



# **Taseko Prosperity Gold-Copper Project**

## **Appendix 5-4-J**

## Appendix 5-4-J Soil Associations and Soil Map Unit Descriptions for the Prosperity Project

### **Common Soil Associations**

A broad reconnaissance level soil survey conducted by Valentine et al. (1987) for the region indicates that the mine site LSA potentially intersects 11 soil associations, the transmission line LSA potentially intersects 14 associations and the access road LSA potentially intersects 17 associations (see Table J-1, Table J-2 and Table J-3).

The mine site occurs in an area mapped predominantly as moderately weathered, well to moderately-well drained, Orthic Gray Luvisols. These soils developed in gravelly sandy to gravelly coarse-fine loamy-textured, non-calcareous, morainal deposits, which commonly occur in hummocky (16 to 30% slopes) or inclined (10 to 15 % slopes) topography. Poorly drained, sedge dominated wetlands occur in depressions.

The access road is mapped predominantly as well drained Orthic Gray Luvisols on till. Slopes are generally gentler than those on the mine site. At the northern extent of the access road glaciofluvial and fluvial parent materials dominate along the Chilcotin River. These are mapped predominantly as Gleysols and Brunisols, but some Chernozems were mapped for the area as well.

The transmission line LSA was mapped as predominantly Orthic Gray Luvisols on gravelly, coarse to medium textured till. Some Orthic Gray Luvisols have developed on glaciofluvial materials. Chernozems were mapped towards the eastern extent of the corridor on similar morainal material. The remaining associations constituted a minor component of the landscape.

**Table J-1 Common Soil Associations for the Mine Site Local Study Area**

<b>Soil Parent Material</b>	<b>Soil Association</b>	<b>Dominant Soil<sup>1</sup> C</b>	<b>Comments</b>
Bedrock	RO – Rock Land	Non-soil	Bedrock outcrops
Colluvium	WN - Willan Lake	Orthic Gray Luvisol	Morainal and colluvial deposits over bedrock; variable slopes
Fluvial	NW - New Meadow	Rego Humic Gleysol	Loamy fluvial soils (peaty phase); level to very gently sloping
	PU - Purjue	Orthic Regosol	Sandy-skeletal floodplains and fans; level to moderately sloping
Glaciofluvial	HS – Hawks	Eluviated Eutric Brunisol	Sandy-skeletal material in narrow river valleys; very gently to gently sloping
	SH – Shemwell	Orthic Gray Luvisol	Loamy-skeletal water washed moraine; variable slopes
Morainal	GC – Granite Creek	Orthic Dystric Brunisol	Sandy-skeletal moraine in mountain valleys and lower slopes; variable slopes
	KL – Kloakut	Orthic Gray Luvisol	Loamy-skeletal moraine between 1500 and 1800 m; variable slopes, hummocky

<sup>1</sup> Note that several of the soils classified as Orthic Gray Luvisols in this report would be classified as Brunisolic Gray Luvisols under the present classification system (Kloakut, Shemwell and Willan Lake associations).

**Table J-1 Common Soil Associations for the Mine Site Local Study Area (cont'd)**

Soil Parent Material	Soil Association	Dominant Soil <sup>2</sup> C	omments
	TT- Tete Hill	Eluviated Dystric Brunisol	Loamy-skeletal moraine between 1600 and 2000 m; variable slopes
	YT – Yohetta	Orthic Eutric Brunisol	Gravelly morainal material on south facing slopes; moderately to steeply sloping
Organic	CL - Chaunigan Lake	Terric Mesisol	Shallow organic meadows (0.4 to 1 m); level to gently sloping
	RL - Rail	Terric Mesisol	Moderately decomposed organics; level to nearly level

**Table J-2 Common Soil Associations for the Transmission Corridor Local Study Area**

Soil Parent Material	Soil Association	Dominant Soil <sup>3</sup> C	omments
Colluvium	CM – Chasm	Eluviated Eutric Brunisol	Gravelly-loamy colluvium on upper slopes of river valleys; moderately to steeply sloping
Fluvial	NW - New Meadow	Rego Humic Gleysol	Loamy fluvial soils (peaty phase); level to very gently sloping
	PU - Purjue	Orthic Regosol	Sandy-skeletal floodplains and fans; level to moderately sloping
	TK – Taseko	Rego Dark Brown	Sandy fluvial material on terraces floodplains; very gently sloping
Glaciofluvial	HS – Hawks	Eluviated Eutric Brunisol	Sandy-skeletal material in narrow river valleys; very gently to gently sloping
	SH – Shemwell	Orthic Gray Luvisol	Loamy-skeletal water washed moraine; variable slopes
Mixed (fluvial/ glaciofluvial/ morainal)	DC3 – Dog Creek	Orthic Dark Brown	Sandy-skeletal mixed material; strongly to steeply sloping; terraced and often gullied
Morainal	CE – Cone Hill	Gleyed Gray Luvisol	Gravelly coarse-loamy till blankets; very gently to gently sloping
	CY1 – Chimney	Orthic Dark Brown	Loamy-skeletal till on undulating plateaus; variable slopes
	KL – Kloakut	Orthic Gray Luvisol	Loamy-skeletal moraine between 1500 and 1800 m; variable slopes, hummocky
	TE2 – Tyee	Orthic Gray Luvisol	Gravelly, loamy till; variable slopes
	WC – Whiskey Creek	Orthic Eutric Brunisol	Gravelly, coarse morainal material on upper slope of river valleys; moderate to steep slopes
	WL1/WL2 – Williams Lake	Orthic Gray Luvisol	Gravelly loamy till blankets; gentle to moderate slopes
Organic	CL - Chaunigan Lake	Terric Mesisol	Shallow organic meadows (0.4 to 1 m); level to gently sloping

<sup>2</sup> Note that several of the soils classified as Orthic Gray Luvisols in this report would be classified as Brunisolic Gray Luvisols under the present classification system (Kloakut, Shemwell and Willan Lake associations).

<sup>3</sup> Note that several of the soils classified as Orthic Gray Luvisols in this report would be classified as Brunisolic Gray Luvisols under the present classification system (Kloakut, Shemwell and Willan Lake associations).

**Table J-3 Common Soil Associations for the Access Road Local Study Area**

Soil Parent Material	Soil Association	Dominant Soil <sup>4</sup> C	Comments
Colluvium	CM – Chasm	Eluviated Eutric Brunisol	Gravelly-loamy colluvial material on upper slopes of river valleys; moderately to steeply sloping
	WN - Willan Lake	Orthic Gray Luvisol	Morainal and colluvial deposits over bedrock; variable slopes
Eolian	CI - Chilcotin	Orthic Dark Brown	Eolian over glaciofluvial material on terraces; level to moderately sloping
Fluvial	EL – Elliot	Rego Humic Gleysol	Fine-loamy fluvial materials in linear depressions; level to gently sloping
	NW - New Meadow	Rego Humic Gleysol	Loamy fluvial soils (peaty phase); level to very gently sloping
	TK – Taseko	Rego Dark Brown	Sandy fluvial material on terraces floodplains; very gently sloping
Glaciofluvial	HA - Hargreaves	Orthic Eutric Brunisol	Coarse, loamy glaciofluvial material on terraces; variable slopes
	HS – Hawks	Eluviated Eutric Brunisol	Sandy-skeletal material in narrow river valleys; very gently to gently sloping
	SH – Shemwell	Orthic Gray Luvisol	Loamy-skeletal water washed moraine; variable slopes
Lacustrine	ZO – Zenzaco	Orthic Brown	Loamy lacustrine material; variable slopes
Morainal	CD – Cardiff	Orthic Gray Luvisol	Gravelly-loamy morainal material overlaying bedrock; variable slopes
	CY1 – Chimney	Orthic Dark Brown	Loamy-skeletal till on undulating plateaus; variable slopes
	DX – Drummond	Eluviated Dark Brown	Loamy-skeletal till on rolling plateau; nearly level to moderately sloping
	KL – Kloakut	Orthic Gray Luvisol	Loamy-skeletal moraine between 1500 and 1800 m; variable slopes, hummocky
	TE1 – Tye	Orthic Gray Luvisol	Gravelly, loamy till; variable slopes
	WC – Whiskey Creek	Orthic Eutric Brunisol	Gravelly, coarse morainal material on upper slope of river valleys; moderate to steep slopes
Organic	CL - Chaunigan Lake	Terric Mesisol	Shallow organic meadows (0.4 to 1 m); level to gently sloping

The following section describes the SMUs developed for each parent material type in the mine site area. The descriptions include site characteristics (drainage and slope position), parent material characteristics (texture and coarse fragment content), and landforms.

### ***Soil Map Unit Descriptions***

#### *Colluvial Soil Map Units*

#### **SMU C1**

This map unit occurs on veneers of colluvium originating from local bedrock or shallow, mixed deposits of slumped morainal and colluvial materials. It contains high proportions

<sup>4</sup> Note that several of the soils classified as Orthic Gray Luvisols in this report would be classified as Brunisolic Gray Luvisols under the present classification system (Kloakut, Shemwell and Willan Lake associations).

of coarse fragments and generally has sandy loam to clay loam textures. The topography associated with this SMU is generally complex with slopes ranging from gentle to very steep (5 to >70%). They usually occur at upper and mid-slope positions. The soils of SMU C1 are generally shallow (<1 m) and rapidly to well drained. Drainage is occasionally restricted by the presence of bedrock.

The SMU C1 soils are classified as Orthic Dystric Brunisols or Orthic Regosols. Orthic Eutric Brunisols occur in some instances although not generally as a major component of the landscape. Bedrock is within 1 m of the soil surface and usually less than 50 cm from the soil surface. Site 16-L is a typical soil of this unit (see description Appendix 5-4-K).

### **SMU C2**

SMU C2 soils occur on colluvial and mixed morainal and colluvial deposits. They are typically between 1 and 3 m deep and contain an average of 50% coarse fragments. Textures range from silt loam to sandy loam to clay loam. Coarse fragments are often a mixture of angular, subangular and subrounded materials, suggesting that the parent material was deposited in a variety of ways. The slopes associated with SMU C2 are generally strong to very steep (20 to >70% slopes). SMU C2 soils are typically well to rapidly drained.

The most commonly found soil in the unit is an Orthic Dystric Brunisol. SMU C2 also includes Orthic Eutric Brunisols, Orthic Humo-Ferric Podzols and Brunisolic Gray Luvisols. The depth to the BC or C horizon is generally less than 75 cm. A description for a typical SMU C2 soil is Site 20-L (Appendix 5-4-K).

### *Residual Soil Map Units*

#### **SMU D1**

SMU D1 soils develop in situ on decomposing bedrock (residuum). Coarse fragment content is typically 45 to 90%, with 70% being average. Textures are generally sandy loam to loam. Coarse fragments are usually angular to subangular. Slopes range from near level to approximately 45% (very strong). These soils are generally well to rapidly drained.

SMU D1 soils are typically Orthic Dystric Brunisols, however, Orthic Eutric Brunisols occur where parent materials have a basic pH. Orthic Regosols predominate on less weathered sites. Depth to bedrock is generally limited to less than 30cm. A typical soil profile, BTM229, is included in Appendix 5-4-K.

### *Fluvial Soil Map Units*

#### **SMU F2**

Soils in SMU F2 developed on recent fluvial deposits and often have a shallow peaty layer at the surface. These soils are located in valley bottoms or depressions and on the floodplains and terraces of small streams. The soil texture and coarse fragment content often vary spatially and with depth, reflecting the dynamic nature of fluvial deposits. Textures generally vary between sand and sandy loam. Slopes are level to gentle (0.5 to 5%). The soils within this SMU are usually imperfectly to poorly drained.

These soils are reclassified as Rego and Orthic Humic Gleysols. The soils are generally mottled to the top of the mineral surface and may have a thin layer of peat at the soil surface. Gleyed Cumulic Humic Regosols also occur in this soil map unit. An example of a typical SMU F2 soil profile is included in Appendix 5-4-K (plot DTM140).

## *Glaciofluvial Soil Map Units*

### **SMU FG1**

SMU FG1 deposits often occur as thick, irregularly shaped hummocks and sinuous, sharp-sided ridges (kame and esker topography). The parent material typically has very coarse soil textures and high, though variable (25 to 80%), coarse fragment content. Textures typically range from loamy sand to sandy loam near the soil surface, to sand at greater depths. Water-worked coarse fragments are rounded or subrounded and range in size from pebbles to stones. Slopes vary from gentle to extreme (5 to >50%). Soils within this unit are typically rapidly drained.

The soils in this SMU are commonly classified as Orthic Dystric Brunisols or Orthic Gray Luvisols depending on their level of development. Orthic Eutric Brunisols can occur on less weathered sites. A profile description of plot 97-70 is included in Appendix 5-4-K.

### **SMU FG2**

SMU FG2 includes undulating, rolling and terraced features, as well as gentle slopes and plains. SMU FG2 soils are similar to those of SMU FG1 but occur on more subtle terrain. The topography associated with this unit is often complex with very gentle to moderate slopes (2 to 15%). Coarse fragment content is generally high at 50% but varies between 30 and 70%. Textures are generally sandy loams or sands. Soils are generally well to rapidly drained.

The most common subgroups to form in this SMU are Orthic Dystric Brunisols or Brunisolic Gray Luvisols. Orthic Eutric Brunisols can also occur. A profile description of plot 105, from the Open Pit area is included in Appendix 5-4-K.

### **SMU FG3**

SMU FG3 is imperfectly to poorly drained, with gentle to moderate slopes. Sample sites indicated slightly lower coarse fragment content than the other glaciofluvial map units. Textures are typical for glaciofluvial deposits and range from sand to loamy sand. Drainage is imperfect to poor.

The most common subgroups in this SMU are Orthic and Rego Humic Gleysols. A profile description of plot DTM53 is included in Appendix 5-4-K.

## *Lacustrine Soil Map Units*

### **SMU L1**

This SMU was encountered rarely within the Taseko minesite area and thus limited data was available. Lacustrine sites within the minesite are limited to the area around Fish Lake. This SMU can be characterized as developing on silty to clayey lacustrine material with few coarse fragments. Slopes are generally nearly level and soils are typically poor to well drained. Most of the SMU is limited to the poor drainage class.

The soils that form in areas with imperfect or poor drainage include Rego and Orthic Humic Gleysols. On better drained lacustrine sites Orthic Gray Luvisols tend to form. A profile description of a Rego Humic Gleysol (plot 97-46) is included in Appendix 5-4-K.

## *Morainal Soil Map Units*

### **SMU M1**

SMU M1 soils have developed in shallow (generally <1 m except for where variable mantles occur), very gravelly morainal materials overlying bedrock. Textures vary from sandy loam, to sandy clay loam, to clay loam. Coarse fragment content averages 40% and ranges from gravels to stones, with occasional boulders. Slopes associated with these soils are moderate to very strong (10 to >30%). SMU M1 soils are moderately well to rapidly-drained.

These soils are generally classified as Orthic Dystric or Orthic Eutric Brunisols. Brunisolic Gray Luvisols occur on better developed sites. A complete profile description for DTM223 is included in Appendix 5-4-K.

### **SMU M3**

SMU M3 soils have developed on relatively thick deposits of morainal parent material. The topography where these soils typically occur is simple with gentle to strong slopes (6 to 30%). Most of the sites in this SMU fall within the lesser slope ranges. Soil textures are generally coarse, with sandy loams and sands predominating, but loams, silt loams and clay loams also occur. Typically, the average coarse fragment content is 40%, but it ranges between 10 and 80% on a site specific basis. Fragment sizes range from gravels to cobbles and stones, with the occasional boulder. SMU M3 soils are moderately well to rapidly drained.

The dominant soil subgroups found in SMU M3 are the same as in SMU M2 except that Orthic Eutric Brunisols are the most common subgroup, followed by Brunisolic Gray Luvisols and Orthic Gray Luvisols. Orthic Dystric Brunisols also occur. A profile description for an Orthic Eutric Brunisol (plot DTM225), a Brunisolic Gray Luvisol (plot TM155D), and an Orthic Gray Luvisol (plot DTM102) are presented in Appendix 5-4-K.

### **SMU M4**

SMU M4 soils have developed on morainal material in poorly and imperfectly drained areas. Often these sites are at the bases of slopes or at the margins of shallow depressions. Textures are typically loamy or sandy. Coarse fragments vary between 15 and 80% and average about 50%. Slopes range from nearly level to gentle (<1 to 10%). The y commonly occur as a minor inclusion associated with SMUs M3 and M2.

This unit includes soils classified as Rego and Orthic Humic Gleysols, and Rego Gleysols. Other subgroups such as Gleyed Gray Luvisols, Gleyed Brunisolic Gray Luvisols or Orthic Gleysols may also occur, but to a limited extent. These soils tend to occur on moderate to well drained sites. Soil profile descriptions for a Rego Humic Gleysol (plot DTM231) and an Orthic Humic Gleysol (plot 109) are included in Appendix 5-4-K.

## *Organic Soil Map Units*

### **SMU O1**

Organic soils of SMU O1 tend to be fairly deep deposits of black to very dark brown organic material. The maximum depth of organic material recorded was 355 cm (plot 97-33). Organic soils within this SMU overlie mineral material at depths greater than 100 cm from the soil surface. Sites are generally level or nearly level but some sites occurred on gentle slopes.

The dominant subgroups in this SMU include Typic Mesisols and Humisols with organic deposits in excess of 160 cm. Mesisols have a moderately well-decomposed middle tier of organic material, whereas Humisols have a well-decomposed middle tier. This SMU also includes organic deposits between 100 and 160 cm in depth (Terric Mesisols and Humisols). Profiles for a Typic Mesisol (plot 119) and a Typic Humisol (plot BC57) are presented in Appendix 5-4-K.

### **SMU O2**

Organic soils within this unit are moderately well to well decomposed, moderately deep organic soils (40 to 100 cm of organic material). These soils occur in depressions and valley bottoms throughout the project area on level to gently sloping terrain.

The soils of SMU O2 are classified as Terric Mesisols and Terric Humisols and consist of moderately to well decomposed organic matter overlying mineral soil. A soil profile description for plot 20-3 is presented in Appendix 5-4-K.

### **SMU O3**

The soils of SMU O3 are peaty phase Rego and Orthic Humic Gleysols, as well as Rego Gleysols. They are similar to the soils of SMU M4 but have developed deeper organic layers (15 to 40 cm). These subgroups usually occur in depressions, gently sloping top positions, and lower valley slopes. They are typically underlain by slowly permeable mineral material (till or fluvial deposits). The water table is at or near the surface for most of the year.

A typical profile from a peaty Rego Gleysol (plot I18), a Rego Humic Gleysol (plot BTM187) and an Orthic Humic Gleysol (plot T95-53) are included in Appendix 5-4-K.

### *Non-Soil Map Units*

#### **SMU R1**

This SMU is reserved for bedrock outcrops. It includes exposed bedrock and thin veneers less than 10 cm (non-soil). Generally this SMU is found on steep slopes or at the top of steep ridges.

#### **SMU WA**

The WA SMU designation is for water bodies. This includes lakes and smaller water bodies that are generally filled with open water most of the year.

#### **SMU DL**

This map unit is used to designate areas that have been disturbed by human activities. Examples include road corridors and gravel pits.