ENVIRONMENTAL IMPACT ASSESSMENT: PROPOSED AGGREGATE QUARRY AT KELLY'S MOUNTAIN, PHASE 1: CONCEPTUAL PLANS AND ENVIRONMENTAL OVERVIEW

Submitted to:

Kelly Rock Limited

Submitted by:

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Project: S89085E

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1.0 INTRODUCTION

Kelly Rock Limited has plans to develop an aggregate quarry on the top of Kelly's Mountain, Victoria County, Cape Breton (see Figures 1 and 2).

Nolan, Davis and Associates (NS) Limited (NDAL) was retained in February 1989 to proceed with Phase 1 of an Environmental Assessment of the site.

Authorization to operate such a facility from the environmental regulatory agencies will be contingent upon the submission of an environmental impact assessment and later compliance with regulatory agency stipulations. It is understood the sequence of work required to obtain final authorization for the operation (P. Weaver, NSDOE, pers. comm.) is as follows:

PHASE 1 - Conceptual Plans and Environmental Overview

PHASE 2 - Environmental Impact Assessment (EIA); utilizing existing data supplemented where necessary with minor field sampling

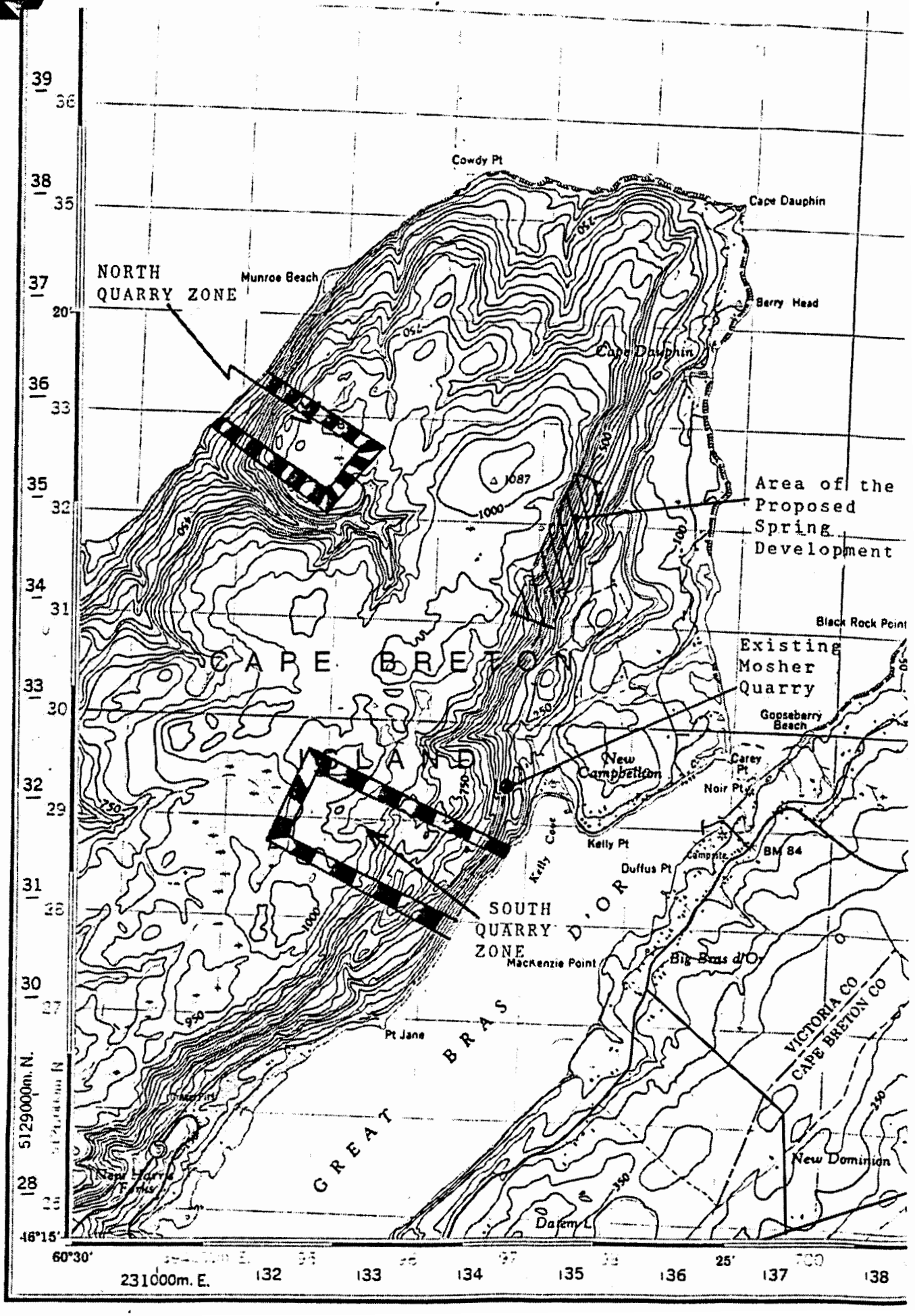
PHASE 3 - Detailed Impact Assessment (if required); utilizing substantial field testing to assess areas of major impacts delineated in Phase 2

PHASE 4 - Formal application of EIA and Final Project Design to regulatory agencies

PHASE 5 - Installation of monitoring programs <u>if so stipulated</u> by regulatory agencies

The following report is designed to meet the Phase 1 requirements and as such to initiate the authorization process between Kelly Rock Limited and the regulatory agencies. It briefly outlines the proposed facility design and the potential environmental impacts associated with the development.

DETAILED LOCATION PLAN
SCALE 1:50,000



2.0 PROJECT RATIONALE

Kelly's Rock Limited has been established to develop a rock quarry on Kelly's Mountain.

The requirement for developing such an operation stems from identified U.S. markets requiring high quality aggregate for concrete and asphalt production.

The attractiveness of this proposed operation to meet these markets is a result of the potential granitic reserve in excess of 2 billion metric tons and its tide water location.

3.0 PROJECT DESCRIPTION

3.1 Introduction

The project is divided into three main components:

1) Quarry site on Kelly's Mountain
2) Aggregate transport system
3) Ocean terminal on St. Ann's Bay or the Bras d'Or Channel

The relationship and location of these components is illustrated in Figures 3 and 4, and the conceptual plans, (Figures 5 and 6 in pocket) and is discussed in more detail below. It should be stressed, at this stage, that these are conceptual plans.

3.2 Quarry Site

The conceptual plan indicates two main potential quarry sites, identified in the remainder of this report as "North" and "South" quarry sites. Both are located in the north central part of Kelly's Mountain, i.e. north of Trans Canada Route 105.

The area of the South Quarry is accessed by a recently constructed road bearing northeast from Route 105 and completed

9 km into the property. The North Quarry is inaccessible at the present time.

The conceptual plan indicates operations will principally involve:

a) quarry operations
b) crushing and loadout facilities
c) spoil piles
d) maintenance and administrative buildings
e) tunnel
f) access roads

Present information regarding these operations is discussed below.

3.2.1 Quarry Operations

There are no depth limitations on the quarry at this time. The side slope of the quarry will be benched down (in 10 meter vertical cuts) to maintain slope stability.

No additional exploration drilling is expected in the area of the South Quarry; however, additional diamond drilling will be required in the vicinity of the North Quarry.

Quarry operations, either currently planned or under study, include:

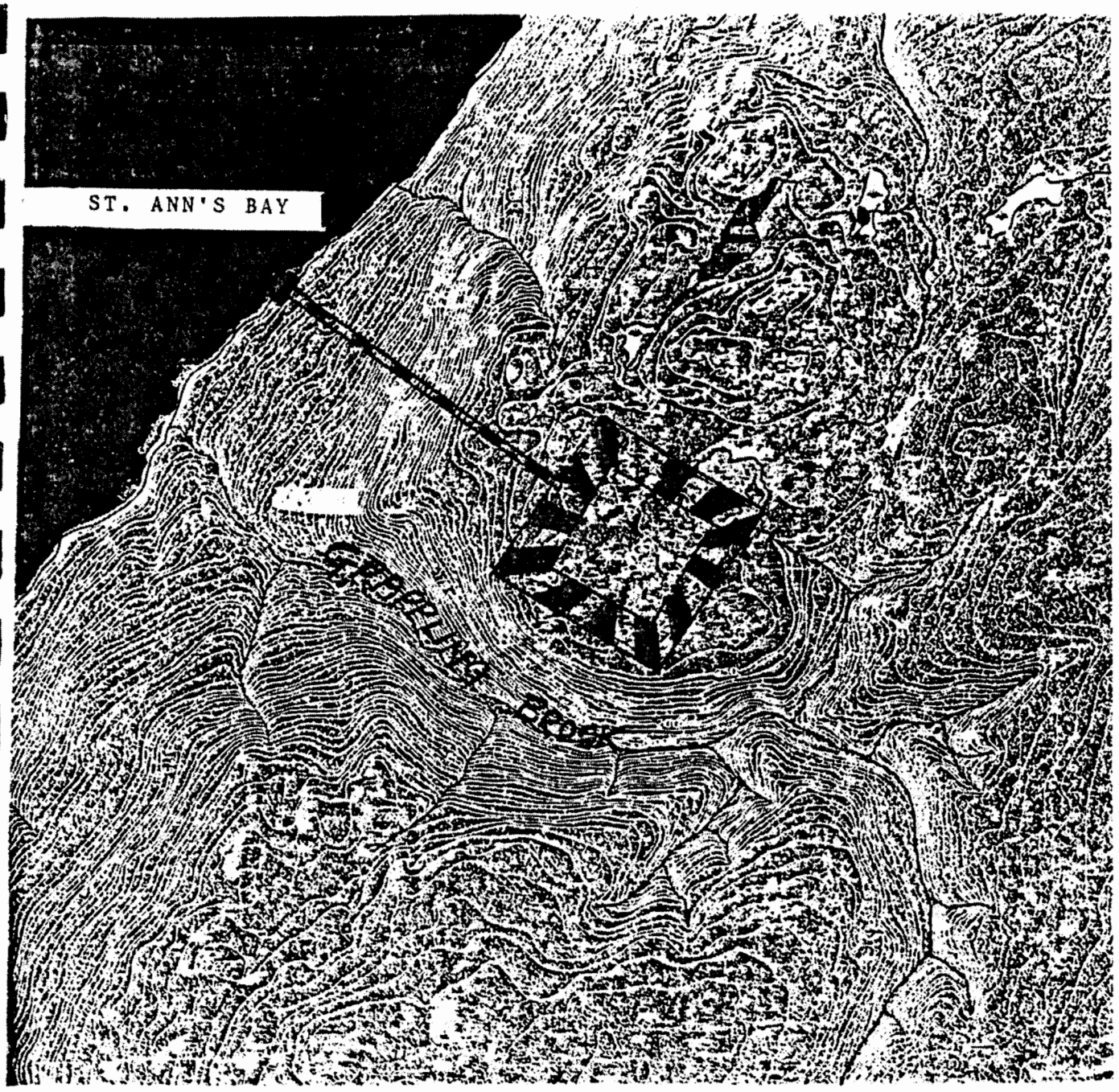
A) Operational Life Time -

Once established, the quarry is expected to operate year round. The projected life of the quarry is 100 + years.

B) Stripping -

The use of mobile equipment (shovel, tractor, off-highway trucks, etc.) is planned for the removal of the glacial overburden covering the quarry area. The surficial material will initially be stockpiled and will later be used for backfilling and rehabilitation.

FIGURE 3
LOCATION OF NORTH QUARRY FACILITIES



Scale 500 m

Contour Interval 5 m

Initial Quarry Site

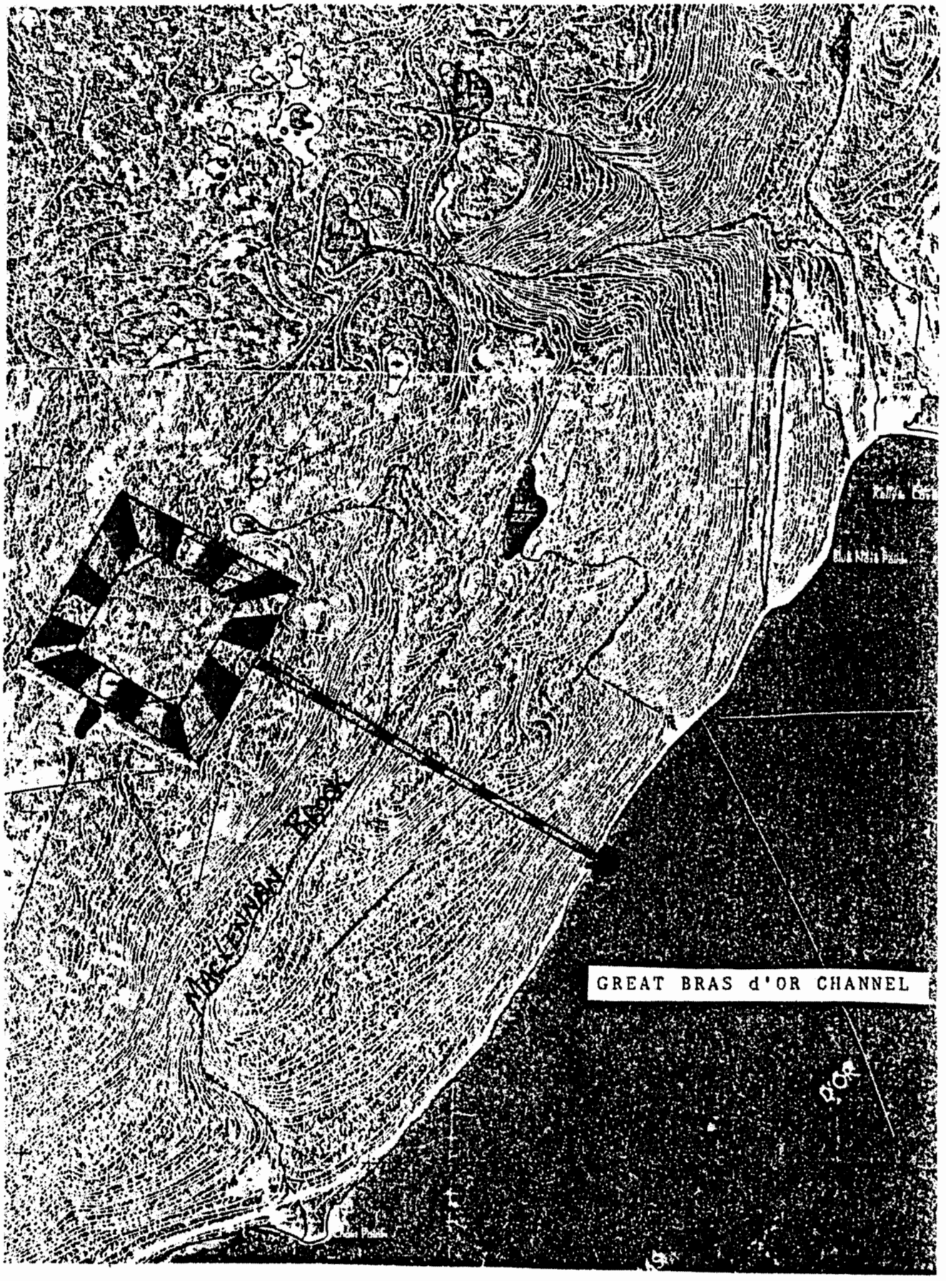
Rock Transport System

Ocean Terminal

FIGURE 4

LOCATION OF SOUTH QUARRY FACILITIES

Scale 500m Contour Interval 5 m



C) Blasting -

Initial quarry operations will necessitate a daily blasting schedule. After full operation schedules are achieved, blasts are expected to be carried out once every 2-3 months.

D) Load and Haulage -

Rubber tired loaders or crawler shovels will be used to load the rock into a mobile crusher located at the quarry site.

E) Ancillary Equipment -

- supply vehicles
- rotary drilling rig for blast holes

F) Primary Crushing and Conveying System -

Depending on petrographic testing, either a mobile jaw crusher or a mobile gyro crusher will be used for primary crushing down to 178 mm. The material will be transferred by conveyor from the quarry to a storage area located on top of the mountain. This storage area will be excavated into rock and covered to: a) prevent windage loss b) provide protection from the weather c) reduce leaching and d) improve visual appearance.

G) Hazardous Chemicals -

Facilities will be constructed for the safe storage of gasoline, diesel fuels and explosives. Fuel storage will be above ground both at the quarry and at the elevation for secondary crushing. If NSPC supplies power, the volume of fuel storage will be significantly reduced.

H) Waste Disposal -

All waste oils will be captured and recycled by subcontractors off-site. Liquid domestic waste will be handled with an on-site septic tank(s) and disposal field(s). Solid wastes will be directed toward a Victoria County landfill site, presently located west of Baddeck.

I) Power -

Quarry operations require 5000 H.P. Presently, NSPC is working on the size of transmission line which would run down the center of the mountain. If the power line is too expensive, power will be supplied by diesel generators.

J) Water -

At the present time, water requirements have not been identified. Potable water is required at the quarry area and at the secondary level for domestic facilities, i.e. drinking, toilets, and showers. A small wash plant located at the lower working area will be used to rinse dust off the aggregate. This water will be recycled through settling ponds. The wash plant will only be in operation while the ships are loading.

K) Reclamation -

Given the minimal spoil material expected, full reclamation of the quarry will not be possible. As active areas of the quarry are abandoned, the benched side walls will be smoothed at certain locations and the quarry left to fill with water.

3.2.2 Spoil Piles

The ideal plan allows for minimal accumulation of spoil piles. "Spoil" material is expected to include glacial drift and weathered granite near the ground surface which may not meet the physical specifications for high quality aggregate. The depth of this weathered zone is unknown at the present time. Glacial drift is sporadic and usually thin (< 2 m).

Spoil storage will be made in topographic depressions and/or constructed pits. Backfilling of abandoned quarry areas will be undertaken where feasible.

3.2.3 Buildings and Access Roads

Vehicle maintenance and administrative buildings will be located near the quarry.

Vehicle traffic will be on the access road presently constructed along the top of the mountain. This road will be upgraded to standard specifications. A gate will be located at the entrance to the property to control access to the site.

3.3 Rock Transport System

No product will be transported off-site by road. Two conceptual plans exist for the transport of aggregate. The North quarry moves the product northwest toward shipping facilities located on St. Ann's Bay (Figure 3). The alternate plan utilizes the South Quarry with product movement toward shipping facilities on the Great Bras d'Or Channel (Figure 4).

3.3.1 North Quarry

From one storage pit on the mountain top, the material drops 130 meters vertically into the mountain (Figure 5) and moves by conveyor through a 350 meter tunnel to a secondary crusher at the 46 meter elevation. Benches will be cut on the outside of the mountain at this elevation to provide the working area and storage pockets. During secondary crushing, material will be brought down to a 50 mm to dust size particle range. From this elevation, a 50 meter tunnel will be constructed to ship loading facilities.

3.3.2 South Quarry

From primary storage on the top of the mountain, the crushed material moves by conveyor through a 1200 meter tunnel to a secondary crusher at the 183 meter level, in the MacLellan Brook Valley. Here the material will be crushed to obtain a 50 mm to dust size particle range. Benches will be cut into the mountain side to provide a working area (see Figure 6). Storage pockets will be excavated into the rock and the material covered. From this storage area the aggregate will be moved through a 2000 meter tunnel to sea level where shipping facilities will be located.

3.4 Ocean Terminal

Ship loading facilities will consist of a radial ship loader, fed from underground storage. No stock piles will be in the terminal area. Vessel size is expected to be in the 30,000-60,000 DWT range. Until full production is achieved, bulk carrier traffic will be infrequent. With full operation, ship traffic will be in the order of twice per week.

3.4.1 St. Ann's Bay Wharf

The wharf will be constructed of concrete cribs oriented parallel to and in close proximity to the shoreline. A breakwater north of the docking facility will be required. Access to this facility will be by boat from Englishtown.

No channel dredging will be required if the ocean terminal is on St. Ann's Bay.

3.4.2 Bras d'Or Channel Wharf

The wharf will be constructed of sheet pile cells oriented parallel to and within 30 meters from shore. Access to this shipping facility will be by the New Campbellton Road or from the top quarry. Dredging off the Great Bras d'Or Channel will be required to facilitate bulk carrier traffic.

3.5 Development Schedule

Present scheduling calls for land clearing to commence in spring 1989. Initial quarrying activities are expected to commence during the summer of 1989. The first shipments will leave the site by a temporary wharf constructed during the spring-summer of 1989. A permanent wharf will follow at a later date.

By 1992, the full production rate of 5×10^6 tonnes/yr should be achieved.

At the present time, it is not known which quarry and transport route will be utilized.

4.0 ENVIRONMENTAL CONSIDERATIONS

4.1 Introduction

Development of an aggregate quarry can be expected to produce varied effects and impacts on the existing environment. Therefore, it will be necessary in the EIA to undertake:

a) Hazard Identification: This essentially entails the identification and separation of 1) natural risks inherent in the existing environment and 2) man's induced risks.

b) Risk Estimation: This involves the quantification of risk by assessing the effects and type of impacts of the hazard, significance and, if necessary remedial procedures.

The determination of the acceptability of these risks will be assessed by the regulatory agencies through review of the reports written at the end of each phase of the EIA.

As a first step, this report is intended to identify the major man-induced risks. Further, it briefly assesses existing data which will be utilized in Phase 2 to quantify risk and to note any deficiencies. Such data gaps will aid in defining Phase 2/3 sampling programs.

It must also be noted that the development and operation of such a facility cannot be bound to one stable, unchanging design. The quarry plan to be submitted in the formal application will best reflect the knowledge gathered to date; however, it will vary in the future depending on the economics of the aggregate market. This variability, coupled with the dynamic nature of the natural systems, will necessitate that the EIA and the regulatory agencies approach, should stress resilience; where resilience is understood to be a property that allows a system to absorb and utilize (or even benefit from) change.

4.2 Hydrologic Environment

4.2.1 Groundwater

Minimal hydrogeological information currently exists for the South Quarry area, no date is available for the north quarry. There are presently no groundwater withdrawal water rights permits for the Kelly's Mountain area. However, the communities located at the base of the mountain to the west (Englishtown) and east (Cape Dauphin, New Campbellton and New Harris) utilize individual wells for water supplies. Application for a major spring development has been made to the Nova Scotia Department of Environment (NSDOE) for the area north and east of the south quarry site (see Figure 2).

Information obtained from exploration diamond drill boreholes at the South Quarry area indicates the granite is extensively fractured in most areas. Permeability in the granite is essentially secondary, i.e. fracture permeability. Groundwater movement is therefore fracture and/or fault controlled. Generally, permeabilities are expected to be low except in highly fractured areas. Minor iron staining of joint surfaces at depths of 30-40 m in BH 1-5 indicates movement of oxygenated groundwater. Extensive staining of the entire core in BH 6 to depths of 38-45 m suggests this area is subjected to higher groundwater flow velocities.

Head data and water chemistry suggests BH 4 is located in a groundwater recharge area.

During drilling of BH 6, overflowing conditions were encountered to a depth of 76 m. These observations, in addition to its location in a deep valley, suggest this is a groundwater discharge area. However, upon termination of BH 6, the water level had dropped below the top of the casing. It seems, therefore, two flow systems were encountered, an upper local flow system discharging into MacLellan's Brook and a deeper more regional groundwater flow system with flow toward the Bras d'Or Channel.

Given the nature of the bedrock and the geomorphology of the site, it can be assumed there are two or more flow systems superimposed upon each other, (1) A very local groundwater flow system where each knoll is a recharge area with groundwater flow toward the nearest depression, (i.e. stream or bog), and (2) a more regional flow system where groundwater flows outward on all sides from the crest of Kelly's Mountain.

The high static water levels (0.5-4.0 m) encountered in all boreholes indicate subsurface operations will be below the water table and will therefore require drainage control. This will necessitate pumping of groundwater into surface receptor streams for off-site discharge.

4.2.2 Groundwater Chemistry

The available water chemistry to date indicates generally good quality groundwater with all 41 inorganic/organic chemical constituents analyzed for being within the recommended maximum acceptable concentrations of the Guidelines for Canadian

Drinking Water, 1987 with the exception of iron, manganese, color and turbidity in BH 2. The water can be classified as a Na - Cl type water in areas of recharge. As the water moves downward through the flow system, it becomes a Ca - HCO_3 type water because of mineral dissolution along the flow path.

Four parameters were measured to characterize radioactivity. Uranium was detected in all boreholes sampled, but concentrations were below the recommended limit of 0.1 mg/l set out in the Canadian Drinking Water Standards. Radon gas was detected in all boreholes with BH 4 reporting the highest concentration. Gross alpha and beta results from BH 1 suggest a more detailed radionuclide scan be carried out. Until more information can be obtained, it is assumed these elevated concentrations may be the result of the nearby bog and/or lake sediments which may act as a scavenger for heavy metals and radionuclides. More groundwater sampling is required to determine the source of the radon gas, gross alpha and gross beta radiation.

4.2.3 Surface Water

No information is available regarding the surface water chemistry or stream flows in this area. The South Quarry is located on the surface water divide, headwater areas for MacDonald Brook (flowing westward into Oyster Cove then St. Ann's Bay) and for MacLellan's Brook (flowing eastward to Bras d'Or Channel. The North Quarry area is in the Grappling Brook drainage basin which discharges westward into St. Ann's Bay.

4.2.4 Sedimentation

No data presently exists on the erodability or the sediment geochemistry of the glacial overburden on-site. The glacial material is comprised of a sandy, silty, cobble till in the area of the proposed quarry and except for the boggy areas is very thin. In the areas of the bogs, the glacial material appears to be very fine sandy, silty and well sorted. Therefore, tampering with the bogs may result in some sedimentation problems. Conditions encountered during the construction of an access road in the vicinity of the MacLellan's Brook suggests thicker, sequences (3-5 m) of ice contact material in this area. It is expected that overburden thickness increases closer to the stream channel and also in the down stream direction. Disturbance or removal of this material may require extra planning to prevent deterioration of MacLellan's Brook. The build up of sediments (delta) where MacLellan's Brook enters the Bras d'Or Channel suggests there is already a significant transport of suspended/bedload sediments by this stream.

4.3 Atmospheric Environment

No site specific data exists for this proposed facility. The closest Atmospheric Environment Service (AES) station with a suitable period of record is at the Sydney Airport. Baechler (1986) has shown that the site receives higher total annual precipitation than the airport records.

Mean total annual precipitation for the site should range around 1400 mm, with maximum monthly values in October

through December and minimum in July and August. Mean annual air temperatures should be approximately 5.7^0 C. Generally the winds should be from the west-southwest with a north component in the winter. During the preliminary investigation, winds were found to be very strong in this area, especially on the knolls. Because spoil piles and process material is to be stored in topographic depressions, it is not expected dust control will be a problem. Therefore, at the present time, there is no plan to utilize dust suppressants.

The location of the site in this humid maritime climate, coupled with low permeable geological materials, will generally result in high groundwater tables and large volumes of surface runoff. Both factors will generate relatively high volumes of mine water which must be dealt with.

4.4 Biological Environment

4.4.1 Terrestrial

A wildlife productivity factor of 62 has been determined by the Canadian Wildlife Service wetlands in the study area on top of the mountain. This represents a relatively low rating.

Nova Scotia Forest Industries have the forestry rights for this area. There is massive spruce budworm damage on Kelly's Mountain, therefore, forestry is not considered a viable resource. The present plan is for the forest industry to clear land ahead of the quarry operation.

Given the nature of the proposed facility, its construction will unavoidably result in a disruption of the fauna and flora within the proposed site. It is expected, however, that mobile populations will be displaced into the surrounding environs. It is proposed that areas which will not be quarried be kept in a natural state.

4.4.2 Aquatic

Detailed information on fresh water/marine aquatic populations within the receptor surface streams and Great Bras d'Or Channel/St. Ann's Bay are lacking. However, Oyster Cove is listed with the Nova Scotia Department of Fisheries as an approved Aquaculture site.

It will be necessary to address the local effects of the quarry and aggregate transport route on the receptor streams, as well as on the receiving water bodies.

4.5 Social Environment

The quarry operation is expected to create 100 new jobs in the area. They will operate on two, 10-hour shifts with a maximum of 50 persons on site at one time.

The quarry sites are remote. There are approximately 30 residences (including summer cottages) in the New Campbellton, Cape Dauphin, New Harris area which is 2.2 km from the nearest proposed quarry (South) and at a 300 m lower elevation. Englishtown is the nearest community on the western side of the mountain (Figure 2) with approximately 60 residences (including

cottages) within 5.5 km from the nearest quarry (South) at a 300 m lower elevation.

The most significant resource in this area at the present time is tourism. Kelly's Mountain, a major topographic feature, is breathtaking both from eastern and northern vantage points. Every effort will be made to protect the public from any sign of this quarry operation. However, benching resulting in visible terracing will be obvious at the ocean terminal on St. Ann's Bay. Plans indicate the wharfs and loading facilities will be visible to the public with either quarry choice. Aggregate storage will be hidden in valleys and material will be fed to loading facilities by tunnels. The quarry itself will be hidden from view by vegetation and topography.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the conceptual design and the existing environmental data, the following conclusions and recommendations have been reached:

1) CONCLUSIONS: Potentially negative impacts may include:

   a) the impact of dewatering (associated with the active quarry, tunnels and storage pits) on the environment, the proposed spring development and the production well at the quarry.

   b) the effect of sediment and radionuclide concentrations in site waters discharged to the receptor stream.

c) disruption to terrestrial and fresh water aquatic/marine biological habitats, with concern for the aquaculture site in Oyster Cove.

d) alterations to the social environment through noise and ground vibration levels associated with blasting and equipment operations.

e) changing tourist viewplanes

Of these impacts, the more significant ones at this time include:

A) impact of dewatering
B) site discharge waters
C) disruption to biological habitats

2) Due to the lack of available data, collection of additional field data will be necessary in order to determine: 1) whether these impacts are significant enough to warrant remediation and 2) to design those remediation procedures necessary to meet regulatory agency standards.

6.0 RECOMMENDATIONS

1) Given the absence of available data and the operational schedule, it is recommended that Phase 2 and 3 of the EIA be carried out as one study.

LIST OF REFERENCES

Baechler, F., 1986, Regional Water Resources Sydney Coalfield, Nova Scotia Department of Environment, 111 pp.

Health and Welfare Canada, 1987, Guidelines for Canadian Drinking Water Quality, 20 pp.