

Groundwater Quality

Water quality samples were collected and analyzed for the three springs within and adjacent to the Soldier Canyon Mine lease area as an index to groundwater hydrologic conditions within the Flagstaff, North Horn, and Price River formations. In addition, a water quality sample was collected from water dripping from the ceiling within the mine to index the groundwater hydrologic conditions of the Blackhawk Formation. One additional water quality sample was collected and analyzed from groundwater encountered in an enclosed pit, dug at the mine train loadout facility near Sunnyside Junction, referred to hereafter as the "Banning Siding" sample (see Figure 1 for location).

Since no active coal exploration program is being conducted on the lease area, high cost relative to expected benefits precluded the drilling of observation wells in the area and the collection of reliable groundwater hydrology data therefrom. The cost of constructing and developing wells to obtain reliable data would have far exceeded the benefits derived therefrom considering the lack of groundwater use in the area, the absence of a significant groundwater aquifer, and the ability to obtain within the mine water quality data for the Blackhawk Formation. The three monitored springs account for nearly all groundwater use in the area.

All water samples were collected and preserved as previously outlined. The results of the chemical analyses for samples from springs, from within the mine, and from the pit at the train loadout site are presented in Attachment C.

Variability in groundwater quality in the geologic formations was analysed by comparing water quality constituents. Concentrations of the various constituents were relatively consistent between the Flagstaff and North Horn formations, with the groundwater from within these formations being primarily of a calcium-bicarbonate type (see figures 10 and 11). Groundwater in the Price River Formation is also strongly calcium-bicarbonate, but sulfate concentrations are much higher than those of the Flagstaff and North Horn formations.

According to the analysis of the sample taken from within the mine, the groundwater from the Blackhawk Formation is predominantly sodium-bicarbonate. The Blackhawk Formation is extremely discontinuous in nature; therefore the groundwater quality within the Blackhawk Formation itself is expected to be highly variable, as has been demonstrated at other locations within the Price River Basin (Vaughn Hansen Associates, December of 1979).

Phenol and total dissolved solids concentrations measured during the fall study period were the only constituents to exceed state water quality standards for the uses specified for water in the area of the Soldier Canyon Mine. None of the springs sampled exceeded state standards. The only sample to exceed state standards was taken from within the mine, having a phenol concentration of 0.012 milligrams per liter, and a total dissolved solids concentration of 1500 milligrams per liter which exceeds the state standard for Class 4 waters (1200 milligrams per liter).

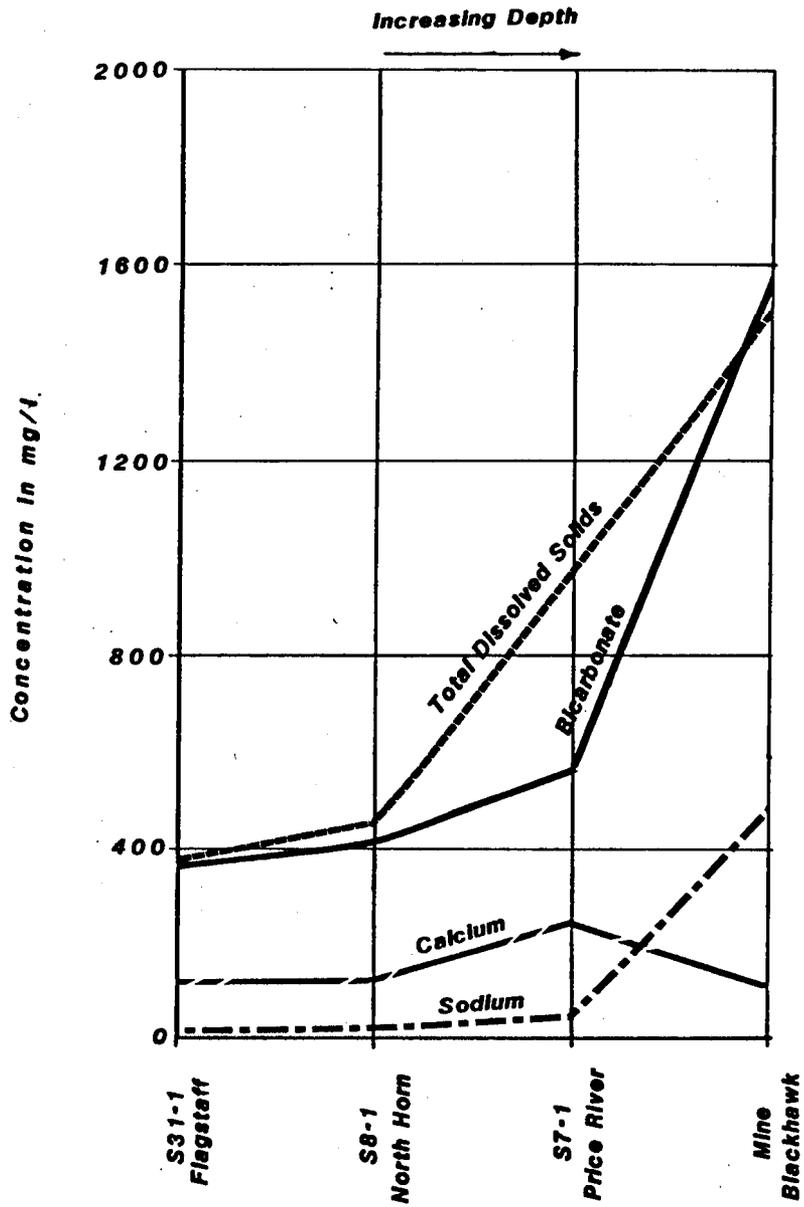


Figure 11. Comparison of water quality data collected from the springs and mine from the separate geologic formations within the Soldier Canyon Mine lease area.

Concentrations of other constituents sampled at stations throughout the vicinity of the Soldier Canyon Mine were quite low. In many cases, trace metal concentrations were consistently below the level of detection by routine laboratory techniques (particularly cadmium, lead, mercury, selenium, and silver).

Groundwater taken from the Banning Siding site at Sunnyside Junction was of a calcium-sulphate type. With the exception of the total dissolved solids concentration, no exceedances to state standards for water use in this area were detected. The total dissolved solids concentration at this site was measured at 2540 milligrams per liter, which exceeds the state standard for Class 4 waters (1200 milligrams per liter). However, the water quality from the Banning Siding site is of comparable quality to surface waters in the near vicinity. Total dissolved solids concentrations in Grassy Trail Creek at Sunnyside Junction have been measured in excess of 3500 milligrams per liter. Therefore, total dissolved solids concentrations naturally and significantly exceed state standards at this point.

Groundwater Monitoring Program

An ongoing groundwater monitoring program will be conducted at each of the springs shown in Figure 9. In addition, data will be collected from within the mine and from the Banning Siding sampling station at the mine train loadout facility.

As stated previously, the quality of water issuing from springs and seeps is representative of groundwater within the various geologic formations.

Groundwater usage in the area consists almost entirely of springs; therefore, because of the desire to monitor impacts from mining activities, the monitoring of springs on the site takes on added importance.

Although Soldier Creek near the Soldier Canyon Mine is accessible most of the year, such is not the case with springs. Therefore, water quality data will be collected once a year (during the month of August) from the springs noted in Figure 9. The collection of a sample in the early spring from springs may result in the inclusion of a significant amount of snowmelt runoff, whereas a later sample would not normally allow the collection of additional data before snowfall if unique and unexpected conditions are found. Each of the water quality samples will be analyzed as outlined by the comprehensive schedule of Table 1 or an approved abbreviated schedule.

Water quality samples will be collected quarterly from seepage near the working face of the mine and from the Banning Siding site at Sunnyside Junction. The sample taken during the month of August will be analyzed according to the schedule of Table 1. In addition to the annual comprehensive sample in August, water quality samples will be gathered from these two sites and analyzed during the months of November, February, and May throughout the period of mine operation. These samples will be analyzed in accordance with the parameters listed in the abbreviated list of Table 6.

An amendment to the existing NPDES discharge permit (as required by the regulatory agency) will be acquired to discharge water currently stored

within the mine. Monitoring of all discharges will be conducted in accordance with this permit.

As required, groundwater quality data collected from the lease area will be submitted to the Utah Division of Oil, Gas, and Mining within 60 to 90 days of the end of each quarter, depending upon the speed of laboratory analyses.

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ATTACHMENT A

Water Quality Analysis Methods

Table 7. Field methods used for the analysis of water quality samples.

Parameter	Units	Instrument
Flow	cfs	Marsh-McBirney current meter, float measurement, or volumetric measurement
Temperature	°C	Thermometer
pH	units	Beckman Model 1009 pH meter
Conductivity	micromhos/cm @ 25°C	Hydrolab TC-2 conductivity meter

Table 8. Laboratory methods used for the analysis of water quality samples, with standard reference page numbers.

Parameter	Unit	Method	1974 EPA Methods Page No.	14th Ed. Standard Methods Page No.
Acidity, as CaCO ₃	mg/l	Titration	1	273
Alkalinity, as CaCO ₃	mg/l	Manual or automated electrometric titration to pH 4.5, or automated method	3 5	278 ---
Ammonia, as N	mg/l	Manual distillation (at pH 9.5) followed by nesslerization, titration, electrode, automated phenolate	--- 159 165 168	410 412 --- ---
Arsenic	mg/l	Digestion followed by silver diethyldithiocarbamate, or atomic absorption	--- 9 95	285 283 159
BOD, 5-day	mg/l	Winkler (azide modification) or electrode method	--	543
Barium	mg/l	Digestion followed by atomic absorption or colorimetric	97	152
Bicarbonate	mg/l	Titration	278	--
Boron	mg/l	Colorimetric (Curcumin)	13	287
Cadmium	mg/l	Digestion followed by atomic absorption or colorimetric	101 ---	148 182
Calcium	mg/l	Digestion followed by atomic absorption or titration	103 ---	148 182

Table 8. Continued.

Parameter	Unit	Method	1974 EPA Methods Page No.	14th Ed. Standard Methods Page No.
Chloride	mg/l	Silver nitrate, mercuric nitrate, or automated colorimetric	---	303
			29	304
			31	613
Chromium, VI	mg/l	Extraction and atomic absorption, colorimetric	89	---
			105	192
Copper	mg/l	Digestion followed by atomic absorption or colorimetric	108	148
			---	196
Cyanide	mg/l	Distillation followed by silver nitrate titration or pyridine pyrazolone (or barbituric acid) colorimetric	40	361
Fluoride	mg/l	Distillation followed by ion electrode, SPANDS, or automated complexone	---	389
			65	391
			59	393
			61	164
Gross Alpha Radioactivity	pCi/l	Scintillation counter	--	641
Gross Beta Radioactivity	pCi/l	Scintillation counter	--	642
Iron	mg/l	Digestion followed by atomic absorption or colorimetric	110	148
			---	208
Lead	mg/l	Digestion followed by atomic absorption or colorimetric	112	148
			---	215

Table 8. Continued.

Parameter	Unit	Method	1974 EPA Methods Page No.	14th Ed. Standard Methods Page No.
MPN Fecal Coliform	MPN/100 ml	MPN procedure	--	922
MPN Total Coliform	MPN/100 ml	MPN procedure	--	922
Magnesium	mg/l	Digestion followed by atomic absorption or gravimetric	114 ---	148 221
Manganese	mg/l	Digestion followed by atomic absorption or colorimetric	116 ---	148 225
Mercury	mg/l	Flameless atomic absorption	118	156
Nitrate, as N	mg/l	Cadmium reduction, brucine sulfate, automated cadmium or hydrazine reduction	201 197 207	423 427 620
Oil & Grease	mg/l	Liquid extraction with freongravimetric	229	515
Phenol	mg/l	Colorimetric (4-AAP)	241	582
Phosphate, as P	mg/l	Manual or automated ascorbic acid reduction	249 256	481 624
Potassium	mg/l	Digestion followed by atomic absorption, colorimetric or flame photometric	143 --- ---	--- 235 234
Selenium	mg/l	Digestion followed by atomic absorption	145	159
Silver	mg/l	Digestion followed by atomic absorption or colorimetric	146	148

Table 8. Continued.

Parameter	Unit	Method	1974 EPA Methods Page No.	14th Ed. Standard Methods Page No.
Sodium	mg/l	Digestion followed by atomic absorption, flame photometric	147 ---	--- 250
Sulfate	mg/l	Gravimetric, turbidimetric, or automated colorimetric	--- 277, 279	493 496
Suspended Solids	mg/l	Glass fiber filtration, 105°C	268	94
Total Suspended Solids	mg/l	Glass fiber filtration, 180°C	266	92
Total Organic Carbon	mg/l	Combustion - infrared	236	532
Turbidity	NTU	Nephelometric	295	132
Zinc	mg/l	Digestion followed by atomic absorption or colorimetric	155 ---	148 265

ATTACHMENT B

Results of Surface Water

Quality Analysis

Table 9. Results of chemical analyses of surface water quality samples collected by Vaugh Hansen Associates.

Station Number		Lower Soldier	Lower Soldier	18-2	18-1	E-22	E-22
Parameter	Units	4-10-79	6-21-79	9-26-79	9-26-79	4-10-79	6-21-79
FIELD MEASUREMENTS							
Discharge	cfs	11.1	12.0	1.2	1.2	10.7	13.0
Dissolved Oxygen	mg/l		9.8				10.8
pH	units	7.88	8.0	7.6	7.60	7.93	8.0
Specific Conductance	umhos/cm @ 25° C	740	780	840	830	570	620
Temperature, Air	°C	0.0	12.0			0.0	13.0
Temperature, Water	°C		6.0	13.0	13.0		6.0
LABORATORY MEASUREMENTS							
Acidity, as CaCO ₃	mg/l			22.0	18.0		
Alkalinity, as CaCO ₃	mg/l	266.0	292.0	310.0	284.0	260.0	302.0
Ammonia, NH ₃ , as N	mg/l						
Arsenic, Total	mg/l			0.002	0.002		
Arsenic, Dissolved	mg/l						
Barium, Total	mg/l			0.130	0.120		
Barium, Dissolved	mg/l						
Beryllium, Dissolved	mg/l						
Bicarbonate	mg/l	324.52	356.24	378.20	346.48	317.20	368.44
Boron, Total	mg/l			0.160	0.180		
Boron, Dissolved	mg/l						
Cadmium, Total	mg/l			<0.001	<0.001		
Cadmium, Dissolved	mg/l						
Calcium	mg/l	60.0	56.80	104.00	88.00	45.60	55.20
Chloride	mg/l	12.0	12.0	16.0	12.0	8.0	8.0
Chromium, Total	mg/l			<0.001	<0.001		
Chromium, Dissolved	mg/l						
Cobalt, Dissolved	mg/l						
Copper, Total	mg/l			<0.001	0.002		
Copper, Dissolved	mg/l						
Cyanide	mg/l						
Fluoride	mg/l			0.38	0.39		
Germanium, Dissolved	mg/l						
Gross Alpha Radioactivity	pCi/l						
Gross Beta Radioactivity	pCi/l						
Iron, Total	mg/l			0.37	0.19		
Iron, Dissolved	mg/l			0.020	<0.010		
Lead, Total	mg/l			<0.001	<0.001		
Lead, Dissolved	mg/l						
Magnesium	mg/l	39.36	45.60	9.60	19.20	32.16	36.48
Manganese, Total	mg/l			0.023	0.012		
Manganese, Dissolved	mg/l						
Mercury, Total	mg/l			<0.0002	<0.0002		
Mercury, Dissolved	mg/l						
Nitrate, NO ₃ , as N	mg/l			0.04	<0.01		
Oil and Grease	mg/l			1.4	<1.0		
Phenol	mg/l				0.026		
Phosphate, PO ₄ , as P Ortho	mg/l			0.15	0.100		
Potassium	mg/l	2.20	1.929	2.762	2.318	1.300	1.189
Selenium, Total	mg/l			0.002	0.003		
Selenium, Dissolved	mg/l						
Silica, as SiO ₂	mg/l						
Silver, Total	mg/l			<0.001	<0.001		
Silver, Dissolved	mg/l						
Sodium	mg/l		39.40	84.20	80.80	53.00	34.71
Sulfate	mg/l	150.0	109.0	143.0	160.0	72.0	52.0
Suspended Solids	mg/l	1644.0	1.0	17.0	6.5	1113.0	6.0
Total Dissolved Solids	mg/l	480.0	442.0	542.0	538.0	374.0	379.0
Total Organic Carbon	mg/l						
Turbidity	FTU	250				200	
Zinc, Total	mg/l			0.005	0.003		
Zinc, Dissolved	mg/l						

Table 10. Results of chemical analyses of surface water quality samples collected at Station E-22 (Data obtained from Anderson, 1979).

Station Number		E-22						
Parameter	Units	7-21-76	8-25-76	5-18-77	8-18-77	4-13-78	8-2-78	10-19-78
FIELD MEASUREMENTS								
Discharge	cfs	0.16	0.15	0.40	0.01	3.7	0.29	0.25
Dissolved Oxygen	mg/l	7.5	9.0					
pH	units	8.4				8.35	8.7	8.65
Specific Conductance	umhos/cm @ 25° C	700	1060	850	780	635	633	785
Temperature, Air	°C	22.0	22.0	6.2	18.3	11.0	22.0	17.0
Temperature, Water	°C	16.0	16.0	11.3	15.5	0.0	19.0	13.0
LABORATORY MEASUREMENTS								
Acidity, as CaCO ₃	mg/l							
Alkalinity, as CaCO ₃	mg/l							
Ammonia, NH ₃ as N	mg/l		0.78	0.40	0.05	0.22	<0.01	0.10
Arsenic, Total	mg/l							
Arsenic, Dissolved	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium, Total	mg/l							
Barium, Dissolved	mg/l		0.021	0.094	0.062	0.010	0.140	0.100
Beryllium, Dissolved	mg/l		<0.001	0.003	<0.001	0.005	0.011	0.005
Bicarbonate	mg/l	332.0	368.4	478.2	414.8	307.4	388.0	458.7
Boron, Total	mg/l							
Boron, Dissolved	mg/l	0.080	<0.001	0.034	0.022	0.123	0.020	0.180
Cadmium, Total	mg/l							
Cadmium, Dissolved	mg/l		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/l	43.0	28.9	29.4	32.0	38.4	32.0	26.4
Chloride	mg/l	12.0	14.0	16.0	12.0	10.0	12.0	16.0
Chromium, Total	mg/l							
Chromium, Dissolved	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Dissolved	mg/l		0.011	0.009	<0.001	<0.001	0.009	<0.001
Copper, Total	mg/l							
Copper, Dissolved	mg/l		0.012	0.008	0.003	0.012	0.009	0.004
Cyanide	mg/l				<0.001	<0.010	<0.010	0.020
Fluoride	mg/l	0.4	0.5	0.62	0.37	0.58	0.49	0.45
Germanium, Dissolved	mg/l		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gross Alpha Radioactivity	pCi/l		<3.5			3.7	4.4	3.7
Gross Beta Radioactivity	pCi/l		<1.5			12.0	12.0	11.0
Iron, Total	mg/l							
Iron, Dissolved	mg/l	0.010	0.197	0.385	0.076	0.110	0.037	0.045
Lead, Total	mg/l							
Lead, Dissolved	mg/l	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/l	35.0	30.2	61.9	34.6	28.8	37.4	44.2
Manganese, Total	mg/l							
Manganese, Dissolved	mg/l		0.014	0.119	0.009	0.018	0.018	0.048
Mercury, Total	mg/l							
Mercury, Dissolved	mg/l	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nitrate, NO ₃ as N	mg/l	0.11	0.04	0.14	0.12	0.20	0.02	0.02
Oil and Grease	mg/l		<1.0	<1.0	1.2	2.6	2.4	<1.0
Phenol	mg/l							
Phosphate, PO ₄ as P Ortho	mg/l	0.01	0.085	0.260	0.020	0.020	0.023	0.065
Potassium	mg/l	2.5	4.1	2.3	3.8	1.8	1.4	1.9
Selenium, Total	mg/l							
Selenium, Dissolved	mg/l	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Silica, as SiO ₂	mg/l	8.2	12.1	28.5	8.15	6.5	7.6	8.0
Silver, Total	mg/l							
Silver, Dissolved	mg/l	0.008	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium	mg/l	64.0	118.0	134.4	112.0	95.2	71.1	110.0
Sulfate	mg/l	90.0	130.0	190.0	114.0	72.0	67.0	92.0
Suspended Solids	mg/l				12.0	968.0	11.0	1.0
Total Dissolved Solids	mg/l	421.0	690.0	860.0			412.0	512.0
Total Organic Carbon	mg/l		10.0	29.0	14.0	10.0	6.0	17.0
Turbidity	FTU							
Zinc, Total	mg/l							
Zinc, Dissolved	mg/l	0.000	0.050	0.014	0.007	0.061	0.021	0.003

Table 11. Results of chemical analyses of surface water quality samples collected by the U.S. Geological Survey (1978, 1979).

Station Number		18-2	18-2	18-2	18-2	18-1
Parameter	Units	7-21-76	8-16-78	10-20-78	11-17-78	7-21-76
FIELD MEASUREMENTS						
Discharge	cfs	0.37	0.45	0.35	0.66	0.46
Dissolved Oxygen	mg/l		7.6	9.2	10.8	
pH	units	8.4	8.6	8.6	8.4	8.4
Specific Conductance	umhos/cm @ 25° C	740	764	900	990	700
Temperature, Air	°C		25.0	11.0	-5.5	
Temperature, Water	°C	21.5	17.0	7.0	0.0	22.5
LABORATORY MEASUREMENTS						
Acidity, as CaCO ₃	mg/l					
Alkalinity, as CaCO ₃	mg/l		340.0	360.0	370.0	
Ammonia, NH ₃ as N	mg/l					
Arsenic, Total	mg/l					
Arsenic, Dissolved	mg/l		0.002		0.002	
Barium, Total	mg/l					
Barium, Dissolved	mg/l					
Beryllium, Dissolved	mg/l					
Bicarbonate	mg/l	337.0	358.0	402.0	448.0	332.0
Boron, Total	mg/l					
Boron, Dissolved	mg/l	0.10	0.10		0.11	0.08
Cadmium, Total	mg/l					
Cadmium, Dissolved	mg/l					
Calcium	mg/l	32.0	51.0	56.0	54.0	43.0
Chloride	mg/l	11.0	12.0	15.0	16.0	12.0
Chromium, Total	mg/l					
Chromium, Dissolved	mg/l					
Cobalt, Dissolved	mg/l					
Copper, Total	mg/l					
Copper, Dissolved	mg/l					
Cyanide	mg/l					
Fluoride	mg/l	0.40	0.40		0.40	0.40
Germanium, Dissolved	mg/l					
Gross Alpha Radioactivity	pCi/l					
Gross Beta Radioactivity	pCi/l					
Iron, Total	mg/l					
Iron, Dissolved	mg/l		0.01		0.01	
Lead, Total	mg/l					
Lead, Dissolved	mg/l		0.18		0.0	
Magnesium	mg/l	41.0	47.0	51.0	49.0	35.0
Manganese, Total	mg/l					
Manganese, Dissolved	mg/l		0.04		0.04	
Mercury, Total	mg/l					
Mercury, Dissolved	mg/l					
Nitrate, NO ₃ as N	mg/l					
Oil and Grease	mg/l		0.0		0.0	
Phenol	mg/l		0.0		0.0	
Phosphate, PO ₄ as P Ortho	mg/l		0.00		0.03	
Potassium	mg/l	3.5	3.3	3.4	2.8	2.5
Selenium, Total	mg/l					
Selenium, Dissolved	mg/l		0.001		0.003	
Silica, as SiO ₂	mg/l					
Silver, Total	mg/l					
Silver, Dissolved	mg/l					
Sodium	mg/l	66.0	70.0	90.0	91.0	64.0
Sulfate	mg/l	98.0	110.0	150.0	180.0	90.0
Suspended Solids	mg/l					
Total Dissolved Solids	mg/l	443.0	506.0	590.0	627.0	421.0
Total Organic Carbon	mg/l					
Turbidity	FTU					
Zinc, Total	mg/l					
Zinc, Dissolved	mg/l		0.003		0.01	

ATTACHMENT C

Results of Groundwater
Quality Analysis

Table 12. Results of the chemical analyses of water quality samples collected from springs, within the mine, and at the Banning Siding site at Sunnyside Junction during the fall study period.

Station Number		7-1	8-1	31-1	Mine	Banning Siding
Parameter	Units	9-26-79	9-26-79	9-26-79	9-26-79	10-10-79
FIELD MEASUREMENTS						
Discharge	gpm	<1.0	2.0	2.0	<1.0	
Dissolved Oxygen	mg/l					7.20
pH	units	7.6	7.4	7.10	7.20	7.20
Specific Conductance	umhos/cm @ 25° C	1480	700	600	2300	3900
Temperature, Air	°C					
Temperature, Water	°C	12.0	13.0	11.0	16.0	13.0
LABORATORY MEASUREMENTS						
Acidity, as CaCO ₃	mg/l	46.0	32.0	28.0	78.0	42.0
Alkalinity, as CaCO ₃	mg/l	460.0	340.0	300.0	1296.0	354.0
Ammonia, NH ₃ as N	mg/l					
Arsenic, Total	mg/l	0.001	<0.001	<0.001	<0.001	0.002
Arsenic, Dissolved	mg/l					
Barium, Total	mg/l	0.090	0.160	0.120	7.530	0.095
Barium, Dissolved	mg/l					
Beryllium, Dissolved	mg/l					
Bicarbonate	mg/l	561.20	414.80	366.00	1581.12	431.88
Boron, Total	mg/l	0.080	0.090	0.060	1.400	0.950
Boron, Dissolved	mg/l					
Cadmium, Total	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium, Dissolved	mg/l					
Calcium	mg/l	243.20	124.00	120.00	116.00	576.00
Chloride	mg/l	12.0	6.0	8.0	72.0	108.0
Chromium, Total	mg/l	0.002	<0.001	<0.001	<0.001	<0.001
Chromium, Dissolved	mg/l					
Cobalt, Dissolved	mg/l					
Copper, Total	mg/l	0.010	0.005	0.012	0.005	0.076
Copper, Dissolved	mg/l					
Cyanide	mg/l					
Fluoride	mg/l	0.40	0.29	0.27	1.27	0.12
Germanium, Dissolved	mg/l					
Gross Alpha Radioactivity	pCi/l					
Gross Beta Radioactivity	pCi/l					
Iron, Total	mg/l	0.580	5.850	0.310	0.100	0.560
Iron, Dissolved	mg/l	0.020	0.010	0.030	<0.010	0.113
Lead, Total	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead, Dissolved	mg/l					
Magnesium	mg/l	32.0	16.80	7.20	9.60	16.80
Manganese, Total	mg/l	7.680	0.030	0.130	0.021	0.590
Manganese, Dissolved	mg/l					
Mercury, Total	mg/l	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercury, Dissolved	mg/l					
Nitrate, NO ₃ as N	mg/l		0.06	0.09	<0.01	0.07
Oil and Grease	mg/l	1.4	<1.0	1.2	<1.0	3.0
Phenol	mg/l	<0.001		<0.001	0.12	0.002
Phosphate, PO ₄ as P Ortho	mg/l		0.08	0.060	0.060	0.040
Potassium	mg/l	3.847	1.240	1.161	23.400	3.990
Selenium, Total	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Dissolved	mg/l					
Silica, as SiO ₂	mg/l					
Silver, Total	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Silver, Dissolved	mg/l					
Sodium	mg/l	44.83	19.02	12.62	464.00	210.00
Sulfate	mg/l	350.0	76.0	52.0	3.0	1410.0
Suspended Solids	mg/l					
Total Dissolved Solids	mg/l	969.0	458.0	386.0	1500.0	2540.0
Total Organic Carbon	mg/l					
Turbidity	FTU					
Zinc, Total	mg/l	0.011	0.009	0.004	0.006	0.021
Zinc, Dissolved	mg/l					

CHAPTER VIII

"SOIL RESOURCES"

Chapter VIII

Soil Resources

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8.1 SCOPE

This chapter examines soil resources and their characteristics within the mine permit area of the Soldier Canyon Mine.

8.2 METHODOLOGY

The information included in this chapter has been compiled from past investigations with specific soil information acquired from a Soil Conservation Service Study.

8.3 GENERAL

Soils on the coal lease area consist of three associations: Badland-Rockland Association; Argic Cryoborolls-Pachic Cryoborolls-Cryic Paleborolls Association; and Typic Argiborolls-Lithic Argiborolls-Typic Haploborolls Association.

Badland-Rockland Association consists of mostly bare rock outcrop, but also includes some shallow soils over bedrock. The shallow soils are on benches or mesas where the topography is undulating to rolling. The relief is steep to very steeply dissected escarpments and breaks along canyons. Runoff is rapid to very rapid and sediment production is very high. Control of soil loss and the resultant heavy sediment production is a major problem.

Argic-Cryoborolls-Pachic Cryoborolls-Cryic Paleborolls Association consists of dark gray and brown silt loams, clay loams,

cobbly in places. The soils in the association are moderately well to somewhat excessively drained. Permeability is slow to rapid. Runoff is medium to slow and sediment production is moderately low. The topography ranges from rolling to very steep.

Typic Argiborolls-Lithic Argiborolls-Typic Haploborolls Association occurs in the northernmost extent of the leases. The slopes are steep to very steep. This soil is neutral to moderately alkaline, and of silty clay with slow to moderate permeability. Runoff is medium to rapid and sediment production is low.

Lying below the coal leases, in the area of future access and surface facilities are two other major soil associations, Castle Valley-Kenilworth and Chpeta-Persayo, with minor occurrences of Ravola-Billings-Penoyer and Sanpete-Minchey.

Castle Valley-Kenilworth Association consists of shallow, very calcareous, well-drained, stony, moderately to coarsely textured, sloping to steep soils on upland benches and old, dissected outwash-plains. These soils have formed from weathering sandstone and shales of the Mesaverde group. A typical profile: The surface is brown to pale brown, very calcareous, stony to sandy loam about 7 inches thick. The subsoil is gravelly, very fine, sandy loam, very calcareous and can contain 47⁰ to 54⁰ F and the frost-free season is 110 to 160 days. In a typical profile the upper 1 to 5 inches is light brownish clay and

silty loam. The underlying material is silty, clay loam, often with a saline and/or gypsiferous layer. Bedrock is 12 to 17 inches from the surface.

Ravola-Billings-Penoyer Association consists of nearly level to gently sloping, deep, well-drained and moderately well-drained medium-textured and moderately fine-textured soils on alluvial fans and flood plains and in alluvial valleys.

Sanpete-Minchey Association consists of gently sloping, deep, well-drained, medium-textured to moderately fine-textured soils over gravel on mesas, benches and old alluvial fans.

8.3 SOIL RESOURCE INFORMATION

8.3.1 - 8.3.3

Soil resource information is provided at the end of this chapter, including a soils resource map in appendix at the end of this report.

The soils information was provided by the Soils Conservation Service of Price, Utah.

8.4 PRIME FARMLAND INVESTIGATION AND DETERMINATION

The affected area encompassing surface operations and facilities of the Soldier Canyon Mine can be justified as not being prime farmland.

Historically, land in the area has not been used as cropland. The rocky character of the landscape in the mine area, accompanied with steep canyon walls, would make farming difficult if not unrealistic within the mine permit area.

8.5 PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

For soils investigation see Rollins, Brown, and Gunnell's report in appendix.

8.6 USE OF OVERBURDEN MATERIALS OR SUBSTITUTES

Although existing soils may be presently and potentially productive, the landscape characteristics of the mine permit area limit their alternative uses. The steep inclines of the area make runoff sometimes a problem. The runoff concern is adequately handled with a control plan previously approved. The letter granting this approval is included at the end of this chapter.

For more information see Rollins, Brown, and Gunnell report figure No.'s 2 and 3 located in the appendix of this chapter.

8.7 PLANS FOR REMOVAL, STORAGE AND PROTECTION OF SOILS

At present, no plans are made to disturb topsoil or subsoil of the mine permit area. If any disturbances are necessary in the future, adequate measures will be taken to assure that soils are carefully removed, stored, and redistributed to keep contamination

and total disturbance at the lowest possible minimum.

For more information see Chapter III - Reclamation.

8.8 PLANS FOR SOIL REDISTRIBUTION

In addition to the information given in section 8.7, additional steps will be taken to assure effective and proper redistribution of soils as to assure adequate environmental protection performance.

When impractical to immediately redistribute disturbed soils, these materials will be stockpiled at a selective place where they will be protected from disturbances, human or natural.

Redistributed soils shall be carefully graded to a configuration resembling as closely as possible the area's original contours. In addition, any nutrient deficiencies detected through careful testing shall be amended by the application of those nutrients necessary to redistributed soils.

The objective of Soldier Creek Coal Company's plans for soil removal, storage, and redistribution shall be minimal soil disturbance with care taken to avoid environmental harm while encouraging an environment that supports the desired post-mining land use.

8.9 NUTRIENTS AND SOIL AMENDMENTS

See Part 8.8.

8.10 EFFECTS OF MINING

With prior approved plans and the control methods mentioned above concerning soil removal, storage, redistribution, and soil nutrient amendments, the detrimental effects of mining operations on soils resources will be negligible.

8.11 MITIGATION AND CONTROL PLANS

By carefully following the guidelines and procedures outlined in this chapter, the environmental protection standards set forth by the division concerning soil resources shall be attained and adhered to.

8.12 INFORMATION SOURCES

United States Government
Department of the Agriculture
Soil Conservation Service
Price, Utah, Office

Soils Investigation of May 26, 1977
Rollins, Brown and Gunnell
Provo, Utah

8.13 MAPS

All maps are located in the appendix.

SOIL RESOURCE INFORMATION

OPF--BENTEEN-DECROSS VARIANT COMPLEX, 15 TO 40 PERCENT SLOPES

This map unit is on north, east and west facing mountain sideslopes. It is located in the Book Cliffs and Roan Cliffs north of Price and east of Sunnyside. The present vegetation is mainly aspen, white fir and Douglas-fir. Elevation is 7,500 to 9,500 feet. The average annual precipitation is about 20 to 30 inches, the mean annual air temperature is less than 38 degrees F, and the average freeze-free season is less than 60 days.

This unit is 50 percent Benteen loam, clayey substratum, 15 to 40 percent slopes, 30 percent Decross Variant fine sandy loam, 15 to 35 percent slopes, and 20 percent other soils. The Benteen loam, clayey substratum soil is on even nonstony sideslopes, the Decross Variant soil is on steep stony sideslopes and in drainageways and concave slope positions.

Included in this unit is about 10 percent of a soil similar to Benteen loam, 15 to 40 percent slopes except that it is deep; 5 percent Podo loam, high rainfall, 3 to 30 percent slopes on canyon rims; 5 percent Pino silty clay loam, 3 to 30 percent slopes on small sagebrush parks.

The Benteen loam, clayey substratum soil is moderately deep and moderately well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale of the Green River Formation. Slopes are long in length and single to concave in shape.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs and needles about 1 inches thick. The surface layer is very dark grayish brown loam and grayish brown silt loam about 10 inches thick. The subsoil is grayish brown silty clay loam about 6 inches thick. The substratum is light brownish gray silty clay about 8 inches thick over calcareous sandstone. Depth to sandstone ranges from 20 to 40 inches. Olive yellow common fine mottles are at a depth of 16 inches.

Permeability of the Benteen clayey substratum soil is moderate to a depth of 10 inches and moderately slow below this depth. Available water capacity, to a depth of 23 inches, is about 3.5 to 4.0 inches. Water supplying capacity is 11 to 18 inches. The organic matter content of the surface layer is 5 to 10 percent. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Decross Variant soil is deep and well drained. It formed in colluvium derived dominantly from sandstone, siltstone and shale. Slopes are 15 to 35 percent. Slopes are medium to long in length and concave in shape.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs and needles about 1 inch thick. The surface layer is dark grayish brown fine sandy loam about 3 inches thick. The upper 16 inches of the subsoil is dark grayish brown loam or silt loam. The lower 5 inches is dark grayish brown gravelly silt loam. The substratum to a depth of 55 inches or more is grayish brown and pale brown gravelly silt loam and very channery fine sandy loam. Depth to calcareous shale ranges from 40 to 60 inches.

Permeability of the Decross Variant is moderate. Available water capacity, to a depth of 55 inches, is about 6.0 to 8.0 inches. Water supplying capacity is 11 to 18 inches. The organic matter content of the surface layer is 5 to 10 percent. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for rangeland, wildlife habitat and recreation.

The Benteen loam, clayey substratum soils are in capability subclass VIIe, nonirrigated and Decross Variant is in capability subclass VIe, nonirrigated.

BENTEEN SERIES

These soils are classified as fine-loamy, mixed Argic Pachic Cryoborolls.

The Benteen series consists of moderately deep, well drained, and moderately permeable soils that formed in residuum derived dominantly from limestone or sandstone.

These soils are on mountain and ridge sideslopes and benches at elevations of 7,200 to 10,100 feet. Slope ranges from 1 to 50 percent. The average annual precipitation ranges from 20 to 30 inches, and the mean annual air temperature is less than 38 degrees F.

They are near the Teton, Adel, and Decross soils. Teton, Adel soils lack a layer of clay accumulation. Decross soils have sandstone at 40 to 60 inches.

A typical pedon of Benteen loam, thin surface, 3 to 15 percent slopes located 10 miles north and 2 miles west of East Carbon City; 2,700 feet south and 1,000 feet east of the SW corner of Section 4., T. 16 S., R. 16 E.

01--3 inches to 0; somewhat decomposed leaves and twigs.

A1--0 to 4 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; few fine and very fine roots; neutral reaction (pH 7.2); abrupt smooth boundary.

B21t--4 to 9 inches; brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine medium and coarse roots, few very fine and fine pores; few thin clay films on ped faces and in pores; neutral reaction (pH 7.2); clear smooth boundary.

B22t--9 to 16 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate, medium subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; few very fine, fine and medium roots; few very fine and fine pores; common moderately thick clay films on ped faces and in pores; mildly alkaline (pH 7.6); clear smooth boundary.

B23t--16 to 35 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky, plastic; few very fine, fine and medium roots; few very fine and fine pores; few thin clay films on ped faces and in pores; mildly alkaline (pH 7.6); abrupt smooth boundary.

R--35 inches; calcareous sandstone.

The mollic epipedon is 16 to 35 inches thick. Depth to bedrock is 20 to 40 inches. Mean annual soil temperature is 40 to 44 degrees F. Mean summer soil temperature is 45 to 52 degrees F.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 dry, 2 or 3 moist, and chroma of 1 to 3. It is dominantly loam, silt loam, and fine sandy loam with less than 27 percent clay.

The A11 horizon is noncalcareous or slightly calcareous and is neutral to mildly alkaline.

The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 dry, 2 or 3 moist, and chroma of 2 to 4. It is loam, clay loam, and silty clay loam, and silt loam with gravel, cobbles, and channery fragment content ranging from 0 to 25 percent. Clay content is 24 to 35 percent.

Some pedons have a thin C horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 dry, 4 or 5 moist, and chroma of 2 to 4. It is loam, clay loam to silty clay with cobbles, pebbles, and channery fragments ranging from 10 to 40 percent in volume.

DECROSS VARIANT

These soils are classified as fine-loamy, mixed Argic Pachic Cryoborolls.

The Decross Variant consists of deep, well drained, moderately permeable soils that formed in colluvium derived dominantly from colluvium sandstone, siltstone, and shale.

These soils are on mountain sideslopes at elevations of 7,500 to 9,600 feet. Slope ranges from 15 to 70 percent. The average annual precipitation ranges from 20 to 30 inches, and the mean annual air temperature is less than 38 degrees F.

They are near the Benteen, Teton, and Midfork soils. Benteen soils have a mollic epipedon which is less than 16 inches thick. Teton soils have a lithic contact within 40 inches and a mollic epipedon less than 16 inches thick. Midfork soils have a mollic epipedon less than 16 inches thick and no argillic horizon.

A typical pedon of Decross Variant fine sandy loam, 35 to 70 percent slopes was described above Range Creek; 2,100 feet north and 4,100 feet west of the southwest corner of Section 7, T. 14 S, R. 14 E. (Photo No. & Coord. 2-143 13-12).

0--1 inch to 0; duff of needles, twigs, and leaves.

A1--0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, medium, few coarse roots; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); abrupt smooth boundary.

B21t--3 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure; hard, friable, sticky, plastic; common very fine, many medium, few coarse roots; common very fine, few fine pores; few thin clay films on ped faces and pores; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

B22t--8 to 19 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; common very fine, few medium and coarse roots; few very fine pores; few thin clay films on ped faces and lining pores; 10 percent gravel; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear wavy boundary.

B3--19 to 24 inches; dark grayish brown (10YR 4/2) gravelly silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky, plastic; few very fine and fine roots; few very fine pores; 20 percent gravels; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C1ca--24 to 32 inches; grayish brown (10YR 5/2) gravelly silt loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, sticky, plastic; few very fine, few medium roots; 20 percent gravel which slakes in water; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca--32 to 55 inches; pale brown (10YR 6/3) very channery fine sandy loam, dark brown (10YR 3/3) moist; single grain; soft, very friable, slightly sticky, slightly plastic; few very fine roots; 40 percent gravel, 20 percent channers; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); diffuse wavy boundary.

C3r--55 inches; calcareous shale.

Depth to bedrock is greater than 40 inches. The control section is commonly loam, and silt loam, but ranges to include clay loam in some pedons. Clay content is 18 to 35 percent. Rock fragments are less than 10 percent in the control section.

The A horizon has hue of 2.5Y or 10YR, value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3. It is loam and fine sandy loam.

The B2t horizon has hue of 2.5Y or 10YR, value of 4 or 5 dry and 3 or 4 moist. It is loam, silt loam, or clay loam with 18 to 35 percent clay and 0 to 10 percent gravel.

The Cca horizon is moderately calcareous or strongly calcareous and is mildly to strongly alkaline.

Vegetation on Decross Variant is white fir, subalpine fir, Douglas fir, and snowberry.

SOIL INTERPRETATIONS RECORD

KEYING ONLY
 REC'D BY: []
 DATE: []
 PROJ. NO.: []
 DATE: []

MLRA(S) []-47 KIND OF UNIT [] VARIANT [] UNIT NAME [] DEGRESS
 STATE [] UTAH RECORD NO. [] AUTHOR(S) [] YCH DATE [] REVISED [] UNIT MODIFIER []
 CLASSIFICATION AND BRIEF SOIL DESCRIPTION []

DEPTH (IN)	SSDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-3	FSL	SM-SC, CL-ML	A-4	0-10	100	95-100	70-85	40-55	20-30	5-10
3-19	L SIL	CL-ML, ML	A-4	0	90-100	85-100	70-95	65-85	25-35	5-10
19-55	GR-SIL, CHV-FSL	SM-SC, SM, ML, CL-ML	A-4, A-2	5-40	60-80	55-75	45-70	30-55	25-35	5-10
55	UWB									

DEPTH (IN)	CLAY (PCT OF <2MM)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								R	T			STEEL	CONCRETE
15-20		1.32-1.4	0.6-2.0	0.11-0.12	8.5-9.0	<2	LDW	24	5	3	5-10	HIGH	MODERATE
20-26		1.35-1.45	0.6-2.0	0.15-0.18	8.5-9.0	<2	LDW	24					
18-24		1.2-1.3	0.6-2.0	0.08-0.16	8.5-9.0	<2	LDW	24					

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
	DEPTH (FT)	HOW	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INITIAL (IN)	TOTAL (IN)		
FREQUENCY [] DURATION [] MONTHS []	DEPTH []	HOW []	MONTHS []	DEPTH []	HARDNESS []	DEPTH []	HARDNESS []	INITIAL []	TOTAL []	B	MODERATE

PROJ. NO. [] NONE

SEPTIC	LAGOON	TRENCH	SANARE	COVER	SANITARY FACILITIES		CONSTRUCTION MATERIAL		
					FOOTNOTES	KEYING ONLY	FOOTNOTES	KEYING ONLY	
[]	[]	[]	[]	[]	SEVERE-SLOPE	FILL	191	15-25% FAIR-AREA RECLAIM, LOW STRENGTH, THIN LAYER	
[]	[]	[]	[]	[]	SEVERE-SEEPAGE, SLOPE	SAND	201	25% SLOPE	
[]	[]	[]	[]	[]	SEVERE-SEEPAGE, SLOPE, DEPTH TO ROCK	GRAVEL	211	IMPROBABLE SOURCE-EXCESS FINES	
[]	[]	[]	[]	[]	SEVERE-SLOPE	SOIL	221	IMPROBABLE SOURCE-EXCESS FINES	
[]	[]	[]	[]	[]	POOR-SLOPE	TOPSOIL	231	POOR-SLOPE	

EXCAV	DWEL	DWEL	BLOGS	ROADS	LANS	BUILDING SITE DEVELOPMENT		WATER MANAGEMENT	
						FOOTNOTES	KEYING ONLY	FOOTNOTES	KEYING ONLY
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	DIKES	241	SEVERE-PIPING
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	PONDAC	251	SEVERE-NO WATER
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	DRAIN	261	DEEP TO WATER
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	IRRIG	271	SLOPE
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	TERRAC	281	SLOPE, LARGE STONES, ERODES EASILY
[]	[]	[]	[]	[]	[]	SEVERE-SLOPE	BATERW		LARGE STONES, SLOPE, ERODES EASILY

REGION	FOOTNOTES	REGIONAL INTERPRETATIONS
[]	[]	[]
[]	[]	[]
[]	[]	[]

KXH--PODO-ROCK OUTCROP COMPLEX, 50 TO 80 PERCENT SLOPES

This map unit is on very steep mountain side slopes. It is located along the Green River near Range Creek in Carbon County. Slopes are single to slightly convex in shape and long in length. The present vegetation is mainly pinyon pine, Utah juniper, Salina wildrye, Mormon tea, and Douglas fir. Elevation is 5,200 to 8,900 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 42 to 45 degrees F, and the average freeze-free season is 100 to 120 days.

This unit is 50 percent Podo very bouldery loam, 50 to 70 percent slopes; 30 percent Rock outcrop, and 20 percent other soils. The Podo soil is on steep mountain sideslopes, and the Rock outcrop is on nearly vertical ledges and cliffs.

Included in this unit is about 10 percent a soil similar to Falcon loam, 1 to 8 percent slopes except on 40 to 70 percent slopes; 5 percent Firo cobbly fine sandy loam, 3 to 30 percent slopes, 5 percent Guben extremely bouldery loam, 50 to 75 percent slopes. These soils are intermixed on the landscape.

The Podo soil is shallow and well drained. It formed in colluvium and residuum derived dominantly from sandstone and shale.

Typically, the surface layer is brown very bouldery sandy loam about 5 inches thick. The underlying material is strong brown gravelly sandy loam. Sandstone is at a depth of 12 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Podo soil is moderate. Available water capacity, to a depth of 12 inches, is less than 2 inches. Water supplying capacity is less than 2 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of areas of exposed sandstone, limestone and hard shale. It dominantly consists of sandstone.

This unit is used for wildlife habitat.

The Podo soil is in capability subclass VIIIE.

PODO SERIES

These soils are classified as loamy, mixed (calcareous), frigid Lithic Ustorthents .

The Podo series consists of shallow, well drained and moderately rapid permeable soils that formed in residuum and local colluvium derived dominantly from sandstone with some soils derived from limestone and shale.

These soils are on gently sloping benches, ridge tops, and sideslopes of moderately steep to very steep hills and mountains at elevations of 5,200 to 8,400 feet. Slope ranges from 1 to 70 percent. The average annual precipitation ranges from 12 to 20 inches, and the mean annual air temperature ranges from 42 to 45 degrees F.

They are near the Detra Variant and Doney soils. Detra Variant and Doney soils have pedons deeper than 40 inches. Detra Variant soils have mollic epipedons.

A typical pedon of Podo very stony loam, 40 to 70 percent slopes located about 4.0 miles north of Bruin Point; 2,200 feet east and 100 feet south of the NW corner of Section 16., T. 13 S., R. 14 E.

A11--0 to 5 inches; grayish brown (10YR 5/2) very stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, friable, slightly sticky, and slightly plastic; common very fine, fine, and medium roots; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

A12--5 to 10 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, firm, sticky, and plastic; common very fine and fine, few medium roots; few very fine and fine pores; 5 percent gravel; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1--10 to 16 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, firm, sticky, and plastic; common very fine and fine, few medium roots; few very fine and fine pores; 5 percent gravel; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.0) abrupt wavy boundary.

R--16 inches; sandstone.

Depth to lithic contact is 8 to 20 inches. Rock fragments are in individual horizons and range from 0 to 70 percent but average less than 35 percent in the control section. Mean annual soil temperature is 44 to 47 degrees F and the mean summer soil temperature is 59 to 64 degrees F.

SOIL INTERPRETATIONS RECORD

NO.	WORK MLRA	STATE	MLRA S) D-24, F-47	KIND OF UNIT SERIES	UNIT NAME P000	XKM, D0G, D0F, H0G, F1G
CLASS DESCR	STATE	RECORD NO.	AUTHOR(S) TJH	DATE 2/28	REVISD	UNIT MODIFIER GRAVELLY SUBSTRATUM
CLASSIFICATION AND BRIEF SOIL DESCRIPTION						

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-3	CB-L, BY-Y	SM-SC, SM	A-4	30-50	70-75	65-70	55-65	40-50	20-25	MP-10
0-3	GR-L, CNV-SIL	GM-GC	A-2, A-1	0-10	55-70	50-65	40-65	30-50	25-30	5-10
3-13	GR-L, GR-SL, CH-SIL	GM-GC, SM-SC, GM, CL-MR	A-2, A-1	0-30	65-95	60-90	40-85	15-60	20-30	MP-10
13	UWB	----	----	----	----	----	----	----	----	----

DEPTH (IN)	CLAY (PCT OF <20µ)	MOIST BULK DENSITY (G/CM³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								K	T			STEEL	CONCRETE
7-16	7-16	1.25-1.35	0.6-2.0	0.10-0.12	7.9-8.4	< 2	LOW	.28	1	B	1-3	HIGH	MODERATE
SAME	19-24	1.25-1.35	0.6-2.0	0.11-0.12	7.9-8.4	< 2	LOW	.37	1	B	1-3		
DEPTH AS ABOVE	9-25	1.25-1.40	0.6-6.0	0.08-0.13	7.9-8.4	< 2	LOW	.28	--	---	---		

FLOODING	HIGH WATER TABLE			CEMENTED PAV.		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACT. MOD.	
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)			HARDNESS
				> 6.0					10-20	HARD		

FOOTNOTES	SANITARY FACILITIES		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
	SEPTIC	LAGOON			ROADFILL	SAND
SEPTIC TANK ABSORPTION FIELDS	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		FILL 151	ROADFILL	3-25% POOR - AREA RECLAIM, THIN LAYER 25+ % POOR - AREA RECLAIM, THIN LAYER, SLOPE	
LAGOON	3-7% SEVERE - DEPTH TO ROCK 7+ % SEVERE - DEPTH TO ROCK, SLOPE		SAND 261	SAND	IMPROBABLE SOURCE - EXCESS FINES, THIN LAYER	
TRENCH	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		GRAVEL 211	GRAVEL	IMPROBABLE SOURCE - EXCESS FINES, THIN LAYER	
SANARY	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		SOIL 271	TOPSOIL	3-15% POOR - AREA RECLAIM, LARGE STONES, THIN LAYER 15+ % POOR - AREA RECLAIM, LARGE STONES, SLOPE	
COVER	3-15% POOR - AREA RECLAIM, THIN LAYER 15+ % POOR - AREA RECLAIM, SLOPE, THIN LAYER		POND 231	POND RESERVOIR AREA	3-B% SEVERE - DEPTH TO ROCK B+ % SEVERE - DEPTH TO ROCK, SLOPE	
EXCAV	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		DIKES 241	EMBANKMENTS DIKES AND LEVEES	SEVERE - THIN LAYER, PIPING	
DWEL	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - SLOPE, DEPTH TO ROCK		PONDAQ 251	EXCAVATED PONDS AQUIFER FED	SEVERE - NO WATER	
DWEL	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		DRAIN 261	DRAINAGE	DEEP TO WATER	
BLOGS	3-B% SEVERE - DEPTH TO ROCK B+ % SEVERE - SLOPE, DEPTH TO ROCK		IRRIG 271	IRRIGATION	DEPTH TO ROCK, SLOPE	
ROADS	3-15% SEVERE - DEPTH TO ROCK 15+ % SEVERE - DEPTH TO ROCK, SLOPE		TERRAC 281	TERRACES AND DIVERSIONS	3-B% CB-L: LARGE STONES, DEPTH TO ROCK 3-B% GR-L: DEPTH TO ROCK B+ % CB-L: SLOPE, LARGE STONES, DEPTH TO ROCK B+ % GR-L: SLOPE, DEPTH TO ROCK	
LAWNS	3-15% CB-L: SEVERE - LARGE STONES, THIN LAYER 3-15% GR-L: SEVERE - THIN LAYER 15+ % CB-L: SEVERE - LARGE STONES, SLOPE, THIN LAYER 15+ % GR-L: SEVERE - SLOPE, THIN LAYER		WATERW 291	GRASSED WATERWAYS	3-B% - LARGE STONES, DEPTH TO ROCK B+ % - LARGE STONES, SLOPE, DEPTH TO ROCK	

FOOTNOTES		REGIONAL INTERPRETATIONS	
REGION			

MTH--CABBA-GUBEN-ROCK OUTCROP COMPLEX, 40 TO 75 PERCENT SLOPES.

This map unit is on sides of mountain canyons mainly east of Price Canyon and South of Nine Mile Canyon. Slopes are medium to long and convex. Elevation is 5,000 to 8,200 feet. The average annual precipitation is about 14 to 20 inches, the mean annual air temperature is 42 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

This unit is 45 percent Cabba bouldery loam, 40 to 70 percent slopes, 20 percent Guben extremely bouldery loam, 40 to 75 percent slopes, and 15 percent Rock outcrop. The Cabba soil is on very steep sideslopes between Rock outcrop ledges, the Guben soil is on steep foot slopes and Rock outcrop is on canyon rims, ledges, and very steep sideslopes.

Included in this unit are about 8 percent Peso extremely bouldery fine sandy loam, 50 to 80 percent slopes on colluvial foot slopes and toe slopes, 5 percent of a soil similar to Lazear sandy clay loam, high rainfall, 1 to 8 percent slopes, except it has slopes of 40 to 75 percent and is between Rock outcrop ledges; 2 percent Rivra Variant extremely bouldery loam, 1 to 8 percent slopes, on bottoms of drainageways and 5 percent of a soil similar to Guben extremely bouldery loam, 40 to 75 percent slopes except that it is very cobbly fine sandy loam, 30 to 50 percent slopes.

The Cabba soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale of the Green River Formation. Slopes are 40 to 70 percent. The present vegetation is mainly pinyon, juniper, Salina wildrye, and Mormon-tea.

Typically, the surface layer is pale brown bouldery loam about 3 inches thick. The next layer is brown loam about 4 inches thick. Below this layer is light yellowish brown loam that is underlain by rippable shale at a depth of about 15 inches. Depth to shale ranges from 3 to 20 inches.

Permeability of the Cabba soil is moderate. Available water capacity, to a depth of 9 inches, is about 1 to 3 inches. Water supplying capacity is 2 to 5 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 3 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Guben soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sandstone and shale of the Green River Formation. Slopes are 40 to 75 percent. The present vegetation is mainly Douglas-fir, pinyon, juniper, Salina wildrye, birchleaf mountainmahogany, and serviceberry.

Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 1/2 inch thick. The upper surface layer is grayish brown extremely bouldery loam about 7 inches thick. The

underlying surface is pale brown very stony loam about 8 inches thick. The next layer is very pale brown very stony loam about 15 inches thick. The next layer to a depth of 60 inches or more is light yellowish brown extremely stony loam. A layer of carbonates is at a depth of about 15 inches.

Permeability of the Guben soil is moderate. Available water capacity, to a depth of 60 inches, is about 6.0 to 7.5 inches. Water supplying capacity is 7 to 10 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 60 inches or more. Runoff is rapid and the hazard of water erosion is high. The hazard of soil blowing is slight. Rock outcrop consists of areas of exposed sandstone and shale. It dominantly occurs on canyon rims, ledges, and very steep sideslopes.

This unit is used as rangeland and for wildlife habitat.

This unit is in capability subclass VIIe, nonirrigated.

CABBA SERIES

These soils are classified as loamy, mixed (calcareous), frigid, shallow, Typic Ustorthents. The Cabba series consists of shallow, well drained, moderately permeable soils that formed in residuum and colluvium derived dominantly from shale or siltstone of the Green River Formation.

These soils are on benches, canyon rims, and steep canyon sideslopes at elevations of 5,000 to 8,200 feet. Slope ranges from 3 to 70 percent. The average annual precipitation ranges from 12 to 16 inches, and the mean annual air temperature ranges from 42 to 45 degrees F.

They are near the Podo, Guben, and Patmost soils.

Podo soils have hard sedimentary rock at depths of less than 20 inches. Guben and Patmos soils have depths greater than 20 inches.

A typical pedon of Cabba extremely bouldery loam, 40 to 70 percent slopes was described on the slopes of Cottonwood Ridge; 250 feet west and 1,500 feet north of the southeast corner of Section 7, T. 13 S., R. 16 E. (Photo No. & Coord. 1-57, J-15).

A1--0 to 3 inches; pale brown (10YR 6/3) bouldery loam, brown (10YR 4/3) moist; moderate medium granular that parts to fine granular structure; loose, slightly sticky, slightly plastic; common very fine and fine roots; 5 percent fine gravels, 10 percent cobbles; 15 percent boulders; slightly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6) abrupt smooth boundary.

C1--3 to 7 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; mottles; weak fine granular structure; loose, slightly sticky, slightly plastic; common very fine and fine roots; slightly calcareous, moderately alkaline (pH 8.4); abrupt smooth boundary.

C2--7 to 15 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; soft, friable, slightly sticky, slightly plastic; common very fine, fine roots; 5 percent shale fragments which slake in water; slightly calcareous, strongly alkaline (pH 8.8); abrupt smooth boundary.

C3r--15 inches; rippable shale; soft carbonate coatings on the surface of rocks.

Depth to soft shale or siltstone is 8 to 20 inches. Rock fragments are soft shale, siltstone with some sandstone fragments and range in size from fine gravel to large sandstone flags and boulders. The surface contains from 0 to 10 percent coarse fragments, but the control section contains less than 35 percent. These soils are commonly calcareous throughout.

The A horizon has hue of 2.5Y or 10YR, value of 5 to 7 dry, 3 to 5 moist, and chroma of 2 or 3. It is loam, bouldery loam, or gravelly loam.

The C horizon has hue of 2.5YR or 10YR, value of 5 or 6 dry, 4 or 5 moist, and chroma of 2 to 4. It is loam, silty clay loam, clay loam, gravelly loam, extremely gravelly loam. The C horizon is moderately calcareous or strongly calcareous and is moderately to strongly alkaline.

GUBEN SERIES

These soils are classified as loamy-skeletal Typic Calciborolls.

The Guben series consists of deep, well drained, moderately permeable soils that formed in colluvium and residuum derived dominantly from sandstone and shale of the Green River Formation.

These soils are on steep and very steep canyon sideslopes at elevations of 5,000 to 8,400 feet. Slope ranges from 30 to 75 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 42 to 45 degrees F.

They are near the Cabba, Peso, and Lazear soils. Cabba and Lazear soils are shallow. Peso soils are moderately deep.

A typical pedon of Guben extremely bouldery loam, 40 to 75 percent slopes, was located in Prickly Pear Canyon; about 1,200 feet south and 2,000 feet east of the northwest corner of Section 14, T. 12 S., R. 15 E. (Photo No. & Coord.) 1-55A, G-7).

01--1/2 inch to 0; litter of partially decayed pine needles and grasses.

A11--0 to 7 inches; grayish brown (10YR 5/2) extremely bouldery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine fine, medium and coarse roots; 15 percent gravel, 10 percent cobbles, 5 percent stones, 10 percent boulders; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

A12--7 to 15 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium, coarse roots, 10 percent gravel, 15 percent cobbles, 20 percent stones; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); clear broken boundary.

Clca--15 to 30 inches; very pale brown (10YR 7/3) very stony loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, few fine, medium, coarse roots, few very fine, and fine pores; 10 percent gravel, 20 percent cobbles, 20 percent stones, 5 percent boulders; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C2--30 to 60 inches; light yellowish brown (10YR 6/4) extremely stony loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; few very fine, medium common fine pores; 10 percent gravel, 20 percent cobbles, 25 percent stones, 5 percent boulders; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 9.0).

The mollic epipedon is 7 to 16 inches thick. Depth to bedrock is greater than 40 inches. The control section is commonly very stony loam but ranges to include fine sandy loam, very stony fine sandy loam in some pedons. Rock fragments are 35 to 60 percent in the control section and consist of gravel, cobbles, stones and boulders. These soils are commonly calcareous throughout.

The A horizon has hue of 10YR, value of 4 or 5 dry, 2 or 3 moist, and chroma of 1, 2 or 3. It is very stony loam, extremely bouldery loam.

The C horizon has hue of 10YR, value of 5 to 7 dry, 4 to 6 moist, and chroma of 3 or 4. The C horizon is moderately calcareous or strongly calcareous and is moderately to strongly alkaline.

SOIL INTERPRETATIONS RECORD

MTH. UMF2

RECORD NO.	WORD NO.	MLRA (S)	47	KIND OF UNIT	SERIES	UNIT NAME	GUREN
STATE	UTAH	RECORD NO.		DATE	2-79	REVISED	UNIT MODIFIER
CLASSIFICATION AND BRIEF SOIL DESCRIPTION							
CLASS. DESCH							

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-5	GR-L	GM-GC, SM-SC	A-4	5-15	70-80	65-75	50-65	35-50	25-30	5-10
0-5	ST-L, RYX-L, STY-L	GM-GC	A-2, A-4	35-45	50-60	45-55	35-50	25-40	25-30	5-10
5-21	GR-L, GRV-L	GM-GC, SM-SC	A-2, A-4	0-20	55-75	50-70	40-65	30-50	25-30	5-10
21-60	CBV-L, CBV-SL	GM-GC, SM-SC	A-1, A-2	25-50	40-75	35-50	30-45	15-35	25-30	5-10

DEPTH (IN)	CLAY (PCT OF < 2MM)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSION	
								K	T			STEEL	CONCRETE
20-22	-	-	0.6-2.0	0.12-0.14	7.9-9.0	<2	LOW	.20	2	B	1-3	HIGH	MODERATE
19-21	-	-	0.6-2.0	0.08-0.10	8.5-9.0	<2	LOW	.24	2	B	1-3		
20-24	-	-	0.6-2.0	0.10-0.14	7.9-9.0	<2	LOW	.32					
22-24	-	-	0.6-2.0	0.06-0.12	7.9-9.0	<2	LOW	.32					

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION	
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS			INITIAL (IN)
				6.0				60				B, MODERATE

SECT.	FOOTNOTES	SANITARY FACILITIES		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
		DESCRIPTION	PERCENTAGE			DESCRIPTION	PERCENTAGE
2		SEPTIC TANK	4-8%: MODERATE - PERCS SLOWLY, LARGE STONES	FILL	191	ROADFILL	4-15%: FAIR - LOW STRENGTH, LARGE STONES
3		ABSORPTION FIELDS	8-15%: MODERATE - PERCS SLOWLY, SLOPE, LARGE STONES		2		15-25%: FAIR - LOW STRENGTH, LARGE STONES, SLOPE
4			15-60%: SEVERE - SLOPE		3		25-60%: POOR - SLOPE
5					4		
6		LAGOON	4-7%GR: MODERATE - SEEPAGE, SLOPE	SAND	201	SAND	1) IMPROBABLE - EXCESS FINES, LARGE STONES
7		SEWAGE LAGOONS	4-7%ST: MODERATE - SEEPAGE, SLOPE, LARGE STONES		2		
8			7-60%: SEVERE - SLOPE		3		
9					4		
10		TRENCH	4-15%: SEVERE - LARGE STONES	GRAVEL	211	GRAVEL	1) IMPROBABLE - EXCESS FINES, LARGE STONES
11		SANITARY LANDFILL (TRENCH)	15-60%: SEVERE - SLOPE, LARGE STONES		2		
12					3		
13					4		
14					5		
15		SANITARY LANDFILL (AREA)	4-8%: SLIGHT	SOIL	271	TOPSOIL	4-15%: POOR - LARGE STONES, AREA RECLAIM
16			8-15%: MODERATE - SLOPE		2		15-60%: POOR - LARGE STONES, AREA RECLAIM, SLOPE
17			15-60%: SEVERE - SLOPE		3		
18					4		
19					5		
20		COVER	4-15%: POOR - LARGE STONES				
21		DAILY COVER FOR LANDFILL	15-60%: POOR - LARGE STONES, SLOPE	PONDRES	231	FOOTNOTES	WATER MANAGEMENT
22					2		4-8%: MODERATE - SEEPAGE, SLOPE
23					3		8-60%: SEVERE - SLOPE
24					4		
25					5		

EXCAV	FOOTNOTES	BUILDING SITE DEVELOPMENT		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
		DESCRIPTION	PERCENTAGE				DESCRIPTION
2		SHALLOW EXCAVATIONS	4-8%: MODERATE - LARGE STONES	DIKES	241	EMBANKMENTS	SEVERE - LARGE STONES
3			8-15%: MODERATE - LARGE STONES, SLOPE		2		
4			15-60%: SEVERE - SLOPE		3		
5					4		
6					5		
7		DWELLINGS WITHOUT BASEMENTS	4-8%: MODERATE - LARGE STONES	PONDAQ	251	EXCAVATED PONDS	SEVERE - NO WATER
8			8-15%: MODERATE - SLOPE, LARGE STONES		2		
9			15-60%: SEVERE - SLOPE		3		
10					4		
11					5		
12		DWELLINGS WITH BASEMENTS	4-8%: MODERATE - LARGE STONES	DRAIN	261	DRAINAGE	DEEP TO WATER
13			8-15%: MODERATE - SLOPE, LARGE STONES		2		
14			15-60%: SEVERE - SLOPE		3		
15					4		
16					5		
17		BLDGS	4-8%: MODERATE - SLOPE, LARGE STONES	IRRIG	271	IRRIGATION	LARGE STONES, SLOPE
18		SMALL COMMERCIAL BUILDINGS	8-60%: SEVERE - SLOPE		2		
19					3		
20					4		
21					5		
22		ROADS	4-8%: MODERATE - LOW STRENGTH, FROST ACTION, LARGE STONES	TERRAC	281	TERRACES AND DIVERSIONS	4-8%: LARGE STONES
23		LOCAL ROADS AND STREETS	8-15%: MODERATE - LOW STRENGTH, SLOPE, FROST ACTION		2		8-60%: SLOPE, LARGE STONES
24			15-60%: SEVERE - SLOPE		3		
25					4		
26		LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	4-8%GR: MODERATE - SMALL STONES, LARGE STONES	WATERW		GRASSED WATERWAYS	4-8%: LARGE STONES
27			8-15%GR: MODERATE - SMALL STONES, LARGE STONES, SLOPE		2		8-60%: LARGE STONES, SLOPE
28			15-60%GR: SEVERE - SLOPE		3		
29			4-15%ST: SEVERE - SMALL STONES, LARGE STONES		4		
30			15-60%ST: SEVERE - SMALL STONES, LARGE STONES, SLOPE		5		

REGION	FOOTNOTES	REGIONAL INTERPRETATIONS	
		DESCRIPTION	PERCENTAGE
181			
2			
3			
4			

KEYING ONLY		UNIT NAME	RECREATIONAL DEVELOPMENT		KEYING ONLY		FOOTNOTE
RECORD NO.	CONTR. NO.	UNIT MODIFIER:	FOOTNOTE		PLAYGRD	321	A-6X: SEVERE - SMALL STONES B-60X: SEVERE - SLOPE, SMALL STONES
			4-BXGR: MODERATE - SMALL STONES			2	
			B-15XGR: MODERATE - SLOPE, SMALL STONES			3	
			15-60XGR: SEVERE - SLOPE			4	
			4-15XST: SEVERE - SMALL STONES			5	
			15-60XST: SEVERE - SLOPE, SMALL STONES			5	
			4-BXGR: MODERATE - SMALL STONES			321	
			B-15XGR: MODERATE - SLOPE, SMALL STONES			321	
			15-60XGR: SEVERE - SLOPE			3	
			4-15XST: SEVERE - SMALL STONES			4	
			15-60XST: SEVERE - SLOPE, SMALL STONES			5	

KEYING ONLY		FOOTNOTE	CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)																	
CRGPHC	151	CLASS- DETERMINING PHASE	CAPABILITY		NIRR		IRR													
		4-40X	6E																	
		40-60X	7E																	

KEYING ONLY		FOOTNOTE	MANAGEMENT PROBLEMS						POTENTIAL PRODUCTIVITY		TREES TO PLANT
WOODS	361	CLASS- DETERMINING PHASE	ORD SYM	EROSION HAZARD	EQUIP. LIMIT	SEEDLING MORT. Y.	WINDTH. HAZARD	PLANT COMPET.	COMMON TREES	SITE INDEX	
									NONE		

KEYING ONLY		FOOTNOTE	WINDBREAKS			
WINDBR	361	CLASS- DETERMINING PHASE	SPECIES	HT	SPECIES	HT
			NONE			

KEYING ONLY		FOOTNOTE	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR			
WILDLF	391	CLASS- DETERMINING PHASE	GRAIN & SEED	GRASS & LEGUME	WILD HERB	HARDW. TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
		4-6X	POOR	POOR	FAIR	-	POOR	FAIR	POOR	V. POOR	FAIR	FAIR	V. POOR	FAIR
		B-40X	POOR	POOR	FAIR	-	POOR	FAIR	V. POOR	V. POOR	FAIR	FAIR	V. POOR	FAIR
		40-60X	V. POOR	V. POOR	FAIR	-	POOR	FAIR	V. POOR	V. POOR	POOR	FAIR	V. POOR	FAIR

KEYING ONLY		FOOTNOTE	POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)											
PHASE	401	COMMON PLANT NAME	PLANT SYMBOL (INLSPN)	PERCENTAGE COMPOSITION (BY WEIGHT) BY CLASS- DETERMINING PHASE										
				HIGH RAINFALL				ST-1						
		INDIAN RICEGRASS	ORHY	-	-	-	-	-	-	-	-	-	-	-
		NEEDLEANDTHREAD	STCO4	-	-	-	-	-	-	-	-	-	-	-
		BLUEBUNCH WHEATGRASS	AGSP	6	-	-	-	-	-	-	-	-	-	-
		WESTERN WHEATGRASS	AGSM	5	-	-	-	-	-	-	-	-	-	-
		BLUEGRASS	PDA++	16	-	-	-	-	-	-	-	-	-	-
		SLENDER WHEATGRASS	AGTR	5	-	-	-	-	-	-	-	-	-	-
		OTHER PERENNIAL GRASSES	PPGG	10	-	-	-	-	-	-	-	-	-	-
		OTHER PERENNIAL FORBS	PPFF	9	-	-	-	-	-	-	-	-	-	-
		OTHER SHRUBS	SSSS	5	-	-	-	-	-	-	-	-	-	-
		BIRCHLEAF MOUNTAINMAHOGANY	CEMO2	-	-	-	-	-	-	-	-	-	-	-
		BLACK SAGEBRUSH	ARARH	22	-	-	-	-	-	-	-	-	-	-
		SASKATOON SERVICEBERRY	AMAL2	8	-	-	-	-	-	-	-	-	-	-
		UTAH SNOWBERRY	SYORU	8	-	-	-	-	-	-	-	-	-	-
		BIG SAGEBRUSH	ARTR2	3	-	-	-	-	-	-	-	-	-	-
		BITTERBRUSH	PIUR2	3	-	-	-	-	-	-	-	-	-	-
		POTENTIAL PRODUCTION (LBS./AC. DRY WT.)		MOUNTAIN VERY STONY LOAM EA7				INLAND STONY LOAM EA7						
		FAVORABLE YEARS		1500				1500						
		NORMAL YEARS		1000				1100						
		UNFAVORABLE YEARS		750				700						

KEYING ONLY		FOOTNOTE
NOTES	411	A ESTIMATES BASED ON ENGINEERING TEST DATA ON THREE PEDONS FOR WINTAH COUNTY, UTAH BOTTOM LAYER IS 39 INCHES THICK

HUG--MIDFORK-ELWOOD COMPLEX, 50 TO 70 PERCENT SLOPES

This map unit is on steep mountain sideslopes. It is located all along the Book Cliff Mountain Range, Whitmore Canyon, and Price Canyon. Slopes are single to convex in shape and long in length. The present vegetation is mainly Douglas fir, snowberry, and quaking aspen. Elevation is 7,900 to 9,500 feet. The average annual precipitation is about 20 to 30 inches, the mean annual air temperature is less than 38 degrees F, and the average freeze-free season is less than 60 days.

This unit is 40 percent Midfork bouldery loam, 50 to 70 slope; 30 percent Elwood extremely bouldery loam, 50 to 70 percent, and 30 percent inclusions of other minor soils. These soils are intermixed on the landscape.

Included in this unit is about 15 percent of a soil similar Midfork bouldery loam, 50 to 70 percent slopes except with less than 6 inches of dark surface; 10 percent Parkay very stony loam, 50 to 70 percent slopes, eroded, 5 percent Comodore very stony, very fine sandy loam, 50 to 60 percent slopes.

The Midfork soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone and shale.

Typically, the surface is covered with a mat of partially decomposed twigs, leaves, and needles about 2 inches thick. The surface layer is dark yellowish brown bouldery loam and clay loam about 7 inches thick. The underlying material to a depth of 30 inches is yellowish brown very channery loam. The next layer to a depth of 60 inches or more is yellowish brown gravelly loam.

Permeability of the Midfork soil is moderately slow. Available water capacity is about 6.0 to 7.5 inches. Water supplying capacity is 15 to 19 inches. The organic matter content of the surface layer is 5 to 10 percent. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Elwood soil is moderately deep and well drained. It formed in colluvium and alluvium derived dominantly from sandstone, siltstone, and shale.

Typically, the surface is covered with a mat of fir needles and twigs about 1 inch thick. The surface layer is brown extremely bouldery loam about 4 inches thick. The subsoil is brown very gravelly silt loam about 15 inches thick. The substratum is brown very gravelly silt loam about 5 inches thick over hard sandstone.

Permeability of the Elwood soil is moderate. Available water capacity is about 2.5 to 3.5 inches. Water supplying capacity is 7 to 10 inches.

The organic matter content of the surface layer is 5 to 10 percent. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for wildlife habitat. This unit is in capability subclass VIIe, nonirrigated.

MIDFORK SERIES

These soils are classified as loamy-skeletal, mixed Typic Cryoborolls.

The Midfork series consists of deep, well drained, moderately slow permeable soils that formed in calcareous gravelly alluvium and colluvium derived dominantly from calcareous sedimentary rocks.

These soils are on gently sloping to very steep fans and mountain sides at elevations of 7,500 to 9,500 feet.

Slope ranges from 50 to 70 percent.

The average annual precipitation ranges from 20 to 30 inches, and the mean annual air temperature ranges from 34 to 38 degrees F.

They are near the Elwood, Macar, Quigley, and Podo soils. Elwood and Macar soils have bedrock within 40 inches. Podo soils have shallow control-sections over sandstone and are neutral or slightly acid throughout. Quigley soils have fine-loamy control sections.

A typical pedon of Midfork bouldery loam, 50 to 70 percent slopes located about 4 miles west and 2 miles south of Rock Creek Ranch, 1,600 feet north and 950 feet east of the SW corner of Section 22., T. 15 S., R. 16 E.

O2--2 inches to 0; partially decomposed twigs, leaves, and needles.

A11--0 to 1 inch; dark yellowish brown (10YR 4/4) bouldery loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, and nonplastic; few very fine and fine roots; neutral (pH 7.2); abrupt smooth boundary.

A12--1 to 7 inches; dark yellowish brown (10YR 4/4) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure that parts to weak medium granular; slightly hard, firm, slightly sticky, and slightly plastic; common fine and few medium roots; few very fine and fine pores; 10 percent fine gravel; mildly alkaline (pH 7.8); clear smooth boundary.

C1--7 to 30 inches; yellowish brown (10YR 5/4) very channery loam, brown (10YR 4/3) moist; massive; slightly hard, firm, slightly sticky, and slightly plastic; common fine and few medium roots; 30 percent channers, 10 percent gravel, and 5 percent cobbles; slightly calcareous, carbonates are disseminated; mildly alkaline (pH 7.8); gradual smooth boundary.

C2--30 to 60 inches; yellowish brown (10YR 5/4) gravelly loam, brown (10YR 4/3) moist; massive; soft, friable, slightly sticky, and slightly plastic; few fine roots; 10 percent channers and 25 percent gravel; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4).

The mollic epipedon is 7 to 15 inches thick. Depth to free carbonates range from 4 to 15 inches. Mean annual soil temperature is 36 to 40 degrees F. The control section is commonly gravelly loam or gravelly clay loam but ranges to include very channery loam in some pedons. Clay content is 18 to 35 percent. Rock fragments are 35 to 65 percent of the control section.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 to 4. The A horizon is neutral to moderately alkaline.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 dry, 4 or 5 moist, and chroma of 2 through 4. The C horizon is mildly alkaline to strongly alkaline.

ELWOOD SERIES

These soils are classified as loamy-skeletal, mixed Argic Cryoborolls.

The Elwood series consist of moderately deep, well drained, and moderately permeable soils that formed in residuum and colluvium derived dominantly from sandstone and shale.

These soils are on moderately steep to very steep mountain slopes at elevations of 7,900 to 9,500 feet. Slope ranges from 50 to 70 percent. The average annual precipitation ranges from 20 to 30 inches, and the mean annual air temperature ranges from 32 to 38 degrees F.

They are near the Decross, Adel, Benteen, Teton, Midfork and Zillion soils. Decross, Adel, Teton, and Benteen soils have fine-loamy control sections. Zillion, Decross, Adel, and Benteen soils have thick dark colored surface horizons. Midfork soils is a very deep soil.

A typical pedon of Elwood extremely bouldery loam, 50 to 70 percent slopes located 1.0 miles south of the Valley Mountain Summit; 10,000 feet east of the SE corner of Section 7., T. 15 S., R. 15 E.

O1--1 inch to 0; undecomposed twigs, needles, and leaves.

A1--0 to 4 inches; brown (10YR 4/3) extremely bouldery loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable, slightly sticky, and slightly plastic; few fine, medium and coarse roots; 5 percent gravel, 5 percent cobble, 15 percent stones, 5 percent boulders; mildly alkaline (pH 7.6); abrupt smooth boundary.

B21t--4 to 13 inches; brown (10YR 4/3) very gravelly silt loam, dark brown (10YR 3/3) moist; weak fine subangular blocky parting to weak fine granular structure; hard, friable, slightly sticky, and slightly plastic; common fine and medium, and few coarse roots; 30 percent gravel, 10 percent cobbles, and 5 percent stones; mildly alkaline (pH 7.6); clear wavy boundary.

B22t--13 to 19 inches; brown (10YR 5/3) very gravelly silt loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, and slightly plastic; common very fine, and few medium roots; 30 percent gravel, 10 percent cobbles, 5 percent stones; mildly alkaline (pH 7.8); abrupt wavy boundary.

B23t--19 to 24 inches; brown (10YR 5/3) very gravelly silt loam, brown (10YR 4/3) moist; rock structure; hard, friable, slightly sticky, and slightly plastic; few very fine, fine and medium roots; 40 percent gravel, 10 percent cobbles, and 5 percent stones; slightly calcareous, carbonates are disseminated; moderately alkaline (pH 8.0); abrupt wavy boundary.

R--24 inches; sandstone.

A range of characteristics has not been determined for this series.

SOIL INTERPRETATIONS RECORD

REV. 1-6-68
FILE CODE 5045-2

REV. NO.	1
NO.	1
DATE	
CLASS. DESC.	

MLRA(S) 47
STATE UT
RECORD NO. 1
AUTHOR(S) RSC
DATE 2-75
KIND OF UNIT SERIES
UNIT NAME ELWOOD
HUG
UNIT MODIFIER

CLASSIFICATION AND BRIEF SOIL DESCRIPTION

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-11	SIL	ML-CL	A-4	0	55-100	80-95	75-80	70-85	25-30	8-10
0-11	BYX-L, GRV-SIL	GM-GG, CL-ML, CL	A-2, A-4	20-50	55-90	50-85	40-75	30-65	25-30	8-15
11-33	CR-SICL, GRV-SICL, CR-L	GM-SC, CL-M	A-2, A-4, A-6	10-40	40-80	35-70	30-70	25-60	25-35	8-15
33-38	GRV-SIL	SM-SC, CL-M	A-2	0-10	45-55	40-50	35-45	30-35	25-30	5-15
38	IMR	SM-SC, CL-M	A-2	0-10	45-55	40-50	35-45	30-35	25-30	5-15

DEPTH (IN)	CLAY PCT OF <2MM	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								K	T			STEEL	CONCRETE
SAME	12-16	-	0.6-2.0	0.16-0.18	5.6-6.5	<2	LOW	24	3	6	5-10	HIGH	MODERATE
DEPTH	14-18		0.6-2.0	0.10-0.14	7.4-7.8	<2	LOW	17	3	41			
AS	27-35		0.6-2.0	0.08-0.14	6.1-7.3	<2	LOW						
ABOVE	13-18												

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION			
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)			HARDNESS	INITIAL (IN)	TOTAL (IN)
NONE				>6.0					20-40	HARD			C	MODERATE

SEPTIC TANK ABSORPTION FIELDS	FOOTNOTES	SANITARY FACILITIES		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
		10-15%: SEVERE - DEPTH TO ROCK	15+%: SEVERE - SLOPE, DEPTH TO ROCK			ROADFILL	10%: POOR - AREA RECLAIM, LARGE STONES
				FILL 191			
				SAND 201			IMPROBABLE SOURCE - EXCESS FINES
				GRAVEL 211			IMPROBABLE SOURCE - EXCESS FINES
				SOIL 221			10-15%: FAIR - SLOPE, SMALL STONES, TOO CLAYEY
							15+%: POOR - SLOPE
							BYX-L: POOR - LARGE STONES

DAILY COVER FOR LANDFILL	FOOTNOTES	SANITARY LANDFILL (AREA)		PONDERS 231	FOOTNOTES	WATER MANAGEMENT	
		10-15%: POOR - AREA RECLAIM, SMALL STONES	15+%: POOR - AREA RECLAIM, SLOPE			POND RESERVOIR AREA	SEVERE - SLOPE

SHALLOW EXCAVATIONS	FOOTNOTES	BUILDING SITE DEVELOPMENT		DIKES 241	FOOTNOTES	EMBANKMENTS DIKES AND LEVEES	
		10-15%: SEVERE - DEPTH TO ROCK	15+%: SEVERE - DEPTH TO ROCK, SLOPE			SEVERE - PIPING, THIN LAYER	BYX-L: SEVERE - THIN LAYER, PIPING, LARGE STONES

DWELLINGS WITHOUT BASEMENTS	FOOTNOTES	DWELLINGS WITHOUT BASEMENTS		PONDAGE 251	FOOTNOTES	EXCAVATED PONDS AQUIFER FED	
		10-15%: MODERATE - SLOPE, DEPTH TO ROCK, LARGE STONES	15+%: SEVERE - SLOPE			SEVERE - NO WATER	

DWELLINGS WITH BASEMENTS	FOOTNOTES	DWELLINGS WITH BASEMENTS		DRAIN 261	FOOTNOTES	DRAINAGE	
		10-15%: SEVERE - DEPTH TO ROCK	15+%: SEVERE - SLOPE, DEPTH TO ROCK			DEEP TO WATER	

SMALL COMMERCIAL BUILDINGS	FOOTNOTES	SMALL COMMERCIAL BUILDINGS		IRRIG. 271	FOOTNOTES	IRRIGATION	
		SEVERE - SLOPE					
							DEPTH TO ROCK, SLOPE
							BYX-L: LARGE STONES, DEPTH TO ROCK, SLOPE

LOCAL ROADS AND STREETS	FOOTNOTES	LOCAL ROADS AND STREETS		TERRAC 281	FOOTNOTES	TERRACES AND DIVERSIONS	
		10-15%: MODERATE - SLOPE, DEPTH TO ROCK, LARGE STONES	15+%: SEVERE - SLOPE			SLOPE, DEPTH TO ROCK	BYX-L: SLOPE, LARGE STONES, DEPTH TO ROCK

LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	FOOTNOTES	LAWNS, LANDSCAPING, AND GOLF FAIRWAYS		WATERW 291	FOOTNOTES	GRASSED WATERWAYS	
		SLOPE, DEPTH TO ROCK	BYX-L: LARGE STONES, SLOPE, DEPTH TO ROCK				

REGIONAL INTERPRETATIONS	FOOTNOTES	REGIONAL INTERPRETATIONS	

DHG2--COMODORE-DATINO COMPLEX, 40 TO 60 PERCENT SLOPES, ERODED

This map unit is on mountain sideslopes and toe slopes.

It is located on the Book Cliffs northeast of Price. Elevation is 6,800 to 8,100 feet. The average annual precipitation is about 16 to 18 inches, the mean annual air temperature is 43 to 45 F, and the average freeze-free season is 50 to 70 days.

This unit is 50 percent Comodore very stony very fine sandy loam, 50 to 60 percent slopes, eroded; 35 percent Datino extremely stony fine sandy loam, 40 to 60 percent slopes, eroded; and 15 percent other soils. The Comodore soil is on sideslopes, and the Datino soil is on toe slopes.

Included in this unit are small areas of Quigley cobbly loam, 30 to 50 percent slopes, eroded, Wellsville cobbly loam, 30 to 50 percent slopes, a soil similar to Datino extremely stony fine sandy loam, 40 to 60 percent slopes, eroded, except 20 to 40 inches deep, and Rock outcrop.

The Comodore soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone and shale. Slopes are 50 to 60 percent. Slopes are on northwest and east aspects and long in length and convex in shape. The present vegetation is mainly Douglas-fir, Salina wildrye, snowberry, serviceberry, and big sagebrush.

Typically, the surface layer is very dark grayish brown very stony very fine sandy loam about 4 inches thick. The underlying material is very dark grayish brown very cobbly very fine sandy loam about 10 inches thick. Sandstone is at a depth of 14 inches.

Permeability of the Comodore soil is moderately rapid. Available water capacity is about 2.0 inches. Water supplying capacity is 4 to 6 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Datino soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone and shale. Slopes are on north, east and west aspects and medium to long in length and convex in shape. The present vegetation is mainly Douglas-fir, pinyon pine, Salina wildrye, bluebunch wheatgrass, snowberry and serviceberry.

Typically, the surface layer is brown extremely stony fine sandy loam about 9 inches thick. The subsoil is brown very stony loam about 7 inches thick.

The upper 25 inches of the substratum is brown extremely stony fine sandy loam. The lower part to a depth of 60 inches or more is brown extremely stony very fine sandy loam. A layer of carbonate accumulation is at a depth of about 16 inches.

Permeability of the Datino soil is moderate. Available water capacity, to a depth of 60 inches is about 3.5 to 5.0 inches. Water supplying capacity is 6.0 to 8.0 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for wildlife habitat and rangeland.

This unit is in capability subclass VIIs, nonirrigated.

COMODORE SERIES

These soils are classified as loamy-skeletal, mixed Lithic Haploborolls.

The Comodore series consists of shallow, well drained, and moderately rapid permeable soils that formed in colluvium derived dominantly from sandstone.

These soils are on toe slopes and mountain sideslopes at elevations of 6,800 to 8,100 feet. Slope ranges from 50 to 60 percent. The average annual precipitation ranges from 14 to 18 inches, and the mean annual air temperature ranges from 43 to 45 degrees F.

They are near the Beenom and Datino soils. Beenom soils have a layer of clay accumulation and Datino soils are deeper than 60 inches.

A typical pedon of Comodore very stony very fine sandy loam, 50 to 60 percent slopes, eroded located in Dugout Creek northeast of Wellington; about 2,100 feet east and 2,300 feet south of the NW corner of Section 23, T. 14 S., R. 12 E.

A11--0 to 4 inches; very dark grayish brown (10YR 3/2) very stony very fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; few very fine and fine pores; 15 percent gravel, 25 percent cobbles and 20 percent stones; mildly alkaline (pH 7.4); clear smooth boundary.

A12--4 to 14 inches; very dark grayish brown (10YR 3/2) very cobbly very fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; few very fine pores; 15 percent gravel and 30 percent cobbles; mildly alkaline (pH 7.4); abrupt wavy boundary.

R--14 + inches; fractured sandstone.

The range in characteristics is not determined for this soil.

DATINO SERIES

These soils are classified as loamy-skeletal, mixed Typic Haploborolls.

The Datino series consists of very deep, well drained and moderately permeable soils that formed in colluvium derived dominantly from sandstone and shale.

These soils are on toe slopes of very steep mountain slopes at elevations of 6,800 to 8,100 feet. Slope ranges from 40 to 60 percent. The average annual precipitation ranges from 16 to 18 inches, and the mean annual air temperature ranges from 43 to 45 degrees F.

They are near the Comodore and Beenom soils. Comodore and Beenom soils have bedrock within 20 inches. Beenom soils have a layer of clay accumulation.

A typical pedon of Datino extremely stony fine sandy loam, 40 to 60 percent slopes, eroded, located about 1/4 mile south of Soldier Creek Mine; 2,400 feet west and 2,200 feet south of the NE corner of Section 18, T. 13 S., R. 12 E. (Photo No. & Coord. 4-100, K-3).

A1--0 to 9 inches; brown (10YR 4/3) extremely stony fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; common very fine and fine, few medium and coarse roots; few very fine pores; 15 percent gravel, 25 percent cobbles and 25 percent stones; moderately alkaline (pH 7.9); clear smooth boundary.

B2--9 to 16 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, medium and coarse roots; common very fine and fine, few medium pores; 15 percent gravel, 15 percent cobbles and 10 percent stones, slightly calcareous; moderately alkaline (pH 7.9); gradual wavy boundary.

C1ca--16 to 41 inches; brown (10YR 5/3) extremely stony fine sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine, fine, medium and coarse roots; common very fine and fine pores; 15 percent gravel, 25 percent cobbles and 30 percent stones; strongly calcareous, carbonates occur as soft powdery masses; moderately alkaline (pH 8.0); gradual smooth boundary.

C2--41 to 60 inches; brown (10YR 5/3) extremely stony very fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, medium and coarse roots; few very fine pores; 15 percent gravel, 25 percent cobbles and 30 percent stones; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 7.9).

The range in characteristics has not been determined for this soil.

SOIL INTERPRETATIONS RECORD

RECORD NO. _____
 STATE _____
 COUNTY _____
 DATE _____
 REVISION _____
 UNIT MODIFIER _____

MLRA(S) 47 KIND OF UNIT SERIES UNIT NAME DHG2 DATUM _____
 STATE UTAH RECORD NO. _____ AUTHOR(S) HKS DATE 12-78 REVISED _____
 CLASSIFICATION AND BRIEF SOIL DESCRIPTION _____

DEPTH (IN)	MOISTURE	TEXTURE	UNIFIED	AASHTO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
						4	10	40	200		
0-9	STX-FSL	GM-GC	A-2	60-70	55-65	50-60	35-50	20-35	20-25	5-10	
9-16	STV-L	GM-GC, SM-SC	A-4	30-45	65-75	60-70	50-65	35-50	20-30	5-10	
16-60	STX-FSL, STX-VFSL	GM-GC	A-2	65-75	50-60	45-55	30-50	20-30	20-30	5-10	

DEPTH (IN)	CLAY (PCT OF <200)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								K	T			STEEL	CONCRETE
12-15	12-15	1.3-1.45	2.0-6.0	0.05-0.06	7.9-8.4	<2	LOW	.15	5	B	3-5	HIGH	MODERATE
17-19	17-19	1.25-1.3	0.6-2.0	0.09-0.11	7.9-8.4	<2	LOW	.28					
15-20	15-20	1.3-1.45	2.0-6.0	0.05-0.08	7.9-8.4	<2	LOW	.24					

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION		
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS			INITIAL (IN)	TOTAL (IN)
NONE				>6.0				>60				B	MODERATE

SEPTIC	LAGOON	TRENCH	SANITARY LANDFILL (TRENCH)	SANITARY LANDFILL (AREA)	DAILY COVER FOR LANDFILL	SANITARY FACILITIES		KEYING ONLY		FOOTNOTES		CONSTRUCTION MATERIAL	
						SEVERE - SLOPE, LARGE STONES	SEVERE - SEEPAGE, SLOPE, LARGE STONES	SEVERE - SEEPAGE, SLOPE, LARGE STONES	SEVERE - SEEPAGE, SLOPE	POOR - LARGE STONES, SLOPE	ROADFILL	SAND	GRAVEL
1	1	1	1	1	1								
2	2	2	2	2	2								
3	3	3	3	3	3								
4	4	4	4	4	4								
5	5	5	5	5	5								

EXCAV	DWELL	DWELL	BLDG	ROADS	LAWNS	BUILDING SITE DEVELOPMENT		KEYING ONLY		FOOTNOTES		WATER MANAGEMENT	
						SEVERE - LARGE STONES, SLOPE	SEVERE - SLOPE, LARGE STONES	SEVERE - SLOPE, SLOPE					
1	1	1	1	1	1								
2	2	2	2	2	2								
3	3	3	3	3	3								
4	4	4	4	4	4								
5	5	5	5	5	5								

REGIONAL INTERPRETATIONS	
REGION	1
	2
	3
	4

UNIT NAME: DATINO RECREATIONAL DEVELOPMENT
UNIT MODIFIER:

RECORD NO.		CAMP NO.		FOOTNOTE		RECORD NO.		PLAYGROUND NO.		FOOTNOTE	
CAMP AREAS		SEVERE - SLOPE, LARGE STONES				PLAYGROUNDS		SEVERE - LARGE STONES, SLOPE, SMALL STONES			
PICNIC AREAS		SEVERE - SLOPE, LARGE STONES				PATHS AND TRAILS		SEVERE - LARGE STONES, SLOPE			

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)															
CROPHD	451	CLASS- DETERMINING PHASE	CAPABILITY												
			RIER	IRL	RIER	IRL	RIER	IRL	RIER	IRL	RIER	IRL	RIER	IRL	
CROPS	341	ALL	75												

WOODLAND SUITABILITY										POTENTIAL PRODUCTIVITY		SITE INDEX		TREES TO PLANT	
WOODS	361	CLASS- DETERMINING PHASE	ORD SYM	MANAGEMENT PROBLEMS				PLANT COMPET.	COMMON TREES		SITE INDEX	TREES TO PLANT			
				EROSION HAZARD	EQUIP. LIMIT	SEEDLING MORT-Y.	WINDY HAZARD		DOUGLAS FIR	PINYON					

WINDBREAKS										
WINDBR	381	CLASS- DETERMINING PHASE	SPECIES		HT	SPECIES		HT	SPECIES	
			NONE							

WILDLIFE HABITAT SUITABILITY														
WILDLF	391	CLASS- DETERMINING PHASE	POTENTIAL FOR HABITAT ELEMENTS							POTENTIAL AS HABITAT FOR				
			GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
		ALL	V. POOR	V. POOR	FAIR	-	POOR	FAIR	V. POOR	V. POOR	POOR	FAIR	V. POOR	FAIR

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)													
PHASE	401	COMMON PLANT NAME	PLANT SYMBOL (NLSFN)	PERCENTAGE COMPOSITION (DRY WEIGHT, BY CLASS- DETERMINING PHASE)									
POTJC	431			MODERN DOUGLAS FIR									
		POTENTIAL PRODUCTION (LBS./AC. DRY WT):											
		FAVORABLE YEARS											
		NORMAL YEARS											
		UNFAVORABLE YEARS											

NOTES														

LSG--ROTTULEE-MORENO COMPLEX, 30 TO 60 PERCENT SLOPES

This map unit is on mountain and canyon sideslopes. It is in the vicinity of Whitmore and Emma Parks. Elevation is 7,100 to 8,700 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

This unit is 40 percent Rottulee loam, 30 to 60 percent slopes; 20 percent Moreno extremely bouldery loam, 30 to 60 percent slopes; and 20 percent Rombo Variant stony loam, 30 to 60 percent slopes. The Rottulee and Moreno soils are intermingled on the landscape, and the Rombo Variant soil is on hillsides.

Included in this unit is about 8 percent Pino silty clay loam, 3 to 30 percent slopes; 5 percent Gappmayer Variant loam, 50 to 70 percent slopes; 3 percent Rock outcrop of sandstone; 2 percent Badland; and 2 percent Benteen thin surface loam, 30 to 50 percent slopes.

The Rottulee soil is very deep and well drained. It formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are short and convex. The present vegetation is mainly mountain big sagebrush, Salina wildrye, serviceberry, and mountain big sagebrush.

Typically, the surface layer is reddish brown loam about 2 inches thick. The subsoil is reddish brown loam about 6 inches thick. The upper 26 inches of the substratum is light gray loam. The lower part to a depth of 60 inches or more is weak red silty clay loam.

Permeability of the Rottulee soil is moderate to a depth of 34 inches and moderately slow below this depth. Available water capacity is about 7.5 to 10 inches. Water supplying capacity is 9 to 13 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Moreno soil is very deep and well drained. It formed in colluvium and alluvium derived dominantly from sandstone and shale. Slopes are short and concave. The present vegetation is mainly serviceberry, mountain big sagebrush, Salina wildrye, snowberry, and scattered Douglas-fir.

Typically, the surface layer is brown extremely bouldery loam about 8 inches thick. The subsoil is brown and reddish brown stony clay loam about 40 inches thick. The substratum to a depth of 60 inches or more is reddish brown clay loam. A layer of carbonates is at a depth of about 48 inches.

Permeability of the Moreno soil is moderate to a depth of 8 inches and moderately slow below this depth. Available water capacity is about 7.5 to 10.0 inches. Water supplying capacity is 9 to 13 inches. The organic

matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Rombo Variant soil is deep and well drained. It formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are short and are convex. The present vegetation is mainly mountain big sagebrush, serviceberry and Mormon-tea.

Typically, the surface layer is light yellowish brown stony silty clay loam about 5 inches thick. The subsoil is light yellowish brown silty clay loam about 23 inches thick. The upper 17 inches of the substratum is light brownish gray silty clay loam. The lower part, to a depth of 55 inches, is light brownish gray and light yellowish brown silty clay loam and fine sandy loam. Sandstone is at a depth of 55 inches.

Permeability of the Rombo Variant soil is moderately slow. Available water capacity is about 7.5 to 10 inches. Water supplying capacity is 12 to 16 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for wildlife habitat and rangeland.

This unit is in capability subclass VIIe, nonirrigated.

ROTTULEE SERIES

These soils are classified as fine-loamy, mixed Typic Haploborolls.

The Rottulee series consists of very deep, well-drained, moderately permeable soils that formed in residuum and some local alluvium derived dominantly from calcareous fine to medium textured sedimentary rocks.

These soils are on sideslopes of rolling ridges and cuesta scarp faces at elevations of 7,100 to 8,700 feet. Slope ranges from 3 to 60 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Rombo, Moreno and Dooley soils.

Rombo, Moreno and Dooley soils have profiles deeper than 40 inches. Rombo soils have a slowly permeable subsoil. Moreno and Dooley soils have an argillic horizon.

A typical pedon of Rottulee loam, 30 to 60 percent slopes located in an unsurveyed area approximately 3.5 miles west and 1.5 miles north of the confluence of Minnie Maud and Nine Mile Creeks.

A1--0 to 2 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky, and slightly plastic; common very fine, and fine; few medium roots; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

B2--2 to 8 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, and plastic; common very fine and fine; few medium and coarse roots; common very fine and moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear wavy boundary.

C1--8 to 17 inches; light gray (5Y 7/2) loam, olive (5Y 5/3) moist; rock structure; hard, firm, slightly sticky, and plastic; common very fine and fine roots; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca--17 to 34 inches; light gray (5Y 7/2) loam, olive (5Y 5/3) moist; rock structure; hard, firm, slightly sticky, and plastic; few very fine and fine roots; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); clear wavy boundary.

IIC3--34 to 60 inches; weak red (10YR 4/3) silty clay loam, dark reddish brown (2.5YR 3/4) moist; rock structure; very hard, firm, sticky, and plastic; few very fine and fine roots; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.2).

The control section is commonly loam, or light clay loam with 20 to 34 percent clay. Gravel-size shale fragments that slake in water increase with depth to as much as 60 percent. The soil is weakly to strongly calcareous.

The A horizon has hue of 7.5YR or 5YR, value of 4 dry, 3 moist, and chroma of 2 or 3.

The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 dry, 3 or 4 moist, and chroma of 3. Thickness of the solum ranges from 6 to 13 inches.

The C horizon may be stratified with hue of 5Y, 10R, or 5YR, value 4 through 7 dry, and chroma of 2 to 6. C horizons are 20 to 60 percent shale fragments by volume that slake in water. The Cca horizon has few to common films and threads of carbonates or few masses of accumulated flour carbonates.

This soil is a taxadjunct and differs from Rottulee in that it has hue of 5Y in parts of the control section, and that it is greater than 40 inches in depth.

MORENO SERIES

These soils are classified as fine, mixed Typic Argiborolls.

The Moreno series consists of deep, well drained, and moderately slow permeable soils that formed in residuum and local colluvium derived dominantly from sandstone and shale.

These soils are on mountain and valley sideslopes at elevations of 7,100 to 8,700 feet. Slope ranges from 30 to 60 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Rottulee, Rombo Variant, and Pino soils. Rottulee soil and Rombo Variant lack argillic horizons. Pino soil has a lithic contact at 20 to 40 inches. Rombo Variant and Pino lack mollic epipedons.

A typical pedon of Moreno extremely bouldery loam, 30 to 60 percent slopes located about 3.0 miles south and 0.5 miles west of the confluence of Nine Mile and Minnie Maud Creeks; 1,800 feet west and 400 feet south of the NE corner of Section 11., T. 13 S., R. 12 E.

A1--0 to 8 inches; brown (7.5YR 4/2) extremely bouldery loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky parting to weak fine granular structure; soft, friable, slightly sticky, and slightly plastic; few very fine, fine, and medium roots; few very fine and fine pores; All horizon may be present under vegetation; slightly calcareous, carbonates are disseminated; mildly alkaline (pH 7.6); clear smooth boundary.

B21t--8 to 15 inches; brown (7.5YR 5/4) stony clay loam, brown (7.5YR 4/4) moderate medium subangular blocky structure; hard, friable, slightly sticky, and plastic; few very fine, fine and medium roots; few very fine and fine pores; few thin clay films on ped faces; 10 percent cobbles, 15 percent stones, 7 percent gravel, and 1 percent boulders; mildly alkaline (pH 7.6); clear smooth boundary.

B22t--15 to 48 inches; reddish brown (5YR 4/4) stony clay loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; very hard, firm, sticky, and plastic; few very fine, fine, and medium roots; common very fine and few fine pores; common moderately thick clay films on ped faces and pore linings; 5 percent gravel, 5 percent cobbles, and 5 percent stones; mildly alkaline (pH 7.6); clear smooth boundary.

C1ca--48 to 60 inches; reddish brown (5YR 5/3) clay loam, reddish brown (5YR 4/3) moist; massive; hard, firm, slightly sticky, and plastic; few very fine and fine roots, 40 percent gravel size soft shale fragments that slake in water; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.0).

SOIL INTERPRETATIONS RECORD

SOIL-1015-1
REV. 2-76
FILE CODE: SOIL-1-1

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RECORD NO.	MLRA (S)	E-47	STATE	UTAH	RECORD NO.	AUTHOR(S)	TLH	DATE	2-80	REVISED	UNIT NAME	LSG	ROMBO
CLASSIFICATION AND BRIEF SOIL DESCRIPTION													
ESTIMATED SOIL PROPERTIES													

PROP	DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHD	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
						4	10	40	200		
	0-5	ST-SICL	CL	A-6	15-25	65-75	60-70	55-65	50-60	30-40	10-15
	5-50	SICL	CL	A-6	0	95-100	90-100	85-100	80-95	30-40	10-20
	50-55	FSI	CL-M	A-4	0	95-100	90-100	70-85	40-55	20-30	5-10
	55	LWB									

PROP	DEPTH (IN)	CLAY (PCT OF <2MM)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
									K	T			STEEL	CONCRETE
	30-35	30-35	1.25-1.35	0.2-0.6	.14-.18	7.9-8.4	-	MODERATE	0.28	5	41	1-3	HIGH	MODERATE
	30-38	30-38	1.25-1.35	0.2-0.6	.15-.19	7.9-9.0	-	MODERATE	0.37	-	-	-		
	12-16	12-16	1.30-1.45	2.0-6.0	.11-.14	7.9-8.4	-	LOW	0.37	-	-	-		

PROP	DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
								INITIAL (IN)	TOTAL (IN)		
	>6.0									C	HIGH

PROP	DEPTH (IN)	FREQ.	DURATION	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
									INITIAL (IN)	TOTAL (IN)		
		NONE									C	HIGH

PROP	DEPTH (IN)	FOOTNOTES	SANITARY FACILITIES	KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL
	0-7		SEVERE - PERCS SLOWLY, SLOPE			POOR - LOW STRENGTH, SLOPE
	0-7		SEVERE - SLOPE			IMPROBABLE SOURCE - EXCESS FINES
	0-7		SEVERE - DEPTH TO ROCK, SEEPAGE, SLOPE			IMPROBABLE SOURCE - EXCESS FINES
	0-7		SEVERE - SEEPAGE, SLOPE			POOR - SLOPE

PROP	DEPTH (IN)	FOOTNOTES	BUILDING SITE DEVELOPMENT	KEYING ONLY	FOOTNOTES	WATER MANAGEMENT
	0-7		SEVERE - SLOPE			SEVERE - SLOPE
	0-7		SEVERE - SLOPE			MODERATE - THIN LAYER, PIPING
	0-7		SEVERE - SLOPE			SEVERE - NO WATER
	0-7		SEVERE - SLOPE			DEEP TO WATER

PROP	DEPTH (IN)	FOOTNOTES	SMALL COMMERCIAL BUILDINGS	KEYING ONLY	FOOTNOTES	IRRIGATION
	0-7		SEVERE - LOW STRENGTH, SLOPE, FROST ACTION			SLOPE, ERODES EASILY
	0-7		SEVERE - SLOPE			SLOPE, ERODES EASILY

PROP	DEPTH (IN)	FOOTNOTES	LOCAL ROADS AND STREETS	KEYING ONLY	FOOTNOTES	TERRACES AND DIVERSIONS
	0-7		SEVERE - SLOPE			SLOPE, ERODES EASILY

PROP	DEPTH (IN)	FOOTNOTES	LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	KEYING ONLY	FOOTNOTES	GRASSED WATERWAYS
	0-7		SEVERE - SLOPE			SLOPE, ERODES EASILY

PROP	DEPTH (IN)	FOOTNOTES	REGIONAL INTERPRETATIONS	KEYING ONLY	FOOTNOTES
	0-7				

JTG--REPP DONEY COMPLEX, 40 TO 70 PERCENT SLOPES

This map unit is on south facing steep mountain and canyon sideslopes, and narrow ridge tops. It is located in the Book and Roan Cliffs north of Price and east of Sunnyside. Slopes are short to medium in length and single in shape. The present vegetation is mainly curlleaf mountain-mahogany, pinyon pine, juniper, and mountain shrubs. Elevation is 7,500 to 9,000 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

This unit is 45 percent Repp extremely bouldery fine sandy loam, 40 to 70 percent slopes, 25 percent Doney very stony loam, 40 to 70 percent slopes, and 30 percent inclusions of other soils. The Repp soil is on lower sideslopes and fans, the Doney soil is on ridge tops, the upper sideslopes, and convex ridge lines.

Included in this unit is about 10 percent Podo very bouldery loam, 50 to 70 percent slopes on sideslopes, 5 percent Podo very stony loam, 40 to 70 percent scattered throughout the unit; 10 percent Rock outcrop as cliffs and ledges and 5 percent of a soil similar to Firo cobbly fine sandy loam, 3 to 30 percent slopes except under curlleaf mountain-mahogany and on slopes of 15 to 50 percent.

The Repp soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone.

Typically, the surface layer is brown extremely bouldery fine sandy loam about 2 inches thick. The subsoil is reddish brown very cobbly fine sandy loam about 22 inches thick. The upper 8 inches of the substratum is brown extremely cobbly fine sandy loam. The lower part to a depth of 60 inches is reddish brown very stony fine sandy loam. A layer of carbonates is at a depth of about 24 inches.

Permeability of the Repp soil is moderately rapid. Available water capacity, to a depth of 60 inches, is about 4.0 to 5.0 inches. Water supplying capacity is 7 to 8 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Doney soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone and siltstone.

Typically, the surface layer is light brownish gray very stony loam about 6 inches thick. The underlying layer is light brownish gray stony clay loam about 3 inches thick. The next layer is light gray shaly clay loam. Fractured soft sandstone siltstone is at a depth of about 29 inches. Depth to soft sandstone ranges from 20 to 40 inches.

Permeability of the Zillion soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 9 to 11 inches. The organic matter content of the surface layer is 5 to 10 percent. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for rangeland, wildlife habitat, and recreation.

This unit is in capability subclass VIIe, nonirrigated.

REPP SERIES

These soils are classified as loamy-skeletal, mixed, frigid, Typic Ustochrepts.

The Repp series consists of very deep, well drained, moderately rapid permeable soils that formed in colluvium derived dominantly from sandstone, siltstone, and shale.

These soils are on steep and very steep canyon and mountain sideslopes at elevations of 7,000 to 9,000 feet. Slope ranges from 40 to 70 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Patmos, Doney, and Gappmayer Variant soils.

Patmos soils have bedrock at 20 to 40 inches. Doney soils have bedrock at 20 to 40 inches. Gappmayer Variants have a dark surface and an argillic horizon.

A typical pedon of Repp bouldery fine sandy loam, 40 to 70 percent slopes was described on Ford Ridge, 100 feet west and 1,900 feet south of the NE corner of Section 31, T. 12 S., R. 9 E. (Photo No. & Coord. 3-95 B-9).

A1--0 to 3 inches; brown (10YR 5/3) bouldery fine sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, few fine roots; common very fine pores; 5 percent gravel; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

B1--3 to 7 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, few fine roots, common very fine pores; 5 percent gravel; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

B2--7 to 14 inches; light yellowish brown (10YR 6/4) gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine, few fine roots, common very fine pores; 15 percent gravel; strongly calcareous, carbonates are disseminated and in soft masses on the underside of gravel; strongly alkaline (pH 8.8); gradual wavy boundary.

C1ca--14 to 30 inches; very pale brown (10YR 7/4) very cobbly fine sandy loam, yellowish brown (10YR 5/4) moist; massive; very hard, friable, slightly sticky, slightly plastic; few fine roots, common very fine pores; 20 percent gravel, 15 percent cobbles; strongly calcareous, carbonates are disseminated and on the underside of gravel and cobbles as soft masses; strongly alkaline (pH 8.8); distinct wavy boundary.

C2ca--30 to 60 inches; pale yellow (2.5Y 7/4) very stony fine sandy loam, light olive brown (2.5Y 5/4) moist; massive hard, friable, slightly sticky, slightly plastic; few fine roots, common very fine pores; 30 percent gravel, 10 percent cobbles; 20 percent stones; strongly calcareous, carbonates are disseminated and on the underside of coarse fragments as soft masses; strongly alkaline (pH 8.8).

Depth to bedrock is greater than 60 inches. The control section is commonly very gravelly fine sandy loam but ranges to include gravelly and very gravelly silt loam in some pedons. Clay content is 18 to 35 percent. Rock fragments are gravels, cobbles, and stones and range from 35 to 60 percent in the control section.

The A horizon has hue of 10YR, 7.5YR, value of 4 or 5 dry, 3 or 4 moist, and chroma of 2 to 4. It is cobbly silty clay loam, extremely bouldery fine sandy loam, bouldery fine sandy loam.

The B horizon has hue of 5YR, 10YR, 7.5YR, value of 4 to 6 dry, 4 or 5 moist, and chroma of 2 to 4. It is commonly fine sandy loam or gravelly fine sandy loam but ranges to cobbly fine sandy loam. The B horizon is moderately calcareous or strongly calcareous and is moderately to strongly alkaline.

The Cca horizon has hue of 2.5Y, 10YR, 7.5YR, value of 5 to 7 dry, 4 to 6 moist, and chroma of 2 to 4. The Cca horizon is moderately calcareous or strongly calcareous and is moderately to strongly alkaline.

This soil is a taxadjunct and varies from the Repp series because it is calcareous throughout and differs in value from the A and B horizons.

DONEY SERIES

These soils are classified as fine-loamy, mixed (calcareous), frigid Typic Ustorthents.

The Doney series consists of moderately deep, well drained, moderate to moderately slow permeable soils that formed in colluvium and residuum derived dominantly from sandstone, siltstone, and shale.

These soils are on south facing steep mountain and canyon sideslopes at elevations of 7,500 to 9,500 feet. Slope ranges from 40 to 70 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Repp, Firo, and Podo soils. Repp soils have bedrock at depths greater than 40 inches. Firo soils have a dark surface and bedrock at depths of less than 20 inches. Podo soils have bedrock at depths less than 20 inches.

A typical pedon of Doney very stony loam, 50 to 70 percent slopes was described above Stone Cabin Draw; 2,700 feet north, 1,400 feet west of the SE corner of Section 34, T. 12 S., R. 14 E. (Photo No. & Coord. 2-145-E-8).

A1--0 to 6 inches; light brownish gray (10YR 6/2) very stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, firm, nonsticky, slightly plastic; common very fine and fine, few medium roots; 15 percent gravel, 10 percent cobbles, 15 percent stones, 1 percent boulders; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1ca--6 to 9 inches; light brownish gray (10YR 6/2) stony clay loam, pale brown (10YR 6/3) moist; weak fine granular structure; hard, firm, sticky, plastic; common very fine and fine, few medium roots; 10 percent gravel, 5 percent stones; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C2ca--9 to 19 inches; light gray (10YR 7/2) shaly clay loam, light brownish gray (10YR 7/2) moist; weak medium subangular blocky structure; very hard, firm, sticky, plastic; few very fine, fine roots; 15 percent soft shale; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C3--19 to 29 inches; white (10YR 8/2) shaley silty clay loam, very pale brown (10YR 7/3) moist; rock structure; few very fine roots; 25 percent siltstone; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); abrupt smooth boundary.

C4r--29 inches; soft sandstone.

Depth to sandstone or siltstone is 20 to 40 inches. The control section is commonly clay loam but ranges to include loam, sandy loam, and silty clay loam in some pedons. Clay content is 18 to 35 percent. Rock fragments are gravel, channers, and flags of sandstone, siltstone, and shale and range from 0 to 25 percent in the control section. These soils are commonly calcareous throughout.

The A horizon has hue of 10YR, value of 4 to 6 dry, and chroma of 2 or 3. It is gravelly loam, very stony loam, fine sandy loam.

The C horizon is strongly calcareous or very strongly calcareous and is moderately or strongly alkaline.

SOIL INTERPRETATIONS RECORD

JTC, JOC

MLRA(S) 47-34 KIND OF UNIT SERIE UNIT NAME DONEY
 STATE UTAH RECORD NO. AUTHOR(S) SHH LHS DATE 1-79 REVISED UNIT MODIFIER
 CLASSIFICATION AND BRIEF SOIL DESCRIPTION

CLAS: 021
DESCR: 031

ESTIMATED SOIL PROPERTIES

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-6	SICL	CL	A-6	0	85-92	80-90	75-90	70-85	30-35	10-15
0-6	STV-1	ML-CC-CL	A-4	40-50	80-100	75-95	60-90	45-70	20-30	5-10
0-6	GR-1-FSL	CL, ML-CL, SM-SC	A-4	0-10	75-100	70-95	50-72	40-55	20-30	5-10
6-31	SH-CL SH-SICL	CL	A-6	0	70-75	65-80	45-70	50-65	30-40	10-15
31	WB									

DEPTH (IN)	CLAY (PCT OF <200)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								K	T			STEEL	CONCRETE
27-30		1.25-1.3	0.2-0.6	0.14-0.19	7.9-8.4		MODERATE	.32	3	4L	1-3	HIGH	MODERATE
14-16		1.25-1.3	0.2-0.6	0.14-0.17	7.9-8.2		LOW	.20	3	8	1-3		
15-20		1.25-1.3	0.2-0.6	0.10-0.13	8.5-9.0		LOW	.20	3	4L	1-3		
18-35		1.25-1.3	0.2-0.6	0.15-0.19	7.9-8.4		MODERATE	.24					

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION		
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS			INITIAL (IN)	TOTAL (IN)
				>6.0				20-40	SOFT			C	MODERATE

SEPTIC	SEPTIC TANK ABSORPTION FIELDS	FOOTNOTES	SANITARY FACILITIES		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
			SEVERE - DEPTH TO ROCK, PERCS SLOWLY, SLOPE				ROADFILL	15-25%: POOR - AREA RECLAIM, LOW STRENGTH 25%+: POOR - AREA RECLAIM, LOW STRENGTH, SLOPE
					FILL			
					SAND			IMPROBABLE SOURCE - EXCESS FINES
					GRAVEL			IMPROBABLE SOURCE - EXCESS FINES
					SOIL			POOR - SLOPE STV - L: POOR - LARGE STONES, SLOPE

COVER	DAILY COVER FOR LANDFILL	FOOTNOTES	BUILDING SITE DEVELOPMENT		PONDRES	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				POND RESERVOIR AREA	SEVERE - SLOPE

EXCAV	SHALLOW EXCAVATIONS	FOOTNOTES	BUILDING SITE DEVELOPMENT		DIXES	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				EMBANKMENTS DIKES AND LEVEES	MODERATE - THIN LAYER

DWEL	DWELLINGS WITHOUT BASEMENTS	FOOTNOTES	BUILDING SITE DEVELOPMENT		PONDQAQ	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				EXCAVATED PONDS AQUIFER FED	SEVERE - NO WATER

DWEL	DWELLINGS WITH BASEMENTS	FOOTNOTES	BUILDING SITE DEVELOPMENT		DRAIN	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				DRAINAGE	DEEP TO WATER

BLDGS	SMALL COMMERCIAL BUILDINGS	FOOTNOTES	BUILDING SITE DEVELOPMENT		IRRIG	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				IRRIGATION	DEPTH TO ROCK, SLOPE

ROADS	LOCAL ROADS AND STREETS	FOOTNOTES	BUILDING SITE DEVELOPMENT		TERRAC	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE				TERRACES AND DIVERSIONS	SLOPE, DEPTH TO ROCK

LAWNS	LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	FOOTNOTES	BUILDING SITE DEVELOPMENT		WATERW	FOOTNOTES	WATER MANAGEMENT	
			SEVERE - SLOPE STV-L: SEVERE - LARGE STONES, SLOPE				BRASSSED WATERWAYS	SLOPE - DEPTH TO ROCK

REGION	REGIONAL INTERPRETATIONS	FOOTNOTES	BUILDING SITE DEVELOPMENT		REGIONAL INTERPRETATIONS	

KEYING ONLY		UNIT NAME: DONEY		RECREATIONAL DEVELOPMENT		FOOTNOTE												
RECORD NO.	CONT. NO.	UNIT MODIFIER:		KEYING ONLY		FOOTNOTE												
CAMPS	NO.	FOOTNOTE		PLAYGRO	321	SEVERE - SLOPE												
	1	SEVERE - SLOPE			2	STY-1 - SEVERE - LARGE STONES, SLOPE												
	2				3													
	3				4													
	4				5													
PICN...	1	SEVERE - SLOPE		PATHS	331	15-25% MODERATE - SLOPE												
	2				2	25+% SEVERE - SLOPE												
	3				3													
	4				4													
	5				5													
FOOTNOTE CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)																		
CROPS	45	CLASS- DETERMINING PHASE	CAPABILITY															
	1		NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.
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VOH--PESO-ROCK OUTCROP COMPLEX, 50 TO 80 PERCENT SLOPES

This map unit is on steep to very steep mountain sideslopes. It is located in the Book Cliffs north of Helper and east of Sunnyside. Slopes are short in length and single to convex in shape. The present vegetation is mainly Douglas fir, serviceberry, birchleaf mountainmahogany, mock-orange, and western wheatgrass. Elevation is 5,000 to 9,500 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

This unit is 55 percent Peso extremely bouldery fine sandy loam, 50 to 80 percent slopes; 20 percent Rock outcrop, and 25 percent other soils. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 12 percent Midfork bouldery loam, 50 to 70 percent slopes on concave slope positions in drainages, 10 percent Comodore very stony fine sandy loam, 50 to 60 percent slopes, intermixed on the landscape and 3 percent Zillion very stony fine sandy loam, 55 to 80 percent slopes.

The Peso soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone and shale.

Typically, the surface is covered with a mat of partially decomposed needles, twigs, and leaves about 1/2 inch thick. The surface layer is yellowish brown extremely bouldery fine sandy loam about 3 inches thick. The subsoil is yellowish brown very gravelly fine sandy loam about 11 inches thick. The substratum is a yellowish brown extremely cobbly fine sandy loam about 8 inches thick over sandstone. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Peso soil is moderately rapid. Available water capacity, to a depth of 22 inches, is about 1.0 to 2.0 inches. Water supplying capacity is 3 to 5 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 20 to 40 inches. Runoff is moderate, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

Rock outcrop consists of areas of exposed sandstone and shale. It is dominantly interbedded and occurs as ledges.

This unit is used for rangeland, wildlife habitat, and recreation.

The Peso soil is in capability subclass VIIe, nonirrigated, and Rock outcrop is in capability subclass VIII.

PESO SERIES

These soils are classified as loamy-skeletal, mixed Typic Haploborolls.

The Peso series consists of moderately deep, well drained, moderately rapid permeable soils that formed in colluvium derived dominantly from sandstone and shale of the Green River Formation.

These soils are on steep to very steep mountain sideslopes at elevations of 5,000 to 9,500 feet. Slope ranges from 50 to 80 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Midfork and Comodore soils. Midfork soils are over 40 inches deep. Comodore soils are shallow.

A typical pedon of Peso extremely bouldery fine sandy loam, 50 to 80 percent slopes, was described at the head of Big Canyon, 4.0 miles west, north west of the mouth of Big Canyon on the Green River.

0--1/2 inch to 0; litter layer of fir needles.

A1--0 to 3 inches; yellowish brown (10YR 5/4) extremely bouldery fine sandy loam, dark brown (10YR 3/3) moist; moderate coarse granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, few very coarse roots; common very fine pores; 15 percent gravel; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

B2--3 to 14 inches; yellowish brown (10YR 5/4) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft very friable, slightly sticky, slightly plastic; common very fine few very coarse roots; common very fine pores; 50 percent gravel, 10 percent cobbles; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1--14 to 22 inches; yellowish brown (10YR 5/4) extremely cobbly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, nonplastic; few very fine, few very coarse roots; 20 percent gravel, 50 percent cobbles; moderately calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); gradual smooth boundary.

R--22 inches; very hard sandstone.

Depth to bedrock is 20 to 40 inches.

The control section is commonly very gravelly fine sandy loam but ranges to include very cobbly fine sandy loam, and cobbly loam in some pedons. Rock fragments are 35 to 60 percent and consist of gravel, cobbles, and stones. These soils are commonly calcareous throughout.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 dry, 2 or 3 moist, and chroma of 2 or 3. It is extremely bouldery fine sandy loam and bouldery loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry, 3 through 5 moist, and chroma of 3 or 4. The C horizon is moderately calcareous or strongly calcareous and is moderately or strongly alkaline.

This soil is a taxadjunct and differs from Peso by having less than 18 percent clay in the control section.

SOIL INTERPRETATIONS RECORD

RECORD NO.	STATE	MLRA(S)	E-47	RECORD NO.	AUTHOR(S)	SHH DTH	DATE	2-80	KIND OF UNIT	SERIES	UNIT NAME	VOH	PESO
CLASS. DESCR.	CLASSIFICATION AND BRIEF SOIL DESCRIPTION												

DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	200		
0-3	BYX-FSL	SM-SC	A-2, A-4	65-80	85-95	80-90	55-65	30-40	20-25	NP-10
3-14	GRV-FSL, CBV-FSL	GP-GM, GM	A-2	15-45	30-45	25-40	15-25	5-15	20-25	MP-5
14-22	CRX-FSL	GM, GM-GC, SM-SC	A-2	60-75	40-65	35-60	20-40	10-30	20-30	NP-10
22	LWB									

DEPTH (IN)	CLAY (PCT OF <20µ)	MOIST BULK DENSITY (G/CM³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY	
								K	T			STEEL	CONCRETE
12-17		1.3-1.45	2.0-6.0	0.05-0.09	7.9-9.0	-	LOW	.10	2	3	3-5	HIGH	MODERATE
12-15		1.3-1.45	2.0-6.0	0.05-0.09	8.4-9.0	-	LOW	.24					
11-15		1.3-1.45	2.0-6.0	0.05-0.09	8.4-9.0	-	LOW						

FLOODING	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION			
	FREQUENCY	DURATION	MONTHS	DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)			HARDNESS	INITIAL (IN)	TOTAL (IN)
NONE				>6.0			-		20-40	HARD	-		8	MODERATE

KEYING ONLY	SANITARY FACILITIES		CONSTRUCTION MATERIAL	
	FOOTNOTES	DESCRIPTION	FOOTNOTES	DESCRIPTION
SEPTIC 071	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	FILL 191	SEVERE - AREA RECLAIM, THIN LAYER, LARGE STONES	ROADFILL
LAGOON 062	SEVERE - SEEPAGE, DEPTH TO ROCK, SLOPE	SAND 201	IMPROBABLE SOURCE - SMALL STONES, THIN LAYER, LARGE STONES	SAND
TRENCH 095	SEVERE - DEPTH TO ROCK, SEEPAGE, SLOPE	GRAVEL 211	IMPROBABLE SOURCE - THIN LAYER, LARGE STONES	GRAVEL
SANARE 101	SEVERE - DEPTH TO ROCK, SEEPAGE, SLOPE	SOIL 221	POOR - LARGE STONES, SLOPE	TOPSOIL
COVER 111	POOR - AREA RECLAIM, SEEPAGE, LARGE STONES	PONDRES 231		FOOTNOTES
EXCAV 121	SEVERE - DEPTH TO ROCK, LARGE STONES, SLOPE	DIKES 241	SEVERE - THIN LAYER, SEEPAGE, LARGE STONES	EMBANKMENTS, DIKES AND LEVEES
DWELL 131	SEVERE - SLOPE, LARGE STONES	PONDAQ 251	NO WATER	EXCAVATED PONDS, AQUIFER FED
DWELL 141	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	DRAIN 261	DEEP TO WATER	DRAINAGE
BLDGS 151	SEVERE - SLOPE, LARGE STONES	IRRIQ 271	LARGE STONES, DROUGHTY, SOIL BLOWING	IRRIGATION
ROADS 161	SEVERE - SLOPE, LARGE STONES	TERRAC 281	SLOPE, LARGE STONES, DEPTH TO ROCK	TERRACES AND DIVERSIONS
LAWNS 171	SEVERE - SMALL STONES, LARGE STONES, SLOPE	WATERW 291	LARGE STONES, SLOPE, DROUGHTY	UNGRASED WATERWAYS

REGIONAL INTERPRETATIONS	
REGION 101	

RECORD NO.		CONT. NO.		UNIT NAME: PESO	RECREATIONAL DEVELOPMENT	FOOTNOTE	
CAMP: 31		PICNIC: 31		FOOTNOTE: SEVERE - SLOPE, LARGE STONES		KEYING ONLY: PLAYGRD 321	
CAMP AREAS		PICNIC AREAS		SEVERE - SLOPE, LARGE STONES		PLAYGROUNDS	
PICNIC AREAS		SEVERE - SLOPE, LARGE STONES		PATHS 331		PATHS AND TRAILS	
						SEVERE - LARGE STONES, SLOPE	
						SEVERE - LARGE STONES, SLOPE	

CROPHD 451	CLASS- DETERMINING PHASE	CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)																	
		CAPABILITY		NIRR		IRR													
341	ALL	7E																	
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
351																			
2																			
3																			

WOODS 361	CLASS- DETERMINING PHASE	ORD SYM	MANAGEMENT PROBLEMS					POTENTIAL PRODUCTIVITY		TRES TO PLANT
			EROSION HAZARD	EQUIP LIMIT	SEEDLING MORT Y.	WINDTH. HAZARD	PLANT COMPET.	COMMON TREES	SITE INDEX	
2										
3										
4										
5										
6										
7										
8										
9										
371										
2										
3										
4										
5										
6										

WINDBR 311	CLASS- DETERMINING PHASE	SPECIES		HT	SPECIES		HT	SPECIES		HT
2										
3										
4										
5										
6										

WILDLF 391	CLASS- DETERMINING PHASE	POTENTIAL FOR HABITAT ELEMENTS							POTENTIAL AS HABITAT FOR				
		GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
2													
3													
4													
5													
6													

PHASE 401	PLANT 411	COMMON PLANT NAME	PLANT SYMBOL (MILSPN)	POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)											
				PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS- DETERMINING PHASE											
2															
3															
4															
5															
6															
7															
8															
9															
421															
2															
3															
4															
5															
6															
7															
8															
9															
431															
2															
3															

NOTES 441	SYM	POTENTIAL PRODUCTION (LBS./AC. DRY WT):		FOOTNOTES
		FAVORABLE YEARS	NORMAL YEARS	
2	A	0 TO 3 INCH. LAYER HAS 30 TO 35 PERCENT GRAVEL AND CHANNERS, AND 0 TO 30 PERCENT Boulders ON THE SURFACE		
3				
4				
5				
6				
7				
8				
9				

SGG2--BEENOM-COMODORE COMPLEX, 30 TO 60 PERCENT SLOPES, ERODED

This map unit is on very steep mountain slopes. It is located in the Book Cliffs, northeast of Price. Slopes are medium to long in length and convex in shape. Elevation is 6,800 to 8,100 feet. The average annual precipitation is about 14 to 18 inches, the mean annual air temperature is 43 to 45 degrees F, and the average freeze-free season is 50 to 70 days.

This unit is 50 percent Beenom loam, 30 to 50 percent slopes, eroded; 35 percent Comodore very stony very fine sandy loam, 50 to 60 percent slopes, eroded; and 15 percent other soils. The Beenom soil is on the steep treeless areas of the sideslopes. The Comodore soil is on very steep slopes near draws.

Included in this unit are small areas of soils similar to Beenom and Comodore except 20 to 40 inches deep; Beenom loam, 3 to 15 percent slopes; and Rock outcrop.

The Beenom soil is shallow and well drained. It formed in colluvium and residuum derived dominantly from sandstone. Slopes are 30 to 50 percent. The present vegetation is mainly Salina wildrye, big sagebrush, serviceberry, bluebunch wheatgrass, Nevada bluegrass, and snowberry.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown clay loam about 8 inches thick. Sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Beenom soil is moderately slow. Available water capacity, to a depth of 14 inches is about 2.0 to 3.0 inches. Water supplying capacity is 4 to 6 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Comodore soil is shallow and well drained. It formed in colluvium derived dominantly from sandstone. Slopes are 50 to 60 percent. The present vegetation is mainly Douglas-fir, salina wildrye, snowberry, serviceberry, and big sagebrush.

Typically, the surface layer is very dark grayish brown very stony very fine sandy loam about 4 inches thick. The underlying material is very dark grayish brown very cobbly very fine sandy loam about 10 inches thick. Sandstone is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Comodore soil is moderately rapid. Available water capacity, to a depth of 14 inches is about 1 to 2 inches.

Water supplying capacity is 3 to 5 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 10 to

20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for rangeland and wildlife habitat.

This unit in capability subclass VIIs, nonirrigated.

BEENOM SERIES

These soils are classified as loamy, mixed Lithic Argiborolls.

The Beenom series consists of shallow, well drained, and moderately permeable soils that formed in residuum derived dominantly from sandstone. These soils are on broad ridgelines, cuesta dipslopes, and gentle mountain sideslopes at elevations of 6,800 to 9,700 feet. Slope ranges from 1 to 50 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Podo, Pino, Benteen, Corpening, Firo and Kiev soils. Podo, Corpening, Firo, and Kiev soils all lack a layer of clay accumulation. Pino and Benteen soils are deeper than 60 inches.

A typical pedon of Beenom fine sandy loam, 1 to 8 percent slopes, low rainfall, 9.0 miles east of Bruin Point; located about 500 feet south and 4,000 feet east of the NW corner of Section 32., T. 13 S., R. 15 E.

A1--0 to 3 inches; brown (7.5YR 4/4) gravelly fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky, and slightly plastic; common very fine and few fine and medium roots; common very fine and fine pores; noncalcareous, lime is disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

B2t--3 to 9 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/2) moist; weak medium prismatic parting to moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and plastic; common very fine and fine, few medium roots; common very fine and fine pores; very few thin clay films, occurring as colloid stains on mineral grains; moderately alkaline (pH 8.4); clear smooth boundary.

C1--9 to 12 inches; pale brown (10YR 6/3) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, firm, nonsticky, and slightly plastic; few fine roots; few fine pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4).

R--12+ inches; calcareous sandstone.

Depth to sandstone is 8 to 20 inches. Rock fragments range from fine gravel to stone but are predominately sandstone cobbles in some horizons. Rock fragments range from 0 to 50 percent but averages less than 35 percent in the central section. Mean annual soil temperature is 41 to 47 degrees F. The mollic epipedon is 8 to 18 inches thick.

The A horizon has hue of 7.5YR and 10YR, value of 3 to 5 dry, 1 to 3 moist, and chroma of 1 to 3. It is fine sandy loam through clay loam and very gravelly fine sandy loam through gravelly clay loam.

The B2t horizon has hue of 7.5YR and 10YR, value of 3 to 5 dry, 2 to 4 moist, and chroma of 1 to 3. It is typically loam or clay loam but may also be silt loam or sandy clay loam with thin strata of very cobbly sandy clay loam, fine sandy loam, or very gravelly sandy clay loam. Clay content is 18 to 35 percent.

Some pedons have an thin C horizon. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry, 4 moist, and chroma of 3 or 4.

COMODORE SERIES

These soils are classified as loamy-skeletal, mixed Lithic Haploborolls.

The Comodore series consists of shallow, well drained, and moderately rapid permeable soils that formed in colluvium derived dominantly from sandstone.

These soils are on toe slopes and mountain sideslopes at elevations of 6,800 to 8,100 feet. Slope ranges from 50 to 60 percent. The average annual precipitation ranges from 14 to 18 inches, and the mean annual air temperature ranges from 43 to 45 degrees F.

They are near the Beenom and Datino soils. Beenom soils have a layer of clay accumulation and Datino soils are deeper than 60 inches.

A typical pedon of Comodore very stony very fine sandy loam, 50 to 60 percent slopes, eroded located in Dugout Creek northeast of Wellington; about 2,100 feet east and 2,300 feet south of the NW corner of Section 23, T. 14 S., R. 12 E.

A11--0 to 4 inches; very dark grayish brown (10YR 3/2) very stony very fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; few very fine and fine pores; 15 percent gravel, 25 percent cobbles and 20 percent stones; mildly alkaline (pH 7.4); clear smooth boundary.

A12--4 to 14 inches; very dark grayish brown (10YR 3/2) very cobbly very fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; few very fine pores; 15 percent gravel and 30 percent cobbles; mildly alkaline (pH 7.4); abrupt wavy boundary.

R--14 + inches; fractured sandstone.

The range in characteristics is not determined for this soil.

SOIL INTERPRETATIONS RECORD

D662, D662, S662

MLRA(S) 47 KIND OF UNIT SERIES UNIT NAME COMPORE
 STATE UTAH RECORD NO. AUTHOR(S) DATE 12-78 REVISED UNIT MODIFIER
 CLASSIFICATION AND BRIEF SOIL DESCRIPTION FR

DEPTH (IN.)	SOIL TEXTURE	UNIFIED	AASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE					LIQUID LIMIT	PLASTICITY INDEX
					4	10	40	60	200		
0-14	STV-VFSL, CBV-VFSL	GM, GI-GC	A-2, A-4	15-50	60-70	55-65	50-60	30-40	20-30	10-12	
14	UWB										

DEPTH (IN.)	CLAY (PCT OF <20µ)	MOISTURE DENSITY (G/G)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MG/100G)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		PIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSION	
								X	T			SLIGHT	CONCRETE
0-14	30-36	1.3-1.45	2.0-6.0	0.00-0.09	7.4-7.8	-	LOW	3	3	B	3-5	SLIGHT	CONCRETE
SAME DEPTH AS ABOVE												HIGH	MODERATE

FREQ.	DURATION	MONTHS	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
			DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INITIAL (IN)	TOTAL (IN)		
	NOBLE		7-6.0					10-20				D	MODERATE

SEPTIC	LAGOON	TRENCH	SANITARY LANDFILL AREA	DAILY COVER FOR LANDFILL	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	DWELLINGS WITH BASEMENTS	SMALL COMMERCIAL BUILDINGS	LOCAL ROADS AND STREETS	LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	FOOTNOTES	SANITARY FACILITIES		CONSTRUCTION MATERIAL		WATER MANAGEMENT	
												KEYING ONLY	FOOTNOTES	KEYING ONLY	FOOTNOTES	KEYING ONLY	FOOTNOTES
1	1	1	1	1	1	1	1	1	1	1		FILL	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	ROADFILL	POOR - AREA RECLAIM, THIN LAYER, LARGE STONES		
2	2	2	2	2	2	2	2	2	2	2		SAND	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	SAND	IMPROBABLE SOURCE - EXCESS FINES		
3	3	3	3	3	3	3	3	3	3	3		GRAVEL	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	GRAVEL	IMPROBABLE SOURCE - EXCESS FINES		
4	4	4	4	4	4	4	4	4	4	4		SOIL	SEVERE - DEPTH TO ROCK, SLOPE	TOPSOIL	POOR - AREA RECLAIM, LARGE STONES, THIN LAYER		
5	5	5	5	5	5	5	5	5	5	5		POUDRS	POOR - AREA RECLAIM, LARGE STONES, SLOPE	FOOTNOTES	SEVERE - DEPTH TO ROCK, SLOPE		
6	6	6	6	6	6	6	6	6	6	6		DIKES	SEVERE - DEPTH TO ROCK, LARGE STONES, SLOPE	EMBANKMENTS DIKES AND LEVEES	SEVERE - THIN LAYER, LARGE STONES		
7	7	7	7	7	7	7	7	7	7	7		PONDAGE	SEVERE - SLOPE, DEPTH TO ROCK, LARGE STONES	EXCAVATED POND/AQUIFER FEED	SEVERE - NO WATER		
8	8	8	8	8	8	8	8	8	8	8		DRAIN	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	DRAINAGE	DEEP TO WATER		
9	9	9	9	9	9	9	9	9	9	9		IRIG	SEVERE - SLOPE, DEPTH TO ROCK, LARGE STONES	IRRIGATION	LARGE STONES, DROUGHT, DEPTH TO ROCK		
10	10	10	10	10	10	10	10	10	10	10		TERRAC	SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	TERRACES AND DIVERSIONS	SLOPE, LARGE STONES, DEPTH TO ROCK		
11	11	11	11	11	11	11	11	11	11	11		WATERS	SEVERE - LARGE STONES, SLOPE, THIN LAYER	BRASSED WATERWAYS	LARGE STONES, SLOPE, DROUGHT		

REGION	FOOTNOTES	REGIONAL INTERPRETATIONS
1		
2		
3		
4		
5		

IVE--BEENOM-PINO COMPLEX, 3 TO 30 PERCENT SLOPES

This map unit is on gently sloping to sloping cuesta dip slopes. It is located in Price Canyon and Minnie Maud Creek areas. Slopes are medium to long in length and convex in shape. The present vegetation is mainly mountain big sagebrush, serviceberry, Salina wildrye, and western wheatgrass. Elevation is 7,000 to 8,400 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

This unit is 25 percent Beenom loam, 3 to 15 percent slopes; 20 percent Pino silty clay loam, 3 to 30 percent slopes, and 20 percent Corpening fine sandy loam, 3 to 30 percent slopes. The Beenom soil is on gentle cuesta dipslopes and ridge sideslopes, Pino and Corpening soils are on steep cuesta dipslopes and ridge sid slopes.

Included in this unit is about 10 percent of a soil similar to Beenom loam, 3 to 15 percent slopes except that it has a horizon of lime accumulation on sideslopes; 8 percent Podo very channery silt loam, 3 to 15 percent slopes on highly eroded ridges; 5 percent Dooley loam, 3 to 8 percent slopes on drainage bottoms, and 5 percent Benteen loam, thin surface, 3 to 15 percent slopes; 3 percent of a soil similar to Benteen loam, thin surface except located at lower elevations (scrubby aspen); 2 percent Rock outcrop, and 2 percent Silas loam, 0 to 3 percent slopes.

The Beenom soil is shallow and well drained. It formed in residuum derived dominantly from calcareous sandstone. Slopes are 3 to 15 percent.

Typically, the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is dark brown clay loam about 12 inches thick. Fractured sandstone is at a depth of 17 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Beenom soil is moderate to a depth of 5 inches and moderately slow below this depth. Available water capacity, to a depth of 17 inches, is about 2.0 to 4.0 inches. Water supplying capacity is 5 to 8 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Pino soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone and shale.

Typically, the surface layer is dark grayish brown silty clay loam about 2 inches thick. The subsoil is grayish brown and light brownish gray silty clay about 14 inches thick. The substratum is light gray silty clay about 8 inches thick over sandstone bedrock. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Pino soil is slow. Available water capacity, to a depth of 24 inches, is about 4.0 to 4.5 inches. Water supplying capacity is 6 to 9 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Corpening soil is shallow and well drained. It formed in residuum derived dominantly from calcareous sandstone.

Typically, the surface layer is brown fine sandy loam about 2 inches thick. The underlying material is a dark grayish brown fine sandy loam about 5 inches thick over fractured calcareous sandstone. Depth to calcareous sandstone ranges from 5 to 20 inches.

Permeability of the Corpening soil is moderately rapid. Available water capacity, to a depth of 12 inches, is less than 2 inches. Water supplying capacity is 2 to 4 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 5 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for rangeland and wildlife habitat.

The Bennon and Corpening soils are in capability subclass VIIs, nonirrigated, and the Pino soil is in capability subclass VIe, nonirrigated.

BEENOM SERIES

These soils are classified as loamy, mixed Lithic Argiborolls.

The Beenom series consists of shallow, well drained, and moderately permeable soils that formed in residuum derived dominantly from sandstone. These soils are on broad ridgelines, cuesta dipslopes, and gentle mountain sideslopes at elevations of 6,800 to 9,700 feet. Slope ranges from 1 to 50 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Podo, Pino, Benteen, Corpening, Firo and Kiev soils. Podo, Corpening, Firo, and Kiev soils all lack a layer of clay accumulation. Pino and Benteen soils are deeper than 60 inches.

A typical pedon of Beenom fine sandy loam, 1 to 8 percent slopes, low rainfall, 9.0 miles east of Bruin Point; located about 500 feet south and 4,000 feet east of the NW corner of Section 32., T. 13 S., R. 15 E.

A1--0 to 3 inches; brown (7.5YR 4/4) gravelly fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky, and slightly plastic; common very fine and few fine and medium roots; common very fine and fine pores; noncalcareous, lime is disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

B2t--3 to 9 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/2) moist; weak medium prismatic parting to moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and plastic; common very fine and fine, few medium roots; common very fine and fine pores; very few thin clay films, occurring as colloid stains on mineral grains; moderately alkaline (pH 8.4); clear smooth boundary.

C1--9 to 12 inches; pale brown (10YR 6/3) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, firm, nonsticky, and slightly plastic; few fine roots; few fine pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4).

R--12+ inches; calcareous sandstone.

Depth to sandstone is 8 to 20 inches. Rock fragments range from fine gravel to stone but are predominately sandstone cobbles in some horizons. Rock fragments range from 0 to 50 percent but averages less than 35 percent in the central section. Mean annual soil temperature is 41 to 47 degrees F. The mollic epipedon is 8 to 18 inches thick.

The A horizon has hue of 7.5YR and 10YR, value of 3 to 5 dry, 1 to 3 moist, and chroma of 1 to 3. It is fine sandy loam through clay loam and very gravelly fine sandy loam through gravelly clay loam.

The B2t horizon has hue of 7.5YR and 10YR, value of 3 to 5 dry, 2 to 4 moist, and chroma of 1 to 3. It is typically loam or clay loam but may also be silt loam or sandy clay loam with thin strata of very cobbly sandy clay loam, fine sandy loam, or very gravelly sandy clay loam. Clay content is 18 to 35 percent.

Some pedons have an thin C horizon. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry, 4 moist, and chroma of 3 or 4.

PINO SERIES

These soils are classified as fine, mixed Typic Argiborolls.

The Pino series consists of moderately deep, well drained, and slowly permeable soils that formed in residuum derived dominantly from shale and interbedded sandstone.

These soils are on cuesta dipslopes, broad ridgelines, and gently sloping mountain sides at elevations of 7,000 to 9,000 feet. Slope ranges from 3 to 30 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Beenom, Benteen thin surface, and Corpening soils. Beenom soils have a lithic contact and have less than 35 percent clay in the control section. Benteen soils have thin surface and are moderately deep. Corpening soils have a lithic contact and lack a mollic epipedon and an argillic horizon.

A typical pedon of Pino silty clay loam, 3 to 30 percent slopes located in an unsurveyed area approximately 5.5 miles west of the confluence of Nine Mile and Minnie Maud Creeks on Minnie Maud Ridge above Bear Canyon.

A1--0 to 2 inches; dark grayish brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, sticky, and plastic; common very fine and fine, few medium roots; moderately alkaline (pH 8.0); abrupt smooth boundary.

B21t--2 to 7 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to moderate coarse subangular blocky structure; extremely hard, very firm, very sticky, and very plastic; common very fine and fine, few medium roots; few very fine and fine pores; many moderately thick clay films on ped faces; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

B22t--7 to 16 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; weak medium prismatic parting to moderate medium subangular blocky structure; extremely hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine and fine pores; many moderately thick clay films on ped faces; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C1--16 to 34 inches; light gray (2.5Y 7.2) silty clay light brownish gray (2.5Y 6/2) moist; massive; extremely hard, very firm, very sticky, and very plastic; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4) abrupt smooth boundary.

R--34+ inches; sandstone.

Thickness of the solum ranges from 15 to 35 inches. Depth to sandstone is 20 to 40 inches. Mean annual soil temperature is 41 to 47 degrees F.

The A horizon has hue of 10YR and 7.5YR, value of dominantly 4 dry, and chroma of 2 or 3. It is silty clay loam, silt loam.

The B2t horizon has hue of 5 to 7 dry, value of 5 to 7, It is silty clay, and silty clay loam. Clay content is greater than 35 percent. The B2t horizon is mildly or moderately alkaline.

Some pedons have an C horizon. The C horizon has hue of 2.5Y and 10YR, value of 5 to 7 dry. It is silty clay, silty clay loam.

SOIL INTERPRETATIONS RECORD

SCS-1014-B
REV. 5-30
FILE CODE 10-13-7

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RECORD NO.	LOCAL P.C.	SILVA(S)	E.A.	KIND OF UNIT	SERIES	UNIT NAME	TYPE
STATE	UTAH	RECORD NO.	AUTHOR(S)	DATE	REVISED	UNIT MODIFIER	COVERING
CLASSIFICATION AND BRIEF SOIL DESCRIPTION							
CLASS	DESCR						

DEPTH (IN)	ASDA TEXTURE	UNIFIED	AAASHO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
					4	10	20	75		
0-B	FSL	CL-ML, SM, SM-SC	A-4	0	100	95-100	70-85	40-55	20-30	MP-10
0	UNKR									

DEPTH (IN)	CLAY (PCT OF < 200)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (CM/HR)	AVAILABLE WATER CAPACITY (CM/IN)	SOIL REACTION (PH)	SALINITY (MG/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	COHESIVITY	
								A	S			STILL	COASTAL
SALE DEPTH AS ABOVE	10-20	1.25-1.35	2.0-4.0	0.11-0.14	7.9-8.4	< 2	LOW	20	1	3	3-5	HIGH	MODERATE

FREQ.	DURATION	MONTHS	HIGH WATER TABLE		CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
			DEPTH (FT)	KIND	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INITIAL (IN)	TOTAL (IN)		
NONE			26.0				8-20	HARD			3	MODERATE

PROP	DESCR	FOOTNOTES	SANITARY FACILITIES		KEYING ONLY		FOOTNOTES	CONSTRUCTION MATERIAL									
			SEPTIC TANK ABSORPTION FIELDS	LAGOON	REBAGE LAGOONS	TRENCH		SANARE	COVER	SEPTIC	LAGOON	REBAGE LAGOONS	TRENCH	SANARE	COVER	SEPTIC	LAGOON
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		FILL	191		2-25x: POOR-THIN LAYER, AREA RECLAIM 25+x: POOR-SLOPE, THIN LAYER, AREA RECLAIM									
			2-7x: SEVERE-DEPTH TO ROCK 7+x: SEVERE-SLOPE, DEPTH TO ROCK		SAND	701		UNSUITED-EXCESS FINES, THIN LAYER									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		GRAVEL	711		UNSUITED-EXCESS FINES, THIN LAYER									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-DEPTH TO ROCK, SLOPE		SOIL	721		2-15x GR: POOR-SMALL STONES, AREA RECLAIM 15+x GB: POOR-SLOPE, SMALL STONES, AREA RECLAIM 2-15x GB: POOR-LARGE STONES, AREA RECLAIM 15+x GB: POOR-LARGE STONES, SLOPE									
			2-15x: POOR-THIN LAYER, AREA RECLAIM 15+x: POOR-SLOPE, THIN LAYER, AREA RECLAIM		FORMS	731		2-8x: DEPTH TO ROCK 8+x: SLOPE, DEPTH TO ROCK									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		DILES	741		THIN LAYER-PAVING									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		FORMS	751		NO WATER									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		DRAIN	761		DEEP TO WATER									
			2-8x: SEVERE-DEPTH TO ROCK 8+x: SEVERE-SLOPE, DEPTH TO ROCK		IRRIG	771		DEPTH TO ROCK, SLOPE									
			2-15x: SEVERE-DEPTH TO ROCK 15+x: SEVERE-SLOPE, DEPTH TO ROCK		TERRAC	781		2-9x: DEPTH TO ROCK 9+x: SLOPE, DEPTH TO ROCK									
			2-9x: DEPTH TO ROCK 9+x: SLOPE, DEPTH TO ROCK		GATEWAY	791		2-9x: DEPTH TO ROCK 9+x: SLOPE, DEPTH TO ROCK									

REGION	FOOTNOTES	REGIONAL INTERPRETATIONS

SOIL INTERPRETATIONS RECORD

RVD, RZH, RWG

REV. ONLY
COND
MLNA
STATE
CLASS
DESC
DT
91
2
3
4
5
6

MLNA 5) 34
 STATE UTAH RECORD NO. _____ AUTHORITY(FRR, LHS) DATE 2-79 REVISED _____ UNIT MODIFIER _____
 KIND OF UNIT _____ SERIES _____ UNIT NAME SUNUP
 CLASSIFICATION AND BRIEF SOIL DESCRIPTION _____

ESTIMATED SOIL PROPERTIES

DEPTH (IN)	MOISTURE	MOISTURE	UNIFIED	AASHTO	FRACT. > 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN. PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX
						4	10	20	40		
0-2	GRV-L		GM-GC	A-2	0-10	30-40	25-35	20-30	15-25	20-25	5-10
0-2	GRV-FSL		GP-GM, GP-GC	A-2	0-10	15-25	10-20	5-20	5-10	20-25	5-10
2-11	GRV-FSL		GM-GC	A-2	0-10	30-40	25-35	20-40	10-30	20-25	5-10
11	UMB										

DEPTH (IN)	CLAY (PCT OF <200)	MOIST BULK DENSITY (G/CM ³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS		WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSION	
								R	S			STEEL	CONCRETE
12-16		1.25-1.30	2.0-6.0	0.08-0.09	7.9-8.4	<2	LOW	24	1	8	<3	HIGH	MODERATE
SAME DEPTH AS ABOVE		1.35-1.45	2.0-6.0	0.04-0.05	7.9-8.4	<2	LOW	24	1	8	<3		
		1.35-1.45	2.0-6.0	0.06-0.08	7.9-9.0	<2	LOW	28					

FREQ	DURATION	MONTHS	HIGH WATER TABLE			CEMENTED PAN		BEDROCK		SUBSIDENCE		HYD GRP	POTENTIAL FROST ACTION
			DEPTH (FT)	KIND	MONTHS	DEPTH (IN)	HARDNESS	DEPTH (IN)	HARDNESS	INITIAL (IN)	TOTAL (IN)		
			> 6.0					5-20	HARD			U	MODERATE

PROF	J	FOOTNOTES	SANITARY FACILITIES		KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL	
			SEPTIC TANK ABSORPTION FIELDS	SEWAGE LAGOONS			ROADFILL	SAND
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - DEPTH TO ROCK, SLOPE	FILL 191		3-25%: POOR - AREA RECLAIM, THIN LAYER	25%: POOR - AREA RECLAIM, THIN LAYER, SLOPE
			3-7%: SEVERE - DEPTH TO ROCK, LARGE STONES	7%: SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	SAND 201		IMPROBABLE SOURCE - EXCESS FINES	
			3-15%: SEVERE - DEPTH TO ROCK, LARGE STONES	15%: SEVERE - DEPTH TO ROCK, SLOPE, LARGE STONES	GRAVEL 211		IMPROBABLE SOURCE - EXCESS FINES	
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - DEPTH TO ROCK, SLOPE	SOIL 221		POOR - AREA RECLAIM, SMALL STONES, THIN LAYER	
			3-15%: POOR - AREA RECLAIM, THIN LAYER	15%: POOR - AREA RECLAIM, SLOPE, THIN LAYER	PONDRS 231		3-8%: SEVERE - DEPTH TO ROCK	
							8%: SEVERE - DEPTH TO ROCK, SLOPE	
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - DEPTH TO ROCK, SLOPE	DINES 241		SEVERE - THIN LAYER	
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - SLOPE, DEPTH TO ROCK	PONDAQ 251		SEVERE - NO WATER	
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - DEPTH TO ROCK, SLOPE	DRAIN 261		DEEP TO WATER	
			3-8%: SEVERE - DEPTH TO ROCK	8%: SEVERE - SLOPE, DEPTH TO ROCK	IRRIG 271		DROUGHTY, DEPTH TO ROCK, SLOPE	
			3-15%: SEVERE - DEPTH TO ROCK	15%: SEVERE - DEPTH TO ROCK, SLOPE	TERRAC 281		3-8%: DEPTH TO ROCK	
							8%: SLOPE, DEPTH TO ROCK	
			3-15%: SEVERE - SMALL STONES, THIN LAYER, LARGE STONES	15%: SEVERE - SMALL STONES, SLOPE, THIN LAYER	WATERW 291		3-8%: DROUGHTY, DEPTH TO ROCK	
							8%: SLOPE, DROUGHTY, DEPTH TO ROCK	

REGION	181	REGIONAL INTERPRETATIONS	
		FOOTNOTES	

RSH2--ROCK OUTCROP-RUBBLE LAND-PODO VARIANT COMPLEX, 60 TO 80 PERCENT SLOPES,
ERODED

This map unit is on very steep mountain slopes.

It is located in the Book Cliffs northeast of Price. Slopes are medium or long in length and concave in shape. Elevation is 7,900 to 8,100 feet. The average annual precipitation is about 14 to 18 inches, the mean annual air temperature is 43 to 45 degrees F, and the average freeze-free season is 60 to 80 days.

This unit is 40 percent Rock outcrop; 25 percent Rubble land; 25 percent Podo Variant cobbly fine sandy loam, 60 to 80 percent slopes, eroded and 15 percent other soils. The Podo Variant soil is intermixed on the landscape with Rock outcrop and Rubble land.

Included in this unit are small areas of Datino extremely stony fine sandy loam 40 to 60 percent slopes, eroded; and Comodore very stony very fine sandy loam, 30 to 60 percent slopes, eroded.

Rock outcrop is exposed bedrock consisting of sandstone, conglomerate sandstone, and limestone. Rubble land are areas of stones and boulders virtually free of vegetation.

The Podo Variant soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale. The present vegetation is mainly Douglas-fir, Rocky Mountain maple, snowberry, Salina wildrye and Sandberg bluegrass.

Typically, the surface is covered with a mat of leaves, twigs and needles about 1 inch thick. The surface layer is brown cobbly fine sandy loam about 6 inches thick. The underlying material is pale brown cobbly fine sandy loam about 8 inches thick. Sandstone is at a depth of 14 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Podo Variant soil is moderately rapid. Available water capacity, to a depth of 14 inches is about 2.0 to 3.0 inches. Water supplying capacity is 3.0 to 5.0 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for wildlife habitat.

Rock outcrop and Rubble land are in capability subclass VIIIs and Podo Variant soil is in capability subclass VIIle.

PODO VARIANT SERIES

These soils are classified as loamy, mixed (calcareous), Lithic Cryorthents.

The Podo Variant consists of shallow, well drained, moderately rapid permeable soils that formed in residuum and colluvium derived dominantly from sandstone and shale. These soils are on very steep mountain slopes at elevations of 7,900 to 8,100 feet. Slope ranges from 40 to 80 percent. The average annual precipitation ranges from 14 to 18 inches, and the mean annual air temperature ranges from 43 to 45 degrees F.

They are near the Datino and Comodore soils.

Datino soils are very deep, and Comodore soils have a dark surface layer.

A typical pedon of Podo Variant cobbly fine sandy loam, 40 to 60 percent slopes located about 5 miles south of Hiawatha; about 2,600 feet east and 1,400 feet north of the SW corner of Section 15 T. 16 S., R. 8 E. (Photo No. & Coord. 2-80-A, C-17).

O1--1 inch to 0; partly decomposed twigs, leaves and needles.

C1--0 to 6 inches; brown (10YR 5/3) cobbly fine sandy loam dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine and medium roots; few very fine pores; 10 percent gravel and 10 percent cobbles; slightly calcareous; moderately alkaline (pH 7.9); clear smooth boundary.

C2--6 to 14 inches; pale brown (10YR 6/3) cobbly fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, medium and coarse roots; few very fine pores; 15 percent gravel and 15 percent cobbles; moderately calcareous, carbonates are in flakes and disseminated; moderately alkaline (pH 8.0).

R--14 inches; fractured hard sandstone.

Podo Variant differs from the Podo series in that the summer soil temperature is less than 59 degrees F.

LZH2--LITHIC USTORTHENTS-ROCK OUTCROP-RUBBLE LAND COMPLEX, 70 TO 90 PERCENT SLOPES ERODED

This map unit is on very steep mountain slopes. It is located on the Book Cliffs northeast of Price. Slopes are long in length and single to slightly convex in shape. The present vegetation is mainly pinyon pine, Douglas fir, Utah juniper, curlleaf mountainmahogany, and Salina wildrye. Elevation is 7,100 to 8,200 feet. The average annual precipitation is about 14 to 18 inches, the mean annual air temperature is 43 to 45 degrees F, and the average freeze-free season is 50 to 70 days.

This unit is 55 percent Lithic Ustorthents; 25 percent Rock outcrop; and 20 percent Rubble land. The Lithic Ustorthents occur on very steep mountain slopes, the Rock outcrop and Rubble land are intermixed on the landscape.

The Lithic Ustorthents soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale.

Typically these soils are light gray to white gravelly or very gravelly sandy loam, gravelly or very gravelly loam, sandy loam or loam. They vary considerably in texture within a short distance.

Permeability of the Lithic Ustorthents soil is moderately rapid or moderate. Available water capacity, to a depth of 20 inches is less than 2.0 inches. Water supplying capacity is 2 to 5 inches. The organic matter content of the surface layer is 1 to 3 percent. Effective rooting depth is 3 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop is exposed bedrock consisting of sandstone, conglomerate sandstone, and limestone.

Rubble land consists of areas covered by stones and boulders to the point that practically no soil is exposed. Rubble land supports only sparse vegetation.

This unit is used for wildlife habitat.

This unit is in capability subclass VIIIs.

IKD--PINO SILT LOAM, 3 TO 30 PERCENT SLOPES

This moderately deep and well drained soil is on benches along the lower sideslopes of canyons. It is located in Minnie Maud Canyon, Whitmore Park and up side canyons along the Price River. It formed in residuum derived dominantly from sandstone and shale. Slopes are long in length and single in shape. The present vegetation is mainly mountain big sagebrush, snowberry and serviceberry. Elevation is 7,500 to 9,000 feet. The average annual precipitation is about 16 to 20 inches, the mean annual air temperature is 38 to 45 degrees F, and the average freeze-free season is 60 to 120 days.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The upper 4 inches of the subsoil is dark brown silt loam. The lower 10 inches is brown and dark brown silty clay loam. The substratum is very pale brown silty clay loam about 18 inches thick over sandstone. Depth to sandstone or shale ranges from 20 to 40 inches.

Included in this unit is about 15 percent Beenom loam, 3 to 15 percent slopes on convex slope positions, 10 percent Benteen loam thin surface 3 to 15 percent slopes on drainageways and concave slope positions and 10 percent Pino silty clay loam 3 to 30 percent slopes on broad bench tops intermingled with Pino silt loam, 3 to 15 percent slopes.

Permeability of this Pino soil is moderate to a depth of 6 inches and slow below this depth. Available water capacity, to a depth of 34 inches, is about 6.0 to 6.5 inches. Water supplying capacity is 9 to 11 inches. The organic matter content of the surface layer is 3 to 5 percent. Effective rooting depth is 20 to 40 inches. Runoff is moderate, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for rangeland, wildlife habitat and recreation.

The Pino soil is in capability subclass VIe, nonirrigated.

PINO SERIES

These soils are classified as fine, mixed Typic Argiborolls.

The Pino series consists of moderately deep, well drained, and slowly permeable soils that formed in residuum derived dominantly from shale and interbedded sandstone.

These soils are on cuesta dipslopes, broad ridgelines, and gently sloping mountain sides at elevations of 7,000 to 9,000 feet. Slope ranges from 3 to 30 percent. The average annual precipitation ranges from 16 to 20 inches, and the mean annual air temperature ranges from 38 to 45 degrees F.

They are near the Beenom, Benteen thin surface, and Corpening soils. Beenom soils have a lithic contact and have less than 35 percent clay in the control section. Benteen soils have thin surface and are moderately deep. Corpening soils have a lithic contact and lack a mollic epipedon and an argillic horizon.

A typical pedon of Pino silty clay loam, 3 to 30 percent slopes located in an unsurveyed area approximately 5.5 miles west of the confluence of Nine Mile and Minnie Maud Creeks on Minnie Maud Ridge above Bear Canyon.

A1--0 to 2 inches; dark grayish brown (10YR 4/2) silty clay loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, sticky, and plastic; common very fine and fine, few medium roots; moderately alkaline (pH 8.0); abrupt smooth boundary.

B21t--2 to 7 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to moderate coarse subangular blocky structure; extremely hard, very firm, very sticky, and very plastic; common very fine and fine, few medium roots; few very fine and fine pores; many moderately thick clay films on ped faces; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

B22t--7 to 16 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) moist; weak medium prismatic parting to moderate medium subangular blocky structure; extremely hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine and fine pores; many moderately thick clay films on ped faces; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C1--16 to 34 inches; light gray (2.5Y 7.2) silty clay light brownish gray (2.5Y 6/2) moist; massive; extremely hard, very firm, very sticky, and very plastic; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.4) abrupt smooth boundary.

R--34+ inches; sandstone.

Thickness of the solum ranges from 15 to 35 inches. Depth to sandstone is 20 to 40 inches. Mean annual soil temperature is 41 to 47 degrees F.

The A horizon has hue of 10YR and 7.5YR, value of dominantly 4 dry, and chroma of 2 or 3. It is silty clay loam, silt loam.

The B2t horizon has hue of 5 to 7 dry, value of 5 to 7, It is silty clay, and silty clay loam. Clay content is greater than 35 percent. The B2t horizon is mildly or moderately alkaline.

Some pedons have an C horizon. The C horizon has hue of 2.5Y and 10YR, value of 5 to 7 dry. It is silty clay, silty clay loam.

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PROFESSIONAL ENGINEERS

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May 26, 1977

Design Construction Inc.
3608 South 500 West
Salt Lake City, Utah

Gentlemen:

I. INTRODUCTION

We have completed a soils investigation at the Soldier Creek Coal Company Mine. This facility is located approximately 16 miles Northeast of Wellington, Utah. The sites for three new facilities were investigated. These facilities were a bath house, shop, and office warehouse. The recommendations contained herein are a result of the investigation performed.

II. FIELD AND LABORATORY TESTING

Three test pits were excavated. Test pit No. 1 was taken in the proposed location of the new office Warehouse. Test pit No. 2 adjacent to the new bath house and test pit No. 3 was for the new shop facility.

The soil profile for test pit No. 1 was approximately three feet of coal waste material mixed with other granular fill. The material appears to be a fill that has been placed over the area. Underlying the fill material is a poorly graded brown silty sandy gravel with cobbles intermixed. This material extended to a depth of six feet. At six feet a sandstone layer was encountered. The backhoe lengthened the hole to assure that the sandstone encountered was not just a boulder but indeed a ledge or bedrock layer. Sandstone appeared at this same depth for a considerable length throughout the new building site.

The soil profile in test pit No. 2 was 18 inches of granular fill material underlain by 3-1/2 feet of coal waste and granular fill material. This was underlain by a sandy gravel which extended to the bottom of the hole or depth of 9 feet.

The soil profile in test pit No. 3 was 1 foot of coal fill material underlain by 8-1/2 feet of brown silty sandy gravel which extended to the bottom of the hole at 9-1/2 feet. The upper portion of this layer was more sandy than the deeper portion. In all of the test pits the silty sandy gravel underlying the surface fill was medium dense density.

No ground water was encountered in any of the holes, within the depth excavated. The location of test pits and the log of boring is shown in figures 1 thru 3.

III. RECOMMENDATION

The foundation for the office warehouse and the shop building can be placed at an elevation sufficient to protect against frost. We would anticipate this to be at least 3 feet below the existing grade. If the foundations are placed at this depth then the bearing capacity values shown in figure No. 4 can be used for the design of the footings.

The bath house building is to be built in an area where there presently exists some fill material. This facility is to be built onto an existing building. A wood retaining wall exists to the west of this facility. Fill has been placed against this wall and also against the west wall of the existing treatment plant building. It is our understanding that the wood tie retaining wall will be removed and the new wall will become the foundation wall for the new bath house facility. The footings for the bath house could probably be stepped up toward the south. The footing that will replace the wood tie retaining wall should be placed approximately 4 feet below the existing grade. Before constructing the footing the soil at 4 feet should be compacted to a density of 95% of the maximum dry density as determined by AASHO T180 - method C. This will densify the layer of about 1 foot which appears to be a granular fill. If it is desired to raise the footings then the material could be compacted back at the same density specified above an the footings placed at the desired elevation.

The bearing capacity values shown in figure No. 4 are to be used for the design of the foundation. The lines sloping upward to the right define the bearing capacity values with shear governing and the line sloping down to the right limits the settlement to 1 inch.

The existing fill material west of the treatment building should be partially removed and then replaced at a Density of 90% of the maximum dry density as determined by AASHO T180 - Method C. This is the material under the new bath house facility. A K value of 0.30 should be used for the design of the north wall of the new facility.

The recommendations are a result of the test borings and testing performed. If any material different than that encountered occur during construction we request the opportunity to visit the site and inspect the excavation so that adjustment can be made if necessary.

Please advise us if there are any questions regarding any information presented in this report.

Yours truly,

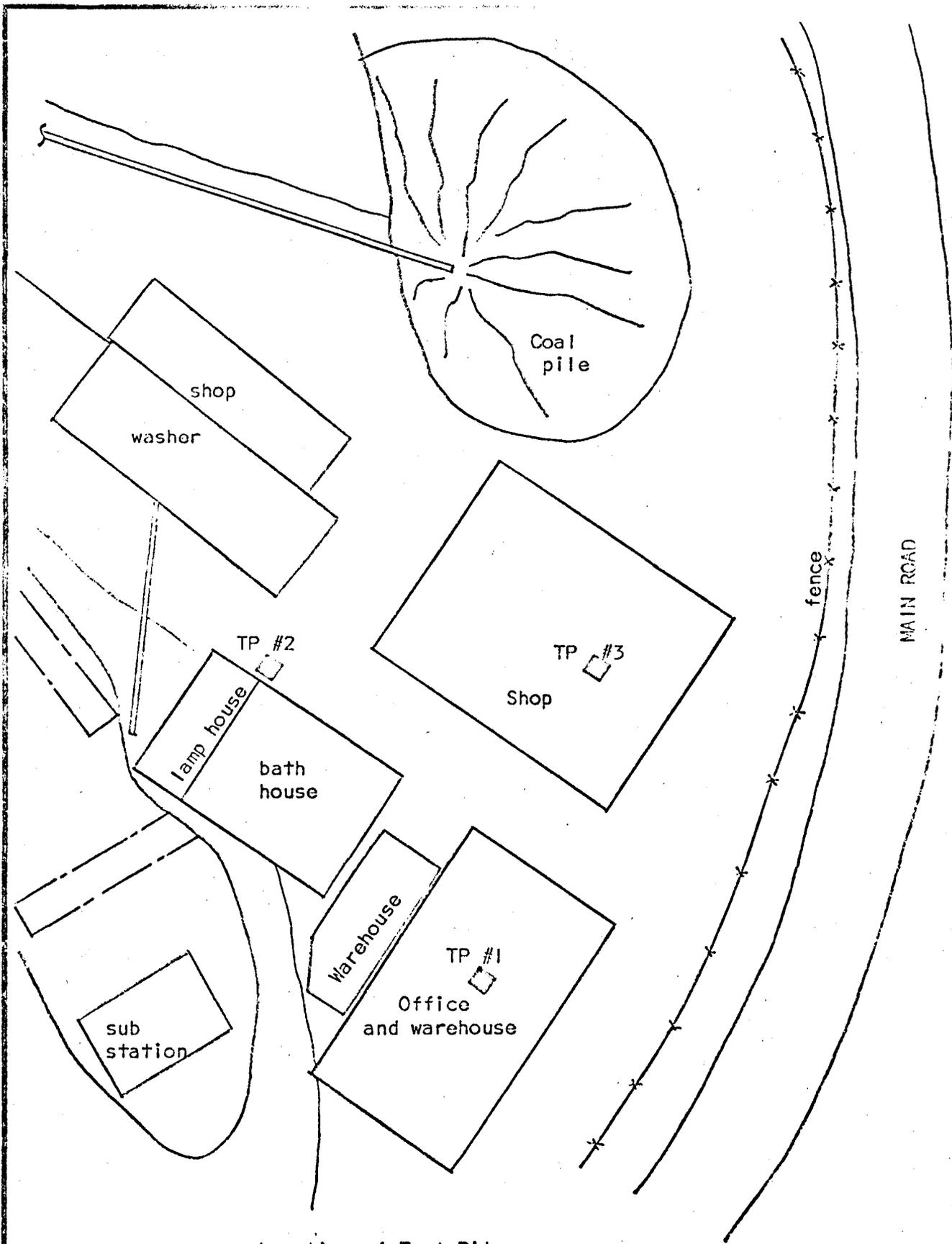
ROLLINS, BROWN AND GUNNELL, INC.



Robert D. Gunnell

Jg

Enclosures

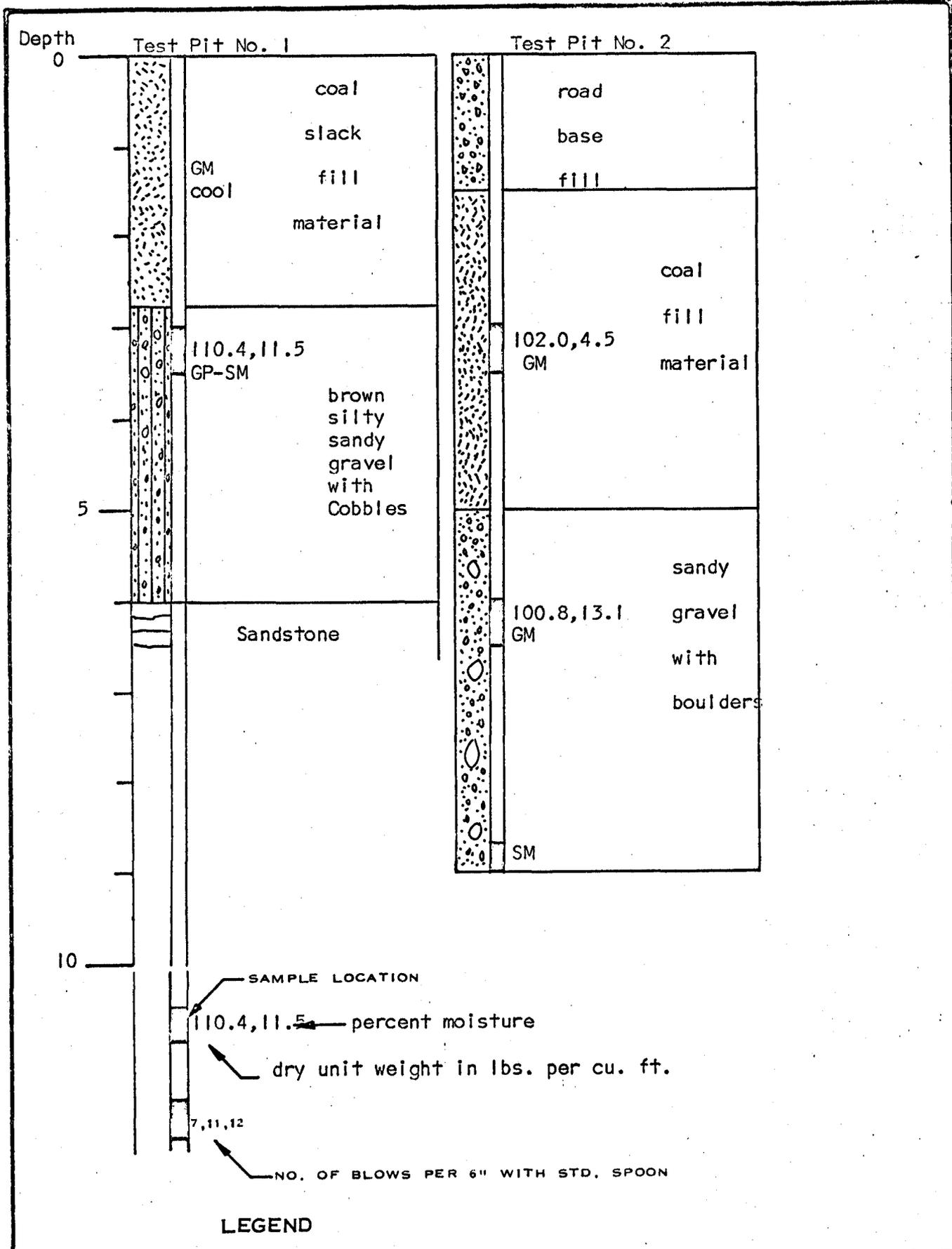


Location of Test Pits

scale: 2" = 50'

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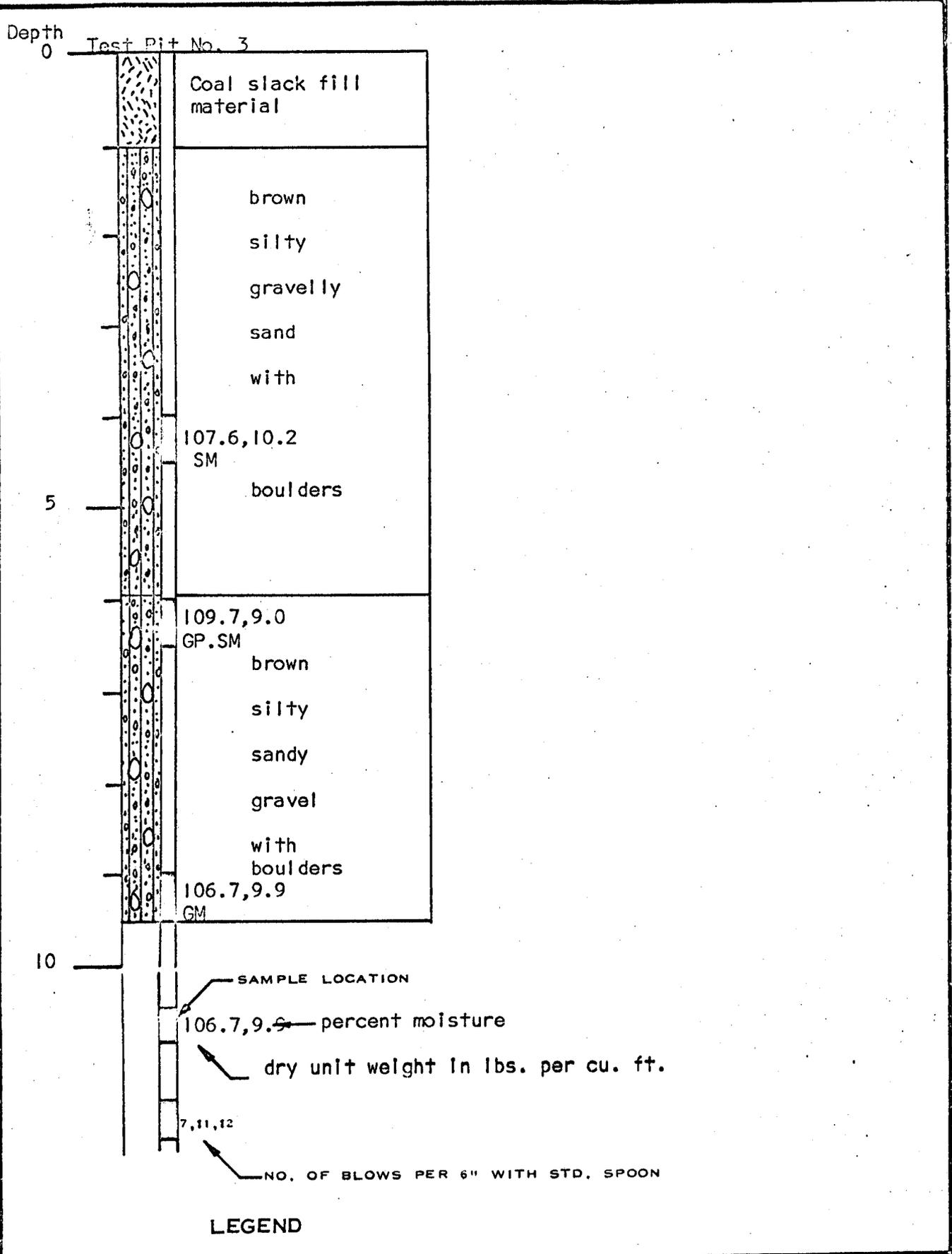
Soldier Creek Coal Company Figure No. 1



LOG OF BORINGS FOR:
Soldier Creek Coal Company

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FIGURE
No.
2



LOG OF BORINGS FOR: Soldier Creek Coal Company	ROLLINS, BROWN AND GUNNELL, INC. CONSULTING ENGINEERS	FIGURE No. 3
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ALLOWABLE SOIL BEARING PRESSURES IN TONS PER SQUARE FT.

