

MOUNTAIN ROAD REHABILITATION AT SUNSHINE VILLAGE SKI AREA

Paper Presented
by

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INTRODUCTION

The Sunshine Village upper access road winds up a steep, narrow valley climbing 424 m in a 5 km length (Figure 1). The village at the top is at 2160 m elevation, just where the dense forest is starting to open out into alpine meadow. This road was built as a make-work project in the 1940's and as such was built to a very low standard. At present, it is characterized by, on the upslope side, deep eroding cutbanks, on the downslope side, by large amounts of mixed gravel and salt that have been plowed off the road's surface. Over forty years of increasingly heavy winter use by buses, the constant plowing and nearly daily gravelling necessary to keep the road open for buses has gradually widened not only the road surface, but the areas of erosion and vegetation damage both above and below the road. Our project is to stabilize these areas, get the drainage under control, reduce the width of the road to the minimum required to service the area, and revegetate the areas on either side of the road with species acceptable in the National Park. This is an interesting reclamation project because: the site is at high elevation with a very short growing season, the requirement to meet Parks Canada standards, and the need to produce a road which will handle bus traffic in the summer and be suitable for ski terrain in the winter.

Sunshine Village, 17 km southwest of Banff Townsite (Figure 2) is one of the major ski resorts in western Canada. The base facilities, hotel and staff quarters are located at an elevation of 2160 m. The ski terrain is right along the continental divide with a small portion of it actually in British Columbia. The skiing season runs from mid November until late May and the hotel is operated for a summer season from late June until early September. From the Trans Canada Highway, west of Banff, an 8.5 km long, all-weather public access road leads to Bourgeau parking area at an elevation of 1636 m. Until 1980, public access from this parking area to the village was a shuttle bus system operated by Brewster Transportation. In winter, the upper road was very heavily used, as on a peak day up to 29 buses were transporting up to 4,500 people to the village. Summer use of the road in comparison was very light, but steady.

There was no organized plan to widen the road, just random work by various cat drivers over the years. Tonnes of mixed gravel and salt were

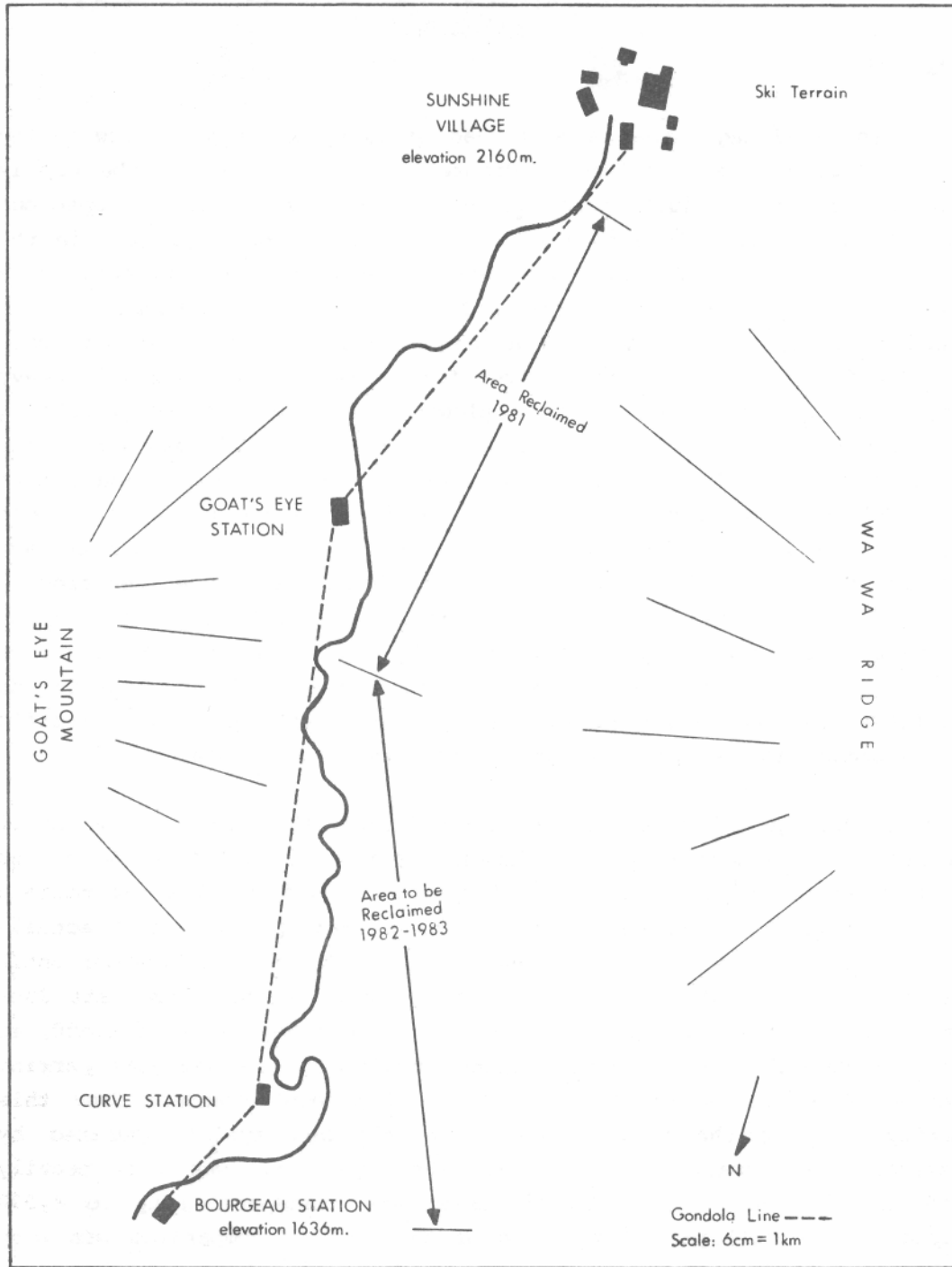


Figure 1. Sunshine Village Upper Access Road

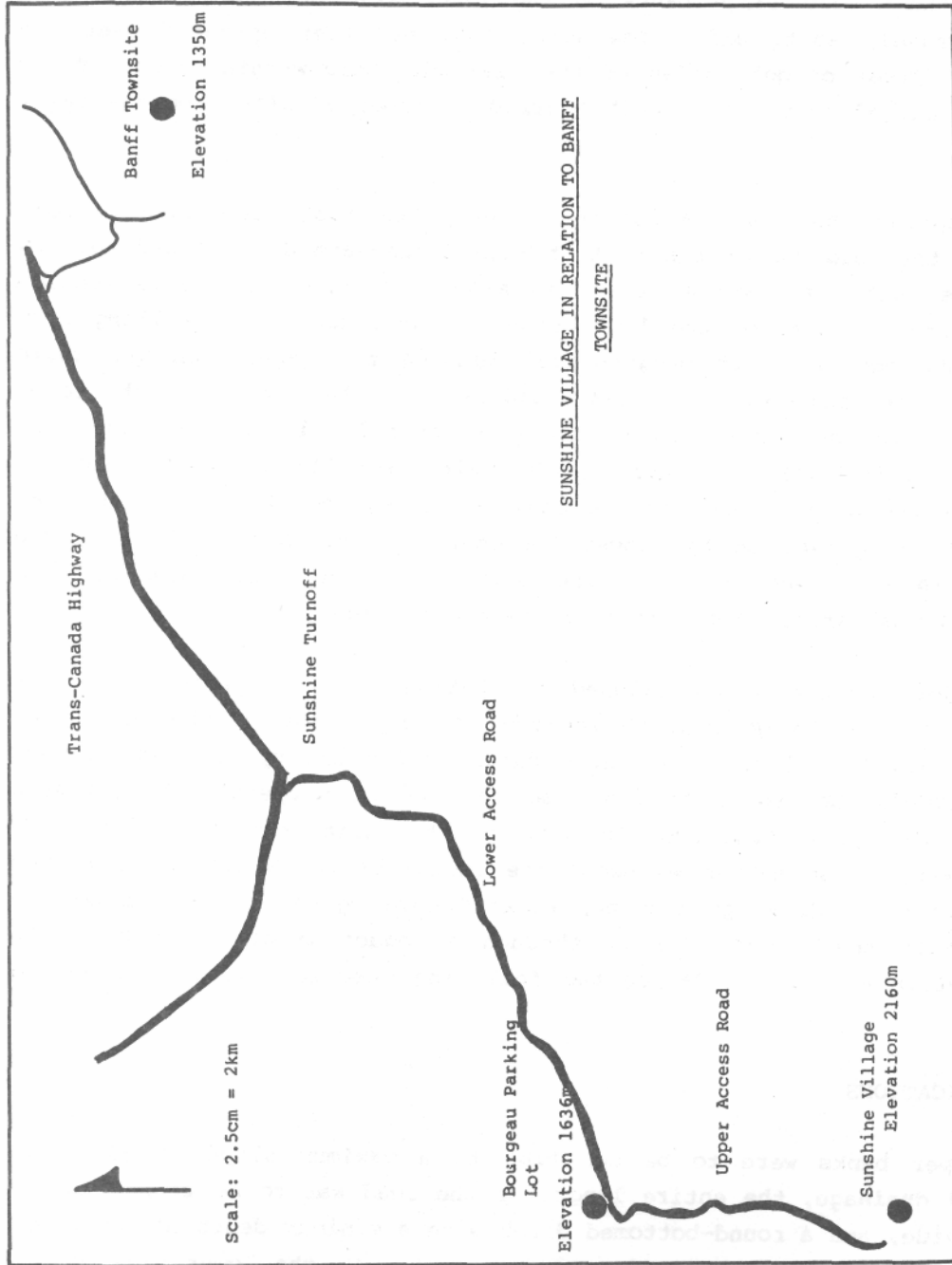


Figure 2. Sunshine Village in Relation to Banff Townsite

poured onto the road to keep it open through the seven month ski season. Many of the bulldozer operators who worked to keep the road open had no concern for the environment and, in fact, the main objective in many cases was to see how many trees they could plow over. Every year, by spring there were large banks on the lower side of the road of mixed snow, gravel, salt, and a few trees that had been uprooted over the winter. Trees on both sides of the road that were within reach, if not already pushed over, were badly scarred by repeated hits from the bulldozer.

Every spring there was a battle to keep the road from washing out. Because the road was of random tilt with inadequate ditches and too few culverts, water ran where it wanted along the surface. Large erosion rills were produced on the lower side, as well as slumps falling from the banks above. With progressive slumping the vegetation mat would overhang more and more and trees would start to lean out over the road. If not felled at this point the trees eventually blocked the road. It has been a deplorable situation both environmentally and aesthetically. Possibly the worst impact on the environment was due to the mixed piles of salt and gravel on the lower shoulder. These crept, slumped, and flowed into the vegetation on the lower side. At times some of this material was carried right down to the creek below.

The major advance which allowed resolution of this problem was the installation of a gondola to replace the upper road. The winter of 1980/81 was the first in 40 years during which the upper road had not been plowed. We proved at that time that we could operate the ski area without the upper road, and, in fact, started using the upper road as a ski trail. Last summer we began the reclamation. Since the road was built by the federal government, Parks Canada agreed to let us do the work, with them paying for it through a reduction of lease fee. In cooperation with Parks Canada the following specifications were agreed to.

SPECIFICATIONS

The upper banks were to be cut back to a maximum slope of 30°. To control drainage, the entire length of the road was to be tipped toward the inside, and a round-bottomed ditch with a minimum depth of 45 cm was to be provided along the entire upper length. On the lower side of the road, where possible, the slope would be reduced to 30° and the shoulder

rounded off. In many places the downhill side of the road was so steep over such a distance that it was impossible to work on these banks with a bulldozer. All that could be done was to round off the outside shoulder of the road and re-seed it. In the summer of 1981 the upper 2,000 m of the 5 km road was to be worked on. Within this length, nine new culverts were to be added. At each of these culverts, inflow and outflow protection was to be provided by hand setting rocks. Rock work was continued as far down slope from the culvert as was likely to be a problem. All the areas of exposed ground were to be seeded except the actual travelling surface of the road. The specified grass mixture was: 30% Creeping Red Fescue (Boreal) (*Festuca rubra rubra*), 25% Slender Wheatgrass (*Agropyron trachycaulum*), 20% Canada Bluegrass (Reubens) (*Poa compressa*), 15% Streambank Wheatgrass (Sodar) (*Agropyron riparium*), and 10% Hard Fescue (Durar) (*Festuca ovina*), at 55 kg/ha. In general, this mix is tolerant of slightly alkaline conditions, drought resistant, shade and cold tolerant and establishes well on soils with low fertility. Two fertilizers would be required: 34-0-0 11% S at 168 kg/ha and 6-24-24 at 336 kg/ha. Straw mulch was to be spread over the seeded areas at a rate of 4.5 tonnes/ha. The seed and fertilizer was to be spread and raked in by hand and the straw also applied by hand. When cutting back the upper bank as many small trees and shrubs as possible were to be dug out and set aside. As soon as possible, they were to be replanted at suitable locations.

CREWS AND EQUIPMENT

We had a labour crew of 18 people. The burning crew (three people and a supervisor) felled, piled and burned the brush and trees that had to be removed. The seeding crew (13 people and a supervisor) did the vegetation salvaging, raking, seeding, fertilizing and mulching. The heavy machinery we contracted consisted of: one D7 caterpillar with logging winch, straight blade and brush blade; a JD 450 with straight blade and logging winch; a standard rubber tired backhoe and loader combination; a ten tonne gravel truck; a grader; and, for a four day period, a gradall.

SEQUENCE OF WORK

In consultation with Parks Canada, the line to which the upper banks would be cut back were flagged and all trees which had to be removed on the downhill side were designated. We chose a starting date of June 15th as the earliest possible date that the road would be dry enough to

work on. The road was divided into seven sections, in each section the sequence we attempted to follow was:

1. Vegetation Salvage: The seeding crew will dig out by hand with the help of a loader all small trees and shrubs that can be salvaged in one-half day's work.
2. Falling and Piling: The burning crew will cut all the timber and brush remaining on the uphill side of the road and the few designated trees on the lower side. All solid wood of over 10 cm diameter will be cut and piled for firewood. The brush will be piled along the shoulder of the road for burning.
3. De-Stumping: The D7 with brush blade will pull out all the stumps, clear them of earth, and push the smaller ones into the brush pile for burning. The larger stumps will be buried in areas requiring fill.
4. Burning of brush and stumps.
5. Rough Shaping of Banks: The D7 with straight blade will cut back the uphill banks to a stable shape.
6. Final Shaping: The JD 450 will produce the final smooth, curving shape on the uphill banks and where possible, shape the downhill shoulder. Where the JD 450 cannot work the downhill shoulder it will be shaped by the gradall.
7. Ditching and Road-Shaping: This will be done by the backhoe and grader. Fill will be hauled by gravel truck from where it is produced in surplus to where it is needed.
8. Seeding: The seeding crew will rake, seed, fertilize and mulch the exposed ground, and finally replant the salvaged vegetation. On the large banks, earth water bars will be installed at 5 m intervals, sloping toward the road on a 5° angle.
9. Culverts will be installed by backhoe and rock work at the inflow and outflow will be done by the seeding crew.

ACTUAL PROCEDURE

The above sequence was, to say the least, idealistic in comparison to what actually happened. Machinery unavailability, breakdowns and nearly continuous bad weather including three major snow storms, made the whole project a scramble to keep things rolling. The D7 was not available until the 20th of June, and then it had several breakdowns, which took it out of service for up to a week at a time. The JD 450 winch broke several times although it was a brand new machine. Heavy rain and snow storms brought work to a complete halt several times but when the rain or snow fall was light we managed to keep work going. How poor the working conditions were, is probably indicated by the attrition of the seeding crew which started with 13 people, but by August 1st was down to four people.

Another factor that we had not foreseen was frost. In some of the cuts we hit frost as late as the first week of July. When this happened, we could only scrape the melted ground off the frozen, leave it for three or four days to thaw out, blade off what had softened and start again. In one location we had to do this three times before we finally got rid of the frost. At times the project looked very disorganized. The downhill shoulder had piles of earth, trees ready for replanting, brush piles ready to be burnt and we were still trying to keep the road open and have a few passing zones so that when cars and buses met they didn't have to back up too far until there was room to pass. One major trouble spot was a large bank known as the Zone 15 cut. At this area the road was very narrow, the bank above quite high and the natural wooded slope above the cut bank was nearly a 30° slope. We originally hoped that the gradall would reach up this bank and back slope it but we didn't think the bulldozers could work on it. We found, however, that the gradall had neither the power nor the reach for this job. We then started working from either end first with the big cat and then with the smaller one. Finally, through skill and perseverance the operator of the 450 managed to do the entire bank. The final slope produced was just under 30* which is very steep for a bulldozer to work on when it must go sideways across the hill. By the first of August all the banks were shaped, all the downhill shoulders rounded off and all areas were seeded. The entire length of the ditch had been brought to the correct depth and shape and the culverts were all placed. Work continued through August, placing the rocks in the inflow and outflow area of the culverts. Parts of the road surface still had not been tipped to the uphill ditch but this would be done as part of next year's work.

RESULTS

We were very pleased with the results. All of the banks seem to be stable. They have all gone through several rain storms during and after the construction period and the grass took well. The areas that were planted early showed very good growth, and of those areas planted near the first of August all were showing at least some green.

The mulch we used was straw purchased from an Alberta farmer. It was apparently barley straw and not too well thrashed; barley was the most obvious of the grasses that grew! Parks Canada was displeased with our introducing domestic grain onto the site although our early frost would probably prevent the seed head from maturing. We cut off all the seed heads in late August for insurance. We have received many positive comments on the improved aesthetic appearance of the road. As far as we can determine all the erosion problems are under control. The final test, of course, will be this spring's run off. We are now in negotiations with Parks Canada for this season's road work. We have asked to complete the road in one more season but it seems likely that Parks will require us to do it over two seasons, to spread out the expenditure. Some very interesting problems are apparent along this section including several banks much larger than we have cut before and one large eroding slope that cannot be cut back because a gondola tower base is right above it. We hope to use a combination of engineering and vegetative practices on this site. A very complicated situation arises at a switchback on the road which is also the location of the gondola curve station and has a rock cliff immediately above the road.

DISCUSSION RELATING TO J. BUCKINGHAM'S AND W. BATES' PAPER

Bruce Ott, Placer Development; Can you tell us what the bottom line was
for the two kilometres?

Answer: \$60,000.