White Oak Mine Complex Area

Channel Reclamation - Belina Mine Area (Determine flow in Channel to Elev ~8750' below Pond 4)
Whiskey Creek

COMPLETE CHANNEL (- RC-2)

Rdg: 7½ Min. Topo Sec 30 T13S, R7E = 436

$$\text{Area} = \frac{\left(\frac{5020+5050}{2}\right) * \left(\frac{5260+5280}{2}\right)}{43560\ ft^2/ac} = 609.8\ ac$$

Rdg: Sec 30, Zeiss Copy = 450 Multiplier = 1.3551

Area = 356.4 ac

	Area	CN	% Cover
Pine Covered	193.7 ac	55	50*
Sage / Aspen Covered	122.0 ac	70	25
Disturbed / Reclaimed	40.7 ac	85	—
	356.4 ac		

* Conservative

100 Yr - 6 Hr Precip = 2.3 in

Ave Slope: $\frac{\text{Cont. Length} * \text{Cont Int} * 100}{\text{Area} * 43560}$

Cont Length = 33.5 in * 2000'/in = 67,000 ft
Cont Int = 80 ft

$$\frac{67{,}000' * 80' * 100}{356.4\ ac * 43560\ ft^2/ac} = 34.5\%$$

Vol. Weighted Curve No.

CN	A	Q_i
55	193.7	0.05
70	122.0	0.36
85	40.7	1.02

$\bar{Q} = 0.27$ $\bar{CN} = 67.0$

Hyd. Length = 5000'

$Q_{100yr-6Hr}$ = 32.2 cfs

For Entire Channel - Break out Upper Portion Above Elev 8935

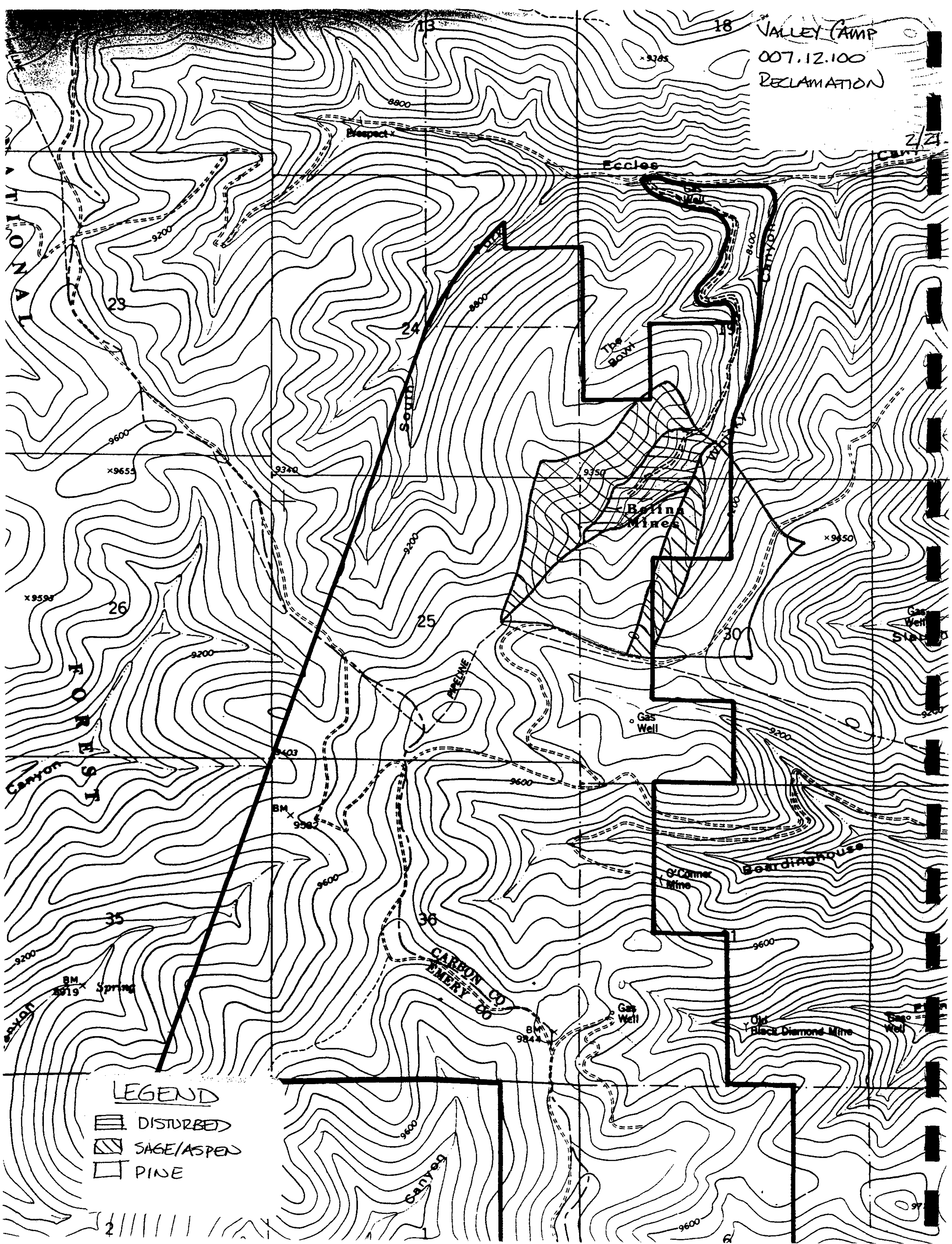
UPPER MAIN CHANNEL (RC-2)

Upper Area = 134.5 ac

	Area	CN	Q_i
Pine Covered	77.0	55	0.05
Sage / Aspen	46.0	70	0.36
Dist / Reclaimed	11.5	85	1.02

$\bar{Q}_i = 0.24$ $\bar{CN} = 65.6$

VALLEY CAMP
007.12.100
RECLAMATION



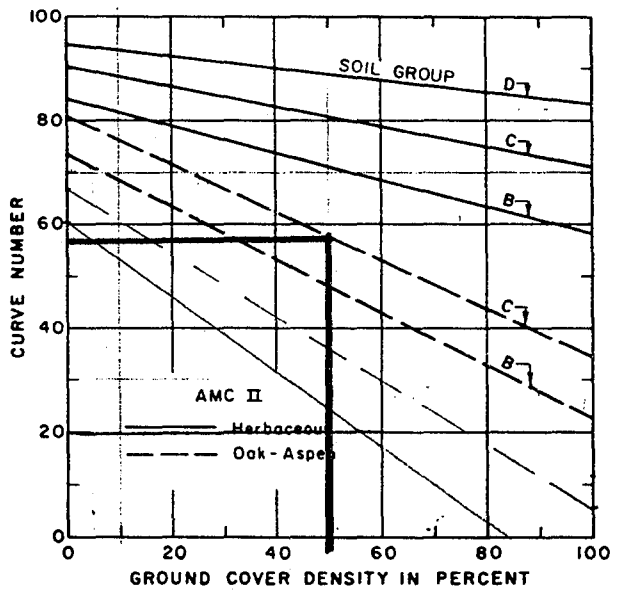


Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

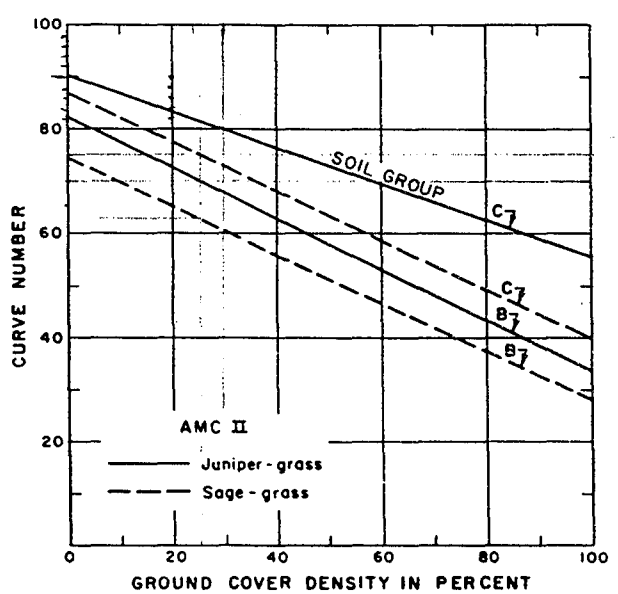


Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

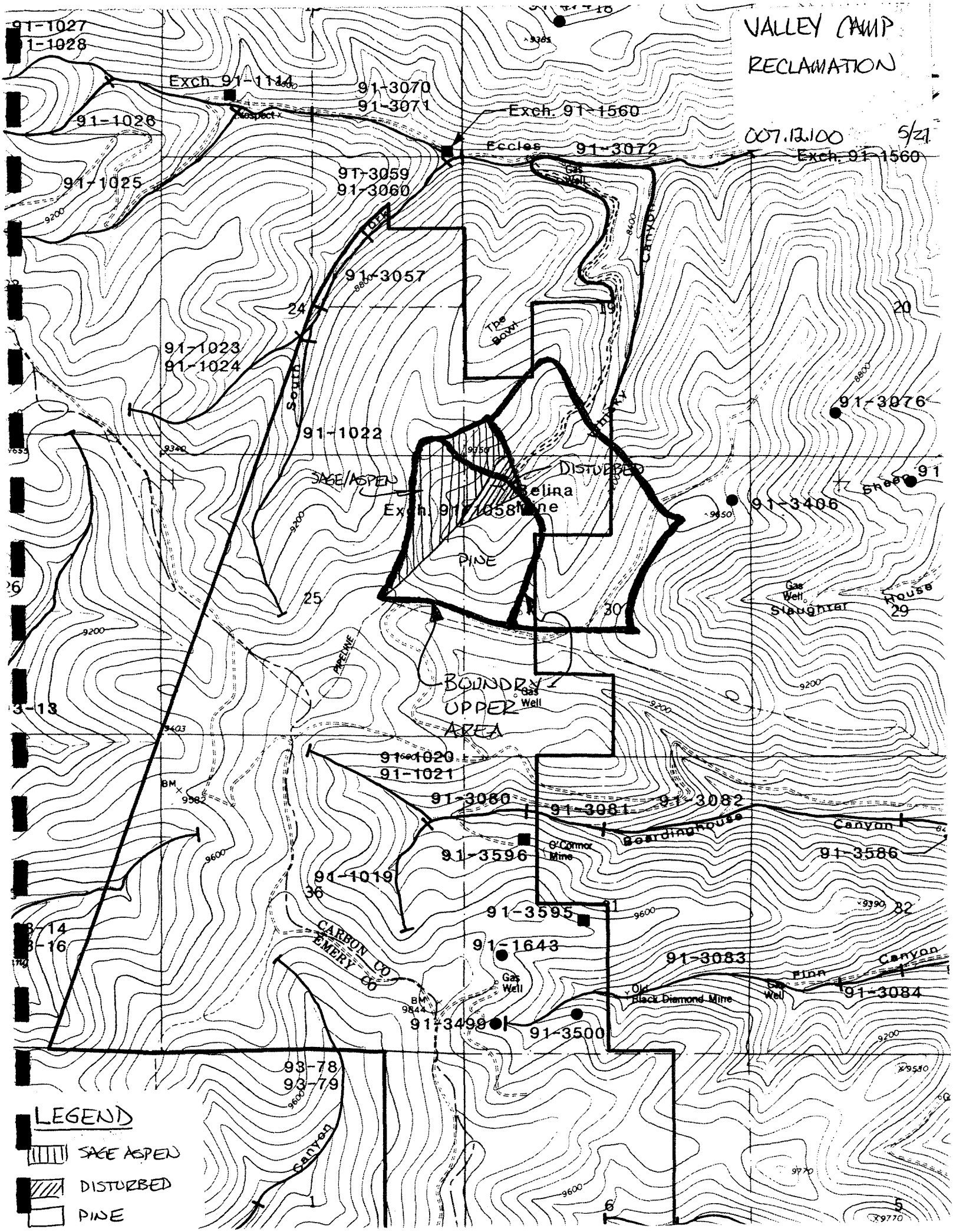
PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-2; 100 Yr 6 Hr

AREA= 356.4 ACRES
AVERAGE BASIN SLOPE= 34.5 PERCENT
CURVE NUMBER= 67.0
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3149 HOURS QPCFS= 855.92 CFS QPIN= 2.3816 INCHES
C3= 11.7391 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.9839	.0000	.0000	.0	.00
2.33	1.0911	.0022	.0022	42.9	.10
2.39	1.1983	.0088	.0066	265.9	.88
2.46	1.3055	.0196	.0107	568.2	3.49
2.52	1.3888	.0306	.0110	785.7	8.84
2.58	1.4178	.0349	.0044	855.9	16.32
2.65	1.4468	.0396	.0046	801.8	23.50
2.71	1.4757	.0445	.0049	676.8	28.57
2.77	1.5047	.0496	.0051	529.3	31.26
2.83	1.5337	.0550	.0054	390.6	32.20
2.90	1.5627	.0606	.0056	275.3	32.21
2.96	1.5916	.0665	.0059	187.0	31.95
3.02	1.6185	.0722	.0057	123.1	31.76
3.09	1.6417	.0772	.0051	79.0	31.72
3.15	1.6648	.0824	.0052	49.6	31.64
3.21	1.6880	.0878	.0054	30.6	31.46
3.27	1.7112	.0933	.0055	18.5	31.23
3.34	1.7344	.0989	.0056	11.1	31.05
3.40	1.7575	.1047	.0058	6.5	31.00
3.46	1.7807	.1107	.0059	3.8	31.12
3.53	1.8008	.1159	.0053	2.2	31.37
3.59	1.8167	.1201	.0042	1.3	31.54
3.65	1.8327	.1244	.0043	.7	31.31
3.72	1.8486	.1288	.0044	.4	30.63
3.78	1.8645	.1332	.0044	.2	29.65
3.84	1.8805	.1377	.0045	.1	28.61
3.90	1.8964	.1423	.0046	.0	27.70

HYDROGRAPH PEAK= 32.21 cfs
TIME TO PEAK= 2.90 Hours
RUNOFF VOLUME= 8.20 Acre-Feet


VALLEY CAMP
RECLAMATION
007.12.100
5/21
91-1027
91-1028
Exch. 91-1144
91-3070
91-3071
Exch. 91-1560
91-1026
Eccles
91-3072
Exch. 91-1560
91-1025
91-3059
91-3060
Gas Well
91-3057
24
19
20
The Bowl
91-1023
91-1024
Sonia
91-1022
91-3076
DISTURBED
SAGE/ASPEN
Exch. 91-1058
Mine
Sheep
91
91-3406
PINE
25
30
Gas Well
Slaughter
House
29
PIPELINE
BOUNDRY
UPPER
AREA
Gas Well
91-1020
91-1021
91-3080
91-3081
91-3082
Boardinghouse
Canyon
91-3596
O'Connor Mine
91-3586
91-1019
36
91-3595
82
91-1643
91-3083
CARBON CO.
EMERY CO.
Gas Well
Old Black Diamond Mine
Finn
Canyon
91-3084
91-3499
91-3500
93-78
93-79
Canyon
LEGEND
SAGE ASPEN
DISTURBED
PINE

AVG SLOPE: $\frac{22500 * 80 * 100}{43560 * 134.5} = 30.72\%$

HYD. LENGTH = 1600 ft
P = 2.3 in

$Q_{100YR-6HR}$ = 13.4 cfs

SIDE CHANNEL - TO NORTH (RC-3)

	AREA	CN	Q_L
PINE COVERED	12.5	55	0.05
DIST/RECLAIMED	4.1	85	1.02
	16.6		

$\bar{Q}_i = 0.29$; $\overline{CN} = 67.5$

P = 2.3"
AVG. SLOPE ~ 31%
HYD. LENGTH = 900'

$Q_{100YR-6HR}$ = 3.1 cfs

RECLAIMED CHANNEL CHARACTERISTICS

	MIN SLOPE	MAX SLOPE
UPPER CHANNEL	3.6%*	33.0%
SIDE CHANNEL	6.3%*	100.0%**
LOWER CHANNEL	3.6%*	33.0%

* AT JUNCTION WITH SIDE CHANNEL
** AT EXTREME UPPER END

CHANGE GRADES TO ALLOW ACCEPTABLE RIPRAP D_{50} (SEE PG's 9+10)

ACCEPT MAX D_{50} = 1.75' - THIS GIVES D_{MAX} = 36" (3 ft)

PROJECT : Valley Camp of Utah, Inc. Reclaimed Upper Channel RC-2

AREA= 134.5 ACRES
AVERAGE BASIN SLOPE= 30.7 PERCENT
CURVE NUMBER= 65.6
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1392 HOURS QPCFS= 730.87 CFS QPIN= 5.3888 INCHES
C3= 26.5616 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.28	1.0097	.0000	.0000	.0	.00
2.31	1.0570	.0000	.0000	36.7	.00
2.34	1.1044	.0006	.0006	227.0	.02
2.37	1.1518	.0020	.0014	485.2	.19
2.39	1.1992	.0042	.0022	670.9	.68
2.42	1.2465	.0072	.0030	730.9	1.68
2.45	1.2939	.0109	.0038	684.6	3.25
2.48	1.3413	.0155	.0045	577.9	5.37
2.51	1.3823	.0199	.0045	452.0	7.93
2.53	1.3951	.0215	.0015	333.5	10.56
2.56	1.4079	.0230	.0016	235.1	12.51
2.59	1.4207	.0246	.0016	159.6	13.36
2.62	1.4336	.0263	.0017	105.1	13.26
2.64	1.4464	.0280	.0017	67.5	12.56
2.67	1.4592	.0298	.0018	42.4	11.65
2.70	1.4720	.0316	.0018	26.1	10.79
2.73	1.4848	.0335	.0019	15.8	10.10
2.76	1.4976	.0354	.0019	9.5	9.61
2.78	1.5104	.0373	.0020	5.6	9.32
2.81	1.5232	.0394	.0020	3.3	9.19
2.84	1.5360	.0414	.0021	1.9	9.19
2.87	1.5488	.0435	.0021	1.1	9.26
2.89	1.5616	.0457	.0022	.6	9.40
2.92	1.5744	.0479	.0022	.3	9.58
2.95	1.5872	.0501	.0023	.2	9.77
2.98	1.6000	.0524	.0023	.1	9.98
3.01	1.6122	.0547	.0022	.0	10.20

HYDROGRAPH PEAK= 13.36 cfs
TIME TO PEAK= 2.59 Hours
RUNOFF VOLUME= 2.69 Acre-Feet

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-3; 100 Yr 6 Hr

AREA= 16.6 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 67.5
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0832 HOURS QPCFS= 150.97 CFS QPIN= 9.0189 INCHES
C3= 44.4541 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.25	.9463	.0000	.0000	.0	.00
2.26	.9746	.0000	.0000	7.6	.00
2.28	1.0029	.0003	.0003	46.9	.00
2.30	1.0313	.0010	.0006	100.2	.02
2.31	1.0596	.0019	.0009	138.6	.07
2.33	1.0879	.0032	.0013	151.0	.16
2.34	1.1162	.0047	.0016	141.4	.30
2.36	1.1445	.0066	.0019	119.4	.49
2.38	1.1728	.0088	.0022	93.4	.71
2.39	1.2011	.0112	.0025	68.9	.95
2.41	1.2294	.0140	.0027	48.6	1.22
2.43	1.2577	.0170	.0030	33.0	1.50
2.44	1.2860	.0203	.0033	21.7	1.79
2.46	1.3143	.0239	.0036	13.9	2.07
2.48	1.3426	.0277	.0039	8.8	2.36
2.49	1.3709	.0319	.0041	5.4	2.65
2.51	1.3852	.0340	.0022	3.3	2.92
2.53	1.3928	.0352	.0012	2.0	3.09
2.54	1.4005	.0364	.0012	1.2	3.08
2.56	1.4081	.0377	.0012	.7	2.91
2.58	1.4158	.0389	.0012	.4	2.64
2.59	1.4235	.0402	.0013	.2	2.34
2.61	1.4311	.0415	.0013	.1	2.06
2.63	1.4388	.0428	.0013	.0	1.83

HYDROGRAPH PEAK= 3.09 cfs
TIME TO PEAK= 2.53 Hours
RUNOFF VOLUME= .40 Acre-Feet

FROM PRINTOUT (PG's 12-13) $S_{MAX} = 0.16$ TO PRODUCE $D_{MAX} = 1.75'$

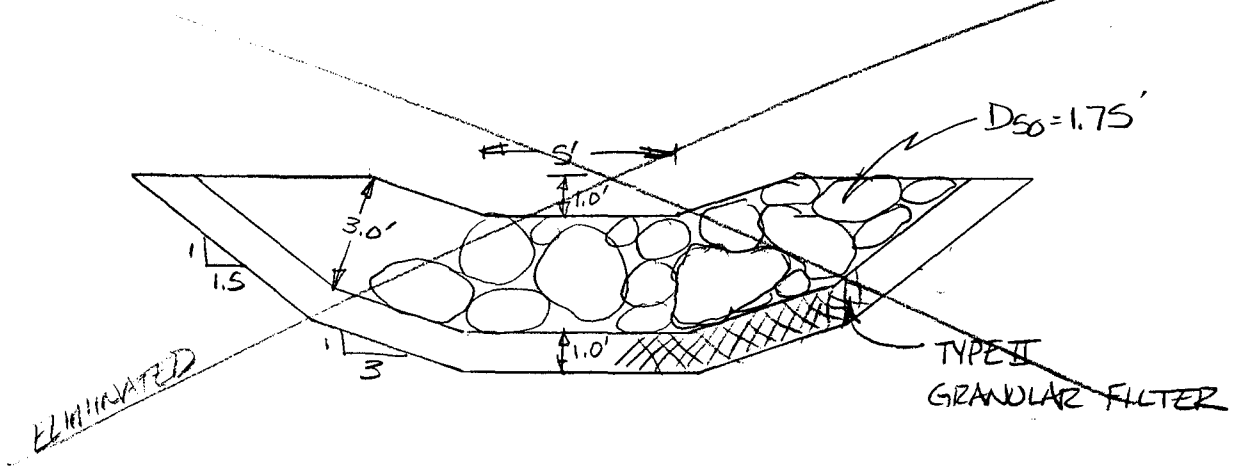
DRAW CONTOURS THROUGH STEEP AREAS WITH A $S_{MAX} = 16\%$

DESIGN CRITERIA

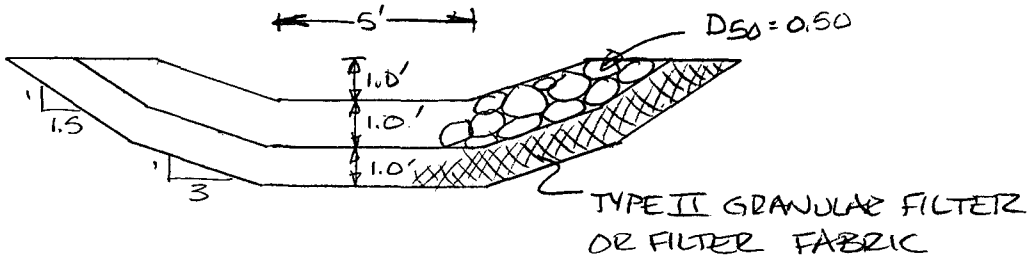
CHANNEL	Q (cfs)	b (ft)	m	Smin (%)	Smax (%)	d (ft)	D50 Smin (ft)	D50 Smax (ft)	Dmax Smin (ft)	Dmax Smax (ft)
UPPER	13.4	5	3	5.0	5.0	1.0	0.50	0.50	1.0	1.0
SIDE	3.1	5	3	32.0	32.0	0.75	1.75	1.75	3.0	3.0
LOWER	32.2	10	3	5.0	16.0	1.1	0.75	1.75	1.25	3.0

SHOW X-SECTIONS FOR CHANNELS

UPPER SECTION BELINA - S = 18% STA 21 + 25 TO STA 25+45



UPPER BELINA - S = 5.0 % STA 13+20 TO STA 17+95



Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:36 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	32.20	cfs
	Bottom Width:	10.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.050	ft/ft
	Max. Bottom Slope:	0.160	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.57	feet
	Qn/1.49(S)1/2=	4.167	
	A(R)2/3=	4.152	
	Required Depth:	1.07	feet
	Area:	6.67	ft2
	Perimeter:	13.60	feet
	Hydraulic Radius:	0.49	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.41	feet
	Qn/1.49(S)1/2=	2.329	
	A(R)2/3=	2.354	
	Required Depth:	0.91	feet
	Area:	4.60	ft2
	Perimeter:	12.59	feet
	Hydraulic Radius:	0.37	feet
	Velocity:	6.99	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	10.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	5.0	%
	Max. Bottom Slope:	16.0	%
	Min Channel Depth:	1.07	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:36 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	32.20	cfs
	Bottom Width:	10.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.05	ft/ft
	Max. Bottom Slope:	0.16	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.57	feet
	Depth (Max. S):	0.41	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	0.75	1.75	feet
T	1.78	4.09	lb/ft2
Nb	0.48	0.48	
Tmax	1.35	3.11	lb/ft2
Ns	0.37	0.36	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	26.99	25.23	degrees
Nsp	0.28	0.28	
SFb	1.85	1.51	
SFs	1.61	1.58	

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp of Utah, Inc.	Date:	26-Feb-90
Project No.:	007.12.100	Time:	09:29 AM
Channel Section:	Channel RC-1; C-14-42 Outlet	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	13.40	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	0.50	feet
	Calc n Value:	0.035	
	Used:	0.035	
	Min. Bottom Slope:	0.050	ft/ft
	Max. Bottom Slope:	0.050	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.44	feet
	Qn/1.49(S)1/2=	1.411	
	A(R)2/3=	1.400	
	Required Depth:	0.94	feet
	Area:	2.78	ft2
	Perimeter:	7.78	feet
	Hydraulic Radius:	0.36	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.44	feet
	Qn/1.49(S)1/2=	1.411	
	A(R)2/3=	1.400	
	Required Depth:	0.94	feet
	Area:	2.78	ft2
	Perimeter:	7.78	feet
	Hydraulic Radius:	0.36	feet
	Velocity:	4.82	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	5.0	%
	Max. Bottom Slope:	5.0	%
	Min Channel Depth:	0.94	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:29 AM
Channel Section: Channel RC-1: C-14-42 Outlet Computed:DEH

DESIGN CRITERIA:			UNITS
	Design Flow:	13.40	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.05	ft/ft
	Max. Bottom Slope:	0.05	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.44	feet
	Depth (Max. S):	0.44	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	0.50	0.50	feet
T	1.37	1.37	lb/ft2
Nb	0.56	0.56	
Tmax	1.04	1.04	lb/ft2
Ns	0.43	0.43	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	30.42	30.42	degrees
Nsp	0.33	0.33	
SFb	1.62	1.62	
SFs	1.50	1.50	

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:31 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	3.10	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.320	ft/ft
	Max. Bottom Slope:	0.320	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.13	feet
	Qn/1.49(S)1/2=	0.159	
	A(R)2/3=	0.160	
	Required Depth:	0.63	feet
	Area:	0.67	ft2
	Perimeter:	5.79	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	4.61	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.13	feet
	Qn/1.49(S)1/2=	0.159	
	A(R)2/3=	0.160	
	Required Depth:	0.63	feet
	Area:	0.67	ft2
	Perimeter:	5.79	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	4.61	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	32.0	%
	Max. Bottom Slope:	32.0	%
	Min Channel Depth:	0.63	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

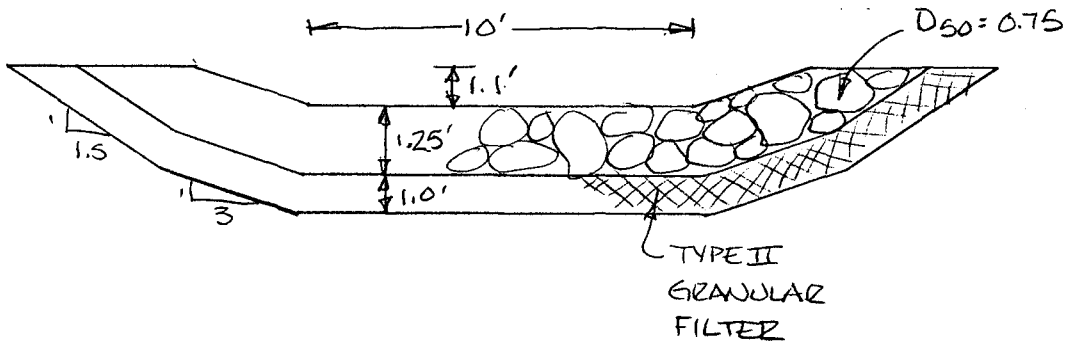
Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:31 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	3.10	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.32	ft/ft
	Max. Bottom Slope:	0.32	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.13	feet
	Depth (Max. S):	0.13	feet
	Angle Repose (Ar):	42	degrees

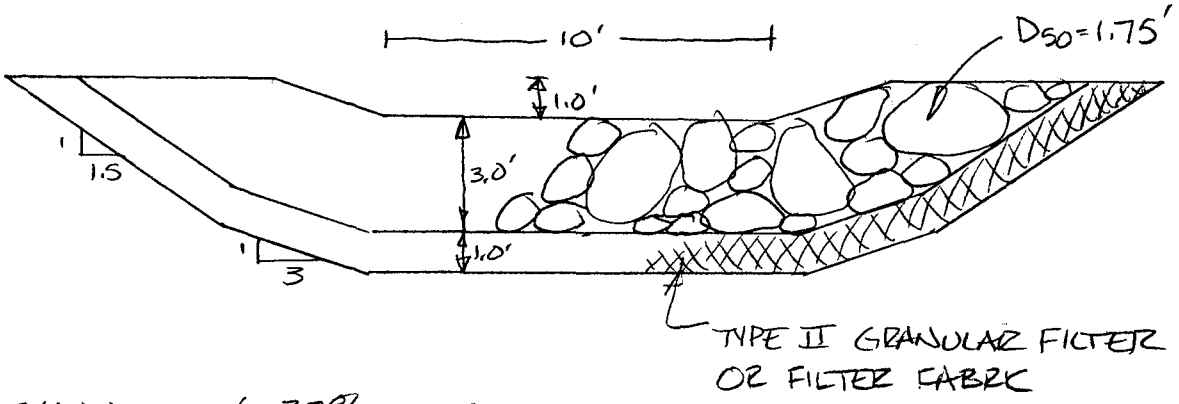
Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.75	1.75	feet
T	2.50	2.50	lb/ft2
Nb	0.29	0.29	
Tmax	1.90	1.90	lb/ft2
Ns	0.22	0.22	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	15.30	15.30	degrees
Nsp	0.17	0.17	
SFb	1.48	1.48	
SFs	1.86	1.86	

LOWER BELINA - S = 5.0% STA 11+00 TO STA 13+20



LOWER BELINA - S = 16% STA 0+00 TO STA 10+95



SIDE CHANNEL - S = 32% STA 0+00 TO STA 5+30

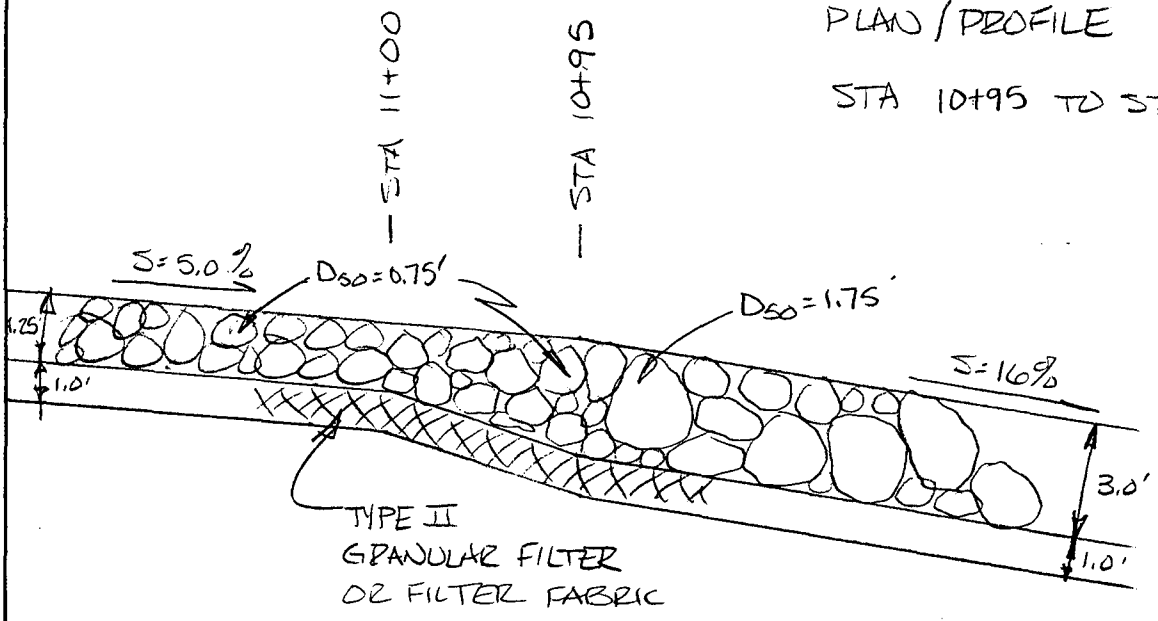
HANSEN ALLEN & LUCE INC

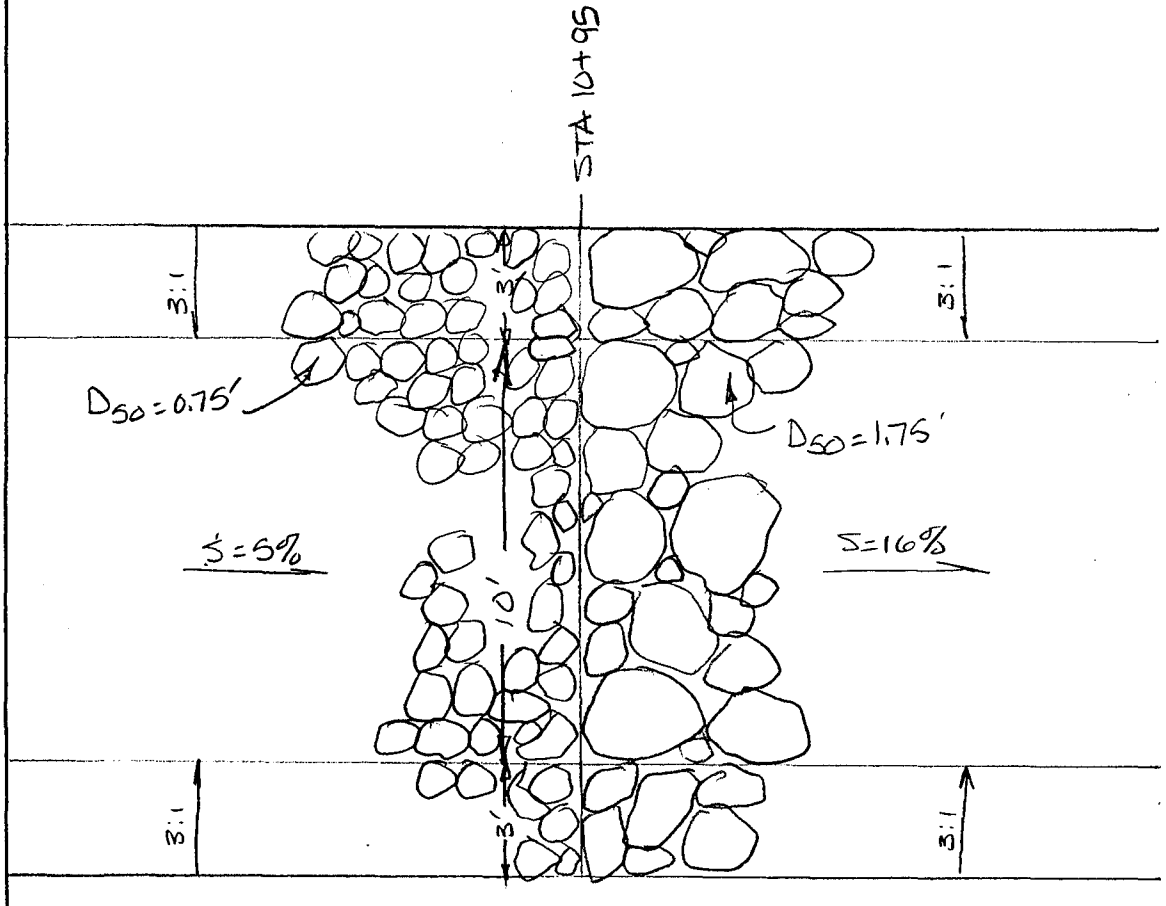
CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 17 OF 21
COMPUTED DEH
CHECKED
DATE 22JAN90

PLAN / PROFILE

STA 10+95 TO STA 11+00





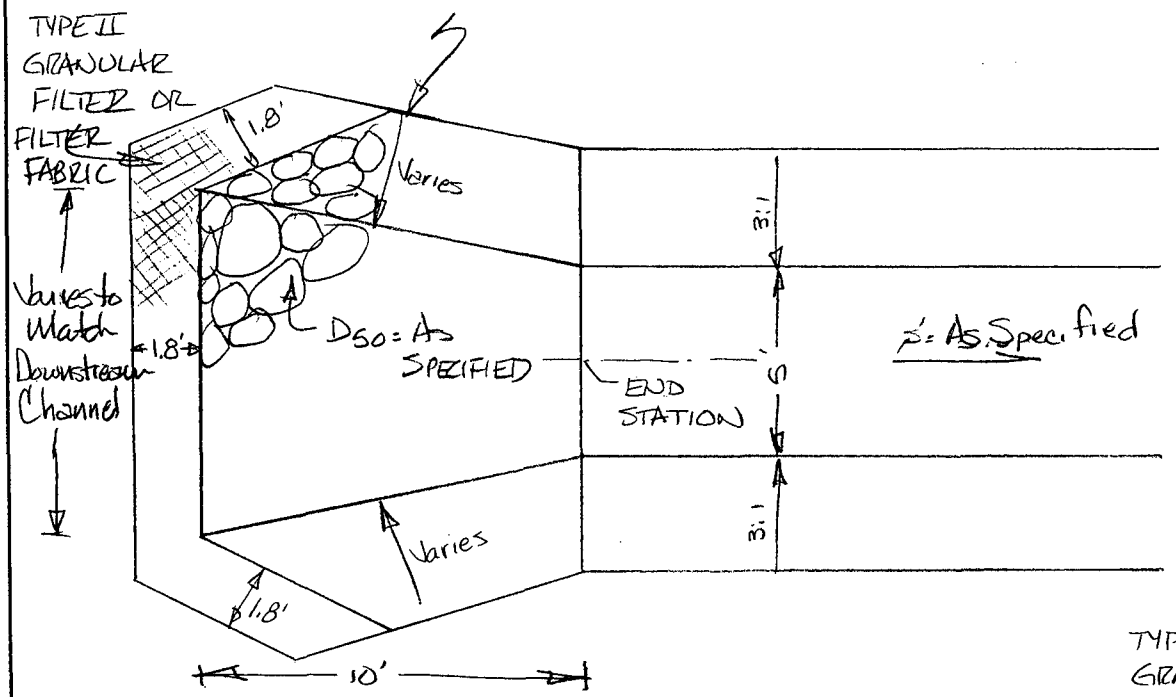
HANSEN ALLEN & LUCE inc

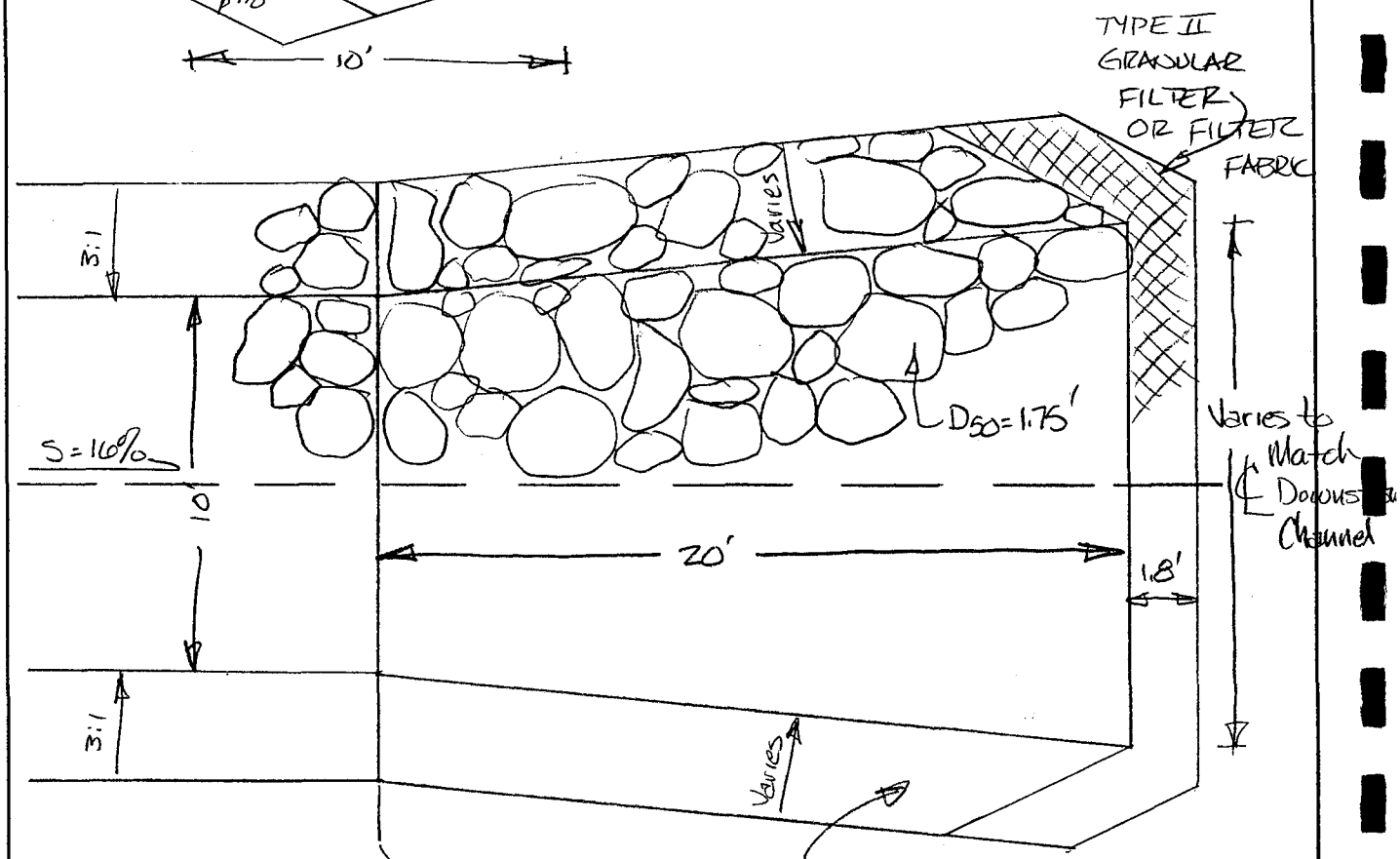
CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 18 OF 21
COMPUTED DEH
CHECKED
DATE 22 JAN 90

INLET DESIGN - UPPER CHANNEL (RIGHT & LEFT FORKS) STA 25+45
SIDE CHANNEL RIGHT STA 5+30
SIDE CHANNEL LEFT STA 0+60

SIDE SLOPES LAID BACK TO MATCH UPSTREAM CHANNEL. 2H:1V MAXIMUM TYPICAL

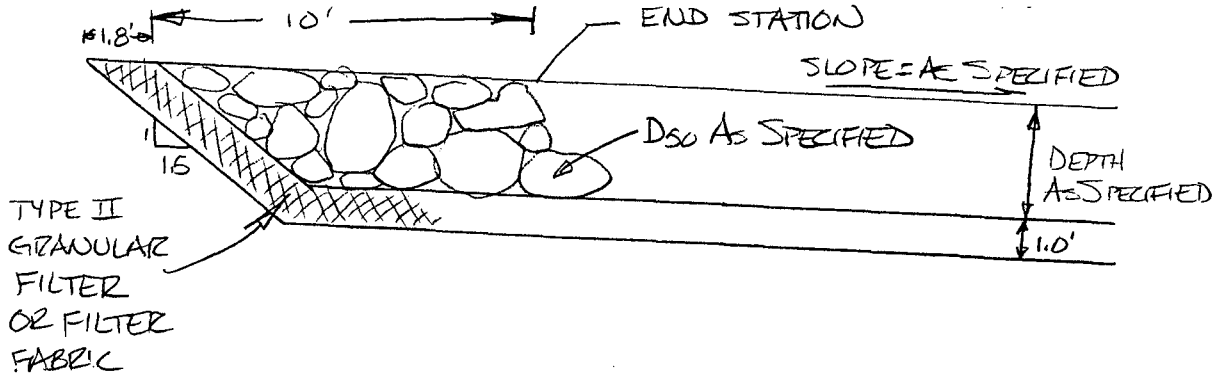




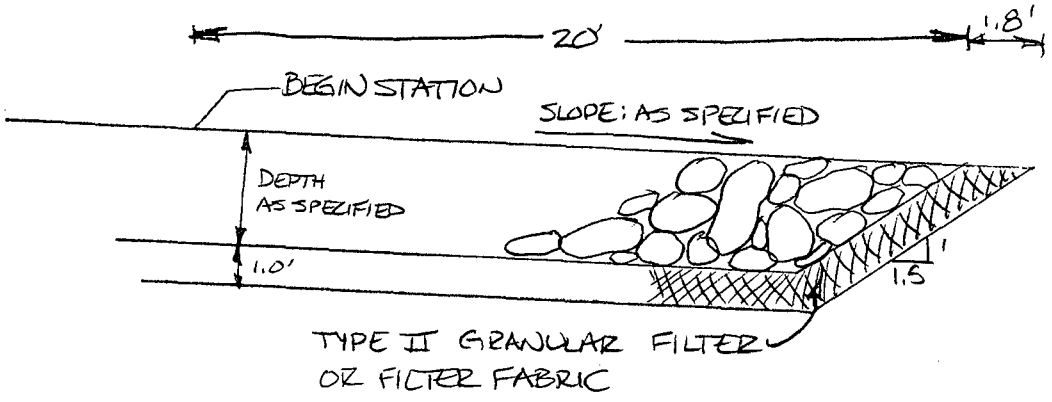
STA 0+00
MAIN CHANNEL

SIDE SLOPES LAID BACK TO MATCH DOWNSTREAM CHANNEL. 2H:1V MAXIMUM TYPICAL

UPSTREAM INLET X-SECTION



DOWNSTREAM OUTLET SECTION

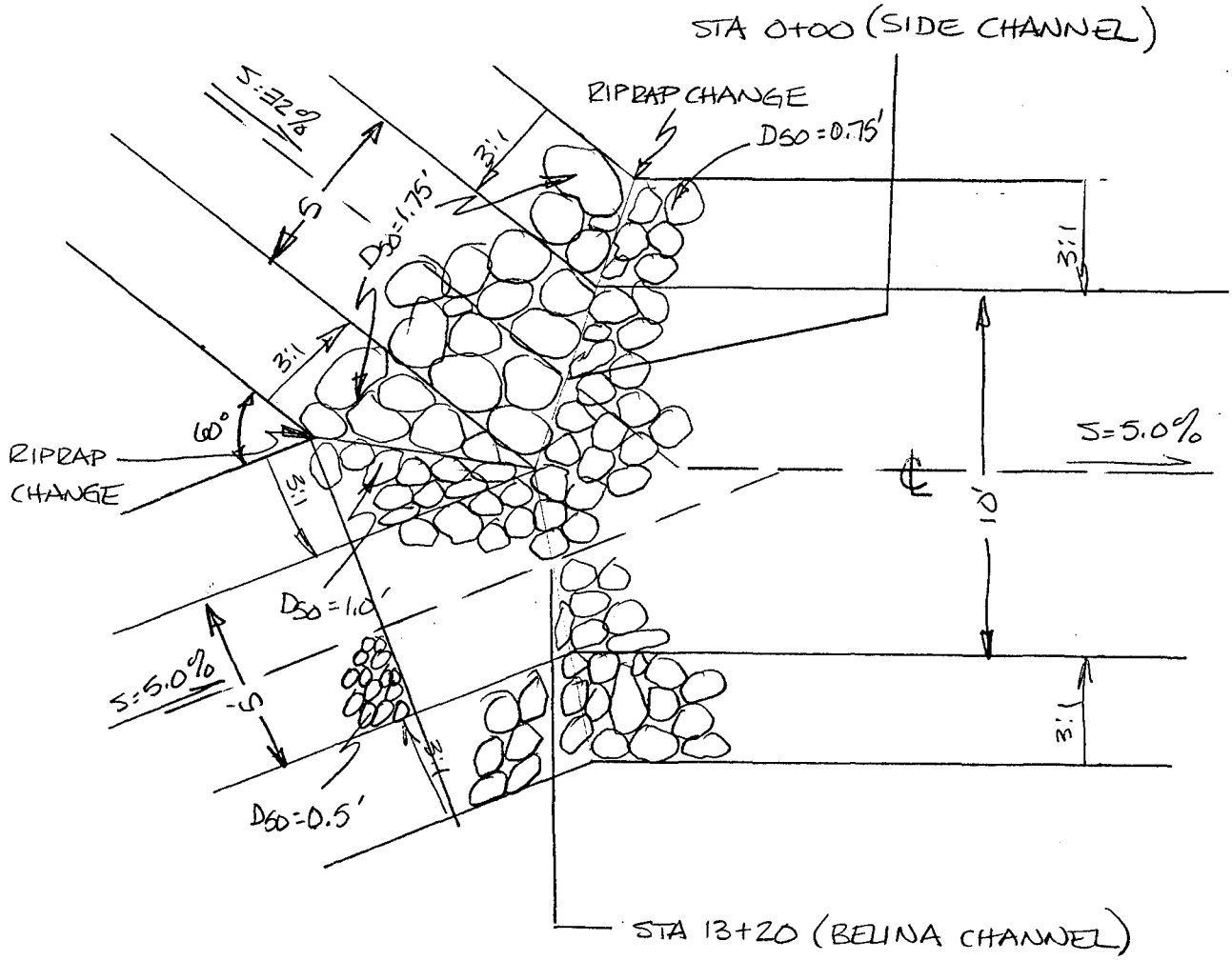


HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 20 OF 21
COMPUTED VEH
CHECKED
DATE 22 JAN 90

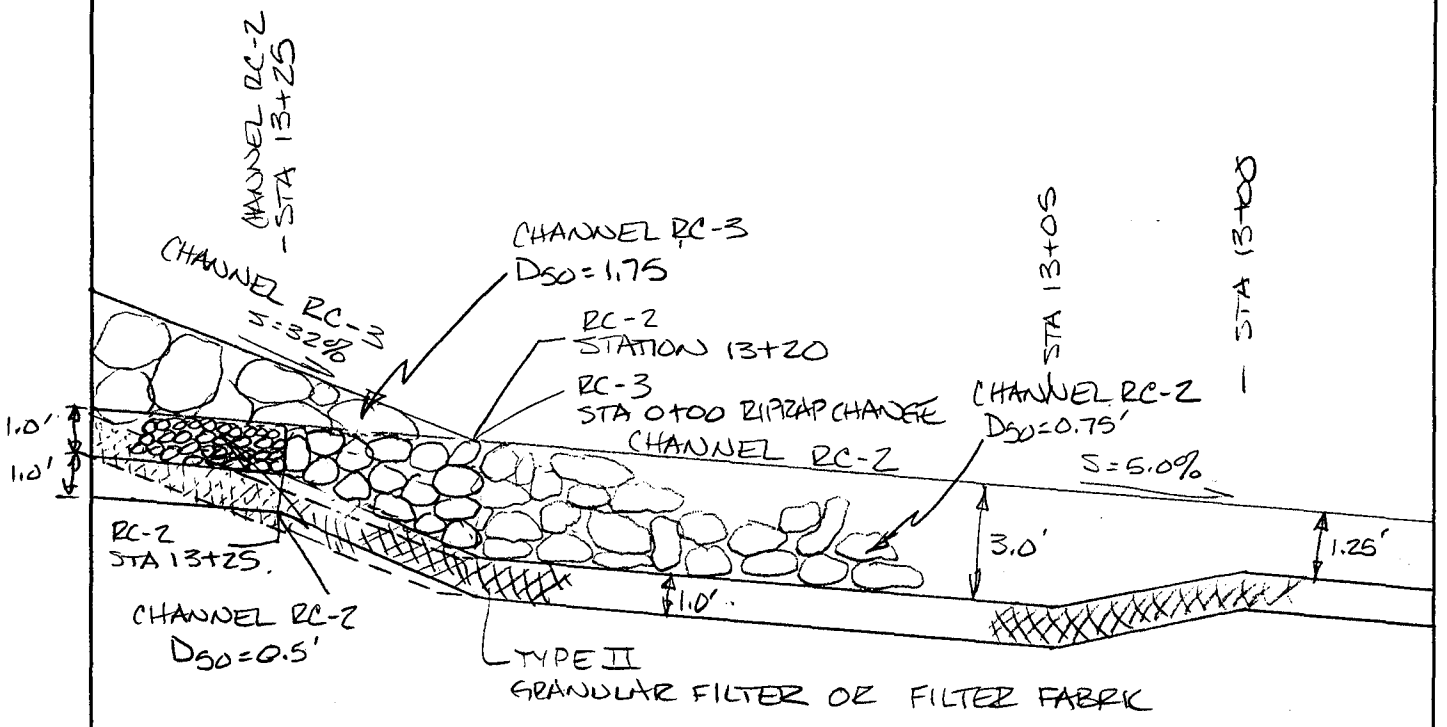
FORK - STA 13+20



HANSEN ALLEN & LUCE INC

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 21 OF 21
COMPUTED DEH
CHECKED
DATE 23 JAN 90



JUNCTION CHANNEL RC-2 AND RC-3

NOTE: RIPRAP UPSTREAM OF STATION 13+20 IN CHANNEL RC-2 HAS D_{50} = 0.50 FT. RIPRAP D_{50}=0.75' USED DOWNSTREAM

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp of Utah, Inc
PROJECT Belsia Mine Area Reclamation
FEATURE Gravel Drain Design
PROJECT NO. 07.14.200

SHEET 1 OF 3
COMPUTED KCS
CHECKED
DATE 7-28-93

Design a gravel drain to intercept seepage from the moist area above Portals 12 and 13 and seepage from Portals 12 through 16

Assume seepage from Portals 12 and 13 and the moist area above Portals 12 and 13 will collect in gravel drains which slope toward the Northeast and drain into Channel RC-3. Seepage from Portals 14, 15 and 16 will collect in a gravel drain which slopes in a southerly direction and drains into Channel RC-2 (Whisky Creek).

Design the gravel drain that intercepts seepage from Portals 12 & 13 and below the moist area above Portals 12 & 13.

Assume that the Gravel drain drainage media will consist of a sand and gravel mixture to a clean gravel. The hydraulic conductivity then ranges between 250 and 350 meters per day. (0.569 to 0.797 feet per minute). (reference Fig. 3.3 in "Groundwater Hydrology" 2nd ed., David Keith Todd, 1980). The figure is attached on the following page.

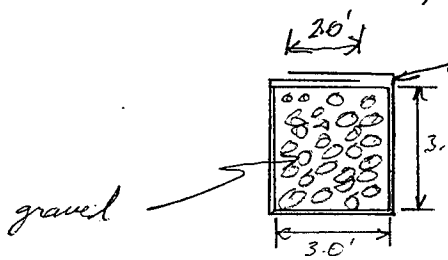
Design the drain to convey roughly 10 gallons per minute or 1.34 cubic feet per minute from the Darcy Equation

$Q = KIA$ where Q = Design flowrate
K = Hydraulic Conductivity
I = Gradient
A = Area of drain in cross section

Drain through moist area above Portals 12 & 13

$I = \frac{9150-9100}{250} = 0.20$ $\therefore$ $1.34 = 0.683(0.20)A$
$A = 9.8097$ sq. ft.

assume a drain of 3' x 3.25' = 9.75 sq. ft.



gravel = 9.75(250)/27 = 90 cy
filter fabric = 14.5(250)/9 = 405 sy

1 meter = 3.281 feet

Hydraulic conductivity, meters/day									
10^4	10^3	10^2	10^1	1	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}
Relative hydraulic conductivity									
Very high		High		Moderate			Low		Very low
REPRESENTATIVE MATERIALS									
Unconsolidated deposits									
Clean gravel	–	Clean sand and sand and gravel	–	Fine sand	–	Silt, clay, and mixtures of sand, silt, and clay		–	Massive clay
Consolidated Rocks									
Vesicular and scoriaceous basalt and cavernous limestone and dolomite	–		Clean sandstone and fractured igneous and metamorphic rocks	–		Laminated sandstone, shale, mudstone	–		Massive igneous and metamorphic rocks

Fig. 3.3 Hydraulic conductivities for various classes of geologic materials (after Bureau of Reclamation[9]).

HANSEN ALLEN & LUCE INC

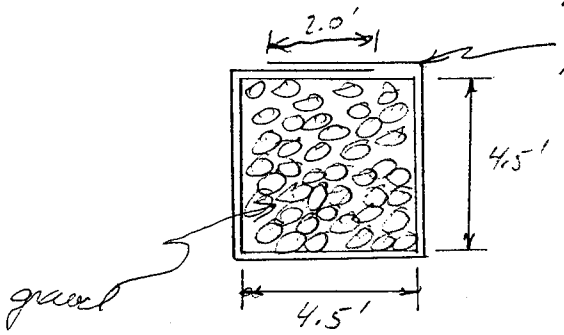
CLIENT Wells Conservation Dist.
PROJECT Bella Bella Reclamation
FEATURE Spring Water Design
PROJECT NO. 97.14.300
SHEET 2 OF 3
COMPUTED KCS
CHECKED
DATE 7-30-98

Drain to pick up seepage from the springs located above portals 14-16 and the fans.

$$I = \frac{9125 - 9065}{640} = 0.094$$

$$\therefore 1.34 = 0.683(0.094)A \Rightarrow A = 20.9\ f^2$$

use a drain of 4.5' square = 20.3 f^2



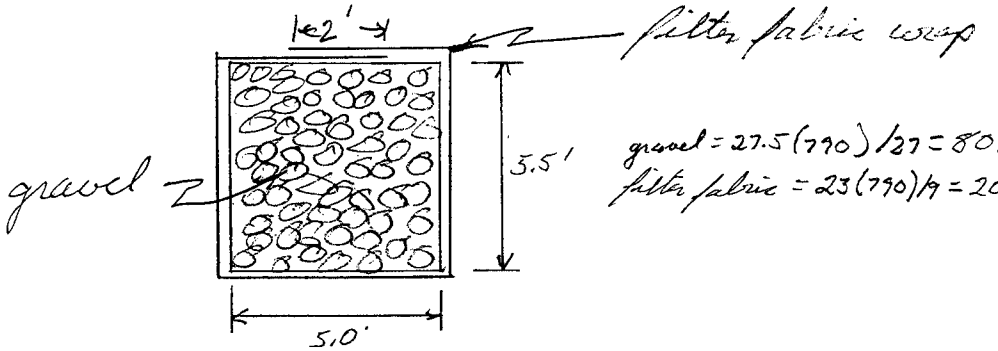
gravel = 20.3 (640)/27 = 481 cy
filter fabric = 20(640)/9 = 1422 sy

Drain to pick up seepage from the mine portals.

$$I = \frac{9050 - 8995}{790} = 0.07$$

$$1.34 = 0.683(0.07)A \Rightarrow A = 28.0\ ft^2$$

use a drain of 5' x 5.5' = 27.5 f^2



gravel = 27.5(790)/27 = 805 cy
filter fabric = 23(790)/9 = 2020 sy

Total quantities: gravel = 1375 cy
filter fabric = 3850 sy

APPENDIX R2

Reclamation Details

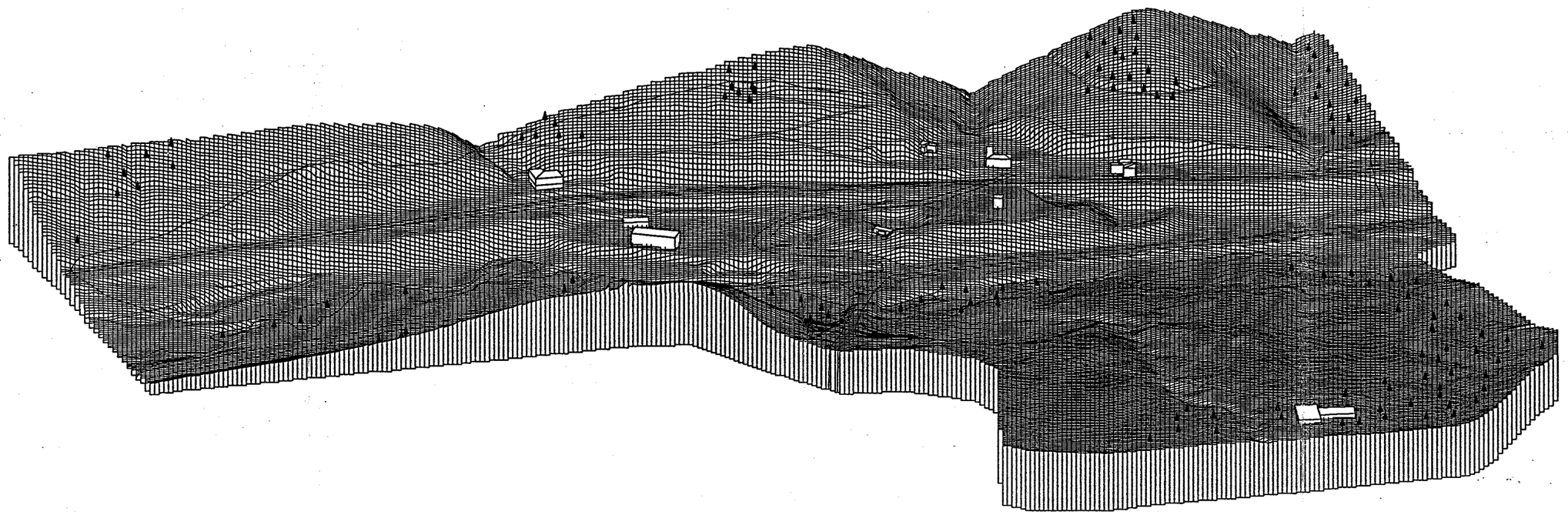
HANSEN ALLEN & LUCE INC.

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK LOADOUT FACILITY
RECLAIMED CONTOUR

FIGURE
R-1

VC-REC.DWG 8-04-93



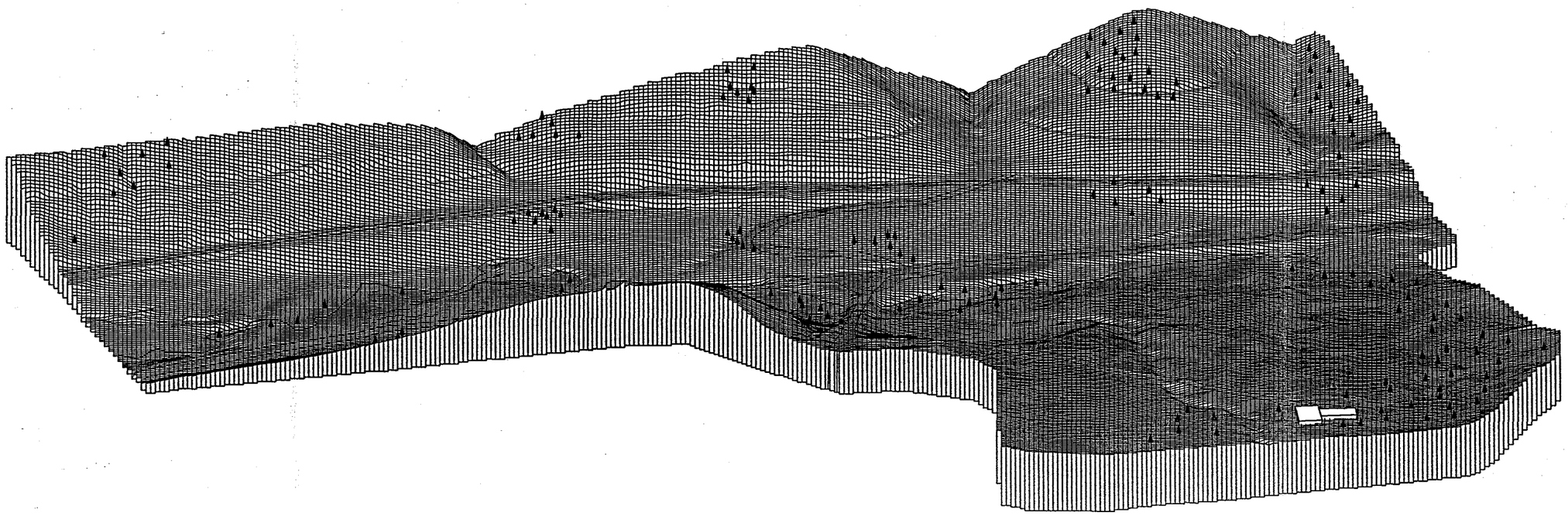
VC-DISB.DWG 8-4-93

HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK LOADOUT - DISTURBED
3-D VIEW

FIGURE
R-2



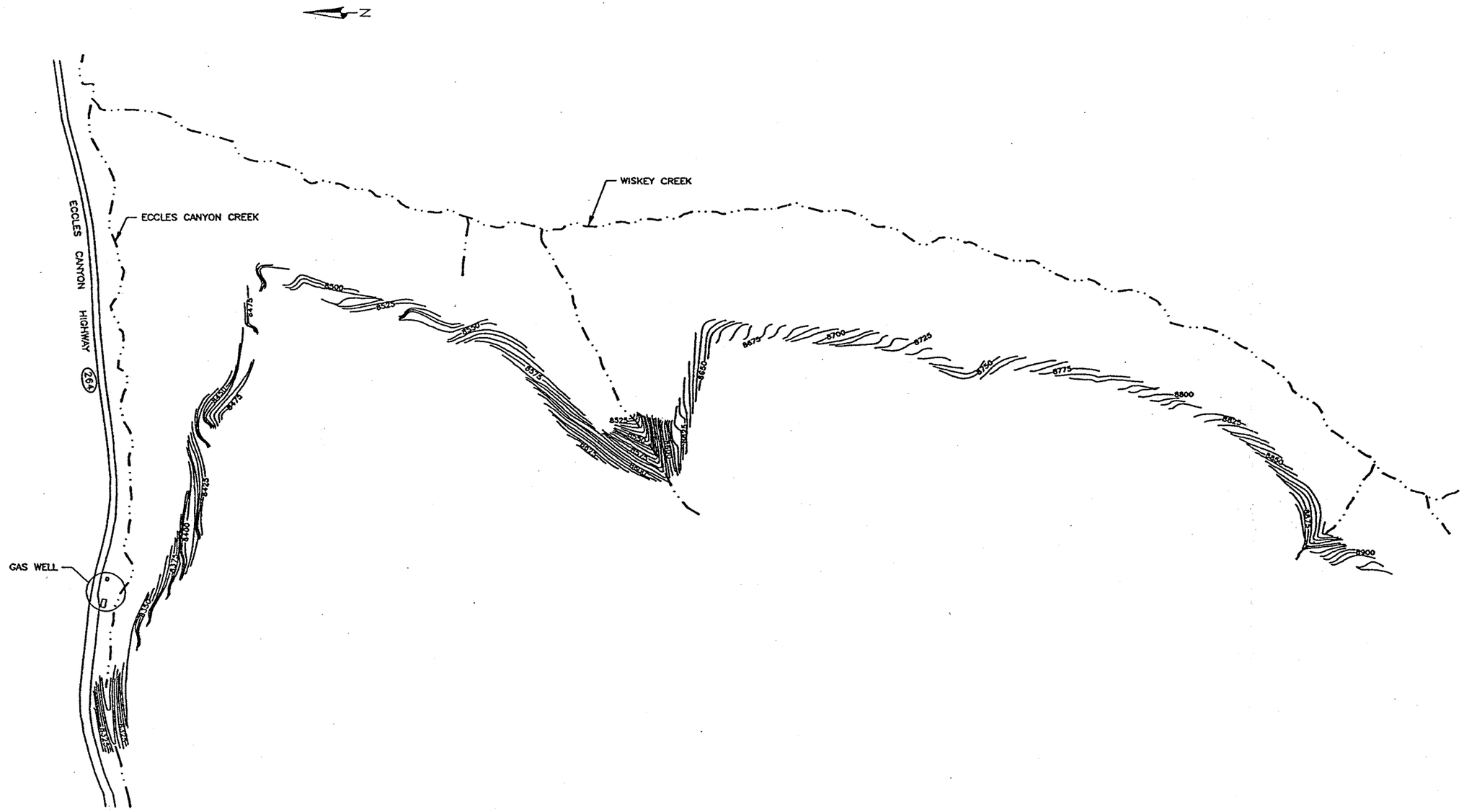
VC-REC.DWG 8-4-93

HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK LOADOUT - RECLAIMED
3-D VIEW

FIGURE
R-3



8-04-93

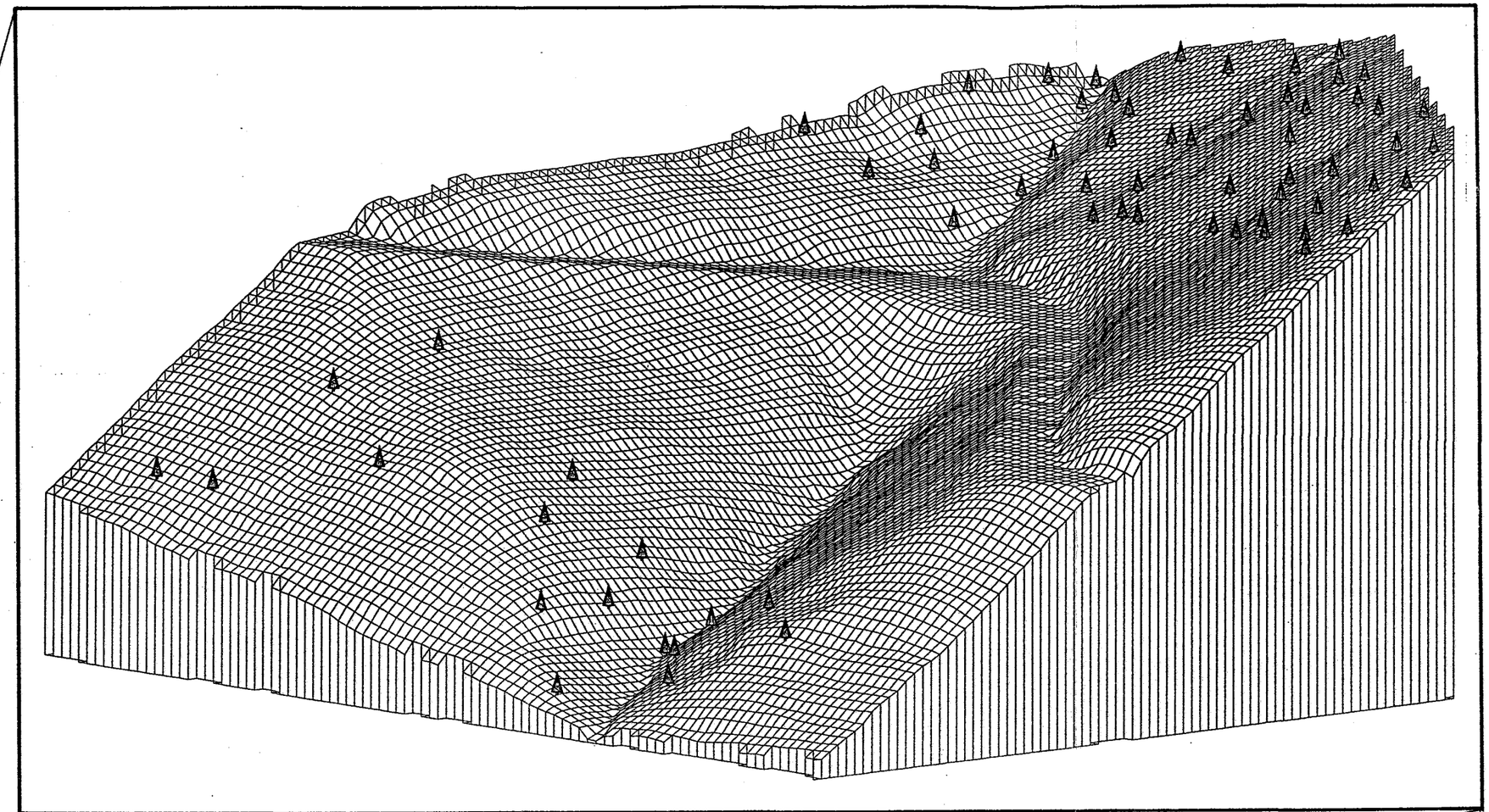
H1.DWG

HANSEN ALLEN & LUCE

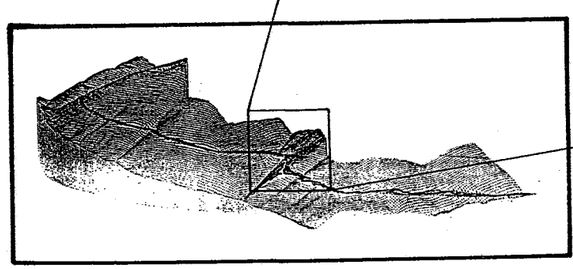
WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK HAUL ROAD
RECLAIMED CONTOUR

FIGURE
R-4



R–7



R–5

8-4-93

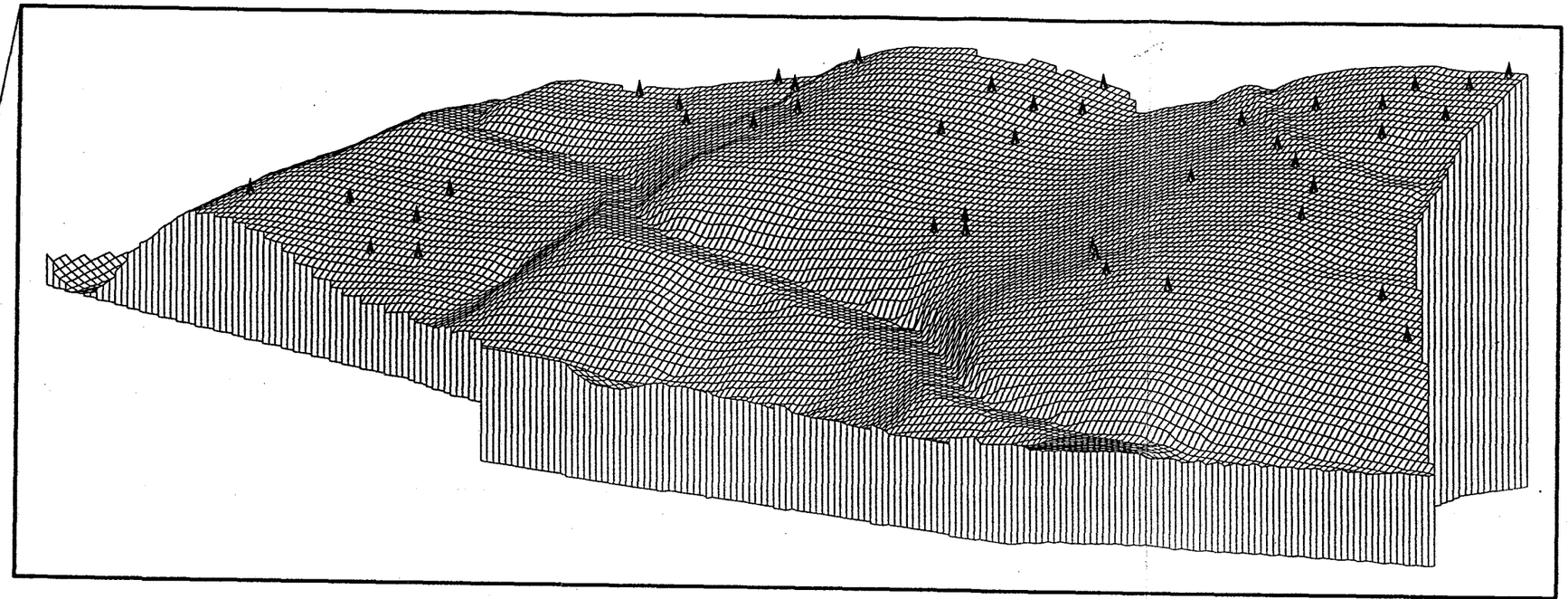
BHLREC.DWG

HANSEN ALLEN & LUCE

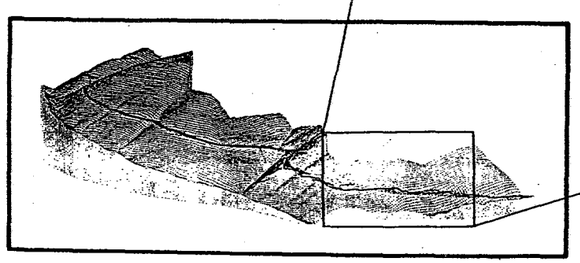
WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK HAUL ROAD - BIG FILL SECTION
DISTURBED 3-D VIEW

FIGURE
R–5
& R–7



R–6



R–5

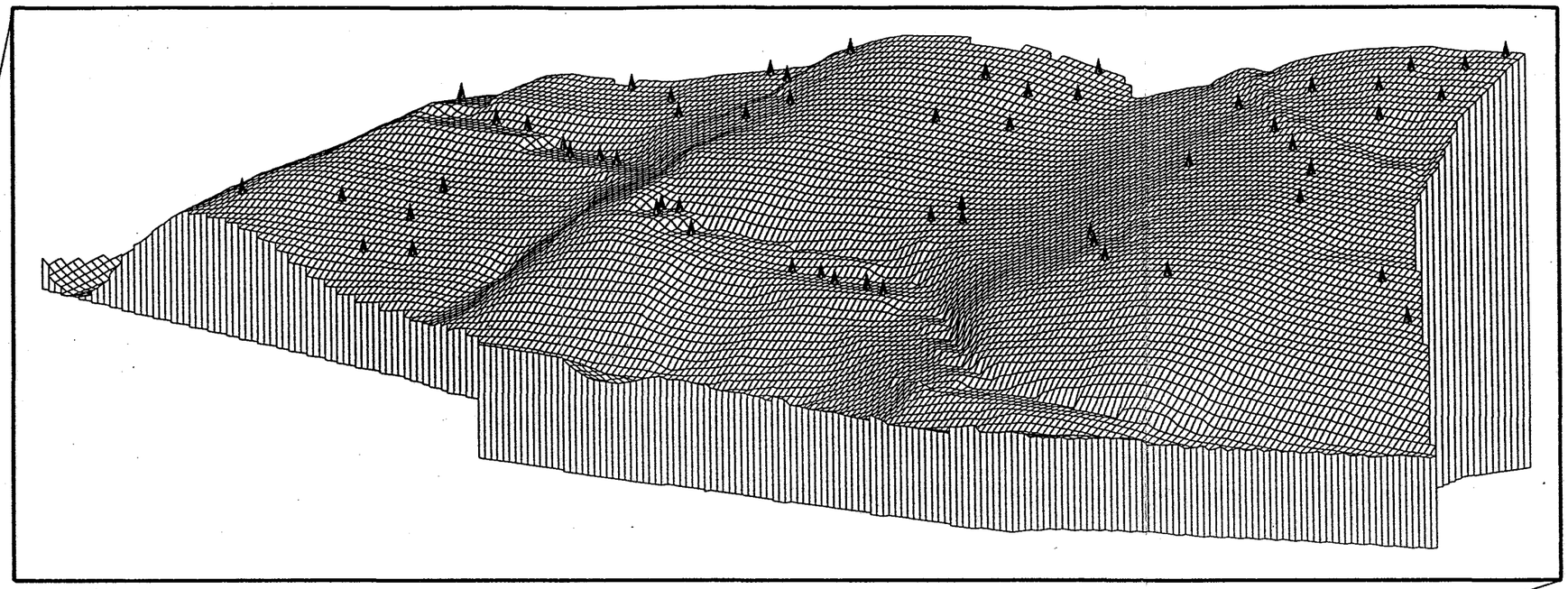
BHLREC.DWG 8-4-93

HANSEN ALLEN & LUCE

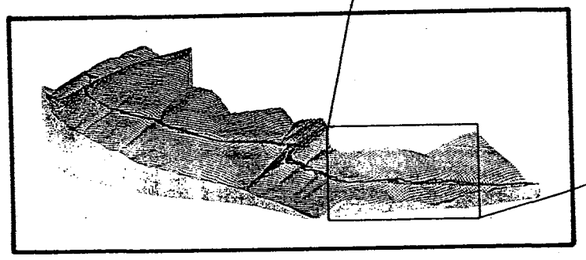
WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK HAUL ROAD - LOWER SECTION
DISTRUBED 3-D VIEW

FIGURE
R–5
& R–6



R–9



R–8

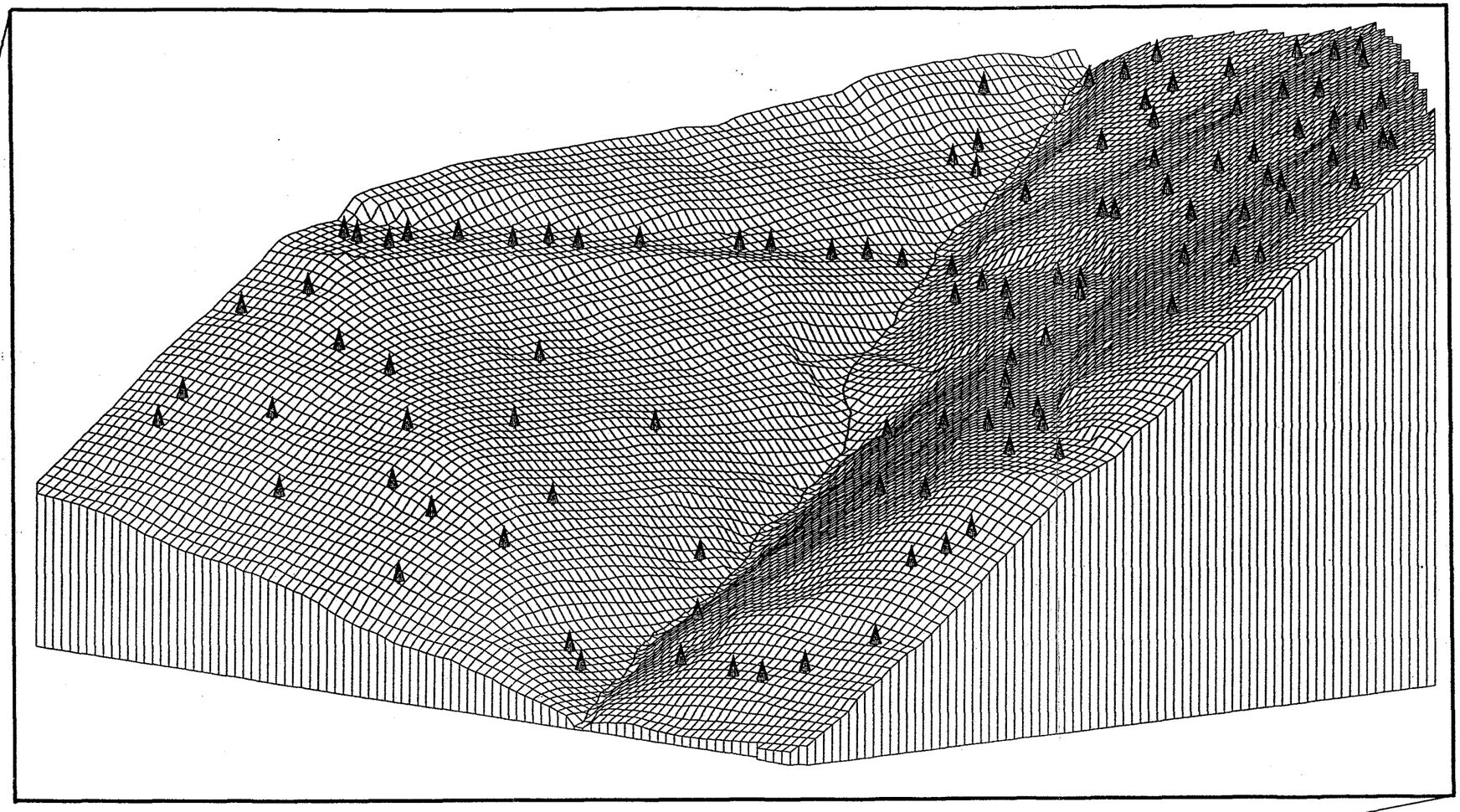
BHLREC.DWG 8-4-93

HANSEN ALLEN & LUCE

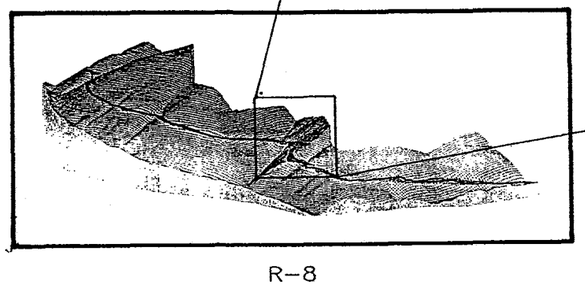
WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK HAUL ROAD - LOWER SECTION
RECLAIMED 3-D VIEW

FIGURE
R–8
& R–9



R–10



R–8

8–4–93

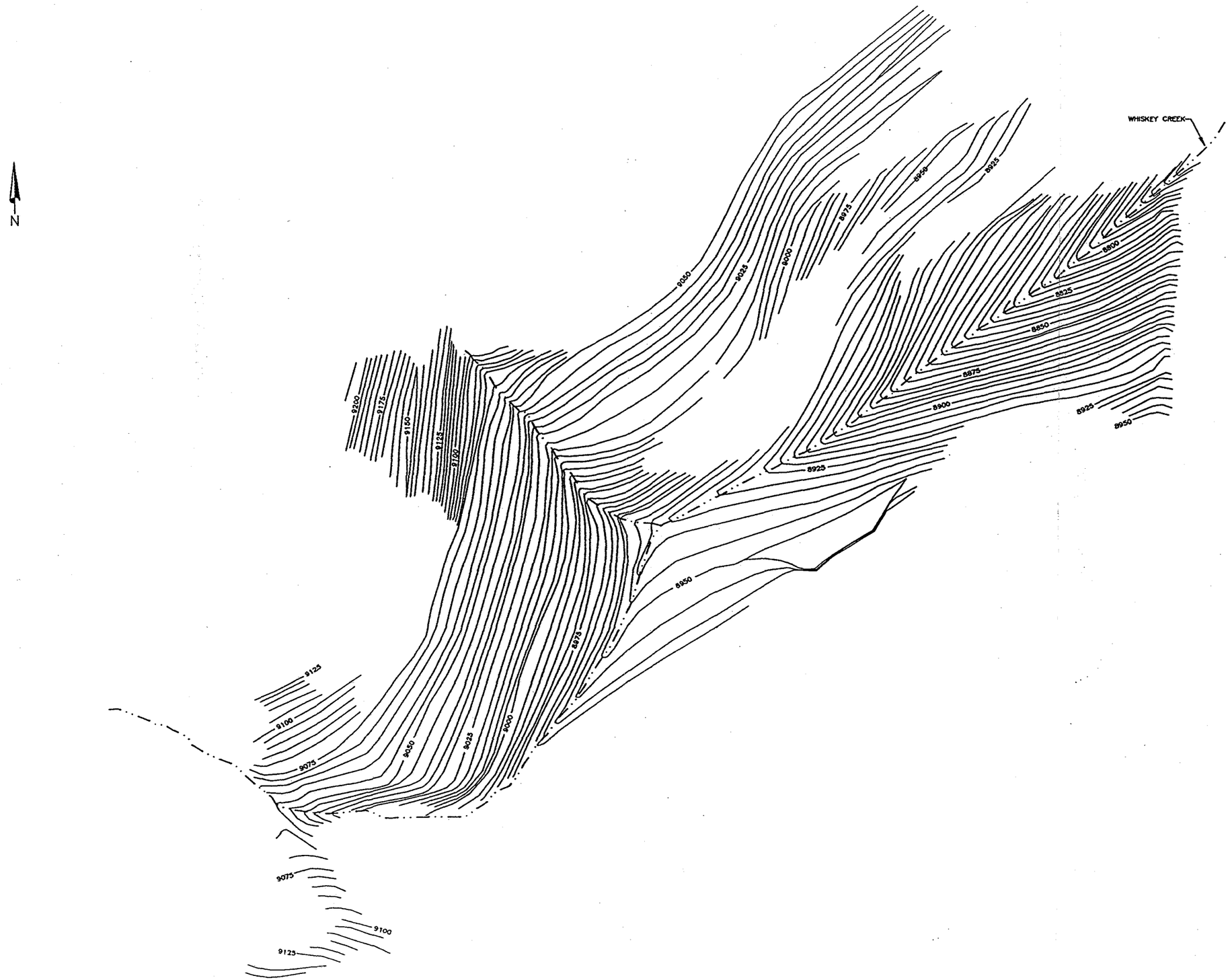
BHLREC.DWG

HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHTIE OAK HAUL ROAD - BIG FILL SECTION
RECLAIMED 3-D VIEW

FIGURE
R–8
& R–10



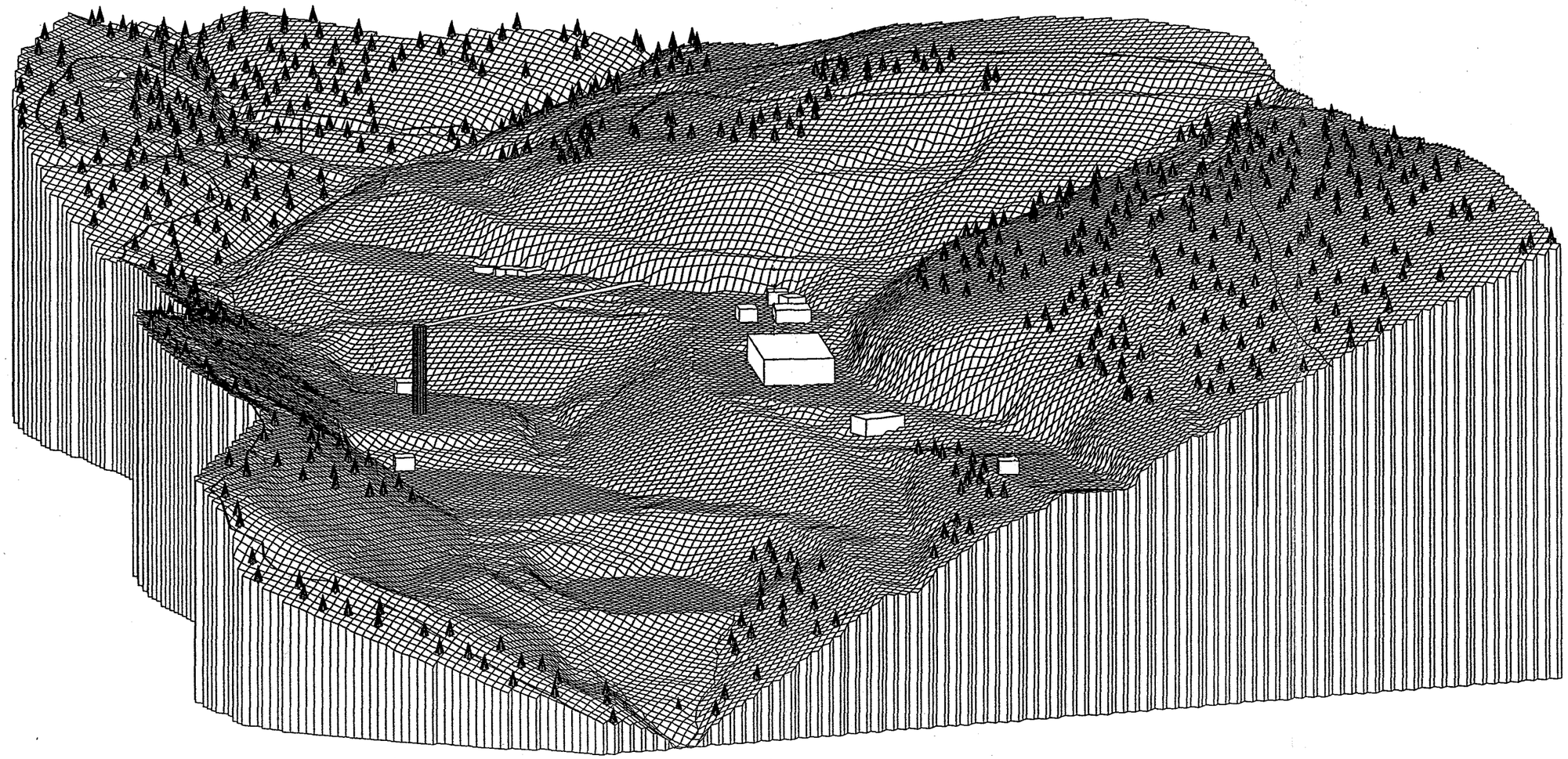
HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK COMPLEX
RECLAIMED CONTOUR

FIGURE
R-11

03-REC.DWG 8-4-93



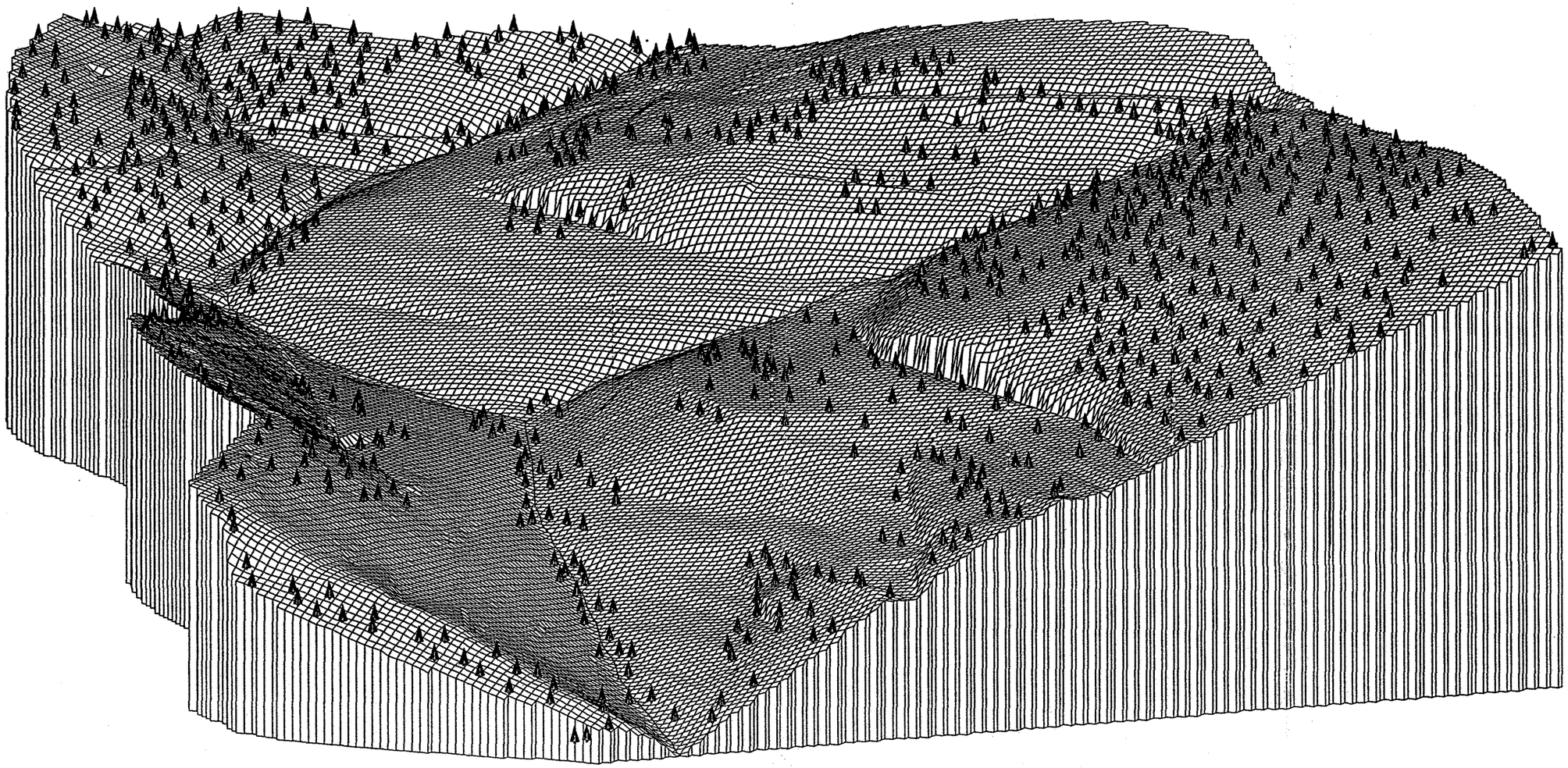
HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK COMPLEX - DISTRUBED
3-D VIEW

FIGURE
R-12

B-DSB.DWG 8-4-93



8-4-93

B-REC.DWG

HANSEN ALLEN & LUCE

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

WHITE OAK COMPLEX - RECLAIMED
3-D VIEW

FIGURE
R-13

APPENDIX R3

Reclamation Cost Estimate

Cost Summary

VALLEY CAMP OF UTAH RECLAMATION COSTS
GJP 03-Aug-93

1.00	**Buildings**		$718,700
2.00	Facilities		$1,012,480
3.00	Earthwork		$1,132,636
4.00	Revegetation		$1,392,094
TOTAL RECLAMATION COSTS			$4,255,910
Maintenance & Monitoring costs			$425,591
Contingency & Engineering costs			$425,591
Mobilization & demobilization			$106,398
		TOTAL	$5,213,490
Conversion to 1995 dollars			$5,346,746
rounded to nearest 1000			$5,347,000

1/2

VALLEY CAMP OF UTAH RECLAMATION COSTS
GJP 03-Aug-93

1.00 **Demolition and Disposal of Buildings**

No.	BLDG description	Total w/out salvage (demo + disposal)
VALCAM LOADOUT		
S-1	Wellhouse	$877
S-1A	Shed	$1,558
S-1B	Shed	$1,229
S-2	Shop	$24,478
S-3	Substation	$2,417
S-4	Bathhouse	$14,349
S-5	Shop	$40,226
S-6	Shed	$4,526
S-7	Shed	$3,337
S-8	Tank	$1,309
S-9	Scale House	$2,049
S-9	Scale	$9,874
S-10	Truck Dump	$10,910
S-11	Conveyor	$26,007
S-12	Transfer	$2,448
S-13	Firehouse	$976
S-14	Conveyor	$14,309
S-15	Crusher	$51,208
S-16	Conveyor	$18,052
S-17	Stacker	$3,943
S-17	Stacker Tube	$5,846
S-18	Reclaim Tunnel	$29,280
S-19	Conveyor	$19,993
S-20	Substation	$6,144
S-21	Loadout	$18,532
S-21	Loadout	$3,326
S-21	Loadout	$4,743
	SUBTOTAL VALCAM	$321,947
BELINA MINE SITE		
S-24	Shed	$3,789
S-25	Treatment Plant	$17,903
S-26	Wellhouse	$1,207
S-27	Bathhouse	$137,870
S-28	Shop	$16,072
S-29	Garage	$4,964
S-30	Pumphouse	$4,539
S-31	Washbay	$6,087
S-32	Truck Bin	$5,921
S-32	Conveyor	$6,939
S-33	Loadout	$5,543
S-34	Substation	$1,922
S-35	Conveyor	$56,543
S-36	Stacker	$6,271
S-37	Reclaim Tunnel	$40,194
S-38	HAC	$9,465
S-39	Conveyor	$5,339
S-40	Transfer	$13,251
S-41	Belina 1 Fan	$15,212
S-42	Belina 2 Fan	$12,030
S-43	Filter Pond	$6,552
S-43	Filter Pond	$13,259
S-44	Substation	$5,880
	SUBTOTAL BELINA	$396,753
TOTAL BLDG DEMOLITION & DISPOSAL		$718,700

VALLEY CAMP OF UTAH RECLAMATION COSTS
GJP 03-Aug-93

2.00	**Demolition and Disposal of Facilities (excluding BLDGS)**	
2.01	Portals	$246,494
2.02	Railroad	$103,398
2.03	Underground Tanks	$7,875
2.04	Power Distribution	$12,018
2.05	Belina Haul Road gutter	$28,466
2.06	Guard Rail	$60,929
2.07	Asphalt Pavement	$553,301
Total Facilities (excluding BLDGS)		$1,012,480

3.00	**EARTHWORK**	
3.01	BELINA EXCAVATION & GRADING	$352,002
3.02	Vegetation Supporting Material (VSM)	$20,662
3.03	Regrade ditch UDD-4 & UDD-5	$593
3.04	Belina Haul Road Rock Lifts	$97,990
3.05	Belina Haul Road Earthwork	$387,002
3.06	Valcam Earthwork	$73,917
3.07	Water Truck & Foreman	$200,470
Total Earthwork		$1,132,636

4.00	**REVEGEATION (INCLUDING RIPRAP)**	
4.01	Belina Complex Riprap	$401,542
4.02	VALCAM RIPRAP CHANNEL	$112,930
4.03	STRAW BALE BARRIER - VALCAM SITE	$27,272
4.04	STRAW BALE BARRIER - BELINA SITE	$31,336
4.05	Riparian Vegetation	$43,343
4.06	Valcam revegetation	$134,644
4.07	Belina Complex Revegetation	$369,706
4.08	Belina Haul Road Revegetation	$271,321
Total Revegetaion		$1,392,094

Building Demolition & Disposal

Valley Camp of Utah Reclamation Costs

		STRUCTURES													
		Plan Area				Foundation		$4.50	Concrete	Unit Cost:	$0.28	Steel/W	Unit Cost:	$0.19	Structure
Structure	No.	Length	Width	Diameter	Area	Perimeter	14.82	Cost	Height	Volume	Cost	Height	Volume	Cost	Cost
Valcam Loadout															
Wellhouse	S-1	8	8		64	32	$474.24	$288.00		0	$0.00	8	512	$97	$860
Shed	S-1A	25	10		250	70	$1,037.40	$1,125.00		0	$0.00	8	2000	$380	$1,505
Shed	S-1B	10	10		100	40	$592.80	$450.00		0	$0.00	8	800	$152	$1,195
Shop	S-2	60	50		3000	220	$3,260.40	$13,500.00		0	$0.00	13	39000	$7,410	$24,170
Substation	S-3	28	10		280	76	$1,126.32	$1,260.00		0	$0.00		0	$0	$2,386
Bathhouse	S-4	55	30		1650	170	$2,519.40	$7,425.00		0	$0.00	13	21450	$4,076	$14,020
Shop	S-5	100	40		4000	280	$4,149.60	$18,000.00		0	$0.00	23	92000	$17,480	$39,630
Shed	S-6	30	15		450	90	$1,333.80	$2,025.00		0	$0.00	13	5850	$1,112	$4,470
Shed	S-7	20	18		360	76	$1,126.32	$1,620.00		0	$0.00	8	2880	$547	$3,294
Tank	S-8			10	79	31	$465.58	$353.43		0	$0.00	18	1413.717	$269	$1,068
Scale House	S-9	16	12		192	56	$829.92	$864.00		0	$0.00	8	1536	$292	$1,986
Scale	S-9	100	12		1200	224	$3,319.68	$5,400.00		0	$0.00		0	$0	$8,720
Truck Dump	S-10	45	18		810	126	$1,867.32	$3,645.00		0	$0.00	22	17820	$3,386	$8,898
Conveyor	S-11	400	6		2400	812	$12,033.84	$10,800.00		0	$0.00	4	9600	$1,824	$24,658
Transfer	S-12	20	10		200	60	$889.20	$900.00		0	$0.00	14	2800	$532	$2,321
Firehouse	S-13	10	8		80	36	$533.52	$360.00		0	$0.00	5	400	$76	$970
Conveyor	S-14	160	10		1600	340	$5,038.80	$7,200.00		0	$0.00	4	6400	$1,216	$13,455
Crusher	S-15	55	30		1650	170	$2,519.40	$7,425.00		0	$0.00	110	181500	$34,485	$44,429
Conveyor	S-16	230	8		1840	476	$7,054.32	$8,280.00		0	$0.00	4	7360	$1,398	$16,733
Stacker	S-17	20	20		400	80	$1,185.60	$1,800.00		0	$0.00	8	3200	$608	$3,594
Stacker Tube	S-17			15	177	47	$698.38	$795.22	66	11683.16	$3,265.69		0	$0	$4,759
Reclaim Tunnel	S-18	200	10		2000	420	$6,224.40	$9,000.00	8	16000	$4,480.00		0	$0	$19,704
Conveyor	S-19	220	10		2200	460	$6,817.20	$9,900.00		0	$0.00	4	8800	$1,672	$18,389
Substation	S-20	38	18		684	112	$1,659.84	$3,078.00		0	$0.00		0	$0	$4,738
Loadout	S-21	35	25		875	120	$1,778.40	$3,937.50		0	$0.00	60	52500	$9,975	$15,691
Loadout	S-21	25	10		250	70	$1,037.40	$1,125.00		0	$0.00	24.5	6125	$1,164	$3,326
Loadout	S-21	24	22		528	92	$1,363.44	$2,376.00		0	$0.00	10	5280	$1,003	$4,743
General Office															
Office	S-22	Not Reclaimed													
Firehouse	S-23	Not Reclaimed													
Belina Mine Site															
Shed	S-24	20	20		400	80	$1,185.60	$1,800.00		0	$0.00	10	4000	$760	$3,746
Treatment Plant	S-25	50	30		1500	160	$2,371.20	$6,750.00	18	27000	$7,560.00		0	$0	$16,681
Wellhouse	S-26	10	10		100	40	$592.80	$450.00		0	$0.00	8	800	$152	$1,195
Bathhouse	S-27	165	80		13200	490	$7,261.80	$59,400.00	18	237600	$66,528.00		0	$0	$133,190
Shop	S-28	40	40		1600	160	$2,371.20	$7,200.00		0	$0.00	20	32000	$6,080	$15,651
Garage	S-29	24	20		480	88	$1,304.16	$2,160.00		0	$0.00	15	7200	$1,368	$4,832
Pumphouse	S-30	20	20		400	80	$1,185.60	$1,800.00	10	4000	$1,120.00		0	$0	$4,105
Washbay	S-31	30	20		600	100	$1,482.00	$2,700.00		0	$0.00	15	9000	$1,710	$5,892
Truck Bin	S-32	18	18		324	72	$1,067.04	$1,458.00		0	$0.00	40	12960	$2,462	$4,987
Conveyor	S-32	95	7		665	204	$3,023.28	$2,992.50		0	$0.00	4	2660	$505	$6,521
Loadout	S-33	24	20		480	88	$1,304.16	$2,160.00		0	$0.00	20	9600	$1,824	$5,288
Substation	S-34	16	14		224	60	$889.20	$1,008.00		0	$0.00		0	$0	$1,897
Conveyor	S-35	500	14		7000	1028	$15,234.96	$31,500.00		0	$0.00	4	28000	$5,320	$52,055
Stacker	S-36			15	177	47	$698.38	$795.22		0	$0.00	80	14137.17	$2,686	$4,180
Reclaim Tunnel	S-37	280	18		5040	596	$8,832.72	$22,680.00		0	$0.00	8	40320	$7,661	$39,174
HAC	S-38	100	7		700	214	$3,171.48	$3,150.00		0	$0.00	4	2800	$532	$6,853
Conveyor	S-39	70	7		490	154	$2,282.28	$2,205.00		0	$0.00	4	1960	$372	$4,860
Transfer	S-40	25	25		625	100	$1,482.00	$2,812.50		0	$0.00	20	12500	$2,375	$6,670
Belina 1 Fan	S-41	65	25		1625	180	$2,667.60	$7,312.50	10	16250	$4,550.00		0	$0	$14,530
Belina 2 Fan	S-42	50	25		1250	150	$2,223.00	$5,625.00	10	12500	$3,500.00		0	$0	$11,348
Filter Pond	S-43	45	15		675	120	$1,778.40	$3,037.50		0	$0.00		0	$0	$4,816
Filter Pond	S-43	98	22		2156	240	$3,556.80	$9,702.00		0	$0.00		0	$0	$13,259
Substation	S-44	55	15		825	140	$2,074.80	$3,712.50		0	$0.00		0	$0	$5,787
					67854	$377.6637								Total	$657,247

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Valley Camp of Utah Reclamation Costs
BUILDING MATERIALS DISPOSAL

STRUCTURES								
		Steel				Concrete		
Structure	No.	Tons	Haulage	Dump	Cost	C.Y.	Cost	Total Cost
Valcam Loadout								
Wellhouse	S-1	0.2	$3.60	$6.60	$10.20	1	$7	$18
Shed	S-1A	0.5	$9.00	$16.50	$25.50	5	$28	$53
Shed	S-1B	0.3	$5.40	$9.90	$15.30	3	$19	$34
Shop	S-2	3	$54.00	$99.00	$153.00	25	$155	$308
Substation	S-3		$0.00	$0.00	$0.00	5	$31	$31
Bathhouse	S-4	5	$90.00	$165.00	$255.00	12	$74	$329
Shop	S-5	10	$180.00	$330.00	$510.00	14	$87	$597
Shed	S-6		$0.00	$0.00	$0.00	9	$56	$56
Shed	S-7		$0.00	$0.00	$0.00	7	$43	$43
Tank	S-8	3	$54.00	$99.00	$153.00	11	$68	$221
Scale House	S-9	1	$18.00	$33.00	$51.00	2	$12	$63
Scale	S-9	5	$90.00	$165.00	$255.00	145	$899	$1,154
Truck Dump	S-10	11	$198.00	$363.00	$561.00	234	$1,451	$2,012
Conveyor	S-11	25	$450.00	$825.00	$1,275.00	12	$74	$1,349
Transfer	S-12	2	$36.00	$66.00	$102.00	4	$25	$127
Firehouse	S-13		$0.00	$0.00	$0.00	1	$6	$6
Conveyor	S-14	15.9	$286.20	$524.70	$810.90	7	$43	$854
Crusher	S-15	123.8	$2,228.40	$4,085.40	$6,313.80	75	$465	$6,779
Conveyor	S-16	23.8	$428.40	$785.40	$1,213.80	17	$105	$1,319
Stacker	S-17	6	$108.00	$198.00	$306.00	7	$43	$349
Stacker Tube	S-17	12.8	$230.40	$422.40	$652.80	70	$434	$1,087
Reclaim Tunnel	S-18	106.3	$1,913.40	$3,507.90	$5,421.30	670	$4,154	$9,575
Conveyor	S-19	29.5	$531.00	$973.50	$1,504.50	16	$99	$1,604
Substation	S-20	26	$468.00	$858.00	$1,326.00	13	$81	$1,407
Loadout	S-21	51.2	$921.60	$1,689.60	$2,611.20	37	$229	$2,841
General Office								
Office	S-22							
Firehouse	S-23							
Belina Mine Site								
Shed	S-24		$0.00	$0.00	$0.00	7	$43	$43
Treatment Plant	S-25	5	$90.00	$165.00	$255.00	156	$967	$1,222
Wellhouse	S-26		$0.00	$0.00	$0.00	2	$12	$12
Bathhouse	S-27	17	$306.00	$561.00	$867.00	615	$3,813	$4,680
Shop	S-28	4	$72.00	$132.00	$204.00	35	$217	$421
Garage	S-29	1.5	$27.00	$49.50	$76.50	9	$56	$132
Pumphouse	S-30	4	$72.00	$132.00	$204.00	37	$229	$433
Washbay	S-31	2	$36.00	$66.00	$102.00	15	$93	$195
Truck Bin	S-32	18.3	$329.40	$603.90	$933.30 *		$0	$933
Conveyor	S-32	8.2	$147.60	$270.60	$418.20 *		$0	$418
Loadout	S-33	5	$90.00	$165.00	$255.00 *		$0	$255
Substation	S-34	0	$0.00	$0.00	$0.00	4	$25	$25
Conveyor	S-35	88	$1,584.00	$2,904.00	$4,488.00 *		$0	$4,488
Stacker	S-36	41	$738.00	$1,353.00	$2,091.00 *		$0	$2,091
Reclaim Tunnel	S-37	20	$360.00	$660.00	$1,020.00 *		$0	$1,020
HAC	S-38	50	$900.00	$1,650.00	$2,550.00	10	$62	$2,612
Conveyor	S-39	9.4	$169.20	$310.20	$479.40 *		$0	$479
Transfer	S-40	7	$126.00	$231.00	$357.00	1004	$6,225	$6,582
Belina 1 Fan	S-41		$0.00	$0.00	$0.00	110	$682	$682
Belina 2 Fan	S-42		$0.00	$0.00	$0.00	110	$682	$682
Filter Pond	S-43		$0.00	$0.00	$0.00	280	$1,736	$1,736
Filter Pond	S-43		$0.00	$0.00	$0.00		$0	$0
Substation	S-44		$0.00	$0.00	$0.00	15	$93	$93
	Totals	741.7	$13,350.60	$24,476.10	$37,826.70	3810.7	$23,626	$61,453

Facilities

VALLEY CAMP OF UTAH RECLAMATION COSTS
2.00 FACILITIES DEMOLITION AND DISPOSAL (not including BLDGS)
03-Aug-93

UNIT COSTS

DESCRIPITON	UNIT COST	Reference
Concrete slab w/rebar	$124.00	93 MEANS 020 554 5200
Concrete disposal on site	$6.20	93 MEANS 020 554 5550
Building demolition (metal)	$0.19	93 MEANS 020 604 0010

ITEM Description	Comments	Computations	
2.01 PORTALS	Concrete removal	477	cy
	removal (93 020 554 5200)	$124.00	/cy
	disposal on site (020 554 5550)	$6.20	/cy
	Total removal & disposal unit cost	130.2	/cy
	Total removal & disposal	$62,105	
	SEALS		
	Forming area	6600	sf
	Form unit cost (93 031 182 4900)	$9.50	/sf
	Total Form Cost	$62,700	
	Concrete Volume	1223	cy
	Unit cost delivered to site	$73.00	/cy
	Pumping cost (033 172 5350)	$26.50	/cy
	Total concrete unit costs	$99.50	/cy
	Total concrete costs	$121,689	
	TOTAL SEAL COSTS	$184,389	
	TOTAL PORTALS	$246,494	

ITEM Description	Comments	Computations	
2.02 RAILROAD	Total track length to be removed	4963	ft
	Removal unit cost (020 554 3500)	$15.35	/ft
	Total track & tie removal	$76,182	
	Track & tie disposal (85 lbs/ft)	210.9	tons
	Haulage distance	110	miles
	Haulage unit cost	$0.15	/ton-mile
	Total Haulage	$3,480	
	Disposal fee unit cost	$33	/ton
	Total disposal fee	$6,961	
	Total track & tie disposal	$10,441	
	Ballast (1 cy / ft)	4963	cy
	unit cost (93 020 554 360)	$3.38	/cy
	total ballast removal	$16,775	
	TOTAL RAILROAD	$103,398	

ITEM Description	Comments	Computations	
2.03 Underground Tanks	Total tanks to be removed	7	ea
	Removal unit cost (020 880 0120)	$425	/ea
	Sludge removal (020 880 0310)	$100	/ea
	Haul & Dispose (020 880 1026)	$600	/ea
	Total unit cost	$1,125	/ea
	TOTAL COST	$7,875	

ITEM Description	Comments	Computations	
2.04 Power Distribution	Transformers	4	ea
	Unit cost (020 708 1570)	$715	/ea
	Total transformer costs	$2,860	
	Poles	41	ea
	Unit cost	$70.15	/ea
	Total poles	$2,876	
	Conductors	5.7	miles
	Unit cost	$1,102	/mile
	Total conductors	$6,281	
	Total Power Distribution	$12,018	

ITEM Description	Comments	Computations	
2.05 Haul Road concrete gutter			
	Length of gutter	6885	ft
	Unit cost (020 554 2400)	2.98	/ft
	Removal cost	$20,517	
	Concrete disposal on site	1282	cy
	Unit cost	$6.20	/cy
		$7,948	
	Total Cost of gutter removal & dispos	$28,466	

ITEM Description	Comments	Computations	
2.06 Guard Rail	Valcam length	1770	ft
	Haul Road	6870	ft
	Belina	2195	ft
	Total length of gaurd rail	10835	ft
	Unit cost (020 554 40800)	$5.50	
	Total removal	$59,593	
	Haul & dispose	27	tons
	Haul 110 miles @ $.15/mile	$16.50	/ton
	Disposal fee	$33	/ton
	Total unit cost haul & dispose	$49.50	/ton
	Total haul & dispose	$1,337	
	Total Gaurd Rail remove and dispose	$60,929	

ITEM Description	Comments	Computations	
2.07 Pavement	Valcam length	4060	sy
	Haul Road	19125	sy
	Belina	7050	sy
	Total asphalt area	30235	sy
	Removal unit cost (020 554 1750)	$6.20	/sy
	Total cost of removal	$187,457	
	Haul & dispose		
	area * 4" thick/12/3 * 2.2 t/cy	7391	tons
	Haul 110 miles @ $.15/mile	$16.50	/ton
	Disposal fee	$33	/ton
	Total unit cost haul & dispose	$49.50	/ton
	Total haul & dispose	$365,844	
	Total asphalt remove and dispose	$553,301	

Earthwork

VALLEY CAMP OF UTAH
EARTHWORK COST COMPUTATIONS
03-Aug-93

Note: Equipment rental rates are taken from the 1993 Rental Blue Book (Dataquest Incorporated)
An overhead and profit allowance of 10% is added to equipment costs based on procedures presented on page 3 of the 1993 Means Heavy Construction Cost Data.
Labor costs including overhead & profit are taken from the 1993 Means Heavy Construction Cost Data (R.S. Means Company, 1992).
Production rates and factors are taken from the Caterpillar Performance Handbook 22nd edition, October 1991.

ITEM	Description	Comments	Computations		
3.01	BELINA EXCAVATION & GRADING				
			Volume to Excavate	254,000	cy
		Assume swell similar to loam	Swell factor	1.25	
		(ref. Standard Handbook for Civil Engineers p. 13-15)	Volume to be hauled (LCY)	317,500	lcy
		Scrapers with dozer assitance will be used to			
		excavate the reclaimed channels and place	Scraper Production Rate:		
		fill in the Belina Complex and Belina Haul road	Cat 637E capacity	31	lcy
			Haul distance	1,700	ft
		Average Scraper Haul Road Description	Loaded Haul Time	2	min
		Load, haul 1700 ft uphill @ 7%	Empty Haul Time	1.3	min
		return empty. Assume rolling equivalent	Manuever & dump	0.6	min
		% Grade of 3%. Therefore total effective	Load Time per pair	1	min
		grade loaded = 10% and empty = -5%.	Total Cycle Time	4.9	min
		See attached sheets from Cat Perf. Book	Cycles per hour	12.2	
		Job efficiency - .83 for normal conditions	Hourly Unit Production	380	lcy/hr
		assume 0.75 due to some site congestion	Job Efficency	0.75	
		A D9N dozer will be used to maintain haul road	Adjusted production	285	lcy/hr
		and assist with spot grading as needed.	Production for 4 units	1,139	lcy/hr
			Total hours to move and spread	279	hrs

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hou Equipme Costs	Number Needed	Equipment Total Job Hourly
Cat D9N dozer U	$12,416.25	$70.55	$34.40	$10.49	$115.44	1	$115.44
Cat 637E P-P scra	$22,296.75	$126.69	$92.25	$21.89	$240.83	4	$963.32
							$1,078.76

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourl Cost	Number Needed	Total Labor costs Hourly
Dozer Operator	$24.10	52.5%	$12.65	$36.75	1	$36.75
Scraper Operators	$24.10	52.5%	$12.65	$36.75	4	$147.01
						$183.76

Total Cost per hour	$1,262.52
TOTAL JOB	$352,002

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ITEM Description	Comments	Computations			
3.02 Vegetation Supporting Material (VSM)					
	VSM is located in two areas on site plus the topsoil stockpile. VSM from the onsite areas is estimated at 1' depth over 1.3 acres and 2' depth over 2.8 acres	Total VSM available		12107	cy
	Part of the VSM on site will need to be stockpiled during excavation			2097	cy
		Swell factor		1.25	
		Total to be stockpiled		2622	lcy
		Scraper Production Rate:			
			Cat 637E capacity	31	lcy
	Assume stockpile over larger VSM site		Haul distance	800	ft
			Loaded Haul Time	0.6	min
			Empty Haul Time	0.6	min
			Manuever & dump	0.6	min
			Load Time per pair	1	min
			Total Cycle Time	2.8	min
			Cycles per hour	21.4	
			Hourly Unit Production	664	lcy/hr
			Job Efficency	0.75	
			Adjusted production	498	lcy/hr
			Production for 2 units	996	lcy/hr
		Total hours to move to stockpile		2.6	hrs
	Spread VSM over site			12107	cy
			Swell factor	1.25	
			Total VSM to be spread	15134	lcy
		Scraper Production Rate:			
			Cat 637E capacity	31	lcy
			Haul distance	1,700	ft
			Loaded Haul Time	2	min
			Empty Haul Time	1.3	min
			Manuever & dump	0.6	min
			Load Time per pair	1	min
			Total Cycle Time	4.9	min
			Cycles per hour	12.2	
			Hourly Unit Production	380	lcy/hr
			Job Efficency	0.75	
			Adjusted production	285	lcy/hr
			Production for 2 units	569	lcy/hr
		Total hours to move & spread		26.6	hrs
		TOTAL HOURS stockpile & spread		29.2	

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Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hou Equipme Costs	Number Needed	Equipment Total Job Hourly
Cat D9N dozer U	$12,416.25	$70.55	$34.40	$10.49	$115.44	1	$115.44
Cat 637E P-P scra	$22,296.75	$126.69	$92.25	$21.89	$240.83	2	$481.66
							$597.10

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourl Cost	Number Needed	Total Labor costs Hourly
Dozer Operator	$24.10	52.5%	$12.65	$36.75	1	$36.75
Scraper Operators	$24.10	52.5%	$12.65	$36.75	2	$73.51
						$110.26

Total Cost per hour $707.36

TOTAL VSM COST $20,662

ITEM	Description	Comments	Computations		
3.03	Regrade ditch UDD-4 & UDD-5		Volume to be graded	259	cy
		1400 feet of ditch with about	Swell factor	1.25	
		5 cf of cut per foot	Total to be moved	324	lcy
			dozer (Means 022 200 2020)	$1.83	/cy
			Total Cost	$593	

3/7

ITEM	Description	Comments	Computations		
3.04	Belina Haul Road Rock Lifts		Volume of rock needed	6000	cy
		Rock lifts are to be formed of material	Average hual distance	6100	ft
		excavated at the Belina site. Large	Haul & dump time (769C)	7	min
		Rock pieces uncovered as part of the work	load time (235C)	3.75	min
		at the Belina site will be loaded on a truck,	Total cycle time	10.35	min
		hauled down the road to near final location,	Capacity	18	cy
		dumped along the inside edge of the road.	Efficiency	0.75	
			Net Prod. capability	78	cy/hr
			Total hours min.	77	hours
		Production time is limited by Belina scrapers (see 3.01)		279	hours

Hoe will be used to assist scrapers with excavation at Belina Complex, truck will haul the 10,000 cy excess from Belina site to haul road.

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hou Equipme Costs	Number Needed	Equipment Total Job Hourly
Cat 769C truck	$8,834.00	$50.19	$27.70	$7.79	$85.68	1	$85.68
Cat 235C Excavat	$14,320.00	$81.36	$92.25	$17.36	$190.98	1	$190.98
							$276.66

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourl Cost	Number Needed	Total Labor costs Hourly
Truck operator	$24.10	52.5%	$12.65	$36.75	1	$36.75
Excavator Operato	$24.95	52.5%	$13.10	$38.05	1	$38.05
						$74.80

Total Cost per hour	$351.46
TOTAL JOB	$97,990

4/4

ITEM	Description	Comments
3.05	Belina Haul Road Earthwork	
		(see 3.04 for 10,000 cy hualed from Belina Complex)
		Approximately half of the cut is located in Upper fill, Big Fill, and Eccles Junction. The Excavator will be used to load trucks from these three sites for hauling and dumping along the road. The Excavator will then reshape the material to form the final reclamation contours including pulling up the existing fill on the outside of the road.

Computations

Total Volume	88300	cy
Swell factor	1.25	
Total Volume loose.	110,375	lcy
Total Volume to be hauled.	55,188	lcy
Truck Production Rate		
Truck Capacity	12	lcy
Average Haul distance	1,100	ft
Trips/hr (Means)	3.2	trips
Net production / truck	38.4	lcy/hr
Unit Cost(022 266 0320)	$2.15	/cy
Excavator production (235C)		
Bucket capactiy	2.75	cy
Cycle time	0.33	min
Cycles per hour	181.8	
Hourly Unit Production	500	lcy/hr
Job Efficency	0.75	
Adjusted production	375	lcy/hr
Production for 4 trucks	154	lcy/hr
Total hours to haul from fills	359	hrs
Excavator shaping and pull up time	294	hrs
Total time for excavator	654	hrs

Truck production governs exc. time due to congestion, only 4 trucks can be used

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hou Equipme Costs	Number Needed	Equipment Total Job Hourly
Cat 235C Excavat	$14,320.00	$81.36	$92.25	$17.36	$190.98	1	$190.98

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourl Cost	Number Needed	Total Labor costs Hourly
Excavator Operato	$24.95	52.5%	$13.10	$38.05	1	$38.05

Total Cost per hour	$229.02
Total cost for excavator	$149,696
Cost for truck hualing	$237,306
TOTAL HAUL ROAD EARTHWORK	$387,002

Truck haul costs found by using Means unit price information

5/7

ITEM	Description	Comments	Computations		
3.06	Valcam Earthwork		Total Volume	93300	cy
		Assume swell similar to loam	Swell factor	1.25	
		(ref. Standard Handbook for Civil Engineers p. 13-15)	Volume to be hauled (LCY)	116,625	lcy
		Scrapers will be used to excavate, haul,			
		and place material to be graded.	Scraper Production Rate:		
			Cat 637E capacity	31	lcy
			Haul distance	900	ft
		Average Scraper Haul Road Description	Loaded Haul Time	1	min
		Load, haul 800 ft uphill @ 6%	Empty Haul Time	0.5	min
		return empty. Assume rolling equivalent	Manuever & dump	0.6	min
		% Grade of 3%. Therefore total effective	Load Time per pair	1	min
		grade loaded = 9% and empty = -3%.	Total Cycle Time	3.1	min
		See attached sheets from Cat Perf. Book	Cycles per hour	19.4	
		Job efficiency - .83 for normal conditions	Hourly Unit Production	600	lcy/hr
			Job Efficency	0.83	
		A D9N dozer will be used to maintain haul road	Adjusted production	498	lcy/hr
		and assist with spot grading as needed.	Production for 4 units	1,992	lcy/hr
			Total hours to move and spread	59	hrs

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hou Equipme Costs	Number Needed	Equipment Total Job Hourly
Cat D9N dozer U	$12,416.25	$70.55	$34.40	$10.49	$115.44	1	$115.44
Cat 637E P-P scra	$22,296.75	$126.69	$92.25	$21.89	$240.83	4	$963.32
							$1,078.76

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourl Cost	Number Needed	Total Labor costs Hourly
Dozer Operator	$24.10	52.5%	$12.65	$36.75	1	$36.75
Scraper Operators	$24.10	52.5%	$12.65	$36.75	4	$147.01
						$183.76

Total Cost per hour	$1,262.52
TOTAL JOB	$73,917

6/9

ITEM	Description	Comments	Computations
3.07	Water Truck & Foreman	A water truck will be required to maintain haul road for Tasks 3.01, 3.02, 3.05, and 3.06. Tasks 3.03 (Regrade UDD-4 & UDD-5) and Task 3.04 (Belina Haul Road Rock Lifts) can be performed concurrent with other tasks and can share the same water truck. Therefore the total time the water truck is needed	

TOTAL WATER TRUCK TI 726 hours

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hourly Equipment Costs	Number Needed	Equipment Total Job Hourly
Water Truck	$15,692.25	$89.16	$55.97	$0.00	$145.13	1	$145.13

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourly Cost	Number Needed	Total Labor costs Hourly
Dozer Operat	$19.45	53.0%	$10.31	$29.76	1	$29.76

Total cost per hour $174.89 per hour

TOTAL WATER TRUCK $126,945

A foreman is assumed to be needed full time during the grading and revegetation.

Reveg time: riprap 46 days, straw 5 days, riparian 10 days, hydro applications 4 days, trees & shrubs 20 days, & sprinkler system 10 days.

FOREMAN TIME grading 726 hours

revegetaion 760

total Foreman hours 1486 hours

Regional Equip. Adjustment Factor 1.05

EQUIPMENT COSTS (ref. Blue Book 93)

item	Monthly Rate	Hourly Rate	Hourly Operating Cost	Overhead & Profit 10%	Total Hourly Equipment Costs	Number Needed	Equipment Total Job Hourly
pickup	$590.00	$3.35	$5.05	$0.00	$8.40	1	$8.40

LABOR COSTS (ref. Means 93)

	Hourly Rate	Olverhead & Profit %	Amount	Total Hourly Cost	Number Needed	Total Labor costs Hourly
Foreman	$26.10	57.4%	$14.98	$41.08	1	$41.08

Total cost per hour $49.48 per hour

TOTAL FOREMAN $73,526

TOTAL FOREMAN + WATER TRUCK $200,470

Revegetation

VALLEY CAMP OF UTAH 4.00 Revegetation Costs (includes riprap)
03-Aug-93

Note: Equipment rental rates are taken from the 1993 Rental Blue Book (Dataquest Incorporated)
An overhead and profit allowance of 10% is added to equipment costs based on procedures presented on page 3 of the 1993 Means Heavy Construction Cost Data.
Labor costs including overhead & profit are taken from the 1993 Means Heavy Construction Cost Data (R.S. Means Company, 1992).
Production rates and factors are taken from the Caterpillar Performance Handbook 22nd edition, October 1991.

ITEM	Description	Comments	Computations		
4.01	Belina Complex	Riprap Channel & riprap slope stabilzation	Total volume riprap needed	4440	cy
			Riprap (93 022 712 0100)	$28.00	/cy
		Haul from quarry near Nephi (110 miles)	Haul costs per cy	$36.30	/cy
		at cost of $0.15/ton-mile with 2.2 tons/cy)	Total cost per cy	$64.30	/cy
			Total riprap Belina site costs	$285,492	
			Granular Filter	2200	cy
			Unit Cost (022 308 2023)	$16.45	/cy
			Haul costs per cy	$36.30	/cy
			Total cost per cy	$52.75	/cy
			Total filter Belina site costs	$116,050	
			TOTAL RIPRAP CHANNEL & SLOPE STABILIZATION	$401,542	

ITEM	Description	Comments	Computations		
4.02	VALCAM RIPRAP CHANNEL		Total volume riprap needed	1100	cy
			Riprap (93 022 712 0100)	$28.00	/cy
		Haul from quarry near Nephi (110 miles)	Haul costs per cy	$36.30	/cy
		at cost of $0.15/ton-mile with 2.2 tons/cy)	Total cost per cy	$64.30	/cy
			Total riprap Valcam site costs	$70,730	
			Granular Filter	800	cy
			Unit Cost (022 308 2023)	$16.45	/cy
			Haul costs per cy	$36.30	/cy
			Total cost per cy	$52.75	/cy
			Total filter Belina site costs	$42,200	
			TOTAL VALCAM RIPRAP CHANNEL	$112,930	

ITEM	Description	Comments		Computations		
4.03	STRAW BALE BARRIER - VALCAM SITE			Total length of straw bale barrier	6040	ft
				Number of bales	2157	bales
				Tons	77	tons
				Straw Unit Cost (93 022 704 1200)	$340	/ton
				Total straw cost (placed & removed)	$26,194	
				Stakes (assume $.5/bale)	$1,079	
			Valcam	Total cost straw bale barrier	$27,272	

ITEM	Description	Comments		Computations		
4.04	STRAW BALE BARRIER - BELINA SITE			Total length of straw bale barrier	6940	ft
				Number of bales	2479	bales
				Tons	89	tons
				Straw Unit Cost (93 022 704 1200)	$340	/ton
				Total straw cost (placed & removed)	$30,097	
				Stakes (assume $.5/bale)	$1,239	
			Belina	Total cost straw bale barrier	$31,336	

ITEM	Description	Comments	Computations			
4.05	Riparian Vegetation					
		Riparian Vegetation to be planted along reclaimed stream channels		Total area	1.5	acres
			Willows harvest & plant (300 sets/ac)		$3,000	/ac
			Shrubs		$25,895	/ac
			Total Costs per acre		$28,895	/ac
			Total riprarian vegetation		$43,343	

ITEM	Description	Comments	Computations		
4.06	Valcam revegetation		Total disturbed area Valcam	34	acres
		Hydro seeding & mulching (029 308 4600)/ thousand sf		42.50	M.S.F.
			Total hydro seeding & mulching	$62,944	
		From areal photo appears would have covered	Tree & shrub planting area	4	acres
		about 4 acres of the site.	Shrub & tree hand sets/acre	1500	sets/ac
			Hand set unit cost	$12	/set
			Shrub cost per acre	$17,925	
			Total cost for shrubs	$71,700	
			Total revegetation cost	$134,644	

ITEM	Description	Comments	Computations		
4.06	Belina Complex Revegetation (except Riparian areas)		Total disturbed area Belina	28	acres
		Hydro seeding & mulching (029 308 4600)/ thousand sf		42.50	M.S.F.
			Total hydro seeding & mulching	$51,836	
		From areal photo appears that trees cover about	Shrub & tree planting area	14	
		50% of undisturbed areas	Shrub & tree hand sets/acre	1900	sets/ac
			Hand set unit cost	$12	/set
			Shrub cost per acre	$22,705	
			Total cost for shrubs	$317,870	
			Total revegetation cost	$369,706	

ITEM	Description	Comments	Computations		
4.07	Belina Haul Road Revetation		Total disturbed area Haul Road	12	acres
		Hydro seeding & mulching (029 308 4600)/ thousand sf		42.50	M.S.F.
			Total hydro seeding & mulching	$22,216	
		Trees/shrubs to be planted based on density	Plant trees & shrubs	8	acres
		of undisturbed areas	Shrub & tree hand sets/acre	1900	sets/ac
			Hand set unit cost	$12	/set
			Shrub cost per acre	$22,705	
			Total cost for shrubs	$181,640	
		Temporary Irrigation system:	Main Line 5" quick couple	6500	ft
		Hadfield Sprinkler & Supply	cost per foot complete	$6.10	/ft
			Total mainline	39650	
			laterals 1300'	5	each
			cost per lateral	$3,625	each
			Total laterals	$18,125	
			Valves, tees, etc.	$2,100	
			Installation manhours	200	hrs
			labor cost	$37.95	/hr
			total labor	$7,590	
			total sprinkler cost	$67,465	
			Total haul road revegetation	$271,321	

Backup Materials & Documentation

BELINA COMPLEX

005A CONCRETE FILTER POND (S-42)

280 C.Y. Concrete
100 ft. 12" CMP

NOTE: The following listed structural steel was erected by R. W. Taylor and the quanitative weights were taken from a set of fabrication and erection drawings with noted weights for the foreman to know the weight of all picks to be made.

B1 BELT STRUCTURE (S-35)

Structural Steel 88 ton

B3 BELT STRUCTURE (S-32)

Structural Steel 8.2 ton

TRANSFER BUILDING (S-39)

Structural Steel 7 ton

CONTROL BUILDING (S-33)

Structural Steel 5 ton

30 TON TRUCK BIN (S-32)

Structual Steel 18.3 ton

STACKING TUBE (S-38)

Structural Steel 41 ton

RECLAIM TUNNEL (S-39)

Aluminum Tunnel Liner 212 L.F.

NOTE: The following information was provided by General Coal, Helper, Utah, cubic yards were taken from invoices to Valley Camp.

CONCRETE (For the above noted structural steel erected by General Coal and R.W. Taylor)

1004 C.Y. Concrete

BELINA HAUL ROAD

NOTE: The following information was taken from a General Coal invoice to Valley Camp.

Bituminous Surface 9300 ton
Bituminous Tack 49 ton
Bituminous Prime 34 ton
6" Apron 27 C.Y. Concrete
9" Pavement 355 C.Y. Concrete
900 C.Y. Concrete (ditch)
24" CMP 700' L.F.
6" CMP 150' L.F.
Beam Guardrail 8,400 L.F.

BELINA No. 1 PORTALS (12,13, & 15)

NOTE: Best guess, no available information.

45 C.Y. Concrete

BELINA No. 1 BELT PORTAL (14)

NOTE: Best guess, no available information

18 C.Y. Concrete

BELINA No. 1 FAN (S-41)

110 C.Y. Concrete

BELINA No. 2 FAN (S-42)

110 C.Y. Concrete

BELINA No. 2 PORTALS (8,9,10, and 11)

NOTE: The Structural Steel Arch weight was taken from the Commercial Shearing, Inc. quotation sheets.

Structural Steel (Arch, liner, pipe, rods, etc) 82 ton

154 C.Y. Concrete

BELINA No. 2 MANWAY PORTAL (7)

Note: Best guess, no information available.

Structure Steel Arch 18 ton
25 C.Y. Concrete

HIGH ANGLE CONVEYOR (S-38)

Structural Steel 50 ton ("EB Foust")
10 C.Y. Concrete

BATHHOUSE (S-27)

NOTE: The following information was taken from the Brotherton/Gillies Architects construction drawings.

Structural Steel 17 ton
PreFab Concrete Walls 490 L.F.
450 C.Y. Concrete

WASTE WATER TREATMENT PLANT (S-26)

NOTE: Best guess, can find no information on quanities, designed for 150 snow and 150 wind loads.

Structural Steel 5 ton
Solid Concrete Block 160 L.F. 15' wall
111 C.Y. Concrete (includes retaining wall and apron in front)

SHOP BUILDING (S-28)

NOTE: Best guess, can find no information on quanities.

Structural Steel 4 ton
35 C.Y. Concrete

WASH BAY (S-31)

15 C.Y. Concrete

NOTE: Best guess can find no information on quanities.

PUMP HOUSE (S-30)

Concrete Block 80 L.F. 8' wall
25 C.Y. Concrete

VALCAM LOADOUT FACILITY

The following information was taken from the Emko Construction Inc. Train Loadout Facility cost summary sheet.

COAL STOCKOUT TUBE (S-17)

77 C.Y. Concrete
Embedded Steel 18.8 ton

RECLAIM TUNNEL (S-18)

670 C.Y. Concrete
Embedded Steel 90.5 ton
Structual Steel 6.2 ton
100 L.F. 5' Dia. CMP
Plate Steel 9.61 ton

MINE PRODUCT SURGE (S-15 partial)

4 C.Y.
Embedded and Structual Steel 1.5 ton

EMERGENCY RECLAIM HOPPER (S-15 backstop wall)

5 C.Y. Concrete
Embedded Steel and Rebar 2 ton
Structual Steel 2 ton
Plate Steel 7 ton

CONVEYOR C-2 42" (S-14)

7 C.Y. Concrete
Structual Steel 9.8 ton
Plate Steel 6.1 ton

CONVEYOR C-12 42" (S-16)

17 C.Y. Concrete
Structual Steel 19 ton
Plate Steel 4.8 ton

CONVEYOR C-18 60" (S-19)

16 C.Y. Concrete
Structual Steel 22.9 ton
Plate Steel 6.6 ton

CRUSHER HOUSE (S-15)

50 C.Y. Concrete
Structual Steel 47 ton
Plate Steel 14 ton
Grating, Stairs, and Handrail 47 ton

UNIT TRAIN LOADOUT (S-21)

37 C.Y. Concrete
Structual Steel 37 ton
Plate Steel 14.2 ton

ELECTRICAL WORK (Substation) (S-20)

26 C.Y. Concrete

EMERGENCY BYPASS (S-15 partial)

16 C.Y. Concrete
Steel 3.25 ton

PORTALS (Valcam) (5 and 6)

235 C.Y. Concrete

GENERAL OFFICE BUILDING (S-22)

184 C.Y. Concrete

WATER TANK (S-8)

11 C.Y. Concrete

Note: The Truck Scale information was taken from the Colt Industries Fairbanks Weighing Division Weighbridge Detail Drawing.

TRUCK SCALE (S-9)

145 C.Y. Concrete

The Truck Dump concrete information was taken invoices from Mathews Industral Contractors, Inc. invoices.

TRUCK DUMP (S-10)

234 C.Y. Concrete
Steel 11? ton

TRUCK DUMP BELT STRUCTURE (S-11)

12? C.Y. Concrete
Steel 25? ton

BATHHOUSE (S-4)

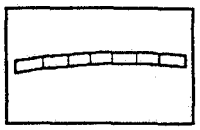
Trailers only

VALCAM SHOP (S-2)

Wood Structure
25 C.Y. Concrete

VALCAM SHOP SUBSTATION (S-3)

Pole Mounted Hardware



STB

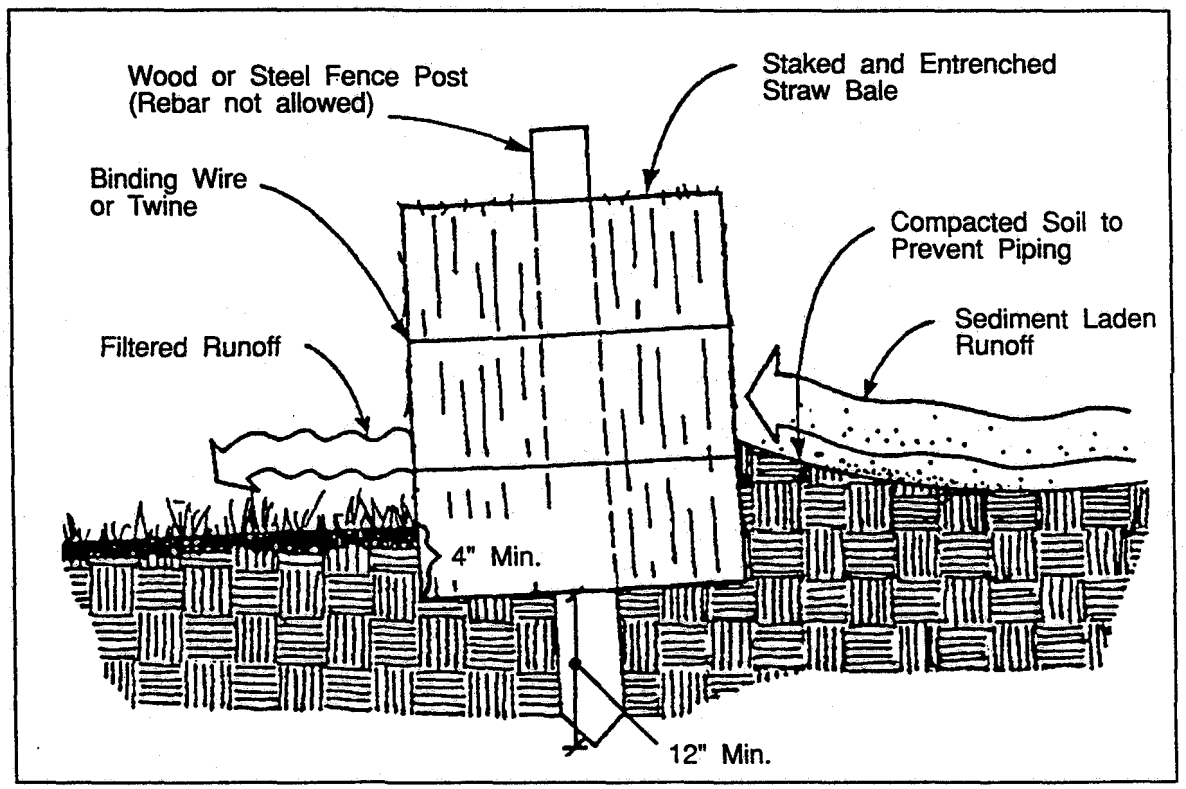
STRAW BALE BARRIER

Definition

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

Purposes

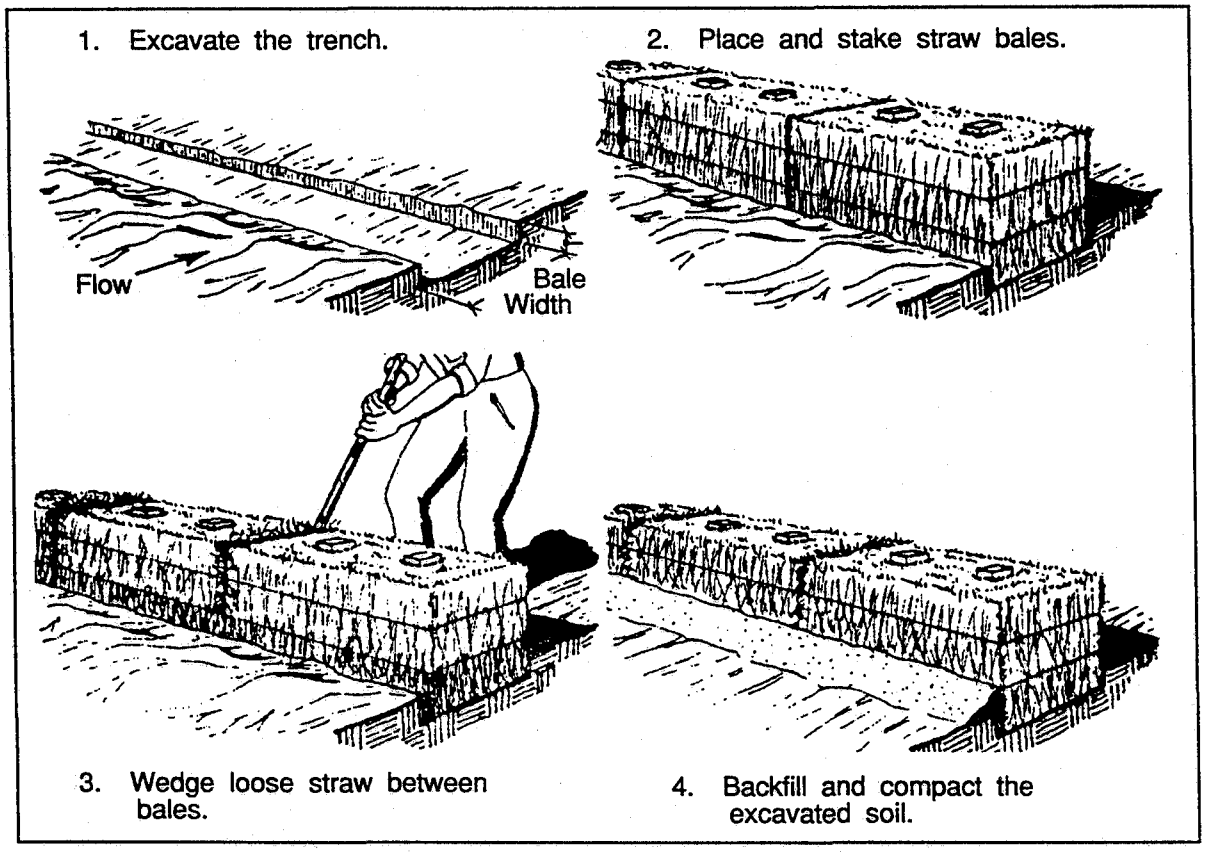
1. To intercept and detain small amounts of sediment from disturbed areas of limited extent in order to reduce sediment in runoff from leaving the site.
2. To decrease the velocity of sheet flows from hillslope areas



From: Virginia Soil and Water Conservation Commission, 1985

Figure 4-5A Straw Bale Barriers

STRAW BALE BARRIER INSTALLATION



From: Virginia Soil and Water Conservation Commission, 1985

Figure 4-5B Straw Bale Barrier Installation

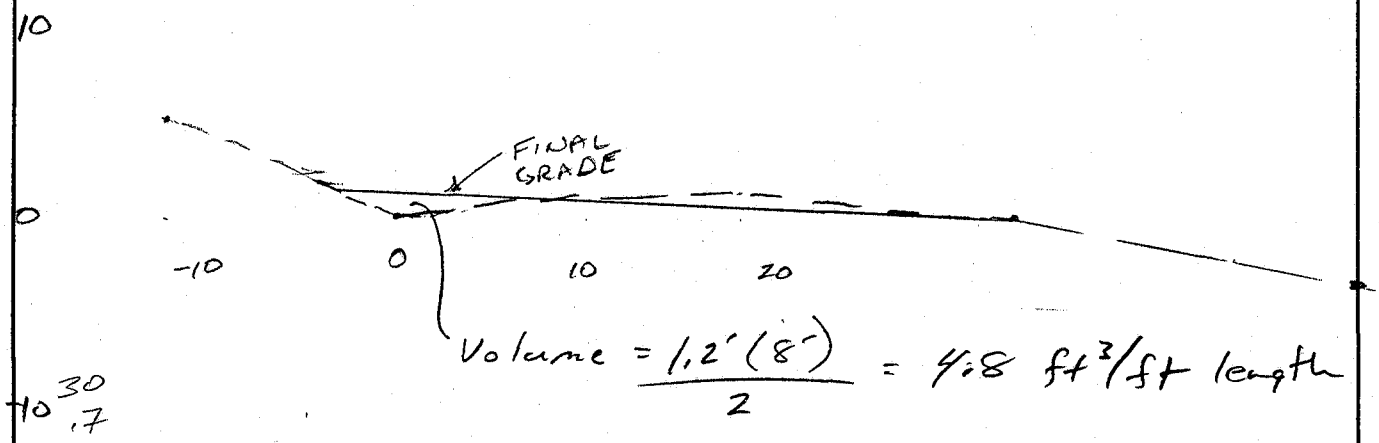
HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Reclamation
FEATURE Ditches UDD-4 & UDD-5
PROJECT NO. 7

SHEET ___ OF ___
COMPUTED G.L.P.
CHECKED
DATE 8/2/93

Typical cross-section

-12	5
0	0
18	1.4'
32'	0'
60'	-5'



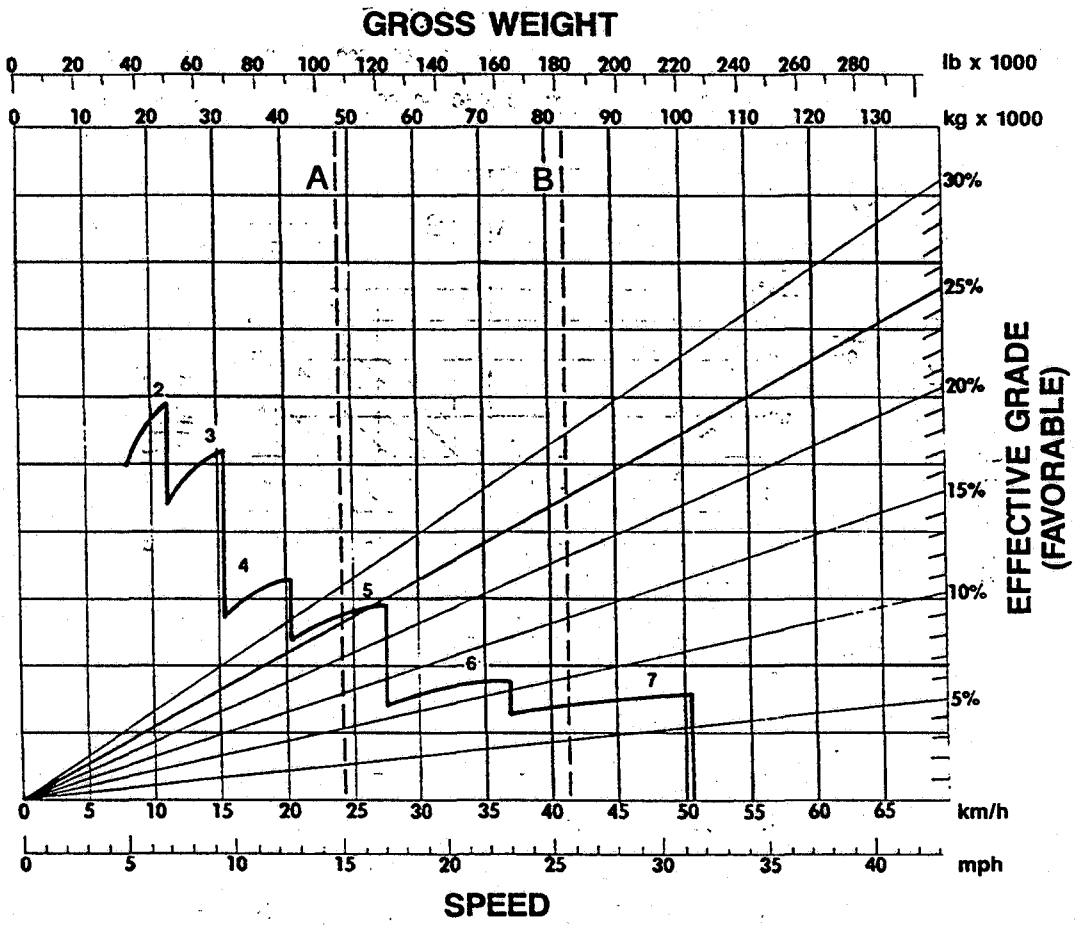
Volume $= \frac{1.2'(8')}{2} = 4.8$ ft³/ft length

Total length = 1400 feet

Total volume $= 1400 \times 4.8/27 =$ **249 CY**

MODEL	627E		637E		657E	
Flywheel Power: Tractor	246.2 kW	330 HP	336 kW	450 HP	410 kW	550 HP
Scraper	168 kW	225 HP	187 kW	250 HP	298 kW	400 HP
Operating Weight (Empty)◄	35 160 kg	77,513 lb	50 843 kg	112,088 lb	68 860 kg	151,808 lb
Scraper Capacity: Struck	10.7 m³	14 yd³	16.1 m³	21 yd³	24.5 m³	32 yd³
Heaped	15.3 m³	20 yd³	23.7 m³	31 yd³	33.6 m³	44 yd³
Rated Load	21 770 kg	48,000 lb	34 020 kg	75,000 lb	47 200 kg	104,000 lb
Weight Distribution — Empty: Front	59%		59%		61%	
Rear	41%		41%		39%	
Weight Distribution — Loaded: Front	48%		49%		51%	
Rear	52%		51%		49%	
Engine Model: Tractor	3406		3408		3412	
Scraper	3306		3306		3408	
Rated Engine RPM: Tractor	1900		2000		1900	
Scraper	2200		2200		1900	
Displacement: Tractor	14.6 L	891 in³	18.0 L	1099 in³	27.0 L	1649 in³
Scraper	10.5 L	638 in³	10.5 L	638 in³	18.0 L	1099 in³
Top Speed (Loaded)	51.3 km/h	32 mph	48 km/h	30 mph	50 km/h	31.1 mph
Non-Stop Turning Circle	10.9 m	35'9"	12.2 m	40'1"	13.6 m	44'7"
With ROPS Restriction	—		—		14.5 m	47'7"
Tires — Tractor Drive	33.25-29, 26 PR (E-3)		37.25-35, 30 PR (E-3)		37.5R39 Radial ★★(E-3)	
Scraper	33.25-29, 26 PR (E-3)		37.25-35, 30 PR (E-3)		37.5R39 Radial ★★(E-3)	
Width of Cut	3.02 m	9'11"	3.51 m	11'6"	3.85 m	12'8"
Maximum Depth of Cut	333 mm	13.1"	437 mm	17"	660 mm	26"
Maximum Depth of Spread	522 mm	20.6"	480 mm	18'8"	533 mm	21"
Fuel Tank Refill Capacity: Tractor	—		—		—	
Scraper	984 L	260 U.S. gal	1220 L	322 U.S. gal	1650 L	435 U.S. gal
GENERAL DIMENSIONS:						
Height to Top of Scraper	3.71 m	12'2"	4.29 m	14'1"	4.71 m	15'5"
Wheelbase	7.72 m	25'4"	8.77 m	28'9"	9.92 m	32'7"
Overall Length	12.93 m	42'3"	14.28 m	46'10"	16.2 m	53'0"
Overall Width	3.47 m	11'4"	3.94 m	12'11"	4.35 m	14'4"
Shipping Width (Draft Arm on Inside of Bowl)	—		3.64 m	11'11"	3.91 m	12'10"
Scraper Tread	2.18 m	7'2"	2.46 m	8'1"	2.85 m	9'4"
Tractor Tread	2.21 m	7'3"	2.46 m	8'1"	2.64 m	8'8"
PUSH-PULL GENERAL DIMENSIONS:						
Operating Weight (Empty)◄	36 620 kg	80,732 lb	52 385 kg	115,487 lb	72 640 kg	160,141 lb
Overall Length	15.2 m	49'7"	16.49 m	54'1"		
Weight Distribution — Empty: Front	60%		60%		61%	
Rear	40%		40%		39%	
Weight Distribution — Loaded: Front	49%		50%		51%	
Rear	51%		50%		49%	

◄Operating weight includes coolant, lubricants, full fuel tank, ROPS and operator.

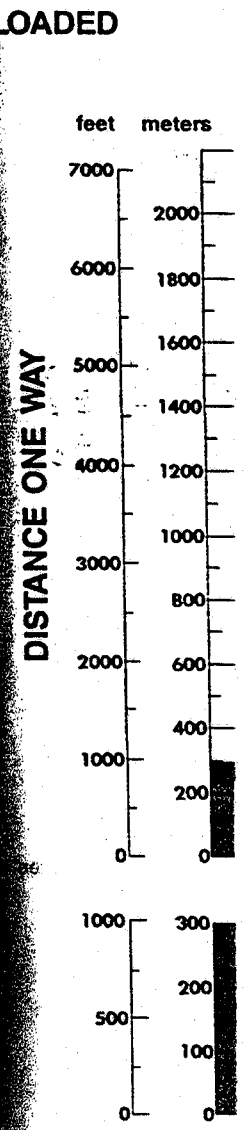


KEY

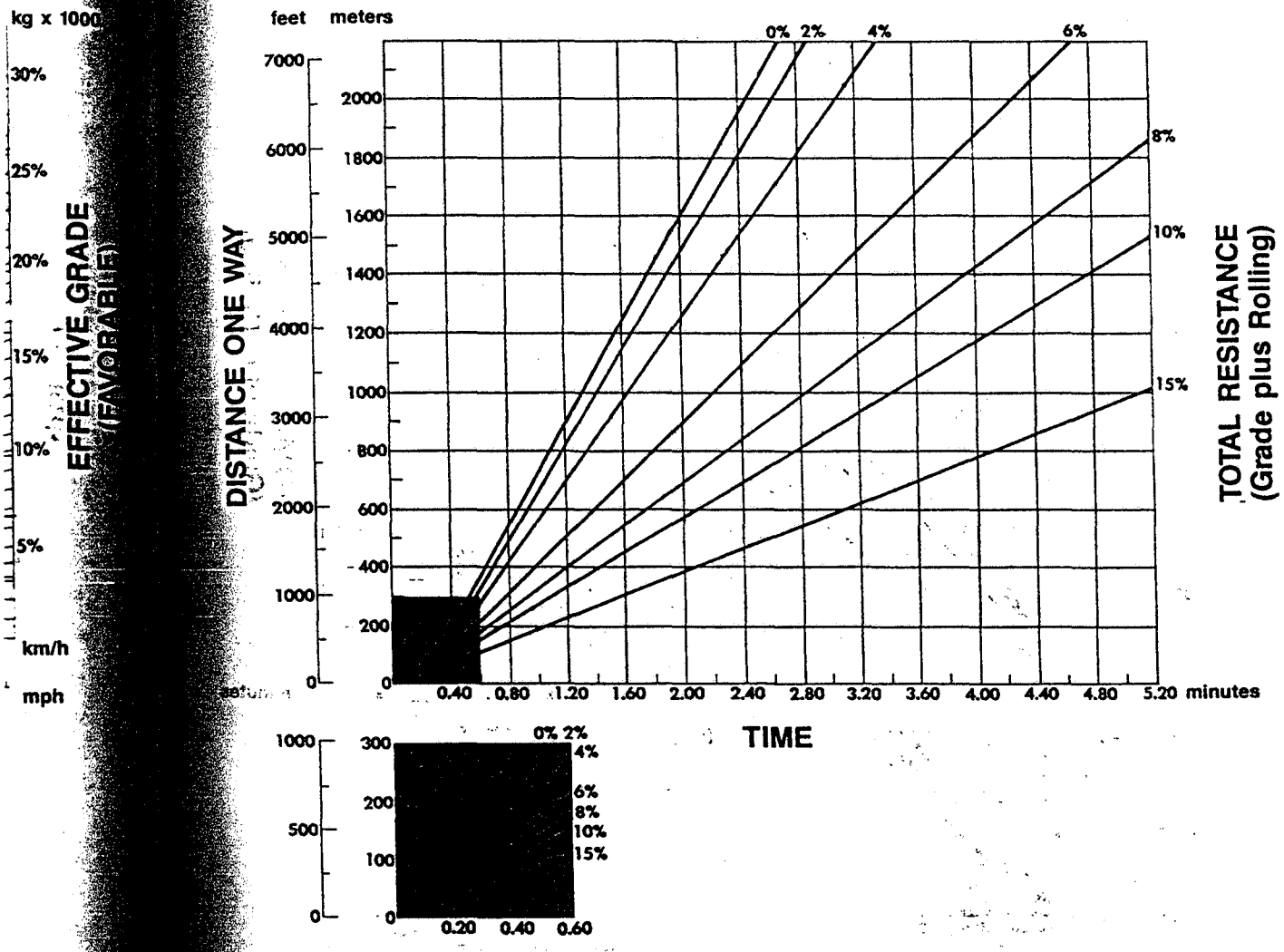
2 — 2nd Gear
3 — 3rd Gear
4 — 4th Gear
5 — 5th Gear
6 — 6th Gear
7 — 7th Gear

KEY

A — Empty 50 843 kg (112,088 lb)
B — Loaded 84 863 kg (187,088 lb)



LOADED

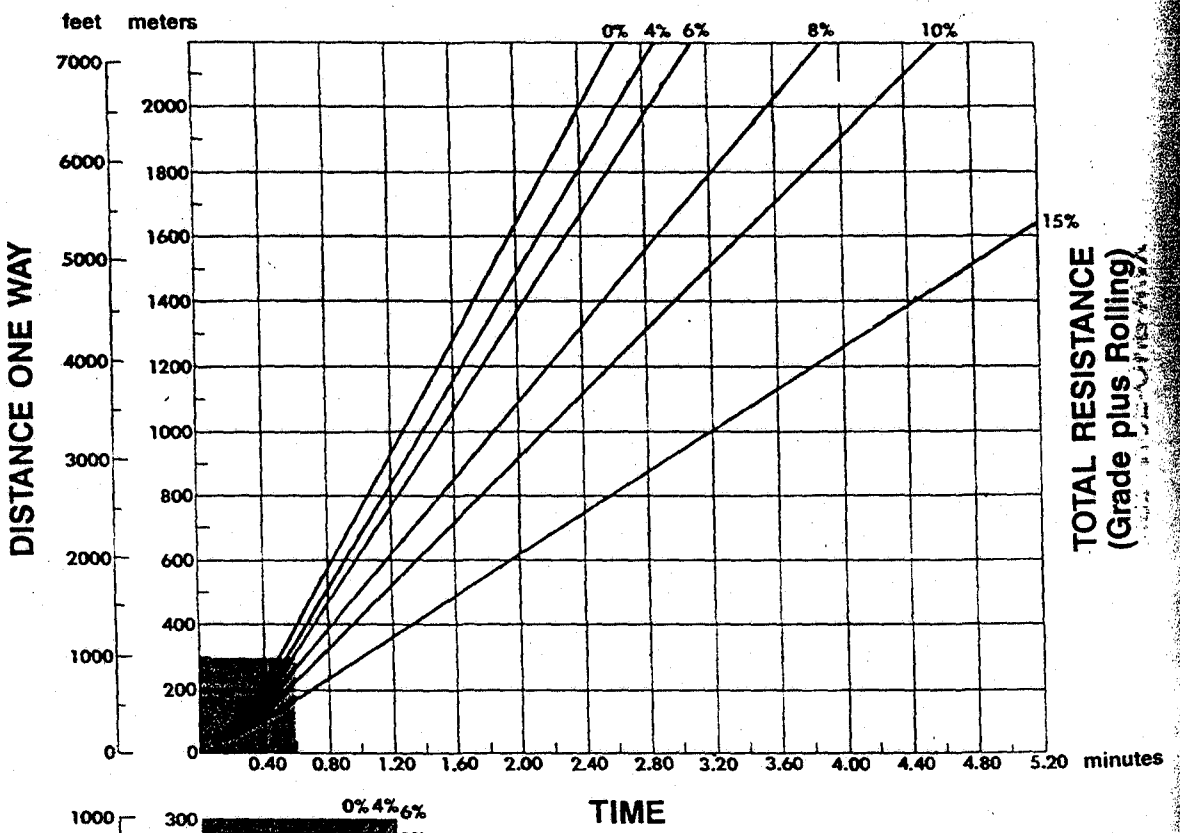


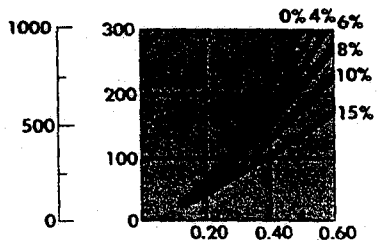
Vehicle empty weight: 50 843 kg (112,088 lb) — Standard
52 385 kg (115,487 lb) — Push-Pull
Payload: 34 020 kg, 19.1 Bm³ (75,000 lb, 25.0 BCY)

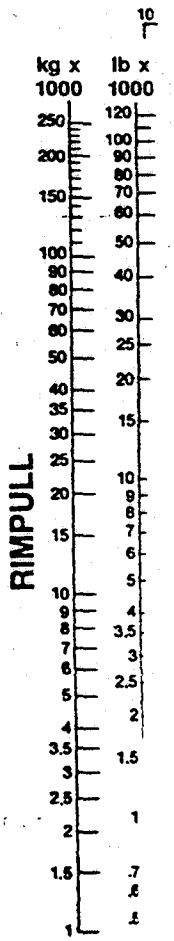
Wheel Tractor-Scrapers

637E Travel Time — Empty
- 37.25-35 Tires
- Standard and Push-Pull

EMPTY







KEY
1 — 1st
2 — 2nd
3 — 3rd
4 — 4th
5 — 5th
6 — 6th
7 — 7th
8 — 8th

Vehicle empty weight: 50 843 kg (112,088 lb) — Standard
52 385 kg (115,487 lb) — Push-Pull

ycle Time —

= load* + haul + maneuver & spread* + return
= 0.6 + 1.4 + .7 + 1.0
= 3.7 min.

*For fixed time (load, maneuver and spread) see the table below.

When cycle time and payload are known, productivity can be calculated. For a more complex example see the Earthmoving Section.

• • •

TYPICAL FIXED TIMES FOR SCRAPERS

(Times may vary depending on job conditions)

Model	Loaded By	Load Time (Min.)	Maneuver and Spread or Maneuver and Dump (Min.)
513C	Self Loading	0.9	0.7
515C	Self Loading	0.9	0.7
623E	Self Loading	0.9	0.7
621E	One D8N	0.5	0.7
627E	One D8N	0.5	0.6
621E	One D9N	0.4	0.7
627E	One D9N	0.4	0.6
627E/PP	Self Loading	0.9*	0.6
631E	One D9N	0.6	0.7
637E	One D9N	0.6	0.6
631E	One D10N	0.5	0.7
637E	One D10N	0.5	0.6
637E/PP	Self Loading	1.0*	0.6
651E	One D11N	0.6	0.7
657E	One D11N	0.6	0.6
657E	Push Pull	1.1*	0.6
	Self Loading		
621E	Auger	0.9	0.7
627E	Auger	0.7	0.7
631E	Auger	0.9	0.7
637E	Auger	0.8	0.7
651E	Auger	1.3	0.7
657E	Auger	1.0	0.7

*ad time per pair, including transfer time.

NOTE: Vehicle Empty Weights shown on the following charts includes ROPS Canopy. The travel times will remain within acceptable limits when applied to a non-ROPS equipped machine. When calculating TMPH loadings *any* additional weight must be considered in establishing mean tire loads.

USE OF RETARDER CURVES

The speed that can be maintained (without use of service brake) when the vehicle is descending a grade with retarder fully on can be determined from the retarder curves in this section if gross vehicle weight and total effective grade are known.

Total Effective Grade (or Total Resistance) is grade assistance *minus* rolling resistance.

10 kg/metric ton (20 lb/U.S. ton) = 1% adverse grade.

Example

15% favorable grade with 5% rolling resistance. Find Total Effective Grade.

Total Effective Grade = 15% Grade Assistance — 5%
Rolling Resistance = 10% Total Effective Grade Assistance.

Example Problem:

A 651E with an estimated payload of 47 200 kg (104,056 lb) descends a 10% total effective grade. Find constant speed and gear range with maximum retarder effort. Find travel time if the slope is 610 m (2000 ft) long.

Empty Weight + Payload = Gross Weight
= 60 950 kg + 47 200 kg = 108 150 kg
(134,370 lb + 104,056 lb = 238,426 lb)

5) Establish a horizontal line right from point D. The farthest right intersection of this line with a curved speed range line is point E.

6) A vertical line down from point E determines point F on the speed scale.

7) Multiply speed in km/h by 16.7 (mph by 88) to obtain speed in m/min (ft/min). Travel time in minutes for a given distance in feet is determined by the formula:

$$\text{Time (min)} = \frac{\text{Distance in m (ft)}}{\text{Speed in m/min (ft/min)}}$$

The Travel Time Graphs in sections on Wheel Tractor-Scrapers and Off-Highway Trucks can be used as an alternative method of calculating haul and/or return times.

Job Efficiency — is one of the most complex elements of estimating production since it is influenced by factors such as operator skill, minor repairs and adjustments, personnel delays, and delays caused by job layout. An approximation of efficiency, if no job data is available, is given below.

Operation	Working Hour	Efficiency Factor
Day	50 min/hr	0.83
Night	45 min/hr	0.75

These factors do not account for delays due to weather, major overhauls, or repairs. You must account for such factors based on experience and local conditions.

• • • • • • • • • • • • • • • • • •

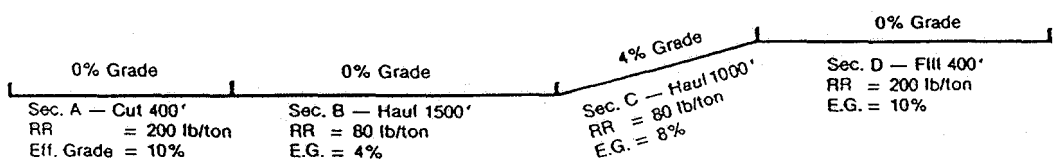
Example problem (English)

A contractor is planning to put the following spread on a dam job. What is the estimated production and cost/BCY?

Equipment:
- 11 — 631E Wheel Tractor-Scrapers
- 2 — D9N Tractors with C-dozers
- 2 — 12G Motor Graders
- 1 — 825C Tamping Foot Compactor

Material:
- Description — Sandy clay; damp, natural bed
- Bank Density — 3000 lb/BCY
- Load Factor — 0.80
- Shrinkage Factor — 0.85
- Traction Factor — 0.50
- Altitude — 7500 ft.

Job Layout — Haul and Return:



Total Effective Grade = RR (%) ± GR (%)

Sec. A: Total Effective Grade = 10% + 0% = 10%
Sec. B: Total Effective Grade = 4% + 0% = 4%
Sec. C: Total Effective Grade = 4% + 4% = 8%
Sec. D: Total Effective Grade = 10% + 0% = 10%

1. Estimate Payload:
Est. load (LCY) × L.F. × Bank Density = payload
31 LCY × 0.80 × 3000 lb/BCY = 74,400 lb payload

2. Establish Machine Weight:
Empty Wt. — 88,000 lb or 44 tons
Wt. of Load — 74,400 lb or 37.2 tons
Total (GVW) — 162,400 lb or 81.2 tons

3. Calculate Usable Pull (traction limitation):
Loaded: (weight on driving wheels = 54%) (GVW)
Traction Factor × Wt. on driving wheels =
0.50 × 162,400 lb × 54% = 43,848 lbs

Empty: (weight on driving wheels = 69%) (GVW)
Traction Factor × Wt. on driving wheels =
0.50 × 88,000 lbs × 69% = 30,360 lbs

4. Derate for Altitude:
Check power available at 7500 ft from altitude deration table in the Tables Section.

631E — 100%	12G — 85%
D9N — 100%	825C — 94%

Cycle Time Estimating Chart

Model	215D LC & 219D/219D LC	225D, 225D LC, 229D/229D LC, & 231D	235C	245B Series II
Bucket Size				
L	902	1351	2100	2600
(yd³)	1.12	1.78	2.75	3.5
Soil Type	Hard Clay	Hard Clay	Hard Clay	Hard Clay
Digging Depth				
m	2.0	3.0	4.0	5.2
(ft.)	8	10	13	17
Load Bucket	0.09 min.	0.08 min.	0.11 min.	0.12 min.
Swing Loaded	0.06 min.	0.07 min.	0.10 min.	0.12 min.
Dump Bucket	0.03 min.	0.03 min.	0.04 min.	0.05 min.
Swing Empty	0.06 min.	0.07 min.	0.08 min.	0.10 min.
Total Cycle Time (min.)	0.24 min.	0.25 min.	0.33 min.	0.39 min.

CYCLE TIME ESTIMATING CHART

CYCLE TIME	MACHINE SIZE CLASS: 215D LC & 219D/219D LC	225D, 225D LC, 229D/229D LC, & 231D	235C	245B Series II	CYCLE TIME
10 SEC.					.7 min.
15					.25 min.
20 SEC.					.33 min.
25					.42 min.
30 SEC.					.50 min.
35					.58 min.
40 SEC.					.67 min.
45					.75 min.
50 SEC.					.83 min.
55					.92 min.
60 SEC.					1.0 min.

Fastest Possible — A
Fastest Practical — B
Typical Range — C
D
Slow — E

KEY

A — Excellent
B — Above Average
C — Average
D — Below Average
E — Severe

CYCLE TIME -vs- JOB CONDITIO DESCRIPTION

— Easy digging (unpacked earth, sand gra ditch cleaning, etc.). Digging to less th 40% of machine's maximum depth capabi ity. Swing angle less than 30°. Dump on spoil pile or truck in excavation. N obstructions. Good operator.

— Medium digging (packed earth, tough c clay, soil with less than 25% rock conten Depth to 50% of machine's maximum cap bility. Swing angle to 60°. Large dump ta get. Few obstructions.

— Medium to hard digging (hard packed so with up to 50% rock content). Depth to 70 of machine's maximum capability. Swin angle to 90°. Loading trucks with truc spotted close to excavator.

— Hard digging (shot rock or tough soil wi up to 75% rock content). Depth to 90% machine's maximum capability. Swin angle to 120°. Shored trench. Small dump target. Working over pipe crew.

— Toughest digging (sandstone, caliche, shale certain limestones, hard frost). Over 90% o machine's maximum depth capability Swing over 120°. Loading bucket in max box. Dump into small target requiring max imum excavator reach. People and obstruc tions in the work area.

STANDARD CRAWLER DOZERS

(Includes dozer and ROPS.)

Model (Yr.Disc.)	Dozer	Transmission	HP	Monthly	Weekly	Daily	Hourly	Estimated Operating Cost/Hr.
Diesel Powered, Continued								
CATERPILLAR, Continued								
D7H DS (1990)	U Blade	Powershift	215.0	$ 8,135.00	$ 2,280.00	$ 570.00	$ 86.00	$ 19.45
D7H DS SERIES II	Angle	Powershift	215.0	8,705.00	2,435.00	610.00	92.00	19.60
D7H DS SERIES II	Semi-U	Powershift	215.0	8,800.00	2,465.00	615.00	92.00	19.70
D7H DS SERIES II	Straight	Powershift	215.0	8,770.00	2,455.00	615.00	92.00	19.70
D7H DS SERIES II	U Blade	Powershift	215.0	8,845.00	2,475.00	620.00	93.00	19.75
D7H SERIES II	Angle	Powershift	215.0	8,440.00	2,365.00	590.00	89.00	19.30
D7H SERIES II	Semi-U	Powershift	215.0	8,535.00	2,390.00	600.00	90.00	19.45
D7H SERIES II	Straight	Powershift	215.0	8,505.00	2,380.00	595.00	89.00	19.40
D7H SERIES II	U Blade	Powershift	215.0	8,580.00	2,400.00	600.00	90.00	19.50
D8L	Angle	Powershift	335.0	11,985.00	3,355.00	840.00	125.00	29.25
D8L	Semi-U	Powershift	335.0	12,000.00	3,360.00	840.00	125.00	29.30
D8N	Angle	Powershift	285.0	10,190.00	2,855.00	715.00	105.00	25.40
D8N	Semi-U	Powershift	285.0	10,230.00	2,865.00	715.00	105.00	25.45
D8N	U Blade	Powershift	285.0	10,305.00	2,885.00	720.00	110.00	25.55
D9L (1987)	Cushion	Powershift	460.0	12,210.00	3,420.00	855.00	130.00	40.80
D9L (1987)	Straight	Powershift	460.0	12,385.00	3,470.00	870.00	130.00	41.10
D9L (1987)	U Blade	Powershift	460.0	12,415.00	3,475.00	870.00	130.00	41.20
D9N	Semi-U	Powershift	370.0	11,730.00	3,285.00	820.00	125.00	34.25
D9N	U Blade	Powershift	370.0	11,825.00	3,310.00	830.00	125.00	34.40
D10N	Semi-U	Powershift	520.0	15,705.00	4,395.00	1,100.00	165.00	45.85
D10N	Semi-U Abrasion Bld	Powershift	520.0	15,795.00	4,425.00	1,105.00	165.00	46.00
D10N	U Blade	Powershift	520.0	15,745.00	4,410.00	1,105.00	165.00	45.95
D11N	Semi-U	Powershift	770.0	25,915.00	7,255.00	1,815.00	270.00	70.00
D11N	Semi-U Abrasion Bld	Powershift	770.0	26,070.00	7,300.00	1,825.00	275.00	70.30
D11N	U Blade	Powershift	770.0	26,125.00	7,315.00	1,830.00	275.00	70.40
DEERE								
350D (1987)	6305-1 Bulldozer	N/A	48.0	1,820.00	510.00	130.00	20.00	6.20
350D (1987)	6305-1 Hyd Bulldozer	N/A	48.0	1,830.00	510.00	130.00	20.00	6.20
350D (1987)	6305-2 Bulldozer	N/A	48.0	1,835.00	515.00	130.00	20.00	6.20
350D (1987)	6310 Bulldozer	N/A	48.0	1,815.00	510.00	130.00	20.00	6.20
400G	Power Angle Tilt	Hi-Lo Reverse	60.0	2,215.00	620.00	155.00	23.00	6.90
450E (1987)	6405 Inside Hyd	Powershift	70.0	2,240.00	625.00	155.00	23.00	7.55
450E (1987)	6410 Outside Hyd	Powershift	70.0	2,230.00	625.00	155.00	23.00	7.55
450E (1987)	6415 Power Tilt	Powershift	70.0	2,235.00	625.00	155.00	23.00	7.55
450G	6405 Inside Hyd	Powershift	70.0	2,430.00	680.00	170.00	26.00	7.50
550B (1987)	6405 Inside Hyd	Powershift	78.0	2,545.00	715.00	180.00	27.00	8.20
550B (1987)	6410 Outside Hyd	Powershift	78.0	2,520.00	705.00	175.00	26.00	8.20
550B (1987)	6415 Power Tilt	Powershift	78.0	2,540.00	710.00	180.00	27.00	8.20
550G	6405 Inside Hyd	Powershift	80.0	2,770.00	775.00	195.00	29.00	8.25
650G	6405 Inside Hyd	Powershift	90.0	3,025.00	845.00	210.00	32.00	8.90
750B	6505 All Hydraulic	Hydrostatic	120.0	4,450.00	1,245.00	310.00	47.00	11.55
750B	6520 Hyd Angle Tilt	Hydrostatic	120.0	4,285.00	1,200.00	300.00	45.00	11.35
750B	6525 Straight w/Tilt	Hydrostatic	120.0	4,215.00	1,180.00	295.00	44.00	11.25
750B	Man Angle Tilt	Hydrostatic	120.0	4,245.00	1,190.00	300.00	45.00	11.30
750B	Straight/wide track	Hydrostatic	120.0	4,255.00	1,190.00	300.00	45.00	11.30
750B LT	All Hydraulic	Hydrostatic	140.0	4,695.00	1,315.00	330.00	50.00	12.65

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SINGLE ENGINE CONVENTIONAL SCRAPERS

Model (Yr.Disc.)	Scraper Capacity	Tractor HP	Monthly	Weekly	Daily	Hourly	Estimated Operating Cost/Hr.
Diesel Powered, Continued							
KOMATSU							
WS23S-1 (1988)	21.6--31.4 CY	438.0	$ 14,570.00	$ 4,080.00	$ 1,020.00	$ 155.00	$ 53.10
WS23S-2 (1990)	21.6--31.4 CY	450.0	15,155.00	4,245.00	1,060.00	160.00	52.95
TEREX							
S24C	24--34 CY	480.0	14,975.00	4,195.00	1,050.00	160.00	51.40

DUAL ENGINE CONVENTIONAL SCRAPERS

Model (Yr.Disc.)	Scraper Capacity	Tractor HP	Scraper HP	Monthly	Weekly	Daily	Hourly	Estimated Operating Cost/Hr.
Diesel/Diesel Powered								
CATERPILLAR								
627E	14--20 CY	225.0	225.0	$ 12,420.00	$ 3,480.00	$ 870.00	$ 130.00	$ 44.00
627E P-P	14--20 CY	225.0	225.0	13,125.00	3,675.00	920.00	140.00	45.35
637E	21--31 CY	450.0	250.0	20,360.00	5,700.00	1,425.00	215.00	71.90
637E P-P	21--31 CY	450.0	250.0	21,135.00	5,920.00	1,480.00	220.00	73.35
657E	32--44 CY	550.0	400.0	25,120.00	7,035.00	1,760.00	265.00	90.10
657E P-P	32--44 CY	550.0	400.0	26,255.00	7,350.00	1,840.00	275.00	92.25

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5 Crew (B-25B)

The "Crew" column designates the typical trade or crew used to install the item. If an installation can be accomplished by one trade and requires no power equipment, that trade and the number of workers are listed (for example, "2 Plum"). If an installation requires a composite crew, a crew code designation is listed (for example, "B-25B"). You'll find full details on all composite crews in the Crew Listings.

- For a complete list of all trades utilized in this book and their abbreviations, see the inside back cover.

CREWS

Crew No.	Bare Costs		Incl. Subs O & P		Cost Per Man-Hour	
Crew B-25B	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman	$20.55	$164.40	$32.25	$258.00	$20.57	$31.91
7 Laborers	18.55	1038.80	29.10	1629.60		
4 Equip. Oper. (medium)	24.10	771.20	36.75	1176.00		
1 Asphalt Paver, 130 H.P.		1145.00		1259.50		
2 Rollers, Steel Wheel		447.60		492.35		
1 Roller, Pneumatic Wheel		231.40		254.55	19.00	20.90
96 M.H., Daily Totals		$3798.40		$5070.00	$39.57	$52.81

6 Productivity: Daily Output (630)/ Man-Hours (.152)

The "Daily Output" represents the typical number of units the designated crew will install in a normal 8-hour day. To find out the number of days the given crew would require to complete the installation, divide your quantity by the daily output. For example:

Quantity	÷	Daily Output	=	Duration
12,000 Ton	÷	630 Ton/ Crew Day	=	19 Crew Days

The "Man-Hours" figure represents the number of man-hours required to install one unit of work. To find out the number of man-hours required for your particular task, multiply the quantity of the item times the number of man-hours shown. For example:

Quantity	x	Productivity Rate	=	Duration
12,000 Ton	x	.152 man-hours/ Ton	=	1824 man-hours

7 Unit (Ton)

The abbreviated designation indicates the unit of measure upon which the price, production, and crew are based. For a complete listing of abbreviations refer to the Abbreviations listing of this book.

8 Bare Costs:

Mat. (Bare Material Cost) (26.50)

This figure for the unit material cost for the line item is the "bare" material cost with no overhead and profit allowances included. *Costs shown reflect national average material prices for January of the current year and include delivery to the job site. No sales taxes are included.*

Labor (3.13)

The unit labor cost is derived by multiplying bare man-hour costs for Crew B-25B by man-hour units. In this case, the bare man-hour cost is found in the Crew Section under B-25B. (If a trade is listed, the hourly labor cost—the wage rate—is found on the inside back cover.)

Man-Hour Cost Crew B-25B	x	Man-Hour Units	=	Labor
$20.57	x	.152	=	$3.13

Equip. (Equipment) (2.90)

Equipment costs for each crew are listed in the description of each crew. The unit equipment cost is derived by multiplying the bare equipment hour cost by the man-hour units.

Equipment Cost Crew B-25B	x	Man-Hour Units	=	Equip.
$19.00	x	.152	=	$2.90

Total (32.53)

The total of the bare costs is the arithmetic total of the three previous columns: mat., labor, and equip.

Material	+	Labor	+	Equip.	=	Total
$26.50	+	$3.13	+	$2.90	=	$32.53

9 Total Costs Including O&P

The figure in this column is the sum of three components: the bare material cost plus 10%; the bare labor cost plus overhead and profit (per the labor rate table on the inside back cover or, if a crew is listed, from the crew listings); and the bare equipment cost plus 10%.

Material is Bare Material cost + 10% = $26.50 + $2.65	=	$29.15
Labor for Crew B-25B = Man-Hour Cost ($31.91) x Man-Hour Units (.152)	=	$ 4.85
Equip. is Bare Equip. Cost + 10% = $2.90 + $0.29	=	$ 3.19
Total	=	$37.19

istance on a slope. Grade resistance

(13-3)

lb per lb
gative for downhill
e rolling and grade resistances, or the

$p + 1\%s)W'$ (13-4)

power with altitude. If so, allow 3%

s:

(13-5)

Art. 13-12.)

raction factors

r tires	Tracks
90	0.45
55	0.90
45	0.70
40	0.70
30	0.30
65	0.55
36	0.50
20	0.25
12	0.12
55	0.90
45	0.60
45	0.60

swell, because of an increase in voids

$\overline{\text{ll}}\ V_L$ (13-6)

(13-7)

l, lb, divided by density of the material

n terms of tons or bank cubic yards of
n job conditions, in 1 hr.

u yd × trips per hr (13-8)

$\frac{\text{n per hr}}{\text{, min}}$ (13-9)

Table 13-9. Load Factors for Earthmoving

Swell, %	Voids, %	Load factor	Swell, %	Voids, %	Load factor
5	4.8	0.952	5.3	5	0.95
10	9.1	0.909	11.1	10	0.90
15	13.0	0.870	17.6	15	0.85
20	16.7	0.833	25.0	20	0.80
25	20.0	0.800	33.3	25	0.75
30	23.1	0.769	42.9	30	0.70
35	25.9	0.741	53.8	35	0.65
40	28.6	0.714	66.7	40	0.60
45	31.0	0.690	81.8	45	0.55
50	33.3	0.667	100.0	50	0.50
55	35.5	0.645			
60	37.5	0.625			
65	39.4	0.606			
70	41.2	0.588			
75	42.9	0.571			
80	44.4	0.556			
85	45.9	0.541			
90	47.4	0.526			
95	48.7	0.513			
100	50.0	0.500			

Table 13-10. Percentage Swell and Load Factors of Materials

Material	Swell, %	Load factor
Cinders	45	0.69
Clay:		
Dry	40	0.72
Wet	40	0.72
Clay and gravel:		
Dry	40	0.72
Wet	40	0.72
Coal, anthracite	35	0.74
Coal, bituminous	35	0.74
Earth, loam:		
Dry	25	0.80
Wet	25	0.80
Gravel:		
Dry	12	0.89
Wet	12	0.89
Gypsum	74	0.57
Hardpan	50	0.67
Limestone	67	0.60
Rock, well blasted	65	0.60
Sand:		
Dry	12	0.89
Wet	12	0.89
Sandstone	54	0.65
Shale and soft rock	65	0.60
Slag, bank	23	0.81
Slate	65	0.60
Traprock	65	0.61

The load, or amount of material a machine carries, can be determined by weighing or estimating the volume. Payload estimating involves determination of the bank cubic yards being carried, whereas the excavated material expands when loaded into the machine. For determination of bank cubic yards from loose volume, the amount of swell or the load factor must be known (Tables 13-9 and 13-10). Then, the conversion can be made by use of Eq. (13-6).

APPENDIX R4

Reclamation Agreement

Last Revised, July 1989
RECLAMATION AGREEMENT

Permit Number ACT/007/001
Date Permit Issued 8-24-84
Effective Date of Agreement 11-30-89

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

COAL RECLAMATION AGREEMENT

--ooOOoo--

For the purposes of this RECLAMATION AGREEMENT the terms below are defined as follows:

"PERMIT" (Mine Permit No.)	ACT/007/001 (County) Carbon
"MINE" (Name of Mine)	Belina Complex
"OPERATOR" (Company or Name)	Valley Camp of Utah, Inc.
(Address)	Scofield Route Helper, Utah 84526
"OPERATOR'S REGISTERED AGENT" (Name)	W. L. Wright, President & Chief Operating Office:
(Address)	Scofield Route Helper, Utah 84526
(Phone)	(801) 448-9456
"COMPANY OFFICERS":	James L. Litman, Vice President & Chief Executive Officer
"BOND TYPE" (Form of Bond)	Performance
"BOND" (Bond Amount-Dollars)	2.3 Million
(Year-Dollars)	1989
INSTITUTION (Bank or Agency)	FEDERAL INSURANCE COMPANY
POLICY OR ACCOUNT NUMBER	8099-56-50
"LIABILITY INSURANCE" (Exp.)	
(Insurance Company)	The Home Indemnity Company
"STATE":	Utah (Department of Natural Resources)
"DIVISION":	Division of Oil, Gas and Mining
"DIVISION DIRECTOR"	Dianne R Nielson

EXHIBITS:

		Revision Dates		
"SURFACE DISTURBANCE"	Exhibit "A"			
"BONDING AGREEMENT"	Exhibit "B"			
"LIABILITY INSURANCE"	Exhibit "C"			
"STIPULATION TO CHANGE BOND"	Exhibit "D"			

RECLAMATION AGREEMENT

This RECLAMATION AGREEMENT (hereinafter referred to as "Agreement") is entered into by the Operator.

WHEREAS, on 8-24, 1984, the Division approved the Permit Application Package, hereinafter "PAP", submitted by Valley Camp of Utah, Inc., hereinafter "Operator"; and

WHEREAS, prior to issuance of a permit to conduct mining and reclamation operations on the property described in the PAP, hereinafter "Property", the Operator is obligated by Title 40-10-1, et seq., Utah Code Annotated (1953, as amended), hereinafter "Act", to file with the Division a bond ensuring the performance of the reclamation obligations in the manner and by the standards set forth in the PAP, the Act, and the State of Utah Division of Oil, Gas and Mining Rules pertaining to Coal Mining and Reclamation Activities, hereinafter "Rules"; and

WHEREAS, the Operator is ready and willing to file the bond in the amount and in a form acceptable to the Division and to perform all obligations imposed by the Division relating to the reclamation of the Property; and

WHEREAS, the Division is ready and willing to issue the subject a mining and reclamation permit upon acceptance and approval of the bond.

NOW, THEREFORE, the Division and the Operator agree as follows:

1. The provisions of the Act and the Rules are incorporated by reference herein and hereby made a part of this Agreement. Provisions of the Act or Rules shall supercede conflicting provisions of this Agreement.

2. The Operator shall provide a legal description of the property including the number of acres approved by the Division to be disturbed by surface mining and reclamation operations during the permit period. The description is attached as Exhibit "A", and is incorporated by reference and shall be referred to as the "Surface Disturbance".

3. The Operator shall provide a bond to the Division in the form and amount acceptable to the Division ensuring the performance of the reclamation obligations in the manner and by the standards set forth in the PAP, the Act and the Rules. Said bond is attached as Exhibit "B" and is incorporated by reference.

4. The Operator shall maintain in full force and effect the public liability insurance policy submitted as part of the permit application. The Division shall be listed as an additional insured on said policy.

5. In the event that the Surface Disturbance is increased through expansion of the coal mining and reclamation operations or decreased through partial reclamation, the Division shall adjust the bond as appropriate.

6. The Operator does hereby jointly and severally agree to indemnify and hold harmless the State of Utah and the Division from any claim, demand, liability, cost, charge, or suit initiated by a third party as a result of the Operator or Operator's agent or employees failure to abide by the terms and conditions of the approved PAP and this Agreement.

7 The terms and conditions of this Agreement are non-cancellable until such time as the Operator has satisfactorily, as determined by the Division, reclaimed the Surface Disturbance in accordance with the approved PAP, the Act, and the Rules. Notwithstanding the above, the Division may direct, or the Operator may request and the Division may approve, a modification to this Agreement.

8. The Operator may, at any time, submit a request to the Division to substitute the bonding method. The Division may approve the substitution if the bond meets the requirements of the Act and the Rules, but no bond shall be released until the Division has approved and accepted the replacement bond.

9. Any revision in the Surface Disturbance, the bond amount, the bond type, the liability insurance amount coverage, and/or the liability insurance company, or other revisions affecting the terms and conditions of this Agreement shall be submitted on the form entitled "Stipulation to Revise Reclamation Agreement" and shall be attached hereto as Exhibit "D".

10. This Agreement shall be governed and construed in accordance with the laws of the State. The Operator shall be liable for all costs required to comply with this agreement, including any attorney fees.

11. Any breach of the provisions of this Agreement, the Act, the Rules, or the PAP may, at the discretion of the Division, result in an order to cease coal mining and reclamation operations, revocation of the Operator's permit to conduct coal mining and reclamation operations and/or forfeiture of the bond.

RECLAMATION AGREEMENT

12. In the event of forfeiture, the Operator shall be liable for additional costs in excess of the bond amount which are required to comply with this Agreement. Any excess monies resulting from the forfeiture of the bond amount upon compliance with this contract shall be refunded to the appropriate party.

13. Each signatory below represents that he/she is authorized to execute this Agreement on behalf of the named party. Proof of such authorization is provided on a form acceptable to the Division and is attached hereto.

SO AGREED this 17th day of December, 1989

STATE OF UTAH:

Dianne R. Nielson

Dianne R. Nielson, Director
Division of Oil, Gas and Mining

OPERATOR:

Walter L. Wright

Company Officer - Position
Walter L. Wright, President & COO

Company Officer - Position
J.L. Litman
Vice Chairman & CEO

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

EXHIBIT "A"

SURFACE DISTURBANCE

LEGAL DESCRIPTION

Permit Number ACT/007/001
Effective Date

SURFACE DISTURBANCE
--ooOOoo--

In accordance with the RECLAMATION AGREEMENT, the OPERATOR intends to conduct coal mining and reclamation activities on or within the surface DISTURBANCE as described hereunder:

Total acres of SURFACE DISTURBANCE 79

Legal Description of SURFACE DISTURBANCE:

T.13S., R.7E., SLB&M

Parts of Section 8, 9, 17, 16, 19 & 30

EXHIBIT "B"

BONDING AGREEMENT

Surety Bond

Permit Number ACT/007/001
Expiration Date _____

(FEDERAL COAL)
SURETY BOND
--ooOOoo--

THIS SURETY BOND entered into and by and between the undersigned OPERATOR, and SURETY COMPANY, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors and assigns unto the State of Utah, Division of Oil, Gas and Mining, and, the U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE) in the penal sum of ($ 2,300,000.00 *) (Surety Bond Amount) for the timely performance of reclamation responsibilities of the surface disturbance described in Exhibit "A" of this Reclamation Agreement.

This SURETY BOND shall remain in effect until all applicable rules and the OPERATOR's reclamation obligation have been met and released by the Division of Oil, Gas and Mining.

Terms for release or adjustment of this BOND are as written and agreed to by the DIVISION and the OPERATOR in the RECLAMATION AGREEMENT incorporated by reference herein, to which this SURETY AGREEMENT has been attached as Exhibit "B".

* Bond Number 8099-56-50

Last Revised, July 1989
Exhibit "B" - BONDING AGREEMENT
SURETY BOND

So agreed this 17th day of November, 19 89.

FOR THE OPERATOR:

Valley Camp of Utah, Inc.
Operator (Company

Walter L Wright
Company Officer - Position
Walter L. Wright, President & COO

FOR THE SURETY COMPANY:

Federal Insurance Company
Surety (Company)

Company Officer - Position Attorney-in-Fact

ACCEPTED BY THE STATE OF UTAH:

Director - Division of Oil, Gas and Mining

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

CHUBB GROUP of Insurance Companies

CHUBB

15 Mountain View Road Warren, NJ 07060

COMPANY

RIDER to be attached to and form a part of
Bond No. 8099-56-50 wherein
FEDERAL INSURANCE COMPANY
is named as Surety, on behalf of
Valley Camp of Utah, Inc.
as Principal, in favor of State of Utah, Div. of Oil, Gas and Mining, and
U. S. Dept. of the Interior, Office of Surface Mining
in the sum of $1,521,000.00
dated 6/29/84 effective 6/29/84

IT IS HEREBY UNDERSTOOD AND AGREED that effective the 17th day of November, 1989
the penalty of this bond is increased
from One Million, Five Hundred Twenty One Thousand and 00/100 ($1,521,000.00)
to Two Million, Three Hundred Thousand and 00/100 ($2,300,000.00)
as to losses occurring after the 17th day of November, 1989

Provided, however, that the liability of the Principal and Surety hereon shall not be cumulative or in any event exceed the larger amount referred to herein

The attached bond shall be subject to all its agreements, limitations and conditions except as herein expressly modified.

Signed, sealed and dated this 14th day of November, 19 89

Valley Camp of Utah, Inc.

By: Walter L Wright
(Principal)

Federal Insurance Company:

By: Mary Elizabeth Hammock
Mary Elizabeth Hammock, Attorney-in-Fact

ACCEPTED

By: [signature]
(Obligee)

POWER OF ATTORNEY

Know all Men by these Presents, That the FEDERAL INSURANCE COMPANY 15 Mountain View Road Warren New Jersey, a New Jersey Corporation has constituted and appointed and does hereby constitute and appoint John W. Hunt, Ronald W. Brown, Mary Elizabeth Hammock, Muriel L. Hoh, M. Joan Norville of Winston Salem, North Carolina and Thomas W. Burke and Teresa T. Gwyn of Charlotte, North Carolina----------

each its true and lawful Attorney-in-Fact to execute under such designation in its name and to affix its corporate seal to and deliver for and on its behalf as surety thereon or otherwise bonds of any of the following classes, to-wit.

1. Bonds and Undertakings filed in any suit, matter or proceeding in any Court, or filed with any Sheriff or Magistrate, for the doing or not doing of anything specified in such Bond or Undertaking.
2. Surety bonds to the United States of America or any agency thereof, including those required or permitted under the laws or regulations relating to Customs or Internal Revenue; License and Permit Bonds or other indemnity bonds under the laws, ordinances or regulations of any State, City, Town, Village, Board or other body or organization, public or private; bonds to Transportation Companies, Lost Instrument bonds; Lease bonds, Workers' Compensation bonds, Miscellaneous Surety bonds and bonds on behalf of Notaries Public, Sheriffs, Deputy Sheriffs and similar public officials.
3. Bonds on behalf of contractors in connection with bids, proposals or contracts.

In Witness Whereof, the said FEDERAL INSURANCE COMPANY has, pursuant to its By-Laws, caused these presents to be signed by its Assistant Vice-President and Assistant Secretary and its corporate seal to be hereto affixed this 1st day of January 19 86

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

Richard D. O'Connor
Assistant Secretary

FEDERAL INSURANCE COMPANY
By
George McClellan
Assistant Vice-President

STATE OF NEW JERSEY
County of Somerset } ss

On this 1st day of January 19 86, before me personally came Richard D. O'Connor to me known and by me known to be Assistant Secretary of the FEDERAL INSURANCE COMPANY, the corporation described in and which executed the foregoing Power of Attorney, and the said Richard D. O'Connor being by me duly sworn, did depose and say that he is Assistant Secretary of the FEDERAL INSURANCE COMPANY and knows the corporate seal thereof, that the seal affixed to the foregoing Power of Attorney is such corporate seal and was thereto affixed by authority of the By-Laws of said Company, and that he signed said Power of Attorney as Assistant Secretary of said Company by like authority; and that he is acquainted with George McClellan and knows him to be the Assistant Vice-President of said Company and that the signature of said George McClellan subscribed to said Power of Attorney is in the genuine handwriting of said George McClellan and was thereto subscribed by authority of the By-Laws and in deponent's presence.

Notarial Seal

ALICE LEONARD NOTARY PUBLIC NEW JERSEY

Acknowledged and Sworn to before me
on the date above written.

ALICE LEONARD Notary Public

CERTIFICATION NOTARY PUBLIC OF NEW JERSEY
My Commission Expires June 28, 1988

STATE OF NEW JERSEY
County of Somerset } ss

I the undersigned Assistant Secretary of the FEDERAL INSURANCE COMPANY, do hereby certify that the following is a true excerpt from the By-Laws of the said Company as adopted by its Board of Directors on March 11 1952 and most recently amended March 11, 1983 and that this By-Law is in full force and effect

"ARTICLE XVIII.

Section 2. All bonds, undertakings, contracts and other instruments other than as above for and on behalf of the Company which it is authorized by law or its charter to execute, may and shall be executed in the name and on behalf of the Company either by the Chairman or the Vice-Chairman or the President or a Vice-President, jointly with the Secretary or an Assistant Secretary under their respective designations, except that any one or more officers or attorneys-in-fact designated in any resolution of the Board of Directors or the Executive Committee, or in any power of attorney executed as provided for in Section 3 below, may execute any such bond, undertaking or other obligation as provided in such resolution or power of attorney.

Section 3 All powers of attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman or the Vice-Chairman or the President or a Vice-President or an Assistant Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed."

I further certify that said FEDERAL INSURANCE COMPANY is duly licensed to transact fidelity and surety business in each of the States of the United States of America, District of Columbia, Puerto Rico, and each of the Provinces of Canada with the exception of Prince Edward Island; and is also duly licensed to become sole surety on bonds, undertakings, etc permitted or required by law

I the undersigned Assistant Secretary of FEDERAL INSURANCE COMPANY, do hereby certify that the foregoing Power of Attorney is in full force and effect.

Given under my hand and the seal of said Company at Warren, N.J. this 14th day of November 19 89

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

D. Mabley
Assistant Secretary

EXHIBIT "C"

LIABILITY INSURANCE

Revised November, 1987.

RECEIVED
JAN 22 1988
DIVISION OF
OIL, GAS & MINING

CERTIFICATE OF LIABILITY INSURANCE
Issued to:
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
--ooOOoo--

THIS IS TO CERTIFY THAT:

The Home Indemnity Company
(Name of Insurance Company)
P.O. Box 5160
Manchester, NH 03108
(Home Office Address of Insurance Company)

HAS ISSUED TO:

Valley Camp of Utah, Inc.*
(Name of Permit Applicant)
*Please refer to Item 13 of the Named Insured Endorsement on the policy

Valley Camp of Utah, Inc. (Mine Name)

ACT/007/001 (Permit Number)

CERTIFICATE OF INSURANCE:

GL 99 48 43 (Policy Number)

April 1, 1987 (Effective Date)

UNDER THE FOLLOWING TERMS AND CONDITIONS:

As Per UMC/SMC Part 800.60 Terms and Conditions for Liability Insurance;

A. The Division shall require the applicant to submit as part of its permit application a certificate issued by an insurance company authorized to do business in the state of Utah certifying that the applicant has a public liability insurance policy in force for the surface coal mining and reclamation operations for which the permit is sought. Such policy shall provide for personal injury and property damage protection in an amount adequate to compensate any persons injured or property damaged as a result of the surface coal mining and reclamation operations, including the use of explosives and who are entitled to compensation under the applicable provisions of state law. Minimum insurance coverage for bodily injury and property damage shall be $300,000 for each occurrence and $500,000 aggregate.

B. The policy shall be maintained in full force during the life of the permit or any renewal thereof, including the liability period necessary to complete all reclamation operations under this chapter.

CERTIFICATE OF LIABILITY INSURANCE

C. The policy shall include a rider requiring that the insurer notify the Division whenever substantive changes are made in the policy including any termination or failure to renew.

40-10-10 IN ACCORDANCE WITH THE ABOVE TERMS AND CONDITIONS, and the Utah Code Annotated ~~40-10-1 et seq.~~, the Insurance Company hereby attests to the fact that coverage for said Permit Applicant is in accordance with the above stated requirements of the State of Utah and agrees to notify the Division of Oil, Gas and Mining in writing of any substantive change, including cancellation, failure to renew, or other material change. No change shall be effective until at least thirty (30) days after such notice is received by the Division.
NOTE: The stated policy contains an Absolute Pollution Exclusion

UNDERWRITING AGENT:

Patricia W. Settlemyre
(Agent's Name)

919/768-4190
(Phone)

Alexander & Alexander of the Carolinas Inc.
(Company Name)

P. O. Box 2896
(Mailing Address)

Winston-Salem, NC 27102
(City, State, Zip Code)

The undersigned affirms that the above information is true and complete to the best of his or her knowlege and belief, and that he or she is an authorized representative of the above-named insurance company.

1-14-88, Patricia W. Settlemyre, Acct. Service Manager
(Date, Signature and Title of Authorized Agent of Insurance Company)

Signed and sworn before me by Gloria M. Cook
(Name)

this 14 day of January, 1988

Gloria M. Cook
(Signature)

My Commission Expires: 2-26-89
(Date)

7000R-28

EXHIBIT "D"

STIPULATION TO REVISE RECLAMATION AGREEMENT

Permit Number ACT/007/001
Expiration Date _____

COAL
STIPULATION TO REVISE RECLAMATION AGREEMENT
--ooOoo--

This STIPULATION TO REVISE RECLAMATION AGREEMENT entered into by and between the OPERATOR and DIVISION incorporates the following revisions or changes to the RECLAMATION AGREEMENT: (Identify and Describe Revisions Below)

The attached rider increases the existing bond amount.

In accordance with this STIPULATION TO REVISE RECLAMATION AGREEMENT, the following Exhibits have been replaced by the OPERATOR and are approved by the DIVISION:

x Replace the RECLAMATION AGREEMENT in its entirety.

__ Replace Exhibit "A" - SURFACE DISTURBANCE.

x Replace Exhibit "B" - BONDING AGREEMENT.

__ Replace Exhibit "C" - LIABILITY INSURANCE.

The BONDING amount is revised from ($ 1,521,000) to ($ 2,300,000).

The SURFACE DISTURBANCE is revised from _____ acres to _____ acres.

The EXPIRATION DATE is revised from _____ to _____.

SO AGREED THIS 17th DAY OF November, 1989.

FOR THE STATE OF UTAH:

Dianne R Nielson
Director, Division of Oil, Gas and Mining

FOR THE OPERATOR:

Walter L Wright
Company Officer - Position
Walter L. Wright, President & COO

Company Officer - Position
J.L. Litman
Vice Chairman & CEO

NOTE: An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the principal is a corporation, the Agreement shall be executed by its duly authorized officer.

CHUBB GROUP of Insurance Companies

CHUBB

15 Mountain View Road Warren NJ 07060

COMPANY

RIDER to be attached to and form a part of
Bond No. 8099-56-50 wherein
FEDERAL INSURANCE COMPANY
is named as Surety, on behalf of
Valley Camp of Utah, Inc.
as Principal, in favor of State of Utah, Div. of Oil, Gas and Mining, and
U. S. Dept. of the Interior, Office of Surface Mining
in the sum of $1,521,000.00
dated 6/29/84 effective 6/29/84

IT IS HEREBY UNDERSTOOD AND AGREED that effective the 17th day of November, 1989
the penalty of this bond is increased
from One Million, Five Hundred Twenty One Thousand and 00/100 ($1,521,000.00)
to Two Million, Three Hundred Thousand and 00/100 ($2,300,000.00)
as to losses occurring after the 17th day of November, 1989

Provided, however, that the liability of the Principal and Surety hereon shall not be cumulative or in any event exceed the larger amount referred to herein.

The attached bond shall be subject to all its agreements, limitations and conditions except as herein expressly modified.

Signed, sealed and dated this 14th day of November, 19 89

Valley Camp of Utah, Inc.

By: Walter L Wright
(Principal)

Federal Insurance Company:

By: Mary Elizabeth Hammock
Mary Elizabeth Hammock, Attorney-in-Fact

ACCEPTED

By: Donna T. Nelson
(Obligee)

Form 15-02-72 (Ed. 8-75) (Formerly 12451)

POWER OF ATTORNEY

Know all Men by these Presents, That the FEDERAL INSURANCE COMPANY, 15 Mountain View Road, Warren New Jersey, a New Jersey Corp tion has constituted and appointed and does hereby constitute and appoint John W. Hunt, Ronald W. Brown, Mary Elizabeth Hammock, Muriel L. Hoh, M. Joan Norville of Winston Salem, North Carolina and Thomas W. Burk and Teresa T. Gwyn of Charlotte, North Carolina----------

each its true and lawful Attorney-in-Fact to execute under such designation in its name and to affix its corporate seal to and deliver for and on its beha surety thereon or otherwise, bonds of any of the following classes, to-wit.

1. Bonds and Undertakings filed in any suit, matter or proceeding in any Court, or filed with any Sheriff or Magistrate, for the doing or not doing of anyth specified in such Bond or Undertaking.
2. Surety bonds to the United States of America or any agency thereof, including those required or permitted under the laws or regulations relating to Custo or Internal Revenue; License and Permit Bonds or other indemnity bonds under the laws, ordinances or regulations of any State, City, Town, Vill Board or other body or organization, public or private; bonds to Transportation Companies, Lost Instrument bonds; Lease bonds, Workers' Compe tion bonds, Miscellaneous Surety bonds and bonds on behalf of Notaries Public, Sheriffs, Deputy Sheriffs and similar public officials.
3. Bonds on behalf of contractors in connection with bids, proposals or contracts.

In Witness Whereof, the said FEDERAL INSURANCE COMPANY has, pursuant to its By-Laws, caused these presents to be signed by its Assistant Vice-President and Assistant Secretary and corporate seal to be hereto affixed this 1st day of January 19 86

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

Richard D. O Connor
Assistant Secretary

FEDERAL INSURANCE COMPANY
By
George McClellan
Assistant Vice-President

STATE OF NEW JERSEY
County of Somerset } ss

On this 1st day of January 19 86, before me personally came Richard D. O Connor to me known and by me known to be Assistant Secretary of the FEDER SURANCE COMPANY the corporation described in and which executed the foregoing Power of Attorney, and the said Richard D. O Connor being by me duly sworn, did depose and say that he is Assistant Secret of the FEDERAL INSURANCE COMPANY and knows the corporate seal thereof, that the seal affixed to the foregoing Power of Attorney is such corporate seal and was thereto affixed by authority of the By-L of said Company, and that he signed said Power of Attorney as Assistant Secretary of said Company by like authority, and that he is acquainted with George McClellan and knows him to be the Assistant Vice-Pre of said Company, and that the signature of said George McClellan subscribed to said Power of Attorney is in the genuine handwriting of said George McClellan and was thereto subscribed by authority By Laws and in deponent's presence.

Notarial Seal

ALICE LEONARD NOTARY PUBLIC NEW JERSEY

Acknowledged and Sworn to before me
on the date above written

ALICE LEONARD Notary Public

CERTIFICATION NOTARY PUBLIC OF NEW JERSEY
My Commission Expires June 28, 1988

STATE OF NEW JERSEY
County of Somerset } ss.

I, the undersigned, Assistant Secretary of the FEDERAL INSURANCE COMPANY, do hereby certify that the following is a true excerpt from the By-Laws of the said Company as adopted by its Board of D on March 11, 1953 and most recently amended March 11, 1983 and that the By-Law is in full force and effect.

"ARTICLE XVIII

Section 2. All bonds, undertakings, contracts and other instruments other than as above for and on behalf of the Company which it is authorized by law or its charter to execute, may and shall be executed in the name and on behalf of the Company either by the Chairman or the Vice-Chairman or the President or a Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations, except that any one or more officers or attorneys-in-fact designated in any resolution of the Board of Directors or the Executive Committee, or in any power of attorney executed as provided for in Section 3 below, may execute any such bond, undertaking or other obligation as provided in such resolution or power of attorney.

Section 3. All powers of attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman or the Vice-Chairman or the President or a Vice-President or an Assistant Vice-President, jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed."

I further certify that said FEDERAL INSURANCE COMPANY is duly licensed to transact fidelity and surety business in each of the States of the United States of America, District of Columbia, Puerto Rico and each Provinces of Canada with the exception of Prince Edward Island; and is also duly licensed to become sole surety on bonds, undertakings, etc., permitted or required by law.

I, the undersigned Assistant Secretary of FEDERAL INSURANCE COMPANY, do hereby certify that the foregoing Power of Attorney is in full force and effect.

Given under my hand and the seal of said Company at Warren, N.J., this 14th day of November 19 89

Corporate Seal

FEDERAL INSURANCE COMPANY NEW JERSEY

R. Mabley
Assistant Secretary

AFFIDAVITS OF QUALIFICATION

AFFIDAVIT OF QUALIFICATION
OPERATOR
--ooOOoo--

I, Walter L. Wright, being first duly sworn under oath, deposes and says that he/~~she~~ is the (officer or agent) President & COO of Valley Camp of Utah, Inc. ; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said OPERATOR is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

(Signed) Walter L Wright
Name - Position
Walter L. Wright
President & COO

Subscribed and sworn to before me this 27th day of November, 1989.

Valerie A. Young
Notary Public

My Commission Expires:
Valerie A. Young
Carbon County, Utah
My Commission Expires August 12, 1990
_____, 19 ____.

Attest:

STATE OF Utah)
) ss:
COUNTY OF Carbon)

AFFIDAVIT OF QUALIFICATION
OPERATOR
--ooOOoo--

I, James L. Litman, being first duly sworn under oath, deposes and says that he/~~she~~ is the (officer or agent) Vice Chairman & CEO of Valley Camp of Utah, Inc. ; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said OPERATOR is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

(Signed) _____
Name - Position
James L. Litman
Vice Chairman & CEO

Subscribed and sworn to before me this 20th day of November, 19 89.

_____
Notary Public

Notarial Seal
Barbara A. Bizard, Notary Public
City of Warren, Warren County
My Commission Expires April 26, 1993
Member, Pennsylvania Association of Notaries

My Commission Expire.

April 26, 1993.

Attest:

STATE OF Pennsylvania)
) ss:
COUNTY OF Venango)

AFFIDAVIT OF QUALIFICATION
DIRECTOR
--ooOOoo--

I, Dianne R. Nielson, being first duly sworn under oath, deposes and says that she is the Director of the Division of Oil, Gas and Mining, Department of Natural Resources, State of Utah; and that she is duly authorized to execute and deliver the foregoing obligations; and that said DIRECTOR is authorized to execute the same by authority of law on behalf of the State of Utah.

(Signed) Dianne R. Nielson
Dianne R. Nielson, Director
Division of Oil, Gas and Mining

Subscribed and sworn to before me this 30th day of November, 1989.

Notary Public

My Commission Expires:

_____, 19 ____.

Attest:

STATE OF _____)
) ss:
COUNTY OF _____)