Table XLI. Plant Community Characteristics

SITE	LOCATION	VEGETATION
Reference Site 4	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. So. facing slope	Aspen

	Taxa	% Cover	% Freq.	% Comp.
Grasses	Bromus carinatus	19.3	74	11
	Poa pratensis	11.4	40	6
	Agropyron caninum	10.3	34	6
	Elymus simplex	2.5	17	1
	Carex hoodii	1.2	4	1
	Melica bulbosa	.7	10	T
	Stipa columbiana	.5	4	T
	Total Grasses	45.9		25
Forbs	Lathyrus lanzwertii	20.5	74	11
	Galium trifidum	17.1	74	9
	Agastache urticifolia	12.3	60	7
	Hackelia floribunda	9.1	27	5
	Nemophila breviflora	7.9	34	4
	Mertensia ciliata	6.7	14	4
	Chenopodium fremontii	6.2	44	3
	Stellaria jamesiana	5.5	40	3
	Viola adunca	4.8	30	3
	Solidago parryi	4.2	14	2
	Gayophytum nuttallii	4.1	7	2
	Descurainia californica	2.0	30	1
	Urtica dioica	1.8	7	1
	Collomia linearis	1.2	30	1
	Taraxicum officinale	1.2	4	1
	Collinsia parviflora	.7	10	T
	Achillea millefolium	.5	4	T
	Polymonium sawatchense	.5	4	T
	Helenium hoopesii	.2	10	T
	Hydrophyllum hoopesii	.1	4	T
	Osmorhiza chilensis	.1	4	T
	Rudbeckia occidentalis	.1	4	T
	Total Forbs	119.2		64
Browse	Sambucus racemosa	14.8	20	8
	Symphoricarpos oreophilus	3.8	10	2
	Populus tremuloides	1.1	10	1
	Total Browse	19.7		11
	Totals	184.8		100%

Table XLII. Grazing Productivity

SITE	LOCATION	VEGETATION
Reference Site 4	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. So. facing slope	Aspen

PLOT SIZE: 9.6 sq. ft.

	Taxa	Dry Wt. Prod.	% Comp.
Grasses	Agropyron caninum	51.45	7
	Bromus carinatus	35.70	5
	Elymus simplex	12.00	2
	Poa pratensis	7.75	1
	Melica bulbosa	2.00	T
	Carex hoodii	1.75	T
	Total Grasses	110.65	15
Forbs	Mertensia ciliata	132.00	16
	Agastache urticifolia	87.00	11
	Solidago parryi	82.50	10
	Lathyrus lanzwertii	58.75	8
	Hackelia floribunda	41.25	5
	Viola adunca	22.20	3
	Chenopodium fremontii	8.70	1
	Nemophila breviflora	7.80	1
	Gayophytum nuttallii	4.40	T
	Polygonum sawatchense	4.25	T
	Stellaria jamesiana	3.22	T
	Descurainia pinnata	2.75	T
	Hydrophyllum capitatum	2.10	T
	Galium trifidum	.90	T
	Smilacina stellata	.90	T
	Thalictrum fendleri	.90	T
	Collomia linearis	.75	T
	Achillea millefolium	.45	T
	Collinisia parviflora	T	T
	Lipidium densiflorum	T	T
	Total Forbs	460.85	55
Browse	Sambucus racemosa	213.00	25
	Symphoricarpos oreophilus	21.00	3
	Populus tremuloides	15.75	2
	Total Browse	249.75	30
	Totals	821.2	100
	Est. Potential Prod. for Site	821.2 lb/acre	

Table XLIII. Tree Productivity

SITE

Reference Site 4

VEGETATION

Aspen

LOCATION

NW1/4 Sec 24 T13S R6E
Elevation 8860 ft.
So. facing slope

Taxa	Mean Distance	Relative Frequency	Density per Acre
Populus tremuloides	15.0	93	193.60
Prunus melanocarpa		7	

Taxa	< 1" Diameter		> 1" Diameter				
	< 3'tall	> 3'tall	1"-3"d.	3"-6"d.	6"-12"d.	12"-15"d.	> 15"d.
Populus tremuloides	20	2	4	5	3		3
Prunus melanocarpa	2		2	4	6	3	2

Table XLIV. Plant Community Characteristics

SITE	LOCATION	VEGETATION
Reference Site 4	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. No. facing slope	Spruce/Fir

	Taxa	% Cover	% Freq.	% Comp.
Grasses	Poa fendleriana	3.8	24	7
	Carex hoodii	1.2	14	2
	Bromus carinatus	.8	14	1
	Total Grasses	5.8		10
Forbs	Arnica cordifolia	15.7	50	29
	Osmorhiza chilensis	9.3	67	17
	Lupinus sericeus	4.9	7	9
	Trifolium repens	3.3	7	6
	Mitella stenopetala	3.0	24	6
	Fragaria virginana	2.7	27	6
	Achillea millefolium	2.3	14	4
	Pyrola secunda	1.4	24	3
	Lathyrus lanzwertii	1.2	4	3
	Monesis uniflora	.6	4	1
	Aquilegia coerulea	.5	4	1
	Epilobium alpinum	.5	4	1
	Hackelia floribunda	.3	14	T
	Taraxacum officinale	.2	7	T
	Geranium fremontii	.1	4	T
	Viola canadensis	.1	4	T
	Total Forbs	46.1		85
Browse	Ribes cereum	1.8	10	3
	Abies lasiocarpa	.5	4	1
	Sambucus racemosa	.5	4	1
	Picea engelmannii	.2	7	T
	Symphoricarpos oreophilus	.1	4	T
	Total Browse	3.1		5
	Totals	55.0		100%

Table XLV. Tree Productivity

SITE

Reference Site 4

LOCATION

NW1/4 Sec 24 T13S R6E
Elevation 8860 ft.
No. facing slope

VEGETATION

Spruce/Fir

Taxa	Mean Distance	Relative Frequency	Density per Acre
Picea engelmannii	11.94	80	305.54
Abies lasiocarpa		20	

Taxa	< 1" Diameter		> 1" Diameter				
	< 3'tall	> 3'tall	1"-3"d.	3"-6"d.	6"-12"d.	12"-15"d.	> 15"d.
Picea engelmannii	2		4	3		2	3
Abies lasiocarpa	26		7	2	1		

Table XLVI. Plant Community Characteristics

SITE	LOCATION	VEGETATION
Reference Site 4	NW1/4 Sec 24 T13S R6E Elevation 8780 ft. Canyon floor	Riparian

	Taxa	% Cover	% Freq.	% Comp.
Grasses	Carex hoodii	29.5	70	11
	Bromus carinatus	10.1	30	4
	Poa reflexa	10.1	45	4
	Calamagrostis neglecta	9.5	25	3
	Juncus ensifolius	7.6	20	3
	Poa pratensis	7.1	25	3
	Agropyron caninum	.8	5	T
	Total Grasses	74.7		28
Forbs	Geranium fremontii	48.6	50	18
	Saxifraga odontiloma	35.6	70	13
	Epilobium alpinum	17.6	55	7
	Achillea millefolium	17.5	55	7
	Osmorhiza occidentalis	14.1	65	5
	Aconitum columbiana	12.5	30	4
	Trifolium repens	11.4	25	4
	Hackelia floribunda	8.1	15	3
	Rorippa curvipes	7.5	15	3
	Lathyrus lanzwertii	7.0	15	2
	Moneses uniflora	3.9	10	2
	Veratrum califoricum	3.9	10	1
	Potentilla fruticosa	2.6	10	1
	Helenium hoopesii	1.9	9	T
	Lupinus argenteus	1.9	5	T
	Fragaria virginiana	1.8	20	T
	Penstemon humilus	.8	5	T
	Cystopteris fragilis	.8	5	T
	Total Forbs	197.5		70
Browse	Ribes cereum	4.1	20	2
	Total Browse	4.1		2
	Totals	276.3		100%

Table XLVII. Grazing Productivity

SITE	LOCATION	VEGETATION
Reference Site 4	NW1/4 Sec 24 T13S R6E Elevation 8780 ft. Canyon floor	Riparian

PLOT SIZE: .96 sq. ft.

	Taxa	Dry Wt. Prod.	% Comp.
Grasses	Carex hoodii	38.50	14
	Elymus glaucus	6.00	2
	Juncus ensifolius	3.50	2
	Poa reflexa	1.80	T
	Bromus carinatus	.30	T
	Carex aquatilis	T	T
	Total Grasses	50.10	18
Forbs	Veratrum califoricum	210.00	73
	Geranium fremontii	10.80	4
	Achillea millefolium	5.76	2
	Saxifraga odontiloma	5.10	2
	Rorippa curvipes	2.10	1
	Trifolium repens	1.88	T
	Epilobium alpinum	.46	T
	Fragaria virginiana	.30	T
	Lathyrus lanzwertii	.25	T
	Osmorhiza occidentalis	T	T
	Viola sp.	T	T
	Total Forbs	236.15	83
	Totals	286.25	100%
	Est. Potential Prod. for Site	286.25 lb/acre	

Table XLVIII. Plant Community Characteristics Summary

Vegetation Type	Av. Cover %	Productivity lbs/Acre	No. Trees per Acre	Diam. Inc. mm/yr.	Diam. Inc. 10 yr. Av.
Aspen	157	586	124	4.2	3.4
Spruce/Fir	45	--	351		
Spruce				4.2	3.3
Fir				3.4	2.2
Sagebrush	126	917	--	--	--
Grass/Forb/ Elderberry	150	746	--	--	--
Riparian	169	182	--	--	--

Table XLIX. Productivity of forbs and grasses of validation sites in animal units (One animal unit equals one cow and calf for one day of use.)

Site	Riparian		Spruce/Fir		Aspen		Sagebrush		Disturbed		Total	
	Acres	AU	Acres	AU	Acres	AU	Acres	AU	Acres	AU	Acres	AU
Portal Yard Area	1.0	38	15.8	0	7.9	114	2.9	84	8.5	0	36.1	236
Waste Rock Disposal Area	1.2	19	6.7	0	8.3	119	-	-	-	-	16.2	138
Proposed Bypass Road	T	0	4.3	0	5.8	83	-	-	-	-	10.1	83
Main Access Road (Does not include conveyor corridor)					3.3	47	11.6	335	-	-	14.9	382
TOTALS											77.3	839

Assumptions:

Spruce/Fir type and presently disturbed road cuts, mine wastes, etc. do not contribute forage.

Conditions:

Weight estimates made in a very dry summer.

Adjacent similar reference site estimates used as a basis for calculations.

Table L. Tree Growth Rates for Validation Sites

Site No.	Taxa	No. of trees measured	Av. growth in diameter (mm/yr)	Av. 10-yr. growth/dia. (mm/yr)
Portal Yard	Picea engelmanii	6	4.1 mm	2.6 mm
	Abies lasiocarpa	5	3.2	1.9
	Populus tremuloides	10	3.8	2.7
1	Picea engelmanii	5	3.9	3.7
	Abies lasiocarpa	4	3.7	2.6
	Populus tremuloides	6	7.0	5.4
2	Picea engelmanii	3	6.6	6.0
	Abies lasiocarpa	5	5.2	3.3
	Populus tremuloides	5	3.8	3.5
3	Picea engelmanii	3	2.4	1.6
	Abies lasiocarpa	4	2.5	.9
	Populus tremuloides	4	2.9	2.6
4	Picea engelmanii	3	4.8	3.3
	Abies lasiocarpa	4	2.8	2.0
	Populus tremuloides	5	3.9	3.9
Waste Rock Dis-posal Area	Picea engelmanii	4	3.3	2.7
	Abies lasiocarpa	4	2.9	2.2
	Populus tremuloides	5	3.7	3.0
Pro-posed Bypass Road	Populus tremuloides	5	4.3	2.6
	Totals	90		

Table LI. Soils Analysis

SITE NO.: Reference Area 1

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryoborolls Fine Loamy	NE1/4 Sec 13 T13S R6E Elevation 9540 ft. So. facing slope	10%	Grass/Forb/ Elderberry	35	0	16	16.2

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
Al_1	0-2	Strong medium granular	10YR5/3	10YR2/2	eo	35	37	28	clay loam	5.9	1.09	∅
Al_2	2-5	Moderate medium granular	10YR6/3	10YR3/2	eo	35	37	28	clay loam	5.9	1.09	∅
A_3	5-9	Weak medium Subang blocky	10YR6/3	10YR3/2	eo	33	38	29	clay loam	5.8		∅
B1	9-15	Moderate medium Subang blocky	10YR6/2	10YR3/2	eo	30	44	26	loam	5.4		∅
B21	15-22	Moderate medium prismatic	10YR6/2	10YR4/2	eo	30	44	26	loam	5.4	0.60	∅
B22	22-36	Moderate coarse prismatic	10YR6/3	10YR4/4	eo	34	42	24	loam	5.8		10% ground 5% cobbles
C	36-40	Weak coarse Subang blocky	10YR6/4	10YR5/4	eo	54	28	18	sandy loam	6.0		20% cobbles
R	40	Consolidated sandstone bed-rock										

Comments: Cryic temp. regime - Ustic moisture regime - Ecological site is high mountain loam.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A	1.81	1.56	2.89	60.2	112	88	450	32.6	24.3	0.088
B	0.81	2.73	0.03	84.2	556	72	25222	14.1	23.3	0.029

Table LII. Soils Analysis

SITE NO.: Reference Area 1

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Lithic Cryoborolls Loamy-skeletal, mixed	NE1/4 Sec 14 T13S R6E Elevation 9540 ft. So. facing slope	45%	Aspen	39	0	22	21.6

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
Al_1	0-3	weak thin platy										
Al_2	3-8	moderate fine granular	10YR4/1.5	10YR2.5/1	eo	57	37	6	sandy loam	5.8	1.17	
A_3	8-12	weak - very fine granular	10YR4.5/2	10YR2.5/1	eo	68	31	1	sandy loam	5.9	1.26	5% gravel
A/C	12-16	weak coarse subang blocky										10% gravel 35% cobbles
R	16	Indurated Sandstone										

Comments: Cryic temperature regime; ustic moisture regime; ecological site is high mountain loam (aspen).

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
Al_2	4.50	0.78	2.93	79.5	151	128	1800	50.9	28.1	0.203
A_3	2.31	0.71	2.46	77.4	74	72	275	36.0	27.3	0.160

Table LIII. Soils Analysis

SITE NO.: Reference Area 1

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Argic Cryoborolls loamy-skeletal, mixed	NE1/4 Sec 14 T13S R6E Elevation 9540 ft. So. facing slope	55%	Spruce/Fir	39	0	16	18.1

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effer-vescence	Particle size Distribution			Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
02	3-2	Slightly decomposed needles, twigs & moss										
01	2-0	Decomposed needles, twigs & moss										
A11	0-5											
A12	5-10		10YR4/2	10YR2.5/1	eo	49	35	16	loam	6.0	1.04	
A&B	10-16		10YR5/3	10YR3/3	eo	47	39	14	loam	5.7	0.70	
B&A	16-22											10% gravel 5% cobbles
B2t	22-36											10% gravel 5% cobbles
C	36-45											5% gravel 40% cobbles 5% stones
R	45	Indurated Sandstone										

Comments: Cryic temperature regime, ustic moisture regime, ecological site is high mountain shallow loam (spruce/fir).

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A12	2.11	0.81	10.72	76.3	175	112	1250	49.8	22.7	0.096
B2	Info. needed									

Table LIV. Soils Analysis

SITE No.: Reference Area 2

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryoborolls Coarse Loamy, Mixed	NW1/4 Sec 23 T13S R6E Elevation 9400 ft.	2-10%	Grass/Forb/ Elderberry	39	4	16	22.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
A_1	0-5	Weak Thin Platy										Ø
A_{12}	5-8	Fine granular moderate	10YR5/2	10YR3/1	eo	59	34	7	sandy loam	6.1	0.91	Ø
A_3-B_1	8-13	Fine granular										Ø
B_2	13-22	Weak, medium subangular blocky	10YR5/2	10YR3/2	eo	57	34	9	sandy loam	6.3	0.68	2% gravel
B_3	22-26	Moderate, coarse subangular blocky										3% gravel
C	26-46	Weak coarse subangular blocky										12% gravel 30% cobbles

Comments: Cryic temp. regime; ustic moisture regime, ecological site high mountain loam.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A12	4.29	0.80	5.06	50.2	186	88	1025	32.8	26.5	0.128
B2	2.12	0.76	2.87	53.0	88	56	38000	36.6	26.7	0.085

Table LV. Soils Analysis

SITE NO.: Reference Area 2

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Agric Lithic Cryoborolls Coarse Loamy	NW1/4 Sec 23 T13S R6E Elevation 9400 ft.	40%	Aspen	39	4	24	24

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
O_1	1-0											
A_1	0-6	Moderate, fine granular	10YR5/2	10YR3/2	eo	53	42	5	Sandy loam	5.7	1.88	Ø
B_2	6-11	Moderate, medium subangular blocky	10YR3/2	10YR3/1	eo	68	23	9	Sandy loam	5.4	1.80	Ø
B_3	11-16	Weak, medium subangular blocky										Ø
C	16-19	Weak, fine subangular blocky										10% gravel 30% cobbles
R	19	Consolidated Sandstone bedrock										

Comments: Cryic temp. regime; Ustic moisture regime.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_1	3.87	0.85	7.95	83.2	142	104	725	51.8	29.6	0.126
B_2	1.74	1.01	6.12	80.0	54	64	28400	58.3	23.8	0.093

Table LVI. Soils Analysis

SITE NO.: Reference Area 2

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Mollic Paleborolf Loamy Skeletal	Problem with location	35%	Spruce/Fir	39	4	16	22.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
O_1	1-0											
A_{11}	0-5	Moderate, medium granular	10YR5/2	10YR2.5/1	eo	50	35	15	loam	5.4	1.42	ø
A_{12}	5-25	Weak, medium angular blocky	10YR6/3	10YR3/2	eo	52	35	13	loam	5.9	0.72	3% gravel
Band A	25-28	Moderate, medium angular blocky										25% gravel 25% cobbles
B_2T	28-36	Strong, coarse angular blocky										15% gravel 35% cobbles
C	36-45	Strong, coarse angular blocky										60% cobbles

Comments: Cryic temp. regime; Ustic moisture regime

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_{11}	4.83	1.68	11.52	80.0	163	104	1850	54.3	28.1	0.149
A_{12}	1.66	2.23	4.37	65.1	84	56	30400	36.3	28.8	0.083

Table LVII. Soils Analysis

SITE NO.: Reference Area 3

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Argic Lithic Cryoboroll Coarse Loamy	Check Location	35%	Aspen	39	4	24	24

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effer-vescence	Particle size Distribution			Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
O_1	1-0											
A_1	0-2	Moderate, fine granular	10YR3/2	10YR3/1	eo	62	32	6	Sandy loam	6.1	1.48	Ø
A_3	2-8	Weak, medium subangular blocky										Ø
B_2t	8-16	Moderate, medium subangular blocky	10YR4/2	10YR3/2	eo	52	31	17	Loam	6.0		10 gravel
C	16-18	Weak, fine subangular blocky										30 gravel
R	19	Consolidated Sandstone										

Comments: Cryic temp. regime; Ustic moisture regime.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_1	7.20	1.10	10.24	97.1	277	200	1750	39.4	33.7	0.343
B_{21}	0.90	1.10	3.06	67.4	163	104	55200	46.5	27.2	0.235

Table LVIII. Soils Analysis

SITE NO: Reference Area 3

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Lithic Cryochrepts	NE1/4 Sec 34 T13S R6E Elevation 8700 ft. So. facing slope	15-25%	Sagebrush	28	4	8	9.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effervescence	Particle size Distribution			Textural Class	pH	Cond. $EC \times 10^3$	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
O_1	1-0											
A_1	1-4	Weak, v. fine granular										Ø
B_2	4-8	Weak, medium subangular blocky	10YR5/3	10YR3/3	eo	65	28	7	Sandy loam	5.6	1.68	Ø
C	8-60	Massive										50 stones 20 boulders

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A&B	2.21	1.50	5.07	77.0	151	120	100	37.4	29.1	0.163

Table LIX. Soils Analysis

SITE NO.: Reference Area 3

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryoborolls Loamy skeletal mixed	NE1/4 Sec 34 T13S R6E Elevation 8700 ft. No. facing slope	40%	Spruce/Fir	35	4	13	16.1

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
O_1	1-0											
A_1	0-3	fine, fine granular	10YR5/2	10YR3/2	eo	44	36	20	loam	5.4	1.02	
A_3	3-9	weak, medium subangular blocky										
B_2	9-19	weak, medium prismatic	10YR5/3	10YR3/5	eo	46	34	20	loam	5.0	0.82	
C	19-	massive										5 stones 10 cobbles 20 gravels

Comments: Ustic moisture regime.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_1	1.73	1.47	15.04	105.0	177	168	46000	46.8	23.0	0.121
B_2	1.56	1.39	9.25	73.3	102	104	76000	34.1	21.9	0.065

Table LX. Soils Analysis *

SITE NO.: Reference Area 3

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Aquic Cryofluvent Coarse Loamy	NE1/4 Sec 34 T13S R6E Elevation 8700 ft. So. facing slope	0	Riparian Carex/ Grass	35	4	16	11.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Moist	Effer-vescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
Profiles not described; other information as indicated.			10YR5/3	10YR3/2	eo	70	23	7	sandy loam	7.5	1.62	

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
	1.31	1.28	5.74	51.7	39	88	3300	21.6	24.0	0.117

*Additional information to be obtained.

Table LXI. Soils Analysis

SITE NO.: Reference Area 4

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Lithic Cryoborolls Loamy-skeletal, mixed	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. So. facing slope	40%	Aspen	39	4	28	22.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effer- vescence	Particle size Distribution			Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
A_1	0-4	Moderate coarse granular	10YR3/2	10YR2.5/1	eo	60	33	7	sandy loam	6.0	1.80	10 gravel 10 cobbles
A C	4-14	Moderate, coarse subangular blocky	10YR5/3	10YR2.5/1	eo	54	33	13	sandy loam	6.0	1.32	10 gravel 25 cobbles 15 stones
R	14	Indurated Sandstone -- Blackhawk Sands Formation										

Comments: Cryic temperature regime; Ustic moisture regime.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_1	4.73	0.93	5.79	86.7	212	144	1150	56.6	30.9	0.287
A C	3.46	0.80	5.92	77.3	178	104	79200	41.4	27.2	0.235

Table LXII. Soils Analysis

SITE NO.: Reference Area 4

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryofluvent Loamy-skeletal, mixed	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. Adjacent to stream	2-8%	Riparian	39	0	12	13.4

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effer- vescence	Particle size Distribution			Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
O_1	1-0	litter										
A_1	0-4	weak very fine subangular blocky	10YR3/1	10YR3/2	eo	68	21	11	sandy loam	5.7	1.24	
C_1	4-25	single grain										15 gravel 15 cobbles
C_2	25+	single grain										15 gravel 30 cobbles 10 stones

Comments: C is stratified recent stream alluvium. Alluvium varies from 65% coarse fragments to mainly organic matter. Predominate bands are noted above.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
C_1	2.81	0.94	5.57	114.9	40	104	100	20	25.2	0.120

Table LXIII. Soils Analysis

SITE NO.: Reference Area 4

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryoboroll Loamy-skeletal, mixed	NW1/4 Sec 24 T13S R6E Elevation 8860 ft. No. facing slope	40%	Spruce/Fir	35	0	23.6	18.9

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effer-vescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
O_1	1-0	Decomposed needles, twigs, bark and moss										
A_1	0-2	Moderate, fine granular										
B_2	2-10	Weak medium subangular blocky	10YR5/3	10YR3/3	eo	57	29	14	sandy loam	5.7	1.35	10 gravel 30 cobbles
C	10-24	weak fine, sub-angular blocky										10 gravel 40 cobbles 15 stones
R	24	Indurated Sandstone										

Comments: Cryic temperature regime; Ustic moisture regime. Ecological site is high mountain shallow loam (spruce/fir).

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
B_2	2.54	1.03	9.75	65.4	62	88	44400	55.4	23.3	0.076

Table LXIV. Soils Analysis

SITE NO.: A - Rock Waste Disposal Area Validation Site

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Argic Cryoboroll Loamy-skeletal, mixed	NE1/4 Sec 23 T13S R6E Elevation 9020 ft. So. facing slope	10%	Aspen	39	4	20	24.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
A11	0-5	Moderate, fine granular										
A12	5-9	Weak, fine subangular blocky	10YR5/2	10YR3/1	eo	59	31	10	Sandy loam	5.8	1.28	
A3	9-13	Weak, fine subangular blocky										
B2t	13-35	Moderate medium subangular blocky	10YR5/3	10YR3/1.5	eo	57	29	14	Sandy loam	5.9	0.72	
C	35-											45%

Comments: A3 has 11% clay

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A12	4.80	0.80	169.6	52.3	81.0	41.5	360	49.6	30.3	0.142
B2t	1.26	0.73	78.1	45.0	45.0	32.0	264	33.7	23.9	0.084

Table LXV. Soils Analysis

SITE NO.: B - Rock Waste Disposal Area Validation Site

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryofluvents Loamy-skeletal, mixed	NE1/4 Sec23 T13S R6E Canyon floor @ 9050 ft.	2-8%	Riparial shrub/ grass/forb.	39	4	4	11.8

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Moist	Effer-vescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
O1	3-0											
A1	0-5	Weak medium granular	10YR3/1	7.5YR2.5/0	eo	47	37	16	loam	6.4	1.36	5 gravel
C	5-13+	Single grain										10 gravel 5 cobbles

Comments: C is stratified recent stream alluvium

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A1	8.70	1.28	344.2	140.5	31.5	184.	3416	29.8	35.7	0.474

Table LXVI. Soils Analysis

SITE NO.: C - Rock Waste Disposal Area Validation Site

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Typic Cryorboralfs Loamy Skeletal Mixed	NE1/4Sec 23 T13S R6E Elevation 9020 ft. No. facing slope	20%	Spruce/Fir	28	0	12	15.7

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color		Effer-vescence	Particle size Distribution			Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
			Dry	Moist		Sand	Silt	Clay				
O1	1-0											
A11	0-10	Moderate fine granular	10YR6/2	10YR3/1.5	eo	47	41	12	loam	5.1	1.00	
A12	10-18	Weak, medium subangular blocky	10YR6/3	10YR3/2	eo	45	39	16	loam	5.7	0.80	35 plus
B21	18-26	Weak, medium angular blocky										35 plus
B2t	26 -	Weak, medium prismatic										35 plus

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A11	1.10	0.69	223.7	74.6	46.5	53.5	632	27.2	27.8	0.094
A12	0.53	0.60	142.1	52.3	55.0	43.0	1000	32.3	25.6	0.059

Table LXVII. Soils Analysis

SITE NO.: D - Bypass Access Road Validation Site - Aspen Slump

Soil	Location	Slope	Vegetation	Penetrometer (depth in.) Max.	Min.	Mode	Ave.
Cumulic Cryoborolls Coarse loamy	NW1/4 Sec 24 T13S R6E Elevation 9140 ft. On contour from Waste Rock Disposal Area to south fork existing trail.	0	Aspen/Grass/ Forb.	35	8	12	19.7

PROFILE DESCRIPTION:

Horizon	Depth (in.)	Structure	Color Dry	Color Moist	Effervescence	Particle size Distribution Sand	Silt	Clay	Textural Class	pH	Cond. EC x 10^3	% Coarse Fragments
A_1	0-9	Fine, fine granular	10YR4/1.5	10YR2.5/1	eo	64	32	4	Sandy loam	5.7	0.90	Ø
B_{21}	9-18	Weak, medium subangular blocky										
$B_{22}T$	18-33	Moderate, medium prismatic	10YR4/1	10YR2.5/1	eo	52	34	14	Sandy loam	6.6	1.25	Ø
B_3	33-45	Weak, medium prismatic										15 gravels

Comments: Distinct movement of soil, old pieces of wood at 18-to-30 inches.

CHEMICAL ANALYSIS (ppm):

Horizon	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3-N	%N
A_1	2.48	1.05	151.7	106.6	35.5	41.5	1624	30.1	34.0	0.311
$B_{22}T$	0.68	1.18	111.4	74.4	37.0	85.5	2216	29.7	28.5	0.207

Table LXVIII. Characteristics of the surface 6" soils in portal yard area validation sites

Location	Vegetation	Av. Penetration (in.)	Color		Particle size Distribution			Tex-tural Class	Effer-ves-cense	pH	Cond. EC x 10^3
			Dry	Moist	Sand	Silt	Clay				
Yard 1	Aspen	16.5	10YR 4/2	10YR 3/1	52	31	17	sandy loam	eo	6.2	1.38
Yard 2	Sagebrush	10.6	10YR 4.5/1	10YR 2.5/1	52	29	19	sandy loam	eo	6.3	0.84
Yard 3	Aspen	17.3	10YR 5/2	10YR 4/2	54	29	17	sandy loam	eo	6.3	1.72
Yard 4	Sagebrush	5.1	10YR 3/2	10YR 2.5/1	73	16	11	sandy loam	eo	6.4	0.75
Yard 5	Aspen	14.7	10YR 4/1.5	10YR 2.5/1	68	21	11	sandy loam	eo	6.2	1.58
Yard 6	Spruce/Fir	16.1	10YR 4/2	7.5YR 3/2	50	37	13	loam	eo	5.0	1.18
Yard 7	Aspen	13.4	10YR 3/2	10YR 2.5/1	38	34	28	clay loam	eo	6.4	1.45
Yard 8	Spruce/Fir	18.9	10YR 6/3	7.5YR 3/2	60	25	15	sandy loam	eo	5.9	1.18

Table LXVIII. Characteristics of the surface 6" soils in portal yard area validation sites

Location	Vegetation	Chemical Analyses (ppm)									
		Zn	Cu	Mn	Fe	K	Mg	Ca	P	$NO^{3}N$	%N
Yard 1	Aspen	4.26	1.31	4.65	57.1	236	112	2750	53.4	26.5	0.156
Yard 2	Sagebrush	1.81	0.78	2.05	86.5	143	328	6925	50.8	26.5	0.243
Yard 3	Aspen	2.45	1.30	7.75	45.9	258	192	2825	41.1	25.5	0.164
Yard 4	Sagebrush	0.78	0.41	1.55	53.6	131	208	3325	32.6	21.3	0.152
Yard 5	Aspen	17.28	1.26	4.99	79.0	306	288	4275	54.7	27.6	0.278
Yard 6	Spruce/Fir	1.51	1.05	6.53	120.5	100	80	700	40.2	22.7	0.073
Yard 7	Aspen	10.62	1.28	10.56	83.7	257	296	3500	35.1	31.3	0.288
Yard 8	Spruce/Fir	0.93	0.95	4.98	73.3	92	72	1100	51.4	21.9	0.046
	Average	4.96	1.04	5.38	72.7	190	197	3175	44.9	25.4	0.175

Table LXVIX. Comparison of average soil mineral content in the A horizon of soils in the vegetation types of the lease area

Vegetation Type	Zn	Cu	Mn	Fe	K	Mg	Ca	P	NO_3N	%N
Aspen	6.22	10.66	33.68	77.11	195.55	154.70	2,076	46.17	29.75	0.230
Spruce/Fir	2.11	1.10	40.32*	85.01	116.50	96.79	13,705	46.44	24.21	0.094
Sagebrush	1.60	0.90	2.89	72.37	141.67	218.67	3,450	40.27	25.63	0.186
Grass/Forb/Elderberry	3.05	1.18	3.98	55.20	149.00	88.00	738	32.70	25.40	0.108
Riparian	4.27	1.17	355.51*	102.37	36.80	125.33	2,272	23.80	28.30	0.237

* Due to high amount in Rock Waste Disposal Area

Table LXX. Comparison of minerals in lease area soils with other Western U.S. soils

Minerals	Shacklette Western U.S. Av.	Tiedeman Desert Grasslands	Lease Area All sites and depths
	ppm	ppm	ppm
Zn	51		3
Cu	21		1
Mn	389		38
Fe	20,800		76
K	17,000	29,600	125
Mg	7,800		115
Ca			11,489
P		370	41
NO_3N			28
% N		750	0.153

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APPENDIX

Scientific and common names of plant species on the McKinnon Properties, Skyline Project, Coastal States Energy Company

Scientific Name	Common Name
Abies lasiocarpa	Subalpine fir
Achillea millefolium	Yarrow
Actaea rubra	Baneberry
Agastache urticifolia	Nettleleaf giant hyssop
Agoseris aurantiaca	Orange agoseris
Agropyron caninum	Wheatgrass
Agropyron cristatum	Crested wheatgrass
Agropyron intermedium	Intermediate wheatgrass
Agropyron spicatum	Bluebunch wheatgrass
Agropyron smithii	Western wheatgrass
Agrostis scabra	Rough bentgrass
Agrostis stolonifera	Redtop
Agrostis variabilis	
Alopecurus pratensis	Meadow foxtail
Amaranthus sp.	Redroot
Amelanchier alnifolia	Serviceberry
Androsace septentrionalis	Pygmy rock jasmine
Antennaria microphylla	Pussytoes
Aquilegia coerulea	Columbine
Arabis drummondii	Rockcress
Arctostaphylos patula	Manzanita
Arenaria sp.	Sandwort
Arnica chamissonis	Chamisso arnica
Arnica cordifolia	Heartleaf arnica
Arrhenatherum elatius	Tall oatgrass
Artemisia cana	Silver sagebrush
Artemisia cana var. bolanderi	
Artemisia dracunculus	Wormwood
Artemisia frigida	Fringed sagebrush
Artemisia tridentata	Big sagebrush
Aster chilensis	Pacific aster
Aster engelmannii	Engelmann aster
Aster occidentalis	Western aster
Astragalus argophyllus	Silver-leaved milkvetch

(Scientific Name)	(Common Name)
Astragalus convallarius	Lesser rushy milkvetch
Barbarea orthoceras	Wintercress
Bromus anomalus	Ripgut brome
Bromus carinatus	Mountain brome
Bromus inermis	Smooth brome
Bromus tectorum	Cheatgrass
Calamagrostis neglecta	Slimstem reedgrass
Caltha leptosepala	Marsh marigold
Capsella bursapastoris	Shepherds purse
Cardamine cordifolia	Heartleaf bittercress
Cardaria draba	Whitetop
Carex aquatilis	Water sedge
Carex egglestonii	Eggleston sedge
Carex geyeri	Elk sedge
Carex hoodii	Hood sedge
Carex kelloggii	Kellogg sedge
Carex lanuginosa	Woolly sedge
Carex microptera	Smallwing sedge
Carex praegracilis	Silver sedge
Carex nebraskensis	Nebraska sedge
Carex rossii	Ross sedge
Carex rostrata	Beaked sedge
Castilleja leonardii	Leonard painted-cup
Castilleja linariifolia	Wyoming painted-cup
Catabrosa aquatica	Brookgrass
Cerastium sp.	Cerastium
Cercocarpus montanus	Birch-leaf mountain mahogany
Chenopodium fremontii	Fremont goosefoot
Chorispora tenella	Chorispora
Chrysothamnus nauseosus	Rubber rabbitbrush
Chrysothamnus viscidiflorus	Low rabbitbrush
Cirsium foliosum	Elk thistle
Cirsium vulgare	Bull thistle
Clematis hirsutissima	Douglas clematis
Cleome serrulata	Bee spider flower
Claytonia lanceolata	Lanceleaf spring beauty
Collinsia parviflora	Blue-eyed mary
Collomia linearis	Slenderleaf collomia
Corallorhiza sp.	Coralroot
Comandra umbellata	Bastard toadflax
Crepis aciminata	Tapertip hawksbeard
Cryptantha crassisepala	Plains hiddenflower
Cystopteris fragilis	Brittle bladderfern
Dactylis glomerata	Orchard grass
Danthonia unispicata	Onespike danthonia

(Scientific Name)	(Common Name)
Delphinium menziesii	Menzies larkspur
Delphinium occidentalis	Western larkspur
Deschampsia caespitosa	Tufted hairgrass
Descruainia californica	California tansy mustard
Descurainia pinnata	Pinnate tansy mustard
Draba sp.	Rockcress
Eleocharis sp.	Spikerush
Elymus glaucus	Blue wildrye
Epilobium alpinum	Alpine willowherb
Epilobium angustifolium	Fireweed
Epilobium paniculatum	Autumn willowherb
Equisetum arvense	Horsetail
Erigeron speciosus	Oregon fleabane
Erigeron subtrinervis	Threenerve fleabane
Eriogonum umbellatum	Umbellate buckwheat
Erysimum asperum	Wallflower
Fragaria virginiana	Strawberry
Frasera speciosa	Showy frasera
Fritillaria atropurpurea	Purplespot fritillary
Galium trifidum	Small bedstraw
Gayophytum nuttallii	Bigflower groundsmoke
Gentiana sp.	Gentian
Geranium fremontii	Fremont geranium
Geranium richardsonii	Richardson geranium
Geum macrophyllum	Largeleaf avens
Gilia aggregata	Skyrocket gilia
Gilia sp. (annual)	
Glaux maritima	Sea milkwort
Glyceria striata	Fowl mannagrass
Habenaria sparsiflora	Bog orchid
Hackelia floribunda	Showy stickseed
Hackelia patens	
Helenium hoopesii	Orange sneezeweed
Heracleum lanatum	Cow parsnip
Hieracium scouleri	Woolly weed
Hordeum brachyantherum	Meadow barley
Hordeum jubatum	Foxtail barley
Hydrophyllum capitatum	Waterleaf
Iva axillaris	Poverty weed
Juncus arcticus	Arctic rush
Juncus ensifolius	Swordleaf rush
Juncus longistylis	Longstyle rush
Koeleria nitida	Junegrass
Lactuca scariola	Prickly lettuce
Lappula occidentalis	Western waterleaf

(Scientific Name)	(Common Name)
Lathyrus lanzwertii	Lanzwert sweetpea
Lathyrus pauciflorus	Utah sweetpea
Lepidium densiflorum	Prairie pepperweed
Ligusticum porteri	Porter ligusticum
Linanthus harknessii	Harkness gilia
Lithophragma bulbifera	Woodland star
Lonicera involucrata	Bearberry honeysuckle
Lonicera utahensis	Utah honeysuckle
Lupinus argenteus	Silvery lupine
Lupinus sericeus	Silky lupine
Luzula parviflora	Millett woodrush
Machaeranthera bigelovii	Bigelow aster
Machaeranthera canescens	Hoary aster
Madia glomerata	Tarweed
Mahonia repens	Oregon grape
Medicago sativa	Alfalfa
Melica bulbosa	Oniongrass
Mertensia ciliata	Bluebell
Mimulus guttatus	Monkeyflower
Mitella stenopetala	Smallflower miterwort
Moneses uniflora	Woodnymph
Monolepis nuttallianus	Nuttal monolepis
Muhlenbergia filiformis	Pullup muhly
Muhlenbergia racemosus	Green muhly
Nemophila breviflora	Great Basin nemophila
Orthocarpus tolemi	Tolemi owlclover
Osmorhiza chilensis	Spreading sweet root
Osmorhiza occidentalis	Sweet anise
Pachystima myrsinites	Mountain lover
Penstemon humilus	Low beardtongue
Penstemon procerus	Little flower beardtongue
Penstemon subglaber	
Penstemon watsonii	Watson beardtongue
Penstemon whippleanus	Whipple beardtongue
Phacelia hastata	Auslate phacelia
Phacelia heterophylla	Varileaf phacelia
Phacelia sericea	Silky phacelia
Phleum alpinum	Alpine timothy
Phleum pratense	Timothy
Phlox caespitosus	Caespitose phlox
Physocarpus malvaceous	Ninebark
Picea engelmannii	Engelmann spruce
Picea pungens	Blue spruce
Pinus flexilis	Limber pine
Plagiobothrys scouleri	Scouler popcorn flower

(Scientific Name)	(Common Name)
Lathyrus lanzwertii	Lanzwert sweetpea
Lathyrus pauciflorus	Utah sweetpea
Lepidium densiflorum	Prairie pepperweed
Ligusticum porteri	Porter ligusticum
Linanthus harknessii	Harkness gilia
Lithophragma bulbifera	Woodland star
Lonicera involucrata	Bearberry honeysuckle
Lonicera utahensis	Utah honeysuckle
Lupinus argenteus	Silvery lupine
Lupinus sericeus	Silky lupine
Luzula parviflora	Millett woodrush
Machaeranthera bigelovii	Bigelow aster
Machaeranthera canescens	Hoary aster
Madia glomerata	Tarweed
Mahonia repens	Oregon grape
Medicago sativa	Alfalfa
Melica bulbosa	Oniongrass
Mertensia ciliata	Bluebell
Mimulus guttatus	Monkeyflower
Mitella stenopetala	Smallflower miterwort
Moneses uniflora	Woodnymph
Monolepis nuttallianus	Nuttal monolepis
Muhlenbergia filiformis	Pullup muhly
Muhlenbergia racemosus	Green muhly
Nemophila breviflora	Great Basin nemophila
Orthocarpus tolemi	Tolemi owlclover
Osmorhiza chilensis	Spreading sweet root
Osmorhiza occidentalis	Sweet anise
Pachystima myrsinites	Mountain lover
Penstemon humilus	Low beardtongue
Penstemon procerus	Little flower beardtongue
Penstemon subglaber	
Penstemon watsonii	Watson beardtongue
Penstemon whippleanus	Whipple beardtongue
Phacelia hastata	Auslate phacelia
Phacelia heterophylla	Varileaf phacelia
Phacelia sericea	Silky phacelia
Phleum alpinum	Alpine timothy
Phleum pratense	Timothy
Phlox caespitosus	Caespitose phlox
Physocarpus malvaceous	Ninebark
Picea engelmannii	Engelmann spruce
Picea pungens	Blue spruce
Pinus flexilis	Limber pine
Plagiobothrys scouleri	Scouler popcorn flower

(Scientific Name)	(Common Name)
Poa bulbosa	Bulbous bluegrass
Poa canbyi	Canby bluegrass
Poa fendleriana	Muttongrass
Poa interior	Island bluegrass
Poa nervosa	Wheeler bluegrass
Poa pratensis	Kentucky bluegrass
Poa reflexa	Nodding bluegrass
Poa sandbergii	Sandberg bluegrass
Polemonium foliosissimum	Jacobs ladder
Polemonium pulcherrimum	Skunkleaf jacobs ladder
Polygonum aviculare	Prostrate knotweed
Polygonum bistortoides	American bistort
Polygonum douglasii	Douglas knotweed
Polygonum sawatchense	Sawatch knotweed
Populus tremuloides	Aspen
Potentilla anserina	Silverweed cinquefoil
Potentilla fruticosa	Bush cinquefoil
Potentilla glandulosa	Glandular cinquefoil
Potentilla gracilis	Slender cinquefoil
Prunus virginiana	Chokecherry
Pseudotsuga menziesii	Douglas fir
Pyrola secunda	Sidebells wintergreen
Quercus gambellei	
Ranunculus alismaefolius	Buttercup
Ranunculus inamoenus	
Ranunculus testiculatus	Bur buttercup
Ribes cereum	Squaw currant
Ribes hudsonianum	Hudson bay currant
Ribes inerme	Whitestem gooseberry
Ribes montigenum	Gooseberry currant
Ribes viscosissimum	Sticky currant
Rorippa curvipes	Obtuse fieldcress
Rosa woodsii	Woods rose
Rubus idaeus	Raspberry
Rubus parviflorus	Thimble berry
Rudbeckia occidentalis	Western coneflower
Rumex acetosella	Sheep sorrel
Rumex crispus	Curly dock
Rumex salicifolius	Willow dock
Salix geyeri	Geyer willow
Salix glauca	Grayleaf willow
Salix rigida	Watson willow
Sambucus coerulea	Blue elderberry
Sambucus racemosa	Red elderberry
Saxifraga odontiloma	Washington saxifrage

(Scientific Name)	(Common Name)
Scrophularia lanceolata	Lanceleaf figwort
Sedum debile	Stonecrop
Senecio integerrimus	Lambstongue
Senecio multilobatus	Lobeleaf groundsel
Senecio serra	Bitterweed groundsel
Shepherdia canadensis	Russet buffaloberry
Sitanion hystrix	Bottlebrush
Silene antirrhina	Sleepy silene
Silene menziesii	Menzies silene
Smilacina stellata	False solomonseal
Solidago parryi	Parry goldenrod
Sorbus scopulina	Mountain ash
Stellaria jamesiana	Tuber starwort
Stipa columbiana	Subalpine needlegrass
Stipa lettermanii	Letterman needlegrass
Symphoricarpos oreophilus	Mountain snowberry
Taraxacum officinale	Dandelion
Tetradymia canescens	Gray horsebrush
Thalictrum fendleri	Fendler meadowrue
Thermopsis montana	Golden pea
Thalaspi montanum	Blue pennycress
Tragopogon dubius	Yellow goatsbeard
Trifolium kingii	King clover
Trifolium repens	White dutch clover
Trisetum spicatum	Spike trisetum
Trisetum wolfii	Wolf trisetum
Urtica dioica	Stinging nettle
Valeriana occidentalis	Western valeriana
Veratrum californicum	False hellebore
Verbascum thapsus	Flannel mullein
Veronica serpyllifolia	Thymeleaf speedwell
Vicia americana	American vetch
Viguiera multiflora	Showy goldeneye
Viola adunca	Hook violet
Viola canadensis	Canada violet
Viola praemorsa	Yellow violet

Note -- Common names were derived in large part from the following publication: Plummer, A. P., S. B. Monsen, and R. Stevens, 1977. Intermountain Rangeplant names and symbols. USDA Forest Service General Technical Report INT-38. 82 pp.

Soil Resources

*1. The chemical and physical analyses of topsoil and overburden for areas proposed for surface disturbance and major structures is not clear. It appears that data has been incorrectly collated to sites. In addition, not all of the parameters have been examined such as acidity or alkalinity. Based on the limited information submitted, the applicant will have to test for sodic concentrations of topsoil and overburden.

Soil Resources - Section 783.21 (211.10(c))

NOTE: The revised soils report (also referred to as the February Report) referenced in the following discussion may be found in this document at the end of the Vegetation and Revegetation section. A single integrated soils and vegetation report was prepared by the consultants.

Deficiency 1. - The chemical and physical analyses of topsoil and overburden for areas proposed for surface disturbance and major structures is not clear. It appears that data has been incorrectly collated to sites. In addition, not all of the parameters have been examined such as acidity or alkalinity. Based on the limited information submitted, the applicant will have to test for sodic concentrations of topsoil and overburden.

Response. - Tables LI-LXVI contain chemical and physical analyses on the soils that have been identified for the project area (Report pp. 106-129). These tables will be completed for all topsoil horizons as the information is compiled. Pages 15 and 16 of Report describe the methods used for chemical analysis. Physical analysis is determined by field observations and study. Chemical and physical analyses of overburden are included.

The pH and conductivity of saturation extract (EC) are presented on the soil tables cited above, and again these tables will become completed as the information is obtained in the 1980 field season.

Sodic concentrations will be determined and recorded onto tables only when the EC x 10^3 should exceed 2 mmhos/cm, or the pH should exceed 8.4.

Table data will be summarized in a mapping unit description. The mapping unit descriptions will be submitted with the soil survey.

Chemical Analysis of Overburden

The following data were obtained by pulverizing core samples and mixing the core sample in distilled water for 24 hours with a blender. The data correlate with water quality analyses of surface and spring waters in the area with the test water containing slightly higher concentrations of some trace metals such as total iron. The slightly basic nature of the water prevents trace elements from staying in solution. Thus, total iron is usually less than 1 mg/l in the nature waters at the site. Total iron in the test sample ranged from 0.59 to 16.7 mg/l.

Drill hole sites can be located in the Soils portion of the mine application in Volume A-2.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis

40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 01/21/80

CERTIFICATE OF ANALYSIS

DAMES & MOORE, ENG.
250 E. BROADWAY
SALT LAKE CITY, UT
84111

80-008511

SAMPLE: CORE FROM JOB #06701-010 RECEIVED 1/8/80 UNDER P.O. #SL 1233 FOR ANALYSIS.

	SAMPLE TH-1 3-9 FT	SAMPLE TH-2 3-12 FT	SAMPLE TH-3 2-15 FT	SAMPLE TH-4 3-15 FT	SAMPLE TH-5 2-15 FT
Arsenic as As (Tot) ppm	.065	.105	.130	.100	.085
Barium as Ba ppm	.220	.316	.820	.410	.620
Boron as B ppm	.150	.180	.161	.210	.200
Calcium Sulfate as CaSO4 %	.022	.012	.027	.023	.012
Chromium as Cr (Tot) ppm	.064	.097	.016	.590	.193
Iron as Fe (Tot) ppm	5.600	5.200	6.560	14.700	6.470
Lead as Pb (Tot) ppm	.002	.003	.014	.088	.005
Magnesium Sulfate as MgSO4 %	.005	.009	.014	.018	.015
Sodium Sulfate as NaSO4 %	.045	.097	.086	.035	.022
Total Soluable Sulfate SO4 %	.054	.090	.099	.058	.037
Total Soluble Solids %	.085	.123	.129	.088	.058
pH Units	7.40	7.50	7.65	7.35	7.45

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis

40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-008511

	SAMPLE TH-6 4-7 FT	SAMPLE TH-7 2-11 FT	SAMPLE TH-8 2-6 FT	SAMPLE TH-9A 2-16 FT	SAMPLE TH-11A (8A) 3 FT
Arsenic as As (Tot) ppm	.095	.020	.080	.070	.045
Barium as Ba ppm	.330	.290	.410	.380	.370
Boron as B ppm	.180	.195	.210	.220	.204
Calcium Sulfate as CaSO4 %	.013	.010	.014	.022	.018
Chromium as Cr (Tot) ppm	.079	.044	.389	.592	.094
Iron as Fe (Tot) ppm	2.660	.590	1.070	3.060	1.780
Lead as Pb (Tot) ppm	.005	.012	.003	.006	.002
Magnesium Sulfate as MgSO4 %	.017	.006	.003	.013	.009
Sodium Sulfate as NaSO4 %	.030	.018	.020	.025	.026
Total Soluable Sulfate SO4 %	.047	.026	.027	.046	.040
Total Soluble Solids %	.070	.042	.040	.068	.055
pH Units	7.40	7.50	7.60	7.80	7.68

FORD CHEMICAL LABORATORY, INC.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-008512

	SAMPLE TH-14 3 FT	SAMPLE TH-17 2-11 FT	SAMPLE TH-17 30 FT	SAMPLE TH-17 45 FT
Arsenic as As (Tot) ppm	.210	.065	.030	.020
Barium as Ba ppm	.279	.810	.714	.350
Boron as B ppm	.114	.180	.150	.165
Calcium Sulfate as CaSO4 %	.031	.026	.028	.022
romium as Cr (Tot) ppm	.005	.012	.004	.002
on as Fe (Tot) ppm	16.700	1.090	1.300	1.000
Lead as Pb (Tot) ppm	.014	.020	.013	.030
Magnesium Sulfate as MgSO4 %	.009	.008	.012	.013
Sodium Sulfate as NaSO4 %	.044	.039	.046	.038
Total Soluable Sulfate SO4 %	.063	.055	.065	.056
Total Soluble Solids %	.095	.088	.092	.085
pH Units	7.40	7.60	7.50	7.72

FORD CHEMICAL LABORATORY, INC.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 01/21/80

CERTIFICATE OF ANALYSIS

DAMES & MOORE, ENG.
250 E. BROADWAY
SALT LAKE CITY, UT
84111

80-008512

SAMPLE: CORE FROM JOB #06701-010 RECEIVED 1/8/80 UNDER P.O. #SL 1233 FOR ANALYSIS.

	SAMPLE TH-12 25 FT	SAMPLE TH-12 50 FT	SAMPLE TH-13 10 FT	SAMPLE TH-13 25 FT	SAMPLE TH-13 50 FT
Arsenic as As (Tot) ppm	.050	<.001	.120	.050	.070
Barium as Ba ppm	.444	.216	.380	.350	.310
Boron as B ppm	.170	.188	.145	.149	.150
Calcium Sulfate as CaSO4 %	.029	.030	.025	.020	.019
Chromium as Cr (Tot) ppm	.002	.008	.012	.010	.006
Iron as Fe (Tot) ppm	1.000	<.100	.970	1.200	65.000
Lead as Pb (Tot) ppm	.009	.024	.063	.038	.007
Magnesium Sulfate as MgSO4 %	.010	.012	.010	.011	.014
Sodium Sulfate as NaSO4 %	.065	.080	.055	.040	.039
Total Soluable Sulfate SO4 %	.080	.094	.070	.055	.055
Total Soluble Solids %	.110	.125	.098	.080	.078
pH Units	7.45	7.50	7.58	7.90	7.80

Soil Resources

2. The soil resource information should include an analysis as to the suitability of the topsoil in different vegetation areas and the amount available for use in these different areas.

Deficiency 2. - The soil resource information should include an analysis as to the suitability of the topsoil in different vegetation areas and the amount available for use in these different areas.

Response. - Pages 24 and 25 of the February report supply the information for the amount of topsoil available. The volume of soil considered as suitable for reclamation purposes is computed for each of the vegetation areas.

Soil Resources

3. Maps should delineate topographic features or cadastral location in order to properly locate soil/vegetation associations on proposed surface disturbance areas.

Deficiency 3. - Maps should delineate topographic features or cadastral location in order to properly locate soil/vegetation associations on proposed surface disturbance areas.

Response. - This is the same deficiency as Item 6 in Vegetation and Revegetation and is handled there.

Soil Resources

*4. A soil survey at the reconnaissance level for the lease area and a high-intensity detailed soil survey for the portal area, facilities area, and surface disturbance area should be included in the application. The standards used in the soil survey should be identified or the Soil Conservation Service (SCS) National Cooperative Soil Survey Standards should be used. Scales of the maps should be no less than 1:12,000. Complete mapping unit descriptions should be included in the application.

Deficiency 4. - "A soil survey at the reconnaissance level for the lease area and a high-intensity detailed soil survey for the portal area facilities area, and surface disturbance area should be included in the application. The standards used in the soil survey should be identified or the Soil Conservation Service (SCS) National Cooperative Soil Survey Standards should be used. Scales of the maps should be no less than 1:12,000. Complete mapping unit descriptions should be included in the application."

Response. - The intensity or order of soil survey to be used in the portal, facilities, and surface disturbance areas is being reconsidered by SCS officials due to the disturbance which has already taken place in some of these areas. We will work with these people and comply with the final decision. The remaining area will be surveyed at an order 3 level.

The survey standards will come from the National Soil Survey Handbook and the Revised Soil Survey Manual which are standards for the National Cooperative Soil Survey Standards.

Maps will be of a scale greater than 1:12,000 for all areas.

As the survey progresses, mapping unit descriptions which comply with the above-mentioned standards will be written and submitted with the soil survey.

Soil Resources

*5. Potential productivity of existing soils should be included in the application.

Deficiency 5. - Potential productivity of existing soils should be included in the application.

Response. - Potential productivity of existing soils will be included in the mapping unit description to be developed during the field season of 1980.

LIST OF MAPS

MAPS:

FISH AND WILDLIFE

SECTIONS 783.20, 784.21 (211.10(c), 211.4(d))

FISH AND WILDLIFE

SECTIONS 783.20, 784.21 (211.10(c), 211.4(d))

Fish and Wildlife

*1. The applicant should supply data on the occurrence of the threatened or endangered species within the mine plan area and adjacent areas and should indicate the measurement or search methods used to determine their presence or absence. The U.S. Fish and Wildlife Service list of threatened and endangered species as well as other lists of such species and ranges in the State should be used to determine the potential presence of endangered and threatened species.

Fish and Wildlife

General Comment: Revisions are attached for the Terrestrial Wildlife--Mammal portion (attachment C) and for the Aquatic Wildlife Section (Attachment D) of Volume A-5. These revisions have been prepared in response to comments in a technical review by the Division of Wildlife Resources. These revisions, which provide clarification on several issues, will be appropriately cross-referenced at a later date.

Sections 783.20, 784.21 (211.10(c), 211.4(d))

*1. The Applicant should supply data on the occurrence of the threatened or endangered species within the mine plan area and adjacent areas and should indicate the measurement of search methods used to determine their presence or absence. The U. S. Fish and Wildlife Service list of threatened and endangered species as well as other lists of such species and ranges in the State should be used to determine the potential presence of endangered and threatened species.

Response: Species lists and an informal consultation were requested of the U.S. Fish and Wildlife Service--Salt Lake City Office, on March 21, 1980. Their response is mandated within thirty days, but should be provided much sooner depending upon personal availability for a project review. In the interim, however, the USF&WS Endangered Species Team suggested that the Skyline Application need not be delayed for a threatened or endangered species analysis since the USF&WS routinely consults with private sector experts on the status of these species. The USF&WS Endangered Species Team suggests that the application approval process can probably be expedited, and the credibility of the consultants established, if necessary, through a telephone call to the appropriate team members (call through Mr. Robert Shields, Area Manager at 801-524-4430 or FTS 588-4430). Summaries of the consultants' evaluation of the status of threatened and endangered species in the project may be found in Attachments E through G. Also attached is a copy of the Utah State Division of Wildlife Resources publication, "Vertebrate Species of Southeastern Utah," which further confirms the consultants' opinions (see Attachment H).

Fish and Wildlife

*2. The application should include a map showing habitat and migration routes for the major terrestrial wildlife types in the mine plan area and adjacent areas.

*2. The application should include a map showing habitat and migration routes for the major terrestrial wildlife types in the mine plan area and adjacent areas.

Response. The attached maps (see Attachments I, J and K and Figures 4 and 5 of Attachment C - Wildlife Assessment of the Skyline Mining Property and Adjacent Areas, Carbon and Emery Counties, Utah) show the requested information by high interest wildlife type and by use classification. The data were assembled from a site specific analysis provided by the Division of Wildlife Resources upon request from Coastal States Energy Company.

*3. The Applicant must indicate what mitigation methods are being applied to lessen the impact of the proposed operation on terrestrial wildlife. In particular, the impact on the conveyor system on the migration of deer, elk, and moose should be considered and mitigated.

Response: The mitigation methods being applied to lessen the impact of the proposed operation on terrestrial wildlife are discussed by species in the application or in the revisions thereto. Coastal States has coordinated the proposed operation with Division of Water Resources and has incorporated many suggestions into both the engineering design and into the construction schedule. Fish and Wildlife studies which are being used to enhance the DWR data base and to provide additional site specific information upon which DWR and Coastal States can jointly establish mitigation measures.

For convenience of the reviewer,the more significant mitigation methods are summarized in the following discussion:

1. Game crossings along the conveyor.

   The application identified three underpasses in the upper portion of the conveyor where the conveyor was elevated across small canyons. Coastal States has added four additional underpasses, one immediately above each transfer point, at the suggestion of DWR. Additionally, an overpass will be provided in lower Eccles Canyon where the conveyor passes under the road. A continuing study, involving Coastal States consultants and DWR personnel, will investigate the need for additional crossings.

2. The areal impact on wildlife will be lessened through the use of a single, well-designed and monitored, utility corridor.

3. The potential for vehicle-wildlife collisions will be substantially reduced through the use of a company-sponsored busing program. Buses will be provided to transport employees from central locations in the various communities to the mine site, thus eliminating the bulk of the employee vehicular traffic through many miles of wildlife habitat.

4. The construction activities schedule is being coordinated with DWR in an attempt to identify activities which can be re-scheduled to a time of minimum impact. Where possible, construction disturbance will be shifted away from identified problem areas during critical periods.

5. DWR recommendations have been included in the revegetation plans to provide optimum habitat for wildlife. The reclaimed habitat will, in many cases, be superior to that found in the pre-construction conditions. A recommended revegetation species list, favorable to wildlife, has been incorporated where appropriate.

6. The stream diversions have been minimized to reduce the impact on the aquatic communities. The diversions have been structurally and

hydraulically engineered to provide optimum fish habitat so that the diversions as designed should result in little, if any, habitat loss.

7. Conservation recommendations have been requested from DWR for inclusion into the employee training program.

Questions regarding Coastal States' coordination with DWR should be directed to Mr. Larry Dalton at the Southeastern Region Office in Price (801-637-3310).

ATTACHMENT C

WILDLIFE ASSESSMENT OF THE SKYLINE MINING PROPERTY AND ADJACENT AREAS, CARBON AND EMERY COUNTIES, UTAH

Prepared for

COASTAL STATES ENERGY COMPANY

Houston, Texas

By

Clyde L. Pritchett
H. Duane Smith
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(801) 378-2492

March 1980

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INTRODUCTION

Prior to any perturbation or manipulation of the environment it is essential to conduct a pre-disturbance study of the factors likely to be disrupted or impacted by the proposed action. This facilitates understanding the dynamics of the environment such that perturbation consequences can be predicted and avoided or considered in any situation requiring ecological and/or economic mitigation or "trade offs".

Purpose

Previous to this study and evaluation of the proposed Skyline Project, the Utah Division of Oil, Gas and Mining in consultative deliberation with the Utah Division of Wildlife Resources and U.S. Forest Service determined the objectives were to: (1) determine habitation and use by moose and elk of the environs in and around the proposed Skyline project, (2) estimate use by mule deer of the canyons to be traversed by the coal conveyor, (3) determine more accurately the presence of other species of mammals, amphibians and reptiles, (4) determine habitat affinities and time of utilization by mammals, amphibians and reptiles, and (5) ensure correct knowledge of the occurrence of any endangered or prime species on the area of the proposed project.

Personnel

The study was done under the direction of Drs. Clyde L. Pritchett, Associate Professor in the Department of Zoology and Curator of Mammals at the Monte L. Bean Museum, and H. Duane Smith, Associate Professor and Coordinator of Wildlife and Range Resources in the Department of Zoology, at Brigham Young University, Provo, Utah. Drs. Pritchett and Smith are well known for their quality research and consultant work on terrestrial vertebrates for various federal, state and private concerns. Vitae of the principal investigators are attached for reference.

Dates of Collection and Analysis

In order to accomplish the stated objectives of the study, it was necessary to establish the following working objectives with an accompanying timetable for accomplishment of the specific tasks necessary to accomplish the objectives.

Working Objectives

1. Conduct a thorough literature review pertaining to the mammal, amphibian and reptile fauna of the geographic area of concern.
2. Establish study sites in the potentially perturbed habitat types.
3. Identify the potentially existing faunal components of concern and determine habitats significant to their presence and persistence.
4. Categorize and identify the status of the faunal components of concern and highlight those that deserve special attention as prime or high-interest species because they are endangered, threatened, or of economic or recreational value.
5. Evaluate and discuss in report form the significant relationships and/or interactions and potential results of the proposed perturbations on the terrestrial vertebrates of concern. High-interest or prime species will be highlighted.
6. Coordinate with other consultants and the company and provide comments and expert testimony at their request.

Methods

This research was designed to qualitatively evaluate the terrestrial vertebrate components in the vegetation habitats proposed to be impacted by the construction and operation of a long-wall coal mine and its attendant facilities including a coal conveyor. The approach and procedures (methods) are presented in reference to the specific working objective to which they apply.

RESEARCH TIMETABLE
(Work Schedule)

Task	Working Objective	Month											
		A	M	J	Ju	A	S	O	N	D	J	F	M
1. Conduct literature review	1	X	X	X									
a. Libraries													
b. State and Federal Agencies													
c. Private Concerns													
d. Public references and records													
2. Establish study sites	2	X	X	X									
a. Contact company													
b. Visit area													
c. Select observation sites													
d. Design data collection													
3. Identify faunal components	3	X	X		X	X							
4. Determine significant habitat	3				X	X	X	X					
5. Determine status of species	4				X	X							
6. Evaluate perturbation impact	5							X	X	X	X		
7. Write format report	5											X	X
8. Provide comments and testimony	6												

<u>Objective 1</u>. This objective is of paramount importance. Considerable work is often done in many geographic and scientific areas but is unknown due to inappropriate literature review procedures. This is particularly true in the case of unpublished thesis and state and federal agency reports. A thorough literature review was conducted. The libraries at each of the major universities in Utah were surveyed. Special emphasis was given to location of published literature pertinent to the geographic area and habitat types in question. In addition, unpublished theses were perused for pertinent data. Visits were also made to state and federal agencies who have jurisdiction or control over the study areas. Pertinent reports and management plans were reviewed and appropriate personnel questioned. Private vested interest concerns were contacted for access to their data.

<u>Objective 2</u>. Other workers within the projects as well as state and federal agencies were contacted to determine mutual needs and cooperation. Those concerned with actual site selection visited the study area to finalize selection of the important areas of impact to be studied in the area of potential impact.

<u>Objective 3</u>. A combination of literature analysis and field observation was used to determine the potential inhabitants of the area of concern and to identify habitats significant to their presence and persistence. Field observations were conducted Thursday, Friday, and Saturday of each week from May 7 to August 4, 1979. Other trips were made as needed to collect specific data.

<u>Objective 4</u>. The methods and procedures essential to accomplish this objective involve basically two things. First, all of the

species observed, known or projected to inhabit the potential habitats of impact were identified through objectives 1 and 3 and listed phylogenetically in tabular form. Second, all listed species were categorized to determine those that are of high-interest (prime species) to management agencies. The term high-interest or prime species designates those that require special attention by scientists and public management agencies because they are either endangered, threatened, game or of economice or recreational value. The reasons for this special designation are many: (1) ranges are small thus restricting the population to perhaps a few individuals, (2) ranges may be small and although populations may be numerically large, the entire range lies within the area of concern, (3) irrespective of population numbers or range little is known of the current status and in some cases information suggests that populations are declining, (4) species are sensitive to perturbations and may potentially be in danger of abnormal declines, (5) species are relict or may have aesthetic or scientific value, (6) economic or recreational importance and (7) combinations of the above.

Objective 5. The objective was met via this report wherein the data are summarily presented in tabular and mapped format to illustrate the significant interactions and potential results of the proposed perturbation on the terrestrial vertebrates. Pertinent points and data are discussed and the pros and cons of the proposed action verbally evaluated.

Objective 6. This objective is being met according to the requirements of Coastal States.

MAPS AND VITAE - SEE APPENDICES

DATA SUMMARIES - SPECIES STATUS LISTS

Literature and field data were summarized for all terrestrial vertebrates of concern, and the species categorized to determine habitat affinities and prime (high-interest) species status. These results are reported in tabular form (Tables 1-3). They are listed according to their various ecological classifications (Dalton et al. 1978; Durrant 1952; Hall and Kelson 1959; Hayward 1967; and Hayward et al. 1958). All species whose ranges appear to overlap any or all of the potential area of impact are listed. Generally speaking, the proposed project area could potentially be inhabited by about 57 mammalian, 6 amphibian and 15 reptilian species. Some of these are considered high interest species for the habitats and local area of concern and 48 percent are protected.

No discussion is included in this section of the report. The prime (high-interest) species of concern are mapped (Figures 1-3) and discussed individually in a separate section, as are the overall impacts by action. Although several of the prime species are mapped individually, others whose ranges are essentially ubiquitous could not be mapped meaningfully because their ranges cover the entire area. Generally, if a prime species in not mapped, it is because its distribution is too broad to be meaningful in the small area such as the proposed Skyline Coal Project.

Terms used in Tables 1-3 are defined as follows:

1. Plant communities (discussed in detail in another portion of this paper): (a) spruce fir; (b) aspen; (c) sage brush; (d) mixed shrub grasses; and (e) riparian habitat.
2. Game species: Any species that is hunted or trapped as a game or fur-bearing animal and requires a trapping permit or a hunting license.
3. Migratory species: Any species that spend only part of the year in the area.
4. Resident species: Any species that inhabits the area during reproduction.
5. Casual or Rare: Any species that are only observed occasionally over a period of several years. There is no connection between this category and a "rare" or "endangered" species.
6. High interest: Any species that is endangered, threatened or of economic or recreation value.

Table 1. Species list and classification of mammals whose published ranges overlap the proposed Skyline Coal Mine Site.

A = Abundant
C = Common
U = Uncommon
Ca = Casual or Rare
R = Permanent Resident
S = Summer Only

Species	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Masked Shrew *Sorex cinereus*					CR	X	
Mirriam Shrew *Sorex mirriami*					CR	X	
Vagrant Shrew *Sorex vagrans*					UP		
Dusky Shrew *Sorex obscurus*					CR	X	
Water Shrew *Sorex palustris*					CS	X	
Little Brown Myotis *Myotis lucifugus*					CS		
Long-eared Myotis *Myotis evotis*					US		
Fringed Myotis *Myotis thysanodes*					US		
Long-legged Myotis *Myotis volans*					US		
California Myotis *Myotis californicus*					US		
Small-footed Myotis *Myotis leibii*					US		
Silver-haired Bat *Lasionycteris noctivagans*					CS		
Big Brown Bat *Eptesicus fuscus*					US		
Red Bat *Lasiurus borealis*					US		

Table 1
Page 2

	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Hoary Bat *Lasiurus cinereus*					CS		
Townsend's Big-eared Bat *Plecotus townsendii*					CR		
Brazilian Free-tailed Bat *Tadarida brasiliensis*					CR		
Nuttall's Cottontail *Sylvilagus nuttallii*		CR			CR	X	X
Snowshoe Hare *Lepus americanus*	CR	CR			CR	X	X
Least Chipmunk *Eutamias minimus*	CR	CR	AR		AR	X	
Uinta Chipmunk *Eutamias umbrinus*	CR	CR		CR	UR	X	
Yellow-bellied Marmot *Marmota flaviventris*		CR		CR		X	
Uinta Ground Squirrel *Spermophilus armatus*				AS		X	
Rock Squirrel *Spermophilus variegatus*			CR	CR	CR	X	
Golden-mantled Ground Squirrel *Spermophilus lateralis*			CR	CR	CR	X	
Red Squirrel *Tamiasciurus hudsonicus*	CR					X	
Northern Flying Squirrel *Glaucomys sabrinus*	CR						
Northern Pocket Gopher *Thomomys talpodes*			CR			X	

Table 1
Page 3

	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Botta pocket gopher *Thomomys bottae*					CA		
Beaver *Castor canadensis*					UR	X	X
Western Harvest Mouse *Reithrodontomys megalotis*			UR	UR		X	
Deer Mouse *Peromyscus maniculatus*	AR	AR	AR	AR	AR	X	
Bushy-tailed Woodrat *Neotoma cinerea*				UR		X	
Meadow Vole *Microtus pennsylvanicus*				CR	CR		
Montane Vole *Microtus montanus*				CR	CR	X	
Long-tailed Vole *Microtus longicaudus*				CR	CR	X	
Water Vole *Arvicola richardsoni*					CR	X	
Muskrat *Ondatra zibethicus*					UR	X	X
Western Jumping Mouse *Zapus princeps*				AS	AS	X	
Porcupine *Erethizon dorsatum*	CR			CR	CR	X	
Red Fox *Vulpes fulva*	CaR	CaR	CaR	CaR	CaR		X
Coyote *Canis latrans*	UR	UR	UR	UR	UR	X	X
Gray Fox *Urocyon cinereoargenteus*				CaR	CaR		X

Table 1
Page 4

	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Black Bear *Ursus americanus*	CaR	CaR		CaR	CaR		X
Ringtail *Bassariscus astutus*					CaR		
Raccoon *Procyon lotor*					CaR		
Marten *Martes americana*	CaR						X
Ermine *Mustela erminea*		UR	UR	UR	UR		X
Long-tailed Weasel *Mustela frenata*	CR	CR	CR	CR	CR	X	X
Mink *Mustela vison*					CaR	X	X
Badger *Taxidea taxus*			UR	UR		X	
Striped Skunk *Mephitis mephitis*	CR	CR	CR	CR	CR	X	
Mountain Lion *Felis concolor*	CaR	CaR	CaR	CaR	CaR	X	X
Bobcat *Lynx rufus*	UR	UR	UR	UR	UR	X	X
Wapiti or Elk *Cervus elaphus*	CS	CS	CS	CS	CR	X	X
Mule Deer *Odocoileus hemionus*	CR	CR	CR	CR	CR	X	X
Moose *Alces alces*		UR		UR	UR	X	X

Table 2. Species list and classification of amphibians whose published ranges overlap the proposed Skyline Coal Mine Site.

	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Tiger salamander *Ambystoma tigrinum*					UR	X	
Great Basin spadefoot toad *Scaphiopus hammondi*					UR		
Boreal toad *Bufo boreas*					CR	X	
Woodhouse's toad *Bufo woodhousei*					CR		
Boreal cricket frog *Pseudacris triseriata*					CR	X	
Western leopard frog *Rana pipiens*					UR		

Table 3. Species list and classification of reptiles whose published ranges overlap the proposed Skyline Coal Mine Site.

	Spruce-Fir	Aspen	Sagebrush	Mixed Shrub & Grasses	Riparian	Observed On Site	High Interest Species (Prime)
Fence lizard *Sceloporus undulatus*		US		US			
Sagebrush lizard *Sceloporus graciosus*			US	US		X	
Tree lizard *Urosaurus ornatus*		US					
Mountain short-horned lizard *Phrynosoma douglassi*			US	US	US	X	
Great Basin skink *Eumeces skiltonianus*					US		
Rocky Mountain Rubber Boa *Charina bottae*	CaS						
Wandering garter snake *Thamnophis elegans*			CS		CS	X	
Red-sided garter snake *Thamnophis sirtalis*					US		
Western or Yellow-bellied racer *Coluber constrictor*					CaS		
Striped whipsnake *Masticophis taeniatus*			US	US			
Western smooth green snake *Opheodrys vernalis*					CaS		
Gopher snake *Pituophis melanoleucus*			CS	CS		X	
Milk snake *Lampropeltis triangulum*	US	US			US		
Utah mountain ringsnake *Lampropeltis pyromelana*	US	US					
Rattlesnake *Crotalus viridus*			US	US	US	X	

IMPACT ANALYSIS BY HIGH INTEREST SPECIES

MAMMALS

The potential area of impact is inhabited by about 57 species of mammals (Table 1). Approximately 30 percent of these species are protected and considered of high interest to the state of Utah. As such, each should be considered in relation to the potential perturbations, but only those likely to be negatively impacted will be discussed.

Moose

The population of moose on the Wasatch Plateau is most numerous in the drainages of Schofield Reservoir and upper Huntington Canyon. In this area the higher elevation areas adjacent to crucial-critical riparian zones (year round range) are ranked high-priority summer range for moose. Via this criteria, the entire proposed mine area represents high-priority summer range for moose, and projected summer use runs from May 16 to November 30. Unlike other ungulates, moose do not mass migrate large distances to other areas for winter but concentrate into the crucial-critical riparian areas (December 1 to May 15). Some utulize the riparian areas year long. Both high elevation and riparian habitats are important to calving activities of moose between May 15 and July 15. No surface facilities or surface habitat destructions should be allowed in crucial critical habitat areas and constructions activities in moose calving areas should not be allowed until after July 15.

During this study one cow and a calf were observed in the environs of the mine lease site. This cow was easily identified by a blue collar put on by personnel of Utah Division of Wildlife Resources (D.W.R.). The cow and calf were sighted on the Huntington side of Eccles Canyon, not far from where the road is intersected by the pipeline road (Fig. 1). These animals were observed by various people and accoridng to D.W.R.

personnel they spent most of the summer in the environs of the mining site. One other moose, a yearling female with an injured front leg, was observed in the general project area. She was seen on Highway 96 two miles from the Schofield turnoff form U.S. Highway 6/50.

Fresh tracks and pellets were found around the beaver ponds in upper South Fork and along the ridge above South Fork. Tracks were also plentiful near a small pond located across the ridge south of South Fork. Some of the willows along the beaver ponds in Eccles Canyon were browsed quite high, apparently by moose during the winter. Sheepherders in the general project area indicated they had seen no moose this year; however, one sheepherder said a bull and cow inhabited James Canyon during most of 1978.

Both Eccles Canyon and South Fork have sufficient stands of willows and beaver ponds to facilitate moose populations, and since these were the focal points of moose sign in the project area, care should be taken to preserve the crucial-critical riparian habitat. Disturbance in Eccles Canyon is and will be considerable, whereas South Fork is relatively undisturbed. Therefore, construction and roads should be restricted to Eccles Canyon. This will provide a refugium for the moose in South Fork during critical calving and high human activity periods and still allow them access to Eccles Canyon when disturbance is minimal.

Elk

Elk on the proposed mine site are from the Manti herd unit and occupy the high priority summer range from May 16 to October 31 each year. The known summer range of this herd is more extensive than the potentially impacted area but the entire area of the mine lease lies within this high priority summer range. During the summer, calving and rearing of elk occurs within the summer range from May 16 to July 15. Unlike moose, elk migrate altitudinally and from November 1 to May 15 occupy lower vegetation communities that are classified as high priority, crucial-critical winter ranges. These winter ranges are not within the potentially perturbed habitat but are on ranges to the east and southeast (Scott, 1977) (Dalton, 1980 - personal communication) (Fig. 4).

During the field work, elk sign (tracks and pellets) were commonly observed throughout the area of concern, but actual sightings of elk were obviously less frequent, however, not unusual (Fig. 2). In the early part of the summer, before traffic increased, elk were often sighted from the road in Eccles Canyon, but after human activity increased few animals were seen. Animals were, however, still using the area because fresh sign was observed just above the portal site on and along the Eccles Canyon Road. It appears that the elk adjusted their circadian behavior to avoid disturbance from vehicles and man.

Although elk were present throughout the area of concern, the environs of the South Fork drainage was occupied by the highest concentration. This drainage appears to be a calving ground, since many cow elk with very young calves were observed therein. By the same criteria there are other probable calving areas in James, Coal and Burn Out Canyons. Since these canyons are external to the Skyline Project, it would be interesting to know if they are near saturation during calving or if they could absorb cows that might be displaced from the area of concern due to distrubance.

The habitat in South Fork is conducive to elk. The mountain is steep, has lots of cover and there is an abundance of good meadows that contain beaver ponds that are used for "elk wallows." The upper beaver

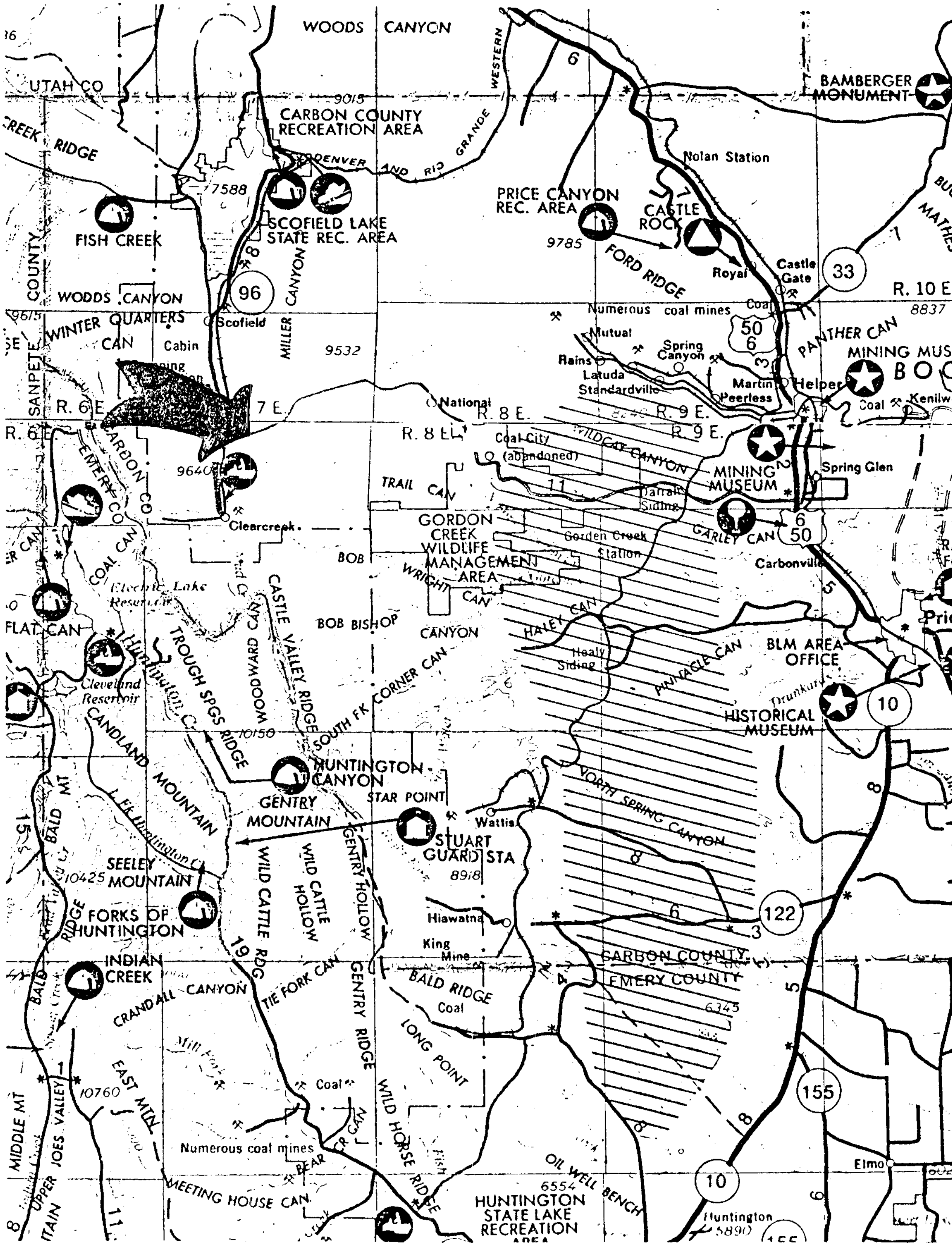

Fig. 4 Winter range and migratory route of Elk living in the environs of the skyline lease area.

ponds were used extensively as determined by the large number of tracks and bedding areas around them. Elk traveled over the ridge from these ponds and less disturbed areas and into Eccles Canyon. Even though the project area is high priority elk habitat, only one animal was positively identified as a bull. This is not suprising, however, due to the isolated and secretive habits of bull elk. Sheepherders reported a 6-point bull plus 10-15 cows and calves in James Canyon plus a separate sighting of a cow with twin calves (Fig. 2).

Minimizing human disturbance, especially during calving, is important if elk are to remain in the area of concern. Elk prefer large areas and it is known that 100 animals will do better on 500 acres than one elk on 5 or even 50 acres (Seton, 1927). Elk often traverse a 10-mile stretch during short periods of time, particularly when distrubed, in either summer or winter disturbance sources and so obstruction to movement must be minimized. Limits to elk populations will be determined by the extent man is willing to dedicate suitable range for this purpose (Rush, 1939). This range must not only include forage but sufficient security cover to allow the population to escape disturbance sources. This makes South Fork crucial-critical elk habit and it is extremely important to the stability of the elk herd in the potentially perturbed area. Efforts should be made to concentrate human activity and disturbance in Eccles Canyon and to maintain at least status quo in South Fork. Both overpasses and under passes should be provided so that elk can cross the conveyor that will otherwise function as a barier to movement. This is essential to elk that occupy or traverse South Fork, between the proposed Valley Camp and Skyline conveyors. Lack of passages may render this most favorable habitat useless for elk production and use.

Mule Deer

Mule deer on the proposed mine site are considered part of herd units 32 and 34 by Utah D. W. R. They utilize the entire mine plan and adjacent areas as high-priority summer range from May 16 to October 31. Fawning and rearing of young occur within this high-priority summer range from mid May to mid July. Unlike moose, deer migrate altitudinally and from November 1 to May 15 occupy lower vegetation commmunities that are classified as high-priority, curcial-critical winter ranges. Winter range for this population is not clearly defined but some deer likely move northeast in the environs of Soldier Summit vicinity while others may migrate east to the Gordon Creek winter range. In either case, these winter ranges are not within the potentially perturbed mine site (Fig. 5).

Field work revealed that mule deer ranged over the entire project area, but were present in varying contrations (Fig. 3). In the mornings and evenings they were frequently sighted at the numerous salt licks in the area, especially South Fork. The ridge on the north of Pipe Spring Canyon had a good stand of manzanita and 25-35 deer were often observed in that area. There was also a good herd, 20-30 deer, in James Canyon. Deer frequented Eccles Canyon and were sighted from the mouth of the canyon to the top of the ridge. Fresh tracks were frequently observed on the road. Most draws coming into Eccles Canyon had deer trails in them, but the two just below the site of the proposed portal and one 1.6 miles from the top end of the conveyor, had heavily used trails.

No deer were observed with twin fawns in the environs of the proposed Skyline project but this is not surprising. According to D. W. R. records the deer population on this unit is below the carrying capacity of the high-quality summer range and productivity is slightly below the state average. The amount of high-priority, curcial-critical winter range is

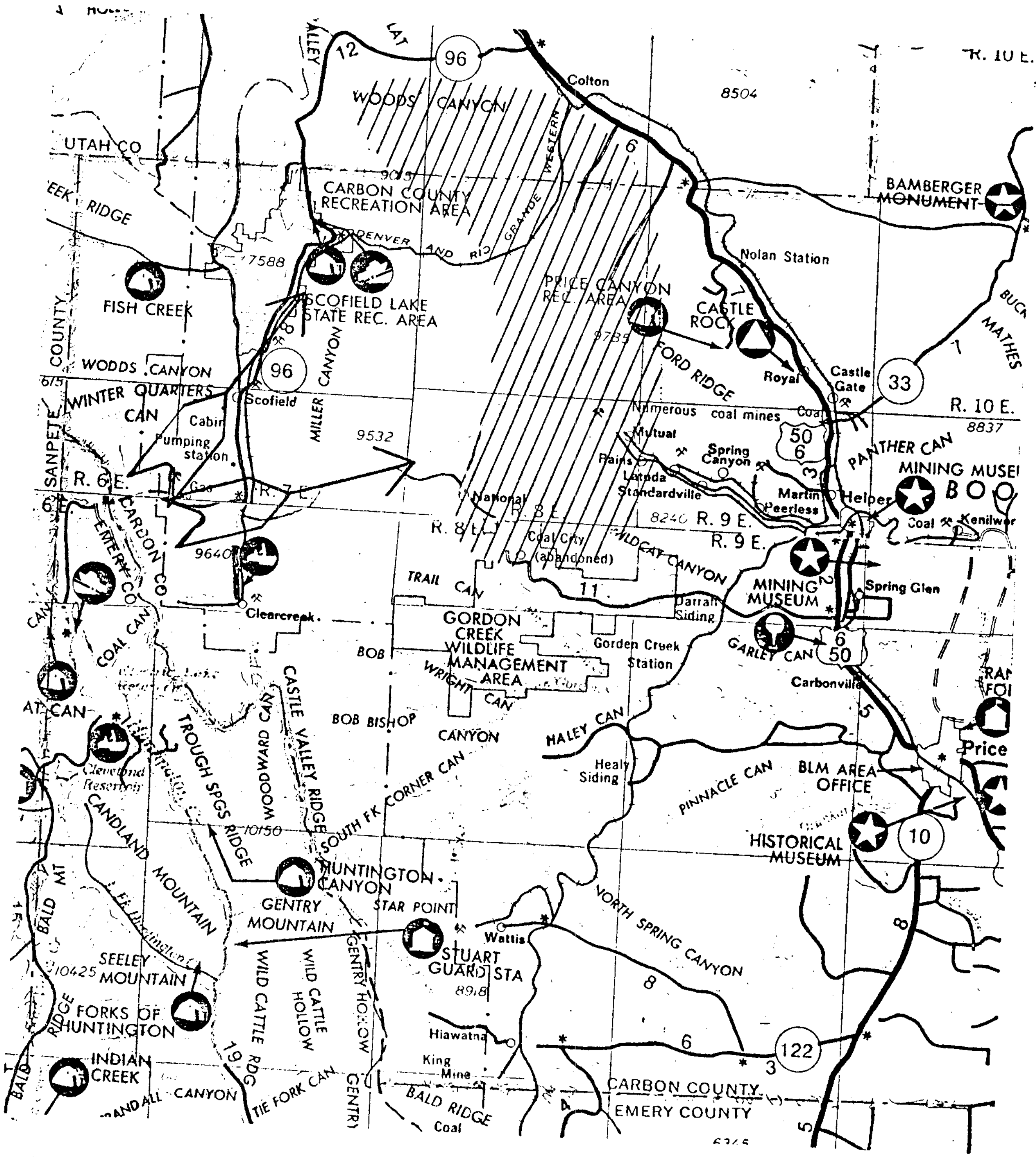

Fig. 5 Winter range and migratory route of Mule Deer living in the environs of the skyline lease area.

the limiting factor for populations of deer in the potentially perturbed habitat. The proposed Skyline project will not decrease the acreage of winter range that limits this population of mule deer, and, therefore, the impact will be less than if crucial-critical winter habitat were involved or if summer habitat were at carrying capacity.

Cougar

The entire Skyline project area provides substantial value, yearlong habitat for cougar. The animals range throughout the area, but their movements are often dictated by migration patterns of mule deer and human disturbance. Although cougars are not overly abunduant and are secretive, concern must be given them particularly when the females are accompanied by their young who are learning to hunt and survive. This is considered a crucial-critical period for cougars and it would be best if disturbance were minimized duringthis time. However, this is a difficult time to determine for cougars since they are known to reproduce year round. If populations in the area of concern were at or near saturation this would be a major concern but since they are not it is likely that cougars will avoid high human activity areas and the overall cougar population will be little affected. In fact, the high human activity in Eccles Canyon and vicinity has likely caused cougars to already adjust their habitat utilization patterns to avoid the Eccles area.

Bobcat

The mine plan and adjacent areas provide substantial value habitats for bobcats who are reputed to occupy all terrestrial habitats on the entire proposed skyline project area. Although little is known about the bobcat for the state of Utah let alone the area of concern, crucial-critical periods would be late February when parturition occurs and May and June when the young bobcats are not as secretive as cougar so they would be less likely to avoid the high human disturbance areas. They would therefore be vulnerable to open human harrassment and illegal killing. Care should be taken via education of employees and law enforcement to prevent such actions.

Black Bear

The entire potential area of concern provides substantial value, yearlong habitat for black bear. The animals range throughout the entire lease area, but are not abundant nor are they active year round. The crucial-critical periods for black bear are February and March when the cubs are born and when they accompany their mother on initial foraging expeditions during early summer. Since parturition occurs within the winter den this crucial-critical period will be little impacted by the proposed action, but when the young are with the mother they will be susceptible to human activity, particularly harassment and illegal killing. Only proper education of employees and law enforcement will help solve the potential problems.

Cottontail Rabbit

The entire mine plan and adjacent areas provide substantial value, yearlong habitats for cottontail rabbits. The young are born between April and July which is considered crucial-critical period, but the activites associated with construction and operation of the proposed mining operation will in all probability not seriously alter the reproductive potential of the population. There will be increased hunting both legal and illegal, but hunted rabbit populations are more healthy and stable than non-hunted populations. Disturbed vegetation leading to succession also enhances reproductive potential.

Snowshoe Hare

The snowshoe hare is present in and dependent upon the spruce-fir vegetation type as a yearlong habitat use area. This habitat type is in abundance over the entire proposed project and adjacent areas, but the proposed actions will do little to harm the total acreage of the habitat type and the hare populations dependent upon it. Althugh the crucial-critical period for reproduction is from April 1 to August 15, the snowshoe hare will not be severely impacted through time nor will the actions lead to the demise of the population. Subsidence will not harm the above ground dweller and the 69 acres lost habitat is sufficiently small that it will do little to snowshoe populations. Hunting pressure, legal and illegal, will be the most detrimental action and it will be up to law enforcement and hunting regulations to control this impact.

Furbearers

Portions of the proposed mine lease and adjacent areas provide substantial value habitats for some furbearing species: beaver, marten, ermine, long-tailed weasel, mink, badger and the striped skunk. The muskrat, a non-furbearing but high interest species must also be considered. Obviously, the breeding and rearing activities of all of these non-migratory species occurs within the proposed area of concern and their dens and lodges are of crucial-critical value to maintenance of their populations, but it is doubtful if the proposed actions will seriously impact them. These species with the exception of the marten are widespread and highly adaptable to the activites of man. In fact, both beaver and muskrats are often controlled as pests. In the 69 acres of actual habitat destruction the species will be lost, but this small acreage loss will be minimal compared to that available and the total impact on the population will be little noticed. It will be meaningless to the perpetuation of the species in this area. A caution is in order however. The cumulative effect of such projects must eventually be considered.

HERPETOFAUNA

HERPETOFAUNA

Increasing elevation rapidly reduces the number and kind of reptiles and amphibians. Furthermore, in Utah the effects of the more northern latitude reduces numbers of herptiles in much the same way as does the increase in elevation.

These geographical and associated climatic factors have eliminated most desert species, leaving species that are adapted either to mountain habitats or montane type habitats developed in the more northern areas. Thus, the reptiles and amphibians of Utah, and particuarly those inhabiting the areas under consideration, have arrived in Utah by means of dispersal lanes coming from the northeast and the southeast. With few exceptions the species listed have wide distributions and are versatile in their adaptive abilities.

Literature pertaining to the amphibians and reptiles is extensive; but, much of it refers to species occurring in the desert areas and has only limited reference to forms inhabiting Utah mountains. Most of the publications dealing with species lists for the state are old (V. Tanner, Amphibians, 1931; Woodbury, Reptiles, 1931; and Pack, Snakes, 1930). Perhaps the most up-to-date listings for the area under consideration are a checklist of Utah amphibians and reptiles (Tanner 1975), and Utah Division publication No. 78-16 (Dalton, 1978).

Other recent literature pertinent to this report are: Schmidt (1953); Stebbins (1954 and 1966); W. Tanner (1953, 1957a and b, 1966-with Banta, 1969-with Morris, and 1972-with Fisher and Willis); and Woodbury (1952).

The area of concern in this report is located in the upper edges of sagebrush (*Artemisia*) and into the Aspen-Spruce-Fir plant communities.

Amphibians

Based on the extensive literature review and limited field work it was determined that probably four and potentially six species of amphibians (Table 2) inhabit the proposed area of concern that provides substantial value habitat for all the species listed. All amphibians are protected, but since the species listed are all widespread throughout the mountains of Utah, none are treated as high-interest species, and, therefore, are not individually discussed. It is doubtful if the proposed action would seriously impact populations but rather localized individuals in the areas of total habitat destruction. An exception to this would result if subsidence interrupted underground aquifers and caused drying present wet or riparian habitats essential to reproduction.

Reptiles

Based on the literature search and limited field work it was determined that probably 10 and potentially 15 species of reptiles (Table 3) occupy the mine land area that is considered as substantial value habitat for all 15 species. All reptiles are protected, but since the species listed are all widespread throughout montane habitats in Utah, none are treated as high-interest species and, therefore, are not individually discussed. It is doubtful if the proposed action would seriously impact populations but it will destroy the habitat for individuals living in the areas of total habitat destruction surrounding the mine portal, conveyor, storage facilities and access roads. If a denning site for any reptile species were discovered during the construction or operational phase, it should be preserved until proper procedures to move the den site to a new location were implemented by the proper D.W.R. personnel. This is relatively easy to do and, therefore, should cause little concern.

Attachment G

ENDANGERED AND THREATENED SPECIES

According to National Wildlife Federation (1977), Dalton (1978) and the Federal Register (1979), there are no endangered or threatened species of amphibians or reptiles, or any threatened mammals that inhabit the south-eastern region of Utah. Dalton (1978), however, indicates that one endangered species, the black-footed ferret, might be found in the Wasatch Plateau east of the skyline drive. Durrant (1952) reports that he knows "...of no occurence of the black-footed ferret north of the Colorado River in Utah...". There are unconfirmed reports of black-footed ferret sightings east of Castle Dale and Ferron in Emery County Utah. We have spent many hours, as have personel of the Utah Division of Wildlife Resources in charge of endangered species, trying to verify the presence of these animals. Up to now these efforts have been unsuccessful. We have traversed all of the Skyline lease and immediate surrounding areas and have observed no signs of prairie dog colonies nor sufficient ground squirrel populations to support ferret populations (Fig. 6).

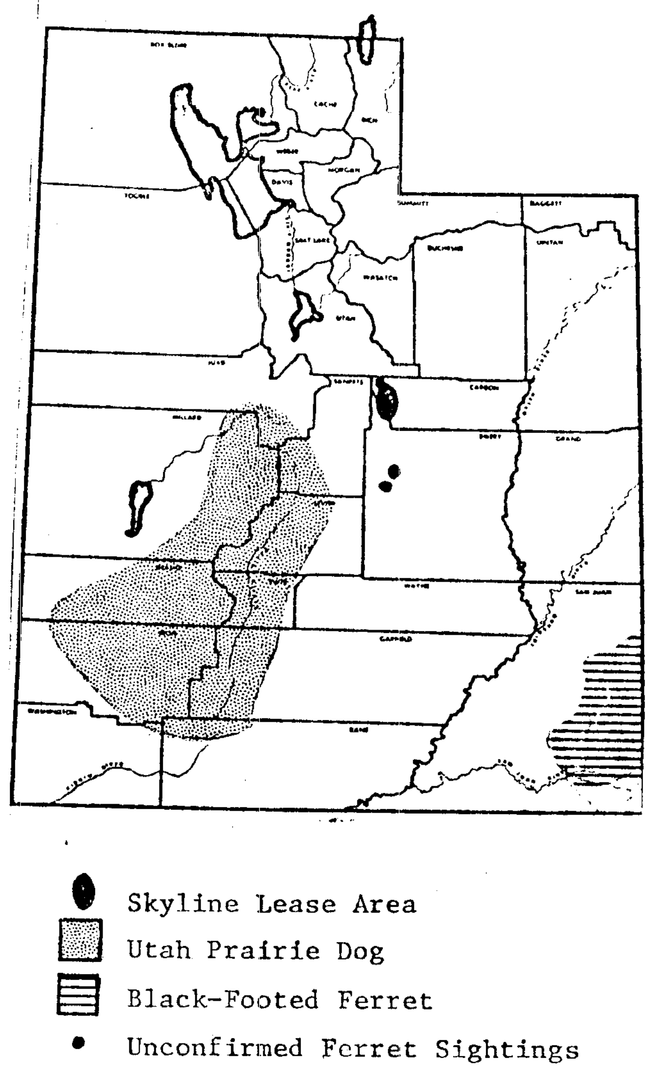

Fig. 6 Distribution map of endangered mammalian species in Utah in relation to the skyline lease area. Modified from Durrant 1952.

IMPACT ANALYSIS BY ACTION

The proposed actions during construction and operation of the Skyline project are many but the ones of major concern for this report are those that will result in perturbations to the environment that must be considered as they relate to the stability of the populations of the mammals, amphibians and reptiles living in and/or utilizing the area of potential impact. Those perturbations of concern are those that are directly related to: (1) surface disturbance, (2) loss of habitat, (3) noise, (4) human activity and (5) air pollution. Any one, all or a combination of the above perturbations could impact terrestrial vertebrates.

Surface Disturbance

Surface disturbance must be a major concern. The proposal calls for radical modification to 45 acres of National Forest and 24 acres of private surface. This 69 acres of surface contour is to be leveled, filled or cut to construct roads, conveyors and portal facilities necessary to the project. Mine No. 2 is to disturb an additional 26 acres in South Fork of Eccles Canyon. These cut and fill operations will alter land forms and surface areas to conform to missing needs and modify natural surface drainage patterns. In addition, 6,250 acres are to be undermined via long-wall techniques and will be subject to subsidence up to a minimum of 70 percent of the thickness of the mined coal (Final EIS on Developemnt of Coal Resources in Central Utah, 1979).

Habitat Loss

Obviously, the immediate are of the mine portal, access routes, coal conveyor and storage facilities will be lost as habitat for wildlife, but the total acreage loss is small compared to that available. Care should be taken to minimize its impact. Portals, roads, and other surface facilities should if possible, be placed at sites that will minimize impacts to wildlife and their use areas. None at least minimal crucial-critical habitat should be disturbed. It would be best if the surface facilities including roads could be screened from wildlife use areas by vegetation and or terrain buffers. Revegetation of road cuts and fill areas should be done immediately. Concern should be given to revegetation with species that will not only benefit, but promote wildlife. This is particularly true if curcial-critical riparian habitats are disturbed. Moose, amphibians and reptiles could readily benefit from successful manipulation of this habitat type. The planned stream channeling in the vicintiy of the storage silos is an example of what can be done. This stream improvement project will benefit terrestrial as well as aquatic species.

Subsidence

Surface disturbance associated with certain mining operations and techniques can be extremely detrimental to terrestrial and aquatic vertebrates, but the long-wall mining technique proposed for use in the Skyline project minimizes much of the impact. Since no over burden is removed with long-wall mining, the major problem is surface subsidence. The 6,250 acres that will be undermined will be subject to subsidence up to 70 percent of the thickness of the mined coal, but it is doubtful that subsidence will reach 70 percent. Similarly mined areas in comparable habitats in New Mexico have experienced less than 12 percent subsidence with little or no visible surface disturbance. This was substantiated by personal inspection by Dr. Smith. It is probable that the integrity of the above ground terrestrial communities will generally remain status quo, with occurence of occasional fractures and minor slippages that will not be detrimental to vegetation or wildlife. Subterranean changes, however, are not understood. There is the possibility that when subsidence occurs it will collapse underground aquifers and burrow systems thus destroying the home and habitat of dwelling mammals, reptiles and amphibians and possibly killing some in the immediate area at the time of collapse. If subsidence were to occur simultaneously over the entire mine area, this would be a major concern not only for the prey species but particularly for predators dependent upon the pray base. However, since subsidence will occur systematically and in small areas at a given time as panels are mined, the impact will be lessened. Only localized populations will be impacted and only for a short while. Reproductive potential coupled with dispersal will facilitate almost immediate recovery and negate the temporary population reduction.

The question of underground aquifer collapse is not so easily dismissed. We really do not know enough about the geology and hydrology in this area or any area to yet predict what interruption of the strata and underground aquifers will do to surface riparian and marsh habitats. These habitats are crucial-critical to moose year round and loss of said habitats would be serious to not only perpetuation of but population build up of moose in the area. Such habitat loss would also harm beaver, muskrat, amphibians, and aquatic dependent reptiles. As mining progresses these wet habitats should be monitored to assess potential degradation impacts. Generally, it is felt that this problem will not occur, but if it does surface water could and should be permanently provided to maintain the integrity of any areas so impacted.

Overland Coal Converyor

One of the major surface disturbance impacts of concern to terrestrial wildlife is the construction of an overland coal conveyor that will of necessity act as a barrier to normal wildlife movement patterns in, along and across Eccles Canyon. The conjunction with the Belina conveyor is also of concern to the stability and integrity of South Fork which is crucial-critical importance to big game, particulary elk.

The overland coal conveyor is to extend 2.6 miles down Eccles Canyon form the portal to the storage facilities at the railroad loading area, and will represent a barrierr to normal big game movements in the area. It is obvious that some means must be devised to facilitate big game crossing this barrier but what, were and how become important questions. Since no literature is available concerning big game interactions with coal conveyors, references to deer and highway passage were consulted. This proved unsatisfactory. It was feared that this particular coal conveyor and highways represented such different problems would not be comparable.

Two basic studies were conducted to facilitate understanding and potential solutions to the problem in this particular project. There is an overland coal conveyor in Deer Creek Canyon north of the Utah Power and Light Huntington Power Plant in Emery County, Utah that is similar to the conveyor proposed for the Skyline project. A cursory study was made along this 2 mile long conveyor to determine deer response to the man constructed barrier. Deer populations were fair to high in the vicinity of the conveyor. The lowest clearance beneath the conveyor is 1 m above the ground and the highest 2.8 m. The highest clearance level was 5 m long and was the primary place that deer passed under the conveyor. Deer traveled as close as .3 m to the conveyor but the established trail running parallel to the conveyor was 2.3 m away. It appeared that deer would follow the conveyor up and/or down the canyon to the underpass. Based on track size both young and mature animals utilized the underpass.

Once it was established that deer would cross an overland coal conveyor if proper clearance were available, a cursory study was done in Eccles Canyon of the Skyline project to determine the most logical places to design and construct the conveyor to allow passage of not only deer but all big game. The areas parallel to the proposed conveyor route in Eccles Canyon were traversed on foot by researchers. All of the side canyons coming into Eccles Canyon had deer trails in them (Figs. 7-11). Three had well used trails, one to two deer passage per day, the others were rated poor with use by less than 1 deer every two days. Since topographic maps of the skyline project area have no names listed for the side canyons, their locations are given in relation to the top end of the proposed conveyor. The first two canyons down from the top (.2 and .3 miles respectively) had well used trails as did the canyon 1.6 miles from the top (Fig. 11). In all, there are 11 game trails, but those coming into the lower end of the conveyor are not heavily utilized. Although deer use was the criteria for determining trail quality, other big game species and domestic sheep, also utilize the game trails mentioned.

To overcome the barrier effect of the overland coal conveyor, it is suggested that a series of overpasses and underpasses be constructed at natural advantageous crossing points for big game. These structures must be designed to facilitate crossing of elk and moose as well as deer. In addition, there are problems related to slope. Animals crossing from a steep uphill slope can easily get down over the conveyor but animals going across and up the steep slope must be able to secure footing on the uphill side when crossing the conveyor. Although it would be ideal to have underpasses and overpasses at each of the game crossing areas and even though cover for safe big game travel on the south exposures that

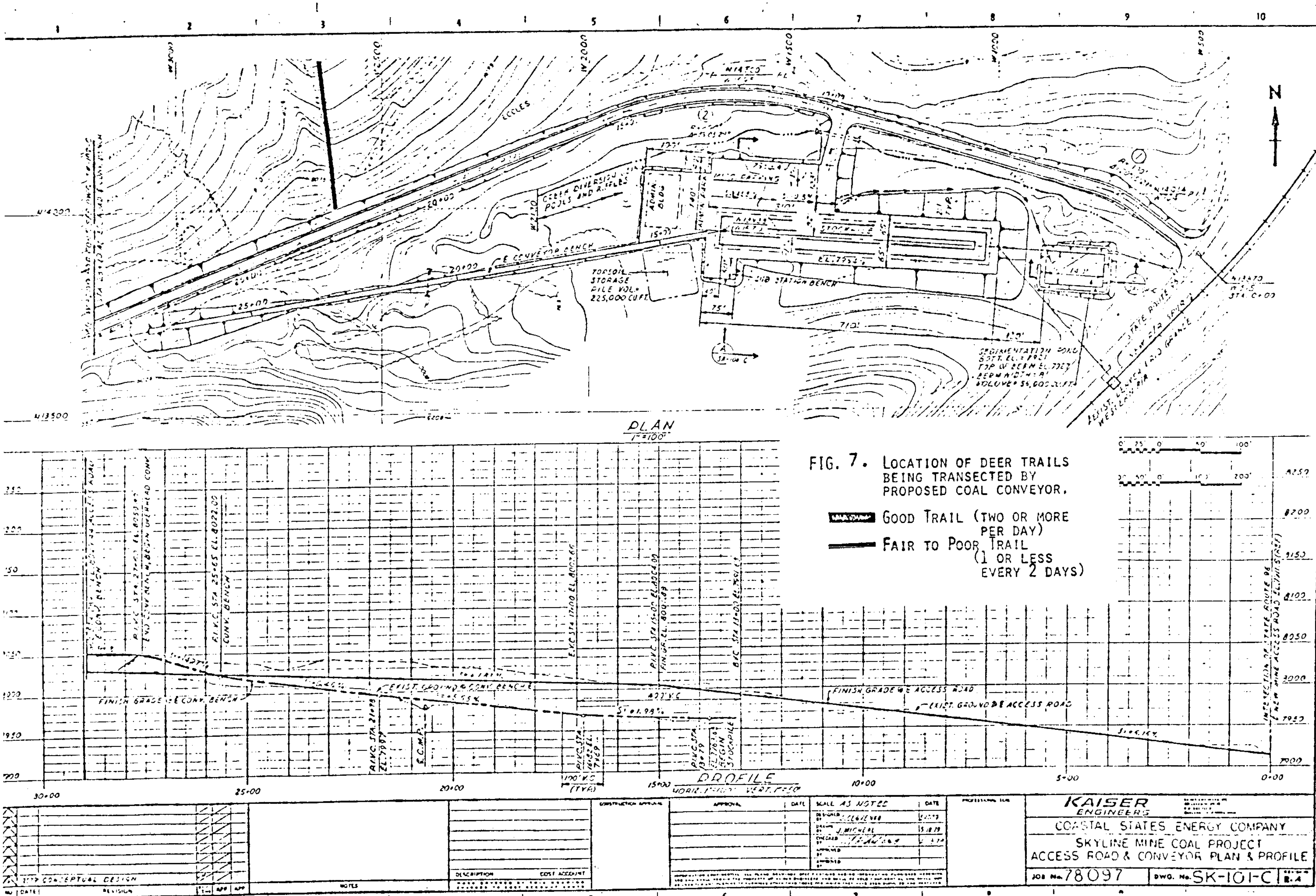

FIG. 7. LOCATION OF DEER TRAILS BEING TRANSECTED BY PROPOSED COAL CONVEYOR.

NOTE: This map is a preliminary design draft. Although the conveyor alignment should remain basically the same, other features may change considerably.

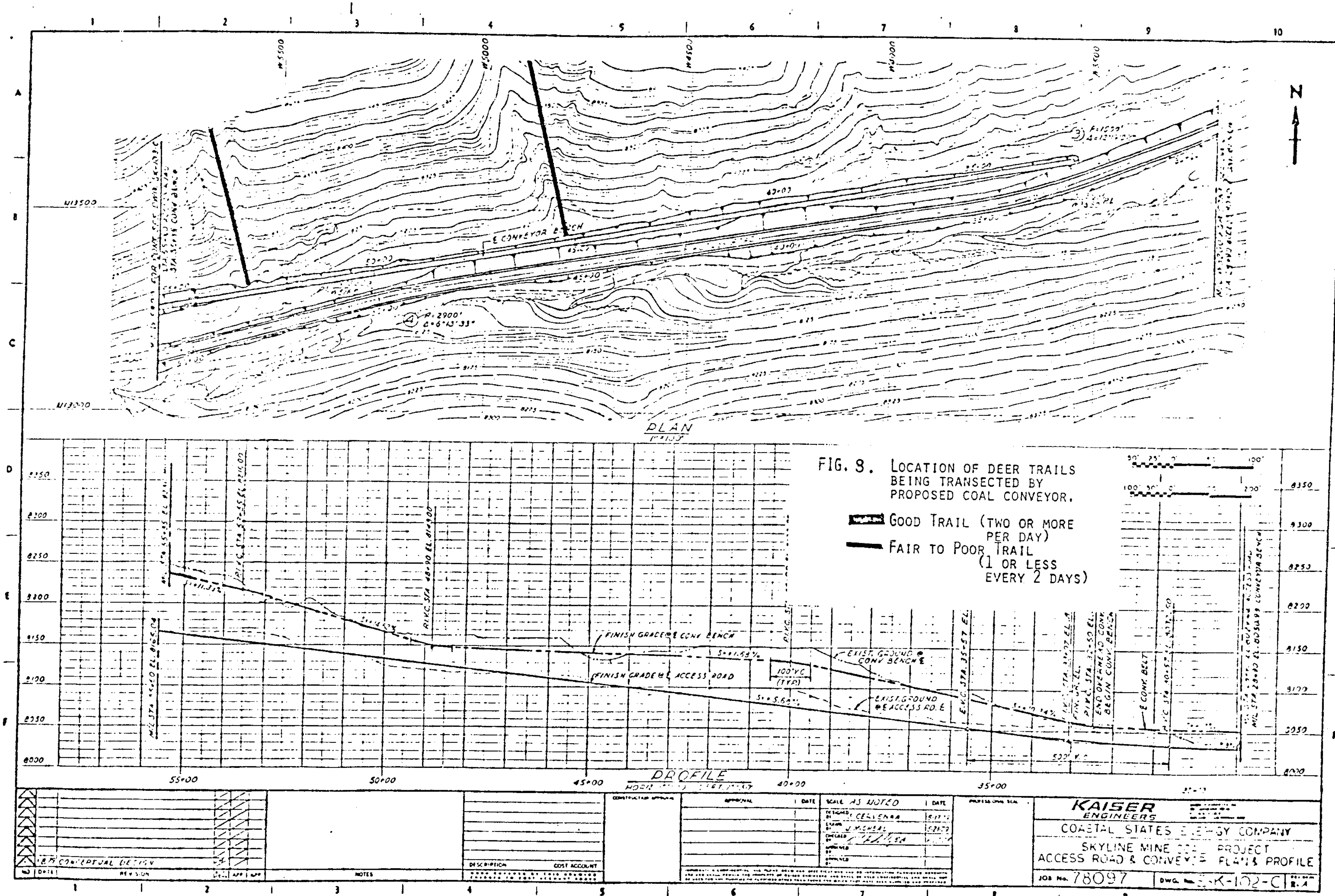

FIG. 8. LOCATION OF DEER TRAILS BEING TRANSECTED BY PROPOSED COAL CONVEYOR.

NOTE: This map is a preliminary design draft. Although the conveyor alignment should remain basically the same, other features may change considerably.

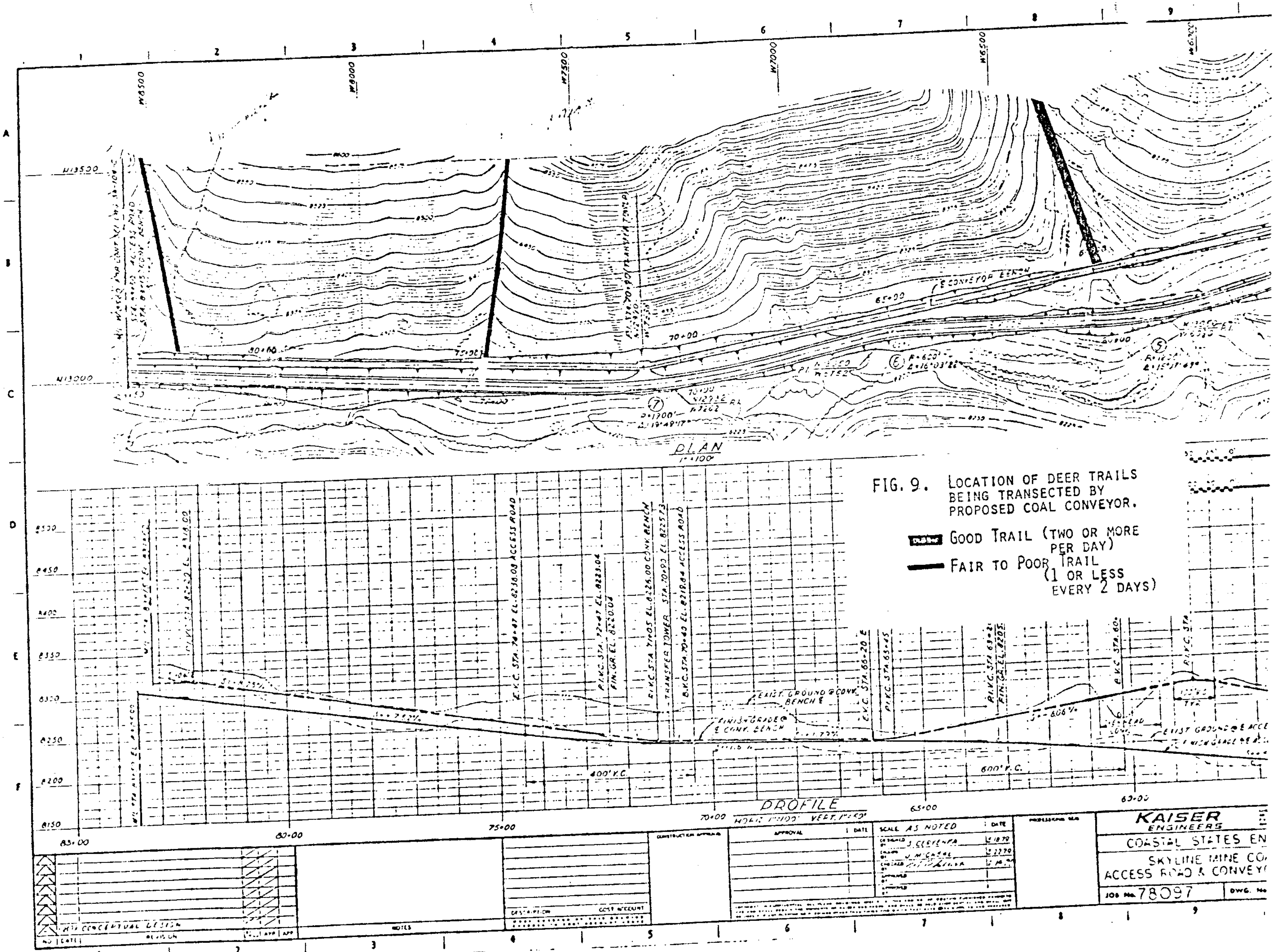

FIG. 9. LOCATION OF DEER TRAILS BEING TRANSECTED BY PROPOSED COAL CONVEYOR.

NOTE: This map is a preliminary design draft. Although the conveyor alignment should remain basically th other features may change considerably.

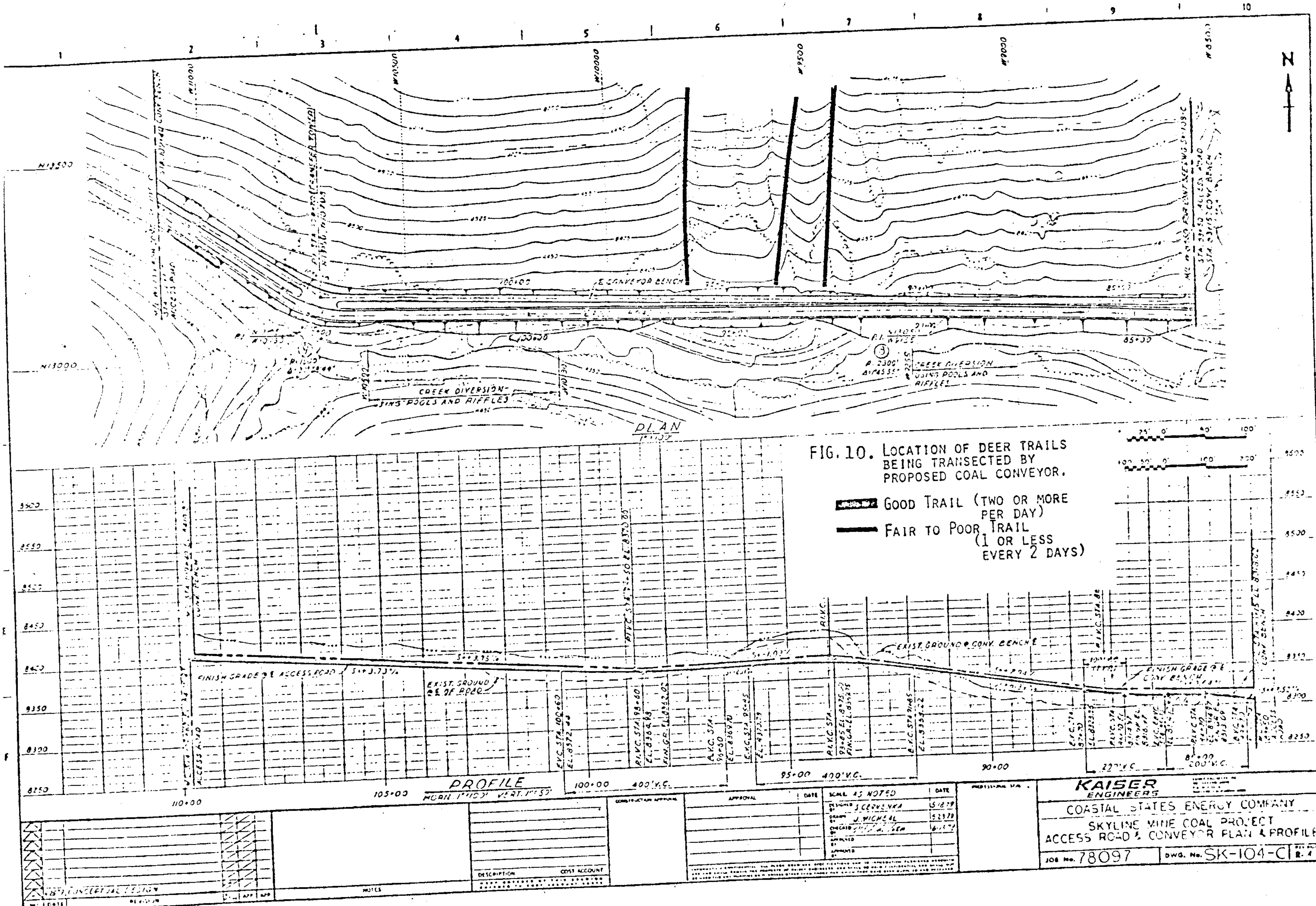

FIG. 10. LOCATION OF DEER TRAILS BEING TRANSECTED BY PROPOSED COAL CONVEYOR.

GOOD TRAIL (TWO OR MORE PER DAY)

FAIR TO POOR TRAIL (1 OR LESS EVERY 2 DAYS)

NOTE: This map is a preliminary design draft. Although the conveyor alignment should remain basically the same, other features may change considerably.

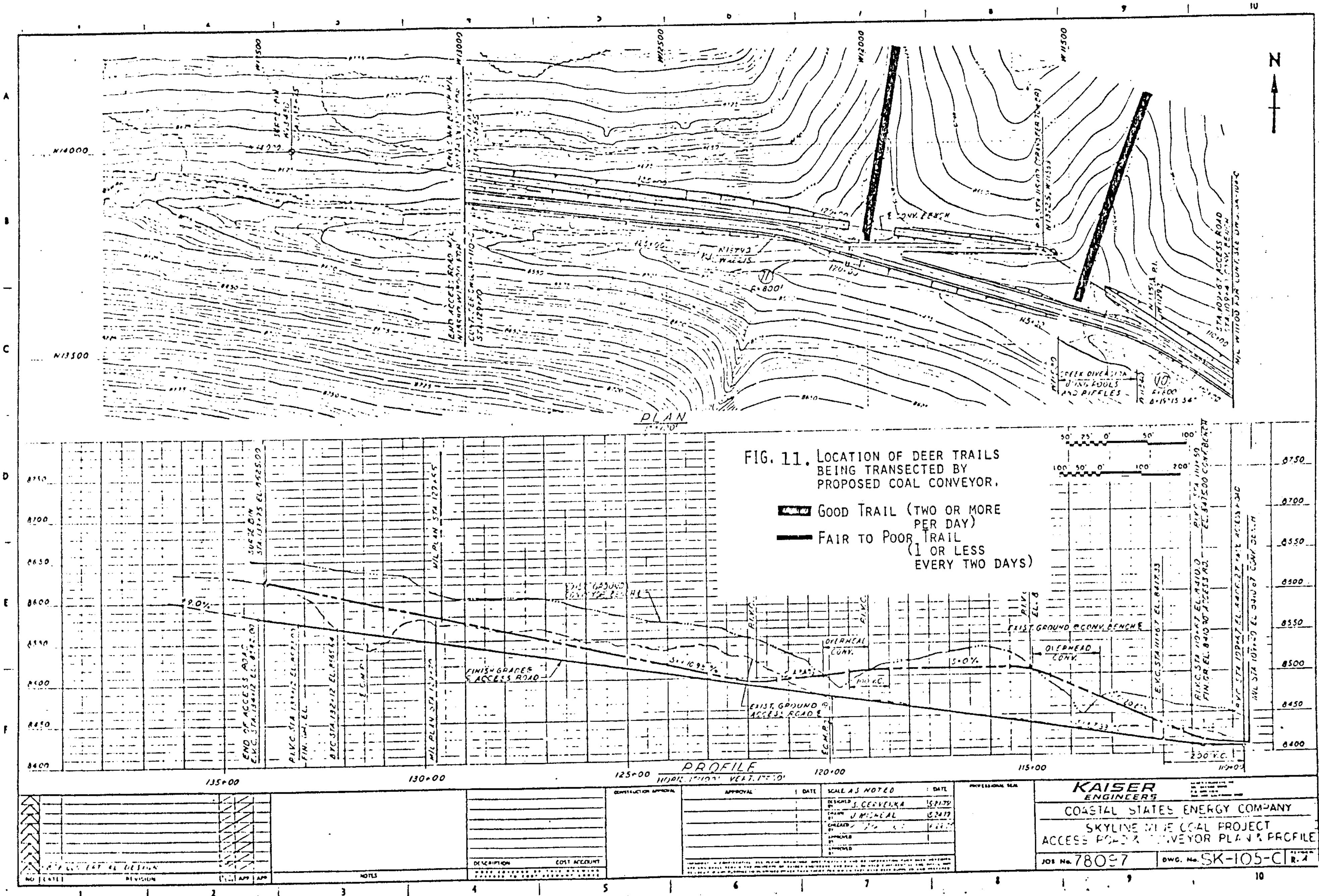

FIG. 11. LOCATION OF DEER TRAILS BEING TRANSECTED BY PROPOSED COAL CONVEYOR.

NOTE: This map is a preliminary design draft. Although the conveyor alignment should remain basically the same, other features may change considerably.

lie north of the road is minimal it is doubtful that crossing structures at each of the 11 canyons that drain into Eccles Canyon are necessary. Crossing structures should definitely be placed at each of the three heavily used game trails identified in the cursory study. In addition, other crossing structures should be evenly or advantageously placed to minimize the parallelling distance traveled along the conveyor without protective cover. Since it is not known if elk and moose will use either an underpass or an overpass, it is suggested that combinations of the two types of passage structures be constructed at each of the three heavily utilized game trails to be safe. Underpasses should definitely be constructed for use at the elevated areas of the conveyor, and overpasses should be constructed at no closer than half mile intervals to the other passage structures.

The two crossing structures types should be built to the following D.W.R. recommended dimensions: (1) "underpasses" should have a minimum height of 3 m maintained across a span of 5 m; and (2) "overpasses" or ramps should have a slope no greater than 3:1 and 5 m wide at an angle of 90° to the conveyor and tapering out to 5:1 at points 180° to the conveyor. These crossings should be as natural as possible so that the animals will unnoticingly cross when they get to the structure without really knowing they are there. The slope should be of natural soil and vegetated so as to preclude guide fencing. The solid covered platform over the conveyor should be of a permanent material either concrete of fiberglass. The steep uphill slopes where they occur should be terrraced with similarly covered concrete or fiberglass material to provide crossing animals a natural footing for negotiating the uphill climb. Construction of such structures should guarantee crossing by big game and lessen the detrimental impact of an artificial barrier to natural movements. These crossings are critical to perpetuating use of South Fork that will be partially barricaded on two sides of a triangle by the juncture of the Belina and Skyline conveyors.

Loss of Habitat

Although approximately 6300 acres of habitat will undergo disturbance only 95 acres will actually be lost for habitation and production by mammal, amphibian and reptile species. This total acreage is small compared to that available and most of it is not of crucial-critical importance to the stability of the wildlife populations of concern. Minimal detrimental impact is expected to occur while still allowing such a project to proceed. Such is not the case, however, if the temporary bypass road is allowed to be constructed as an elaboration of the primitive road in South Fork. The South Fork area is crucial-critical (Figs. 1-2) habitat to the continued sustenance of elk and moose in the project area and should be preserved as close as possible to its present condition. It is a primary fawning and calving area and provides security cover for those animals that traverse and forage in the already disturbed Eccles Canyon. If a temporary bypass is necessary it would be best if another canyon such as Boardinghouse could be used.

Once the mining operation is completed, the structures should be dismantled and the area revegetated to enhance return to and use of the habitat by wildlife. If properly done with care and consideration for wildlife needs the animals will readily reinvade this area.

Noise

Noise created from construction and operation of the mine and its facilities will initially be of consequence, but for most species will ultimately be inconsequential. With the possible exception of cougar and elk, there are no wildlife species of concern that will be permanently impacted. Wildlife will be initially disturbed and reproductive success possibly impaired but habituation will occur thus allowing a return to normal.

Cougars do not readily habituate but they are usually in sufficiently low population numbers and have such extensive ranges that they avoid the source of disturbance. This has likely occurred already in the project area due to the high level of noise and activity already in Eccles Canyon Elk and noise are still an enigma. It is generally thought that elk will habituate to noise and observations by Dr. Smith, during blasting for seismic studies on the Big Horn Ranch, Utah, substantiates this. The observations to date, however, have been on elk in wide open areas where they did not have to be in close contact with the noise. Our concern is whether elk will habituate sufficiently to the noise of the overland conveyor to use the underpasses. This is of particualr concern at transfer towers and is a primary reason for requesting that overpasses be constructed to allow passage in an unconfined space.

Human Activity

Increased human activity will possibly cause the greatest impact. Construction and subsequent mining operation personnel will not only increase the population of the towns in the vicinity of the project, but will greatly increase the number of people currently utilizing the project area. Considerably more people will be actively using and traversing the area on a work day basis plus many will also utilize the area for recreation. Many more road kills of wildlife will occur and many of those people traversing and utilizing the area will carry firearms in their vehicles and use them for target shooting of small mammals, carnivores and even game species whether legal or not. Such action could seriously impact the stability of many of our non-protected species but trophically the impact will not cause a "domino effect." Removal of the herbivores will not cause radical declines in populations of higher trophic level species, since the carnivores and raptors will also experience declines. Game and protected species will also be taken but hopefully the laws of protection will sufficiently deter such actions to minimize their impact.

Recreational use of the environs other than hunting will undoubtedly impact the wildlife of concern, and will occur in all seasons of the year. It is especially important that wildife not be harassed during crucial-critical periods in their life history. During winter, wildlife are often in a delicate energy state. Unnecessary disturbance by man causes them to use up critical and limited energy reserves that, often times, results in mortality. In less sever cases, the fetus, being carried by gestating mammals may be aborted or absorbed thus reducing reproductive success and productivity of the population.

During breeding seasons, disturbance by man can negatively affect reproductive success by disrupting territorial selection or defense, interrupting courtship displays and disturbing mating animals. This could result in reduced reproductive success and ultimately in reduced population levels.

During parturition, lactation and early in the rearing process, young animals need to be undisturbed. It is during this time that young animals gain the strength and ability to elude predators and man. Undisturbed habitats allow the young animals to develop in relatively unstressed situations and to utilize habitats that are secure from predators. Disturbance by man can compromise this situation and result in abandonment of the young by the female, increased accidents that result in mortality or increased natural predation. Then there is the too often occuring situation of man coming upon young animals and taking them home thinking that they are abandoned.

It is essential that the company make every effort to educate all employees associated with the mine operation in the Skyline project area to the intricate values of the wildlife resources associated with the mine plan area. Each employee should be advised not to unnecessarily or without proper permits or licenses harass or take any wildlife. They should also be admonished to establish a game alert program wherein they report violators to the proper company and management authorities for reprimand or prosecution. They should be impressed that they as hunting and recreation users stand to gain the most by preserving what they have in proximity to their places of work and abode.

Air Pollution

Air pollution will be of little concern if air standards are met and the coal is properly washed prior to transport or wetted during conveyance. The overland coal conveyor should be covered.

MITIGATION

See impact analysis by species and impact analysis by action.

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APPENDIX

PROFESSIONAL DOSSIER

Name: Clyde L. Pritchett

Title: Associate Professor of Zoology

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Place of Birth: Mt. Pleasant, Utah

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Academic Record:

Institution and Location	Degree	Scientific Field	Dates Attended
Snow College, Ephraim, Utah	A.A. (1959)	Biology	1944-1945
Brigham Young University, Provo, Utah	B.S. (1960)	Zoology	1958-1960
Brigham Young University, Provo, Utah	M.S. (1962)	Zoology	1960-1962
University of Utah, Salt Lake City, Utah	NA	Radiation Biology	Summer, 1963
Arizona State University, Tempee, Arizona	NA	Desert Biology	Summer, 1965
University of Wyoming, Laramie, Wyoming	Ph.D.(1977)	Ecology	1968- 1970-1971

Employment Record:

U.S. Army, Medic, 1945-1946
Asst. Manager, Stringham Feed Mill, 1950-1958
Nebo School District, Biology Teacher, 1962-1964
Ricks College, Instructor, 1964-1967
Brigham Young University, Instructor, 1967-1971
University of Wyoming, Visiting Professor of Ecology, Science Summer Camp, 1969
Brigham Young University, Assistant Professor, 1971-1979
Brigham Young University, Associate Professor, 1979-present

Professional Experience:

Research Associate: (1) Project 10 with D. E. Beck, 1960-1961. (2) Ecological Studies, Nevada Test Site, Mercury, Nevada with D. E. Beck and Clive Jorgensen, summer 1964. (3) National Reactor Testing Station, Idaho Falls, Idaho with D. M. Allred, summer 1966 and 1967. (4) Four Seasons Incorporated 1972-1973, "Impact of Proposed Recreational Construction and Use." (5) Raft River Environmental Studies. Energy Research and Development Administration, Idaho Operations Office, Idaho Falls, Idaho 83401, 1977 to present. (6) Curator of Mammals, M.L. Bean Museum, Brigham Young University, Provo, Utah 1972-present.

Consultant with: (1) Bureau of Reclamation on the Jensen Unit of the Central Utah Project 1972. (2) Navajo - Kaiparowits Project, 1973. (3) Bureau of Reclamation on the Bonneville Unit of the Central Unit Project, 1973 to present. (4) National Science Foundation In-service Institute for High School Biology Teachers. Drs. A. L. Allen and Marden Broadbent, Directors, 1968-1972. (5) Coon, King, and Knowlton Engineering (1975-1978), "Biotic Assessment of the Proposed West Valley (Salt Lake Co.) Highway." (6) Utah Power and Light/Vaughn Hansen Associates, 1979, "Effect of Reservoir Construction on Terrestrial Vertebrates." (7) Coastal States Coal Co./Vaughn Hansen Associates, 1979, "Impact of Coal Mining and Conveyor Construction on Big Game Behavior."

Research Activities:

(1) Brigham Young University, "Vertebrate distribution in relation to certain habitats in Central Kane County Utah," 1960-1962. (2) University of Wyoming, "Variability in populations of the pocket gopher *Thomomys talpoides rostralis* along an altitudinal transect across the Snowy Range, Wyoming.

Current Research: (1) Cytotxonomic studies of the Tassel-eared squirrel on the north and south rims of the Grand Canyon, Arizona. (2) The impact of selected native rodents on certain plant species in the cool desert biome. (3) Comparative Vascularity of Appendages in Lagomorphs (with Kent Van De Graaff) (4) Ecological studies of the porcupine *Erethizon dorsatum*.

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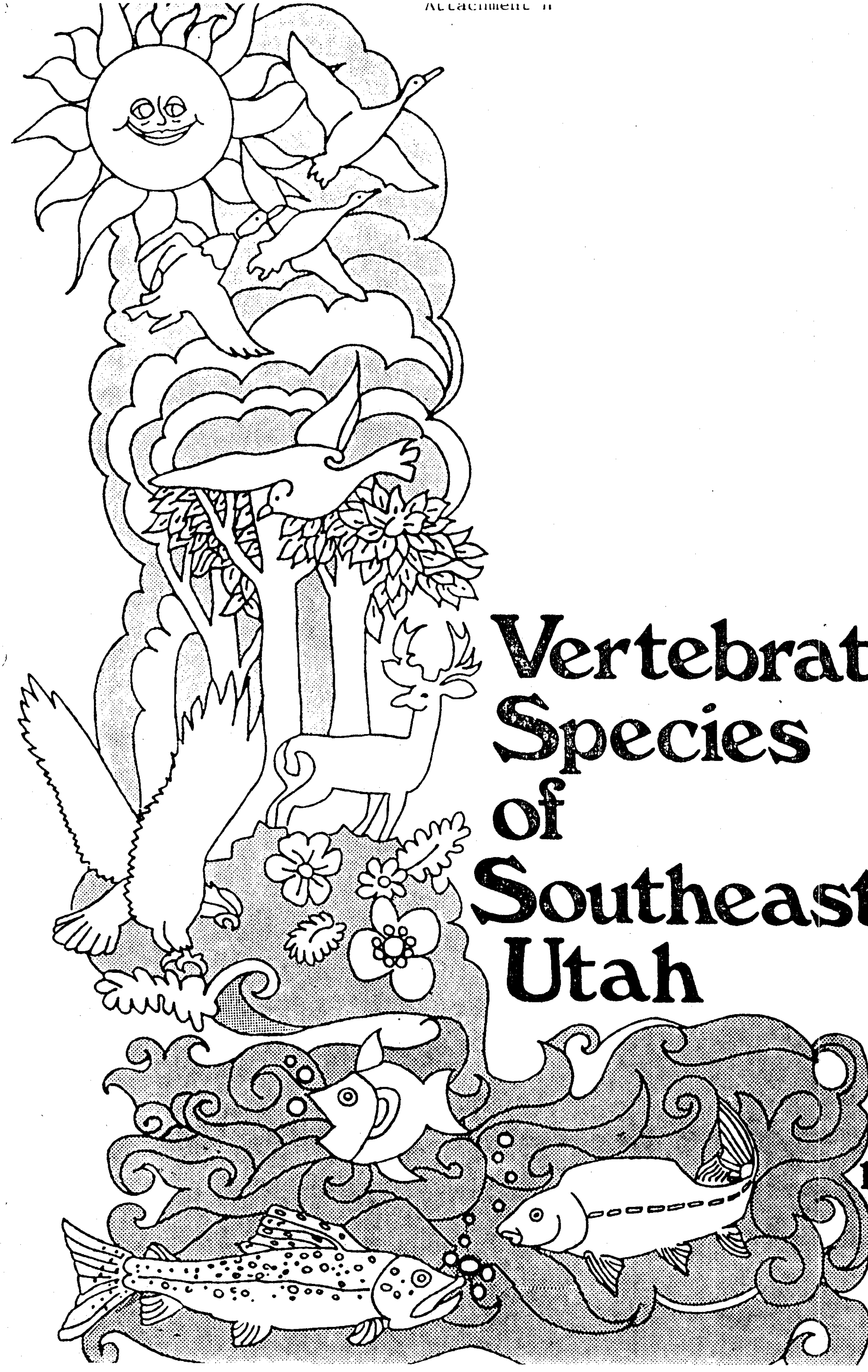
MAMMALS

ENDANGERED AND THREATENED SPECIES

Dr. Clyde Pritchette
and
Dr. H. Duane Smith
Department of Zoology
Brigham Young University

According to National Wildlife Federation (1977), Dalton (1978) and the Federal Register (1979), there are no endangered or threatened species of amphibians or reptiles, or any threatened mammals that inhabit the southeastern region of Utah. Dalton (1978), however, indicates that one endangered species, the black-footed ferret, might be found in the Wasatch Plateau east of the Skyline Drive. Durrant (1952) reports that he knows "...of no occurrence of the black-footed ferret north of the Colorado River in Utah...". There are unconfirmed reports of black-footed ferret sightings east of Castle Dale and Ferron in Emery County, Utah. We have spent many hours, as have personnel of the Utah Division of Wildlife Resources in charge of endangered species, trying to verify the presence of these animals. Up to now these efforts have been unsuccessful. We have traversed all of the Skyline lease and immediate surrounding areas and have observed no signs of prairie dog colonies nor sufficient ground squirrel populations to support ferret populations.



Vertebrate Species of Southeastern Utah

publ. no. 78-16

SPECIES LIST OF VERTEBRATE WILDLIFE

THAT INHABIT SOUTHEASTERN UTAH

Compiled by

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Randall B. Smith
R. Craig Wallace
Roger B. Wilson
Samuel C. Winegardner

PUBLICATION NO. 78-16

UTAH STATE DIVISION OF WILDLIFE RESOURCES

Douglas F. Day, Director

ACKNOWLEDGMENTS

Agencies and individuals that have contributed information on species distribution within the southeastern region are acknowledged. Bureau of Land Management and U.S. Forest Service biologists provided information concerning local sightings and distribution of wildlife species. Species lists obtained from Arches and Canyonlands National parks were also helpful. Within the Utah Division of Wildlife Resources, local conservation officers and wildlife biologists provided valuable information on species within their districts or areas of experience. Thanks go to other Division personnel who assisted with review of this document.

The status and population trend for individual species is a product of the experience of the authors and others who have professional experience with the wildlife resource in southeastern Utah.

Larry B. Dalton
C. Brent Farnsworth
Randall B. Smith
R. Craig Wallace
Roger B. Wilson
Samuel C. Winegardner

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LIST OF TABLES

SPECIES LIST OF VERTEBRATE WILDLIFE THAT INHABIT SOUTHEASTERN UTAH

Utah is believed to be inhabited by 734 species of vertebrate wildlife. Four hundred forty-five of these species are protected: 2 amphibians, 2 reptiles, 26 mammals, 58 fish and 357 birds. One hundred of the protected species are game species: 10 species of big game; 20, fish; 10, furbearers; 43, migratory game birds; 5, small game mammals; and 12, upland, small game birds. Table 1 provides a comparison of inhabitation by game species between Utah Division of Wildlife Resource's five regions.

Southeastern Utah is inhabited by 466 species of vertebrate wildlife in six biogeographic areas (Table 2). Three hundred forty-three of these species are protected: 2 amphibians, 26 mammals, 38 fish and 277 birds. Seventy-nine of the protected species that inhabit southeastern Utah are game species: 9 species of big game; 13, game fish; 9, furbearers, 35, migratory game birds; 4, small game mammals; and 9, upland, small game birds.

Southeastern Utah has been divided into six biogeographic areas. Each area allows an overlap of wildlife species that inhabit contiguous low and high elevation areas. This procedure was utilized to reduce any controversy that would normally arise from a "sharp line" drawn on a map.

A- Wasatch Plateau extending east from Skyline Drive to Highway 10 and bounded on the north by Highway 6 and on the south by Interstate 70.

B- West Tavaputs Plateau including all drainages into the Price River drainage from Soldier's Summit east along Reservation Ridge and including the drainages into Argyle, Nine Mile and Minnie Maud creeks; bounded on the east by the Green River and south and west by Highway 6.

C- East Tavaputs Plateau bounded on the east by the Colorado-Utah state line; on the south by Interstate 70; on the west by the Green River and on the north by Uintah-Ouray Indian Reservation and the Uintah-Grand county line.

D- San Rafael Swell and San Rafael Desert bounded by Highway 6 on the north; Highway 10 on the west; the Green River on the east and the Emery-Wayne county line on the south.

E- Henry Mountains and Burr Desert bounded on the north by Emery-Wayne county line; the Green and Colorado rivers on the east; Lake Powell on the south and Capitol Reef National Park and the Waterpocket Fold on the west.

F- Mountains and deserts of Grand and San Juan counties south of Interstate Highway 70 and north of the San Juan River bounded on the east by the Utah-Colorado border and on the west by the Green and Colorado rivers and Lake Powell.

Each species is listed by common name followed by the generic and specific nomenclature. The status for each species was determined by the authors after evaluation and consultation from several sources. The listing for mammals was developed from Sparks (1974), Burt and Grossenheider (1976) and Durrant (1952). The primary sources consulted in compiling the bird list were Behle and Perry (1975) and Hayward et al. (1976) although, Peterson (1969), Robbins et al. (1966) and Udvardy and Rayfield (1977) were also used.

Holden (1973), Bailey et al. (1970), Eddy (1969) and Sigler and Miller (1963) were consulted for preparation of the list of fishes.

The status of reptiles and amphibians was determined through discussion with local herpetologists. The phylogenetic listing is after Stebbins (1966). Tanner (1975) was consulted for species inhabiting Utah.

The following code letters are given for each species to describe its status.

K Status unknown - It is believed that these species are present, but little is known of their population dynamics.
C Common - These species are widespread and abundant.
U Uncommon - These species are widespread, but not abundant.
R Rare - These species are seldom identified during any one year.
O Occasional - These species are periodically identified during a long term period--10-50 years.
A Accidental - Distribution for these species does not normally include this area. Sightings are as far between as 50 to 100 years.
E Endangered - These species are endangered with extinction or extirpation from wildland in Utah.
T Threatened - These species are threatened with becoming endangered in Utah.
L Limited - These species are common but restricted to a particular use area or habitat type in Utah.
X Extirpated - These species have disappeared from wildland habitats in Utah.
P Protected - These species are protected by state or federal laws in Utah.
N Nonprotected - These species are not protected by any laws in Utah.

The following terminology is used to describe the seasonal status for avian species.

Transient - These species pass through southeastern Utah twice a year during their migratory travels.

Resident - These species occur yearlong in southeastern Utah.

Summer Resident - These species breed in southeastern Utah and migrate elsewhere for the winter.

Winter Resident - These species breed elsewhere but winter in southeastern Utah.

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
ishes -- 38 species in southeastern Utah				
Family Clupeidae				
Threadfin Shad (*Dorosoma petenense*)	E,F	L-P	Stable	Lake-pelagic areas
Family Salmonidae				
Cutthroat Trout (*Salmo clarki*)	A,B,D,F	C-P	Stable	Lakes-rocky shores, deep pelagic water; river-pools, riffles, and overhanging banks
Rainbow Trout (*Salmo gairdneri*)	A,B,E,F,	C-P	Stable	Lake-littoral and pelagic areas rivers-pools, riffles, overhanging banks
Brown Trout (*Salmo trutta*)	A,B,E,F	C-P	Stable	Lake-pelagic and littoral areas rivers-pools, riffles, and overhanging banks
Brook Trout (*Salvelinus fontinalis*)	A,F	L-P	Stable	Lake-pelagic and littoral areas
Family Esocidae				
Northern Pike (*Esox lucius*)	E,F	L-P	Unknown	Lake-littoral areas with submerged trees and brush
Family Cyprinidae				
Longfin Dace (*Agosia chrysogaster*)	E,F	K-P	Unknown	Unknown
Carp (*Cyprinus carpio*)	A,B,C,D,E,F	C-P	Stable	Lakes-littoral areas; quiet water areas in rivers, ponds, sloughs, creeks, and irrigation ditches
Utah Chub (*Gila atraria*)	A,B	L-P	Abundant	Irrigation ditches, ponds, sloughs, creeks, rivers, and lakes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Leatherside Chub (*Gila copei*)	A,E	C-P	Stable	Pool and riffle areas
Humpback Chub (*Gila cypha*)	B	E-P	Decreasing	Eddies and backwaters
Bonytail Chub *Gila elegans*)	B,C,F	E-P*	Decreasing	Main channels of large rivers
Roundtail Chub (*Gila robusta*)	B,C,D,E,F	C-P	Stable	Riffles and stagnant backwaters
Red Shiner (*Notropis lutrensis*)	B,C,D,E,F	C-P	Increasing	Riffles, pools, backwaters, and eddies
San Shiner (*Notropis stramineus*)	F	C-P	Increasing	Riffles, pools, backwaters, and eddies
Fathead Minnow (*Pimephales promelas*)	B,C,D,E,F	C-P	Stable	Pools and backwaters
Colorado Squawfish (*Ptychocheilus lucius*)	B,C,D,E,F	E-P	Decreasing	Slow waters, eddies, backwaters, and large pools
Longnose Dace (*Rhinichtys cataractae*)	A	U-P	Unknown	Pools and riffles
Speckled Dace (*Rhinichtys osculus*)	A,B,C,D,E,F	C-P	Stable	Pools and riffles
Redside Shiner (*Richardsonius balteatus*)	A,B,D	C-P	Stable	Lakes, creeks and rivers
Family Catostomidae				
White Sucker (*Catostomus commersoni*)	E,F	U-P	Unknown	Unknown
Bluehead Sucker (*Catostomus discobolus*)	A,B,C,D,E,F	C-P	Stable	Pools, riffles and lakes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Flannelmouth Sucker (*Catostomus latipinnis*)	B,C,D,E,F	C-P	Stable	Pools and riffles
Mountain Sucker (*Catostomus platyrhynchus*)	A	L-P	Stable	Pools and riffles
Humpback Sucker (*Xyrauchen texanus*)	B,C,D,E,F	T-P*	Decreasing	Large rivers with strong currents
Family Ictaluridae				
Black Bullhead (*Ictalurus melas*)	B,C,D,E,F	C-P	Stable	Pools, quiet water and lakes
Yellow Bullhead (*Ictalurus natalis*)	E,F	R-P	Stable	Quiet water areas and lakes
Channel Catfish (*Ictalurus punctatus*)	B,C,D,E,F	C-P	Stable	Pools, riffles, quiet water areas and lakes
Family Cyprinodontidae				
Plains Killifish (*Fundulus kansae*)	F	R-P	Stable	Quiet water areas
Family Poeciliidae				
Mosquito fish (*Gambusia affinis*)	F	R-P	Stable	Quiet water areas
Family Cottidae				
Mottled Sculpin (*Cottus bairdi*)	A	C-P	Stable	Rocky riffles and pool areas
Family Percichtyidae				
Striped Bass (*Morone saxatilis*)	E,F	C-P	Increasing	Lake-pelagic areas
Family Centrarchidae				
Green Sunfish (*Lepomis cyanellus*)	B,C,D,E,F	C-P	Stable	Quiet backwaters and lakes
Bluegill (*Lepomis macrochirus*)	E,F	C-P	Stable	Lakes-littoral areas with rocky shores and submerged brush

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Largemouth Bass (*Micropterus salmoides*)	A,B,C,D,E,F	C-P	Stable	Rivers-quiet water areas; lakes-littoral rocky areas, with submerged brush
Black Crappie (*Pomoxis nigromaculatus*)	E,F	C-P	Stable	Lake-littoral zone around submerged brush and trees, and pelagic areas
Family Percidae				
Perch (*Perca flavescens*)	F	U-P	Unknown	Unknown
Walleye (*Stizostedion vitreum*)	E,F	C-P	Stable	Lake-deep water around rocky bottoms

* It is believed that these species will be included on the Federal list of threatened and endangered species in the near future.

Amphibians -- 11 species in southeastern Utah				
Family Ambystomatidae				
Tiger Salamander (*Ambystoma tigrinum*)	A,B,C,D,E,F	C-P	Unknown	Quiet water of ponds, reservoirs, lakes, temporary rain pools and streams from arid sagebrush plains to rolling grasslands, mountain meadows and forests
Family Pelobatidae				
Great Basin Spadefoot Toad (*Scaphiopus intermontanus*)	A,B,C,D,E,F	C-N	Unknown	Sagebrush flats, pinion-juniper woodlands to high elevations in spruce-fir communities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Spadefoot Toad <u>(Scaphiopus hammondi)</u>	F	K-N	Unknown	Washes, alkali flats, foothills, mountain valleys, in open vegetation and shortgrass, where soil is sandy and/or gravelly
Family Bufonidae				
Western Toad <u>(Bufo boreas)</u>	A	K-N	Unknown	Desert streams, springs, grasslands, woodlands, and mountain meadows
Red Spotted Toad <u>(Bufo punctatus)</u>	D,E,F,	C-N	Unknown	Open grassland and rocky canyons
Woodhouse's Toad <u>(Bufo woodhousei)</u>	A,B,C,D,E,F	C-N	Unknown	Grassland, sagebrush flats, woods, desert streams, valleys, flood plains, farms, and city backyards
Great Plains Toad <u>(Bufo cognatus)</u>	C,D,E,F,	C-N	Unknown	Prairies, deserts, quiet water of streams, grass-lands and sagebrush plains
Family Hylidae				
Chorus Frog <u>(Pseudacris triseriata)</u>	A,B,C,D,F	C-N	Unknown	Grassy pools, lakes, and marshes of prairies or mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Canyon Tree Frog *(Hyla arenicolor)*	E,F	L-N	Unknown	Intermittant or permanent streams with rocky pools in canyons with cottonwoods or other trees
Family Ranidae				
Bullfrog *(Rana catesbeiana)*	F	L-P	Unknown	Colorado River-usually quiet water where there is thick growth of aquatic vegetation
Leopard Frog *(Rana pipiens)*	A,B,C,D,E,F	C-N	Unknown	Springs, creeks, rivers, ponds, canals, reservoirs and wet meadows
Reptiles -- 36 species in southeastern Utah				
Family Iguanidae				
Chuckwalla *(Sauromalus obesus)*	E,F	L-N	Unknown	Rocky hillsides
Collared Lizard *(Crotaphytus collaris)*	A,B,C,D,E,F	C-N	Unknown	Canyons, rocky gullies, mountain slopes and boulder strewn alluvial fans where vegetation is sparse
Leopard Lizard *(Crotaphytus wislizenii)*	A,B,C,D,E,F	C-N	Unknown	Arid and semi-arid plains with bunchgrass, sagebrush or other low desert shrub communities; avoids dense vegetation
Lesser Earless Lizard *(Holbrookia maculata)*	F	K-N	Unknown	Washes, sandy stream banks and sand dunes on shortgrass prairi and farmlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Eastern Fence Lizard (*Sceloporus undulatus*)	A,B,C,D,E,F	C-N	Unknown	Forest, woodlands, prairie, brushy flatlands, sand dunes, rocky hillsides and farmlands
Desert Spiny Lizard (*Sceloporus magister*)	D,E,F	C-N	Unknown	Shadscale deserts, pinion-juniper woodland, willows and cottonwoods.
Sagebrush Lizard (*Sceloporus graciosus*)	A,B,C,D,E,F	C-N	Unknown	Variety of habitat types; sagebrush, pinion-juniper, low desert shrub and rocklands
Tree Lizard (*Urosaurus ornatus*)	A,B,C,D,E,F	C-N	Unknown	Trees and rocks
Side-blotched Lizard (*Uta stansburiana*)	A,B,C,D,E,F	C-N	Unknown	Inhabits a variety of habitat types; sandy washes with scattered rocks and low growing shrubs
Desert Horned Lizard (*Phrynosoma platyrhinos*)	E	K-N	Unknown	Along washes at the edge of dunes in saltbrush and sagebrush areas
Short-horned Lizard (*Phrynosoma douglassi*)	A,B,C,D,E,F	C-N	Unknown	Desert grassland, sagebrush, pinion-juniper, pine-spruce and spruce-fir associations, extending from desert shrub to mountain habitats

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Xantusiidae				
Utah Night Lizard (*Xantusia vigilis*)	E,F	L-N	Unknown	Dead clumps of yucca plants and woodrat middens
Family Teiidae				
Plateau Whiptail (*Cnemidophorus velox*)	F	K-N	Unknown	Mountains in pinion-juniper woodland and lower edges of ponderosa pine forests
Western Whiptail (*Cnemidophorus tigris*)	A,B,C,D,E,F	C-N	Unknown	Desert shrub communities where plants are sparse and there are open areas for running
Family Scincidae				
Many-lined Skink (*Eumeces multivirgatus*)	E,F	K-N	Unknown	Shortgrass prairie that extends into the mountains; often vacant lots, city dumps and backyards
Western Skink (*Eumeces skiltonianus*)	C	K-N	Unknown	Grasslands, woodlands and forests in rocky habitat near streams with abundant cover
Family Boidae				
Rubber Boa (*Charina bottae*)	A	C-N	Unknown	Grasslands, woodlands, and forests with rotting logs; often found under rocks and under the bark of fallen or standing dead trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Colubridae				
Smooth Green Snake (*Opheodrys vernalis*)	F	K-N	Unknown	Damp grassy environment
Striped Whipsnake (*Masticophis taeniatus*)	A,B,C,D,E,F	C-N	Unknown	Brushlands, grasslands, sagebrush flats, pinion-juniper woodlands and open pine forests
Coachwhip (*Masticophis flagellum*)	E,F	K-N	Unknown	Utilizes a variety of habitats but avoids dense vegetation; rodent burrows, rocks and branches are used
Racer (*Coluber constrictor*)	A,B,C,D,E,F	C-N	Unknown	Meadows, sparse brush and forest openings with semi-arid and moist areas; grassy places near rocks and logs are preferred
Corn Snake (*Elaphe guttata*)	F	K-N	Unknown	Stream and river bottoms, rocky wooded hillsides, coniferous forests, and farmland with rodent burrows, rocks and logs
Ringneck Snake (*Diadophis punctatus*)	A	K-N	Unknown	Moist habitats usually in the mountains or along stream and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Gopher Snake (*Pituophis melanoleucus*)	A,B,C,D,E,F	C-N	Unknown	Lowlands to high mountains including desert, coniferous forest and farmland types; grassland and open brushland are prescribed
Milk Snake (*Lampropeltis triangulum*)	A,B,C,F	K-N	Unknown	Variety of habitats from lowlands to mountains; rotten logs and stumps are preferred
Common Kingsnake (*Lampropeltis getulus*)	E,F	K-N	Unknown	Variety of habitats from lowlands to mountains with rock outcrops and clumps of vegetation under rotting logs or rocks
Sonora Mountain Kingsnake (*Lampropeltis pyromelana*)	A	K-N	Unknown	Mountains, pinion-juniper woodlands, mountain brush, coniferous forests with rocks, logs and dense clumps of vegetation
Long-nosed Snake (*Rhinocheilus lecontei*)	F	K-N	Unknown	Prairies, brushland and irrigated parts of deserts
Western Terrestrial Garter Snake (*Thamnophis elegans*)	A,B,C,D,E,F	C-N	Unknown	Variety of terrestrial and aquatic habitats from lowlands to mountains
Common Garter Snake (*Thamnophis sirtalis*)	A,F	K-N	Unknown	Variety of habitats, usually near water

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Black-necked Garter Snake (Thamnophis cyrtopsis)	F	K-N	Unknown	Desert and grasslands
Western Black-headed Snake (Tantilla planiceps)	E,F	K-N	Unknown	Grasslands, woodlands and deserts; often found under rocks and logs
Night Snake (Hypsiglena torquata)	A,B,C,D,E,F	C-N	Unknown	Plains, sagebrush flats, desert and woodlands; often found under rocks and surface litter
Family Crotalidae				
Hopi Rattlesnake (Crotalus viridis nuntius)	E	U-N	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts
Prairie Rattlesnake (Crotalus viridis viridis)	F	U-N	Unknown	Prefers rock piles and rodent burrows on grasslands, woodlands and forests; avoids sparsely vegetated deserts
Midget Faded Rattlesnake (Crotalus viridis concolor)	A,B,C,D,E,F	C-N	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Birds -- 278 species in southeastern Utah				
Order Gaviiformes				
Family Gaviidae				
Common Loon _(Gavia immer)_	A,B,C,D,E,F	U-P transient and winter resident	Stable	Lakes of coniferous forests, open lakes, reservoirs and bays
Order Podicipediformes				
Family Podicipedidae				
Horned Grebe _(Podiceps auritus)_	A,B,C,D,E,F	R-P transient and summer resident	Stable	Lakes, ponds and reservoirs
Eared Grebe _(Podiceps nigricollis)_	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, bays and reservoirs
Western Grebe _(Aechmophorus occidentalis)_	A,B,C,D,E,F	C-P summer resident	Stable	Sloughs, bays and reservoirs and lakes with emergent vegetatior for nesting
Pied-billed Grebe _(Podilymbus podiceps)_	A,B,C,D,E,F	C-P summer resident	Stable	Ponds, lakes, streams and marshes
Order Pelecaniformes				
Family Pelecanidae				
White Pelican _(Pelecanus erythrorhynchos)_	A,B,C,D,E,F	L-P transient and summer resident	Stable	Larger shallow bodies of water and large rivers
Family Phalacrocoracidae				
Double-crested Cormorant _(Phalacrocorax auritus)_	A,B,C,D,E,F	U-P summer resident	Stable	Bays, lakes and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Ciconiiformes Family Ardeidae Great Blue Heron (*Ardea herodias*)	A,B,C,D,E,F	C-P resident	Stable	Marshes, shallow reservoirs, rivers, streams, shores and irrigation ditches
Green Heron (*Butorides striatus*)	B,E,F	R-P transient	Unknown	Marshes, wooded streams, rivers, small ponds and lake margins
Cattle Egret (*Bubulcus ibis*)	E,F	O-P transient	Unknown	Marshes, lake margins, and irrigated lands
Snowy Egret (*Egretta thula*)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, ponds, lake margins and irrigated land
Black-crowned Night Heron (*Nycticorax nycticorax*)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, lake margins and shores
Least Bittern (*Ixobrychus exilis*)	D,E,F	U-P transient	Unknown	Densely vegetated marshes
American Bittern (*Botaurus lentinginosus*)	A,B,C,D,E,F	U-P summer resident	Stable	Densely vegetated marsh
Family Ciconiidae Wood Stork (*Mycteria americana*)	D,E,F	O-P transient	Unknown	Marshes, ponds and lake margins
Family Threskiornithidae White-faced Ibis (*Plegadis chihi*)	A,B,C,D,E,F	C-P summer resident	Increasing	Marshes and irrigated land

Species	Biogeogra[illegible] Area Inhabited	Status	Population Trend	Habitat Use Area
Order Anseriformes				
Family Anatidae				
Whistling Swan *(Olor columbianus)*	A,B,C,D,E,F	O-P winter resident C-P transient	Stable	Lakes, large rivers and fields
Trumpeter Swan *(Olor buccinator)*	B,C,D,E,F	R-P transient	Unknown	Lakes and large rivers
Canada Goose *(Branta canadensis)*	A,B,C,D,E,F	C-P resident and transient	Increasing	Lakes, bays, marshes, rivers and grainfields
White-fronted Goose *(Anser albifrons)*	A,B,C,D,E,F	R-P transient	Stable	Marshes, fields, lakes and bays
Snow Goose *(Chen caerulescens)*	A,B,C,D,E,F	U-P transient	Stable	Marshes, grainfields, reservoir, ponds and bays
Ross' Goose *(Chen rossii)*	A,B,C,D,E,F	O-P transient	Stable	Marshes, grainfields, prairies, ponds and bays
Mallard *(Anas platyrhynchos)*	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land grainfields, ponds, riv[illegible] lakes, bays and reservo[illegible] extending from lowlands [illegible] mountains
Gadwall *(Anas strepera)*	A,B,C,D,E,F	C-P resident and transient	Stable	Lakes, ponds, rivers and marshes
Pintail *(Anas acuta)*	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, grainfields, ponds, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Green-winged Teal (*Anas crecca*)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, lakes, ponds, rivers and bays
Blue-winged Teal (*Anas discors*)	A,B,C,D,E,F	U-P resident and transient	Stable	Ponds and marshes
Cinnamon Teal (*Anas cyanoptera*)	A,B,C,D,E,F	C-P resident and transient	Stable	Stock ponds, rivers, marshes and lakes
American Widgeon (*Anas americana*)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, ponds, lakes and bays
Northern Shoveler (*Anas clypeata*)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds and sloughs
Wood Duck (*Aix sponsa*)	A,B,C,D,E,F	R-P transient	Stable	Wooded rivers and ponds
Redhead (*Aythya americana*)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes with some deep water, lakes and reservoirs
Ring-necked Duck (*Aythya collaris*)	A,B,C,D,E,F	U-P transient	Stable	Coniferous lakes, wooded ponds, marshes and reservoirs
Canvasback (*Aythya valisineria*)	A,B,C,D,E,F	C-P transient R-P summer resident	Stable	Marshes, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Greater Scaup *(Aythya marila)*	A,B,C,D,E,F	U-P transient	Stable	Lakes, rivers and ponds
Lesser Scaup *(Aythya affinis)*	A,B,C,D,E,F	C-P transient	Stable	Marshes, ponds and lakes
Common Goldeneye *(Bucephala clangula)*	A,B,C,D,E,F	U-P transient	Stable	Lakes and rivers
Bufflehead *(Bucephala albeola)*	A,B,C,D,E,F	U-P transient	Stable	Lakes, ponds and rivers
White-winged Scoter *(Melanitta deglandi)*	D	O-P transient	Stable	Large lakes and reservoirs. Recorded occurrence at Desert Lake WMA
Ruddy Duck *(Oxyura jamaicensis)*	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds, rivers and reservoirs
Hooded Merganser *(Mergus cucullatus)*	A,B,C,D,E,F	R-P transient	Stable	Wooded lakes, ponds, rivers and reservoirs
Common Merganser *(Mergus merganser)*	A,B,C,D,E,F	C-P transient U-P winter resident	Stable	Wooded lakes and rivers in summer; in winter, open rivers, lakes and ponds
Red-breasted Merganser *(Mergus serrator)*	A,B,C,D,E,F	C-P transient	Stable	Lakes, reservoirs and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Falconiformes				
Family Cathartidae				
Turkey Vulture (*Cathartes aura*)	A,B,C,D,E,F	C-P summer resident	Stable	Usually seen in sky or perched on dead trees, posts, carrion or on groun[d]
California Condor (*Gymnogyps californianus*)	A,B,C,D,E,F	X-P	Extirpated	Usually seen in sky or perched on dead trees, posts, carrion or on groun[d]
Family Accipitridae				
Goshawk (*Accipiter gentilis*)	A,B,C,D,E,F	U-P resident	Stable	Mountain woodlands
Sharp-shinned Hawk (*Accipiter striatus*)	A,B,C,D,E,F	U-P resident and transient	Stable	Forests, thickets, scruboak, desert riparian, mountain woodlands and aspen
Cooper's Hawk (*Accipiter cooperii*)	A,B,C,D,E,F	C-P summer resident and transient R-P winter resident	Stable	Broken woodlands, dry wooded canyons, riparian areas, pinion-juniper and conifers
Red-tailed Hawk (*Buteo jamaicensis*)	A,B,C,D,E,F	C-P resident	Stable	Open country, woodlands, mountains and deserts
Red-shouldered Hawk (*Buteo lineatus*)	C,F	A-P transient	Unknown	Broken woodlands, primarily along lowland rivers and often close to cultivated fields
Swainson's Hawk (*Buteo swainsoni*)	A,B,C,D,E,F	U-P summer resident	Stable	Dry plains and rangeland with hills; open forest or alpine meadows with sparse trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Rough-legged Hawk (*Buteo lagopus*)	A,B,C,D,E,F	C-P winter resident	Stable	Open country, woodlands, deserts and marshes
Ferruginous Hawk (*Buteo regalis*)	A,B,C,D,E,F	U-P summer resident R-P winter resident	Stable	Open desert; infrequentl marshes and farmlands are utilized
Golden Eagle (*Aquila chrysaetos*)	A,B,C,D,E,F	C-P resident	Stable	Open mountains, foot-hills, canyons and deser
Bald Eagle (*Haliaeetus leucocephalus*)	A,B,C,D,E,F	E-P winter resident	Increasing	Lakes, rivers and marsh surrounded by open country with available perching sites
Marsh Hawk (*Circus cyaneus*)	A,B,C,D,E,F	C-P resident	Stable	Marshes, fields and prairies
Family Pandionidae				
Osprey (*Pandion haliaetus*)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and large bodies of water
Family Falconidae				
Prairie Falcon (*Falco mexicanus*)	A,B,C,D,E,F	C-P resident	Stable	Canyons, open habitat in mountains, plains and deserts
Peregrine Falcon (*Falco peregrinus*)	A,B,C,D,E,F	E-P resident	Unknown	Canyons, high cliffs, rivers, marshlands and deserts
Merlin (*Falco columbarius*)	A,B,C,D,E,F	C-P winter resident	Unknown	Open country and foot-hills; often associated with flocking passerine

ecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
American Kestrel (_Falco sparverius_)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Stable	Open country, prairies, deserts, wooded streams, farmland and cities
Order Galliformes				
Family Tetraonidae				
Blue Grouse (_Dendragapus obscurus_)	A,B,C,D,E,F	C-P resident	Stable	Coniferous forests, aspen, mountain brush, open slash and burns
Ruffed Grouse (_Bonasa umbellus_)	A,B	C-P resident	Stable	Aspen and coniferous forests near stream courses
Sage Grouse (_Centrocercus urophasianus_)	A,B,C,F	C-P resident	Stable	Sagebrush plains associated with pasture lands; sagebrush parks associated with wet meadows
Family Phasianidae				
California Quail (_Lophortyx californicus_)	A,B,D,E,F	C-P resident	Stable	Mountain brush, woodland edges and farmlands near river bottoms
Gambels Quail (_Lophortyx gambelii_)	D,E,F	C-P resident	Stable	Desert thickets, usually near water
Chukar (_Alectoris chukar_)	A,B,C,D,E,F	C-P resident	Stable	Rocky, grassy or brushy slopes in arid mountains and canyons
Ring-necked Pheasant (_Phasianus colchicus_)	A,B,C,D,E,F	C-P resident	Decreasing	Irrigated cropland, pastureland, wetlands and desert washes

Species	Biogeograph Area Inhabi	Status	Population Trend	Habitat Use Area
White-winged Pheasant <u>(Phasianus colchicus)</u>	E,F	L-P resident	Decreasing	Irrigated cropland, pastureland and wetland: near Hanksville and Bluff, Utah
Family Meleagrididae				
Merriam's Turkey <u>(Meleagris gallapavo)</u>	F	L-P resident	Stable	Mountainous regions wit! Ponderosa pine, mixed conifer and aspen woodlands or mountain brush
Order Gruiformes				
Family Gruidae				
Sandhill Crane <u>(Grus canadensis)</u>	A,B,C,D,E,F	R-P transient	Stable	In winter, prairies grainfields and marshes in summer, mountain meadows and marshes
Family Rallidae				
Virginia Rail <u>(Rallus limicola)</u>	A,B,C,D,E,F	C-P resident	Stable	Marshes
Sora Rail <u>(Porzana carolina)</u>	A,B,C,D,E,F	U-P resident	Stable	Marshes and wet meadows
Common Gallinule <u>(Gallinula chloropus)</u>	A,D	R-P transient	Unknown	Marshes, wet meadows, lakes with bulrush or cattails and sedges
American Coot <u>(Fulica americana)</u>	A,B,C,D,E,F	C-P resident and transient	Stable	Ponds, lakes, marshes, and agricultural lands adjacent to wetland habitats.
Order Charadriiformes				
Family Charadriidae				
Semipalmated Plover <u>(Charadrius semipalmatus)</u>	A,B,C,D,E,F	U-P transient	Stable	Shores of marshes, reservoirs and mudflats

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Snowy Plover (*Charadrius alexandrinus*)	A,B,C,D,E,F	U-P transient	Stable	Alkali and sand flats
Killdeer (*Charadrius vociferus*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Fields and pastures, lawns, riverbanks, irrigated land, shores, plowed fields, alkali flats and gravel roads
Mountain Plover (*Charadrius montanus*)	A,B,C,F	R-P transient	Stable	Semi-arid grasslands, plains and plateaus
American Golden Plover (*Pluvialis dominica*)	A,B,C,D,E,F	U-P transient	Stable	Prairies, mudflats and shores
Black-bellied Plover (*Pluvialis squatarola*)	A,B,C,D,E,F	C-P transient	Stable	Mudflats, open marshes and shores
Family Scolopacidae				
Common Snipe (*Capella gallinago*)	A,B,C,D,E,F	C-P resident	Stable	Marshes, irrigation ditches, stream sides, and wet meadows
Long-billed Curlew (*Numenius americanus*)	A,B,C,D,E,F	U-P summer resident and transient	Declining	Meadows, pastures and wetlands
Willet (*Catoptrophorus semipalmatus*)	A,B,C,D,E,F	U-P summer resident and transient	Stable	Marshes, wet meadows and muddy shores
Spotted Sandpiper (*Tringa macularia*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Pebbly lake shores, ponds and stream sides

Species	Biogeograph Area Inhabited	Status	Population Trend	Habitat Use Area
Solitary Sandpiper (*Tringa solitaria*)	A,B,C,D,E,F	U-P transient	Stable	Stream sides, ponds and marshes
Greater Yellowlegs (*Tringa melanoleuca*)	A,B,C,D,E,F	U-P transient	Stable	Open marshes, mudflats, streams and ponds
Lesser Yellowlegs (*Tringa flavipes*)	A,B,C,D,E,F	C-P transient	Stable	Marshes, mudflats, shores and pond edges
Pectoral Sandpiper (*Calidris melanotos*)	A,B,C,D,E,F	U-P transient	Stable	Prairie pools and marshy shores
Baird's Sandpiper (*Calidris bairdii*)	A,B,C,D,E,F	U-P transient	Stable	Rainpools, pond margins mudflats and shores
Least Sandpiper (*Calidris minutilla*)	A,B,C,D,E,F	C-P transient	Stable	Grassy marshes, rain-pools, shores and alkal mudflats
Western Sandpiper (*Calidris mauri*)	A,B,C,D,E,F	C-P transient	Stable	Shores, beaches, mud-flats and open marshes
Sanderling (*Calidris alba*)	A,B,C,D,E,F	U-P transient	Stable	Lake shores
Short-billed Dowitcher (*Limnodromus griseus*)	A,B,C,D,E,F	U-P summer resident and transient	Stable	Mudflats, open marshes and ponds
Long-billed Dowitcher (*Limnodromous scolopaceus*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Mudflats, shallow pools and wetlands

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Marbled Godwit (*Limosa fedoa*)	A,B,C,D,E,F	C-P transient	Stable	Grasslands and meadows near lakes and shallow lake margins
Family Recurvirostridae				
American Avocet (*Recurvirostra americana*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, mudflats, alkaline lakes, shallow ponds and sloughs
Black-necked Stilt (*Himantopus mexicanus*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Grassy marshes, alkali mudflats, pools and shallow lakes
Family Phalaropodidae				
Wilson's Phalarope (*Phalaropus tricolor*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Shallow lakes, marshes, pools, shores and mudflats
Northern Phalarope (*Phalaropus lobatus*)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Lakes and ponds
Family Laridae				
Glaucous Gull (*Larus hyperboreus*)	D	R-P transient	Stable	Recorded using marshlands at Desert Lake WMA
Herring Gull (*Larus argentatus*)	A,B,C,D,E,F	U-P transient	Stable	Lakes, farmlands and dumps
California Gull (*Larus californicus*)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, rivers, farmlands and dumps
Ring-billed Gull (*Larus delawarensis*)	A,B,C,D,E,F	C-P winter resident	Stable	Lakes, rivers, refuse dumps, fields and cities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Franklin's Gull (Larus pipixcan)	A,B,C,D,E,F	C-P summer resident	Stable	Prairies, marshes, lakes and plowed fields
Bonaparte's Gull (Larus philidelphia)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and open marshes
Forsters Tern (Sterna forsteri)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Common Tern (Sterna hirundo)	A,B,C,D,E,F	U-P transient	Stable	Lakes and reservoirs
Black Tern (Chlidonias niger)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Caspian Tern (Hydroprogne caspia)	A,B,C,D,E,F	U-P transient	Stable	Large lakes and reservoirs
Order Columbiformes				
Family Columbidae				
Band-tailed pigeon (Columba fasciata)	A,E,F	U-P summer resident and transient	Stable	Forests, canyons and foothills near mountain brush (acorns) and agricultural lands
Rock Dove (Columba lavia)	A,B,C,D,E,F	C-N resident	Stable	Cities, farms and cliffs
Mourning Dove (Zenaida macroura)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Farmlands, towns, open woods, grassland and deserts
White-winged Dove (Zenaidura asiatica)	E,F	A-P summer resident and transient	Unknown	Open woods and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Cuculiformes				
Family Cuculidae				
Yellow-billed Cuckoo (Coccyzus americanus)	A,B,C,D,E,F	K-P summer resident	Unknown	River thickets and willows
Order Strigiformes				
Family Tytonidae				
Barn Owl (Tyto alba)	A,B,C,D,E,F	K-P resident	Unknown	Woodlands, fields, farms, towns, canyons, cliffs an dirt banks
Family Strigidae				
Screech Owl (Otus asio)	A,B,C,D,E,F	U-P resident	Stable	Riparian communities and wooded canyons
Flammulated Owl (Otus flammeolus)	A,B,C,D,E,F	K-P summer resident	Unknown	Open pine and fir forests in mountains
Great Horned Owl (Bubo virginianus)	A,B,C,D,E,F	C-P resident	Stable	Ubiquitous
Pygmy Owl (Glaucidium gnoma)	A,B,C,D,E,F	K-P resident	Unknown	Wooded canyons in open coniferous, mixed woodlands and pinion-juniper forests
Burrowing Owl (Speotyto cunicularia)	A,B,C,D,E,F	L-P resident	Declining	Open grassland, prairies, dikes, desert, farms and prairie dog colonies

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Spotted Owl *(Strix occidentalis)*	C,E	K-P Unknown	Unknown	Wooded canyons with narrow side canyons in the desert
Long-eared Owl *(Asio otus)*	A,B,C,D,E,F	C-P resident	Stable	River woodlands, pinion-juniper forests, willow thickets and Russian olive trees
Short-eared Owl *(Asio flammeus)*	A,B,C,D,E,F	C-P resident	Stable	Marshes, prairies, irrigated land and open country with short vegetation
Saw-whet Owl *(Aegolius acadicus)*	A,B,C,D,E,F	K-P resident	Stable	Forest, conifers and groves
Order Caprimulgiformes				
Family Caprimulgidae				
Common Nighthawk *(Chordeiles minor)*	A,B,C,D,E,F	C-P summer resident	Stable	Treeless plains to mountains with open pin woods; often seen in fl over country side or to
Lesser Nighthawk *(Chordeiles acutipennis)*	E	R-P summer resident	Unknown	Arid open scrub, dry grasslands, pastures and desert washes
Poor-will *(Phalaenoptilus nuttallii)*	A,B,C,D,E,F	C-P summer resident	Stable	Arid uplands with open pinion-juniper and spar brush; riparian areas a. roadsides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Apodiformes				
Family Apodidae				
Black Swift (Cypseloides niger)	A,B,C,D,E,F	U-P summer resident	Unknown	Open areas in mountain country
White-throated Swift (Aeronautes saxatalis)	A,B,C,D,F	C-P summer resident	Unknown	Open areas; wide ranging and breeds mainly in dry mountain canyons
Family Trochilidae				
Black-chinned Hummingbird (Archilochus alexandri)	A,B,C,D,E,F	C-P summer resident	Unknown	Semi-arid country near water; semi-wooded canyons and slopes, mountain brush and riparian woodlands
Broad-tailed Hummingbird (Selasphorus platycercus)	A,B,C,D,E,F	C-P summer resident	Unknown	Ubiquitous
Rufous Hummingbird (Selasphorus rufus)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Forest edges, thickets in coniferous and deciduous forests, mountain brush and alpine meadows
Calliope Hummingbird (Stellula calliope)	A,B,C,D,E,F	C-P summer resident	Unknown	High mountains, canyons and forest openings
Rivoli's Hummingbird (Eugenes fulgens)	E,F	U-P summer resident	Unknown	High mountain forest openings, pine-oak forests and canyons

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Caraciiformes				
Family Alcedinidae				
Belted Kingfisher (Megaceryle alcyon)	A,B,C,D,E,F	U-P resident	Stable	Rivers, ponds and lakes
Order Piciformes				
Family Picidae				
Common Flicker (Colaptes auratus)	A,B,C,D,E,F	C-P resident	Stable	Deciduous or mixed woodlands, open forest, farms towns, canyons and semi-open country
Pileated Woodpecker (Dryocopus pileatus)	F	R-P resident	Unknown	Mature coniferous and mixed forests with many snags
Red-headed Woodpecker (Melanerpes erythrocephalus)	B	R-P resident	Unknown	Groves, farm country, riparian areas, towns and scattered trees
Yellow-bellied Sapsucker (Sphyrapicus varius)	A,B,C,D,E,F	C-P resident	Unknown	In summer woodlands and aspen groves; in winter orchards and other trees
Williamson's Sapsucker (Sphyrapicus thyroideus)	F	U-P summer resident	Unknown	Higher coniferous forests and burns
Lewis Woodpecker (Asyndesmus lewis)	F	K-P summer resident and transient	Unknown	Scattered or logged forests, burns, cottonwood groves and ponderosa pine
Hairy Woodpecker (Dendrocopos villosus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain forests, woodlands and river grove

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Downy Woodpecker (*Dendrocopos pubescens*)	A,B,C,D,E,F	C-P resident	Unknown	Broken or mixed forest, willows, poplars, riparian woodlands, orchards and shade trees
Northern Three-toed Woodpecker (*Picoides tridactylus*)	A,B,C,E,F	U-P resident	Unknown	Coniferous forests
Order Passeriformes				
Family Tyrannidae				
Western Kingbird (*Tyrannus verticalis*)	A,B,C,D,E,F	C-P summer resident	Stable	Open country with scattered trees, farms and roadsides
Cassin's Kingbird (*Tyrannus vociferans*)	A,B,C,D,E,F	U-P summer resident	Unknown	Semi-open high country, scattered trees, pine-oak mountains and ranch groves
Eastern Kingbird (*Tyrannus tyrannus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Wood edges, parklands, riparian areas, farms, shelter belts, orchards and roadsides
Ash-throated Flycatcher (*Myiarchus cinerascens*)	A,B,C,D,E,F	C-P summer resident	Stable	Semi-arid country, deserts, brush, pinion-juniper and open woods
Black Phoebe (*Sayornis nigricans*)	F	C-P resident	Unknown	Streamside woodlands, farmyards and towns with cliffs near water
Says Phoebe (*Sayornis saya*)	A,B,C,D,E,F	C-P resident	Unknown	Open arid country, deserts, bushy plains, prairie farms, canyon mouths and buttes

Species	Biogeograph Area Inhabited	Status	Population Trend	Habitat Use Area
Willow (Traill's) Flycatcher (*Empidonax traillii*)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in willow thickets in low valleys, along canyons or in high mountain meadows
Hammond's Flycatcher (*Empidonax hammondii*)	A,B,C,E,F	U-P summer resident	Unknown	High coniferous forests
Dusky Flycatcher (*Empidonax oberholseri*)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in mountain brush with a scattering of trees
Gray Flycatcher (*Empidonax wrightii*)	A,B,C,D,E,F	K-P summer resident	Unknown	Breeds in sagebrush and pinion-juniper woodlands
Western Flycatcher (*Empidonax difficilis*)	A,B,C,D,E,F	C-P summer resident	Unknown	Moist woods, mixed or coniferous forests, canyons, groves; must have water and shade
Western Wood Peewee (*Contipus sordidulus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands, pine-oak forests, open conifers and river groves
Olive-sided Flycatcher (*Contopus borealis*)	A,B,C,D,E,F	U-P summer resident	Unknown	Coniferous forests, burns and clearings; in migration habitats used are varied; usually seen on tip of dead tree or branch

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Alaudidae				
Horned Lark (*Eremophila alpestris*)	A,B,C,D,E,F	C-P resident	Unknown	Plains, desert, prairies, fields, sparse sagebrush flats, dirt roads, shores, alpine meadows, alkali flats and areas of sparse vegetation
Family Hirundinidae				
Violet-green Swallow (*Tachycineta thalasssina*)	A,B,C,D,E,F	C-P summer resident	Unknown	Widespread when foraging; when nesting, open forests foothill woods, mountains, canyons, cliffs and towns
Tree Swallow (*Iridoprocne bicolor*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country near water, marshes, mountain meadows, streams, lakes and wires; when nesting requires dead trees and snags, preferabl; near water
Bank Swallow (*Riparia riparia*)	A,B,C,D,E,F	C-P summer resident	Unknown	Usually near water; over fields, marshes, streams and lakes
Rough-winged Swallow (*Stelgidopteryx ruficollis*)	A,B,C,D,E,F	C-P summer resident	Unknown	Near streams, lakes and washes
Barn Swallow (*Hirundo rustica*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open or semi-wooded country, farms, ranches, fields, marshes and lakes; usually near man's habitation

Species	Biogeographi Area Inhabited	Status	Population Trend	Habitat Use Area
Cliff Swallow (Petrochelidon pyrrhonota)	A,B,C,D,E,F	C-P summer resident	Unknown	Open to semi-wooded country, neat farms, cliffs, canyons, rivers or lakes
Purple Martin (Progne subis)	A,B,C,E,F	U-P summer resident	Unknown	Open forests of aspen and conifers
Family Corvidae				
Steller's Jay (Cyanocitta stelleri)	A,B,C,D,E,F	C-P resident	Unknown	Conifers and pine-oak forests
Gray Jay (Perisorius canadensis)	A,B,C,E,F	R-P resident	Unknown	Coniferous forests
Scrub Jay (Aphelocoma coerulescens)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, oaks, mountain brush, river woods and pinion-juniper woodlands
Black-billed Magpie (Pica pica)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, ranches, sage-brush, river thickets, shelterbelts and prairie brush
Common Raven (Corvus corax)	A,B,C,D,E,F	C-P resident	Unknown	Mountains, deserts, canyons and cliffs
Common Crow (Corvus brachyrhynchos)	A,B,C,D,E,F	O-P transient	Unknown	Deciduous, mixed and open coniferous woodlands farmlands and river grove
Pinion Jay (Gymnorhinus cyanocephala)	A,B,C,D,E,F	C-P resident	Unknown	Pinion-juniper woodlands, but ranges into sagebrush
Clark's Nutcracker (Nucifraga columbiana)	A,B,C,E,F	C-P resident	Unknown	High mountains in conifer. near tree line

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Paridae				
Black-capped Chickadee <u>(Parus atricapillus)</u>	A,B,C,D,E,F	C-P resident	Unknown	In summer aspen-conifer, mixed woodlands and forest edges; in winter woodlands along valley streams and tree rows
Mountain Chickadee <u>(Parus gambeli)</u>	A,B,C,D,E,F	C-P resident	Unknown	In summer mountain forests and conifers; in winter riparian woodlands at lower elevations
Plain Titmouse <u>(Parus inornatus)</u>	A,B,C,D,E,F	C-P resident	Unknown	Pinion-juniper woodlands
Bushtit <u>(Psaltriparus minimus)</u>	A,B,C,D,E,F	C-P resident	Unknown	Oak woodlands, mountain brush, broad-leafed and mixed woods and pinion-juniper forest
Family Sittidae				
White-breasted Nuthatch <u>(Sitta carolinensis)</u>	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, pinion-juniper woodlands, oak brush, and riparian woodlands
Red-breasted Nuthatch <u>(Sitta canadensis)</u>	A,B,C,E,F	C-P resident	Unknown	Coniferous forests
Pygmy Nuthatch <u>(Sitta pusilla)</u>	A,B,C,D,E,F	C-P resident	Unknown	Ponderosa pines and Douglas fir

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use
Family Certidae				
Brown Creeper (Certhia familiaris)	A,B,C,E,F	C-P resident	Unknown	In summer mature montane mixed and coniferous forests; lower elevations in winter
Family Cinclidae				
Dipper (Cinclus mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Fast-flowing streams in or near mountains; lower levels in winter
Family Troglodytidae				
House Wren (Troglodytes aedon)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands of mountains and valleys
Rock Wren (Salpinctes obsoletus)	A,B,C,D,E,F	C-P resident	Unknown	Desert to high mountain areas with talus slopes and cliffs
Canyon Wren (Catherpes mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Rocky cliffs, crevices, and rock slides
Bewick's Wren (Thryomanes bewickii)	A,B,C,D,E,F	C-P resident	Unknown	Under brush and pinion-juniper woodlands
Long-billed Marsh Wren (Cistothorus palustris)	A,B,C,D,E,F	L-P resident	Unknown	Cattail marshes
Family Mimidae				
Mockingbird (Mimus polyglottos)	A,B,C,D,E,F	U-P transient and summer resident	Unknown	Towns, farms, ranches, roadsides, brush and desert streamsides
Gray Catbird (Dumetella carolinensis)	A,B,C,D,E,F	U-P summer resident	Unknown	Undergrowth, brush or thickets along valley streams

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Brown Thrasher _(Toxostoma rufum)_	D,E,F	R-P resident	Unknown	Brushy places and thorny thickets
Bendire's Thrasher _(Toxostoma bendirei)_	F	R-P resident	Unknown	Desert scrub and farmlands
Sage Thrasher _(Oreoscoptes montanus)_	A,B,C,D,E,F	C-P resident	Unknown	Sagebrush, rabbit-brush, brushy slopes and mesas
Family Muscicapidae				
American Robin _(Turdus migratorius)_	A,B,C,D,E,F	C-P resident	Unknown	In summer towns, lawns, farmland, open forests, streamsides and any wooded habitat; in winter berry-bearing trees
Varied Thrush _(Ixoreus naevius)_	E,F	O-P winter resident	Unknown	Deciduous and coniferous forests usually near water
Hermit Thrush _(Catharus guttatus)_	A,B,C,D,E,F	C-P summer resident and transient	Unknown	In summer mixed woodlands and open coniferous forest in winter woods, thickets and parks
Swainson's Thrush _(Catharus ustulatus)_	A,B,D	C-P summer resident	Unknown	Willow thickets, river woodlands, aspens, forest undergrowth and conifers
Veery _(Catharus fuscescens)_	A,B	U-P summer resident	Unknown	Streamside woodlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Bluebird (*Sialia mexicana*)	A,B,C,D,E,F	U-P summer resident	Unknown	Scattered trees, open conifers, forests and farms
Mountain Bluebird (*Sialia currucoides*)	A,B,C,D,E,F	C-P resident	Unknown	In summer open areas where mountain meadows and pastures are interspersed with loose stands or single coniferous trees; in winter lower elevations, often open areas with available perching sites
Townsend's Solitaire (*Myadestes townsendi*)	A,B,C,D,E,F	C-P resident	Unknown	In summer open coniferous forests in the mountains; in winter canyons, brushy slopes and junipers
Family Sylviidae				
Blue-gray Gnatcatcher (*Polioptila caerulea*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open mixed woods, streamside thickets, mountain brush and pinion-juniper woodlands
Golden-crowned Kinglet (*Regulus satrapa*)	A,B,C,D,E,F	U-P resident	Unknown	In summer coniferous forests; in winter pinion-juniper and brush in lower elevations
Ruby-crowned Kinglet (*Regulus calendula*)	A,B,C,D,E,F	C-P resident	Unknown	In summer coniferous forests; in winter other woodlands and thickets

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Motacillidae				
Water Pipet (*Anthus spinoletta*)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine zone; in migration and winter plains, bare fields, shores and irrigated fielc
Family Bombycillidae				
Bohemian Waxwing (*Bombycilla garrulus*)	A,B,C,D,E,F	U-P winter resident	Unknown	Widespread and feeds on berries
Cedar Waxwing (*Bombycilla cedrorum*)	A,B,C,D,E,F	C-P winter resident	Unknown	Open woodlands, Russian olive and other fruiting trees or orchards
Family Laniidae				
Northern Shrike (*Lanius excubitor*)	A,B,C,D,E,F	U-P winter resident	Unknown	Semi-open country or open country with look-out posts
Loggerhead Shrike (*Lanius ludovicianus*)	A,B,C,D,E,F	C-P resident	Unknown	Deserts and other open country with lookout posts, wires, scattered trees and low scrub
Family Sturnidae				
Starling (*Stuirnus vulgaris*)	A,B,C,D,E,F	C-P resident	Unknown	Cities, fields, orchards and woodlands
Family Vireonidae				
Gray Vireo (*Vireo vicinior*)	D,E,F	U-P summer resident	Unknown	Brushy mountain slopes, scrub oak and junipers
Solitary Vireo (*Vireo solitarius*)	A,B,C,D,E,F	U-P summer resident	Unknown	Streamside woodlands, pinion-juniper and Ponderosa pine forests

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Ar
Warbling Vireo (*Vireo gilvus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous and mixed aspen woodlands near mountain and valley streams
Family Parulidae				
Orange-crowned Warbler (*Vermivora celata*)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Brushy woodland clearings, hillsides, aspens and mountain brush; in migration streamside woodlands
Nashville Warbler (*Vermivora ruficapilla*)	A,B,C,D,E,F	U-P transient	Unknown	Open mixed woods with undergrowth and at forest edges
Virginia's Warbler (*Vermivora virginiae*)	A,B,C,D,E,F	C-P summer resident	Unknown	Oak canyons, brushy slopes and pinion-juniper brushland
Lucy's Warbler (*Vermivora luciae*)	E,F	U-P summer resident	Unknown	Along desert streams in willows and cottonwoods
Yellow Warbler (*Dendroica petechia*)	A,B,C,D,E,F	C-P summer resident	Unknown	Willows, aspens, stream-side trees and shrubs or town shade trees
Grace's Warbler (*Dendroica graciae*)	E,F	U-P summer resident	Unknown	Ponderosa pine-oakbrush communities of the mountains
Magnolia Warbler (*Dendroica magnolia*)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests

Species	Biogeographi Area Inhabited	Status	Population Trend	Habitat Use Area
Hermit Warbler (Dendroica occidentalis)	E,F	U-P summer resident and transient	Unknown	Coniferous forests; in migration other trees
Yellow-rumped Warbler (Dendroica coronata)	A,B,C,D,E,F	C-P summer resident	Unknown	In summer coniferous and mixed forests; in winter varied woods, river thickets, brush and gardens
Black-throated Gray Warbler (Dendroica nigrescens)	A,B,C,D,E,F	C-P summer resident	Unknown	In summer dry oak slopes, pinion-juniper woodlands, open mixed woods; in migration varied trees and brush
Townsend's Warbler (Dendroica townsendi)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests
Northern Waterthrush (Seiurus noveboracensis)	B,C,D,E,F	U-P transient	Unknown	Swampy or wet woods, streamsides and lake-shores; in migration thickets
MacGillivray's Warbler (Oporornis tolmiei)	A,B,C,D,E,F	C-P summer resident	Unknown	Low dense undergrowth and shady, damp thickets
Yellowthroat (Geothylpis trichas)	A,B,C,D,E,F	L-P summer resident	Unknown	Cattail and bulrush marshes, willow thickets and streamsides
Yellow-breasted Chat (Icteria virens)	A,B,C,D,E,F	C-P summer resident	Unknown	Dense brush along water courses, willow thickets and moist canyons

pecies	Biogeographic Area Inhabite	Status	Population Trend	Habitat Use A
Wilson's Warbler (*Wilsonia pusilla*)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous shrubbery or thickets, streamside growth, willows and fir thickets in the mountains
American Redstart (*Setophaga ruticilla*)	A,B,C	U-P transient	Unknown	Open secondary deciduous woodlands and riparian woodlands
Family Ploceidae				
House Sparrow (*Passer domesticus*)	A,B,C,D,E,F	C-P resident	Unknown	Cities, farms and houses
Family Icteridae				
Western Meadowlark (*Sturnella neglecta*)	A,B,C,D,E,F	C-P resident	Unknown	Open fields, meadows and plains
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Marshes with cattail and bulrushes; forages in fields and open country
Red-winged Blackbird (*Agelaius phoeniceus*)	A,B,C,D,E,F	C-P resident	Unknown	Breeds in marshes with emergent aquatic vegetation, forages in cultivated land and at the edge of water
Northern Oriole (*Icterus galbula*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open woodlands, cottonwoods or other shade trees and riparian areas

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Scotts Oriole (*Icterus parisorum*)	C,D,E,F	U-P summer resident	Unknown	Pinion-juniper woodlands of desert mountains oak slopes and cottonwood trees in canyons
Rusty Blackbird (*Euphagus carolinus*)	A	O-P transient	Unknown	Wooded marshes and riparian woodlands
Brewer's Blackbird (*Euphagus cyanocephalus*)	A,B,C,D,E,F	C-P resident	Unknown	Varied open country, lakeshores, irrigated pastures, feed lots, parks and cities
Common Grackle (*Quiscalus quiscula*)	A,B,D	A-P transient	Unknown	Farms, fields, streamsides and wet woodlands
Brown-headed Cowbird (*Molothrus ater*)	A,B,C,D,E,F	C-P resident	Unknown	Farms, fields, barnyards wood edges and riparian woodlands
Family Thraupidae				
Western Tanager (*Piranga ludoviciana*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open coniferous, aspen or mixed forests; widespread in migration
Family Embarizidae				
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	F	O-P summer resident	Unknown	Broadleaf riparian areas and aspens
Black-headed Grosbeak (*Pheucticus melanocephalus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Edges of second growth deciduous woods, pinion, riparian areas, orchards and parks

Species	Biogeographic Area Inhat	Status	Population Trend	Habitat Us ea
Blue Grosbeak (Guiraca caerulea)	B,C,D,E,F	C-P summer resident	Unknown	Brushy and weedy places willows and river thick and other riparian area
Lapland Longspur (Calcarius lapponicus)	A,B,C,D,E,F	R-P winter resident	Unknown	Fields, grasslands, saline flats, desert shrub; often seen with horned larks
Indigo Bunting (Passerina cyanea)	A,B,D	R-P summer resident	Unknown	Brush, farm lands and streamsides
Lazuli Bunting (Passerina amoena)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain brush, stream-side shrubs and farmlan tree rows
Green-tailed Towhee (Chlorura chlorura)	A,B,C,D,E,F	C-P summer resident	Unknown	Low mountain brush, greasewood and pinion-juniper woodlands
Rufous-sided Towhee (Pipilo erythrophthalmus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain brush, forest edges and city shrubs
Lark Bunting (Calamospiza melanocorys)	A,B,C,D,E,F	O-P transient	Unknown	Plains, prairies, desert shrub and sagebrush
Savannah Sparrow (Passercules sandwichensis)	A,B,C,D,E,F	C-P summer resident	Unknown	Grasslands, fields, saltgrass meadows and open country
Grasshopper Sparrow (Ammodramus savannarum)	A,B,C,D,E,F	R-P transient	Unknown	Dry grasslands
LeConte's Sparrow (Ammospiza leconteii)	F	A-P transient	Unknown	Tall grass, weedy meadows and marshes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Vesper Sparrow (*Pooecetes gramineus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Alfalfa and grain fields, meadows, sage-brush and desert shrub
Lark Sparrow (*Chondestes grammacus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country in sagebrush and desert shrub with available perch sites
Sage Sparrow (*Amphispiza belli*)	A,B,C,D,E,F	U-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs
Dark-eyed Junco (*Junco hyemalis*)	A,B,C,D,E,F	C-P resident	Unknown	In summer openings and edges of coniferous and mixed woodlands; in winte greasewood and undergrowt
Gray-headed Junco (*Junco caniceps*)	A,B,C,D,E,F	C-P summer resident	Unknown	Coniferous, mixed forests and mountain brush
Tree Sparrow (*Spizella arborea*)	A,B,C,D,E,F	U-P winter resident	Unknown	Willow thickets and brushy areas
Chipping Sparrow (*Spizella passerina*)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain coniferous and deciduous woodlands, valley woodlands, farms, orchards, parks and brushlands
Brewer's Sparrow (*Spizella breweri*)	A,B,C,D,E,F	C-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs or brushy areas
Harris Sparrow (*Zonotrichia querula*)	A,B,C,D,E,F	U-P winter resident	Unknown	Brushy edges of open woodlands, Russian olives and willows

Species	Biogeograpl Area Inhabited	Status	Population Trend	Habitat Use ...ea
White-crowned Sparrow (*Zonotrichia leucophrys*)	A,B,C,D,E,F	C-P resident	Unknown	In summer forest edges and clearings, low brush and mountain thickets; i: winter widespread in the valleys, along fence row willows, brushy areas, corn and greasewood
White-throated Sparrow (*Zonotricia albicollis*)	E,F	R-P winter resident	Unknown	Coniferous and mixed woodlands, woodland undergrowth thickets and brush
Golden-crowned Sparrow (*Zonotrichia atricapilla*)	E,F	R-P winter resident	Unknown	Mountain brush and brushy areas in the lower valleys
Swamp Sparrow (*Zonotrichia georgiana*)	F	U-P winter resident	Unknown	Marshes; in migration weedy fields
Fox Sparrow (*Zonotrichia iliaca*)	A,B,C	K-P summer resident and transient	Unknown	Valley and mountain woodlands and brushy areas usually near water
Lincoln's Sparrow (*Zonotrichia lincolnii*)	A,B,C	U-P summer resident R-P winter resident	Unknown	In summer willow thickets, brushy bogs; in winter lowland thickets, tall weeds and bushes
Song Sparrow (*Zonotrichia melodia*)	A,B,C,D,E,F	C-P resident	Unknown	Woodland edges, grass-lands, cattail marshes, thickets and brushy fence rows

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Black-throated Sparrow (*Amphispiza bilineata*)	A,B,C,D,E,F	U-P summer resident	Unknown	Pinion-juniper, mountain brush and sagebrush
Family Fringillidae				
Evening Grosbeak (*Coccothraustes vespertinus*)	A,B,C,D,E,F	C-P winter resident	Unknown	Boxelders, Russian olive trees and fruiting shrubs
Cassin's Finch (*Carpodacus cassinii*)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Unknown	In summer, open conifer forests of high mountains in winter valleys
House Finch (*Carpodacus mexicanus*)	A,B,C,D,E,F	C-P resident	Unknown	Varied habitats; towns, ranches, open woods, mountain scrub, canyons, deserts and riparian area
Pine Grosbeak (*Pinicola enucleator*)	A,B,C,E,F	U-P resident	Unknown	In summer coniferous forests; in winter mixed woods and fruiting trees
Rosy Finch (*Leucosticte arctoa*)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine tundra, meadows and snowfields; winters in lowlands
Pine Siskin (*Carduelis pinus*)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, along edges of second growth deciduous forests; in migration seen in large flocks in the lower valle

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
American Goldfinch (*Carduelis tristis*)	A,B,C,D,E,F	C-P resident	Unknown	Riparian woodlands, willows, cottonwoods, orchards, roadsides and sunflowers
Lesser Goldfinch (*Carduelis psaltria*)	A,B,C,D,E,F	C-P resident	Unknown	Open brushy country, open woods, wooded streams and gardens
Red Crossbill (*Loxia curvirostra*)	A,B,C,E,F	U-P summer resident	Unknown	Coniferous forests
Mammals -- 103 species in southeastern Utah				
Order Insectivora				
Family Soricidae				
Dwarf Shrew (*Sorex nanus*)	B,C,D,E,F	R-N	Unknown	Open grass-covered areas which may have scattered brush, marshes coniferous forests and openings in woods
North Water Shrew (*Sorex palustris*)	A,B,C,E,F	C-N	Unknown	Along nearly all permanent streams in mountainous areas
Merriam Shrew (*Sorex merriami*)	A,B,C,D,E,F	U-N	Unknown	Arid sagebrush or grassland areas, mountain mahogany, coniferous forests, aspe and cottonwoods
Vagrant Shrew (*Sorex vagrans*)	A,B,C,F	C-N	Unknown	Marshes, bogs, wet meadows and along streams in forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Masked Shrew (*Sorex cinereus*)	A,B,D,E	C-N	Unknown	Moist sites in forests, open country and brushlan
Dusky Shrew (*Sorex obscurus*)	A,B,C,F	C-N	Unknown	Marshes, coniferous forests and dry hillsides
Gray (Desert) Shrew (*Notiosorex crawfordi*)	E,F	R-N	Unknown	Arid alluvial fans, brushy slopes, sagebrush and other low desert shrub communities
Order Chiroptera				
Family Vespertilionidae				
Little Brown Myotis (*Myotis lucifugus*)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, hollow trees or buildings usually near water
Fringed Myotis (*Myotis thysanodes*)	A,B,C,D,E,F	U-N	Unknown	Caves, old buildings, roc crevices, pinion-juniper and desert shrub
Long-eared Myotis (*Myotis evotis*)	A,B,C,D,E,F	C-N	Unknown	Coniferous forests in hig mountains, around buildin or trees and occasionally caves
Long-legged Myotis (*Myotis volans*)	A,B,C,D,E,F	C-N	Unknown	Buildings, small pockets, crevices in rock ledges and trees

Species	Biogeographi Area Inhabit	Status	Population Trend	Habitat Use
Yuma Myotis *(Myotis yumanensis)*	A,B,C,D,E,F	U-N	Unknown	Caves, tunnels and buildings in arid areas
California Myotis *(Myotis californicus)*	A,B,C,D,E,F	C-N	Unknown	Mine tunnels, hollow trees, loose rocks, buildings, bridges; chiefly a crevice dweller (up to 6,000 feet in elevation)
Small-footed Myotis *(Myotis leibii)*	A,B,C,D,E,F	U-N	Unknown	Caves, mine tunnels, crevices in rocks and in buildings
Silver-haired Bat *(Lasionycteris noctivagans)*	A,B,C,D,E,F	C-N	Unknown	Forest areas, occasionall in caves or buildings
Western Pipistrelle *(Pipistrellus hesperus)*	A,B,C,D,E,F	C-N	Unknown	Caves, under loose rocks, crevices, in cliffs, buildings; arid areas nea water courses
Big Brown Bat *(Eptesicus fuscus)*	A,B,C,D,E,F	C-N	Unknown	Caves, tunnels, crevices, hollow trees, buildings and wooded areas
Red Bat *(Lasiurus borealis)*	A,B,C,D,E,F	U-N	Unknown	Wooded areas; roosts in trees and occasionally enters caves
Hoary Bat *(Lasiurus cinereus)*	A,B,C,D,E,F	U-N	Unknown	Wooded areas
Western Big-eared Bat *(Plecotus townsendii)*	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels and buildings utilized for roosting; inhabits arid western desert shrub, pinion-juniper and pine forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Mexican Big-eared Bat (*Plectus phyllotis*)	F	R-N	Unknown	Caves in pine-oak forests between 5,000 to 8,500 feet elevation
Spotted Bat (*Euderma maculata*)	Unknown	K-N	Unknown	Arid country; it occasionally enters buildings and caves
Pallid Bat (*Antrozous pallidus*)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, crevices in rocks, buildings and trees are utilized for roosts; inhabits scattered desert shrub and pine-oak forests below 6,500 feet elevation
Family Molossidae				
Mexican Free-tailed Bat (*Tadarida brasiliensis*)	A,B,C,D,E,F	C-N	Unknown	Caves and buildings are utilized for roosts; inhabits lower and upper Sonoran Life Zones
Order Lagomorpha				
Family Ochotonidae				
Pika (*Ochontona princeps*)	A,B,C,E,F	C-N	Unknown	Talus slopes and rock-slides above 8,000 feet elevation
Family Leporidae				
White-tailed Jackrabbit (*Lepus townsendii*)	A,B,C,D	C-N	Stable	Open, grassy or sage-brush areas at medium elevation
Snowshoe Hare (*Lepus americanus*)	A,B,C	C-P	Cyclic	Coniferous forests and aspen, riparian and brush types near conifers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Black-tailed Jackrabbit (*Lepus californicus*)	A,B,C,D,E,F	C-N	Stable	Open grassland, sagebrush and desert shrub areas at low to medium elevations
Mountain Cottontail (*Sylvilagus nuttallii*)	A,B,C,E,F	C-P	Stable	Thickets, sagebrush, loose rocks, cliffs and forests
Desert Cottontail (*Sylvilagus audubonii*)	A,B,C,D,E,F	C-P	Stable	Open plains, foothills and low valleys with grass, sagebrush or scattered pinion-juniper
Order Rodentia				
Family Sciuridae				
Zuni Prairie Dog (*Cynomys gunnisoni*)	F	C-N	Stable	Mountain valleys, 5,000-12,000 feet elevation; open to slightly brushy country with scattered pinion-juniper
White-tailed Prairie Dog (*Cynomys leucurus*)	A,B,C,D,E,F	C-N	Stable	Valleys and flatlands where vegetation is sparse
Abert Squirrel (*Sciurus aberti*)	F	L-P	Stable	Ponderosa pines
Red Squirrel (*Tamiasciurus hudsonicus*)	A,B,C,F	C-N	Stable	Coniferous forests in the mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Spotted Ground Squirrel (*Spermophilus spilosoma*)	F	L-N	Unknown	Open forests, scattered brush and grassy areas with sandy soil is preferred
Rock Squirrel (*Spermophilus variegatus*)	A,B,C,D,E,F	C-N	Stable	Rocky canyons with boulder strewn slopes, riparian woodlands, and ditchbanks
Uintah Ground Squirrel (*Spermophilus armatus*)	A,B	C-N	Stable	Meadows and edges of fields near green vegetation up to 8,000 feet elevation
Golden-mantled Ground Squirrel (*Spermophilus lateralis*)	A,B,C	C-N	Stable	Mountain brush, open pine and spruce-fir forests to above timberline
Whitetail Antelope Squirrel (*Ammospermophilus leucurus*)	A,B,C,D,E,F	C-N	Stable	Arid areas of low desert and foothills with sparse vegetation
Yellow-billied Marmot (*Marmota flaviventris*)	A,B,C,E,F	C-N	Stable	Rocky sites or talus slopes along valleys or in foothills 5,000 to 9,000 feet elevation
Northern Flying Squirrel (*Glaucomys sabrinus*)	A,B,C,F	C-N	Unknown	Coniferous and mixed forests in high mountains

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Least Chipmunk (*Eutamius minimus*)	A,B,C,D,E,F	C-N	Stable	Variety of habitat types including sagebrush, desert shrub, mountain bush, coniferous and mixed forest areas
Colorado Chipmunk (*Eutamius quadrivittatus*)	C,E,F	C-N	Stable	Coniferous forests, mountain brush areas, rocky slopes and ridges
Uintah Chipmunk (*Eutamius umbrinus*)	A,B,D,E,F	C-N	Stable	Coniferous forest and mountain brush areas up to timberline with rocky slopes
Cliff Chipmunk (*Eutamius dorsalis*)	A,B,C,D,E	U-N	Stable	Pinion-juniper slopes, riparian woodlands with rocky areas
Family Geomyidae				
Northern Pocket Gopher (*Thomomys talpoides*)	A,B,C,D,E,F	C-N	Unknown	Grassy prairies, alpine meadows, brush areas, open pine forests; generally restricted to the mountains
Valley or Botta Pocket Gopher (*Thomomys bottae*)	A,B,C,D,E,F	C-N	Unknown	Valleys and mountain meadows; prefers loam soil but may be found in sandy or rocky situations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Ord Kangaroo Rat (*Dipodomys ordii*)	A,B,C,D,E,F	C-N	Unknown	Desert shrub, pinion-juniper and tamarisk communities; sandy soils preferred but found on hard soils
Baird Pocket Mouse (*Perognathus flavus*)	F	C-N	Unknown	Prefers short grass areas with sandy or rocky soils
Great Basin Pocket Mouse (*Perognathus parvus*)	A,D	C-N	Unknown	Sagebrush or greasewood and other desert shrub communities and pinion-juniper
Apache Pocket Mouse (*Perognathus apache*)	C,D,F	C-N	Unknown	Sparse brushlands and scattered pinion-juniper, usually 5,000-7,200 feet elevation
Family Castoridae				
Beaver (*Castor canadensis*)	A,B,C,D,E,F	C-P	Increasing	Streams, lakes and irrigation systems with poplars, birch or willows on the bank
Family Cricetidae				
Western Harvest Mouse (*Reithrodontomys megalotis*)	A,B,C,D,E,F	C-N	Unknown	Grasslands, open desert, wetlands, irrigated farm-land of dense vegetation near water
Canyon Mouse (*Peromyscus crinitus*)	A,B,C,D,E,F	C-N	Unknown	Rocky canyons and slopes with mountain brush

cies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Deer Mouse (*Peromyscus manicalatus*)	A,B,C,D,E,F	C-N	Unknown	All dry-land habitat and irrigated farmland within its range
Brush Mouse (*Peromyscus boylei*)	A,B,C,D,E,F	C-N	Unknown	Brushy areas of arid and semi-arid regions; prefers rocky sites
Pinion Mouse (*Peromyscus truei*)	A,B,C,D,E,F	C-N	Unknown	Rocky terrain in pinion-juniper areas
Northern Grasshopper Mouse (*Onychomys leucogaster*)	C,F	U-N	Unknown	Open country of grass, sagebrush or greasewood and sandy or gravelly soil
White-throated Wood Rat (*Neotoma albigula*)	F	C-N	Unknown	Brushland with rocky cliffs and shallow caves
Desert Wood Rat (*Neotoma lepida*)	A,B,C,D,E	C-N	Unknown	Desert floors and rocky slopes with low desert vegetation or arid mountain brush
Mexican Wood Rat (*Neotoma mexicana*)	F	C-N	Unknown	Rocks, cliffs and mountains
Bushy-tailed Wood Rat (*Neotoma cinerea*)	A,B,C,D,E,F	C-N	Unknown	High mountains with rimrock, rock slides and pines
Muskrat (*Ondatra zibethicus*)	A,B,C,D,E,F	C-N	Stable	Marshes, edge of ponds, lakes, streams and irrigation canals

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Meadow Vole (*Microtus pennsylvanious*)	A,D	C-N	Unknown	Moist areas with dense growth of grasses
Mountain Vole (*Microtus montanus*)	A,B,D,E	C-N	Unknown	Dense vegetation in sagebrush-grass communities
Richardson's Vole (*Microtus richardsoni*)	A	C-N	Unknown	Creekbanks and marshes in mountains to above timberline
Longtail Vole (*Microtus longicaudus*)	A,B,C,D,E,F	C-N	Unknown	In summer streambanks, mountain meadows with dry sites; in winter brushy areas
Sagebrush Vole (*Lagurus curtatus*)	C,F	C-N	Unknown	Scattered sagebrush with loose soil and arid conditions
Family Muridae				
Black Rat (*Rattus rattus*)	A,B,C,D,E,F	C-N	Unknown	Buildings and dumps
Norway Rat (*Rattus norvegicus*)	A,B,C,D,E,F	C-N	Unknown	Burrows along building foundations and beneath rubbish piles
House Mouse (*Mus musculus*)	A,B,C,D,E,F	C-N	Unknown	Buildings and occasionally in fields

pecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Zapodidae				
Western Jumping Mouse (*Zapus princeps*)	A	C-N	Unknown	Low meadows near streams with lush growth of grasses and forbs; found in various land habitats
Family Erethizontidae				
Porcupine (*Erethizon dorsatum*)	A,B,C,D,E,F	C-N	Stable	Forested areas, occasionally away from trees if brush is available
Order Carnivora				
Family Canidae				
Coyote (*Canis latrans*)	A,B,C,D,E,F	C-N	Stable	Ubiquitous
Red Fox (*Vulpes fulva*)	A,B,C,D,E,F	C-N	Stable	Forest and open country preferred
Kit Fox (*Vulpes macrotis*)	A,B,C,D,E,F	U-N	Stable	Open level, sandy ground preferred with low desert vegetation
Gray Fox (*Urocyan cinereoargenteus*)	A,B,C,D,E,F	C-N	Stable	Brush and open forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Gray Wolf (*Canis lupus*)	A,B,C,D,E,F	X-P	Extirpated	Wilderness forests
Family Ursidae				
Black Bear (*Ursus americanus*)	A,B,C,E,F	C-P	Increasing	Mountainous areas
Grizzly Bear (*Ursus horribilis*)	A,B,C,E,F	X-P	Extirpated	Remote mountainous regions
Family Procyonidae				
Ring-tailed Cat (*Bassariscus astutus*)	A,B,C,D,E,F	C-N	Stable	Near water on slopes with mountain brush, rocky ridges and cliffs
Raccoon (*Procyon lotor*)	A,B,C,D,E,F	O-N	Increasing	Along streams, lake borders and near wooded areas or rock cliffs
Family Mustelidae				
Short-tailed Weasel (*Mustela erminea*)	A,B,C,F	R-P	Stable	Brushy or wooded areas not far from water
Long-tailed Weasel (*Mustela frenata*)	A,B,C,D,E,F	C-P	Stable	All land habitat types near water
Mink (*Mustela vison*)	A,B,C,F	L-P	Unknown	Along streams and lakes
Wolverine (*Gulo luscus*)	A,B	X-P	Extirpated	Remote mountain regions
Black-footed Ferret (*Mustela nigripes*)	A,B,C,D,F	E-P	Unknown	Prairie dog towns
Marten (*Martes caurina*)	A,B,C,F	R-P	Unknown	Coniferous forests at high elevations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Badger *(Taxidea taxus)*	A,B,C,D,E,F	C-P	Stable	Open grasslands, deserts and high mountain forests where prey is available
Striped Skunk *(Mephitis mephitis)*	A,B,C,D,E,F	C-P	Increasing	Semi-open country of prairie, brushlands or mixed woodlands within two miles of water
Spotted Skunk *(Spilogale gracilis)*	A,B,C,D,E,F	C-P	Stable	Prairies or grasslands with brushy or sparsely wooded areas along streams with boulders
River Otter *(Lutra canadensis)*	A,B,C,D,E,F	R-P	Unknown	Along streams and lake borders
Family Felidae				
Bobcat *(Lynx rufus)*	A,B,C,D,E,F	C-P	Declining	Rimrock and mountain brush areas
Canada Lynx *(Lynx canadensis)*	A,B,C,E,F	X-P	Extirpated	Forested areas in the mountains
Cougar *(Felis concolor)*	A,B,C,D,E,F	C-P	Stable	Rugged mountains with forests, cliffs and ledges
Order Artiodactyla				
Family Cervidae				
Mule Deer *(Odocoileus hemionus)*	A,B,C,D,E,F	C-P	Increasing	Coniferous forests, desert shrub, mountain brush, grassland with shrubs and other habitats where browse species are present

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Moose (*Alces alces*)	A	L-P	Increasing	Mountainous areas, forests, mountain brush and willow bottoms
Rocky Mountain Elk (*Cervus canadensis*)	A,B,C,E,F	C-P	Increasing	Semi-open forests, mountain meadows (in summer), foothills, plains and valleys
Family Antilocapridae				
Pronghorn Antelope (*Antilocapra americana*)	B,C,D,E,F	L-P	Stable	Open prairies and sagebrush or desert shrub plains
Family Bovidae				
Desert Bighorn Sheep (*Ovis canadensis nelsoni*)	D,E,F	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*)	B,C	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
Bison (*Bison bison*)	E	L-P	Stable	Desert shrub plains of the Burr Desert and mountain brush forest habitats associated with steep mountain slopes of the Henry Mountains

1. List of Game Species and Region of Inhab n Within Utah.

Game Species of Utah	REGION Southeastern	Southern	Central	Northeastern	Northern
10 BIG GAME SPECIES					
Bison	x	x			
Black Bear	x	x	x	x	x
Cougar	x	x	x	x	x
Desert Bighorn Sheep	x	x			
Elk	x	x	x	x	x
Moose	x		x	x	x
Mountain Bighorn Sheep	x		x	x	x
Mountain Goat			x		
Mule Deer	x	x	x	x	x
Pronghorn Antelope	x	x	x	x	x
Subtotal	9	7	8	7	7
20 GAME FISH SPECIES					
Arctic Grayling		x		x	x
Black Bullhead	x	x	x	x	x
Black Crappie	x	x	x	x	x
Bluegill	x	x	x	x	x
Bonneville Cisco					x
Brook Trout	x	x	x	x	x
Brown Trout	x	x	x	x	x
Channel Catfish	x	x	x	x	x
Cutthroat Trout	x	x	x	x	x
Golden Trout			x	x	
Kokanee Salmon				x	x
Lake Trout		x	x	x	x
Largemouth Bass	x	x	x	x	x
Mountain Whitefish			x	x	x
Northern Pike	x	x			
Perch	x	x	x	x	x
Rainbow & Albino Trout	x	x	x	x	x
Smallmouth Bass			x	x	x
Striped Bass	x	x			
Walleye	x	x	x	x	x
White Bass		x	x		
Subtotal	13	16	16	17	17

	.ON				
Game Species of Utah	Southeastern	Southern	Central	Northeastern	Northern
9 FURBEARER SPECIES					
Badger	x	x	x	x	x
Beaver	x	x	x	x	x
Long-tailed Weasel	x	x	x	x	x
Marten	x	x	x	x	x
Mink	x	x	x	x	x
River Otter	x			x	x
Short-tailed weasel	x	x	x	x	x
Spotted Skunk	x	x	x	x	x
Striped Skunk	x	x	x	x	x
Subtotal	9	8	8	9	9
43 MIGRATORY GAME BIRD SPECIES					
American Widgeon	x	x	x	x	x
Band-tailed Pigeon	x	x	x		
Barrows Goldeneye	x	x	x	x	x
Black Brant		x			x
Black Duck		x	x		x
Blue-winged Teal	x	x	x	x	x
Bufflehead	x	x	x	x	x
Canada Goose	x	x	x	x	x
Canvasback	x	x	x	x	x
Cinnamon Teal	x	x	x	x	x
American Coot	x	x	x	x	x
Common Gallinule	x	x	x		x
Common Goldeneye	x	x	x	x	x
Common Merganser	x	x	x	x	x
Common Snipe	x	x	x	x	x
European Widgeon			x		x
Fulvous Tree Duck		x			x
Gadwall	x	x	x	x	x
Greater Scaup	x	x	x	x	x
Green-winged Teal	x	x	x	x	x
Harlequin Duck					x

	REGION				
Game Species of Utah	Southeastern	Southern	Central	Northeastern	Northern
Hooded Merganser	x	x	x	x	x
Lesser Scaup	x	x	x	x	x
Mallard	x	x	x	x	x
Mourning Dove	x	x	x	x	x
Old Squaw		x	x		x
Pintail	x	x	x	x	x
Red-breasted Merganser	x	x	x	x	x
Redhead	x	x	x	x	x
Ring-necked Duck	x	x	x	x	x
Ross Goose	x	x			x
Ruddy Duck	x	x	x	x	x
Sandhill Crane	x	x	x	x	x
Shoveler	x	x	x	x	x
Snow Goose	x	x	x	x	x
Sora Rail	x	x	x	x	x
Surf Scoter			x		x
Trumpeter Swan		x	x		x
Virginia Rail	x	x	x	x	x
Whistling Swan	x	x	x	x	x
White-fronted Goose	x	x	x	x	x
White-winged Scoter	x	x	x		x
Wood Duck	x	x	x	x	x
Subtotal	35	40	39	31	42

5 SMALL GAME-MAMMAL SPECIES

Abert Squirrel	x				
Desert Cottontail	x	x	x	x	
Mountain cottontail	x	x	x	x	x
Pigmy Cottontail		x	x		x
Snowshoe Hare	x	x	x	x	x
Subtotal	4	4	4	3	3

Game Species of Utah	REGION Southeastern	Southern	Central	Northeastern	Northern
12 SMALL GAME-UPLAND BIRD SPECIES					
Blue Grouse	x	x	x	x	x
California Quail	x	x	x	x	x
Chukar	x	x	x	x	x
Gambels Quail	x	x			
Hungarian Partridge			x		x
Merriam's Turkey	x	x			
Ring-necked Pheasant	x	x	x	x	x
Ruffed Grouse	x	x	x	x	x
Sage Grouse	x	x	x	x	x
Sharp-tailed Grouse					x
White-tailed Ptarmigan				x	x
White-winged Pheasant	x	x			
Subtotal	9	9	7	7	9
100 Total Game Species in Utah	78	83	81	73	86

Table 2. Classification of the 466 species of vertebrate wildlife that inhabit six biogeographic areas within Southeastern Utah.

	Biogeographic Areas[1]					
	A	B	C	D	E	F
FISH	14	20	15	15	24	31
Protected-Threatened	(0)	(1)	(1)	(1)	(1)	(1)
Protected-Endangered	(0)	(3)	(2)	(1)	(1)	(2)
Protected-Nongame	(10)	(11)	(9)	(10)	(12)	(16)
Protected-Game	(4)	(5)	(3)	(3)	(10)	(12)
AMPHIBIANS	6	5	6	7	7	10
Protected-Nongame	(1)	(1)	(1)	(1)	(1)	(2)
Unprotected-Nongame	(5)	(4)	(5)	(6)	(6)	(8)
REPTILES	18	14	15	14	21	28
Unprotected-Nongame	(18)	(14)	(15)	(14)	(21)	(28)
BIRDS	242	244	242	235	251	262
Protected-Extirpated	(1)	(1)	(1)	(1)	(1)	(1)
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(2)	(2)	(2)	(2)	(2)	(2)
Protected-Nongame	(199)	(202)	(202)	(193)	(208)	(217)
Protected-Game	(39)	(38)	(36)	(38)	(39)	(41)
Unprotected-Nongame	(1)	(1)	(1)	(1)	(1)	(1)
MAMMALS	84	80	80	65	66	90
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(1)	(1)	(1)	(1)	(0)	(1)
Protected-Extirpated	(2)	(2)	(2)	(0)	(2)	(2)
Protected-Game	(18)	(19)	(19)	(12)	(16)	(19)
Unprotected-Extirpated	(0)	(0)	(0)	(0)	(0)	(0)
Unprotected-Nongame	(63)	(58)	(58)	(52)	(53)	(62)
Total Protected Species	277	286	279	263	293	317
TOTAL:	364	363	358	336	369	421

[1] Biogeographic areas of southeastern Utah
A- Wasatch Plateau east of Skyline Drive
B- West Tavaputs Plateau
C- East Tavaputs Plateau
D- San Rafael Swell and Desert
E- Henry Mountains and Burr Desert
F- Mountains and Deserts south of I-70 in Grand and San Juan counties

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Appropriations No. 01-59-09
Archives Approval No. 7900014

SOIL RESOURCES

SECTION 783.21 (211.10(c))

SOIL RESOURCES

SECTION 783.21 (211.10(c))

SOIL RESOURCES

SOILS

OSM 783.21

Soils analysis (methods). -- At each vegetation reference site a soil pit was excavated to the parent material. The exposed soil profile allowed for determination of information for classification of the soils into taxonomic units. The portal-yard, waste rock disposal, and bypass access road areas were sampled also. Soils collected at the portal-yard validation sites were taken as a composite of the top six inches of the profile.

In addition to depth information obtained from the soil pit descriptions, there were 100 depth measurements along the transect areas and in the validation sites. These readings were obtained by observing the depth of penetration of a sharpened steel rod.

Soils were classified to family unit according to the system utilized for classification of soils by the Soil Conservation Service (Johnson 1975). Use of this method will allow correlation of lease area soils at the series level when the Soil Conservation Service completes the current mapping effort of adjacent areas.

Chemical analyses for micro-nutrients were made by testing a soil extract with DTPA solution and measured by use of an atomic absorption analyser. Ammonium acetate was used to extract K, Mg, and Ca for atomic absorption analysis. Phosphorus determinations were made using sodium bicarbonate extraction and colorimetric analysis. The Kjeldahl method was used for determination of total nitrogen. All nutrient analyses were conducted in the Agronomy laboratory at Brigham Young University.

Soil texture was determined by using a Bouyoucus hydrometer method, with sodium hexametaphosphate dispersing agent. Soil reaction was determined on a 1: 1 soil/water mixture which was tested in a Corning pH meter model 10. Salinity was analysed by use of a Wheatstone conductivity cell on an extract of each soil sample. Carbonate content was estimated from observations of effervescence following application of a 10-percent solution of hydrochloric acid. The scale of effervescence follows the rating system suggested by the Soil Conservation Service (see USDA Soil Survey Manual 1937): eo = none, es = slight, em = moderate, and etc. Soil color was obtained by comparing a moist and a dry sample with the standard Munsel soil color charts. Observations of soil structural units also followed the Soil Conservation Service suggested designation as outlined in the Soil Survey Manual.

Soils (discussion, results, and conclusions). -- Details of analysis of soils at each of the sites are summarized in Tables LI - LXVI. The data compiled on soils suggests that cryic temperature regimes are proper designations for this area. Cryic is typically conifer-aspen related, with some high meadows included. These areas are too cold for cultivation of crop plants by ordinary means. Frigid designation is given to soils typical of aspen-sagebrush types, and some crops can be grown. Most of the soils are in the udic (moisture arriving in summer) regimes.

All soils have textures ranging from sandy loams to clay loams, and are considered neither unusual for the area in general nor for the vegetation types those soils support. The soils are not of a textural class that would be considered a problem either in disturbance or in reclamation activities. A comparison of spruce-fir and aspen soils, which as broad categories make up more than 80% of the lease area soils, shows that the pH and salinity measurements are probably normal for this climatic regime with the pH range from somewhat acidic to neutral for spruce-fir and aspen soils. There is a slight difference in soil reaction between spruce-fir (pH 5.0) and aspen (pH 6.0) soils, but this is also considered to be characteristic of evergreen conifer types for them to be more acidic than the deciduous forest of aspen.

Even the most saline soil measured in the lease area, at reference site 2 - aspen, with an EC x 10^3 measurement of 1.88, is considered extremely low when compared to agricultural soils. A slight difference between soils is noted when depths are compared. The solum of aspen extends to an average depth of 20 inches from nine locations and to 18 inches at seven locations of the spruce-fir type. This corresponds to the average depths of penetrometer readings in aspen of 19.9 in. and of 18.1 in. in spruce-fir soils.

It is also apparent that soils in aspen communities are more fertile in the commonly applied fertilizer elements, N, P, and K, and also in most micro-nutrients (see Tables LXVII - LXIX). The levels of Fe, Mg, and Mn are considered to be adequate for growth of native vegetation, even though somewhat below amounts reported for average soils in the western United States (Shacklette, et al. 1971). Moderate amounts of Zn, Ca, and K indicate that adequate quantities of these minerals are present, except in sagebrush soils.

High amounts of Ca, especially in the B-horizon of spruce-fir soils are not considered a problem in immobilization of P due to the acid pH for these soils. Concentrations of Ca in sagebrush and aspen soils could become a problem in P relations if soils are altered to become more basic. NO_3--nitrogen is low in quantity, as was expected for these soil types. Average amounts of NO_3--nitrogen are inadequate in all soils of the region, and in all horizons. All areas would respond to addition of nitrogen, as indicated by the low total nitrogen content, from all vegetation types.

In summary, the most important fertilizer to be applied in reclamation attempts is nitrogen. The addition of nitrogen should be timed with suitable moisture content in the soils (fall and spring). If soil moisture is insufficient, then supplemental irrigation should be provided.

A soils map of the portal yard area has been prepared (see appended map of soils). The soils are classified by the vegetative type with which they are correlated, as is recommended by the Soil Conservation Service. Information from other areas to be disturbed can be extrapolated from the vegetative map and from the soil nomenclature assigned on the portal-yard area map.

TOPOGRAPHY AND MAPS

SECTION 783.25 (211.10(b))

TOPOGRAPHY &
MAPS

TOPOGRAPHY AND MAPS

SECTION 783.25 (211.10(b))

Topography and Maps

1. The application is inconsistent in showing that maps are prepared by or under the direction of and certified by a qualified registered professional engineer or professional geologist; this inconsistency should be corrected.

Topography and Maps

1. The application is inconsistent in showing that maps are prepared by or under the direction of and certified by a qualified registered professional engineer or professional geologist; this inconsistency should be corrected.

Response: The following letters from: 1)M. D. Phillips, Professional Engineer; 2)R. V. Hall, Certified Professional Geologist; and 3)R. B. Heath, Professional Engineer, are submitted to document that all maps and drawings contained in the Skyline Mine Permit Application were prepared by/or under the direct supervision of either a certified professional geologist or a registered professional engineer.

KAISER
ENGINEERS

KAISER ENGINEERS, INC.
300 LAKESIDE DRIVE
POST OFFICE BOX 23210
OAKLAND CALIFORNIA 946[illegible]

March 24, 1980

TO WHOM IT MAY CONCERN:

Please be advised that all drawings prepared by Kaiser Engineers, Inc. contained in the Skyline Mine Permit Application, made by Coastal States Energy Company, were prepared by/or under the direct supervision of the writer, M. D. Phillips.

Please be further advised that the writer, M. D. Phillips, is registered as a Professional Engineer in the state of Utah (No. 5167).

Very truly yours,

M. D. Phillips

MDP:jsb

PROFESSIONAL
MICHAEL D. PHILLIPS
NO. 5167
STATE OF UTAH

Coastal States
Energy Company
411 West 7200 South
Suite 200
Midvale, Utah 84047
(801) 566-0691

Subsidiary of
The Coastal
Corporation

March 25, 1980

TO WHOM IT MAY CONCERN:

Please be advised that all engineering drawings prepared by Coastal States Energy Company contained in the Skyline Mine Permit Application, made by Coastal States Energy Company, were prepared by/or under the direct supervision of the writer, Roland B. Heath.

Please be further advised that the writer, Roland B. Heath, is registered as a Professional Engineer in the state of Utah (No. 4740).

Very truly yours,

Roland B. Heath

RBH/js

REGISTERED PROFESSIONAL ENGINEER
No. 4740
ROLAND B.
HEATH
STATE OF UTAH

Coastal States Energy Company
Nine Greenway Plaza
Houston, Texas 77046
(713)877-1400

Subsidiary of
The Coastal
Corporation

March 25, 1980

To Whom It May Concern:

I, Richard Vance Hall, being a Certified Professional Geologist, duly certified by the American Institute of Professional Geologists, (Certificate No. 4530), did prepare or have prepared under my supervision all geological maps (including, but not limited to, those described and listed as G-1 through G-42), found within the Amendment to the Mining and Reclamation Plans for the Proposed McKinnon No. 1 and No. 2 Mines and Revised Mining Permit dated October, 1979, also known as the "Skyline Mine Plan" and do hereby certify that, consequently, all the above described geological maps were prepared by of under the supervision of a Certified Professional Geologist.

Richard Vance Hall

AIR QUALITY

SECTION 784.13 (21.40(a))

AIR QUALITY

AIR QUALITY

SECTION 784.13 (21.40(a))

Air Quality

1. The applicant should list methods of suppressing dust from truck transport of coal.

Air Quality

Sections 784.13 (21.40(a))

1. The applicant should list methods of suppressing dust from truck transport of coal.

Response: Include on page 4-80, vol, 3, permit application:

Methods of suppressing dust from the truck transport of coal include: (1) reduced haul-road speeds, (2) covering the loaded truckbed, and (3) a water spray system at the truck loadout. The Applicant will select the most appropriate control measure to mitigate the dust emission potential during truck haulage.

Temporary Facilities

The facilities used for transporting coal by truck during construction of the overland conveyor are the truck loadout bin at the crusher building, the 2.8-mile haul road down Eccles Canyon, and the temporary coal stockpile and loading facilities at the railroad loading site. The temporary coal stockpile will be sprayed with water and a non-toxic chemical dust suppressant to prevent fugitive dust emissions. A dust hood will be incorporated at the belt loading point to reduce fugitive dust emissions. Travel areas around the pile and the railroad cars will also be sprayed with water and a non-toxic chemical dust suppressant as necessary.

Methods of suppressing dust from the truck transport of coal include: (1) reduced haul-road speeds, (2) covering the loaded truckbed, and (3) a water spray system at the truck loadout. The Applicant will select the most appropriate control measure to mitigate the dust emission potential during truck haulage.

4.22.6 Air Quality Control Monitoring

The Applicant has contracted with Radian Corporation to prepare the baseline air quality study for the proposed mine area and to design an air quality monitoring program for use throughout the life of the Skyline Mines.

It is the intent of the Applicant to use this monitoring program to determine the effectiveness of the planned fugitive dust control measures. Adjustments to the dust suppression measures will be considered on the basis of monitoring program evaluations.

The air pollution control plan is based upon preliminary design of the planned dust control measures of the Skyline Mines and will be updated when detailed design specifications are available.

The following describes the Applicant's proposed Monitoring Program.

Post-Operational Monitoring

The main objective of the post construction air quality monitoring program will be to characterize the impact of coal handling operations

Air Quality

2. The applicant implies that dust mitigation measures have been modeled but doesn't state how the mitigation has been evaluated; this deficiency should be corrected.

2. The applicant implies that dust mitigation measures have been modeled but doesn't state how the mitigation has been evaluated; this deficiency should be corrected.

<u>Response</u>: Replace p. 4-74, vol. 3 of permit application: (begin at bottom of page)

The evaluation of the fugitive dust control measures described in the following subsections is contained in the Application for Preconstruction Review and Prevention of Significant Deterioration Permit which is attached. The air pollution emission factors used in calculating dust emissions were obtained from the "Interim Policy Paper on Air Quality Review of Surface Mining Operations," prepared by Region VIII of the Environmental Protection Agency.

Portions of the Application for Preconstruction Review and Prevention of Significant Deterioration Permit (PSD) were amended due to changes in the Skyline Mine design which occurred during the preparation of the Skyline Mine plan. Any changes in the mine design did not affect the overall emission amounts as calculated in the original PSD Permit Application. Any amendments to the PSD Permit Application were incorporated before evaluation (including modeling) of the proposal by the Environmental Protection Agency and, accordingly, before approval of the PSD Permit.

U.S. ENVIRONMENTAL PROTECTION AGENCY

APPLICATION FOR PRECONSTRUCTION REVIEW AND PREVENTION OF SIGNIFICANT DETERIORATION PERMIT

SKYLINE PROJECT

prepared by

COASTAL STATES ENERGY COMPANY
NINE GREENWAY PLAZA
HOUSTON, TEXAS 77046

March 1, 1979

TABLE OF CONTENTS

Coastal States Energy Company
March 1, 1979

1.0 INTRODUCTION - Notice of Intent to Construct

Coastal States Energy Company intends to construct and operate an underground coal mining operation to be located near Scofield, Utah. This permit application is intended to technically define the proposed project and facilities as well as proposed emission controls such that both the potential and controlled emissions can be adequately calculated. The following items have been developed and are presented herein:

- Amount of coal to be produced per year,
- Facility design and description,
- Facility flow diagrams,
- Equipment arrangements,
- Facility emission levels,
- Emission controls proposed.

The coal mining project proposed by Coastal States Energy Company is presently known as the "Skyline Project" and will be called the "Skyline Mine" after development. (This project was previously known as the proposed McKinnon Mine). The mine will be operated as Utah Fuel Company, a wholly owned subsidiary of Coastal States Energy Company. At full production the mine will produce an estimated 5.4 million tons of coal per year from three main portals. The mine plan now on file with the United States Geological Survey discusses in detail the planned development for the first two main portals. The third main portal was discussed in the mine plan and in the environmental statement in a preliminary manner. The seheduled maximum production from the first two main portals is to be 3.5 million tons per year. Dirtwork for the first portal is to begin during the summer of 1980 with construction starting in 1981. This permit application is based on the estimated maximum production rate which will be developed in three major phases. Interim phased development will at no stage be such as to cause either average or maximum emissions to exceed those noted in the application.

2.0 BACKGROUND INFORMATION

Coastal States Energy Company acquired in 1978 the properties on which the proposed mining operations are to be developed. The properties known locally as the "McKinnon Property" had been under investigation for development for several years. A Mining and Reclamation Plan detailing the proposed development had been filed by Routt County Development, Ltd., Coastal States's predecessor in title, with the United States Geological Survey prior to Coastal States's acquisition of the properties. The proposed development, identified as the McKinnon project, was evaluated for site specific impact and as a part of the regional analysis in the Draft Environmental Statement for Development of Coal Resources in Central Utah. The environmental assessment was based upon the filed mining plan which details the development, operation and reclamation of the first two phases. The third phase was given preliminary treatment with details to be supplied at a later date. Coastal States Energy Company proposed to develop the properties in substantially the same manner as detailed in the filed Mining and Reclamation Plan. Some modification and addition to the filed plan will be necessary to enable the existing Mining and Reclamation Plan to comply with regulations promulgated pursuant to Public Law 95-87, the Surface Mining Reclamation and Control Act of 1977, which were promulgated after the preparation and filing of the mine plan.

3.0 DESCRIPTION OF PROPOSED PROJECT AND FACILITIES

3.1 Purpose of the Project

The purpose of the project is to construct and operate an underground coal mine which will ultimately produce 5.4 million tons of coal per year from three main protals. The coal will be conveyed from the portals to train load-out facilities for shipment to customers. The destination of all the coal produced has not been determined and will depend on future marketing activities.

3.2 Description of the Facility

The location of the proposed mining operation is near Scofield in Carbon County, an air quality attainment area, about 50 miles northwest of Price, Utah. (See Exhibit 1). The majority of the development will be on Manti-La Sal National Forest lands administered by the U.S. Forest Service and will be located in close proximity to the eastern border of the National Forest. Portions of the conveyor and the load-out facilities are on private land. There are no Class I areas within 50 kilometers of the location of the proposed development. The source boundary is to be the permitted area.

The coal to be produced at the mine will average about 11,500 BTU/lb., with 10% moisture, 10% ash and 0.6% sulfur. It will be crushed to 2 inch minus size. No coal preparation activities beyond primary crushing and screening are to be conducted on the site.

Bathhouses for employees, maintenance shops, sewage disposal systems, parking lots, office buildings and other ancillary structures will be located near the portals. (See Exhibit 2). At full production the mining operation will employ up to 1000 persons. The facility is designed to allow the coal mined underground to be conveyed from the portal to silos for storage. The coal will be conveyed from the silos to crushing and screening facilities. From the crushing and screening facilities, the coal will be conveyed to an enclosed slot-storage facility. Coal will leave this enclosed slot-storage facility via conveyor to adjacent train load-out facilities near the mouth of Eccles Canyon. (See Exhibits 3 & 4). The crushing and screening facilities and the slot-storage will be enclosed. The train load-out will be enclosed except for rail car access which will be covered. (See Exhibit 5). (For descriptions of remaining facilities see Exhibits 6 through 10).

3.3 Construction

The project is to be developed in three stages with dirtwork beginning during the summer of 1980 and formal construction commencing in 1981. Construction of the second and third stages will follow as soon as is reasonably possible, contingent upon obtaining all necessary permits. Each stage represents the opening of a mine portal. The chart below illustrates the staged development as presently proposed:

Stage	Dirtwork/Commence Construction	First Production
Stage 1	1980	1982
Stage 2	1983	1984
Stage 3	1984	1985

The maximum production rate of 5.4 million tons per year is not anticipated until after full development of the third stage, or sometime after 1988. During the construction phase, control measures will be applied to reduce potential fugitive dust emissions. These control measures include:

1) chemical dust suppression of roads and parking lots before eventual paving,
2) confining traffic to specific roads,
3) minimizing the area of land to be disturbed,
4) mulching and rapid revegetation of topsoil storage piles.

3.4 Operation

It is the intent of Coastal States Energy Company to operate the Skyline Mine in compliance with all Federal, Utah state, and local codes governing the operation of such facility and to specifically comply with all legal requirements related to airborne emissions.

4.0 PERMIT APPLICATION

4.1 Basis for Permit Application

A. "Clean Air Act Amendment of 1977," Public Law 95-95, August 7, 1977.

B. 43 Code of Federal Regulations Section 51.21 as amended June 19, 1978.

C. EPA Region VIII's "Interim Policy Paper on the Air Quality Review of Surface Mining Operations", January, 1979.

4.7 Description of Emission Sources

Potential sources of emissions include:

1. Conveyors,
2. Silos,
3. Crushing and screening facilities,
4. Transfer points,
5. Slot-storage,
6. Load-out facilities,
7. Miscellaneous Sources:
    a) Dust from topsoil storage piles,
    b) Temporary truck haulage.

4.3 Calculation of Potential Emissions

According to the "Interim Policy Paper on Air Quality Review of Surface Mining Operations", prepared by Region VIII of the Environmental Protection

Agency, the following emission factors are applicable for the sources listed above (Section 4.2):

Control Devices	Emission Factors-lbs/ton
Conveyors	0.2
Silos (in or out)	0.0002
Primary Crushing	0.02
Screening	0.1
Transfer Points	0.2
Slot-storage (in or out)	0.0002
Train load-out	0.2
Topsoil storage	Wind loss equation.

Assuming that 5.4 million tons will be produced and conveyed to the load-out , the potential emissions have been calculated to be 1946.16 tons per year. (See Exhibit 11, for calculations of potential emissions at the maximum production rate.)

During the construction of stage one, coal will be hauled by truck to the train load-out facilities. This truck haulage will be necessary until the conveyor system is in operation. Coastal States proposes to mine 250,000 tons of coal per year during the development years of 1982 and 1983, which will be transported by 40 ton capacity trucks to the train load-out facilities. Potential emissions are calculated for this interim period to be 86.50 tons per year. (See Exhibit 12, for calculations).

4.4 Proposed Control Devices

Coastal States Energy Company proposes to fully cover all conveyors. The silos, by design, are enclosed and will have baghouses installed to control emissions. The crushing and screening facilities and slot-storage are to be enclosed and have baghouses installed to reduce emissions. The train load-out facilities will be enclosed with baghouses except for car access. The operator plans to bus employees from neighboring towns. Roads in the mine area as well as the parking lots will be paved or otherwise adequately treated with a dust suppressing agent.

Control efficiencies for the various devices and sources as stated in the "Interim Policy Paper on the Air Quality Review of Surface Mining Operations" are as follows:

Control Devices	Control Efficiencies
Fully covered conveyors	98%
Baghouse for silos	95%
Baghouse for crusher	99%
Baghouse for screening facility	99%
Fully covered transfer points	95%
Baghouse for slot-storage	95%
Baghouse for load-out	99%

Coastal States Energy Company proposes to fully cover the transfer points in the conveyor from the crushing and screening facilities to the slot-storage. Coastal States believes that the covering proposed for these transfer points will control at least 95% of the potential emissions. It is felt that permanent coverings will be more reliable and less costly to maintain.

Although the EPA policy paper indicates that a fully covered conveyor has a control efficiency of 100%, we feel this value to be slightly high and, consequently, have estimated the control efficiency for our proposal to be 98%.

Economic considerations and alternative control measures have not been discussed in this application due to the low amount of controlled emissions from the near Best Available Control Technology system now proposed.

In addition to the above listed control devices, Coastal States Energy Company plans to incorporate other features which will minimize the amount of particulates entering the atmosphere. These features are listed below:

1. Pave or treat with chemical dust suppressent roads and parking lots,
2. Transport mine workers to the site via bus,
3. Apply mulch and rapidly revegetate any disturbed areas.

4.5 Controlled Emissions

Assuming that all proposed devices are installed and operating at the control efficiency stated above, the total allowable controlled emissions at 5.4 million tons per year production level are calculated to be as follows:

46.55 tons per year

387.90 pounds per day

32.33 pounds per hour

See Exhibit 13 and 14 for calculations of controlled emission. The calculations indicate that the Skyline operation as proposed will not produce allowable controlled emissions greater than 50 tons per year, 1000 pounds per day, or 100 pound per hour.

5.0 EXHIBITS

1. Location Map
2. Surface Map
3. Conveyor Route
4. Schematic Diagram of Coal Handling System
5. Design of Load-Out Facilities
6. Design of Conveyor - Cross Section
7. Design of Transfer Point
8. Design of Silo Storage Facility
9. Design of Crushing/Screening Facilities
10. Design of Slot-Storage Facility
11. Potential Emissions - Maximum Production Rate
12. Potential Emissions - Construction Phase
13. Controlled Emissions - Construction Phase
14. Controlled Emissions - Maximum Production Rate

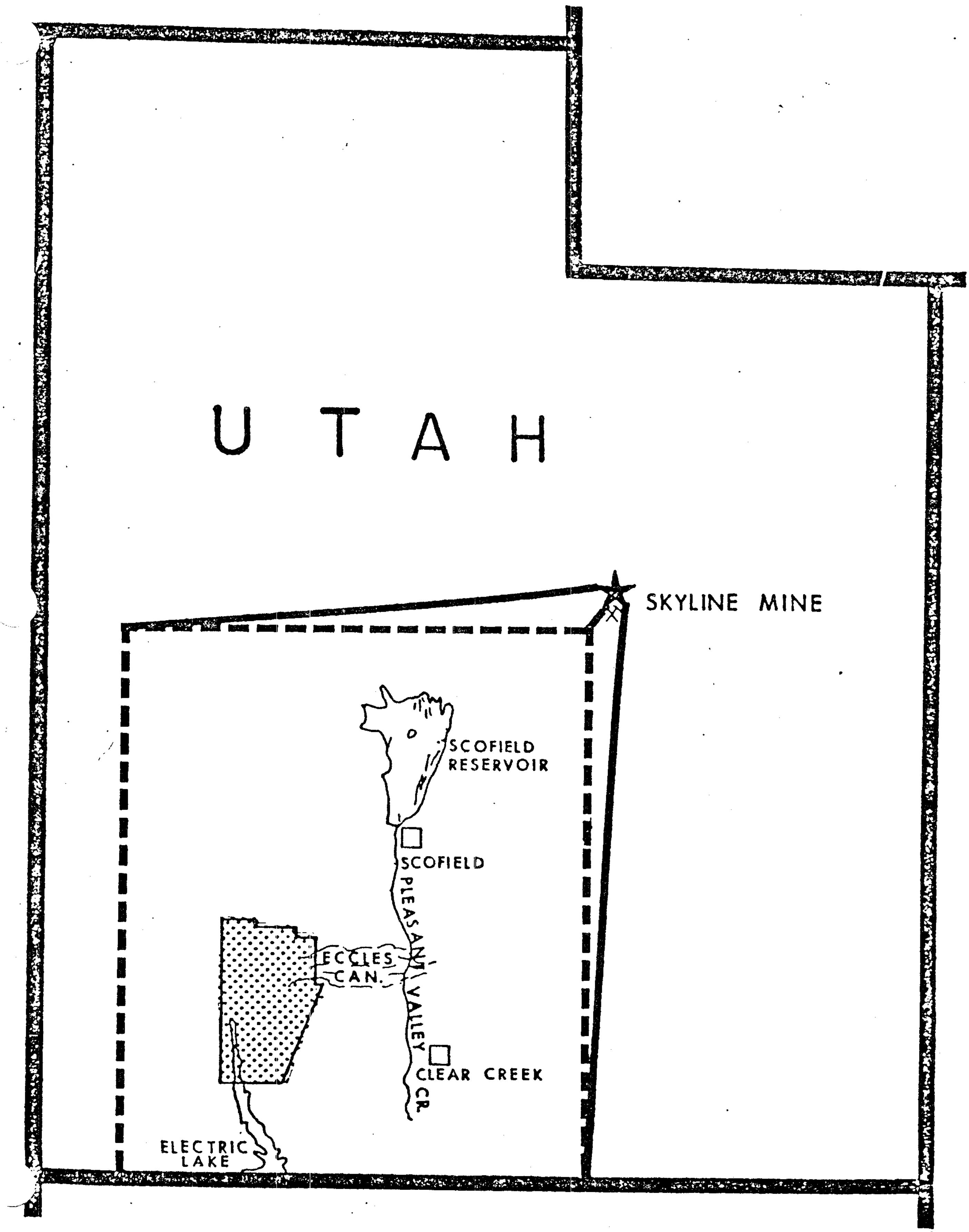

UTAH
SKYLINE MINE
SCOFIELD RESERVOIR
SCOFIELD
PLEASANT VALLEY CR.
ECCLES CAN.
CLEAR CREEK
ELECTRIC LAKE

EXHIBIT 1

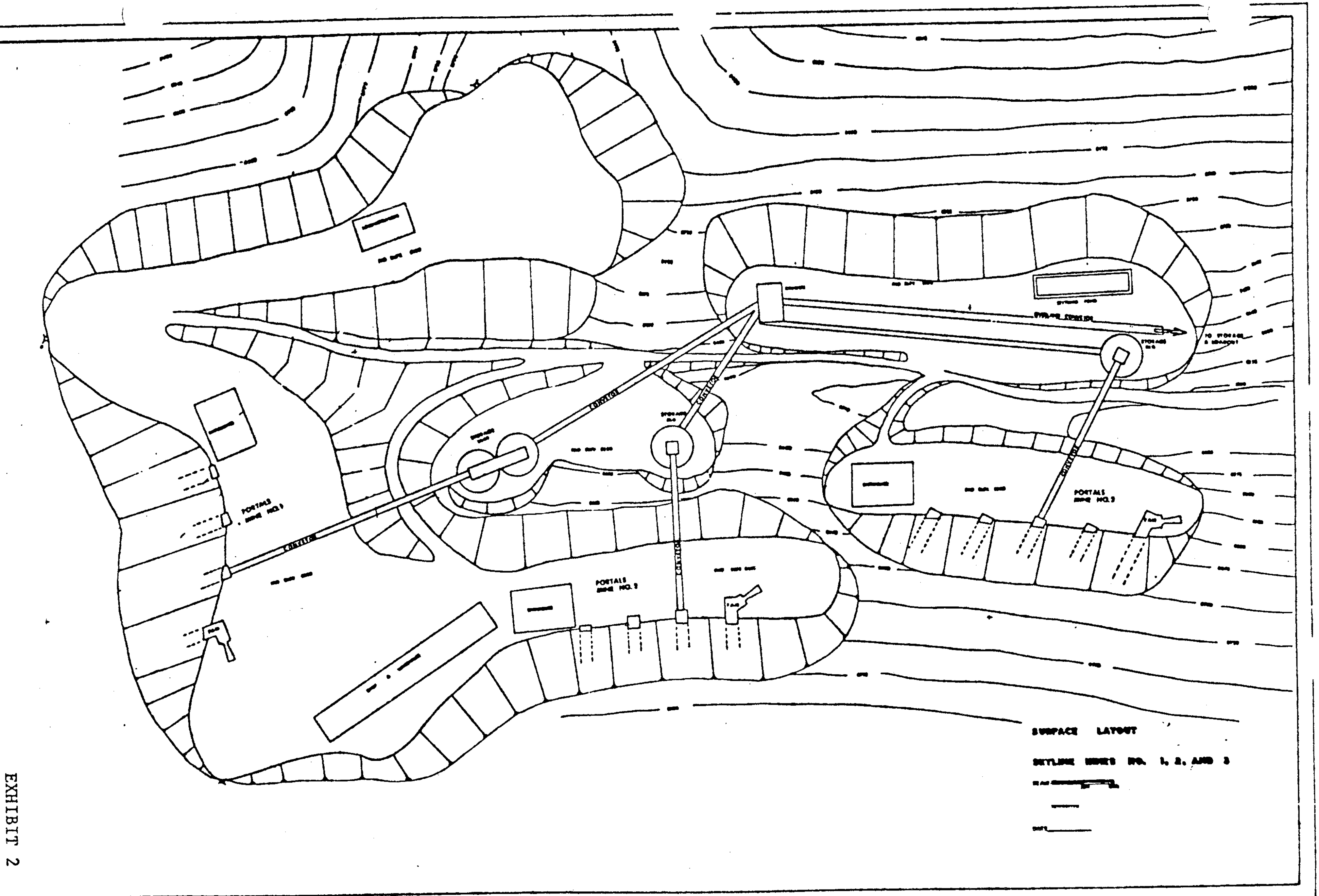
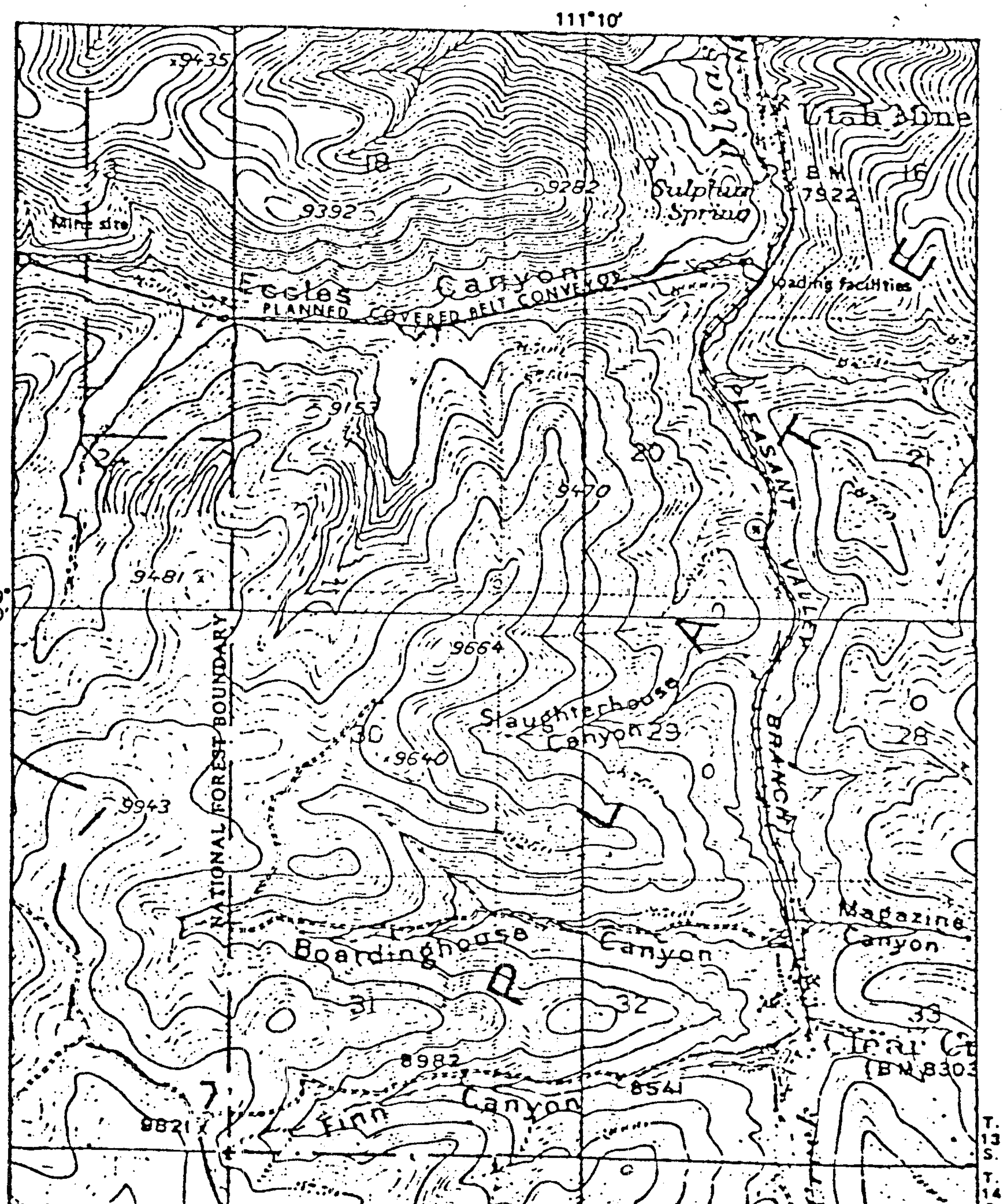

SURFACE LAYOUT
SKYLINE MINES NO. 1, 2, AND 3
PORTALS MINE NO. 1
PORTALS MINE NO. 2
PORTALS MINE NO. 3
CONVEYOR

EXHIBIT 2



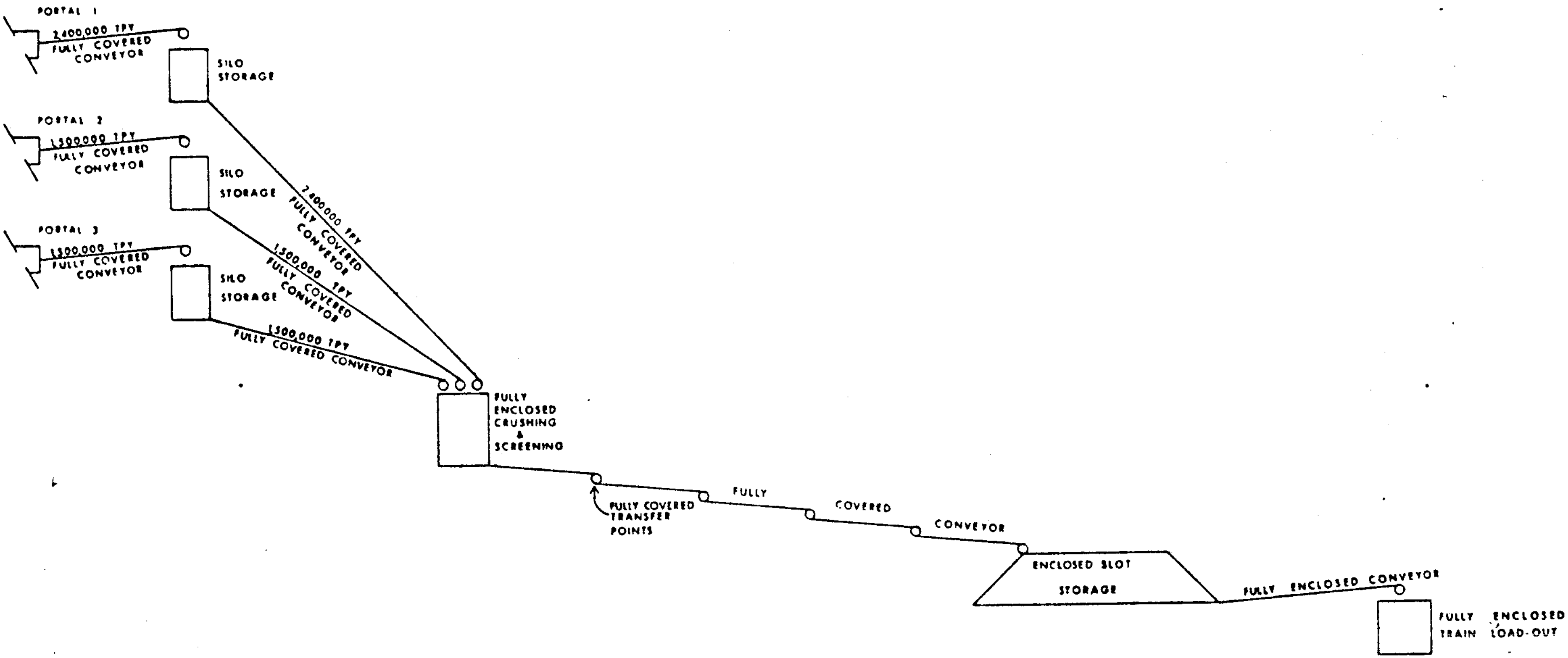
Base from U.S. Geological Survey
Scofield 1:62,500, 1923

0 — 1 MILE

Location of conveyor from Skyline Mine to train load-out.

EXHIBIT 3

SKYLINE PROJECT

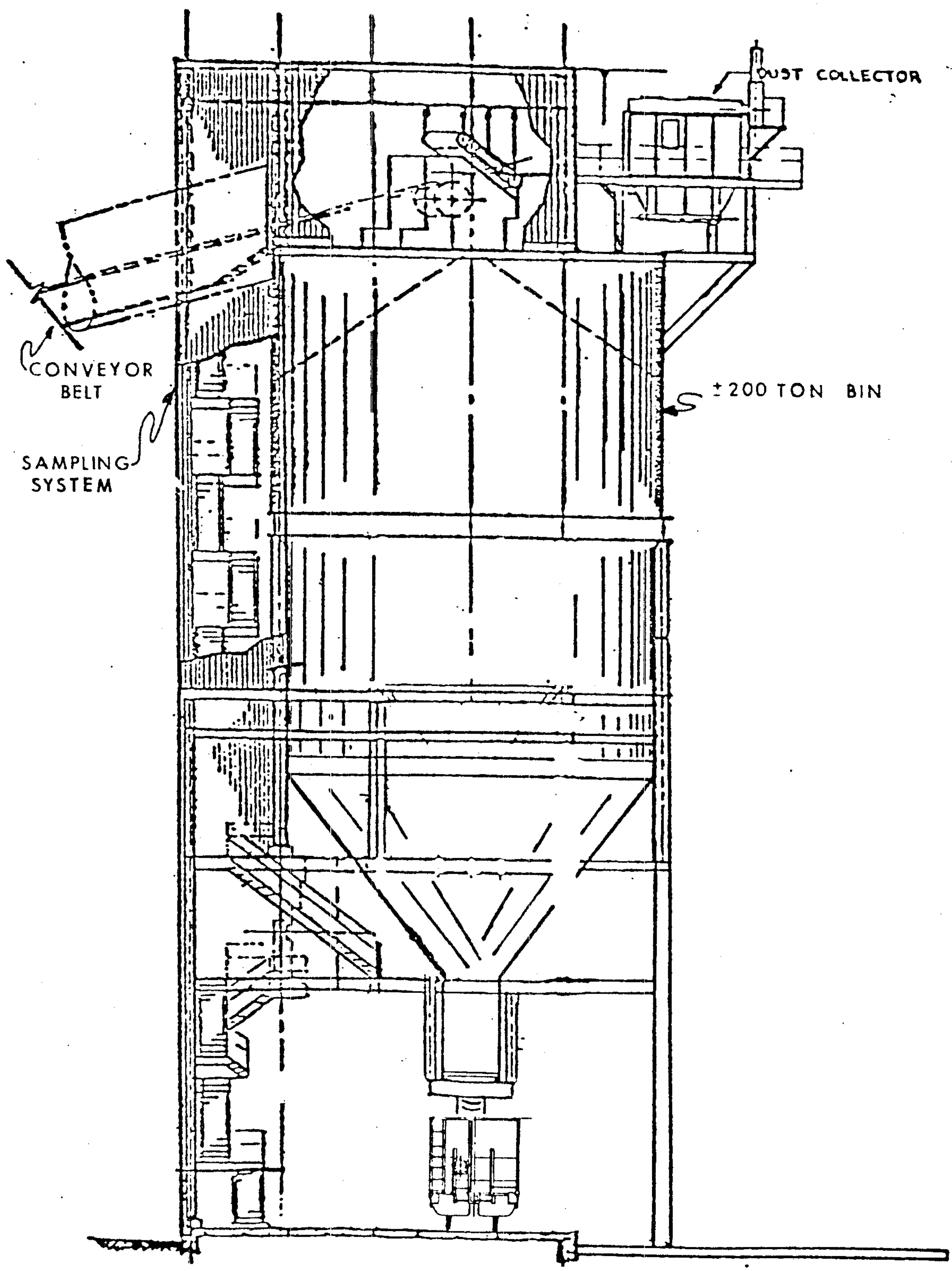


STAGE 1- CONSTRUCTION & DEVELOPMENT OF PORTAL 1, CONVEYORS, SILO, CRUSHING & SCREENING, OVERLAND CONVEYOR, SLOT STORAGE, LOAD

STAGE 2- CONSTRUCTION & DEVELOPMENT OF PORTAL 2, CONVEYORS, SILO, EXPANSION OF CRUSHING & SCREENING

STAGE 3 CONSTRUCTION & DEVELOPMENT OF PORTAL 3, CONVEYORS, SILO, EXPANSION OF CRUSHING & SCREENING

EXHIBIT 4

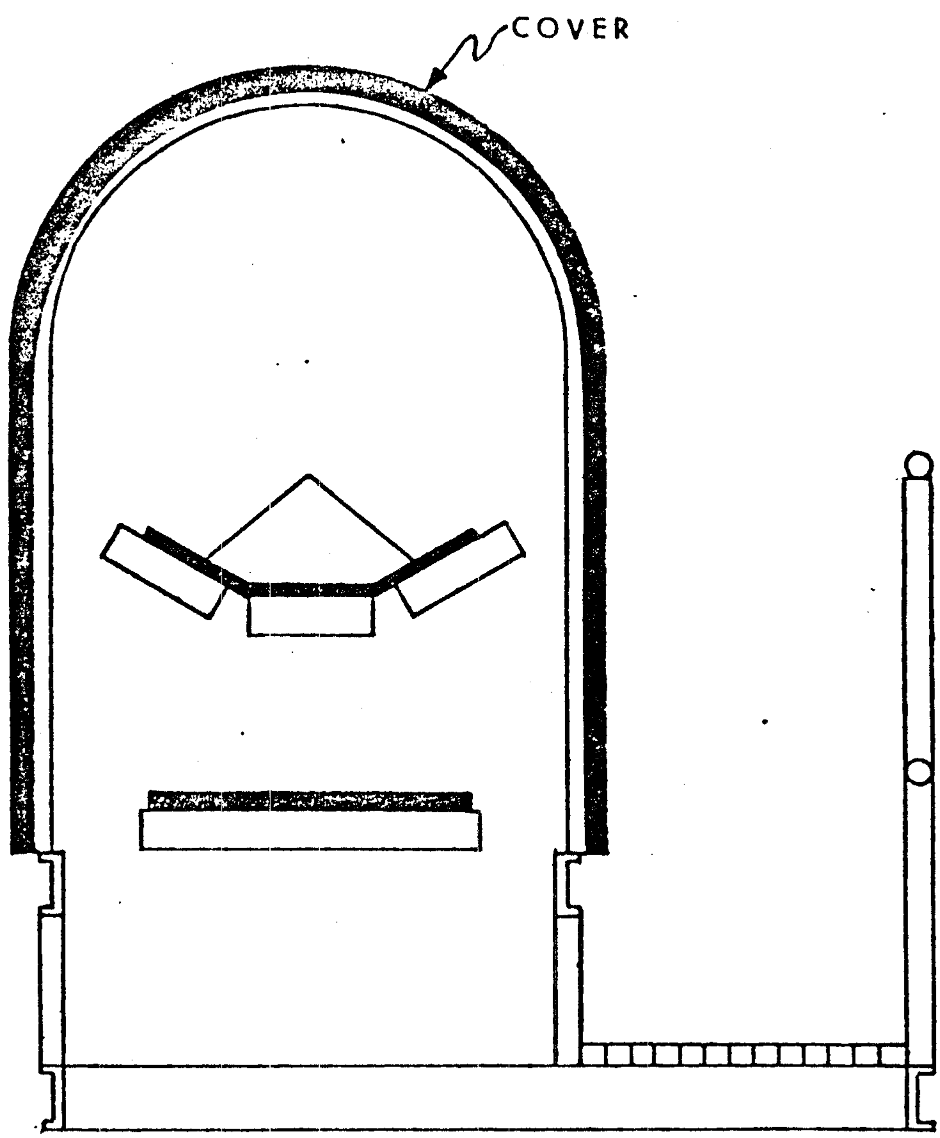


TRAIN LOADING FACILITY

COASTAL STATES ENERGY CO.
HOUSTON, TEXAS

UTAH FUEL COMPANY
SKYLINE MINE

EXHIBIT 5

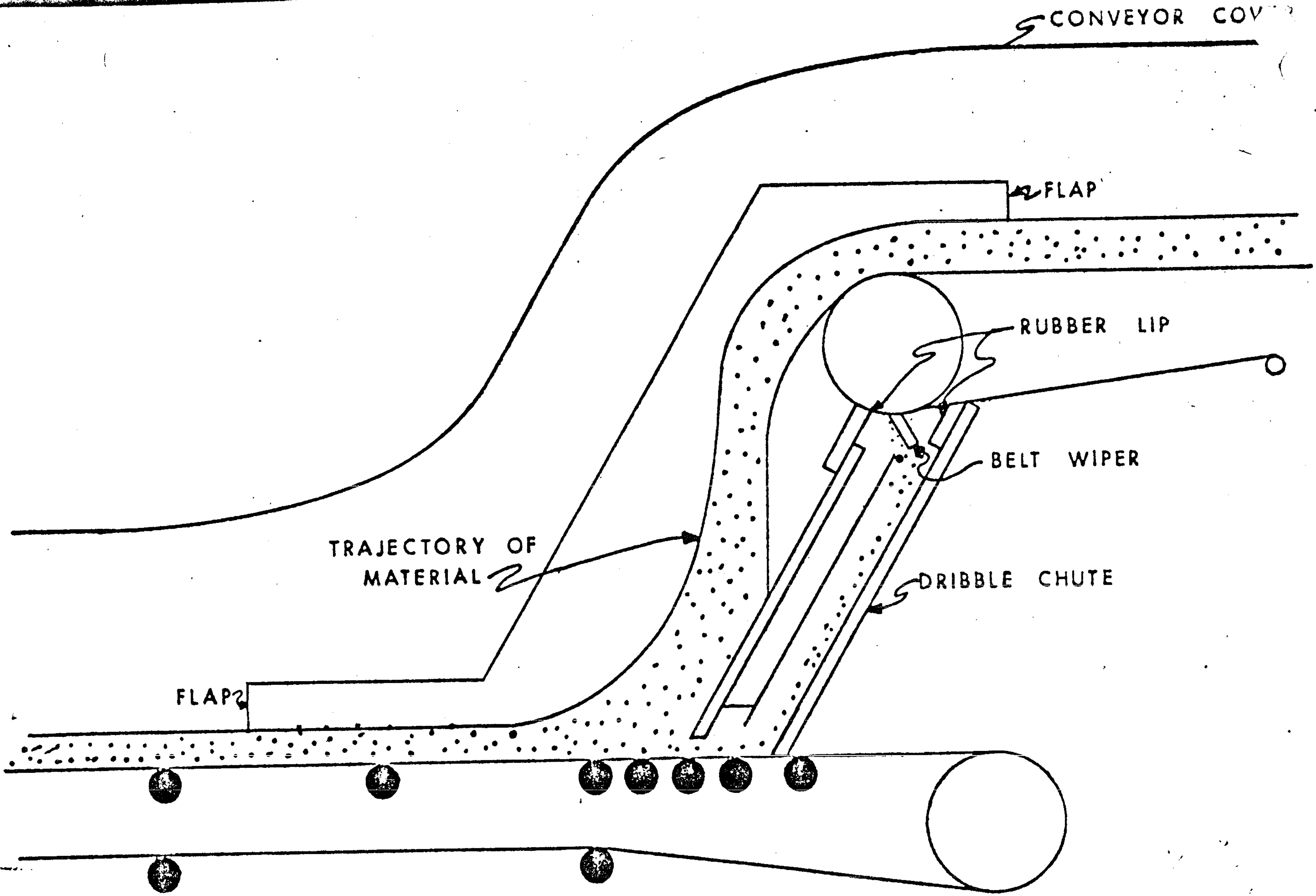


CROSS SECTION
COVERED CONVEYOR

COASTAL STATES ENERGY CO.
HOUSTON, TEXAS

UTAH FUEL COMPANY
SKYLINE MINE

EXHIBIT 6

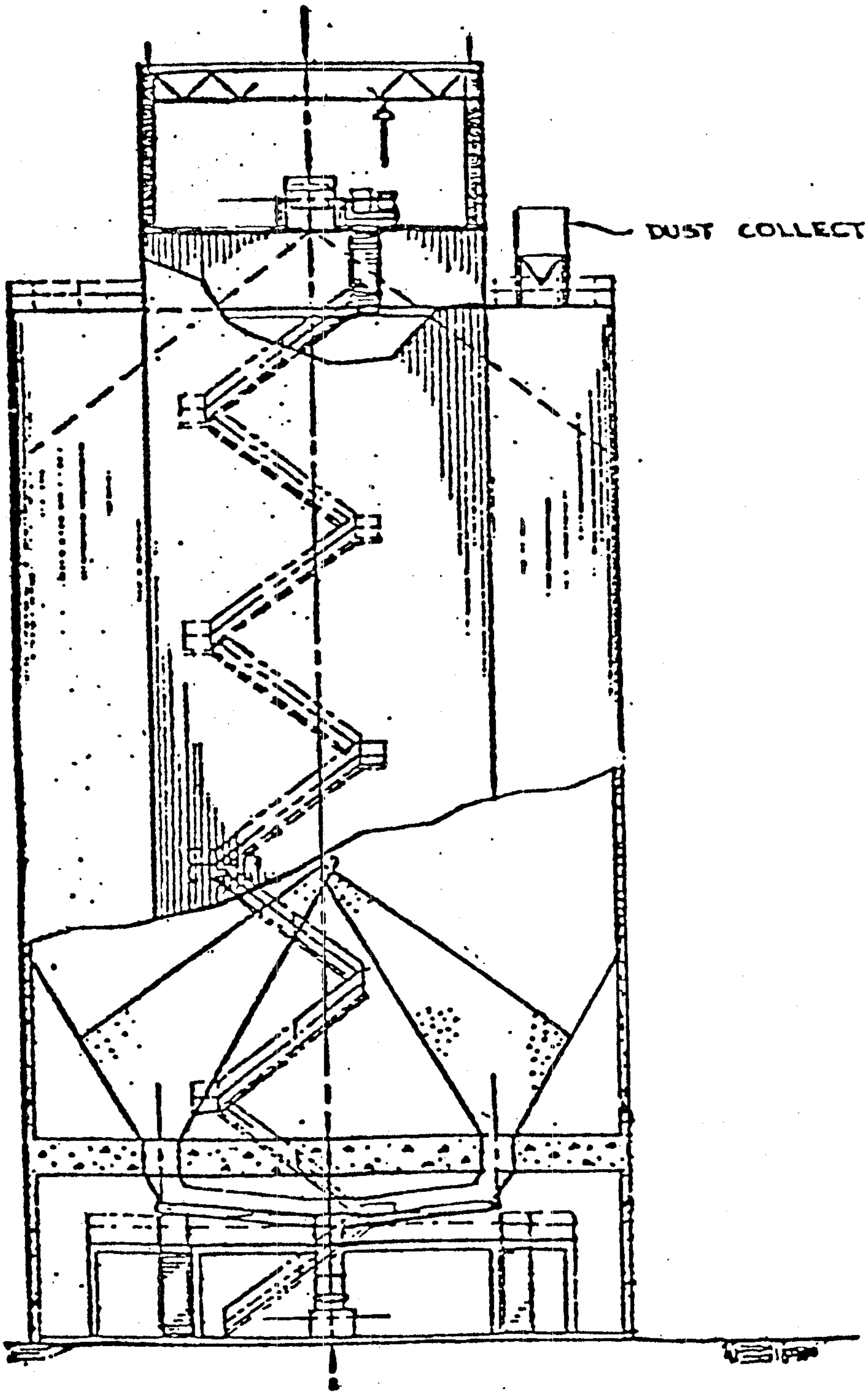


TYPICAL DISCHARGE CHUTE

COASTAL STATES ENERGY CO.
HOUSTON, TEXAS

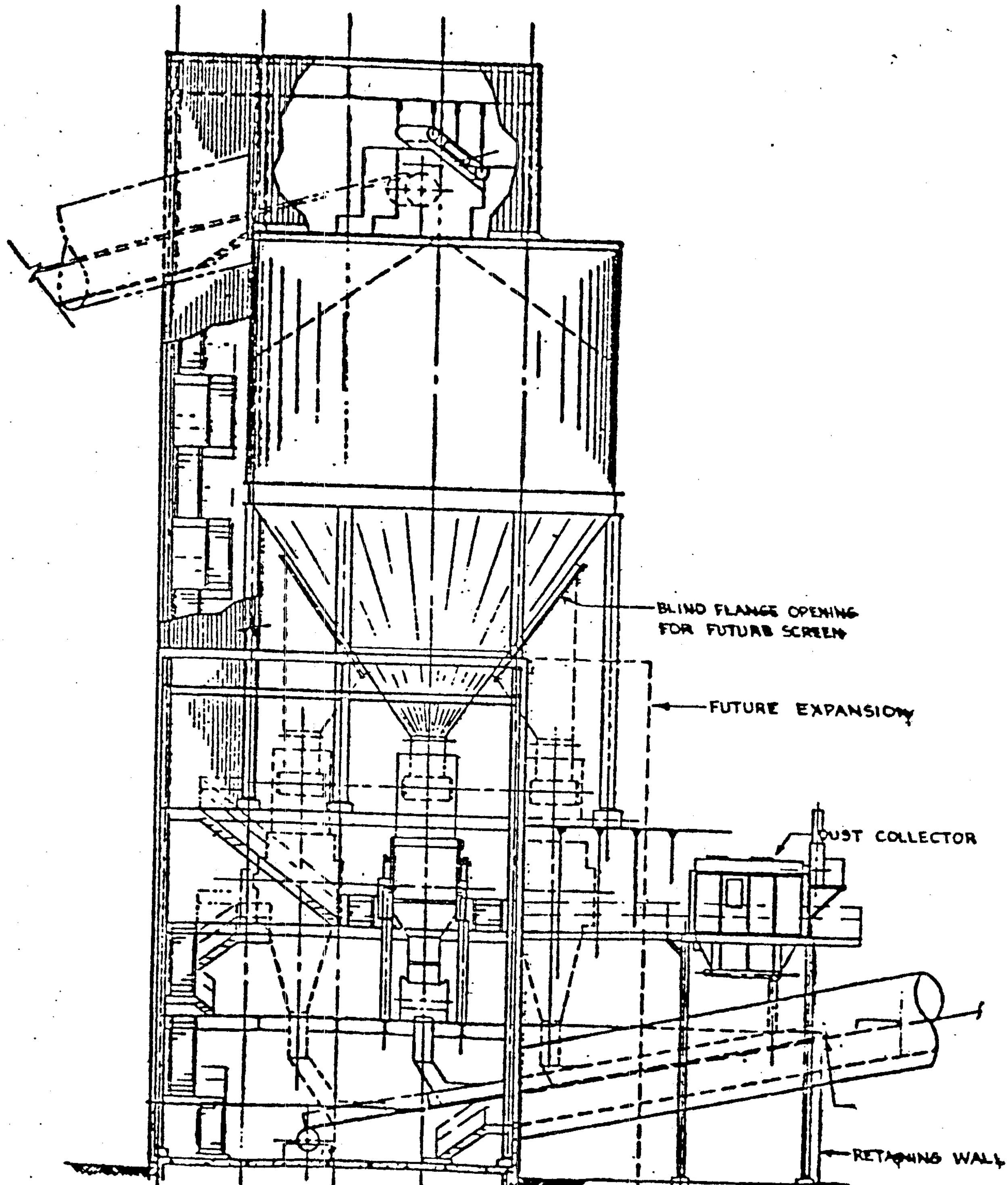
UTAH FUEL COMPANY
SKYLINE MINE

EXHIBIT 7



RAW COAL STORAGE

COASTAL STATES ENERGY CO. HOUSTON, TEXAS
UTAH FUEL COMPANY SKYLINE MINE EXHIBIT 8



CRUSHING FACILITY

COASTAL STATES ENERGY CO.

HOUSTON, TEXAS

UTAH FUEL COMPANY

SKYLINE MINE

EXHIBIT 9

POTENTIAL EMISSIONS

Maximum production rate of 5.4 million tons/yr.

Source	Emission Factor lbs./ton	Production (tons)	Tons
Conveyors	0.2	5.4 million	540.00
Transfer points	0.2	5.4 million	540.00
Silos-in	0.0002	5.4 million	0.54
Silos-out	0.0002	5.4 million	0.54
Crusher	0.02	5.4 million	54.00
Screening	0.1	5.4 million	270.00
Slot-Storage-in	0.0002	5.4 million	0.54
Slot-Storage-out	0.0002	5.4 million	0.54
Load-Out	0.2	5.4 million	540.00
TOTAL			1,946.16 tons/yr.

Assume: After 1983, topsoil storage pile will be fully revegetated.

POTENTIAL EMISSION - CONSTRUCTION PHASE

Construction Phase - 1982, 1983

Temporary Truck Haulage

Assume: 250,000 tons/year proudction

40 - ton capacity haulage trucks

6 mile round trip

Dirt Haul Road

Source	Emission Factor lbs./ton	Production (tons/year)	Tons
Conveyor	0.2	250,000	25.00
Truck Loading	0.12	250,000	15.00
Haulage		250,000	18.30
Product Dumping	0.007	250,000	0.88
Load-Out	0.2	250,000	25.00
Topsoil Storage		250,000	2.40
TOTAL			86.50 tons/year

TEMPORARY COAL HAULAGE

From: Compilation of Air Pollution Emission Factors,
U.S.E.P.A. Publication AP-42, August, 1977

Assume: Coal dump trucks travel over dirt haul road from mine portals to train load-out. Round trip 6 miles.

Where: E = Emission Factor, lbs. per vehicle mile

s = Silt content road, % = 2%

S = Average vehicle speed = 20 mph.

W = Mean number days with = 0.01 inches of rainfall = 35

$$E = (0.81s)(s/30)(365-W/365)$$

$$= (0.81)(2)(20/30)(365-35/365)$$

$$= 0.976 \text{ lbs./mile}$$

250,000 tons/yr ÷ 40 tons/truck = 6,250 round trip/year

6,250 X 6 miles X 0.975 lbs./mile ÷ 2000 lbs./ton = 18.3 tons/year

TOPSOIL STORAGE

From EPA Region VII Interim Policy Paper on the Air Quality Review of Surface Mining Operation:

E = 1.2 tons/acre-year

Assume: storage pile of two acre (6 inches of topsoil, from 30 acre area)

E = 1.2 tons/acre-year X 2.0 acres
= 2.4 tons/year

CONTROLLED EMISSION - CONSTRUCTION PHASE

Assume: (Temporary Truck Haulage during 1982, 1983)

250,000 tons/year production rate.

Source	Emission Factor lbs./ton	Production tons/year	Control Efficiency	Tons
Conveyor	0.2	250,000	98%	0.50
Truck Loading	0.12	250,000		15.00
Haulage	(see Exhibit 7)	250,000	100%	0.00
Product Dumping	0.007	250,000		0.875
Load-Out	0.2	250,000	99%	0.25
Topsoil Storage	(see Exhibit 7)		85%	2.04
TOTAL				18.67 tons/year

Assume Controls:

1. Haul road paved.
2. Minimize fall distances in product loading.
3. Dust suppression equipment (baghouse, dust collector) at load-out facility to achieve 99% control.
4. Mulch and revegetate rapidly topsoil storage area (85% control).

Assume: 140 tons per hour production rate.

Source	Emission Factor lbs./ton	Production tons/hour	Control Efficiency	Lbs.
Conveyors	0.2	140.00	98%	0.56
Truck Loading	0.12	140.00		16.80
Haulage		140.00	100%	0.00
Product Dumping	0.007	140.00		0.98
Load-Out	0.2	140.00	99%	0.28
Topsoil Storage	(neglible)	140.00	85%	0.00
TOTAL				18.62 lbs/hr

CONTROL EMISSIONS - TEMPORARY TRUCK HAULAGE

Assume: 1100 tons per day production rate.

Source	Emission Factor lbs./ton	Production tons/day	Control Efficiency	Lbs.
Conveyor	0.2	1100.00	98%	4.40
Truck Loading	0.21	1100.00		132.00
Haulage		1100.00	100%	0.00
Product Dumping	0.007	1100.00		7.70
Load-Out	0.2	1100.00	99%	2.20
Topsoil Storage	(neglible)		85%	0.00
TOTAL				146.30 lbs/day

The peak hourly and daily production rates should not be more than twice the average hourly and daily production rates.

Assuming that the maximum production rate on a per hour and per day basis is twice the average, the emission at the peak level should be no more than twice the emission level at the average production rate. Therefore, the daily emissions during the temporary truck haulage period (1982-1983) should never be greater than 292.6 pounds. The hourly emissions should never be greater than 37.24 pounds.

CONTROLLED EMISSIONS - AT MAXIMUM PRODUCTION

RATE OF 5.4 MILLION TONS/YEAR

Source	Emissions Factor lbs./ton	Production tons/yr	Control Efficiency	Tons
Conveyors	0.2	5.4 million	98%	10.8
Transfer points	0.2	5.4 million	95%	27.0
Silos-in	0.0002	5.4 million	95%	0.027
Silos-out	0.0002	5.4 million	95%	0.027
Crusher	0.02	5.4 million	99%	0.54
Screening	0.1	5.4 million	99%	2.70
Slot-Storage-in	0.0002	5.4 million	95%	0.027
Slot-Storage-out	0.0002	5.4 million	95%	0.027
Load-Out	0.2	5.4 million	99%	5.40
TOTAL				46.55 tons/yr

Assume: Production 240 days per year. 22,500 tons per day

Source	Emission Factor lbs./ton	Production tons/day	Control Efficiency	Lbs.
Conveyors	0.2	22,500	98%	90.00
Transfer points	0.2	22,500	95%	225.00
Silos-in	0.0002	22,500	95%	0.225
Silos-out	0.0002	22,500	95%	0.225
Crusher	0.02	22,500	99%	4.50
Screening	0.1	22,500	99%	22.50
Slot-Storage-in	0.0002	22,500	95%	0.225
Slot-Storage-out	0.0002	22,500	95%	0.225
Load-out	0.2	22,500	99%	45.00
TOTAL				387.90 lbs/day

Assume: 5.4 million tons per year production rate

240 days per year production

12 hours per day production at rate of 1875 tons per hour

Source	Emmision Factor lbs./ton	Production tons/hr.	Control Efficiency	Lbs.
Conveyors	0.2	1875	98%	7.5
Transfer points	0.2	1875	95%	18.75
Silos-in	0.0002	1875	95%	0.019
Silos-out	0.0002	1875	95%	0.019
Crusher	0.02	1875	99%	0.375
Screening	0.1	1875	99%	1.875
Slot-Storage-in	0.0002	1875	95%	0.019
Slot-Storage-out	0.0002	1875	95%	0.019
Load-Out	0.2	1875	99%	3.75

TOTAL 32.33 lbs/hr.

EXHIBIT 14

The peak hourly and daily production rates should be not more than twice the average hourly and daily production rates. Assuming that the maximum production rate on a per hour and per day basis is twice the average, the emission at the peak level should be no more than twice the level at the average production rate.

Therefore, the daily controlled emissions should never be greater than 775.8 pounds and the hourly emissions should never be greater than 64.66 pounds.

*ECONOMIC COAL RECOVERY (USGS comments)

SECTIONS 211.4(b), 211.10(c)(6)(xv), 211.30, 211.32, and 211.35

Economic Coal Recovery

1. The plan does not include recoverable reserves for each Federal lease; however, it will not be necessary to submit this information now as each mining company is required to comply with the General Mining Order No. 1, which requires reporting recoverable coal reserves from each Federal lease.

NO RESPONSE REQUIRED

Economic Coal Recovery

2. The applicant plans to store underground wastes and excess surface spoil in underground workings. They also plan to return coal processing wastes to abandoned underground workings. The plan should state that whenever wastes of this nature are to be stored underground, the applicant will notify the USGS Mining Supervisor by submitting a map showing the proposed disposal area and an explanation of how it will be accomplished so that the maximum amount of coal can be recovered from the disposal area prior to disposal. Wastes should only be stored in abandoned areas where pillars must be left and only after the maximum amount of coal has been recovered.

*Economic Coal Recovery (USGS comments)

Sections 211.4(b), 211.10(c)(6)(xv), 211.30, 211.32, and 211.35

2. The applicant plans to store underground wastes and excess surface spoil in underground workings. They also plan to return coal processing wastes to abandoned underground workings. The plan should state that whenever wastes of this nature are to be stored underground, the applicant will notify the USGS Mining Supervisor by submitting a map showing the proposed disposal area and an explanation of how it will be accomplished so that the maximum amount of coal can be recovered from the disposal area prior to disposal. Wastes should only be stored in abandoned areas where pillars must be left and only after the maximum amount of coal has been recovered.

Response: (Change pg. 3-18, vol. 3. Insert as third paragraph under 3.17):

At times it may be necessary to store noncombustible underground wastes, excess surface spoil, or coal processing wastes in underground workings. Whenever wastes of this nature are to be stored underground, the Applicant will notify the Mining Supervisor by submitting a map showing the proposed disposal area and an explanation of how it will be accomplished so that the maximum amount of coal can be recovered from the disposal area prior to disposal. Wastes will only be permanently stored in areas where the maximum amount of coal has been recovered within safe limits or where the waste can be stored so as not to interfere with future pillar recovery.

Economic Coal Recovery

3. It states in the plan that the applicant does not plan to construct or utilize coal processing facilities as a part of the Skyline project. Information generated by the company relative to making this decision should be submitted in detail as a part of the plan. Cleaning or not cleaning coal must be considered in determining maximum economic recovery.

The response to Items 3 and 7 should be joined together and inserted on p. 3-18 under 3.1.7 after the first paragraph.

3. It states in the plan that the applicant does not plan to construct or utilize coal processing facilities as a part of the Skyline project. Information generated by the company relative to making this decision should be submitted in detail as a part of the plan. Cleaning or not cleaning coal must be considered in determining maximum economic recovery.

Response: From studies of available core hole analyses, the weighted average in-seam quality for the Skyline coal ranges as follows:

% Moisture	5.64-6.67
% Ash	6.23-7.49
BTU	12,274-12,350

During mining, the coal will be diluted by roof and floor material, material mined during fault crossing, and water added at the face and along beltlines for dust suppression. The quantity of dilutants added as roof and floor material and as water for dust suppression can be approximated by using averages obtained from existing mines in similar conditions. Based upon this, it has been assumed that 2% moisture has been added for dust suppression. In addition, the following amounts of roof and floor material have been assumed to dilute the coal at the face:

	Continuous Miners		Longwalls	
Coal Height (ft.)	Rock (in.)	Weight Dilution (%)	Rock (in.)	Weight Dilution (%)
5	6	15	4	10
6	6	12	4	9
7	6	11	4	8
8	6	10	4	7
9	2	3	2	3
10	2	3	2	3
11	2	3	2	3
12	2	2	2	2

The quantity of dilutants added by crossing faults has been approximated by estimating the linear footage and displacement of faulting for each seam from photolinear studies. By relating this to the corresponding seam height, a severity value can be assigned to each projected faults. Then the amount of floor or roof material which must be mined to ramp over a fault can be calculated.

Adding these three forms of dilution, the following weighted average run-of-mine coal quality ranges can be expected:

% Moisture	7.64-8.67
% Ash	10.3-10.9
BTU	11,327-11,514

It is anticipated that this BTU value of run-of-mine coal is conservative and that with a well monitored quality control program, the coal can be marketed on a run-of-mine basis with no loss of reserves for quality control purposes.

Therefore, at this time the applicant believes that a wash plant is not necessary to obtain maximum economic recovery. However, should conditions change so as to adversely affect maximum economic recovery, the question of a wash plant will be reassessed at that time.

Economic Coal Recovery

4. Several times throughout the plan, it states that maximum economic recovery (MER) will be considered. More explanation as to how MER will be achieved is necessary, including some detail on technology not utilized which would maximize coal recovery in the mine, i.e., coal cleaning, full seam mining in thick seams, etc.

4. Several times throughout the plan, it states that maximum economic recovery (MER) will be considered. More explanation as to how MER will be achieved is necessary, including some detail on technology not utilized which would maximize coal recovery in the mine, i.e., coal cleaning, full seam mining in thick seams, etc.

<u>Response</u>: Responses to items 3, 6, and 7 describe how the MER will be achieved.

Economic Coal Recovery

5. It must be noted that no entry level or panel workings in which the pillars have not been completely extracted within safe limits shall be permanently abandoned or rendered inaccessible, except with the prior written approval of the USGS Mining Supervisor.

5. It must noted that no entry level or panel workings in which the pillars have not been completely extracted within safe limits shall be permanently abandoned or rendered inaccessible, except with the prior written approval of the USGS Mining Supervisor.

Response: Change p. 3-18, vol. 3, second paragraph under 3.1.7 insert:

It is intended that no entry, room or panel workings, in which the pillars have not been completely extracted within the safe limits, will be permanently abandoned or rendered inaccessible except with the prior written approval of the Mining Supervisor.

Economic Coal Recovery

6. The proposed projections on the mining plan maps have some areas without proper explanation as to whether or not they are to be mined. Explain your reasons for not mining areas containing coal of mineable thicknesses that are not shown to be mined.

6. The proposed projections on the mining plan maps have some areas without proper explanation as to whetner or not they are to be mined. Explain your reasons for not mining areas containing coal of mineable thickness that are not shown to be mined.

Response: (Page 3-11, vol. 3, after first full paragraph insert):

The mining plan projection maps are based upon the best interpretation of the geological information available. Since the Applicant considers 5 feet to be the minimum seam height which can be economically extracted, Maps 3-1A, 3-1B, and 3-1C show mining areas which are at this time predicted to be greater than 5 feet in height and have more than 30 feet of interburden to the next seam. As new drill hole data, seismic studies, actual mining conditions, etc., become available, the geologic structure maps will change to reflect this new information. In addition, the mine projections will be modified to accommodate this information. In the extreme case, if the three seams prove to be greater than 5 feet over their entire areas and have greater than 30 feet of interburden, the mine projections for each seam would result in the configuration shown in Map 3-1D. Further, with advances in technology, it may be possible to mine those areas of less than 5 feet seam height or 30 feet interburden. Therefore, advances in technology may also cause the mine projections to be modified. The Applicant anticipates the workings to be less extensive over the property than shown in Map 3-1D; however, they indicate the maximum extent the workings could conceivably achieve.

MISCELLANEOUS

Economic Coal Recovery

7. The "A" Seam, in the northwest part of the property has a potential for the longwall multilift method. We believe the company should consider this system.

7. The "A" Seam, in the northwest part of the property has a potential for the longwall multilift method. We believe the company should consider this system.

Response: The Applicant realizes that certain areas of the Skyline Mines, such as the northwest corner of the Lower O'Connor "A" Seam, present opportunities for utilization of new technologies in thick seam mining. These new technologies include thick seam longwall units, multilift longwall techniques, and sublevel caving techniques. Although these methods have not yet been attempted in the United States, there are successful applications of each at various places around the world. The Applicant fully intends to consider these new methods for their possible use at the Skyline Mines.

Miscellaneous

1. The following points will also need clarification or explanation before the technical analysis is started:

A. Section 2.3.2, page 2-26, states that springs are of local origin, yet section 2.3.5, page 2-29, states that the water quality of the springs can be used as indices of the quality of the deep underground system;

B. Section 4.19.2, page 4-66, states that mine site diversion channels will be designed to carry a 100-year, 24-hour precipitation event, yet a 10-year, 24-hour rainstorm was used in the design;

C. Appendix A-1, hydrology, page 37, states daily flows range from 0.6 to 200 cfs for Huntington Creek and 1 to 50 cfs for Pleasant Valley Creek, yet Table 4, page 41, lists the 25- and 50-year floods as 78 and 84 cfs for Huntington Creek and 26 and 28 cfs for Pleasant Valley;

D. The correlation of flow duration curves, as shown in Appendix A-1, hydrology, page 22, is no longer an acceptable technique. Concurrent flow events are now correlated. A check should be made to see if this changes the results.

Miscellaneous

1. The following points will also need clarification or explanation before the technical analysis is started:

A. Section 2.3.2, page 2-26, states that springs are of local origin, yet section 2.3.5, page 2-29, states that the water quality of the springs can be used as indices of the quality of the deep underground system;

Response: The springs are of local origin and, therefore, cannot be used as indices of deep underground water quality. Page 2-29 has therefore been revised and shall appear in the text as the attached page.

extent and discontinuous, provides water to numerous seeps and springs through thin sandstone layers in the Blackhawk Formation. A deep groundwater system is present in the saturated rocks surrounding and below the coal. This deep system has little effect on the surface hydrologic regime of the permit area since the water generally flows well below the perennial streams of the permit area (i.e., the water level contours showed no connection with permit area streams, etc.).

Drawdown and recovery tests, which were conducted at two different depths in an open test well located in the proposed portal area, indicated that the transmissivity of the Blackhawk Formation is approximately 18 gallons per day per foot. No significant difference in transmissivity exists between the coal zone and the Aberdeen Sandstone. The low transmissivities and discharge rates (approximately 5 gallons per minute) indicate that the Blackhawk Formation is, at best, a poor aquifer.

2.3.5 Ground Water Quality

The high cost associated with properly constructing and developing the observation wells drilled in the formations found in the area precluded the collection of reliable water quality data from the wells. A comparison of water quality data collected from the permit area springs, local mines, and a well indicated that the springs were of similar quality as the quality of the deep groundwater system of the area (Hydrologic Inventory Report, pp. 88-89, Volume A-1, Appendices). Thus, inferences on ground water quality were drawn from data collected almost entirely from springs as listed in the appendix.

Almost without exception, the ground water in the area is of a strong calcium bicarbonate type. Although the quality of the deeper groundwater is expected to be more uniform, the data show that three distinctive qualities of spring water can be found in the project area. Springs issuing near the outcrop of the Castlegate Sandstone in the northwest corner of the project area have very low dissolved solids content (normally less than 100 milligrams per liter). This results from the lack of shaley layers in the Castlegate. Local conditions have probably resulted in the slightly higher concentrations in the springs issuing the headwaters of Eccles Canyon (dissolved solids

Miscellaneous

1. The following points will also need clarification or explanation before the technical analysis is started:

B. Section 4.19.2, page 4-66, states that mine site diversion channels will be designed to carry a 100-year, 24-hour precipitation event, yet a 10-year, 24-hour rainstorm was used in the design;

Response: The "10-year" is a typographical error. Please change as per the next page.

temporary increase in sediment loads. The culverts will be placed on a sand pad (see Map 3-12A, Drawing 111-C "Corrugated Steel Manhole" for details). The inlet for each culvert will be constructed of concrete with a trash rack installed to prevent drift material from plugging the culverts. At each inlet structure, twenty feet of upstream area will be riprapped to ensure minimal erosion (See Map 3-12A, Drawing 111-C "Typical Inlet Structure"). A pool structure will be constructed immediately downstream of the outlet structure. The purpose of the pool is to reduce the headwater flow before entry into Eccles Creek (See Map 3-12A, Drawing 111-C "Culvert Outlet Detail". Gradient profile is shown on Map 3-14, Drawing 114-C, Profiles I, II and III).

Following completion of the mining operations, the culverts will be removed and the stream channel bed will be restored to ensure development of an adequate macroinvertebrate community.

4.19.2 Mine Site Diversion Channels

Mine site diversion channels will be designed and constructed to carry the peak flow resulting from a 100 year, 24-hour precipitation event. The precipitation from a ~~10~~ 100 year, 24-hour rainstorm is expected to be approximately 1.55 inches. After infiltration losses, surface runoff is ancitipated to be approximately 0.01 inches. The resulting peak runoff flow would be approximately 23 cfs.

The channels will be placed beyond the mine site facilities, as shown on Map 3-8 (Drawing 102-C). The channels will be triangular or trapezoidal in shape. Triangular-shaped channels will have 1.5 horizontal to 1.0 vertical (1.5h:1v) side slopes. The triangular-shaped channels will have a minimum depth of 3 feet and a top width of 9 feet. In addition, a minimum of 1 foot of freeboard will be maintained. The channels will be riprapped as needed to help reduce erosion. Riprap will also act as an energy dissipator. Trapezoidal-shaped channels will have 1.5 horizontal to 1.0 vertical (1.5h:1v) side slopes. Each trapezoidal-shaped channel will have a minimum depth of 3 feet, a bottom width of 2 feet and a top width of 11 feet. In addition, a minimum of 1 foot of freeboard will be maintained. The channels

Miscellaneous

1. The following points will also need clarification or explanation before the technical analysis is started:

C. Appendix A-1, hydrology, page 37, states daily flows range from 0.6 to 200 cfs for Huntington Creek and 1 to 50 cfs for Pleasant Valley Creek, yet Table 4, page 41, lists the 25- and 50-year floods as 78 and 84 cfs for Huntington Creek and 26 and 28 cfs for Pleasant Valley;

Response: The different flow rates cited above come from different methods of estimating described in the text. The values should be used as a comparative basis in evaluating the two methodoligies. To somewhat clarify the issue, the heading on Table 4 can be changed as per the following page.

Table 4. Flood frequency discharge estimates of selected streams on and adjacent to the Skyline Property, Using Techniques by Field (1975)

Stream	Channel Bar Width, in feet	25-Year Peak, in cfs	50-Year Peak, in cfs
Main Fork Eccles Creek above South Fork	2.0	11.0	11.7
South Fork Eccles Creek above Main Fork	2.5	15.6	16.6
Eccles Creek above Pleasant Valley Creek	3.5	26.4	28.2
Huntington Creek above Burnout Canyon	7.0	78.5	84.4

Seasonal variations in water quality, as indexed by major cations and anions, are depicted on Plate 3. As is to be expected, total dissolved solids concentrations in the area are lowest during the months of April through June when flows are highest and affected by the diluting effect of direct snowmelt. As flows decrease later in the year and the majority of the flow is derived from seepage out of local ground water systems, this dilution effect becomes less pronounced and concentrations tend to increase (see Figure 17).

According to Plate 3, surface water in the Skyline Property area is of a strong calcium-bicarbonate type, which agrees with the findings of Mundorff (1972). Magnesium concentrations tend to proportionately increase with lower flows, especially at the lower elevations (see the results of stations VC-6, VC-9, VC-10, SCR-2, and SCR-3). Total dissolved solids concentrations are relatively low throughout the general area, ranging from less than 100 milligrams per liter in the headwaters of Huntington Creek Basin during the high flow season (stations CS-8 and CS-10) to slightly greater than 500 milligrams per liter in Pleasant Valley Creek during low flow conditions (stations SCR-2 and SCR-3).

Question Raised By OSM:

1D. The correlation of flow duration curves, as shown in Appendix A-1, hydrology, page 22 is no longer an acceptable technique. Concurrent flow events are now correlated. A check should be made to see if this changes the results.

Response:

OSM recommended that a check be made to see if correlating concurrent flow events produced similar results to correlating flow duration curves in examining flow characteristics of Huntington Creek and Eccles Creek. Data used in this check are shown in Attachment A. The following information summarizes the results of this check.

Huntington Creek above Burnout Canyon

Regressions of concurrent flow events for nearby streams and Huntington Creek above Burnout Canyon for water years 1972 and 1973 show Oak Creek near Fairview to correlate best with Huntington Creek ($r^2 = 0.98$ for a linear regression). The resulting regression equation can be used to estimate Huntington Creek flows from the measured flows in Oak Creek. This equation is $Q_1 = 1.05Q_2 - 0.1$ where Q_1 is the predicted flow in Huntington Creek above Burnout Canyon in cubic feet per second, and Q_2 is the measured flow in Oak Creek in cubic feet per second. The minimum, mean, and maximum flows for Oak Creek for the 14 year period of published record (water years 1965 through 1978) are 1.1, 10.44, and 211 cubic feet per second respectively. Substituting these values in the equation predicts flows in Huntington Creek above Burnout Canyon of 1.1, 10.90, and 222 cubic feet per second for the minimum, mean, and maximum values for the corresponding 14 year period of record. The conclusion based on the flow duration curves of

Huntington Creek and the White River below Tabbyune Creek which are summarized in the original hydrology report are that flows in Huntington Creek above Burnout Canyon range from an occasional low of 0.6 cubic feet per second to an occasional high of about 200 cubic feet per second (with no return period specified). These values seem to be quite close, but slightly lower than the range of flows for a 14 year period using results of correlating concurrent flow events of Oak Creek and Huntington Creek. The average flow of 10.90 cubic feet per second predicted for Huntington Creek using this method is slightly less than the estimate of 12.84 cubic feet per second obtained using the flow duration curves. This new value converts to an average annual yield of 13.6 inches over the 6944 watershed. This value compares quite favorably with the 13.5 inches predicted by Grunsky's Formula and the 14.0 inches predicted by Ol'deKop's formula.

Eccles Creek above Pleasant Valley Creek

Regressions of concurrent flow events for nearby streams and the mouth of Eccles Creek were made. Fifteen concurrent flow measurements taken between January, 1976 and August, 1978 were available for comparison. The highest coefficient of determination ($r^2 = 0.85$) produced was for a linear relationship between Fish Creek above the Scofield Reservoir and Eccles Creek. Sinch Fish Creek has a small amount of stream regulation which would principally affect low flows (high flows are affected to a relatively small degree by the small amount of regulation present), an additional regression was performed after eliminating low flow events. The resulting equation had a moderately higher coefficient of determination ($r^2 = 0.93$) and is consequently considered to be more reliable in predicting Eccles Creek flows when these flows are near or above average. This equation is $Q_3 = 0.028 Q_4 + 3.15$ where Q_3 is the predicted flow of Eccles Creek in cubic feet per second, and Q_4 is the measured flow in Fish Creek in cubic feet per second. The minimum, mean, and maximum flows for Fish Creek during the 40 year period of published record (water years 1939 through 1978) are 0.6, 46.2 and 1160 cubic feet per second respectively. Substituting the mean and maximum values in the above equation predicts flows in Eccles Creek of 4.44 and 35.6 cubic feet per second for the mean and maximum values for the corresponding 40 year period of record. Minimum flows in Eccles Creek for this same period would have been at or near zero. The conclusions based on the flow duration curves of Eccles Creek and the White River which are summarized in the initial hydrology report are that the mean daily flows in Eccles Creek likely vary between 1 and 50 cubic feet per second (with the average flow being 5.43 cubic feet per second). These values seem to be quite close to those predicted using the method of correlating concurrent flow events although they are possibly a little bit higher.

ATTACHMENT A

Data Used For Correlating Concurrent Flow Events

VAUGHN HANSEN ASSOCIATES
CONSULTANTS/ENGINEERS

COMPUTED DGC CLIENT Coastal
CHECKED ________ PROJECT [illegible]
DATE 2/4/80 FEATURE Flows

1

FLOWS

DATE	VC-9	Fish Creek	Oak Creek	Gooseberry Creek	Beaver Creek (POOR FIT)	White River (POOR FIT)
1-26-76	4	14	2.7	5	1.7	6.8
3-9-76	1.4	14	2.5	4.2	2	8
4-28-76	4.3	31	6.6	11	3.7	51
6-14-76	3.7	48	9.8	21	3.2	19
8-2-76	2.4	13	2.6	5.4	.62	4.8
9-30-76	2.1	8.1	1.7	2.5	.4	4.4
10-27-76	3.5	8.1	1.7	2.8	.5	3.1
11-29-76	2.2	6.6	1.7	2	.07	.95
12-28-76	1.8	7	1.9	1.9	.07	1.7
3-19-77	3.5	5.5	2.0	2.5	.10	3.5
6-16-77	1.7	12	4.5	8.7	.07	1.5
5-10-78	5.0	90	30	31	3.6	125
6-14-78	11.3	282	67	149	5.6	64
7-12-78	3.4	38	7.3	16	.4	13
8-23-78	1.5	11	3.1	4.4	.5	3.4
10-25-78	3.2					
12-27-78	1.3					
2-28-79	2.1					
4-18-79	2.6					
5-11-79	5.2					
6-20-79	7.1					
8-23-79	2.4					
9-26-79	3.0					
10-31-79	1.7					
11-30-79	1.8					

Results of Regressions	Geometric r^2	Geometric a	Geometric b	Linear r^2	Linear a	Linear b	
VC-9 vs. Fish Creek	.60	.94	.40	$\boxed{.85}$	$\boxed{2.31}$	$\boxed{.033}$	
" vs. Gooseberry	.58	1.50	.36	.83	2.49	.061	
" vs. Oak Creek	.57	1.69	.39	.83	2.34	.133	
VC-9 vs. Fish Creek	.82	.78	.46	$\boxed{.93}$	$\boxed{3.15}$	$\boxed{.028}$	for Fish Creek Flows > 20 cfs
VC-9 vs. Gooseberry	.85	1.37	.41	.94	3.57	.052	for Gooseberry Flows > 10 cfs
VC-9 vs. Oak Creek	.72	1.91	.38	.86	3.23	.112	for Oak Creek Flows > 5 cfs

Water Years 1939-1978

Maximum Fish Creek Flow recorded = 1160 cfs
Mean " " " " = 46.2 cfs

Max. Predicted Eccles Creek flow for Water years 1939-1978 = 0.028(1160) + 3.15 = 35.6 cfs
Mean " " " " " " " " " = 0.028(46.2) + 3.15 = 4.44 cfs

Original Report compared regressions of Huntington Creek above Burnout Canyon vs. White River, Beaver Creek, Huntington Creek, Minnie Maud Creek, and Willow Creek for monthly flows. The best ($r^2 = .92$) fit was with the White River below Tabbyune Creek near Soldier Summit, Utah. A quick check showed that correlation of individual flow events with these same stations produced a significantly lower r^2. Oak Creek near Fairview produced an r^2 of .98 for daily flows during the 1972-1973 water years (which is the period of record for Huntington Creek above Burnout Canyon). Oak Creek was selected as the index station by which Huntington Creek flows were predicted.

The equation of the best fit line comparing concurrent flow events of Oak Creek and Huntington Creek is:

$$H.C. = 1.05(O.C.) - 0.1 \qquad (r^2 = .98)$$

The maximum flow for the 14 year period of record on Oak Creek is 211 cfs
The mean " " " " " " " " " " " " 10.44 cfs
The minimum " " " " " " " " " " " " 1.1 cfs

The maximum predicted flow for the same 14 year period on Huntington Creek = 1.05(211) - .1 = 222
The mean " " " " " " " " " " " = 1.05(10.44) - .1 = 10.9
The minimum " " " " " " " " " " " = 1.05(1.1) - .1 = 1.1 c

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

Vacation or Termination of Notice or Order

To the Following Permittee or Operator: Karry Frame

Coastal States Energy Co

Name Southern Utah Fuel Company; P.O. Box P; Sa

Mailing Address Salina Utah 84656

State Permit No. ACT/041/002

Under the authority of the Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87, 30 U.S.C. 1201), with respect to:

Notice of Violation No. N 79-5-5-2 ☐ Y ☐ TV dated May 10, 1979

Cessation Order No. C ______ ☐ Y ☐ TV dated ______, 19__

Violation No. 1 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection Oct 11, 1979.

Violation No. 2 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection of October 11, 1979.

Violation No. 4 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection of October 11, 1979.

Date of Service Feb 14 1980 Gary L Fritz

Signature of Authorized Representative

Time of Service or Mailing 11:45 ☒ a.m. ☐ p.m. Gary Fritz V-15

Name and I.D. No.

RECEIVED LEGAL DEPARTMENT

10208500 Oak Creek near Fairview, Utah

LOCATION.—Lat 39°40'26", long 111°24'30", in NW¼NE¼SW¼ sec.19, T.13 S., R.5 E., Sanpete County, on right bank 1.5 miles (2.4 km) upstream from mouth and 3.5 miles (5.6 km) northeast of Fairview.

DRAINAGE AREA.—11 sq mi (28 km^2), approximately.

PERIOD OF RECORD.—October 1964 to current year.

GAGE.—Water-stage recorder. Altitude of gage is 6,300 ft (1,920 m) from topographic map.

AVERAGE DISCHARGE.—9 years, 11.0 ft^3/s (0.312 m^3/s), 7,970 acre-ft/yr (9.83 hm^3/yr).

EXTREMES.—Current year: Maximum discharge, 262 ft^3/s (7.42 m^3/s) May 20 (gage height, 4.08 ft or 1.244 m); minimum, 0.85 ft^3/s (0.024 m^3/s) Nov. 22.
Period of record: Maximum discharge, 262 ft^3/s (7.42 m^3/s) May 20, 1973 (gage height, 4.08 ft or 1.244 m); minimum discharge, 0.9 ft^3/s (0.025 m^3/s) Mar. 19, 1965.

REMARKS.—Records good. No diversion or regulation above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	1.9	2.2	2.1	2.1	2.2	2.5	11	93	9.9	4.2	2.6
2	1.6	2.2	2.2	2.1	2.1	2.2	2.5	10	96	9.5	4.0	2.9
3	1.6	2.0	2.2	2.1	2.1	2.4	2.5	12	82	9.1	3.9	2.6
4	2.4	2.1	2.2	2.1	2.1	2.5	2.5	15	72	8.7	3.9	2.5
5	3.1	2.6	2.1	2.1	2.1	2.4	2.5	17	64	8.4	4.2	2.4
6	2.0	2.3	2.2	2.1	2.1	2.4	2.9	19	59	8.1	4.2	2.3
7	1.9	2.2	2.3	2.1	2.1	2.4	3.0	21	55	7.8	3.9	2.3
8	2.0	2.3	2.3	2.1	2.1	2.5	2.6	25	51	7.8	3.7	2.3
9	2.1	2.3	2.3	2.1	2.1	2.5	2.7	32	48	7.5	3.4	2.4
10	2.3	2.1	2.2	2.1	2.1	2.5	2.9	47	44	7.1	3.3	2.3
11	1.9	2.2	2.2	2.1	2.1	2.4	3.1	66	39	6.8	3.1	2.7
12	1.8	2.2	2.2	2.1	2.1	2.4	3.6	88	35	7.4	3.1	2.7
13	1.7	2.1	2.2	2.1	2.1	2.5	4.4	110	31	7.1	3.0	2.5
14	1.8	2.1	2.2	2.1	2.1	2.5	4.5	121	32	6.7	3.0	2.3
15	2.6	2.1	2.3	2.1	2.1	2.4	4.1	120	30	6.7	2.9	2.2
16	2.0	2.1	2.3	2.1	2.1	2.4	4.4	130	27	6.6	2.8	2.1
17	1.9	2.1	2.3	2.1	2.1	2.5	5.0	135	24	6.5	3.0	2.1
18	1.8	2.2	2.3	2.1	2.1	2.5	4.8	155	22	6.3	3.2	2.0
19	2.5	2.0	2.3	2.1	2.1	2.5	4.4	193	19	6.6	3.1	2.0
20	3.6	1.9	2.3	2.1	2.1	2.6	4.3	211	18	6.4	3.1	2.0
21	2.7	2.3	2.3	2.1	2.1	2.7	4.1	166	16	6.1	3.5	2.0
22	2.5	1.6	2.5	2.1	2.1	2.6	4.3	135	15	5.9	3.0	2.0
23	2.4	1.7	2.8	2.1	2.1	2.5	5.3	129	14	5.7	2.8	2.8
24	2.5	1.7	2.8	2.1	2.1	2.5	5.4	138	13	5.5	2.7	2.8
25	2.3	2.1	2.7	2.1	2.1	2.6	5.2	136	13	5.2	2.5	3.2
26	2.3	2.5	2.6	2.1	2.1	2.8	6.3	118	12	5.0	2.4	2.9
27	2.2	2.2	2.4	2.1	2.1	2.7	8.1	100	12	4.9	2.3	2.7
28	2.1	2.1	2.3	2.1	2.2	2.7	10	90	11	4.9	2.3	2.6
29	2.1	2.3	2.1	2.1	------	2.6	12	86	11	4.8	2.2	2.5
30	2.1	2.2	2.1	2.1	------	2.5	12	85	10	4.6	2.1	2.4
31	1.7	------	2.1	2.1	------	2.5	------	87	------	4.4	2.1	------
TOTAL	67.2	63.7	71.5	65.1	58.9	77.4	141.9	2,808	1,068	208.0	96.9	73.1
MEAN	2.17	2.12	2.31	2.10	2.10	2.50	4.73	90.6	35.6	6.71	3.13	2.44
MAX	3.6	2.6	2.8	2.1	2.2	2.8	12	211	96	9.9	4.2	3.2
MIN	1.6	1.6	2.1	2.1	2.1	2.2	2.5	10	10	4.4	2.1	2.0
AC-FT	133	126	142	129	117	154	281	5,570	2,120	413	192	145

CAL YR 1972 TOTAL 2,207.3 MEAN 6.03 MAX 48 MIN 1.4 AC-FT 4,380
WTR YR 1973 TOTAL 4,799.7 MEAN 13.1 MAX 211 MIN 1.6 AC-FT 9,520

PEAK DISCHARGE (BASE, 25 CFS).--May 20 (1900) 262 cfs (4.08 ft).

NOTE.--No gage-height record Dec. 22 to Feb. 20

10208500 Oak Creek near Fairview, Utah

LOCATION.—Lat 39°40'26", long 111°24'30", in NW¼NE¼SW¼ sec.19, T.13 S., R.5 E., Sanpete County, on right bank 1.5 miles upstream from mouth and 3.5 miles northeast of Fairview.

DRAINAGE AREA.—11 sq mi, approximately.

PERIOD OF RECORD.—October 1964 to current year.

GAGE.—Water-stage recorder. Altitude of gage is 6,300 ft (from topographic map).

AVERAGE DISCHARGE.—8 years, 10.7 cfs (7,750 acre-ft per year).

EXTREMES.—Current year: Maximum discharge, 52 cfs May 9 (gage height, 2.92 ft); minimum, 1.0 cfs Nov. 6.
Period of record: Maximum discharge, 208 cfs May 14, 1969 (gage height, 3.72 ft); maximum gage height, 3.79 ft June 5, 1968; minimum discharge, 0.9 cfs Mar. 19, 1965.

REMARKS.—Records good. No diversion or regulation above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.7	2.8	2.5	2.9	2.3	2.3	4.3	16	16	4.0	1.9	1.8
2	3.3	2.8	2.4	2.9	2.3	2.2	4.0	18	16	3.8	2.2	1.7
3	3.0	2.7	2.6	2.9	2.3	2.8	3.7	22	15	3.6	1.9	1.7
4	3.0	2.8	2.3	2.9	2.5	2.4	3.8	26	14	3.5	1.8	1.5
5	2.9	2.8	2.5	2.9	2.5	2.3	4.2	31	15	3.3	1.8	1.8
6	2.9	2.3	2.7	2.9	2.5	2.6	5.3	34	14	3.2	1.7	2.3
7	2.8	2.6	2.6	2.9	2.5	2.7	5.6	40	13	3.1	1.6	1.7
8	2.8	2.7	2.2	2.9	2.5	2.9	6.2	45	13	3.0	1.6	1.6
9	2.6	2.6	2.4	2.8	2.5	3.3	7.6	48	12	2.9	1.6	1.6
10	2.6	2.6	2.5	2.8	2.5	3.8	8.9	47	11	2.9	1.5	1.7
11	2.6	2.6	2.5	2.8	2.5	4.1	9.2	43	10	2.8	1.5	1.5
12	2.6	3.0	2.5	2.8	2.5	4.4	9.3	41	9.2	2.6	1.5	1.4
13	2.6	3.2	2.5	2.8	2.5	4.8	9.6	41	8.6	2.5	1.6	1.4
14	2.6	3.0	2.5	2.8	2.5	4.6	9.2	42	8.2	2.4	2.1	1.4
15	2.6	2.8	2.5	2.8	2.5	4.4	8.5	45	7.9	2.5	1.9	1.4
16	2.9	2.7	2.5	2.6	2.5	4.6	8.5	46	7.5	2.4	1.9	1.4
17	3.0	2.5	2.5	2.6	2.5	5.2	8.7	45	7.6	2.4	1.7	1.4
18	3.1	2.2	2.3	2.6	2.5	5.8	8.7	43	7.5	2.3	1.7	1.4
19	3.0	2.0	2.3	2.6	2.5	5.9	8.6	39	6.9	2.3	2.0	3.4
20	2.9	2.4	2.3	2.6	2.6	5.7	8.1	36	6.4	2.4	1.8	2.2
21	2.7	2.7	2.3	2.6	2.6	5.9	7.8	32	6.0	2.2	1.7	1.8
22	2.6	2.7	2.3	2.6	2.6	6.3	8.0	29	5.9	2.2	1.6	1.6
23	2.6	2.5	2.3	2.5	2.6	6.3	8.5	27	5.7	2.1	1.6	1.6
24	3.3	2.5	3.1	2.5	2.5	5.7	10	25	5.6	2.1	1.6	1.6
25	3.6	2.5	5.8	2.5	2.4	5.7	12	24	5.2	2.1	1.6	1.6
26	3.1	2.5	3.9	2.4	2.4	5.8	12	23	4.9	2.4	1.7	1.6
27	3.2	2.8	2.4	2.3	2.4	4.7	13	22	4.6	2.1	1.8	1.6
28	3.0	2.6	2.9	2.3	2.4	4.5	13	20	4.4	2.0	2.1	2.8
29	2.3	2.7	3.1	2.3	2.4	4.1	14	19	4.2	1.9	1.9	1.9
30	2.8	2.5	3.1	2.3	—	4.6	15	18	4.0	1.8	1.7	1.8
31	3.1	—	3.1	2.3	—	4.5	—	17	—	1.9	1.7	—
TOTAL	89.8	79.1	83.4	82.4	71.8	134.9	255.3	1,004	269.3	80.7	54.3	52.2
MEAN	2.90	2.64	2.69	2.66	2.48	4.35	8.51	32.4	8.98	2.60	1.75	1.74
MAX	3.7	3.2	5.8	2.9	2.6	6.3	15	48	16	4.0	2.2	3.4
MIN	2.3	2.0	2.2	2.3	2.3	2.2	3.7	16	4.0	1.8	1.5	1.4
AC-FT	178	157	165	163	142	268	506	1,990	534	160	108	104

CAL YR 1971 TOTAL 3,826.3 MEAN 10.5 MAX 126 MIN 2.0 AC-FT 7,590
WTR YR 1972 TOTAL 2,257.2 MEAN 6.17 MAX 48 MIN 1.4 AC-FT 4,480

PEAK DISCHARGE (BASE, 25 CFS).—May 9 (1700) 52 cfs (2.92 ft); May 15 (1800) 51 cfs (2.89 ft).

UTAH POWER & LIGHT COMPANY
STREAM DISCHA   RECORDS

STATION HUNTINGTON CREEK ABOVE BURNOUT CANYON
DATE OCT71-SEPT72

DAILY DISCHARGE (CFS)
MONTHS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.70	2.10	1.80	1.40	1.40	1.30	2.70	19.00	30.00	5.10	2.00	1.50
2	1.70	2.10	1.80	1.40	1.40	1.50	2.80	23.00	33.00	4.70	1.90	1.50
3	1.80	2.10	1.80	1.40	1.30	2.20	2.50	30.00	33.00	4.60	1.80	1.50
4	1.80	2.10	1.80	1.40	1.30	1.60	3.20	33.00	30.00	4.40	1.50	1.50
5	1.80	2.10	1.70	1.40	1.00	1.60	4.00	35.00	27.00	4.90	1.50	1.50
6	1.80	2.10	1.70	1.40	0.86	1.80	5.20	35.00	25.00	4.30	1.30	1.50
7	1.80	2.00	1.70	1.40	1.20	2.20	5.20	39.00	25.00	3.70	1.30	1.50
8	1.80	2.00	1.70	1.40	1.40	2.40	6.20	41.00	25.00	3.00	1.30	1.60
9	1.90	2.00	1.70	1.40	1.40	2.40	9.00	37.00	22.00	3.30	1.30	1.60
10	1.90	2.00	1.70	1.30	1.50	2.90	13.00	35.00	19.00	3.20	1.40	1.50
11	1.90	2.00	1.70	1.30	1.60	3.20	17.00	36.00	18.00	2.50	1.40	1.40
12	1.90	2.00	1.70	1.30	1.70	3.30	17.00	36.00	17.00	2.10	1.40	1.40
13	1.90	2.00	1.70	1.30	1.30	3.80	15.00	38.00	15.00	2.10	1.50	1.30
14	2.00	2.00	1.60	1.30	1.20	3.30	11.00	43.00	12.00	2.10	1.70	1.30
15	2.00	2.00	1.60	1.30	1.10	3.30	9.00	52.00	13.00	2.20	1.60	1.30
16	2.00	1.90	1.60	1.30	1.10	3.40	8.60	59.00	14.00	2.30	1.60	1.30
17	2.00	1.90	1.60	1.30	0.97	4.30	9.40	47.00	13.00	2.40	1.60	1.30
18	2.00	1.90	1.60	1.30	1.30	4.90	9.00	47.00	12.00	2.40	1.60	1.50
19	2.10	1.90	1.60	1.20	1.20	5.40	8.10	47.00	11.00	2.40	1.60	13.00
20	2.10	1.90	1.60	1.20	1.20	5.50	7.10	41.00	10.00	3.30	1.60	2.10
21	2.10	1.90	1.60	1.20	1.20	6.70	6.80	36.00	8.80	3.20	1.60	1.60
22	2.10	1.90	1.60	1.20	1.20	7.10	7.40	33.00	10.00	3.00	1.60	1.50
23	2.10	1.90	1.50	1.20	1.20	7.00	10.00	31.00	9.40	2.90	1.60	1.40
24	2.10	1.90	1.50	1.20	1.20	6.20	15.00	32.00	8.80	2.80	1.60	1.40
25	2.20	1.90	1.50	1.20	1.20	5.90	17.00	34.00	7.80	2.70	1.60	1.40
26	2.20	1.80	1.50	1.20	1.50	6.10	13.00	35.00	7.60	2.60	1.60	1.40
27	2.20	1.80	1.50	1.20	1.40	6.50	12.00	35.00	6.40	2.50	1.50	1.80
28	2.20	1.80	1.50	1.10	1.40	5.40	15.00	36.00	6.20	2.40	1.50	2.90
29	2.10	1.80	1.50	0.95	1.50	5.50	20.00	35.00	5.90	2.30	1.50	1.60
30	2.10	1.80	1.50	1.50	0.0	4.70	20.00	33.00	5.40	2.20	1.50	1.50
31	2.10	0.0	1.50	1.50	0.0	4.10	0.0	31.00	0.0	2.10	1.50	0.0

MONTHLY

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TOT	61.40	58.00	50.40	40.15	37.23	125.00	301.50	1144.00	485.30	94.30	48.00	57.60
MEA	1.98	1.95	1.63	1.30	1.28	4.03	10.0	36.9	16.2	3.04	1.55	1.92
MAX	2.20	2.10	1.80	1.50	1.70	7.10	20.00	59.00	33.00	5.10	2.00	13.00
MIN	1.70	1.80	1.50	0.95	0.86	1.30	2.70	19.00	5.40	2.10	1.30	1.30
ACR FT	122.00	116.00	100.00	80.00	74.00	248.00	598.00	2270.00	963.00	187.00	95.00	114.00

OCT71-SEPT72 TOTAL 2503.48 MEAN 6.84 MAX 59.00 MIN 0.86 TOT ACR FT 4970.00

TOTAL MEAN MAX MIN TOT ACR FT (4967)

MAX UNIT DISCHARGE 59.00 CFS DATE MAY 16 MIN UNIT DISCHARGE 0.0 CFS DATE JAN 29

REMARKS: NO GAGE HEIGHT RECORD OCT 1, 1971 - JULY 12, 1972.

UTAH POWER & LIGHT COMPANY
STREAM DISCHARGE RECORDS

STATION HUNTINGTON CREEK ABOVE BURNOUT CANYON
DATE OCT72-SEPT73

DAILY DISCHARGE (CFS)
MONTHS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.50	2.40	2.80	2.00	1.20	1.40	3.90	8.70	81.00	8.70	3.90	2.20
2	1.60	2.00	3.00	2.00	1.20	1.40	4.00	7.10	86.00	8.30	3.70	3.00
3	1.50	1.60	3.00	1.90	1.20	1.50	4.10	7.80	73.00	8.10	3.60	2.40
4	1.50	1.60	2.90	1.90	1.20	1.50	4.00	12.00	62.00	8.00	3.50	2.00
5	1.50	1.60	2.80	1.90	1.20	1.50	3.90	16.00	56.00	7.80	3.30	1.90
6	1.40	1.80	2.70	1.90	1.20	1.60	4.00	19.00	54.00	7.70	3.20	1.90
7	1.40	1.80	2.70	1.80	1.20	1.60	3.90	26.00	53.00	7.50	3.00	1.80
8	1.80	1.80	2.70	1.80	1.20	1.70	3.90	34.00	59.00	7.40	2.90	1.90
9	1.60	1.80	2.70	1.80	1.20	1.70	3.90	51.00	59.00	7.20	2.70	1.90
10	1.50	1.90	2.70	1.80	1.20	1.70	3.90	70.00	60.00	7.10	2.60	1.80
11	1.50	1.90	2.70	1.70	1.20	1.80	3.70	88.00	63.00	6.90	2.40	2.10
12	1.60	1.90	2.70	1.70	1.20	1.80	3.90	99.00	50.00	6.80	2.30	2.00
13	1.60	1.90	2.70	1.70	1.20	1.90	4.10	112.00	43.00	6.70	2.30	1.90
14	1.60	2.30	2.70	1.70	1.20	1.90	4.30	120.00	44.00	6.50	2.30	1.70
15	1.60	2.30	2.70	1.60	1.20	1.90	4.10	127.00	38.00	6.40	2.30	1.70
16	1.40	2.40	2.70	1.60	1.20	2.00	4.00	141.00	29.00	6.20	2.40	1.60
17	1.50	2.20	2.60	1.60	1.30	2.00	4.30	155.00	24.00	6.10	2.40	1.60
18	1.50	1.90	2.60	1.50	1.30	2.10	4.00	162.20	20.00	5.90	2.40	1.60
19	2.20	2.00	2.50	1.50	1.30	2.10	4.60	172.00	17.00	5.80	2.40	1.60
20	2.50	2.00	2.50	1.50	1.30	2.20	3.70	174.00	16.00	5.60	2.40	1.50
21	2.20	2.10	2.40	1.50	1.30	2.20	3.90	170.00	14.00	5.50	2.40	1.60
22	2.10	2.20	2.40	1.40	1.30	2.30	4.00	162.00	13.00	5.20	2.40	1.60
23	2.10	2.20	2.20	1.40	1.30	2.30	4.90	155.00	15.00	5.20	2.50	2.00
24	2.10	2.30	2.30	1.40	1.30	2.30	5.50	146.00	14.00	5.10	2.50	2.00
25	2.20	2.30	2.20	1.40	1.30	2.40	4.90	156.00	13.00	4.90	2.50	1.70
26	2.20	2.40	2.20	1.20	1.20	2.40	~~0.40~~	122.00	11.00	4.80	2.50	1.60
27	2.50	2.50	2.20	1.20	1.30	2.50	7.00	90.00	11.00	4.60	2.50	1.50
28	2.30	2.50	2.20	1.30	1.30	2.50	8.30	78.00	11.00	4.50	2.50	1.40
29	2.30	2.60	2.10	1.20	0.0	2.60	9.10	76.00	10.00	4.30	2.50	1.40
30	2.30	2.70	2.10	1.20	0.0	3.20	8.10	80.00	9.00	4.20	2.10	1.40
31	2.20	0.0	2.00	1.20	0.0	3.90	0.0	71.00	0.0	4.00	1.80	0.0

MONTHLY

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TOT	58.00	63.50	78.70	49.60	34.80	63.90	137.10	[illegible]	1096.00	193.10	82.70	54.90
MEA	1.87	2.12	2.54	1.60	1.24	2.06	4.57	92.90	36.60	6.23	2.67	1.83
MAX	2.50	2.70	3.00	2.00	1.30	3.90	[illegible]	174.00	86.00	8.70	3.90	3.00
MIN	1.40	1.60	2.00	1.20	1.20	1.40	0.40	7.10	9.00	4.00	1.80	1.40
ACR FT	115.00	126.00	156.00	98.00	69.00	127.00	272.00	5770.00	2180.00	383.00	104.00	109.00

OCT72-SEPT73 TOTAL 4122.90 MEAN [illegible] MAX 174.00 MIN 0.40 TOT ACR FT 9570.00

TOTAL MEAN MAX MIN TOT ACR FT 9569

MAX UNIT DISCHARGE 174.00 CFS (174.00 FT) DATE MAY 20. MIN UNIT DISCHARGE 0.40 CFS DATE APR 26

RE: Gage height effected by ice Oct. 26, 1972 to Oct. 30, 1972 and Nov. 4, 1972 to Dec. 15, 1972.
No gage height record from Dec. 16, 1972 to April 30, 1973 and from May 1, 1973 to May 31, 1973
and from June 11, 1973 to August 30, 1973.

Miscellaneous

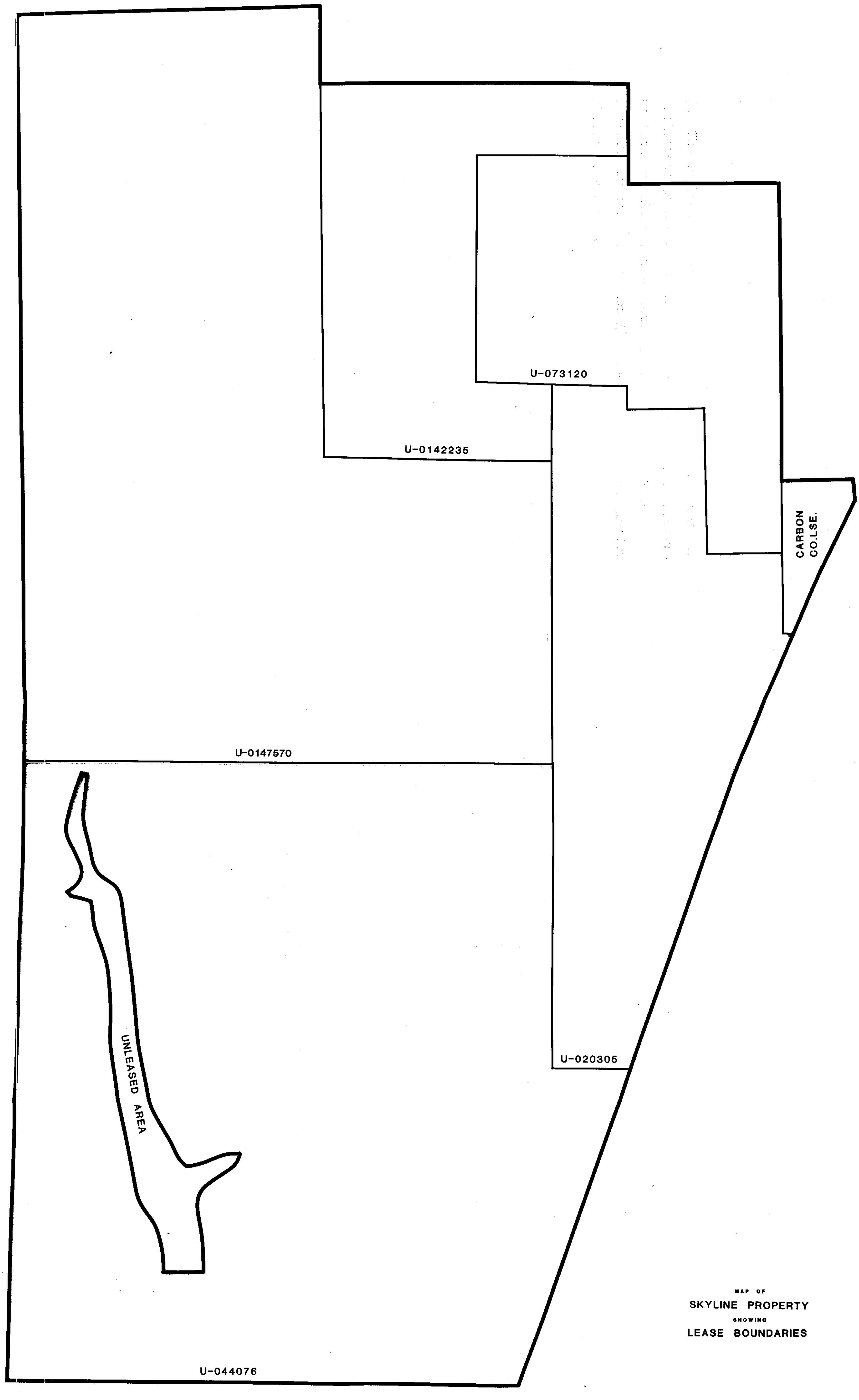
2. All plan type maps that show the property and drill hole locations or other exploration data should identify the boundaries of each Federal lease (211.20).

2. All plan type maps that show the property and drill hole locations or other exploration data should identify the boundaries of each Federal lease (211.20).

Response: The Applicant has prepared maps to overlay many of the maps previously submitted as a part of the Skyline Mine Plan. These overlays depict the boundaries of the portions of the Federal coal leases and Carbon County coal lease which leases comprise a major portion of the Skyline prospects.

The overlays are presented in two scales. The smaller map is presented as an Attachment to this response. The other is presented separately due to its size.

The Applicant can provide additional copies of these overlays, if requested.



MAP OF
SKYLINE PROPERTY
SHOWING
LEASE BOUNDARIES

Miscellaneous

3. The application indicated the owner has been cited for violations at another mine. However, the specific actions utilized to abate the violations listed has not been included in the application (782.14(c)). This information should be submitted.

Miscellaneous

3. The application indicated the owner has been cited by violation at another mine. However, the specifications utilized to abate the violations listed has not been included in the application (782.14(c)). This information should be submitted.

Response: Violations (1), (2), and (4) as described on page I-10 of the application have been terminated. Confirmation of these terminations is presented in the attached "Vacation Notice" dated February 14, 1980, signed by Authorized Representative Gary Fritz. The proposed actions to abate Violation (3) have been submitted to the Office of Surface Mining as a part of the Addendum to the Southern Utah Fuel Company Mine Plan filed with the appropriate agencies in October, 1979.

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

Vacation or Termination of Notice or Order

To the Following Permittee or Operator: Karry Frame

Coastal States Energy Co

Name Southern Utah Fuel Company, P.O. Box P, Sa

Mailing Address Salina Utah 84656

State Permit No. ACT/041/002

Under the authority of the Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87, 30 U.S.C. 1201), with respect to:

Notice of Violation No. N 79-5-5-2 ☐ ☐ dated May 10, 1979

Y T V

Cessation Order No. C ____ ☐ ☐ dated ____, 19__

Y T V

Violation No. 1 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection Oct 11, 1979.

Violation No. 2 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection of October 11, 1979.

Violation No. 4 is hereby ☒ Terminated ☐ Vacated because:

Violation abatement was confirmed by Ray Lewis's followup inspection of October 11, 1979.

Date of Service Feb 14 1980 Gary L Fritz

Signature of Authorized Representative

Time of Service or Mailing 11:45 ☒ a.m. ☐ p.m. Gary Fritz II-15

Name and I.D. No.

The items in the following section are responses to questions from agencies other than OSM. These responses do not, therefore, directly address omissions described in the Skyline Project apparent completeness review.

The following pages (2-66, 2-67, 2-68) are to replace the same pages in the previously filed plan.

2.11 SOILS

At each vegetation reference site (see Plant Community Map in Volume A-5, Appendices; Soils Report), a soil pit was excavated to the parent material layer. The exposed soil profile allowed for determination of information for classification of the soils into taxonomic units. The portal-yard and bypass access road areas were also sampled. Soils collected at the portal-yard validation sites were taken as a composite of the top six inches of the profile.

In addition to depth information obtained from the soil pit descriptions, there were 100 depth measurements along the transect areas and in the validation sites. These readings were obtained by observing the depth of penetration of a sharpened steel rod.

Soils were classified to family unit according to the system utilized for classification of soils by the Soil Conservation Service (Johnson, 1975). Use of this method will allow correlation of permit area soils at the series level when the Soil Conservation Service completes the current mapping effort of adjacent areas.

The data compiled on soils suggest that cryic temperature regimes are proper designations for this area. Cryic is typically conifer-aspen related, with some high meadows included. These areas are too cold for cultivation of crop plants by ordinary means. Frigid designation is given to soils typical of aspen-sagebrush types, and some crops can be grown. Most of the soils are in the udic (moisture arriving in summer) regimes.

All soils have textures ranging from sand loams to clay loams, and are considered neither unusual for the area in general nor for the vegetation types those soils support. The soils are not of a textural class that would be considered a problem either in disturbance or in reclamation activities. A comparison of spruce-fir and aspen soils, which as broad categories make up more than 80% of the permit area soils, shows that the pH and salinity measurements are probably normal for this climatic regime with the pH range from somewhat acidic to neutral for spruce-fir and aspen soils. There is a slight difference in soil reaction between spruce-fir (pH 5.0) and aspen (pH 6.0) soils, but this is also considered to be characteristic (i.e., evergreen conifer types for them to be more acidic than the deciduous forest of aspen).

Saline soil measured in the permit area, at reference site 2--aspen with an EC x 10^3 value of 1.88, is considered extremely low when compared to agricultural soils. A slight difference between soils is noted when depths are compared. The solum of aspen extends to an average depth of 20 inches from nine locations and to 18 inches at seven locations of the spruce-fir. This corresponds to the average depths of penetrometer readings in aspen of 19.9 inches and of 18.1 inches in spruce-fir soils.

It is also apparent that soils in aspen communities are more fertile in the commonly applied fertilizers, N, P, and K, and also in most micro-nutrients. The levels of Fe, Mg, and Mn are considered to be adequate for growth of native vegetation, even though somewhat below amounts reported for average soils in the western United States (Shacklette, et. al., 1971). Moderate amounts of Zn, Ca, and K indicate that adquate quantities of these minerals are present, except in sagebrush soils.

High amounts of Ca, especially in the B-horizon of spruce-fir soils, are not considered a problem in immobilization of P due to the acid pH for these soils. Concentrations of Ca in sagebrush and aspen soils could become a problem in P relations if soils are altered to become more basic. NO_3--nitrogen is low in quantity, as was expected for these soil types. Average amounts of NO_3--nitrogen are inadequate in all soils of the region and all horizons. All areas would respond to addition of nitrogen, as indicated by the low total nitrogen content from all vegetation types.

In summary, the most important fertilizer to be applied in reclamation attempts is nitrogen. The addition of nitrogen should be timed with suitable moisture content in the soils (fall and spring). If soil moisture is insufficient, then supplemental irrigation should be provided.

A soils map of the portal-yard area has been prepared (see Volume A-5, Appendices; Soils Report). The soils are classified by the vegetative type with which they are correlated, as recommended by the Soil Conservation

Service. Information from other areas to be disturbed can be extrapolated from the vegetative map and from the soil nomenclature assigned on the portal-yard area map.

The following page (4-16) is to replace the same page in the previously filed plan. The drawings (116-C and 116A-C) referred to on this page represent revised maps which incorporate design changes requested by the Utah State Division of Oil, Gas and Mineral Resources.

Report). Stability and the designated postmining land use will be achieved without extensive backfilling and therefore the mine site will not be returned to the original contours.

Reclamation Plan Drawings 116-C, 116A-C (Map 3-16, 3-16A) and Reclamation Section Drawing 118-C (Map 3 - 18) illustrate planned, final contours.

The cut slopes will be constructed in a manner which will achieve the necessary physical stability. This design will prevent slides and reduce other related erosional damage from occurring. Operational bench slopes will be reduced to the approximate original contour (2h:1v) upon abandonment, utilizing a bull-dozer working along the slopes.

Grading operations will be possible at the loadout site and on certain portions of the road and conveyor route. The loadout area will be returned to the approximate original contour.

4.4.3 Soil Stabilization

In addition to the vegetative stabilization discussed in Section 4.7 - VEGETATION PLAN, physical stabilization of the soil is also planned. The specific methods to be implemented will be defined on the basis of additional soil analyses. An example of the soil stabilization methodology that might be used includes the placement of crushed and heavier material at the toe of road fill slopes and along stream banks.

The following page (3-42) is to replace the same page in the previously filed plan. The drawing (113-C) incorporates design changes requested by the State of Utah Department of Social Services, Division of Health.

for the projected effluent volumes. Following aeration, the sewage effluent will be further clarified through the use of multi-media filters prior to pumping to the industrial water storage tank for reuse within the mine as process water. The sanitary sewage system has been designed to provide for 30-day water storage capacity during start-up (Drawing 113-C). The water, after testing, can either be recycled or disposed of at an approved disposal site. No sewage effluent, treated or otherwise, will be discharged into Eccles Creek. Oil and water separators will be used within the maintenance complex building for separation of oils from wash-down water. Skimmed oil will then be discharged to the waste oil storage tank for disposal. It is anticipated that waste oil will be pumped from the tank and sold to a waste oil dealer for refining. The remaining water will be discharged to the sewage treatment unit.

Mine drainage water, although not expected in large amounts, will normally be pumped to the industrial water storage tank for later reuse within the mine as process water. Quantities in excess of that necessary for this purpose will be discharged to the sedimentation pond for further clarification prior to discharge. Should the mine water drainage be either high or low pH or high in concentrations of heavy metals, treatment facilities will be provided to reduce these values to acceptable levels prior to discharge. Preliminary information indicates that this will not be necessary.

Water pollution control facilities for the railroad loadout and coal storage area at the mouth of Eccles Canyon consist of a sedimentation pond and a leach field for sewage effluent. All storm water run-off from the disturbed area will pass through the sediment pond. Run-off from the truck and train loadout facilities will be directed to the sedimentation pond (see Drawing 102-P). Effluent from the 50-person septic tank will be directed to a leach field with similar capacity (see Drawing 113-C).

3.2.7 Procedures for Construction Through Removal of Major Structures and Facilities

Mine Site Benches and Cut Slopes

Vegetation and topsoil will be removed prior to any earth work (see Section 4.6 - TOPSOIL AND SUBSOIL HANDLING PLAN). The two types of