples from these areas will be taken and analyzed for acceptability as substitute topsoil. If the analysis indicates an acceptable material for revegetation purposes, a request will be made of the regulatory authority to reclaim these areas without further topsoil distribution. If the results of the analysis prove unacceptable, the minimum depth will be increased from three (3) to six (6) inches on these sites.

5. A minimum of six (6) inches of substitute topsoil will be used in the reclamation of the Belina Complex access road.

6. If the results of the field site trials prove the three (3) inch substitute topsoil depth to be unacceptable for obtaining satisfactory revegetation, the minimum application will be increased to six (6) inches.

CONDITION NO. 6

Within sixty (60) days of the effective date of this permit, Valley Camp of Utah, Inc. shall provide a sound design to the regulatory authority for approval for either field site trials or a revised greenhouse study. The permittee shall also provide a commitment to conduct either of these tests and to submit results of test selected to the regulatory authority to demonstrate the feasibility of using the proposed topsoil substitute material pursuant to UMC 817.22 (e).

If Valley Camp of Utah, Inc. elects to conduct field site trials, the design of the trials must include, at a minimum, the following: test sites at both the Belina portal area and the Utah No. 2 loadout area; the test of types and rates of soil amendments; a test for optimum topsoil depth; tests for each proposed seed mixture by appropriate aspect; and established control plots for each test.

If Valley Camp of Utah, Inc. elects to conduct greenhouse studies, the existing design proposed in the permit application must be revised to include at a minimum, tests for soil samples from both Belina portal area and Utah No. 2 loadout area; tests for types and rates of soil amendments, tests for optimum topsoil depth, tests for each proposed seed mixtures by appropriate aspect; and establish control plots for each study. The design of the greenhouse study shall simulate environmental conditions in the greenhouse (such as growing season, air temperature, soil temperature, soil moisture, precipitation, light, available rooting depth, and aspect) to those at the mine site.

The design of either the field site trials or the greenhouse study must provide a monitoring schedule, identify methods for monitoring, analysis of seedling establishment and plant mortality, and standards for determining success of each test.

The applicant must provide types and rates of application for amendments to be added to the respread substitute topsoil based on the laboratory data from either the greenhouse study or field site trials.

RESPONSE

The following plan for the installation and evaluation of test plots will be implemented at the Belina and Utah No. 2 Portal sites to fulfill the requirements of Condition #6. The objectives of the test plots are to determine the optimum reapplication depth of topsoil substitute material and to evaluate the applicability of several seed mixtures currently identified in the reclamation plan.

At this time, Valley Camp of Utah, Inc. does not propose to test various types and rates of fertilizer. The Company will be applying fertilizer, during actual revegetation of disturbed areas, as a result of laboratory tests conducted on samples of seedbed materials. Since this is a normal, accepted revegetation practice, the Company believes this to be the optimum approach to the use of fertilizer materials and, as such, it is not necessary to include this factor in the parameters to be tested. As per conversations with an OSM representative, the control plots will consist of plots with six (6) inches of topsoil substitute material tested against plots overlain with three (3) inches of substitute material.

As part of this response, Valley Camp of Utah, Inc. proposes that, prior to test plot construction, a meeting be held with the reviewing agency to further discuss this program in terms of test plot locations, seed mixtures to be tested, etc. This meeting would serve to finalize the specifics upon which the test plot program is based.

I. Experimental Design and Construction

A. Test Plot Orientation and Layout

Test plots will be constructed in late September of the year they are to be installed to approximate normal revegetation seeding conditions. Techniques to be used in plot construction, fertilizer, seeding, and mulching will approximate those identified in the revegetation plan in so far as possible, given the size and nature of the test plots.

Seven (7) blocks of plots will be installed. Five (5) will be located at the Belina site and two (2) at the Utah No. 2 Portal site. The number of plot blocks corresponds to the number of seed mixtures that will be required at each site during final revegetation. The five (5) mixtures to be tested at the Belina site are the Flat/Slight Slope, North Facing Slope, South Facing Slope, Riparian Habitat, and Steep Roadcut mixtures. At the Utah No. 2 site, the Flat/Slight Slope and South Facing Slope mixtures will be tested.

Plot blocks representing each seed mixture will be sited on each disturbed area at locations paralleling the mixture's use during final revegetation. For example, the plot block testing the North Facing Slope mixture at the Belina site will be located on a north-facing slope. The single exception is the plot block for the South Facing Slope mixture at Utah No. 2 Portal. This test will be conducted on a west-facing slope since very few, if any, south-facing slopes will exist following final grading. Plots representing the North Facing Slope and South Facing Slope

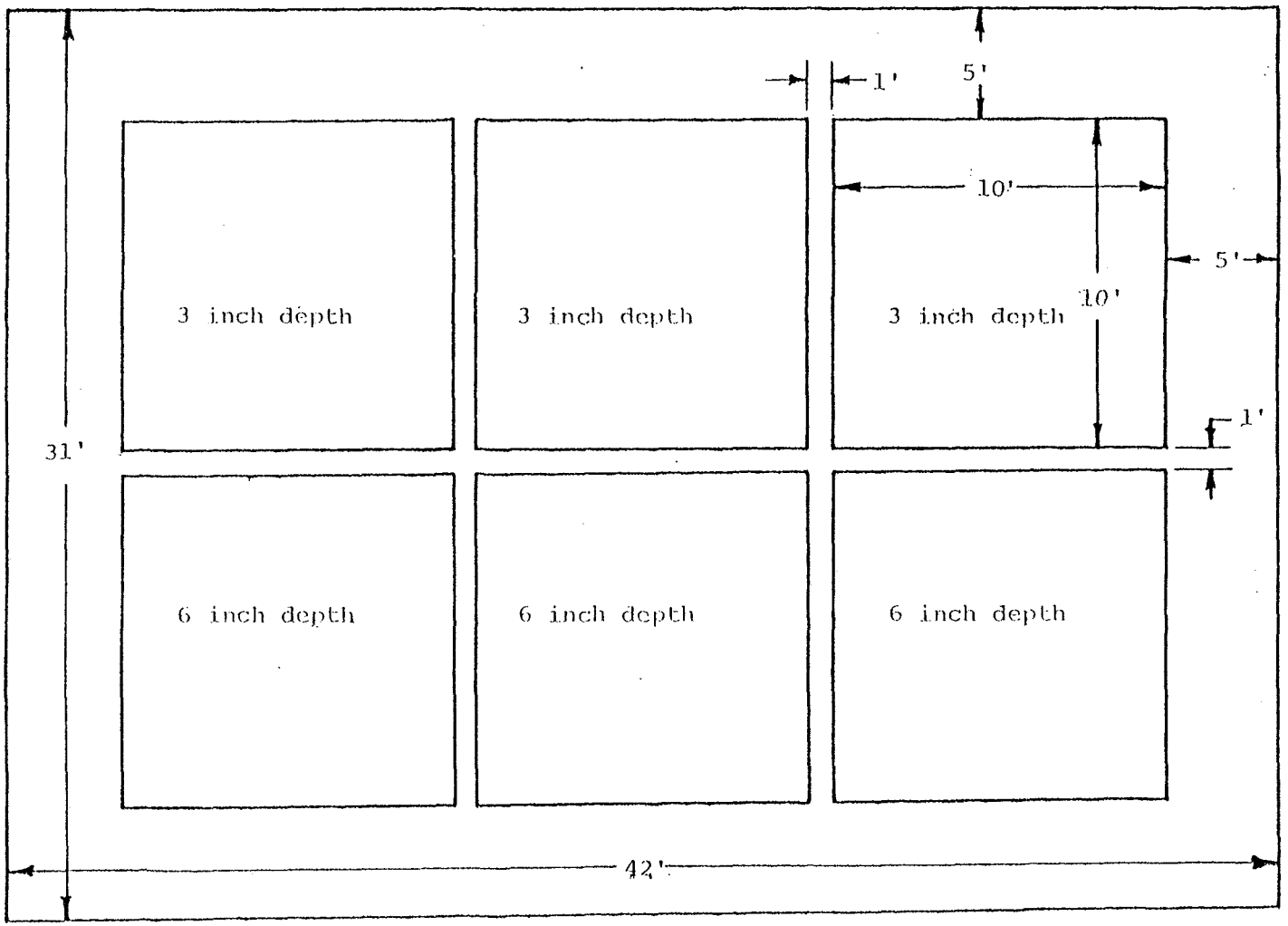

Figure 1

Test Block Diagram.

seed mixtures will be constructed on 3h:1v slopes. The Steep Roadcut plot block will be constructed on a 2h:1v slope.

Each plot block consists of six (6) plots as depicted on Figure 1. Three plots in each block will be overlain with three (3) inches of topsoil substitute material and three (3) with six (6) inches (control) of substitute material. Each plot will measure ten (10) feet x ten (10) feet with a one (1) foot buffer between each plot. The seed mixture to be tested will be seeded at equal rates on all plots for testing purposes.

B. Plot Block Construction

With the exception of plot blocks constructed on steep roadcuts, each plot block will be constructed using a dozer equipped with a ripper implement. The spoil surface will be graded on the contour to the required slope leaving the spoil surface in a roughened condition. Following grading, the spoil will be ripped to a depth of two (2) to four (4) feet to relieve compaction and provide a bonding surface for the applied topsoil substitute material. The appropriate depth of topsoil substitute will then be applied minimizing the number of equipment passes over the site to reduce compaction. On steep roadcuts, initial plot block construction will be completed by hand, resulting in a roughened slope suitable for topsoil substitute application.

An erosion control ditch will be placed at the toe of the plot block to control sedimentation from the plots. An interception ditch or berm will be constructed above each plot block to prevent overland flow from crossing the plots.

During plot construction, samples will be taken of spoil and topsoil substitute materials to determine fertilizer requirements. Samples will be taken as soon as grading and substitute material application has been completed. Each plot block will be represented by two (2) composite samples. One (1) composite sample will represent the topsoil substitute material and one (1), the spoil material to a depth of eighteen (18) inches. Each composite sample will be composed of three (3) sub-samples randomly collected from within the plot block boundaries. Immediately following collection, the composite samples will be sent to a competent laboratory for chemical and physical analysis. Each composite sample will be analyzed for the following parameters:

- texture (mechanical analysis),
- pH,
- electrical conductivity,
- sodium adsorption rates,
- total nitrogen (ppm),
- organic matter,
- phosphorus (ppm), and
- available potassium (ppm).

The laboratory will be requested to furnish, as a result of the analysis, a recommendation for fertilizer application rates. The laboratory will be furnished with specific information regarding the nature and history of the sample material to amend, if advisable, these recommendations. All efforts will be made to limit the time between sample analysis and subsequent plot block layout and fertilization.

C. Plot Block Layout

Following finished grading, plot blocks will be constructed. The outer boundaries of each plot block will be staked using one (1) inch x three (3) inch x thirty-six (36) inch stakes and outlined with cord. Flourescent flagging will be tied to the cord at intervals to identify the boundaries and prevent subsequent plot disturbance. The corners of individual plots (randomly located) within the blocks will then be staked using two (2) inch x two (2) inch x twelve (12) inch grade stakes. A one (1) foot buffer between individual plots will be maintained. Figure 1 depicts an envisioned randomized plot block design.

D. Seedbed Preparation and Planting

Following layout, the plot block surface will be raked as the initial step in seedbed preparation. Hand-cultivators will be used to increase the depth at which raking is effective. Fertilizer will then be applied by broadcasting at rates recommended as a result of the laboratory analysis. The plot block will be raked again to incorporate the fertilizer into the soil. Individual plots will then be broadcast seeded (see Table 1) by hand and lightly raked to cover the seed and provide the appropriate growing conditions.

Shrub seedlings will be planted as a part of these tests with respect to the "North Facing Slope,"

"Steep Roadcut" and "Riparian Habitat" planting mixtures as outlined in permit submittal "Recommended Reseeding Mixtures" (February 1983). Ten (10) seedlings will be planted of each candidate species on approximately two (2) foot centers at the base or along the borders of the plot block. Each seedling will be planted as described below.

A hole will be dug large enough to accomodate seedling placement without bending the roots. A small amount of fertilizer will be mixed with the backfill material. The seedling will be placed vertically in the hole and the hole will be backfilled. The seedling will then be watered to promote backfill settling and eliminate air spaces. A basin approximately twelve (12) inches in diameter will be formed around the seedling to aid in water catchment. The basin will then be straw mulched. The area in which seedlings are planted will be prepared, fertilized, and seeded as per test plots to provide competition equal to that which would be expected under normal revegetation conditions.

E. Quadrat Staking

Five (5) quadrats from which plant density and productivity data will be collected will be randomly located within each plot. The upper and lower corners of the quadrats will be permanently marked to permit future identification for data acquisition. All quadrats will be randomly (without replacement) located within each plot. One (1) quadrat in each plot will be designated as a "photo quadrat" whereby a photo will be taken at the end of the growing season for visual comparison purposes.

F. Mulch Application

Following seeding, the plot block will be mulched with the equivalent to two (2) tons of straw per acre to simulate proposed post-mining revegetation techniques. The mulch will be anchored using plastic netting fixed in place with anchoring staples.

II. Data Collection

A. Plant Establishment

Establishment of herbaceous species will be determined by measuring the density of plants, by species where possible, from five (5) 1/10th square meter quadrats within each test and control plot. Each quadrat (0.2 meter x 0.5 meter) will initially be randomly located within the plot and permanently

Figure 2

QUADRAT DATA FORM

COVER

Date_____

Field Analyst(s) _____ QA Check_____ Project_____

Location_____ Pit_____ Plot _____

Quadrat size_____ Transect Length_____

Block No. _____ Orientation_____ Slope(%)_____ Aspect_____

Species	Species Code	1	2	3	4	5	Mean	Freq.	Ht.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
Total Plant Cover									
Litter and Rock									
Total Cover									
Bare ground									

Notes: Soils

Wildlife

Figure 3

VEGETATION PRODUCTIVITY DATA FORM

Pit _____ Plot _____ Block _____ Project _____

Collected By _____ Date Collected _____

Weighed By _____ Date Weighed _____

Tare Weight _____

Plot Size _____ QA Check _____

Quadrat	Species Description	Species Code	Life Form	Dens. or % Cover	x̄ Shrub Hts. (cm)	Net Weight (g)	Comp. %	Comments
Slope (%)								
Aspect (deg)								
						TOTAL →		
Slope (%)								
Aspect (deg)								
						TOTAL →		
Slope (%)								
Aspect (deg)								
						TOTAL →		
Slope (%)								
Aspect (deg)								
						TOTAL →		

marked with corner stakes. The number of stems of each species will be recorded at the end of the 1st, 3rd, and 5th growing seasons following planting (see Figure 2).

Establishment of shrubs and tree species will be determined by direct measurement of height during each sampling period (1st, 3rd, and 5th years after planting), as well as a qualitative evaluation of vigor. The number of decadent shrubs and trees will also be recorded.

B. Plant Growth

Ground cover and forage production (Figures 2 and 3) will be measured for herbaceous species as follows: Cover will be determined along four (4) permanent ten (10) foot line-intercept transects situated at the two (2), four (4), six (6), and eight (8) foot intervals of each plot, thereby effectively dividing the plot into five (5) two (2) by ten (10) foot segments. Data will be recorded by species where possible, during the 1st, 3rd, and 5th growing seasons following planting.

Due to the destructive nature of productivity sampling, this variable will only be measured during the 5th year following planting. All current annual productivity within the density quadrats will be clipped, bagged, and weighed (dry weight) separately, by species, for each plot following the 5th year's density measurement.

C. Plant Mortality

Herbaceous plant mortality data will not be measured directly. An assessment of this parameter will be made through evaluation and inference of cover, production, and density data collected on plots for individual species within the seed mixture. The results of analysis and inference will be presented in the report with respect to a discussion of species' potential and revegetation success. General species' vigor will also be noted and discussed. Plant mortality for shrub and tree species will be evaluated according to their living status during the 1st, 3rd, and 5th growing seasons following planting.

III. Data Analysis and Standards for Success

A. Data Analysis

Plant establishment and growth data will be analyzed by routine t-test of the means at the alpha = 0.05 level to identify differences in density, production,

and cover. Total density, total cover, and total production will be compared, in terms of three (3) inch topsoil substitute depth test plots vs. six (6) inch topsoil substitute depth control plots, for each of the seven (7) plot blocks.

B. Standards for Success

To provide the basis for reclamation success, Valley Camp of Utah, Inc. has opted to use t-tests of the means between test and control plots. To prove that test plots are statistically equivalent to their corresponding control plots with respect to the measured variables, a standard two-tailed t-test of the means (Zar 1979) will be performed. This test will be performed at the alpha = 0.05 level for differences between means.

Because the number of samples taken for each test area may not necessarily be the same as the number taken for the corresponding control areas, a weighted tabular t comparison statistic (t_c) will be calculated as follows:

$$t_c = \frac{(s_1^2/n_1)\ (t_{a1}) + (s_2^2/n_2)\ (t_{a2})}{(s_1^2/n_1) + (s_2^2/n_2)}$$

where:

subscript 1 = vegetation community parameters

subscript 2 = corresponding reference area parameters

t_a = tabular t value for n_1-1 or n_2-1 d.f. at the a = 0.05 level

The sample t statistic (t') to be compared with the weighted tabular t comparison statistic (t_c) will then be calculated as follows:

$$t' = (\bar{x}_1 - \bar{x}_2) \ / \ \sqrt{s_1^2/n_1) + (s_2^2/n_2)}$$

where:

subscript 1 = vegetation community parameters

subscript 2 = corresponding reference area parameters

The hypothesis test is that there is no difference between sample means for a particular variable (cover or productivity). If the sample t statistic (t') is closer to zero (positive value or negative value) than the tabular t comparison statistic (t_c),

then the hypothesis is proven correct at that given level of alpha (i.e. there is no difference between populations of the test plot and the corresponding control plot regarding the variable of concern).

$$H_o: \ \bar{x}_1 = \bar{x}_2, \text{ if } /t'/ \leq /t_c/$$

If this inequality is false, then $\bar{x}_1 \neq \bar{x}_2$ and the means are from different populations.

IV. Report Contents and Submittal

The results of this study will be submitted to UDOGM at the end of data collection and analysis each year of field collection. The reports will include the following major sections.

INTRODUCTION

OBJECTIVES

MATERIALS AND METHODS

- Experimental Design
- Plot Construction and Planting
- Data Collection
- Data Analysis

RESULTS AND DISCUSSION

- Statistical Comparisons for Density
- Statistical Comparisons for Cover
- Statistical Comparisons for Production (Year 5 report only)
- Tree and Shrub Species Survival and Growth
- Plant Vigor

CONCLUSIONS AND SUCCESS ANALYSIS

REVEGETATION RECOMMENDATIONS

REFERENCES

APPENDIX

- Quadrat Photos

CONDITION NO. 7

Within 180 days of the effective date of this permit, Valley Camp of Utah, Inc. shall submit to the regulatory authority, for approval, an implementation plan for monitoring wetland and riparian areas in the entire subsidence area. The plan shall include: (1) a map locating all wetland and riparian areas; (2) a description of the size and plant characteristics of each wetland; (3) the source of water supporting each wetland; (4) details and commitment to replace affected sources; and, (5) a monitoring schedule.

RESPONSE

An attempt was made to provide the requested information for all wetlands in the subsidence area; but, due to inclement weather, only a portion of the springs have been inventoried. It is felt, however, that the information acquired from this effort and the proposed monitoring plan is sufficient to provide information necessary to determine regulatory adequacy for the period of mining.

1. The locations of springs and wetlands are shown on Plate No. 1 (Identified Seeps and Springs) found in the Map Section of the previously submitted Volume VI.

2. A description of the size and plant characteristics of each surveyed wetland is provided in the attached Seep and Spring Inventory.

3. The source of water of each spring or wetland has previously been identified on Plate 1 (Identified Seeps and Springs), found in the Map Section of Volume VI.

4. A commitment to replace affected sources, and details of such recompense, can be found on pages 41 and 42 of Appendix N of Volume VI. An additional discussion related to temporary replacement of interrupted water flow can be found on Page 817.97-3 of Volume VI.

5. A proposed monitoring schedule is contained in the attached Seep and Spring Inventory.