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ASSESSMENT REPORT**

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A REPORT ON RECLAMATION OF COAL EXPLORATION  
ON THE DUKE MOUNTAIN BLOCK OF THE MONKMAN  
COAL PROJECT IN 1978

FOR

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A REPORT ON RECLAMATION OF COAL  
EXPLORATION ON THE DUKE MOUNTAIN BLOCK  
OF THE MONKMAN COAL PROJECT IN 1978

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## 1.0 SUMMARY

The 1978 reclamation program on the Duke Mountain Block of the Monkman Coal project started on 11 September 1978 and was completed 18 October 1978. Total area of disturbance made by Pacific in exploration was approximately 40 hectares (100 acres). All was reclaimed. A three part reclamation procedure was used on these disturbances: slashing brush, erosion control on bare ground, and revegetation with commercial grasses and clover.

Slash abatement included slashing 35 km (22 mi) of road, 47 drill sites and total disposal of slash on the first quarter-mile section of the Duchess Mountain Main Access. Slash abatement on the Duke Mountain Block passed inspection by the B.C. Forest Service.

Erosion control measures were established on disturbed areas throughout the block. This included constructing erosion bars, cross ditches, contour ditches and spreading slash on the road surface. Close attention was paid to establishing good erosion control on the two adit sites and a slumping area near MDD 78-5. The slumping area had culverts removed and was permanently abandoned. Ministry of Mines recommends that this slumping area be checked in the spring of 1979.

Revegetation procedures consisted of spreading seed and fertilizer on 60 km (36 mi) of road, 47 drill sites, 2 adit sites, campsite and the garbage site. Two types of seed mixes were spread - one for above treeline areas (alpine mix) and one for below treeline areas (forst mix).

The Ministry of Mines and Petroleum Resources Mineral Resources Branch of the Province of British Columbia has undertaken a field inspection, and considers the reclamation program for 1978 to be current.

## 2.0 INTRODUCTION

IEC, International Environmental Consultants Ltd., were retained by Pacific Petroleum Ltd. to provide technical services for the reclamation of the Duke Mountain Block coal exploration activities that took place in the 1978 field season.

This report has been prepared for submission to the Department of Mines as part of Pacific Petroleum's environmental management program on the property. Included is a brief account of previous exploration and reclamation undertaken by other operators. The report represents the summation of the available data for the property to the present time. Pacific Petroleum Ltd. will use it as a reference document in future years as continuing exploration of the property takes place.

In the following sections the methods used in reclamation, the reclamation program in 1978, and an estimate of the costs are presented.

### 3.0 THE PROPERTY

#### 3.1 Location

The Monkman Coal project is located between latitude  $50^{\circ} 15'$  and  $54^{\circ} 50'$  N. and longitude  $120^{\circ} 15'$  and  $121^{\circ} 00'$  W. within the designated northeast coal block, approximately 120 km (75 mi) SSW of Dawson Creek, near the British Columbia-Alberta border.

#### 3.2 Size, Elevation

The property covers 34,497 hectares (85,240 acres), and stretches in a northwesterly - southeasterly direction some 80 km. The section of property in which exploration work was done in conjunction with road building is known as the Duke Mountain block, and is located in the northeast corner of the property. Within the block, road building was kept primarily to two mountains, known in local terminology as Duke Mountain (el. 1742 m, 5716 ft), and Duchess Mountain (el. 1791 m, 5876 ft), see Map 1.

#### 3.3 Vegetation, Climate, Soils

The Pacific property is within the boreal and sub-boreal regions as defined by Harcombe (1978). The boreal regions - sub-boreal regions interface on the eastern slope of the Duke and Duchess Mountain complex. The complex is primarily in the sub-alpine Engelmann Spruce - Alpine Fir zone and Krummholz and forested sub-zones. The boreal region is influenced by cold Arctic air during most of the winter and by relatively dry westerly air flows during the summer. The sub-boreal region is influenced by moist coastal air flows near the Rocky Mountains, but is also susceptible to cold, dry Arctic air during the winter.

Generally speaking, temperature on the property is  $1^{\circ}$ - $4^{\circ}$ C lower than recorded at Dawson Creek. This has been interpreted as indicating that the frost free days should be 10-30 days shorter than Dawson Creek (in Dawson Creek 78 days: June 4 - Aug. 22). Also growing degrees should be at least 400 lower than 1,125 days at Dawson Creek (E.L.U.S.C. 1978).

On the valley bottom and lower slopes of Duke Mountain (1000 - 1500 m, 3280 - 4921 ft), the soils have developed mainly from glacio-fluvial materials and show a brunisolic-luvisolic development. On the mid-slope section of Duke Mountain (1300-1500m, 4200-5000 ft), where most 1978 exploration was done, the parent material is colluvial or morainal, which show some isolated areas of podzolic soil development. On the upper slopes the parent material is shallow colluvium undergoing cryoturbation (frost churning of soils). The soil development is predominantly brunisolic with podzolic development in the more stable krummholz subzone.

Most of the exploration activities on Duke Mountain were carried out on the mid to upper slope areas. Similar soil orders are evident on Duchess Mountain, except for the lack of a predominant podzolic soil development on the mid-slope section. Most of the exploration activities on Duchess Mountain were carried out in an area of combined brunisols and podzols.

#### 3.4 Previous Exploration and Reclamation Activity

Exploration has been conducted on the licences during 1970 and 1973 by McIntyre Mines Ltd.; in 1975 by Canadian Superior Exploration Ltd.; and in 1976 and 1977 by Pacific Petroleum Ltd. The exploration programme conducted by Canadian Superior in 1975 was an extension of work carried out by McIntyre in 1970 and 1973. Early records of reclamation activities by McIntyre, Canadian Superior and Pacific Petroleum describe general features of their reclamation programme - although it is evident from the well established vegetation cover on the roads that their reclamation procedures were effective (Fig. 1).

In 1976 Pacific completed twelve diamond drill holes and three hand trenches. Access to three of the drill holes was by roads built or upgraded by Pacific. The other nine drill holes were accessible only by helicopter. Reclamation activities included seeding the drill holes accessible by road and backfilling the trenches. The reclamation programme for the 1976 season was approved by the Forest Service.

In 1977 Pacific completed eight diamond drill holes and 29 backhoe trenches. Reclamation activities for 1977 included establishing erosion control measures on the hills, backfilling the trenches and slashing 3 km of the Duchess Mountain main access road.

In this report the reclamation programme for 1978 field season is described. This programme includes reclaiming some 1977 areas and all the areas disturbed in Pacific's 1978 exploration season.

The Ministry of Mines and Petroleum Resources Mineral Resources Branch of the Province of British Columbia has undertaken a field inspection of the completed 1978 reclamation programme. In a letter of 30 October 1978, to Pacific Petroleum, the Mineral Resources Branch informed the company that the reclamation programme is considered to be current.

## 4.0 RECLAMATION PROCEDURES

### 4.1 Physical Preparation

#### 4.1.1 Berms and Grading

Berms are usually left along the edge of roads as a safety feature, but once the road is abandoned the berms should be removed where they may restrict drainage. On roads traversing sidehills, berms were levelled and the road graded to produce an outsloping road surface.

Most roads were graded to remove wheel ruts, which would tend to channel run-off, increasing erosion of the road surface. A level road surface without water pockets also increases the chance for seed germination. Berm levelling and grading was done mostly with a Cat D-6.

#### 4.1.2 Culverts

Culverts were installed at all creek crossings and where they were needed to ensure proper drainage. Culverts were laid with the slope of the ground and in the original water channel.

Where it was necessary to have overhanging outfalls, rip-rap was placed in the channel directly below the outfall. As a precaution to prevent culverts from plugging up, catch basins were constructed at the culvert inlet. Fish populations were not evident in any of the streams culverted.

Culverts were removed from an abandoned section of road (Map 1). In all cases, the streams were restored to their natural water course. The culverts were removed from these streams with a Cat 225 backhoe. The backhoe worked well for this job; with the large bucket it was possible to pull out the culvert with a minimal disturbance of surrounding ground and stream. With the use of the bucket it was possible to build a narrow stream channel with high banks so they will not be breached during high water (Fig. 2).

#### 4.1.3 Slash Abatement

Slash abatement for the 1978 season included slashing of all 1978 roads and drill sites as well as any outstanding from 1977. In total 35 km (22 mi) of road and 45 drill sites were slashed. Slashing consisted of dropping "leaners" and trees damaged during road construction. The fallen trees were then bucked and limbed in accordance with regulations enforced by the Forest Service.

As requested by the Forest Service, total disposal was carried out along the first quarter mile section of the Duchess Mountain Main Access. The section of road was widened and all slash was walked down and buried with a Cat D-7 along the right of way created. Slashers then bucked up any remaining slash or leaners and hand-piled it in the middle of the road for burning. The ashes were later spread and buried on the road surface with a D-4.

All slashing and total disposal on the Pacific property passed inspection by Mr. Herb Norden of the Dawson Creek Forest Service office.

#### 4.1.4 Erosion Control

Erosion control on the Pacific property consisted primarily of constructing erosion bars, cross-ditches, contour ditches and pulling slash onto the road. Erosion control started as soon as the roads were no longer in use.

Erosion bars were placed on all roads where the slope was great enough to require some drainage control. Frequency of erosion bars depended on the slope of the road and soil type, and skewed to ensure effective drainage (Fig. 3). Erosion bars were built with a wide pad Cat D-4 with a backhoe attachment, which was found to be superior to a D-6 for this type of work. A D-6 was initially used but it was found to be impractical. The D-4 could build better erosion bars and work in areas too soft to support the heavier D-6 and the backhoe attachment was also found to be useful. When installing erosion bars on a downhill slope it is unavoidable for the Cat to run over the bars after they have been built; with the backhoe it was



possible to restore the bars behind the Cat. Another advantage of the backhoe was that it was able to pull itself out of soft spots. The backhoe was also found ideal for pushing holes through berms or roadside slash and for building cross-ditches.

Cross-ditches were built along roads which traversed side hills, often in conjunction with outsloping or in depressional areas. On side hills they were placed where gullies or small rivulets would have naturally crossed the road. Cross-ditches were built by a Cat D-4, with either the backhoe or blade.

Contour ditches were used primarily on the adits and drill sites. On large sloping drill sites where runoff may be concentrated and create some erosion problems, contour ditches were used to break up the surface area and divert the runoff into smaller channels. Contour ditches were built with a Cat D-6 by tilting the blade and ditching across the slope of the site. Contour ditches around the adits divert runoff away from unstable fill slopes; these were hand dug.

Due to extremely unstable cut banks, one section of road was totally abandoned (Map 1). The erosion control measures used on this section are slightly different than those mentioned above. Erosion bars and cross ditches built by a Cat 225 backhoe and D-6 were constructed larger than normally built. At one section of road where a steep slope ends with a creek at the bottom, it was not possible to build any erosion bars due to the steep banks on each side of the road. To help stabilize the road surface and to reduce the chance of erodable materials from entering the stream, slash was pulled on to the road surface using a Cat 225 backhoe. In order to try and stabilize the area of active slumping, a Cat 225 backhoe was utilized to reduce the slope of the slumping cut-bank.

Using the long-reach bucket, unstable soil was taken from the upper slope placed at the toe of the slope where it meets the road. In this way the slope of the bank was reduced and the road surface serves as a catchment area for any further slumping material. Erosion bars and cross ditches were placed around the slide area to keep runoff away from the unstable material.

## 4.2 Re-vegetation

### 4.2.1 Seed Mix

Two seed mixes were used on the Pacific Petroleum property during the 1978 season. These mixes were recommended for the Peace River Coal Field in the Ministry of Mines and Petroleum Resources Handbook of Environmental Protection and Reclamation in Coal Exploration (Appendix V). The "above treeline mix" or "alpine mix" was used on all roads and drill sites that occurred in areas of minimum tree cover; generally these areas are above the 1500 m (4925 ft) contour. The alpine mix was spread at approximately 40-45 kg/ha (35-40 lbs/acre), although this varied with site conditions (see Appendix I). 816 kg (1800 lbs) of alpine mix were used to cover 20 km (11 mi) of road and nine drill sites (Map 2). The "forest mix" was used to seed the rest of the disturbed areas. Generally these areas occurred below the 1500 m (4925 ft) contour and in well forested areas. The forest mix was spread at approximately 25 kg/ha (22 lbs/acre), although this varied with site conditions (see Appendix I). 907 kg (200 lbs) of forest mix were used to cover 40 km (25 mi) of road, 26 drill sites and two adits (Map 2).

### 4.2.2 Fertilizer

A highly soluble fertilizer of a minimum analysis of 22-22-12 was used on most of the disturbed areas. The fertilizer was spread at different rates depending on site specific conditions such as soil type, elevation and aspect (see Appendix I).

In general, fertilizer was applied in conjunction with the alpine mix at approximately 250 kg/ha (222 lbs/acre), (Map 2) although in some spots it was spread as high as 400-500 kg/ha (350-450 lbs/acre) (see Appendix I). Fertilizer applied in conjunction with the forest mix was spread at approximately 150 kg/ha (133 lbs/acre), (Map 2) although this varied considerably depending on site conditions (see Appendix I). Generally, in large areas of disturbance such as drill sites and areas with little topsoil, the fertilizing rate was increased.

#### 4.2.3 Application

The seed mixes and fertilizer were applied using the broadcast method, Cyclone seeders (the hand held model and the 12 volt electric drive model), and hand sowing was used to disperse the seed and fertilizer.

The seed and fertilizer was transported to the mountain in slings moved by a heicopter from the bse camp stockpile. Sling drop locations were prearranged so it was possible to pick up the proper proportions of fertilizer with the correct seed mix, as it was needed. A Bombardier was used to pick up the load and transport it along the roads while the seeding and fertilizing was being carried out.

The forest mix was spread by hand-held Cyclone seeders. Two people walking side by side with Cyclone seeders were able to cover the road surfce, fill slopes and cut banks in one pass.

The alpine mix was sown by hand as this mix would not flow freely through the hand-held or powered Cyclone seeders. This technique is slower than using the Cyclone seeder but just as effective at dispersing the seed.

Fertilizer was spread by a Cyclone seeder, powered by a 12-volt electric motor, mounted on the back of a bombardier (Fig. 4). The powered Cyclone seeder could easily spread the fertilizer the width of the road in one pass. Deflectors were built on the sides of the seeders to help regulate the distance the fertilizer was spread. To save time, the seed and

fertilizer was applied at the same time. This was usually done with two people spreading seed by hand while the Bombardier followed behind spreading fertilizer. On some of the more exposed alpine areas several passes were made with the Bombardier to harrow in the seed as protection from dessication and wind.

## 5.0 THE 1978 RECLAMATION PROGRAMME

### 5.1 Roads

The road network on the Duke Mountain Block is shown on Map 1. The roads made reference to in the following discussion of reclamation procedures can be located on this map. As shown on the map the road network on the Duke Mountain Block occurs in two main areas: the Duke Mountain area and the Duchess Mountain area, corresponding with the areas of exploration. The solid lines on Map 1 represent roads built by Pacific or existing roads which they have used. The heavy solid lines represent major access routes through the property. The major access routes, the most heavily travelled roads on the property, were generally wider, better drained and received some road maintenance. The light solid lines represent spur roads providing access to drill sites. The spurs, temporary roads to drill sites, were used during the short period of drilling. The broken lines represent roads not used by Pacific, built before 1976 when Pacific started exploration on the property.

The first 3.0 km (1.8 mi) of the Duke Mountain Main Access from the Kinuseo Falls Road was left open to local traffic. At km 3 a large barricade was built across the road to block access onto the property. Spurs along the first 3.0 km section of road were also barricaded to prevent access. This short section of road was graded but seed and fertilizer were not applied.

The campsite located near the junction of the Main Access road and Kinuseo Falls Road was levelled, seeded and fertilized.

The garbage dump for the camp, located approximately 2 km (1.2 mi) from camp along the Main Access, was backfilled, graded, seeded and fertilized at the close of the 1978 field season.

The Duke Mountain Adit Spur, built in 1978, was susceptible to extensive ground water seepage with resultant ponding on the road surface. Cross ditches were placed at frequent intervals to channel the water off the surface and disperse it into the downslope vegetation.

Access east of MDD 78-5 on the Adit Spur was abandoned because of excessive groundwater seepage causing cut-banks to slump. In an attempt to stabilize the slumping cut-banks, the banks were recontoured to reduce their grade, and the road surface was designed as a catchment area for further slumping material. Ditches were constructed to prevent surface water from collecting in pools. As described in Section 3.1.2, culverts were removed from creek crossings in the abandoned section. In order to help stabilize a steep road surface adjacent to a stream crossing near MDD 78-6, slash was spread across the surface area. The Ministry of Mines recommends that the slumping section of the Adit Spur be checked in the spring of 1979.

In 1978 a D-6 Cat walked a previously reclaimed section of road, leading from the Alpine Spur and past MDD 76-11, damaging the erosion bars and seeding. The erosion bars were repaired and track marks were re-seeded and fertilized.

A persistent mudhole on the Alpine Spur was drained and filled in with surrounding slash and soil, levelled, seeded and fertilized. Drainage ditches were constructed to channel run-off away from the area, see "Mudhole" on Map 1. A second mudhole on the Alpine Spur is referred to as the "Detour". When this section of road became too muddy for further use, an alternate route was built around it. The original route was drained and filled in with slash and soil, levelled and seeded.

As described in Section 3.1.3, slash along the first quarter-mile stretch of the Duchess Mountain Main Access - Wapiti Road junction was completely removed. A large barricade was placed at the junction to prevent access onto the property. Most of the roads occurring in the Duchess Mountain area occurred in open sub-alpine areas and were not susceptible to the ground water seepage problems present on Duke Mountain. Except in the instances described above, the remaining roads on Duchess Mountain were readily reclaimed without much difficulty.

## 5.2 Adits

During the 1978 field season two adits were constructed in the Duke Mountain Block. Their positions can be located on Map 1; on the east face of Duchess Mountain and on the north face of Duke Mountain. Similar reclamation procedures were carried out for each adit site. Reclamation consisted of backfilling the coal wastes against the exposed coal seam around the portal which had been reinforced and extended with a 6x20 ft culvert or cattle pass. Coal wastes were deposited as high as possible against the coal face until the backfilled slope reached the angle of repose. The adit platform was then levelled and sloped outwards slightly to ensure runoff did not pool on the platform. Backfilling and spreading of the coal wastes was done with a Cat 225 backhoe.

Erosion control measures consisted of installing ditches along the edge of the high wall and backfilled slope to divert runoff from the unstable fill slope. Ditches were placed at the adit portals to ensure that water emitted from the portals was drained away from coal-bearing areas and unstable slopes. Erosion bars and ditches were placed around the adit site to keep runoff from flowing onto the platform.

The fill slope, platform and slope below the platform were all covered with soil, seeded and fertilized.

The Cat 225 backhoe proved to be a very useful machine in reclaiming adit sites. With the long reach bucket it was possible to deposit the coal wastes high against the coal face.

With the bucket teeth it was possible to contour the fill slope to the desired shape and angle. Also the long reach bucket was capable of reaching down and pulling up any coal which may have slid over the edge of the platform. The bucket was extremely useful in spreading soil as it was able to reach and take soil from the platform edges and deposit it on the sloped banks. The Duchess Mountain adit had a very soft platform but due to a heavy frost and the backhoe's ability to work in soft areas it was able to complete the work on this site.

Both adits were timbered inside to prevent their collapse and were boarded shut.

### 5.3 Trenches

No trenches were dug in the 1978 season, therefore no subsequent reclamation procedures were undertaken.

### 5.4 Campsite

The 1978 campsite can be located on Map 1, just off the Kinuseo Falls Road on the Duke Mountain Main Access. At the end of the 1978 field season the camp trailers were moved out and the site was levelled, seeded and fertilized.

### 5.5 Drill Sites

All holes drilled in 1977 and 1978 in the Duke Mountain Block can be located on Map 1. When the drills were moved out garbage and discarded materials were removed from the drill site and the pad was graded and levelled. Further reclamation procedures included placing contour ditches on large or sloping drill sites to ensure controlled drainage of runoff. Most drill sites received a slightly higher application of seed and fertilizer than the roads. Holes flowing water had grout plugs installed and flow stopped. All hammer holes had casing left in place for future monitoring of ground water level. All diamond drill holes with casing left were capped.

### 5.6 Helicopter Drill Sites

Six holes were drilled on the southern part of the property in 1978. These were completely serviced by helicopter (see Map 3). The sites were cleared by cutting down trees and reclamation consisted of cutting up the slash to short lengths, breaking off large limbs and removing all rubbish from the sites. Hole MBD 78-28 had a significant water flow; a grout plug was installed and flow stopped.



## 6.0 COSTS

During 1978 Pacific Petroleum Ltd. spent about \$135,000 directly on reclamation. These costs are shown in Appendix III.



FIG. 1 PREVIOUSLY SEEDED SECTION OF ROAD ON DUKE MOUNTAIN



FIG. 2 CAT 225 BACKHOE REMOVING CULVERT FROM AN ABANDONED SECTION OF ROAD





FIG. 3 EROSION BARS ON A NEWLY SEEDED SECTION OF THE ALPINE SPUR, DUKE MOUNTAIN



FIG. 4 BOMBARDIER MOUNTED WITH A 12-VOLT CYCLONE SEEDER USED TO SPREAD FERTILIZER

## APPENDIX I - Detailed Field Procedures

## I.1 Duke Mountain

Location:	Description:
East Spur; MDH 78-11, MQD 77-1 and spur	Elevation: 1000-1025 m (3280-3362 ft)  Road was seeded and fertilized with a powered cyclone seeder mounted on the back of a 4x4. Seeded with forest mix at 25 kg/ha Oct. 18/78. Fertilized with 22-22-12 at 150 kg/ha Oct. 18/78.
Camp Site (which also includes MDH 78-10)	Elevation: 997 m (3270 ft)  Campsite levelled with Cat D-7 before seeding. Seeded with forest mix and alpine mix at 50 kg/ha Fertilized with 22-22-12 at 250 kg/ha Seeding and fertilizing took place as trailers were moved out October 17-18-19/1978
Duke Mt. Main Access; Campsite to Barricade on Main Access	Elevation: 2000 m (3280 ft)  This section of road was left open and not seeded or fertilized, as it provides as an access route for local trappers. The main road was graded and dirt barricades were placed on side roads which lead to drill sites, as well as one on the main access route, to block further access onto the property.
Duke Mt. Main Access; MDD 78-1, MDH 78-8, MDH 78-9 and Spur 8	Elevation: 985 m (3231 ft)  Drill sites were levelled with Cat D-6; access barricaded. Seeded with forest mix at 25 kg/ha Oct. 3/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 3/78
Duke Mt. Main Access; MDD 78-2, MDD 78-3, MDD 78-12, MDD 78-12, MDD 78-24 and spur	Elevation: 100-1025 m (3280-3363 ft)  Drill sites were levelled with Cat D-6, access was graded with Cat D-4 and then barricaded. Seeded with forest mix at 25 kg/ha Oct. 4/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 4/78

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Duke Mt. Main Access; Barricade to Fork	Elevation: 1025-1250 m (3363-4101 ft)  Road was graded and erosion bars installed by a Cat D-4 Seeded with forest mix at 25 kg/ha Oct. 18/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 18/78
Culvert #1 on Duke Mt. Main Access	Elevation: 1050 m (3445 ft)  24"x20' culvert installed by a Cat D-4 with a backhoe attachment Culvert installed flush with stream bed eliminating overhanging outfall
Duke Mt. Main Access; MDD 77-7, MDD 77-8, MDD 77-3	Elevation: 1075, 1125, 1225 m (3527, 3691, 4019 ft)  Drill sites initially levelled with Cat D-6, final work was done with Cat D-4; MDD 78-8 was cross-ditched to improve drainage and minimize erosion. Seeded with forest mix at 25 kg/ha Oct. 18/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 18/78
Duke Mt. Main Access; MDH 78-1 to 5 and spur	Elevation: 1150 m (3773 ft)  Drill sites and access were levelled and graded with a Cat D-6 Seeded with forest mix at 25 kg/ha Oct. 18/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 18/78
Adit Spur; Fork to Slide Area	Elevation: 1255-1275 m (4019-4183 ft)  Spur initially graded and berms reduced with a Cat D-6 Erosion bars and cross-ditches were installed by a Cat D-4, the latter to assist runoff streams to cross the road surface unrestricted Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Adit Spur; Duke Mt. Adit; B4-1/B3-1	Elevation: 1255 m (4117 ft)  A 6 ft x 20 ft culvert was installed in the adit entrance and adit was boarded closed. A Cat 225 backhoe was then used to pile the coal fines up against the high wall. Any exposed coal fines were then covered with overburden. Drainage consisted of ditches along the edge of the high wall and the re-contoured coal fines, directing runoff water off the unstable fill slope and into stable well-vegetated areas off to the sides. At the adit entrance a ditch was made across the face of the disturbed area into a vegetated more stable area in order to properly drain the adit entrance of draining water. A ditch was also constructed to provide drainage from a gully near the north edge of the adit site. Seeded with forest mix at 40 kg/ha Oct. 7/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 7/78
Adit Spur; drill site MDD 78-4	Elevation: 1250 m (4101 ft)  Overburden was pulled up from the down-slope side of the drill site, and piled up against the cut-face to stabilize overburden and reduce slope of disturbed area. Work was done with a Cat 225 backhoe. Seeded with forest mix at 30 kg/ha Oct. 7/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 7/78
Adit Spur; drill site MDD 78-5	Elevation: 1250 m (4101 ft)  Site was levelled with Cat 225 backhoe. Site was too soft for a D-6 or D-4 to work on. Drill hole was making water in October - a drainage ditch was built to take water directly off the site and into nearby vegetation. Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Adit Spur; Roadside disturbances between MDD 78-4 and slide area	Elevation: 1250 m (4101 ft)  All roadside disturbances were levelled with a Cat 225 backhoe as most of the sites were too soft to support a D-6 or D-4 Cat. Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78
Adit Spur; slide area	Elevation: 1250 m (4101 ft)  From this point on the road is permanently closed Culvert at creek crossing was removed using Cat 225 backhoe To stabilize slumping cut-banks a Cat 225 backhoe was used, to pull down material from the upper slope and place at front of cut-bank to decrease the slope of the bank. Erosion bars and ditches were placed to direct runoff water away from the most unstable areas. Seeded with forest mix at 35 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78
Adit Spur; Slide Area to drill site MDD 78-23	Elevation: 1275-1200 m (4183-3937 ft)  Erosion bars on access were built with a Cat D-6. Two cross-ditches were built across the drill site to prevent runoff from draining directly into a nearby stream. Ditching was also done with Cat D-6. Access seeded with forest mix at 25 kg/ha Oct. 17/78 MDD 78-23 seeded with forest mix at 35 kg/ha Oct. 17/78 Access fertilized with 22-22-12 at 150 kg/ha Oct. 17/78 MDD 78-23 fertilized with 22-22-12 at 200 kg/ha Oct. 17/78
Adit Spur Area to Drill Site MDD 78-6	Elevation: 1250-1300 m (4101-4265 ft)  Culvert was removed from creek crossing with a Cat 225 backhoe. Berms and drill site levelled with a Cat D-6.

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Adit Spur; slide area to drill site MDD 78-6 (cont.d)	On part of the access, at the stream crossing, slash was pulled onto the road to help stabilize the steep slope and to minimize the chance of erodable materials from entering the stream. Erosion bars along access were built with Cat 225 backhoe. Roadside disturbance near drill site was levelled and cross-ditches placed to direct runoff water away from the nearby creek, with the Cat 225 backhoe. Site was too wet for Cat D-6 to work. Seeded with forest mix at 25 kg/ha, Oct. 17/78 Fertilized with 22-22-12 from slide to creek crossing only at 150 kg/ha Oct. 17/78
Alpine Spur; Fork to MDD 78-9	Elevation: 1055-1255 m (3463-4167 ft)  Erosion bars built by Cat D-6 and D-4. Berms on upper part of road removed by D-6 Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78
West Alpine Spur; old road to and past MDD 76-11	Elevation: 1490-1685 m (4888-5528 ft)  This section of the old road system was re-disturbed so new erosion bars were built with a Cat D-6; re-seeding and fertilizing followed. Seeded with forest mix from main access to drill site MDD 76-11 at 30 kg/ha Fertilized at 150 kg/ha Oct. 4/78
Alpine Spur; MDD 78-8 and spur	Elevation: 1515-1470 m (4970-4822 ft)  Spur was graded and berms levelled with a D-6 up to the drill site. Drill site was too muddy for a D-6; D-4 levelled site and built erosion bars on the spur. Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 up to drill site only at 150 kg/ha Oct. 17/78
Alpine Spur; MDH 78-15 and spur	Elevation: 1495-1390 m (4905-4560 ft)  Spur was graded and berms levelled with a C-6. Erosion bars were installed with a D-4 Drill site levelled by a D-6



## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Alpine Spur; MDH 78-15 and spur (cont'd)	Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 17/78
Alpine Spur; MDD 78-9 and spur	Elevation: 1550-1525 m (5085-5003 ft)  Spur to drill site was graded with D-6, drill site and rest of spur too muddy for D-6. Cat D-4 levelled drill site and installed erosion bars along rest of the spur. Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized with 22-22-12 up to drill site only at 150 kg/ha Oct. 17/78
Alpine Spur; MDD 78-9 spur to MDH 78-14	Elevation: 1550-1660 m (5085-5446 ft)  Berms levelled and erosion bars built by a D-4 along access. On exposed areas the Bombardier was run up and down the road after seeding, so the tracks would break up the compacted road surface and cover the seed. Seeded with Alpine mix at 40 kg/ha Oct. 16/78 Fertilized with 22-22-12 at 250 kg/ha, exposed areas at 400 kg/ha Oct. 16/78
Alpine Spur; MDH 78-12 and spur	Elevation: 1600 m (5249 ft)  Site and spur levelled with a D-6. Seeded with forest mix at 25 kg/ha Oct. 16/78 Fertilized with 22-22-12 at 20-0 kg/ha Oct. 16/78
Alpine Spur; MDH 78-14, MDD 78-13 and spur	Elevation: 1605-1445 m (5266-4741 ft)  A Cat D-6 was used to grade and level berms along the spur to produce an outsloping road. D-4 was used to build erosion bars and level drill sites. MDH 78-14 was very wet - backhoe attachment on the D-4 was used to build drainage ditches. Seeded with Alpine mix from Main Access to first switchback at 40 kg/ha, rest of spur and drill sites seeded with forest mix at 25 kg/ha Oct. 16/78

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Alpine Spur; MDH 78-14, MDD 78-13 and spur (cont'd)	Fertilized with 22-22-12 from main access to first switchback at 150 kg/ha; rest done at 250 kg/ha Oct. 16/78
Alpine Spur; Spur to unused Drill Site	Elevation: 1605-1525 m (5266-5003 ft)  Erosion bars were installed along spur with a D-4. Drill site was too soft to work on. Seeded with forest mix at 25 kg/ha Oct. 16/78 Fertilized spur only with 22-22-12 at 150 kh/ha Oct. 16/78
Alpine Spur; MDH 78-14 spur to MDD 78-11 spur (including mud hole)	Elevation: 1605-1580 m (5226-5183 ft)  Access was graded, berms levelled with a D-6. The mud hole, a depressional area, was filled with surrounding slash and soil, levelled and drainage ditches installed to ensure proper drainage. Erosion bars were installed to divert runoff water away from the depression. Work was performed by a Cat D-6. Erosion bars along the access were installed with a D-4. Seeded with Alpine mix at 40 kg/ha Oct. 16/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 16/78
Alpine Spur; MDD 78-11 and spur	Elevation: 1605-1475 m (5226-4839 ft)  The spur up to drill site was graded and berm removed with a D-6. Two cross-ditches were built across the steep slope of the drill site to channel runoff water into vegetated areas. The spur past the drill site was too wet for a D-6 to work. A D-4 was used to construct erosion bars along the full length of the spur. Seeded with forest mix at 25 kg/ha Oct. 17/78 Fertilized up to drill site with 22-22-12 at 150 kg/ha Oct. 17/78
Alpine Spur; MDD 78-11 spur to MDD 78-10 (including detour)	Elevation: 1605-1525 m (5266-5003 ft)  Grading, levelling of berms and installing erosion bars was done with a Cat D-4, on the access and MDD 78-10.

## APPENDIX I (cont'd)

## I.1 Duke Mountain (cont'd)

Location:	Description:
Alpine Spur; MDH 78-11 spur to MDD 7-10 (including detour) (cont'd)	The 'detour', an old water trap, was filled with surrounding slash and soil and levelled using a D-6. Seeded with Alpine mix at 40 kg/ha Oct. 16/78 Fertilized (except detour) with 22-22-12 at 250 kg/ha Oct. 16/78
Alpine Spur; MDD 78-10 to MDD 78-22	Elevation: 1525-1350 m (5003-4429 ft) Grading, levelling of berms and installing erosion bars was done with a Cat D-4. Seeded with Alpine mix at 40 kg/ha Oct. 16/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 16/78

## I.2 Duchess Mountain

Location:	Description:
Duchess Mt. Main Access Wapiti Rd. to Fork	Elevation: 1200-1450 m (4003-4757 ft) First 1/4 mi - total disposal. Initially slash was buried along right-of-way with a Cat D-7; final clean up consisted of hand piling slash on right-of-way and burning; ashes were later buried with a D-4. Remaining access had erosion bars installed with a D-4 and a barricade was constructed to prevent access. Seeded with forest mix at 25 kg/ha Oct. 15/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 15/78
Low Road; (not used)	Elevation: 1250-1375 m (4101-4511 ft) Road was not fertilized as there was little disturbance and it is located in a well-forested area Seeded with forest mix at 25 kg/ha Oct. 15/78
Adit Spur; Fork to adit, including drill sites MUD 77-4, MUD 78-14, MUH 78-17	Elevation: 1450-1550 m (4757-5085 ft) Berms levelled and erosion bars installed along spur with a Cat D-4. Drill site MUH 78-17 was levelled with a Cat 225 backhoe. Seeded with forest mix at 25 kg/ha Oct. 13/78

## APPENDIX I (cont'd)

## I.2 Duchess Mountain (cont'd)

Location:	Description:
Adit Spur; Fork to Adit (cont'd)	Fertilized with 22-22-12 at 150 kg/ha Oct. 13/78 Seeding and fertilizing was done on about 2-3 inches of snow cover.
Duchess Adit - B9-1	Elevation: 1475 m (4839 ft)  A 6 ft x 20 ft cattle pass was placed into the adit entrance; entrance was boarded closed. The adit pad was levelled and coal fines were piled up against the high wall around the adit entrance, then covered with overburden. A ditch was constructed from the adit entrance across the adit site to nearby vegetation to ensure an unrestricted flow of adit drainage water. A ditch was constructed along the edge of the high wall and the coal fines, diverting runoff water off the unstable fill slope and into a more stable area. Seeded with forest mix at 35 kg/ha Oct. 13/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 13/78
Duchess Mt. Main Access; Adit Spur to MUD 78-15	Elevation: 1550-1700 m (5085-5577 ft)  Berms levelled and erosion bars installed with a D-4 Seeding and fertilizing was carried out on top of 2-3 in. of snow cover Seeded with alpine mix at 45 kg/ha Oct. 13/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 13/78
Duchess Mt. Main Access; MUD 78-21 and spur	Elevation: 1650 m (5413 ft)  Drill site was initially levelled with a D-6. Later berms were levelled and erosion bars installed by a D-4 Seeding and fertilizing was carried out on top of 2-3 inches of snow cover Seeded with alpine mix at 45 kg/ha Oct. 13/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 13-78
Duchess Mt. Main Access; MUD 78-15 to MUD 78-16	Elevation: 1700-1775 m (5577-5823 ft)  Berms levelled and erosion bars installed with a D-4.

## APPENDIX I (cont'd)

## I.2 Duchess Mountain (cont'd)

Location:	Description:
Duchess Mt. Main Access; MUD 78-15 to MUD 78-16 (cont'd)	Seeding and fertilizing was carried out in 2-3 inches of snow cover; some areas had drifted to 3-6 inches. Seeded with alpine mix at 45 kg/ha Oct. 13/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 13/78
Duchess Mt. Main Spur; MUD 78-15 to cut-line, including all side disturbances	Elevation: 1700-1550 m (5577-5085 ft)  Berms levelled and erosion bars installed with a D-4 All roadside disturbances cleaned up with a D-4. Seeded with alpine mix at 45 kg/ha Oct. 13-14/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 13-14/78
Duchess Mt. Main Spur; MUD 78-18 and spur	Elevation: 1575 m (5167 ft)  Road graded, drill site levelled and erosion bars installed with a D-4 Seeded with alpine mix at 45 kg/ha Oct. 14/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 14/78
Cut-line; Unused Drill Site to MUD 77-5, including alternate spur	Elevation: 1550-1400 m (5085-4593 ft)  Berms levelled and erosion bars installed along cut-line Alternate spur was seeded with alpine mix at 40 kg/ha Oct. 15/78 MUD 77-5 was seeded with forest mix at 25 kg/ha Fertilized with 22-22-12 at 150 kg/ha, Oct. 15/78 Cut-line was seeded with alpine mix at 45 kg/ha Fertilized with 22-22-12 at 250 kg/ha Oct. 15/78
East Spur; MUD 77-5 to Fork	Elevation: 1400-1450 m (4593-4757 ft)  Access was graded and erosion bars installed with a D-4 Seeded with forest mix at 25 kg/ha Oct. 15/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 15/78

## APPENDIX I (cont'd)

## I.2 Duchess Mountain (cont'd)

Location:	Description:
East Spur; MUD 78-19	Elevation: 1425 m (4675 ft)  Spur and drill site levelled and erosion bars installed with a D-4 Seeded with forest mix at 25 kg/ha Oct. 15/78 Fertilized with 22-22-12 at 150 kg/ha Oct. 15/78
Cut-line MUD 78-22 to MUD 78-17	Elevation: 1525-1625 m (5003-5331 ft) Berms levelled and erosion bars installed along cut-line with a D-4 Drill sites were levelled with a D-6 Seeded with alpine mix at 45 kg/ha Oct. 14/78 Fertilized at 22-22-12 at 250 kg/ha Oct. 14/78
West Spur; MUD 78-17, MUD 77-6, MUD 78-20 and spur	Elevation: 1575-1650 m (5167-5413 ft)  Berms levelled and erosion bars installed along spur with a D-4 Drill sites levelled with a D-6 Seeded with alpine mix at 45 kg/ha Oct. 14/78 Fertilized with 22-22-12 at 250 kg/ha Oct. 14/78

APPENDIX II

Bibliography

Environment and Land Use Sub-Committee 1978. Northeast Coal Study Environmental Report 1977-1978. Victoria, B.C. 201 pp. and Appendices (2nd Draft).

Harcombe, Andrew P. 1978. Vegetation Resources of the Northeast Coal Study Area, 1976-1977. Resource Analysis Branch, Ministry of the Environment. Kelowna, B.C. 46 pp. and Appendices.

## APPENDIX III

Pacific Petroleum Ltd. - Monkman Coal Project1978 RECLAMATION PROGRAM FIELD COSTS

International Environmental Consultants Ltd.	
Fees & Expenses for Reclamation	\$ 5,524.67
Fosters Feed & Seed Ltd.	
Seed and Fertilizer	5,156.60
Tompkins Contracting 1977 Ltd.	
D4 with Backhoe - Ditching, etc.	5,808.00
Grizzly Valley Contractors Ltd.	
50% of Camp Construction - Disposal	5,448.45
Cat Work - Drill Site Cleanup, etc. (est.)	10,548.00
Hackwel Construction Ltd.	
Cat Backhoe - Contour Restoration, Adits	4,156.60
D.W. Coates Enterprises Ltd.	
Plugging MUD 78-28, Wages, Materials	1,552.99
Liftair International Ltd.	
Transporting Personnel & Supplies (est.)	9,666.00
Fillion Slashing & Location Clearing Ltd.	
Seeding & Extra Slashers	5,675.49
Pacific Petroleum Ltd.	
Slashers wages (est.)	34,680.08
Camp Costs for Slashers & Operators	14,618.43
10% of Equipment Rental	11,514.09
10% of Freight & Hauling	4,345.35
Helicopter Fuel	1,480.00
Other Fuel, Oil (est.)	1,000.00
10% of Misc. Services, etc.	1,883.27
10% of Communications	1,875.44
10% of Administration	<u>10,060.70</u>
TOTAL	\$134,991.16



## APPENDIX IV

## SUMMARY OF EXPLORATION AREAS DISTURBED AND REVEGETATED

JANUARY 1 TO DECEMBER 31, 1978

Type of Disturbance	Length (km)	Disturbed Area (ha)	REVEGETATION			Total Area Receiving Work (ha)	Total Not Seeded
			Area Recontoured (ha)	Area Seeded (ha)	Area Fertilized (ha)		
Roads	35	25	5	23	23	23	2
	<u>Number</u>						
Test Pits	0	0	0	0	0	0	0
Trenches	0	0	0	0	0	0	0
Adits	2	2	2	2	2	2	0
Drill Sites	47	15	14	15	15	15	0
Helicopter							
Drill Sites	6	3	3	0	0	3	3
Campsite	1	2	1	2	2	2	0
Garbage Dumps	2	0.5	0.5	0.5	0.5	0.5	0

## APPENDIX V

## Seed Mixtures

## Alpine Mix Recommended for the Peace River Coal Field

<u>Species List:</u>	<u>% by weight:</u>
Boreal Creeping Red Fescue	25
Meadow Foxtail	25
Climax Timothy	20
Canada Bluegrass	5
Carlton Bromegrass	10
<sup>1</sup> Alsike Clover	15

Applied at a rate of 45 kg/ha (40 lbs/acre)

Total amount used - 816 kg (1800 lbs)

## Forest Mix recommended for the Peace River Coal Field

<u>Species List:</u>	<u>% by weight:</u>
Boreal Creeping Red Fescue	40
Climax Timothy	20
Red Top	15
<sup>1</sup> Alsike Clover	25

Applied at a rate of 25 kg/ha (22.5 lbs/acre)

Total amount used - 907 kg (2000 lbs)

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DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

## NOTICE OF WORK ON A COAL LICENCE

Pursuant to section 7 of the *Coal Mines Regulation Act* this notice is to be completed by all companies or individuals carrying out exploration work prior to commencement of work, and within one month of cessation of work and one copy is to be sent to each of the following:

Senior Reclamation Inspector, Victoria  
District Inspector of Mines  
Regional Water Rights Engineer

District Forester or Forest Ranger  
Regional Fish and Wildlife Office

PERMIT NO. 97

1. NAME OF PROPERTY: MONKMAN COAL PROJECT  
Coal Licence Numbers: 3131-35, 3138, 3139, 3141-49, 3151-55, 3157-64, 3166-68, 3170-74, 3177-84, 3187-90, 3193, 3195-3207, 3209-3264
2. LOCATION: Mining Division Prince George NTS Map Sheet (e.g., 82E/9E) 93-I-7, 8, 10, 15  
Lat. 120° 40' W Long. 54° 45' N Locality and Access from Beaverlodge to Stony Lake by vehicle, then west on the Kinuseo Falls Road.
3. OWNER: Name Canadian Superior Exploration Ltd. Free Miner's Cert. No. 558858 & 166415  
McIntyre Mines Limited  
Address 355 - 4th Avenue S.W. City Calgary Prov. Alberta
4. OPERATOR: Name Guy Lokhorst Free Miner's Cert. No. 166498  
Company Pacific Petroleum Ltd. Telephone No. 268-6666  
Address 700 - 6th Avenue S.W. City Calgary Prov. Alberta
5. ESTIMATED DURATION OF WORK: From May 20th to November 15th, 1978
6. ACTUAL DATE WORK COMPLETED: Day \_\_\_\_\_ Month \_\_\_\_\_ 19 \_\_\_\_\_
7. APPROXIMATE NUMBER OF MEN EMPLOYED: up to 40
8. EXPLORATION WORK: Proposed  Completed  (Use metric measure - 1 metre = 3.3 feet.)  
Linecutting (distance, width, method) \_\_\_\_\_  
(Requires approval of Forest Service. 'Licence to Cut' or 'Free Use Permit' may be withheld until Reclamation Permit approval.)  
Drilling - No. of Sites 65 Total Area 39,000 square metres  
Road Construction - Total Length 39,000 metres Approximate Width 5.5 metres  
Underground Exploration Maximum 7 coal adits, one to cross-cut rock to 2nd coal seam  
Trenching - Number 30 Total Length 210 metres Width 1 metres  
Test Pitting - Number 0 Total Disturbed Area 254,130 square metres  
Work by Self  OR Name of Contractor \_\_\_\_\_  
(Owner is responsible for ensuring the Contractor complies with pertinent regulations, see section 8, *Coal Mines Regulation Act*.)
9. DATE FOREST SERVICE ADVISED BY OPERATOR: March 28, 1978  
Name and Title of Forest Official Mr. M. G. Isenor, District Forester  
Address 1488 - 4th Avenue, Prince George, B.C.

NOTE: Pursuant to section 8, subsection 2(a) of the *Coal Mines Regulation Act*, "...where the employment of mechanical equipment is likely to disturb the surface of the land in clearing, stripping, trenching..." the Application for a Reclamation Permit on the reverse side is also to be submitted.

SIGNATURE OF APPLICANT [Signature] TITLE Manager of Coal  
PRINT NAME D. McKelvie DATE March 28, 1978



DEPARTMENT OF MINES AND PETROLEUM RESOURCES  
MINERAL RESOURCES BRANCH  
INSPECTION AND ENGINEERING DIVISION

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## APPLICATION FOR A RECLAMATION PERMIT ON A COAL LICENCE

Pursuant to section 8 of the *Coal Mines Regulation Act*, this form is to be completed when applying for a Reclamation Permit, when renewing same, or when reporting exploration work to be done. When reporting on work which has been done, see instructions at the bottom of the page. For recommended methods of reclamation and environmental control, see booklet entitled, *Guidelines for Coal and Mineral Exploration*, which is available at the office of the District Inspector of Mines.

PERMIT NO. 971. THIS IS: An Initial Application  Renewal  Report of Proposed Exploration Work 

2. PRESENT STATE OF LAND ON WHICH EXPLORATION WILL BE DONE IS:

Canada Land Inventory (where possible) \_\_\_\_\_  
Present Land Use (ranching, timber, etc.) Sparse oil exploration, coal exploration, trapping.  
Type of Vegetation Black spruce, lodgepole pine and mixed aspen.  
Access Roads (present use, condition) Logging and exploration road to Kinuseo Falls & Wapiti River.  
Campsites, Old Workings (location, condition) Campsite on Kinuseo Falls Road

NOTE: Items shown above should be indicated on the NTS maps which are required for the following section.

3. PROPOSED SURFACE WORK: (Attach 7 copies of 1:50,000 NTS map with full extent of exploration work noted - Coal Titles Reference Maps.) (Use metric measure - 1 metre = 3.3 feet.)

Roads: Total length	<u>39,000</u>	metres	Total disturbed area	<u>214,500</u>	square metres
Test Pits: Total No.	_____		Total disturbed area	<u>0</u>	square metres
Trenches: Total No.	<u>30</u>		Total disturbed area	<u>210</u>	square metres
(include ground slope at trench on NTS map)					
Adits: Total No.	<u>7</u>		Total disturbed area	<u>8,400</u>	square metres
Drill Sites: Total No.	<u>65</u>		Total disturbed area	<u>39,000</u>	square metres
Other: <u>Campsite</u>			Total disturbed area	<u>3,500</u>	square metres
Total Disturbed Area (square metres):				_____	square metres
Total Disturbed Area (hectares):				<u>265,610</u>	hectares
(1 hectare = 10 000 square metres)					

4. EQUIPMENT TO BE USED (list size, capacity, and number):

(a) <u>Longyear 44 Diamond Drill</u>	(d) <u>D7 G Caterpillar</u>
(b) <u>Longyear Super 38 Diamond Drill</u>	(e) <u>D6 C Caterpillar</u>
(c) <u>Hughes 500C Helicopter</u>	(f) <u>Chicago Pneumatic Downhole Hammer Drill</u>

5. GOVERNMENT CLEARANCES INITIATED AT REGIONAL/DISTRICT LEVEL:

	Forestry	Fish and Wildlife	Water Rights
Name of Official	<u>M. G. Isenor</u>	<u>Mr. R. Goodlad</u>	<u>Mr. E. Wilson</u>
Title	<u>District Forester</u>	<u>Fish &amp; Wildlife Officer</u>	<u>Water Rights Engineer</u>
Location	<u>Prince George</u>	<u>Prince George</u>	<u>Prince George</u>
Date Notified	<u>March 28, 1978</u>	<u>March 28, 1978</u>	<u>March 28, 1978</u>

6. SIGNATURE OF APPLICANT [Signature] DATE March 28, 1978Title Manager of Coal Company Canadian Superior Exploration Ltd.

## FOR DEPARTMENT OF MINES USE ONLY

Terms and Conditions other than Guidelines \_\_\_\_\_

Bonding Required (Permit is issued on receipt of bonding.) \_\_\_\_\_

Approved by Advisory Committee \_\_\_\_\_ Date \_\_\_\_\_

Approved by Sr. Reclamation Inspector \_\_\_\_\_ Date \_\_\_\_\_

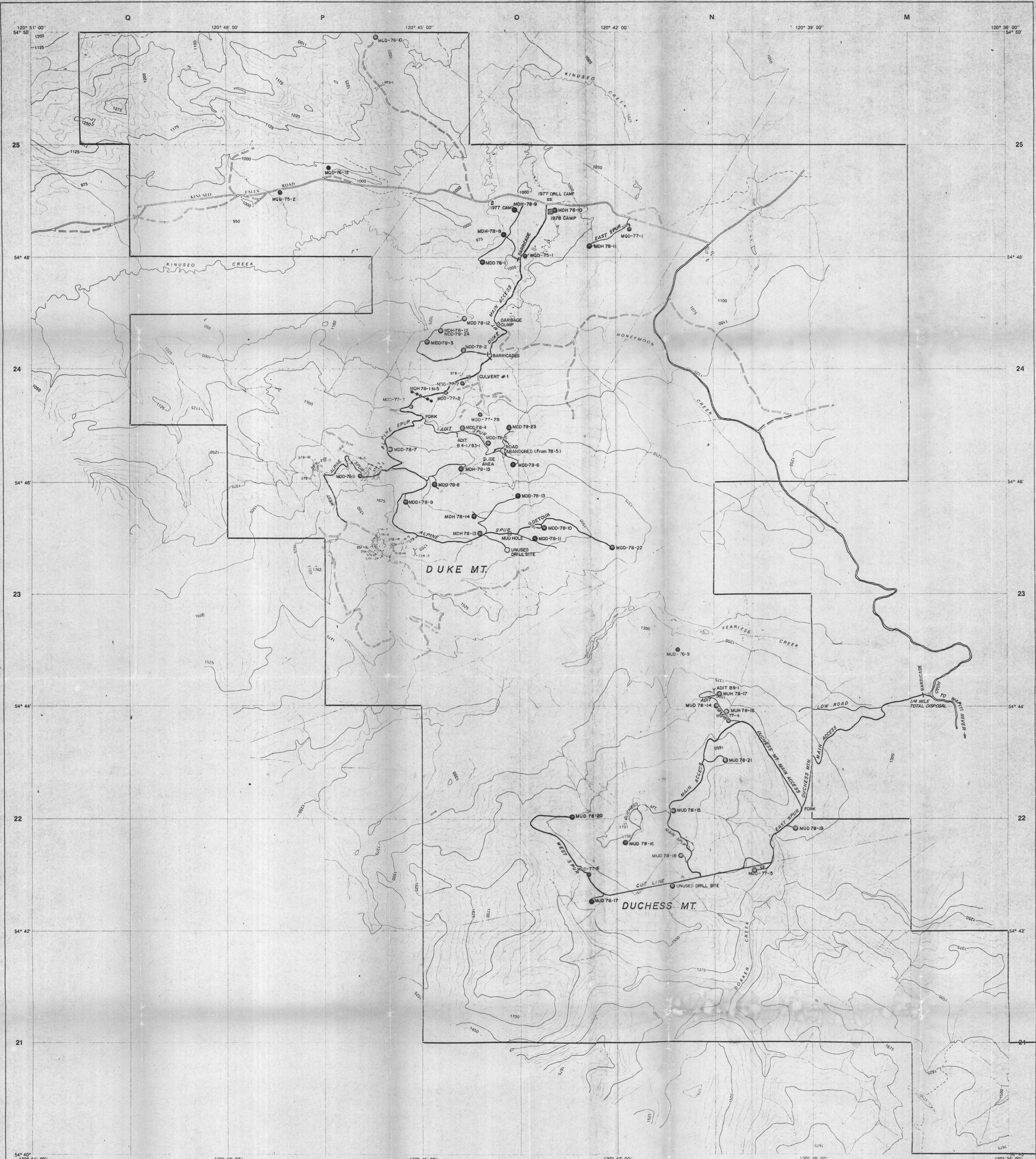
Date of Minister's Approval \_\_\_\_\_

Order-in-Council \_\_\_\_\_

Date Permit Issued \_\_\_\_\_

NOTE: When geotechnical and reclamation work have been completed for the calendar year, a Reclamation Report should be submitted to the Senior Reclamation Inspector in Victoria. For a sample of the format to be used see the Appendix of the booklet entitled, *Guidelines for Coal and Mineral Exploration*. The Reclamation Report will describe all work done and the details of the reclamation which was achieved. Two 1:50,000 NTS maps are required for the Report.





**TOPOGRAPHIC LEGEND**

MAIN ACCESS ROAD - DRY WEATHER	—————
EXPLORATION ROAD	- - - - -
EXPLORATION TRAIL	- · - · -
AIR STRIP	
SEISMIC LINE CUT LINE	- · - · -
POWER TRANSMISSION LINE	- · - · -
RIVER	~~~~~
STREAM	~~~~~
LAKE	~~~~~
SWAMP	~~~~~
CONTOURS	~~~~~
DEPRESSION CONTOUR	~~~~~

**SURVEY NOTE**  
 Control Survey was carried out for Photogrammetric Mapping to cover MONKMAN COAL PROJECT COAL LEASES. Mapping outside of the Coal Leases was taken from existing N.T.S. maps and 25 metre contour intervals were interpolated.

CONTOUR INTERVAL 25m

R.M. HARDY & ASSOCIATES LTD  
 1977

**SYMBOLS**

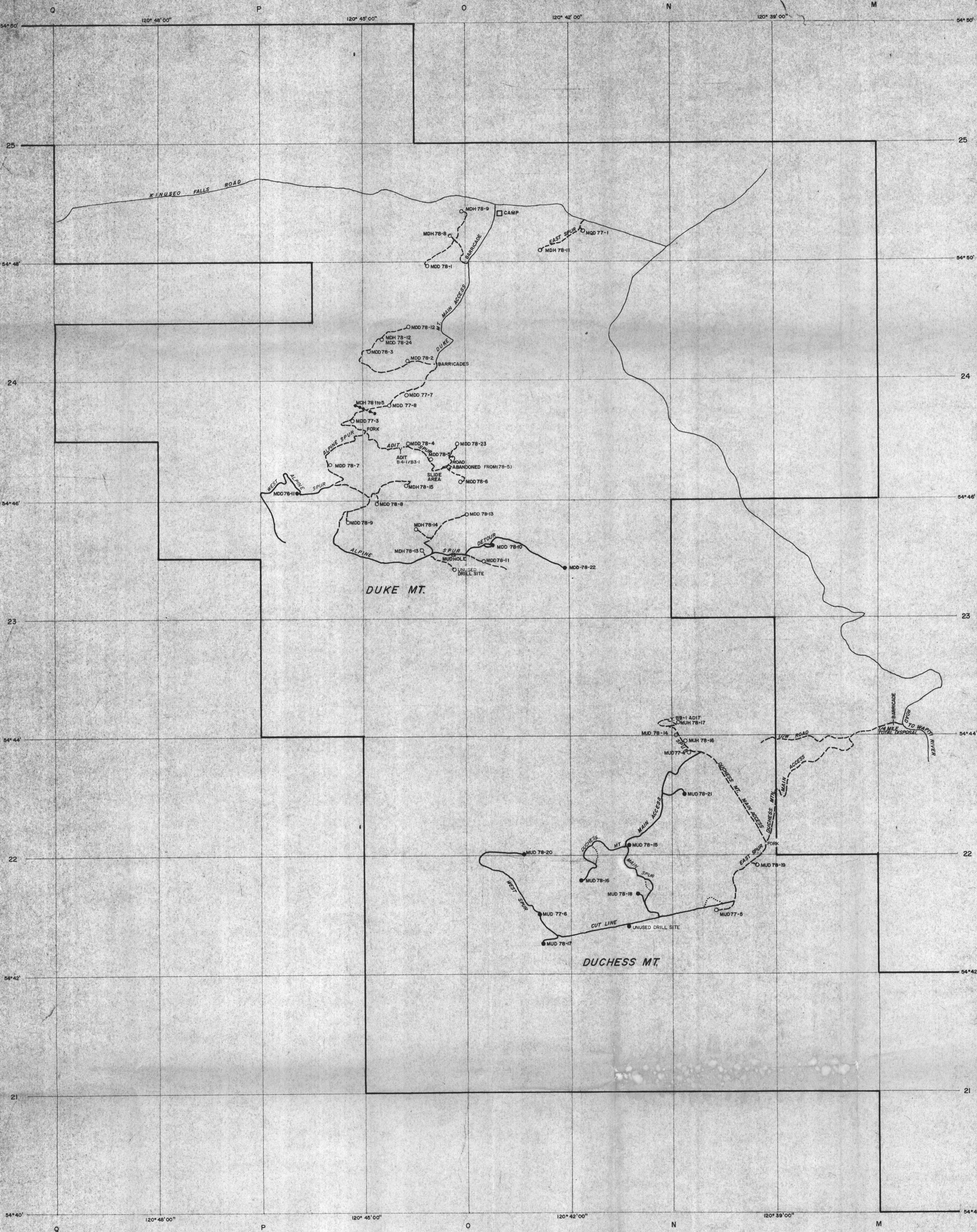
GEOLOGICAL CONTACT	———
DIP AND STRIKE REGULAR	———
VERTICAL	———
HORIZONTAL	———
OVERTURNED	———
THRUST FLAGS SHOW DIP DIRECTION	———
NORMAL FAULT	———
ANTICLINE SYNCLINE	———
DRILL HOLE COLLAR	———
TRENCH	———
ADIT	———

PR - MONKMAN - BELLEVILLE 78 (2) B.

<b>PACIFIC PETROLEUMS LTD.</b> MINING DEPARTMENT	
MONKMAN COAL PROJECT	Date December 1978
SURFACE DISTURBANCE MAP	Revised
	Author
	Drafted
	Scale 1:25,000
544	MAP 1







**LEGEND:**

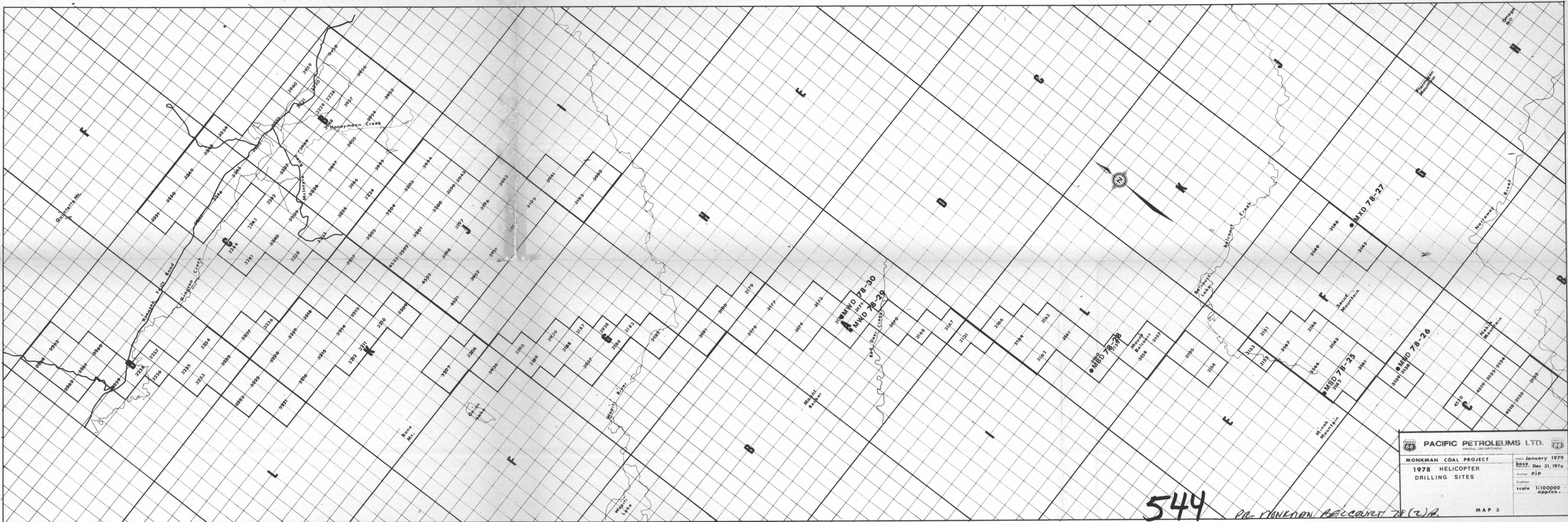
- FOREST MIX (~25 kg./ha., 22 lbs./acre.)  
FERTILIZED (~150 kg./ha., 133 lbs./acre.)
- ALPINE MIX (~45 kg./ha., 40 lbs./acre.)  
FERTILIZED (~250 kg./ha., 222 lbs./acre.)
- ● DRILL HOLE COLLAR
- ADIT

*16-NUNKMAN BELCOVIC 7(2)6*

<b>PACIFIC PETROLEUMS LTD.</b> MINING DEPARTMENT	
<b>MONKMAN COAL PROJECT</b>	
Date	December 1978
Reviewed	
Author	
Drafted	
Scale	1" = 25,000'
<b>544</b>	
<b>MAP 1</b>	







<b>PACIFIC PETROLEUMS LTD.</b> <small>MINING DEPARTMENT</small>	
<b>MONKMAN COAL PROJECT</b> <b>1978 HELICOPTER DRILLING SITES</b>	
Date: January 1979 Base: Dec 31, 1978 Author: pjp Drafted: Scale: 1:100000 approx.	MAP 3

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