PROSPERITY
A Gold-Copper Project of Taseko Mines Limited

Taseko Prosperity Gold-Copper Project

Appendix 5-5-F

Taseko Mines Limited

Appendix 5-5-F Taseko Ecosystem Mapping Summary

F.2 – Access Road TEM Ecosystem Summary

Terrestrial Ecosystem Mapping

Terrestrial ecosystem mapping (TEM) is the stratification of a landscape into map units, drawing on biophysical and ecological features, including climate, physiography, surficial material, bedrock geology, soil, and vegetation.

Terrestrial Ecosystem Mapping – Access Road

Terrestrial Ecosystem Mapping (TEM) was conducted at a scale of 1:20,000 for the Taseko mine access road, which follows existing roads as far as the minesite (except the last 8 km). The access road starts in Hanceville or, more specifically, at Lee's Corner, where it meets the Chilcotin Highway. From there the road goes south, crossing the Chilcotin River. South of the river it gains in altitude as it skirts the village of Stoney. Some 10 km southwest of Stoney, the road reaches the higher, flat plateau country. The IDF zone slowly gives way to the SBPS zone, until about 20 km north of the minesite, where the boundary with the MS zone occurs. The total access road distance is about 120 km, with a 500 metre mapping buffer on each side of the road, and a total area of 17,348.7 hectares.

A total of 73 vegetated ecosystem units (site series) and 10 non-vegetated or sparsely vegetated units were mapped in the four biogeoclimatic units (Table F.2-1). There were 129 hectares of rivers and lakes mapped.

Table F.2-1 Terrestrial Ecosystem Mapping Summary – Access Road

Biogeoclimatic Unit	Map Code	Description	Area (ha)
IDFdk4	AF	Nuttall's alkaligrass - Foxtail barley	1.6
IDFdk4	AR	Trembling aspen - Rose	40.9
IDFdk4	BK	Scrub birch - Kinnikinnick shrub-carr	21.1
IDFdk4	BW	Water sedge - Beaked sedge	46.0
IDFdk4 CF		Cultivated field	4.2
IDFdk4	CM	Cattail Marsh (Typha)	16.0
IDFdk4	DB	Drummond's willow - Bluejoint	31.9
IDFdk4	DJ	Fd - Juniper - Saskatoon	441.6
IDFdk4	DM	Fd - Feathermoss - Step moss	185.5
IDFdk4 ES		Exposed Soil	5.8
IDFdk4	JP	Fd - Juniper - Peltigera	29.5
IDFdk4 LA		Lake	45.5
IDFdk4	LP	FdPl - Pinegrass - Feathermoss	4313.2
IDFdk4	OW	Yellow pond-lily - Robbin's pondweed	12.2
IDFdk4 PD		Pond	0.5
IDFdk4 RM		Baltic Rush	9.2
IDFdk4	RS	Baltic rush - Field sedge meadow	58.7

IDFdk4 RZ		Road Surface	3.6
IDFdk4	SF	Sxw - Feathermoss - Brachythecium	38.8
IDFdk4	SH	Sxw - Horsetail - Glow moss	22.2
IDFdk4	SS	Sxw - Scrub birch - Feathermoss	39.1
IDFdk4	SW	Scrub birch - Water sedge fen	50.3
IDFdk4	TS	Macall’s willow - Beaked sedge	1.9
IDFdk4	WB	Bluebunch wheatgrass - Balsamroot	36.8
IDFxm	AR	Trembling aspen - Prickly rose	40.4
IDFxm	BW	Water sedge - Beaked sedge fen	0.6
IDFxm CF		Cultivated Field	345.2
IDFxm CL		Cliff	3.7
IDFxm	CR	Cottonwood-Dogwood Mid-bench FP	17.6
IDFxm	DB	Drummond’s willow - Bluejoint	16.2
IDFxm	DJ	Fd - Juniper - Cladonia	401.4
IDFxm	DM	Fd - Feathermoss - Step moss	97.8
IDFxm	DP	Fd - Pinegrass - Feathermoss	577.4
IDFxm	DS	Fd - Bluebunch wheatgrass - Pasture sage	1.4
IDFxm	DW	Fd - Bluebunch wheatgrass - Penstemon	208.3
IDFxm ES		Exposed Soil	3.6
IDFxm PD		Pond	4.5
IDFxm RI		River	30.9
IDFxm RO		Rock Outcrop	8.2
IDFxm	RS	Fd - Prickly rose - Sarsaparilla	3.1
IDFxm R	W	Rural	65.8
IDFxm RZ		Road Surface	2.8
IDFxm	SS	Sxw - Snowberry - Prickly Rose	2.8
IDFxm	TS	Macall’s willow - Beaked sedge	35.4
IDFxm	WY	Bluebunch wheatgrass - Yarrow	217.9
SBPSxc	AR	Trembling Aspen - Rose	31.4
SBPSxc	BF	Water sedge - Beaked sedge	136.3
SBPSxc	BK	Scrub birch - Kinnikinnick shrub-carr	206.1
SBPSxc	BM	Beaked sedge - Water sedge marsh	16.6
SBPSxc	BW	Scrub birch - Water sedge fen	23.8
SBPSxc CF		Cultivated Field	1.0
SBPSxc CL		Cliff	0.0
SBPSxc	DB	Drummond’s willow - Bluejoint	1.8
SBPSxc	JK	Juniper - Kinnikinnick	25.3
SBPSxc	LC	Pl- Kinnikinnick - Cladonia	207.6
SBPSxc	LK	Pl - Kinnikinnick - Feathermoss	6475.4
SBPSxc	OW	Yellow pond-lily - Robbin's pondweed	30.4
SBPSxc PD		Pond	19.8
SBPSxc RM		Baltic Rush	8.4
SBPSxc RO		Rock Outcrop	2.7
SBPSxc	RS	Baltic rush - Field sedge meadow	73.5
SBPSxc R	W	Rural	4.7
SBPSxc	SB	Sxw - Scrub birch - Fen moss	13.5
SBPSxc	SF	Sxw - Scrub birch - Feathermoss	101.0
SBPSxc	SH	Sxw - Horsetail - Glow moss	17.6
SBPSxc	SM	Sxw - Horsetail - Meadowrue	12.4

SBPSxc TA		Talus	3.7
SBPSxc	WM	Grey-leaved willow - Glow moss	6.0
SBPSxc	WW	Willow - Scrub birch- Sedge Fen	0.7
MSxv	BF	Water sedge - Beaked sedge fen	27.1
MSxv	GK	Pl - Grouseberry - Kinnikinnick	59.9
MSxv LA		Lake	13.2
MSxv	LG	Pl - Grouseberry - Feathermoss	1626.8
MSxv	LK	Pl - Kinnikinnick - Cladonia	2.1
MSxv	LT	Pl - Trapper's tea - Crowberry	1.9
MSxv O	W	Open Water	2.7
MSxv	SC	Sxw - Crowberry - Knight's plume	38.9
MSxv	SG	Sxw - Crowberry - Glow moss	74.5
MSxv	SH	Sxw - Horsetail - Crowberry	73.7
MSxv	WS	Willow - Scrub birch - Sedge fen	95.7
MSxv	YL	Yellow pond-lily - Robbin's pondweed	1.2
SBPSxc	BF	Water sedge - Beaked sedge fen	17.6
SBPSxc LA		Lake	0.3
SBPSxc	LC	Pl - Kinnikinnick - Cladonia	1.0
SBPSxc	LK	Pl - Kinnikinnick - Feathermoss	336.2
SBPSxc OW		Open Water	0.2
SBPSxc	SB	Sxw - Scrub birch - Fen moss	4.5
SBPSxc	SH	Sxw - Horsetail - Glow moss	3.0
SBPSxc WM		Grey-leaved willow - Glow moss shrub carr	1.1
SBPSxc	WW	Willow - Scrub birch - Sedge fen	6.1
SBPSxc	YL	Yellow pond-lily - Robbin's pondweed	0.1
			17,348.7

Terrestrial Ecosystem Mapping – Access Road

Rationale

The access road mapping was done in order to support Environment Assessment analyses for terrestrial disciplines (such as wildlife) and to satisfy the guidelines of the BC *Mines Act.* Due to the fact that the access road uses existing roads for the most part, the level of analysis is lesser than that for the minesite area. Thus there is not a Local Study Area (LSA) for the Access Road.

Mapping Resources

The following resources were used for development of the refined TEM in the Minesite LSA:

- 1:15,000 scale colour aerial photographs of the entire corridor, taken in 2002;
- 1:20,000 scale TRIM topographic maps;
- 1:20,000 forest cover maps;
- Existing Madrone mapping of the minesite;
- Ministry of Forests Biogeoclimatic Zone mapping.

Ecosystem Mapping Process

As opposed to the SEI approach used in the Transmission corridor, a more conventional TEM approach was taken. Ecosystem mapping took place following provincial standards and provincially approved mapping codes (RIC 1998a, 1998b).

The GIS component of the ecosystem mapping was completed by using digital scans of colour photos and imported into ArcMap. The images were "draped" over 3D Digital Elevation Model (DEM), and viewed using PurView software. This method allows one to digitize map polygon lines directly on the computer without having to put them on the hard copy maps. The approach has advantages such as the ease of editing lines, and the ability to zoom in and out of landscape features as necessary. An average mapping scale of 1:10,000 was used for the linework delineation and classification, however in those instances where forested areas border on non-forested sites linework, delineation was conducted at a scale of 1:7,500 to accurately capture ecological boundaries.

Application of ecosystem attributes for each map polygon was completed and interpreted using PurView, and data was entered directly into an ArcMap attribute table. The ecosystems have been named, coded, and labeled according to provincial TEM mapping conventions. Mapping databases contain polygon numbers, biogeoclimatic subzones and variant, percentile, two-letter ecosystem code, structural stage, site modifiers. A total of 17,348.7 hectares was mapped, and 1150 map polygons were created; see expanded legend (Appendix 5-5-E) for descriptions of all mapped units.

Field Data Collection Protocols

Two levels of sampling were used in this project – ground inspections and visual inspections (Luttmerding et al. 1990). The information from the field plots also includes data about plant communities, surficial materials, landforms, and soils.

Ground Inspection Forms (GIFs) were used to collect basic ecological data at any given sampling area. This data included location, aspect, slope, elevation, landform, soils, and plant lists. Plots are established in areas that are uniform and representative of the ecosystem type being sampled.

All vegetation, soil and site information on the GIFs was completed as per RIC (1998a) guidelines. GIFs were also used to gather information regarding wildlife habitat and use.

Visual checks are a simplified version of the ground plots, and are done when familiar ecosystem patterns are repeated, when time was lacking, or when two different plant communities were adjacent to each other. Basic ecological data such as biogeoclimatic unit, site series, and terrain classification is collected plus an abbreviated plant list if time permits.

Field Survey Methods and Results

Fieldwork and sampling was completed in late June 2006 by Harry Williams and Jeff Bertoia, following standard ecological sampling procedures as outlined in RIC (1998a). Field maps were developed to support data collection and to highlight wetlands and old forest, allowing the field crew to prioritize their sampling. Study area access, field sampling logistics, and relationships between air photo features and ground features were reviewed prior to fieldwork. Hard copy air photos were carried in the field and used for navigation, and also to calibrate field data from specific forest stands or wetlands features with their appearance on the air photos.

Sampling sites were selected to collect information across the full range of commonly occurring ecosystem types, as well as to describe any plant community that had an unusual or unique appearance or plant composition. Basic ecological data was collected at each plot including site, vegetation, surficial materials, landforms, and soils. In addition, efforts were made to find and record any invasive plants, rare plants, and rare ecosystems.

Sixty-six GIFs and 125 quick visuals (informal notes or handwritten labels on maps indicating ecosystem, wildlife or landform information) were completed across all biogeoclimatic units along the access road. In total there were 191 TEM plots completed.

The results of the access road TEM mapping and field program are summarized in Table F.2-2. The survey intensity calculation, according to the number of hectares per inspection (Table F.2-3), and the % polygon sampled method (Table F.2-4), gives a sampling intensity level (SIL) of 4 (SIL 4).

Table F.2-2 Access Road TEM Survey Intensity Summary

Study Area	**Area (ha)**	**Number of TEM Polygons**	**Number of Sample Points**	**SIL (% polygons sampled)**	**SIL (ha/inspection)**
Access Road	17348.7	1150	191	16.6%	90.8

Table F.2-3 TEM field inspection density for selected survey intensity/map scale combinations (adapted from RIC 1998a)

Survey intensity level[1]	**Hectares per inspection**		**Interpretation Example**
	1:10 000	**1:20 000**	
1 3.8–5		15–19	Site specific silviculture prescription; **soil sensitivity** to erosion, **soil compaction**, etc.

2 5.1–9		20–29	Silviculture planning; **tree species selection**.
3 8–14		30–59	Vegetation potential; forest productivity; habitat enhancement prescriptions.
4[2] 15–25		60–100	Forestry, wildlife capability; ecosystem representation; general forest productivity; local resource planning; landscape management planning.
5[3] 26–76		101–302	Forestry, wildlife capability; ecosystem representation; general forest productivity; local resource planning; landscape management planning.
R[3,4] 77–370+		303–1500+	Regional planning; broad landscape management planning.

1 Values are guidelines only and are based on an average polygon size of 3–4 cm^2. Mapsheet areas and hectares per field inspection are based on an average map size; actual values will vary somewhat, depending on latitude.

2 Survey intensity level recommended for most mapping. This provides a reasonable balance of cost and reliability.

3 Survey intensity level recommended when Level 4 is too costly and lower reliability is acceptable.

4 Level R (reconnaissance) ecosystem mapping should only be conducted by ecologists who have considerable field experience in the ecosystems of the study area.

Table F.2-4 Survey Intensity Levels and map scales (adapted from RIC 1998b).

Survey Intensity Level	Percentage of Polygon Inspections	Ratio of Full Plots: Ground Insp.: Visual Checks[1]	Suggested Scales (K =1000)	Area Covered by 0.5 cm^2	Range of Study Area (ha)	Example Project Objectives
1	**76–100%**	2 : 98 : 0	1:1 K to 1:10 K	0.0025–0.5 ha	0.025–100	Restoration planning, conservation covenants and conservation tax credits, element occurrence mapping. Site specific environmental impact assessments for energy, housing, or other developments. May be used to refine larger scale mapping for sites of specific interest.
2	**51–75%**	6 : 24 : 70	1:10 K to 1:20 K	0.5–2 ha	50–5 000	Local government land use planning (zoning, OCP, DPs, and growth strategies), greenways and park planning, element occurrence mapping, medium scale pre-planning for energy, housing, or other developments (e.g., neighbourhood plan or rezoning).
3	**26–50%**	6 : 24 : 70	1:10 K to 1:50 K	0.5–12.5 ha	1 000–50 000	Landscape level land use planning, land acquisition priorities, habitat mapping and habitat protection, element occurrence mapping.
4	**15 – 25%**	5 : 20 : 75	1:20 K to 1:50 K	2–12.5 ha	10 000–500 000	Land use planning, conservation priorities, SOE reporting.
R	**0–14%**	0 : 25 : 75	1:100 K to 1:250 K	25–156 ha	50 000–1 000 000+	Strategic level land use planning for forest companies or local governments, SOE reporting.

[1] Inspection ratios are guidelines; actual project ratio should be set by the project ecologist.

QA/QC Process

The Quality Assurance process includes both an internal and external review procedure. The internal process includes: investigation of data base issues (e.g., ensuring correct use of map codes and modifiers, deciles, etc.); ecological consistency (e.g., ensuring correct structural stage, recognition of ecological gradients and changes in moisture and aspect, interpreting air-photo signatures); and GIS quality checks (e.g., elimination of slivers and any duplicate polygon numbers, one-to-one relationship between database and polygons, database issues etc). The external process consists of having an independent, qualified third-party ecologist look at a sample of map polygons to verify accuracy and consistency.

The revised Taseko Access Road TEM was externally reviewed by randomly selecting 149 polygons and assessing polygon labels for:

- accuracy of forested site series, including percentage proportions in compound polygons
- accuracy of non-forested site series, predominantly wetlands
- accuracy of structural stages

If polygon labels were deemed to be inaccurate, changes were subsequently made in the polygon database. The result of the external review showed an average percent accuracy of 81%, based on the review of 149 polygons.