

RECLAMATION ACTIVITIES AT THE NICKEL PLATE MINE

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ABSTRACT: Nickel Plate Mine is a 3 700 tonnes / day open pit gold mine located 45 kilometres west of Penticton. The mine is owned by Homestake Canada. During 1992 & 1993 the mine was able to demonstrate a number of progressive reclamation techniques. Last year over 18 000 000 tonnes of waste rock was removed during the Stage 4 expansion of the North Pit. The North Pit will be mined for the next three years. A number of waste rock dumps reached their capacity thereby making final reclamation possible.

This paper describes how changes to the slope of the recent North Waste rock area allowed for the waste rock dump reclamation to coincide with rock placement. This process required alteration to the initial waste rock deposition design.

Waste rock dump reclamation will be continuing, at an accelerated pace, for the next three years. The paper also describes the waste rock overburden methodologies and vegetation research for a mine situated at a high altitude.

INTRODUCTION

The Nickel Plate Mine is located approximately 45 km west of Penticton in the Okanagan Region of south central B.C - see Figure 1. Gold mining and milling initially began in the early 1900's. Underground mining continued until the mid-1950's at which time all buildings and equipment were either removed or destroyed. The current mining development, which includes an open pit mine for the remaining ore deposits, commenced in 1987 under Mascot Gold Mines. The mine is currently

operated by Homestake Canada Inc. with their headquarters located in Vancouver, B.C.

The property is located on Nickel Plate Mountain which lies on the southern part of the Thompson Plateau. The sides of Nickel Plate mountain are steep, especially the west side which drops over 1200 metres from the summit. The north and northeast sides are more gentle and slope at an average of 16° into Cahill Creek - see Figure 1. Higher slopes within the vicinity of the mine are generally well-covered with pine, fir, spruce, aspen and balsam. Those slopes with southern exposure have moderate to sparse tree cover with many open areas of grass and sagebrush vegetation. Lower slopes of the mountain are typically open and grassy or sparsely wooded with pine and aspen.

Water Courses

Red Top Gulch and Cahill Creek are the major watercourses located within the mine property. Drainage to the east is carried by Cahill Creek and its tributaries. The southeastern flank of the property is drained by Red Top Gulch. However most of the mining activity and the tailings impoundment basin are situated within the Cahill Creek watershed. The catchment area of Cahill Creek above the tailings impoundment area is approximately 1700 hectares. The Creek displays the morphology of a typical mountain stream. The channel is lined with boulders and cobbles and the active stream bed is narrow, being encroached upon by vegetation. The mean annual precipitation for the property is approximately 585 mm (23 in.) with 34% of the total precipitation appearing as runoff.

RECLAMATION PLANNING

There are a number of reclamation activities occurring at the Nickel Plate Mine. For this paper however we limit discussion on the reclamation of the waste rock dumps.

Recent Mining Methods

In recent times mining has been by open pits. These pits have been designed and operated as

conventional truck and shovel operations. Four main pits have been developed (the South Pit, Central Pit, North Pit and Canty Pit).

North Pit mining has entered Phase 4, the last phase and is scheduled for completion by mid-1997. Table 1 shows the past three years of waste rock removal at the mine. During 1993 the mining rate increased to over 70,000 tonnes per day in order to achieve the development of the Phase 4 prestrip. Once this work was completed the mining rate decreased to approximately 38,000 tonnes per day. This rate is expected to continue until the middle of this year and then drop to 25, 000 tonnes for the balance of the mine life. Consequently, accelerated progressive reclamation has commenced at the waste rock dumps.

END LAND USE OBJECTIVES

Mine Reclamation programs in British Columbia have been designed with the overall long range objective of reestablishing pre-existing land uses on a property average basis. For the Nickel Plate Mine property this entails returning the land to a state of productive cattle grazing and wildlife use at the completion of mine operations. In addition to meeting land use productivity goals for cattle and wildlife use, the final dump configurations and the reclamation program designs have also specifically attempted to minimize visual impact to the users of the Penticton-Headley public road. This road bisects the current operation. To satisfy these objectives the Company has incorporated the following procedures:

- (i) designing waste rock areas and resloping configurations that are structurally stable and readily blend in with the contours of the surrounding natural topography, especially on the high, visible east side of the North Dump,
- (ii) preserving tree stands as much as possible between the road and dump area, and
- (iii) creating a self-sustaining vegetative mosaic on the disturbed areas using local growth patterns and species as much as possible to reduce the discontinuity between natural

and altered landscapes.

With the exception of some of the pit areas and a few small areas of scree which will provide no foraging values all other reclaimed mine land will receive a land end use objective designation for both cattle grazing and wildlife habitat. Incidentally, cattle grazing is limited to approximately two to three months only, during the summer months each year. To achieve these objectives Table 2 shows the land use reclamation plan features and final vegetation cover.

DESCRIPTION OF WASTE ROCK DUMPS

The main areas for waste rock disposal include the Canty, North, and South dumps. The North and South dumps are the sites for waste rock deposition during Phase 4 development - see Photos #1 and #2.

South Dump

South Dump - Final Configuration

The South Dump was developed on relatively steep original ground and the dump toe is located adjacent to the tree line - see Photo #1. In 1992 the crest of the lower slope was rounded off and covered with till and seeded with a grass/legume seed mixture. Since recontouring the dump face will force waste rock material into a treed area between the public road and the dump the lower reaches will be left as a scree slope.

In 1992, sixteen hectares were recontoured, surfaced with till, seeded and fertilized. The site was resloped during September, a layer of till was spread to a minimum depth of 15 cm. The site was immediately seeded at a rate of approximately 60 kg per hectare using a seed mix recommended by the Ministry of Energy, Mines and Petroleum Resources as a suitable starting point for the development of range mix. the seed mix is shown below (percent by weight):

Crested Wheatgrass	30%
Creeping Red Fescue	30%
Alfalfa	15%
Alsike Clover	15%
Kentucky Bluegrass	10%

Seeding was done with a hydro seeder with a 100 m hose to reach most areas. No mulch or tasifying agent was used. Residual areas which could not be reached by the hydro-seeder were seeded by ATV and broadcast seeder. Fertilizer was placed simultaneously with seed. 11-55-0 and 18-18-18 fertilizers were applied at a rate of 40 to 120 kg per acre respectively.

During 1993 soil nutrients, root growth and above ground stand vigour, species composition, metal uptake in the vegetation and preliminary productivity levels were examined on a property wide basis. As a result of this testwork the following activities will be undertaken in 1994-1995 to increase species diversity, and thereby increase the adaptability of the seed mix to accommodate the highly variable site conditions encountered in reclamation of mine soils;

1. test species proven successful in other high elevation locations;
2. test several native species for which seed is commercially available; and
3. compare short term performance of seed mixtures on various sites.

Testing of a seed mix, till depth and fertilizer regime was initiated and results will be available mid year.

South Dump Expansion

Backfilling of the South Pit is currently under way using waste rock from the North Pit. Once dumping is completed the face of the dump will be sloped similarly to the North Dump. The South Dump is being constructed in a series of 24 to 36 m lifts. The dumps cover former pit slopes and will fill the South Pit. This will allow for the deposition of 17.5 million tonnes of waste rock. To date approximately $\frac{3}{4}$ of the Pit has been filled.

North Dump

North Dump Design and Contouring

The preliminary design was developed specifically for ensuring adequate dump volumes. The design called for ramps coming off large flat benches - see Photo #3. One of the major considerations for dump design was to develop a plan which did not require moving the Hedley Road. Refinement of the design included flexibility in waste rock dumping to allow for the simultaneous working on two elevations. Other measure included the construction of ramps to shorten the contouring height. Shorter dump heights also reduced contouring costs, since the volume of material moved will be less. The North Dump is being constructed in a series of switch-back ramps - see Photo #4. The design extends the existing lifts and keys the material to the east hillside. The rock will originate from the upper elevations of the north side of the Phase 4 development.

North Dump Testwork

Overburden stockpiles were created as development progressed. Prior to the open pit expansions, approximately 102 000 m³ of overburden was removed and stored in three piles for reclamation activities.

During 1993 a test site reclamation program commenced along the upper benches of the North Dump. Few of the slopes currently exceed 80 feet with alterations to slope design there was little requirement for resloping of the Dump. Slopes range from a grade of 18° to 22° In 1993 till was placed in selected areas. Plots containing 30 cm, 15 cm., 7 cm., and no till were developed. In some of these areas till was incorporated onto the surface. In each of the test plots there were various seed mixtures.

The Cantv Dump

The waste rock from the Canty Pit was placed in the Sunset drainage area during 1991 and 1992. At that time, guidelines established by the Ministry of Energy, Mines & Petroleum Resources controlled

the design, placement and monitoring obligations, as the dump was to perform as a rock drain. The performance of the rock drain is monitored in accordance with the criteria set out by the chief inspector of mines in consultation with the South Central Mine Development Review Committee. The Canty Pit was excavated directly within Sunset Creek. As a temporary measure the Creek was diverted around the Pit. With the suspension of mining, the Creek is now being returned to its original drainage course and the Pit has been flooded to the 1685 m elevation to form a small lake of approximately 1.6 hectares in size. The overflow from the pond continues along the old stream course through the rock drain which is self sustaining. The final reclamation configuration for the Canty Dump will include small sections of rock left as rock scree. The reclamation program for the Canty Dump avoided the placement of fine material at both the inlet and outlet of the Canty Rock Drain. This was necessary to insure the integrity of the drain. During 1993 progressive reclamation at the Canty Dump included resloping and seeding. The seed mixtures for the Canty Dump are shown in Table 3.

In the upper Canty Dump, at the 1 727 m elevation there is storage of overburden stripped during the opening of the Canty Pit. This material was used for reclaiming the dump in 1993.

CONCLUSIONS

Nickel Plate Mine has initiated a reclamation plan to satisfy corporate and regulatory as well as mine planning objectives. As existing dumps advance active reclamation will continue, so by the end of mine life only a relatively small amount of activity will remain. Reclamation planning is a key element in the mine dump planning and construction.

Using reclamation planning as a design tool today -will ensure a suitable reclaimed area for tomorrow.

FIGURE 1

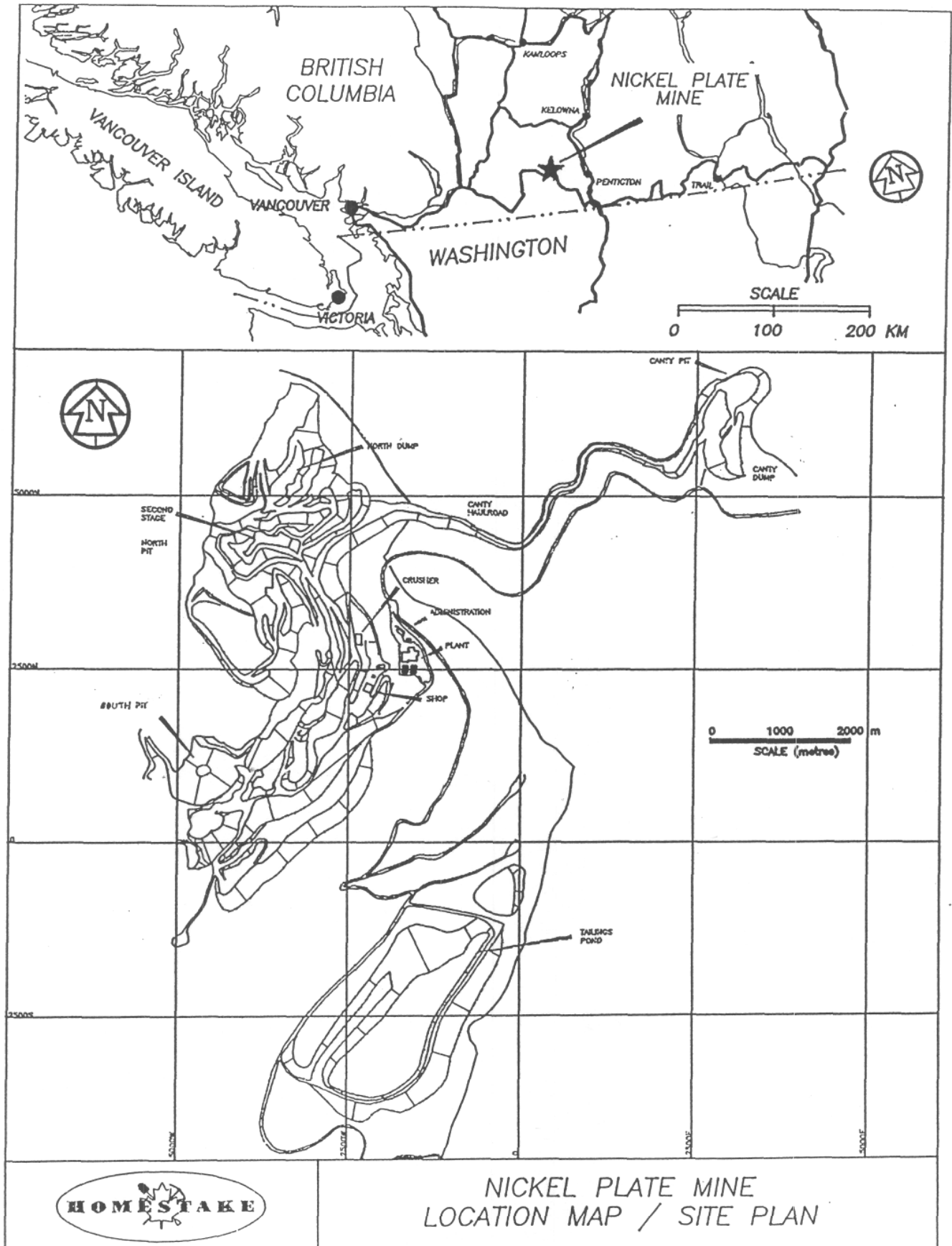


TABLE 1
WASTE ROCK INVENTORIES

Short dry tons

	1993	1994	1995	1996	1997
South Dump	32,308,000	42,438,000	47,437,000	50,865,000	52,492,000
North Dump	39,502,000	--	--	--	--
Canty Dump	3,300,000	--	--	--	--

TABLE 2
WASTE DUMP RECLAMATION OBJECTIVES

Location	Area disturbed (ha)		Post Mining Land Use	Final Vegetation Cover
	1992	1997		
South Dump	37.00	63.97	Cattle Grazing Wildlife Habitat	Range grasses & legumes Shrubs & trees
North Dump	28.84	40.42	Cattle Grazing Wildlife Habitat	Range grasses & legumes
Canty Dump	9.18	9.18	Cattle Grazing Wildlife Habitat	Range grasses & legumes Shrubs & trees

TABLE 3

SEED MIXTURES FROM THE CANTY DUMP

CRESTED WHEATGRASS	20 %
CREEPING RED FESCUE	20 %
ALSITE CLOVER	15 %
WHITE CLOVER	5 %
MEADOW FOXTAIL	15 %
COURTENAY TALL FESCUE	10 %
KENTUCKY BLUEGRASS	5 %
PERENNIAL RYEGRASS	10 %

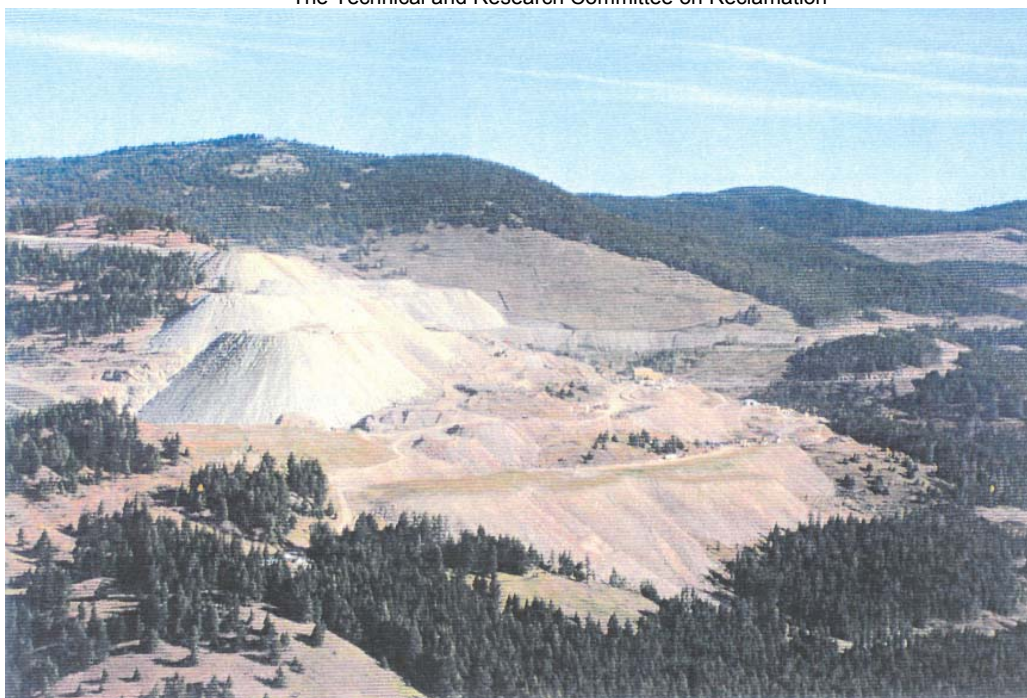


Photo 1 **SOUTH VIEW OF NICKEL PLATE MINE**
- South dumps with lower benches reclaimed

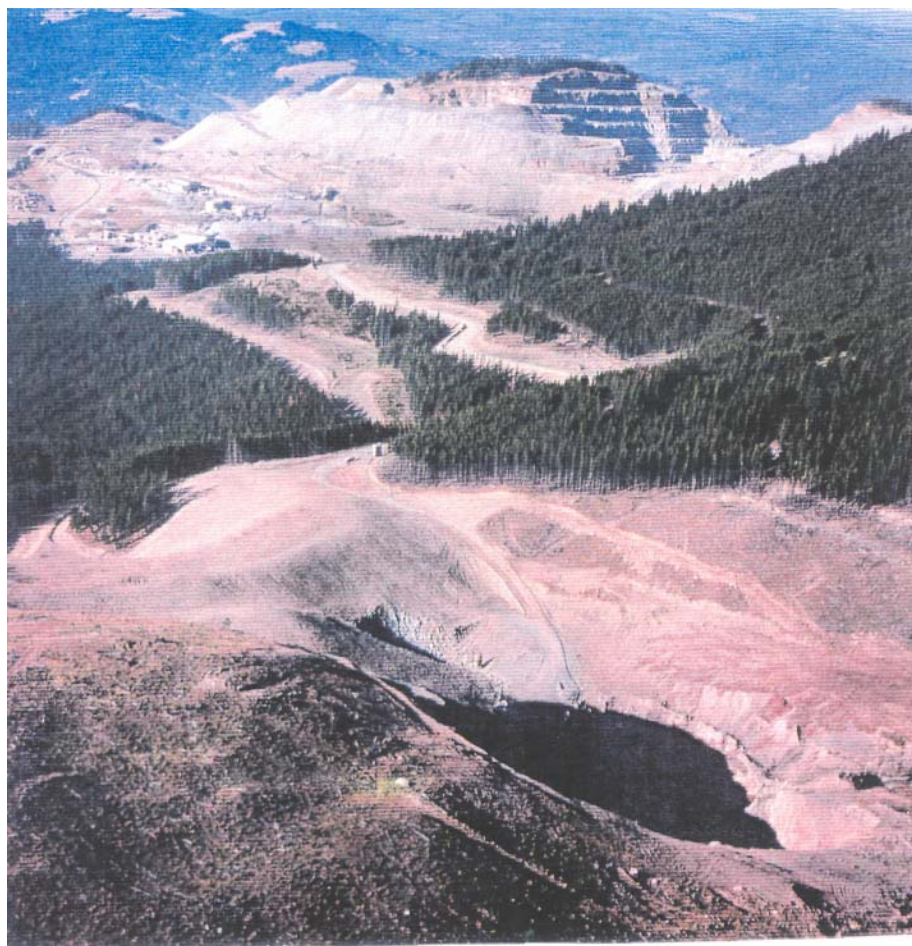


Photo 2 **NORTHEAST VIEW OF NICKEL PLATE MINE**
- Canty dump and pit area - North Pit in background



Photo 3. **NORTH DUMP**
- Prior to contouring



Photo 4. **NORTH DUMP**
- Dump lifts have been resloped to angles of 18° - 24°