3.5 Solid Waste Management

Three aspects of waste management at the site have been identified those being domestic waste, industrial waste and solids in the liquid effluent. Domestic waste and solid industrial waste will be hauled off-site in accordance with applicable local, provincial and federal regulations. The solids in the liquid effluent consisting mainly of quartz fines will be sent to a quartz fines storage area. These materials would consist mainly of sand, silt and clay sized natural materials that could be reprocessed or used in reclamation.

3.6 Product Transportation

3.6.1 Trucking

Various quartz products will be transported by truck from the mine site directly to the customer's facility or to the Port of Shelburne or Yarmouth for ocean shipping. The quartz will be washed and screened before being transported. Dump trailers that carry approximately 25 tonnes are planned to be used to transport the quartz in bulk form. Fine sand sized quartz will be transported in bags (e.g. 1 tonne sacs) by enclosed truck or container. Each vehicle will be weighed prior to leaving the mine site to comply with weight restrictions and provide product weight records. Black Bull anticipates using skilled local trucking contractors.

Highway 203 would be used to transport the quartz products to Highway 103 for trucking directly to a customer's facility outside of the local region or to the Port of Shelburne for shipping. Highways 203 and 340 would be used to truck quartz to the Port of Yarmouth. Highways 203 and 340 have spring weight restrictions. Trucking of product will be in accordance with provincial weight requirements.

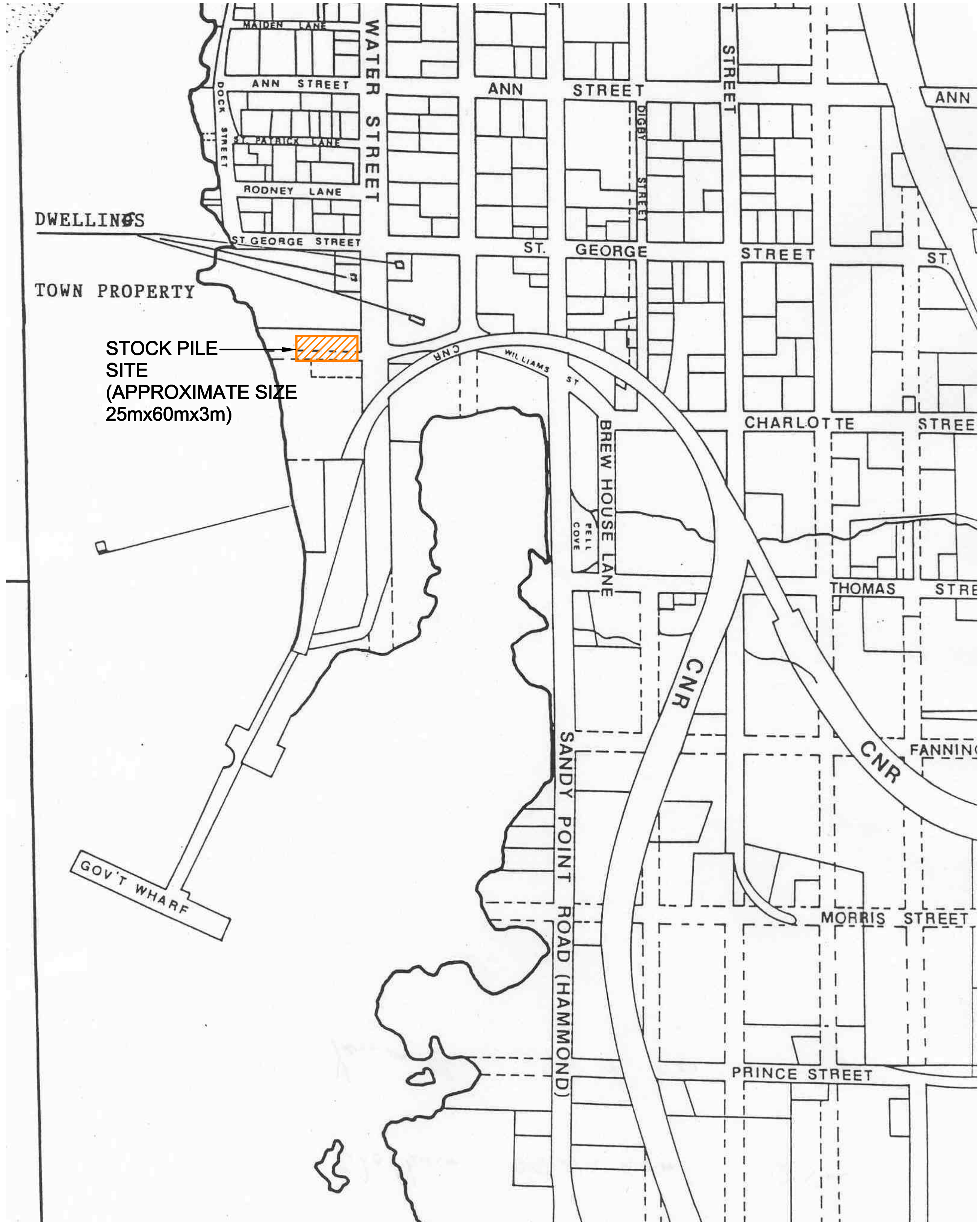
The number of trucks and frequency will depend on the size and timing of customer's orders. Some manufacturers of products that use quartz may also prefer just-in-time delivery. It is expected to take one to two years for the company to build a market base that will result in a routine shipping schedule.

Orders sent by barge or ship through the Port(s) of Shelburne or Yarmouth are expected to be in the 5,000 tonne range. Stockpiling of the quartz would likely occur over a two-week period prior to shipping. This would require 20 truck loads per day operating 5 days per week or 2 truck loads per hour based on a 10 hour day. It is expected trucking will be divided between the Shelburne and Yarmouth Port facilities. Trucks will be staggered to avoid creating a convoy situation or traffic interference.

3.6.2 Ports

Truck routes identified by the Town of Shelburne and the Town of Yarmouth will be used to transport quartz products to the ports.

The Town of Shelburne and Port Authority have identified a location to stockpile and load quartz products at the Town Wharf (Appendix L). Figure 3-9 shows the port layout for Shelburne.



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TITLE	DATE	PROJECT NO.
Port Layout-Shelburne	July 2002	20232G
PROJECT	SCALE	FIGURE NO.
Environmental Registration Document White Rock Quartz Mine Flintstone Rock, Nova Scotia	N.T.S.	3-9
	DRAWN	
	SYC	

There are two wharves in the Town of Yarmouth that could be used to load product onto a vessel from a stockpile or directly from the mine site (Lobster Rock Wharf, Old Public Wharf – Figure 3-10). The Port Authority is evaluating stockpile locations. One site under consideration is the Lobster Rock Wharf site, Appendix L. The exact location for stockpiling will be determined in consultation with the Town of Yarmouth. The site to stockpile quartz will require zoning approval, a process which includes public input.

Stockpile sites at the ports will be secured with suitable 2 m high fencing. Sand sized products will be stored in bags and or containers. Bulk quartz products (pebble to boulder in size) would be deposited at the stockpile and a front-end loader would pile the quartz to an approximate height of 2.5 to 3 metres. A material bed will be placed as a base for stockpiling quartz to minimize the risk of impurities being mixed with the product. Quartz products will be washed at the mine site to remove dust or fine sediment. However, as a precaution, monitoring for dust and sedimentation will be undertaken (see section 6.11.2).

Quartz products from stockpiles would be loaded on to the barge/ship by front-end loader, truck, hopper and/or conveyor system. Products shipped by bag or container would be loaded by crane, forklift or a system used by self-loading vessels. Quartz products may also be directly loaded from the mine onto the vessel without stockpiling. Front-end loaders and crews will clean the work areas after the barge/ship is loaded.

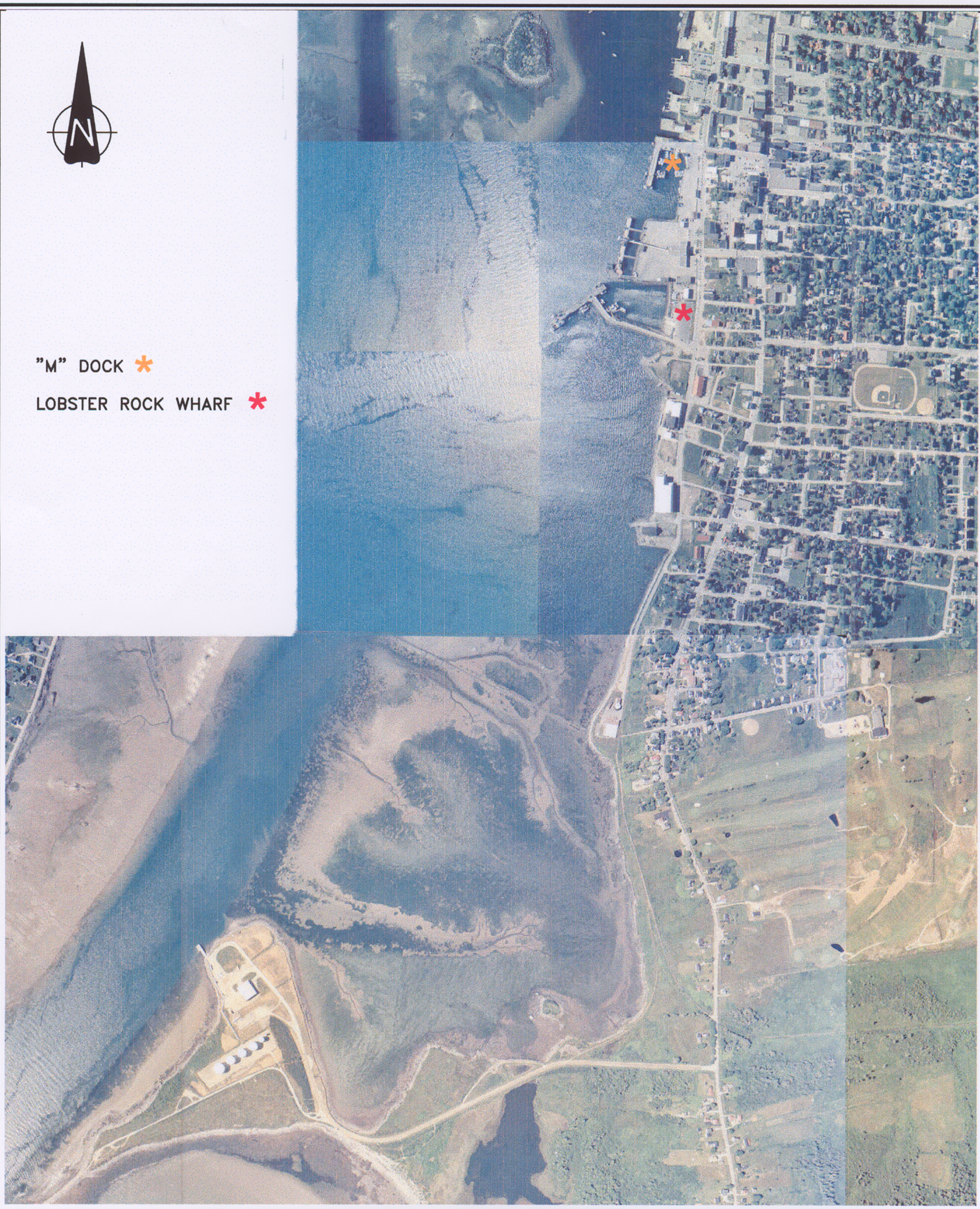
The number of barges/ships per month will depend on when customers want the quartz delivered. During the first year, 100,000 tonnes of quartz products are anticipated to be produced with approximately 80,000 tonnes delivered by barge or ship and the remaining 20,000 tonnes trucked directly to customers. The ports of Shelburne and Yarmouth are expected to each load about 40,000 tonnes of bulk and processed quartz. This shipping ratio between ports may vary depending on customer location and preference, and as production increases in Year 2 and 3. There will also be periods when spring weight restrictions prevent products from being transported to the ports from the mine site. The storage and loading process will be monitored for air quality, with particular attention to airborne particulates. If required, misting or spraying the quartz with water will minimize dust and airborne particles.

3.7 Site Decommissioning and Reclamation

The conceptual reclamation plan for the site will comprise of several phases. These will include closure and decommissioning, site contouring, and water management of aquatic environments. Black Bull will, with direction from NSDNR continuously develop and re-develop the final reclamation plan.

Site areas to be included in the reclamation plan development are as follows:

- extraction area
- quartz fines storage area
- the processing plant site
- the holding, settling and water treatment ponds and associated infrastructure
- unprocessed rock storage areas
- all equipment, portable and fixed
- crushing and product storage pads
- roads
- any other disturbed areas



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TITLE	DATE	PROJECT NO.
Port Layout-Yarmouth	Aug.2002	20232G
PROJECT	**SCALE**	**FIGURE NO.**
Environmental Registration Document White Rock Quartz Mine Flintstone Rock, Nova Scotia	N.T.S.	3-10
	DRAWN	
	SYC	

The closure and decommissioning phase would include removal of infrastructure components such as weigh scales, buildings, portable and fixed equipment. Inert materials such as concrete foundations would be taken to below final grade and left in place unless otherwise directed by NSDNR. Roads and travelways created during the operation of the mine would be taken out of service to minimize accessibility to the site and adjoining properties. Site contouring and revegetation activities would be undertaken in any areas of exposed soil or erodible material. Areas of exposed bedrock above grade would be left, as this is a typical feature in the area.

The mine areas (Pit A and Pit B) would be recontoured where appropriate to ensure slopes are stable and safe, access/egress locations are available at selected distances around the perimeter of the pits. One of the objectives of this approach would be to create exit locations at periodic intervals so that if animals enter the former pit areas they would have several points to exit. The ramp area between Pit A and Pit B would convert to a travel corridor through the area oriented approximately north to south.

The water levels within the former pits will rise until they stabilize in relation to surrounding topography and water levels. It is expected that this would take 3-5 years. Fluctuations of the water levels would be expected to occur on a seasonal basis. Recharge of water would occur from precipitation and runoff as well as from groundwater infiltration. The former pits are not expected to overflow as the water level should rise to the original static level of 3 to 7 metres below ground surface based on modeling of groundwater data collected at the site. During the operation of Pit B, it is planned that Pit A would continue to have operating functions for storage of water and unprocessed rock. On this basis, final reclamation of Pit A would be undertaken after the operation of Pit B was completed.

The conceptual reclamation plan would create two lakes roughly 200 m in width and 300 m in length with expected water depth in the 15-25 m range for Pit A and 10-15 m range for Pit B. With the creation of access points noted above and a vegetation program, the resultant aquatic environments will be similar to those now represented in the area. The lakes will have nearshore shallow depth areas favourable for aquatic plant growth and deep portions (10-25 m depth) offering lower temperature refuge areas during summer months for fish species.

Detailed information on the final reclamation plan will be submitted in conjunction with the required documentation for the Mining Permit. This plan will be designed with input from the NSDNR, NSDEL, CLC and other government departments.

4.0 EXISTING ENVIRONMENT

4.1 Introduction

This section outlines the physical setting and project features of the site and general area including the transportation routes and proposed port facilities. Environmental baseline information collected from published sources and studies completed at and near the mine site are presented. Several of the environmental baseline studies continue to generate information relative to the site through follow-up work to assist in the development of the Land Management Plan (Section 9.0). Additionally, surface water monitoring at the site was extended past the environmental baseline study timeframe (April 2000 to July 2002) to continue to collect data to be used in mine design and aquatic habitat evaluations. Where a report or data was generated by MGI or sub-consultants during the environmental baseline study, this information has been summarized within the body of this document with the original report in Volume II, Appendices.

4.2 Regional and Local Physiography

The White Rock Mine is located within the Southern Upland physiographic region as defined by Roland, 1982. This region comprises the southwestern half of the mainland portion of the province and ranges in elevation from sea level to near 300 metres with the interior portions being typically the greatest in elevation. The region is dominated by granitic material in the form of an old erosion plain. Glaciation has shaped much of the surface with post-glacial action assisting in the development of abundant surface water features such as boulder strewn streams and rivers connected to shallow lakes with boulder rich edges.

The relief in the claim block area is slight with topography ranging from 100 to 140 metres above sea level (masl). The local topography ranges from highs in the north (near Upper Frog Pond and the Aggies Rock area) to lows in the south-southwest (in the Lower Frog Pond area and along the southern edge of the claim block boundary). Slopes are typically low with occasional hummocky areas being formed from localized mounds of glacial material creating localized increased slopes. Erosion potential is low due to the coarse grained nature of the materials, typically low slopes and almost complete coverage by scrub vegetation.

4.3 Geology

4.3.1 Regional Geology

The White Rock Mine is located within the Meguma Tectonostratigraphic Terrane of the Canadian portion of the Appalachian Mountain Range. The Meguma Terrane is the farthest outboard terrane in the northern portion of the Appalachians and is characterized regionally in southwest Nova Scotia by deformed Cambro-Ordovician aged turbidites (Meguma Group strata). Many of the Meguma Group units have been intruded in southwest Nova Scotia by late Devonian to early Carboniferous plutons (typically granitic material). The Meguma Group is comprised of the Goldenville Formation (meta-greywacke and quartzites) and Halifax Formation (slate).

Southern Nova Scotia was subjected to three distinct periods of glacial action with the oldest to youngest ice directions being 1) to the southeast, 2) to the south-southeast, and 3) to the north. The resultant glacial and post-glacial action in the site area has created a blanket of surficial deposits that consist of 3 to 15 metres of glacial till and post-glacial materials. The description of local geology below is based on published information and the results of the exploration and advanced exploration programs completed at the property over the past few years.

4.3.2 Local Geology

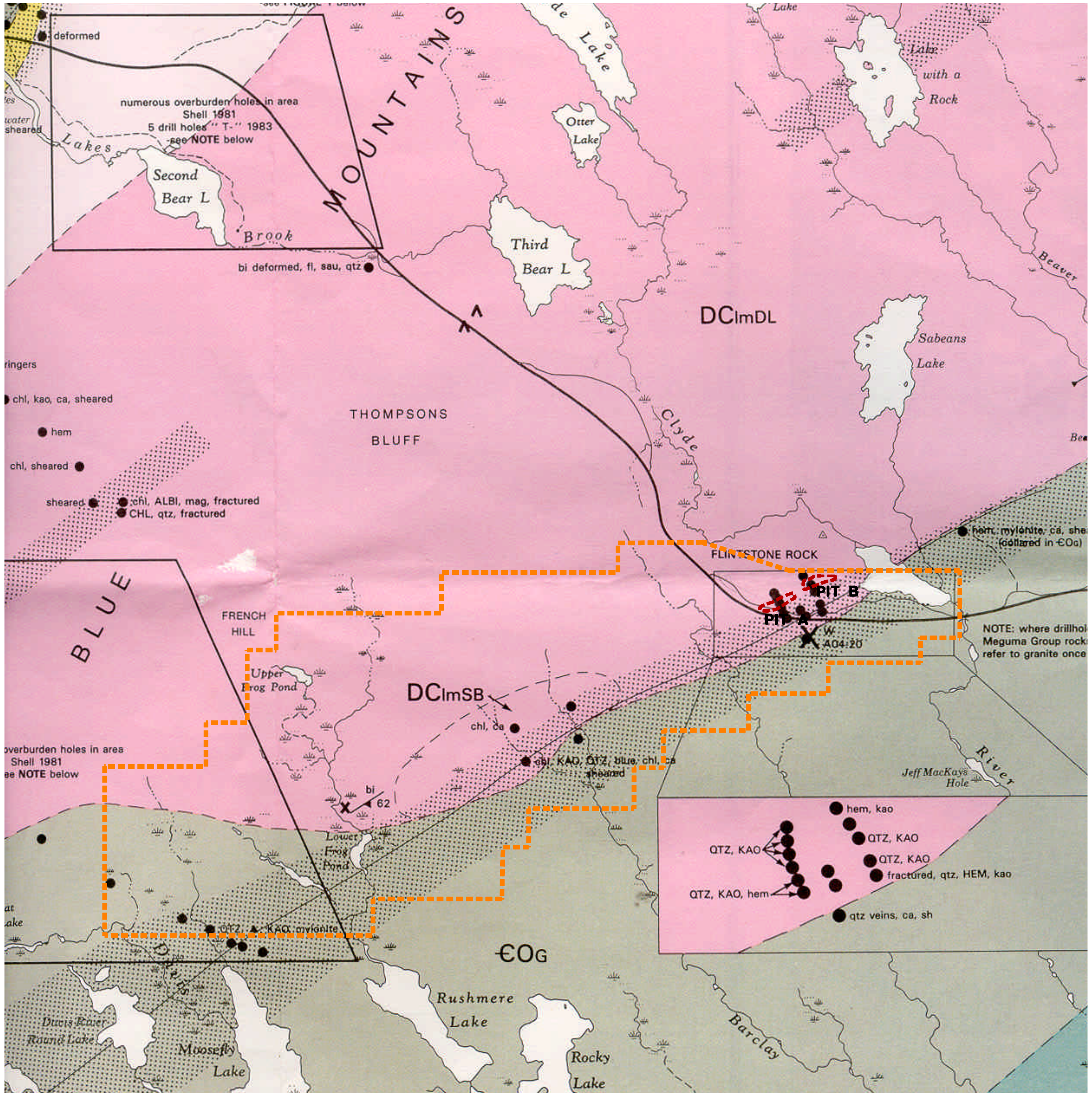
The southern two thirds of the claim block is underlain by rocks of the Cambro-Ordovician Goldenville Formation which consists of greenish-grey coloured greywackes which form the south dipping limb of a regional syncline. These greywackes have been intruded by the Devono-Carboniferous Sabeans Lake pluton, part of the South Mountain Batholith. The pluton consists of grey, medium to coarse grained, porphyritic leucomonzogranite.

The contact zone between the greywackes and the pluton are faulted by a regional shear zone called the Tobeatic Shear. This shear has been the focus of intense hydrothermal alteration which has completely altered the hosting plutonic and sedimentary rocks into a zone of complete silica replacement generally flanked by very strong kaolinite and quartz development. The core of the zone is occupied by a 25 to 75 metre wide zone of high quality quartz breccia that has been sealed by multiple phases of quartz deposition. In general, the quartz zone is massive and white in appearance. This alteration has been traced through drilling or geophysics for about 6,400 metres along strike over widths of 50 to 150 metres. Bedrock geology is presented in Figure 4-1.

Surficial deposits of granite till and drumlin facies overlie the majority of the claim block. The till facies consist of greyish orange to yellowish brown loose sandy, angular cobble-sized clasts. The drumlin facies are similar in color to the till facies, however, in some places they are compacted with a finer matrix. Quartizite till and drumlin facies overlie the southern tip of the claim block. The till facies consist of bluish grey, loose, sandy, angular cobble-sized clasts with siltier matrix in metamorphosed terrane. The drumlin facies can be relatively compact. This blanket of surficial material results in no exposed bedrock and numerous scattered boulders of varying sizes throughout the claim block. Surficial geology is presented in Figure 4-2.

4.3.3 Environmental Geology

The environmental geology of the site and adjacent areas was examined using existing data from published sources. Two items of note were examined in detail, those being possible uranium presence associated with the granitic material and acid producing materials associated with the Meguma Group strata.



SYMBOLS

(not all symbols occur on map)

Rock outcrop, probable outcrop, float . . . . x ^ ⊗

Geological boundary — gradational (< 100 m; > 100 m) . . . .

Anticline (defined, approximate, overturned) . . . .

Syncline (defined, approximate, overturned) . . . .

Preferred orientation of feldspar megacrysts (horizontal, inclined, vertical, dip unknown) . . . .

Breccia . . . . ▲

Shear zone, with central mylonite zone . . . .

Dyke or vein: ALBI-albitite; APPG-aplite with minor pegmatite; DIAB-diabase; ELVA-elvan; LUGR-leucogranite; LUMZ-leucomonzogranite; LUPO-leucoporphyry; MIAP-mica aplite; MONZ-monzogranite; PEGM-pegmatite; PEGMZ-zoned pegmatite; PGAP- pegmatite with minor aplite; PORP-porphyry; QTZ-quartz (indicated if mineralized); all unlabelled dykes are aplites; < 1 m-thin lines > 1 m-heavy lines (inclined, vertical, dip unknown) . .

Diamond-drill hole (DDH; reference number from N.S.D.N.R. drill hole database and assessment reports) . . . . ● 82-158

COMMON MINERAL ABBREVIATIONS

ad-andalusite; am-amethyst; ap-apatite; as-arsenopyrite; at-autunite; bi-biotite; bo-bornite; ca-calcite; cc-chalcocite; cs-cassiterite; cp-chalcopyrite; ch-chlorite; cd-cordierite; cy-chrysocola; fl-fluorite; gn-galena; gr-garnet; he-hematite; il-ilmenite; ka-kaolinite; ma-malachite; man-manganese minerals; mo-molybdenite; mu-muscovite; po-pyrrhotite; py-pyrite; qtz-quartz; sh-scheelite; sl-sillimanite; sp-sphalerite; se-sericite; to-torbernite; tr-tourmaline; wo-wolframite.

COMMON ALTERATION ABBREVIATIONS

ALB-albitization; CHL-chloritization; DES-desilicification; HAA-high alumina; HEM-hematization; KAO-kaolinitization; LIM-limonitization; POT-potassic (which includes biotitization and K-feldspathization); SAU-saussuritization; SIL-silicification; *intense and pervasive in capitals; slight to moderate in lower case.*

- - - - - Approximate Quartz Extraction Areas

- - - - - Claim Block Area (Approximate Boundary)

BEDROCK UNITS

ЄOG	Goldenville Formation
DCImDL	Davis Lake
ЄOH	Halifax Formation

Reference: Nova Scotia Department of Natural Resources, 1994
Wentworth Lake, N.T.S. Sheet 21A/04 and part of 20P/13

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TITLE	**Bedrock Geology**	DATE: July 2002	PROJECT NO.: 20232G
PROJECT	**Environmental Registration Document White Rock Quartz Mine Flintstone Rock, Nova Scotia**	SCALE: 1:50000	FIGURE NO.: **4-1**
		DRAWN: SYC	

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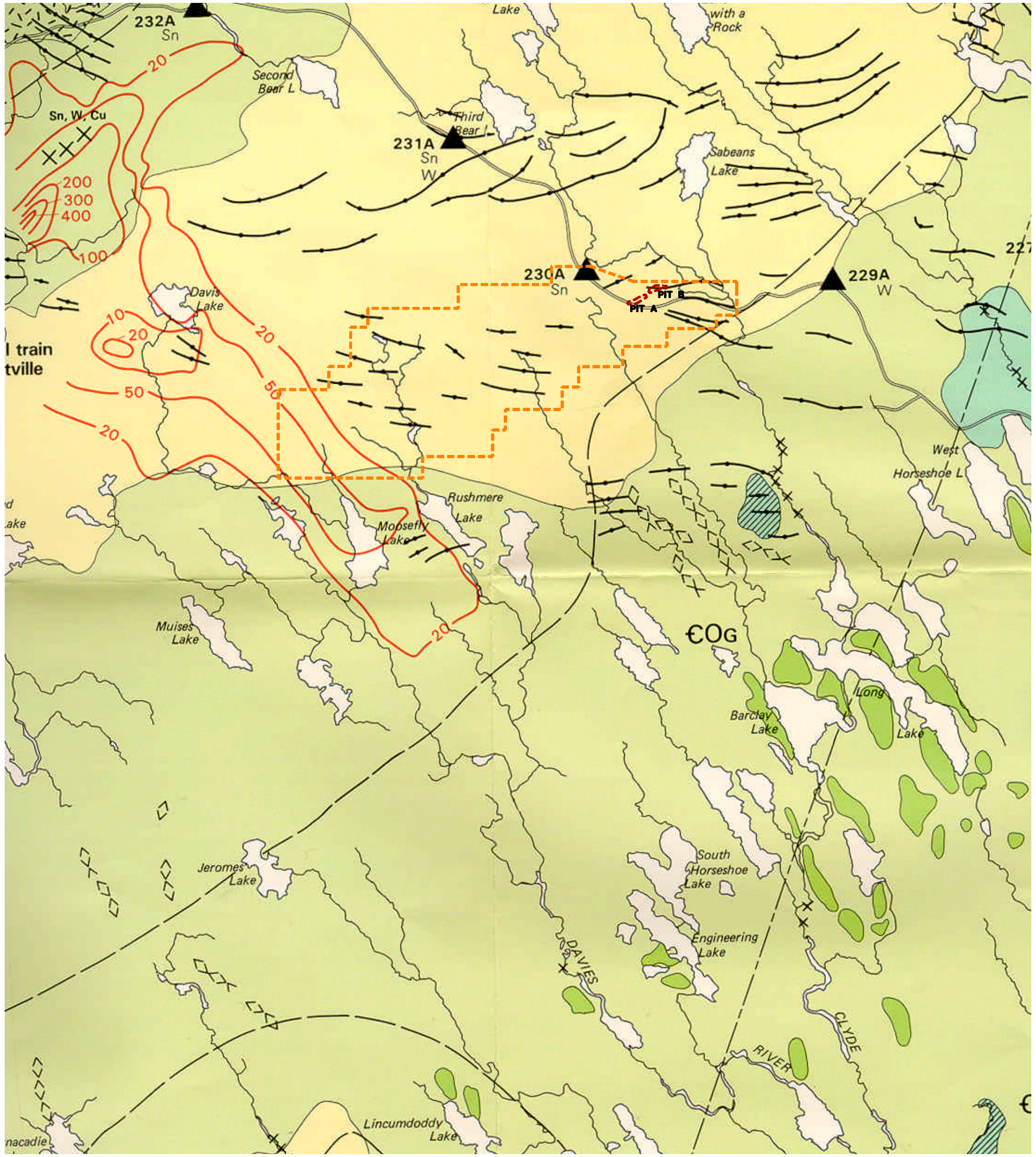

SYMBOLS

Bedrock geological boundary

Surficial geological boundary

Glacial striae (sense of ice movements known, unknown
Note: numbers indicate relative age, 1 being older)

Tin dispersal train contour —20—
(Analysis of entire -10 + 100 mesh fraction of till, value in ppm)

Drumlin

Moraine (ribbed)

Esker (direction of flow unknown) <><><><>

Bedrock outcrop ×

Approximate Quartz Extraction Areas

Claim Block Area (Approximate Boundary)

SURFICIAL MATERIALS UNITS

- Outwash
- Ice Contact Stratified Drift
- Ablation Till
- Granite Till facies including Drumlin facies
- Granzite Till facies including Drumlin facies

BEDROCK UNITS

- €OG Goldenville Formation, Grey Wacke, Slate
- €OGm Goldenville Formation, Metamorphosed Equivalent
- DCgt Granitied

Reference: Province of Nova Scotia Department of Mines and Energy, 1982.
Pleistocene Geology, Sheet 8

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TITLE	Surficial Geology
PROJECT	Environmental Registration Document White Rock Quartz Mine Flintstone Rock, Nova Scotia
DATE	July 2002
PROJECT NO.	20232G
SCALE	1:50000
FIGURE NO.	4-2
DRAWN	SYC

CADFILE No. CADFILE_NO

Acid Rock Drainage

There are no acid producing materials at the White Rock Mine. Detailed analytical work was completed on acid consuming and producing potential of on-site materials at the White Rock Mine. Concern had been expressed over the ability of local natural materials to generate acid if disturbed as part of the surface mining operation. Testing was completed on samples from within the mine area at the Daltech Minerals Engineering Center in Halifax with the results indicating that all materials did not generate acid but were net acid consuming. The samples were of all of the consolidated (rock) units that would be potentially disturbed as part of the mining operations and included argillital quartzite (Goldenville Formation strata found in local tills), granite, meta-sediment breccia (broken-up quartzite), muscovite bearing granite, quartz breccia and kaolin breccia. Table 4-1 summarizes all data relative to Updated Acid-Base Accounting Testing Summary.

TABLE 4-1: ACID-BASE ACCOUNTING TESTING SUMMARY

Rock Types	pH	% S (Total)
Silica ①	6.20	0.004
Clay ②	5.95	<0.001
Argillital Quartzite	7.95	<0.001
Granite	8.30	0.001
Meta-Sediment Breccia	6.70	0.009
Muscovite Bearing Granite	7.60	<0.001
Quartz Breccia	6.20	0.004
Kaolin	5.95	<0.001

① **Bulk quartz from the 2000 sample program – Proposed Pit A area.**
② **Kaolinite**

Section 6.0 provides additional detail on mitigation or management plans as a precaution if acid generating materials are ever encountered. It is important to note that no such materials have been encountered at the site or have been mapped for the site by the NSDNR or in previous exploration assessment reports for the mining area. Based on this information, acid mine drainage issues are not identified for the site.

Uranium

A spectrometer survey (to detect radiation) was carried out at the White Rock Mine by NSDNR staff on September 21, 2000. No anamolous radiation was detected. An excerpt from the letter report provided by NSDNR is as follows with the full letter contained in Appendix C.

> *"A Urtec Differential Gamma Ray Spectrometer, Model UG135, was used to examine representative drill core samples, exposed bedrock in the area of the excavation work, and float in the general vicinity of the property for potential uranium mineralization. The unit was set to read total count (full spectrum radiation above 80 keV). No anomalous readings were encountered in either the drill core or any of the bedrock or float material examined on the property. The silica and kaolinite/quartz breccias had very low background values and the results for the locally derived granitic float examined on the property carried typical background values for intrusive rocks in the area."*