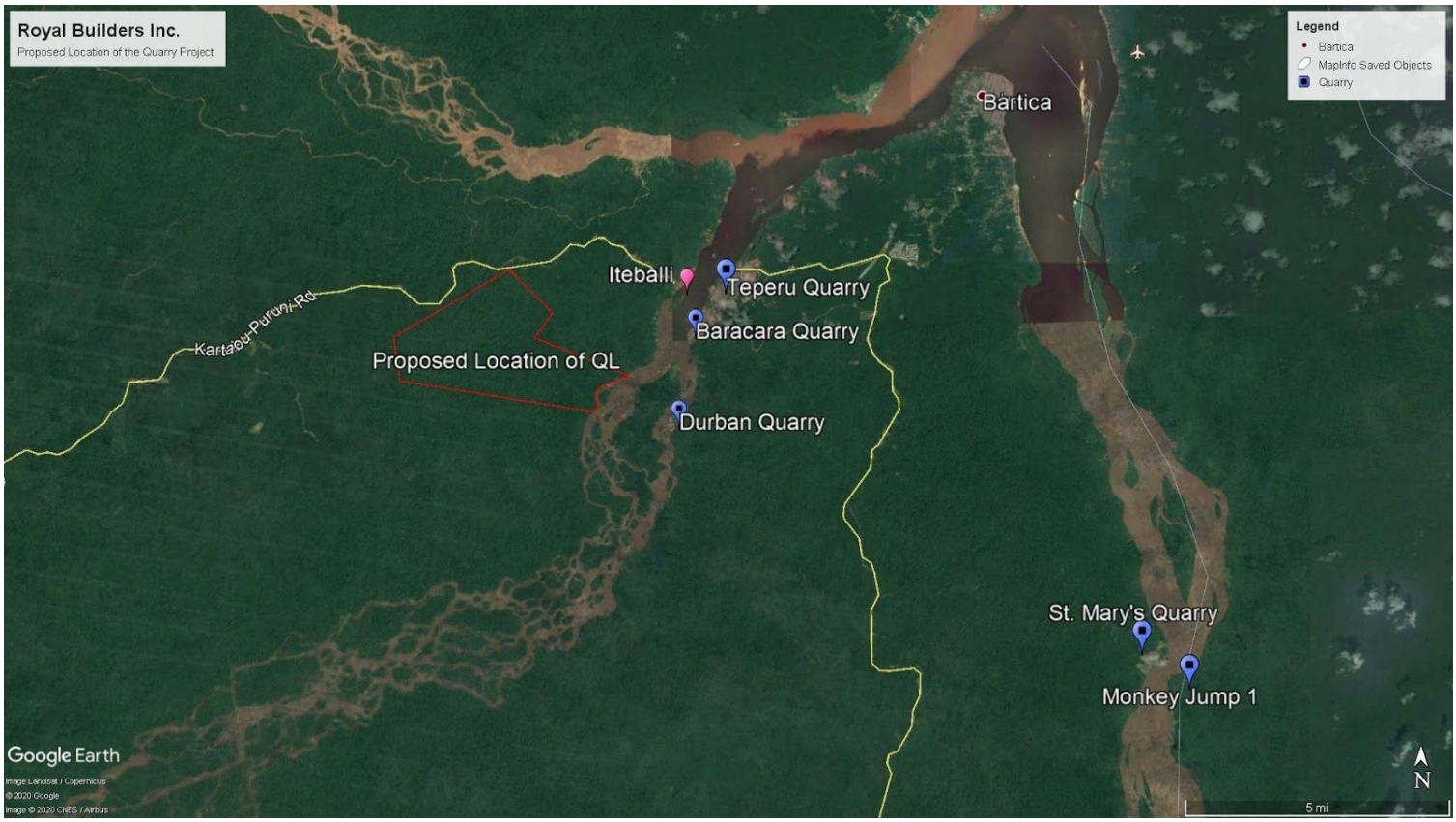
ROYAL BUILDERS INC.

Mazaruni Quarry Project

[Project Summary - Mazaruni Quarry Project
@ Altana Creek, Mazaruni River]



Prepared by:
Omar Persaud B.Sc.

August 2020

Prepared for:
Royal Builders Inc.
Lot 15 Garnett Street, Campbellville, Georgetown, Guyana

Table of Contents

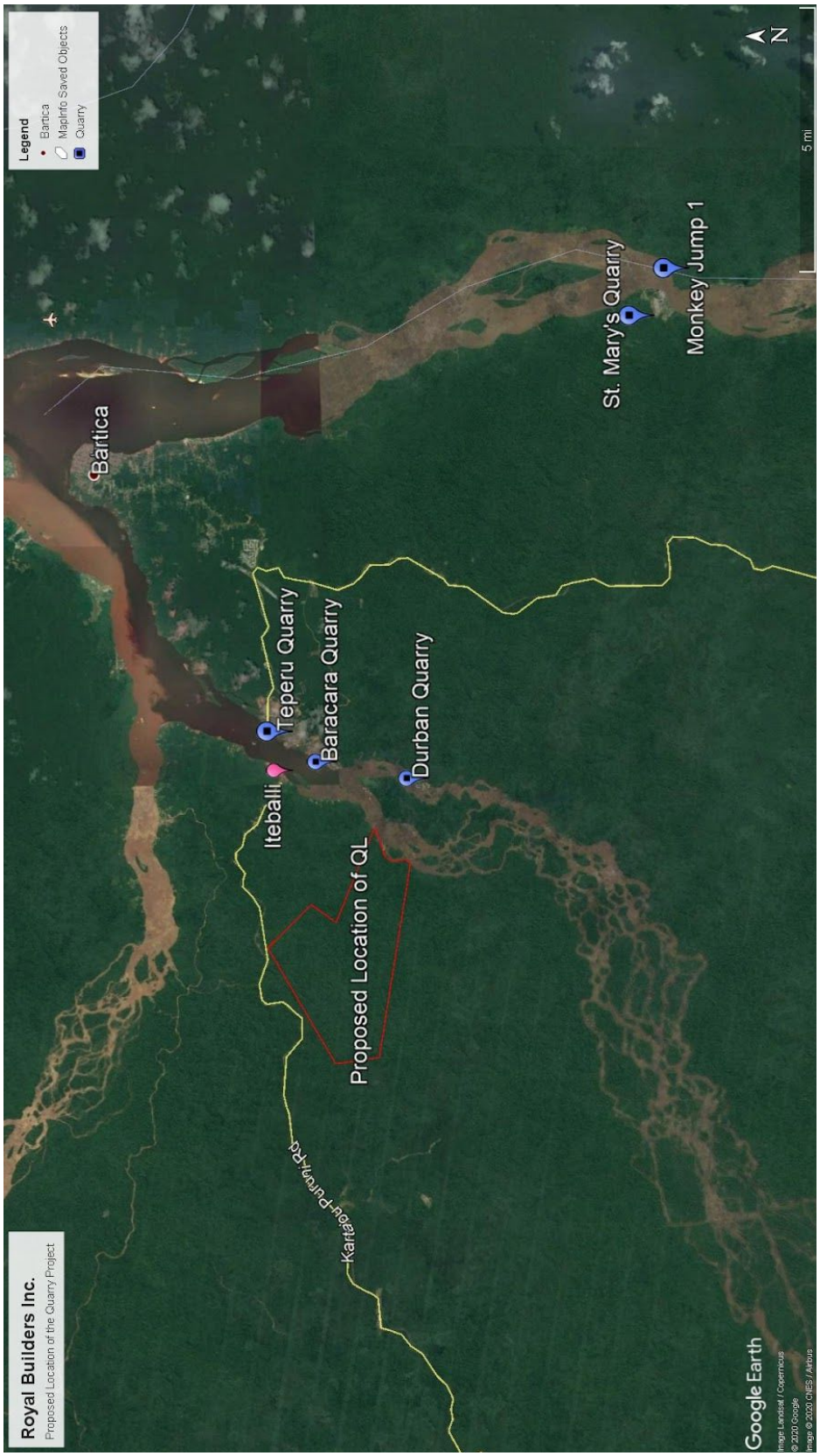
1) Executive Summary

1) Royal Builders Inc. (the company) recognises the demand for aggregate, the current limitations of supply and the anticipated increase in demand from the emerging oil and gas sector and the expanding construction sector.
2) As such the company seeks to obtain from the Guyana Geology and Mines Commission (GGMC) a Quarry License (QL) develop a modern, large scale quarry to meet the existing and projected demand for aggregate.
3) The Teperu, Baracara and Durban quarries are all located on the Mazaruni river, immediately downstream from the location of the proposed new quarry development. The area historically referred to as Karia Island quarry is also to the immediate east of the proposed new quarry development, on Karia Island in the Mazaruni river.
4) The proposed Mazaruni New Quarry project site is located on the left bank of the Mazaruni river, ~20 km SW of Bartica, ~75 km from Parika and ~115 km from Georgetown, all distances measured along the riverain routes.
5) The potential for hard rock occurrences which may become exploitable quarry material is very good. The region is part of the Trans-Amazonian Craton and the underlying rocks are collectively known as the Barama – Mazaruni Supergroup (BMS) and the QL, more specifically, lies on the younger intrusions within the Bartica - Gneiss Complex. The general area is covered by young alluvium, fluviatile materials as well as saprolitic material. However the work at the Kartabu Point, St. Edward's Mission, Teperu, Baracara, Durban and Karia Island quarries have all exposed fresh rock at and close to the surface. This together with other observed float rock and the topographic indications of the underlying the 'hard rock' materials being good indicators of extensive quarryable material.
6) The Mazaruni New Quarry Project lies on the major dominant regional structural trends of younger granitic intrusions and is perfectly placed to host a significant quarry reserve
7) The proposed project site encompasses approximately 3,888 acres of land. This covers an unnamed, large topographic high that is over 200 feet in elevation and occupies most of the

aerial extent of the proposed QL. The elevation at the bank of the Mazaruni river is less than 40 feet.

8) This topographic high will be the initial focus for the development of the new quarry, where initial reconnaissance has shown the presence of rock at and close to the surface.
9) The main operational centre will be closer to the north western sector of the license; rocks harvested from the central and eastern sectors will be transported here for processing into aggregate, or will be shipped as boulders for use in sea defence projects if needed.
10) The proposed QL is adjacent to the Mazaruni river at Karia Island, at this point in the Mazaruni river it is easily navigated with sizable vessels.
11) Alternatively, the QL is already connected by trails to the Kartubu - Puruni Road and then to the Iteballi docks. Transport will also be possible by trucks along these routes.
12) The company will be investing and expending more than three million United States Dollars (US$3,000,000) in the development and commissioning of this new quarry operation.
13) This investment is being made to meet the growing demand for aggregate domestically as the economy continues to be boosted by increasing construction, infrastructure and sea defence works, with further expansion anticipated with the increasing oil production related activities.
14) The initial output of this quarry is expected to be at least 2000 tons per week of aggregate (½", ¾",⅞").
15) The company is committed to being a responsible corporate partner to the Government of Guyana and is currently assembling a team of experienced and professional persons to manage this project.
16) This project developmental plan will be revised at the direction and requirements of the relevant regulatory bodies.

Map 1: Location of the Project Site



2) Introduction

The company is currently applying for a Quarry Licence (QL) from the Guyana Geology and Mines Commission (GGMC). The QL being applied for covers an approximate area of 3,888 acres and lies to the immediate south of the historic St. Edwards Quarry and to the west of Teperu, Baracara, Durban and Karia Island Quarries. This proposed QL is located approximately on the left bank of the Mazaruni river opposite the northern tip of Karia Island and the Durban Quarry. This area was selected and located based on the presence of the numerous historic and active quarries in the area along with the indications of fresh rock suitable for aggregate being present in the topographic high that occurs along a NE/SW trending granitic intrusion which dominates this entire area.

A historic and respected estimate by the notable H. Schielly in 1968 from the surveys and work he did in all of the potential quarry sites in the entire Essequibo - Mazaruni - Cuyuni confluence area places the reserves of the Durban quarry (historically known as Big Hope quarry) at 5-6 million tons. This reserve is based on much lower topographic expressions than those that occur in the area of the proposed QL. After initial developmental works, a consolidated reserve estimate will be arrived at through a comprehensive drilling program with major resources anticipated in the topographic highs to the eastern sector of the proposed QL.

For this project it is estimated that not less than 2000 tons of rock will be produced per week for the first phase of established production. The annual production for the first few years during the consolidation of operations will be ~100,000 tons of aggregate and some estimated 20,000 tons of boulders and other sea defence related materials. After the recovery of a substantial portion of the capital investment a second phase of investment and expansion will aim to have production increased. The quarry will see the capital investment of not less than USD$3,000,000 and will have an initial work force of at least 40 (local) employees. Development of the facilities for this quarrying complex will be completed within 6 to 8 months of the QL being granted. The primary reason for the establishment of this quarry is to satisfy the current and anticipated demand based on the projections by the Ministry of Public Infrastructure and private sector.

3) Location and Access

The Mazaruni New Quarry Project area is centered on N 6° 20' W 58° 45.3' in the Mazaruni #3 mining district, central northern Guyana (See Map 2). The area is approximately 115 km south west of the capital city of Georgetown and the closest town is Bartica some 20 km to the north east, all distances along the riverain routes.

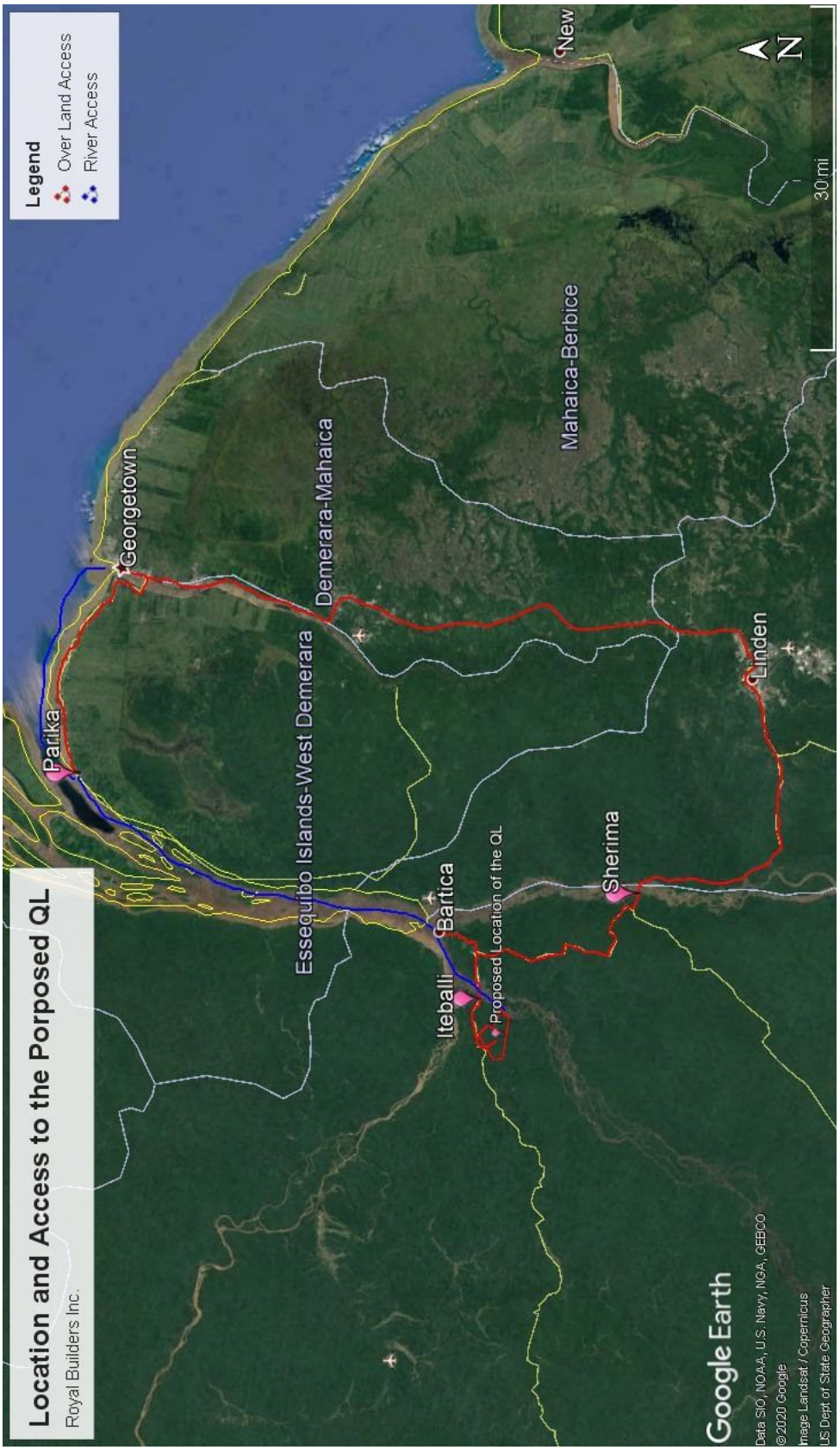
The Project area is located in the Amazon rainforest of Guyana. It is bracketed to the north by the Altana Creek, to the east by the Mazaruni river, to the west by the Kartabu - Puruni road. To the South is Kwapau creek. Access to the project area, which is heavily forested, depends on the nature of what is being transported: (a) Personnel and Perishables; (b) Heavy Equipment; and (c) Light Equipment and fuel. The closest town is Bartica some ~20km away to the north east.

Personnel and perishables can be taken from Georgetown to Parika by road; then by river from Parika up the Essequibo and Mazaruni River to the project site. The area is also accessible by helicopter or small aircraft from either Timehri or Ogle to the Bartica airstrip which is only 15 km due north -east on the Bartica - Potaro road, in the same direction as Bartica. The air strip is connected to the project site by roads and trails and the Iteballi pontoon crossing. There is an established pontoon service at Sherima to cross the Essequibo river to connect to the trials to Linden and the Soesdyke highway to Georgetown.

Heavy equipment can be transported by pontoon from Georgetown to the nearby Iteballi wharf and then by road and trials to the project site directly. Light equipment and fuel can be taken by road from Georgetown to Parika, then from Parika by boat or barge to Iteballi, then to the site. Alternatively, light equipment can be taken from Georgetown through Linden and Rockstone to the Sherims/Suribanna crossing on the right bank of the Essequibo River, then by the road/trail to the Iteballi crossing on the Mazaruni river and then to the project site. When wharfage is established in the project area, the pontoons will be able to dock and discharge/load directly at the project site.

Access within the boundaries of the prospect is relatively good; the previous logging operations within the area left a network of trails and lines throughout the proposed QL.

Map 2: Location and Access of the Proposed Quarry Site



4) Property Title

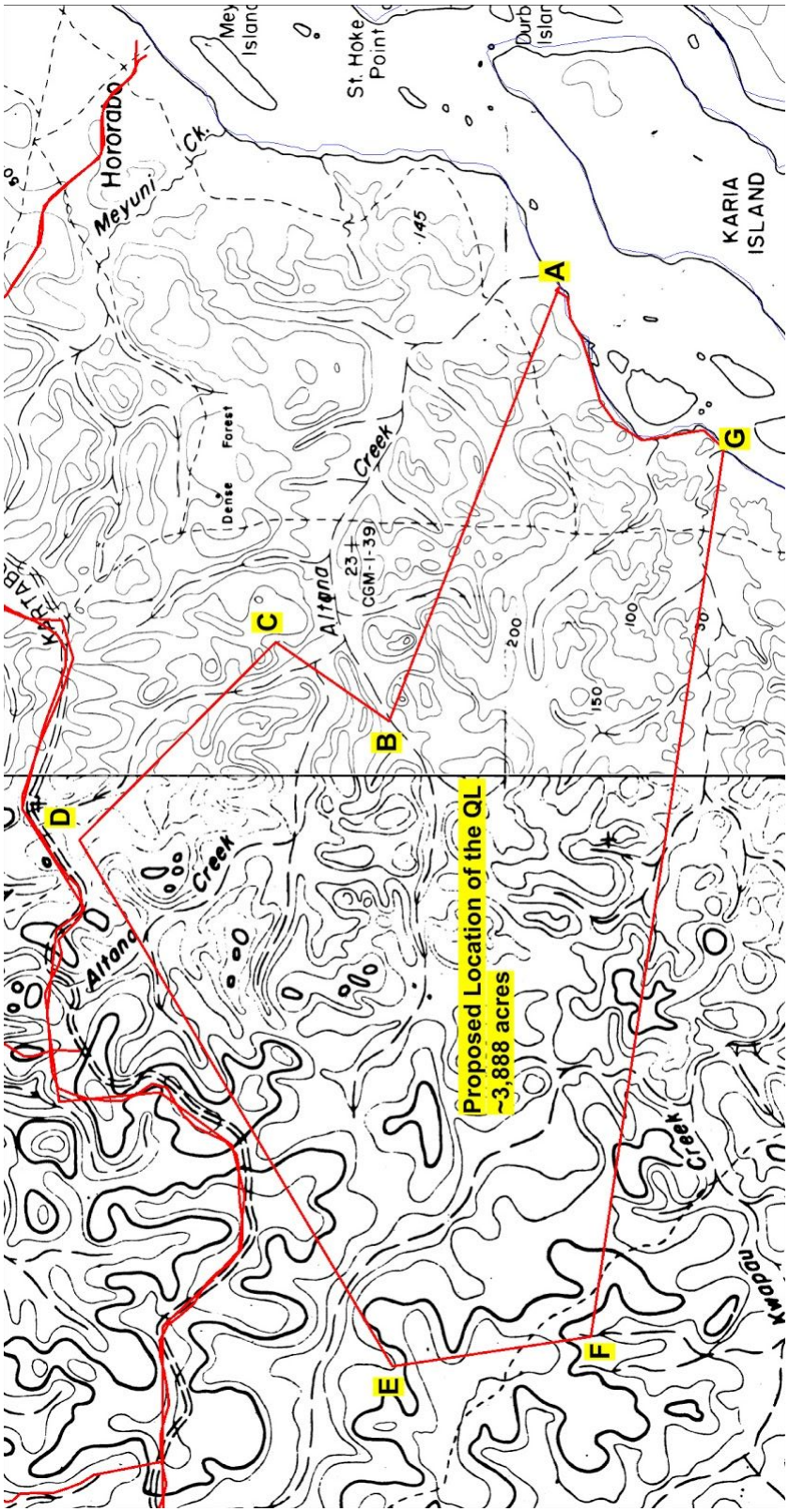
The Mazaruni New Quarry Project is a proposed QL which is being sought by the company from the Guyana Geology and Mines Commission (GGMC). A QL is usually issued for 25 years with subsequent renewals being determined by the life of the mine. The area being applied for is already allocated for mining by the GGMC. The area is presently covered by a series of medium scale prospecting permits for gold. There are no active gold mining operations in the area and the potential for significant gold occurrences is virtually non-existent. Given the lack of mining activity in the area and the low potential for any gold occurrences the company expects that the QL being applied for will be granted. The QL carries a work performance bond which has to be lodged with the GGMC and a fixed schedule of rental payments for the land as well as several other reporting and performance requirements to keep the license in good standing.

5) Cartographic Description of Proposed QL

Tract of state land located in the Mazarin Mining District No.3 as shown on Terra Surveys Topographic Maps 27NW & 27NE. The proposed boundaries of the QL may be revised based on the recommendations of the relevant authorities. The area enclosed is approximately 3,888 acres and the end points of the proposed QL are as follows:

Point	Coordinates (PSAD'56 HH MM SS.SS)
A	6°19'48.10"N 58°43'14.30"W
B	6°20'24.90"N 58°44'47.80"W
C	6°20'49.20"N 58°44'31.30"W
D	6°21'31.60"N 58°45'13.70"W
E	6°20'24.30"N 58°47'07.30"W
F	6°19'41.30"N 58°47'0.80"W
G	6°19'12.80"N 58°43'49.10"W

Map 3: Topography and Boundary points of the proposed QL

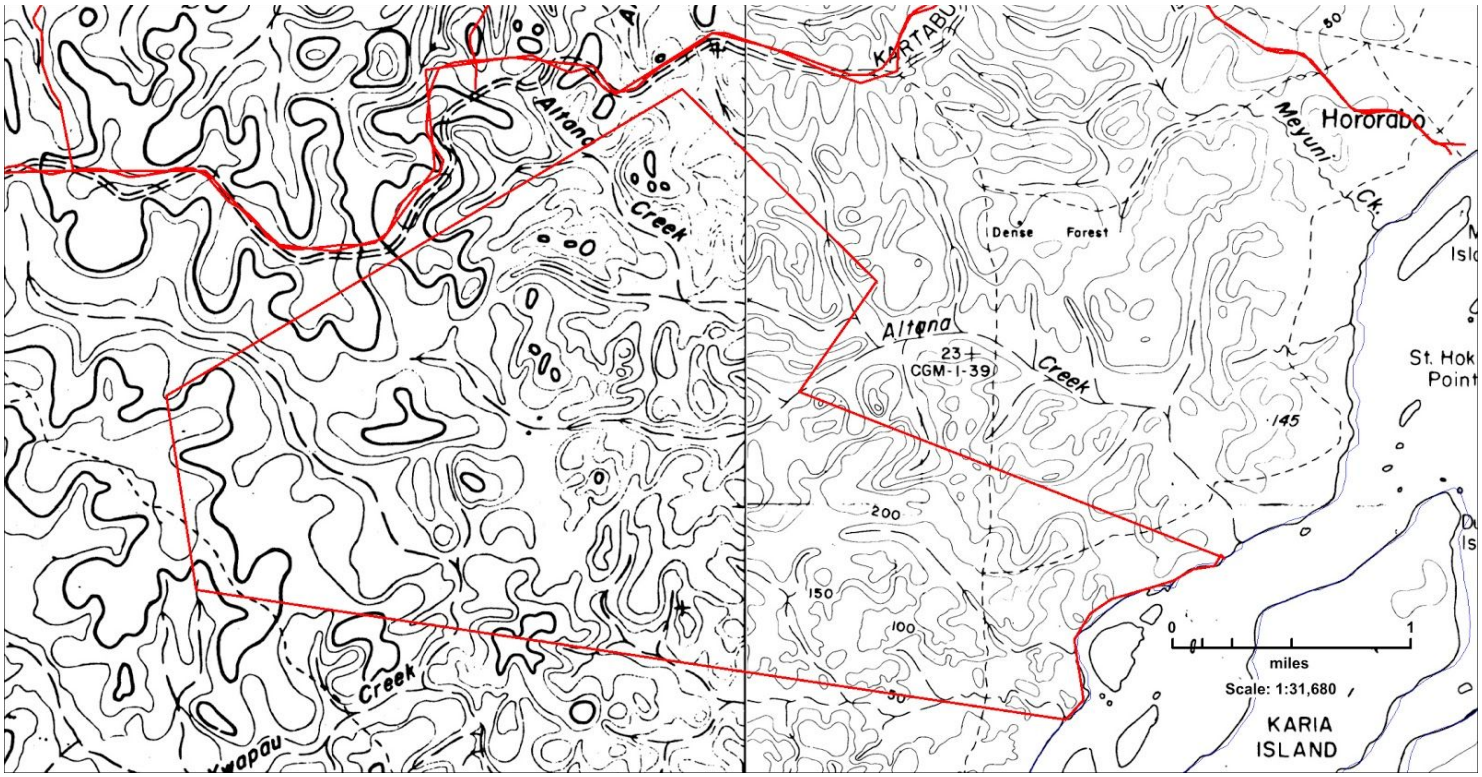


6) Topography, Vegetation and Land Use

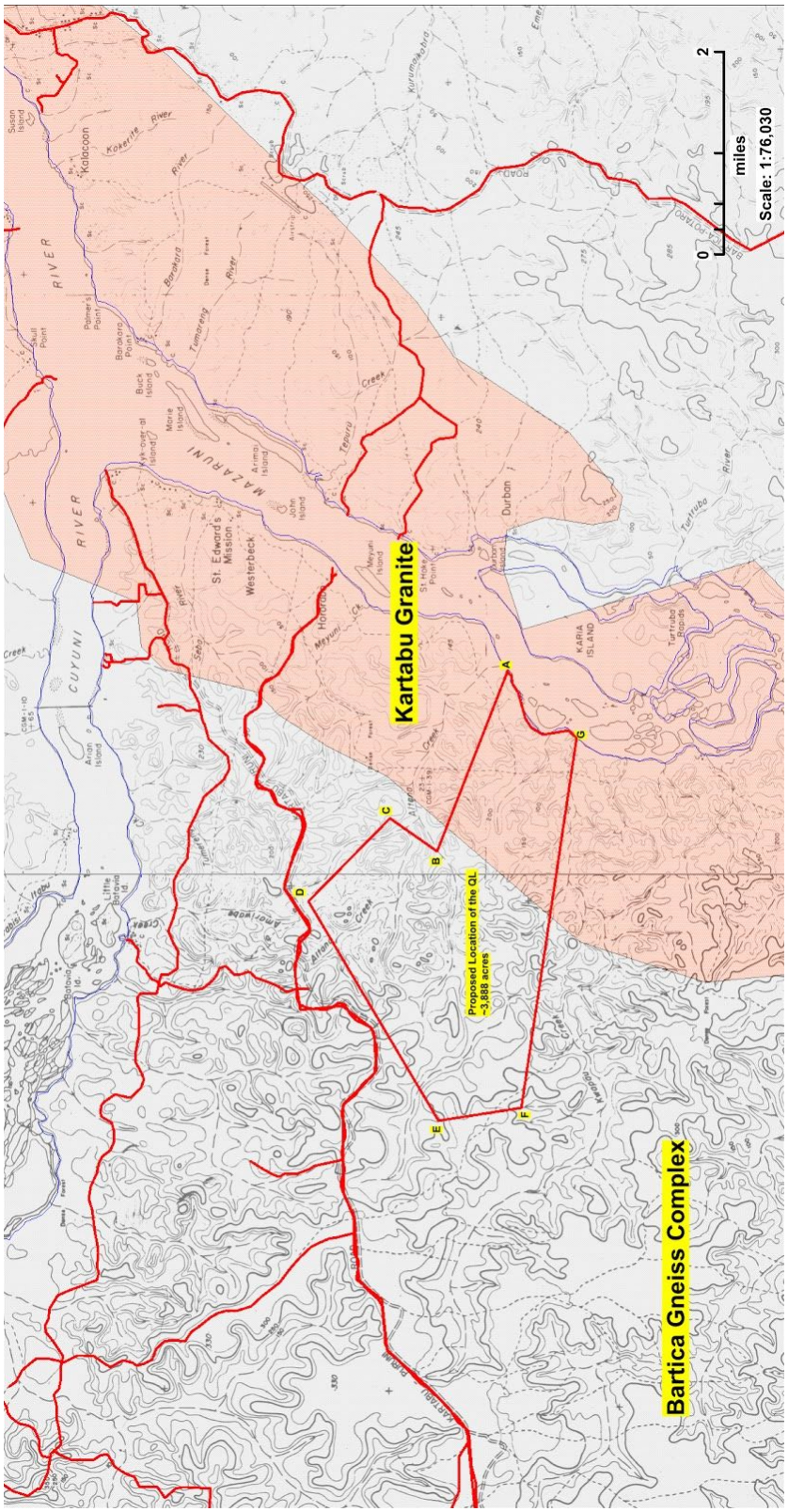
The proposed QL is dominated by sharp and steep hills with elevations reaching over 200 feet. The area is drained by a dendritic network of moderately incised small streams and creeks. The hills and ridges are elongated and oriented along a dominant N-S structural trend. The high elevations carry relatively sharp and steep slopes as a result of hard underlying rock which resists mass movement. The lower elevations are covered by fluviatile material. The Project area is veneered entirely by tropical lowland forest with the canopy height ranging from approximately 15m to 20m. Aside from tracks and trails made by small scale artisanal loggers the forest cover has essentially been preserved, only very selective logging practices were carried out in the area.

The area is currently undeveloped and uninhabited, there is no activity in the area presently - neither mining or logging. Selective logging was previously done in this area. The larger general area is already designated as mining lands and have been allocated to several persons as a series of medium scale prospecting permits for gold. The area to the immediate north is being granted as LM 40: B-1000/000 to BK Quarries Inc. for quarry development.

Map 4: Topographic Map of Proposed QL



Map 5: Geological Map of Proposed QL and surrounding area



7) Climate

The climate in Guyana is strongly influenced by the Inter-tropical Convergence Zone (ICZ). Due to the movement of the ICZ, most climate variables show bimodality through the year. There are two (2) wet seasons and two (2) dry seasons, the dry season months have an average of more than 150 mm of rain per month. The long wet season occurs from May to August, and a short wet season from December to February. The intervening months are drier, with October being the driest month. In November a thermal low pressure develops in the Amazon basin, causing air masses to flow into the basin, thus diminishing the effect of the normal air convergence of the ICZ. Therefore, the December rainy season is less pronounced. Rainfall in Guyana is greatly affected by the Pakaraima Mountains in the west and the Wilhelmina Mountains of Suriname in the east. As easterly winds prevail, orographic uplifts and subsequent condensation causes a high rainfall of 4400 mm on the eastern sides of the mountains. The annual rainfall decreases 1700 mm on the western sides of the mountain.

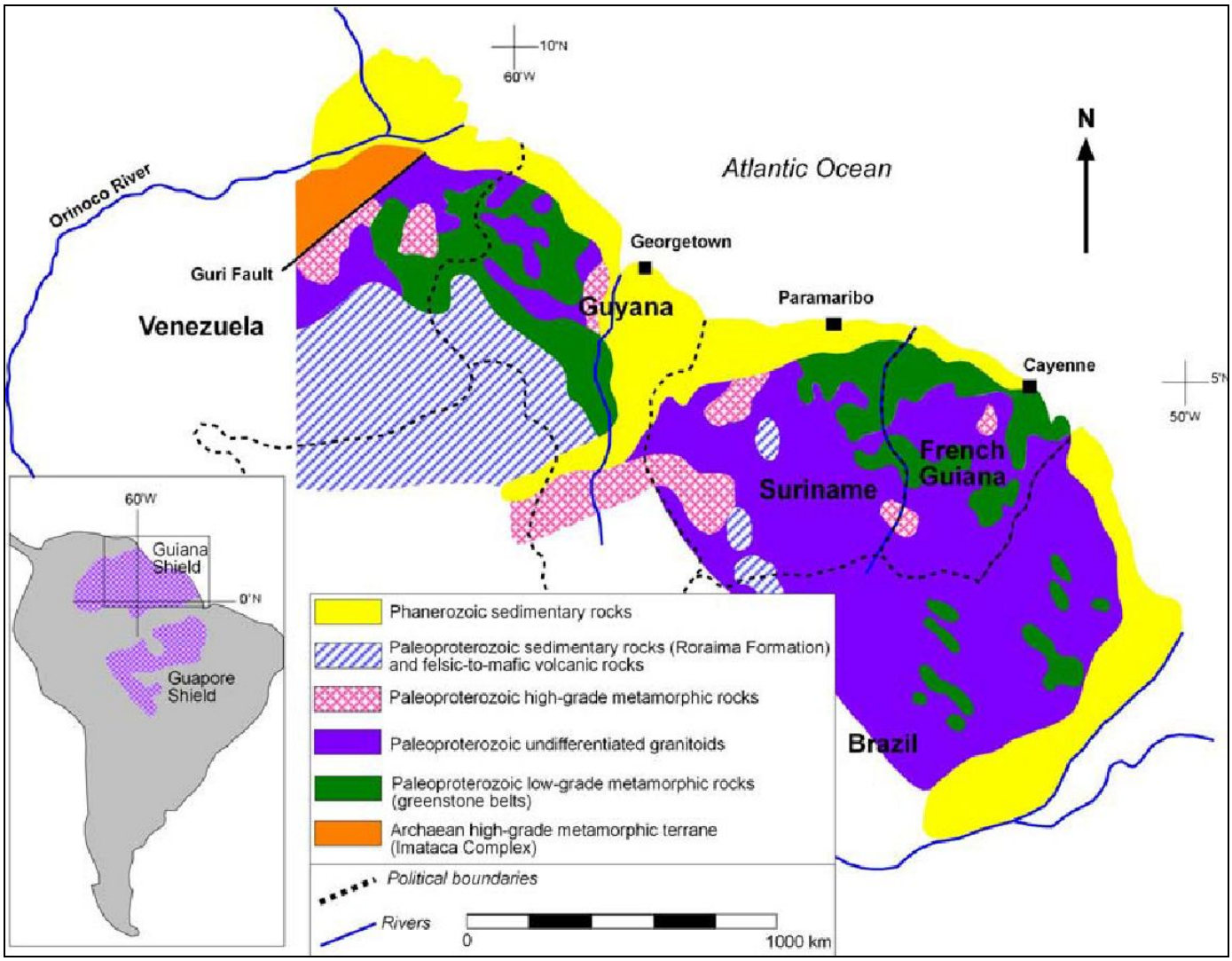
Within the project area, which is characterized by a tropical rainforest climate, annual rainfall averages about 3000 mm. Temperature along the creeks ranges from 29˚C to 31˚C; under the forest canopy it is humid but cooler.

8) Infrastructure and Services

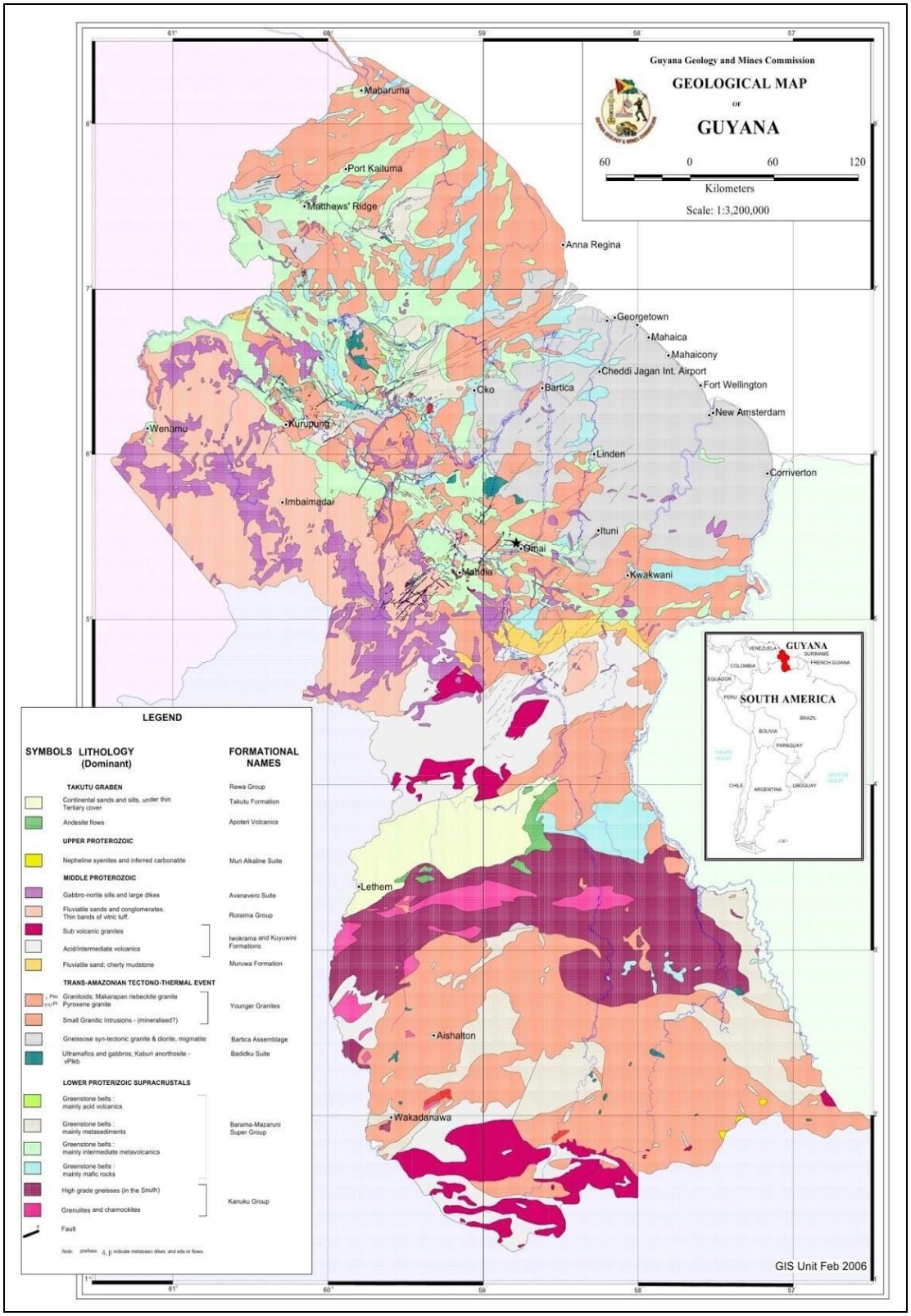
Within the area of the proposed QL itself there is presently no infrastructure, save a few old logging roads. However, in proximity to the Project area are a number of shops and residences at the Iteballi pontoon crossing which caters to the flow of equipment, personnel and supplies to the gold mining operators further in the mining district. There is also the town of Bartica just a few kilometers downstream, approximately 20km north. Bartica has a population of approximately 50,000 persons is a fully equipped town with all civil and commercial facilities readily available. Under normal circumstances the operations within the proposed QL will be supported with transport of goods and services from Georgetown either though Parika and the Essequibo river or through Linden and the trails. Necessary infrastructure and service requirements will have to be met by the development of onsite infrastructure.

9) Geological Setting

Map 7: Simplified Geology of the Guiana Shield



Map 8: General Geological Map of Guyana



9.1) Local Geology

The area under and around the proposed QL is dominated by two main features. The first is a large granitic intrusion which stretches approximately 24 km from the Trape Falls area, under the Mazaruni river, through the Durban, Baracara and Teperu quarries (which is extracting the same granitic material) and goes further north. This granite is locally called the Kartabu granite and is NE-SW in orientation. It is on both banks of the Mazaruni with the river incising its roughly along its long axis. Its width is consistently ~6 km throughout the 24 km length. The intrusion is expressed at the surface in a series of non-uniform topographic highs. The granite, as described by H. Schielly 1968, is made up of 'uniform and massive, leucocratic muscovite granite which contains a few angular, black xenoliths of biotite hornblende hornfels (less than 1%)' .

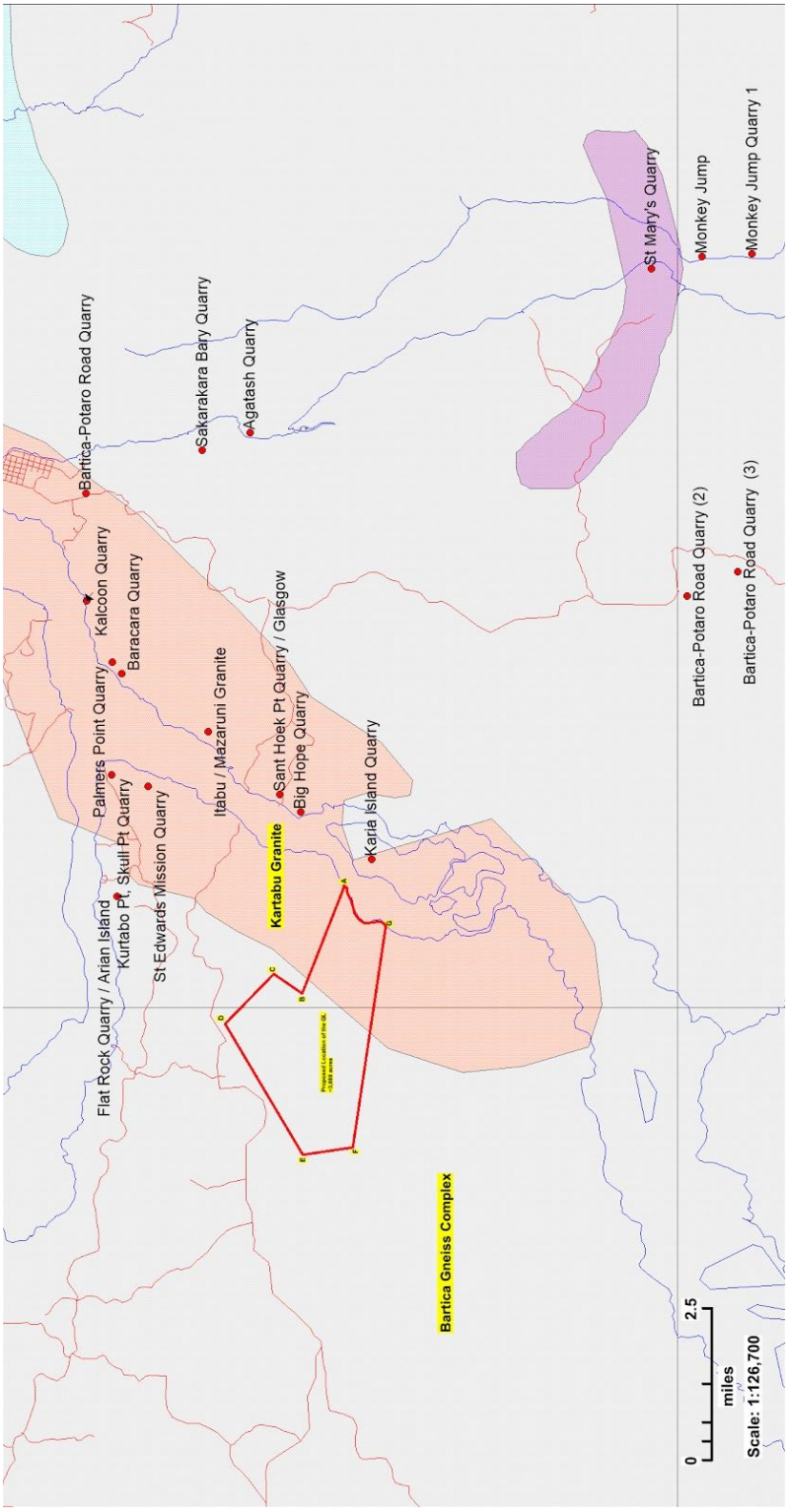
The second feature is the Bartica - Gneiss complex, which is a broad term applied to a large area of metamorphosed rock, which were generously intruded by the younger granitoids. From H. Schielly 1968 observations in this and similar areas found the variation in this setting to be between biotite gneiss /biotite granite/granite gneiss and biotite hornblende gneiss.

The material within the project area is described by Schielly as heavily jointed, foliated, hornblende-biotite gneiss with granite and pegmatite dykes and even if fractured moderately still carries good characteristics for the following utilization:

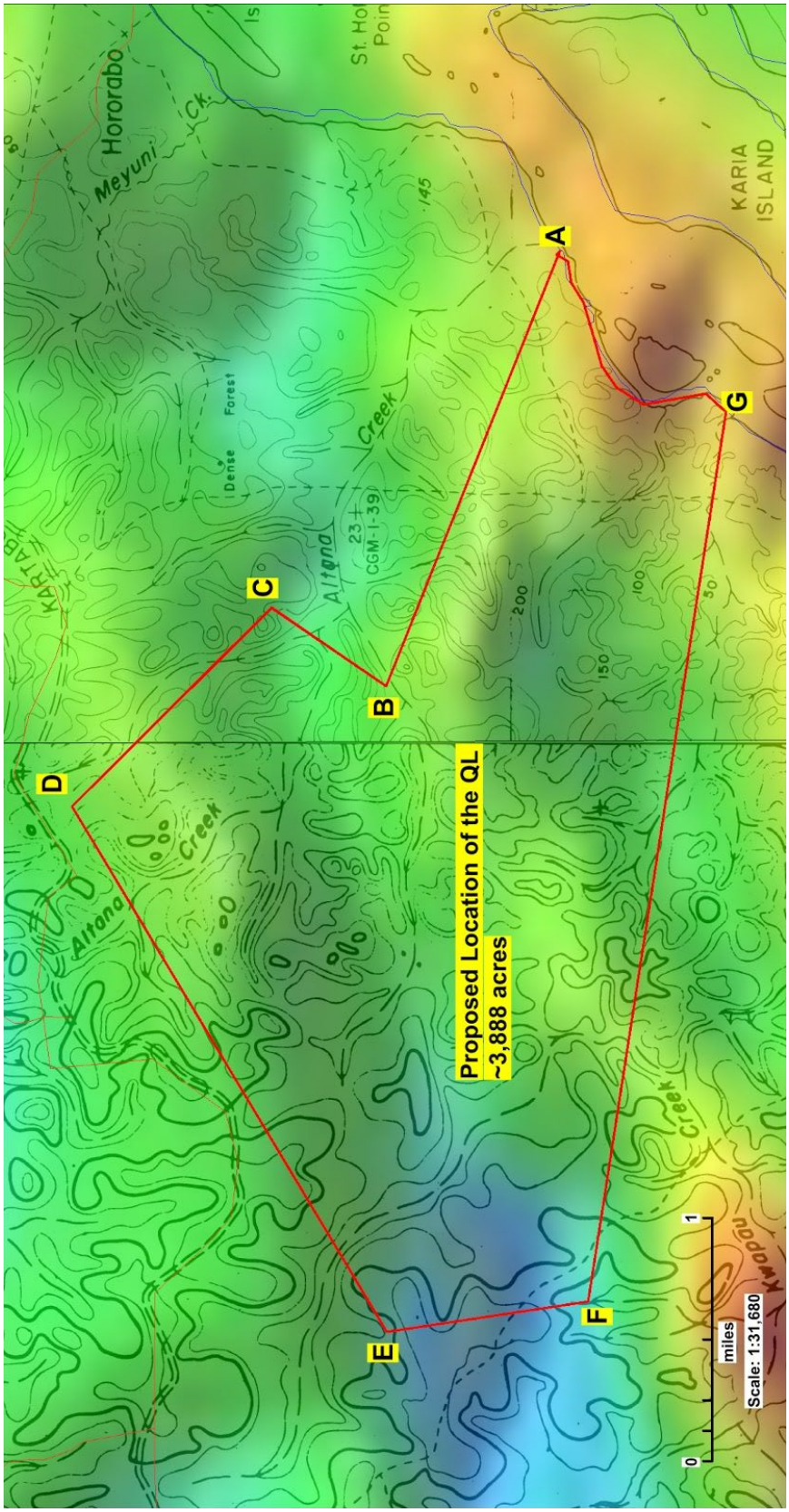
1. It is suitable for first class concrete aggregate
2. It is suitable for road foundation works and other foundation and fill applications
3. Large boulders and armor layer material for use in sea defenses

The suitability for utilization of the other rocks originating from the Bartica - Gneiss complex will depend on the extent to which it may have been deformed/metamorphosed/foliated and will be determined upon further investigation.

Map 9: Location and Geological Map of other historic and active Quarry Occurrences around the proposed QL



Map 10: Topographic and Aeromagnetic data of the Proposed QL



10) Hard Rock Resource Estimate

The only resources estimate available at this time is from the work done by H. Schielly in 1968. According to him the nearby Durban quarry area has reserves of 5-6,000,000 tonnes. The proposed QL encloses an area of 3,8888 acres which is dominated by a topographic highs that are roughly the same as those of the Durban quarry area. Also, the morphology of these high areas indicate that they are mostl likely related to the regional NE-SW trending intrusions that passes through the entire area. These intrusions are prime sources of material for aggregate production. Based on these facts and other supporting data it would be reasonable to expect a reserve of approximately 2,000,000 tons. This will be verified and quantified by comprehensive drilling after operations have been established in the project site.

11) Proposed Quarry Equipment Configuration & Utilization

11.1) Stripping Plan (General)

The Cat. D8 bulldozers, excavators and trucks will spend 100% of their time for the first month to strip the overburden and establish the working faces. After which the bulldozer will carry on much of this work by itself with the excavators and trucks using an expected 20% of their time when necessary to help remove the overburden. Dumping of overburden will take place outside the stripping limits into valleys and other low areas; adequate dumping room is available.

11.2) Quarry Plan (General)

Quarrying will be done with a fleet of two (2) 720 Cat. Trucks being loaded by two 245 Cat.excavators; the 980 Front-end loader (Caterpillar) can serve as a standby loading machine. Quarrying of stone will be done using an operating system (2*10*6). A truck productivity of 40 tons per hour is estimated with average cycle time of 30 minutes and effective truck capacity of 20 tons. The annual production (estimated) is ~134,400, tons and with an estimated ore, loss of 2.5% or 3,360 tons the crude ore supply will be 131,040 tons.

11.3) Drilling and Blasting (General)

An Ingersoll Rand ECM590 Rotary percussive Blast hole Drill will be utilized to drill 3 ½ inch diameter holes. Senatel Magnafrac will be used as the primary explosive, initiated by primer cord and 25 millisecond delay detonators.

A programme for dry season drilling and blasting only will not be possible at this or any other location in Guyana since the rainy season is now indefinite therefore drilling and blasting will also have to be done during the rainy season..

Drilling and Blasting is a field science and it is difficult to arrive at a blast design until some trial and error tests are carried out in the field. From the local experience and knowledge the Crater Test can be a useful start to arrive at an "optimum depth, grid, spacing, and burden and power factor"-this may have to be adjusted after first production blast design.

For this quarry operation, the spacing, burden and Powder Factor previously used at the St. Mary's quarry is reused- a grid system of 8ft by 8ft and Powder factor of three (3) tons per pound of explosive – with the proviso that this blast design will have to be modified for "effective" fragmentation.

With the face, being approximately 64 feet high it will be important that drilling and blasting be done in two (2) lifts of approximately 32 feet each.

The magazine design and protocols already established by the Guyana Police force and other regulatory will be implemented and utilized for this operation.

11.4) General Drainage Plan

An effective drainage system is necessary for this Quarry. The 236 excavator and D8 bulldozer will have to be utilized to establish both top level and quarry floor level drainage (See Topographic Plan). Dykes and drains will be established on top of the quarry face and drains will be drilled and blasted around the quarry face and drains will be drilled and directed to the Mazaruni river.

Priority will be given to the maintenance of these drainage systems for a clean/ dewatered quarry

11.5) Crushing and Loading

Crushing operations will start with a mobile crusher being used to crush first 200,000 tons. This mobile Crushing Plant is rated at 80 tons/ operating hour.

This size specification for the crusher is as follows:

Siftings		
¼"minus	)	
⅜"	)	
½"	)	Aggregate
¾"	)	
1"	)	
Rip-Rap		
Boulders		

Out-loading will be done with two(2) motor tugs boats at 1800 h.p each and six (6) 2500 ton barges (one equipped with extremely heavy metal decking for riprap and boulders).

The estimated barge turn around time is 72 hours-24 hrs on the river , 24 hrs at production site wharf (on-loading) and 24 for offloading; efforts will be made to reduce on this barge turn around time by reducing on the on – loading and off-loading times.

It is estimated that 131,000 tons of product will be transported down river per annum.

No immediate river dredging will be required at this time for continuous river transport (for all tides), as the wharf is located downstream of the rapids in the area.

12) The Life of the Quarry

Assuming an annual crude ore supply of 134,400 tons to satisfy a minimum annual out-loading of 131,040 tons for the first three (3) years of operation and from the fourth year, production will be boosted by 50% by works done in the third year to increase capacity and productivity, it is envisaged that this quarry will have a life of at least 11 years based on the reasonably estimated reserves of ~2,000,000. The expected total reserves in the proposed QL subsequent to drilling verification should see at least 10 years added to the life of the quarry for a total of at least 21 years.

Map 11: Draft Site Plan of the Proposed QL