PROJECT SUMMARY

NRG Holdings Inc.
PORT OF VREED-EN-HOOP PROJECT

Foreshore, Plantation Best
West Bank Demerara, Guyana

March 2021

Contents

1. Introduction

Recent offshore oil discoveries in Guyana, resulted in estimated gross recoverable resources at more than 8.0 billion oil-equivalent barrels, making it one of the most significant global finds in recent years. Guyana is poised to experience an economic 'boom' in the medium to long term outlook. The development of Guyana's embryonic energy sector resulted and will continue to see a plethora of opportunities emerge in 2020 and beyond; some of which have already manifested for Guyanese businesses to capitalize upon, through the formation of partnerships with international and regional entities to provide support services to the offshore oil and gas operators and other related ventures.

ExxonMobil commenced oil production offshore in December 2019 and several other developments are expected over the next few years. Significant direct employment of Guyanese by multinational oil companies such as ExxonMobil, among others, is not expected. However, indirect opportunities will result from an increase in demand for support goods and services. Many companies are forging strategic partnerships with both local and foreign companies. The impact of inadequate facilities to accommodate the work in the O&G sector is a loss of local content within this emerging sector. Without this important supporting infrastructure, much of the business opportunities are carried to other countries such as Trinidad and Tobago. These services can be carried out in Guyana, with the local economy benefitting from employment, duties and taxes, ancillary goods and services and capacity-building. Guyana will continue to lose out under the current arrangement, unless increased emphasis is placed on the development of these supporting facilities that capture these benefits in-country, and direct them into the development of the Guyanese people. Guyana's Government and the private sector will have to work together to ensure that they benefit from these opportunities through infrastructure development and building the requisite skills and competence in all possible respects to capitalize on the opportunities that the new sector is anticipated to bring. The oil and gas rapid growth and the country's economic transformation is expected to be substantial, with opportunities for infrastructural and logistical development.

The proposed **Port of Vreed-en-Hoop** is one such opportunity to fulfil this gap in Guyana. This proposed project will help the Government of Guyana meet its strategic priorities to boost the economy and stimulate job growth along with helping the country expand key shipping, port, and shore base facilities to rapidly meet industry requirements. The Port of Vreed-en-Hoop will be established, inter alia, by a consortium of leading local entrepreneurs highlighting the capabilities of Guyanese and 100% indigenous ownership of this project (the "Consortium"). The goal is to develop a landmark facility that will equip and bringing tremendous value to the management and operation of the emerging oil & gas sector while directly meeting the high standards of overall industry needs.

The proposed project is estimated to cost approximately US$200-600 million which shall include geotechnical and environmental studies, engineering works, dredging operations, reclamation, and the construction of wharf, storage, warehouse, and safety facilities.

This project summary document describes the proposed initiative – Port of Vreed-en-Hoop (the proposed project), an industry leading shore base facility for the oil and gas sector including the possible environmental and social impacts. This project summary was prepared as part of a suite of applications to regulatory agencies in Guyana, particularly the Environmental Protection Agency (EPA) to fulfill the requirement for environmental authorization.

The following sections of this project summary presents the relevant information on project design and components, existing environmental and social conditions, and possible environmental impacts, as required by the EPA.

2. Proposed Project Location and surrounding Land Use

The proposed project will occupy approximately 400Ha of coastal and nearshore lands and water located seaward of existing Mangroves on the Atlantic coast at Plantation Best, West Bank Demerara within the Best/Klein/Pouderoyen Neighborhood Democratic Council (NDC) Administrative Region No. 3 (Figures 1and 2). The coastal area consists of a combination of natural and man-made sea defence structures, tidal mud banks and beaches, and approximately 60 ha of mangrove forests. The proposed site is bounded to the east by the confluence of the Demerara River; the west by the foreshore of Best Village; the south by mangrove forest; and north, the Atlantic Ocean.

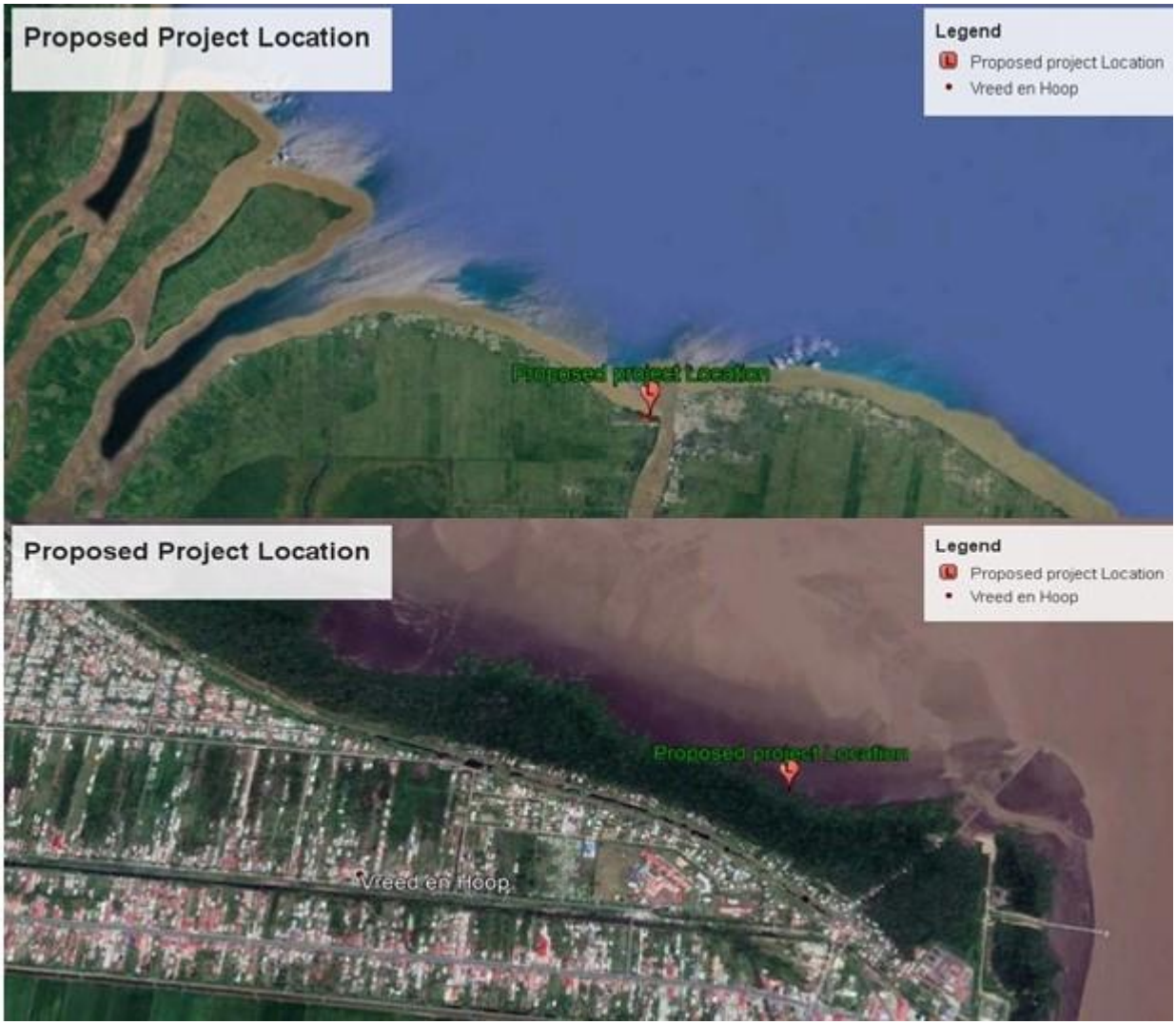

Figure 1: Proposed Project Location

The Vreed-en-Hoop mixed residential and commercial area is immediately south and approximately 0.5 to 0.8 km of the proposed project area. Immediately south and bordering the mangrove landward is a squatting area known as “Plastic City”. Approximately 0.3 km south west is the West Demerara Hospital. East and South East are the Guyana Power and Light (GPL) Wharf, Power sub-station, Vreed-en-Hoop Bus Park, commercial area and stelling (Figure 2). Figures 3 and 4 provides a view from the western end of the proposed project area looking east along the foreshore. Some portion of the shoreline is protected by rocks (rip rap) and short lengths of earthen dams.

Figure 2: Proposed Project Location Surrounding Land Use

Figure 3: Photograph showing foreshore looking east of proposed project location

Figure 4: Photograph showing beach area looking east of proposed project area

3. Existing environmental and social conditions

3.1.1 Climate and Air Quality

Guyana is situated at latitude 5º north and 59º west longitude and therefore, in the wet, hot and humid tropics just above the equator. This location ensures that temperatures are high and consistent year-round, averaging 26º-28º Celsius, with nighttime temperatures varying between 22º-24º Celsius. The hot, humid climate is moderated by the northeast Trade Winds along the coastal plain, which in hotter months can record 30º Celsius temperatures. Weather is affected by the migration patterns of the Inter-Tropical Convergence Zone (ITCZ), a massive system of weather located over the Atlantic Ocean, as well as by easterly and tropical waves moving west across the Atlantic from Africa.2. The ITCZ migrates between latitudes 2º – 5º N in March and 12º – 15º N in September with high pressure systems and drier air that influence the double rainy and dry seasons. The project site falls within the coastal plain which is characterized by two wet seasons from April to July, and November to January and two dry seasons in between. Daily temperatures range between 25-32 ºC. Annual rainfall is approximately 2000-2500 mm. Wind speed in generally 1.5 to 2.5 mph in east to north east direction. The westerly movement of tropical waves can bring disruptive weather and high rainfall conditions on the Coast (e.g., during hurricane season in the Caribbean). Guyana's weather is also affected by periodic episodes of the El Niño-Southern Oscillation (ENSO) weather system off the west (Pacific) coast of South America and the counter-cycles of La Niña that bring drier and wetter conditions, respectively.

Guyana's low-lying coastal plain – in parts, lying about 1.5m below the mean high-water mark – is also likely to be threatened by climate-induced sea-level rise. Historic sea-level rise at the coastline of Guyana (1960 – 1981) was determined to be as 5.1 mm/yr.[1] the prediction based on models is that by 2031 sea-levels could increase by 26 cm, and in 2071 by 51 cm. Significantly, according to Nerem et al. [2], by 2031 storm surges could result in a 2.94 cm sea-level rise (in a moderate scenario), and up to 5.94 cm (in a catastrophic scenario)[2]. Although these models output has a level of uncertainty serve as important early warning signals for preparing most of the population (90%) that reside on the coastal plan, and the extensive agricultural and infrastructural systems and related investments. These predictions at their worst, have the potential of severely disrupting livelihoods and activities, changing ecosystems and natural resources such as freshwater and groundwater, and having huge cost implications for climate-related mitigation and adaptation.

[1] Dalrymple, O.K. and Pulwarty, R.S., 2006, June. Sea-level rise implications for the coast of Guyana: Sea walls and muddy coasts. In Breaking Frontiers and Barriers in Engineering: Education, Research and Practice. Fourth LACCEI International Latin American and Caribbean Conference for Engineering and Technology (LACCET 2006) Conference Proceedings (pp. 21-23)

[2] Nerem, R. S., D. P. Chambers, C. Choe, and G. T. Mitchum. 2010. "Estimating Mean Sea Level Change from the TOPEX and Jason Altimeter Missions." Marine Geodesy 33 (sup1): 435–46. https://doi.org/10.1080/01490419.2010.491031

There is a general lack of air quality data. The State of the Environment Report for the Demerara Watershed[3], utilized the Industrial Pollution Projection System (IPPS) software to estimate emission levels. The report indicated that generally air quality in the Demerara Watershed is good except for the areas immediately around industries. Air Quality Index for proposed location is generally good (25 AQI) and $PM_{2.5}$ at 6.1 µg/m^3 [4]. Data from the Environmental and Social Impact Assessment (ESIA) for Payara Oil Production by Esso Exploration and Production Limited (EEPGL) in Georgetown, adjacent and east of the proposed project area showed that maximum PM $_{10}$ and $_{2.5}$ values were slightly above WHO Standard (see table 1 below). This can be attributed to dense vehicular traffic typical of the area. Other parameters are generally within WHO standard. Air quality values related to specific pollutants are provided in table below. Based upon these measurements ambient air quality in the proposed project area is expected to be well within WHO limits.

Table 1: Air quality measurements Taken in Georgetown. Source: EEPGL Payara ESIA 2018.

Pollutant	Units	Maximum value	WHO Standard
PM_{10}	Annual (µg/m^3)	27.9	20
$PM_{2.5}$	Annual (µg/m^3)	10.8	10
CO	8-hour (ppm)	1.6	8.7
NO_2	Annual (ppb)	4.6	21.3
SO_2	24-hour (ppb)	0.3	7.6

3.1.2 Soil Type and Land Capability Classification

Soil type within the proposed project area falls within the classification of fertile low humic gleys-frontland clays and are classified as good and moderate agricultural land by Guyana Lands and Survey (GLSC). These soils are generally silty and clayey loams developed from a mix of fluvial deposits. Units nearer the coast have higher fertility. The main limitation is drainage, and a few units can even have high salinity and toxicity.

3.1.3 Coastal Vulnerability

The proposed project location coastline geomorphology is dynamic as typical along the coast of Guyana due to erosion and accretion changes over the years, and due to elevation levels and slope. Ali (2016)[5] presents vulnerability ranking for various aspects of the coastline at Vreed-en-Hoop and concluded a coastal vulnerability index of 14.8 resulting in a moderate vulnerability ranking (Figure 5). The various rankings are provided in table 2 below.

[3] Environmental Protection Agency, 2006. State of the Environment Report for the Demerara Watershed.

[4] https://www.iqair.com/us/guyana/essequibo-islands-west-demerara/vreed-en-hoop

[5] Ali, Ayat Ruh. 2016. Assessing Change and Vulnerability of Guyana Coastline with Multi-Temporal Landsat Imagery and Survey Data. University of Windsor.

Table 2: Coastal vulnerability ranking Vreed-en-Hoop. Source of data: Ali (2016)

	Erosion rate	Coastal elevation	Coastal slope	Sea level rise	Coastal geomorphology	Mean significant wave height	Mean tidal range
Measurement	-0.8-1.0 metre	0.79 - 2.33 metre	0.313-0.331 %	Assumption of 4.7 mm /year	Mudflats and mangroves	1.07 - 1.11 metres	-
Ranking	Moderate	Very high	High	Very high	Very high	Moderate	Moderate

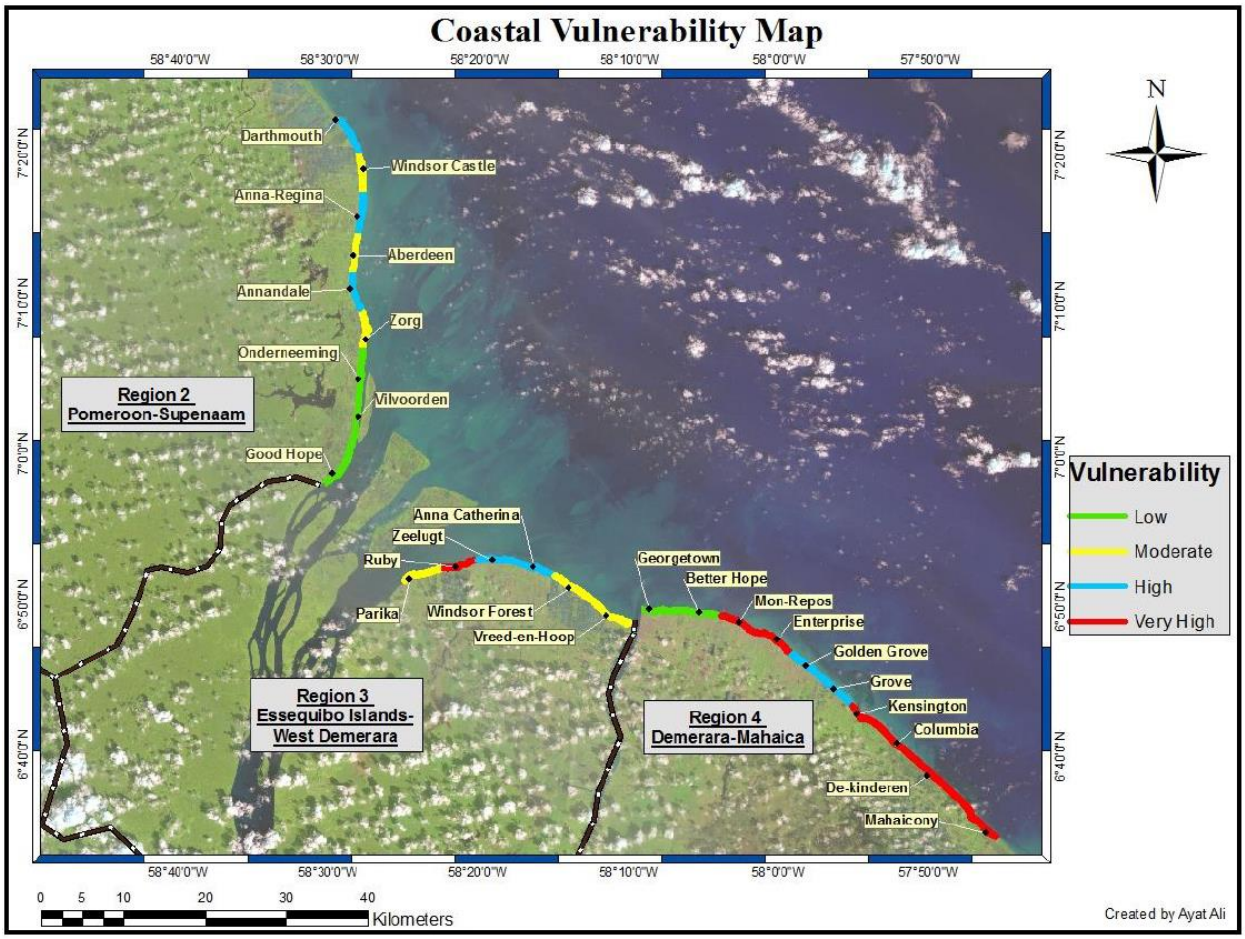

Figure 5: Coastal Vulnerability Map. Source: Ali (2016)

At the proposed project location low coastal slope and sandy beaches, coastal elevation that ranges from low to very high pointing towards higher vulnerability are compensated by erosion that is moderate and mean tidal range that is high to moderate that results in a lower vulnerability ranking (moderate). As a result, this area is suitable for the proposed development providing that appropriate environmental and social safeguards are implemented to address any possible impacts.

3.1.4 Hydrography

A hydrographic study conducted by the proposed developer found water depths in the proposed project location ranging from -2 to 2 metres nearshore and 2 to 10 metres in the Demerara River channel (Figure 6). The proposed project area is generally shallow waters with mudflats and swampy conditions. This data suggests that some amount of dredging and widening will be required to meet the proposed project requirements and design. Further bathymetric, sedimentological, hydrometeorological characterization studies and assessments, including hydrodynamic modelling will be undertaken to ensure appropriate designs.

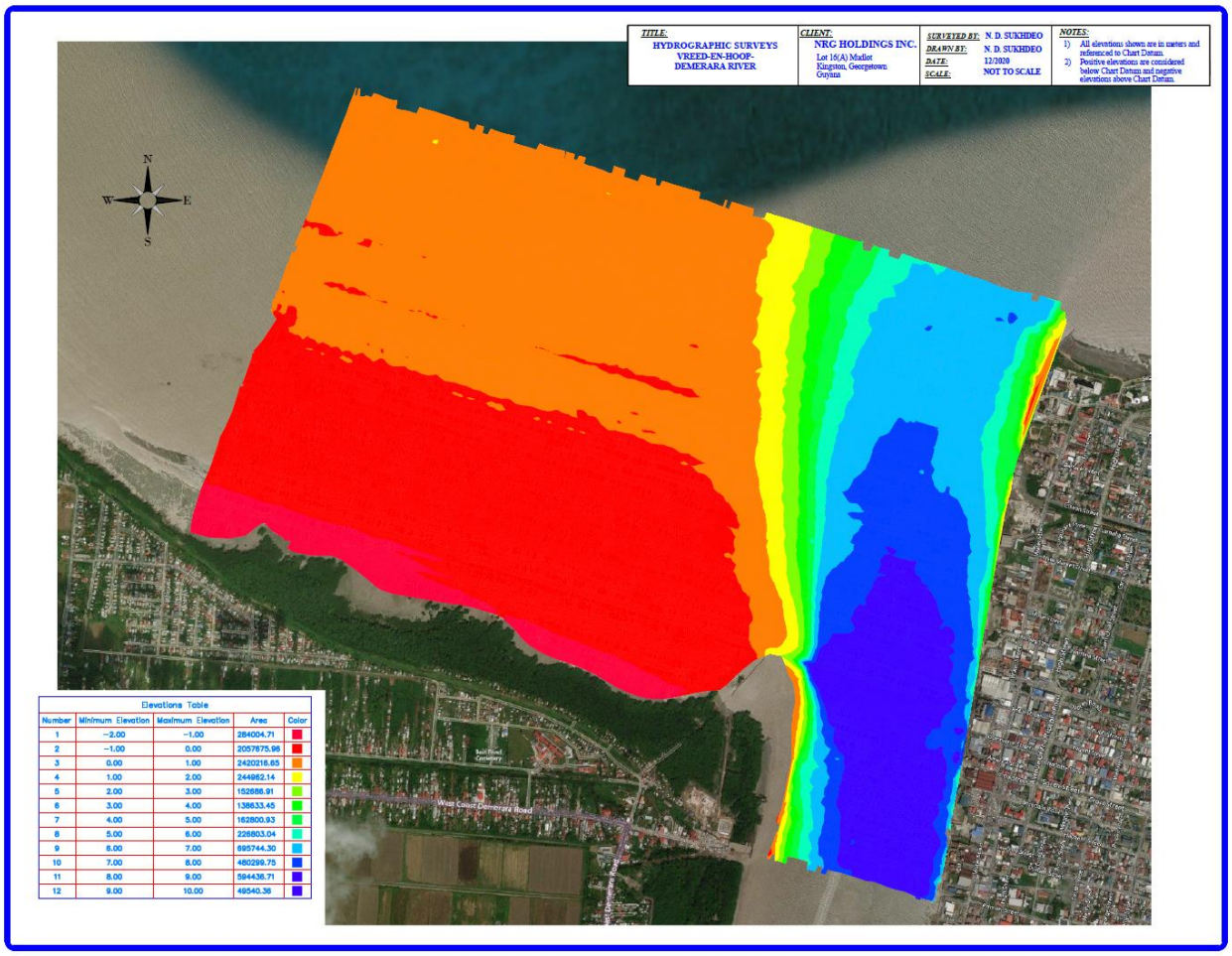

Figure 6: Water Depths in proposed project area

3.1.5 Flora and Fauna

The proposed project location comprises approximately 60 hectares of standing mangrove forest consisting primarily of Black Mangroves (Avicennia germinans) locally known as 'courida bush'. The coastal and nearshore ecosystem is also home to many of Guyana's commercial "fish" species including the bangamary (Macrodon ancyclodon), the Guyana seatrout (Cynoscion virecens), prawns (Penaeus spp.), seabob (Xiphopenaeus kroyeri), the whitebelly shrimp (Nematopalaemon schmitti) and crabs e.g., blueback (Callinectes bocourti), the bunderi (Cardiosoma guanhami) and the red sheriga (Portunus rufiremus). Important commercial species of the marine ecosystem include the gill backer (Sciades spp.), red snapper (Lutjanus purpureus).

According to Payara ESIA[6] bird studies 175 birds of 24 species were recorded in 2017 and 33 birds of 9 species were recorded in 2018 in the Ruimzeight area which is located approximately 3 km west of the proposed project area. Common fauna on the shoreline observed in these studies included the Semi-palmated Sandpiper (Calidris pusilla), Semi-palmated Plover (Charadrius semipalmatus), White-Rumped Sandpiper (Calidris fuscicollis), Lesser Yellowlegs (Tringa flavipes), Sanderling (Calidris alba), Short-Billed Dowitcher (Limnodromus griseus), and Spotted Sandpiper (Actitis macularius). The most common colonial waterbirds observed were Snowy Egret (Egretta thula), Little Blue Heron (Egretta caerulea), Scarlet Ibis (Eudocimus ruber), and Tricolored Heron (Egretta tricolor).

Fish species recorded from fish studies by EEPGL in 2017-and 2018 found 6 species of fish with Sciaenidae (drums and croakers), Ariidae (sea catfishes), and Engraulidae (anchovies) being dominant and diverse. The most common species observed at the nearshore were white spring cariss, highwaterman catfish, parassi mullet, and pemecou sea catfish, and Crabs.

Based on design and components the proposed project is not expected to significantly impact flora and fauna.

3.1.6 Mangroves

Mangroves provide an important nursery function and provide habitat for several commercial fish and shellfish species. Some people catch crabs throughout the year by hunting them in the mangroves. The proposed project area will fringe approximately 60 ha of mangrove forest comprising mainly black mangroves (Avicennia germinans). Mangrove growth at Crane, Best Village, Vreed-en-Hoop, and Pouderoyen. Mangrove spread is increasing with wildlife within mangroves including several species of birds, monkeys, raccoons, wild ducks, etc. Mangroves and other coastal vegetation play a major role in maintaining coastal stability and protecting inland areas from waves, wind, and flooding from storms. The migrating mud flats are on the move and consequently areas rich in mangroves are being washed away while new beaches are built elsewhere. There is heavy squatting and associated solid waste and other forms of pollution on the southern fringe/border of the mangrove area.

[6] Esso Exploration and Production Limited (EEPGL). 2018. Environmental Impact Assessment. Payara. Pp 991-1168

It must be noted that the proposed project does not contemplate large scale removal of the mangrove forest in the area. The plan is to leave the existing forest intact as far as practical. There may be some minor impacts due to clearance for example access road, but these are expected to be insignificant. The final designs will articulate the level of footprint expected.

3.1.7 Water Quality

The coastal waters of Guyana are persistently brown in color from the silt deposited by river flow from inland rivers and from external sources such as the Orinoco and Amazon Rivers of Venezuela and Brazil, respectively. The coastal zone comprises marine inter-tidal mudflats, intersected by sandy beaches and mangrove forests. The ambient water quality in Demerara River Mouth area adjacent to proposed project area based on water quality data from EEPGL Payara ESIA[7] was found to be generally good with temperature at 27.2 Degrees Celsius, Dissolved Oxygen (DO) 6.16 mg/L, Salinity 0.30 ppt, and Conductivity 2,500 µS/cm.

The A Sand aquifer is considered the principal ground water source for Georgetown and the coastal lowlands region. The A Sand aquifer is composed of quartz sand and fine gravel, and ranges from 150 to 215 meters deep and 12 to 27 meters thick. The quality of water withdrawn from this aquifer is good with low chloride content; however, its high carbon dioxide and iron content can corrode ferrous and cement-based materials, with the excessive iron requiring treatment.

Whilst there may be short-term and mitigable impacts due to dredging, the proposed project is not expected to have significant long-term impacts on the existing coastal and Demerara River waters, and the ground water sources.

3.2 Existing Socio-economic and Land Use conditions

The Best/Klein/Pouderoyen area has an estimated population of 25000. The area comprises a mix of cultural, commercial, residential, and provisioning uses. These include Religious activities carried out on the sea dam in the area and a cremation site at Ruimzeight and La Jalousie west of project area. Commercial businesses including banks, restaurants, and supermarkets at Vreed-en-Hoop. There is an area of squatting known as “Plastic City” bordering the proposed project area. There is the GPL power substation at Vreed-en-Hoop with fuel and supporting services depot. The area on the foreshore and Demerara River mouth are used by fishing related and transportation activities. There are on average about 11 fishing boats docked at the Vreed-en-Hoop stelling. Nearshore fishing and crab catching are conducted in the area. Speedboat stelling located at Vreed-en-Hoop with approximately 75 boats registered to crossing between Georgetown and Vreed en Hoop with fifty-three (53) working daily[8]. There are some boat building activities in the area.

[7] Esso Exploration and Production Limited (EEPGL). 2018. Environmental Impact Assessment. Payara. Pp 1217

[8] Esso Exploration and Production Limited (EEPGL). 2018. Environmental Impact Assessment. Payara. Pp 1780

Along the coast nearshore area there are three shipwrecks, two beacons, and GPL power cable crossing the Demerara River in the proposed project location (Figure 7).

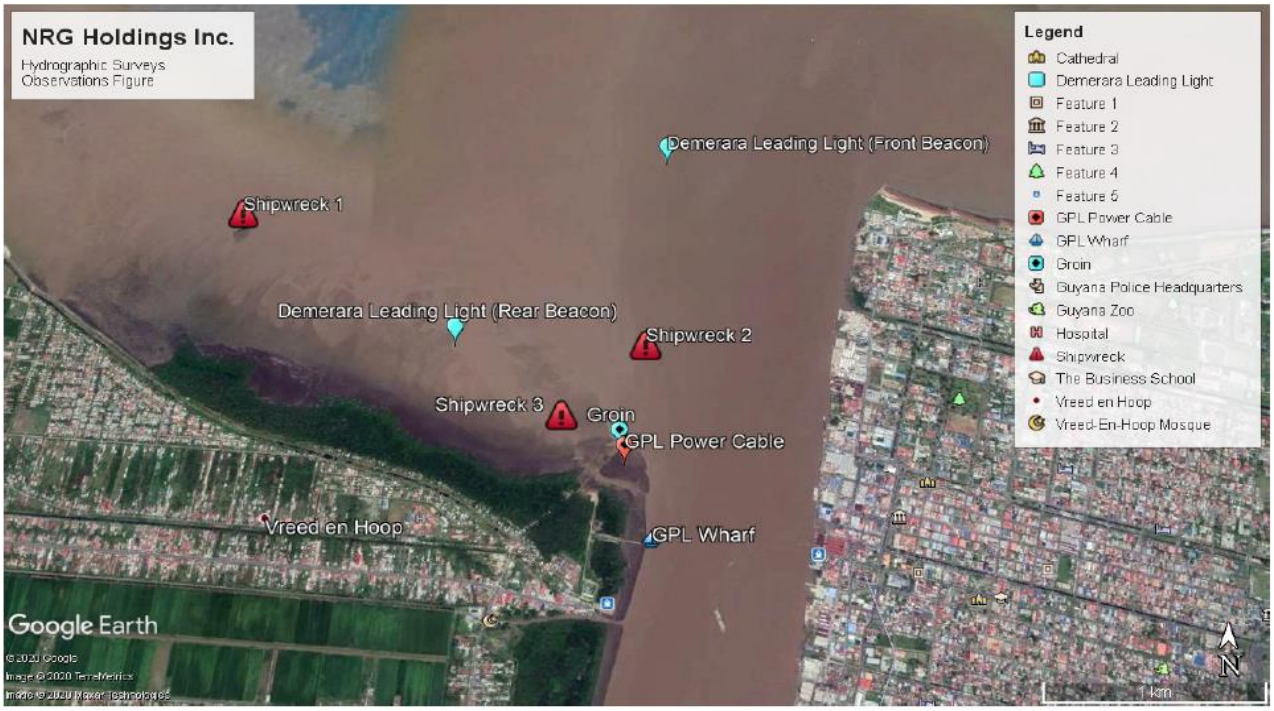

Figure 7: Shipwrecks and Beacons location

4. The Project Design, Size, and Capital Investment

4.1 Project Components and Design

NRG Holdings Inc will construct and operate the Port of Vreed-en-Hoop which is conceptualized as a base port facility that will have potential to service the offshore oil and gas and other shipping needs. Detailed designs (including plans, design drawings, layout etc.) are currently being developed and will be made available once completed.

The port is expected to comprise but not necessarily limited to the following:

- Offshore terminal, fabrication, umbilical and spooling yards
- Administrative buildings will house offices and modernized logistics centers.
- Warehousing
- Container management systems, and potential for storage of sub-sea equipment, pipe inspection and repairs,
- Areas for individual and separate operators to provide relevant services to the offshore oil and gas operators including but not limited to waste management/effluent treatment plant(s), other environmental services, lodgings, mud plant, logistics etc.
- Area for a potential helipad
- Wharf, berths, and dry dock

It must be highlighted the Port of Vreed-en-Hoop will only provide the base port facility infrastructure and components as highlighted above. It is expected that individual contractors and operators will design their proposed activities in accordance with the Port of Vreed-en-Hoop and secure the relevant regulatory authorizations.

This proposed project will be implemented in two phases. Phase 1 (Figure 8) will comprise deepening, widening, and dredging of access channel approximately 100-125 metres wide and 7-10 metres deep. Dredging of the port basin and berth pockets. Offshore dredging and the hydraulic fill reclamation of the area behind quay wall and will include:

  - 57 a offshore terminal
  - 17 ha dry dock facility
  - 65 ha fabrication yard
  - 37 ha offshore components
  - 38 ha umbilical preparation and spooling yard

Construction of 1200 m quay wall, including up to 30 metre concrete platform, bollards, fenders: 6 berths for offshore supply terminal, with carrying capacity of quay wall of 10 tons/m^2. Construction of lifting pocket with capacity of 75 tons/m^2 and Dry dock.

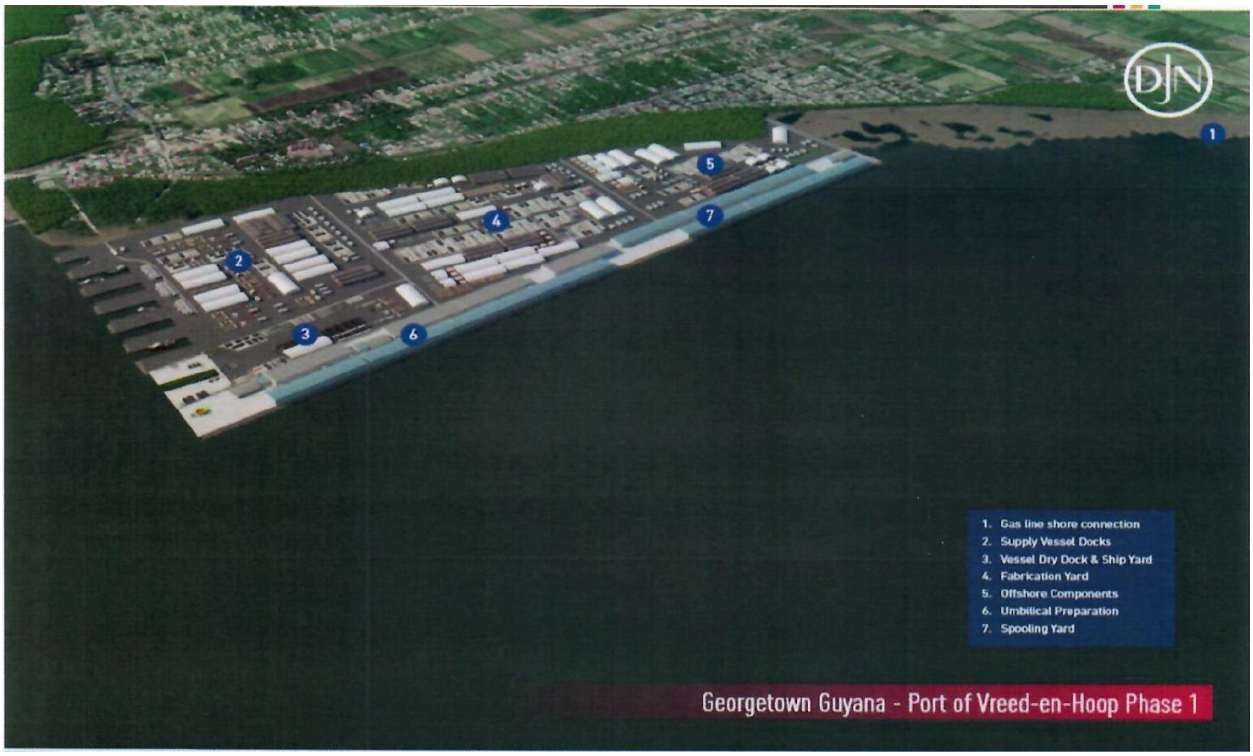

Figure 8: Phase 1 conceptual image of proposed facilities

Phase 2 (Figure 9) will comprise deepening dredging of the access channel (10-12 metres deep). Deepening dredging of the port basin and berth pocket. Offshore dredging and reclamation of the laydown area behind quay wall with total capacity of approximately 400 ha. The expansions will include:

- Construction of extra 800 metre quay wall including 30 metre concrete platform, bollards, and fenders.
- Expanded reclamation to increase capacity for the following:
  - Additional fabrication, spooling and umbilical preparation areas
  - Industrial development and support services such as liquid bulk area, container terminal, power station, customs and immigration, training centre
  - Area for logistics providers
  - General cargo port

Figure 9: Phase 2 conceptual image of proposed facilities

4.2 Investment, Employment and Turn-over

NRG Holdings Inc. expects to invest approximately USD$200-600. Employment is expected to be approximately 150-200 persons during construction and 50-100 persons for the basic operation and maintenance of the base port facilities indicated in phase 1. It is expected that once phase 1 components are fully operational, inclusive of service providers, approximately 1000 persons will be employed. This number is expected to double with phase 2 components completed and operationalized.

4.3 The Company

NRG Holdings Inc. is a consortium of leading local entrepreneurs highlighting the capabilities of Guyanese and 100% indigenous ownership of this project (the "Consortium"). The goal is to develop this landmark facility as a means of equipping and bringing tremendous value to locals in the management and operation of the emerging oil & gas sector while directly meeting the high standards of overall industry needs. This space will be developed into sustainable and industry leading facilities showcasing what can be done through local content, investment, and international partnership. The Consortium include:

1. ZRN INVESTMENT INC ("Partner 2"), a company incorporated under the Companies Act of Guyana, with its registered office at lot 16, Sublot A, Mudlot, Kingston, Georgetown, Guyana (represented herein by its duly appointed authorized representative ANDRON ALPHONSO). ZRN Investment Inc is a subsidiary of Adamantium Holdings and A. Alphonso and Sons multifaceted organizations with a combined 40 years in business and over 500 full-time employees, and experience in mineral exploration, gold mining, agriculture, and manufacturing.

2. HADI'S WORLD INCORPORATED ("Partner 3"), a company incorporated under the Companies Act of Guyana, with its registered office at 29 Lombard Street, Werk en Rust, Georgetown, Guyana (represented herein by its duly appointed authorized representative NAZAR MOHAMED). HADI's World is a local gold trading company in business for 38 years and over 200 employees. HADI's World has experience with laydown yard, construction of executive homes, apartment, real estate, and the extractive industry.

3. NATIONAL HARDWARE (GUYANA) LTD ("Partner 4"), a company incorporated under the Companies Act of Guyana, with its registered office at 17A Water Street, Georgetown, Guyana (represented herein by its duly appointed authorized representative NICHOLAS DEYGOO). National Hardware (Guyana) Ltd is a leading wholesale distributor and retailer in building materials and industrial engineering tools in Guyana since 1972. It also has experience in real estate development and has over 300 employees.

NRG Holdings Inc. Health, Safety and Environment Policy

Health, Safety, Environment (HSE) and Corporate Responsibility are built into everything NRG Holdings Inc. do, from the way the marine infrastructure portfolio is developed, recruitment of, and development of employees, to interaction and requirements for its clients. NRG Holdings Inc

is committed to health and safety in a way that takes care of people, clients, the communities in which the company operates, and the environment. Through a commitment to a culture of health, the company strives to create an environment that promotes the importance of wellbeing and encourages all employees to be a leader in their own and clients' health while at work, at home, and in the community. It is our goal to ensure our operations will be free of injuries, accidents, illnesses, or harm to the environment. Every employee will be responsible to ensure NRG Holdings Inc achieve this goal by committing to be proactive and alert and do the right things always for fellow employees, our clients, people, communities, and the environment; adhere to and maintain high standards and compliance to HSE policies, procedures, and national laws; ensuring sustainable and efficient use of resources.

NRG Holdings Inc. Corporate Responsibility

NRG Holdings believe in and embrace a people, community, client-oriented approach and being a good steward of the environment whilst meeting its business objectives and priorities. NRG Holdings Inc's corporate responsibility is to ensure an inclusive and participatory culture that supports people, communities, and the environment, through good governance, partnership, and ethical and responsible business practices.

5. Potential Effects on the Environment and Proposed Plans to Mitigate Environmental and Social Impacts

5.1 Possible Environmental and social impacts

The main activities associated with the project during the construction phase are land clearing, earthworks, stockpiling, machine operation and concrete works. These will have the potential to affect the environment directly or indirectly. The potential impacts are loss of land and habitats, pollution of air and sedimentation of surface water, generation of solid waste, and health and safety related. The impacts, however, are expected to be insignificant and short term in duration and therefore mitigable. The following is a preliminary assessment of possible impacts to environment and human health and the general mitigation measures that can be implemented. It must be noted that the detailed Environmental Social Management Plan (ESMP) will identify direct and indirect impacts and propose appropriate avoidance and mitigation measures.

Table 3; Possible Environmental and Social Impacts and mitigation measures

Environmental Component	**Nature of Impact**	**Impact significance**	**Mitigation measures**
Land	Erosion due to topsoil and vegetation removal during construction	Localised, Short-term, mitigable, insignificant, reversible	Minimize removal of vegetation to only areas where necessary. Revegetate where practical. Temporary bund exposed soil and redirect flows from heavy runoff areas that threaten erosion. Landscaping to reduce sloping. The development of the landscape and planting of trees and vegetative cover will be carried out after construction work.
Surface and Coastal waters	Sedimentation due to land revetting, dredging and reclamation and construction especially during rainfall events and storm water run-off	Insignificant, short-term, mitigable, localised	Avoid earthworks during rain events. Install appropriate sediment traps where applicable.
Waste	Waste generated during construction and operation that are generally municipal/domestic in nature.	Insignificant, mitigable	Recover and recycle as far as practical. Garbage receptacles placed at appropriate locations on site and covered. Construction debris will be segregated and stored in storage bins provided at the site. Regular collection and disposal by

Environmental Component	Nature of Impact	Impact significance	Mitigation measures
	The Construction debris & waste during construction.		authorized disposal services for disposal at Haags Bosch landfill. Develop and implement waste management plan
Air Quality and Noise	Dust particles is a potential environmental impact during construction. Operation of Diesel-powered generators and emissions of greenhouse gases Noise from operation of machinery during construction and operation	Insignificant, mitigable	Avoid open storage of sand and other materials that may become windblown. Wet areas during construction. The process of spraying water should be carried out at least three times on every construction day especially if construction work is carried out during the dry season. Haulage trucks will be covered, and the aggregates sprayed with water before loading the haulage trucks. Use of clean low sulphur diesel. Regular inspection and maintenance of equipment and machinery. No mitigation is required for generator emissions. Appropriate noise attenuation and adjusting working hours where other noise controls are not effective.
	During the construction, noise is expected to generate mainly from machinery and vehicular traffic.	Localized, Short-term, mitigable, insignificant	Adjust working hours where other noise controls are not effective.
Mangroves and Fauna	No removal of mangroves expected however, potential exist for bare minimum removal and filing in of portions to facilitate access road	Localized, short term, mitigable	No removal of mangroves is expected however, all precautions and approval conditions will be adhered to.

Environmental Component	Nature of Impact	Impact significance	Mitigation measures
Human Health and Safety	Potential for accidents and upset conditions related to workers safety and health during construction and operations.	Mitigable	Provide workers with training in the proper use and maintenance of equipment. Appropriate PPE and safety equipment. Proper housekeeping. First aid for all staff on the site. Appropriate contingency and emergency response plans developed and implemented
Social	Most of the impacts are expected to be positive due to increased employment and improvements in the area. Potential conflict may exist with regards to access related to squatting at Plastic City	Localized, Mitigable	Employment opportunities provided during construction. Consultation with key agencies and with residents in area including plastic city.

5.2 Basic Requirements for Contractors during construction

At all times Contractors would be required to conform to the following stipulations in implementing construction works:

- Adherence to all regulatory requirements and authorizations e.g EPA
- There should be clear demarcation of the extent of Contractor's work sites including areas for material storage, working yards and plant storage.
- Health and safety equipment (including protective clothing and boots) should be available and in use at work sites and construction facilities/camps. First Aid boxes will be mandatory.
- If required, fuel storage sites during construction will be bonded by breams to confine and mitigate the effects of any spillage. The capacity of the confined area to be 100% of volume of fuel stored and protected from rainwater.
- Discharge of dust and fumes should be minimized and there should be no burning of materials/substances.
- Dump trucks will be equipped with devices to prevent material spillage and roads should be kept clean of mud and construction debris.
- The contractor should remove all construction equipment and scrap waste from his sites on completion.

5.3 Health and Safety Management

NRG Holdings Inc. HSE policy will be implemented during construction and operation. All opportunities be taken to ensure awareness and adherence to health and safety issues and implement appropriate standards of performance. There will be a requirement for emergency and contingency plans. It will be a requirement that the contractors supervising foremen will have basic First Aid training. Appropriate first aid and safety protection equipment will always be available and utilized. Protective equipment includes hard boots and hats, protection for eyes and ear. Likewise, fire prevention measures should be in place, including the deployment of adequate functional extinguishers and simple dry sand buckets. The project monitoring programme should include inspection of safety equipment use. Basic hygiene standards should be required, with waste disposal collection containers and disposal by authorized companies.

5.4 Environmental Monitoring

Environmental monitoring programs will be implemented to address all activities that have been identified to have any potential impacts on the environment during normal operations and upset conditions. Environmental monitoring activities would be based on direct or indirect indicators of emissions, effluents, and resource use as applicable.