APPENDIX E
SOIL LOSS, SEDIMENT PRODUCTION AND SALT DELIVERY CALCULATIONS

Soil loss, sediment production, and salt delivery rates for the alternatives in the North and South Areas were calculated using the methods and some of the assumptions and scenarios presented in Appendix 4A-1 to the Price CBM EIS, prepared by the BLM (1997c). **Tables E–1** through **E–6** summarize soil loss, sediment production, and salt delivery rates for existing conditions, Alternative 1 (Proposed Action), Alternative 2 (Proposed Action with additional Environmental Protection Measures), and Alternative 3 (No Action).

SOIL LOSS

The Revised Universal Soil Loss Equation (RUSLE) was used to evaluate sediment loss from long-term disturbances in the North and South Areas. The various types of long-term disturbances used to calculate the amount of soil loss for each alternative include soils disturbed by well pads; transportation corridors, including roads, pipelines, and electrical transmission lines; and central production facilities. RUSLE also forms the basis for estimating sediment and salt delivery. The RUSLE equation is A = RKLSCP, where:

A = soil loss in tons per acre per year.

R = an erosivity factor related to rainfall intensity and runoff. Rainfall is based on data collected from the National Weather Service and is measured in inches per acre per hour per year. The R value for the North and South Areas is 15.

K = the soil erodibility constant K is a function of soil texture, structure, permeability and organic matter. K values ranging from 0.10 to 0.49 were provided in the Carbon Area soil survey for each soil series in the North and South Areas. For the purpose of the evaluation of the estimated soil loss, the highest K values of identified soils for each slope category in the North and South Areas were employed in the analysis.

L = is the length parameter L within the RUSLE equation, and reflects the length of overland flow within a watershed. Overland flow occurs for a short distance at the top of a watershed and is followed by channel flow unless there is a reduction in slope and deposition occurs. Length parameters are based on best professional judgement after examining the slopes in each individual subwatershed. In both the North and South Areas, L was estimated to be 100 feet on slopes with angles of 10 percent or less, and 50 feet for all others. These estimates were based on the BLM environmental protection measure that requires the construction of water bars on slopes greater that 2 percent.

Table E-1

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 1
North Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	77.22	0.45	0.39
6-10%slopes	23.52	1.08	1.35
11-24% slopes	28.12	4.41	3.72
>25%	12.13	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity Class	% Dist Area	% of Soil
	%	%
Very High	0.00%	4.67%
High	9.53%	3.50%
Moderate	7.19%	1.50%
Low	83.28%	0.58%

							Soil Loss		Sediment Delivery		Salt Delivery	
							Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ac/yr) w/cover C factor = 0.038		C Factor=	0.55	0.038				
							(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0	Very High	0	0.0	0.0		0	0	0	0	0.0	0.0
0-5%	0.43	High	2.84	1.6	0.1		5	0	2	0	0.2	0.0
0-5%	0.49	Moderate	8.57	1.8	0.1		16	1	6	0	0.7	0.0
0-5%	0.49	Low	65.81	1.8	0.1		120	7	48	3	5.6	0.3
			77.22	*5.2*	0.3	*Subtotals>*	*140*	*8*	*56*	*3*	*6.5*	*0.4*
6-10%	0	Very High	0	0.0	0.0		0	0	0	0	0.0	0.0
6-10%	0.43	High	1.67	3.8	0.3		6	1	3	0	0.2	0.0
6-10%	0.49	Moderate	0.48	4.4	0.4		2	0	1	0	0.1	0.0
6-10%	0.49	Low	21.37	4.4	0.4		93	8	37	3	3.3	0.3
			23.52	*12.6*	1.1	*Subtotals>*	*102*	*9*	*41*	*4*	*3.6*	*0.3*
11-24%	0	Very High	0	0.0	0.0		0	0	0	0	0.0	0.0
11-24%	0.43	High	4.1	15.6	0.9		64	4	26	1	1.0	0.1
11-24%	0.49	Moderate	1.09	17.8	1.0		19	1	8	0	0.3	0.0
11-24%	0.49	Low	22.93	17.8	1.0		409	24	164	10	6.1	0.4
			28.12	*51.3*	3.0	*Subtotals>*	*492*	*29*	*197*	*11*	*7.4*	*0.4*
>25%	0	Very High	0	0.0	0.0		0	0	0	0	0.0	0.0
>25%	0.43	High	4.83	24.2	1.4		117	7	47	3	5.5	0.3
>25%	0	Moderate	0	0.0	0.0		0	0	0	0	0.0	0.0
>25%	0.24	Low	7.3	13.5	0.8		99	6	39	2	4.6	0.3
			12.13	37.8	2.2	*Subtotals>*	*216*	*13*	*86*	*5*	*10.1*	*0.6*
TOTALS			*140.99*			*TOTALS>*	*950*	*58*	*380*	*23*	*28*	*2*
						TOTALS (tons/yr/ac)	*6.7*	*0.4*	*2.7*	*0.2*	*0.2*	*0.0*

Table E-2

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 1
South Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	138.35	0.45	0.39
6-10%slopes	141.00	1.08	1.35
11-24% slopes	235.17	4.41	3.72
>25%	108.40	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity		
Class	% Dist Area	% of Soil
	%	%
Very High	0.09%	4.67%
High	11.28%	3.50%
Moderate	16.66%	1.50%
Low	71.98%	0.58%

							Soil Loss		Sediment Delivery		Salt Delivery	
							Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ w/cover C factor = 0.038		C Factor=	0.55	0.038				
								(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0.43	Very High	0.46	1.6	0.1			0.73	0	0	0	0.0	0.0
0-5%	0.43	High	21.61	1.60	0.1			34.50	2	14	1	1.6	0.1
0-5%	0.49	Moderate	37.44	1.82	0.1			68.11	4	27	2	3.2	0.2
0-5%	0.49	Low	78.84	1.82	0.1			143.42	9	57	3	6.7	0.4
			138.35	6.83	0.4		*Subtotals>*	246.76	*15*	*99*	*6*	*11.5*	*0.7*
6-10%	0.43	Very High	0.04	3.8	0.3			0	0	0	0	0.0	0.0
6-10%	0.43	High	18.25	3.8	0.3			70	6	28	2	2.4	0.2
6-10%	0.49	Moderate	16.85	4.4	0.4			74	6	29	3	2.6	0.2
6-10%	0.49	Low	105.86	4.4	0.4			462	40	185	16	16.2	1.4
			141	*16.4*	1.4		*Subtotals>*	*606*	*52*	*242*	*21*	*21.2*	*1.8*
11-24%	0.43	Very High	0.03	15.6	0.9			0	0	0	0	0.0	0.0
11-24%	0.43	High	25.57	15.6	0.9			400	23	160	9	6.0	0.3
11-24%	0.49	Moderate	40.23	17.8	1.0			717	42	287	17	10.8	0.6
11-24%	0.49	Low	169.34	17.8	1.0			3019	176	1208	70	45.3	2.6
			235.17	*66.9*	3.9		*Subtotals>*	*4137*	*241*	*1655*	*96*	*62.0*	*3.6*
>25%	0	Very High	0	0.0	0.0			0	0	0	0	0.0	0.0
>25%	0.43	High	4.81	24.2	1.4			117	7	47	3	5.4	0.3
>25%	0.37	Moderate	9.25	20.8	1.2			193	11	77	4	9.0	0.5
>25%	0.43	Low	94.34	24.2	1.4			2286	133	914	53	106.7	6.2
			108.4	69.3	4.0		*Subtotals>*	*2595*	*151*	*1038*	*60*	*121.2*	*7.1*
TOTALS			*622.92*				*TOTALS>*	*7584*	*459*	*3034*	*184*	*216*	*13*
							TOTALS (tons/yr/ac)	*12.2*	*0.7*	*4.87*	*0.3*	*0.3*	*0.0*

Table E-3

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 2
North Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	72.27	0.45	0.39
6-10%slopes	22.31	1.08	1.35
11-24% slopes	30.94	4.41	3.72
>25%	1.47	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity		
Class	% Dist Area	% of Soil
	%	%
Very High	0.00%	4.67%
High	10.46%	3.50%
Moderate	5.21%	1.50%
Low	84.33%	0.58%

							Soil Loss		Sediment Delivery		Salt Delivery	
							Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ac/yr) w/cover C factor = 0.038		C Factor=	0.55	0.038				
								(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0	Very High	0	0.0	0.0			0	0	0	0	0.000	0.000
0-5%	0.43	High	3.32	1.6	0.1			5	0	2	0	0.248	0.015
0-5%	0.49	Moderate	6.06	1.8	0.1			11	1	4	0	0.515	0.031
0-5%	0.49	Low	62.89	1.8	0.1			114	7	46	3	5.343	0.320
			72.27	*5.2*	0.3		*Subtotals>*	*131*	*8*	*52*	*3*	*6.105*	*0.366*
6-10%	0	Very High	0	0.0	0.0			0	0	0	0	0.000	0.000
6-10%	0.43	High	2.59	3.8	0.3			10	1	4	0	0.347	0.030
6-10%	0.49	Moderate	0.24	4.4	0.4			1	0	0	0	0.037	0.003
6-10%	0.49	Low	19.48	4.4	0.4			85	7	34	3	2.977	0.257
			22.31	*12.6*	1.1		*Subtotals>*	*96*	*8*	*38*	*3*	*3.361*	*0.290*
11-24%	0	Very High	0	0.0	0.0			0	0	0	0	0.000	0.000
11-24%	0.43	High	7.28	15.6	0.9			114	7	46	3	1.708	0.100
11-24%	0.49	Moderate	0.32	17.8	1.0			6	0	2	0	0.086	0.005
11-24%	0.49	Low	23.34	17.8	1.0			416	24	166	10	6.241	0.364
			30.94	*51.3*	3.0		*Subtotals>*	*536*	*31*	*214*	*12*	*8.035*	*0.468*
>25%	0	Very High	0	0.0	0.0			0	0	0	0	0.000	0.000
>25%	0.43	High	0.09	24.2	1.4			2	0	1	0	0.102	0.006
>25%	0	Moderate	0	0.0	0.0			0	0	0	0	0.000	0.000
>25%	0.24	Low	1.38	13.5	0.8			19	1	7	0	0.872	0.051
			1.47	37.8	2.2		*Subtotals>*	*21*	*1*	*8*	*0*	*0.973*	*0.057*
TOTALS			*126.99*				*TOTALS>*	*783*	*49*	*313*	*19*	*18.474*	*1.181*
							TOTALS (tons/yr/ac)	*6.2*	*0.4*	*2.5*	*0.2*	*0.145*	*0.009*

Table E-4

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 2
South Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	141.27	0.45	0.39
6-10%slopes	144.65	1.08	1.35
11-24% slopes	226.08	4.41	3.72
>25%	41.35	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity Class	% Dist Area %	% of Soil %
Very High	0.10%	4.67%
High	12.53%	3.50%
Moderate	14.94%	1.50%
Low	72.44%	0.58%

							Soil Loss		Sediment Delivery		Salt Delivery	
							Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ w/cover C factor = 0.038		C Factor=	0.55	0.038				
							(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0.43	Very High	0.46	1.6	0.1		1	0	0	0	0.034	0.002
0-5%	0.43	High	24.59	1.6	0.1		39	2	16	1	1.833	0.110
0-5%	0.49	Moderate	32.08	1.8	0.1		58	3	23	1	2.725	0.163
0-5%	0.49	Low	84.14	1.8	0.1		153	9	61	4	7.148	0.428
			141.27	*6.8*	0.4	Subtotals>	*251*	*15*	*101*	*6*	*11.741*	*0.703*
6-10%	0.43	Very High	0.04	3.8	0.3		0	0	0	0	0.005	0.000
6-10%	0.43	High	19.84	3.8	0.3		76	7	30	3	2.660	0.230
6-10%	0.49	Moderate	15.33	4.4	0.4		67	6	27	2	2.343	0.202
6-10%	0.49	Low	109.44	4.4	0.4		478	41	191	17	16.723	1.444
			144.65	*16.4*	1.4	*Subtotals>*	*621*	*54*	*248*	*21*	*21.731*	*1.877*
11-24%	0.43	Very High	0.03	15.6	0.9		0	0	0	0	0.007	0.000
11-24%	0.43	High	23.79	15.6	0.9		372	22	149	9	5.583	0.325
11-24%	0.49	Moderate	29.91	17.8	1.0		533	31	213	12	7.998	0.466
11-24%	0.49	Low	172.35	17.8	1.0		3073	179	1229	72	46.088	2.686
			226.08	*66.9*	3.9	*Subtotals>*	*3978*	*232*	*1591*	*93*	*59.676*	*3.478*
>25%	0	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
>25%	0.43	High	1.09	24.2	1.4		26	2	11	1	1.233	0.072
>25%	0.32	Moderate	5.35	18.0	1.1		96	6	39	2	4.505	0.262
>25%	0.49	Low	34.91	27.6	1.6		964	56	386	22	45.013	2.623
			41.35	69.9	4.1	*Subtotals>*	*1087*	*63*	*435*	*25*	*50.751*	*2.957*
TOTALS			*553.35*			*TOTALS>*	*5937*	*364*	*2375*	*146*	*143.900*	*9.015*
						TOTALS (tons/yr/ac)	*10.7*	*0.7*	*4.3*	*0.3*	*0.260*	*0.016*

Table E-5

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 3
North Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	19.02	0.45	0.39
6-10%slopes	7.52	1.08	1.35
11-24% slopes	9.06	4.41	3.72
>25%	1.25	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity		
Class	% Dist Area	% of Soil
	%	%
Very High	0.00%	4.67%
High	11.83%	3.50%
Moderate	11.48%	1.50%
Low	76.69%	0.58%

						Soil Loss		Sediment Delivery		Salt Delivery	
						Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ac w/cover C factor = 0.038	C Factor=	0.55	0.038				
							(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0.00	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
0-5%	0.43	High	2.57	1.6	0.1		4	0	2	0	0.192	0.011
0-5%	0.49	Moderate	3.83	1.8	0.1		7	0	3	0	0.325	0.019
0-5%	0.49	Low	12.62	1.8	0.1		23	1	9	1	1.072	0.064
			19.02	*5.2*	0.3	*Subtotals>*	*34*	*2*	*14*	*1*	*1.589*	*0.095*
6-10%	0.00	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
6-10%	0.43	High	1.18	3.8	0.3		5	0	2	0	0.158	0.014
6-10%	0.37	Moderate	0.18	3.3	0.3		1	0	0	0	0.021	0.002
6-10%	0.49	Low	6.16	4.4	0.4		27	2	11	1	0.941	0.081
			7.52	*11.5*	1.0	*Subtotals>*	*32*	*3*	*13*	*1*	*1.120*	*0.097*
11-24%	0.00	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
11-24%	0.43	High	0.61	15.6	0.9		10	1	4	0	0.143	0.008
11-24%	0.49	Moderate	0.22	17.8	1.0		4	0	2	0	0.059	0.003
11-24%	0.49	Low	8.23	17.8	1.0		147	9	59	3	2.201	0.128
			9.06	*51.3*	3.0	*Subtotals>*	*160*	*9*	*64*	*4*	*2.403*	*0.140*
>25%	0.00	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
>25%	0.00	High	0	0.0	0.0		0	0	0	0	0.000	0.000
>25%	0.00	Moderate	0	0.0	0.0		0	0	0	0	0.000	0.000
>25%	0.24	Low	1.25	13.5	0.8		17	1	7	0	0.789	0.046
			1.25	13.5	0.8	*Subtotals>*	*17*	*1*	*7*	*0*	*0.789*	*0.046*
TOTALS			*36.85*			*TOTALS>*	*243*	*15*	*97*	*6*	*5.902*	*0.378*
						TOTALS (tons/yr/ac)	*6.6*	*0.4*	*2.6*	*0.2*	*0.160*	*0.010*

Table E-6

Ferron Natural Gas EIS
Soil Loss, Sediment Yield and
Salinity Contributions

Alternative 3
South Area

Slope Magnitude vs LS Factors		LS Factor	
Class	Acres	(bare grnd)	(w/ cover)
0-5% slopes	87.04	0.45	0.39
6-10%slopes	80.91	1.08	1.35
11-24% slopes	120.34	4.41	3.72
>25%	53.91	6.83	5.76

RUSLE Parameters	
R Factor	15
K Factor	(as shown)
LS Factor	(as shown)
C Factor	(as shown)
P Factor	1

Soil Salinity		
Class	% Dist Area	% of Soil
	%	%
Very High	0.15%	4.67%
High	12.05%	3.50%
Moderate	16.33%	1.50%
Low	71.47%	0.58%

							Soil Loss		Sediment Delivery		Salt Delivery	
Disturbed Ground Slope Magnitude (range)	K	Soil Salinity Content (class)	Disturbance Area (acres)	Soil Loss (tons/ac/yr) bare ground C factor = 0.55	Soil Loss (tons/ac/yr) w/cover C factor = 0.038		Long-term Disturbance (20% Cover)	Undisturbed Native Veg. (50% Cover)	Long-term Disturbance	Undisturbed Native Veg.	Long-term Disturbance	Undisturbed Native Veg.
						C Factor=	0.55	0.038				
							(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
0-5%	0.43	Very High	0.46	1.6	0.1		1	0	0	0	0.034	0.002
0-5%	0.43	High	14.95	1.6	0.1		24	1	10	1	1.115	0.067
0-5%	0.49	Moderate	20.03	1.8	0.1		36	2	15	1	1.702	0.102
0-5%	0.49	Low	51.6	1.8	0.1		94	6	38	2	4.384	0.262
			87.04	*6.8*	0.4	*Subtotals>*	*155*	*9*	*62*	*4*	*7.234*	*0.433*
6-10%	0.43	Very High	0.04	3.8	0.3		0	0	0	0	0.005	0.000
6-10%	0.43	High	11.34	3.8	0.3		43	4	17	2	1.521	0.131
6-10%	0.49	Moderate	5.25	4.4	0.4		23	2	9	1	0.802	0.069
6-10%	0.49	Low	64.28	4.4	0.4		281	24	112	10	9.822	0.848
			80.91	*16.4*	1.4	*Subtotals>*	*347*	*30*	*139*	*12*	*12.151*	*1.049*
11-24%	0.43	Very High	0.03	15.6	0.9		0	0	0	0	0.007	0.000
11-24%	0.43	High	13.76	15.6	0.9		215	13	86	5	3.229	0.188
11-24%	0.49	Moderate	23.85	17.8	1.0		425	25	170	10	6.378	0.372
11-24%	0.49	Low	82.7	17.8	1.0		1474	86	590	34	22.115	1.289
			120.34	*66.9*	3.9	*Subtotals>*	*2115*	*123*	*846*	*49*	*31.729*	*1.849*
>25%	0	Very High	0	0.0	0.0		0	0	0	0	0.000	0.000
>25%	0.43	High	1.17	24.2	1.4		28	2	11	1	1.324	0.077
>25%	0.32	Moderate	6.75	18.0	1.1		122	7	49	3	5.684	0.331
>25%	0.43	Low	45.99	24.2	1.4		1114	65	446	26	52.038	3.032
			53.91	66.5	3.9	*Subtotals>*	*1264*	*74*	*506*	*29*	*59.046*	*3.440*
TOTALS			*342.2*			*TOTALS>*	*3882*	*236*	*1553*	*94*	*110.159*	*6.772*
						TOTALS (tons/yr/ac)	*11.3*	*0.7*	*4.5*	*0.3*	*0.322*	*0.020*

S = is a representative slope gradient for the predominate subwatersheds. The S values were derived from topographic information in the GIS database for this project, and ranged from 0 to 90 percent. Values of 0 to 5, 6 to 10, 11 to 24, and >25 percent were acquired from GIS, and the average slope within each range was used. The slope and length parameters were combined to give an LS factor. Values for LS were obtained from LS tables for rangeland (applicable to soils where both interill and rill erosion are significant) and soils with little-to-moderate cover (USDA Agricultural Research Service).

C = the "C" factor is determined by ground cover, annual site production, roughness value, mechanical disturbance, and the number of years needed for soil consolidation. The C factors for the North and South Areas were derived from SCS guidelines on cover practice values (Hamon 1982). Bare ground (long-term disturbance) was run at 0.55 to reflect 20 percent rock cover. Native grass or sagebrush range was run at 0.038, reflecting 25 percent vegetative grass type cover, 15 percent litter, 20 percent rock, for total cover of 60 percent.

P = RUSLE computes the effect of erosion control practices on the amount of soil loss. The most conservative value of 1.0 was used for the calculations.

All factors of the RUSLE equation, with the exception of K, were assumed to be consistent across the North and South Areas in order to simplify calculations, even though soil loss would not be equally distributed across the areas. Acres of Disturbance were divided into four categories based on the slope angles noted above. An RUSLE calculation was run for each category and then these numbers summed to arrive at the total amount of soil loss for the Proposed Action. Two different RUSLE calculations were run to estimate soil loss; (1) bare soil conditions — representing long-term disturbance resulting from project facilities and (2) native grasses and shrubs, representative of both a baseline scenario assuming no disturbance has occurred in the North and South Areas and successful reclamation after project closure.

SEDIMENT DELIVERY

The calculations for sediment delivery, based on information provided in the San Rafael Resource Management Plan (Moab District, BLM), estimated soil loss was one to four times higher than the sediment delivery. Therefore, soil loss figures calculated by RUSLE for the North and South Areas were divided by 2.5, the average value determined in the San Rafael study.

SALT DELIVERY

Salinity yield rates for the North and South Areas were obtained from the Price CBM EIS, which were based on a study done for the San Rafael Resource Area RMP. The salt percentage of the badland soils that typify the region is 3.5, as determined in the San Rafael study. The electrical conductivity for the badland soils is 12 mmhos/cm. A ratio using the salt percentage and the electrical conductivity were used to derive the percent salt for other soil types in the North and South Areas. The resulting soil salinity levels were divided into four categories:

Very high salinity – soil with electrical conductivity greater than 16 mmhos/cm or 4.67% calculated as follows: 3.5%/(12 mmhos/cm) = x/(16 mmhos/cm); 12x = 56; x = 4.67%

High salinity – soil with electrical conductivity of 8 to 16 mmhos/cm or 3.50% calculated as follows: 3.5%/(12 mmhos/cm) = x/(12 mmhos/cm); 12x = 42; x = 3.50%

Moderate salinity – soil with electrical conductivity of 2 to 8 mmhos/cm or 1.75% calculated as follows: 3.5%/(12 mmhos/cm) = x/(5 mmhos/cm); 12x = 18; x = 1.50%

Low salinity – soil with electrical conductivity less than 2 mmhos/cm or 0.58% calculated as follows: 3.5%/(12 mmhos/cm) = x/(2 mmhos/cm); 12x = 7; x = 0.58%

The salinity levels for each soil series were entered in the GIS database to determine acres of impacts for each salinity category. Salinity delivery was based on sediment delivery values. Results are shown in **Table E-7**.

RESULTS

Soil losses of 9.86 to 11.2 tons/acre/year for long-term disturbances are consistent with area natural soil losses of 2 to 12 tons/acre/year based on topography (BLM 1997c). There is slightly less soil loss under Alternative 2 compared with the other alternatives, based predominantly on avoidance of siting of facilities on critical soils. Sediment delivery results of 4.0 to 4.5 tons/acre/year is directly related to the soil loss values, and represents sediment delivery seen at the base of the watershed. Sediment delivery rates associated with this project are approximately 16 times natural soil delivery, but within the upper end of the natural range of 0.8 to 4.8 tons/acre/year.

Salt delivery ranges from 0.009 to 0.347 tons per acre per year, depending on topography (BLM 1997c). The rate of salt delivery associated with this project is 12 to 17 times higher than undisturbed conditions but well within regional norms. Again, the alternative with the least salt delivery is Alternative 2.

Table E–7
Summary — Long-Term Soil Loss, Sediment Delivery and Salt Delivery

	Undisturbed	Alternative 1	Alternative 2	Alternative 3
Soil Loss (tons/acre/year)				
North	0.4	6.7	6.2	6.6
South	0.7	12.2	10.7	11.3
Total	**0.64**	**11.2**	**9.9**	**10.8**
Sediment Delivery (tons/acre/year)				
North	0.2	2.7	2.5	2.6
South	0.3	4.9	4.3	4.5
Total	**0.28**	**4.5**	**4.0**	**4.3**
Salt Delivery (tons/year)				
North	0.010	0.195	0.145	0.160
South	0.021	0.347	0.260	0.322
Total	**0.019**	**0.319**	**0.239**	**0.306**