

APPENDIX E

SOILS



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Soils

Ecological Hierarchy

South George project planning area is within the Tollgate Plateau Subsection in the far northern-most portion of the Blue Mountains section of the Blue Mountains Ecoregion (Province). The Tollgate Plateau is influenced by marine air flowing through the Columbia River Gorge and is particularly strong in this area with comparatively high rain and snowfall amounts and temperature moderated compared to southern portions of the Umatilla National Forest.

Table E-1 Soils - Subsection Description

SUBSECTION				
Blue Mountains Ecoregion/Province, FS				
Ecological Framework: Subsection	Geomorphology Process, typical landform, top features, drainages	Geology Lithology, structure, hard fracture	Inferred climate, Potential Natural Vegetation, unique features	Natural disturbance; Fire, flooding, slope stability, and flow regime
M323Gaa Tollgate Plateau other names: CRB Plateau-maritime or Tollgate CRB Plateau-maritime	Major process: Volcanism, fluvial erosion (stream incision) Major landforms: Upland plateaus, V-canyons, narrow valley bottoms Dendritic and parallel drainage patterns, often follow structural features (faults) Moderate relief, ~3000 (fluvial incision)	Columbia River Basalts Thick sequence of basalt flows, with deep loess and ash soils on stable plateaus, north slopes and valley bottoms Local groundwater influence on base flows Basalts among more impermeable in the Blues (min. fracturing)	Maritime influence zone directly intercepts maritime weather systems moving east through Columbia river gorge. Relatively high precip. for the elevation range and cool to cold temperatures Grand fir communities dominant	Slope stability affected by ROS with localized shallow rapid landslides in 1 st order drainages and steep concave headwalls Winter rain-on-snow, spring snow-melt mixed flow regimes with some localized flashy runoff (peak flows, low flows) moderated by deep surficial ash deposits Fire regime: III Mixed severity; II Stand-replacing non-forest on grass-tree mosaic canyons and shallow soil plateaus

Land Type Associations (LTA)

A Land Type Association (LTA) is a grouping of ecologically similar geomorphic processes, landform and potential vegetation at a (larger) scale more detailed than subsections. An LTA map and descriptions has been completed for the three Blue Mountains National Forests, the Umatilla, Wallowa-Whitman, and Malheur (unpublished USFS data).

Table E-2 displays the LTA codes, descriptive name, and primary and secondary soils found in these LTAs. The soils are discussed later in the Soils section.

Table E-2- South George Land Type Associations

LTA CODE	DESCRIPTOR	SLOPE GRADIENT	MAJOR SOIL	SECONDARY SOIL
116	Moist Forest-Basic Igneous-Gentle Slopes	0 -30%	Limberjim	Syrupcreek
117	Moist Forest-Basic Igneous-Steep Slopes	30 -60%	Limberjim	Mountemily
118	Moist Forest-Basic Igneous-Canyons	60%+	Harl	Limberjim
216	Dry Forest-Basic Igneous-Gentle Slopes	0 -30%	Larabee	Bennettcreek
217	Dry Forest-Basic Igneous-Steep Slopes	30 -60%	Klickson	Larabee
218	Dry Forest-Basic Igneous-Canyons	60%+	Klicker	Fivebit
317	Dry Non-Forest-Basic Igneous-Steep	30-60%	Anatone	Imnaha

Table E-3 provides a compilation of the primary SRI map units for the harvest activity units described in the Proposed Action. Table E-4 lists soil map units for mechanized thinning activity units. The key management interpretations for hazards (ratings) due to machine activity are listed in the four columns on the right. Listed is hazard rating for Compaction, Displacement, Puddling, and Erosion, and Regeneration Potential as listed in the SRI. Ash soil depth is shown as a primary characteristic due to its importance for site properties and response to management activity. Interpretations for compaction, displacement, puddling and erosion hazard are listed for dominant soils (indicated as Primary SRI Map Unit).

Table E-3- Summary SRI Soil Map of Activity Units

HARVEST UNIT NUMBER	PRIMARY SRI MAP UNIT [Complex]	TOTAL SOIL DEPTH Average /ASH depth Average in inches	REGEN. POT.	COMP. HAZ.	DISPL. HAZ.	PUDD. HAZ.	EROS. HAZ.
1	14 [149]	40/25	H	L	H	L	M
4	12 [312]	30/17	M	L	M	L	M
6	17 [173]	22/0	M	H	M	L	M
9	14 [000]	40/25	H	H	H	L	M
10	12 [129]	30/17	M	L	H	L	H
11	15 [000]	60/26	H	H	L	M	M
12	13 [000]	36/26	H	H	L	H	M
13	13 [000]	36/26	H	H	L	H	M
14	91 [912]	4/0	L	L	H	L	H
15	13 [000]	36/26	H	H	L	H	M
16	17 [174]	22/0	L	M	L	L	H
17	13 [000]	36/26	H	H	L	H	M

HARVEST UNIT NUMBER	PRIMARY SRI MAP UNIT [Complex]	TOTAL SOIL DEPTH Average /ASH depth Average in inches	REGEN. POT.	COMP. HAZ.	DISPL. HAZ.	PUDD. HAZ.	EROS. HAZ.
18	14 [000]	40/25	H	H	H	L	M
19	20 [209]	15/0	L	L	H	L	H
20	15 [158]	60/26	M	H	L	M	M
21	15 [158]	60/26	M	H	L	M	M
22	14 [000]	40/25	H	H	H	L	M
23	14 [000]	40/25	H	H	H	L	M
24	15 [158]	60/26	M	H	L	M	M
25	14 [000]	40/25	H	H	H	L	M
26	17 [174]	22/0	L	M	L	L	H
27	14 [000]	40/25	H	H	H	L	M
28	14 [149]	40/25	H	L	H	L	M
29	13 [135]	36/26	H	M	L	H	M
30	14 [149]	40/25	H	L	H	L	M
32	12 [129]	30/17	M	L	H	L	H
35	15 [158]	60/26	M	H	L	M	M
36	13 [138]	36/26	M	M	L	M	M
37	13 [000]	36/26	H	H	L	H	M
38	15 [158]	60/26	M	H	L	M	M
40	13 [135]	36/26	H	M	L	H	M
41	14 [000]	40/25	H	H	H	L	M
42	12 [129]	30/17	M	L	H	L	H
43	15 [315]	60/26	M	H	L	M	M
44	15 [158]	60/26	M	H	L	M	M
45	14 [000]	40/25	H	H	H	L	M
46	18 [000]	50/27	M	H	L	M	M
47	20 [209]	15/0	L	L	H	L	H
48	18 [000]	50/27	M	H	L	M	M
49	15 [158]	60/26	M	H	L	M	M
50	12 [000]	30/17	M	L	M	L	M
51	18 [000]	50/27	M	H	L	M	M
52	18 [000]	50/27	M	H	L	M	M
53	13 [135]	36/26	H	M	L	H	M
54	14 [000]	40/25	H	H	H	L	M
55	13 [135]	36/26	H	M	L	H	M
58	13 [000]	36/26	H	H	L	H	M
59	13 [135]	36/26	H	M	L	H	M
60	18 [000]	50/27	M	H	L	M	M
61	13 [000]	36/26	H	H	L	H	M
62	13 [000]	36/26	H	H	L	H	M
63	13 [138]	36/26	M	M	L	M	M
64	12 [129]	30/17	M	L	H	L	H
65	18 [000]	50/27	M	H	L	M	M
68	13 [000]	36/26	H	H	L	H	M
69	12 [000]	30/17	M	L	M	L	M
71	13 [138]	36/26	M	M	L	M	M
72	18 [000]	50/27	M	H	L	M	M
73	17 [174]	22/0	L	M	L	L	H
74	14 [000]	40/25	H	H	H	L	M
75	13 [000]	36/26	H	H	L	H	M

HARVEST UNIT NUMBER	PRIMARY SRI MAP UNIT [Complex]	TOTAL SOIL DEPTH Average /ASH depth Average in inches	REGEN. POT.	COMP. HAZ.	DISPL. HAZ.	PUDD. HAZ.	EROS. HAZ.
76	18 [000]	50/27	M	H	L	M	M
77	14 [000]	40/25	H	H	H	L	M
78	13 [000]	36/26	H	H	L	H	M
79	13 [000]	36/26	H	H	L	H	M
81	13 [000]	36/26	H	H	L	H	M
82	13 [135]	36/26	H	M	L	H	M
84	18 [000]	50/27	M	H	L	M	M
85	13 [000]	36/26	H	H	L	H	M
87	91 [912]	4/0	L	L	H	L	H
88	14 [000]	40/25	H	H	H	L	M
89	13 [135]	36/26	H	M	L	H	M
90	13 [135]	36/26	H	M	L	H	M
91	13 [135]	36/26	H	M	L	H	M
92	13 [135]	36/26	H	M	L	H	M
94	13 [138]	36/26	M	M	L	M	M
95	13 [135]	36/26	H	M	L	H	M
96	13 [138]	36/26	M	M	L	M	M
97	13 [000]	36/26	H	H	L	H	M
99	13 [139]	36/26	M	M	L	M	M
100	13 [000]	36/26	H	H	L	H	M
101	13 [000]	36/26	H	H	L	H	M
102	13 [000]	36/26	H	H	L	H	M
103	13 [000]	36/26	H	H	L	H	M
104	17 [174]	22/0	L	M	L	L	H
105	13 [139]	36/26	M	M	L	M	M
106	13 [000]	36/26	H	H	L	H	M
107	13 [000]	36/26	H	H	L	H	M
108	17 [174]	22/0	L	M	L	L	H
111	17 [173]	22/0	L	M	L	L	H
112	13 [139]	36/26	M	M	L	M	M
113	13 [139]	36/26	M	M	L	M	M
114	12 [129]	30/17	M	L	H	L	H
115	09 [000]	15/0	L	M	H	H	M
116	13 [139]	36/26	M	M	L	M	M
119	13 [000]	36/26	H	H	L	H	M
120	14 [000]	40/25	H	H	H	L	M
121	17 [174]	22/0	L	M	L	L	H
122	13 [000]	36/26	H	H	L	H	M
123	17 [173]	22/0	L	M	L	L	H
124	17 [173]	22/0	L	M	L	L	H

L = Low; M = Moderate H = High

Table E-4- Summary SRI Soil Map of Activity Units, Mechanized Thinning

THINNING UNIT NUMBER	PRIMARY SRI MAP UNIT [Complex]	TOTAL SOIL DEPTH Average /ASH depth Average in inches	REGEN. POT.	COMP. HAZ.	DISPL. HAZ.	PUDD. HAZ.	EROS. HAZ.
1	15 [158]	60/26	M	H	L	M	M
2	17 [173]	22/0	L	M	L	L	H
3	12 [312]	30/17	M	L	M	L	M
4	12 [000]	30/17	M	L	M	L	M
5	13 [135]	36/26	H	M	L	H	M
6	18 [000]	50/27	M	H	L	M	M
8	18 [000]	50/27	M	H	L	M	M
9	12 [000]	30/17	M	L	M	L	M
10	17 [173]	22/0	L	M	L	L	H
11	17 [173]	22/0	L	M	L	L	H
18	13 [135]	36/26	H	M	L	H	M
19	13 [135]	36/26	H	M	L	H	M
20	13 [138]	36/26	M	M	L	M	M
21	13 [000]	36/26	H	H	L	H	M
23	13 [139]	36/26	M	M	L	M	M
24	13 [139]	36/26	M	M	L	M	M
25	13 [000]	36/26	H	H	L	H	M
26	13 [000]	36/26	H	H	L	H	M

Table E-5 is a detailed listing of soil conditions by activity unit. The units with a history of multiple entries were evaluated more closely by the soil specialist to determine the existing detrimental soil condition (DSC). An estimate of DSC as a percentage of the areas was assigned for each activity unit to provide a consistent tracking measure.

Table E-5- Summary Existing Condition of Harvest Units

Harvest Unit	Previous Harvest Entries Entries≥1:Ac	Existing Soil Disturbance Condition Description/Level Of Concern	Existing Detrimental Soil Condition (DSC) Percentage
1	0	No/Low	0-2
4	1	Low	0-4
6	1-2	Moderate	4-6
9	0-1	Low	0-4
10	0-1	Low	0-4
11	0-1	Low	0-4
12	0-1	Low	0-4
13	0	No/Low	0-2
14	0	No/Low	0-2
15	0	No/Low	0-2
16	0-1	Low	0-4
17	1	Low	0-4
18	0-1	Low	0-4
19	0	No/Low	0-2
20	0-1	Low	0-4

Harvest Unit	Previous Harvest Entries Entries≥1:Ac	Existing Soil Disturbance Condition Description/Level Of Concern	Existing Detrimental Soil Condition (DSC) Percentage
21	0-1	Low	0-4
22	0	No/Low	0-2
23	0	No/Low	0-2
24	0-1	Low	0-4
25	0-1	Low	0-4
26	0-1	Low	0-4
27	0-1	Low	0-4
28	0	No/Low	0-2
29	0	No/Low	0-2
30	0	No/Low	0-2
32	0	No/Low	0-2
35	0	No/Low	0-2
36	0-1	Low	0-4
37	0	No/Low	0-2
38	0	No/Low	0-2
40	0	No/Low	0-2
41	0	No/Low	0-2
42	0	No/Low	0-2
43	0-1	Low	0-4
44	0-1	Low	0-4
45	0	No/Low	0-2
46	0	No/Low	0-2
47	0	No/Low	0-2
48	0-1	Low	0-4
49	0	No/Low	0-2
50	0	No/Low	0-2
51	0	No/Low	0-2
52	0	No/Low	0-2
53	0	No/Low	0-2
54	0-1	Low	0-4
55	0	No/Low	0-2
58	0-1	Low	0-4
59	0	No/Low	0-2
60	0-1	Low	0-4
61	0-1	Low	0-4
62	0	No/Low	0-2
63	1-2	Moderate	4-6
64	0	No/Low	0-2
65	1-2	Moderate	4-6
68	0	No/Low	0-2
69	0	No/Low	0-2
71	0-1	Low	0-4
72	0-1	Low	0-4
73	0	No/Low	0-2
74	0	No/Low	0-2
75	0-1	Low	0-4
76	1-2	Moderate	4-6
77	0-1	Low	0-4
78	0-1	Low	0-4
79	0-1	Low	0-4

Harvest Unit	Previous Harvest Entries Entries≥1:Ac	Existing Soil Disturbance Condition Description/Level Of Concern	Existing Detrimental Soil Condition (DSC) Percentage
81	0-1	Low	0-4
82	0-1	Low	0-4
84	1	Low	0-4
85	0	No/Low	0-2
87	0	No/Low	0-2
88	0	No/Low	0-2
89	1-2	Moderate	4-6
90	0	No/Low	0-2
91	1-2	Moderate	4-6
92	1-2	Moderate	4-6
94	0	No/Low	0-2
95	0-1	Low	0-4
96	0	No/Low	0-2
97	0-1	Low	0-4
99	0-1	Low	0-4
100	1	Low	0-4
101	0-1	Low	0-4
102	1	Low	0-4
103	0-1	Low	0-4
104	0-1	Low	0-4
105	0-1	Low	0-4
106	0	No/Low	0-2
107	0-1	Low	0-4
108	0	No/Low	0-2
111	1	Low	0-4
112	0	No/Low	0-2
113	0	No/Low	0-2
114	0	No/Low	0-2
115	0-1	Low	0-4
116	1	Low	0-4
119	1	Low	0-4
120	0-1	Low	0-4
121	1	Low	0-4
122	0-1	Low	0-4
123	0-1	Low	0-4
124	0-1	Low	0-4

Assessment Methodology

Effects due to harvest, thinning, and associated operations were assessed on a unit basis. Direct effects estimates include observations from previous monitoring of both green and fire salvage operations on Umatilla National Forest.

New temporary roads were factored in by converting miles into approximate acres and added to DSC by Alternative totals. Temporary roads would be obliterated as part of the project design and placed back into productive capacity in the long-term, but were factored into the detrimental soil condition tabulation for immediate post-project conditions. Calculated in acres, most are quite small (less than 1 acre) with little to no effect on overall unit percentages in most units. Use of existing unclassified/unauthorized roads would facilitate rehabilitation on those sites, improving the productive capacity from present

condition. In total they represent restoration efforts to improve heavily disturbed sites and increase productivity in the area. Additional rehabilitation efforts under consideration for the area (unauthorized trails; road decommissioning) would further improve on current conditions as they occur.

A primary intent of the Forest Plan standard and guidelines for the DSC is to inform managers of areas with potential and need for rehabilitation. Relatively higher numbers (percentage or acres) indicate areas where rehabilitation opportunity is more likely to exist.

Table E-6 Detrimental Soil Condition, Alt B Harvest

Harvest Unit Number	Acres	Average Existing DSC%	Existing DSC Acres	Pot Increase DSC Harvest%	Pot Increase Fuels%	Total Pot Increase DSC%	Total Potential DSC Post Activity %	Total Potential Acres DSC
1	100	0	0	1	1	2	2	2.0
4	99	2	2	5	1	6	8	5.9
6	126	5	6	5	1	6	11	7.6
9	27	2	1	2	2	4	6	1.1
10	158	2	3	1	1	2	4	3.2
11	17	2	0	5	1	6	8	1.0
12	17	2	0	5	1	6	8	1.0
13	37	0	0	5		5	5	1.9
14	35	0	0	2	1	3	3	1.1
15	66	0	0	5	1	6	6	4.0
16	26	2	1	5	1	6	8	1.6
17	18	2	0	5	1	6	8	1.1
18	36	2	1	2	1	3	5	1.1
19	27	0	0	2	1	3	3	0.8
20	41	2	1	5	2	7	9	2.9
21	99	2	2	5	2	7	9	6.9
22	35	0	0	2	1	3	3	1.1
23	69	0	0	2	1	3	3	2.1
24	44	2	1	5	1	6	8	2.6
25	16	2	0	5	1	6	8	1.0
26	25	2	1	5	1	6	8	1.5
27	7	2	0	5	1	6	8	0.4
28	33	0	0	2	1	3	3	1.0
29	29	0	0	5	1	6	6	1.7
30	74	0	0	2	1	3	3	2.2
32	51	0	0	1		1	1	0.5
35	41	0	0	5	2	7	7	2.9
36	33	2	1	5	1	6	8	2.0
37	29	0	0	5	1	6	6	1.7
38	18	0	0	5	2	7	7	1.3
40	65	0	0	2	1	3	3	2.0
41	35	0	0	2		2	2	0.7
42	24	0	0	2	1	3	3	0.7
43	10	2	0	5	2	7	9	0.7
44	82	2	2	5	2	7	9	5.7
45	23	0	0	5		5	5	1.2
46	49	0	0	5	2	7	7	3.4
47	31	0	0	2	2	4	4	1.2
48	50	2	1	5		5	7	2.5

Harvest Unit Number	Acres	Average Existing DSC%	Existing DSC Acres	Pot Increase DSC Harvest%	Pot Increase Fuels%	Total Pot Increase DSC%	Total Potential DSC Post Activity %	Total Potential Acres DSC
49	19	0	0	2		2	2	0.4
50	94	0	0	5		5	5	4.7
51	44	0	0	5	2	7	7	3.1
52	93	0	0	5	2	7	7	6.5
53	6	0	0	5	1	6	6	0.4
54	17	2	0	5		5	7	0.9
55	138	0	0	5	2	7	7	9.7
58	65	2	1	5		5	7	3.3
59	51	0	0	5		5	5	2.6
60	7	2	0	5		5	7	0.4
61	9	2	0	5	1	6	8	0.5
62	23	0	0	5	2	7	7	1.6
63	154	5	8	5		5	10	7.7
64	10	0	0	5		5	5	0.5
65	99	5	5	5		5	10	5.0
68	13	0	0	5		5	5	0.7
69	30	0	0	2	1	3	3	0.9
71	55	2	1	5		5	7	2.8
72	34	2	1	5	2	7	9	2.4
73	81	0	0	2	1	3	3	2.4
74	18	0	0	2	1	3	3	0.5
75	46	2	1	5	1	6	8	2.8
76	46	5	2	5		5	10	2.3
77	40	2	1	2	1	3	5	1.2
78	37	2	1	5		5	7	1.9
79	15	2	0	5		5	7	0.8
81	6	2	0	5		5	7	0.3
82	8	2	0	5		5	7	0.4
84	21	2	0	5	1	6	8	1.3
85	16	0	0	5		5	5	0.8
87	18	0	0	2	1	3	3	0.5
88	18	0	0	2	1	3	3	0.5
89	17	5	1	5		5	10	0.9
90	37	0	0	5		5	5	1.9
91	18	5	1	5		5	10	0.9
92	40	5	2	5		5	10	2.0
94	24	0	0	5		5	5	1.2
95	13	2	0	5	1	6	8	0.8
96	25	0	0	2		2	2	0.5
97	4	2	0	5		5	7	0.2
99	9	2	0	5	1	6	8	0.5
100	25	2	1	5		5	7	1.3
101	15	2	0	5	2	7	9	1.1
102	29	2	1	5		5	7	1.5
103	16	2	0	5	2	7	9	1.1
104	11	2	0	5		5	7	0.6
105	28	2	1	5		5	7	1.4
106	16	0	0	5	2	7	7	1.1
107	66	2	1	5		5	7	3.3

Harvest Unit Number	Acres	Average Existing DSC %	Existing DSC Acres	Pot Increase DSC Harvest %	Pot Increase Fuels %	Total Pot Increase DSC %	Total Potential DSC Post Activity %	Total Potential Acres DSC
108	29	0	0	2	1	3	3	0.9
111	38	2	1	5	1	6	8	2.3
112	12	0	0	2		2	2	0.2
113	22	0	0	5	2	7	7	1.5
114	54	0	0	2	1	3	3	1.6
115	6	2	0	5	1	6	8	0.4
116	37	2	1	5	1	6	8	2.2
119	27	2	1	5	1	6	8	1.6
120	34	2	1	5		5	7	1.7
121	31	2	1	5		5	7	1.6
122	13	2	0	5	1	6	8	0.8
123	21	2	0	5	1	6	8	1.3
124	28	2	1	5	1	6	8	1.7
Total			57					190.2

Table E-7 - Cumulative Detrimental Soil Condition, Thinning Units

Thinning Unit Number	Acres	Average Existing Dsc %	Existing Dsc Acres	Pot Increase Dsc Harvest %	Pot Increase Fuels %	Total Pot Increase Dsc %	Total Acres Dsc
HT7	105	2	2	0	0	2	0.0
HT12	50	2	1	0	0	2	0.0
HT15	45	2	1	0	0	2	0.0
HT16	89	2	2	0	0	2	0.0
HT17	57	2	1	0	0	2	0.0
MT1	26	2	1	2	0	4	0.5
MT2	106	2	2	2	0	4	2.1
MT3	24	2	0	2	0	4	0.5
MT4	115	2	2	2	0	4	2.3
MT5	54	2	1	2	0	4	1.1
MT6	40	2	1	2	0	4	0.8
MT8	53	2	1	2	0	4	1.1
MT9	94	2	2	2	0	4	1.9
MT10	26	2	1	2	0	4	0.5
MT11	22	2	0	2	0	4	0.4
MT18	17	2	0	2	0	4	0.3
MT19	37	2	1	2	0	4	0.7
MT20	24	2	0	2	0	4	0.5
MT21	18	2	0	2	0	4	0.4
MT23	28	2	1	2	0	4	0.6
MT24	9	2	0	2	0	4	0.2
MT25	65	2	1	2	0	4	1.3
MT26	37	2	1	2	0	4	0.7
Total			23				15.9