2023

CLIFTON ANTHONY HICKEN- SAND PROJECT: OPERATIONAL PLAN

Prepared by : Robert Bostwick

Geological Engineer

Prepared for : Clifton Anthony Hicken

Project Proponent

Contents

1 Operational Plan 6

1.1 Introduction 6

2 Location and Access 8

3 Geology 9

3.1 Regional Geology 9

3.2 Local Property Geology 10

4 Climate 12

5 Vegetation 13

6 Physical and chemical characteristics 13

7 Market Outlook 14

7.1 Silica Sand Industry Drivers: 14

7.2 Projections 15

8 Reserve Estimation for Sand 15

9 Mining methods 17

10 Production Schedule/sequence 17

10.1 Equipment selection 18

10.2 Staffing Requirements 18

11 Financial Considerations 19

11.1 Capital Costs for Project 19

11.2 Operating Costs of mine 20

11.3 Profits 20

12 PROJECT SITING 21

12.1 WATER 22

Environmental Management Plan for Project 23

13 Objectives of EMP 23

14 Project's Policy Statement 25

15 Policy Principles 25

16 Institutional Arrangement 26

17 Key Potential Physical Environmental Impacts and Risks 26

17.1 Construction Impacts 27

17.2 Impacts on Soils 29

17.3 Operation Impacts 33

17.4 Air Quality 34

17.5 Power Generation 35
17.6 Generation of Solid Wastes 35
17.7 Water Resources – Impacts to surface water 35
17.8 Key Potential Ecological Environmental Impacts and Risks 38
17.9 Construction Impacts 39
17.10 Loss of Aquatic Habitats 39
17.11 Operation Impacts 40
17.12 Key Sociocultural and Socioeconomic Impacts and Risks 42
18 Implementation of EMP 48
18.1 Training 48
18.2 Environmental Management Responsibilities 48
Environmental Management Responsibilities 49
19 Communication 49
20 Reporting and Monitoring 49
Reporting and Monitoring Requirements 50
20.1 Management of Environmental Incidents, Complaints and Non-Conformances 50
21 Review of EMP 51
22 Water Management 52
22.1 Issues and Aspects 52
22.2 Action Plan 57
23 Biodiversity 58
23.1 Issues and Aspects 58
23.2 Noise and Vibration 59
23.3 Air Quality 61
23.4 Hazards and Risk Management 62
23.5 Traffic 64
24 Social Management Plan 65
24.1 Fuel Oil Management 66
24.2 Waste Management 68
24.3 Hazardous Material Management 69
24.4 Soils Management 69
24.5 Erosion and Sediment Control Plan 70
24.6 Overburden Management 72
25 Operations 72
25.1 Issues and Aspects 72
26 Environmental Monitoring 75
26.1 General Monitoring Requirements 75

26.2 Air Quality & Dust Monitoring 76
Emergency Response Plan for Clifton Anthony Hicken Sand 84
27 Introduction 84
28 AIM of the Emergency Response Plan 84
29 Objectives 84
4 Clifton Anthony Hicken project Assessment 85
30 Reviewing and Updating the ERP 87
31 Incident Classification and Response 88
32 Types of emergencies 88
32.1 Immediate response 88
32.2 Emergency response 100
33 ER Team Purpose 102
33.1 ER Team Responsibilities 103
33.2 Damage Control / Containment 103
34 Communications (internal and external) 104
34.1 Internal Communications 104
34.2 External Communications 104
34.3 Evacuation 104
35 Declaration of an Emergency 106
35.1 Emergency Response Centre 106
35.2 Activation 107
36 Interaction with Emergency Services 108
36.1 Hand Over Control 109
37 Administration 111
37.1 Public Relations and Debriefing 111
38 Training and Evaluation 113
38.1 Review and Revision of the Plan 114
39 CLOSURE PLAN- CLIFTON ANTHONY HICKEN SANDPROJECT 115
39.1 Introduction 115
40 Purpose and Objectives of Report 115
41 Rehabilitation Management Plan 116
41.1 Rehabilitation Objectives 116
41.2 Conceptual Final Landform and Land Use 117
41.3 Rehabilitation and Revegetation 118
42 Final Void Management 125
42.1 Objectives 125
43 Closure and Decommissioning 128

43.1 Closure Objectives 128
43.2 Closure Methodology – Earthworks and Rehabilitation 129
44 Post Mine Land Use 130
44.1 Land Capability 130
44.2 Sudden or Unplanned Closure 130
45 Roles & Responsibilities 131
46 Review 131
46.1 Sand Records 132
47 Appendices 133
47.1 Appendix 1 – Image of Proposed Fuel Storage Tank 133
47.2 Appendix 2- Cross-Sectional View of Containment Structure 134
47.3 Appendix 3- Conceptual Representation of Closure 135
47.4 Appendix 4- Conception Sequence of Reclamation 136

PROJECT INFORMATION

PROJECT PROFILE

PROJECT NAME	CLIFTON ANTHONY HICKEN PROJECT
NATURE OF PROJECT	MINING OF SAND
PROJECT LOCATION	**YARROWKABRA**
PROJECT SIZE	Property Size: 11.7 Acres
PROJECT COST	
PROPONENT PROFILE	
PROPONENT'S NAME	CLIFTON ANTHONY HICKEN
OFFICE ADDRESS	28 HASLINGTON E.C.D
AUTORIZED SIGNATORY	CLIFTON ANTHONY HICKEN
CONTACT DETAILS	TEL: (592) 600-3019

1 Operational Plan

1.1 Introduction

Mr. Clifton Anthony Hicken of Lot 1454 Block X East Bank Demerara has sought to acquire from the Guyana Geology and Mines Commission Mining Permit for the purpose of extracting on a commercial scale quarry sand.

The scope of this document is to detail the operational parameters of the Project involving the extraction and removal of sand.

This document details the extraction of the sand; the emergency response measures associated with such mining activities; the measures to manage and mitigate the environmental concerns; and the plans for reclamation and closure of the site upon the completion of the mining activities.

This document is intended as a tool for the management of the mining activities and will be used to guide the developers' operations throughout the life of the mine; it will be modified to capture any other issue that may arise that wasn't captured in the initial investigations.

The preparation of this Mine and Progressive Mine Closure Plan is to fulfill the conditions stipulated by the GGMC required under the mining Act Cap 65:01 of the Cooperative Republic of Guyana.

The mining activities will be guided by the GGMC Mining Environmental Management Codes of Practice for Sand and Loam (2010), which is based on sound management practices and on principles and approaches from various sources.

2 Location and Access

The area can be accessed by road from Georgetown to Soesdyke, then via the Linden-Soesdyke highway, then via a sand trail for approximately 1 km until the property boundary has been entered. Total trip time is approximately 1 hr.

It is intended that the boundaries will be demarcated and marked accordingly when all permits are issued in order to prevent any potential conflict and identify property. (see fig. 1)

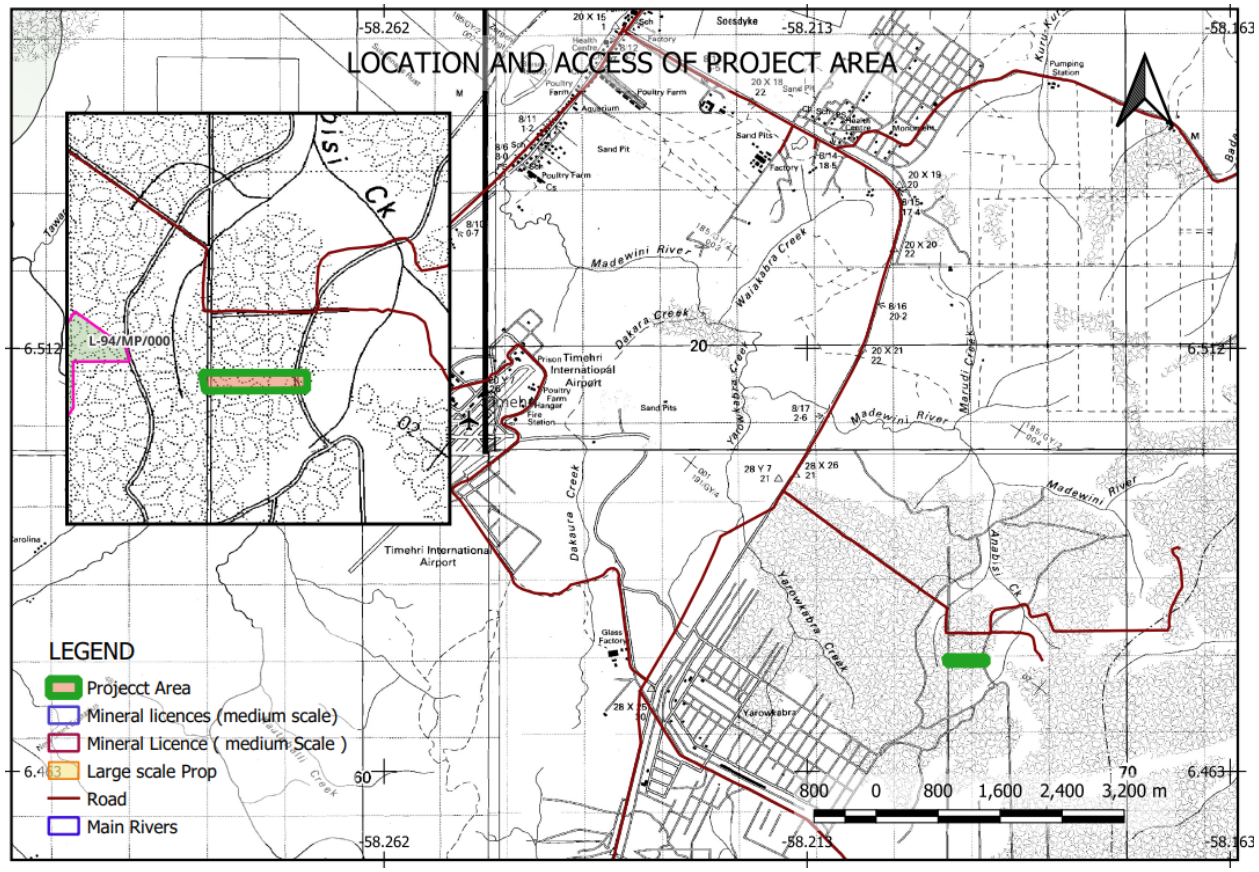


Figure 1- Location and Access Map of Sand Project

3 Geology

3.1 Regional Geology

The area is located in Trans-Amazonian Tectonothermal province in the Guiana Shield, part of the Amazonian Craton (Plate 6). The Trans-Amazonian Tectonothermal province is a granitoid- greenstone terrane between 2.25 and 2.0 Ga in age (Gibbs and Olszewski, 1982; Cox et al., 1993; Santos et al. 2000) whose structural trends broadly parallels the Atlantic coast from Venezuela, through the Guianas to Amapa state in Brazil. In Guyana, the region's rocks, collectively known as the Barama-Georgetown Supergroup, are Paleoproterozoic in age and comprise an east-west trending series of mafic through felsic volcanic flows with intercalated clastic sediments (Gibbs, 1980; Gibbs and Barron, 1993). The Barama-Georgetown Supergroup sequences formed through orogenic collision events, which developed due to juvenile plate tectonic processes (Gibbs and Barron, 1993). These strata were deformed by the Trans-Amazonian Tectonothermal Episode (2.1- 2.0 Ga). They were subsequently intruded by granite intrusions known as the Younger Granite Group, which probably were emplaced coevally with a regional sub-greenschist facies metamorphic event (Williams et al., 1967)

Mafic dykes belonging to the Younger Basic Group or the Avanavero Suite (1.78 Ga) cut the metamorphosed rocks as seen at Bartica. The Georgetown Assemblage in eastern Guyana consists of various ortho-and Para gneisses and amphibolites, generally metamorphosed in the almandine facies (Gibbs and Barron, 1993). The development of hypersthene in some Georgetown Assemblage bands suggests that these may have reached the granulite facies, possibly reflecting an original dried composition (Cannon, 1964). The northern Guyana metallogenic Province, which includes Barama-Georgetown Supergroup, is the principal metallogenic province of Guyana.

3.2 Local Property Geology

Three distinct lithological units are found within the area (Figure 2). The oldest unit being the Georgetown Gneiss complex with ages of 1.9 Ga – 1.8 Ga, then the pluton was emplaced (younger granites) approximately 1.7 Ga – 1.6 Ga ago. The PAPA dykes (Post Avanavero Pre Apoteri) then intruded the Georgetown gneiss complex around 0.2 Ga.

The geology of the deposits was essentially defined by channel profiling. Superficial white sand, carrying a distinctive xerophytic scrub vegetation, associated with the Georgetown Formation extends to depths of over 30 m. and has gradational contacts with flanking material. Discontinuous pans of humic material occur below. Shallower profiles show pronounced development of a humic B horizon overlying red sandy clay. The results suggest that the white sand was derived from sediments of a ferruginous nature with greater clay content, which supported a higher forest formation.

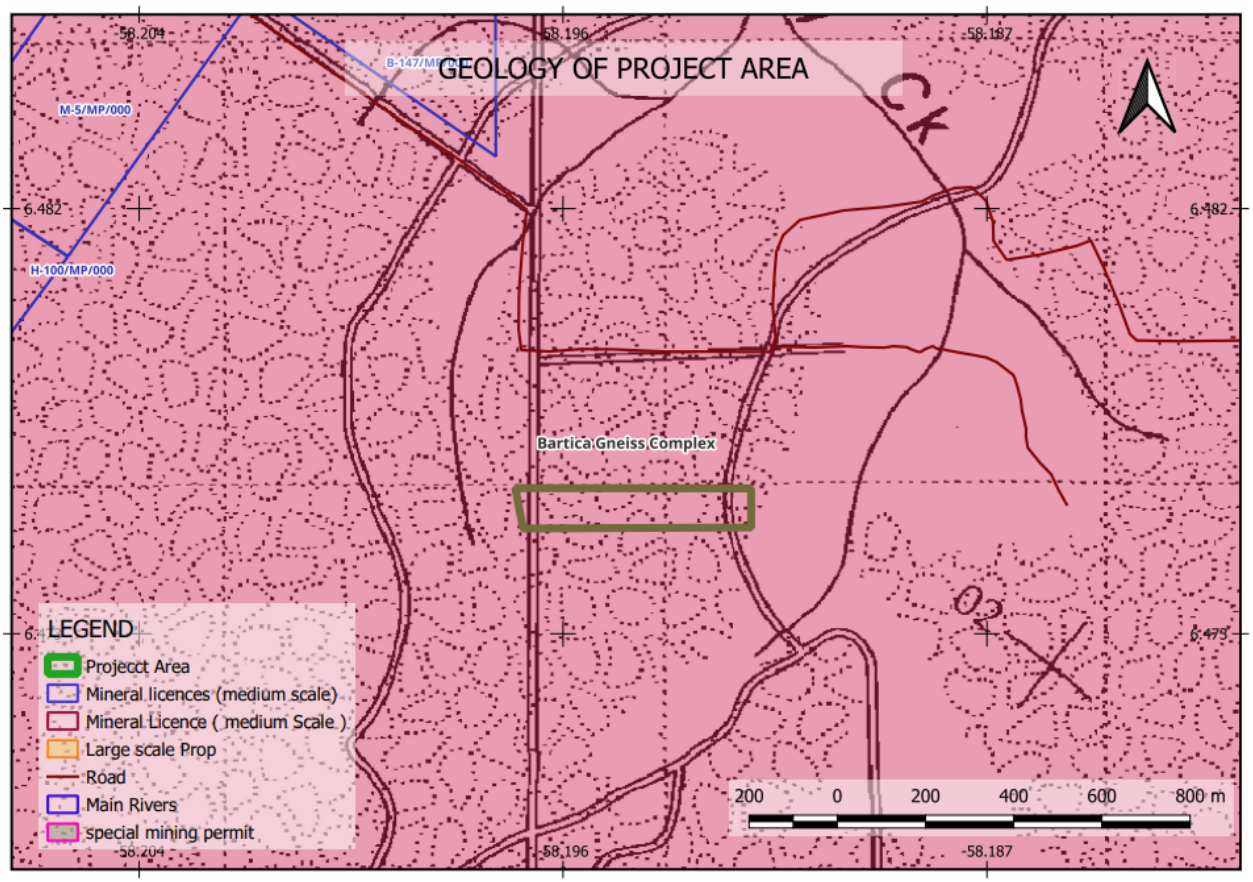


Figure 2- Geology and mine development of Project Area

4 Climate

The climate in the proposed project area is tropical and is typical for the near coastal region of Guyana. The climate data for the project area came from the Hydro meteorological office. Weather data from the Timehri and Georgetown weather stations were used since the area is located between the two (2) stations. Climate data for five (5) years (2005 – 2009) were reviewed and compared.

Rainfall data for the last 30 years (1979 – 2009) from the Timehri station was analyzed. The average annual rainfall is 2,614 mm, while pan evaporation data for 1997 to 2007 indicate that the annual evaporation rate is 1,353 mm. The rainfall occurs in two (2) distinct seasons: May to July and December through January. The driest period is between August and November.

The average monthly mean temperature, which does not fluctuate much throughout the year, is 26.7 °C. Relative humidity is generally high, averaging about 81%, but can vary significantly. The daily average maximum humidity from the data collected thus far is 94.2% while the average minimum humidity is 45.5%. Wind speed is, on average, higher during the dry season than the wet season, but the highest instantaneous wind speeds tend to accompany severe thunderstorms, with maximum observed wind speed to date achieving 16.7 km/h at the campsite. The average wind speed recorded is 2.1 km/h. Winds flow predictably from the E/NE during the dry season. Winds during the wet season continue to move principally from E/NE to S/SW, but this is much more variable than in the dry season. The prevailing weather conditions allow for the mine to operate throughout the year.

5 Vegetation

The main area of direct influence of the proposed project is characterized by vegetation which can be described as dakama rainforest. This area has been logged for the commercial species in the past and it was observed that smaller trees of secondary growth are widely distributed over the study area. The canopy of the forest in the area is fairly open, reflecting the impact of logging, allowing light penetration to support understory growth.

The proposed Project is dominated by flat sand dunes with elevations reaching hardly over 30 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 NE-SW trend. The Project area is veneered entirely by tropical lowland forest with the canopy height ranging from approximately 4 to 9m. Aside from tracks and trails made by small scale artisanal loggers the forest cover has essentially been preserved.

6 Physical and chemical characteristics

Technically, sand is merely a size category. Sand is particulate matter that's larger than silt and smaller than gravel. Different specialists set different limits for sand: Engineers call sand anything between 0.074 and 2 millimeters, or between a U.S. standard #200 sieve and a #10 sieve. Soil scientists classify grains between 0.05 and 2 mm as sand, or between sieves #270 and #10. Sedimentologists put sand between 0.062 mm (1/16 mm) and 2 mm on the Wentworth scale, or 4 to –1 unit on the phi scale, or between sieves #230 and #10.

In some other nations a metric definition is used instead, between 0.1 and 1 mm. From a geological viewpoint, sand is anything small enough to be carried by the wind but big enough that it doesn't stay in the air, roughly 0.06 to 1.5 millimeters. It indicates a vigorous environment. Most sand is made of quartz or its microcrystalline cousin chalcedony, because that common mineral is resistant to weathering. The sand is of a high quality silica with little impurity, which makes it ideal for various purposes.

The white sands in the project area are excessively drained, very deep soils which consist for almost 100% of quartz sand. They are mainly located on the nearly flat interfluves but locally also on the slopes. These soils are acid and have extremely low levels of plant nutrients. Also the soil moisture storage capacity is very low.

7 Market Outlook

Silica sand, generally known as industrial sand, is one of the most common varieties of sand found across the world, and this is no exception to Guyana. Silica sand has been mined for thousands of years and was first put to industrial use during 3000 -5000 BC for metallurgical and glass making activities. Nowadays, silica sand is being used for well - diversified applications including paving roads, glass making, foundries and coal burning boilers, oil and water filtration, industrial casting, sandblasting, etc. Apart from this, it is also used in the hydraulic fracturing process where the demand for silica sand has increased significantly in the recent years. This can be accredited to the advantageous properties of silica sand such as strength, high silica content, as well as resistance to heat and chemical reactions.

From a global perspective, the silica sand market reached around US$ 14.1 Billion in 2020 (IMARC, 2021 Silica Sand Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2021-2026). Moreover, looking forward the market is expected to exhibit moderate growth during 2021-2026.

7.1 Silica Sand Industry Drivers:

Globally, the glass market is experiencing high growth due to increased demand from the construction market, rising automotive production and sales, mounting per capita income, and technological advancements. Besides this, emerging trends such as increasing usage of hybrid guide plate, solar control glazing for automotive and building glasses, lightweight glazing glass, and advanced nanotechnology in flat glass are also contributing towards the growth of the glass industry, consequently, boosting the demand for silica sand.

It is a known fact that several countries worldwide are preferring naturally available shale gas in order to reduce their dependence on crude oil. Shale gas is extracted using hydraulic fracturing process, wherein silica sand is used as a proppant. As a result, the growth in the gas production is expected to increase the demand for silica sand.

On the local scene, upcoming infrastructural projects in various parts of Guyana are envisaged to stimulate the construction industry, thereby mounting the demand for sili ca sand, and lateritic material across different sectors. For instance, the construction of Linden-Mabura Road, the construction of the East Coast- East Bank by-pass and the

construction of 56km of road from Parika to Monkey- Jump. In addition, the construction of several malls and hotels which are scheduled to come on stream in the near future would significantly increase the demand for sand throughout the country.

It is a known fact, that the traditional sand-pits along the Linden Soesdyke Highway are the main suppliers for the local sand market and it a known fact that many are near exhaustion. It is therefore imperative that as the demand for sand increases in Guyana, new locations for extracting sand must be opened up so as to eliminate to possibility of shortages of sand on the local market. The granting of this sand mining permit would ensure that the available local market is tapped into.

7.2 Projections

The Ministry of finance reported that in 2018 there was an increase of 12% in the construction industry (CDB, 2018) and there continues to be a steady increase in the demand for construction material including sand. Based on the current market trends and prices, the market forecast over the next few years is extremely viable for this commodity.

The figures obtained after conducting financial analysis within the current market structure would support the case that based on the current and projected market prices and trends, that a project of such a nature as this one would be viable to execute.

8 Reserve Estimation for Sand

The reserve estimation was done to guide the long term feasibility of the project; in calculating the reserve, boreholes data collected played a critical role. The data collected from the boreholes are, depth to bedrock, depth to water table and bulk density. The bedrock was intersected at 30 m and the water table was intersected at 22 m. factoring the environmental implications of possible contamination of the water table, and the feasible operating parameter of the equipment selected, it was determined that the mine would not go beyond a 10 m depth. The mine would be restricted to an area of 5 acres. The reserve has been calculated below.

Allotted area = 11.7 acres

Area of mine = 5 acres

Depth to bedrock = 30 m

Depth of mine = 10 m

Bulk density = 1600 kg/m^3

Mineral Property (11.75 acres)

1acre = 4046.86 m^2

Tonnage = V x BD

V= A x H

Total area in m2 = 11.75 x 4046.86 =47,550.605

m2

V = 47,550.605 m2x 10 m = 475,506.05 m3

Tonnage = 475,506,95, m3 x

1600kg/m3

T = 760,809,680 x .001 =

760,809.68Tonnes

The production target for the Project is 76,000 tons of sand annually for a mine life of 10 years. Mining operations for the Project will be five (5) days per week, operating on one (1) eight (8) hour shift.

9 Mining methods

The mining method selected for the Project is conventional truck and shovel for both overburden stripping and sand mining. The shallow pit depth, relatively low production levels and soft ground conditions favour a fleet of backhoe oriented hydraulic excavators and small rigid frame mining haul trucks, as no rock blasting is required.

The mine would be developed using straight trenches, Thickness of the bench is limited to 3.0 m only and width will be more than 1.5 the height of the bench. The sand will be excavated using a backhoe. The commodity would be loaded onto a truck which will use already established trails. Sand extracted would sold to trucks on site

As it relates to the vegetation and topsoil, these will be cleared by a backhoe ahead of the mining operation. Suitable organic material will be stockpiled for future reclamation use. Overburden and clays will be stripped with backhoe exposing the siliceous zone; it is important to note that no drilling and blasting is required to facilitate the extraction of the sand.

To properly manage water infiltration into the pit, a sump will be established at the lowest point on the pit floor. Water collected in this sump will be pumped to a collection point at surface.

10 Production Schedule/sequence

A production schedule is developed for the life of the Project. The schedule realizes the pre-production requirements and meets the annual production target of 72,000 tons.

The pre-production phase of mining will begin east and progress west. The stripping ratio is very low, and a total of 10 tons of waste material will be excavated during pre-production along with 70,000 tons of Sand, Unsuitable grade of materials mined during pre-production will be used for capping of the haulage road. All other waste will be hauled to an area designated for the waste dump.

During the first five (5) years of production, mining will progress in Southern half of the pit, establishing the Eastern and western portion of the final pit wall.

Sufficient waste will be stripped each year in order to expose the materials to be mined for the following year's production. The stripping operation would be carried out in approximately 30 m wide panels that run the 200 m length of the western half of the pit. To reduce the slope of the advancing face, the stripping will be carried out in two (2), 5 m high blocks.

10.1 Equipment selection

The sand will be sold at site so there will be no need for a tipper. The debushing and excavation will be done using a CAT hydraulic excavator (backhoe/shovel), this will suffice the tonnages presented in the mine plan. A CAT 950 bucket wheel loader will then be used to load the sand onto the dump truck One Toyota land cruiser will be used to transport personnel in and out of the mine, and for supplies and this will complete the mining fleet.

Description	Quantity
CAT hydraulic excavator	1
CAT 950 bucket wheel loader,	2
Toyota 4x4 land cruiser	1

Table 1-List of Equipment Required for Project

10.2 Staffing Requirements

For the effective and efficient operation of the Clifton Anthony Hicken Project, a compliment of 5 employees of various skillsets are required.

Employment Capacity	Number of personnel
Mine Superintendent	1
Excavator Operator	1
Loader Operator	1
Mechanic	1
Labourer	1
Total employees	5

Table 2- List of Employees Required for Project

11 Financial Considerations

11.1 Capital Costs for Project

The Capital Costs estimate covers all areas of the Project and includes estimated capital costs from the initial set-up period to the capital costs during the life of the operation. The initial set-up period is envisaged to be no more than 6 months and it includes activities such as; detailed engineering, construction and mine development, while the capital cost during the life of the mine covers operation plus the mine closure and rehabilitation period.

The estimate was prepared with feasibility study based on current and traditional price points information. The estimate is presented in US Dollars unless noted otherwise. The overall capital costs accuracy level is estimated to be ± 15%.

The estimate was based on budgetary prices obtained from prospective suppliers of equipment and materials. The effective date of the estimate is the end of the fourth quarter of 2022. The initial capital costs estimate includes the materials, equipment, freight and labour required to develop the open pit mine, facility construction, hauling, storage and loading. Capital costs during the life of the mine essentially include costs for mine equipment additions and replacement, additional roads and expansions. Mine closure costs are also part of Sustaining Capital Costs.

The summary capital costs estimate in USD for the total project over the life of the exploitation is shown in Table 3.

Item	Initial set up (USD)	Ongoing Capital cost (USD)	Total (USD)
Roads	1000	1000	2000
mining	60000	10000	70000
Waste management	4500	2500	7000
Infrastructure and power	1000		1000
Auxiliary services	2000		2000
Spares and consumables	2000		2000
Developers cost	5000		5000
contingency	5000	5000	5000
Closure cost		5000	5000
Total	**80,500**	**23,500**	**104,000**

Table 3- Breakdown of Capital Costs of Project

11.2 Operating Costs of mine

The overall operating costs of the operation covers: mining, processing, water management, infrastructure and services as well as general and administration

Item	Annual Quantity (tons)	Revenue (USD)
Local market value ($8/t)	72,000	576,000
Total	**72,000**	**576,000**

Table 4-Operating Costs for a typical year of operation of LSH Project

11.3 Profits

In our economic model, profit is calculated by subtracting operating cost from revenues with a tolerance level of ± 25%. This gives the developers a projection that will allow the company to minimizes debt exposure due to making ambiguous assumptions and unnecessary expenditures.

12 PROJECT SITING

The geological explorations conducted ensured that the Sand will meet the material quality criteria and are economically viable for the operations of the intended project.

The following are the criteria used for site and technology selection:

• Functionality of the site location which refers to accessibility and mobility of the ore body with respect to the transport system to the market and the resources available essential for the sustained operations of the Sand and the manufacturing counterpart.

• Complementarity, and compatibility between and with various uses of adjacent lands, and associated activities they serve.

• Consistency with the natural resources plans and policies, and environmental regulations that guide the region, and the country at large.

• Mining facility design and operational requirements as established by others, including the Guyana Geology and Mines Commission, Environmental Protection Agency, the industry, and requirements of the market, among others.

• Implied in the choice of area would be the relatively stable peace and order situation.

• Input and participation from local stakeholders, and appropriate regional and national oversight agencies.

• Cost effectiveness – the value returned to the proponent for the investments to be made, and the contributions to the national and local governmental agencies, and the other stakeholders, including contributions to social development and management, environmental protection and enhancement, safety and health, mine rehabilitation and decommissioning.

• Development design factored in provisions for health and human safety, including the provisions for mining operations as provided by Guyana Geology & Mines Commission, and the Environmental Protection Agency for set back; and guidelines to protect humans, and their sources of livelihood, for example providing allowances to protect equipment used to minimize environmental impact due to operations.

12.1 WATER

Water consumption by the Sand operation will mainly be used for dust suppression in the area and this will be sourced from the recycled water from project's reservoir. Clifton Anthony Hicken Project plan that drinking water will be brought-in from a local purified water supplier, further aiding in the economic development of residents from the region.

13 Objectives of EMP

The principal objectives of this EMP are to facilitate:

- Compliance with the Environmental Permit from EPA
- The sustainable Management of Project's Operations

This EMP is guided by several international policies and local legislation and regulations developed to ensure sound management of the environment. National Policies, Regulations and Legislations which are relevant to the deliberations of this EMP include the National Environmental Action Plan, The Environmental Protection Air Quality Regulations, The Environmental Protection Water Quality Regulations, The Environmental Protection Noise Management Regulations, The Environmental Protection Hazardous Wastes Management Regulations, The Environmental Protection Authorizations Regulations, The Environmental Impact Assessment Guidelines for Mining, The Mining Guidelines for Water Quality, The Mining (Amendment) Regulations 2005, The Guyana Geology and Mines Commission Act of 1979 and Mining Act of 1989, The Amerindian Act No. 6 of 2006, The Occupational Safety and Health Act Chapter 99:10, The Wild Birds Protection Act Chapter 71:01, The Town and Country Planning Act Chapter 20:01, The National Biodiversity Action Plan, The Public Health Act Cap 145, The Forest Act 2008 and Guyana Forestry Commission Act 2007 and the Code of Practice for Timber Harvesting 2002.

Mr. Clifton Anthony Hicken will be committed to ensuring that all activities during the project are undertaken and managed in a responsible manner to promote our fundamental responsibilities to the environment in which we will be operating in.

It must be noted that the activities and operations will support the principles of sustainability and be managed to minimize effects on the environment.

The Project's Environmental Policy will aim to embrace the principle of sustainable development through implementation of the following commitments which are of relevance to this EMP:

- Conducting of operations to minimize environmental risk and, where practicable, eliminate adverse environmental impacts.

• Continual improvement of environmental performance including regular review and the setting of rigorous environmental objectives and quantified targets- particularly with regards to:

- Efficient use of energy (including appropriate use of alternative fuels);

- Conservation of water; - Minimization and recycling of wastes;

- Prevention of pollution; and

- Effective use of virgin and recovered resources and supplemental materials.

• Open and constructive engagement with communities that surround Operations.

• Reducing the greenhouse gas emissions from processes, operations and facilities.

• Protecting and where possible, enhancing biodiversity values at and around facilities.

• Complying with environmental legislation, regulations, standards and codes of practice relevant to the particular business as the absolute minimum requirements in each of the communities in which we operate.

It therefore follows that we will strive for continuous improvement in environmental performance involvement through:

- assessing the actual and potential impact of all our activities on the environment and taking appropriate actions to minimize any risk;
- conducting operations in a manner that complies with all applicable legal and regulatory requirements as specified by the Guyana Geology and Mines Commission (GGMC) and the Environmental Protection Agency (EPA);
- implementing measures to prevent or minimize pollution, waste and other environment impacts in the environment in which we operate;
- ensuring that this policy, including our environmental management systems and objectives and targets, are reviewed regularly and updated as required;
- communicating the policy, environmental management practices and procedures to all employees and contractors.
- Furthermore, we will ensure all personnel have the necessary training, skills and resources to fulfil environmental commitments;
- implementing effective systems for reviewing objectives, targets and management practices such that they remain relevant to the organization and comply with legislation;
- using resources efficiently;
- open communication with stakeholders;

- ensuring that appropriate resources are available to effectively implement this policy.

We will strive to meet and exceed our goals and commitments and to demonstrate environmental excellence to our stakeholders and customers.

14 Project's Policy Statement

Our commitment is to continuously improve our environmental performance and provide positive contributions to our business and to society. Clifton Anthony Hicken is committed to sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

15 Policy Principles

There are four main pillars of our Environmental Policy, for which we have assigned principles to guide our progress.

1) Management Systems: We apply environmental management guidelines and standards while monitoring our performance. We promote our commitment through training and integration into business processes. We comply with environmental laws, regulations and standards applicable to our products and operations, and subscribe to leading industry initiatives and internal requirements. We translate our commitments into actions by setting corporate objectives and targets, and monitor our progress towards these targets.

2) Resources Utilization: We promote eco-efficiency, conservation of non-renewable natural resources and recycling of secondary materials over our entire value chain. We invest in the development of innovative and sustainable products and processes.

3) Environmental Impacts: We assess and measure our environmental impacts, continuously improve processes, tools and capabilities and promote best practice in our industry. We develop and implement effective controls to monitor, prevent or minimize the release of pollutants to the environment in our operations. We seek opportunities to protect, restore and enhance biodiversity on and around our site.

4) Stakeholder Relations: We engage our stakeholders and report publicly on compliance, performance and progress.

16 Institutional Arrangement

The relevant personnel that will have the responsibility of carrying out and fulfilling Clifton Anthony Hicken's Project environmental management objectives and policies will be the Environmental Officer. The Environmental Officer will further communicate with the Environmental Protection Agency (EPA) and the Guyana Geology and Mines Commission (GGMC) in the form of annual reports on the status and progress regarding implementation of Project's environmental objectives and policies.

Legal Requirements The following are the laws and standards which our operation will follow:

1) The Guyana Environmental Act Cap. 20:05 of 1996

2) The Guyana Environmental Protection Agency Regulations:

¬ Hazardous Waste Regulations

¬ Water Quality Regulations

¬ Air Pollution Regulations

¬ Noise Management Regulations

¬ Guyana EPA Environmental Guidelines:

Removal, Treatment & Disposal of Oily Sludge

¬ Guyana EPA Environmental Guidelines:

Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste

3) The Guyana Mining Act of 1989

4) The Guyana Blasting Operations Act of 1998

5) The Explosives Act Cap 16:06

6) The Guyana Occupational Safety and Health Act of 1997

17 Key Potential Physical Environmental Impacts and Risks

The key potential physical environmental impacts and risks related to the Project are detailed in this section. Potential impacts and risks for the mine site and access road are detailed for the construction, operation, and closure phases of the Project.

The primary intent of this assessment is to identify the potential impacts and risks that will require protective management and mitigation actions during each project phase. The protective measures and mitigations actions are expanded in the Environmental Management Plan. This assessment considers "impacts" as consequences likely to occur during normal operations. "Risks" are considered to be unlikely adverse consequences resulting from system failure or accidents.

It is important to emphasize the physical context of the Project Area of Direct Influence prior to the identification of impacts. The environment in the area of the Project has not been subjected to mining activities. The project now proposed may result in environmental impacts. The majority of potential impacts on the physical environment will take place during the construction phase. During operations, potential impacts will be related to air, land, water and waste management. The potential impacts and risks are segregated by project component and phase in the section which follows.

17.1 Construction Impacts

17.1.1 Noise and Odours

Construction activities will produce noise levels above the WHO industrial/commercial noise level guideline value of 70 decibels (dBA) from heavy earthmoving machinery operation. Maintenance operations in workshops will generate noise levels in the vicinity of 72-110 dBA. Noise levels from the power generation plant will range from 90-105 dBA, based on manufacturer specifications of the equipment. Exposure to noise levels above 90 dBA can cause noise-induced hearing loss. Noise levels above the tolerable threshold of 72 decibels may result in fatigue, tiredness, low morale and decreased production levels (OSHA, 2012). Employees are expected to be exposed about 4 hours to noise levels. Tired workers are prone to accidents which may contribute to an increase in work-related accidents. These are major impacts (high likelihood, high severity).

Primary noise receptors in the area will be individuals involved in construction activities at the site. Construction phase noise will also have an adverse effect on many species of wildlife that are sensitive to increased noise levels. However, many species may become habituated to frequent noise events or continuous noise levels and may return to the area. These impacts will be mitigated by implementation of the following:

- Installation of sound suppression devices (such as mufflers) on earthmoving equipment, generators etc.; • Avoiding unnecessary idling of vehicles and machinery that are used intermittently;

- Employing best available work practices on-site to minimize occupational noise levels; and,

- Provide personal protective equipment (PPE) to employees and contractors, and requiring their usage under the health and safety plan.

Implementation of these measures will result in minor residual impacts (medium likelihood, low severity).

Construction activities will be localized to the project area and are unlikely to generate any significant odors. The short construction duration coupled with the absence of odor generating activities will require no mitigation measures.

17.1.2 Air Quality

Construction activities will result in an increase in dust generation from the movement of vehicles and machinery, and the generation of atmospheric emissions from vehicles, machinery, and electrical generators. Fugitive dust emissions will result from land clearing, vehicle movements on earthen roads, excavation, grading and loading and unloading of soil, crushed rock, etc. Dust generation, transport and deposition will be a function of construction activities, soil type, moisture content, wind speed, frequency of precipitation, vehicle traffic and vehicle type. Fugitive emissions will be greater during dry periods.

Combustion emissions will result from chainsaw operations, diesel and/or gasoline-fired heavy duty equipment usage and power generation from diesel generators. Products of combustion will include: benzene, PM10, PM2.5, carbon monoxide, NOx, SO2, VOCs – a precursor of ozone, and hydrocarbons. These emissions will be short-term and will be elevated only in the vicinity of construction operations. Burning of waste will also generate emissions.

The impacts to air quality will be moderate (high likelihood, low severity). These impacts will be mitigated by employing the following measures:

- Covering trucks to minimize dust particulate emission;
- Minimizing drop heights from vehicles;
- Scheduling land clearing activities on less windy days;
- Limiting vehicle speed during construction to a maximum 30 km/hr.;
- Employing dust suppression techniques such as wetting earthen roads with water or non-toxic chemicals;
- Avoiding open burning of wastes at the construction site; and,
- Maintaining construction equipment according to manufacturer’s specifications.

Implementation of the mitigation measures will result in minor residual impacts (low likelihood, low severity).

17.2 Impacts on Soils

Construction of the site roads could result in potential impacts to soil. Potential impacts could result from vegetation clearance, landscape grading, and re-contouring to ensure proper drainage, and other construction activities. Soil erosion and sedimentation impacts may result from vegetation clearance and other construction activities. Significant impacts to soils are expected to occur in steeply sloping areas and where the soils erosion potential is severe or very severe. Short-term impacts are expected to occur in areas where the soils have a severe or very severe erosion potential and where slopes are steep. These are moderate impacts (high likelihood, low severity). The likelihood of soil erosion and sedimentation will be minimized or avoided by the implementation of the following mitigation measures:

- Implementation of best management practices in soil erosion, storm water runoff, and sedimentation control (e.g., silt fences) will be implemented;
- Installation of channel control structures;
- Implementation of an Interim Reclamation Plan following clearance activities; and
- Implementation of a long-term Reclamation Plan for disturbed areas.

Implementation of these mitigation measures will result in minor impacts (low likelihood, low severity) on soil.

Potential impacts resulting from the movement of heavy equipment required to support the planned mining and construction activities may impact the soil resources by causing rutting and compaction of susceptible soils. Given the soils of the Project site, compaction and rutting is not considered a widespread concern, and the impacts to the soil resources are expected to be minor (low likelihood, low severity). Rutting and compaction will be minimized by scheduling the majority of the construction activities, to the extent practicable, to occur in the dry season, by limiting off-road access, and by implementing an awareness education and training program.

The construction of roads, access ways, and mine preparation during landscape grading and recontouring to ensure proper drainage; and during vegetation clearance has the potential to result in topsoil mixing. The mixing of the topsoil with the subsoil from these activities could result in a loss of soil fertility and the loss of viable seeds present (seed banks) in the topsoil. These are moderate impacts (medium likelihood, medium severity). To prevent mixing of soil horizons, the following mitigation measures will be implemented:

- Segregate topsoil or surface soil from subsurface layers during construction activities;
- Replace topsoil following construction, as applicable;
- Site topsoil storage areas;
- Identify and maintain or salvage topsoil pockets; and
- Replace segregated topsoil as indicated in the Reclamation Plan.

Following these mitigation measures, the impact of the proposed Project on soils will be minor (low likelihood, low severity).

Soil contamination may occur by accidental release of fuels, oils, grease and other hazardous materials from equipment and/or from the failure of fuel/hazardous material containment areas. These are major impacts (medium likelihood, high severity). The potential for accidental spills of fuels and other hazardous materials and associated soil contamination will be minimized or avoided by the implementation of a Spill Prevention and Contingency Plan (SPCP). Management measures detailed in the SPCP includes; the siting of fuel containment tanks on impervious bases located within bermed impermeable enclosures designed to hold 110 percent of the contents of the tank and channeling of storm water discharge from fuel storage areas to an oil-water separator prior to being discharged to surface water.

Implementation of these mitigation measures will result in minor impacts (medium likelihood, low severity) on soil during construction.

17.2.1 Surface Water

Sediment discharge from cleared areas has the potential to reduce water quality in streams and creeks adjacent to cleared areas. These are major impacts (high likelihood, medium severity). The construction duration is likely to be relatively short. An Erosion and Sediment Control Plan will be implemented to mitigate potential impacts to water quality from erosion. This will focus of reduction of slope angles, capping exposed surfaces with crushed rocks and The mitigation measures will result in minor impacts (low likelihood, low severity).

The clearing of vegetation will reduce interception and may result in increased discharge to streams and creeks around the construction area and increased water levels in these streams and creeks. These are moderate impacts (medium likelihood, medium severity). Increased water levels in the streams and creeks are unlikely to exceed typical wet season levels. These impacts will be mitigated by undertaking most of the construction activities, which may result in increases in storm

water runoff, in the dry season. These mitigation measures will result in minor impacts (low likelihood, low severity).

Surface water quality may be negatively impacted during construction of the mine site by accidental discharges of fuels, oils and grease from construction equipment. These are major impacts (medium likelihood, high severity). The potential for accidentals spills of fuels, oils and grease and the associated contamination of surface waters will be minimized by implementation of a Spill Prevention and Contingency Plan. This Plan details measures which will be implemented to prevent, and if necessary, contain spills of fuels, oils, or other contaminants. Such measures will include; siting of fuel containment tanks on impervious bases located within a bermed impermeable enclosure designed to hold 120 percent of the contents of the tank and channeling storm water discharge from fuel storage areas to an oil-water separator prior to being discharged to surface water. Implementation of these mitigation measures will effectively remove any potential impacts to surface water quality. The residual impacts will consequently be minor (low likelihood, low severity).

Road construction activities may include placing culverts at several stream crossings. Culverts constructed through the roads will modify the natural flow of surface water and concentrate flows at certain points and may increase the speed of surface water flow. These changes may potentially result in flooding, soil erosion, and increased sediment discharge to streams in the vicinity of roads. These are major (high likelihood, high severity) impacts. These impacts will be mitigated by designing culvert sizes to pass the natural surface water flows. Culverts will also be lined with grass and/or, riprap, where necessary. Flow volumes will be determined as part of the hydrological monitoring program to be undertaken during design works at the site. This will result in minor residual impacts (low likelihood, low severity).

Land clearing and earthmoving activities associated with development of the mine infrastructure, including the tailings and water management ponds may increase the potential for erosion and the associated increased sediment transport to waterways and sedimentation of these waterways in the Project area. Streams in the Project area have historically been adversely impacted by sedimentation from artisanal miners. Construction activities will pose increased risks of added sediment discharge to these streams. The potential for increased sediment discharge to surface water as a result of construction activities is considered to be major (high likelihood, high severity). The potential for sediment discharge to waterways will be minimized or avoided by the implementation of best management practices such as: • optimization/minimization of vegetation clearance,

- revegetation of disturbed areas (even if temporary),

- Use of storm runoff retention ponds and silt fences, etc. Implementation of these mitigation measures will result in minor residual impacts (low likelihood, low severity).

17.2.2 Groundwater Quality

Impermeable liners will be placed over the base of the water management pond during construction. The impermeable liners will reduce recharge to groundwater. However, the project foot print is quite small in comparison to the area available for groundwater recharge. The impacts of reduced groundwater recharge, occasioned by the impermeable liner, will therefore be minor (low likelihood, low severity).

Spills of fuel and oils from equipment, from equipment and fuel storage and from service areas can flow to the underlying aquifer and potentially impact groundwater quality. This will result in major impacts (high likelihood, high severity) to groundwater quality. Potential contamination of the underlying aquifer will be minimized by installing drip pans on all equipment, enforcing a program to check for equipment leaks and implementation of the SPCP. The SPCP will detail plans for utilization of sorbents, biological agents, chemical dispersants and gelling agents. All fuel will be stored within containment walls designed to contain 120 percent of the tank contents. Implementation of these mitigation measures will result in minor residual impacts (low likelihood, low severity) to groundwater quality.

Groundwater dewatering may be required during construction of foundations for project infrastructure. Surface spills of fuels in the vicinity of foundation excavations may result in localized impacts to shallow groundwater at the project site via runoff into the open excavations. Groundwater dewatering activities will, however, capture any petroleum-related releases to groundwater. The potential impact to groundwater during the construction phase is consequently considered to be minor (low likelihood, low severity). Nevertheless, potential impacts to groundwater quality related to surface spills will be mitigated by the use of secondary containment structures around above ground storage tanks containing fuel oil and the maintenance of spill containment equipment in the vicinity of refueling areas.

17.2.3 Traffic

Traffic flow within the site will increase during construction activities. Increased traffic will increase the risk of vehicular accidents. This will result in moderate impacts (low likelihood, medium severity). Speed limits will be imposed for vehicles during construction activities and in

the Sand production phase. Construction equipment will be equipped with manufacturer specified equipment to minimize the likelihood of accidents on site roads. Traffic impacts during construction will therefore be minor (low likelihood, low severity).

17.3 Operation Impacts

17.3.1 Soils

During operations, additional areas will be cleared, graded, mined, and covered. This will result in expansion of the area of impacted soils. Spills of fuels, lubricants, and other hazardous substances can lead to contamination of soils. In the absence of mitigation, the collective impacts to soils during operations are rated as major (high likelihood, medium severity).

The mitigation measures for soils will include continued implementation of the following:

- Implementation of best management practices for erosion control;
- Topsoil and organic matter stockpiling;
- Re-spreading, de-compaction, and re-vegetation; and,
- Implementation of the Spill control and Clean-up Plan

Implementation of these measures will result in minor residual impacts (low likelihood, low severity).

17.3.2 Noise

During the mining, crushing and screening operations, noise levels above the WHO industrial/commercial noise level guideline value of 70 dBA will be emitted from heavy equipment and earthmoving machines operation and from process equipment.

In addition to the earthen noise barriers created to minimize impacts on the community, additional mitigation measures, to mitigate impacts to both the community and the mine site employees, will consist of the following:

- Installation of sound suppression devices (such as mufflers) on earthmoving equipment and generators, as necessary;
- Employing best available work practices on-site to minimize occupational noise levels;
- Isolation of noise source from employees' living and dining area;
- Using acoustic insulating materials such as silencers on exhaust systems;

- Issuing/requiring use of PPE (e.g., ear plugs or ear muffs) especially in high noise locations;

- Posting visible warning signs in areas of high noise levels instructing employees to wear ear protection; • Periodically monitoring noise levels to ensure compliance with recommended threshold levels;

- Conducting regular hearing tests and maintaining records of results for workers exposed to high noise levels.

During the operational phase of the project, noise will continue to affect surrounding habitats, but most species remaining will have either become habituated to noise during the construction phase or were otherwise pre-adapted to higher noise levels. Implementation of these measures will result in minor impacts (low likelihood, low severity) related to noise generated.

17.4 Air Quality

The operation phase of the project will see the generation of dust and combustion emissions from:

- Stripping topsoil and overburden

- Loading and unloading of haul trucks

- Transport/haulage of extracted ore from the mine pit to the processing facility

- Vehicles traversing site roads

- Wind erosion of stockpiles and spoil piles

- Operation of heavy duty equipment

Stripping topsoil and overburden will generate dust when undertaken in the dry season. Dust emissions from blasting, loading and unloading of haul trucks, haul roads, crushing and screening equipment, material stock piles and other fugitive dust generating operations will occur over the duration of the operation. This will result in moderate impacts (high likelihood, low severity).

Dust and other emissions from haul roads and other sources will be mitigated by employing the following measures:

- Minimizing drop heights from vehicles

- Limiting vehicle speed

- Employing dust suppression technique such as applying water or non-toxic chemicals

- Maintaining construction equipment according to manufacturer's specifications
- Storing all waste in a waste pit

Implementation of these mitigation measures will result in minor impacts (low likelihood, low severity).

17.5 Power Generation

Facility Electrical energy will be required for implementation of the project. A power plant will be installed onsite and will generate peak power of approximately 3000 Watts using generators. The generators will be fueled by diesel and/or heavy fuel oil, and the heat from the exhaust of the generators will be used to preheat the fuel oil to increase combustion efficiencies.

17.6 Generation of Solid Wastes

The operation of the Sand pit generates large volumes of solid wastes, including spoils, trash, scrap, rubble, domestic wastes, and hazardous wastes. If not properly managed, these wastes could lead to contamination of soils and water, as well as generation of odors, attraction of vermin, and creation of human health and safety hazards. This impact is rated as major (high likelihood, medium severity).

The Project will minimize and mitigate these potential impacts by developing and implementing the respective waste management plans for each type of solid waste anticipated to be generated by the operation phase of the Project. Reuse and recycling will be preferred over disposal to the extent practicable. Under proper management, the residual impact associated with solid waste generation is considered to be minor (low likelihood, low severity).

17.7 Water Resources – Impacts to surface water

Several types of potential surface water impacts are attributed to mining activities, including sediment loading and low pH due to acid mine drainage (AMD).

Precipitation may induce leaching of chemicals from waste rock and overburden stockpiles at the Project site. In the event of significant storm events, these stockpiles may become saturated, causing slope failures. Storm water discharge from stockpiles containing water soluble chemicals and/or heavy metals and sediment discharge to surface water from slope failures can potentially result in degradation of surface water quality. These are considered major impacts (high likelihood, medium severity). Perimeter drainage channels will be installed around waste stockpiles to collect storm water runoff. Storm water from the perimeter drainage system will be discharged to a water

management pond before final discharge to surface water. This pond will be designed to retain 4.0x103 gallons of surface/storm water with dimensions 40m by 15m and 3.5m depth. This pond will be located 345m from the Lukubuna. Additional mitigation measures to preclude impacts on surface water quality will include the following:

- Installation of an impermeable liner as part of a leachate collection system to minimize potential impacts to surface water; and,
- Periodic monitoring of the physical integrity of the overburden stockpiles during operations to minimize the potential for discharges due to slope failures.

Implementation of these mitigation measures will result in minor impacts (low likelihood, low severity).

Breaches and overtopping of the water management pond will result in major impacts (high likelihood, high severity) to surface water quality. These impacts will be mitigated by utilization of BMPs during design, construction and operation of these facilities, including monitoring of dam integrity. Implementation of BMPs will result in minor impacts (low likelihood, low severity).

Water quality may be potentially impacted by wastewater discharges from the onsite sewer system, domestic wastewater, and/or by storm water runoff from developed areas (i.e., workshops, equipment storage and service areas, etc.). Discharge of wastewater from these areas to surface water may impair surface water quality by causing changes to physical, chemical and biological properties within the receiving waters. These potential wastewater discharges were considered to be major impacts (high likelihood, high severity). Mitigation measures will include the following:

- Proper design, use and maintenance (including regular de-sludging) of plant sewer systems and/or individual septic tank systems (e.g., septic tanks and leach fields consisting of gravel infiltration beds).
- Septic tanks will be designed in accordance with the new Guyanese septic tank standards developed in 2008; o Proper disposal of sludge (i.e., in a secure landfill); and,
- Storm water runoff from developed areas will be channeled through several oil water separators prior to discharge to surface water.
- Monitoring of the effluent from the oil-water separators to ensure that the discharged storm water meets effluent discharge/water quality standards prior to discharge into surface water.

Implementation of these mitigation measures will result in minor impacts (low likelihood, low severity). Wastewater during operations will consist of groundwater extracted from the Sand dewatering operations and slurry from crushing and screening operations. Groundwater from the mine dewatering operations will be discharged to surface water after passing through the water management pond to ensure the attainment of discharge effluent/water quality standards. The extracted groundwater will also be subject to conditions detailed in the Erosion and Sediment Control Plan to minimize sediment discharge to surface water during operations. The potential discharge of groundwater from the pit dewatering activities is considered to be a minor impact (low likelihood, low severity). No mitigation measures are proposed.

Surface spills and releases of fuels, oils and grease from mining equipment and/or the failure of fuel containment facilities (i.e., the tank farm) during the operations phase are considered to be moderate impacts (high likelihood, medium severity).

Mitigation measures will include the following:

- Implementation of spill containment, control and prevention measures during transport and refueling operations as well as during all vehicle and mining equipment maintenance and repair; and,
- Channeling storm water discharge from fuel storage areas to an oil-water separator prior to being discharged to surface water.

Implementation of these mitigation measures will result in minor impacts (low likelihood, low severity) on surface water quality during operation.

17.7.1 Fuel Oil Spill

It is assumed that a 5,000-gallon diesel fuel tank will be present onsite. A diesel oil spill into the river may have an effect on shorelines (where staining may coat plants or be ingested by wildlife), on the benthos (where sediments may become contaminated and organisms become physically fouled), on the water surface (where birds and sea creatures may become contaminated by contacting the oil), and in the water column (where aquatic organisms may ingest dissolved hydrocarbons causing narcosis in high concentrations and durations of exposure). If the assumed accidental fuel spill occurred, high concentrations of fuel oil could be present in the Lukubuna. At these concentration levels, humans, fish, invertebrates, mammals, and birds in the river may be at risk. These are considered to be major impacts (medium likelihood, high severity).

These impacts will be mitigated by strict adherence to the Environmental Monitoring Plan, specifically to include frequent monitoring and inspection of fuel storage tanks. The Spill Prevention and Clean-up Control and Emergency Response Plans will include aggressive alerts,

education, and clean-up activities. In addition, discharges/drainage from these areas will be directed to the tailing ponds, if practical or to a separate emergency containment pond. The emergency containment pond will act as a failsafe mechanism and will complement the Best Management Practice (BMP), Environmental Monitoring Plan (EMP) and the Spill Prevention and Clean-up Control and Emergency Response Plans proposed for implementation to mitigate impacts from spills. Application of these mitigation measures to contain and localize potential spills will result in a rating of minor impact (low likelihood, low severity).

17.7.2 Mine Closure- Surface Water/Groundwater/Soil

Failure of the water management pond may impact surface water and groundwater quality in the vicinity of the Project area. The potential failure of the water management pond after completion of mining activities is considered to be a potentially low impact (low likelihood, low severity).

The following mitigation measures will be implemented to minimize the likelihood of water management pond failure.

- Post-closure monitoring of the stability of the water management pond; and,
- Periodic monitoring of surface and groundwater conditions in the vicinity of the pond. Implementation of these measures will result in minor impacts (low likelihood, low severity).

In addition, the dismantling and clean-up of fuel storage tanks, hazardous waste receptacles, and other accumulated materials during closure could lead to spills which could contaminate surface water and/or groundwater, as well as soils. Potential spills associated with these closure activities are considered to be moderate impacts (high likelihood, medium severity). Mitigation of these potential impacts will be achieved by adhering to a mine closure plan that specifies appropriate and specific procedures for dismantling/decommissioning mining infrastructure.

17.8 Key Potential Ecological Environmental Impacts and Risks

The key potential ecological impacts and risks related to the Project are detailed in this section. Potential impacts and risks for the mine site and access road are detailed for the construction, operation, and closure phases of the Project.

The primary intent of this assessment is to identify the potential impacts and risks that will require protective management and mitigation actions during each project phase. The protective measures and mitigations actions are expanded in the Environmental Management Plan. This assessment considers “impacts” as consequences likely to occur during normal operations. “Risks” are considered to be unlikely adverse consequences resulting from system failure or accidents. Given

this consideration, loss of habitat resulting from clearing for construction is an impact, while a spill of fuel resulting from a tanker truck accident is a risk.

It is important to emphasize the biological context of the Project Area of Direct Influence prior to the identification of impacts. The environment in the area of the Clifton Anthony Hicken Project may result in additional ecological impacts.

The majority of potential impacts on the biological environment will take place during the construction phase. The potential impacts and risks are segregated by project component and phase in the section which follows.

17.9 Construction Impacts

17.10 Loss of Aquatic Habitats

The construction conducted within the project area and the associated infrastructure will result in the loss of various swamp habitats within the concession area. Several of these habitats have already been affected by historical exploration activities at the site. Surveys have not identified any of the aquatic habitats to be critical habitats based on the criteria of IFC PS6. Similar aquatic habitats are common in the region. There will be minor of aquatic habitats in the open pit area, water management pond, and other areas where major conversion of the land surface is required will be unavoidable due to the nature of the activities.

Retention ponds and other detention storage/sedimentation facilities will be installed to ensure that storm water discharges do not degrade the water quality and habitat structure of the receiving bodies. None of the aquatic fauna identified in the streams or creeks within the Area of Direct Influence is known to be threatened or restricted-range endemic.

The loss of aquatic habitat in the concession area is considered to be a potentially minor impact (low likelihood, low severity). These impacts will be mitigated by minimizing the extent of areas cleared for diversion channels and by the installation of bypass structures, where possible, to facilitate flow in the downstream section of streams which have been diverted. Application of these mitigation measures will result in low residual impacts (low likelihood, low severity) on aquatic habitats.

17.10.1 Loss of Terrestrial Habitat and Flora

It is estimated that a relatively small amount of land will be cleared for the site and associated infrastructure. The loss of terrestrial habitats and flora is unavoidable within the project footprint area.

None of the terrestrial habitats in the Area of Direct Influence have been identified as critical habitat per the criteria of IFC PS6. None of the plant species known to be present in the Area of Direct Influence are known to be threatened locally or to be restricted-range endemic. The loss of terrestrial habitats in the Area of Direct Influence is considered to be a major impact (medium likelihood, high severity). With appropriate mitigations such as strict minimization of clearing and progressive restoration, the impact rating is considered to be minor (low likelihood, low severity).

17.10.2 Loss of Terrestrial Fauna

Some loss of small and/or slow-moving fauna will inevitably occur during land clearing and earthmoving activity. None of the invertebrate, amphibian, non-avian reptile or small mammal species determined to be present in the Area of Direct Influence is known to be threatened or endemic. More mobile fauna including large mammals and adult birds will very likely flee the area well in advance of any land clearing operations. The surrounding area is large enough to absorb fauna fleeing cleared areas. The loss of terrestrial fauna in the Area of Direct Influence is estimated to be a moderate impact (high likelihood, medium severity) since the area has been disturbed by prior mining and exploration activities. This impact will be mitigated by minimization of the areas cleared. The residual impact will consequently be minor (low likelihood, low severity).

17.10.3 Increased Human Population and Activity in the Area of Influence

The construction works will lead to increased human population and increased levels of general activity in the area. The increased human presence has the potential to lead to increased impacts on flora and fauna through harvesting, collecting, hunting, fishing, disturbance, and other activities by construction workers. This impact is considered minor (low likelihood, low severity). The company will enforce a policy of no hunting and fishing by its employees and will also implement measures to ensure that no flora and/or fauna are harvested from the area or brought into the area. Implementation of these measures will result in low residual impacts (low likelihood, low severity).

17.11 Operation Impacts

17.11.1 Loss of Aquatic Habitats

The operation of the mine and associated infrastructure will impact swamp habitats within the concession area. These habitats will have already been affected by construction phase activities,

but the initiation of mining operations will bring additional impacts to these affected aquatic habitats.

Impacts to aquatic habitats associated with the operation of the Sandpit area, the water management pond and other areas where major conversion of the land surface occurs will be unavoidable due to the nature of the activities. Upstream and downstream segments of streams will be affected. Water discharged from the diversion channels surrounding the waste stockpile areas will affect downstream receiving bodies and their aquatic fauna.

The loss of aquatic habitats in the concession area is considered to be a minor impact (low likelihood, low severity). With application of the mitigation measures, for surface waters and groundwater, the residual impact rating will be low (low likelihood, low severity).

17.11.2 Loss of Terrestrial Habitats and Flora

During operation, the additional loss of habitats and flora will not affect any threatened or restricted- range endemic species of flora and fauna. Much of the fauna will have likely already left the affected habitats due to disturbance during the construction phase. This impact is rated as moderate (medium likelihood, medium severity). These impacts will be minimized by implementation of the following:

- Minimization of the Project footprint; and,
- Initiating restoration as soon as practicable in temporary work areas.

Implementation of these measures will result in minor residual impacts (low likelihood, low severity).

17.11.3 Loss of Terrestrial Fauna

During the operation of the mine, most of the larger animals will have already abandoned the area during the construction phase. Only small fauna accustomed to disturbed environments are likely to remain in or enter mining areas and other work sites. It is likely that small numbers of small animals such as amphibians and snakes will experience mortality due to equipment and vehicle use.

The loss of terrestrial fauna during the mining operations phase is rated as moderate (high likelihood, low severity). These impacts will be mitigated by implementation of the following:

- Minimization of the Project footprint; and,
- Performance of preclearance surveys.

17.11.4 Introduction or Promotion of Alien Invasive Species

The movement of people, equipment, and materials to the mine has the potential to cause the introduction of alien invasive species of both plants and animals. The disturbance and clearing of natural habitats can also promote the growth or colonization of alien invasive species. This impact is rated as moderate (high likelihood, low severity). These impacts will be mitigated by implementation of the following mitigation measures:

- Monitoring of biodiversity; and,
- Control of invasive species.

Implementation of these measures will result in minor impacts (low likelihood, low severity).

17.12 Key Sociocultural and Socioeconomic Impacts and Risks

There are no communities within the vicinity of the concessions. The social impact assessment also considered an indirect area of influence (IAI). The IAI incorporates areas beyond the operational boundaries of the project. It includes areas providing goods and services, including labour, to the project and logistical corridors to be used for effective implementation of the project. The IAI also incorporates communities indirectly affected by interaction with the project in spite of their physical distance from the project site.

Several of the social issues, detailed in this document, are in fact risks associated with project implementation. The social impacts and risks, likely to be associated with the project, are detailed in the following sections. The impacts and risk are identified and segregated by project component and phase.

17.12.1 Construction Impacts

The construction phase of the project is projected to extend over 1 month. During the construction period, the project is likely to have a positive impact on economic conditions of some communities. Impacts of the project on overall socio-economic conditions of communities will include

generation of employment and increased demand for some goods and services and it is expected that at the peak of construction activities, the project will provide work for approximately 15 individuals. These will be direct hires by Mr. Clifton Anthony Hicken and his sub-contractors. This will represent an increase in regional jobs.

The construction phase will also demand goods, services and logistics. These will include transportation services, construction materials and construction equipment. Logistics contractors including truckers and security companies will directly benefit. Suppliers of building materials and construction equipment will also directly benefit from increased demand. Construction companies could also potentially benefit if some of the construction work is farmed out to sub-contractors.

The overall impact on the national socio-economic conditions during the construction phase is considered to be a major beneficial impact with high level of enhancement and medium likelihood. The site is located in an interior area with a small and dispersed population. During construction, the project will be construed as a potential employment opportunity and may attract people to the site in search of work. This is a low potential impact with low likelihood and low severity. Clifton Anthony Hicken will develop and implement a focused influx management plan to mitigate these potential impacts. The post mitigation impact is rated to have a low likelihood and low severity.

Consultations revealed that unemployment and lack of economic opportunities are primary concerns. There is an expectation that the Project will provide both employment opportunities and economic benefits. As currently configured, the project will centralize hiring in Kuru Kuru.

17.12.2 Operation Impacts

Mining projects create a ‘boom and bust’ economic cycle. The demand for labour, goods and services will be high during the construction period. This demand will decrease significantly during the project operational phase. Workers and subcontractors sourced from Communities may become economically vulnerable during the project operational phase. Some areas may thus be more affected economically than others and there may be widespread and sudden unemployment, loss of supply and contracts and assured sources of income.

There is likely to be a decline in the demand for construction workers as the project shifts into the operation phase. The demand for skilled mining workers will however increase. It is expected that the number of skilled mining workers will be less than the number required for the construction phase. The requirements for service providers and contractors such as construction companies are

also likely to decline significantly once construction is complete. Similarly, the sourcing of goods such as food, electrical goods, camp equipment, etc. from Georgetown is likely to decline, impacting the livelihoods and incomes of many who had benefited from the construction boom.

This is judged to be a major impact with medium likelihood and high severity. Careful planning will be required to manage the 'boom and bust' cycle and mitigate the potential secondary negative impacts. Measures such as diversifying workforce skills (so that they can work in other industries) or targeting the worker's families for income generation projects can be successful mitigation measures to reduce these impacts.

Although the exact traffic estimates are not known, the construction and operations phase of the mine is likely to significantly increase movement of road traffic. It is anticipated that fuel in large quantities will be transported to meet the energy requirements of the project.

This is rated to be a moderate impact with medium likelihood and medium severity. The enforcement of a road traffic management plan in partnership with the Guyana Police Force Traffic Department and other users will reduce the impact to minor.

17.12.3 Closure Impacts

The Project as currently envisaged has a projected total life of 5 years from the start of production. Closures of projects of such scale typically have significant impacts on the national socio-economic conditions.

Depending on the scale of total employment provided by the project over its lifecycle, there could be a decrease in employment due to project closure. This may disproportionately affect one area of the country over another.

All of the service providers and suppliers to the project could be severely impacted, especially if the bulk of their business came from the project. The closure of the project will also result in decreased revenues to the Government in the form of taxes and royalties. This in turn may negatively impact the GDP of the country.

The impacts of closure are therefore considered to be potentially major. The project proponents in partnership with the Government and its workforce along with suppliers/contractors need to carefully plan for eventual closure. A carefully formulated forward looking closure plan should be commissioned to address the socio-economic impacts of closure.

17.12.4 Landscape and Visual Resources

The project will alter the vertical dimensions of the landscape and the materials present therein. In addition, the colour, reflectivity and visible emissions will be changed slightly from current levels since the operations will be shielded by surrounding vegetation. Landscape and visual impacts will result from creation of the access road from and to the site. These impacts will be minor (low severity, low likelihood). These impacts will not be mitigated. Additional landscape and visual impacts will result from clearing of greenery, mining and for facility construction. The scale of the area to be cleared is however relatively small in comparison to the overall area and will be shielded and adsorbed by the adjacent forest. The impacts of clearing will be minor (low severity, low likelihood). These impacts will not be mitigated.

17.12.5 Heritage

Removal and destruction of artefacts currently in the project area will compromise the quality of these artefacts. In additions, if artefacts exist below ground in the project area, removal of the ground cover may alter the pressure required to maintain the integrity of these artefacts. Changes in water conditions may also compromise the quality of any artefacts located below ground in the project area. If artefacts are present in the area their quality may be compromised. These are moderate impacts (medium severity, low likelihood). These impacts will be mitigated by preparing an archaeological watching brief for implementation during earth moving, excavation and blasting. Archaeological evidence will be recorded and artefacts should be removed or preserved in place after consultations with the Guyana National Trust. The mitigation measures will result in insignificant impacts (low severity, low likelihood).

17.12.6 Land Use

The primary land use activities in the area are mining and forestry. The land will be initially used for mining and will be reconverted to forestry after mine closure. The project will result in minimal impacts on land use. These impacts will be mitigated.

17.12.7 Low Carbon Development Strategy

Approximately less than 15 acres of tropical forest will be cleared for the project, widened roadway and related facilities. The total life of mine is approximately 20 years. Deforestation rates will therefore approximate to 0.7 acres per year over the life of the mine. The Guyana Forestry Commission document “Terms of Reference for Developing Capacity for a National Monitoring, Reporting and Verification System to Support REDD+ Participation of Guyana” indicates that Guyana has approximately 16 million ha of land area covered by forest. Further deforestation rates

in Guyana are relatively low at 0.1 to 0.3% per year. Nationally that rate equates to 16,000 to 48,000 ha per year. The deforestation rate of this project will add a total of 2.8 ha per year to those values which equates to less than 0.00583-0.00175 % increase in the national deforestation rate. This increase is very tiny and will have no impacts on national deforestation rates.

The greater value of the deforested area will be restored by rehabilitation of the quarried out areas. The impacts of the project on the LCDS are consequently minor (low likelihood, low severity). No mitigation is necessary.

17.12.8 Cumulative Impacts Associated with Proposed Action

Cumulative impacts are defined as the combination of multiple impacts from existing projects, the proposed project, and/or anticipated future projects that may result in significant adverse and/or beneficial impacts that will not be expected in the case of a standalone project. This section provides a description and analysis of the potential cumulative impacts of the proposed project and past and/or future actions/projects on the natural and socio-economic environment.

Determining the cumulative environmental consequences of the proposed action requires delineating the cause-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. This cumulative impact study was constrained by the lack of existing data detailing environmental impacts of existing and proposed actions within the area of influence of the project.

17.12.9 Potential Cumulative Impacts

The poverty levels in Guyana are relatively high. However, Guyana is a natural resource rich country and there are approximately 100,000 persons who work directly or indirectly in gold and other mineral resources exploitation. The area is well known for its mining activities and has historically been the lead geographical region in stone resources exploitation. Evidence from communities within the project's area of influence indicates employment in mining and logging in addition to other subsistence livelihood activities are the main sources of livelihood in the Region.

This project together with logging operations around the concession will provide significant sources of employment, training, and revenue for the region.

An upsurge in uncontrolled resource extraction activity and other knock on activities may have significant adverse effects on the natural environment, social and economic conditions, the overall health of the area and Region. These are major impacts (major severity, medium likelihood). These impacts will be managed by implementation of a Multi-Stakeholder Influx Management Committee. This committee will be comprised of representatives of any established community, GGMC, GFC, major stakeholders such loggers and miners and the Clifton Anthony Hicken Project. The committee will provide an ongoing mechanism to manage and respond to attempts by

unauthorized

persons to access the areas adjoining the access road and site to exploit resources construed to be present in those areas. This committee will meet quarterly or with greater frequency if circumstances dictate, to discuss access issues and concerns related to development of the access road and site. At a minimum the committee will conduct periodic stakeholder and access management reviews. These measures will result in in significant impacts (low severity, low likelihood).

The cumulative impacts in the area will be managed by institution of a long term, multi-stakeholder regional planning program. Such planning will be done by building consensus, collaboration and partnerships between the affected and responsible parties.

Key stakeholders who will be included in the process are:

- Government of Guyana through authorities in Region 4;
- Residents of Kuru Kuru Settlement;
- Guyana Forestry Commission;
- Guyana Geology and Mines Commission;
- Guyana Gold and Diamond Miners Association;
- Local WWF and CI conservation NGO offices; and
- Other regional stakeholder organizations.

18 Implementation of EMP

18.1 Training

The level of environmental awareness required of personnel and contractors/suppliers who enter and undertake work at the Sand should include:

- Familiarity with all legislation and guidelines relevant to the services being provided;
- Familiarity with the EMP and Clifton Anthony Hicken EMS;
- Emergency Response Preparedness;
- Waste Management/Minimization Practices;
- Dangerous Goods Handling (where applicable); and
- Other environmental awareness training as relevant to specific Sand operations.

18.2 Environmental Management Responsibilities

All employees have a responsibility for the effective and ongoing management of environmental impacts at the site. The following positions have specific duties and responsibilities as specified in Table.

Environmental Management Responsibilities

Position	Responsibility
Environmental Officer	• Undertake Annual Environmental Compliance Audit • Submit Annual Environmental Management Report to EPA and GGMC • Provide Assistance to Environmental Monitoring as required
Manager	• Day to Day implementation of EMP • Ensuring that site personnel have undertaken appropriate environmental awareness training and are observing all necessary management requirements • Ensure all required environmental auditing is undertaken

Table 5-Breakdown of Environmental Management Responsibilities

19 Communication

Clifton Anthony Hicken will implement a risk-based management system which will determine engagement methods and mechanisms to govern internal and external communications. Under this system the Clifton Anthony Hicken operation will be required to have an updated and active Stakeholder/Community Engagement Plan, which incorporates communication arrangements from both day- to- day and incidental perspective. Once this system has been implemented at Clifton Anthony Hicken Hauraruni, a Stakeholder/Community Engagement Plan will be prepared.

20 Reporting and Monitoring

There are various reporting obligations and monitoring requirements imposed by the development consent (GGMC) and EPA. These are provided in the Table.

Reporting and Monitoring Requirements

Reference		Requirements
Reporting		
EPA	&	An Annual report to be prepared and submitted to GGMC and EPA.
GGMC		
EPA	&	Provide Annual Return to EPA comprising statement of compliance and monitoring and complaints summary.
GGMC		
EPA		Provide notice of environmental harm to EPA.
EPA		Provide written report to EPA as requested on incidents causing or likely to cause material harm to the environment.
GGMC		The report on blast monitoring required by GGMC must be submitted at the end of each reporting period.
Monitoring		
EPA	&	Monitoring of Total Suspended Solids (TSS), NTUs and pH concentrations at discharge points
GGMC		
EPA	&	Monitoring of all blasts at the nearest residence or noise sensitive location that is not owned by Clifton Anthony Hicken., or the
GGMC		subject of a private agreement between Clifton Anthony Hicken. and the owner of the residence or noise sensitive location.
		.
EPA		Rainfall at the premises must be measured and recorded in millimetres per 24 hour period, at the same time each day.

Table 6 Reporting and Monitoring Requirements

In addition to the formal monitoring required under the Environmental Permit (EP) and GGMC, it is prudent Clifton Anthony Hicken to undertake appropriate monitoring of the effectiveness of the adopted control measures to demonstrate due diligence if necessary.

20.1 Management of Environmental Incidents, Complaints and Non-Conformances

Mr. Clifton Anthony Hicken Project Emergency and Contingency Plan describes the procedure for reporting environmental incidents, non-compliances and community concerns at the site.

Forms are provided for reporting environmental incidents, complaints, alerts and learning experiences to the organization, as described in the Emergency and Contingency Plan. All requirements and information specified the Emergency Response and Contingency Plan must be addressed and/or required as appropriate.

While all due care is taken with mining activities, there will still be potential for unforeseen incidents which could detrimentally affect the receiving environment. The effective management of incidents and emergencies is achieved through a combination of proactive and reactive measures.

The purpose of these is:

- To ensure that appropriate procedures are in place to allow a timely response to incidents;
- To ensure that any incident does not represent a threat to employees, the wider community or the environment;
- To ensure the safe movement of all personnel in any incident;
- To minimize environmental damage; and
- To minimize damage to Clifton Anthony Hicken assets or corporate reputation.

Proactive measures include:

- Implementation and maintenance of appropriate control measures;
- Provision of suitable equipment to facilitate an appropriate response to an incident or emergency; and • Training of construction personnel in the importance of maintaining control measures and in the use of emergency response equipment.

Reactive measures essentially comprise putting into action all relevant response measures at the time of the incident. They also include a post-incident review of the effectiveness of the response measures and revision required.

21 Review of EMP

The environmental management plan will be regularly reviewed to assess the effectiveness of the management actions against the objectives of the management plan. The management plan may be revised due to:

- Deficiencies being identified;
- Results from the monitoring programme for the management actions being compared against completion criteria;
- Changing environmental requirements;
- Improvements in knowledge or technology becomes available;
- Change in legislation;

- Change in the activities or operations associated with Clifton Anthony Hicken Hauraruni;
- Changes to the plan of Management;
- Amendments to the development consent; and
- Amendments to the Environmental Permit (EP). Any major amendments to the management plan which affect the fundamentals of the plan will be undertaken in consultation with the relevant regulatory authorities.

22 Water Management

22.1 Issues and Aspects

The Sand project will have two discharge points. The first allows discharge from the sedimentation pond into the drainage system along an Unknown Creek. The second is provided for discharge from the oil and grease separator adjacent to the workshop. The water quality criteria for discharge from the Sand is provided in Table below.

Pollutant	Concentration Limit	Discharge Point
Non-filterable residue	50 NTUs	Discharge Point 1
pH	6.5-8.5	Discharge Point 1
Grease and oil	Visually free	Discharge point 2

Table 7 Project water quality criteria

Monitoring of pH and NTUs is required by GGMC and EPA at Discharge Point 1 and 2, and visual monitoring of grease and oil to ensure that it has been removed at Discharge Point 3. This will better allow the proponent to better manage surface water quality.

22.1.1 Management Objectives

In order to minimize the impact on the environment, Clifton Anthony Hicken will aim to achieve these criteria:

- To improve/maintain water quality in the Lukubuna, Unknown Tributary Lukubuna, Creek;
- To prevent illegal discharge from monitoring all points; and
- To prevent sediment runoff leaving Sand site.

22.1.2 Water Management Strategy

water management system at the Sand has been designed so that all rainfall runoff is contained within the Sand sump then pumped to a sedimentation pond. This water will then be reused within the Sand operation or discharged into the Creek. Discharges of water into the Creek will only be under controlled circumstances. Discharges from the Sand will not exceed 50 NTUs and pH 6.5-8.5, and visibly free of oil and grease.

22.1.2.1 Features and Strategy

Implementation of this strategy involves the maintenance or construction of the following features which are also shown in Figure. The sump is designed at 2000m^3 retention capacity, thus allowing slurry to settle for a calculated period of 72 hrs. The density of the material will allow for natural settlement in 4 to 8 hours. Supernatant turbidity will be tested using a HACH Turbidity meter 3000.

22.1.2.1.1 Sand Sump

All rainfall runoff is diverted to the Sand sump at -2.6 m ASL in the east. A sump will be excavated to collect rainfall water. The Sand Sump has a capacity of 2000 m3. The floor of the sump contains three small dams which will be excavated to assist in settling sediment from small rainfall events.

22.1.2.1.2 Sedimentation Dams and Ponds

One sedimentation pond will be constructed onsite. This pond has been designed to act as a sedimentation trap and water storage and facilitate settlement of suspended solids. Rainfall water from the Sand sump will be pumped to the sedimentation pond.

22.1.2.1.3 Water Diversion Mounds and Channels

A water diversion mound or channel redirecting runoff from the stockpile area into the Sand sump will be constructed in front of the weighbridge. This will prevent water from exiting the Sand via the driveway and the drain adjacent to the office. The mound or channel will divert water from the stockpile into the sedimentation pond. These channel act as sediment traps, retaining significant quantities of fine sediment.

22.1.2.1.4 Discharge Point No.1 & 2

Discharge Point No. 1 has been established adjacent to the one (1) sedimentation pond (WMP1) to allow controlled discharge, by pumping of runoff collected from the Sand sump. Sedimentation pond 2 (WMP2) contains water from processing plant activities. The water is pumped from the sedimentation pond1, as required and discharged into the Unknown Creek. Sedimentation pond 2 water will be recycled into the processing plant. As Clifton Anthony Hicken will be in a position to choose when to pump out of the sump, it is expected that a high level of water quality can be achieved with the NTUs being lower than 50 NTUs.

22.1.2.1.5 Storage Capacity of the Sand Sump and Sedimentation Pond

It is proposed to maintain storage capacity in the main sump and sedimentation pond at all times by pumping water promptly after storm events. The following information is provided relating to storage capacity at the Sand under the water management plan. The requirement for containment of rainfall run-off at the Sand site is the 1 in 10-year storm event of 24 hours' duration. For Clifton Anthony Hicken this is equivalent to an average rainfall of 27 mm in a 24-hour period (1.125 mm per hour).

The Sand sump will have a capacity of 2,000 cubic meters (m^3).

It is assumed that only 50% of the sump is available for (1,000 m^3) at any time in case, for example, of previous storms which have not yet been pumped from the sump. It is also assumed that 100% of the rainfall will run into the sump (in reality a maximum of 80% of the rainfall will become runoff).

Run-off (m3) = Rainfall Intensity (m/hr.) x Duration (hr.) x Area (m^2).

= 0.001125m/hr. x 24hr x 4047 m2 (1 acre)

= 109 m3 per acre of catchment

The total area of catchment (i.e. all Sand workings and undisturbed areas which drain into the Sand workings) is 17.9 acres. This gives a total runoff volume of 1951.1 m^3. Therefore, 97.5% of the storage capacity of the Sand sump can easily contain the runoff from a 1 in 10-year storm event of 24 hours' duration.

22.1.2.1.6 Oil Water Separator

In the unlikely event of an oil spill, an oil separator and holding tank has been installed adjacent to the workshop. Water discharged at this point should not contain levels of oil and grease exceeding 10 mg per litre.

The concrete apron outside the workshop on which vehicles are serviced is covered by a color bond awning preventing rain from falling on the servicing area. The only runoff which travels along the apron and into the oil/grease separator is water from hosing down the service area.

Accordingly, the volumes of water which passes through the oil grease separator are exceedingly small.

22.1.3 Groundwater Management

Mining will not extend into the water table which is estimated at a depth of 800 m. As such groundwater quality will not be affected. Any surface contaminant that percolates with water will not reach the water table as the competent, massive rock mass serves as an impermeable layer to the water table. Percolating water will be collected in the sumps.

22.1.4 Surface Water Management

Improper management of surface water can result in discharge of contaminated water and sediments to surface water and overtopping of the water management ponds.

All contaminated water will be directed to a water management pond. All water retention facilities will be provided with adequate capacity to contain the design rainfall event and to eliminate the likelihood and frequency of spills that may impact on downstream waters and on groundwater quality.

Site clearing operations will progress in a gradual and phased manner to ensure there are no large increases in sediment discharge. Sediment control structures will be used to prevent the inflow of sediment to surface water. These control practices will include sediment traps and screens to control run- off and sedimentation. Surface runoff from the workshop and other vehicle service areas will be channeled to oil/water separators. All water from the oil/water separators will be skimmed prior to discharge. The operations will monitor discharges to surface water up gradient and down gradient of the site.

The water management pond will be designed for the critical rainfall event. The top of the water management pond will sit above surrounding ground level and will preclude runoff from the surrounding area from entering the pond. The pond will be provided with a minimum operating freeboard of 3 m which will allow for adequate containment of precipitation associated with the design rainfall event.

Water can exit the sedimentation pond as seepage through its embankment. Seepage controls will be provided in the design to maintain embankment stability, to decrease water losses and maintain

water-quality at the site. Drains will be provided for seepage collection and all seepage collected in these drains will be pumped back into the process stream.

Precipitation data, topographic maps and stream flow measurements will be used during the design of the ponds to prepare hydrographs and frequency curves for use in estimating volumes of precipitation. Precipitation data from wet and dry years will be used to provide minimum, average, and maximum precipitation volumes to determine storage capacity for the ponds. The design of the ponds will include capacity to store precipitation incident on the ponds during rainfall. Surface runoff from other areas of the site will be channeled into the sedimentation pond.

All storm water runoff will be channeled to the water management pond. Discharge from the water management pond will be via a spillway and will be channeled through a sediment control structure to remove sediment prior to discharge to surface water bodies in the site area. In some instances, water from the water management pond will be discharged to augment water in the process circuit.

All pits and water management and tailings ponds locations will eliminate flow in some streams/creeks. The project site will be developed to ensure minimum disturbance to streams and creeks in the area. In instances where this cannot be avoided, these streams/creek will be diverted to ensure flow to downstream sections.

Infiltration through the base of the tailings and/or water management pond can negatively impact groundwater quality.

The water management pond will both be provided with impervious liners. No direct discharge to surface water will be permitted from any of the ponds that constitute a part of the process circuit.

22.1.5 Water Monitoring Program

A water monitoring program will be implemented at discharge points from which water leaves the property on a quarterly basis. The programme will involve the testing of NTUs and pH and requires the collection of a sample each time water is discharged.

The Sand uses a significant volume of water for dust suppression especially on haul roads. The water tanker will be filled with water from the sedimentation ponds for watering the haul roads and stockpile areas.

22.1.6 Potable Water

Potable water will be pumped from the unknown right bank tributary of the Creek and treated at a mini water treatment plant. Rainwater will be collected and treated for drinking

purposes. Alternatively, in the dry season, drinking water will be purchased from a suitable source for supply to workers. A well will also be constructed onsite.

22.2 Action Plan

In addition to the management strategy provided above a number of actions will be implemented to meet the requirements of the Environmental Permit (EPA) and the Mining Regulations.

22.2.1 Water Management Plan

The water management plan for the site will be updated and improved to adapt to water management strategies.

Action	Responsibility	Timing	Performance Indicator	Monitoring
Ensure the area adjacent to the quarry access remains clear of material spillages	Quarry Manager	Ongoing	Written inspection records and No. of records of complaints	Quarterly
Discharge of TSS to waters from Discharge Point No. 1 & 2 only when discharge occurs solely as a result of rainfall at the premises exceeding a total of 63.2 mm over any consecutive 5 day period or whenever process plant water starts overtopping the freeboard	Quarry Manager	Ongoing	Monitoring records	Per event
Undertake all practical measures to avoid or minimise oil and grease, TSS, etc. contained in wet weather discharges.	Quarry Manager	Ongoing	Monitoring records	Quarterly
Measure NTUs and pH for all discharge	Quarry Manager	As required	Grab sample records	Daily during any discharge

Table 8 Water Management Action Plan

23 Biodiversity

23.1 Issues and Aspects

The Sand area consists of on two predominant forest types:

• Liana forest • Mixed forest on foot slopes;

• Wallaba and damaka forest on white sand soils.

Progressive rehabilitation of quarried areas with native species endemic to the site is recommended to maintain the genetic integrity of the vegetation of the site and improve habitat values.

23.1.1 Management Objectives

Maintain Areas of Remnant Vegetation Clearing or disturbance of vegetation will be kept to a minimum to minimize the impact of the project footprint in the area.

23.1.2 Rehabilitation

Rehabilitation of the site will be focused on undertaking regeneration of the Project Pits, improving visual amenity of the site by providing additional screening of the Sand operations and to establish a vegetation corridor. Final rehabilitation of the site will be undertaken prior to closure of the Sand when a final landform can be determined. Rehabilitation strategies for the site are provided in a later section.

The establishment of a vegetation corridor will be implemented through a comprehensive tree planting programme.

23.1.3 Minimize Visual Impact through Landscaping and Rehabilitation

The project will aim to improve visual screening through landscaping and rehabilitation of the site. To minimize visual impact ground disturbance is to be kept to a minimum and overburden stockpiles are to be revegetated as soon as possible. Overburden is also to be managed in the most efficient manner appropriate which is compatible with the final rehabilitation plan.

23.1.4 Rehabilitation Strategy

23.1.4.1 Immediate Rehabilitation

A comprehensive tree planting program is to be initiated during the course of the project. Due to the exposed nature of the subject land to rain, wind and sun, the vegetation species to be used in this program will be a combination of those common to the indigenous forest type.

23.1.4.2 *Intermediate Rehabilitation*

It is not conceivable to rehabilitate in the immediate term the majority of the land as it will remain an active space likely up until the mine closure. Potential landscaping and rehabilitation options for the Project pits are minimal and may include:

- Gently sloping to preserve hard-standing area for site activities
- Southern area to be graded to a more even slope for better access such as stockpiling; and
- Potential revegetation of the eastern embankment.

23.1.5 Action Plan

Action	Responsibility	Timing	Performance Indicator	Monitoring
All site rehabilitation and landscaping works shall be designed to ensure the maximum reasonable visual screening of quarrying operations and shall be maintained so as to ensure optimum establishment and growth and shall be performed by qualified, professional persons.	Environmental Officer	Ongoing	1. Rehabilitation of site 2. Landscaping of site 3. Records of GGMC and EPA approval	Biannually
Ensure that disturbed areas of ground are kept to a minimum.	Quarry manager	Ongoing	1. Minimal areas of ground disturbance 2. Vegetation of mined out areas	Annually
Ensure that all faces are rehabilitated to blend in with the surrounding area following completion of quarrying	Quarry Manager	After completion of quarrying	Rehabilitation of all faces	Once off

Table 9 Breakdown of action plan for biodiversity

23.2 Noise and Vibration

23.2.1 Issues and Aspects

A range of mitigation measures are proposed to be undertaken in the EIS to mitigate the noise levels from Sand operations, these include:

- The primary and secondary crushing and screening components will be fully enclosed within color bond steel housings. The housings will be lined on the inside with acoustic grade Rockwool and perforated steel sheeting to absorb sound and reverberation within enclosure.

To manage noise levels of ongoing operations additional noise surveys will be undertaken by Clifton Anthony Hicken, and where required to achieve acceptable noise levels, mitigation or management measures may be implemented.

23.2.1.1 Management Objectives

The Guyana National Bureau of Standards (GNBS), along with the EPA and other relevant agencies, has developed standards on Noise Emissions into the Environment.

This standard is applied to regulate noise emissions into the environment. Noise management strategies will include:

Noise levels at the nearest sensitive receptor will meet the noise guidelines in the General EHS Guidelines; • Implementation of enclosure and cladding of processing plants;

• Installation of proper sound barriers and /or noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens);

• Installation of natural barriers at facility boundaries, such as vegetation curtains or soil berms and

• Optimization of internal traffic routing, particularly to minimize vehicle reversing needs (reducing noise from reversing alarms) and to maximize distances to the closest sensitive receptors.

Noise emissions will be limited by appropriate soundproofing of individual pieces of equipment. Equipment exhaust systems will be fitted with mufflers. The electrical generators will be housed in closed structures with acoustic insulation that will reduce external noise levels. Additionally, all workers with potential chronic or acute noise exposures will be required to wear appropriate personal noise-protection gear.

The mines will minimize significant sources of vibration by implementation of best management practices such as through adequate design of crusher foundations.

23.2.1.2 Action Plan

A number of actions will be implemented to meet the requirements of the GNBS and EPA. An action plan for noise and vibration is provided.

23.3 Air Quality

23.3.1 Issues and Aspects

The main sources of dust from the Sand were identified in the EIS as the crushing plant, haul roads and stockpiles. Measures to manage dust emissions were proposed in the EIS to manage the generation of dust from these and other sources. Provided that these measures are properly and consistently implemented there should be no need for additional dust mitigation measures.

23.3.2 Management Objectives

The management objectives with respect to air quality are as follows:

- Minimize dust generation through the consistent application of appropriate dust management measures; and

- Maintain the premises in a condition which minimizes or prevents the emission of dust from the premises.

23.3.3 Action Plan

A number of actions will be implemented to meet the air quality requirements of the EPA and the commitments stipulated in the EIS. An action plan for air quality is provided.

Action	Responsibility	Timing	Performance Indicator	Monitoring
Verify the premises are maintained in a condition which minimises or prevents the emission of dust from the premises.	Quarry Manager	Ongoing	1. Written Inspection records 2. No complaints about dust	Annually
Ensure use of dust extractor/water spray on drilling equipment.	Project Manager	Prior to start of site operations	Installation of dust extractor or water spray.	Annual check on condition of extractor or sprays

Ensure face operations are sprayed by water cart	Quarry Manager	Ongoing	Visual inspections	Daily
Ensure haul and access roads are wetted when conditions are dry and/or windy	Quarry Manager	During dry and/or windy conditions	No complaints about dust	Visual observation during dry and windy conditions
Ensure product screens are enclosed and water sprays used on all material change over points in the crushing plant.	Project Manager	Prior to start of site operations	Enclosure of crushing plant and installation of water sprays	Annual check on condition of cladding and sprays.
Ensure stockpiles, loading pad and roads are wetted down in dry and/or windy conditions.	Quarry Manager	During dry and/or windy conditions	No complaints about dust	Visual observation during dry and windy conditions
Ensure truck loads are sprayed prior to dispatch.	Quarry Manager	Ongoing	Visual inspections	Daily
Ensure loads of material less than 7mm are covered.	Quarry Manager	Ongoing	Visual inspections	Daily
Ensure stripping of overburden is kept to a minimum and scheduled to the best climatic conditions, disused quarry benches are progressively rehabilitated and new bund walls and overburden stockpiles are revegetated and stabilized with grass.	Quarry Manager/Environmental Representative	Ongoing	1. Minimal bare surfaces 2. Successful revegetation	Every stripping campaign. Annual check on vegetative cover
Ensure a dedicated water spray truck is maintained on site for the purposes of dust suppression and firefighting.	Quarry Manager	Ongoing	No complaints about dust	Daily

Table 10 Action Plan for Air Quality

23.4 Hazards and Risk Management

23.4.1 Issues and Aspects

23.4.1.1 Introduction

Risk management involves the identification, ranking and elimination or reduction of the inherent hazards associated with the operation or processes being studied. In extractive industries these hazards can be the operational hazards due to the physical attributes of the mining activity or the commercial, contractual or legal risks associated with the overall development.

Clifton Anthony Hicken has also devised a Risk Management standard operating procedure. This standard provides for OH&S risk management to ensure that health and safety risks are eliminated, or where that is not reasonable practicable, minimized.

23.4.2 Management Objectives

The management objectives with respect to hazard and risks are as follows:

- To reduce the total risk of a hazardous event occurring to the risk assessment with protective/educational responses installed level presented in the Table below;
- Reduced fire risk using appropriate and required measures;
- Adequately maintain fire breaks; and
- Educate staff in fire safety awareness.

23.4.3 Action Plan

In addition to the physical and educational protective measures to reduce hazards/risk presented, a number of actions will be implemented to address relevant requirements of the Environmental Permit and the commitments stipulated in the EIS.

An action plan for hazard and risk is provided in Table below.

Ensure all operations are conducted in accordance with The Occupational Health and safety act Cap. 99:10	Quarry Manager	Ongoing	No records of incidents or injuries	Annually
Ensure all fuel and bituminous storage facilities are properly bunded in accordance with GEA standards	Project Manager	Prior to commencement of site operations	Bunding constructed	Annual review of bunding condition
Ensure a dedicated water spray truck and pumps are maintained on site for the purposes of dust suppression and fire fighting	Quarry Manager	Ongoing	Water trucks and pumps present onsite	Pre-summer annually
Ensure all mobile equipment is fitted with spark arresting mufflers	Project Manager	Prior to site operations	Spark arresting mufflers fitted to all mobile equipment	Annual check on condition of mufflers

Ensure flammable liquids are stored in a bunded area which is isolated from any vegetation	Quarry Manager	Ongoing	1. Flammable liquids are stored in bunded area 2. Bunded area isolated from any vegetation	Pre-summer annually
Ensure fire extinguishers are located around buildings and in all mobile equipment and are serviced regularly	Quarry Manager	Ongoing	1. Fire extinguishers located around buildings and in all mobile equipment 2. Written records of regular services	Pre-summer annually
Ensure all buildings are cleared of any vegetation build up.	Quarry Manager	Ongoing	Visual inspections	Pre-summer annually
Ensure all trafficked areas are regularly watered down to minimise potential of vehicles to start fires	Quarry Manager	Ongoing	Visual inspections	Pre-summer annually
Ensure adequate water supplies are maintained onsite at all times which can be supplemented with mains water during extended dry periods	Quarry Manager	Ongoing	Water supplies and connected mains present	Pre-summer annually
Ensure employees have been trained in fire awareness and instructed in basic firefighting procedures	Quarry Manager	Ongoing	Written records of training	Pre-summer annually

Table 11 Action plan for hazard and risk

23.5 Traffic

23.5.1 Issues and Aspects

The main issues of safety are provision of safety equipment on site. Access to the Sandpit will be through a constructed access road, and as such there will be threats to native wildlife from vehicles.

23.5.2 Management Objectives

The management objectives with respect to traffic are as follows:

- Avoid injury/death to road users and wildlife associated with access to and from the project site;
- Maintenance of adequate parking and docking facilities; and
- Maintenance of direction of internal traffic movements to avoid accidents/injuries within the site.

12.3 Action Plan

A number of actions will be implemented to meet the traffic requirements. An action plan for traffic is provided in Table below:

Action	Responsibility	Timing	Performance Indicator	Monitoring
Ensure the area adjacent to the quarry access remains clear of material spillages which may otherwise present a hazard to motorists	Quarry Manager	Ongoing	1. Records of visual inspections 2. No records of complaints or accidents	Daily
Ensure the placement of improved road signs including the installation of a 'give way,' sign	Project Manager	Prior to commencement of operations	1. Records of correspondence 2. Installation of signs	Once off
Installation of hinged truck warning signs on either side of the quarry entrance	Project Manager	Prior to commencement of operations	1. Records of correspondence 2. Installation of signs	Once off
Ensure all loading and unloading of goods is undertaken wholly within the site	Quarry Manager	Ongoing	Visual Inspections	Daily
Ensure truck driver education and training procedures are maintained and an equal standard of courtesy from all drivers accessing material	Quarry Manager	Ongoing	1. Training records 2. No records of complaints	Annually
Construction of a Parking Lot for haul trucks and HEMM	Project Manger	Prior to commencement of operations	1. GPF approval	Once off

Table 12 action plan for traffic management

24 Social Management Plan

The project can potentially result in influx into the concession and the problems associated therewith due to mine area development.

Clifton Anthony Hicken will actively discourage influx into the area and not allow outsiders to settle in the periphery of the site. This Project will also train its personnel on site to handle influx sensitively without conflict or security issues. Clifton Anthony Hicken will also promote and run health awareness campaigns especially on HIV, STD and malaria amongst the workers as well as local communities upstream and downstream of the project site.

The project will increase expectations of employment and economic opportunities.

The company will dialogue with the local community to understand their expectations and create strategies to generate local employment. The company will also promote community development

projects that enhance local benefits and which create skills, capacities, improve education, health and infrastructure of the local community. The developer will also take practical measures to ensure that residents do not abandon their current livelihoods.

The project can potentially result in reduced employment and other induced economic benefits after closure of the operation.

The company will train and build capacity of the workers and service providers to find economic opportunities with other industries in Guyana.

Inadequate dissemination of information on the operations can potentially generate animosity between communities in proximity to the operations, the GGMC and Clifton Anthony Hicken Hauraruni.

The Company will liaise totally with indigenous communities. Company employees will be restricted to the mine site and will have no interaction with the indigenous communities.

The operator will give priority to the recruitment of unskilled employees such cleaners and field hands from indigenous communities. The employer will mount training programs and potentially apprenticeships for residents of indigenous communities to boost local labour supply and will provide employment opportunities for motivated individuals from the indigenous village who successfully graduate from the training programs. The intent is to eventually have a significant majority of the unskilled labour pool be represented by individuals from the indigenous communities.

The Project will have open days for local suppliers and will maintain a register of local suppliers and the goods these suppliers provide. The developer will source provisions for its canteen and kitchen from local residents to boost and sustain current indigenous farm practices.

24.1 Fuel Oil Management

Spills of fuel oil could result in soil, surface and groundwater contamination. Fuel oil storage areas will be located well away from areas of fire hazard such as where welding operations will be performed. All fuel will be barged and/or trucked to site by secure fuel trucks and transferred into fuel storage tanks that are founded on impervious concrete surfaces. The fuel tanks will be housed within bermed enclosures. The enclosures will be sized to retain the contents of 120% of the tank in the event of tank failure. Discharge from fuel storage areas will be channeled to oil-water

separators prior to being discharged to surface water. Indiscriminate dumping of waste oil will not be permitted under any circumstances. Waste oil will be stored in suitable containers at designated points located around the Project site. All locations will be selected based on factors such as proximity to water, migration routes, fire risks and access. All waste oil storage areas will be provided with secondary containment to deal effectively with any leakage or spillage. All liquids, spent oils, fuels and lubricants will be collected and returned in drums to oil companies and/or sold to timber harvesters.

24.2 Waste Management

Improper disposal of waste could result in releases to the environment and the presence of vectors and vermin at the site. Non-hazardous solid wastes such as household and non-process related industrial waste will be managed according to the recommendations presented in the IFC General EHS Guidelines. Non-hazardous solid waste should be collected for recycling or disposal at an approved sanitary landfill constructed onsite. No other solid wastes or liquid wastes will be mixed or disposed of together with waste rock or overburden.

The following waste will be generated by the project:

- overburden during mining
- tailings from the processing operation
- solid waste, including food waste from the camp operations
- septic waste from the camp operations

Overburden will be placed in spoil piles in the mined out area. All tailings and other process waste will be placed in the tailings pond. The coarse fraction of the tailing waste, recovered from the gravity circuit, will be used as hard capping for access roads.

Solid waste from the operation of the camp will be disposed of in secure areas designed in accordance with guidelines provided by the Guyana EPA. All food waste and organic matter will be composted and the composted material will be used as fertilizer for revegetation of the spoil piles after closure. Food waste will be stored so as not to attract vermin or generate odors that affect work or residential areas.

Septic waste will be managed by a series of septic tanks on site. Discharge from the septic tanks will be channeled through a granular filter bed prior to discharge. Septic tanks contents will be

emptied as dictated by capacity constraints, and will be disposed in accordance with EPA guidelines.

24.3 Hazardous Material Management

Improper handling of hazardous materials could result in discharge to the environment. Hazardous materials at the mine site are expected to include waste oils and grease from work shop operations and from vehicle. Hazardous materials will be located in secure storage facilities on-site to prevent accidental release and to protect against rainfall that may result in contaminated run-off and leaching. All storage areas for hazardous material will be concreted to provide an impervious surface and to prevent uncontrolled discharges to groundwater. Material Safety Data Sheets (MSDS) will be kept on site and all measures to contain spills of hazardous materials shall be in accordance with the procedures therein. No rainfall will be allowed to percolate through areas where hazardous materials are stored and no uncontrolled run-off will be permitted from these areas. Storm water from areas around storage facilities will be channeled to the water management pond.

Incompatible substances that can react upon mixing to generate heat, fire, gas, explosion, or violent polymerization will not be located within proximity of each other. Hazardous material will be disposed of in accordance with guidelines established by the EPA.

24.4 Soils Management

Soils will be protected from contamination and erosion during all Project activities. Soil erosion measures are detailed in the Erosion and Sediment Control Plan. Soil will not be allowed to become a contaminant itself by entrainment in runoff or wind. Topsoil and organic matter will be separated from subsoils and will not be intermixed. Topsoil and organic matter will be stockpiled and protected from rainfall and sunlight. Stockpiled materials will be reutilized in progressive restoration works as soon as practicable to avoid losses of organic matter through oxidation. No topsoil will be removed from any area outside the mining limits unless approved by the EPA.

Soils in temporary work areas will be decompacted by disking, ploughing, ripping, or other mechanical means. Soils will be protected from contamination as detailed in the Spill Prevention and Control Plan. Contaminated soil will be remediated by in situ or ex situ means as appropriate.

24.5 Erosion and Sediment Control Plan

Sand mining will be undertaken with long-term erosion and sediment control as a primary consideration. Mining operations conducted during the rainy season will be clearly demonstrated, to the satisfaction of the EPA, that at no stage of the operations will there be any substantial risk of increased sediment discharge from the site. When mining occurs in the rainy season, the smallest practicable area of erodible land will be exposed during mining operations and the time of exposure shall be minimized. Natural features, including vegetation, terrain, watercourses and similar resources shall be preserved wherever possible. Limits of mining shall be clearly defined and marked to prevent damage by mining equipment.

Site clearing operations will progress in a gradual and phased manner to ensure there are no large increases in sediment discharge. Sediment control structures will be used to prevent the inflow of sediment to surface water. These control practices will include sediment traps and screens to control run- off and sedimentation from active mining and developed areas.

Permanent vegetation and structures for erosion and sediment control shall be installed as soon as possible. Adequate provision shall be made for long-term maintenance of permanent erosion and sediment control structures and vegetation. No topsoil shall be removed from the area outside the mining limits unless approved by the EPA. Topsoil overburden shall be stockpiled and redistributed to provide a suitable base for seeding and planting. Runoff from the stockpiled area shall be controlled to prevent erosion and resultant sedimentation of receiving waters. Runoff shall not be discharged from the site in quantities or at velocities substantially above those which occurred before grading.

Waste rock and soil from the mining operations will be disposed in spoil piles located in the mined out areas. All spoil piles will be surrounded by a soil containment berm to preclude the easy flow of surface runoff and sediment from stockpiles. The containment berms will be constructed of soil pervious enough to enable the passage of surface runoff water while trapping sediment contained

in that runoff. The height and slope of each spoil pile will be such that foundation and slope failures do not occur.

Storm water runoff and water from the mining operations will both be channeled to temporary sedimentation ponds. Those ponds will be designed to provide a detention time of 48 hours. Discharge from the sedimentation pond will be via a spillway and will be channeled through a sediment control structure constructed of a matrix of stone, sand grass to remove sediment prior to discharge to surface water bodies in the site area.

Mining will proceed in such a manner as to minimize disturbance to streams in the area. In instances where this cannot be avoided, sediment control structures and practices will be used to prevent the inflow of sediment to surface water. These control practices will include sediment traps or screens to control run-off and sedimentation. Surface runoff from maintenance workshops and other vehicle service areas will be channeled to an oil/water separator. All water from the oil/water separators will be skimmed prior to discharge. Discharges from the oil/water separators will meet effluent discharge limitations

Sumps will be excavated on the floor of the Sand and all groundwater flow and precipitation will be channeled into sumps. Measures will be implemented to prevent surface runoff from entering the open pit and from adding to the volume of groundwater inflow and direct precipitation. Erosion control operations will be performed under favourable weather conditions. When excessive moisture or other unsatisfactory conditions prevail, the work will be stopped.

Erosion control materials will not be applied in adverse weather conditions which could affect their performance. Erosion control will be accomplished by using one of the following:

- Erosion control blankets
- Geotextile fabric
- Seeding

Before placing the erosion control blankets the subgrade will be graded smooth with no depressions or void areas and will be free from obstructions, such as tree roots, projecting stones or other foreign matter. No vehicles will be permitted directly on the blankets. Before geotextile fabric is placed the subgrade shall be compacted and graded level with no depressions, voids, soft

or uncompact areas and shall be free from obstructions, such as tree roots, projecting stones or other foreign matter. Seeding shall then be applied to the areas.

24.6 Overburden Management

Improper management of overburden spoils could increase sediment discharge to surface water. To minimize excessive land consumption and the associated clearing of forested areas, spoil piles will be located in mined out areas in the open pit. Initially spoils will be disposed in above ground areas determined to be free of economic grade of stone. However, as mining progresses, spoils will be disposed in mined out areas as part of the progressive reclamation. Spoil piles will be periodically watered to minimize dust emission. In addition, all spoil piles will be surrounded by a soil containment berm to preclude the easy flow of surface runoff and sediment. The containment berm will be constructed of soil pervious enough to enable the passage of surface runoff water while trapping sediment contained in that runoff. The height and slopes of each spoil pile will be such that foundation and slope failures do not occur. Spoil piles will be seeded and revegetated after closure.

25 Operations

25.1 Issues and Aspects

A Community consultative committee (CCC) will be formed with the following representatives:

- The Project Director
- The Company Secretary
- The Sand Manager
- The Mining Engineer
- The Environmental Officer

A Representative from the kuru kuru Community

The CCC is required to meet at least twice a year.

The establishment and maintenance of the CCC will ensure that the relevant governmental agencies are kept informed of the progressive development of the Sand and measures being adopted to ameliorate environmental impacts.

25.1.1 Action Plan

A number of actions will be implemented to meet the operational requirements. An action plan for operations is provided in Table below.

Action	Responsibility	Timing	Performance Indicator	Monitoring
Any changes in the EMP will be submitted to the GGMC and EPA	Project Director	As required	Records of correspondence with CCC	Each change or amendment to EMP
All operations within the quarry shall be conducted in accordance with the OSH Act Cap. 99:10 and the Labour Act	Quarry Manager	Ongoing	Obtain workers licenses and permits	Yearly
Ensure compliance with hours of operation for excavation, blasting, processing, loading and Transportation: • 8:00 am to 5:00 pm Monday to Friday Restrict plant maintenance outside the workshop to: • 4:00 pm to 12:00 am Monday to Saturday Restrict maintenance operations inside the workshop to: • 8:00 am to 5:00 pm Monday to	Quarry Manager	Ongoing	Records of clocking in and out	Monthly

Friday Restrict domestic scale loading and transportation (where vehicles do not exceed 8t loading capacity) to: • 8:00 am to 5:00 pm Monday to Friday				
Ensure compliance with hours of blasting operations: • 8:00 am to 5:00 pm Sunday to Saturday	Quarry Manger	As required	Monitoring records	Every blast
Extension of quarry operations and transportation of product up to 6:00 pm Monday to Friday	Quarry Manager	As required	Records of correspondence	As required
Extension of maintenance outside the workshop up to 6:00 pm Monday to Friday	Quarry Manager	As required	Records of correspondence	As required
Treatment and disposal of all trade waste fluids and materials generated on site to the satisfaction of council	Quarry Manager	Prior to commencement of site operations	Records of correspondence	Once off
Ensure a workers representative is appointed to accept responsibility for compliance with the OSH Act Cap. 99:10 and the Labour Act	Environmental Officer	Ongoing	Records of appointment	Annual check of employee appointment
Ensure the total amount of material removed from the site does not exceed 300,000 tons per calendar year	Quarry Manager	Per calendar year	Dispatch records	Annually-end of calendar year
Ensure material additional to 300,000 tons per calendar year is only removed from the site following receipt of approval from GGMC	Quarry Manager	As required	Records of correspondence with CCC	Every exceedance of 300,000 tons
Ensure the processing, handling, movement and storage of materials and substances used is carried out in a competent manner	Quarry Manager	Ongoing	No records of incidents involving materials and substances	Daily
Ensure the treatment, storage, processing, reprocessing, transport and disposal of waste generated is carried out in a competent manner.	Quarry Manager	Ongoing	No records of incidents involving waste	Daily
Ensure all plant and equipment installed at the premises or used in connection with the quarry is maintained and operated properly and efficiently	Quarry Manager	Ongoing	Plant and equipment maintenance records	Annual Check of plant and equipment maintenance

Table 13 Action plan for Operations

26 Environmental Monitoring

26.1 General Monitoring Requirements

The Mining Regulations require that "environmental effects monitoring" should be conducted for every mine, including new mines. An "environmental effects monitoring program" is required to be submitted to the GGMC for approval as part of the Environmental Management Plan.

The IFC recommends that environmental monitoring programs should be implemented to address all activities that have been identified to have potentially significant impacts on society and the environment, during both normal operations and unexpected conditions. Social and environmental monitoring activities will be based on direct and indirect indicators of emissions, effluents, and other potential sources of impacts associated with the project. IFC guidelines recommend that monitoring should extend for a minimum period of five years after closure.

Monitoring frequency for each parameter will be sufficient to provide representative data for the parameter being monitored. Specific monitoring frequencies are specified in the following sections.

Monitoring will be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data will be analyzed and reviewed/compared against operating standards so that any necessary corrective actions can be taken.

The environmental monitoring program for the Sand will serve as an integral part of the operation and will be implemented to generate information for environmental management and environmental information dissemination. The monitoring plans described in this chapter encompass two distinct categories, environmental and operational. The environmental aspect is structured to monitor the physical, biological and socioeconomic changes in the environment, if any, and includes the mitigation measures. The operational monitoring will include those variables important for day-to-day operations such as processing methods and camp facilities.

Monitoring will be conducted during all phases of the project; specifically, the design, construction, operation and closure phases. The monitoring program will play a pivotal role in ensuring that the trends for specific parameters are tracked and will provide information on compliance with legislative norms, set guidelines or desirable operational limits. Review of the

monitoring data will provide a basis for corrective actions and modification of activities if necessary. Sampling intensity during monitoring will depend on the time and location of the development activities and results derived from monitoring data.

26.1.1 Noise Monitoring

In accordance with IFC General EHS Guidelines, the noise monitoring program will be designed and conducted by trained specialists. Monitoring periods will be sufficient for statistical analysis and may last 48 hours with the use of noise monitors that will be capable of logging data continuously over this time period, or hourly, or more frequently, as appropriate (or else cover differing time periods within several days, including weekday and weekend workdays). The type of acoustic indices recorded depends on the type of noise being monitored, as established by a noise expert. Monitors will be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface (e.g., wall). In general, the noise level limit is represented by the background or ambient noise levels that will be present in the absence of the facility or noise source(s) under investigation. Noise monitoring locations will be at the:

- Office building;
- Workshop; and,
- site

26.2 Air Quality & Dust Monitoring

Vehicles and non-stationary equipment will be visually monitored to identify any vehicles or equipment with visible particulate emissions that should be inspected to identify need for repair or maintenance.

Emissions from the generator house stack will be tested annually for NOx and PM, with fuel testing for SO2, to ensure IFC emissions guidelines are met. After three years, the testing frequency may be relaxed to every 2-3 years if the annual testing produces consistent results.

Roads and roadside vegetation will be monitored to ensure that excessive dust is not emitted by vehicle traffic, construction, and maintenance activities.

26.2.1 Soils Monitoring

The removal, storage, and reutilization of topsoil and organic matter will be registered and documented. The removal, storage, treatment, and final disposition of contaminated soils will also be registered and documented.

26.2.2 Water Quality Monitoring

Sampling of discharge points downstream of the tailings and water management ponds will be conducted weekly for the first year of operation and twice per month after that time. Effluent from the sewage treatment systems will be sampled weekly at the discharge point(s) and tested for total coliform bacteria, BOD5, COD, pH, total N, total P, oil & grease, and TSS and these will be compared against IFC General EHS Guidelines' indicator values for treated sewage discharges. Monitoring of effluent from oil-water separators will also be conducted weekly to ensure that discharged storm water meets effluent discharge/water quality standards prior to discharge into surface water.

Surface water samples will be collected in streams/creeks in proximity of the operations on a quarterly basis (i.e., four times each year). Statistical evaluation of the data will be performed to determine if sampling should be conducted at more frequent intervals. Stream flow data will be collected at each surface water sampling event as part of the sampling protocol. Surface water monitoring data will be compared to the IFC/World Bank Standards (IFC/World Bank Environmental, Health and Safety Guidelines for Mining, December 10, 2007) to assess for potential impacts from the mining operations and Guyana National Bureau of Standards Guidelines (2002). These levels should be achieved, without dilution, at least 95 percent of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours. Turbidity and temperature will be measured at the locations and logged.

Groundwater monitoring wells will be installed both up-gradient and down-gradient of the water management pond. Samples will be collected from these wells on a monthly basis and analyzed for the presence of heavy metals. Three additional permanent groundwater monitoring wells will be installed on the perimeter of the operations area. Groundwater sampling will be conducted at each perimeter well on a yearly basis and samples will be analyzed for the presence and concentration of parameters of the World Health Organization (WHO) guideline values provided in Guidelines for Drinking-water Quality Incorporating First and Second Addenda to Third Edition, Volume 1, Recommendations, 2006 to assess for potential impacts from the mining

operations. For cases where the baseline conditions exceed IFC/World Bank or WHO standards, the surface water and groundwater parameters should not show a statistically significant increase over the baseline levels.

26.2.3 Water Management Dam Integrity Monitoring

Monitoring and preventive maintenance will be undertaken to assure optimal performance of the water management ponds. Monitoring will consist of visual observation of the ponds embankment, and the monitoring of piezometers and other instrumentation installed to assess the performance of these facilities.

The water management ponds will be monitored on a weekly basis, at a minimum, or as dictated by the EPA/GGMC to visually determine their structural integrity. The ponds will also be inspected to determine seepage through embankment cross-sections and to ensure that adequate freeboard exist for their continued use. This is likely to require a specific piezomete based monitoring system for seepage water levels within the dams and downstream of them, which will be maintained throughout their life cycle.

Visual inspections and monitoring of dam embankment structural stability using settlement plates, slope inclinometers and pore water pressure measurements will be conducted to assess the stability of the dams. Soil strength gains associated with consolidation of the fill and the widened cross-section of the embankments due to tailings deposition should also be factored into the periodic evaluation of the impoundment stability.

Preventive maintenance will be undertaken at all potential trouble spots observed during visual inspection. The preventative maintenance will be geared primarily to ensure the stability of the structure and to control seepage through the embankment cross-section. A beach will also be maintained immediately adjacent to the upstream slope of the embankments to increase the length of the seepage path and the stability of the embankment slope.

Measurements and monitoring will be made after the occurrence of unusual conditions such as heavy surface runoff or peak floods. Changes could occur in crest levels, water levels, embankment slopes, cross-section geometry, seepage conditions, and material characteristics. A continuous program of inspection and maintenance will therefore be undertaken from the beginning of

deposition throughout the life of the dam. Through careful monitoring, areas of concern will be noted and quickly repaired, thereby preventing failure.

Visual monitoring will be done to identify typical distress signals associated with water management pond dam operation, such as cracking, wet spots on the downstream face, and critical settlement. The visual observations will be supplemented by instrumentation to enable an accurate interpretation of the extent of any problem likely to occur. The instrumentation inclusive of piezometers, settlement plates and inclinometers will be used to show developing trends in the behaviour of the tailings and water management ponds.

The instrumentation will be installed in the embankment and its foundation to monitor changes which are critical to the embankment stability, and to predict unstable conditions. Instruments will be installed to measure pore water pressures, seepage flows, embankment movements, and total pressures. Pore water pressure in soils will be measured with piezometers. Seepage flow emerging downstream from the embankment, will be collected and directed to a weir for flow measurements. Seepage flows will be used to indicate when significant changes occur and to permit an evaluation of potential problems from piping.

Markers will be installed on the embankment surface and will be aligned in a straight line-of sight to permit rapid detection of horizontal movement during surveys. In instances where cracks are visible on the embankment surface, successive measurements between two stakes spaced either side of the crack should indicate any widening and acceleration in separation rate.

Slope indicators will also be used to measure horizontal movement of the embankment. The slope indicators work by telescoping cylindrical casing into the embankment during construction. A sensing element is lowered down grooves inside the casing and measures the slope of the casing in two directions at right angles. From the measured slopes, the horizontal movements occurring over the length of the casing can be calculated. Settlement will be measured by levelling of temporary benchmarks.

The frequency of monitoring will depend on previous observations and on the critical nature of the parameters. The frequency of monitoring will be more pronounced during and immediately after construction. When records indicate that conditions are relatively stable, the frequency of

monitoring will be extended. Monitoring auditing will include water balance, freeboard, and deposition plans.

26.2.4 Overburden Stockpiles Monitoring

The overburden stockpile will be monitored on a weekly basis to determine the integrity of the containment berm around the perimeter of the stockpiles. The monitoring events will include an evaluation of the height and slopes of the stockpiles to ensure that they do not exceed the tolerable limits.

Potential geotechnical changes in the stockpiles will be monitored to assess potential changes that can significantly decrease the stability of the stockpiles. In accordance with the IFC EHS Guidelines for Mining, modern topographical 3D deformation measurements and related specific processing and evaluation software will be the standard method for stability monitoring.

Dust emissions from the stockpiles will be visually monitored and corrective action implemented, if required. Corrective actions may include wetting down or covering the stockpiles to reduce dust emissions.

Runoff from the stockpiles will be monitored for water quality. Samples will be collected from the leachate collection/perimeter drainage system and analyzed for the presence and concentration of appropriate parameters to assess whether the leachate can be discharged directly into the diversion channel system or whether it must be pumped to the water management pond for treatment prior to discharge to surface water.

Potential changes in geotechnical properties due to chemical or biologically catalyzed weathering will be considered and monitored as these can reduce the geotechnical stability of the stockpiles.

26.2.5 Hazardous Material Monitoring

Inventories of hazardous material will be monitored to ensure all material is used for the purposes intended. Waste containment areas will be monitored to ensure that the impervious surface upon which they are sited is not breached. The area will be monitored to determine that incompatible chemicals are not stored together and that storm water discharges from the area are channeled to the water management pond. Hazardous material inventory data, will be reported to the GGMC and made available to interested stakeholders.

26.2.6 Solid Waste Monitoring

The solid waste disposal operation will be monitored to determine the effectiveness of the recycling, composting and disposal operations. Manifests will be developed to ensure proper disposal of septic tank waste.

26.2.7 Aquatic Ecology Monitoring

In addition to the monitoring of the physical and chemical quality of water in streams and rivers, Clifton Anthony Hicken will perform periodic sampling to assess trends in the abundance and diversity of the aquatic biota in all of the streams affected by the Project. Special attention should be given to the detection of invasive alien species.

26.2.8 Terrestrial Ecology Monitoring

Wildlife monitoring will be conducted concurrently with the vegetation monitoring. Observations will be recorded in a wildlife-sighting logbook and these will be periodically examined to determine if there have been any significant changes in species abundance and/or distribution. All collisions with wildlife on haul and site roads will be recorded. The record will note the proximity to cleared areas, the animal involved in the collision and the time of that collision etc. These records will be used to evaluate the success of the measures outlined in the Management Plan.

In the event that endangered species are observed at any time during construction or operations, special monitoring plans will be developed to track these occurrences. A record will be maintained of all animal mortality associated with The Water Management Pond. The location of the fatality, the time of day and the process discharge at that time will be among the parameters recorded. Additional fencing around the ponds will be installed as needed based on the results of this monitoring. Special attention should be given to the detection of invasive alien species in order to preemptively identify areas were control measures are required.

26.2.9 Progressive Reclamation Monitoring

As part of the rehabilitation program, a record will be maintained of all spontaneous and natural regrowth after clearing and the conditions contributing to that that regrowth. The record will note plant species, soil type, weather conditions during the period, drainage conditions etc. The records will be used to examine parameters considered necessary for the successful establishment of plant cover after reclamation.

Land rehabilitation areas will be monitored to ensure that compaction of the ground surface does not preclude the infiltration of precipitation. The humus from the composting operation will also be monitored to ensure its use in the land rehabilitation. The growth of any trees planted for revegetation will be monitored. Substitute plant types will be identified if the growth rates are unacceptable.

26.2.10 Post-Closure Monitoring

Post closure monitoring of the Water Management Pond will be conducted to ensure the integrity of the embankment cross-section and to verify that surface water and groundwater are not being impacted by releases from the Water Management Pond. Post closure monitoring of the Water Management Pond will also include the collection of surface water and groundwater samples from locations in the vicinity of the Water Management Pond on a quarterly basis. Both surface and groundwater samples will be analyzed for parameters mandated by the EPA. Minimum parameters for which both surface and groundwater will be analyzed are detailed. Sampling will be conducted for a period of five years after Sand closure, at a minimum. Additional monitoring beyond five years may be required depending on the results of a risk analysis.

Closed facilities will be inspected and annual reports provided to evaluate the success of progressive rehabilitation. Rehabilitation monitoring will be coordinated with the EPA and GFC. Rehabilitation success will be evaluated both in terms of vegetation and erosion. The existing monitoring programs for surface and groundwater will continue in accordance with the proposed monitoring plans. Monitoring will be modified to address progressive rehabilitation as it proceeds.

26.2.11 Monitoring Checklist

This section contains a pro forma environmental inspection checklist to facilitate routine environmental monitoring.

Environmental Inspection Checklist Date of Inspection: _____

Inspected by: _____

Item	Yes	No	N/A
Copy of EMP is readily accessible			
Check training, complaints registers for new entities			
Incident Response Plan displayed in a prominent position			
Soil and water management measures are well maintained			
There is no material on area adjacent to quarry access			
Dust suppression equipment is accessible			
Areas where construction has ceased are being rehabilitated			
Vegetation corridor is being rehabilitated			
No apparent illegal discharges to waterways			
No river traffic violations for use of the Essequibo River			
Appropriate noise control measures are being implemented			
Stockpiles appear adequately maintained and managed			
No unnecessary land disturbance onsite			
Newly created bund walls or overburden stockpiles have been revegetated			
Minimal to no dust emissions from premises			
Hazardous materials are being stored in bunded areas			
Appropriate documents available for off-site disposal of hazardous waste			
Spill control measures in place and easily accessible			
Waste receptacles are in place and adequately maintained			

Table 14 Elements of Checklist

Emergency Response Plan for Clifton Anthony Hicken Sand

27 Introduction

In support of the proposed Sand activities and operations for the Clifton Anthony Hicken project, we have developed an emergency response plan (ERP) that outlines procedures and identifies responsible personnel and third party support expertise the are capable of dealing with emergency situations. This ERP will speciffically adress alert levels, evacuation requirements, call down procedures and external agency involvement.

It is important to note that the primary objectives of the ERP is to limit the danger or increased hazard therefore this Emergency Response Plan (ERP) is designed to cover all operations at the site, including:

- The main site processes;
- Services and utilities;
- Support infrastructure including administration and workshops;
- Exploration; and
- Public Safety

28 AIM of the Emergency Response Plan

The aim of this ERP is to describe the appropriate emergency response actions should an emergency situation occur at the property.

29 Objectives

The objectives of the Emergency Response Plan (ERP) are:

Provide the project personnel with an efficient and coordinated emergency response plan to:

- Minimise consequences of an emergency situation arising from any aspect of the Sandactivities; and
- Protect the health and safety of any employees, contractors, subcontractors, nearby communities and the company;
- Define the roles, responsibilities and actions of the Emergency Response Team;
- Work with external emergency organisations in the event of an emergency which could threaten neighbouring personnel or properties. This involves development of a

Memorandum of Understanding with local emergency services organisations and conducting scheduled and regular joint emergency exercises;

- Work with and support contractors implementing approved emergency procedures to control or minimise any effect that any emergency may have on the Sandand decrease the risk of injury and/or damage to employees, neighbouring land users, property, the environment and the general public;
- Provide the emergency response team members and contractors management with a series of actions that will minimise any serious consequence that could occur;
- Provide guidelines on determining the severity of any emergency situation and the response that is required;
- Provide Duty Statements for each emergency response team member and initial responses for each type of extreme emergency and external contact numbers for use in an emergency situation;
- Establish formal communications protocols during emergency response;
- Establish the requirements for regular coordinated training exercises and drills on likely emergency scenarios; and
- Provide the basis for subsequent review and recommendation for on going improvement of the ERP. The intention is to minimise the number of people exposed to the risks involved in an emergency and the subsequent response.

This ERP is based on a philosophy that site personnel, led by the company's appointed Manager, shall take all actions necessary to manage an emergency and bring the incident under control, within the constraints of the situation. The emergency plan also reflects the possibility that control may need to be handed over to external emergency services but that the projrct personnel may need to manage the incident at least in the interim.

4 Clifton Anthony Hicken project Assessment

The major risks associated with mining are drilling risks, slope failure, fly rock and vibration due to blasting, storage of explosives, toxic fumes from blasting etc. However, this phase of the project is focused on the extraction of sand, and lateratic material and as such, blasting activities would not be necessary.

This risk analysis for the proposed Sandoperations involves systematic identification and assessment of major damage potential credible risk scenario to help management to make objective decisions on hazard reduction or avoidance measures meeting regulatory requirements and develop a structured management framework for an effective Disaster Management and Emergency Response.

Plan including emergency preparedness and contingency plans.

The planning for mitigating the emergency involves recognizing the accident or possible, assessing the consequences of such possible accidents and deciding on emergency planning /procedures in advance both on site & off site that are deemed necessary to be implemented in the event of emergency without any delay and confusion.

Proper bench design in mines and observing safety measures for transportation, storage, handling of fuels, etc, good maintenance of vehicles, roads, fire prevention measures are critical in preventing disaster/accidents.

Clifton Anthony Hicken Sand intends to conduct mining activities in accordance with the stipulations of the revelant Laws and Regulations of Guyana. It therefore follows that mining operations would adhere to the mandates of the Mining Act of 1989, the Environmental Protection Act, the Occupational Health And Safety Act, ect. and the accumpanying regulations whereever applicable.

As the Sand operation is open cast , only possible risk is collapse of mine pit when

people are working. For this proper bench slope will be maintained as per the mining plan. At all instances during mining operations, sufficient overburden pushbacks to avoid any collapse of the overburden into mine pit.

The proposed Sandsite located at about 35 Km from the town of Georgetown and will have good transport

and communication systems.

The Sandarea would be provided with good communication facilities like telephone & mobile phones and radio systems .

In case of any minor/major accidents within the mine, the same will be communicated to the local medical Officials, Police, Fire Department, etc for action.

A high powered motor vessle will be kept all the time at the Sandsite for conveyance.

The employees at the project would be periodically trained for proper safety training.

At Sandlevel first aid facility would be provided and person(s) will be shifted to nearest major hospital which is in the nearby town of Georgetown where they would receive further medical assessment since this Government hospital is at minimum equipped with all basic amenities. Further, there are

qualified medical officers in the Hospital, who are capable of handling normal

accidents. In case of high risk accidents injured will be shifted by air transport from Georgetown to hospital in Georgetown for more advanced health care.

A designated Sand Manager will be the person responsible of the emergency response and he

needs to be contacted immediatly in case of any emergency.

30 Reviewing and Updating the ERP

Clifton Anthony Hicken acknowledges that from time to time, adjustments would be necessary to ensure the ERP achieves the highest standard. This plan would be subjected to an annual review and possible amendment. It may also be reviewed following audits or incidents. Changes to this plan shall be communicated to to the Guyana Geology and Mine s Commission, the Environmental Protection Agency and all other relevant stakeholders as deemed necessary since each person receiving a copy of the plan is responsible for ensuring their areas of responsibility are aware of the changes. Emergency Response personnel under the direction of the designated Manager are responsible for ensuring the ERP is updated in all distributed folders.

31 Incident Classification and Response

For the purpose of this ERP and in order for ensure the established protocals are followed, incidents will be classified into one of the following levels depending on the severity of the emergency or the potential of the incident to become more serious:

Level A – External Alert where effects may spread and impact on the people, property or the environment outside the site or cannot be contained by site resources

Level B – Site Alert where the effects may spread to other areas on the site

Level C – Local Alert for any situation which THREATENS LIFE, property or the environment In the event that there is any doubt that an incident is an emergency, the incident should be treated as an emergency and classified in accordance with this plan.

32 Types of emergencies

32.1 Immediate response

32.1.1 Manager Immediate Actions

The manager at the Clifton Anthony Hicken site, on being notified of a potential emergency, will assess the situation and proceed with the following:

- Confirm the emergency severity and declare an emergency situation;
- Mobilise the Emergency Response Team members to assemble at the Emergency Response Centre.
- Brief the Emergency Response Team.
- Allocate roles to members;
- Manage the team; and
- Implement and monitor the activities of the Emergency Response Team.

32.1.2 Emergency Evacuation

There would be an Emergency Evacuation diagram for the site, which is displayed on ER (emergency response) Notice Boards and at the entrance of every building. The Emergency Muster Points would be pre-identified and all personnel at the Sandwould be made aware of the

designaded muster points and periodically reminded of such points by means of drills and other exercises. Signs identifying the muster points would be made conspicuous posted.

32.1.3 Contact Directory

The company Phone List would comprise all the internal and external emergency numbers and it would be updated monthly. An up to date list would be maintained by the IT personnel and displayed in all offices, dining area and in the accommodations of employees.

Potential Crisis	Likelihood	Consequence	Level of Risk	Initiating and Secondary Events	Control Measures
Fire; including toxic combustion products, substations and Transformer (includes electrocution)	Possible	Major	High	An explosion which causes structural damage, the fire to spread and injuries	Training, inspections, maintenance schedules, Detection systems, alarm systems, Fire breaks, Fire Hydrants and trained ER personnel, ER exercises
Spills (liquids, solids, radioactive and other dangerous materials)	Possible	Moderate	Medium	A release that causes environmental harm	Meeting design standards, Inspection of facilities, small containers, bunding, training
Gas leak – flammable (including natural gas)	Possible	Major	High	A fire or explosion that causes structural damage and injuries	Training, inspections, maintenance schedules
Gas leak – toxic	Possible	Major	High	A release of gas that spreads and causes harm to people, animals and the environment	Training, inspections, maintenance schedules
Natural events: Flood	Unlikely	Minor	Low	An ingress of water that causes land slip or subsidence	Flood protection, inspections, audits
Grass/bush fire	Likely	Minor	Medium	An out of control fire that causes property damage and injuries	Fire breaks, Fire Hydrants and trained ER personnel, ER exercises
Earthquake	Rare	Moderate	Medium	A tremor or ground movement that could cause spills, gas leaks,	Building specification/design

			fires, injuries, Land slip or subsidence		
Potential Crisis	**Likelihood**	**Consequence**	**Level of Risk**	**Initiating and Secondary Events**	**Control Measures**
Wind/Lightening storms	Rare	Negligible	Low	Strong winds and heavy rain that causes flooding , land slip/subsidence, fires or explosion	Building specification/design
Exotic stock/plant disease	Rare	Negligible	Low	An outbreak that causes human epidemic/ or plague	Environmental procedures, training
Human epidemic/plague	Rare	Minor	Low	An outbreak that causes human health issues	Environmental/health procedures, training
Land slip/subsidence	Possible	Moderate	Medium	Ground movement that causes flooding, property damage and injuries	Inspections, ground maintenance

Impact events: Road vehicles	Possible	Minor	Low	A significant impact event that causes fire, explosion, gas leaks, injuries	Training, inspections, ER personnel
Civil disturbances: Riots	Rare	Minor	Low	An out of control mob that causes a fire, explosion, gas leaks, injuries	Security Guards, training, community relations

Table 15List of Potential Crisis and control measures

32.1.4 Fire Response:

- Arrange for safe removal of employees, contractors and the public from any dangerous situation;
- Secure the area and do not allow any disturbance to the area;
- Ensure all hazards identified and managed / isolated prior to entry
- Transformer or Sub station fire requires approval and confirmation that plant and equipment is de-energised from site electrician prior to response / entry. Isolations will be required, which may include de-activating the emergency generator.
- NB – any incidence of electrocution, or suspected electrocution, requires immediate notification of the Emergency Response Officer (ERO). Please refer to the site First Aid Procedure.
- Many vessels and equipment contain oil, including the transformer and the electrical capacitors. Use fire water and foam to combat fires (liquids incl. oil). Immediate consideration to cooling or protecting from radiant heat is required to avoid an explosion.
- A tyre fire has the capacity to explode as gasses heat up and expand. General procedure is a 300 metre stand off and a 24hour stand down. If a task requires advancing into the 300 metre perimeter (e.g. extrication of personnel) – this will only be approved after a risk assessment recognizing the hazards has been conducted, and with the Manager's approval.
- Allow only designated personnel into the area;
- Ensure that water or water based suppression is not applied to (electrical) fires until de-energised
- Mobilise emergency response personnel to protect any endangered equipment by using the site's fire protection resources; and
- If required call external emergency services organizations at Georgetown and escort to the area.

32.1.5 Explosion (including Boiling Liquid Expanding Vapour Explosion-BLEVE)

Response

- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation;
- Secure the area and do not allow any disturbance to the area;
- Ensure all hazards identified and managed / isolated prior to entry.
- Transformer or Sub-station incident requires approval and confirmation that plant and equipment is de-energized from site electrician prior to response / entry. Isolations will be required, which may include de-activating the emergency generator.
- Allow only designated personnel into the area;
- Ensure that water or water based suppression is not applied to Class E (electrical) fires until de-energized
- If the fire is a jet fire, isolate the source if possible. DO NOT EXTINGUISH THE FLAME AS A VAPOUR CLOUD COULD FORM WHICH COULD SUBSEQUENTLY EXPLODE;
- If the jet fire cannot be extinguished via isolation of the fuel source, apply fire water to any equipment and/or structures that are subject to excessive levels of radiant heat and could propagate the emergency if they fail. Perform this task until the emergency services arrive or the fuel source is depleted;
- Use fire water with foam when applicable and cool heat affected equipment and/or structures as required;
- If there is a fire impinging on the LPG storage tank, there is a risk of a BLEVE occurring. If safe to do so, apply fire water to the LPG tank for cooling and extinguish the fire if possible. If there is a risk of a BLEVE, all personnel should be evacuated to a safe distance as the effects of a BLEVE (i.e. fireball and missiles) can travel hundreds of meters;
- Where buildings containing drums are on fire, there is a risk of exploding drums (some drums have been known to travel up to 300 meters from fires). All personnel should be

evacuated to a safe distance in such an event. Fire- fighting is to be assessed based on the risk to the responders who are required to apply fire water; and

- If required call external emergency services organizations from Georgetown and escort to the area.

32.1.6 Spills (liquids, solids, radioactive, other dangerous materials)

Response

- EPA must be contacted immediately by the Manager;
- Ensure appropriate PPE
- Control the leak/flow;
- Contain the spillage to the smallest area possible;
- Limit access to the area to only clean up personnel;
- Manager to arrange for sampling of any water pollution or potential pollution;
- Environmental Officer to record the incident details with photographs and samples; and
- Environmental Officer to advise statutory authorities of the incident.
- If required call external emergency services organizations and escort to the area.

32.1.7 Gas Leak – flammable (including natural gas)

32.1.7.1 Response

- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation; Secure the area and do not allow any disturbance to the area;
- Allow only designated personnel into the area;
- Mobilize emergency response personnel to protect any endangered equipment by using the site's fire protection resources; and
- If required call external emergency services organizations and escort to the area.

32.1.8 Gas leak – toxic

32.1.8.1 Response

- Ensure appropriate PPE is utilized
- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation; Secure the area and do not allow any disturbance to the area;
- Allow only designated personnel into the area;
- Mobilize emergency response personnel to protect any endangered equipment by using the site's fire protection resources; and
- If required call external emergency services organizations and escort to the area.

32.1.9 Flood

32.1.9.1 Response

- Arrange for safe removal of all employees, contractors and/or the public from any dangerous situation;
- Conduct a survey of the damage caused.

32.1.10 Grass/Bush fire

32.1.10.1 Response:

- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation; Secure the area and do not allow any disturbance to the area;
- Allow only designated personnel into the area;
- Mobilize emergency response personnel to protect any endangered equipment by using the site's fire protection resources; and
- If required call external emergency services organizations and escort to the area.

32.1.11 Earthquake

Response

- Arrange for safe removal of all employees, contractors and/or the public from any dangerous situation;
- Conduct a survey of the damage caused; and
- Secure the area and do not allow any disturbance of the area.

32.1.12 Wind/Electrical(Lightening) storm

32.1.12.1 Response

- Arrange for safe removal of all employees, contractors and/or the public from any dangerous situation; Conduct a survey of the damage caused; and
- Secure the area and do not allow any disturbance of the area.

32.1.13 Exotic Stock/Plant Disease

32.1.13.1 Response:

- Arrange for safe removal of all employees, contractors and/or the public from any dangerous situation; Conduct a survey of the damage caused; and
- Secure the area and do not allow any disturbance of the area.
- Contain the spread of the disease;
- Clean up area;
- Environmental Officer to arrange for sampling of any water pollution or potential pollution;
- Environmental Officer to record the incident details with photographs and samples; and
- Environmental Officer to advise statutory authorities of the incident

32.1.14 Human epidemic/Plague

32.1.14.1 Response

- Arrange for safe removal of the affected personnel;
- Arrange for treatment of the affected personnel;
- Arrange for safe removal of employees and contractors from any dangerous situation;
- Secure the area and do not allow any disturbance to the area; and
- Call external Emergency Services Organizations (if necessary).

32.1.15 Land slip/Subsidence

32.1.15.1 Response:

- Arrange for safe removal of all employees, contractors and/or the public from any dangerous situation; Secure the area and do not allow any disturbance to the area;
- Allow only designated personnel into the area;
- Environmental Manager to arrange for sampling of any potential pollution;
- Environmental Manager to record the incident details with photographs and samples; and
- Environmental Manager to advise statutory authorities of the incident

32.1.16 Road Vehicles

32.1.16.1 Response:

- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation; Secure the area and do not allow any disturbance to the area;
- Allow only designated personnel into the area;
- If required and approved by the Manager, organize emergency response personnel; and
- If required call external emergency services organizations and escort to the area

32.1.17 Riots:

32.1.17.1 Response:

- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation;
- Phone the police and give details; and
- When police arrive provide them with any assistance they require.

32.1.18 Impact events

Road vehicles and aircraft present a possibility of impact with process site areas. Emergency situations caused by impact of road vehicles or aircraft are likely to be similar to those emergencies described above and will be handled as per the magnitude of any consequential impacts that they cause, as described above.

32.1.19 Civil disturbances

Demonstrations and riots may result in emergency situations. Handling these types of emergencies is based on management of any consequential event that they cause, as described above. Because civil disturbances such as public demonstrations may become violent and result in employee injury or property damage, it is important that Police be notified immediately.

32.2 Emergency response

32.2.1 Emergency response flowchart

This shows the overall process of how Clifton Anthony Hicken Site personnel would respond to various levels of emergencies.

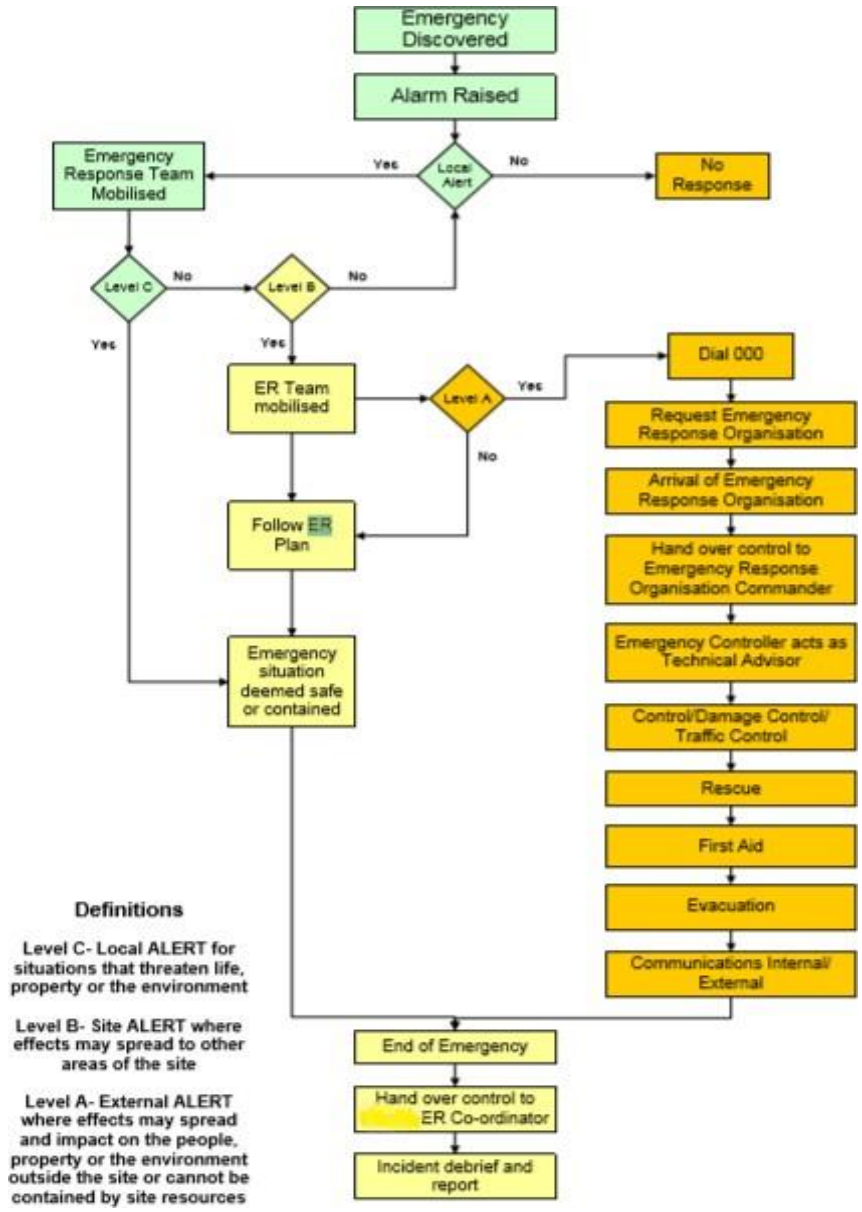


Figure 3 Emergency Response Flowchart

Emergency Response

32.2.1.1 Contact Telephone and Fax numbers

The people, companies and/or services that may be required to be contacted in an emergency would be kept and circulated to the relevant personnel at the Project site.

32.2.2 Emergency Controller

The Emergency Controller for the site is the Manager and he would oversee the Emergency Response team members including the Security Supervisor. There are a number of people who would be trained as part of the emergency response team. These people are the Emergency Response and Security Supervisor, Safety Superintendent, Emergency Response Officers and certain Shift Supervisors. Should the primary Manager not be available for the emergency situation, e.g. he/she is incapacitated by the emergency; the most senior staff member who is adequately trained will assume the role of Emergency Control Duty Officer.

The responsibilities of the Emergency Controller during the period of any emergency are to prioritize and then coordinate the following activities:

- Damage Control
- Search and Rescue
- First Aid
- Communications – both internal and external
- Evacuation
- Traffic Control

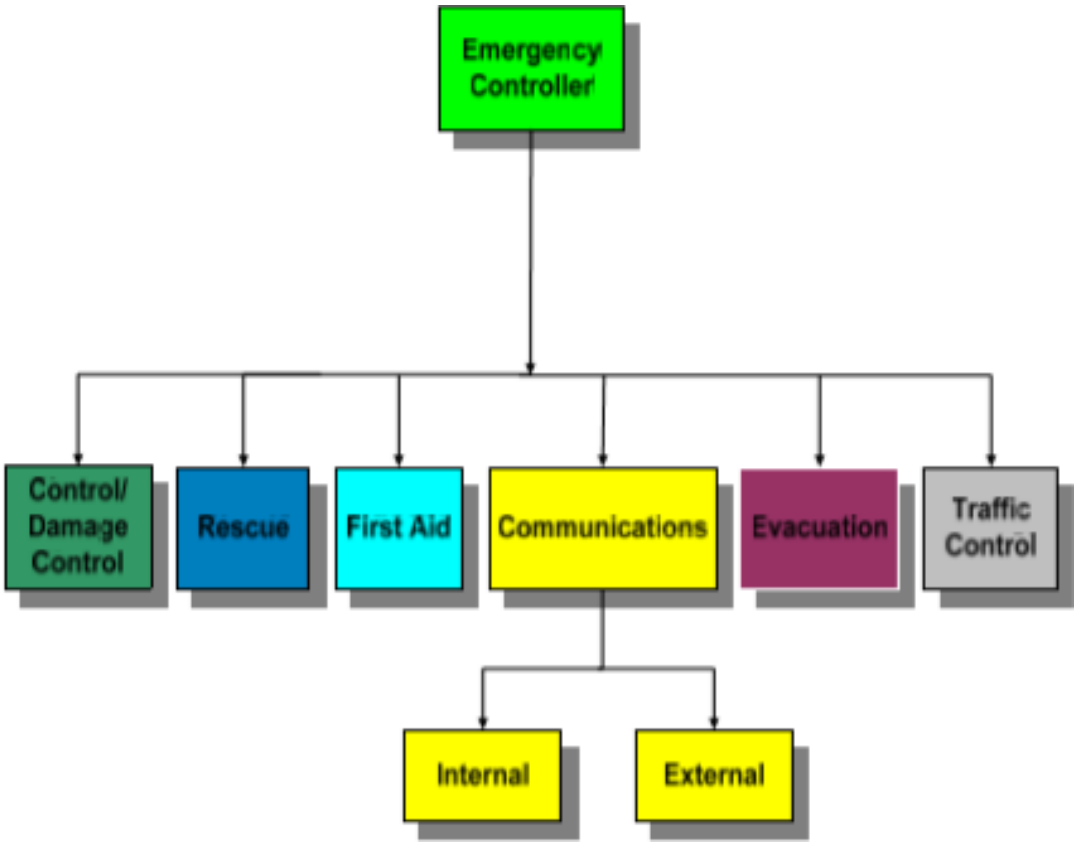


***Figure 4 The responsibilities of the Emergency** Controller*

33 ER Team Purpose

The ERT are to be uniquely dressed at times of emergencies in brigltly coloured rescue overalls for protection and identification. The purpose of the Emergency Response Team would be to:

- Obtain all the facts about the incident/situation;
- To develop actions to address the immediate needs of the Emergency Controller;
- To provide high level direction to managing any emergency situation;
- To coordinate and implement the requirements of this ERP;
- To minimise losses associated with any emergency situation;

• Protect the interests of the project proponent and all other stakeholders associated with the Project site. The Emergency Response Team is also responsible for anticipating all potential threats during an emergency situation, developing and implementing preventative strategies and planning to minimise their impact if they do occur.

33.1 ER Team Responsibilities

In an emergency situation the Clifton Anthony Hicken Emergency Response Team responsibilities would be to:

• Confirm that an emergency situation is occurring;

• Obtain all facts about the emergency;

• Establish effective communication channels;

• Assess the situation;

• Identify stakeholders potentially effected;

• Identify priority actions to be taken;

• Implement actions;

• Monitor the effectiveness of actions implemented

33.2 Damage Control / Containment

Damage control / Containment will be handled by the nominated people under direction of the Emergency Controller. These nominated people are likely to be employees who are knowledgeable of the site design and operation. The priority is to make the site safe, minimise further escalation of the incident and isolate the incident to the smallest area. This will be done by the nominated people by means of process and heavy equipment isolation, both electrical and mechanical.

33.2.1 Search and Rescue

Search and rescue will be handled by the nominated people under direction of the Emergency Controller. The priority is to account for all personnel in the area, direct them to a safe location,

arrange first aid/medical assistance for injuries and never endanger the safety of the rescuers. Personnel performing search and rescue are to be fully trained in the use of self contained breathing apparatus. They are also to be fully knowledgeable of all areas of the site.

33.2.2 First Aid

First Aid is provided by the Emergency Response Officer or the Emergency Response Team. The basis for good First Aid in an emergency is to survey the area and commence rescues with the aim of doing the greatest good for the greatest number of injured people. In emergency situations the site First Aid Vehicle will be taken to the scene of the emergency by the Emergency Response Officer. Any injured people who can be moved safely are to be taken to the First Aid Centre and treated there. Those people who are trapped or unable to be moved are to be given First Aid on the spot provided the lives of the First Aid providers are not subject to unacceptable risks. If assistance is required of the local hospital at Georgetown they are to be contacted at the earliest opportunity – to be assessed and actioned by the Emergency Controller. If casualties require immediate transfer to Georgetown Hospital, a minimum of 2 attendees are required.

34 Communications (internal and external)

34.1 Internal Communications

Communications within the site are via the UHF radio and the telephone system. The Emergency Controller, First Aid Officers and Emergency Response Officers will have UHF radio sets and access to telephones.

34.2 External Communications

Communications to the emergency service organisations (Fire Brigade, Ambulance, Police, Georgetown Hospital and Fire Service) will be by use of telephone. Any phone (landline or mobile) will be used to notify external organisations. This is to eliminate any unnecessary delays. The Emergency Controller will be responsible for this task.

34.3 Evacuation

34.3.1 Muster Points Site

Muster Points would be located at the parking lot at the front gate car park, the open space at the front of the administrative building, and at the main cafetira. To ensure that all those present on

the site are accounted for (including contractors and visitors) a head count is performed. This will include the use of the employee and visitor register, and the sign in register. Nominated personnel would perform the necessary head counts at each Muster Point and communicate to the Emergency Controller via radio or telephone. The personnel at each Muster Point should be accounted for prior to and after each move. If someone on the site cannot be accounted for, then a search will be initiated by the Emergency Controller.

34.3.2 Evacuation from the Site

Depending on the type of emergency, a site evacuation may be initiated. Based on the initial assessment of the emergency (i.e. a Level A, B or C emergency), the Emergency Controller may take the following steps:

- Initiation of an area or site evacuation;
- Announce over the radio the type and location of emergency;
- Contact the main gate via radio or telephone detailing the nature of the incident and request to contact the Emergency Response Team;
- Account for personnel; and
- If all people are established to be safe (i.e. search and rescue is not required), proceed with emergency response actions as per the ERP procedures. If not, search and rescue operations must be commenced.

For releases of hazardous gases, people are to proceed up wind if they are downwind of the release. If an Emergency Muster Point is downwind of the gas release then the warden is to relocate all people to a safer location. It may be decided by the Emergency Controller that employees should be further evacuated. This could include relocation off-site. In such an event, employees will remain under the control of the Emergency Controller. This is to ensure the safety of employees throughout the evacuation. Where it is safe to do so, processes are to be shutdown and hazardous materials isolated and made safe, before evacuating. Personnel are to be directed to evacuate by the shortest, safest route. It is the responsibility of the Emergency Response team to review and update the evacuation procedure at the completion of any evacuation or drill.

34.3.3 Traffic Control

Traffic control is used to prevent traffic from entering areas of danger. With the exception of emergency response vehicles, external traffic will be prevented from entering the site at the main gate. External traffic will only enter if requested by the Emergency Controller. The Emergency Controller, and/or Emergency Officers will manage on-site traffic during an emergency. When the external emergency services arrive at the main gate, a nominated person may be requested by the Emergency Controller to escort the emergency services personnel. Escorts will provide advice on roads, plant areas, hazards as well as any other relevant information.

35 Declaration of an Emergency

The Emergency Controller will confirm the emergency severity and declare an emergency situation and mobilise the Emergency Response Team members to assemble at the Emergency Response Centre.

35.1 Emergency Response Centre

The Emergency Response Centre is located in the main office at the project site. The Emergency Response Centre shall be equipped with the following:

- Phones/faxes
- Current maps/drawings
- ER Manual
- Two-way radios
- Emergency lighting
- Phone message log sheets
- Whiteboard & markers
- Computer and printer
- Group telephone directory
- Writing pads and pens

The Security Supervisor is responsible for auditing the two Emergency Response Centres on a quarterly basis to ensure that they are correctly equipped.

35.1.1 Emergency Response Equipment

Type of Emergency Equipment	Location
Hydrant	Located at strategic points around the operations
Hoses	Located in cabinets at each hydrant
Fire extinguishers	Located in each building and vehicle and around the Process Plant
Self contained breathing apparatus Located in the	Separate Section of Stores
Acid suits Located in the Mines Rescue Station	Separate Section of Stores
PPE	Separate Section of Stores
Gas detector	
Rescue harness	Located on the Fire/Rescue Appliance
Ropes	Located on the Fire/Rescue Appliance
First aid boxes	Located in FA Centre and all vehicles
First aid centre	Located in Administration Building
Emergency radio	Monitored by Security Supervisor
Emergency telephone	Monitored by Security Supervisor
Emergency lighting	Separate Section of Stores

Table 16 shows the type and location of all emergency equipment kept at the site.

35.2 Activation

35.2.1 Alarm

35.2.1.1 Alarm System

Description The site has three systems for raising an alarm. They are by use of UHF radio, telephone and siren.

35.2.1.2 UHF Radio

All mobile equipment is fitted with UHF two way radios. A pre-selected radio Channel would dedicated emergency channel. This emergency channel would be monitored at all times by Emergency Response personnel. Araeai employees, contractors and visitors will be trained in the method of notifying of an emergency via UHF radio. In the event of an emergency, the caller is instructed to announce "Emergency, Emergency, Emergency" over the designated Channel. Upon acknowledgement, the caller will then be asked a series of questions. These questions will assist in assessing the level of the emergency which will then determine the level of response. UHF radios are maintained on site by the Electrical Supervisor. Termination of the emergency and All Clear notification is made via the said emergency channel.

35.2.1.3 Telephone

All buildings are fitted with telephones. Key mine personnel will be issued with mobile telephones. A special telephone number would be dedicated as emergency number. This telephone number would be monitored at all times by Emergency Response personnel. C CLIFTON ANTHONY HICKEN SANDPROJECT employees, contractors and visitors will be trained in the method of notifying of an emergency via telephone. In the event of an emergency, the caller is instructed to announce "Emergency, Emergency, Emergency" over the telephone. Upon acknowledgement, the caller will then be asked a series of questions. These questions will assist in assessing the level of the emergency which will then determine the level of response. Telephones would be maintained on site by Information Technology personnel. The Emergency telephone number would be tested weekly.

35.2.1.4 Sirens

Sirens would located at the Cafetira building, the main Admintrative building. Heavy Vehicle Workshop and on the top of the Process Plant Control Room building. The sirenis to be an audible alarm. The siren is installed for the purposes of notifying personnel that an emergency is activated. The Emergency Controller is responsible for activation of the Emergency Sirens.

36 Interaction with Emergency Services

It is essential that complete co-operation is achieved between emergency services such as the Georgetown Fire Brigade,Georgetown Police and Georgetown hospital and the company personnel managing any emergency. This ERP requires that emergency services be called to the site immediately once the emergency is declared as a Level A. Whilst anyone can call this number,

it would normally be the Emergency Controller's responsibility. The system would be designed to handle multiple telephone calls for the same emergency. After arrival of the Fire Brigade, the Emergency Controller should hand over control to the Senior Fire Brigade Officer who becomes the Emergency Services Controller. When hand over is made, the Emergency Controller will maintain close liaison to the Emergency Services Controller, providing advice and directing company personnel as required. The Emergency Controller is to remain at the site during the emergency unless they are relieved of their duties by another person who is appropriately trained to assume this role.

Road access to the site via the main gate on the mine access road must be maintained so that emergency service personnel have easy entry. Internal roads must be kept free of vehicles not involved in handling the emergency. Vehicles which are not directly involved in the emergency must not be allowed onto the site. Technical and general advice about the site's hazards would be given to the arriving emergency services personnel. Material safety data sheet information must be made available to the Emergency Services, copies of will be kept at the Front Gate, First Aid Centre, and Emergency Response Centre and at each storage site.

36.1 Hand Over Control

When other authorities including Police, Fire Brigade, medical personnel or othe State Emergency Services arrive on site, the Emergency Controller should hand over responsibility for directing emergency operations to the Senior Officer. This person then becomes the Emergency Services Controller with overriding authority.

The handover briefing will include:-

- Location, nature and status of the emergency
- Details of personnel injured or trapped
- Action taken to date
- Location of all personnel involved
- Details of product(s) involved
- Details of other known hazards
- Any other relevant information
- Access to a written copy of this manual

The Emergency Controller will then continue to provide advice to the Emergency Services Controller about the particular plant hazards, location of equipment, access to buildings, location of plant personnel etc. He/she will continue in this role unless relieved. The Emergency Services Controller takes charge of:

- Fire fighting
- Spillage control
- Identification
- Containment
- Make safe
- Rescue
- Clean Up

The Police Commander would be in charge of:

- Ground Control
- Traffic Control
- Perimeter Control
- Evacuation
- Disaster victim registration/identification
- Investigation
- Property Security
- Support to Fire Brigade
- Co-ordination

37 Administration

37.1 Public Relations and Debriefing

"Communications with the Media" It is important that communications to the news media during an emergency are well planned. The news media can be very helpful during an emergency. This ERP allocates this duty to the Sand Manager. Crisis communications includes the management of communications to:

• The media

• External Government Authorities

• Emergency Services

• Neighbours (residents and industrial)

• Senior Management

• Company legal and insurance

The only company person who will provide information regarding the emergency situation to the media, government authorities, neighbours and company legal and insurance is the Manager, his delegate or the General Manager. The Manager will provide details of the emergency situation to the attending Emergency Services and Senior Management. All other personnel, including contractors and visitors, will not respond to media questions about any emergency situation. Enquires shall be directed to the Manager (Emergency Controller).

Media releases can include:

• Cause of the emergency (if known);

• Action taken;

• Effectiveness of the corrective action;

• Expected time when the emergency will be terminated; and

• Cooperation needed from the media.

37.1.1 Statutory Investigation

Various types of Statutory Investigations may follow an emergency.

37.1.2 Coronial Inquiry

A Coronial Inquiry will be held in the case of any fatality and may be held in the case of fire. In these cases preservation of evidence is highly important. The Emergency Controller will ensure that there is no cleaning up, repairs or movement of bodies, apart from that necessary to control the emergency, without approval of the Senior Police Officer on site. The Police will manage all aspects of the Coronial Inquiry. There must be no interference with the scene or with evidence that may be used in the inquiry. Cooperation must be given to the investigating Police.

37.1.3 Other Departmental Investigations

Other relevant Government Authorities may decide to investigate an emergency, e.g. Guyana geology and Mines commission, Ministry Natural Resources, Ministry of Labour,and the Environmental Protection Agency. They are to be directed in the first instance to the Emergency Controller. It is essential that these visitors are escorted on site by personnel nominated by the Emergency Controller, but only when safe conditions exist.

37.1.4 Written Report after the Emergency

Immediately after the emergency is over the Emergency Controller will arrange for an investigation and written report of the incident to be prepared. The investigation will include a detailed review of the sequence of events and communications and actions taken immediately prior to, during and after the emergency situation. Where available, instrument charts, plant logs etc will be examined carefully and retained. In most cases, photographs taken immediately after the emergency will be of value to the investigators. Those present at the emergency situation will be interviewed by the investigating team as soon as practicable after the emergency.

37.1.5 Review of the Emergency Response Plan

The report will include a review of the ERP and recommend changes as required. Normally the report will be produced by the investigating team and should be completed within 28 days of the emergency.

37.1.6 Report Contents

The report will contain the following information:

1. Report Outline

• Objectives of the report

• Summary

• Conclusions

• Recommendations including the ERP review and preventative measures

2. Main Section

• Introduction

• Findings of the report

• Analysis and discussion of the findings including background and information on the details of the incident, identification of the root causes, discussion of any quick fixes to prevent recurrence while longer term corrective actions are identified, corrective actions proposed to prevent recurrence and how to review these corrective actions to ensure their effectiveness

• Any relevant operating history of the site

• References

• Acknowledgments

3. Appendices as appropriate

38 Training and Evaluation

Training is an essential part of this ERP. Training will be arranged for personnel (including contractors) as appropriate to their duties. This will include:

• Induction safety training for all personnel including actions on discovering an emergency, actions on hearing the alarm and location of the Emergency Muster Points;

• Specialised training for operational personnel in this procedure and roles during an emergency, e.g. search and rescue;

• Ongoing training as relevant to each individual in fire fighting, first aid, breathing apparatus etc and

• Emergency response training.

Records of the training programs, who has attended and the results would be kept at the Rescue Station. Evaluation of the plan will be conducted through emergency exercises. These would be simulated emergencies involving the employees, contractors and visitors. Exercises can be table top exercises leading to a walk through exercise or a full simulation. Exercises would be conducted annually. One of these exercises iwould be a simulated plant emergency. During these simulated plant emergencies, Observers would monitor the actions taken by the personnel involved. Feedback from these Observers would then be used to improve this ERP. Coordination of the exercises would be the responsibility of the Emergency Response and Security Supervisor.

38.1 Review and Revision of the Plan

In addition to review and revision arising from real emergency situations and training exercises, this ERP will require ongoing amendments to take account of any significant changes. Periodic review is performed with updated information as required. This ERP is revised annually. Reviews and approval of the amendments is the responsibility of the Emergency Response and Security Supervisor. To ensure compliance with the need for review and revision, this ERP would be included in Clifton Anthony Hicken's Sand audit program.

39 CLOSURE PLAN- CLIFTON ANTHONY HICKEN SANDPROJECT

39.1 Introduction

Before mining begins, the project proponent is already planning ahead to ensure that all land disturbed by our activities is proactively managed and restored, both during the operational phase of mining and when mineral extraction ends.

It therefore follows, that whilst the Sand pit is active, we aim to balance the amount of disturbed and rehabilitated land at all times. Moreover, when mining ceases, we strive to leave a positive legacy.

It is worth mentioning that the closure plan will cover the full lifecycle of the project site, ensuring that all legislative and operational requirements are met, and that adequate resources are in place for final rehabilitation.

We recognize that a critical aspect to successful land rehabilitation is constructive and continuous dialogue with all stakeholders. Such stakeholder dialogue is an essential part of the operation of our project site, helping to ensure that project site leave a positive legacy.

This Closure and Rehabilitation Plan has been prepared as an addendum to the mining plan.

40 Purpose and Objectives of Report

The objective of this report is to address the key aspects of Sand closure and rehabilitation so that they will meet both the Government and company expectations. More specifically, the Closure and Rehabilitation Plan has been prepared in accordance with the following objectives:

- Achievement of acceptable post-disturbance land use suitability – Rehabilitation will aim to create a stable landform with land capability and/or vegetation suitability similar to that prior to disturbance, unless other beneficial land uses are pre-determined and agreed. This will be achieved by setting clear rehabilitation success criteria and outlining the monitoring requirements that assess whether or not these criteria are being accomplished.

- Creation of stable post-disturbance landform – Disturbed land will be rehabilitated to a condition that is self-sustaining, or one where maintenance requirements are consistent with the agreed post-Sand land use.

- Preservation of downstream water quality – That post closure surface waters that leave the site are not degraded to a significant extent. Current and future water quality will be maintained at levels that are acceptable for users downstream of the site.

In order to achieve this, we see it is necessary to coordinate a practical approach that will include, but not be limited to:

- Conducting proven and resilient revegetation techniques that acknowledge altered landform and soil conditions;

- Undertaking effective soil management techniques including stripping, stockpiling, re-spreading and appropriate weed control; and

- Establishing a monitoring program that can that determined whether the rehabilitated areas are moving towards a successful outcome.

41 Rehabilitation Management Plan

41.1 Rehabilitation Objectives

The objectives of this rehabilitation plan are to:

- Undertake ongoing and staged rehabilitation works to limit the area of disturbance at any given time;

- Establish a sustainable native ecosystem, commensurate with adjacent land use types;

- Provide a safe and stable landform compatible with the intended final use;

- Re-establish habitat for local flora and fauna;

- Comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the Project area;

- Reduce the need for long term monitoring and maintenance by achieving effective rehabilitation;

- Complete the closure, decommissioning and rehabilitation works as quickly and cost effectively as possible whilst achieving primary objectives;

- Provide a sustainable plant/groundcover through rehabilitation of disturbed areas; and

- Ensure that the design periods and factors of safety for all site works take into account extreme events and other natural processes such as erosion.

- Produce a final "walk away" landform that is geo-technically stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses; and

- Minimize visual impact of the operation during the operational phase as well as post-mining.

41.2 Conceptual Final Landform and Land Use

At the completion of extraction works on-site, we propose to rehabilitate the entire site back to its natural state and pre-development conditions, being rural vegetation consistent with a number of adjoining lands.

- Waste Disposal Area

Consideration needs to be given to the rehabilitation of the waste disposal areas in accordance with other rehabilitation works proposed onsite. Leachate dams will be decommissioned and the area will be backfilled with bio solid waste, vegetation and soil. The area will be stabilized and capped

with 300mm (minimum) of virgin/clean fill and overburden will be stockpiled adjacent to this area and the land will be reshaped consistent with the existing topography.

The area will then be top dressed (seeded), revegetated with local native species.

41.3 Rehabilitation and Revegetation

The proposed project land contains native vegetation, some of which is contiguous with native vegetation on adjacent properties. The site has had some modification to the canopy with historical tree removal occurring for timber harvesting. Higher quality woodland remnants occur on hilltops and rocky rises where the canopy remains relatively intact and the understory is predominantly native.

Rehabilitation of the site will be undertaken in a staged process once portions of the Sand is exhausted. The revegetation program will re-establish native trees/shrubs/ground covers and will stabilize and reshape exposed areas.

Rehabilitated areas will be deep ripped to actively promote infiltration of water, which will enhance soil moisture requirements for direct tree seeding and minimize surface run-off. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

41.3.1 Topsoil Management

Topsoil stripping within the disturbed area will be undertaken when the soil is in a slightly moist condition thus reducing damage to soil structure. Stripped material will be placed directly onto the disturbed areas and spread immediately if excavation sequences, equipment scheduling and weather conditions permit.

A maximum stockpile depth of 3 meters will be maintained to preserve viability and reduce soil deterioration.

Stockpiles will be protected with sediment fencing and planted with a sterile cover crop (annual species) to ensure stabilization. Surface drainage in the vicinity of the stockpiles will be configured so as to direct any runoff around the stockpile.

Where the stockpile is not wholly contained within the “closed loop” water management system, temporary sediment control measures such as sand bags and silt fences will be used to prevent sediment from leaving the disturbed areas. Stockpiles will be placed in areas, so as to avoid impediment of natural localized drainage lines and minimize the likelihood of water ponding against the stockpile.

Topsoil will be re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Topsoil will be spread to a minimum depth of 50 mm on 1:3 or steeper slopes and to a minimum depth of 150 mm on flatter slopes. Re-spreading on the contour will aid runoff control and increase moisture retention for subsequent plant growth. Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

41.3.2 Surface Preparation

The ripping of soil is important in assisting rapid tree growth through deep root growth and enhanced soil water infiltration. The ripping depth must be sufficient to penetrate any near-surface rock or clay. Inadequate site preparation and weed control are often the two biggest single factors responsible for tree revegetation failure. Thorough site preparation will be undertaken to ensure rapid establishment and growth of seedlings. All areas proposed for seeding will be deep ripped to an approximate depth of 400 – 500 mm. Where ripping on slopes is required, the ripping will be undertaken around the contour of the land at right angles to water flow.

41.3.3 Direct Seedling

Direct seeding (via broadcasting) is preferred over tube stock planting as it enables a far greater success rate, limits the need for ongoing maintenance (e.g. watering) and is the most effective method in achieving a successful rehabilitation outcome. Notwithstanding this, tube stock will be utilized in landscape planting around the site. Not all native trees and shrubs are suited to direct

seeding due to their innate germination requirements, therefore, it may be required to supplement with some tube stock to increase biodiversity.

41.3.4 Native Trees and Shrubs

A mixture of native trees and shrubs endemic to the area will be sown onto the majority of the reshaped pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank. Trees and shrubs endemic to the local area will be chosen consistent with the recommendations of the Guyana Forestry Commission.

Subject to sufficient follow up rain, high initial tree densities can be expected. These high densities will quickly help stabilize and screen the site and will result in healthy mature tree stands over time. It is intended to create, over time, a mosaic of variable native species and plant densities representative of that currently occurring in the area. Growth rates of between 1 and 2 meters per year can be initially expected for many of the more dominant trees and shrubs.

The correct treatment and application of seed in the appropriate ratios is important in controlling emerging weeds and in allowing the tree stand to develop in a positive direction. Seeds will be broadcast evenly onto top-dressed areas. Care will be taken to ensure it will not be buried. Seeding will be conducted in late spring, summer and early autumn giving superior results due to higher ground temperatures.

Revegetation activities will generally be undertaken early months of the year; however opportunistic revegetation will be undertaken if areas become available for sowing during other periods. After surface soil amelioration and tillage is completed for any given area, revegetation will commence as soon as practicable. The proposed method of sowing will be via conventional spreading using by hand.

41.3.5 Scheduling of Works

Rehabilitation work will be undertaken progressively as soon as reshaped, benched and top soiled areas become available.

It is noted that the progressive rehabilitation proposed will also ensure that any visual impacts associated with the top portions of the Sandpit will be mitigated through the early establishment of groundcover, shrubs and trees on the rehabilitated portions of the site as soon as they become available.

41.3.6 Final Land Use

The area currently supports open rural forest. The broad rehabilitation objective for the post-mining landform is to establish a similar land use. The topography of the final landform within all Pits will be reshaped and battered consistent with the current topography of the land and revegetated.

Until such time as all extraction has ceased, rehabilitation will occur around the edges of the pits only, and will not involve benches or the pit floor.

Once all operations have been completed, all buildings and infrastructure will be removed from within the activity areas. These areas will be reshaped and ripped where necessary for top-soiling and revegetation.

41.3.7 Rehabilitation Maintenance

Due to the hardiness of young directly sown tree seedlings (compared to planted tube stock), these trees require minimal maintenance. Direct seeded trees and shrubs require no watering while planted seedlings (tube stock) may require extensive watering if conditions remain dry.

Some maintenance fertilizer will be required for treed areas on occasion post-closure. Effective control of weed species within rehabilitated areas will be a critical and essential component of the proposed revegetation plan. Weed and noxious animal control will be undertaken on all rehabilitation areas.

All erosion and sediment control measures will be maintained in a functioning condition until individual areas have been deemed “successfully” rehabilitated. Structural soil conservation works will be inspected after high intensity rainfall so that de-silting and prompt repairs and/or replacement of damaged works can be initiated as required.

41.3.8 Rehabilitation Monitoring

Regular monitoring of the revegetated areas will be required during the initial vegetation establishment period and beyond to demonstrate that the objectives of the rehabilitation strategy are being achieved and that a sustainable, stable landform has been provided.

Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Annual reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness.

41.3.9 Preliminary Rehabilitation

Success criteria Performance indicators will be utilized to demonstrate achievement of rehabilitation

objectives. The closure and rehabilitation performance criteria for the Project are outlined:

Performance Indicator	Rehabilitation Performance
Safety	
• Access and public safety to be managed during operations and at the closure of the project site.	• Access to the site post closure will be restricted and only authorized personnel would be allowed within the confides of the property.
Native Vegetation	
• Rehabilitated areas contain flora species characteristic of the desired native vegetation communities in the landscape; • Monitoring indicates that natural regeneration is occurring.	• More than 75 per cent of trees are healthy and growing. • Second generation tree seedlings are present or likely to be, based on monitoring in comparable older

• The majority of trees are healthy and growing in rehabilitated areas. • There is no significant weed infestation.	rehabilitation sites (i.e. evidence of fruiting of native species observed). • There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum.
Landform	
• No significant erosion or runoff impacts are present. • Rehabilitation activities are undertaken as soon as reasonably possible to minimize unnecessary dust generation from cleared areas. • No significant visual impacts from the project site.	• Final void areas have been backfilled with clean virgin fill and stabilized. • Rehabilitated slopes on overburden dumps are stabilized. • No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use. • Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff. • Visually prominent locations are immediately rehabilitated.
Decommissioning	
• All surface infrastructure to be decommissioned and removed, including the removal of services (roads, power, water and communications).	• All surface infrastructure which does not have a potential future use associated with the post mining land use will be removed, unless such removal has a greater environmental impact than rehabilitating the area with the infrastructure remaining in place. • Removal of all services (power, water, communications) that are not needed as

	part of the future development of the land. • All infrastructure that is to remain as part of the future land use have been assessed by an appropriately qualified person and determined to be suitable for the intended use and do not pose any hazard.
Soil	
• Revegetated areas to be top dressed with topsoil. Soils pH to be within an appropriate pH range. • The land is to be free of land contamination or hazardous materials.	• Topsoil or a suitable alternative has been spread uniformly over the rehabilitation surface. • Soil pH to be within acceptable range. • Monitoring demonstrates soil profile development in rehabilitated areas (e.g. development of organic layer, litter layer). • Surface layer is free of any hazardous materials. Any contamination will be appropriately remediated so that appropriate guidelines for land use are met.
Water	
• Existing dams to be inspected to ensure they are structurally sound following closure of the project site. • No evidence of excessive run-off or contamination (namely silt) into downstream waterways. • Cut off drains to be removed and/or retained for water quality control.	• Inspection of downstream waterways to ensure that the development site is not causing excessive run-off. • Dams to be retained on-site are structurally sound and show no signs of leaks.

- Water control measures (where remaining) are stabilized and working effectively.

Table 17 Closure and Rehabilitation Criteria

As it relates to the performance indicators, CLIFTON ANTHONY HICKEN SANDPROJECT will ensure that these are revised through the Project life and used as the basis for further refinement following the commencement of rehabilitation activities, consideration of the results of the rehabilitation monitoring programs and consideration of any stakeholder feedback.

42 Final Void Management

42.1 Objectives

The primary objectives of the Final Void Management section of this Closure and Rehabilitation Plan include the following:

- Propose mitigation measures to minimize potential off-site impacts associated with the final void; and
- Propose measures to be incorporated in the final landform which aim to minimize potential safety hazards to the general public.

42.1.1 Justification for the treatment of the final void

The following design and environmental criteria were considered when determining the treatment of the final void. These include:

- Minimizing the area of disturbance;
- Diverting clean water around disturbed areas to ensure that water collected within the pit is minimized as much as possible;
- Designing site batters to minimize erosion and enhance rehabilitation opportunities both during operation and post closure;
- Minimizing water, noise, and visual impacts generated by the operation;
- Progressively rehabilitating disturbed areas; and
- Rehabilitation of the site in a manner that guarantees the long term environmental, ecological and aesthetic integrity of the area.

42.1.2 Void Design Criteria and Specifications

Given the size of the final void in the south eastern Pit, this area will not be completely backfilled to current day levels, but rather will be reshaped and stabilized with a batter consistent with the topography of the land. This will avoid the creation of a formal 'void', as the land will be reshaped instead.

The area will be backfilled with vegetation (mulch) and clean virgin soil and overburden that has been stockpiled as part of mining activities conducted on-site. The area will then be top dressed (seeded), revegetated with local native species.

Due to the size of the proposed project area and subsequent void, the works will be undertaken in stages with initial mining activities to occur in a northerly direction prior to moving east and then north-east. Consequently, rehabilitation works are also proposed to occur in a staged manner once portions of the Sandpit become exhausted with rehabilitation works to occur backwards from the pit edges.

42.1.3 Minimisation of Adverse Impacts from the Final Void

42.1.3.1 Void Slope Stability

To ensure the safety of the final void, the surrounding final slopes should be left in a condition where the risk of slope failure is minimized. This may require the slopes to be battered back from the vertical to enable a stable overall slope angle.

The following will need to be considered when assessing the geotechnical stability of the slope:

- Height and inclination of slope and number and spacing of any intermediate benches;
- Shear strength of the soils and rocks;
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- The effects of the external factors, such as surface runoff. Prior to closure, investigations will be undertaken to confirm the criteria above.

42.1.4 Control of Surface Inflow

The control of surface inflow into the final void is essential for the long term management of water quality within the void and will also aid in the control of erosion.

Surface water is a possible cause of slope deterioration and ultimate failure. Drainage will be directed away from the pit floors through the construction or maintenance of cut off drains around the voids and spoon drains will be utilized on the upslope side of all batters.

The catchment area of the final void will be minimized by the installation of diversion drains where required. This will reduce the amount of water reporting to the final void.

42.1.5 Monitoring and Management

After decommissioning works have been undertaken, whether progressive or final, a monitoring program will be designed to demonstrate that the completion criteria have been met and that the site is not resulting in any off site effects.

This period should also be used to plan for remedial action where monitoring demonstrates completion criteria are unlikely to be met. If progressive rehabilitation has been successful, with stabilization and revegetation meeting completion criteria this last phase of closure may be shortened.

The post closure monitoring and measurement program will be similar to that undertaken during operation of the pit, only scaled back to focus on those aspects of the site that have the potential to cause pollution or is being used as an indicator to verify the success or failure of the rehabilitation works (e.g. noise monitoring will not be required once all decommissioning and rehabilitation activities at the site have ceased).

42.1.6 Final Void Rehabilitation

As discussed above, it is proposed to re-establish a native open woodland vegetation cover consistent with the post-mining landform. Native vegetation will largely be established using directly applied seed and from the seed store within re-spread topsoil. Supplementary native pasture and/or tube stock seeding will be undertaken where specific species combinations are required.

Rehabilitation will be undertaken once extraction has been completed. As the surface mine progresses, the land will be reshaped and battered consistent with the topography of the area.

The revegetation program will progressively re-establish native tree/shrub/ground cover and will stabilize reshaped areas. Battered areas will be deep ripped to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimize surface runoff. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

43 Closure and Decommissioning

43.1 Closure Objectives

The objectives of the closure and decommissioning are to:

- Provide a safe and stable landform compatible with the intended final use;
- Comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the Project area;
- Complete the closure, decommissioning and rehabilitation works as quickly and cost effectively as possible whilst achieving primary objectives;
- Produce a final "walk away" landform that is geotechnically stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses.

43.1.1 Closure Methodology – Decommissioning of Infrastructure, Plant and Buildings

The following sections summaries the key aspects related to the decommissioning and closure of the site infrastructure, plant and buildings. It assumes that all buildings and other infrastructure are demolished and removed from the site despite the potential for them being used after mining (subject to the stakeholders' requirements).

43.1.2 Site Services

All services including power and water on the site should be isolated, disconnected and terminated to make them safe. Generally, all underground services should be made safe and left buried in the ground. Overhead power lines (where they are not used by others) should be removed and the materials (i.e. poles and wire) recovered for potential re-sale or recycling as applicable.

43.1.3 Infrastructure and Buildings

All infrastructure, including the site office/workshop, parking areas, crushing plant and product storage areas will be demolished and removed from the site. Where possible, assets will be reused by the site Operators other quarries or sold to other operators. The remaining items will be demolished, removed and transported from the site as required.

All recoverable scrap steel will be sold and recycled, with the remaining non-recyclable wastes being taken to a licensed landfill. Prior to disposal, all wastes will be assessed and classified in accordance with Waste Classification Guidelines.

All concrete footings and pads will be broken up to at least 1.5 m below the surface. The waste concrete will be crushed to produce an aggregate that can either be used on the site or sold for some other beneficial use.

All remaining areas will then be reshaped, deep ripped, top soiled and seeded in accordance.

43.2 Closure Methodology – Earthworks and Rehabilitation

43.2.1 Dams, Diversions and Surface Water

Features Sedimentation dams which assist in the water flow from the final rehabilitated surface will be retained following closure. All dams will be assessed for structural integrity and upgrade works completed if the dam is to be retained. Any of the remaining dams that are not required (namely the leachate dam in the waste disposal area) will be removed and the original drainage paths reestablished wherever possible.

43.2.2 Void

As outlined above, the two voids will be backfilled and re-shaped with a batter. The main aim will be to ensure that the pit is left geo-technically stable.

- The rehabilitation will involve the following:
- Surface preparation of the area by ripping;
- Placement of at least 100 mm of top dressing on the battered areas; and
- Planting of native shrubs and trees on the top soiled batter. It is proposed to undertake some tree planting in the early stages of the project. These rehabilitated areas will assist in minimizing the visual impacts of the mining activities from the adjacent landowners. By the time open pit operations have reached an advanced stage, these rehabilitated areas will be well established and will form part of the final landform.

The areas to be rehabilitated can be prepared, top soiled and revegetated. The site topography will allow for continued access to all rehabilitated areas.

44 Post Mine Land Use

44.1 Land Capability

The proposed mining activities will not have a significant impact on land capability in the area. No impacts will occur on adjacent lands and the only impacts will be associated with the area immediately impacted by the operation.

The area contains a valuable local construction material resource and the proposed development will involve extracting this resource prior to returning the area to rural forest and grasslands consistent with a number of adjoining lands.

Following completion of extraction, the area surrounding the open cut void will be rehabilitated and returned to rural paddocks and grasslands. The land capability of this area will not alter from current land capability although the area of the voids will be altered in terms of topography.

44.2 Sudden or Unplanned Closure

Sudden or unplanned closure occurs when mining and/or processing suddenly cease due to a variety of reasons including: financial constraints (or similar economic imperatives) or if the operation is instructed to close due to non-conformance/s with regulatory requirements.

In the event of unplanned closure some of the objectives, processes and implementation timeframes may vary. However, the practice of progressive rehabilitation and closure planning including adequate financial provisioning will be in place. This forms a strong foundation in the event of unplanned closure, to provide the highest chance of a successful closure to the satisfaction of the relevant agencies and stakeholders.

The following general site requirements will be completed under a sudden unplanned closure:

- Notify workers and contractors, as well as council and other government authorities;
- Review and update the Rehabilitation and Closure Plan;

- Designate a contact person(s) for authorized access to the site and project management of rehabilitation and closure;
- Where required, demolish buildings/infrastructure, if buildings were to remain then seal, secure and/or lock buildings;
- Remove all mobile equipment from the site, salvage and sell machinery/infrastructure to assist with closure costs;
- Construct fences/barriers to restrict access to the site of specific areas within the site;
- Establish a program for roadway maintenance to ensure access to the site is maintained;
- Continue regular inspections; and
- Establish a schedule for environmental and rehabilitation monitoring.

45 Roles & Responsibilities

The Manager (or their nominated representative) is responsible for overseeing the implementation of this Closure and Rehabilitation Plan, including:

- Delegating tasks associated with this Closure and Rehabilitation Plan where necessary;
- Providing adequate resources to implement this Closure and Rehabilitation Plan; and
- Providing adequate training to employees and contractors regarding their requirements under this Closure and Rehabilitation Plan.

46 Review

The Sand operation is proposed to have an additional life of several years, during which time the Plan may be changed or altered depending on operational circumstances. Therefore, this Closure and Rehabilitation Plan will be regularly updated, where needed, to capture these Plan changes. One year prior to Closure, the Closure and Rehabilitation Plan will be reviewed addressing the final Plan and any changes that may have occurred since the previous Plan.

46.1 Sand Records

Throughout the life of the Project, project proponent will ensure that active records will be maintained in relation to processes that may impact upon rehabilitation of the Project area. This will provide the basis for interpretation of subsequent rehabilitation monitoring outcomes.

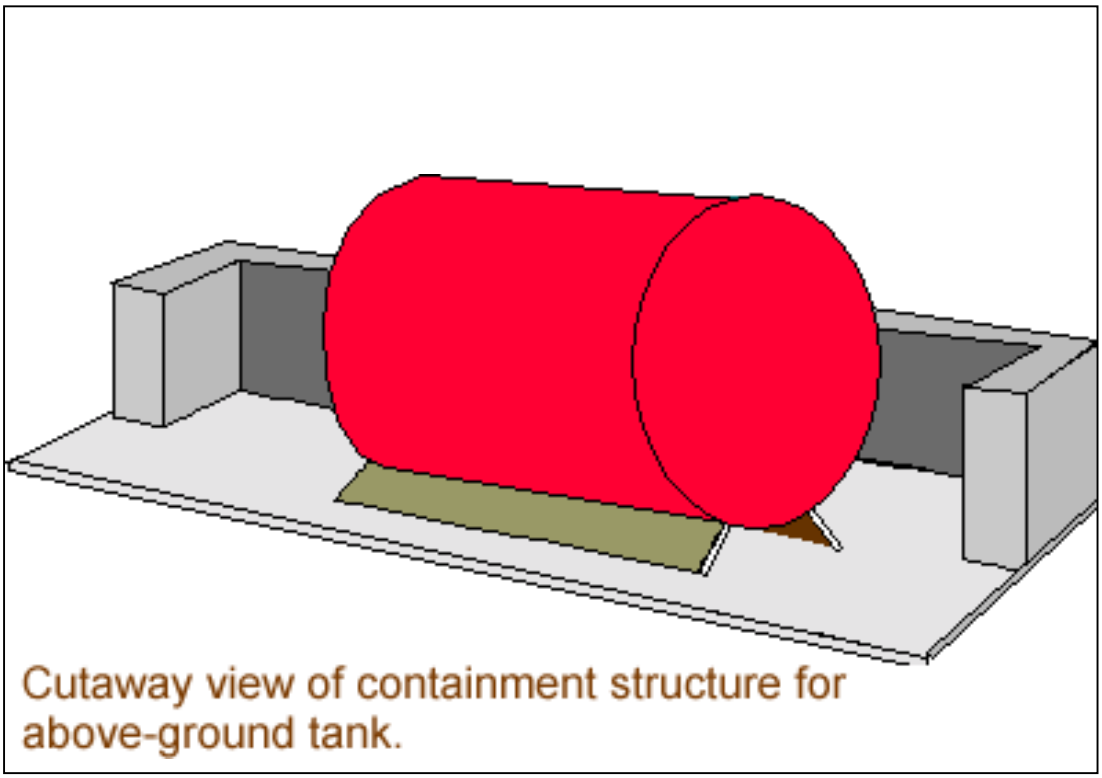
Amongst these records to be maintained include:

- detailed rehabilitation procedures;
- identification of any potentially contaminated sites (e.g. fuel/oil facilities);
- environmental monitoring records;
- records of topsoil stockpiles, including information such as the date in which they were formed and maintenance works undertaken; and
- environmental incident records.

47 Appendices

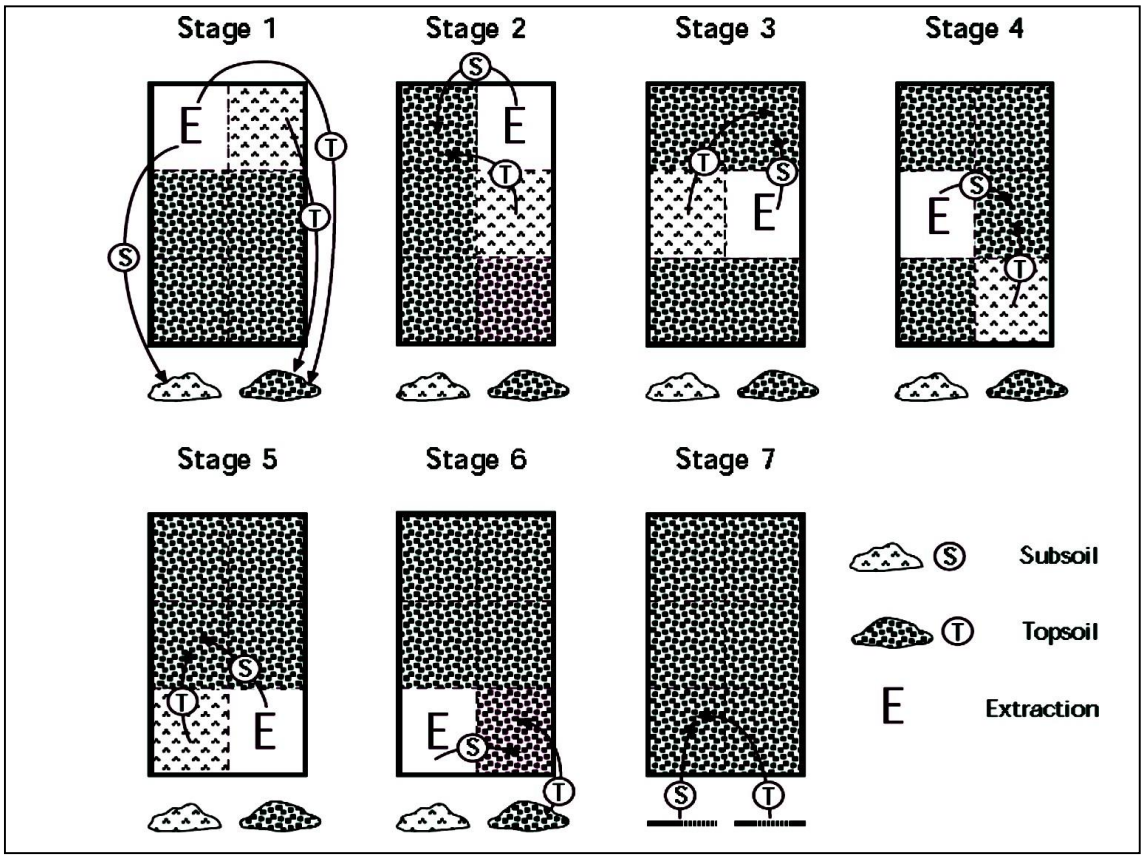
47.1 Appendix 1 – Image of Proposed Fuel Storage Tank

47.2 Appendix 2- Cross-Sectional View of Containment Structure

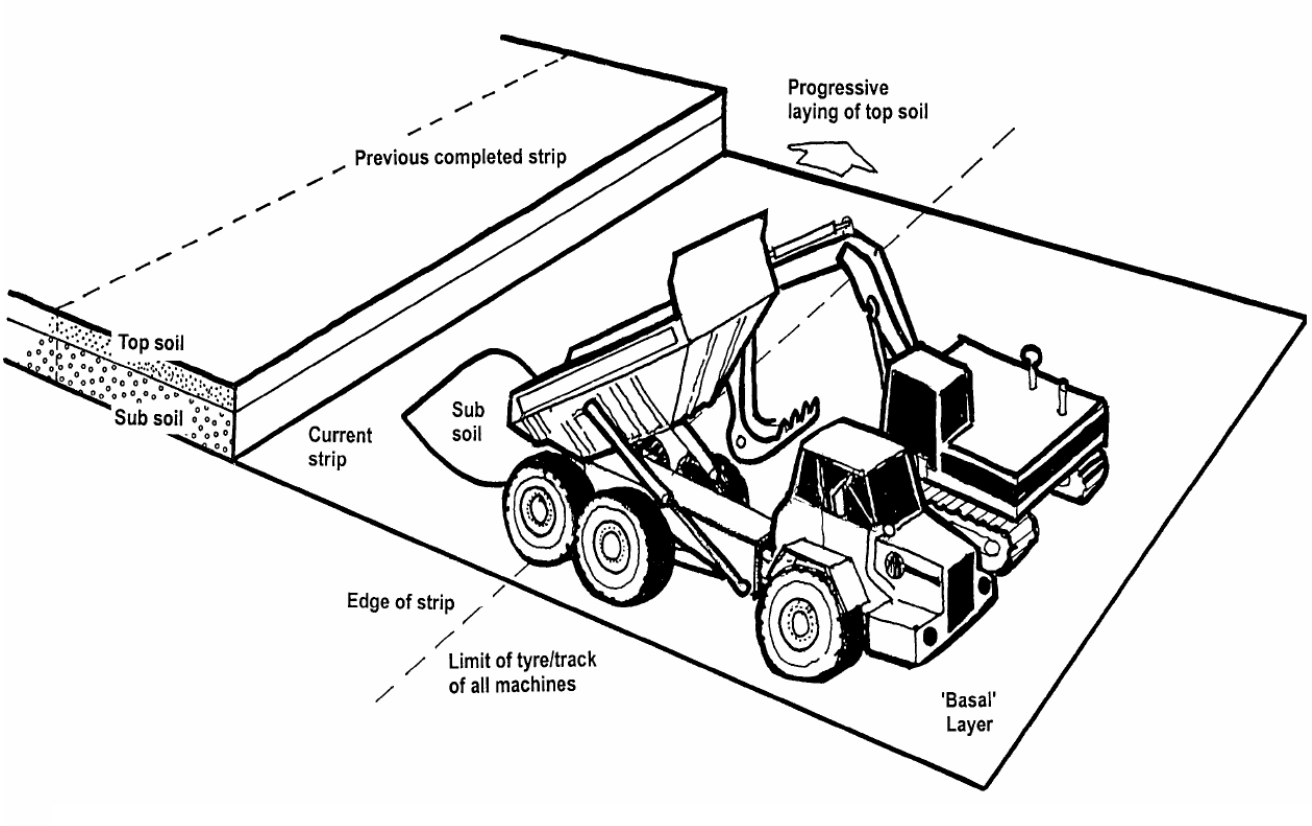


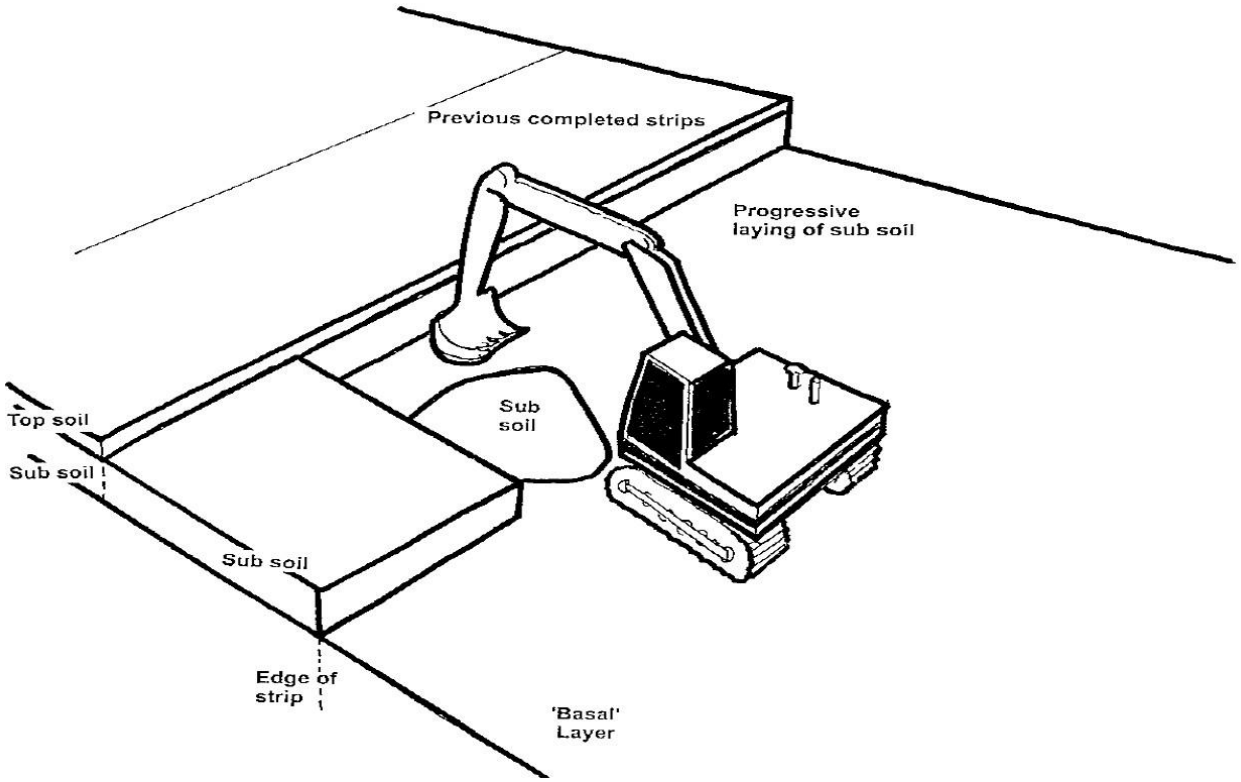
Cutaway view of containment structure for above-ground tank.

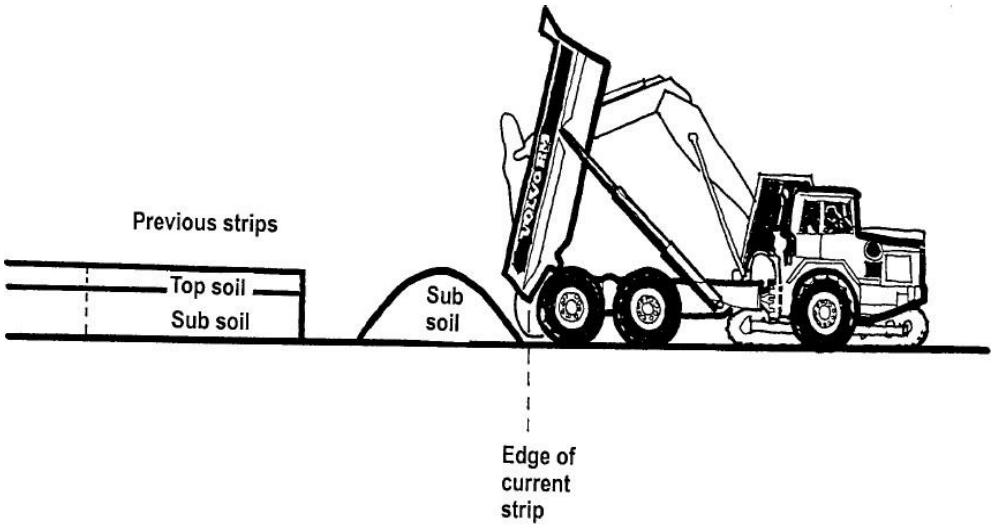
47.3 Appendix 3- Conceptual Representation of Closure

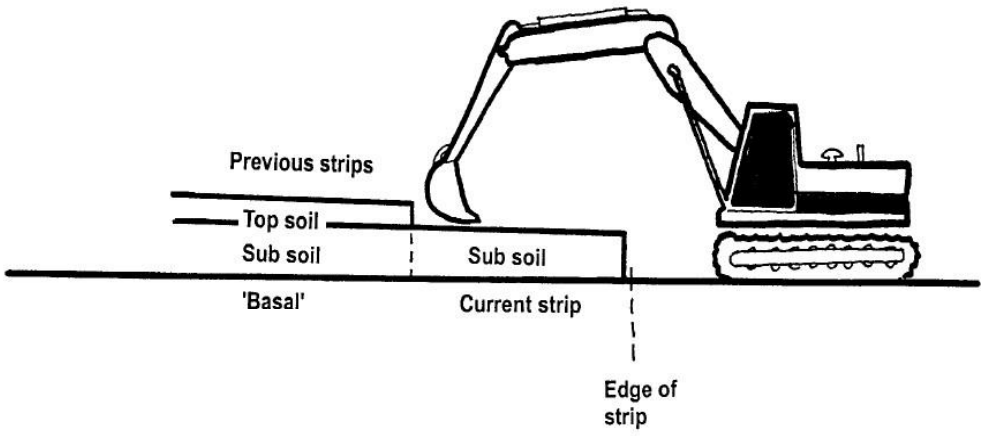


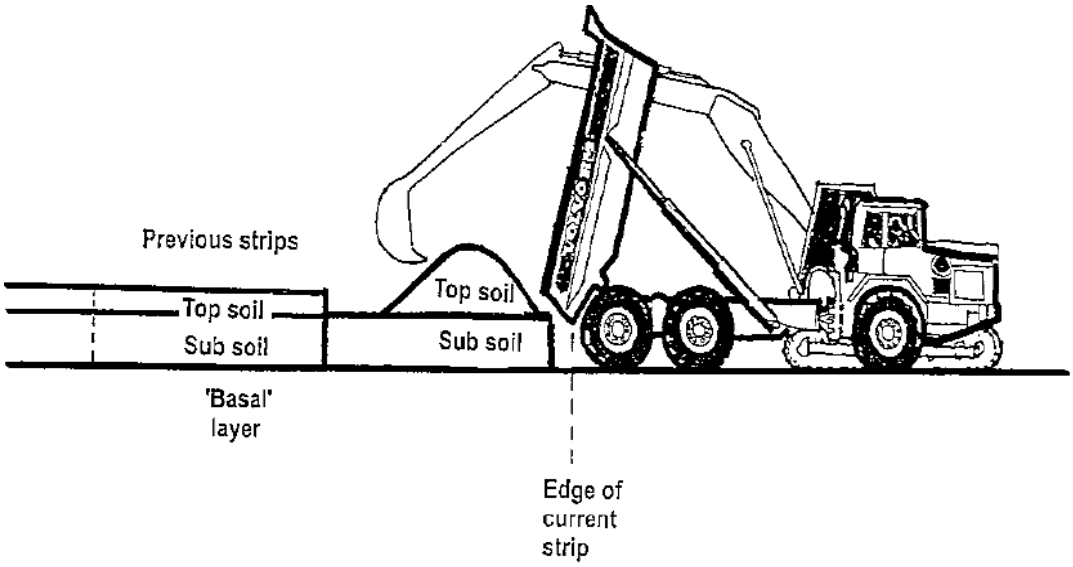
47.4 Appendix 4- Conception Sequence of Reclamation

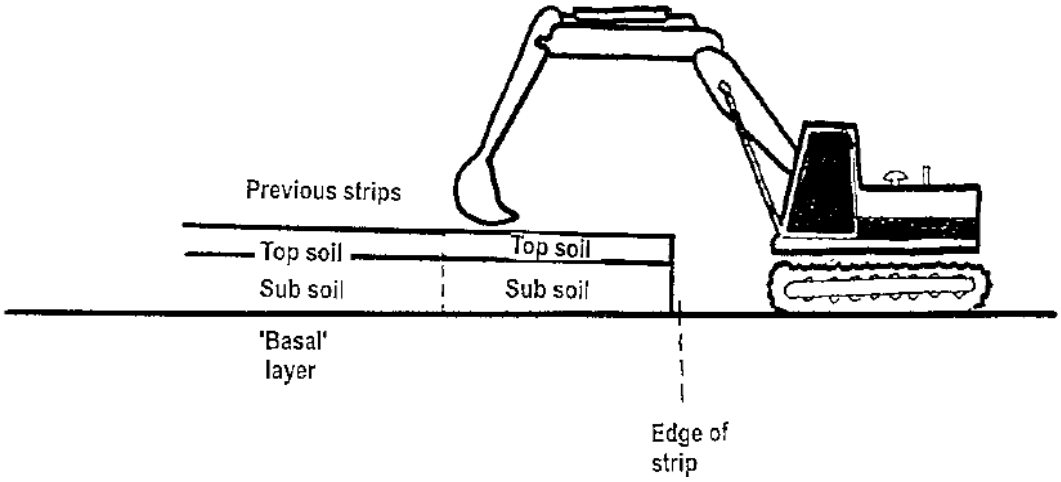





Previous strips
Top soil
Sub soil
Sub soil
Edge of current strip


Previous strips
Top soil
Sub soil
Sub soil
'Basal'
Current strip
Edge of strip


Previous strips
Top soil
Sub soil
Top soil
Sub soil
'Basal' layer
Edge of current strip


Previous strips
Top soil
Sub soil
Top soil
Sub soil
'Basal' layer
Edge of strip