Environmental Impact Assessment

For

Martin Marietta Materials
Bahama Rock Limited Area 4 Project
Freeport, Grand Bahama

Submitted to:
The Grand Bahama Port Authority
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MARTIN MARIETTA MATERIALS
BAHAMA ROCK LTD.

REPORT

ON

AREA 4 PROJECT

Freeport, Grand Bahama Island

Submitted to:

THE GRAND BAHAMA PORT AUTHORITY

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Chapter 1: Executive Summary

1.0 Executive Summary

This Environmental Impact Assessment (EIA) is being submitted on behalf of Bahama Rock Limited (Bahama Rock) to the Grand Bahama Port Authority (Port Authority) and provides the necessary details of the proposed Area 4 Freeport Harbour expansion request. The EIA scope has been established through the submittal and agreement of a Terms of Reference (TOR) document. The TOR incorporates subsequent comments by the Port Authority to establish a common understanding with project stakeholders regarding the preparation and approval of the EIA. Bahama Rock has worked cooperatively with the Port Authority to ensure that it operates utilizing Best Management Practices.

Through the provisions of the Hawksbill Creek Agreement only the Port Authority has, "*the sole right from time to time and at all times during the continuance of the Agreement to plan, layout, and vary the development of the Port Area.*" The proposed Area 4 project is located on Bahama Rock property just west of the Warren J. Levarity Highway and parallel to the south side of a tributary of the Hawksbill Creek. The Area 4 property boundary is approximately 192 acres of which approximately 135 acres **(Figure 1.1)** will be excavated. It is bordered by the Warren J. Levarity Highway to the east, Bahama Cement Company

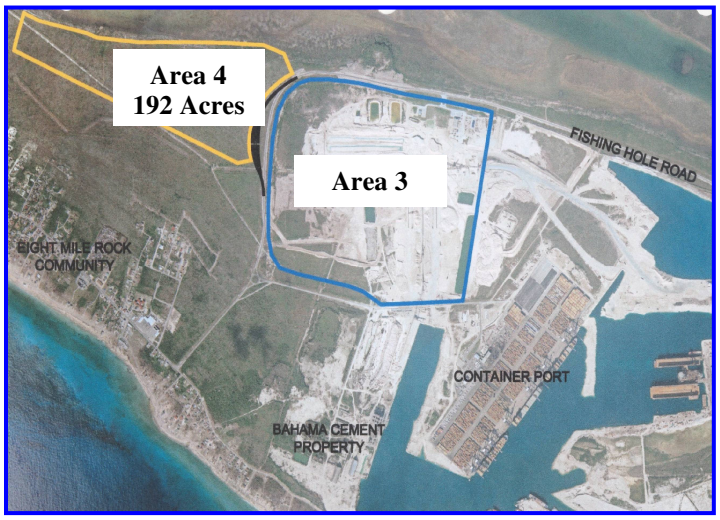
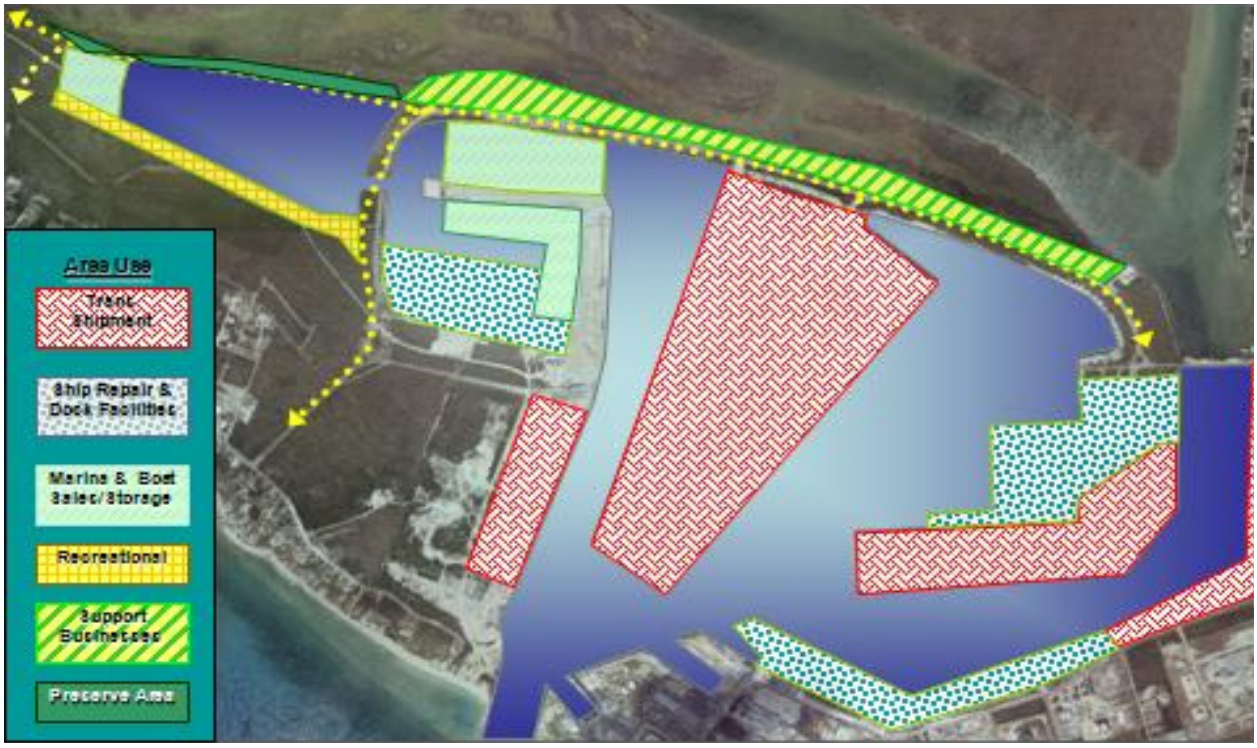


Figure 1.1: Area 4 Project Boundary

(Bahama Cement) property to the south and southeast; the Eight Mile Rock settlement to the south, the Hawksbill Creek to the north and Bahama Rock property to the west. Area 4 is a component of a larger Freeport Harbour Master Plan developed by Bahama Rock, Freeport Harbour Company and Freeport Container Port that will result in the creation of additional

turning basins and berths to expand the Harbour. The Freeport Harbour Master Plan shows the expansion of the Harbour at completion with the proposed land uses and incorporates the potential addition of a new deepwater berth facility on Billy Cay side (east) of Hawksbill Creek (**Figure 1.2**). This Freeport Harbour Master Plan was developed through a Memorandum of Understanding with the Freeport Harbour Company and Freeport Container Port.

Figure 1.2: Freeport Harbour Master Plan



Once Area 4 has been excavated, the resultant waterway will connect to an adjacent water body currently being excavated, known as Area 3. When retreat excavations are completed along the West Channel of the Harbour, a marine connection will be made to the Harbour entrance.

A key component of the Area 4 project includes the construction of a bridge along the Warren J. Levarity Highway west of the facility to accommodate safe movement of equipment and materials with no impact to local traffic. Movement of aggregate under the bridge will be accomplished by truck. With project approval, Bahama Rock will provide for a 150-foot road

right-of-way and utility easement parallel to Hawksbill Creek for the West End Connector Highway.

Data acquired for this EIA consisted of background literature and site-specific field evaluations. Background literature included review of past studies completed for parcels located in the vicinity of the Area 4 project. These studies included the EIA and the Environmental Assessment (EA) conducted for the Area 3 project and the Warren J. Levarity Highway North Parcel (Levarity Parcel), and other harbour area studies. In accordance with the TOR five additional studies are submitted as separate reports in the Appendices and include (prepared by).

- Vegetative Communities Report (M.A. Roessler Associates, Inc)
- Water Resources Assessment and Computer Modeling Report (R.C. Minning & Associates)
- Water Resources Assessment and Computer Modeling Report Addendum 1 (R.C. Minning & Associates)
- Noise Measurement, Modeling and Evaluation Report (Geosonics Inc.)
- Private Well Sampling Report Eight Mile Rock Community (Envirologic International)

Four other studies are included in the Appendices which were prepared for Bahama Rock in 2007 and relied on this report.

- Comparative Damage and Evaluation (Geosonics Inc.)
- Bahama Rock/Area Construction Review, Structural Inspection (Haag Engineering Co.)
- Bahama Rock/Travis Williams Residence Structural Inspection (Haag Engineering Co.)
- Bahama Rock/Dr. Kavala Structural Inspection (Haag Engineering Co.)

1.1 Vegetation

The Area 4 project site encompasses approximately 192 acres of undeveloped vegetated land. Five predominant vegetative communities were identified during field observations. These

include: Pine Whitelands, Slope/Coastal Strand, Mangrove wetland, Coppice, and Freshwater wetlands. The vegetative communities are presented in **Table 1.1**

Table 1.1: Vegetative Community Acreage Breakdown

Community	Acreage
Pine Whitelands	162.4
Slope/Coastal Strand	10.8
Coppice	2.3
Mangrove Wetland	9.7
Freshwater Wetland	0.8
Human Disturbed	5.5
Total	**192**

The Pine Whitelands is the predominant vegetative community. However, this community was observed to be in very poor condition for a variety of possible reasons. Most of the historic pine specimens were removed from the property during non-restorative logging in 1954. It is likely that the remaining pines were destroyed by a combination of significant storms and/or insects. There were little signs of pine seedling regeneration within the under story. This may be due to poor fire management and an absence of viable pine seed sources in adjacent nearby areas.

Figure 1.3: Indiscriminant Dumping

Within the Pine Whitelands, some localized areas have been subject to indiscriminate dumping of appliances, automobiles, furniture and household waste. Bahama Rock will implement the same Environmental Management Plan that was incorporated into the Levarity Parcel. Therefore, the mangrove habitat will be preserved along Hawksbill Creek and a 75-foot

buffer will be established in the Slope/Coastal Strand. The human disturbed area consisting of overgrown hardened spoil material dumped from the former Bahama Cement facility will be set aside as a recreational area for the general public. **Table 1.2** summarizes the vegetation impacts:

Table 1.2: Vegetation Impacts Summary

Impacted Areas	Acres	Preserved Areas	Acres
Pine Whitelands	161.6	Pine Whitelands	0.8
Freshwater Wetlands	0.8	Coppice	1.5
Coppice	0.8	Slope/Coastal Strand	7.1
Slope/Coastal Strand	3.7	Mangrove Wetland	9.7
Human Disturbed Road	4.1	Human Disturbed Historical	0.9
Human Disturbed Historical	0.5		
Totals	**171.5**		**20**

1.2 Groundwater

As a component of the EIA a Water Resources Assessment and Computer Modeling Report was prepared for the study area. Subsequently, an Addendum was prepared for this report which captured the seasonal variations. Baseline conditions were established for, the immediate freshwater lense boundary, local potable water supplies, groundwater quality, and impact modeling of the freshwater lense due to the development. Ten monitor wells were installed throughout the study area as part of the assessment. Initial water levels and the vertical distribution of salinity and conductivity in each well were measured and recorded from November 2007 through February 2008. Earlier measurements of salinity and conductance were also made in segments of an existing fresh water collection trench system just to the south of Area 4. These data were used to define the potentiometric surface and delineate the vertical and horizontal extent of the freshwater lense. A freshwater lense was determined to be present in the approximate area delineated by Hawksbill Creek to the north, the William J. Levarity Highway to the east, Queens Highway to the south, and Eight Mile Rock High School to the west. The maximum thickness of the lense was approximately 22-25 feet. The size and shape of the freshwater lense is more or less in a constant state of change in response to the frequency, duration and intensity of local precipitation events.

Additional monitoring of the freshwater lens in the vicinity of Area 4 was continued with four measuring events taking place on July 21, 2008, August 5, 2008, August 18, 2008 and August 19, 2008 which is reported in the Groundwater Resources Assessment and Modeling Report Addendum 1. During each monitoring event, conductivity and salinity measurements were made in each of the ten (10) permanent monitor wells that had been installed as part of the water resources assessment. The results reported in the Addendum supported the finding s in the original Report.

A private well survey was conducted by students of the Eight Mile Rock High School within the settlements of the Eight Mile Rock community. The study was for the Bartlett Hill, Pinedale and Hanna Hill communities, which are north of the Queen's Highway. Four hundred ninety-seven properties were included in the survey of which 23 were found to rely solely on a private well for their water supplies. Water samples from six of the wells were collected and analyzed for salinity and conductivity on February 19, 2008. All water supplies were categorized as freshwater based on salinity of <6.0 parts per thousand and a conductivity of <1,300uS/cm. An additional eighteen properties that were connected to the Grand Bahama Utilities Company municipal water supply system had private wells that were primarily utilized for washing, cleaning, bathing and emergencies. However, a few residents indicated that they relied on the water for drinking. Detailed information on well construction, depths and method(s) of extraction were beyond the scope of the survey.

The data obtained from the baseline portion of the assessment together with published information were used as input to a numerical computer model utilizing Visual Modflow and the SEAWAT code. Modeling of the freshwater lense for three simulations was conducted: (1) completion of Area 3, (2) 50% completion of Area 4, and (3) full completion of Area 4. The development of Area 4 at both 50% and to its full extent will result in a decrease in the size and shape of the freshwater lense in the study area.

While groundwater would still be available to the private wells, the salinity (chloride content) would be expected to increase over the concentration currently found in the well water. Bahama Rock is committed to provide a city water connection to any existing homes within the survey

boundary that only have a private well and are adversely impacted by the Area 4 project. This will be coordinated with the Grand Bahama Utility Company.

1.3 Blasting

Bahama Rock has developed a Blast Management Plan (BMP) that focuses on obtaining a balance between minimizing any nuisance to nearby residents while providing sufficiently broken rock that can be excavated safely within the mechanical limitations of the equipment. It is

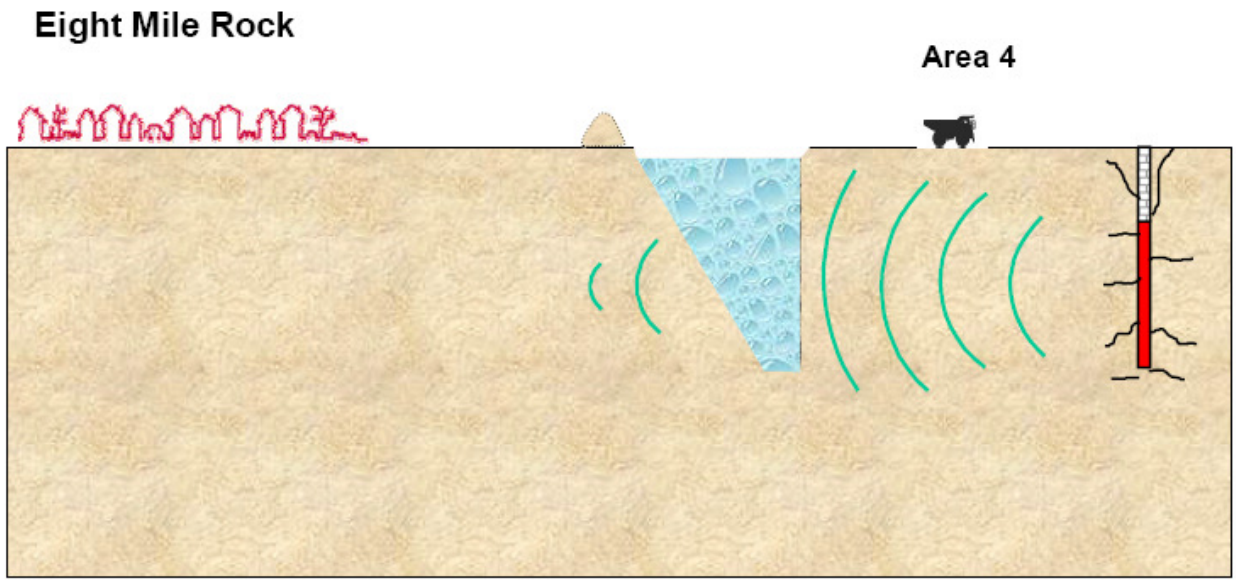


Figure 1.4: Blasting Schematic

important to realize that the natural hardness of the limestone is such that none can be excavated without first being blasted. The BMP has actual field-proven advantages and should meet expectations of all stakeholders. However ensure success, the plan is considered dynamic and is not fixed, final or inflexible. Reasonable adjustments can be made to improve the process as they are identified.

The blasting results for 2007 and 2008 are superior to those of the major limestone operations in South Florida where maximum allowable ground vibrations are 0.50 inches per second peak particle velocity. A series of Eight Mile Rock community meetings conducted in 2006 resulted in a maximum target vibration level of 0.2 inches per second peak particle velocity. This target has not been exceeded during 2007 and 2008. In addition, the number of community complaints has decreased from eighteen in 2006 to two in 2008.

Regarding Area 4, Bahama Rock will construct an open water trench as illustrated above in **Figure 1.4**. Although not required to meet target ground vibration levels, the trench will provide supplemental vibration protection over the entire southern boundary of Area 4. Pre-Blast surveys have been completed for a number of homes in the Harbour West community. However, additional homes within a 2,000 foot radius of Area 4 will be included depending on the permission of the individual residents. Bahama Rock will continue to monitor real time satellite downloaded data collected from the three permanent seismic monitors located in the Eight Mile Rock community. Predicted ground vibrations for the Area 4 project are below the current 0.2 inches per second peak particle velocity target. Bahama Rock is committed to maintaining the low vibration levels obtained during the past two years.

The detailed Blast Management Plan and Standard Operating Procedures for Surface Blasting are attached in the Appendices.

1.4 Noise

In order to address noise levels off property, noise modeling of the operation was completed. The modeling was completed using Cadna A Computer Aided Noise Abatement software, Version 3.7 (2007). The software utilizes CAD type drawings in conjunction with user specified noise sources and receivers. This program was utilized to evaluate the Area 4 noise impacts from the excavation of the initial Buffer Trench and the noise that would be produced by the excavation of Area 4. The noise modeling was performed incorporating the 15.0 feet berm represented in the project plans. The berm construction creates a significant change in the noise to the adjacent community for the excavation conducted on the south side of Area 4.

Overall, all projections for all excavation locations within Area 4 are less than the standards. While some noise may exceed the ambient community levels during initial work in the site, the construction of the noise berm and buffer will reduce the effect upon the adjacent community.

1.5 Air Quality

In the absence of specific air quality data or emission standards for this region, particulate emissions from the development of Area 4 have been analyzed and compared to the U. S. Environmental Protection Agency and State of Florida standards for crushed stone mining and processing. Both potential and actual emissions from the current Bahama Rock Limited activities and the addition of the Area 4 development have been calculated and compared. Since air modeling is not required in the State of Florida for crushed stone processing facilities, emissions have been calculated using Crushed Stone Processing and Pulverized Mineral Processing (AP-42 Section 11.19.2.1, August 2004) for PM10 emissions from the processing plant and Fugitive Quarry Road Emissions Calculation (Unpaved Roads) – (AP-42 Section 13.2.2 and EPA-450/3-88-008 Section 3.3.3.1). In the absence of comprehensive emissions factors for PM2.5 and the fact that PM2.5 is not considered in determining regulated emissions, calculations for this particle size are not included.

Actual PM10 emissions for the current Area 3 activities at Bahama Rock Limited are estimated to be 8.3 tons per year. Actual PM10 emissions including the development of Area 4 are estimated to be 13.8 tons per year. The processing plant annual production will remain essentially the same during the development of Area 4 at approximately 6.6 million tons, thus processing plant emissions will not change. The resultant increase in PM10 emissions from the development of Area 4 is due to the increased haul road distance. Haul roads are the major contributor to PM10 emissions at facilities of this type.

Processing plant and haul road emission control will be accomplished by the inherent moisture content of the raw material, the blasting, excavation and processing of material in a water medium and the application of water to haul roads.

Based on the 100 ton per year threshold of Title V of the U. S. Clean Air Act, this facility would not be classified as a major source of emissions. As the actual emissions are significantly below the Title V threshold, the Bahama Rock Limited facility is not considered a significant source of PM10 emissions and thus is not considered to have a significant impact on air quality.

1.6 Tropical Storm Flood Risks

Flood risks for the project site and surrounding areas will not significantly change as the result of the proposed project. In the past, Hawksbill Creek has been the site of several flood events primarily resulting from hurricane induced storm surges.

Two storm surge and flooding studies completed for central Grand Bahama Island were referenced for this report. The first was performed by Dames and Moore in 1995 to assess the storm surge and flooding probability for areas around Hawksbill Creek. The second study performed by Richard Czlapinski, Consulting Coastal Engineer was completed in 1996 and used a similar methodology to predict storm surge levels for various recurrence interval storms along the south side of the Island in the vicinity of Lucaya.

The project plan calls for establishing a right-of-way for a future construction of the West End Connector Highway along the north edge of the project site. The proposed roadbed will be raised to a minimum elevation of 15 feet above mean sea level (msl). This road base will provide flood protection by reducing the access for landward migration of storm flooding to a 100-year recurrence interval. In other words, the project directly reduces the potential of flooding from the north side of the Island. This will directly benefit the project, Freeport Harbour, and the Eight Mile Rock communities.

The Czlapinski Study predicts the maximum surge elevations for tropical storms impacting the south side of Grand Bahama Island. As mentioned above, the existing site elevations average 12 feet msl which are considerably higher than the 8.2 feet mean low water (mlw) still water elevation predicted for the 100-year recurrence interval event. Because of the more inland location of the project site, flood routing will be via the Freeport Harbour entrance rather than overland. Existing ground elevations to the south of the project area rise to over 20 feet mlw. Therefore, interior storm surge flooding from the southern open coast will not occur. Water levels in the Harbour will rise to a level approximately equal to the levels presented in the Czlapinski Report but the surrounding land elevations are above these potential flood levels. The project is not altering the harbour entrance channel or the contours of properties located adjacent

south so there will be no change in storm surge flooding probability to the Harbour and surrounding lands or the properties lying along the south shore of the Island. In addition, flood analysis computer assisted drawings were prepared for both northern and southern 100 year storm events. Results indicate the project directly reduces the potential of flooding from the north side of the island and this will benefit the project, Freeport Harbour and the Eight Mile Rock communities. The exhibits are presented in **Exhibits 39, 40, 41, and 42.**

1.7 Traffic Interruptions

Bahama Rock is committed to maintaining safe traffic flow. Traffic interruptions are anticipated to be short-term events. Minor interruptions may occur during bridge construction and when the dragline is relocated. Local police will be coordinating any traffic interruptions and will be scheduled during off peak hours.

1.8 Socio-Economic

The expansion of the Panama Canal and the addition of a third lock system, which will be 427 meters (1400 feet) long, 55 meters (180 ft.) wide and 18.3 meters (60 feet) deep, is scheduled to become operational in 2014 or 2015. The Bahama Rock operation presents an advantage to Grand Bahama over competing ports by matching these depths at "no cost." The advantage would be the ability to receive post-Panamax vessels by the Container Port along the west channel allowing the next generation of 18 meter draft vessels to utilize Freeport Harbour. This has the potential to position Grand Bahama for further economic growth over the next fifty years facilitating possible Mega-Port status.

If Area 4 Expansion is approved, Bahama Rock is expected to extend operations through at least 2018. Therefore the following economic benefits are anticipated to accrue to Freeport and Grand Bahama:

- 85 jobs at Bahama Rock are expected to continue for a 10-year period, creating 850 man-years of employment. Bahama Rock payroll expenditures over this period are anticipated to approximate $58 million representing a $22.8 million payroll increase if Area 4 is approved. Currently one expatriate is employed at Bahama Rock.

- Approximately $163.4 million in total expenditures resulting from Bahama Rock operations are expected to flow into the local economy over a ten-year period, representing an approximate $64.2 million increase in expenditures if Area 4 is approved.

- This expansion and excavation will increase harbour capacity and contribute to increased business activity. The Area 4 basin with harbour connection will transform a terrestrial environment into valuable water front property. The potential development will enable small business persons and pleasure craft owners access for the first time through a private harbour while entitled to all the benefits derived from Port Authority licensure.

- The completion of Area 4 will add to the differentiation of the Freeport Harbour as outlined in the Harbour Master Plan.

- Provisions will be made for a highway right-of-way and utility easement property valued at $1,428,000 through Bahama Rock Property if Area 4 is approved.

- Wetland protection and transitional buffer zones through additional Bahama Rock properties are provided for the protection of wildlife habitat.

- Area 4 will allow Bahama Rock to continue to provide a reliable, convenient and economic supply of building materials, which are the key to the Bahamian residential and commercial construction industry. Bahama Rock is the largest supplier of construction grade aggregate in the Bahamas.

The Area 4 project will alter the land use of the area by the creation of the excavated basin. A conceptual artist rendering, post-excavation, illustrates some of the potential long term uses for the basin which includes a marina, recreational areas with a boat launch, scenic highway overlook and bridge view **(Figures 1.5, 1.6, 1.7 and 1.8.).**

Figure 1.5: Artist Rendering Area 4

Figure 1.6: Conceptual Marina

Figure 1.7: Boat Launch

Figure 1.8: Scenic Turnout

Community Concerns

The primary community concern regarding the Bahama Rock operation was the blasting related nuisance complaints from the homeowners in the Harbour West subdivision of Eight Mile Rock in the summer of 2006. The concerns regarding the proximity of the homes to the Bahama Rock facility were apparent in the two town meetings in July 2008. Some residents expressed a concern that the movement of the Bahama Rock excavation operation over to Area 4 may cause a repeat of the 2006 events in regards to blast related ground vibrations. It is noted that in 2006 there were 18 complaints reported to Bahama Rock between May and December. In 2007, nine complaints were reported by four different persons. And in 2008 there were a total of two complaints lodged up to Oct 2008.

Bahama Rock modified its blasting procedures to reduce blasting vibrations to below the 0.2 inches per second peak particle velocity target. Moreover, Bahama Rock commissioned two studies in early 2007 using two different companies, Haag Engineering Co. and Geosonics Incorporated as a result of a February 2nd, 2007 meeting with all invited Harbour West residents. The studies compared structures away from the facility where there would be no ground vibrations or blast overpressure to homes in Harbour West. The results of those studies indicated that there was no correlation between defects found in homes within the quarry proximity compared with those beyond the proximity of the quarry. Comparative defects were found throughout the study area regardless of proximity.

1.9 Environmental Management Plan

Bahama Rock has already implemented environmental management procedures for the Levarity Parcel. These same procedures have been incorporated into the Area 4 Environmental Management Plan. Bahama Rock has a proven track record of leading by example with existing Environmental Management Plans and Procedures. Bahama Rock is committed to operating its facilities in a manner that is in compliance with Grand Bahama Port Authority requirements and applicable Central Government regulations.

1.10 Community Consultation

Prior to the preparation of the EIA, meetings were held with the GBPA to determine the Scope of Work and the Terms of Reference for the project. During the preparation of the EIA consultation meetings were held with various community leaders, service clubs, business leaders and representatives of the Government of the Bahamas. Additionally, a detailed presentation was made to various members of the media followed by a facility tour and blast demonstration. Two town hall meetings were held in the Eight Mile Rock Community in July of 2008 and discussion points from those meetings were incorporated in this document. See **Chapter 11.0.**

1.11 Conclusion

While typical resource extraction operations are not considered sustainable in an island environment, the Bahama Rock operation is unique to the Bahamas. The Area 4 project offers four important benefits:

1. Expansion of the Freeport Harbour which provides a continuous creation of economic development and local employment.

2. Enhanced infrastructure supporting east-west Grand Bahama Island connectivity.

3. Provides continuous supply of high quality and low cost aggregates for nearly 100% of all new construction requirements for the Commonwealth of the Bahamas.

4. The existence of Bahama Rock allows for the preservation of the natural relief in New Providence and the Family Islands as the affordable, convenient, single source Bahamian aggregate supplier.

Bahama Rock will work with the Port Authority and Government of the Bahamas to ensure that this project is managed to maintain the integrity of the valuable wetland habitat identified for preservation and is committed to monitor operations to prevent adverse impacts to the local community.

Chapter 2: Project Introduction & Objectives

2.0 Chapter Overview

Chapter 2.1 provides a brief introduction to the Area 4 project. It includes a statement of need and a brief summary of the various benefits of the Area 4 project as discussed in further detail in 4.0. **Chapter 2.2** defines the purposes, scope, and objectives of the Environmental Impact Assessment (EIA) as well as the review process it will undergo.

2.1 Area 4 Introduction

This EIA was prepared at the request of the Grand Bahama Port Authority (Port Authority) for the proposed excavation of a parcel of property owned by Bahama Rock Limited (Bahama Rock) designated as Area 4 located on Grand Bahama Island. Area 4 encompasses approximately 192 acres and is generally located in the Freeport Harbour (Harbour) area. The area for proposed excavation is approximately 135 acres, with the remaining area to be incorporated into other land uses detailed later in this report. It is bordered by the Warren J. Levarity Highway to the east, Bahama Cement Company (Bahama Cement) property to the south and southeast; followed by the Eight Mile Rock settlement to the south, Hawksbill Creek to the north and Bahama Rock property to the west. The Bahama Rock property boundary survey has been recorded as plan number 1873 in the Lands and Survey Department of the Port Authority on June 2nd, 1998 and is included as **Appendix 7**. Please refer to **Figures 2.1, 2.2, & 2.3 (Exhibits 1-2)**.

Figure 2.1: Grand Bahama Island

Figure 2.2: Area 4 Project Site

Area 4 is a critical component of the Freeport Harbour Master Plan by Bahama Rock, Freeport Harbour Company and the Freeport Container Port (Container Port) that will result in the creation of additional turning basins and berths to expand the harbour. Once Area 4 has been excavated, the resultant waterway will connect to an adjacent water body identified as Area 3. Area 3 is located east of Area 4, as indicated in **Figure 2.3**. In accordance with Bahama Rock's excavation plan, waters of Area 4 will eventually connect to waters of Area 3 resulting in a significant westward expansion of Freeport Harbour **(Figure 2.4).**

Figure 2.3: Areas 4 & 3

Figure 2.4: Expanded Freeport Harbour

Figure 2.4 depicts the completion of Area 3, Area 4, retreat excavation back to the Freeport Container Port, and the hydraulic connection of the Bahama Rock projects to the harbour.

With the development of Area 4 comes an opportunity for the creation of a new highway system, referred to throughout this report as the "West End Connector". As part of the Area 4 project, Bahama Rock will provide a one hundred and fifty foot (150 foot) right-of-way, totaling approximately 73.2 acres. Completion of the roadway through Bahama Rock's property could be completed by others in the near future. The highway right-of-way would commence along Area 4's northeastern boundary, beginning at the Warren J. Levarity Highway. It then runs parallel to Hawksbill Creek, through Area 4 and additionally owned Bahama Rock properties north of the settlement of Sea Grape. The right-of-way is the same width as the Warren J. Levarity Highway. East/west commuters from all West Grand Bahama settlements will have direct alternative roadway access as a result of this highway. The details of this future highway are further described in 5.7.1. The location of the proposed right-of-way is illustrated in **Exhibit 24**.

The details for the connection of feeder roads to the Eight Mile Rock Community from the proposed West End Connector right-of-way will be the responsibility of others and not part of the Bahama Rock Area 4 Project. The proposed Nuthall Avenue would link the Warren J Levarity Highway to the Queen's Highway at the Bahama West subdivision as discussed further in 4.4 and 5.7.1.

2.1.1 Statement of Need

The Area 4 project would fulfill important business needs for Bahama Rock and provide future maritime economic development. The initiative enables Bahama Rock to plan and coordinate Harbour development in a balanced approach that meets minimum sustainable aggregate production levels while advancing completion of the Freeport Harbour Master Plan. Area 4 will present new opportunities within Freeport Harbour for local businesspersons. Bahama Rock seeks to continue to meet regional demands for major construction projects throughout the Bahamas, and the Region. The development of Area 4 will also compliment the Port Authority's mission to develop the harbour in accordance with the Hawksbill Creek Agreement (Agreement),

further discussed in 3.0. Finally, the project presents the opportunity to develop a West End Connector which has the potential to improve cross island traffic flow.

2.1.2 Benefits

Development of Area 4 will provide important benefits for three primary stakeholders. These stakeholders include Bahama Rock, Freeport Harbour businesses, and citizens of Grand Bahama Island. Examples of these benefits are presented below and discussed in further detail in 4.0.

1) Bahama Rock
   - Continued operation
   - Continued local spending and employment
2) Freeport Harbour Businesses
   - No Cost Mega-Port Construction
   - Support for Existing Port Facilities/Businesses
   - Opportunity for new Businesses and Industry

3) Citizens of Grand Bahama Island
   - West End Connector Right-of-Way and Utilities Easement supporting the future development of all Western Grand Bahama
   - Waterfront property available to the Eight Mile Rock Constituency (See "Recreational" **(Figure 3.7)**
   - Future Land Use Opportunities
   - Employment and Career Opportunities

2.2 EIA Purpose, Scope, and Objectives

2.2.1 EIA Purpose

The purpose of this EIA is to provide the Port Authority with a thorough assessment of the various benefits and potential adverse impacts associated with the Area 4 project in the context of environmental protection.

2.2.2 EIA Scope

The EIA scope has been established through the submittal and agreement of a Terms of Reference (TOR) document, between the Port Authority and Bahama Rock. The TOR incorporates subsequent comments by the Port Authority to establish a common understanding with project stakeholders regarding the preparation and approval of the EIA. The TOR defines the EIA scope which outlines the study area and project components. It also established the relative areas of influence which include the Warren J. Levarity Highway and neighboring residential communities of Eight Mile Rock. Please refer to **Appendix 1** for a copy of the TOR document. This appendix also contains a reference guide to the TOR scoping document and Port Authority response comments.

2.2.3 EIA Objectives

In accordance with the TOR document, the objectives of the EIA are as follows:

1) Provide a detailed description of the Area 4 project (Chapters 3, 4, & 5)

2) Describe baseline socio-economic and environmental characteristics (Chapter 4 & 6)

3) Evaluate adverse and positive impacts (Chapter 4 & 7)

5) Provide mitigation options & develop environmental management plans (Chapters 8 & 9)

2.2.4 EIA Review Process

The reviewing entity for this EIA is the Port Authority Environmental Department. The Port Authority will advise, within 30 days of receiving the EIA, if it meets the scope outlined in the TOR. The Port Authority will provide notification of its decision within 90 days of receiving the EIA and advise Bahama Rock of any technical deficiencies, the need for additional information, or if the EIA has been satisfactorily completed.

The Port Authority will subject the review process to include independent third party review and consultation with the Government of the Bahamas.

However, based upon the letter received from the Department of Physical Planning, dated June 18, 1997, and the letter from the Port Authority, dated August 1997, it is the sole responsibility of the Port Authority to grant or deny approval (**Appendix 8)**

2.2.5 Considerations Outside of the EIA

Bahama Rock is an existing business operating in the "Port Area" and as such is regulated by the Grand Bahama Port Authority. Any operational influences outside of the" Port Area" are monitored by the Government of the Bahamas and its relevant government agencies.

Bahama Rock will include additional considerations related to parallel planning and permitting of related infrastructure as identified in this EIA. Such items will include the engineering details for bridge construction, relocation of the existing highway, and utility relocation. Details for design will be submitted to the appropriate Port Authority departments following the EIA approval.

Chapter 3: Project Background

3.0 Chapter Overview

This chapter provides an overall historical perspective of the development of Freeport Harbour. Discussion on the importance of the 1955 Agreement to the Harbour's development is detailed, as well as Bahama Rock's role in expanding the harbour. More recent Bahama Rock projects, including the proposed Area 4, are outlined as they are integrated into the Freeport Harbour Master Plan.

The following discussion references several aerial photographs covering the Harbour's history. These photographs are located in **Exhibits 7-13** and include the following dates:

- 1942: **Exhibit 7**
- 1958: **Exhibit 8**
- 1967: **Exhibit 9**
- 1970: **Exhibit 10**
- 2002: **Exhibit 12**
- 2005: **Exhibit 13**

3.1 Freeport Harbour History and the Hawksbill Creek Agreement

The City of Freeport was founded after the signing of the Hawksbill Creek, Grand Bahama (Deep Water Harbour and Industrial Area) Act on August 4, 1955, between the Bahamas Government and Wallace Groves of the Port Authority. This Act, which is commonly referred to as the Agreement, has had a profound impact on the development of Grand Bahama Island. It is directly responsible for the birth of the City of Freeport, as well as the development of the Freeport Harbour, which was largely undeveloped prior to 1955 (**Figure 3.1**).

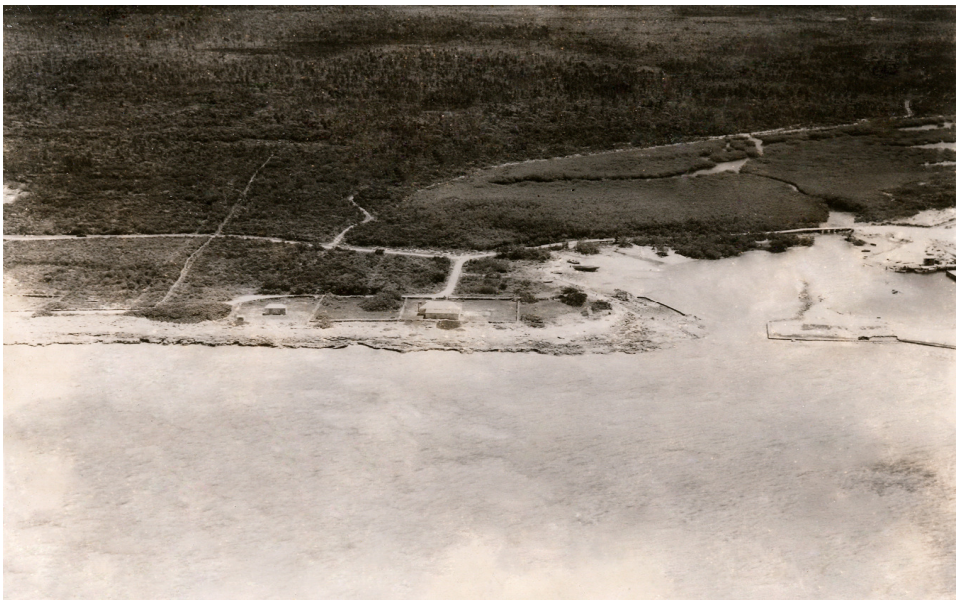
The Agreement enabled the Port Authority to purchase 50,000 acres of Crown Land surrounding Hawksbill Creek. It also granted a conditional purchase lease to the Port Authority for seabed underlying Hawksbill Creek, and gave permission to purchase land from private owners in the

vicinity of Hawksbill Creek. In return, the Port Authority was responsible for excavating a deep water harbour and turning basin. The Port Authority was also encouraged to establish factories and other industries within the Port Area. Under Section 2 Paragraph 1 sub-clause (3) of the Hawksbill Creek Agreement, it mandates the Port Authority to:

(3) Use their best endeavors to promote and encourage the establishment of factories and other industrial undertakings , and in particular factories, industrial undertakings, and industries which will make use of the natural resources and products available at Hawksbill Creek such as limestone rock and pine timber, within:

(a) The area comprising the said Fifty thousand acres of Crown land to be leased by the Crown to the Port Authority;
(b) the said Eighty acres of land to be purchased by the Port Authority from private landowners; and
(c) Such part of the said Fourteen hundred and Twenty acres of land as the Port Authority may purchase from private owners within three years from the date of this Agreement; all of which including the Port Project are hereinafter collectively referred to as "the Port Area" which term shall include such other lands situate on the said Island of Grand Bahama and lying Eastwardly of a line drawn across the said Island North and South at a point Three miles West of the West bank of Hawksbill Creek where it joins the Sea on the South side of the said Islands as may be purchased by the Port Authority during the continuance of this Agreement and are declared to be part of the Port Area by Order-in-council published in the Official Gazettte pursuant to the provision of subclause (19) of clause 2 hereof

Figure 3.1: Pre-1955 South Entrance of Hawksbill Creek



Circa 1956, the Port Authority began work on the harbour and the turning basin at the southern mouth of Hawksbill Creek. The harbour channel was to measure no less than 200 feet wide and 30 feet deep at mean low water. The radius of the basin was to measure no less than 600 feet with a minimum depth of 27 feet at mean low water. **Figure 3.2** taken from the National Geographic Society (February of 1958) illustrates this initial harbour project taking place. Please also refer to **Exhibits 7** & **8.**

Figure 3.2: Freeport Harbour Excavation Circa 1958

The Port Authority has allowed for the expansion of Freeport Harbour and the development of businesses in the harbour area in accordance with Section 2, Paragraph 22, of the Hawksbill Creek Agreement which states:

> *"That subject to the provisions of sub-clause (10) of clause 1 hereof only the Port Authority shall have the sole right from time to time and at all times during the continuance of the Agreement to plan, layout, and vary the development of the Port Area in such a manner as the Port Authority shall in their absolute discretion deem fit and proper and that neither the Port Authority nor any Licensee shall have during the continuance of this Agreement require any building permit from the Government or any Department thereof for any excavation and/or for the erection or*

> *demolition of any building or structure in the Port Area, or for the installation, operation, maintenance, or removal of any machinery, plant equipment, or other apparatus in or about any buildings and/or structures within the Port Area."*

After the signing of the Agreement, the Freeport Land Use Master Plan was developed by the Port Authority (**Exhibit 5).** The Freeport Land Use Master Plan indicates different zoning areas for the "Port Area". For example, the area surrounding Hawksbill Creek and the harbour is designated "Heavy Industry" use. One of the first industrial based businesses in the "Port Area" was the Bahama Cement Company Ltd facility, which produced Portland cement. Bahama Cement was owned by U.S. Steel, which initially purchased the land in the harbour area circa 1962, after Her Majesty, Queen Elizabeth, signed the Bahama Cement Confirmation of Title Act in April of 1962. Bahama Cement used limestone rock from harbour excavation projects to produce quality cement for local manufacturing and export. **Exhibits 8 & 9** depict the Bahama Cement plant due west of the excavated harbour channel.

Other industrial companies that established in the early years of the harbour's development include: The Bahamas Oil Refining Company (BORCO) and Syntex Pharmaceuticals International Ltd. The new harbour created an area for these companies and others to operate and thrive. As a result, Grand Bahama quickly became the industrial capital of the Bahamas which began attracting further economic investment. In a February 1967 National Geographic Society article titled, "*The Bahamas: More Land than Sea,"* Wallace Groves, Chairman of the Port Authority, explained the Port Authority's sentiments on Freeport's growth. He said: "*Our formula is simple. We attract industry by making life pleasant for people working here – and for visitors as well. Without tourists we could not afford a jet airport, golf courses, and theaters – all the things that make a community. These things bring more industry*."

In summary, the signing of the Agreement led to the transformation of the southern portion of Hawksbill Creek from a mangrove community to a deep water harbour. The harbour has been excavated on several occasions to accommodate larger class ships and has been under expansion since 1955. This continual expansion has resulted in Freeport becoming a world class port facility. Numerous jobs and career opportunities have been provided for Bahamians outside the tourism sector, thus diversifying the economy of Grand Bahama.

The following is a partial list of major companies that have established themselves in the harbor since 1955:

- Freeport Container Port
- Martin Marietta Materials
- Polymers International Ltd.
- Bradford Marine
- Grand Bahama Shipyard **(Figure 3.3)**
- Freeport Container Port
- Bicham Ltd.
- Quality Services
- Freeport Oil Company Ltd.
- International Food Distributors of Grand Bahama
- The Bahamian Brewery & Beverage Company
- Syntex Pharmaceuticals International Ltd.
- PharmaChem Technologies
- Bahamas Oil Refining Company (Vopak)
- CEMEX

Figure 3.3: Grand Bahama Ship Yard

(***Source:*** ***www.freeportcontainerport.com***)

3.2 History of Bahama Rock in the Harbour

Martin Marietta Material's (Martin Marietta) subsidiary, Bahama Rock has played a significant role in the harbour expansion. Bahama Rock has been providing excavation and port basin expansion services to the Freeport Harbour Company at no cost through its excavation activity since the 1990s. In the 1990's, Dravo Bahama Rock (DBR) obtained rights to excavate and deepen the harbour. Martin Marietta Materials subsequently acquired DBR in 1995, which at the time, was excavating the rectangular shaped "lake" which was to become the site for the Freeport Ship Care Facility, now called the Grand Bahama Shipyard. DBR conducted limestone rock crushing and screening operations at the former Bahama Cement facility.

In 2000, Martin Marietta embarked on a major capital investment project located in Freeport, Grand Bahama. Martin Marietta acquired approximately 800-acres of land in the DBR purchase. The project invested $60,000,000 in a state of the art aggregate plant, maintenance shop, office building and ship loading conveyor system for the new Bahama Rock facility. Since the DBR purchase, Bahama Rock has continued its excavation operations to the present day under an agreement with the Port Authority and the Freeport Harbour Company. Under this agreement, Bahama Rock has been granted exclusive rights for limestone excavation in exchange for the expansion of the harbour area. In 2002, the highly automated Bahama Rock facility was brought online. The Bahama Rock facility currently serves the Bahamas, other Caribbean countries, and the United States.

Historical aerials of Freeport Harbour in **Figure 3.4, 3.5, & 3.6 (Exhibits 8, 9, & 13)** depict the Hawksbill Creek Area and former Bahama Cement facility and Property circa 1958, 1967, and 2005. The aerials respectively illustrate significant harbor expansion activities since 1955.

Figure 3.4: Freeport Harbour 1958

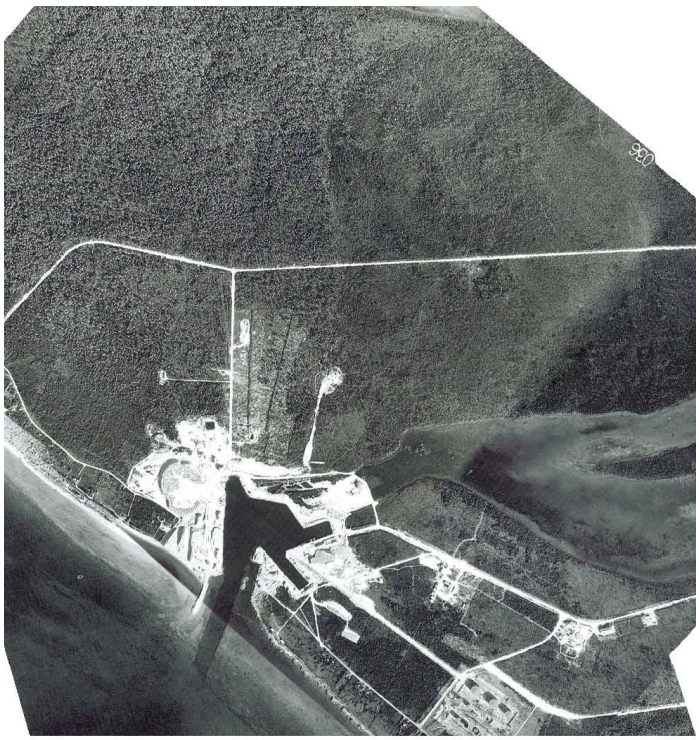


Figure 3.5: Freeport Harbour 1967

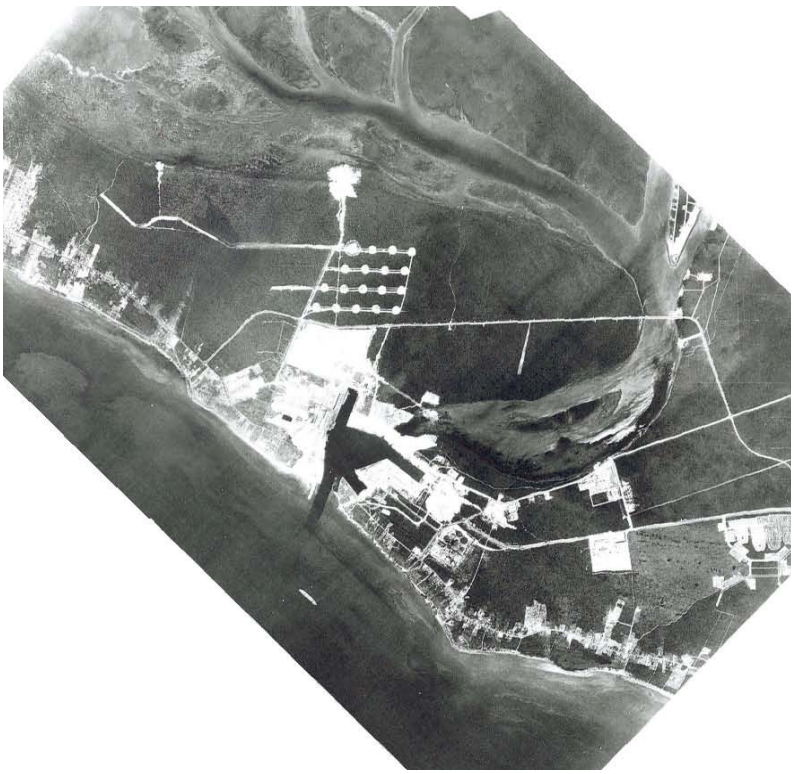


Figure 3.6: Historical Aerial 2005

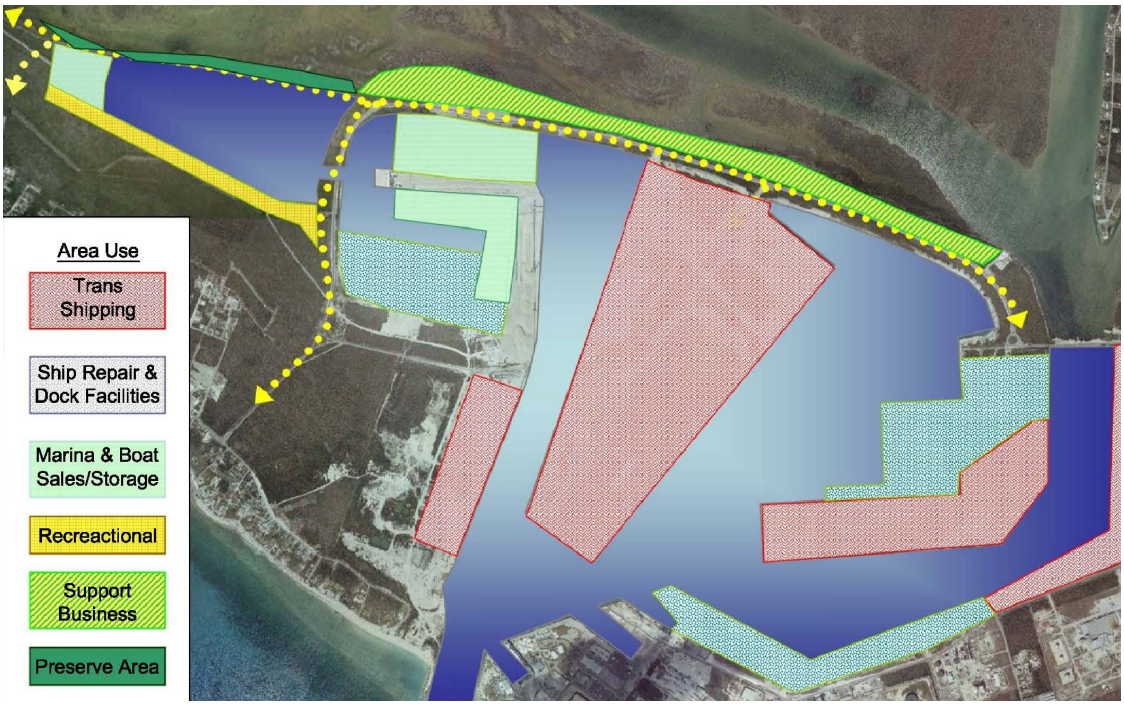
3.3 Freeport Harbour Master Plan

Bahama Rock and the Freeport Harbour Company wish to continue to expand the harbour in the original vision established by the Hawksbill Creek Agreement. The development of Area 4 is part of the Freeport Harbour Master Plan as outlined in a Memorandum of Understanding (MOU) by both parties. Due to the confidentiality of the MOU only the attachments are presented in **Appendix 15**. The MOU is available at the Bahama Rock office for the reviewers. The letter of support from the Freeport Harbour Company for the Area 3 project and West Channel development is also presented in **Appendix 15.**

The Freeport Harbour Master Plan will have a significant impact on the continued development of Freeport Harbour. The proposed plan is depicted in **Figure 3.7 (Exhibit 20)**. The proposed plan calls for continued harbour expansion, which will integrate future, current and already

completed projects by Bahama Rock. The plan significantly expands berthing space in the harbour. The Freeport Harbour Master Plan is geared toward anticipating an increase in global trading, and making Freeport a world competitor in trans-shipment. The future harbour could cater to vessels with drafts of 60.0 ft and post-Panamax shipping vessels. These large vessels are being planned for with the current expansion project of the Panama Canal. Presently, the depth and aerial extent ranks it as the largest of its type along the eastern seaboard of North and South America.

Figure 3.7: Freeport Harbour Master Plan



The plan segments the harbour in several categories of proposed land use, including trans-shipment, ship repair & dock facilities, marina & boat sales/storage, recreation and support business. These future land uses would take hold at the completion of Bahama Rock's Area 3, Area 4, and miscellaneous harbour cleanup projects (detailed later in 3.3.1, 3.3.2, & 3.3.3). See **Exhibit 23** for an illustration of the Area 4 project plan. This EIA does not cover or detail project proposals for the connection of Area 3 and Area 4 to Freeport Harbour, they are separate projects to be permitted in the future upon completion of detailed environmental studies.

3.3.1 Bahama Rock's Harbour Trim Projects

Bahama Rock is currently excavating parcels of land for Freeport Harbour Company. These parcels are depicted in **Figure 3.8 (Exhibit 21)**, and are referenced as "miscellaneous cleanup" and "the wedge". The recent removal of the wedge, located just southwest of the Container Port, allows for a greater turning radius inside the harbour and is a step forward in developing the western side of the facility. The removal of the miscellaneous land masses located in the northeastern section of the Container Port is also currently underway. Once the project is completed it will provide for an additional 500 meters (or 1,640 feet) of berthing and more container stacking areas as depicted by in **Figure 3.9.**

Figure 3.8: Proposed Harbour Cleanup Projects

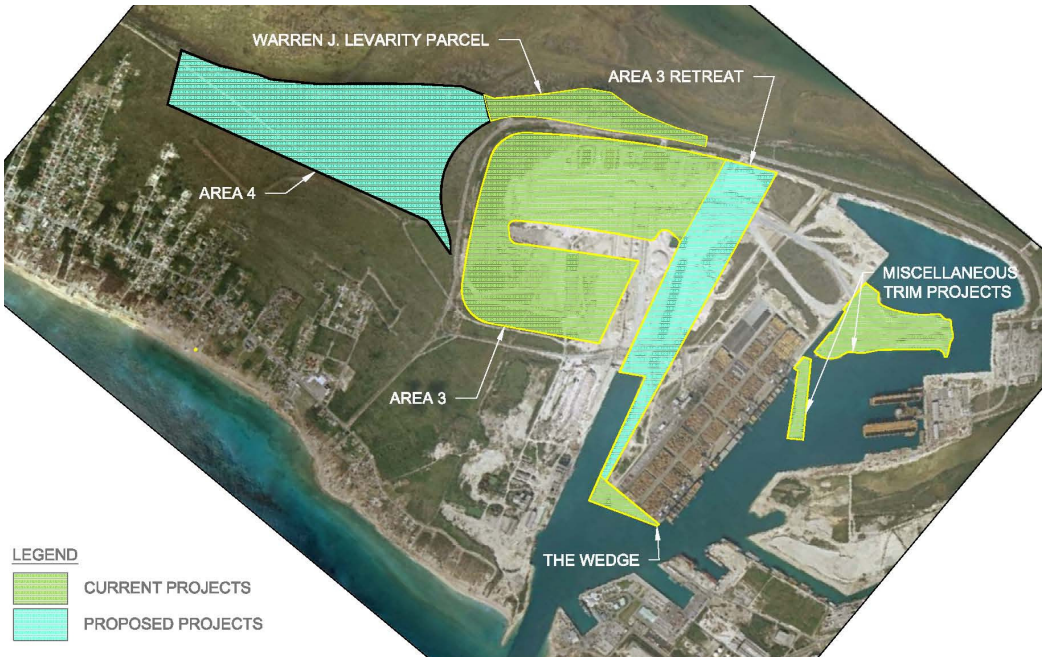
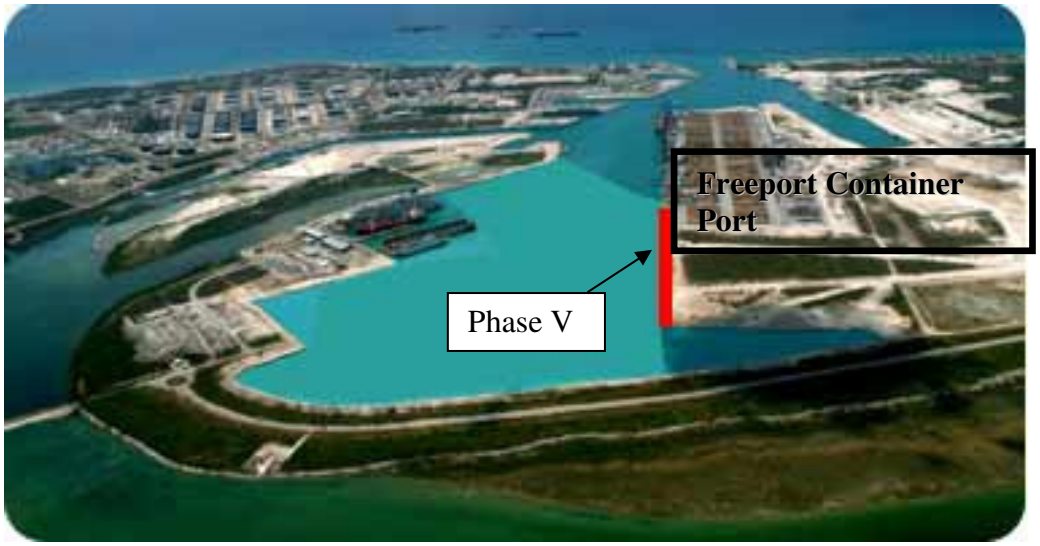


Figure 3.9: Freeport Container Port Phase V Berth Line



Source: ***www.freeportcontainerport.com***

3.3.2 Warren J. Levarity Highway Parcel

Bahama Rock is developing a parcel of land north of the processing plant between the Warren J. Levarity Highway and Hawksbill Creek, hereafter referred to as the Levarity Parcel. This property provides a location to deposit pre-strip material from ongoing port expansion projects and the developed land will be utilized for the relocation of the Bahama Rock offices once Area 3 north is completed. Additionally, the electric substation for the large dragline will be located on this property.

An Environmental Assessment (EA) was completed for the Levarity Parcel in May of 2007. The Port Authority has accepted the EA and Bahama Rock has received a building permit. The EA includes protection of the mangroves and Hawksbill Creek. The plan for the Levarity Parcel entails placing pre-strip material in compacted lifts to develop the property. The Levarity Parcel will create valuable real estate, allowing businesses that support the harbour to establish a presence in the Harbour area and will ultimately create economic opportunities for the Grand Bahama community.

3.3.3 Area 3

Bahama Rock is currently excavating Area 3 North which is scheduled to be completed in early to mid 2010. The aggregate processing facility lies within Area 3. Area 3 and Area 4 are separated by the Warren J. Levarity Highway. The eastern boundary of Area 3 is adjacent to Freeport Harbour Company property. Currently, Bahama Rock has excavated approximately 50% of the Area 3 parcel.

However, the Area 3 retreat excavation will not begin until after the Area 4 basin is completed. Therefore, the sequence for Area 3 and the retreat mining will be:

- Area 3 North
- Area 4
- Area 3 East Retreat
- West Channel

Once the Area 3 retreat process is completed, the existing West Channel will be extended along the Container Port and Bahama Rock properties, creating approximately 4,000 feet of new berth wall. It is anticipated that this will not be complete until 2018. Please refer to **Figures 3.10 & 3.11 and Exhibit 21** for the proposed waterway connection of Areas 3, 4, and the harbour.

Figure 3.10: Area 3South in 2007

Figure 3.11: Area 4 and Area 3North/ East Complete, with West Channel Connection

Chapter 4: Socio-Economics

4.0 Summary

If Area 4 Expansion is approved, Bahama Rock is expected to extend operations through at least 2018 and therefore the following economic benefits are anticipated to accrue to Freeport and Grand Bahama:

- 85 jobs at Bahama Rock are expected to continue for a 10-year period, creating 850 man-years of employment. Bahama Rock payroll expenditures over this period are anticipated to approximate $58 million representing a $22.8 million payroll increase if Area 4 is approved.

- Approximately $163.4 million in total expenditures resulting from Bahama Rock operations are expected to flow into the local economy over a ten-year period, representing an approximate $64.2 million increase in expenditures if Area 4 is approved.

- This expansion and excavation will increase harbour capacity and contribute to increased business activity. The Area 4 basin with harbour connection will transform a terrestrial environment into valuable water front property. The potential development will enable small business persons and pleasure craft owners access for the first time through a private harbour while entitled to all the benefits derived from Port Authority licensure.

- The completion of Area 4 will add to the differentiation of the Freeport Harbour as outlined in the Harbour Master Plan.

- Provisions will be made for a highway right-of-way and utility easement property valued at $1,428,000 through Bahama Rock Property if Area 4 is approved.

- Wetland protection and transitional buffer zones through additional Bahama Rock properties are provided for the protection of wildlife habitat.

- Area 4 will allow Bahama Rock to continue to provide a reliable, convenient and economic supply of building materials, which are the key to residential and commercial construction growth throughout the Bahamas.

- Bahama Rock will continue to support the local communities of Eight Mile Rock through monetary donations and provisions of materials and services as coordinated through an employee centered Community Relations Committee. See **Appendix 6** for tables and support letters detailing Bahama Rock's contributions.

4.1 Overview

This chapter presents an overview of the direct and indirect socioeconomic impacts. This section reflects the expenditures of Bahama Rock in the local economy and describes the potential benefits of the Area 4 project if completed in accordance to the Freeport Harbour Master Plan. Additionally, this chapter discusses the historical influx of industry to Freeport Harbour, which was made possible only through the harbour expansion. A brief history of the Port Authority and Freeport Harbour development is provided to clarify the impact of the harbour genesis to Freeport.

4.2 Bahama Rock

Bahama Rock is one of only two resource extraction operations in Grand Bahama and the Bahamas. The other operation is smaller and the primary business is the manufacturing of concrete block and ready mix concrete for local sales. Bahama Rock produces 5 million tons of aggregate per year or twenty times the volume of the next available supply. Bahama Rock supplied the Bahamas with 812,364 tons of aggregate in 2006 of which 218,983 tons were used in Grand Bahama. Bahama Rock is the leading supplier of aggregate throughout the Commonwealth of the Bahamas.

Bahama Rock supplies all construction grade aggregate for Bahamian anchor projects and has supplied 100% of materials for all three phases of the Paradise Island Atlantis development. As other anchor projects are scheduled to come online in Grand Bahama and New Providence in the future, Bahama Rock will be the key supplier of low cost, high quality construction aggregate

and marine armor rock. This is particularly relevant if the approved projects are in construction simultaneously. See Mosko Group Limited letter dated February 18, 2008 describing the importance of having a high quality supply of domestic aggregates available to meet the construction needs in Nassau and throughout the Bahamas in **Appendix 6.**

Bahama Rock has demonstrated a commitment to be a good corporate citizen through assistance to the local schools in the Eight Mile Rock communities and by its donation of services and materials to the community at large. Bahama Rock has made local donations during 2006-2007 valued in excess of $200,000. Projects included support for Eight Mile Rock High School, Martin Town Primary, Bartlett Hill Primary, Holmes Rock Primary, YMTA, Sea Grape Youth Development, and repairs to the Hepburn Town Boiling Hole attraction and over one mile of beach restoration, to name just a few.

4.3 Economic Background

To understand the role that the harbour development has played in transforming Grand Bahama Island, a historical review is necessary.

The City of Freeport was founded following the signing of the Agreement on August 4, 1955 between Wallace Groves of the Port Authority and the Bahamas Government, which is discussed in **3.0.** This agreement granted 50,000 acres of crown land to the Port Authority with specific tax concessions, with the requirement that the Port Authority build a deep-water harbour. The harbour was to be built to a depth of 27 feet at mean low water of average tide and channel entrance 30 feet deep at mean low water with a channel entrance of 200 feet in width at a minimum. After the signing of the Agreement, the "Port Area" was expanded to cover some 150,000 acres (230 square miles) of land. Based on the 2000 census Freeport proper is home to some 26,910 persons and is the second largest city in the Bahamas. Since the initial dredging of the southern mouth of Hawksbill Creek, the harbour has grown in both size and depth. Freeport now boasts the deepest harbour in the region with a consistent depth of 52 feet (16 meters) and a channel entrance of 500 feet it has become a strategic location for maritime industry.

A major development occurred in 1995 when the Port Authority partnered with Hutchinson Port Holdings (HPH) in a joint venture whereby HPH purchased an interest in the Freeport Harbour Company, the Grand Bahama Airport Company and the Grand Bahama Development Company. The first task at hand was building the Container Port.

This facility according to the Grand Bahama Port Authority Handbook is now one of the world's fastest growing container transshipment hubs and can handle 1.3 million TEU (Twenty-foot Equivalent Units). The Container Port has completed four (4) phases of expansion and is currently working on Phase V that will add a further 500 meters of deepwater berth, 30 acres of stacking area and 27 more straddle carriers and new container handlers/top loaders. This expansion will amount to a total investment of $585 million in the Container Port and will result in a total production capacity of 2.6 million TEU for the facility. It is anticipated that this will result in 300 additional jobs bringing the total to 1,200. Phases VI and VII also rely on areas already completed by Bahama Rock and westward expansion through Basin 3 is also planned.

It is noted that the Port Authority, in exchange for specific tax concessions, was mandated under the Freeport, Grand Bahama Act, 1993, Statue Laws of the Bahamas 2000, Chapter 30 under Schedule (Clause 1) Works and Undertaking, Item 9 - to *"Promote home porting and container port facility at Freeport Harbour"*. The approval of the Area 4 expansion would assist the Port Authority in meeting this commitment.

Another milestone for the Harbour development was the establishment of the Lloyd Werft Freeport Ship Care Facility (Lloyd Werft) in 2000 that was renamed the Grand Bahama Shipyard after Lloyd Werft sold its interest in the facility. As noted in 3.2 the Grand Bahama Shipyard now occupies an area excavated by Bahama Rock. The addition of the Grand Bahama Shipyard and the Container Port helped transform Freeport into a World Class Maritime Center. The Grand Bahama Shipyard is a state-of -the-art facility that had only two floating dry docks and finger pier until September of 2008. A third floating dry dock was received the weekend of September 13th and 14th, 2008. The new floating drydock is 300 metres in length, 54 metres wide and has a lift capacity of 50,000 tonnes. **Figure 4.1** shows the excavated area which was to become the home of the Grand Bahama Shipyard. **Figure 4.2** shows the Grand Bahama Shipyard

and Freeport Container Port**.** **Figure 4.3** shows the continued excavation of the Grand Bahama Shipyard which now is home to the Drydock 3.

Dock 1 is 880 feet long and Dock 2 is 985 feet long making it one of the largest floating dry docks in the western hemisphere. The third floating dock will increase the capacity of the shipyard and will likely lead to increased employment opportunities. The Grand Bahama Shipyard currently employs some 600 persons.

The Grand Bahama Shipyard and the Container Port are examples of how Bahama Rock operations have been indirectly responsible for the creation of industry and thus providing non-tourism career diversification for Bahamians. This industrialization has helped to stabilize the economy of Grand Bahama.

Figure 4.1: Opening of Lake for G.B. Shipyard (1999)

Figure 4.2: G.B. Shipyard and Container Port

Figure 4.3: Aerial Photograph of Bahama Rock Expanding G.B. Shipyard (2000)

The examples cited illustrate the symbiotic relationship between Freeport Harbour and Bahama Rock which creates new business opportunities through a "no cost" harbour expansion. Coupled with the business incentives of the Port Authority, business attraction and rapid growth has thrust Freeport into the role of a premier maritime center in a relatively short time. Other companies that have established facilities in the harbour area over the past 10 years include Bradford Marine, Bicham, Quality Services, Polymers International, Bahamian Brewery and Beverage, and International Distributors.

Moreover, the expansion of the harbour will be a contributing factor for the development of the Sea Air Business Center (SABC), a 741-acre park earmarked for the development of the warehousing and distribution facilities, located between the Grand Bahama International Airport and Freeport Harbour. The location and size of the SABC is presented in **Figure 4.4**. Last year, Associated Grocers of Florida was the first tenant to lease space in the SABC. Construction of the office/warehouse complex was completed in 2007.

Figure 4.4: Aerial Photograph Circa 1996

1) Freeport Harbour, 2) SABC, and 3) GBIA

The Freeport Harbour Master Plan allows for further expansion of the harbour and Container Port facilities that have the potential to bring more industry to Grand Bahama. These key employment opportunities are the primary pathway for high school graduates, skilled labour, and supervisory and professional staff.

4.4 Area 4 Development

The development of Area 4 is part of the Freeport Harbour Master Plan as outlined in a Memorandum of Understanding (MOU) between Bahama Rock and the Freeport Harbour Company. The project will produce a variety of important beneficial socio-economic impacts. Just as the previous harbour expansions have brought major industry to Freeport Harbour and the Industrial Park, there is the potential that the completion of Areas 3 and Area 4 will also allow for other business opportunities to be created. Through careful planning a variety of marine business applications could be applied. This land is part of the "Port Area" and as such businesses wishing to be established here will be entitled to all the benefits attributed to a licensee of the Port Authority.

A major component of the Area 4 project is the provision for a highway right-of-way and utilities easement extending approximately 2.7 miles through Bahama Rock's properties from the Warren J. Levarity Highway to the Sea Grape community. Preservation and protection of the

mangrove community along a tributary of Hawksbill Creek is also included. The right-of-way is 47.5 acres more-or-less and the preservation and buffer zone is approximately 25.7 acres, and is valued at $1,098,000 for the Area 4 portion only. However, the greater value is the future improvement of infrastructure and access for the development of West Grand Bahama while preserving the Hawksbill Creek wetlands. Bahama Rock will provide the highway sub-base material along the right-of-way as the project advances. This is estimated to require 700,000 cubic yards and is valued at $1,750,000. The West End Connector has the potential to significantly improve traffic efficiency through the Eight Mile Rock Community and provide a more direct route to the West End if the necessary lands are acquired to join the roadway through Sea Grape. This would benefit residents by rerouting heavy truck traffic and vehicles commuting to West End thus reducing the overall number of vehicles passing through the Eight Mile Rock community. The alternate route would increase road safety, reduce noise levels attributed to motor vehicles and reduce air emissions from vehicles passing through the community. These benefits are especially important with anticipated population growth and increased traffic when various projects located on the West End become operational. Please see support letter from the Ginn Sur Mer Development Company in **Appendix 6.0**. Infrastructure benefits are summarized in **Table 4.1** below.

Table 4.1: Community and Socio-Economic Benefits

Item	Amount	Estimated Value
Harbour Direct Employment		TBD
Harbour Indirect Employment		TBD
EMR Utility Corridor	33 Acres	$330,000
EMR Traffic Plan	Multi Access	TBD
EMR Marina Property	400 Ft. Wall	$600,000
EMR Highway Property	73.2 Acres	$1,098,000
EMR Sub-base	700,000 Cubic Yards	$1,750,000
EMR Boat Ramp	2 Acres	$30,000
Connector Bridge	Estimated	$2,500,000
TOTAL		**$ 6,308,000**

A series of conceptual artist renderings of Area 4 post excavation are presented in **Exhibits 35** to **Exhibit 38** to illustrate the potential long-term uses and aesthetics. Completion of the west side Harbour expansion, including the West Channel, is required prior to full utilization. However, in the short-term Area 4 could be utilized as an open space recreational area**. Figure 4.5** illustrates Area 4 post excavation with the West End connector highway.

Figure 4.5: Conceptual Artist Rendering of Area 4 Completed

4.5 Employment

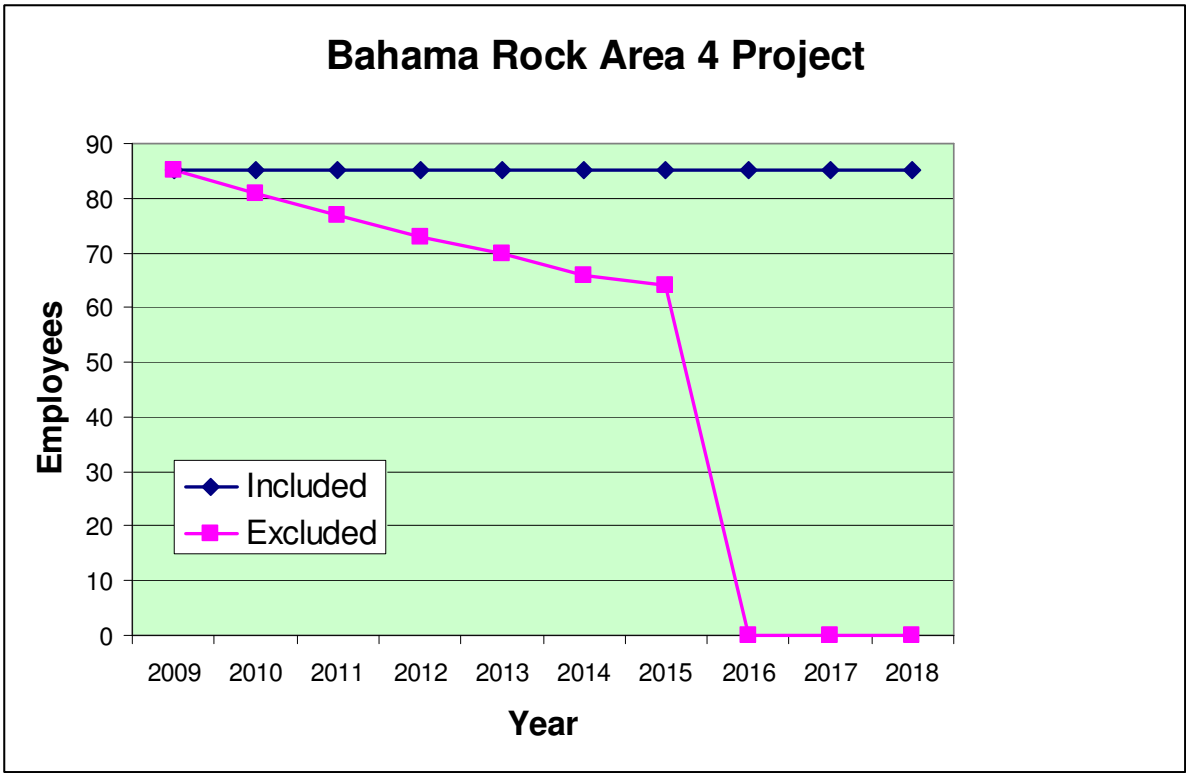
4.5.1 Direct Employment

Bahama Rock currently has 85 direct employees and 30 indirect employees working at the plant. The annual payroll for the facility is $5,800,000 direct employment and $1,100,000 indirectly. Of the 85 direct employees there is one expatriate. The direct jobs include heavy equipment operators, maintenance specialists, administrative staff, quality assurance specialists, lead men, supervisors, blasting specialists, ship loading specialists, etc. Employees are provided extensive

training and valuable skill sets. These employment opportunities are a direct result from of the continual harbour expansion.

Should the Area 4 project not be approved, removal of the large dragline is necessary. Under this scenario the dragline would be redeployed outside of Grand Bahama in approximately two years with a corresponding 35% reduction in aggregate production. These actions would result in immediate declining employment with a loss of all 85 jobs by 2016.

Figure 4.6: Area 4 Manpower Impact Direct Employees



4.5.2 Indirect Employment

Bahama Rock employs indirectly 30 individuals through the hiring of contracted specialized labor. Contract maintenance services totaled approximately $1.1 million in 2007. Should Area 4 not be approved there would be a negative differential of $4.37 million through 2018. However, with the potential of a plant closure in 2016 it can be assumed that the reduction of indirect jobs would also begin once the large dragline is relocated and production requirements decrease.

4.5.3 Short Term Employment

Short-term jobs are generally associated with the first phase of implementation of the Area 4 project. Contractors and temporary employees will be required for land clearing, clean up of illegal dumping, and bridge construction. The bridge project would create approximately 25 jobs for six months

4.5.4 Long Term Employment

Long-term employment includes retention of jobs for Bahama Rock employees and contractor services, as well as indirect employment associated with future waterfront opportunities. Job multipliers for Bahama Rock supplies and services exclusive of Grand Bahama are not calculated but do exist. Future waterfront opportunities include typical Port facilities such as transshipment, ship repair, marinas, boat sales, dockage, and adjacent support businesses. These future facilities and businesses will obviously require staffing, and hence long-term employment opportunities will be created by the harbour expansion.

4.6 Economic Impact

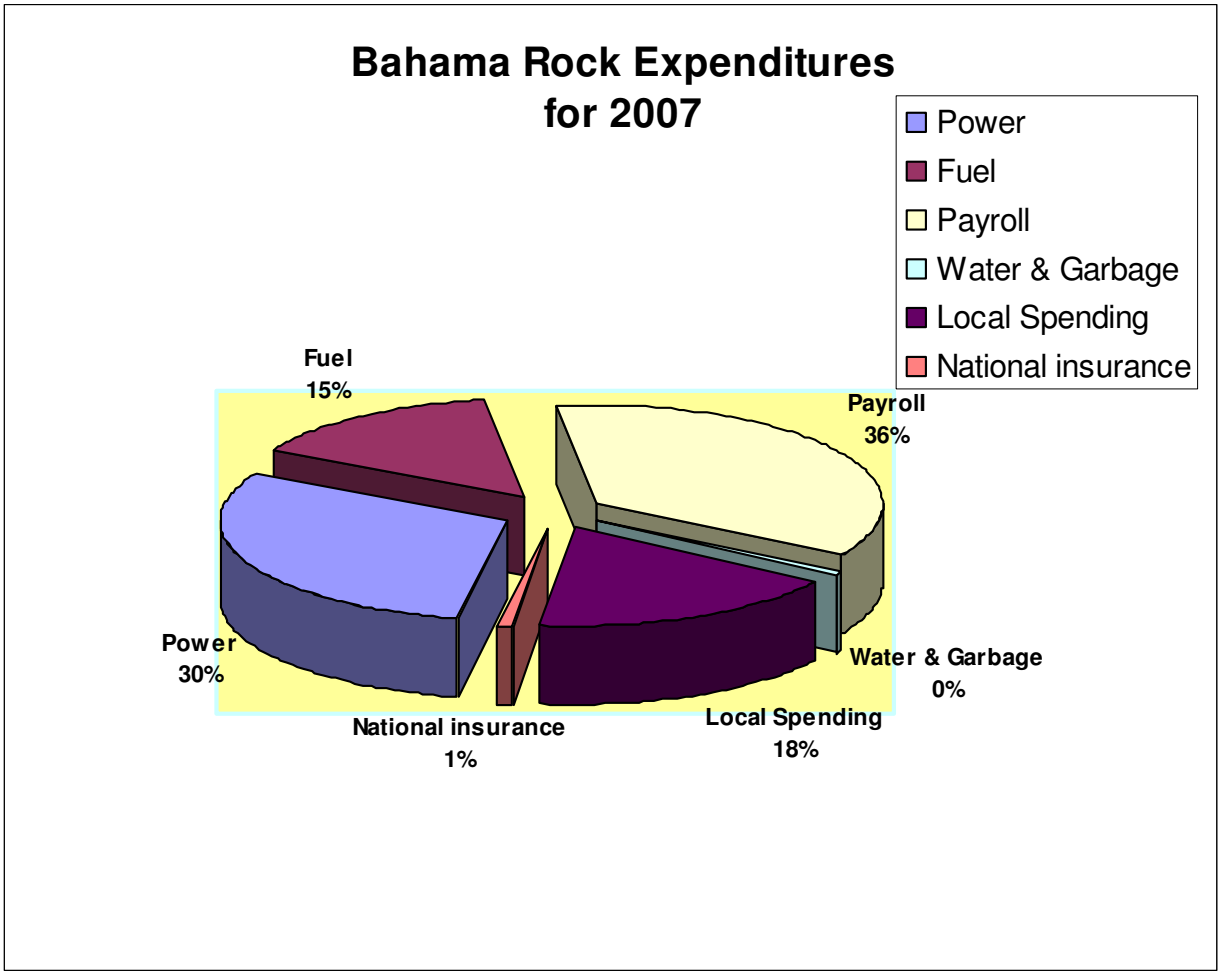
The Bahama Rock facility has a significant contribution to the economics of Grand Bahama directly through operational costs. It is estimated that Bahama Rock's annual expenditures represent almost one percent of total GDP for the Bahamas as a whole, when excluding tourism and the financial sectors. **Table 4.2 & Figure 4.7** identifies the Bahama Rock local expenditures for 2007.

Table 4.2: Local Expenditures for Bahama Rock 2007

Expenditure	Amount
Payroll	$5,800,000.00
Power	$4,926,899.10
Fuel	$2,380,625.83
Local Spending	$2,891,001.44
National Insurance	$138,000.00
Water & Garbage	$74,611.48
Total:	**$16,211,137.85**

Source: Bahama Rock Ltd.

Figure 4.7: BRL Local Expenditures for 2007

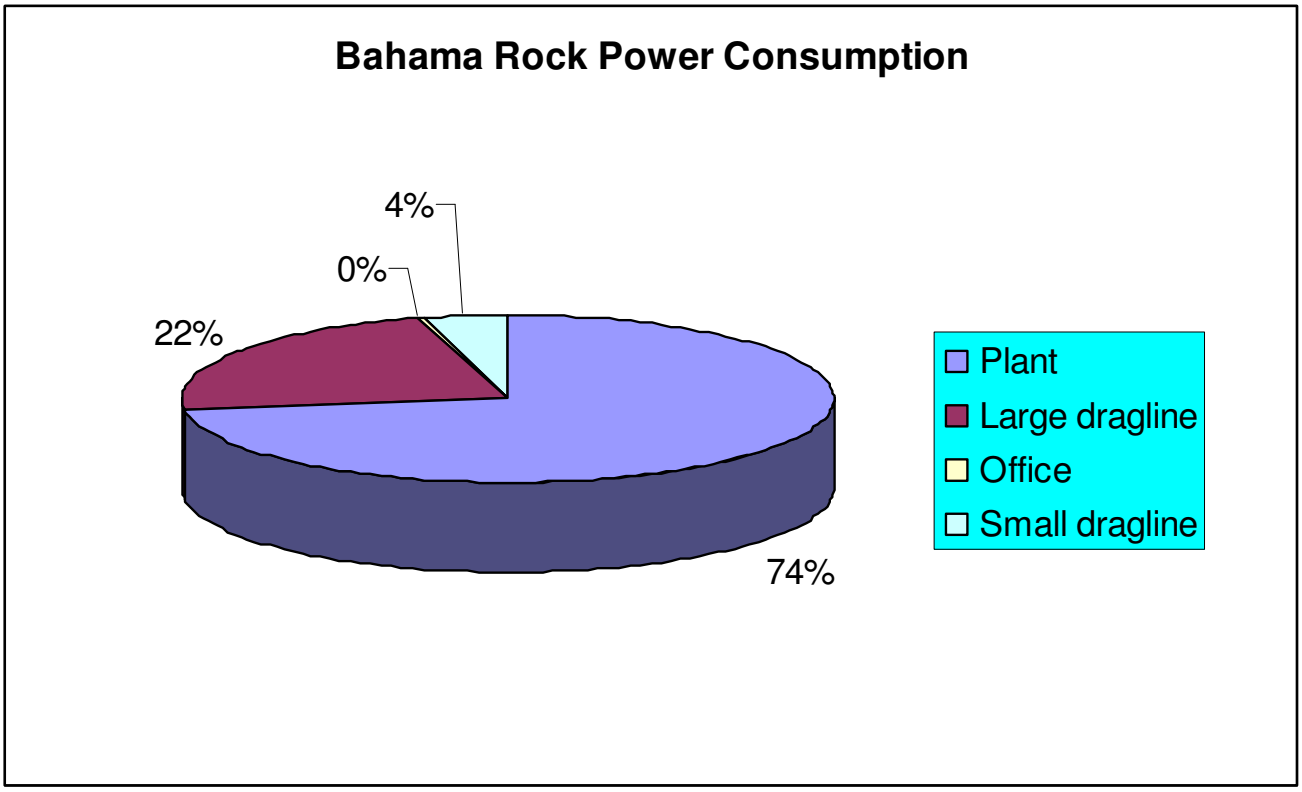


Source: Bahama Rock Ltd.

The category defined as "Local Spending" includes expenditures for parts providers, equipment maintenance companies, Port Authority fees, phone, trucking company's services, shipping fees, stationary supplies, contract maintenance companies and security companies.

Bahama Rock is the third largest consumer of power in Grand Bahama and is responsible for approximately 10% of Grand Bahama Power Company's revenue. Bahama Rock spent $5,131,272 in 2006, $4,926,899 in 2007 for power consumption and is estimated to exceed $6,000,000 in 2008. Energy conservation efforts include power factor correction and fully automated lighting systems. The pie chart below shows the utilization of power at the facility.

Figure 4.8: Utilization of Power at Bahama Rock Facility



Based on **Figure 4.8,** it is evident that the rock plant and the large dragline are responsible for 96% of the electrical costs associated with the facility. If Area 4 is approved and excavation continues at the present pace the power consumption by Bahama Rock will remain relatively stable until the year 2018 and then it will decrease considerably once the harbour expansion nears completion. Once Area 3 is completed in early 2010, Bahama Rock may not have enough production to justify the larger equipment and installed assets without the Area 4 expansion. A likely scenario involves elimination of the large dragline and replacement of the high capacity plant with a smaller portable rock crushing facility.

A comparison of local spending is provided in the following tables identifying Area 4 Included and Area 4 Excluded is presented on the following page in **Tables 4.3 and 4.4** respectively.

Table 4.3: Estimated Expenditure to Local Economy Area 4 Included

(Includes Retreat Mining to Container Port)

Area 4 included	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Totals**
Shipments (000)	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	55,000
# of Employees	85	85	85	85	85	85	85	85	85	85	850
Payroll	5,800	5,800	5,800	5,800	5,800	5,800	5,800	5,800	5,800	5,800	58,000
Power	5,049	5,049	5,049	5,049	5,049	5,049	5,049	5,049	5,049	5,049	50,490
Fuel	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	24,400
Repairs	800	800	800	800	800	800	800	800	800	800	8,000
Contract Services	1,113	1,113	1,113	1,113	1,113	1,113	1,113	1,113	1,113	1,113	11,130
Government	65	65	65	65	65	65	65	65	65	65	650
Government Corp.	48	48	48	48	48	48	48	48	48	48	480
Government	132	132	132	132	132	132	132	132	132	132	1,320
Port Authority	340	340	340	340	340	340	340	340	340	340	3,400
Water	7	7	7	7	7	7	7	7	7	7	70
Sanitation	70	70	70	70	70	70	70	70	70	70	700
Import Svcs	475	475	475	475	475	475	475	475	475	475	4,750
Local Spending ($000)	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$16,339**	**$163,390**

Prepared by Bahama Rock

Should Area 4 be approved then it is anticipated that the retreat excavation back to the Container Port would occur once the necessary approvals were obtained. Under this scenario, as illustrated in the table above, spending in the local community would remain constant until 2018 resulting in an estimated $163,390,000 being injected into the local economy. Employment would remain constant throughout the period.

One of the main recipients of Bahama Rock spending, Grand Bahama Power, would continue to bill approximately $5 to $6 million per year, totaling in excess of $50 million in revenue over the ten year period. The Freeport Oil Company would likewise receive $24.4 million of revenue over the same ten-year period based on 2007 pricing.

If Area 4 is excluded from the Freeport Harbour Master Plan, then starting in 2010 manpower reductions will begin. The initial scale back is gradual until 2016 when full closure is expected. Under this scenario the harbour expansion would cease. It is unclear if the retreat excavation to provide the Container Port additional berths on the West Channel will be completed.

Table 4.4: Area 4 Excluded Estimated Expenditure in Local Economy

Area 4 Excluded	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals
Shipments (000)	5,500	5,250	5,000	4,750	4,500	4,250	4,150				33,400
# of Employees	85	81	77	73	70	66	64	0	0	0	516
Payroll	5,800	5,536	5,273	5,009	4,745	4,482	4,376	0	0	0	35,222
Power	5,049	4,820	4,590	4,361	4,131	3,902	3,810	0	0	0	30,661
Fuel	2,440	2,329	2,218	2,107	1,996	1,885	1,841	0	0	0	14,817
Repairs	800	764	727	691	655	618	604	0	0	0	4,858
Contract Services	1,113	1,062	1,012	961	911	860	840	0	0	0	6,759
Government	65	62	59	56	53	50	49	0	0	0	395
Government Corp.	48	46	44	41	39	37	36	0	0	0	291
Government	132	126	120	114	108	102	100	0	0	0	802
Port Authority	340	325	309	294	278	263	257	0	0	0	2,065
Water	7	7	6	6	6	5	5	0	0	0	42
Sanitation	70	67	64	60	57	54	53	0	0	0	425
Import Svcs	475	453	432	410	389	367	358	0	0	0	2,885
Local Spending ($000)	**$16,339**	**$15,596**	**$14,854**	**$14,111**	**$13,368**	**$12,626**	**$12,329**	**$0**	**$0**	**$0**	**$99,222**

Prepared by Bahama Rock

The differential between the project being included and excluded is summarized in **Table 4.5** below:

Table 4.5: Bahama Rock Local Spending

Local Spending Economic Impact Bahama Rock Spending			
	Included	Excluded	Difference
Total Jobs (Man Years)	850	516	-334
Local Spending ($000)			
Payroll	$58,000	35,222	-22,778
Electric Power	$50,490	30,661	-19,829
Diesel Fuel	$24,400	14,817	-9,583
Local Repairs	$8,000	4,858	-3,142
Local Services	$11,130	6,759	-4,371
Fees Government	$2,450	1,488	-962
Fees Port Authority	$4,170	2,532	-1,638
Import Services	$4,750	2,885	-1,865
Totals	**$163,390**	**99,222**	**-64,168**

Prepared by Bahama Rock

Other economic impacts absent Bahama Rock include a significant cost escalation in providing construction grade aggregates throughout the Commonwealth of the Bahamas for all major developments. An estimated 300% increase in local Bahamian aggregate pricing could be expected and would add approximately $15 million to the annual construction sector costs. Finally, the excavation and expansion of the harbour would likely cease. Conventional dredging can cost more than $30 per cubic yard and require specialized environmental containment. Bahama Rock is a no cost harbour construction operation without the added problem of dredge spoils storage and disposal. The expectation is that Freeport Harbour would not likely be enlarged beyond the current size due to these issues.

4.7 Local Impact

Bahama Rock has made contributions to the local community. Bahama Rock employees are actively working on community projects and have established an employee committee to review requests for donations of monetary funds, services, and materials. Bahama Rock sponsored projects include improvements to a gymnasium, track and field, basketball courts, and beach area. Education programs have been provided in the form of facility tours, open house visits, and community meetings. Bahama Rock will continue to participate as a community leader throughout all stages of their project development. Bahama Rock spent in excess of $200,000 in donations, materials and services during 2006 and 2007 on over seventy-five various community projects.

4.8 The Bahamas

An important long-term government policy question will be raised sooner than later if Bahama Rock reduces aggregate supply. Bahama Rock supplies New Providence Island through an agreement with a Nassau based contractor with 100% of all coarse aggregate needs (**Appendix 6**). Taking a long-term term viewpoint, the Bahama Rock operation is finite and once the harbour expansion ceases Bahama Rock will depart. The future availability of a domestic supply of aggregate or conversely importation is an issue needing further evaluation by policy makers and those in the construction industry.

4.9 International

The expansion of the Panama Canal and the addition of a third lock system, which will be 427m (1,400 feet) long, 55m (180 feet) wide and 18.3 m (60 feet) deep, is scheduled to become operational in 2014 or 2015. The Bahama Rock operation presents an advantage to Grand Bahama over all competing ports by matching these depths at "no cost." The advantage would be the ability to receive post-Panamax vessels by the Container Port along the West Channel allowing the next generation of 18 meter draft vessels to utilize Freeport Harbour. This has the potential to position Grand Bahama for significant economic growth over the next fifty years resulting in Mega-Port status.

Additionally, as reported in a May 19, 2008 Nassau Guardian News article the Container Port is laying the ground work to secure trade from Brazil. According to the article, Sherry Rodgers, the Container Port's corporate affairs manager is quoted as stating, that the Container Port is still in the planning stages and is working with the Brazil Chamber of Commerce and Ambassador's office. The article informs that the Brazil's economy has expanded 5.4% in 2007. It further stated the Brazil's business would buoy the bottom line for the Container Port as export from the country has tripled in the past five years. The article is attached in **Appendix 6**.

4.10 Social Issues

4.10.1 Blasting Concerns

The major community issue related to the Bahama Rock operation was the blasting related nuisance complaints from primarily the homeowners in the Harbour West subdivision of Eight Mile Rock in the summer of 2006. The concerns from 2006 are still present and have been expressed in recent months by some community members in regards to the Area 4 project. The issue of the 2006 complaints and alleged damage to homes was raised again by the homeowners at the two town meetings in July 2008. They expressed a concern that the movement of the Bahama Rock excavation operation to Area 4 may cause a repeat of the 2006 events. This section is intended to give the reviewer a summary of the 2006 concerns and events based on newspaper accounts. As a result of communication between the residents of Harbour West and Bahama Rock two studies were commissioned by Bahama Rock and are summarized below.

On August 10, 2006, The Freeport News reported that residents complained of the blasting being carried out by Bahama Rock. Residents described the blasting had gone from trembling to tremors. This resulted in the Ministry of Energy and Environment issuing a 'Cease and Desist' order on Tuesday August 8, 2006 through the Grand Bahama Port Authority. The then Minister for the Ministry of Energy and Environment Minister Marcus Bethel attended a Town meeting on August 14, 2006 at the Bartlett Hill Primary School. According to the Bahamas Information Services press release dated August 17, 2006. Minister Marcus Bethel is quoted as describing as follows:

"*… that Bahama Rock, a licensee of the Port and operating within the Port area, by virtue of the blasting was creating some sort of disturbance outside of the Port Area: and so the Central Government had a responsibility at that point, once fully informed of the circumstances and concerns, to step in and try to bring some parity and some resolution to the problem."*

Minister Bethel informed the residents attending the meeting that the Government had started an investigation which was headed by Mr. Mike Wallace of the Department of Environmental Health Services- Grand Bahama Office. Furthermore, Minister Bethel informed the audience that Mr. Wallace met with the Grand Bahama Port Authority and Bahama Rock on August 14th, 2006 and that the "Cease and Desist" order would stay in effect until the investigation was completed.

According to the Bahamas Information Services article, Bethel explained that determining if blasting was a cause of the damage to the homes*," was outside the investigative report and may well require further documentation on your part,"*

Minister Bethel assured the citizens that the "Cease and Desist" order would be in effect until the investigation is completed and a way forward determined.

In a December 12, 2006 Freeport News article it was reported that Minister Bethel was pleased that Bahama Rock was going to very shortly begin repair work on homes that were alleged to be damaged from the blasting occurring at the Bahama Rock facility. Minister Bethel informed the

residents at a Town Meeting at Bartlett Hill Primary School that the results of the government investigation was completed and would be tabled in the Cabinet. Don Moss (Explosive expert), Edwin Yuklow (Structural Engineer) and Mike Wallace (Department of Environmental Health Services) attended the meeting.

At the meeting Minister Bethel informed the audience that Yuklow inspected a number of homes in the area but could not conclusively state that the damage to those homes was the result of blasting from the Bahama Rock facility.

The same article reported that Mr. Reed, General Manager of Bahama Rock informed the residents that Bahama Rock has to co-exist and be good neighbors with the local community. Therefore, Bahama Rock offered to repair the homes commencing in January 2007 for those interested. Minister Bethel said he was pleased that Bahama Rock would commence on repairing homes. Minister Bethel is quoted as saying, *" I think that this should bring some sort of comfort to those in Harbour West, and in understanding the context of Bahama Rock recognizing that in order to exist, it has to co-exist, and coexistence means reaching out."*

Additionally, Minister Bethel told the audience.

"let the news go far and wide. This is the good news season and that this is important, good news coming out tonight. It is a very important step forward."

Minister Bethel is also quoted as saying, *"I think we have ample evidence that, first of all, Bahama Rock has modified its blasting procedures in order to reduce the nuisance, the noise level to community, and hopefully any other potential effects on the community and their structures."*

Minister Bethel at this meeting also informed the residents that the Port Authority had its own monitoring mechanisms through their own environmental department.

Bahama Rock held a meeting on February 1, 2007 with the Harbour West residents to discuss the repairs of the structures. All residents of the Harbour West community were offered assistance by Bahama Rock to make any repairs to structural defects identified by the resident. Through September 2008 a total of three home owners have accepted any assistance. In addition and as a result of the residents' comments, Bahama Rock contracted two expert consulting companies to further investigate the matter. The two companies were Haag Engineering Co. based in Carrollton, Texas and Geosonics Inc. based in Florida.

The Haag Engineering study commenced in February 2007 and a report was issued in March 2007 titled: **Bahama Rock/Area Construction Review, Structural Inspection.**

In this study homes in Hannah Hill, Grand Bahama East subdivision (Eight Mile Rock), Regency Park subdivision (Freeport) and condominiums known as the Hamptons in South Bahamia were inspected. The purpose of the inspections were to compare the construction practices and conditions of homes that were closer to the Bahama Rock facility compared with those at great distances outside any potential influences of ground vibrations. The study included both completed structures and those under construction. The closet structure was more than a mile from the Bahama Rock facility and the farthest were between four and five miles away from the facility. A part of the Summary of the report stated the following:

"*We reviewed construction drawings for the homes in the area, inspected homes under construction, and inspected homes that were new and of varying ages within a four to five mile radius of the Bahama Rock quarry. The conditions found near the quarry and remote from the quarry were similar, and cracks and other finish problems were observed were consistent with the materials used and the construction methods. There was no correlation between the extent of damage or the type of damage found and proximity to the quarry. The construction used in a typical home result in a stiff, strong structure intended to resist strong lateral loads*."

The complete Haag Engineering Co. report is attached in **Appendix 13.** The report was submitted by David L. Teasdale, P.E., his qualifications are presented in the back of the HAAG report.

The Geosonics Comparative Damage Evaluation report dated March 28, 2007 was a study that compared homes in the Harbour West subdivision to homes beyond any potential influence of the blasting. The complaints received from primarily the Harbour West residents indicated that homes were allegedly damaged by the blasting from the Bahama Rock facility. It was also alleged that cracking did not exist where homes were not subjected to vibrations and air overpressure. Therefore, the study was to examine homes to provide a baseline evaluation and compare defects from different locations on Grand Bahama Island.

Geosonics examinations were conducted from July 2006 to October 2006. Examinations were performed on both residential and commercial structures within the Eight Mile Rock community with a special emphasis on the Harbour West Subdivision. The examinations were to document the claimed cracking and other damages that the property owners attributed to the Bahama Rock operation. At the time that the inspections were conducted interior and exterior cracks and other issues claimed to be from blasting were documented and representative photographs taken of the defects. The inspections were conducted by Jeffery A. Straw, Vice President and Area Manager of Geosonics Inc. Some inspections were witnessed by Mr. Phillip English, P.E. (Freeport, Bahamas) and joint inspections were conducted together with Mr. David Teasdale, P.E. of Haag Engineering Co October 17-20, 2006

In March 2007 in response to the issue of comparing structures near the Bahama Rock facility to others outside of the Eight Mile Rock area were reviewed selected and inspected. The criteria used in the study for selecting the structures are paraphrased below.

1. The distance from the Bahama Rock, Ltd quarry was great enough so that ground vibration and air overpressure levels would not affect the construction nor could it contribute to observed effects.

2. The type of structure examined was consistent with the Eight Mile Rock area and with special emphasis placed upon structures matching the type of structures examined within Harbour West. The structures examined were consistent with new (actually under

construction) residences completed within 30-90 days and homes within five years of construction. Additionally, older structures were examined and made part of the study to address the continually re-occurring nature of cracks

3. The type of structure was considered ranging from single story residential homes, two story construction, plus commercial multi-residence units.

4. The construction type was maintained as consistent with the observed construction materials used within the Eight Mile Rock area. Concrete foundation, steel-reinforced poured, concrete columns and concrete block infill with stucco finish were examined and documented. Interior construction was wood frame with drywall materials and corresponding masonry wall construction stuccoed and painted.

In order to compare the structures from the Eight Mile Rock community to the others the type and locations of the cracks were grouped, this was possible as the homes that were allegedly damaged from the vibrations in Eight Mile Rock had similar locations of cracks. Moreover, Geosonics also evaluated construction techniques utilized on Grand Bahama Island.

After examining the structures, both within Harbour West and where structures were not subjected to vibrations and evaluating construction techniques and materials used, Geosonics concluded that the cracking found was not different nor did the cracks appear to be more numerous.

The cracking observed in the Harbour West subdivision of Eight Mile Rock in Geosonics opinion did not show more cracks than those where no vibrations had occurred. Geosonics examination revealed that in the Regency Park subdivision located in Freeport had the same type and location of exterior cracks and separations.

The complete Geosonics Comparative Damage Report is presented in **Appendix 13** of this EIA. Two other structural inspections by Haag Engineering Company for Dr. Kavala Residence & Clinic and Travis Williams's residence are included in **Appendix 13**.

The cease and desist was lifted when the Area 3 permit was granted on May 22, 2007 after the completion of an Environmental Impact Assessment that was submitted to the Grand Bahama Port Authority.

Given the concerns expressed by the Eight Mile Rock community and Bahama Rock's need to coexist with the community, homes within a 2000-foot radius will be subject to a pre-blast survey if the Area 4 project is approved. The surveys will be stored at the Bahama Rock office and subject to review by the Grand Bahama Port Authority, Department of Environmental Health Services and any other relevant government agency. Moreover, Bahama Rock should maintain vibrations levels below the 0.200 inches/sec PPV target level to minimize any nuisance to the community.

Measured vibration levels exceeding the target would trigger an investigation involving the Port Authority and relevant government agencies. Identification and correction of blast procedures would be required to reduce vibrations prior to resumption of blasting. These procedures are currently in place.

4.10.2 Dust Suppression

A potential nuisance to the community is dust emissions from active haul roads. Haul trucks transporting excavated limestone from the basin to the central processing plant will be traveling unpaved roads creating a dust emission source. Bahama Rock intends to suppress dust generation by wetting the roads with a water truck and use of a sprinkler system.

Dust suppression will be important to maintain road traffic safety and prevent a nuisance to the local community.

4.11 Conclusions

Bahama Rock has played a significant role in the Freeport Harbour expansion by providing excavation and waterway expansion services to the Freeport Harbour Company at no cost. As Bahama Rock completes each excavation, valuable real estate is created. Deepwater ports are considered by many to be some of the most valuable real estate in the world. The traditional

methods of harbour creation (i.e. dredge and material disposal) are very costly. To date, Bahama Rock has provided equivalent harbour construction dredge value of approximately $750 million. The harbour would simply not exist as a large and modern deepwater port without the win-win arrangement currently in place with Bahama Rock. It is also estimated that Area 3, Area 4 and the West Channel development would contribute an additional $750 million in conventional dredge value. To the community, Area 4 provides potential increases in real estate values, reductions in traffic congestion, and direct spending benefits to Grand Bahama Island of an additional $64.2 million, including 334 additional man-years of direct employment, and an estimated $6.3 million in infrastructure improvements over the ten year period ending in 2018.

Bahama Rock will work closely with the Port Authority, relevant Bahamas Government Agencies and the local community to ensure that any potential nuisances are kept at a minimum.

Chapter 5: Area 4 Project Details

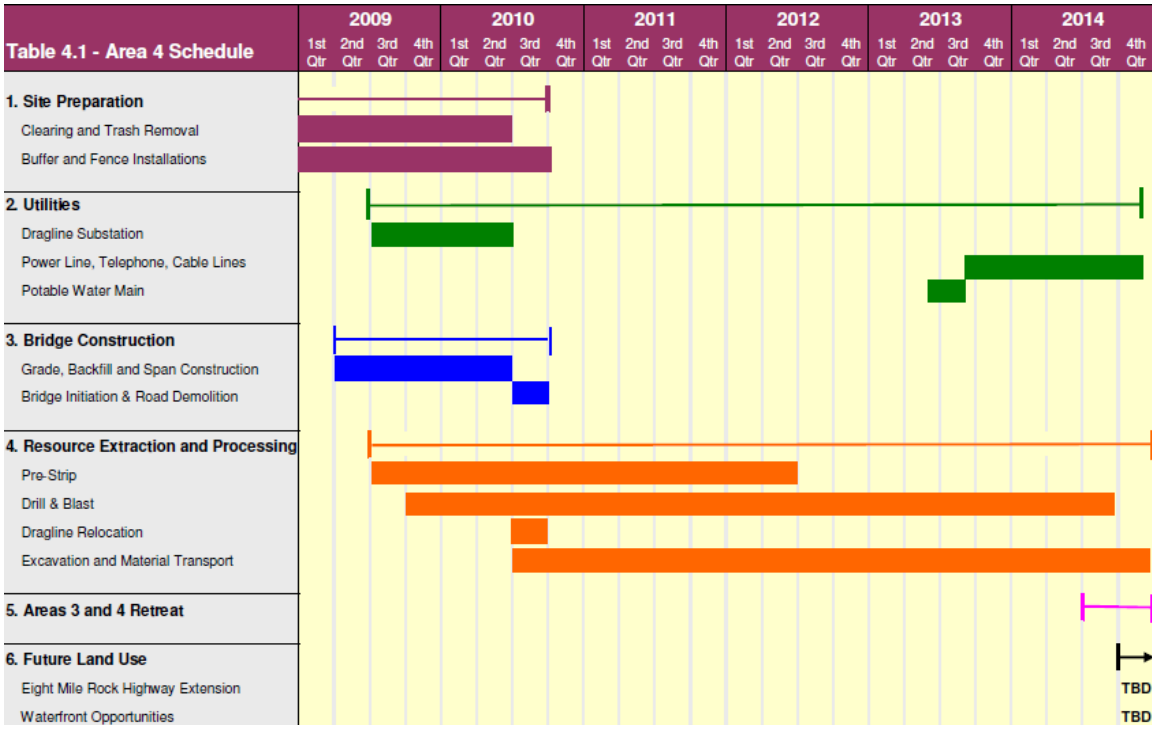
5.0 Chapter Overview

This chapter discusses Area 4 project details in greater depth. Various project stages and associated activities are introduced along with a schedule in which they will be completed as discussed in the following.

5.1 Project Details

Area 4 excavation will be completed in several stages with multiple project activities as depicted in **Table 5.1.** Stages are described incrementally as the project progresses from initial site clearing through future land use opportunities. Baseline conditions and impacts, discussed later in 6.0 and 7.0, correlate with each of these phases and activities. The excavation program is scheduled to take place beginning in June 2010 and ending in December 2014. Scheduled excavation stages and activities are as follows:

Table 5.1: Area 4 Project Schedule



The following describes the project development stages and associated activities listed in the table above. A detailed Area 4 project plan is included in **Exhibit 23**.

5.2 Site Preparation

Site preparation will take place as the first stage of development for the project. This stage is expected to be complete by August 2010. Items within this stage include trash removal, vegetation clearing, and delineation of buffers. They are subsequently described as follows.

5.2.1 Trash Removal

Before site preparation removal can begin the derelict cars, appliances, furniture and other trash will have to be removed from the dirt track road and bushes and transported to the Pine Ridge Landfill for disposal. The trash should be inspected to ensure no hazardous materials are present. However, none have been identified to date. Car batteries can be recycled locally.

5.2.2 Vegetation Clearing

It is expected that clearing will begin in the first quarter of 2009, and be completed by June 2010. Before substantial clearing activities occur, a protective berm (15-foot) will be constructed around the southern boundary of the property for security and safety. Approximately 171.5 acres of vegetation will be cleared using traditional equipment such as bulldozers and trackhoes. Once the debris is stockpiled, vegetation will be transported to the Pine Ridge Landfill in accordance with Environmental Management Procedures within the Environmental Management Plan (EMP) in 9.0. Baseline conditions of the project site to be affected by the land clearing are described in 6.3. Impacts of clearing are described further in 7.4.

5.2.3 Pre-strip

Pre-strip is generally the top three feet of material located just above the limestone formation. Pre-strip is not a suitable material for processing through the plant. A combination of organics, tree root balls, loose vegetation and rocky substrate often make-up the pre-strip material. Pre-strip can be processed to provide a base material for construction once the organics are removed.

This is performed by screening the organic debris out of the rocky limestone substrate. Often this material can be used as road base or building foundation sub-base.

Pre-strip material will be stored in berms and used as base material for the future West End Connector right-of-way. Excavators, bulldozers, and track-hoes will be used in removing pre-strip. Bahama Rock has calculated that 657,259 cubic yards of material will be removed from the 171.0 acres of the Area 4 boundary. It is anticipated that 627,457 cubic yards will be required for the road fill through the Bahama Rock properties to Sea Grape **(Exhibit 34)**. The road fill elevations are calculated at 15.0 ft above mean sea level. Probable impacts occurring during this site activity are outlined in 7.4. Mitigation and an EMP with specific environmental management procedures to be employed are detailed later in 8.0 and 9.0. The process of removing pre-strip is scheduled to begin in June 2009 and be completed over time by June 2012.

5.3 Utilities

The project is not expected to significantly alter the current demand for utility services. Services such as the potable water main and overhead transmission lines may require eventual re-routing as a result of the final excavation of Area 4 (2013). Bahama Rock will be responsible for any such relocation.

A new power sub-station will be required for relocating the dragline excavator from Area 3 to Area 4. The dragline substation will be installed between June 2009 and June 2010. Bahama Rock is coordinating with the Grand Bahama Power Company on the substation installation. The power substation will be located on Bahama Rock property, north of the Warren J. Levarity Highway. Power consumption of the dragline will remain the same as current operations.

5.3.1 Potable Water Main

The eight inch (8") existing water line will remain intact through the Area 4 project and will not be interrupted. Bahama Rock will communicate and coordinate with the Grand Bahama Utility Company to ensure that eventual water main relocation is integrated into other projects associated with future infrastructure improvements for Western Grand Bahama. This connection

will not be necessary until possibly the middle of 2014 when Area 3 and Area 4 retreat is scheduled. Bahama Rock has had some preliminary discussions with the GBUC regarding this issue.

5.3.2 Overhead Transmission Lines

Transmission lines carrying power, and telephone will be raised or relocated based on final bridge design. Coordination will be performed with Grand Bahama Power Company and Bahamas Tele-communications Company (BaTelco). Any buried cables will be relocated as part of Area 3 and Area 4 retreat.

5.4 Bridge Construction

A bridge is proposed to provide connectivity from Area 3 to Area 4 **(Exhibits 30-31).** The bridge will be constructed to handle daily vehicular and pedestrian traffic. Initially the underside of bridge will serve as a passageway for haul trucks. Once Area 4 is complete, the earthen plug will be removed to provide a waterway access route from the harbour to Area 4 **(Figure 5.1).** The conceptual bridge detail drawings are attached in **Appendix 9**.

Bahama Rock has initiated discussions with the Port Authority and will submit all bridge and road engineering drawings to the Grand Bahama Development Company Technical Division for approval.

Figure 5.1: Proposed Bridge

The bridge layout has been designed to avoid conflicts with the existing Warren J. Levarity Highway. Traffic will remain continuously unimpeded from obstructions or long-term interruptions. Appropriate construction signage and barriers will be utilized for maintenance of traffic. See **Figures 5.2 & 5.3** for a conceptual cross section of the proposed bridge in pre and post excavation phases (**Exhibits 30 & 31**).

Figure 5.2: Excavation Access Bridge Schematic

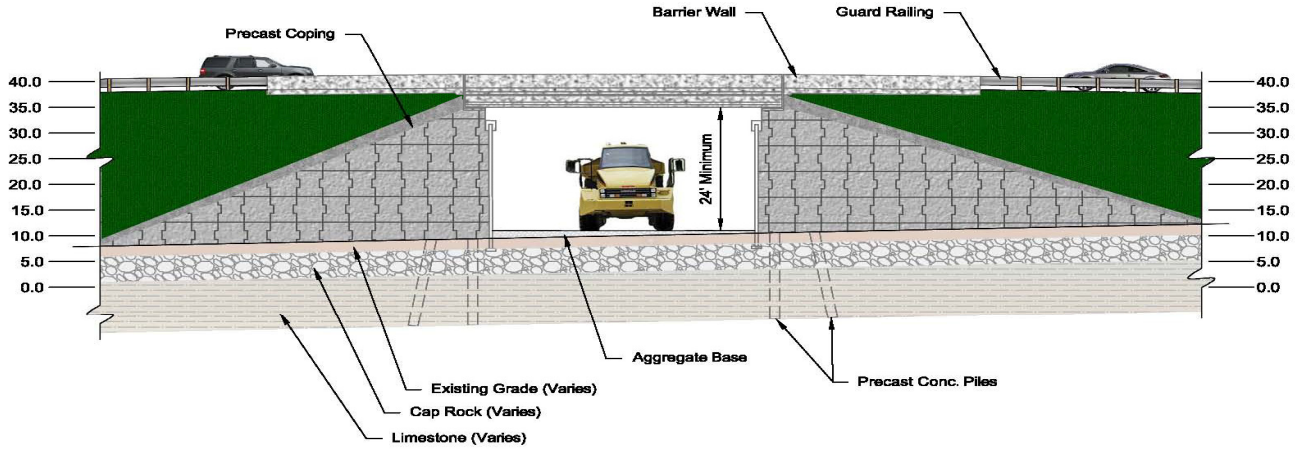
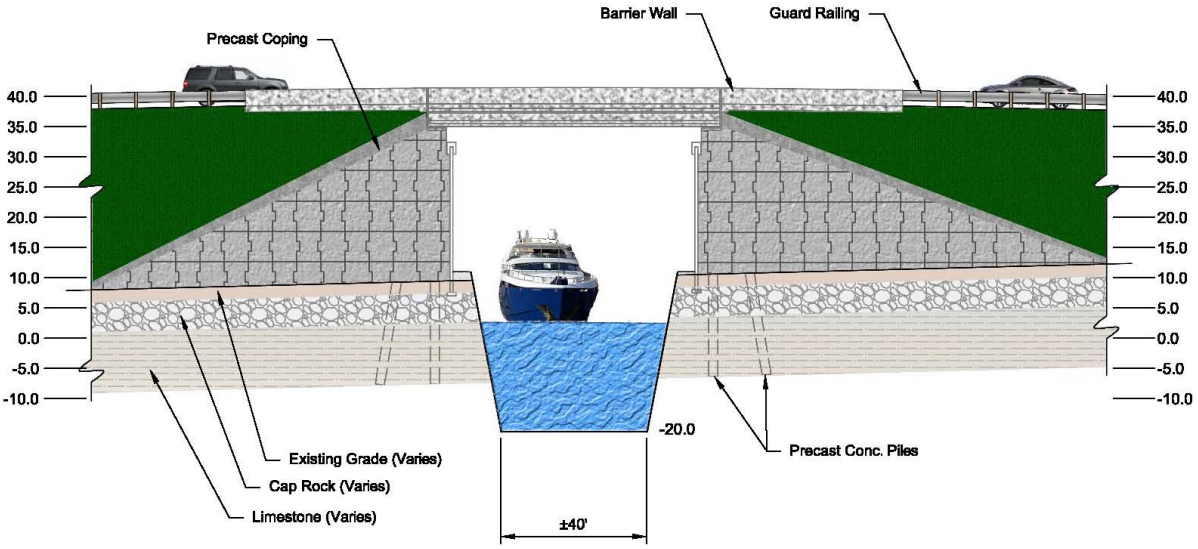


Figure 5.3: Area 4 Waterway Bridge Schematic



5.4.1 Grade Preparation, Backfill, & Span Construction

Teams of, heavy equipment operators, construction workers, laborers, etc. will be utilized for the bridge construction. Construction is expected to be completed by September 2010. The proposed bridge area will first be cleared and pre-strip removed. Geotechnical investigations will be performed as part of the building permit process required for bridge construction. These investigations will be performed only within the footprint of the bridge utilizing industry standards. This will be coordinated separately with the G.B. Devco Technical Department. Existing subgrade will be compacted as required. Suitable material will be used to backfill each end of the bridge to an elevation of approximately 40 feet above mean low water. The material will be retained by concrete or steel headwall. Crews will install pre-stressed concrete spans over the crossing.

5.4.2 Bridge Traffic

Upon completion of the bridge, traffic will be re-routed from the existing highway onto the finished structure. Appropriate operational controls such as the installation of signage and barriers will be utilized to provide safe passage from the detour zone to the new bridge. Bahama Rock will coordinate all new detours and bridge/road openings with the Port Authority and Road Traffic Police. These operational controls currently exist in the EMP procedures referred to in the Levarity Parcel Environmental Assessment. Once traffic is initiated and established onto the new bridge, the detour zone will be permanently closed.

5.5 Resource Extraction and Processing

The following activities include initial facility setup, drilling and blasting, excavation, processing, and fines disposal. Area 4 excavation is planned to handle material as efficiently as possible. Excavated material from Area 4 will be trucked to the main processing plant in Area 3.

Limestone is first fractured by a careful blasting process. A large dragline then excavates the limestone from the pit and deposits it into a surge pile. The material is then hauled by truck to the primary rock crusher and processing plant. Once the limestone is delivered to the rock plant,

material handling is an automated process. A flow diagram for material processing is included as **Exhibits 25 & 26**. The fines material will be sent back to either Area 3 or the Area 4 basins, as per industry standard, depending on desired controlling depths. Bahama Rock will handle the material according to Best Management Practices for the aggregate industry. Please refer to the cross sections in **Exhibits 32** and **33** for backfill details and proposed depths.

5.5.1 Dragline Relocation

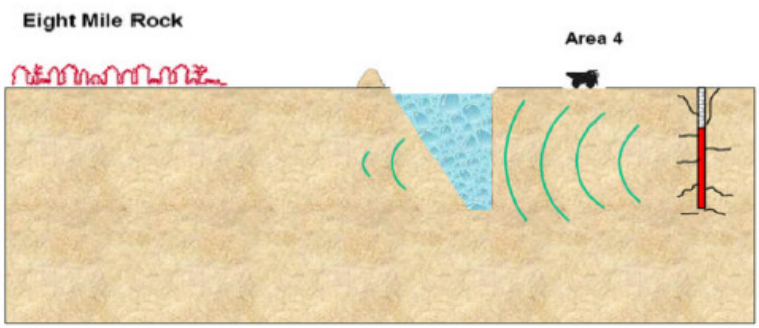
Bahama Rock's dragline will be moved from Area 3 to Area 4 sometime in June of 2010. A section of the western berm of Area 3 will be removed to walk the dragline, across the Warren J. Levarity Highway into Area 4. This will be coordinated with local road traffic authorities. A protective layer of clean fill will temporarily be placed over the roadway to protect the pavement during the crossing.

5.5.2 Drilling and Blasting

Blasting is required to fracture the limestone rock. The drill and blast procedure itself is straight forward, yet the development, planning, design, and implementation has taken into account a multitude of safety and vibration reduction measures. Bahama Rock has aggressively refined the blast procedures since mid 2006. The new techniques which have been incorporated into Area 3 have resulted in minimized impacts to nearby businesses and communities by achieving very low vibration results. A detailed Blast Management Plan (BMP) is included as **Appendix 4**. Impacts associated with blasting are outlined in 7.4.

Once Area 4's pre-strip is removed and rough graded, an open water buffer trench will be excavated along the southern perimeter of Area 4. The trench is only designed to provide additional vibratory protection to the adjacent Eight Mile Rock Community and will become part of the Area 4 basin as the excavation advances. The trench is planned to be 75 feet wide by 60 feet deep and approximately 4,000 feet long **(Figure 5.4).** Blasting is required for the excavation of this trench. Drill sequencing will utilize a series of shallow boreholes and reduced amount of explosives during construction.

Figure 5.4: Blasting Trench Schematic



Initial blasting and excavation of Area 4 will begin at the northern perimeter of the property near Hawksbill Creek. This will lessen impacts to the community and will allow Bahama Rock to make adjustments to blasting if necessary. Blasting will generally follow a rectangular shaped pattern. Forty-five holes, spaced 20 feet apart, are drilled at a nine by five configuration. Holes are drilled up to 80 feet in depth, dependent on location within the harbour and natural grade elevations. A cardboard tube filled with explosive emulsion gel is inserted into the hole. Explosives are kept below the water level. The hole is backfilled with compacted rock to help contain the energy. The frequency of blasting is expected to remain constant at approximately two blasts per week. The time of day for initiation is expected to remain per current plan of mid afternoon target. Current call procedures and road sign notifications communicating blast schedules will remain in effect. Seismic monitors will be relocated as shown in the BMP and pre-blast surveys will be conducted within a 2,000 feet radius from Area 4. These pre-blast surveys will not be completed until 60 days prior to the first blast. More details of predicted blast vibrations with distance calculations can be found in the BMP **(Appendix 4)**.

5.5.4 Excavation and Material Processing

Excavation immediately follows blasting. Blasting and excavation will generally be performed in a linear fashion east to west across the site. The dragline will incrementally remove loose material to a maximum depth of 80 feet. Material will be placed into a surge stockpile adjacent to the dragline. As material is removed, subsurface water is exposed. As excavation progresses, the basin will begin to take shape as a small linear pond and then advanced into an interior waterbody. Material within the surge pile will be allowed to dry out for a period of up to one

month. Surge piles will reach heights of 45 feet x 200 feet wide x and 1,500 feet long. Excavation of Area 4 is expected to be complete by December 2014. Please refer to **Exhibit 33**, for a cross section of the proposed Area 4 basin.

Material from the surge pile will be loaded with a front end loader onto haul trucks for delivery to the central processing plant (**Figure 5.5**). The central plant consists of crushers, screens, and conveyor belts. The central plant sorts and processes material into aggregate sizes varying from 2-inch to 3/8-inch. Sand is also produced with sizes prescribed by direct orders. Boulders for shoreline armoring and jetty construction are also produced.

Figure 5.5: Central Processing Plant

The final products are transported by a conveyor belt to the Bahama Rock ship loading facility where it is loaded onto cargo vessels. These large vessels are capable of transporting 30,000 to 60,000 tons of material. Local distribution is by trucking, barges, and large vessels

Approximately 69% or 135 acres more or less, will be transformed into an open waterbody. The total amount of substrate to be excavated is approximately 17,000,000 cu.yds. after excavation and relocation of 657,000.cu.yds. of pre-strip for the road base and berms. Backfilling of Area 4 to a minimum controlling depth of 40.0 feet will occur during the Area 3 retreat and West Channel excavations. Therefore an estimated 50% limestone fines will be returned to Area 4 in a contained fashion but maintaining commercial marine depth viability.

5.6 Area 3 and 4 Retreat

Once excavation is complete within Area 4 the process to hydraulically connect Area 3 to Area 4 will begin by excavating beneath the bridge. Retreat excavation will continue in Area 3 towards the Container Port until the West Channel is constructed. The result will be an expanded

contiguous deep water harbour. Bahama Rock's facilities will be removed upon completion of the West Channel. (**Figures 5.6, 5.7, 5.8, & 5.9**).

Figure 5.6: Area 3 Excavated

Figure 5.7: Area 4 Excavated

Figure 5.8: Area 3 & 4 Connection

Figure 5.9: Retreat Excavation Complete

5.7 Future Land Use

As presented in the Freeport Harbor Master Plan, Areas 3 and 4 will be converted into entirely new land use categories. A variety of waterfront opportunities will be made available. Because the area is zoned for heavy industry there is a potential for marine industry projects to utilize the Area 4 basin. The Bahamas Government and Port Authority policy for wetland preservation and creation of a protective buffer zone has been incorporated into the project and will remain.

5.7.1 West End Connector Right-of-Way

The West End Connector is a northern roadway route which was part of the Grand Bahama Properties development in the 1960s. Development of Area 4 will allow for the first portion of

the West Connector Highway which would provide a more efficient traffic route from Freeport to West End. The future road will reduce traffic within Eight Mile Rock. There is also potential for feeder roads to be constructed from the proposed West End Connector Highway into the Eight Mile Rock community. Feeder road construction would require several purchases from private landowners and Ministry of Works approval. If the West End Connector and feeder roads were eventually constructed, it would alleviate traffic through the Hepburn Town, Pinedale, Hannah Hill, and Bartlett Hill settlements creating a safer environment, particularly for school children. The feeder road construction is not part of the project and would have to undertaken by others. Historically the West End Connector has been known as Nuthall Avenue and it was planned as a dual carriageway.

The Area 4 project includes the dedication of a 150 foot wide and approximately 13,800 feet long right-of-way which encompasses some 47.5 acres through Bahama Rock properties. See **Figure 5.10**. Beginning east, the right-of-way will commence along the Warren J. Levarity Highway located at the property's northeastern corner. It will continue west throughout Bahama Rock's property and end at the settlement of Sea Grape, providing a scenic view of Hawksbill Creek.

A small portion of vacant land, owned by Bahamas Cement Company, would have to be secured between Nuthall Avenue and Bahama Rock's property by others. The majority of the Nuthall Avenue right-of-way is in existence.

Nuthall Avenue was proposed during the development of the Grand Bahama Properties subdivisions. It extends from just west of Bahama Rock property through the Grand Bahama Properties Subdivision and connects to Queens Highway at the Bahama Beach subdivision just before Bootle Bay. Ultimately, this right-of-way could potentially be an important component to help meet the island's long-term transportation needs. Refer to **Figure 5.10** as well as **Exhibit 24** for the proposed West End Connector.

Figure 5.10: West End Connector

5.7.1.1 New Utility Right-of-Way

The demand for utility services on West End will be ever increasing, especially with large projects such as Ginn Sur Mer. The existing eight inch (8") diameter water main, which runs along the Warren J. Levarity Highway and through Eight Mile Rock, is in need of an upgrade. The existing main is too small to satisfy the demand for West End. The West End Connector right-of-way incorporates utility easements. These easements will provide an opportunity for future utility upgrades to occur throughout the Western communities if needed. Additional utility easements west of the project will require coordination beyond the scope of this project, but may likely be available within the Nuthall Avenue right-of-way.

5.7.2 Waterfront Opportunities

The conversion of Areas 3 and 4 from a commercially undeveloped land mass to a deep water harbour will be significant. The new Area 3 and Area 4 basins have the potential to attract both local and foreign investment. Area 4 will be suitable for marina and recreational land for the

local Eight Mile Rock community. In addition, water depths in Area 4 will provide a potential connection for large vessels should the opportunity arise in the future. This would require the removal of existing land barriers between basins Area 3 and Area 4. Waterfront opportunities include typical Port facilities such as trans-shipment, ship repair, marinas, boat sales, dockage, commercial, residential and recreational. Please refer to the Freeport Harbour Master Plan **Exhibit 20**.

5.8 Project Alternatives

The project plan discussed above represents Bahama Rock's preferred development alternative. Project alternatives are discussed in further detail below.

5.8.1 No Action Alternative

The No Action alternative assumes that Bahama Rock does not invest in the development of Area 4. Under this alternative the property will remain undeveloped. Although adverse environmental impacts will not occur, the many benefits associated with the project will not be realized. In evaluating alternative sites, proximity to the main processing plant and synergy in the Freeport Harbour development are key.

Of the two aggregate suppliers in the Bahamas, Bahama Rock is the largest. If Bahama Rock is not able to excavate material in Area 4 it is likely that large development projects would be forced to purchase materials imported outside of the Bahamas. This will cause construction material costs to rise significantly both in Grand Bahama and throughout the Bahamas. Such cost increases will be passed along to the end user.

The No Action Alternative does not support the ability of Bahama Rock to sustain minimum economic production levels for the advancement and completion of the Freeport Harbour Master Plan. Bahama Rock is essentially providing a "no cost" deep water harbour with its excavation operation. Bahama Rock excavates a waterbody, and ancillary businesses, such as Freeport Harbour Company, realize the benefits of a deep water harbour. Without Bahama Rock, harbour

expansion would have to rely on traditional dredging methods which are very costly, and create significant material disposal and environmental issues.

Benefits of employment during various phases of the project will be lost if Area 4 is not developed. Substantial long-term employment opportunities associated with the day-to-day operations of future waterfront enterprises will also not occur. Ancillary harbour based companies will not expand into Area 4, resulting in a lost opportunity for future economic growth. Revenues from the sales of fuel and electricity will substantially decrease as the Bahama Rock operation scales down. Currently, Bahama Rock is the third largest consumer of electricity in Grand Bahama spending some $5 million per annum. Also the West End Connector right-of-way and utility easement through Bahama Rock's property will not be granted. Moreover, if the project is not advanced and the operation is eventually scaled back, businesses that are supported by Bahama Rock will lose revenue. Bahama Rock economics change significantly from the original business plan which invested over $100 million since 2001.

5.8.2 Bridge Removal Alternative

An alternative was considered for the elimination of the waterway connector bridge, located between Areas 3 and 4. Before excavation activity commenced, highway traffic would be re-routed around Area 4 on a new roadway to the north, located within the proposed 150 foot right-of-way. At some point west of Area 4, a north-south feeder road could connect the new road to Queens Highway in Eight Mile Rock. Hence, the first phase of the West End Connector would be built. However, this would involve having to locate landowners and purchasing land which would take time to develop.

This alternative may be selected or investigated further in the future, since it may convene a higher economic use of the Area 4 basin. The elimination of the fixed bridge allows for larger marine vessels to be accommodated.

This alternative was not selected due to the logistics of re-routing traffic around Area 4. The right-of-way required to run the north-south feeder road is likely to be time consuming. In the

long-term, locals and strategic planners may foresee additional economic value by eliminating the bridge and adjacent land masses.

Chapter 6: Baseline Description

6.0 Chapter Overview

The following summarizes the existing baseline conditions of the project study area and associated areas of influence. Summaries are based on background literature and detailed site specific field evaluations. Field evaluations are available for review and are located in the appendices of this EIA. Baseline conditions will be used to guide development of Area 4 and provide an origin for comparison of proposed impacts, later discussed in 7.0. Discussion of baseline conditions cover the general topics listed below.

- Physical Environment
- Biological Environment
- Infrastructure and Public Services
- Adjacent Community

6.1 Data Acquisition and Analysis

Data acquired for this EIA consisted of background literature and site specific field evaluations. Background literature included review of past studies already completed for parcels located in the vicinity of the Area 4 project. These studies included EIAs and EAs conducted for the Area 3 project, the Levarity Parcel, and other nearby more specific harbour development projects.

The project team who prepared this EIA consisted of qualified professionals, the credentials of which are appended to the TOR document (**Appendix 1**). Standard scientific methodologies were followed. The details of these methodologies are presented in the attached appended reports.

6.2 Physical Environment

The following discusses physical environmental data covering climate, tides, topography, soils, geology, surface water, and groundwater hydrology. Data presented is based on available literature, survey data, and confirming field evaluations.

6.2.1 Climate

The climate of Grand Bahama is subtropical with a mean temperature range of 70°F (21°C) in January to 83°F (28°C) in August. The island is generally characterized by warm moist summers and drier cooler winters. Summer trade winds from the east bring warm humid air to the area. Winter high pressure cells arriving from the North Atlantic and North America bring periods of cold, sometimes precipitating fronts. Summer rainfall peaks in June through September, with a year total averaging approximately 60 inches.

For most of the year Grand Bahama Island remains sunny. Cloudiness often indicates isolated rain showers, but sustained overcast days are rare. A fairly constant breeze helps to alleviate the effects of the high humidity, yet most businesses and homes use air conditioning, especially in summer. Frost is unknown because any invading cold air mass must cross over the warming influence of the Gulf Stream.

6.2.2 Tides

According to tidal data recorded at Freeport Harbour the mean tidal range is approximately 3.1 feet. The mean tidal range typically increases in the spring to approximately 3.6 feet. Tides are diurnal, cycling every 12 hours and 25 minutes on average.

6.2.3 Storms and Flooding

Grand Bahama Island is located within the Atlantic Tropical Cyclone Basin. This basin includes much of the North Atlantic, Caribbean Sea and the Gulf of Mexico. On the average six to eight storms form per year in this basin. The formation of these storms, and the possible intensification into mature hurricanes, takes place over warm tropical and sub-tropical waters. Eventual dissipation or modification of these storms occurs on average seven to eight days later over the colder waters of the North Atlantic, or when the storms move over land away from the sustaining marine environment. The hurricane season extends from about June to November.

Serious hurricanes passed over Grand Bahama in 1926, 1957, 1999, 2004, and 2005, accompanied by high winds and flooding. Hurricane Floyd passed Grand Bahama in August

1999 resulting in flooding of the north coast, including the Grand Bahama International Airport and the Queen's Cove subdivision. Hurricane Frances passed and stalled directly over Grand Bahama Island on September 5, 2004. The storm had maximum sustained winds of 105 mph or 165 km/hr. Flooding mostly occurred on the northern shoreline but extended to West End, Hawksbill, Bahamia, the Lucayan Waterway, and other parts of Grand Bahama with a storm surge of five feet to 12' feet above normal tide levels. Shortly following Frances, Hurricane Jeanne passed just north of Grand Bahama Island on September 25, 2004, accompanied by similar wind speed and storm surge as Frances. Jeanne was noted as significantly impacting the Eight Mile Rock community located just south of Area 4. According to reports, the eastern portion of Grand Bahama Island was cut off to vehicular traffic by storm surge and flooding. Following Frances and Jeanne, Wilma was the next hurricane to impact Grand Bahama Island on October 25, 2005. Hurricane Wilma passed approximately 90 miles northwest of Freeport. Storm surge and rain caused significant flooding along the southwestern portion of the island particularly the coastal settlements along the south shore of Grand Bahama.

Past studies on the Island have predicted surge elevations up to nine feet along the south shore and up to 12feet on the northern shoreline of Grand Bahama Island. Based on recent topography, the majority of the Area 4 site exists at levels at or above the most conservative storm surge estimations. Please refer to 7.5.4 for predicted storm surge elevations.

6.2.4 Geology

The Bahama Islands are a relatively recent geological formations consisting of various forms of limestone and coral. Geological investigations throughout the Bahamas indicate limestone has been encountered as deep as 18,906 feet (Cay Sal, 1959). Such data suggests that limestone in the Bahamas was once located at the surface (Sealy, 1995). Geographically the island, together with the Little Bahama Bank and Great Abaco Islands, are exposed portions of the Little Bahama Bank.

Bahama Rock has taken four (4) core borings within Area 4, and inspection of the photo logs suggests that limestone of varying density, porosity and permeability are present to a depth of 110 feet below grade. This lithologic sequence is also confirmed to a depth of 150 feet below

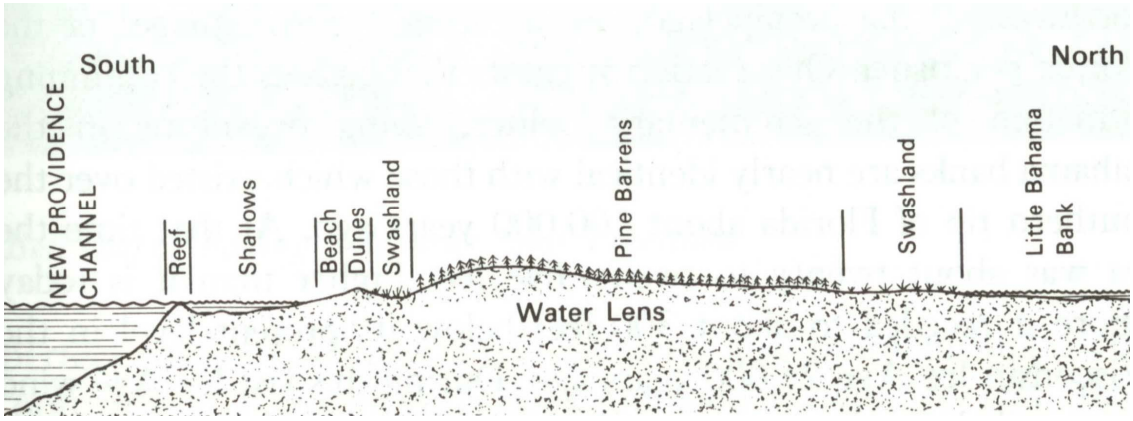
grade via the lithologic logs for boreholes drilled in the adjacent Area 3 to the east, and to 50 feet below grade for boreholes drilled in the Bahama Cement Company property to the southeast. The lithologic logs for deep disposal wells at the Grand Bahama Shipyard, Ltd. and Polymers International, Ltd. located approximately two (2) miles southeast of Area 4 show that the limestone/dolostone sequence is present to a depth of 600 feet below grade.

According to the September 2nd, 2008 interoffice memorandum from Steven McKeel to David Brisely during the exploratory drilling of Area 4 no caverns, caves, or large voids were encountered. According to the memorandum there were no "falling rod" conditions that were indicative of caves or caverns. During the recovery of the core samples both primary and secondary porosity were noted. The most porous of the limestones recovered were "honeycomb" or skeletal in appearance with pores ranging from ¼ to 3-inches in size. The memorandum and drill logs are presented in **Appendix 14.**

6.2.5 Topography and Soils

Grand Bahama Island is relatively flat with the highest point being 60 feet above sea level, located in the central south portion of the island. A typical section of the island shows a swamp near the southern sandy shore, a low ridge further inland from which there is an almost indiscernible slope down to the north coast, and then miles of swashland before the Little Bahamas Bank is reached. Please refer to **Figure 6.1** for a generalized cross section which depicts the topography of Grand Bahama Island.

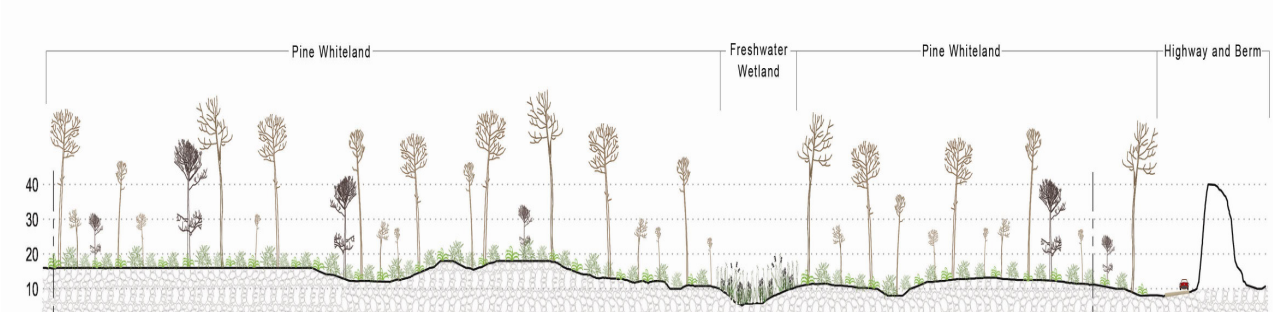
Figure 6.1: Generalized Cross Section (Barret, 1989)



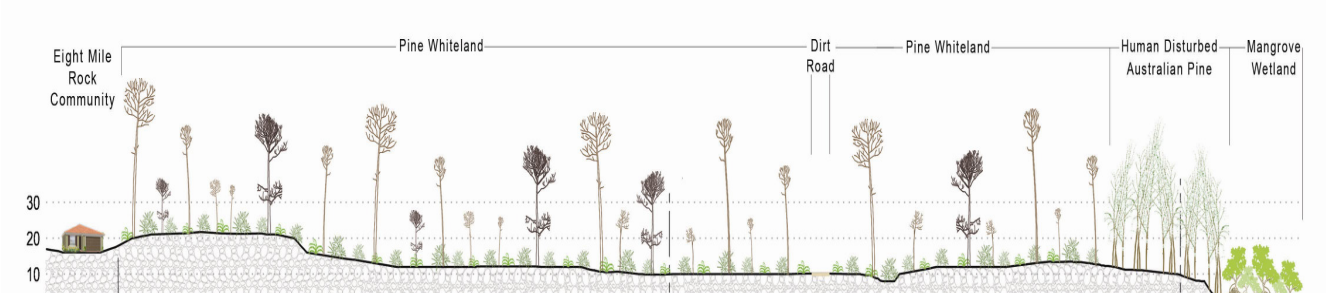
Soils on Grand Bahama Island's south shore are composed of sand and/or limestone which are continually washed and further eroded by the action of the sea. The north shore is composed of calcareous muds and clayey limestone, also called marl beds. These white marl beds support thousands of acres of mangroves and other swamp-type vegetation. Further inland, beneath a canopy of pines and scrub vegetation, broken lime rock is ubiquitous and visible on the surface. Organic topsoil is occasionally found in the forested areas as a product of biological decay, but despite a thin cover of mosses and ferns, the rock is seldom more than a few inches below the surface. Infrequently sparse areas of lush vegetation is supported by rich organic loam found in the occasional "banana holes". Most of the agriculture since early times took place in the loamy coral sands slightly inland from the dunes of the south shore.

Area 4 features a range of general topographic features resulting from differences in elevation as depicted **Exhibit 14**. Associated cross sections are indicated in **Exhibit 32**. Based on cross section C-C, beginning along the project's northern shoreline, these topographic features generally includes: low lying wetland areas containing mangroves, a coastal ridge, disturbed fill mounds, and upland areas containing pine whitelands. Based on cross section A-A, beginning along the project's western property boundary these topographic features generally include: upland areas containing pine whitelands, low lying wetlands comprised of freshwater wetlands, uplands again containing pine whitelands followed by a large man-made berm. **Exhibit 32** is summarized in **Figure 6.2**.

Figure 6.2: Site Specific Cross Sections



Cross Section A-A



Cross Section C-C

6.2.5.1 Low Swashland (mangroves)

Low swashlands are located parallel to the northern project boundary, and are contiguous with the waters of the Hawksbill Creek. This area encompasses only a small portion of the Area 4 project site. Elevations in this area range from approximately zero to two feet above mean sea level (msl). Soils consist of organic marl beds.

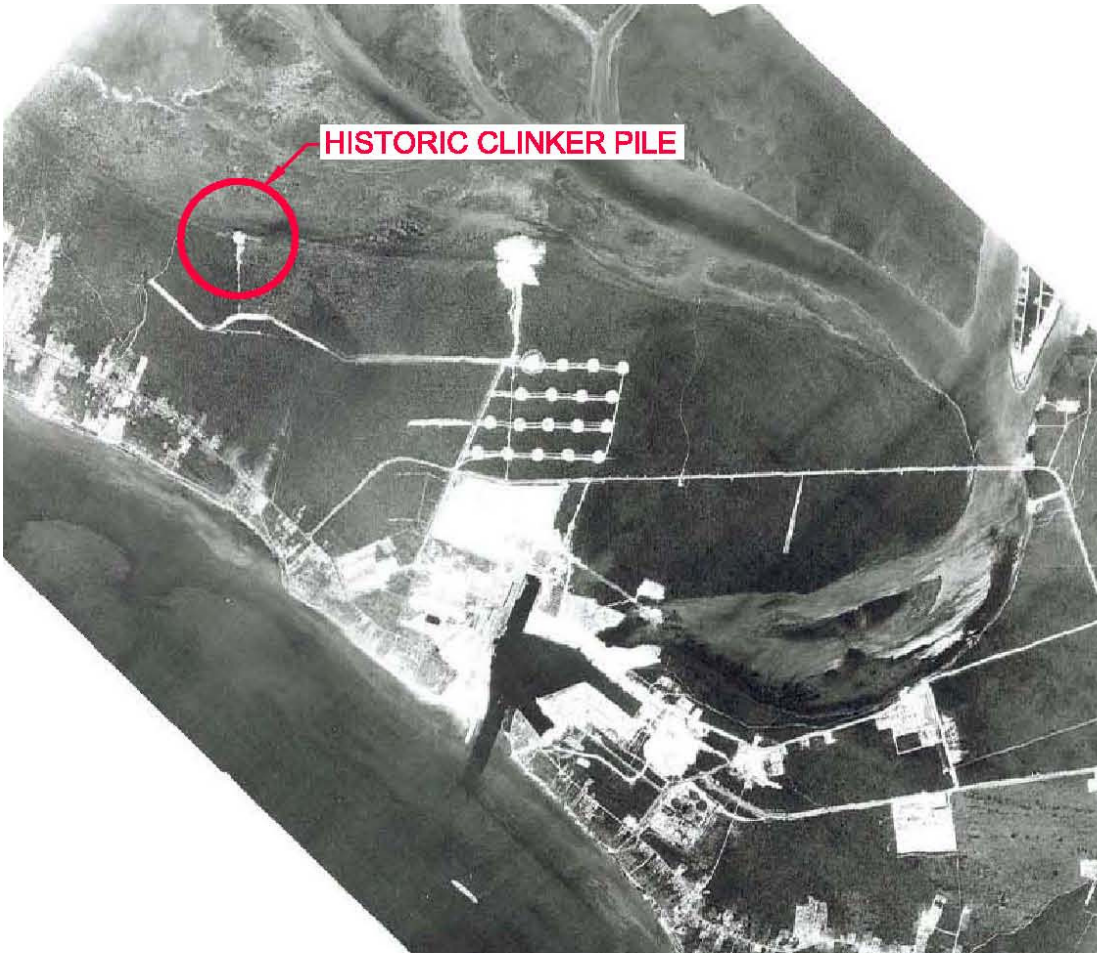
6.2.5.2 Steep Sloping Coastal Ridge

A narrow steep sloping coastal ridge, consisting of rocky outcropping, is located parallel and to the south of the low swashland. Elevations in this area range from approximately two to 12 feet msl. Smooth rock outcroppings are apparent along the steep slope. Very little soil exists along this area. Some shallow solution holes containing organic topsoil as a result of organic decay occur infrequently throughout.

6.2.5.3 Disturbed Fill Mounds

A mound of suspected clinker reject material from the former Bahama Cement is located on the northwestern portion of the parcel. The northern portion of the mound extends to waters of the Hawksbill Creek. Elevations on the mound range from two to 12 feet msl. Field investigations and review of historical aerial photographs indicate that this mound is a historic clinker pile created during the time that Bahama Cement was operational **(Figure 6.3)**. Soils in the fill mound area appear to be fine grain sands and contain organics in the upper soil horizons. There are no plans to remove this pile as it was deposited over thirty years ago. A larger pile exists where the Warren J. Levarity was constructed without the fill pile being removed by the Port Authority.

Figure 6.3 Historic Clinker Pile



6.2.5.4 Pine Highlands

The remainder of the property ranges from approximately eight feet to 12 feet msl. Soils throughout this area consist of a thin layer of organic topsoil over rocky substrate. Some limited areas of the pine highlands have depressions within the topography, with elevations ranging from five to eight feet above msl. These depressions are karstic solution holes and have higher organic content and moisture. The vegetative composition associated with these topographic features is further discussed in 6.4.1.

6.2.6 Surface Water

Grand Bahama Island has no natural lakes, surface rivers, or streams. However, a series of north-south trending "cross island" creeks and marshes divide the central and eastern part of the island into sections. Within the central parts of the island, the creeks and marshes are cut off from the seas at their southern end by beach ridge deposits derived from westerly long shore sand drift. Other types of surface water features found on the island include blue holes as well as man-made features.

Large substantial surface waters are non-existent within the confines of Area 4. The northern segment of the site contains a small portion of Hawksbill Creek, which is a saltwater body connected directly to the ocean. The site also contains some small, intermittent, depressional wetlands. Standing water occurs in these wetlands at times when the water table rises above the land surface in response to significant single event or seasonal rainfall. During the dry season, there is no standing water in these areas. A trench-well system is also present to the south of Area 4. This system was originally constructed to provide a freshwater supply to the Bahama Cement Company facility located on the western side of Freeport Harbour. Although the trenches can be close to twenty feet deep, on the average they only penetrate the upper three to five feet of the water table. There are also a number of ponds within Area 3 that have been formed through excavation and contain brackish to salt water.

6.2.7 Groundwater Hydrogeology

The following details the existing state of groundwater within the Area 4 project site. The full detailed Water Resources Assessment and Ground Water Modeling Report, Water Resources

Assessment and Ground Water Modeling Report Addendum 1 prepared by R.C. Minning & Associates and Private Well Sampling Report by EIL prepared in September 2008 are presented in **Appendix 3.**

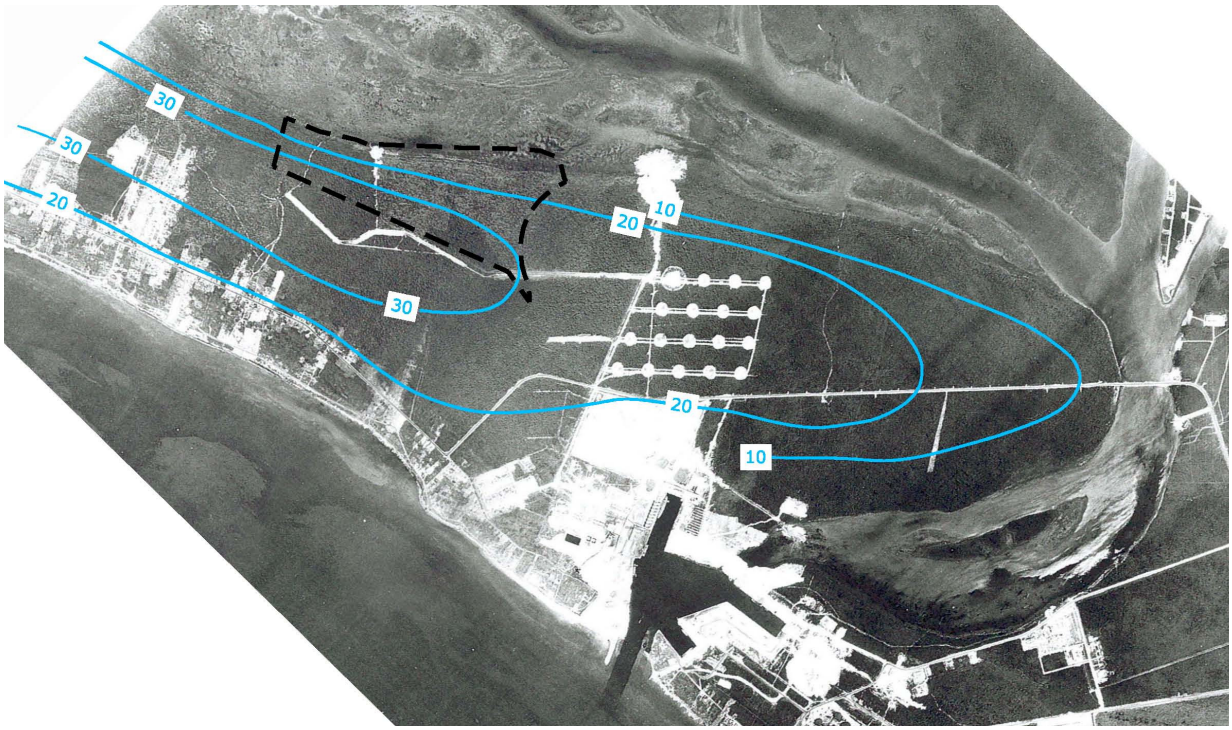
6.2.7.1 Background

As reported by Little et al. (1975), changes in groundwater levels as a result of rainfall may be classed as short-term or long-term. Short-term rises after individual storms are quite common. These contribute to a long-term seasonal rise of the water table during the wet summer months, followed by a slow decline throughout the drier winter months. The wet season begins in May and ends in October with a maximum rainfall period occurring around the month of September. Since the aquifer is recharged by local rainfall only, this maximum rainfall period always coincides with the yearly peak elevation of the water table in the aquifer.

Existing data obtained from four core borings conducted by Bahama Rock prior to this study as well as data from other sources indicate that Area 4 is composed of a limestone/dolostone sequence that is present to a depth of at least 600 feet below grade. The upper 60 to 70 feet of this sequence comprises the Lucayan Limestone Aquifer (LLA) which is the principle aquifer on Grand Bahama Island. The LLA exists under unconfined or water table conditions. Within the LLA, freshwater can occur as lenses depending on the amount of rainfall and the physical characteristics of the LLA such as permeability and porosity. Rainfall in the area averages approximately 60 inches per year of which about 30 inches infiltrates the subsurface and 18 inches returns to the atmosphere as evapotranspiration. At steady state, the freshwater lens receives an average of 12 inches of annual recharge.

As indicated in a report prepared by Little, et al., 1975 (often referred to as the Overseas Development Agency -1975 report), a freshwater lens was identified to occur in the area from the current Freeport Harbour westward through Bahama Rock property circa 1971. The approximate extent of this lens has been placed over a historical aerial photograph as indicated in

Figure 6.4: Approximate Historic Freshwater Lens Circa 1975



As depicted in the figure above **(Exhibit 11)**, the historic freshwater lens conformed to the shape of the land mass, i.e., elongated along a northwest – southeast trending axis attaining a thickness of greater than 30 feet but less than 40 in the center. Note that there has been extensive development of Freeport Harbour since 1975, and the freshwater lens in that area is expected to have greatly diminished or disappeared.

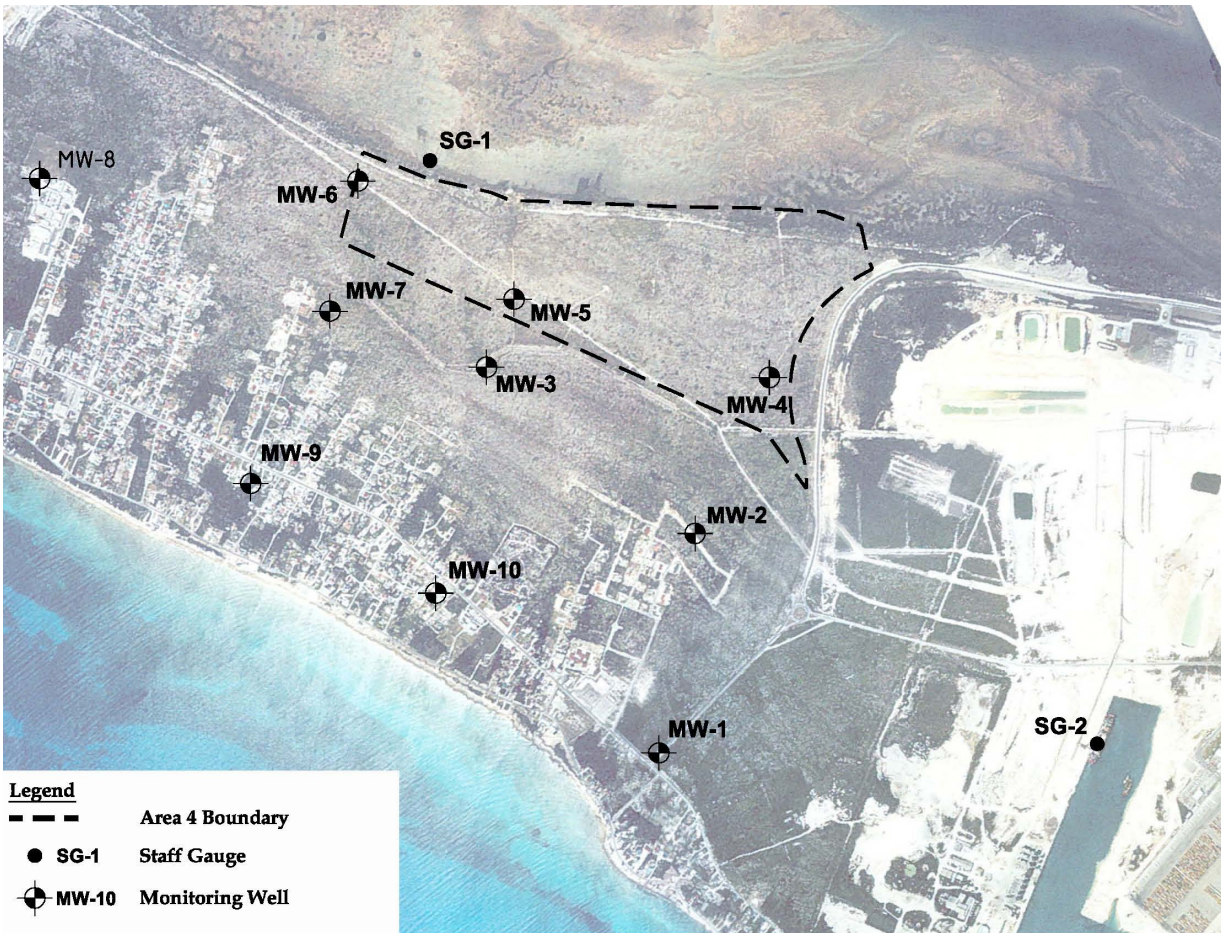
6.2.7.2 Existing Freshwater Lens

To determine the existing freshwater lens configuration within the Area 4 site, monitoring wells were installed and data loggers were put in place in various locations. A total of ten monitoring wells were installed to depths ranging from 66 to 75 feet. Of these ten wells, three wells designated MW-4, MW-5, and MW-6 were located within Area 4. The remaining seven wells (MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, and MW-10) were located in the surrounding communities and adjacent area. Upon completion of the monitoring wells, self recording data loggers were placed in each well and at designated locations in Hawksbill Creek and Freeport

Harbour. The data loggers were used to collect data regarding length of tidal period, magnitude of tidal and groundwater fluctuations, and the lag between tidal change and groundwater level changes. A separate data logger was also placed on the ground to monitor atmospheric pressure during the test.

After completion of the private well survey, a total of six private wells, two from each community were sampled for conductivity and salinity. During this sample event the ten monitoring wells were sampled again. Please refer **to Figure 6.5 (Exhibit 17)** for a map depicting the location of the monitoring well and staff gauge locations.

Figure 6.5: Monitor Well & Staff Gauge Location Map



Information collected from data loggers and monitoring wells included measurements on tidal length, magnitude of tidal fluctuation, time lag between tidal change and groundwater levels.

This data was used to determine parameters which describe hydraulic properties of the aquifer such as transmissivity, hydraulic conductivity, hydraulic, gradients, recharge rates, flow direction, and hydraulic communication between adjacent surface water bodies. Water quality parameters such as salinity and conductivity were also collected at various intervals in the water column in monitoring wells to delineate salt versus freshwater boundaries.

The data discussed above was obtained during three separate sampling events. The first event took place in November of 2007. The second event took place in December of 2007. The third took place in February of 2008 and are reported in the original Groundwater Resources Assessment and Modeling Report. Based on the data collected during these events, the freshwater lens maps depicted in **Figures 6.6**, **6.7, & 6.8** were generated. Additional field work was conducted in July and August 2008 to capture data during the rainy season. This information is presented in the Addendum in **Appendix 3.** Bahama Rock will continue to accumulate data on a quarterly basis.

Figure 6.6: Freshwater Lens Map - November 2007

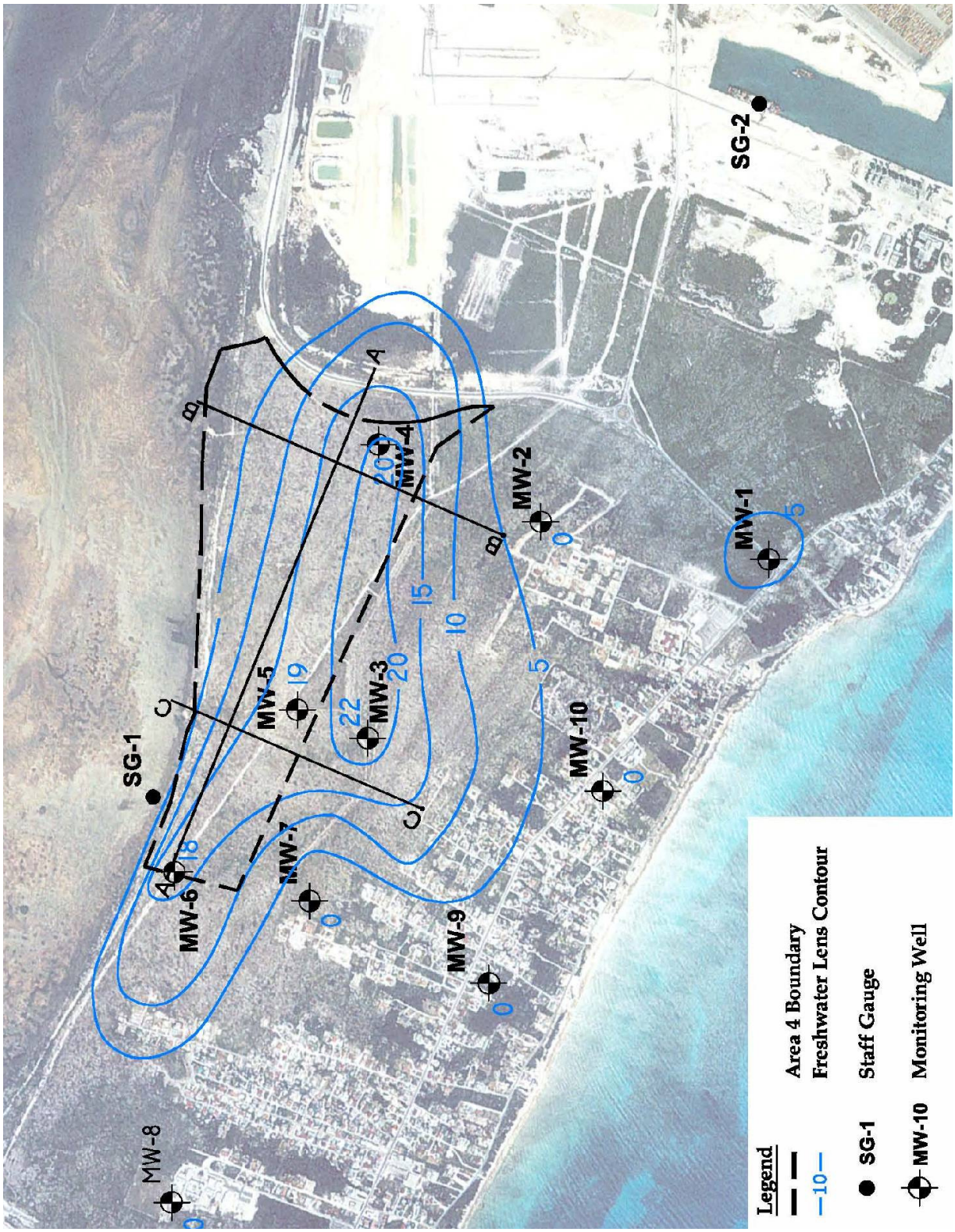


Figure 6.7: Freshwater Lens Map December 2007

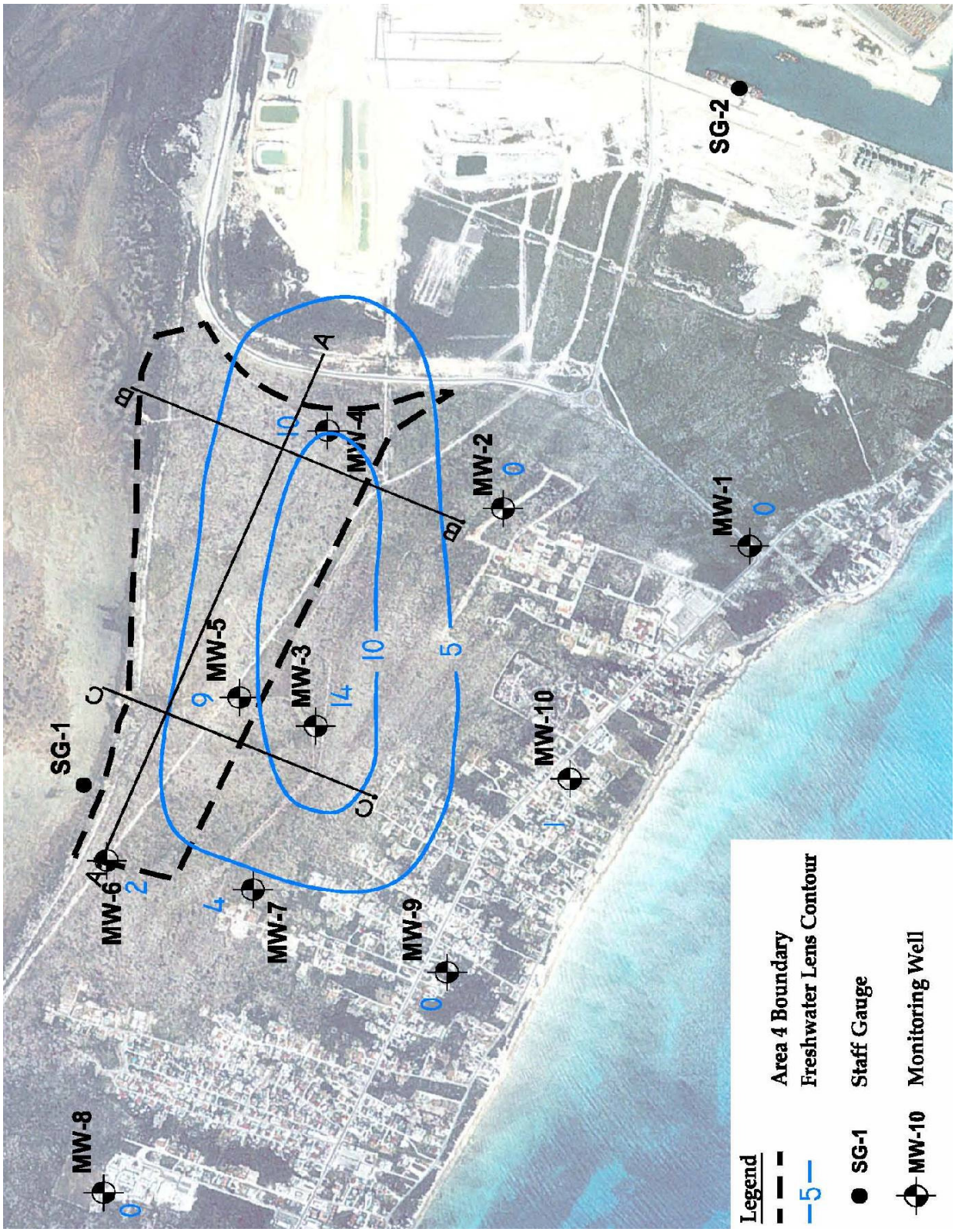


Figure 6.8: Freshwater Lens Map February 2008

These maps indicate the following significant conditions: 1) the existing freshwater lens has significantly decreased as compared to 1975 conditions; and 2) the freshwater lens measured in November was observed to be larger than the freshwater lens measured in December. The apparent diminution of the lens in the vicinity of Freeport Harbour from 1975 conditions is to be expected due to the expansion of the port and associated waterways to the east. However, the lack of a lens to the west of Area 4 cannot be readily explained. No changes in land use, land form or groundwater use are apparent. Some change in the topography west of Area 4 is due to the removal of the surficial layer (10-15 ft) of limestone (This refers to the historically excavated area west of Area 4, also known as Area 5). The current land surface is more dense limestone at an elevation approximately equal to the water table. During periods of high water table, the area is under water, with the limestone surface being exposed at times of lower water table elevation. Recharge to the LLA would still occur although evaporation may be greater due to the larger exposed area. Consideration must also be given to the possibility that the fresh water lens delineation presented in the Little, et al., 1975 report was based on an extrapolation of the data from boreholes in the vicinity of Freeport Harbour, and did not exist to the extent depicted.

In November of 2007, the freshwater lens was observed along the axis roughly along the southern boundary of Area 4 over an approximate distance of 8,200 feet. The width of the lens' measures about 4,200 feet and its maximum thickness was approximately 22 feet (**Exhibit 18**). In comparison, the freshwater lens observed in December 2007, maintained a similar width of approximately 4,200 feet. However its length along the east-west axis reduced from 8,200 feet in November to 7,200 feet in December **(Exhibit 19)**. Similarly, the lens' overall thickness reduced from 22 feet in November to 14 feet in December.

In February of 2008, the freshwater lens remains present and the apparent center of the lens has shifted to the west. The approximate dimensions are a width (north-south) of 4,500 feet, a length (east-west) of 8,400 feet, and a thickness of 25 feet at MW-7. These dimensions are a little larger than those derived from the prior two monitoring events, a condition which can be directly attributed to the 2.60 inches of rainfall that the area received on February 13, 2008. Also evident is the absence of the freshwater lens east of the Warren J. Levarity Highway. This condition is due to the development of Area 3 as shown in **Figure 6.8**. The thickness of the lens as measured

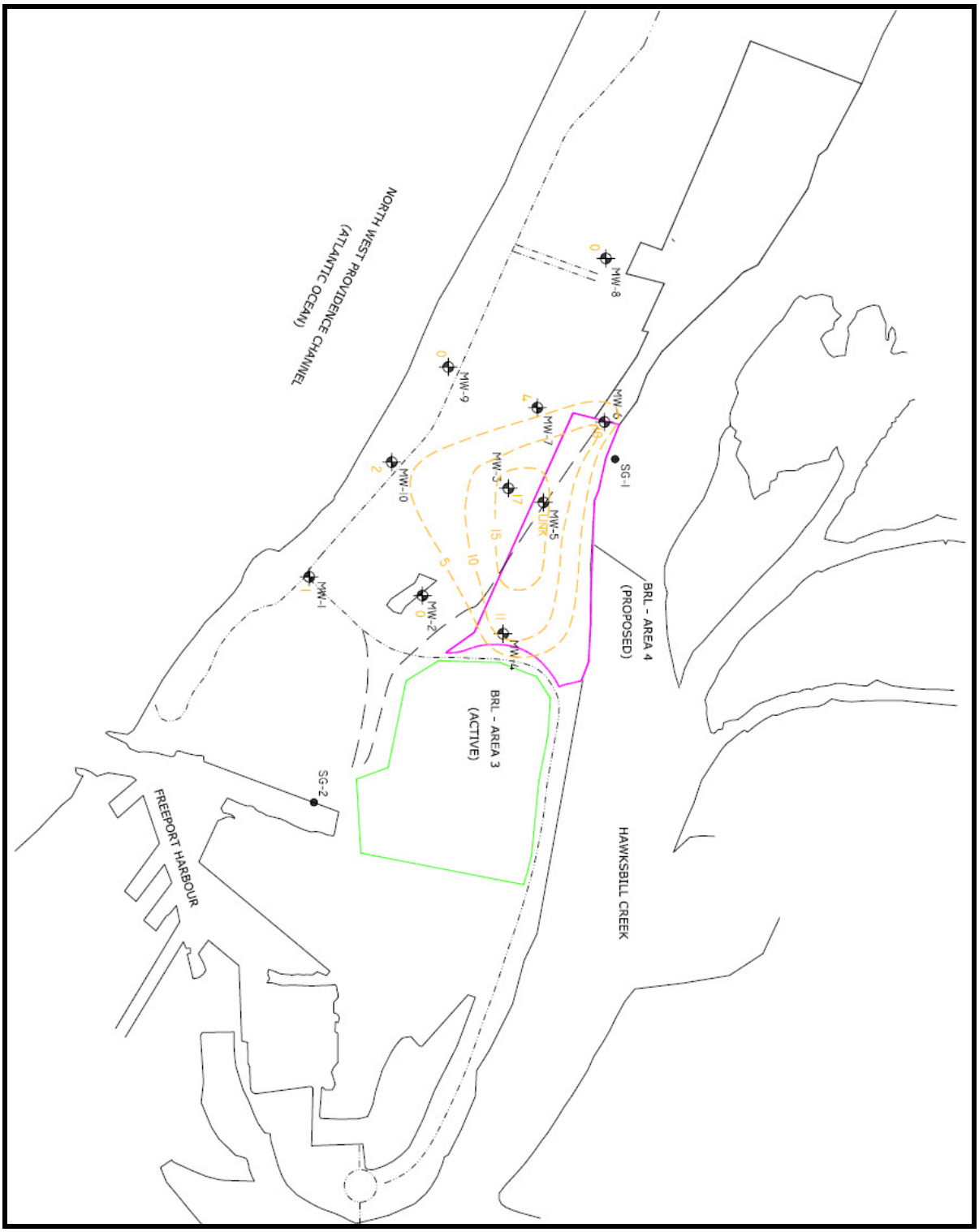
in MW-7 has increased when compared to the November and December measurements. As with the previous measurements, no freshwater lens was encountered at the location of MW-8.

Given that the LLA hydrogeologic characteristics are constant in Area 4 and surrounding area, the changes in the configuration of the freshwater lens between the November and December 2007 monitoring events can be attributed to a decrease in precipitation and coincident recharge to the LLA. Rainfall records for Freeport, Grand Bahama show the total recorded rainfall for 2007 was 52.90 inches through December 25th with 43.52 inches (82%) coming in the period June 1st through October 31st. Rainfall decreased beginning in November and continuing into December. On this basis, the extent and thickness of the fresh water lens was most likely greater during the rainy season (April – October) than that delineated based on the November and December measurements.

Monitoring of the freshwater lens in the vicinity of Area 4 has continued with four measuring events taking place on July 21, 2008, August 5, 2008, August 18, 2008 and August 19, 2008. A separate report Groundwater Resources Assessment and Groundwater Modeling Report Addendum 1 by R.C. Minning and Associates that presents this data is in **Appendix 3**.

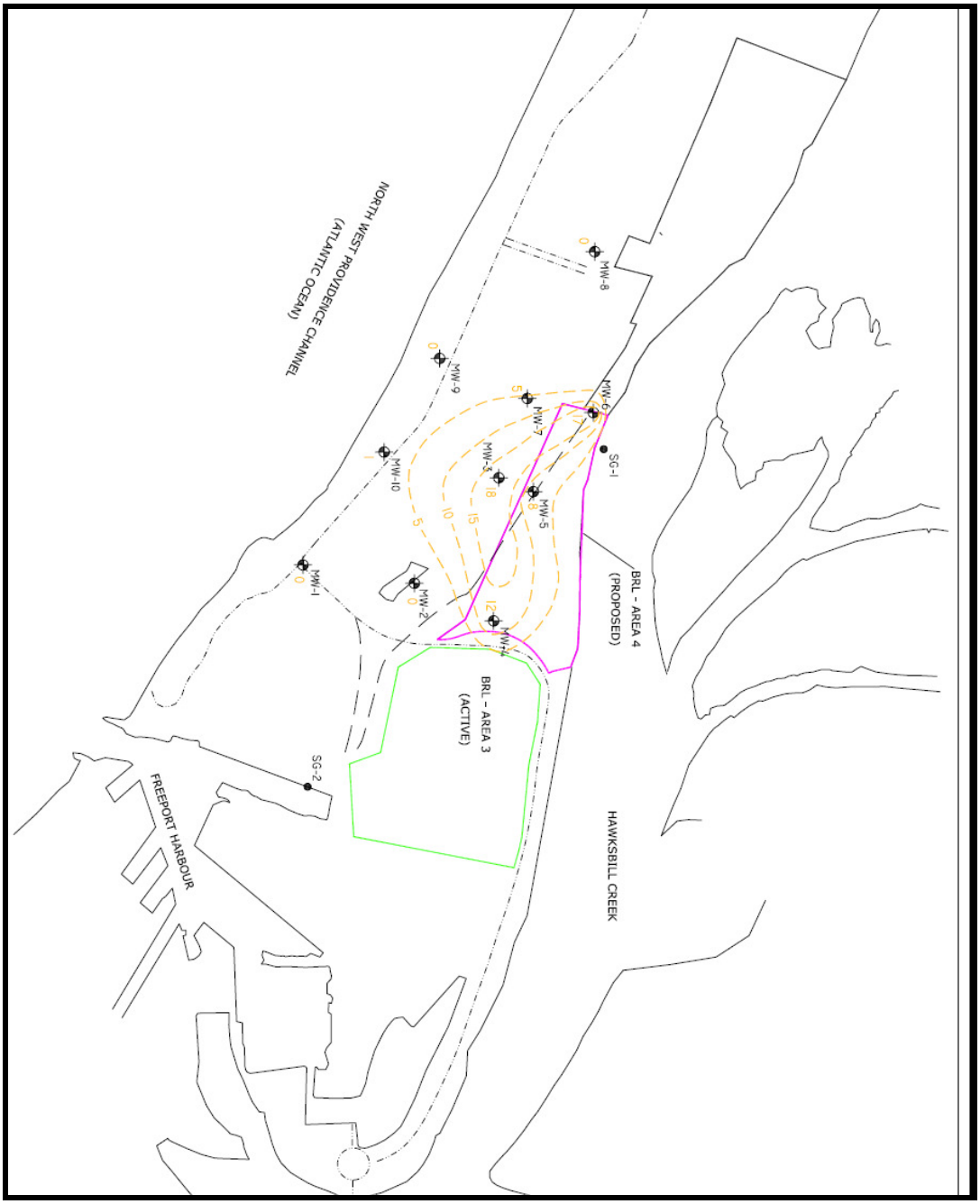
During the July 21, 2008 sampling event a freshwater lens is present and measured along the long axis of Area-4 in a east–west direction at approximately 5480 feet between the five (5.0) foot thick contour line. The width of the lens measures north to south was approximately 3,760 ft and the thickness is approximately 17.0 ft. As the exact boundary of the zero freshwater line is not known a zero contour line was not plotted The plan view and cross sectional views can be seen in **Addendum 1** in **Figures A-A, A-B and A-C**. The plan view is presented in **Figure 6.9**

Figure 6.9: July 21, 2008 Plan view of Freshwater Lens



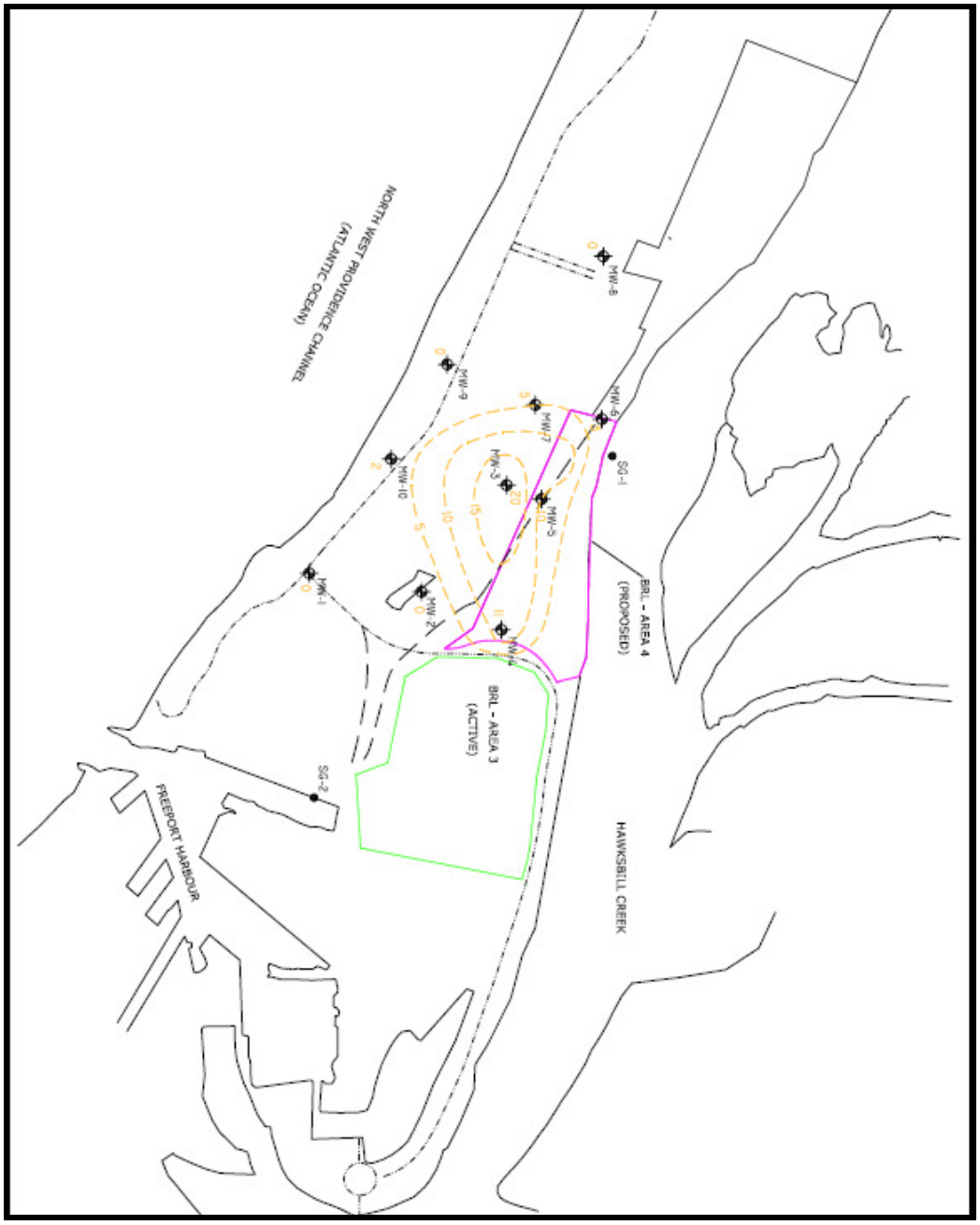
Salinity Profiles from August 5, 2008 indicates that a freshwater lens is present along the long axis of Area 4 in an east- west direction measuring approximately 6,000 feet between the five (5) foot contour line. The width of the lens was measured at approximately 3,200 ft with a thickness of about 18 ft as measured in MW-3. The plan view is presented **in Figure 6.10.**

Figure 6.10: August 5, 2008 Plan view of Freshwater Lens



On August 18, 2008 salinity measurements were recorded before the arrival of Tropical Storm Fay. The freshwater lens measured along the long axis of Area 4 between the five (5) foot contour line was 5,440 feet in an east to west direction. The width of the lens was measured in a north-south direction was approximately 3,360 feet with a thickness of 20 feet as measured in MW-3. The plan view of the August 18, 2008 profile is presented in **Figure 6.11**

Figure 6.11: August 18, 2008 Plan View of Freshwater Lens

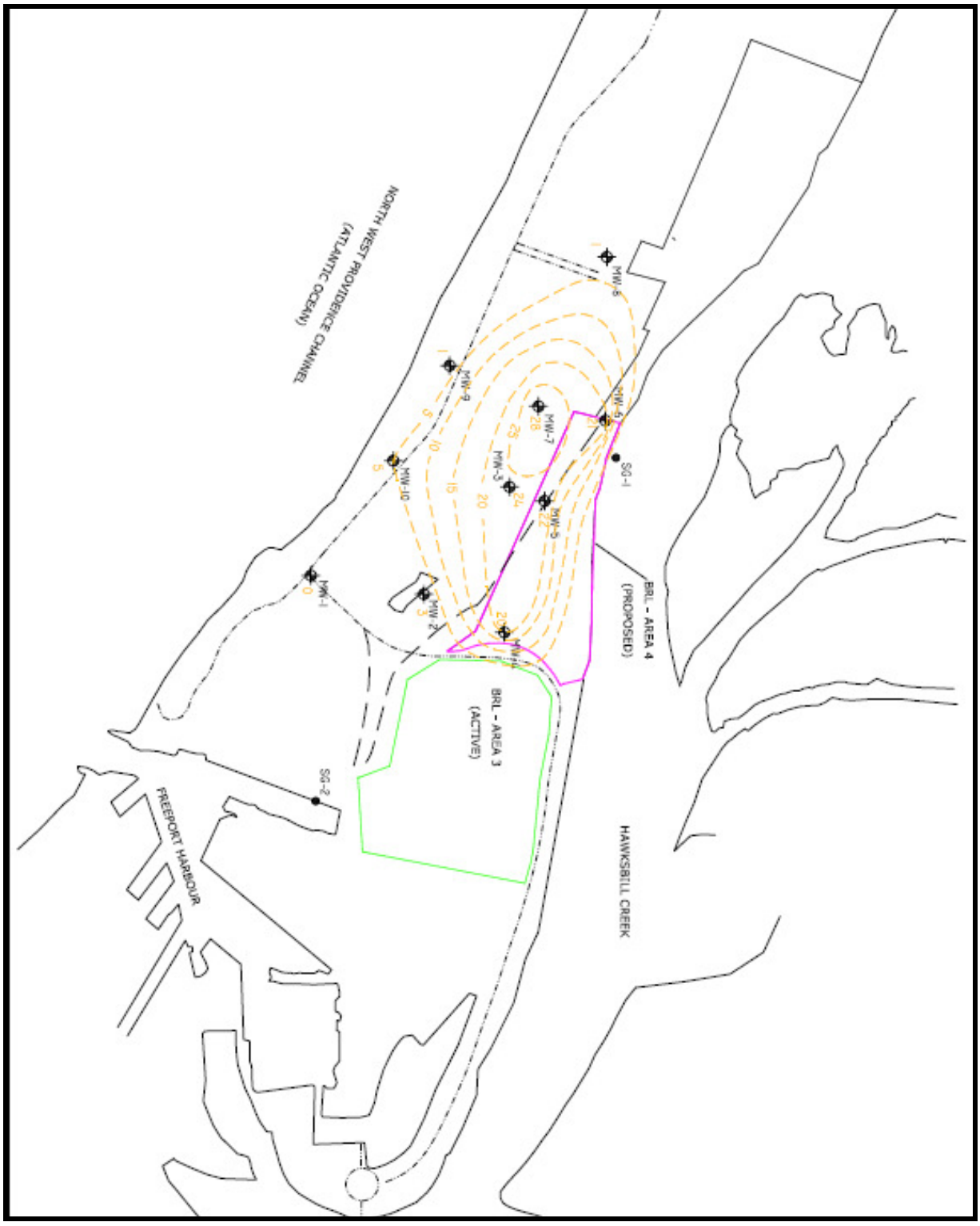


On August 19, 2008 after a heavy rain event due to Tropical Storm Fay salinity measurements were recorded from the 10 monitoring wells. There was a total 6.29-inches of rainfall as recorded at the Grand Bahama International Airport for the 24-hour period from late August 18th to early August 19th, 2008. The freshwater lens measured approximately 8,400 feet in distance along the east-west axis of Area 4 between the five (5) foot contour line. The width of the lens was about 4,080 feet with a thickness of 27-feet as measured in MW-7. As in all of the previous salinity profiles the zero contour line is not known. As stated by R. C. Minning & Associates:

"The freshwater lens thickness is in direct response to the high intensity rainfall associated with Tropical Storm Fay."

The plan view of the freshwater lens as measured on August 19, 2008 is presented in **Figure 6.12**

Figure 6.12: August 19, 2008 Plan View of Freshwater Lens



Based on the data collected from both the **Groundwater Resources Assessment & Modeling Report** and the Addendum 1 Report it shows in **Figure 2K** of the former report the smallest freshwater lens occurred in December 2007. This correlated with the lowest rainfall for the 30-previous days recorded at the Grand Bahama International Airport. In comparison, **Figure A-J** in **Addendum 1** showed the largest freshwater lens present on August 19, 2008 which corresponds to 6.29 inches of rainfall in 24-hours from Tropical Storm Fay. **Table 6.1** summarizes freshwater water lens dimensions and the relationship to precipitation.

Table 6.1: Precipitation Summary

Figure	Date	Length	Width	Thickness	Total precipitation 30- days prior to measurement	Comments
2H	Nov 6 to Nov 13, 2007	8200	4200	22		
2K	Dec 10 to Dec 17, 2007	7200	4200	16	1.33	
2N	February 19 to Feb 20, 2008	8400	4500	25	3.93	2.60 in. of rain on Feb 13, 2008
A-A	21-Jul-08	5480	3760	17	4.59	
A-D	5-Aug-08	6000	3200	18	3.83	
A-G	18-Aug-08	5400	3360	20	5.98	Measurements taken for before 2.61 in. of rainfall.
A-J	19-Aug-08	8400	4080	27	9.66	6.29-inches of rain on Aug 18 to Aug 19, 2008

Additionally, private wells were sampled on August 6, 2008 and again on September 2, 2008. The data for the August 6, 2008 event is discussed in Addendum1. The August 6, 2008 results are consistent with the configuration of the freshwater lens in **Figure 6.10.**

6.3 Biological Environment

The following discusses data collected on major vegetative communities, wildlife and migratory birds, and sensitive and/or protected flora and fauna. It is noted that there is relatively little wildlife present in Area 4. The discussion summarizes field observations conducted by M.A. Roessler and Associates, Inc. M.A. Roessler's detailed report is included within **Appendix 2**.

Dr. Roessler and Mr. Zirkelbach visited the Bahama Rock Ltd. Area 4 site on September 12 and September 13, 2007 to conduct an ecological survey of the site. Previous work on the adjacent Area 3 had been conducted in April 2007, and subsequent observations of wildlife were made while delineating the boundary between wetland mangroves and coastal strand communities in January 2008. The survey started on the road that runs diagonally from southeast to northwest starting on Bahama Cement Company (BCC) property to the site to an old quarry site northeast of the settlement of Sea Grape, on property acquired from BCC by Bahama Rock. Roessler & Zirkelbach traversed the three north to south foot paths on the western half of the site and small depressional wetlands. Additionally, they examined the well field trench south of the main access road on Bahama Cement property, on the eastern section of the property walking in an east to west transect along the well field Trench (T-3) between the diagonal road and the WJL Highway. They crossed the coppice habitat, slope, coastal strand habitat and wetlands at the cleared area at the bend in the WJL Highway, then followed the slope westward to the next path where they walked another transect of the slope, coastal strand and wetland habitats. They ended with another transect through the pine/whiteland community. **Figure 6.13** is an aerial photograph of the site with the approximate location of the auto and pedestrian transects shown.

Figure 6.13: Auto and Pedestrian Transects for Area 4 Study

During field observations, photographs were taken, field observations of individual plant and animal species were recorded, and major plant communities identified. Individual plant and animal identifications were verified using relevant literature covering Bahamian flora and fauna. Plant community observations were assisted using recent aerial photography and available topographic information.

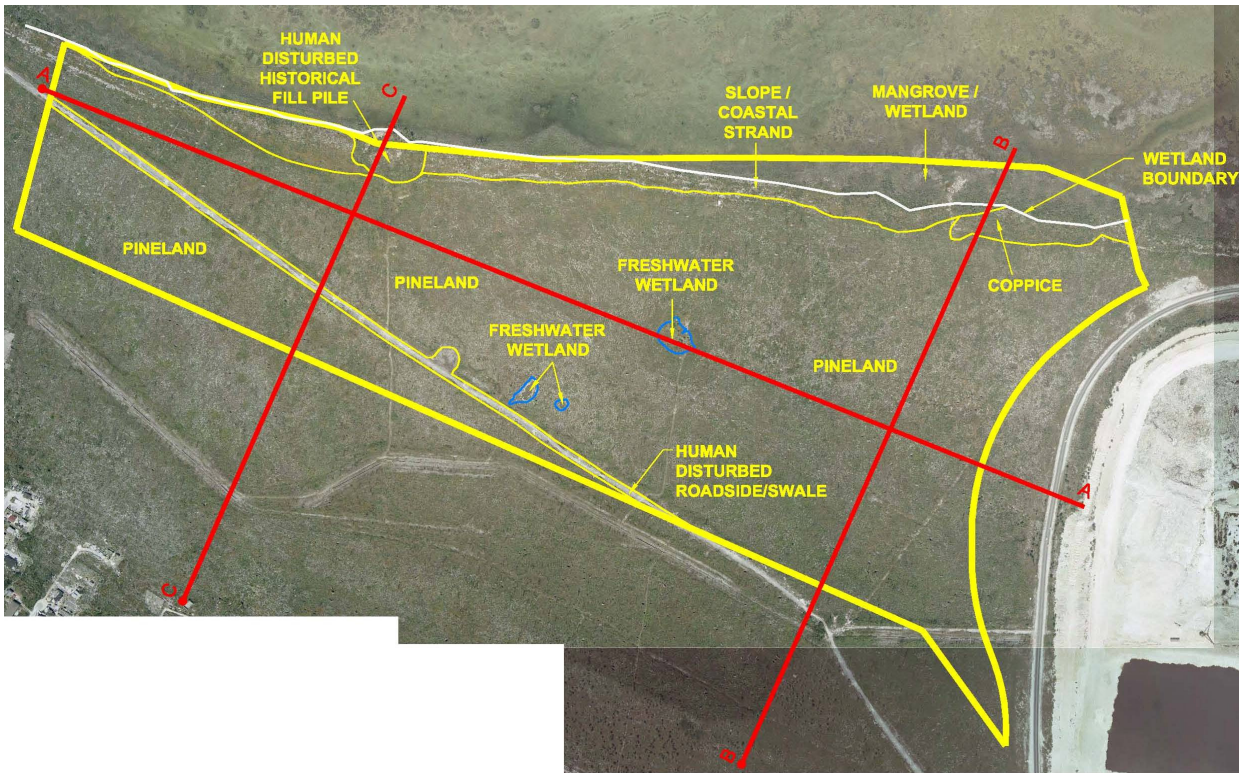
6.3.1 Vegetative Communities

The Area 4 project site encompasses approximately 192 acres of undeveloped vegetated land. Five predominant vegetative communities were identified during field observations. These include: pine whitelands, slope/coastal strand, mangrove wetland, coppice, and freshwater wetland. A detailed discussion of ecological communities can b found as well as scientific names can be found in the Vegetative Communities Report **in Appendix 2**. Please refer to **Table 6.2** for an acreage breakdown of each community as well as **Figure 6.14** for a map of these communities which is depicted in further detail in **Exhibit 16.**

Table 6.2: Vegetative Community Acreage Breakdown

Community	Acreage
Pine Whitelands	162.4
Human Disturbed (Roadside)	1.4
Human Disturbed (Historic Fill Pile)	4.1
Coppice	2.3
Mangrove Wetland	9.7
Freshwater Wetland	0.8
Slope/Coastal Strand	10.8
Total:	**192**

Figure 6.14: Vegetative Community Map



6.3.1.1 Pine Whitelands

Approximately 162.4 acres of Pine Whiteland occur on the site. The community corresponds almost entirely with the pine highland topographic features previously identified (6.2.5). This community has been identified as Pine Whitelands because Caribbean pines were encountered

growing within an understory displaying characteristics similar to secondary scrub communities known as "whitelands". Caribbean pines in this community appeared to be growing sparsely. Most pines were observed to be dead or exhibiting signs of severe distress. There were few hardwood trees observed, but the shrub and ground cover layers were varied and dense. The shrub layer contains poisonwood, cinnecord, golden dewdrop, velvet seeds, steel wood, Florida clover ash, trema, five fingers, gum elemi, guana berry, longleaf blolly, mahogany and the exotic jumbay. Ground cover was dominated by woe vine, southern bracken fern, China brier, Florida whitetop, wild yam, flat-spiked rush, sandmats, devil's potato, golden creeper, morning glory, broom sedge, lice root, butter fly pea, low rattlebox, common tick-treefoil, striped milk pea, nightshades, melanthera, wild poinsettia, slender beard grass, poison ivy, sanddune cinchweed, golden aster, buttonweed, pencil flower, grape and sleepy morning. A red tailed hawk was observed sitting on a pine snag in this habitat.

Figure 6.15: Pine Whiteland Community

This community was observed to be in poor condition for a variety of possible reasons. Most of the historic pine specimens were removed from the property due to previous logging activity in 1954. It is likely that the remaining pines were destroyed by a combination of significant storms and/or insect damage. There were little signs of pine seedling regeneration within the understory. This may be due to poor fire management and an absence of viable pine seed sources in adjacent nearby areas **(Figure 6.15).**

Additionally, some localized areas have been subject to indiscriminate dumping of appliances, automobiles, furniture and household waste **(Figures 6.16 and 6.17).**

Figure 6.16: Indiscriminant Dumping (1)

Figure 6.17: Indiscriminant Dumping (2)

6.3.1.2 Slope and Coastal Strand

The Slope/Coastal Strand community consists of approximately 10.8 acres and corresponds with the previously identified coastal ridge topographic features (6.2.5). The Slope Community has a rapid elevation drop from the pine/whiteland or coppice down to the coastal strand. It is likely that ground water stored in the lens under the pine and whiteland coppice communities seeps out from the base of this slope in the rainy season. It is characterized by having a considerable amount of exposed limestone rock. It shares most of the hardwoods of the whiteland coppice with the addition of sea grape (*Coccoloba uvifera*), dogwood (*Piscidia piscipula*), casuarinas (*Casuarina equisetifolia*), rams horn (*Pithecellobium keyense*), black torch (*Erithalis fruticosa)*, wild lime (*Zanthoxylum fagara*), black sage (*Lantana bahamensis*), smooth wild coffee (*Psychotria ligustrifolia*) and golden creeper (*Ernodea littoralis*).

The Coastal Strand Community includes the base of the slope and the area between the slope and the wetlands. The freshwater wetland species are probably supported by seepage of groundwater from the lens of freshwater under the higher elevations. The vegetation shares mahogany, five fingers, poison wood, cinnecord, steel wood, gum-elemi, groundsel, and trema in higher areas, but also has rams horn, sea grape, pigeon plum, spiny milk berry, bay berry, dogwood, longleaf blolly, darling plum, wild dilly, necklace pod, beach iva, nightshades, golden creeper and buttonwood in lower areas. The understory is dominated by snow berry, bracken fern, wild poinsettia, wild mulberry, Florida whitetop, fimbrys, morning glory, and milkpea **(Figure 6.18).**

Figure 6.18: Slope/Coastal Strand Community

6.3.1.3 Coppice

The coppice community consists of approximately 2.3 acres and is located south of the slope / coastal strand community along the northwestern property boundary. The coppice community contains fewer pine snags. The shrub layer is taller and there is greater species richness. Shrubs included white and Spanish stoppers, bay berry, five fingers, poison wood, black torch, jumbay, nightshades, golden dewdrop, black torch, longleaf blolly, pond top palm, mosquito bush, mosquito bush, Florida clover ash, mahogany, ram's horn and pigeon plum. The ground cover includes bracken fern, wild yam, China brier, Florida whitetop, goldenaster, wild mulberry, fox-tail grass, broom sedge, beard grass, slender paspalum, Virginia creeper, grape, lice-root maidenhair anemia and flat-spiked rush **(Figure 6.19).**

Figure 6.19: Coppice Community

6.3.1.4 Human Disturbed

Human disturbed areas consisted of approximately 5.5 acres. Of these 5.5 acres approximately, 4.1 acres consist of a road and associated swales and 1.4 acres consist of a historic fill pile. The historic fill pile corresponds with the fill mound topographic feature previously identified (6.2.5). This area is of little ecological value. It is dominated by jumbay at higher elevations and casuarina near the wetland boundary. A few pine snags are present. Pond top palm, poison wood and dogwood are also present. Shrubs include nightshades, rough velvet seed and bracken fern.

Vines including poison ivy, China brier and wild yam are common. Ground cover includes broom sedge and beard grass.

Roads and associated swales are composed of compacted lime rock. These areas retain runoff from the road allowing some grasses and ephemeral wetland indicator plants to persist. The dominant plants include shrubby false buttonweed, matchgrass, dropseed, slender beardgrass, bushy beard grass, broom sedge, sleepy morning, white beggar ticks, morning glory, blue flower, pencil flower, coastal stemodia, capeweed, blue hearts, burr grass, sandmats, low rattlebox, goosegrass, lovegrass, silver plume grass, Johnson's grass, rustweed, finger grass, sanddune chinchweed, low beak rush and marsh pink. The roadways provided habitat for red-legged thrush and the gravel along the diagonal road attracted mourning and ground doves **(Figure 6.20).**

Figure 6.20: Human Disturbed Community

6.3.1.5 Freshwater Wetland

Three distinct freshwater wetland communities consisting of a total of approximately 0.8 acres were observed in karstic limestone depressions. These communities correspond with the karstic solution holes associated with the pine highland topographic features (6.2.5). These depressions flood in the rainy seasons and contain rich soils due to the accumulation of organic matter providing suitable habitat for freshwater wetland plant communities. Plant associations vary considerably between each depression and include knotted spikerush, water hyssop, pennywort, water grass, Florida whitetop, smooth corchorus, pond top palm, and sugar cane. Other plants of

these depressional wetlands include giant fern, marlberry, sawgrass, hurricane grass, silk grass, loosestrife, capeweed, beak rushes, milk vine and wild mulberry. A red-winged blackbird was observed near these depressions **(Figure 6.21).**

Figure 6.21: Freshwater Wetland Community

6.3.1.6 Mangrove Wetland

A large area of dwarf mangrove swamp consisting of approximately 9.7 acres occurs between Hawksbill Creek and the site. The dominant species is the red mangrove. Low levels of nutrients and rocky substrate has resulted in a dwarf forest and recent hurricanes have caused serious damage. The presence of arching prop-roots indicates the small trees are mature but dwarfed by lack of suitable habitat**.** A few fiddler crab burrows were observed but were scarce. No mangrove crabs, coffee snails or ramshorn snails were observed. No wading or shore birds were observed during the September survey but were present in a January 2008 site visit. The low mangroves appear to have low production, export and wildlife value (**Figure 6.22**).

Figure 6.22: Mangrove Wetland Community

The mangrove wetland was delineated in the field using pink flags marked with "wetland delineation" in text. Each flag was assigned a number beginning with #98 and ending with #137. A total of 40 flags were established along the boundary. A map of the located flags and wetland boundary is located in **Exhibit 15**. Generally, the boundary follows along three wetland transitional species, including:

- Green buttonwood (*Conocarpus erectus*)
- Brier tree / Ming tree (*Bucida spinosa*)
- Ram's horn (*Pitchecellobium guadelupense*)

6.4 Migratory Bird Surveys

Bird surveys were conducted throughout the year on the project site. Surveys were conducted in April 2007, September 2007, and January 2008. Also bird species were documented during other field investigation for well surveys conducted from November through December 2007. Observations were made along auto (diagonal road) and pedestrian transects using binoculars **(Figure 6.13).** The special quantitative study was done in the morning. The other transects were performed throughout the day. Please refer to the following tables for survey results.

- **Table 6.3**: April 18, 2007 (All Day – Adjacent Levarity Site)

- **Table 6.4**: September 12, 2007 (All Day)
- **Table 6.5**: September 13, 2007 (Early Morning Hours)
- **Table 6.6**: January 4, 2008 (Early Morning Hours Along Hawksbill Creek)
- **Table 6.7**: Random Observations – Between September 2007 – January 2008

Table 6.3: Bird Survey April 18, 2007 – Adjacent Levarity Site

Common Name	*Scientific Name*	Habitat
Great Egret	*Casmerodius albus*	Mangrove
Turkey Vulture	*Cathartes aura*	All
Common Ground Dove	*Columbia passerine*	Pine/Whiteland
Crow	*Corvus spp.*	Disturbed
Smooth-Billed Ani	*Crotophaga ani*	Pine/Whiteland, Disturbed
Prairie Warbler	*Dendroica discolor*	Pine/Whiteland, Coppice
Olive Gray Warbler	*Dendroica spp.*	Costal strand, Mangrove
Northern Mockingbird	*Mimus polyglottos*	Pine/Whiteland

Table 6.4: Bird Survey September 12, 2007

Common Name	*Scientific Name*	Habit
Red-Winged Blackbird	*Agelaius phoeniceus*	Freshwater wetland
Red-Tailed Hawk	*Buteo jamaicensis*	Coppice
Turkey Vulture	*Cathartes aura*	All
Common Ground Dove	*Columbia passerine*	Pine/Whiteland
Smooth-Billed Ani	*Crotophaga ani*	Pine/Whiteland, Disturbed
Bahama Mockingbird	*Mimus grundlachii*	Pine/Whiteland
Northern Mockingbird	*Mimus polyglottos*	Pine/Whiteland
Hairy Woodpecked	*Picoides villosus*	Pine
American Redstart	*Setophaga ruticilla*	Coastal strand
Red Legged Thrush	*Turdus plumbeus*	Disturbed
Gray Kingbird	*Tyrannus dominicensis*	Pine/Whiteland
Mourning Dove	*Zenaida macroura*	Pine/Whiteland

Table 6.5: Bird Survey September 13, 2007

Common Name	*Scientific Name*	Number Observed	Habitat
Common Ground Dove	*Columbia passerine*	2	Pine/Whiteland, Disturbed
Smooth-Billed Anis	*Crotophaga ani*	5	Pine/Whiteland, Disturbed
Northern Mockingbird	*Mimus polyglottos*	11	Pine/Whiteland
Red Legged Thrush	*Turdus plumbeus*	10	Disturbed
Mourning Doves	Zenaida macroura	12	Pine/Whiteland, Disturbed

Table 6.6: Bird Survey January 4, 2008

Common Name	*Scientific Name*	Number Observed	Habitat
Common Ground Dove	*Columbia passerine*	2	Pine/Whiteland, Disturbed
Smooth-Billed Anis	*Crotophaga ani*	5	Pine/Whiteland, Disturbed
Northern Mockingbird	*Mimus polyglottos*	11	Pine/Whiteland
Red Legged Thrush	*Turdus plumbeus*	10	Disturbed
Mourning Doves	Zenaida macroura	12	Pine/Whiteland, Disturbed

Table 6.7: Random Observations – Between September 2007 – January 2008

Common Name	Scientific Name	Number Observed
American Kestrel	*Falco sparverius*	1
Unidentified Ducks	*G. spp.*	>20

These assessments did not reveal the presence of any species of special concern. Assessments also suggest that more in depth analyses would reveal that bird species richness and overall diversity would be low. It appears that the lack of canopy trees and tall shrubs in the pine and coppice communities adversely affects bird life. As observed, the taller plants of the coastal strand provided habitat for anis, warblers, and hawks. The ducks were not able to be identified as they took flight immediately on approach. Very few wading birds were observed in the mangrove swamp and shallow waters of Hawksbill Creek. This may be explained by the low productivity of the dwarf red mangroves and the absence of coffee snails, ramshorn snails, mangrove crabs, portunid crabs, and small fishes seen in our examination of the red mangroves. A few fiddler crab burrows were observed but living specimens were not observed.

6.4.1 Special Features, Sensitive Areas, and Protected Flora and Fauna

Two species of trees listed in the 1997 Conservation and Protection of the Physical Landscape of the Bahamas Act were found on the site. These include the Caribbean Pine *Pinus caribaea* var *bahamensis* and the mahogany *Swietenia mahogany*. The mahogany is also listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The red cedar *Juniperus lucayana* or also known as *Juniperus barbadensis* is another species listed by CITES and the Physical Landscape Protection Act. The red cedar was not seen on the Area 4 site, but was found west near the old Bahama Cement quarry (Area 5). All three of these

species are listed because of their importance as objects of commerce. Both pine and mahogany were cut as commercial lumber crops and over harvesting resulted in the need for protection.

The Caribbean Pine occurs on five islands in the Bahamas; Grand Bahama Island, Great and Little Abaco, Andros and New Providence. Pine forests were logged commercially on all of these islands between 1905 and 1967. Development on the uplands of these five islands requires the removal of pine trees. There are virtually no live pines larger than saplings on the Bahama Rock Area 4 site. All of the larger pine trees died due to wind or salt water damage resulting from storms, or from changes in water levels or disease. The lack of living mature trees has severely limited the number of young on the site.

The site contains numerous mahogany seedlings, saplings and small trees. They are not of timber size or quality. Their common use as landscape trees has spread the species into many new habitats and additional protection of small trees is probably not warranted. The transplanting of trees from a rocky substrate such as Area 4 has a very poor survival rate and, Bahama Rock does not intend to transplant the trees. The trees will be made available to the general public.

Red cedar also was harvested for wood to line chests, closets and for making pencils. In places where the cedar occurs at low elevations, they are often associated with depressional wetlands and can be the host of *Tolumnea* and *Broughtonia* orchids. None were observed in the depressional wetlands or other habitats on the site. Those observed to the west (offsite) were small bushy specimens growing on the slope of an abandoned borrow pit. None were observed on the Area 4 site.

6.5 Ambient Air Quality

Grand Bahama Island's relatively remote location and low density of development help ensure that the air quality is excellent year around. The small population and expansive character of Grand Bahama Island successfully keeps pollution sources from having a significant effect on the ambient air quality of the region. In the absence of baseline air quality standards for the region, the emissions from the development of Area 4 have been calculated and compared to

United States standards. These calculations indicate that the resulting emissions are not significant.

Area 4 is an undeveloped parcel. No significant sources of air emissions currently exist. The adjacent Area 3 is an active excavation area. Emission sources include particulate emissions from excavation activities, material transportation and material processing. Emissions from excavation activities result during the removal of unsuitable material from the surface to reach consolidated material. Emissions from these pre-strip removal activities can be minimized by the application of water during the removal activity. The majority of the material is blasted underwater, thus emissions from this activity are negligible. All blasted material is excavated from below the water surface therefore no emissions result from this process. The dragline is electrically powered with no particulate emissions. Emissions from material processing will remain essentially the same as no increase in material production is planned. The processing plant is powered electrically, thus no particulate emissions result. The increased emissions from the development of Area 4 will result from the added distance the material will be transported to the existing processing plant. Haul road emissions will be controlled through the use of dust suppression techniques such as use of a water truck and installation of fixed sprinkler systems in certain areas. Emissions from mobile sources do occur, but are not included in the emission calculations since in the absence of baseline standards and the comparison to U. S. standards; emissions from mobile sources are not regulated or included when calculating emissions from this type of facility. A minor increase to current mobile source emissions is expected due to the increase in the haul distance in developing Area 4 as compared to the current Area 3 development activities. Any potential transboundary emissions will be controlled or eliminated through the methodology described above and the specific EMP procedure.

Figure 6.23: Dust Suppression with Water Truck Area 3

6.6 Ambient Noise Quality

As part of the Environmental Impact Assessment (EIA) a Noise Study was conducted by Geosonics Inc. In order to provide the evaluation, current and future noise levels were measured, predicted and evaluated as part of this study. In all aspects of this review, recommendations as necessary to reduce community impacts were made. This is consistent with Bahama Rock, Ltd.'s goals to minimize the effects on adjacent communities while still conducting quarrying operations.

Noise levels measurements were made of heavy equipment operating at the Bahama Rock, Ltd., quarry at various locations and at specific distances. The noise levels were taken to be used in noise level prediction when operations would be relocated to Area 4. The equipment that would be used for Area 4 was recorded to allow prediction of noise to adjacent communities. In addition, noise levels were made of existing equipment that would remain stationary within the existing operation to allow a full review of noise to be completed. On June 26, 2008 through July

24, 2008 background noise level measurements were made within the adjacent community. Two Geosonics, Inc. remote noise level meters were placed at locations west and southwest of the existing quarry operation, the harbor and within the community adjacent to Area 4. These noise levels were recorded at a minimum for Thursday through Tuesday to assess the existing community noise levels. The measurements of background noise were completed at six individual locations over the one month monitoring period. The units provided daily download of data for evaluation by Geosonics, Inc. Each unit was set up at a location that would represent one of, if not the, closest location to the future Area 4 site. The measurements were taken to provide the current existing noise levels at each location so that they are able to be used as representative background noise levels of the community.

Noise levels from the quarry operation and the overall noise within the adjacent communities are evaluated for general "annoyance or interference" to human activity. Standards are generally developed so that annoyance with speaking and sleep will not be produced. The overall evaluation of a community and not a single individual has been assessed and noise level standards created.

The noise levels from the various quarry equipment were measured as a part of this study. Noise from the ship loader, primary crusher, loaders and haul units and the dragline were measured at varying distances. Measurements were made to indicate relative distances from this equipment that operations could be conducted and meet noise standards, or at least would fall within ambient levels. These levels were also used for noise modeling. Specific noise levels for the equipment are in **Table 6.8**.

Table 6.8 Noise Measurements – A-Weighted Sound Levels

Equipment	Distance (ft)	Noise Range dB(A)	Comment
Dragline	250	72-76	Dragline-Hoist, swing, dump & return
Dragline	500	65-72	Dragline-Hoist, swing, dump & return
Loader / Hall Units	30 – 143	110.5	Maximum Noise Level momentary peak
Loader / Hall Units	500	60-68	Loading
Loader / Hall Units	1,000	50-67	Loading
Loader / Hall Units	2,000	50-60	Loading
Ship Loader	250	60-65	
Ship Loader	500	50-57	
Ship Loader	1,000	48-52	> 1,000' Ship Loader not audible-conveyor louder noise
Conveyor	150	72	Ship Loader Conveyor with material
Conveyor	100	65	Primary Crusher Conveyor Empty

In order to address noise levels within the community and determine whether the noise would exceed the World Bank limitations, measurements were required within the adjacent community. Community noise levels are an aggregate of traffic, ambient noise and individual activity within the community. The noise levels were measured during periods that would represent work day and weekend activity. The closer locations would also be influenced by the Port of Freeport activity, at all times. The hourly L_{Aeq} noise levels are summarized in **Table 6.9**. These are separated between daylight and nighttime hours and averaged for the overall measurement period over multiple days to reach a single number level.

Table 6.9 Community Noise Levels

Monitoring Location	L_{Aeq} Daytime	L_{Aeq} Nighttime
Brian Burrows Residence	48.220	45.135
Lindy Russell Residence	42.979	43.574
Rudolph Evans Residence	45.749	45.676
Robert Campbell Residence	48.187	40.301
Keva Garland Residence	41.271	42.704
Anna Swan Residence	41.303	45.559

From the noise levels measured, all of the locations would have ambient levels less than the 55 dB L_{Aeq} World Bank daytime standards for residential communities. The nighttime levels that currently exist in the area of the Brian Burrows residence; Rudolph Evans residence and the Anna Swan residence are all slightly in excess of the 45 dB L_{Aeq} World Bank nighttime standard.

The Geosonics Inc. Noise Measurement and Evaluation report is located in **Appendix 10**. Bahama Rock commits to maintaining an acceptable level of ambient noise to ensure a positive coexistence with the nearby community.

6.7 Infrastructure and Public Services

The following discusses the infrastructural setting and public services available in the vicinity of the Area 4 project site and surrounding vicinity.

6.7.1 Potable Water Supply

An eight inch (8”) water main exists along the south/east side of the Warren J. Levarity Highway. This main provides potable water from Grand Bahama Utility Company to settlements scattered throughout the western portion of the island, including Eight Mile Rock.

6.7.2 Private Wells

A private well survey was conducted within the Eight Mile Rock Community on the dates of November 14th, December 13th, 19th, and 20th of 2007. Door to door interviews were conducted in the Settlements of Hanna Hill, Bartlett Hill, Harbour West, and Pinedale. Approximately 500 homes were investigated. A total of 41 private wells were identified as existing. Residents indicate that these wells are used for a variety of water uses including cooking, cleaning, bathing, irrigation, and back-up supply during severe storm events. Of the 41 residences with wells, 18 residences have a city water connection. The remaining 23 residences are not connected to the city water system. Only a few of the 41 residences indicate that water from wells is used for all purposes.

Water samples from six (6) of the wells were collected and analyzed for salinity and conductivity on February 19, 2008. Additionally samples were collected on August 6, 2008, and September 2, 2008. Salinity and Conductivity measurements were analyzed in the field using a Yellow Springs Instrument (YSI) model 30 conductivity and salinity meter for all three events. All water samples from the February 19th, 2008 event were categorized as freshwater based on salinity of <0.6 parts per thousand (ppt) and a conductivity of <1,300 microsiemens/centimeter (uS/cm). On August 6, 2008 water samples were collected from 12 residences with private wells. All of the residents with the exception of Mr. Fox (3.1 ppt and 6150uS/cm) and Mr. Green (0.8 ppt and 1608 us/cm) both located in Andros Town, Eight Mile Rock were categorized as freshwater. This may be due to well construction or intakes being below the freshwater lens. The results for this event are presented in Table A-7 in **Addendum 1**.

On September 2, 2008 water samples were collected from seven (7) residences in the Eight Mile Rock Community and one (1) from the Envirologic International Ltd. office located at 6 West Atlantic Drive, Freeport, Grand Bahama Island. This was the first sampling event in which samples were collected for laboratory testing. Samples were collected for the following parameters, volatile organic chemicals, chlorides, and total coliform and escherichia coli. Conductivity and Salinity were measured in the field using an YSI Model 30 portable meter. The results from this sampling are presented in **Table 6.10**.

Table 6.10: September 2, 2008 Sample Results

Number	Settlement	Sample	Resident	City	Private	Both	Conductivity us/cm	Salinity(ppt)	Chlorides (mg/L)	Total Coliforms	E.Coli
1	Bartlett Hill	PW-MW-JRS	Myrtle Williams		X		1031	0.5	120	Present	Present
2	Bartlett Hill	PW-CB-JRS	Claudia Bain	X	X	X	816	0.4	70	Present	Present
3	Pinedale	PW-KW	Keva Garland		X		722	0.3	51	Present	Absent
4	Hanna Hill	PW-AB-JSR	Alfred Bethel	X	X	X	1355	0.7	210	Present	Absent
5	Hanna Hill	PW-JL-Atown	Jennifer Louistean		X		938	0.4	82	Present	Present
6	Hanna Hill	PW-JG-Atown	Jeff Green		X		2180	1.1	430	Present	Present
7	Hanna Hill	PLU-MBLucitas-SR	Mrs. Blackey (Lucita's)	X	X	X	1090	0.5	93	Present	Present
8	Freeport	EIC Office	Evirologic Office	X			1237	0.6	230	Present	Absent

Notes:

Street names are local names and not official names

JRS - John Rolle Street
JSR - Jack Smith Road
- Private Well Only
SR- Sapodilla Road
- Private Well and City Water
A-Town - Andros Town
- City Water only

No Volatile Organic Chemicals by EPA 8260B were detected at a dilution factor of one (1) in any of the seven (7) private wells sampled in the Eight Mile Rock Community. The water sample collected from Envirologic International Ltd. office, the source of which is city water provided by the Grand Bahama Utility Company, showed the presence of Bromoform and Chlorodibromomethane at 21 ug/L (parts per billion) and 1.9 ug/L respectively. These two compounds are byproducts from the chlorination of water to kill bacteria.

Chlorides results for water samples ranged from 51 mg/L to 430 mg/L. The United States National Secondary Drinking Water Standard (NSDWS) for Chlorides is 250 mg/L. The NSDWS suggested maximum contaminant level is to protect the public from odor and aesthetic problems in drinking water that could cause many people to stop using an affected public water system. Only Jeff Green (430 mg/L) in Andros Town, Eight Mile Rock exceeded the secondary standard.

Of the seven (7) samples collected from the Eight Mile Rock Community five (5) tested positive for both Total Coliform and E.Coli. The one city water sample tested positive for total coliforms but was negative for E.Coli. It is recommended that an additional round of sampling be conducted to confirm the results and aid in determining the extent and source of the freshwater lens contamination.

A summary of the well survey and the locations are presented in the Water Resource Assessment and Ground Water Modeling Report located in **Appendix 3**. Other monitoring well profiles and

private well data are presented in the Water Resource Assessment and Ground Water Modeling Report Addendum 1 and the Private Well Sampling Report Eight Mile Rock Community also in **Appendix 3**. A Private Well Location map is also located in **Exhibit 29**.

Bahama Rock will continue monitoring of both the permanent monitoring wells and private wells (6 nearest and 6 furthest) on a quarterly basis to monitor changes in the freshwater lens. Changes in dimensions of the freshwater lens can be adequately monitored using these monitor wells and selected private wells.

Bahama Rock will be responsible for city water connection of any homes with a private well adversely affected by a diminished freshwater lens. This commitment includes payment of any connection fees and deposits required. This issue will require further discussion with the Grand Bahama Utility Company, Port Authority, and homeowners. Bahama Rock commits to mitigation efforts as it relates to the protection and minimizing damage to the freshwater lens.

6.7.3 Transmission Lines

Transmission lines carrying power, cable, and telephone services run along the north and west side of the Warren J. Levarity Highway. Services are provided by Grand Bahama Power Company, Bahamas Tele-communications Company (BaTelco), and Cable Bahamas.

6.7.4 Roads

Grand Bahama Island is approximately 80 miles long and nine miles wide at the widest point. With the exception of urban and residential areas, the road system on the island consists primarily of one major two-lane highway that extends from West End to McLean's Town on the east end of the island. Access to Area 4 is obtained from the Warren J. Levarity Highway via a track road. The track road extends northwest through Area 4 to the western project boundary. A series of smaller less frequented paths intersect the track road in a north south direction at different locations. These smaller roads are more difficult to locate because they are partially overgrown with vegetation, however, they are apparent upon review of recent aerial photography.

Chapter 7: Impact Analysis

7.0 Chapter Overview

An impact is defined as a change to baseline conditions caused by project activities. This chapter discusses impacts to the existing baseline condition defined in 6.0 caused by project activities defined in 5.0. For the purpose of this EIA, impacts were analyzed using two impact matrices. One matrix was used to identify anticipated impacts. The other was used to classify impacts and mitigation measures based on relative significance.

7.1 Impact Identification Matrix

The Impact Identification Matrix was developed as follows:

1) Project stages and individual project activities were arranged along the matrix's horizontal axis.
2) Baseline categories and individual baseline conditions were arranged along the matrix's vertical axis.
3) Cell interactions between project activities and baseline characteristics were marked where an impact was anticipated to occur. Cells not marked indicate than an impact is not anticipated to occur.

Please refer to **Table 7.1** for the resulting Impact Identification Matrix.

7.1.1 Interpretation of the Impact Identification Matrix

Major baseline characteristics including physical environment; biological environment; infrastructure and utilities; and socio-economics, health, safety, and quality of life are indicated in a top to bottom sequence. Project activities which affect baseline characteristics are included in a left to right sequence. Project activities include site preparation, utility work, bridge construction, Area 4 excavation, Area 3 & 4 retreat, and future land uses.

7.1.2 Explanation of Impact Identifications

Some portions of **Table 7.1** are marked with a "-", meaning no impact is anticipated to occur. A "No Proposed Impact" was assumed where an interaction between the site activity and baseline condition is not proposed occur, or where the interaction is so minor that a reasonable quantitative approach is not capable of being performed. For example, the baseline condition of "Climate and Tides" is not anticipated to be impacted by the activities of "Bridge Construction, Climate and tides will not be adversely or positively react to the project activities of site preparation, utility work, and bridge construction. This approach of impact determination was utilized on the 374 possible impact interactions.

If an impact is identified in **Table 7.1** ("X"), the impact interaction and its relative degree of significance is further detailed in **Table 7.2**, and then described in greater detail in the following text.

7.2 Impact Classification and Mitigation Matrix

Table 7.2, the Impact Classification and Mitigation Matrix, stems from and further details impacts identified in **Table 7.1**. The Impacts Identification Matrix was developed as follows:

1) Impacts to project baseline conditions were summarized and named along the matrix's vertical axis.

2) Impact types were arranged along the matrix's horizontal axis. In order of determination impacts were classified as:
    a) Positive or Adverse: Refers to whether the impact is likely to either benefit or adversely affect existing environmental conditions, general community, or the economy of Grand Bahama Island.

    b) Insignificant, Moderate, or Significant: Refers to the degree of impacts as they relate back to societal uses or extreme differences from established baseline conditions. These classifications are assigned in order of extremity from the original baseline condition. For example, a significant impact would be the

creation of a land mass, which was formally an open water body, or vice versa. Insignificant impacts include those that are generally unnoticeable, very short term, intangible, or where only small changes are anticipated to occur. Moderate is obviously a classification for an extremity between significant and insignificant. These classifications are subjective and often difficult to assign since relative degree of significance can change from one perspective to another.

d) Direct or Indirect: Direct impacts include those that are completely tangible. For example, a direct impact may be five acres loss of an ecological community or creation of 25 jobs. Indirect impacts often include the secondary affects on society as the result of a direct impact. For example, if five acres of mangrove wetlands are directly impacted, this could indirectly affect fisheries, which society often depends on for commercial use.

e) Short-Term or Long-Term: Short-term and long-term refers to the duration of the expected impact. An impact may only last for a couple of days or be as long as lifetime of the project or future use. For example, a road project might have a short-term risk for erosion to occur during construction, but may have long-term impacts to improved traffic flow. For the purposes of this assessment, short-term refers to an impact expected to last for the timeline of the Area 4 project, while long-term generally refers to the duration being generally fixed and permanent, lasting beyond the Area 4 project timeline and is some cases in perpetuity

3) Mitigation for each impact was determined as being required or not. Mitigation measures are discussed in 8.0.

Please refer to **Table 7.2** for the resulting Classification and Mitigation Matrix.

7.2.1 Interpretation of the Impact Classification and Mitigation Matrix

Impacts are listed vertically down the left side of the table. Vertical columns running left to right further classify the impact as being positive or negative, and indicate significance, type, and duration. Mitigation is proposed as "yes" or "no". The report section for justifying the classification of the impact is included in the far right column.

Table 7.1 Impact Identification Matrix

Table 7.1 Impact Identification Matrix (X) = Indicates Proposed Impact (-) = No Proposed Impact		Site Preparation		Utility Work			Bridge Construction				Area 4 Excavation			Area 3 and 4 Retreat	Future Land Use		
		Vegetation Clearing and Stockpiling	Overburden Removal	New Potable Water Main	Relocate Overhead Transmission Lines	New Power Substation	Grade Preparation	Bridge Construction	Bridge Traffic Initialization	Old Highway Section Demolition & Removal	Dragline Reloation	Drilling and Blasting	Excavation and Material Processing	Area 3 and 4 Retreat	West End Connector Right-of-Way	Waterfront Opportunities	Preservation Areas
Baseline Site Conditions	**Physical Environment**																
	Climate and Tides	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-
	Storm Surge and Flooding	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	-
	Geology, Topography, and Soils	X	X	-	-	-	-	-	-	-	-	X	X	X	-	-	-
	Surface Water	X	X	-	-	-	X	-	-	X	-	-	X	X	-	-	-
	Groundwater	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-
	Ambient Air	X	X	-	-	-	X	-	-	X	-	X	X	X	-	-	-
	Ambient Noise	X	X	-	-	-	X	X	-	X	X	X	X	X	X	X	-
	Biological Environment																
	Mangrove Wetland	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
	Slope/Coastal Strand	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
	Pine Whitelands	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Coppice	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
	Human Disturbed	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fresh Water Pocket Wetlands	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Special Features & Species of Concern	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wildlife and Migratory Birds	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Road/Utility																
	Utility Services (i.e. power, water, cable, telephone)	-	-	-	X	X	X	-	-	X	-	-	-	-	X	-	-
	Residential Structures	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
	Roads and Traffic	X	-	-	-	-	-	X	X	-	-	-	-	-	X	-	-
	Socio-Economic, Health, Safety, and Quality of Life																
	Employment	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	-
	Economic Opportunities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
	Health and Safety	X	X	-	-	-	X	X	X	X	X	X	X	X	X	X	-
	Aesthetics	X	X	-	X	X	-	X	-	X	-	-	X	-	-	-	X

Table 7.2: Impact Classification & Mitigation Matrix

Table 7.2 Impact Classification & Mitigation Matrix	Impact Type								Mitigation Proposed		Reference to EIA Discussion
	Positive	Adverse									
	Significant	Insignificant	Moderate	Significant	Direct	Indirect	Short Term	Long Term	No	Yes	
Physical Environment											
Loss of Substrate and Topographic Relief				X	X			X	X		7.4.1
Risk of Erosion and Sedimentation into Surface Waters			X		X		X			X	7.5.1
Risk of Elevated Turbidity Levels within Port and Ocean			X		X		X			X	7.5.2
Tropical Storm Flooding		X			X			X		X	7.6.1
Rainfall Flooding		X			X			X		X	7.6.2
Tides, Currents, & Water Quality			X		X			X	X		7.5.3
Loss of Freshwater Lens				X	X			X		X	7.4.2
Risk of Dust Emissions		X			X		X			X	7.6.3
Biological Environment											
Loss of Vegetative Communities and Wildlife			X		X			X		X	7.5.4
Risk of Construction Encroachment into Preserve Areas			X		X		X			X	7.5.5
Infrastructure and Utilities											
Relocation of Utilities		X				X	X		X		7.6.4
Utility Upgrades	X				X			X	X		7.3.1
Traffic Interruptions		X				X	X			X	7.6.5
Improved Traffic Flow	X				X			X	X		7.3.2
Socio-Economic, Health , Safety, Quality of Life											
No Cost Harbour Expansion	X				X			X	X		7.3.3
Employment Opportunities	X				X	X	X	X	X		7.3.4
Future Economic Opportunities	X					X		X	X		7.3.5
Nuisance of Blasting Vibrations				X	X		X			X	7.4.3
Employee Safety		X				X	X			X	7.6.6
Short Term Noise from Site Activity			X			X	X			X	7.5.6
Long Term Ambient Noise		X				X		X	X		7.6.7
Short Term Aesthetics from Site Activity			X			X	X			X	7.5.7
Long Term Aesthetics from Land Use Changes		X				X		X	X		7.6.8
Loss of Private Wells		X				X		X		X	7.6.9

Impacts identified in the Impact Classification and Mitigation Matrix are broken down and explained as follows:

7.3 Positive Significant Impacts
7.4 Adverse Significant Impacts
7.5 Adverse Moderate Impacts
7.6 Adverse Insignificant Impacts

7.3 Positive Significant Impacts

There are a total of five (5) positive significant impacts. These impacts will more or less be realized in the long-term once the Area 4 excavation is complete. These anticipated impacts include the following:

- Utility Upgrades
- Improved Traffic Flow
- No Cost Harbour Expansion
- Employment Opportunities
- Future Economic Opportunities

7.3.1 Utility Upgrades

As discussed in 5.0, Area 4 does not currently contain provisions for utilities. Development of Area 4 will provide a utility right-of-way for future installations of new service lines and upgrades (4.0). Benefits from these upgrades are anticipated to be long-term. Benefits will be experienced during future land uses as waterfront opportunities develop and Area 4 becomes utilized.

The utility corridor, which will be dedicated along the West End Connector right-of-way, will eventually benefit projects on Western Grand Bahama, with additional power, water, cable, and telephone options. Therefore, this impact is considered a positive, significant, direct impact.

7.3.2 Improved Traffic Flow

Motorists traveling from the harbour Area to the West End must pass through Eight Mile Rock. Currently traffic through the area is frequent and somewhat congested, specifically during early morning and late afternoon school and work related rush hours. Also as projects in Western Grand Bahama continue to develop, traffic is likely to increase. Future development of the West End Connector Highway right-of-way will help alleviate bottlenecks, improve safety, and the overall quality of life for local residents. Benefits resulting from traffic alleviation are anticipated to be significant, direct, and long-term.

7.3.3 No Cost Harbour Expansion

Discussed previously in 3.0 and 5.0, Bahama Rock is providing a "no cost" deep water harbour as a result of its excavation activity. The traditional methods of harbour creation (i.e. dredge and material disposal) are costly. To date, Bahama Rock's past and current projects have provided a monetary value of approximately $750 million in equivalent harbour dredging costs. Areas 3 and 4 and the West Channel development would contribute an additional $750 million in dredge value. Several companies located within Freeport Harbour, have already realized economic gain from this significant benefit. This impact is obviously positive, significant, direct, and long-term.

7.3.4 Employment Opportunities

Development of Area 4 will generate a variety of employment opportunities during site preparation, haul road construction, bridge construction, excavation, Area 3 and 4 retreat, and future land use stages of the project. Employment impacts were previously discussed in 4.5, including short-term and long-term opportunities.

Employment opportunities will be generated on varying degrees. The Area 4 project will create employment positions for completion of the harbour expansion, which are defined as direct and short-term (10 years). In the long-term as businesses move into the expanded harbour, including marinas, shipping businesses, and marine services, indirect employment positions will be

created, and will last indefinitely. These positions will be dependent on the relative success of the business, but are generally considered long-term, or permanent future opportunities. Other employment positions could be created in adjacent areas, which will be indirectly attributable to the expanded harbour. An example could include businesses within the sea/air business center benefiting, thereby creating additional job opportunities.

7.3.5 Future Economic Opportunities

Development of Area 4 will generate various business and economic opportunities for a range of stakeholders. The future land use opportunities are anticipated to be long term as the waterfront develops and the future West End Connector Highway is constructed. The positive impact is categorized as indirect, since it is difficult to predict the exact monetary value that Area 4 will contribute to future uses, and ancillary spin off benefits as a result of the harbour expansion.

7.4 Adverse Significant Impacts

There are a total of three impacts categorized as adverse and significant. These impacts are anticipated to occur as a result of the Area 4 project. Impacts described are offset by measures outlined in 8.0 and 9.0. Collectively, these documented impacts include the following:

- Loss of Substrate and Topographic Relief
- Loss of Freshwater Lens
- Nuisance of Blasting Vibrations

7.4.1 Loss of Substrate and Topographic Relief

The conversion of the Area 4 uplands to a large water body is probably the most obvious of all impacts associated with the project. Disturbance of substrate and topography will take place during project activities including vegetation clearing, pre-strip activities, drilling and blasting, and excavation. Approximately 69% of Area 4 or approximately 135 acres more or less, will be transformed into an open waterway. The total amount of substrate to be excavated is approximately 17,000,000 cubic yards initially. Backfilling of Area 4 to a minimum controlling depth of 40 feet will occur during the Area 3 retreat and West Channel excavations. An

estimated 50% limestone fines will be returned to Area 4 in a contained fashion but maintaining commercial marine depth viability.

The majority of existing site soils and topographic relief features within Area 4 will be lost, thus making this a significant, direct, and long-term impact. There are not any direct mitigation measures which can be utilized to offset this transformation.

7.4.2 Loss of Freshwater Lens

Details of proposed changes to the freshwater lens are provided below, which is a summary of the detailed, "Water Resources Assessment and Groundwater Modeling Report", prepared by R.C. Minning & Associates, Inc. **(Appendix 3).** The existing state of the freshwater lens is detailed earlier in 6.2.7.

The configuration of the existing freshwater lens was observed to fluctuate significantly due to variations in precipitation, which was collected periodically throughout several seasons. Data collected to support the existing state of the freshwater lens occurred in the months of November 2007, December 2007, February 2008, July 2008, and August 2008. In order to determine how proposed development activities will likely impact the existing freshwater lens, a numerical model was completed using Visual Modflow and the SEAWAT code. Modflow was developed by the US Geological Survey and is the standard for three dimensional groundwater flow and transport modeling. SEAWAT couples the flow portion of the Modflow code with a mass/density-related flow transport model MT-3DMS. In addition to other solute transport projects, SEAWAT is specifically designed to simulate saltwater/freshwater interactions due to the density variations between salt and freshwater.

A 3D model grid was created and overlaid the area of interest after which the model was calibrated to measured field parameters. A number of computer simulations were developed to reflect various stages of Area 4 development and the corresponding changes to the existing freshwater lens. The model is discussed further below.

7.4.2.1 Simulation Results

The final simulation (Simulation 3, **Appendix 3 -**Water Resources Assessment and Groundwater Modeling Report) illustrates the effects of Area 4 being completely developed to its total depth. As indicated in the simulation, a small freshwater lens would remain to the south of the project area. The lens is approximately 1,800 feet across (North to South) and 6,000 feet long (East to West). Please refer to **Figures 7.1 - 7.4** for plan and cross section views of the simulated lens after full development of Area 4. Please also refer to **Exhibits 32 & 33** for more detailed depictions of these figures.

Figure 7.1: Plan View of Average Freshwater Lens After Full Development of Area 4

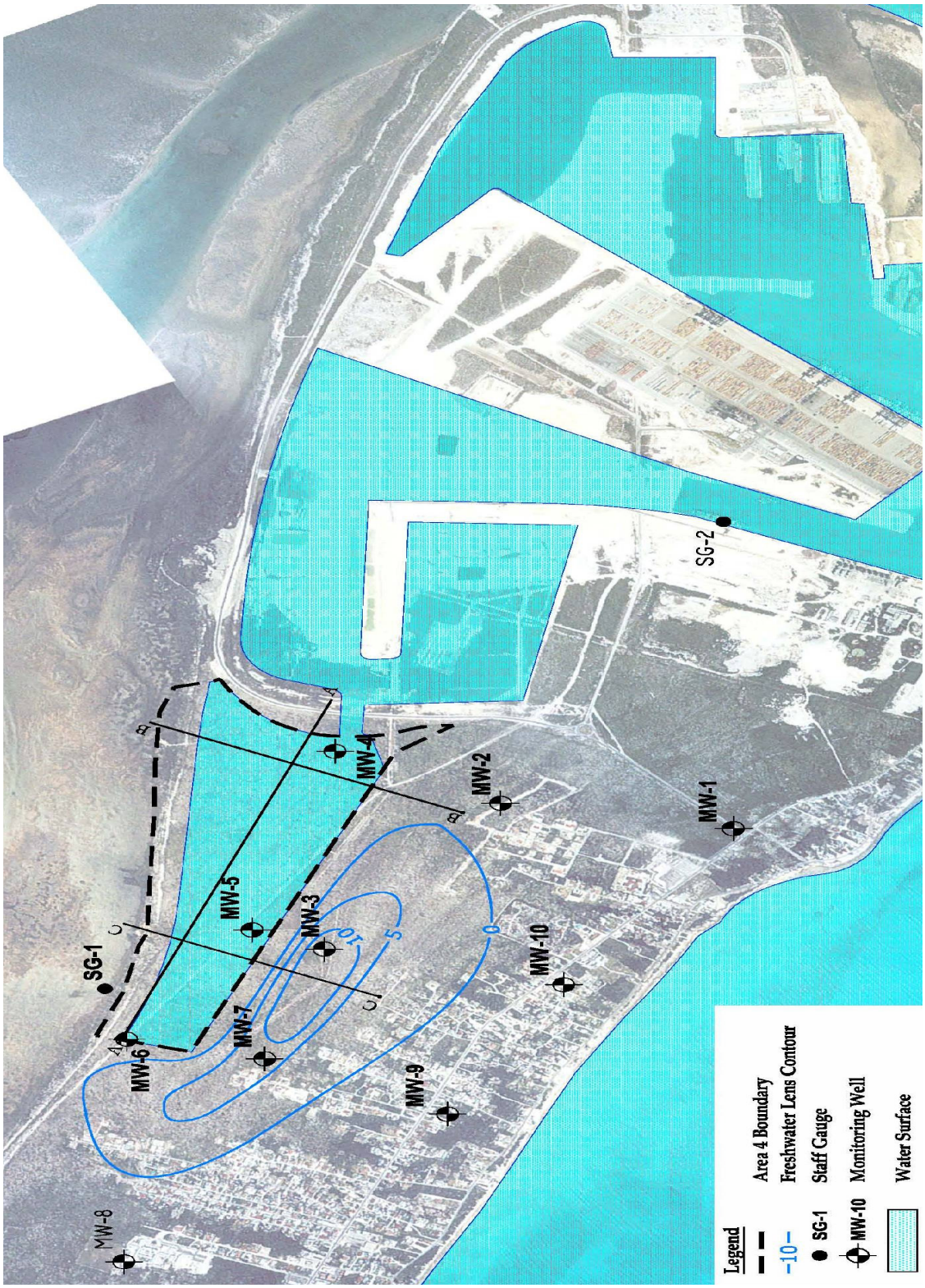
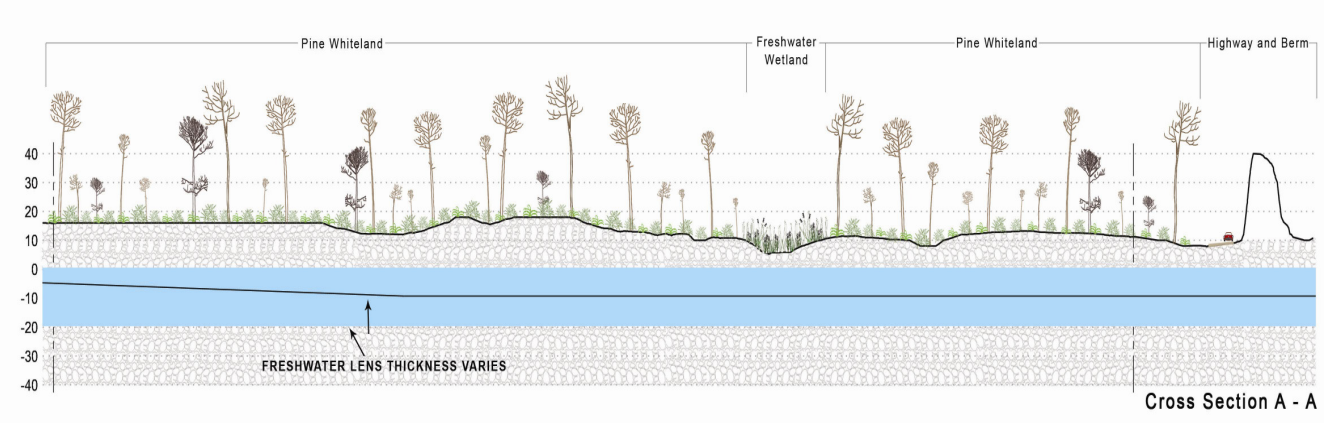
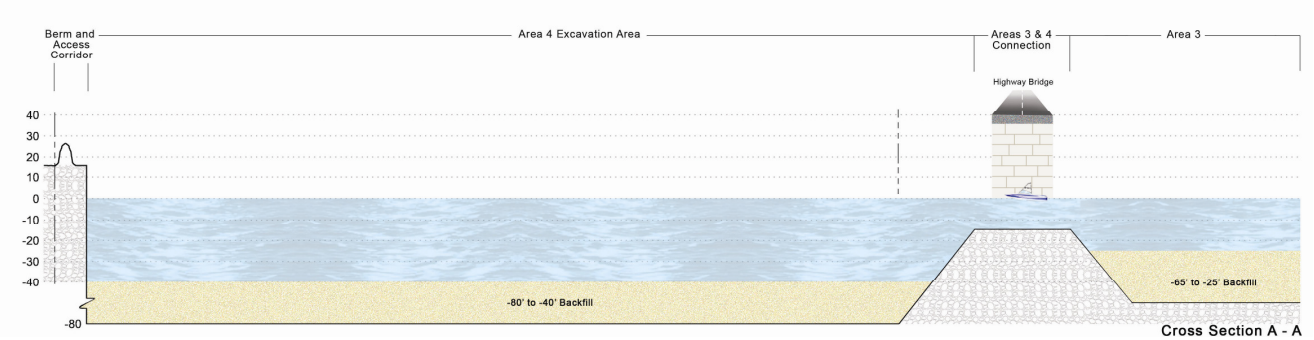


Figure 7.2: Cross Section A-A: Freshwater Lens Comparison

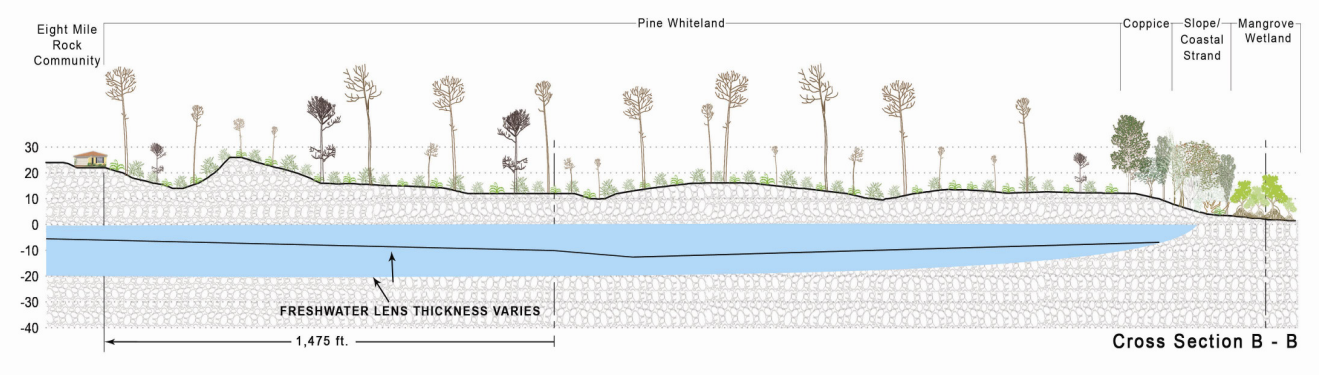


Existing

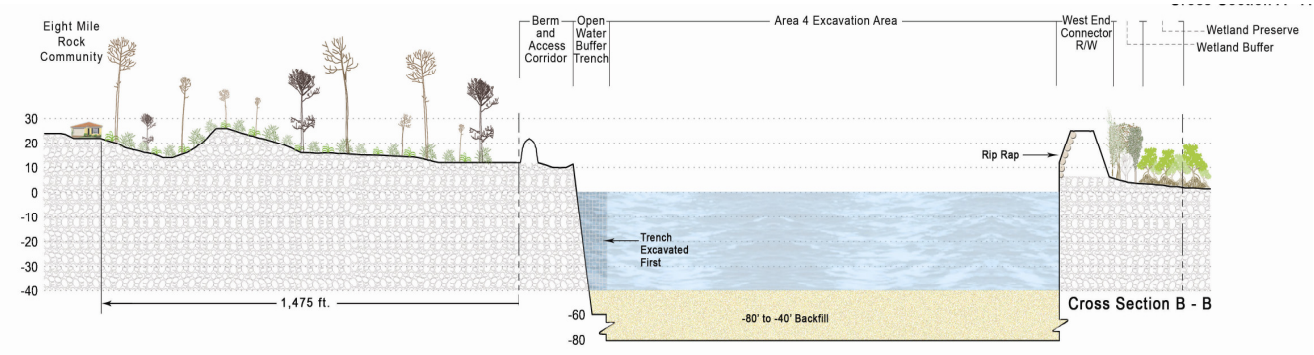


Proposed

Figure 7.3: Cross Sections B-B: Freshwater Lens Comparison

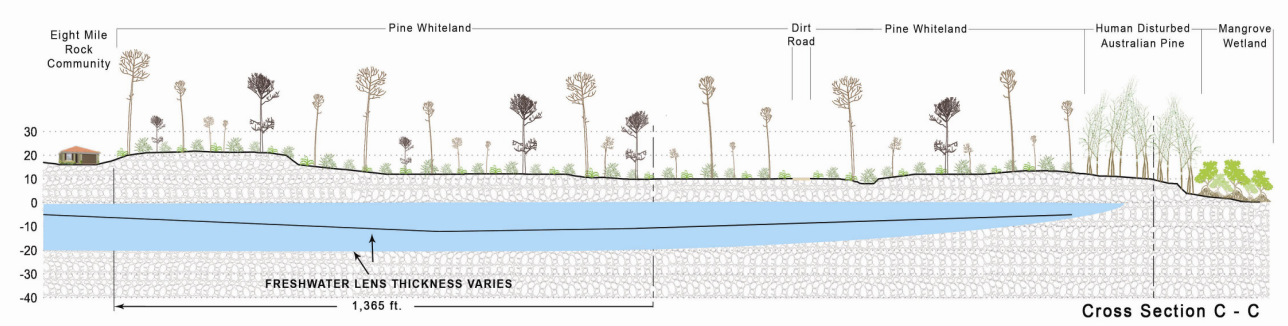


Existing

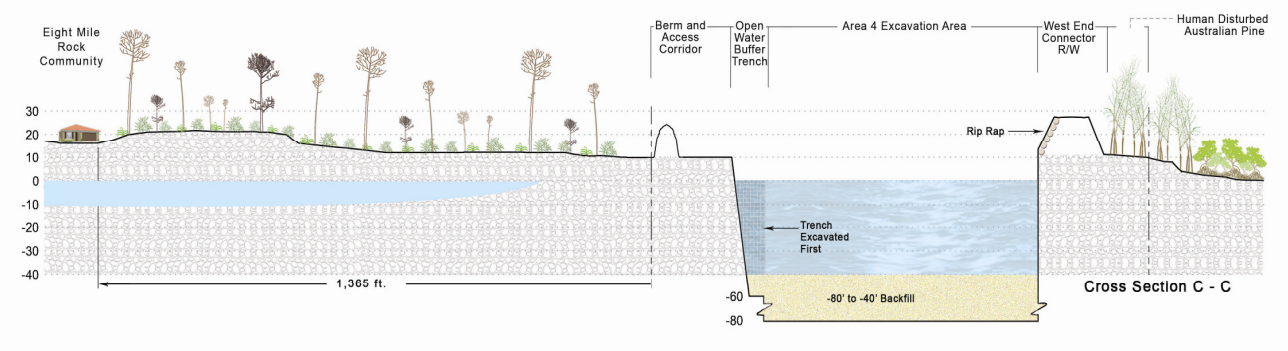


Proposed

Figure 7.4: Cross Sections C-C: Freshwater Lens Comparison



Existing



Proposed

As the figures suggest, impacts to the already reduced freshwater lens will be unavoidable resulting in a decrease in its average size and shape. Through years of harbour expansion and coincident development, the freshwater lens in the vicinity of Freeport Harbour has been progressively altered. The new impact will occur gradually as development of Area 4 progresses and waterway connections to the harbour are established. When considering the significance of this impact, it is important to note that the Grand Bahama Utility Company has repeatedly stated that the proposed area is not a viable source for potable water (**Appendix 11**). Area 4 lies in the Port Area west of the Fishing Hole Causeway. The development of Area 4 would undoubtedly result in a further reduction in the size and shape of the freshwater lens, and this impact is considered significant, direct, and long-term. Well impacts are discussed in 7.6.9. Mitigation is detailed in 8.0.

7.4.3 Nuisance of Blasting Vibrations

Data collection at the project site has been continual through the last several years of blasting at Area 3. Blasting vibration levels are measured in units of inches per second peak particle velocity (ppv). The U.S. Bureau of Mines has a standard of 0.75 inches/second ppv. Martin Marietta's standard is 0.50 inches/second ppv. The U.S. Bureau of Mines standard implies a 0% probability of any damages to a structure from the blast event. Three seismic data recorders have been in place within the community of Eight Mile Rock. These units will be relocated as shown in the Blast Management Plan (**Appendix 4**) and pre-blasts surveys will be conducted from structures within a 2,000 foot radius of the project. Results for 2006, 2007, and 2008 are summarized in **Table 7.3, 7.4,** and **7.5** respectively.

Table 7.3: 2006 Bahama Rock Blasting Results

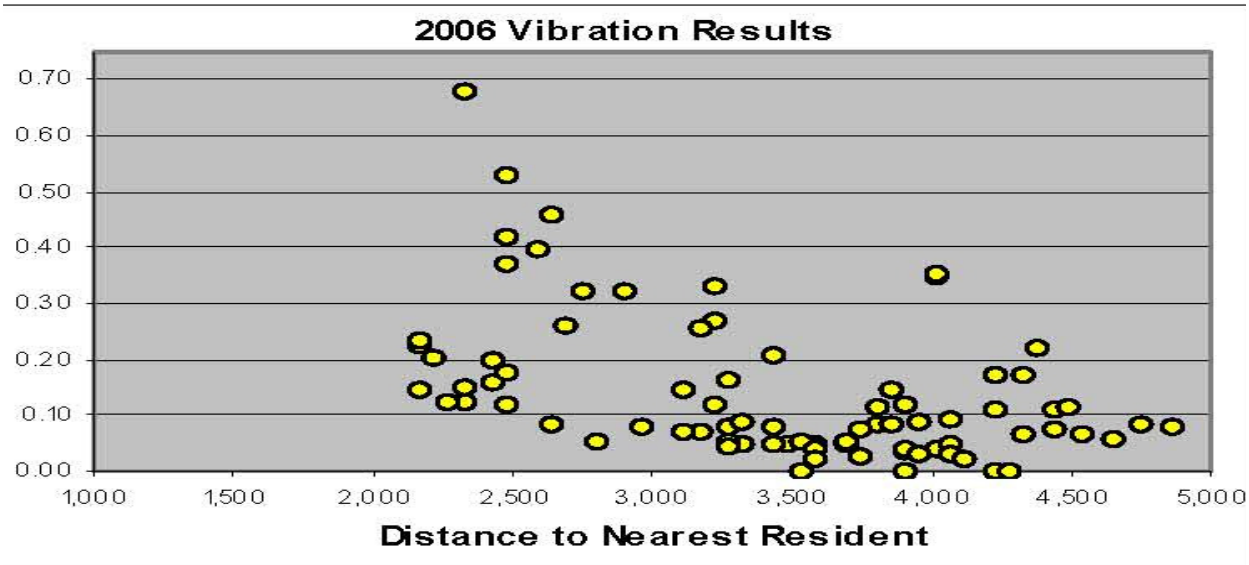


Table 7.4: 2007 Bahama Rock Blasting Results

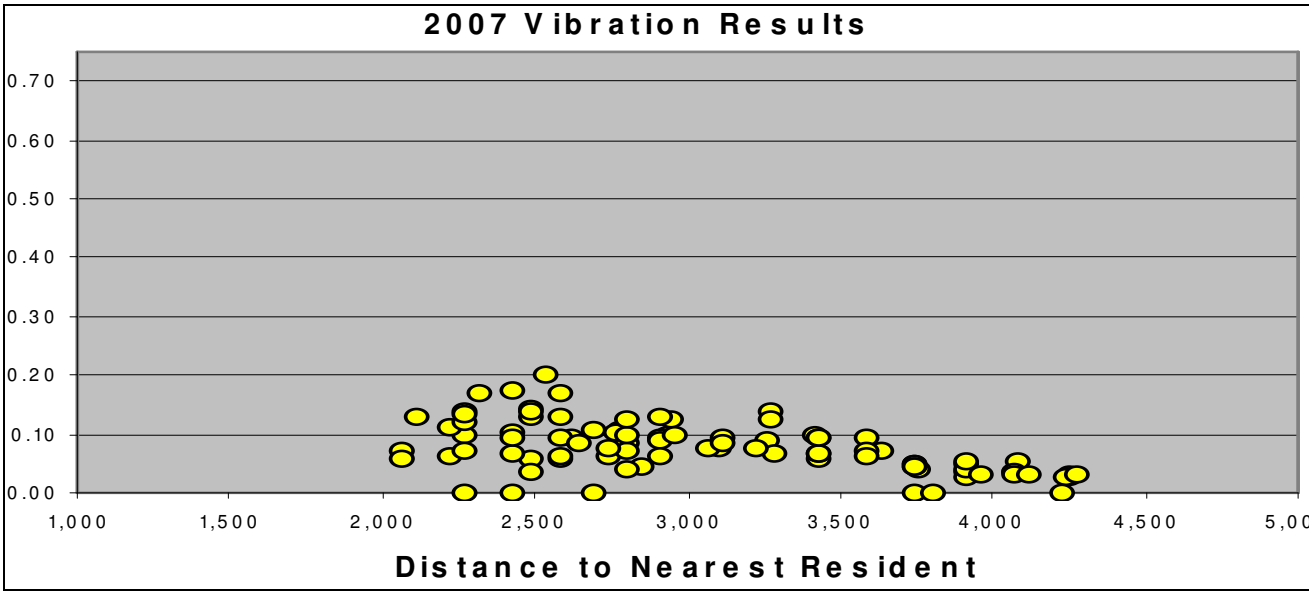
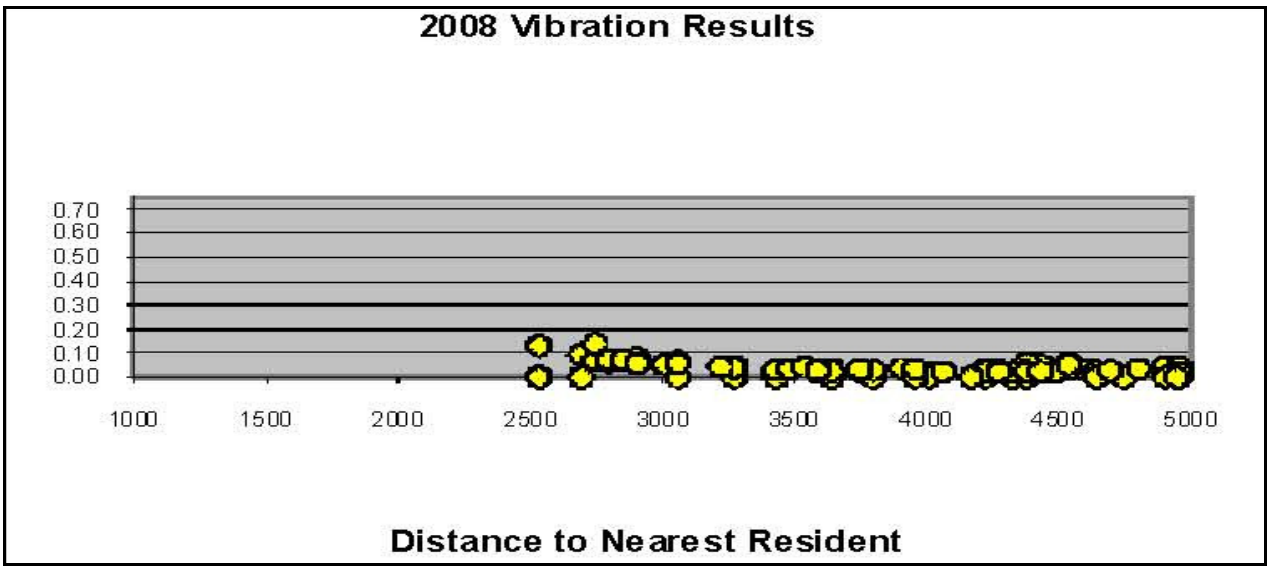


Table 7.5: 2008 Bahama Rock Blasting Results



Bahama Rock has a formalized blast complaint procedure. This procedure is currently being utilized for blasting of Area 3, and will continue to be utilized for Area 4. A summary of filed blast complaints is included within **Table 7.6**. In 2006, 18 complaints were reported to Bahama Rock between May and December. In 2007, nine complaints were reported by four different persons. All complaints were logged and investigated by Bahama Rock. From January to September 2008, only two complaints were received from one person. Individual detailed reports are available at Bahama Rock's offices. The significant reduction in nuisance complaints correlates to the modified blast techniques employed since late 2006. These techniques have resulted in achieving vibrations consistently below the target level since that time.

Table 7.6: Blast Complaint Summary

Date	Name 1	Name 2	Location	Complaint	Initial Visit	Dist. Ft. (1)	Inspection
24-May-06	Rolle	Gloria	Harbor West	Cracks	12-Jun-06	2,465	Yes
24-May-06	Bowe	Olivia	Harbor West	Cracks	12-Jun-06	2,325	Yes
12-Jun-06	Greene	Rosalie	Seagrape	Shake	1-Aug-06	9,464	Yes
12-Jun-06	Moxey	Stephen	Harbor West	Cracks	17-Jun-06	2,765	Yes
19-Jun-06	Jones	Wesley	Harbor West	Cracks	25-Jun-06	3,458	Yes
03-Jul-06	Duncombe	Tyrone	Harbor West	Cracks	13-Jul-06	3,248	Yes
17-Jul-06	Miller	Wilson	Harbor West	Shake	1-Aug-06	3,357	Yes
17-Jul-06	Fyne	Zandil	Bayshore	Cracks	21-Jul-06	8,788	Yes
26-Jul-06	Fowler	Jacqueline	Harbor West	Shake	27-Jul-06	3,677	Yes
26-Jul-06	Farquharson	Andre	Harbor West	Skake	31-Jul-06	2,254	Yes
26-Jul-06	Williams	Perleane	Bartlett	Cracks	28-Jul-06	4,732	Yes
26-Jul-06	Williams	Travis	Harbor West	Cracks	26-Jul-06	2,254	Yes (2)
26-Jul-06	Deveaux	James	Bartlett Hill	Shake	26-Jul-06	3,867	Yes
31-Jul-06	Fyne	Zandil	Bayshore	Shake		7,436	Yes
15-Aug-06	Kavala	Dr. M. R.	Hanna Hill	Shake	16-Aug-06	6,084	Yes (2)
19-Sep-06	Kavala	Dr. M. R.	Hanna Hill	Shake		5,137	Yes
21-Sep-06	Smith	Ernestine	Harbor West	Shake		3,075	Yes
04-Dec-06	Bowe	Olivia	Harbor West	Shake		2,433	Yes
03-Jan-07	Robinson	Solomon	Harbor West	Shake		3,312	Yes
15-Feb-07	Kavala	Dr. M. R.	Hanna Hill	Cracks		6,354	Yes
21-Feb-07	Kavala	Dr. M. R.	Hanna Hill	Cracks		6,185	Yes
29-May-07	Williams	Perleane	Bartlett Hill	Shake		3,914	Yes
23-Jul-07	Williams	Perleane	Bartlett Hill	Shake		4,398	Yes
08-Jun-07	Benson	Freddy	Hepburn Town	Shake	10-Jun-07	2,230	Yes
06-Nov-07	Williams	Perleane	Bartlett Hill	Shake		4,623	Yes
19-Nov-07	Williams	Perleane	Bartlett Hill	Shake		4,512	Yes
03-Dec-07	Williams	Perleane	Bartlett Hill	Shake		4,286	Yes
29-Apr-08	Nortlaus	Maria	Harbor West	Shake		3,582	No
22-May-08	Nortlaus	Maria	Harbor West	Shake		3,651	No

(1) = Distance (2) = Third Party Inspection Completed

Year	Complaints	Persons
2006	18	15
2007	9	4
2008	2	1

Source: Bahama Rock

As detailed earlier in 5.5.3, the blasting methodology used by Bahama Rock has been continually improved upon. Area 4 excavation will follow a strict Blast Management Plan (BMP), which is included as **Appendix 4.** The BMP includes details to assure that ground vibration levels remain below 0.20 inch/sec ppv. As an additional precautionary measure, Bahama Rock will utilize an open water buffer trench **(Exhibit 23)** to suppress vibrations to nearby residents. Open water as a method of reducing blast vibrations has been utilized extensively and shown to reduce surface vibrations by 25%. It should be noted that the buffer trench is not required to achieve a design blast level below the 0.20 inches/second ppv. The construction of the buffer trench is voluntary by BRL and provides additional assurance to minimize trans-boundary nuisances.

Construction of the trench will be performed by drill, blast, and excavation. The trench excavation will precede Area 4's blasting and excavation activities commence. Bahama Rock is committed to holding blasting vibration below 0.20 inches per second for peak particle velocity within the Community of Eight Mile Rock throughout all project blasting activities. Based on the BMP and modified procedures, the technical risk of exceeding the target is zero. However, if due to any unforeseen reason the target is exceeded as measured by the permanent seismographs, operations would be suspended pending investigations and resolution. This is stated in Bahama Rock's Surface Blasting for Site Specific Standard Operating Procedures manual Dyno Nobel, Section 6.2.2 (**Appendix 18**).

Appendix 18, 6.2.2 – *"If a blast should produce vibration levels higher than these guidelines, another blast is not to be drilled prior to the investigation, which will determine the reason for the abnormal reading and methods to ensure the vibration levels do no exceed expected levels."*

It is noted that this document (**Appendix 18**) is considered valuable, confidential, and proprietary information of Dyno Nobel Inc. and is not to be used, copied or transferred, electronically or otherwise, without the express written consent of Dyno Nobel Inc.

7.5 Adverse Moderate Impacts

There are a total of seven (7) adverse moderate impacts. These impacts are anticipated to occur as a result of the Area 4 project. Impacts described are offset by measures outlined in 8.0 and 9.0. Collectively, these documented impacts include the following:

- Risk of Erosion and Sedimentation into Surface Waters
- Risk of Elevated Turbidity Levels within the Harbour and Ocean
- Tides, Currents, and Water Quality
- Tropical Storm Flood Risks
- Loss of Vegetative Communities and Wildlife
- Risk of Construction Encroachment into Preserve Areas
- Short Term Noise from Site Activity
- Short Term Aesthetics from Site Activity

7.5.1 Risk of Erosion and Sedimentation into Surface Waters

There is a risk that sedimentation may occur in adjacent surface waters during excavation of Area 4. The Hawksbill Creek directly abuts the project on the north side. Sedimentation within the water column inhibits light penetration, and thus can affect the health of marine communities. The site's underlying substrate will be exposed, and at times, may be unstable. Earth moving and grading is required to create the West End Connector right-of-way, which adjacently slopes toward the creek. This impact is considered to be short term. This adverse risk can be easily minimized and/or prevented. Mitigation measures such as silt fencing and stormwater retention swales will be implemented before site activity commences, which will intercept stormwater before it enters the adjacent Hawksbill Creek. Stormwater on the highway will be managed to direct rain events appropriately.

7.5.2 Risk of Elevated Turbidity Levels within the Harbour and Ocean

Due to the potential for turbid water, Freeport Harbour and the ocean could be at risk if measures are not implemented properly. It should be noted that harbour connectivity is not a part of the Area 4 project, but when this occurs it will be permitted separately through the Port Authority. Turbid waters within Area 4 and 3 will be "settled" before waterway connection takes place. Standard procedures have been established for minimizing turbidity (8.2). Two separate connections are planned to take place, connection of Area 4 to Area 3, and then the retreat of Area 3 into Freeport Harbour. If offsetting measures are implemented properly, the risk will be negated. Because waterway connections will be relatively short in duration, this impact risk is determined to be short term.

7.5.3 Tides, Currents and Water Quality

This project does not propose to alter the configuration or controlling depth of the Freeport Harbour entrance channel. However, the project does propose to expand the interior harbor (basin) size to meet the future needs of Grand Bahama's Port and marine related industries. The mean tidal range within the existing Freeport Harbour is 3.1 feet (refer to DMA Chart #26323, **Exhibit 4**), and will not likely change with the proposed harbour expansion. This is the result of the large size of the entrance channel. In other words, the system is not inlet controlled. The tide

range in the harbour is effectively the same as nearby offshore. The channel and interconnected basins easily convey tide waters into and out of the harbour basins. Water level fluctuations in the expanded harbour will be as they are now in the existing harbour. The degree of variation from a tide range and the timing of peak high and low points within the expanded harbor will be imperceptibly small and masked by the vagaries of daily tidal variations and winds.

While the change of the mean tide range in the harbour will be imperceptible, the volume of water entering and leaving the harbour system with each tidal cycle (tidal prism) will change considerably. This amount increases in direct proportion to the increased surface area of the expanded harbour. This increased volume translates to higher tidal velocities through the inlet. Computation of the existing and proposed tidal prism and the corresponding tidal velocities in the entrance channel are presented in **Table 7.7**. Please note that the presented values ignore any flow beneath Fishing Hole Road.

Table 7.7: Projected Tidal Exchange Volumes and Currents

	Harbor Area (Acres)	Tidal Prism (Acre Feet)	Avg. Channel Velocity (Feet per Second)
Existing Harbour Plan	432	1339	0.10
Harbour w/ Areas 3 and 4	892	2765	0.21
Overall Harbour Completed	1166	3615	0.27

The average depth of the existing harbour and entrance channel is reported to be approximately -15 meters or -49 feet deep at mlw per DMA Chart #26323 (**Exhibit 4**). Tides are diurnal cycling approximately twice per day. Ignoring the percentage of discharged water returning to the harbour on a flood cycle, and wind mixing, Freeport Harbour exchanges approximately 13% of its total volume per day. Considering the depths of the harbour there is a relatively low potential for tidal mixing. This situation is typical for deep water ports. The main mechanism for mixing and water column turn over is ship movements, in areas located some distance from the harbour entrance. This mechanism is considerable and difficult to quantify but should not be discounted. With the completion of the excavation of Areas 3 and 4, the overall area of the harbour will increase from 432 acres to 892 acres. Since the final average depth of a portion of Area 3 and all

of Area 4 will be shallower, the overall percentage of the harbour that will exchange with each tide cycle will actually increase by approximately 1%. However, the new basins increased distance from the entrance of the harbour causes them to have a lower rate of exchange than the portions of the Harbor nearer the inlet. Conversely, the portions of the harbour located near the inlet will be better flushed.

Because of the locations of Basins 3 and 4 relative to the Ports inlet, the rate of water exchange with the open ocean waters is less than for those harbour areas located closer to the inlet. The harbour does not have a flow-through configuration that promotes water exchange with adjacent ocean waters. This closed configuration is very common with the design of commercial harbours. There are few deepwater harbor locations that lend themselves to an effective flow through design unless they are located at the mouth of a significant river.

It is important to recognize that the area of impact to the surrounding open ocean area for a well flushed harbour will be considerably greater than what now presently occurs. This pertains primarily to pollutant transport out of the Port basins to nearby open waters.

The above values are not atypical for deepwater harbors. For example, Port Canaveral, Florida exhibits similar conditions although the tide range is closer to five feet in that system. The State of Florida developed special water quality criteria for deep water ports recognizing that such water bodies cannot comply with the many parameters measured for typical natural surface waters. The most troublesome parameter is dissolved oxygen which occurs in reduced concentrations at the deeper depths. This occurrence limits the opportunity for biota to thrive in such conditions. As a result, the suitability of deep water harbors to support a diverse marine flora and fauna is typically limited to depths of approximately 30 feet and above. This varies to a great degree but the maintenance of consistent conditions well suited for the establishment of a marine ecosystem is difficult to achieve at depths below 30 feet in semi confined or vertical sided deep water ports. However, this occurrence does not appear to significantly reduce the potential ecological value of the shallower waters and littoral zones located in and around port harbours. This is evidenced by numerous successful marine habitat mitigation projects completed

as a part of harbour development at similar Ports such as Port Canaveral, Port Manatee and Port Everglades.

It is also important to recognize that a modest exchange rate does not mean that the water quality characteristics of a harbour basin are automatically poor. It has been documented that the quality of port waters typically are of a lower quality than the surrounding waters, but not necessarily as the result of poor circulation. Often the degraded harbor waters result from conventional pollutants attributable to industrial and shipping activities. The State of Florida recognized the vital need for deepwater ports, and performed considerable water and sediment testing. As a result, a special deepwater port water quality program to monitor and manage port waters to sustain the industry and protect the surrounding environment was developed. The two most prevalent conditions that were encountered included depressed dissolved oxygen (DO) levels at deeper depths and increased concentrations of heavy metals in the fine grained bottom sediments of the harbours.

There has been no sedimentation deposition modeling of harbour in its existing or proposed configuration. There is a lack of data to calibrate such a model and any such effort would be highly speculative at this early stage of the harbor development. Considering the size and depth of the harbour basins and the limited amounts of available readily transportable sediments located around the property, the potential for any significant sedimentation to occur should be small. The ongoing harbour expansion effort has created a dynamic situation that prevents the reasonable projection of future sedimentation rates. This presently prevents the projection of any base rate of sedimentation into the future. It is certain that the suspension of sediments resulting from the ongoing harbour expansion is causing a more rapid rate of sedimentation than will occur into the future once the excavation work has been completed and the harbour stabilizes. However, excavations of Area 3 and 4 will be completed prior to any harbour connections and therefore minimal amounts of suspended sediments will exist.

Maintenance dredging is periodic dredging that is undertaken to maintain a harbour or navigable waterway at a desired depth to offset some regular deposition of sediments. The need for overall harbour maintenance dredging is very unlikely. However, there may be a need for infrequent

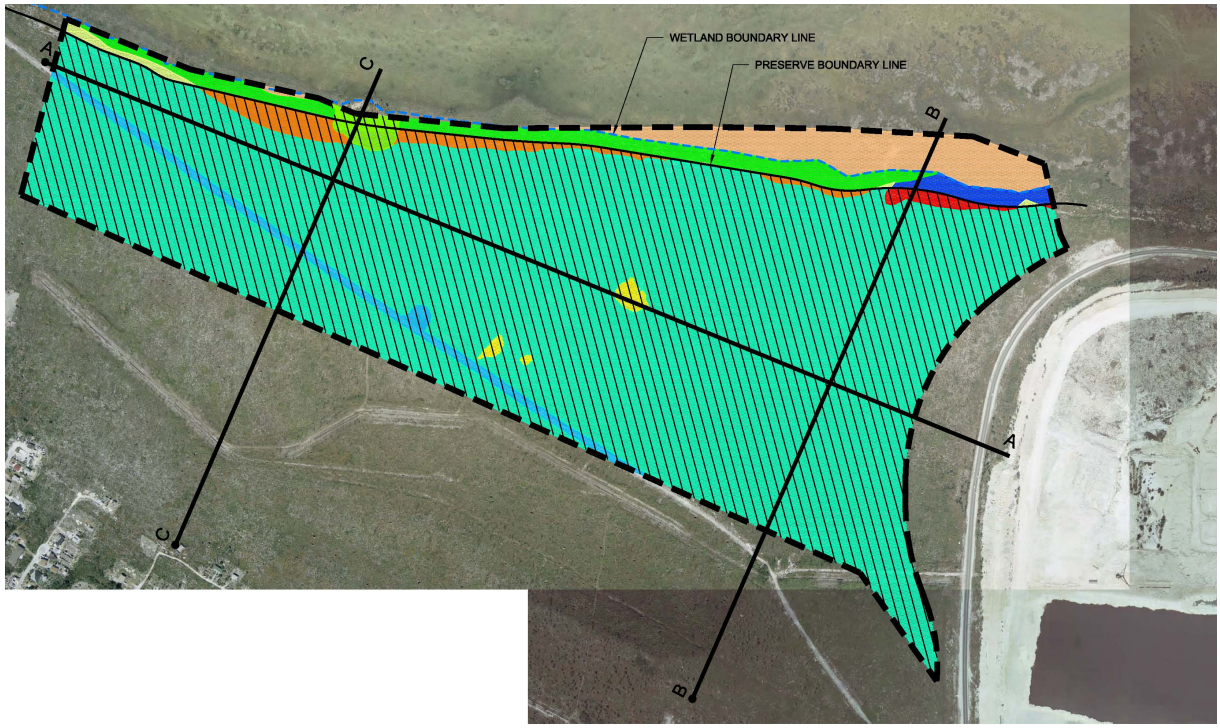
maintenance dredging at critical locations such as the harbour entrance channel. Entrance channel shoaling is often caused by littoral transport along the south shore of Grand Bahama. Additionally, certain (presently unknown) areas in the harbour may experience shoaling in the future as the result of sediments being re-deposited from ship propeller blasts. Until a regular ship maneuvering pattern develops, this is not expected to be a problem (if it ever occurs).

The large size and significant depths of the completed harbour combined with the limited potential for sediment influx, eliminate the need for a scheduled maintenance dredging program.

7.5.4 Loss of Vegetative Communities and Wildlife

Portions of the existing Pine Whiteland, Coppice, Slope/Coastal Strand, and Human Disturbed will be preserved as part of the Area 4 project plan. However, all of the existing Mangrove Wetlands will be preserved as part of the Area 4 project plan. Communities which will be directly impacted as a result of the project include Pine Whitelands, Coppice, Freshwater Wetlands, and Slope/Coastal Strand. Please refer to **Figure 7.5 (Exhibit 27)** for a Vegetative Communities Map and acreage breakdowns for proposed impacts.

Figure 7.5: Vegetative Communities Map & Acreage Breakdown



Impacted Areas			Preserved Areas		
Pine Whitelands	-	161.6 Acres	Pine Whitelands	-	0.8 Acres
Freshwater Wetlands	-	0.8 Acres	Coppice	-	1.5 Acres
Coppice	-	0.8 Acres	Slope/Coastal Strand	-	7.1 Acres
Slope/Coastal Strand	-	3.7 Acres	Mangrove/Wetland	-	9.7 Acres
Human Disturbed Road	-	4.1 Acres			
Human Disturbed Historical	-	1.4 Acres			

These impacted vegetative communities are commonly found throughout Grand Bahama Island, and are not considered unique or areas of special concern. The most abundant community, Pine Whiteland, exhibits signs of severe distress, most likely from past storm damage. Although evident as once abundant, healthy mature pines do not exist on the site. They are now scattered throughout the site as dead snags or fallen over stumps.

Nevertheless, the reduction of these communities will result in habitat loss for associated wildlife and impact the overall biological composition of the area. However, in general, the richness and diversity of wildlife was very low. The lack of canopy trees and tall shrubs in the pine and coppice communities adversely affects bird life. The taller plants of the coastal strand and

buttonwood wetland transition provided habitat for anis, the warbler, and hawk as observed. No shoreline or wading birds were observed in September within the mangrove swamp and shallow waters of Hawksbill Creek. This may be explained by the low productivity of the dwarf red mangroves and the absence of coffee snails, mangrove crabs, portunid crabs, and small fishes as observed in the red mangrove community.

The most productive ecological areas, edge communities, are being preserved (i.e. Coastal Strand and Mangrove Wetland). Edge communities are areas where wildlife congregates, for roosting or other refuge purposes, in a denser manner; in comparison to open expanses of vast marshes or forests. Mangrove/Wetland and transitional Coastal/Strand areas are the most ecologically sensitive and valuable communities on the Area 4 project site.

7.5.5 Risk of Construction Encroachment into Preserve Areas

As described earlier, onsite ecological communities are being preserved, including mangrove wetland, the majority of onsite slope/coastal strand, and portions of coppice. Construction activity may risk encroachment into preservation areas. An Environmental Management Procedure located in the EMP has been written to delineate the preserve limits, and segregate construction activity from entering. These include the installation of construction barrier fencing along the preserve boundary. It should be noted that this EMP will apply to the preserve areas for other Bahama Rock properties associated with the future Western Corridor, which located west of Area 4.

7.5.6 Short Term Noise from Site Activity

As discussed in Section 6.6 noise level measurements were made at multiple locations. Current measurements of operations were made on site to provide emission levels in order to complete noise modeling for the quarry operation. The levels were evaluated at the closest structures adjacent to the proposed operation in order to show noise levels would not, first, exceed the recommended noise standards and in addition, would not create community annoyance levels. The evaluation at the closest residence would insure the noise would be less at adjacent properties at greater distances.

In order to address noise levels off property, noise modeling of the operation was completed. The modeling was completed using Cadna, a Computer Aided Noise Abatement software, Version 3.7 (2007). The software utilizes CAD type drawings in conjunction with user specified noise sources and receivers. This program was utilized to evaluate the Area 4 noise impacts from the excavation of the initial Buffer Trench and the noise that would be produced by the excavation of Area 4. The evaluation includes projections of noise from the measured sources to the individual receivers in graphic format, included in the Appendices following the Conclusion of the Geosonics Report (**Appendix 10**).

The noise modeling was performed incorporating the 15.0 foot berm represented in the project plans. The berm construction creates a significant change in the noise to the adjacent community for the excavation conducted on the south side of Area 4. Noise levels are projected from the excavation to be reduced to 37.9 decibels at the Lindy Russell (Harbour West) location. This level is significantly below the existing ambient levels measured and in our opinion, would make the operation inaudible.

As stated in the Geosonics Report, the noise levels for the dragline and loader / haul units when operating at the south end of Area 4 and projected to these residences without the berm in place generate levels of 50.3 decibels to the south structure and 42.6 decibels to the west. These levels would be consistent with the short duration requirement for excavation of the buffer trench and construction of the berm. Both of these levels fall below the World Bank Standards referenced (**Table 7.8**). The south location however, is greater than the 48 decibel daytime normally occurring level. This would make the equipment audible; however, it is within standards and would have a limited effect in our opinion. As the loader/haul unit operation is projected to exceed the hourly L_{Aeq} recommended limit, consideration of the community during nighttime hours is required. This may include limiting operating hours for the loaders until the berm is constructed in this area.

Table 7.8 Noise Level Guidelines – World Bank Standards

	One Hour L_{Aeq} (dBA)	
Receptor	Daytime	Nighttime
	07:00-22:00	22:00-07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Overall, all projections for all excavation locations within Area 4 are less than the standards. While some noise may exceed the ambient community levels during initial work in the site, the construction of the noise berm and buffer will reduce the effect upon the adjacent community. The Noise Measurement and, Modeling and Evaluation Report by Geosonics Inc. is presented in **Appendix 10**.

7.5.7 Short Term Aesthetics from Site Activity

The Area 4 site is undeveloped and may be considered visually unappealing due to the impacted nature of the pine trees on the site. The visual line of sight across the site is filled with dead trees, and is somewhat blighted. Also indiscriminant dumping has occurred site. The predominant vegetation is saw palmetto, which provides some visual appeal of greenery. The most appealing feature on the site is the ridge which has a peak elevation of approximately ten feet above sea level. The ridge provides a vast view across the Hawksbill Creek and Little Bahama Bank.

Aesthetic conditions will dramatically change with the Area 4 project. Visually the site will appear much different, but is not anticipated to affect the overall quality of life or alter the character of Grand Bahama Island. An undeveloped parcel sits between the project site and Eight Mile Rock and functions as a visual buffer. The perimeter berm around Area 4 will also soften views into the Area 4 project site.

Site activities including vegetation clearing, overburden removal, relocation of utilities, power substation relocation, and old highway demolition will all result in indirect, short term impacts to site aesthetics. The duration of relocation of utilities along the roadway will generally be short enough to not warrant mitigation, which is typical of most construction projects, while the

disturbance to topography will last through the duration of the project, and thus a berm is being constructed to soften the view into the project site.

7.6 Adverse Insignificant Impacts

There are a total of nine (9) Insignificant Impacts for which mitigation will not be required. These impacts include:

- Tropical Storm Flooding
- Rainfall Flooding
- Risk of Dust Emissions
- Relocation of Utilities
- Traffic Interruptions
- Employee Safety
- Long-Term Ambient Noise
- Long-Term Aesthetics from Land Use Changes
- Saltwater Intrusion to Private Wells

7.6.1 Tropical Storm Flooding

Flood risks for the project site and surrounding areas will not significantly change as the result of the proposed project. In the past, Hawksbill Creek has been the site of several flood events primarily resulting from hurricane induced storm surges. Storm surge is associated with lowered barometric pressure of a hurricane, combined with the storms forward motion and wind field stress applied to the waters surface. Depending on the location and direction of a tropical storm relative to open water and a land mass, a hurricane can cause a dramatic increase in sea level. This is primarily caused by the high winds forcing and trapping water against a land mass. This storm wind driven tide combined with the overlying waves and wave run-up can cause significant flooding. Such circumstances have caused flooding along the north side of the Island during the hurricanes in 1999, 2004 and 2005.

Two storm surge and flooding studies completed for central Grand Bahama Island were referenced for this report. The first was performed by Dames and Moore in 1995 to assess the storm surge and flooding probability for areas around Hawksbill Creek. The table below presents

the predicted maximum storm surge levels for various intensity storms along the northern side of the Island in the vicinity of Hawksbill Creek.

Table 7.9 Estimated Maximum Surge Elevations
Little Bahama Bank in the Vicinity of Hawksbill Creek

Recurrence Interval (yrs)	Wind Speed (mph)	Maximum Water Level (ft. mlw)
100	117	12.1
50	103	10.5
20	88	8.9
10	77	7.9
5	68	7.2

Source: Dames and Moore 1995

The second study performed by Richard Czlapinski, Consulting Coastal Engineer, was completed in 1996 and used a similar methodology to predict storm surge levels for various recurrence intervals along the south side of the island in the vicinity of Lucaya (**Table 7.10**).

Table 7.10: Estimated Maximum Surge Elevations
South Shore of Grand Bahama Island in the Vicinity of Lucaya

Recurrence Interval (yrs)	Wind Speed (mph)	Maximum Water Level (ft. mlw)
100	117	8.2
50	103	7.7
20	88	7.2
10	77	6.9
5	68	6.7

Source: Czlapinski, 1996

The above presented predicted storm surge elevations are the still water elevations that are likely to occur with a given design storm. Areas located near the open coast may also be subjected to

direct wave impacts and wave run-up in addition to the predicted storm surge. The wave run-up can cause flooding at elevations several feet higher along the near shore areas located on the open coast. This near shore area is often termed the velocity zone. It is prudent to avoid developing in this zone. If development is unavoidable, additional construction safeguards should be implemented, which will be capable of withstanding the higher flood levels and wave / water dynamics. Please refer to **Exhibits 39** and **40** for projected limits of flooding and wave velocity zones associated with a 100 year event, from a north and south storm surge.

The existing ground elevations for the overall study area average approximately 12 feet above mean sea level (msl). The northern portion has site elevations averaging approximately ten feet msl sloping down to Hawksbill Creek. The Area 4 property, which fronts Hawksbill Creek, is flood prone from surge events approaching the north side of the island. The lower elevation near shore project area is susceptible to storm surge and wave run-up flooding from a hurricane having an unfavorable storm track and wind speeds of 88 mph or greater (20 year recurrence interval storm). Flooding from such an event will extend up to about ten feet msl (**Exhibit 39**).

The project plan calls for establishing a road bed in a right-of-way located along the north edge of the project site for the future construction of the West End Connector Highway Corridor. The proposed road bed will be raised to a minimum elevation of 15 feet msl. This road bed will provide flood protection by reducing the potential for the landward migration of storm flooding to a 100 year recurrence interval. In other words, the project directly reduces the potential of flooding from the north side of the island. This will directly benefit the project, Freeport Harbour and Eight Mile Rock communities (**Exhibit 41**).

The Czlapinski Study predicts the maximum surge elevations for tropical storms impacting the south side of Grand Bahama Island. As mentioned above, elevations that exist over the site average 12 feet msl. This is considerably higher than the 8.2 feet mlw still water elevation predicted for the 100 year event. Because of the more inland location of the project site, flood routing will be via the Freeport Harbour entrance rather than overland. Existing ground elevations to the south of the project area rise to over 20 feet mlw, so interior storm surge flooding from the southern open coast will not occur. Water levels in the harbour will rise to a

level approximately equal to the levels presented in the Czlapinski Report (8.2 feet), but the surrounding lands are generally at elevations above the predicted flood levels (**Exhibits 40 and 42**). The project is not altering the harbour entrance channel or the contours of properties located adjacent east. Therefore there will be no change in storm surge flooding probability to the harbour and surrounding lands or the properties lying along the south shore of the Island.

In 2005, Hurricane Wilma approached Grand Bahama from the south west causing a significant surge along the island's southern shoreline. The most significant damage was caused by storm waves to infrastructure and structures located in the nearshore area. No flooding occurred as the result of the storm surge entering the harbour.

Another possible flooding scenario to be considered is for the expanded harbour to route storm surge flood waters further inland, potentially impacting the interior of the island. It has been assumed that the new road bed constructed along the north side of the project site prevents flooding from the north, so the predicted maximum surge elevations from the Czlapinski study for the southern side of the island are used for this determination. The 8.2 feet mlw still water elevation predicted for the 100 year recurrence interval event is considerably lower than the grade elevations that exist between the harbour and the Eight Mile Rock community. In fact the existing grade around the perimeter of the proposed harbor is also above the predicted flood elevation so the flood waters will be contained within the newly excavated basins.

One final potential flooding scenario to be considered involves the overtopping of Fishing Hole Road from flood waters emanating from either side and adversely effecting properties on the opposite side. There has been considerable discussion over the years on the pros and cons of reconnecting Hawksbill Creek, or alternatively raising the roadway across the creek via a bridge or culverts to allow safe passage during storm tide events. The existing low elevation length of the road across the creek has been overtopped during past and recent tropical storms and hurricanes preventing safe road passage between the western Settlements and Freeport. The project plan does not propose to alter the Fishing Hole Road. The Queen's Cove Community which is located to the north of Fishing Hole Road along Hawksbill Creek has suffered extensive flooding from past hurricanes. Questions have been raised about the potential for this project to

exacerbate this Community's flooding problems. The proposed project is located at higher elevations than Queen's Cove and on the opposite side of the Fishing Hole Road causeway. No fill is being placed at elevations lower than the Community so there is no reduction of flood storage potential. In fact, the excavation of the harbour and entrance channel can serve as a flood reliever should the Government decide that it is best to improve the hydraulic conveyance capabilities beneath Fishing Hole Road, or by reconnecting Hawksbill Creek to the harbour.

7.6.2 Rainfall Flooding

The potential to increase or alter the potential for flooding related to rainfall induced surface water run-off exists. To prevent this from occurring, care needs to be taken to create and maintain properly designed stormwater conveyances such as swales and retention / detention ponds. The Island's relatively porous limestone formation is not prone to trap and hold surface water runoff. However, when conventional development relying on the placement and compaction of fill or surface soils, the soil's ability to absorb surface waters is reduced considerably. The excavated Area 4 basin will serve as the storm water retention basin until the project is completed.

7.6.3 Risk of Dust Emissions

Grand Bahama Island's air quality is not likely to be significantly affected by the proposed project. Emissions resulting from the development of Area 4 including the existing processing plant have been calculated and are well below the 100 ton per year threshold to be considered a major source of PM10 emissions. The emissions have been calculated for both Area 3 and Area 4 for comparison using Crushed Stone Processing and Pulverized Mineral Processing (AP-42 Section 11.19.2.1, August 2004) for PM10 emissions from the processing plant and Fugitive Quarry Road Emissions Calculation (Unpaved Roads) – (AP-42 Section 13.2.2 and EPA-450/3-88-008 Section 3.3.3.1). These calculations are included as **Appendix 16** with AP-42.

The potential and actual PM10 emissions for Area 3 are 23.7 and 8.3 tons per year, respectively. The potential and actual PM10 emissions for Area 4 are 39.4 and 13.8 tons per year, respectively. The annual production rate of 6.6 million tons will remain relatively the same, thus

the potential and actual emissions from the processing plant will remain the same at 6.0 and 2.1 tons per year, respectively. For clarity the processing plant is a wet process. The increase in emissions results exclusively from the increase in the haul road distance. Area 3 potential and actual haul road emissions are 17.7 and 6.2 tons per year, respectively. Area 4 potential and actual haul road emissions are 33.4 and 11.7 tons per year, respectively.

For consistency, the haul road emissions for the development of Area 4 have been calculated using the same formula as Area 3. Since the formula utilized was developed, a more refined formula has been developed and is published in AP-42. The new formula indicates approximately a 24% reduction in haul road emissions.

While utilizing this conservative approach for haul road emission calculations, the actual emissions from the development of Area 4 of 13.8 tons per year is well below the 100 ton per year threshold of Title V of the U. S. Clean Air Act. This facility would not be classified as a major source of emissions under the Clean Air Act regulations. Since the actual emissions are significantly below the Title V threshold, the Bahama Rock Limited facility is not considered a significant source of PM10 emissions and thus is not considered to have a significant impact on air quality.

However, as stated in 6.5 Bahama Rock will use dust suppression techniques to minimize emissions.

7.6.4 Relocation of Utilities

As described in 5.4 the construction of the new bridge may require several utility services to be relocated, including a water main and transmission lines for power, cable, and telephone. Each of these utility services will be relocated while keeping disruption to a minimum. Utility relocations will be determined upon final design of the bridge. Bahama Rock will communicate with each of the utility companies to coordinate the relocation of the services at the appropriate times.

7.6.5 Traffic Interruptions

Bahama Rock is committed to maintaining safe traffic flow. Traffic interruptions are anticipated to be short term events for Area 4. Minor interruptions may occur during bridge construction and when the dragline is relocated. Maintenance of traffic will be continual, and the local police will be coordinated with. When roadway interruptions are required, and will be scheduled during off-peak traffic hours as detailed in the traffic environmental management procedure.

7.6.6 Employee Safety

Bahama Rock has developed an excellent safety track record throughout its history working in the harbour area. Bahama Rock strictly follows a reputable and solidified emergency management plan. Should any injuries occur, Bahama Rock and its staff are well equipped and prepared to deal with them as they occur. Also the company maintains an emergency response plan and hurricane preparedness plan.

7.6.7 Long-Term Ambient Noise

There are two categorizations in ambient noise levels as a result of the project, including short-term and long-term. Short-term increases in ambient noise were explained previously in Section 7.5.6. Long-term increases may be resultant from future land uses. After the Area 4 project is complete, the new harbour basin will most likely be utilized by a higher level of urbanism. Specifically an increased level in noise may result from future marinas, transient ship facilities, boat traffic, road traffic, etc. Ambient noise levels will likely not be substantial enough for local residents to recognize them. The transition from Area 4 to future land uses will be gradual, and a general familiarity with noise levels will occur as time progresses.

7.6.8 Long-Term Aesthetics from Land Use Changes

Once Area 4's excavation is complete and new land uses begin to take hold, an insignificant change in aesthetics will occur. The obvious change is that Area 4 will be converted from an undeveloped parcel to a waterfront basin with recreational and marina use. This impact is somewhat subjective and could be considered as neutral, adverse, or positive. The future land

use will not be any different from other similar land uses within Grand Bahama. Long-term aesthetics may resemble those of Lucaya, or other waterfront marine areas.

7.6.9 Saltwater Intrusion to Private Wells

As discussed previously, a loss in the freshwater lens is expected. According to the well survey 41 homes had private wells in the adjacent Eight Mile Rock Community. Of these, 18 homes also had city water. The remaining 23 homes did not have a city water connection. Based on the private well survey these homes used primarily used for bathing and clothes washing, consumption data was not collected. Continued salt water intrusion is likely to occur and may affect these identified wells. The extent and severity of each well's affected water quality is difficult to predict because the thickness of the freshwater lens in dependent upon rainfall duration, intensity, and seasons.

Table 7.2 notes that the "Loss of Freshwater Lens" is a **Significant – Adverse** impact. Additionally, **Table 7.2** classifies "Loss of Private Wells" as an **Insignificant – Adverse** impact. The difference in classification is due to the role private wells play in the overall water supply for the homeowners. The freshwater lens in the area is mostly dependant on rainfall and therefore is dynamic with changes in thickness and aerial extent related to rainfall events and seasons. Although the depths of the private wells could not be measured, they are most likely shallow and draw groundwater from the top of the water table. This condition renders the private wells susceptible to changes in both the quantity and quality of "freshwater" at any given location. In addition to natural impacts on the freshwater lens, anthropogenic impacts to water quality most likely are occurring due to the proximity of septic tanks to private wells, potential sources of pollution from storm water infiltration, well construction methods, and lack of any groundwater quality testing program. Privates Wells sampled on September 2, 2008 and reported in the Private Well Sampling Report showed that Total Coliforms were present in all seven samples and E. Coli was present in five of the seven private wells tested. It should be noted that connecting the private well homes to city water could, and should be considered a benefit. A detailed plan will be developed with GBPA, GBUC and homeowners to have the homes with only private wells connected to city water.

7.7 Project Impacts & Summary

As detailed previously proposed impacts are as follows:

- Three (3) adverse significant impacts
- Seven (7) adverse moderate impacts
- Nine (9) adverse insignificant impacts
- Five (5) positive significant impacts

When weighing all of the positive, adverse, and offsetting measures, there are several considerations. Obviously classifying and collectively weighing impacts on a broad scale is subjective and considers a wide range of variables, including economics, biology, physical environment, infrastructure, etc. The goal of the evaluation is to weigh the sum of these as to not prove detrimental or adverse to the Grand Bahama community or environment.

The following is a list of impact summaries in order of severity. Each impact is described on how they are balanced, offset, or are warranted from a standalone perspective. Collectively this list supports the cumulative sum of arriving at a viable project for Area 4. Some of these impacts are inter-related. For example, impact #1 below is offset through the several benefits of impacts #20 through #24. **Tables 7.1 & 7.2** also provide a quick reference for the discussion below.

7.7.1 Adverse Significant Impacts Summary

1) Loss of Substrate and Topographic Relief - The loss of substrate is offset by the potential for future land use and economic opportunities. The offset is one of socioeconomic gain versus loss of ecological value. The area in question does not represent an important high quality or unique habitat.

2) Loss of the Freshwater Lens - The loss of the freshwater lens, or change in groundwater conditions from fresh to brackish and saltwater conditions cannot be directly offset. This impact is unavoidable. However, Area 4 is not an economical or commercial potable water source for

the Grand Bahama Utility Company **(Appendix 11).** Freshwater lens modeling indicates a reduction but not an entire elimination of the freshwater lens in the area.

3) Risk of Blast Vibrations - The risk of blast vibrations is offset through utilization of existing blast management procedures. These procedures have been continually improved so as to establish vibratory levels well below international recommended standards. Area 4 also includes the provision of a buffer trench which will further reduce vibrations to the adjacent community.

7.7.2 Adverse Moderate Impacts Summary

1) Risk of Erosion and Sedimentation into Surface Waters - Risk of erosion and sedimentation into surface waters will be reduced through the implementation of procedures outlined in the Environmental Management Plan. These include the creation of stormwater diversion swales or the utilization of silt fencing during development activities.

2) Risk of Elevated Turbidity Levels within the Harbour and Ocean – Both Areas 3 and 4 are being completely excavated in isolation from the adjacent harbour and ocean. Before connection of these areas to one another, or to the harbour, sediment will be settled before connection occurs. The harbor connection is several years away; however, this will be done in cooperation with the Port Authority.

3) Tides, Currents, and Water Quality – The creation of additional basins that eventually will be connected to the ocean, will have currents and water quality characteristics similar those existing at the harbour.

4) Loss of Vegetative Communities and Wildlife – Loss of vegetative communities will occur. The most ecologically sensitive areas will be preserved through the mangrove preservation area and the 75 foot buffer.

5) Risk of Construction Encroachment into Preserve Areas – Construction encroachment risk is being abated through the utilization of environmental management procedures, including the installation of construction barrier fencing.

6) Short-Term Noise from Site Activity – Site development activity will produce noise levels above existing levels currently on the Area 4 site. These noise levels are predicted to not be at or near the World Bank standards. A perimeter berm is being installed to counteract noise from Area 4, as detailed within the included EMPs.

7) Short-Term Aesthetics from Site Activity – Short-term adverse aesthetics from site activity will be avoided through the implementation of a perimeter berm.

7.7.3 Adverse Insignificant Impacts Summary

1) Tropical Storm Flooding – The project includes the installation of a 150 feet wide West End Connector right-of-way. The right-of-way will be built to at least 15 feet above sea level, which is above the predicted storm surge elevations for the 100 year storm event.

2) Rainfall Flooding – Ponding or stormwater flooding will be negated by utilizing conventional conveyance measures or through the use of the excavated basin.

3) Risk of Dust Emissions – Dust emissions will be adequately controlled through the use of watering trucks, or fixed sprinkler systems. An appropriate environmental management procedure will be utilized.

4) Relocation of Utilities – Utilities will be relocated through coordination with each company at the appropriate time.

5) Traffic Interruptions – Several traffic safety measures will be implemented within the Area 4 project. With the installation of the bridge, traffic interruptions resulting from Area 4's excavation activity will be reduced. Traffic interruptions should be limited to the bridge tie in to the Warren J. Levarity Highway.

6) Employee Safety – Bahama Rock has a proven safety track record through the last several years at their current operation. It is expected that Area 4 will not prove to be any less safe for future working conditions..

7) Long-Term Ambient Noise – The future land use of Area 4 will not have significant noise sources. As with any land development project a minor change in background ambient noise will be experienced.

8) Long-Term Aesthetics from Land Use Changes – Aesthetic conditions will be changed in the long-term of the project. These changes may be viewed by some as adverse, neutral, or positive. The West End Connector Highway will provide easy access to the scenic view of Hawksbill Creek and the Little Bahama Bank for the first time in this area. Others may see the long-term land uses as adverse impact from existing site conditions.

9) Loss of Private Wells – Saltwater intrusion is expected to occur through the reduction of the freshwater lens.

7.7.4 Positive Significant Impacts Summary

1) Utility Upgrades - New utility easements within the West End Connector right-of-way will be available for future upgrades in power, water, cable, and telephone.

2) Improved Traffic Flow – The new West End Connector right-of-way provides a new roadway improvement over existing conditions. Traffic will be reduced within the Eight Mile Rock Community.

3) No Cost Harbour Expansion – To date, Bahama Rock's past and current projects have provided a monetary benefit equivalent to approximately $750 million in conventional dredging value. It is also estimated that the Area 3, Area 4 and the West Channel development would contribute an additional $750 million in conventional dredging value.

4) Employment Opportunities – Presently Bahama Rock employs approximately 85 direct and 35 indirect employees. Indirect employment constitutes specialized contracted services.

5) Future Economic Opportunities – At the completion of Area 4, future land uses will create economic opportunities throughout the Port area.

Chapter 8: Proposed Mitigation and Impact Management

8.0 Chapter Overview

The Area 4 project will significantly change the character of the site. Some of these changes are favorable. Positive impacts include creation of waterfront property, highway right-of-way improvements to infrastructure, provision of new utility easements, and other future economic opportunities. Adverse impacts from original baseline conditions will also occur. As indicated in the Impact Classification & Mitigation Matrix (**Table 7.2**) adverse impacts have been subcategorized into different impact types. Depending on their impact type and severity, offsetting measures are proposed under three separate categories, including:

- Avoidance
- Minimization / Prevention
- Mitigation

The following provides an overview of offsetting measures employed to each identified impact.

8.1 Avoidance

Avoidance refers to an offsetting measure which totally negates an impact. Avoidance measures were utilized during the planning phase of Area 4. Through careful planning, the preferred development scenario was conceived for Area 4. Please refer to Project Alternatives (5.8) for discussion of the evaluation. Avoidance during the planning stage included considerations of:

- Avoidance of Roadway Traffic
- Avoidance of Ecological Impacts

By utilizing avoidance in project planning, direct traffic and ecological impacts were offset before the impact ever occurs.

8.1.1 Avoidance of Roadway Traffic

The Warren J. Levarity highway is a main roadway through the project site. Bahama Rock considered this when planning Area 4. Currently, Area 3 and 4 are separated by the highway. This was recognized as a challenge for the transportation of excavated material from Area 4 to the processing facility located in Area 3. To prevent traffic disruptions and to ensure public safety, the bridge became a part of the project so that material could be transported beneath the roadway. The bridge is planned to be constructed parallel to the existing highway, and therefore will not affect the existing travel flow.

8.1.2 Avoidance of Ecological Impacts

Mangrove wetland impacts will be avoided with the Area 4 project plan. The mangrove wetland community is considered as the most valuable biological habitat onsite, and therefore Bahama Rock will preserve this area. An approximate 75.0 ft upland buffer has also been incorporated into the preservation areas of the plan. Both the mangrove wetlands and associated buffer will be preserved in perpetuity. In total, the plan avoids approximately 20 acres of habitat in Area 4 as referenced in **Exhibit 27**.

8.2 Minimization and Prevention

Minimization and prevention measures are utilized where an impact is anticipated to occur. This will occur in instances of dust emissions, land clearing, grading, blasting, excavation, and truck hauling. Impacts will be offset with minimization and prevention measures. Collectively these measures have been assembled into an Environmental Management Plan (EMP) with specific environmental management procedures which is presented in 9.0. Details of the EMP have been developed to minimize and prevent temporary development impacts common to most projects. The purpose of the EMP is to establish methods, guidelines, and procedures that Bahama Rock will follow so that temporary short-term impacts are prevented and/or minimized.

8.2.1 Erosion and Turbidity Control

Chapters 5.0 and 7.0 detail several activities which are likely to cause risks for erosion and elevated turbidity levels. Controls will be put into place to reduce the risk of sedimentation to adjacent surface waters.

Erosion typically occurs as sediment from disturbed areas which can be carried into surface waters via stormwater runoff. Sediments entering the water, block sunlight, and can significantly affect water quality, often affecting dissolved oxygen levels. Stormwater runoff will be managed through a combination of techniques, including infiltration directly into porous surfaces (i.e. silt fencing) and diversion of sheet flow into catchment swales, earthen berms, and planned stockpiles. Ultimately these various controls will be placed in areas where erosion likelihood is highest.

The excavation of Area 4 will create an expansive water body. Turbidity levels in the new basin are expected to be high throughout the project, but controlled through isolation. Two basin connections are planned to connect Areas 3 and 4 to Freeport Harbour. First, upon completion, Area 4 will be connected to Area 3. Next, following the completion of the Area 3 retreat both Areas 3 and 4 will become a formal extension of the harbour. The harbour connectivity is a separate issue beyond the Area 4 project. The Port Authority Environmental Department will be consulted with before any connections are made.

Since 2001, northeast harbour expansion has created excavations within 200 feet of the existing Levarity Highway. The highway is located at a similar distance from Hawksbill Creek as the proposed West End Connector. No known adverse environmental impacts have resulted from the construction of the Harbour within this proximity of the Hawksbill Creek. The Area 4 project provides no connectivity to Hawksbill Creek, therefore, no analytical turbidity monitoring will be performed unless warranted.

8.2.2 Dust Emission Control

There is potential for particulate emissions resulting from material excavation, material transportation and material processing. Emission control measures to be employed for material transportation include operation of a water truck and a fixed sprinkler system in specific areas. The majority of the excavated material is blasted and excavated below the water surface, thus emissions are negligible. The inherent moisture content of the material being processed acts as emission control for material processed dry in the processing plant.

8.2.3 Construction Encroachment Control

The Area 4 project is directly adjacent to proposed preserve areas and out parcels owned by others. Measures will be implemented to avoid accidental construction encroachment into these areas. A construction fence will first be installed along the north boundary of Area 4. This will minimize the risk of heavy equipment from entering the preserve area. These measures are described in detail within EMPs.

8.2.4 Noise Reduction Measures

Activity from excavation will result in noise levels above those experienced from existing conditions. Heavy equipment operation, limestone processing, and excavation noise levels will be buffered with the construction of the 15.0 foot high perimeter berm constructed from the pre-strip material.

8.2.5 Blast Management Plan

A Blast Management Plan (BMP) is included as **Appendix 4**. The plan's focal point is to minimize nuisances to nearby residents, while providing sufficiently broken rock for excavation purposes. The EMP provides technical information related to blast design including amounts of explosives per delay. Additionally, it predicts blast vibrations at varying distances. Monitoring of Area 4 is described including the relocation of existing permanent seismographs and a commitment to complete the pre-blast surveys for structures within a 2000 foot radius of the

project. Finally the BMP provides useful background information describing international standards and proven threshold limits on vibration damage to structures.

8.2.6 Waste Management Plan

Area 4 is an excavation project and as such only a small amount of solid waste is expected to be generated. Solid waste will be transported o the Pine Ridge Landfill operated by Sanitation Services Company. Bahama Rock has been handling solid waste in a responsible manner and will continue to do so. As part of the Area 4 site preparation, a clean-up will be initiated to remove all illegally dumped derelict vehicles to the local recycler. Appliances and other waste will be transported to the Pine Ridge Landfill.

8.2.7 Traffic

As detailed in (8.1.1), Bahama Rock's priority is to avoid traffic disruptions. Steps will be taken to minimize impacts to motorists to the greatest extent possible. Please refer to the traffic environmental management procedure. Bahama Rock will incorporate the same road safety procedures currently utilized in the Levarity Parcel.

8.2.8 Employee Safety

Bahama Rock is committed to the health and safety of its employees. The employees are the most valuable asset of this operation. Bahama Rock strives toward a world-class safety program and continually trains employees on health and safety issues that could affect them.

Bahama Rock has summarized its emergency response procedures within the EMP. The procedures address situations such as fire and explosion; severe storm or weather conditions, injury and security.

8.3 Mitigation

Many adverse environmental impacts, as documented previously, can be offset by conventional means, while others are offset by realization of overall project benefits. Those remaining impacts

which cannot be avoided, minimized, prevented, or otherwise justified must be mitigated for and include the following.

8.3.1 Mitigation for Private Wells

While groundwater would still be available to the private wells, the salinity (chloride content) would be expected to increase over the concentration currently found in the well water. Any resident with a private well and increasing salinity levels will be evaluated for a municipal connection. Furthermore, a diminished supply would likewise trigger an evaluation. Bahama Rock is committed to provide a city water connection to any existing homes within the survey boundary that suffer from insufficient quantity or significant change in quality as determined from the quarterly monitoring. This will be coordinated with the Grand Bahama Utility Company.

Chapter 9: Environmental Management Plan

Environmental Management Plan

Bahama Rock Ltd.

EMERGENCY CONTACT LIST

Onsite Contact

General Manager	**Office: 352-2345**	**Cell: 727-1403**
Plant Manager	**Office: 352-2345**	**Cell: 375-1280**
Maintenance Manager	**Office: 352-2345**	
Human Resources Manager	**Office: 352-2345**	
Security Office	**Office: 352-2345**	

Offsite Contact

Ambulance	**352-2689**
Hospital	**352-6735**
Eight Mile Rock Clinic	**348-2227**
Police (Freeport)	**911**
Police (Eight Mile Rock)	**348-3444**
Fire Department (Freeport)	**911**
Fire Department (Eight Mile Rock)	**348-2911**
Grand Bahama Utility	**352-8411**
Grand Bahama Power	**352-8411**

Environmental Incidences

Department of Environmental Health	**352-5074 (Mr. Mike Wallace)**
Grand Bahama Port Authority (Environmental)	**350-9000**
Freeport Oil Company	**352-8131**
Sanitation Services	**352-9721**
Bahamas Oil Refining Company (BORCO)	**352-9811**

9.0 Introduction

This document describes how Bahama Rock will comply with the Environmental requirements set forth in the Environmental Impact Assessment (EIA) submitted to the Port Authority for the operation of the facility, including future excavations so as to minimize any adverse environmental impacts. This document shall be regularly reviewed, and the specific details and requirements for each environmental management part shall be revised if necessary.

9.1 Employees Responsibility

All employees are responsible for knowing the environmental management procedures set forth in this document. The employees are to actively promote a commitment to the environmental protection of the facility and for following all safety protocols. It is the duty of each employee to report any environmental or safety incident to the appropriate manager.

9.2 Managers, Supervisors and Lead men Responsibilities

Ensure that the Environmental Management Plan (EMP) is in place and reviewed and modified as necessary for the environmental protection of the property and that all personnel operate in accordance with the EMP.

Ensure all new employees and sub-contractors are instructed on environmental and safety requirements, especially specific environmental management requirements and monitoring requirements during the development of the facility.

9.3 Environmental Management Philosophy

Bahama Rock is committed to operating its facilities in a manner that is in compliance with all Port Authority Freeport Bylaws, Sanitary and Building Codes and Laws of the Commonwealth of the Bahamas to surrounding communities in a manner that does not create adverse impacts for our neighbors. Bahama Rock will devote such time and resources as are necessary to carry out this commitment. The staff will maintain

qualified personnel to handle and manage these duties in a responsible manner. All employees are expected and required to conduct their activities in a way that is consistent with its commitment to sound environmental management. If anyone is made aware of any instance that is inconsistent with this management philosophy, they are expected and encouraged to report such instance to the facility management promptly. Compliance and adherence to this philosophy is a 'team effort' and it's expected to be implemented by all Bahama Rock employees.

9.3.1 Environmental, Health and Safety Management System

Numerous tools are in-place and utilized as an effective Environmental, Health and Safety Management System to track and support the Bahama Rock operation. These systems include, but are not limited to: environmental compliance manuals/handbooks; environmental database management system, safety observation database, online Material Safety Data Sheets program, online safety training program, annual safety refresher training program, written safety guidelines, incident-injury reporting system, root-cause analysis procedures for evaluating and rectifying injuries and/or near misses, hazardous communication program, respiratory protection program, auditory monitoring program, and a safety award program. The parent company, Martin Marietta Materials, Inc., fully supports and assists in ensuring the Bahama Rock employees and management have effective tools to enable the protection and health of their most important asset – their employees.

9.3.2 Organizational Structure and Responsibilities

The Bahama Rock operation's organizational structure begins at the corporate level with the Chief Executive Officer and proceeds all the way down to the Bahama Rock Plant Manager. Numerous people are connected to and carry responsibilities for this operation to ensure it operates effectively, efficiently, profitably and in compliance with all applicable laws and regulations. Control mechanisms are in place to ensure not only this facility, but all of Martin Marietta Materials, Inc.'s operations, meet strict business practice requirements.

9.3.3 Standard Procedures and Practices

The Bahama Rock facility operates utilizing numerous types of procedures, practices, plans, and policies designed to protect human health and the environment. The Bahama Rock operation is committed to conducting its business activities and operations in a manner that complies with the laws and regulations pertaining to the environment. This facility is operated using best management practices and environmental control mechanisms so as to fully comply with all laws and regulations and to prevent unacceptable risks to its employees, to public health and to the environment.

Training and monitoring programs are in place to help assist in educating and instructing plant personnel in regards to the proper procedures/methods for health, safety and environmental management. Periodic internal audits and training exercises are utilized to assist in identifying environmental concerns and to ensure the environmental practices of this operation in meeting the Corporation's objectives. These activities are coordinated by the division Sr. Environmental Engineer biannually. Bahama Rock has multiple plans available for review at their offices.

9.4 Waste Management, Pollution Control, Environmental Quality Monitoring

Various types of waste that may be generated during the project could include: solid waste, hazardous waste, liquid waste, sanitary wastes and universal wastes. Waste streams will be segregated by waste type (solid, liquid, nonhazardous, hazardous, etc.), properly labeled and stored in appropriate, suitable containers that are compatible with the waste type until proper transportation and disposal. Waste minimization practices are employed by this operation to reduce or eliminate, where possible, unnecessary waste streams. The following sections describe the various typical waste streams that are or may become part of the Bahama Rock Area 4 project.

9.4.1 Air Emissions Management

Area 4 is located in a non-industrialized area of the port. Outside of this area, sources of pollution exist. These include a power station located approximately 3 kilometres to the

east of Area 3 and G.B. Shipyard and other industrial facilities inside of the Industrial Park.

Sources of emissions from the facility include the existing processing plant, the haul roads within the excavation area and to the processing plant, as well as pre-strip removal operations. The inherent moisture content of the rock aids in reducing particulate emissions generated from material processing. The majority of material processing occurs in a water medium with no emissions. Particulate emissions from the haul roads will be controlled using the current dust control practice. Bahama Rock currently uses a water truck to dampen haul roads and suppress dust generation. Although physical dampening of the substrate may not be so effective for blasting operations, the particulate emissions resulting from this activity is not considered to be significant.

The risk of fire to machinery, fuel or equipment used in excavation and processing operations may pose a slight impact to air quality should a fire occur. Impacts from this source would be a short term and would not be considered significant.

9.4.2 Solid & Liquid Waste Management

The management of solid and liquid wastes anticipated to be generated during the implementation of the proposed Area 4 project is as follows:

- All waste will be transported to the Pine Ridge Landfill for Disposal.

- Waste generated during normal work activities such as: vehicle air filters, oil filters, waste tires, batteries, conveyor belting, hoses, belts, and junked equipment will be disposed of at the Pine Ridge Landfill. Where there is an opportunity for recycling locally this will done.

- Sanitary wastes will be managed at Area 4 through .the use of portable toilets.

Spills and accidental releases of petroleum-related waste materials will be controlled, cleaned up, and managed in accordance with the requirements, as described in this facility's SPCC Plan.

9.4.3 Operation-Related Waste Management

The types, sources, and management of wastes anticipated to be generated during the operation of the proposed project are as follows:

- Municipal wastes which include paper and food from employee meals will be disposed of at the Sanitation Services Facility.

- Plant Wastes such as office wastes, packaging materials, garbage, refuse, and rubbish generated during the construction and operational phases of the proposed project will be handled in the same manner as the current wastes are managed.

- Special Wastes include chemicals, industrial solvents and other related wastes, lead-acid batteries, and used oil, generated during the construction and operational phases of the proposed project. Special wastes could also include items such as waste oils, waste lubricants, paints, and empty or nearly empty chemical containers. Special wastes will be segregated from other waste streams, collected and stored in suitable containers, within secondary containment and periodically transported off-site for proper disposal in with Bahama guidelines for such waste.

- Sewage Wastes will be contained in an on-site septic tank. This waste will be periodically pumped out by a licensed/certified waste transporter/disposer.

Hazardous wastes or hazardous materials that have the potential of being generated as part of this project may include: industrial solvents, paints, lead-acid batteries, waste lubricants and used oil. All of these wastes will be handled in a safe manner and properly disposed. Through a certified, licensed or permitted hazardous waste transporter and/or Disposal Company.

9.5 Spill Prevention Control & Countermeasures (SPCC) Plan

Spills and accidental releases of petroleum-related waste materials such as oil will be controlled, cleaned up, and managed in accordance with the requirements, as described in this facility's SPCC Plan.

9.6 Storm Water Management

Storm water runoff from Area 4 will be managed by the utilization of the Area 4 basin. Structural elements may include drainage structures such as swales, culverts, and catch basins that discharge into the basin. Velocity dissipation devices may be used where necessary to prevent washouts of slopes.

In conjunction with this facility's Spill Prevention Control and Countermeasures (SPCC) Plan, containment dikes/berms will be utilized around petroleum bulk storage tanks, containers (i.e., 55-gallon drums), oil-containing equipment such as transformers, and in other areas where oil or chemicals are used or stored to minimize the potential for release of contaminants into storm water runoff. Storm water that collects in containment areas will be periodically inspected, and treated if necessary via oil absorbent/adsorbent pads, to ensure it is uncontaminated prior to its release into the environment. Storm water drainage from equipment areas and exterior storage area drains will be directed towards the closed excavation pit. Storm water inside the aboveground storage tank containment will be manually discharged provided there is no sheen on the surface of the storm water. Storm water that has been impacted by petroleum constituents will be pumped out by a vendor who is qualified to handle this type of wastewater.

Sediment and erosion control measures will be implemented to minimize soil erosion within areas disturbed by excavation/construction activities. Sediment and erosion control will provide for appropriate measures that could include the following:

- Installation of silt fencing, as needed, at the perimeters of actively disturbed areas;
- Grading of exposed soil surfaces to minimize runoff and increase infiltration;

- Reinforcement of soil slopes, as needed, with suitable materials to minimize erosion;

- Diversion of runoff, as needed, to sedimentation basin(s); and

- Providing secure storage for oil, chemicals, and waste materials to prevent contaminated runoff.

Periodic inspections and maintenance of soil erosion measures will be performed. Due to the nature of the limestone it is doubtful there will be much standing water. The closed Area 4 basin will be used as the collection pond. The road base will be inspected after each heavy precipitation event.

During the operational phase of the project, this plan will be modified to include the following means and measures to minimize the potential for oil, chemicals, particulate matter, and other pollutants to contaminate storm water runoff from the project area:

- Oil, chemical, and waste storage containers or vessels will be stored in adequate, secondary containment to contain spills and leaks;

- Protection from erosion will be provided as needed, by properly grading susceptible slopes and by having or reinforcing exposed surfaces with riprap or other suitable means;

- Discharges of oil, chemicals, or wastewaters will be prohibited to the ground or to drainage structures, unless properly treated and approved;

- Periodic inspections will be conducted to check for leaks from equipment, storage containers and vessels, and to observe the integrity of secondary containment structures; and

- Preventative maintenance of equipment will be performed on a routine basis to reduce the potential for leaks.

9.7 Soil Erosion and Sedimentation Control

9.7.1 Excavation and Operations Management

As excavation in Area 4 involves the creation of two self contained lakes which are physically separated from open water, the use of measures to control sediment migration as a direct result of excavation operations, such as the use of sediment curtains, is not considered to be necessary. Procedures for the control and monitoring of soil erosion and sedimentation are outlined in 9.7.2.

Only one basin will be created in Area 4. It will be isolated until the keyway under the bridge is removed thus connecting Area 4 to Area 3. Once Area 3 retreat plug is removed all the areas will then be connected to Freeport Harbour. The removal of the earthen plug from the area 3 retreat will be the last activity, thus sedimentation will be minimal.

9.7.2 Sedimentation and Soil Erosion

The removal of vegetation and the exposure of hard surfaces can increase the volume of storm water run-off. Consequently storm water runoff from Area 4 and surrounding associated excavation areas will be managed with a combination of techniques including infiltration directly into porous surfaces, sheet flow discharge across sloped land surfaces and structural elements (rock diversion berms, check dams, vegetated berms, etc.) designed to control or direct flows to the active excavation area.

During resource extraction operations the following measures will be implemented by Bahama Rock and its subcontractors to minimize erosion and sediment run-off within areas disturbed by the construction activities, but with the main emphasis on preventing large volumes of sediment being washed into the open harbour.

- Grading of exposed soil surfaces to minimize runoff and increase infiltration and encourage run-off to flow into the two self contained lakes within Area 3;
- Reinforcement and grading of berms, as needed, with suitable materials to minimize erosion;
- Performing periodic inspections and maintenance of soil erosion measures and storm water control structures; and
- Early leveling of berm structures is advised to reduce any risk of flood and surge impacts and redistribution of sediment materials during such events.

Measures to minimize the potential for oil, chemicals, particulate matter, and other pollutants to contaminate storm water runoff from the project area are as follows:

- Providing secure storage for oil, chemicals, and waste materials to prevent contamination of runoff;
- Maintain the existing oil and fuel containment structures. Discharges of oil, chemicals, or wastewaters will be prohibited to the ground, unless properly treated and approved;
- Periodic inspections will be conducted to check for leaks from equipment, storage containers and vessels, and to observe the integrity of secondary containment structures; and
- Preventative maintenance of equipment will be performed on a routine basis to reduce the potential for leaks;

Further details of measures designed to control and prevent chemical and fuel spills, including relevant procedures, roles and responsibilities for release response, control, clean up and management of materials can be found in the SPCC Plan.

9.8 Health and Safety Considerations

Bahama Rock is committed to the health and safety of its employees. The employees are the most valuable asset of this operation. Bahama Rock has a world-class safety program

with over 500,000 employee hours without a lost time accident. The employees are periodically trained on health and safety issues that could affect them.

Bahama Rock currently contracts with Factory Mutual Insurance Company (FM Global) for business interruption insurance. They are one of the world's largest commercial and industrial property insurance and risk management organizations specializing in property protection and risk reduction. As a requirement of this coverage, inspections are made twice per year and enhancements to risk prevention and emergency response are made regularly.

9.9 Emergency Management, Contingency and Response Plan

The 'Security, Safety and Environmental Management System Manual' for this facility outlines a number of principles for Emergency Response and Control Measures. A designated Emergency Command Centre (EEC) will administer the Crisis/Emergency Response that will be designed to inform management actions to be taken in events such as:

- Fire and explosion;
- Severe storm or weather conditions, including hurricanes;
- Vessel collision;
- Serious injury, major illness, or fatality; and
- Bomb or terrorist threat.

Of these identified emergencies, hurricanes are seen most likely to occur on a regular basis and as such the locations of local hurricane shelters are posted in staff rooms and kitchens.

Co-ordination with Local and Area Wide Emergency Mitigation and Response Plans

With any industrial operation there are inherent safety risks. These risks can lead to emergency responses requiring outside support and expertise. No formal plan is in place although local fire and rescue services have been contacted by Bahama Rock and have

been provided with details of the excavation operation. Any further co-ordination considered necessary to ensure an effective response to area wide emergency situations will be covered by the appropriate *Crisis/Emergency Response Plans.*

Fires and explosions are one of the more serious risks. The highest risk for fire or explosion has been identified in the area of the Maintenance Shop and adjoining Lubrication/Fuel Station. The employees working in those areas normally have regular drills and inspections to minimize these risks. Fire drills are routinely conducted as part of these exercises. Such fire risks may result from combustible or flammable liquids igniting from a source originating from either man-influenced or uncontrolled outside influences such as weather (lightning). All areas are equipped with fire extinguishers. In addition, the plant has a water distribution system that includes 2-inch piping with a 250 GPM wash down hose system. A large water truck complete with water cannon has recently been added to the fleet of equipment to aid in the fighting of fires.

The Bahama Rock facility also includes the more qualified and more trained Freeport Fire Response Team as part of their fire fighting measures. Plans are being formulated to have trained First Responders on each production crew as well as updated medical equipment onsite to assist in the event of a safety incident. Bahama Rock utilizes the Freeport 911 Emergency Response System for all medical emergencies warranting it.

Natural Disaster Preparedness Measures

In the event of a forecasted natural disaster such as a hurricane, there are measures that can be taken to provide the Bahama Rock operation organizational structure to manage activities prior to, during and after natural disaster events. The measures cover preparedness activities from several days before through the return to normal operations after the event has concluded. The measures are only implemented when there is a high probability of a natural disaster such as a hurricane affecting this operation. The goals of these measures are to limit the negative affects of a natural disaster and to enable Bahama Rock to continue to operate and/or resume operation within a short period of time after. They are also designed to ensure the utmost safety of Bahama Rock personnel as well as security of the facility.

Explosives

The Bahama Rock/Dyno Blasting Standard Operating Procedures (SOPs) address safety issues related to explosive handling and storage. This document which is **confidential and proprietary** is attached in **Appendix 18.**

10.0 Security and Terror Threat

Three Bahama Rock employees are currently trained and recognized by Global Consulting Group as approved by the Bahamian Government for onsite International Ship and Port Facility Security (ISPS) Certification. Bahama Rock is also compliant with the Freeport Harbour Company security inspection requirements that include 24-hour security personnel certified in Maritime Security Training for Port Security Officers (Simmons Security & Investigations Ltd.). Security cameras and restricted access procedures such as security entrance gates, random inspections, ID badges, etc. are all being implemented as required by security threat protocols.

Martin Marietta Materials

Environmental Management Procedures

Bahama Rock Ltd.

Bahama Rock Limited	**Date Written: January 8, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP- 001	**Approved by:**
Title: Preserve Area Management Procedure	**Supersedes:**

OBJECTIVE:

To protect and encourage long term management of the mangrove preserve and transitional zone buffer areas.

PROJECT ACTIVITIES:

Delineation of the Mangrove Community and Transitional Zone Buffer Areas and Long-Term Management of Preserve Areas

RESPONSIBILITY:

It is the responsibility of the Project Manager to ensure that the Mangrove communities within the Area 4 property boundary are delineated and mapped. Moreover, the Project Manager is responsible for marking the wetland areas and transitional plant communities which make up the preserve area and inform the contractor and/or sub-contractor performing land clearing work of the importance in preserving these areas.

PROCEDURES:

- The mangrove community will be delineated and flagged in the field by an Environmental Specialist.

- This will be field verified by the Port Authority Environmental Department, if they deem necessary. Once the mangrove delineation has been accepted, a buffer zone that averages approximately 75.0 feet will be flagged in the field so that berms and silt fencing can be installed for protective measures as generally depicted below.

- The primary purpose of preserve areas is to maintain the existing mangrove wetland and coppice that functions as a permanent buffer between the site and the adjacent Hawksbill Creek. The property owner reserves the right to develop boardwalks, trails, points of access, or other ecologically friendly observation points to preserve areas for pedestrian use.

- All native vegetation within designated preserve areas will remain undisturbed. invasive exotic vegetation within designated preserve areas will be removed by hand using handheld equipment or light machinery. Heavy machinery will not be utilized inside preserve areas unless conditions warrant such use. If heavy equipment is necessary permission will have to be obtained from the General Manager or Project Manger of Bahama Rock.

- The following activities will not be permitted in the mangrove preserve areas:
    - Use of heavy machinery or motorized vehicles and/or equipment without prior approval by Bahama Rock's General Manager.
    - Placement of construction/fill materials, trash, landscape waste, or litter
    - Removal of native vegetation, animals, and other natural resources
    - Excavation, dredging, or removal of soil materials

Bahama Rock Limited	**Date Written: January 10, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP- 002	**Approved by:**
Title: Site Clearing	**Supersedes:**

OBJECTIVE:

Prevention of Inadvertent Loss and/or Damage to Preserve Areas

PROJECT ACTIVITIES:

Site Preparation for Area 4 Parcel Change area

RESPONSIBILITES:

General Manager or Project Manager

PROCEDURES:

- Prior to land clearing activities, a meeting shall be held with Bahama Rock, Port Authority Environmental, and the Contractor responsible for land clearing to provide information on the preserve areas and to determine responsibilities in monitoring the land clearing near the protective buffers. A cleanup and disposal program for the abandoned cars and appliances and miscellaneous garbage should be developed. The land clearing Contractor will be made aware of his duties in keeping the cleared vegetation separate from the trash on the property and stockpiled for proper disposal.

- Designated buffer zone boundaries and property boundaries will be demarcated using stakes and/or flagging. Construction barrier fencing will be installed along established boundaries and will be maintained intact throughout subsequent lot filling and grading activities. Construction fencing will be highly visible orange safety fence extending from the ground to a height of at least 4 feet and will not be attached to vegetation.

- Silt fencing will be installed in erosion prone areas, along the northern project boundary and preserve areas. All silt fencing will be installed directly in front of construction barrier fencing. Silt fencing will be maintained intact throughout subsequent lot filling and grading activities.

- All vegetation proposed to be removed will be cleared, temporarily stockpiled, and disposed at the Pine Ridge Landfill.

- All construction and mechanical debris encountered will be segregated into separate temporary stockpiles. Construction and mechanical debris will not be mixed into vegetation stockpiles and will be disposed of into an appropriate landfill.

- Should any hazardous materials be encountered, the Port Authority Environmental Department will be contacted immediately. This material will be handled by procedures outlined in the waste management plan.

- All erosion prone areas will stabilized using silt fencing or earthen berms.

- Haul roads will be periodically watered down, as necessary to prevent dust and sediments from becoming airborne.

Bahama Rock Limited	**Date Written: January 10, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP- 003	**Approved by:**
Title: Ground Water Monitoring	**Supersedes:**

OBJECTIVES:

To monitor changes to the configuration of the freshwater lens due to excavation activities.

PROJECT ACTIVITIES:

Resource Extraction

RESPONSIBILITY:

The General Manager or his designee will provide quarterly groundwater monitoring reports to the Port Authority Environmental Department to keep them apprised of changes in the configuration of the freshwater lens due to excavation activities.

GROUNDWATER MONITORING PROCEDURE:

Groundwater monitoring wells MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, and MW-10, the Bahama Cement trenches are located in and adjacent to Area 4, and Private Wells. The locations of these monitoring points are presented in the Water Resource Assessment and Groundwater Modeling Report and listed below:

- MW-1: Intersection of Warren J. Levarity and Queens Highway.
- MW-2 : Grant's Property Harbour West Area
- MW-3: Trench Well Field
- MW-7: Mr. Campbell Heavy Equipment Yard (east)- flush mounted
- MW-8 Eight Mile Rock High School (northwest basket ball court) - flush mounted
- MW-9: Rental Apartments south of Church of God (Queen's Highway) - flush mounted
- MW-10: Eight Mile Rock Motel – flush mounted

Quarterly monitoring events will be conducted each year to monitor changes in the freshwater lens. The frequency will decrease if deemed unnecessary with approval by the Port Authority. Groundwater monitoring reports will be made available to the Port Authority Environmental Department.

- Salinity and conductivity measurements will be made with a YSI Model 30 – Salinity, Temperature and Conductivity Meter (or comparable) beginning just below the water surface and continuing at one (1)-foot intervals to trench bottom or to a depth of 50 feet in the monitor wells.

- All measurements will be entered into data base in spreadsheet or similar form.

- Included in the data base will be the rainfall summary for the corresponding period as recorded at Station 78062 (MYGF) Freeport, G.B.

- Configuration of the freshwater lens will be determined based on a salinity measurement of 0.6 ppt (600 – 699 ppm) and a conductivity measurement of less than (<) 1,300 uS/cm.

Bahama Rock Limited	**Date Written: January 10, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP- 004	**Approved by:**
Title: Blasting Procedure	**Supersedes:**

OBJECTIVES:

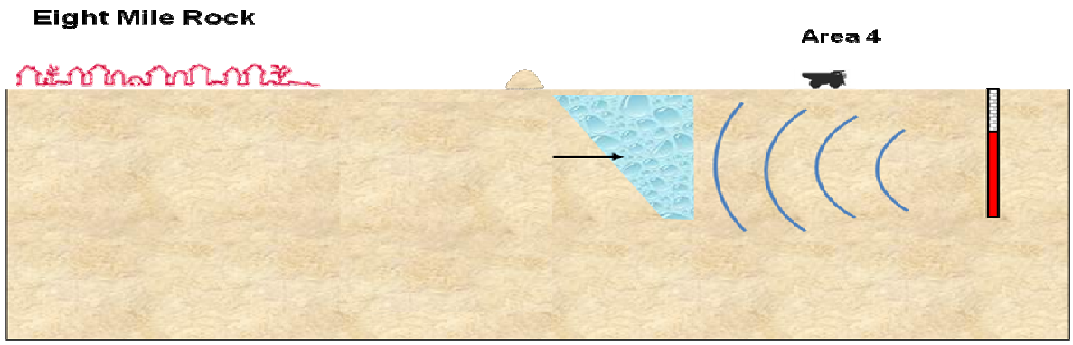
Bahama Rock recognizes the sensitivity of blasting activities to the nearby communities and will take all necessary steps to minimize nuisance complaints and vibrations.

PROJECT ACTIVITIES:

Blasting is required for all limestone rock excavations throughout Area 4. This also includes the open water buffer trench. These activities are preceded by borehole drilling in defined patterns and depths for loading of the explosives Upon completion of the open water buffer trench along the southern border of Area 4, blasting will progress generally east to west averaging two to three shots per week and approximately 370 shots in total over the life the project.

RESPONSIBILITY:

The General Manager and/or Site Engineer will have to meet with the Port Authority Environmental Department and the Department of Environmental Health Services to make them aware of the Blasting Plan and Schedules for the construction of the Buffer Trench and timetable for the start of Area 4 excavation. It is imperative that the all relevant regulatory agencies are advised on the progress of the Area 4 Project start date. The specific Surface Blasting for Bahama Rock Site Specific Standard Operating Procedures and the Blast Management Plan is attached in **Appendix 4.**



Blasting Procedures and Noise & Vibration Mitigation Measures:

1) Prior the start of the Area 4 project pre-blasts surveys will have to be completed 60-days prior.
2) Prior to blasting the information signs located on the Warren J. Levarity Highway will be updated and phone calls made to notify the local community.
3) The seismic monitors located in the community will be checked and verified that they are in working order.

- The excavation/dredge of the Area 4 basin will be accomplished by a combination of trenching, drill/blast, and mechanical removal.

- An open water buffer trench will be created along the southern boundary of Area 4. The trench is planned to be 75 feet wide by 60 feet deep and over 4,000 feet long. The trench will provide vibration protection over the entire length of Area 4 southern boundary to the community of Eight Mile Rock.

- All efforts will be taken to ensure that blast vibrations will be less than the target 0.20 inches per second peak particle velocity.

Should vibrations exceed 0.20 PPV the Bahama Rock Blasting Specialist will notify the Bahama Rock General Manager or designated person immediately. A thorough investigation shall begin. Appropriate measures shall be taken to reduce the vibrations. This is stated in the Standard Operating Procedure in **Appendix 18.**

- Should any complaints be received by the local community Bahama Rock will log each complaint using the attached log sheet then investigate and document the finding. A follow-up report shall be submitted to the Port Authority Environmental Department

MARTIN MARIETTA MATERIALS
BLASTING COMPLAINT FORM

QUARRY/MINE_____BLAST REPORT NO. (MUST BE ATTACHED)_____

NAME OF COMPLAINANT_____PHONE/NO_____

ADDRESS_____

DATE OF COMPLAINT_____TIME OF COMPLAINT_____

DATE OF BLAST_____TIME OF BLAST_____

COMPLAINT RECEIVED BY:_____VIA: TELEPHONE_____PERSON_____LETTER_____

LOCATION/DESCRIPTION OF PROPERTY_____

DISTANCE/DIRECTION FROM BLAST_____

WAS SEISMOGRAPH USED?_____IF YES, ATTACH REPORT OF FILL IN READINGS ON BLAST REPORT.

GIVE DISTANCE/DIRECTION TO COMPLAINANT'S PROPERTY FROM SEISMOGRAPH_____

COMPLAINANT ALLEGES: VIBRATION_____NOISE_____OTHER_____

HAS INDIVIDUAL COMPLAINED BEFORE? YES – NO (CIRCLE ONE) WAS A PRE-BLAST SURVEY DONE ON PROPERTY? YES – NO

DID COMPLAINANT REQUEST CERTAIN STEPS BE TAKEN, OR MAKE DEMANDS YES – NO (CIRCLE ONE) DESCRIBE BELOW.

NOTE IMPORTANT DETAILS ON CONVERSATION:_____

RESPONSE: **DATE** **ACTION TAKEN**

_____ _____

_____ _____

_____ _____

Bahama Rock Limited	**Date Written: January 10, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP- 005	**Approved by:**
Title: Waste Management	**Supersedes:**

OBJECTIVE:

The objective of this EMP is to control and manage various waste streams associated with activities at the facility in an environmentally acceptable manner following the Freeport Bylaws and Bahamian Regulations.

PROJECT ACTIVITIES:

Waste Management applies to the daily operation of the facility and to be applied to Area 4 construction of site preparation, bridge construction, and production operations.

RESPONSIBILITIES:

It is the responsibility of all employees, contractors and sub-contractors to ensure that proper waste management procedures are utilized in the performance of their work. All employees and contractors are to comply with the procedures outlined in this plan.

PROCEDURES:

- All domestic waste, such as cardboard boxes, food scraps, papers, bottles, plastic containers and other such waste generated daily should be disposed of in the appropriate garbage receptacle for collection by Sanitation Services Company.

- Bulky construction wastes, such as concrete, clean fill material, and scrap wood and metal generated during construction of the proposed project will be staged in a designated staging area or dumped in a roll-off container if provided. Arrangements should be made to have the material disposed of at the Pine Ridge Landfill.

- Waste generated during normal work activities such as: vehicle air filters, oil filters, waste tires, batteries, conveyor belting, hoses, belts, and junked equipment should be disposed of in the appropriate receptacle and arrangements made for disposal at the Pine Ridge Landfill. Bahama Rock will recycle materials where the opportunities exist locally.

- Sanitary wastes will be managed through the onsite septic tanks at the facility. Portable toilets will me provided for Area 4.

- Plant Wastes such as office wastes, packaging materials, garbage, refuse, and rubbish generated during the construction and operational phases of the proposed project will be handled in the same manner as the current wastes are managed.

  Special Wastes include chemicals, industrial solvents and other related wastes, lead-acid batteries, and used oil, generated during the construction and operational phases of the proposed project. Special wastes could also include items such as, waste lubricants, paints, and empty or nearly empty chemical containers. Special wastes will be segregated from other waste streams, collected and stored in suitable containers, and periodically transported off-site for proper disposal.

  In conjunction with this facility's Spill Prevention Control and Countermeasures (SPCC) Plan, containment dikes/berms will be utilized around petroleum bulk storage tanks.

- Storm water that collects in containment areas will be periodically inspected, and treated if necessary via oil absorbent/adsorbent pads, to ensure it is uncontaminated prior to its release into the environment. Storm water drainage from equipment areas and exterior storage area drains will be directed towards the closed excavation area.

Bahama Rock Limited.	**Date Written: Jan 10, 2008**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP-006	**Approved by:**
Traffic Plan	**Supersedes:**

OBJECTIVE:

To safely warn the motoring traffic of heavy truck and equipment crossings and detours if necessary during relocation of the Warren J. Levarity Highway and construction of the new bridge.

PROJECT ACTIVITIES:

During construction of the Warren J. Levarity Highway detour road and bridge construction projects it may be necessary to have temporary road detours. Additionally, it will be necessary for heavy equipment and trucks to cross and/or enter and exit the highway.

RESPONSIBILITY:

It is the responsibility of the general manager or designee to coordinate and arrange for road traffic police to ensure public safety. All efforts must be made by both Bahama Rock and its contractors and subcontractors to ensure the safety of the motoring public, pedestrians, employees and heavy equipment operators during movements or crossing along Warren J. Levarity Highway.

PROCEDURES:

- If truck crossings are necessary or heavy equipment must enter and exit the highway; Bahama Rock will inform the public in advance through the local newspapers. Additionally, caution signs will be posted on the sides of the highway with Port Authority Technical Department approval.

- Bahama Rock Management shall meet with the Road Traffic Police in advance to inform them of any long-term movements and/or crossings along the Warren J. Levarity Highway that involves heavy equipment. Bahama Rock must seek the Police assistance to regulate traffic if there is a potential danger to either the motoring public or heavy equipment operators.

- Bahama Rock shall inform contractors and sub contractors that it is their responsibility to provide flagmen if necessary for the safe movement of vehicular traffic through any detour areas or crossings.

- If possible crossings of the highway should be conducted during off peak traffic hours.

Bahama Rock Limited.	**Date Written: January 10, 2007**
Environmental Management Procedure	**Written by:**
Procedure Number: EMP-007	**Approved by:**
Spill Prevention and Countermeasure Plan	**Supersedes:**

OBJECTIVE:

To provide the protocols for responding to an oil spill at the Bahama Rock facility.

PROJECT ACTIVITY:

The SPCC Plan for the Bahama Rock facility has been prepared by its parent company Martin Marietta Materials, Inc. This document describes the procedures to be used in the event of an oil/ fuel or hazardous material spill at the facility.

RESPONSIBILITY:

It is the responsibility of the General Manager to ensure that the procedures detailed in the SPCC Plan are complied with.

PROCEDURES:

- Spills and accidental releases of petroleum-related waste materials such as oil will be controlled, cleaned up, and managed in accordance with the requirements, as described in this facility's SPCC Plan.
- Any spill over 25-gallons must be reported to the South Central Division Environmental Staff within 24- hours.
- Any spill over 25-gallons should also be reported to the Port Authority Environmental Department.
- The SPCC Plan shall be amended within 6-months where there is a change in facility design, construction, operation or maintenance that affects its potential for a discharge.
- A Detailed Discharge Report form as provided in the attached SPCC Plan (Appendix C) must be completed. Additionally, a Record of Discharge Prevention

Form (Appendix D) must also be completed. See SPCC Plan attached in **Appendix 12**.

Bahama Rock Limited	**Date Written: January 10, 2008**
Environmental Management Plan	**Written by:**
Procedure Number: EMP- 008	**Approved by:**
Title: Dust Suppression	**Supersedes:**

OBJECTIVE:

To minimize particulate and prevent emissions from becoming airborne and traveling beyond the property line.

PROJECT ACTIVITIES:

Site clearing, overburden removal, material transportation and material processing.

RESPONSIBILITIES:

It is the responsibility of the Site Manager to ensure that the designated person performing the work is aware of and complies with the procedures outlined in this plan. The majority of these procedures are currently employed and all procedures outlined herein will be initiated prior to the development of Area 4.

PROCEDURES:

- All disturbed soils that will not be further affected will be graded and/or compacted if appropriate and stabilized with vegetation within a reasonable period after disturbance.

- Existing vegetation will not be removed from an area to be excavated until just prior to the excavation activity where practical.

- If during high wind periods the application of water to haul roads is not sufficient to control emissions, haul vehicle speed reduction will be employed.

- Graded and/or compacted soils will be wetted using a water truck.

- All haul roads at the production facility, Area 3 and Area 4 other areas on the property were dust will be generated and has a potential to leave the property should be watered on a frequency sufficient to suppress emissions. Should visual observation indicate uncontrolled emissions at the facility or crossing the property boundary it is the employee's responsibility to report this to the appropriate person so that preventative measures can begin immediately.

- Should a community complaint be received the Site Manager will be notified immediately and all appropriate correction action taken.

- Driveways, streets, associated heavy equipment routes, and other areas prone to emissions will be watered on an as needed basis contingent upon site conditions and precipitation. A precipitation gauge will be installed and a precipitation log maintained.

- A water truck operation log will be maintained.

Bahama Rock LTD

Summary of Emergency Response Procedures

BAHAMA ROCK LIMITED

Summarized below are the current status of plans and existing documents regarding crisis/emergency response action:

1. Medical Emergency: Bahama Rock utilizes the Freeport 911 Emergency response system for medical emergencies. Plans are being formulated to have a trained First Responder on each production crew as well as improved medical response equipment on-site for 2007. Bahama Rock has a world-class safety program and recently passed 500,000 employee hours without a lost time incident.

2. Fire or Explosion: The highest risk of fire or explosion has been identified in the area of the Maintenance Shop and adjoining Lubrication/Fuel Station. Those employees normally working in these and other areas have regular drills and inspections to minimize this risk. For example, a fire drill in the Ship loader area was conducted during March 2007. There is some risk of conveyor belt fires; however, the open construction of the plant prevents the accumulation of factors normally causing such ignitions. All areas are well equipped with fire extinguishers and the plant also has a water distribution system that includes 2-inch piping with a 250 GPM wash down hose system. In addition, the purchase of a large off-highway water truck with fire fighting spray canon has been submitted for approval at this time. Notification of Freeport Fire Response is also part of the plan. The Bahama Rock/Dyno Blasting SOPs address safety issues related to explosives handling and storage in a previously submitted document.

3. Security and Terror Threat: Three Bahama Rock employees (Chris Culmer, Don Singh and Andrew Davenport) have been officially trained and recognized by Global Consulting Group as approved by the Bahamian Government for on-site International Ship and Port Facility Security (ISPS) Certification. Training has been conducted for all Bahama Rock employees and all action items as identified by the security consultant have been completed. Bahama Rock is in compliance with the Freeport Harbour Company security inspection requirements that include 24-hour security personnel certified in Maritime Security Training for Port

Security Officers (Candid Security Ltd.), security cameras and restricted access procedures (secure entrance gates, random inspections, and ID badges).

4. Severe Storm Plan: Bahama Rock has a severe weather plan than basically outlines shutdown, tie down and evacuation procedures. Sufficient back-up power is now installed for life support, along with 30-days water and food supplies for 80 people. The plan is currently under revision, as changes in management and resources require an update. The plan is available for review at the Bahama Rock Administration office.

5. Risk Reduction: Bahama Rock currently contracts with Factory Mutual Insurance Company (FM Global) for business interruption insurance. They are one of the world's largest commercial and industrial property insurance and risk management organizations specializing in property protection and risk reduction. As a requirement of this coverage, inspections are made twice per year and enhancements to risk prevention and emergency response plans are made regularly. The last inspection was made April 11, 2007 with a follow-up scheduled for July 2007. Action items include fire prevention, wind damage protection and non-destructive testing.

6. Spill Prevention Control and Countermeasures (SPCC): A copy of the existing plan is provided in Environmental Management Procedures

Chapter 10: Agency Consultation

The Grand Bahama Port Authority is responsible for the administration of the Port Area. Therefore, all communication with regard to the requirements and expectations in the preparation of the Area 4 Environmental Impact Assessment have been held directly with the Building and Development Services staff of the Port Authority.

Initial organizational meetings were held to determine the Scope of Work and clarification of the Terms of Reference (TOR) checklist provided by the Environmental Department. A qualified consultant was selected by Bahama Rock and approved by the Port authority to provide both a response to the TOR and preparation of the actual EIA documents.

The TOR was submitted to the Port Authority in August 2007 and comments were received promptly. As work and preparations progressed, interim and update meetings were held with various members of the Environmental and Building Permitting Departments. The last two meetings, January 28th and February 25th involved both progress reports and the introduction of a third-party review consultant solicited by the Port Authority to analyze specific elements of the Bahama Rock Area 4 EIA.

Parallel to the Port Authority review process, Bahama Rock continues to solicit feedback and advice from Central and Local Government, concerned citizens and business community leaders:

- August 7, 2006 Open house at the Bahama Rock facility that discussed Area 4 and Harbour Expansion with 500 residents of the eight Mile Rock Community

- On November 3, 2007 a preliminary review with Minister Kenneth Russell, M. P. was conducted on site.

- On November 16, 2007 Minister Russell, Deputy Speaker Kwasi Thompson and Member of Parliament for Eight Mile Rock Vernae Grant toured the Bahama Rock operation. A detailed review of the Harbour Master Plan, Area 4 project and environmental and

blasting issues was discussed. Additional documentation was provided for review by other Parliament members. An electronic copy of the presentation was also provided to the Office of the Prime Minister.

- January 17, 2008 Presentation to the Rotary Club of Freeport at Ruby Swiss Restaurant.

- On February 13, 2008 an on-site meeting was held with a representative from the Bahamas National Trust and Michele Knowles of the Department of Marine Resources.

- On February 16, 2008 a presentation was made to Minister Zhivargo Laing M.P. and additional information on economic impact was provided.

- On February 18, 2008 a meeting was held with Mrs. Hilda Luoga of the BEST Commission to discuss blasting procedures and an overview of the Area 4 plan.

- On March 11, 2008 Bahama Rock management met with Mr. Calvis Bartlett of Eight Mile Rock Local Government.

- April 1, 2008 Draft submission of EIA to Port Authority.

- May 13, 2008 a meeting with the Kiwanis Club of Eight Mile Rock at the Local Government Office.

- May 28, 2008 a meeting with Port Authority and third party GBPA consultant.

- July 14, 2008 a presentation and facility tour with news media.

- July 17, 2008 a Town Meeting was held at Bartlett Hill Primary School in the evening.

- July 24, 2008 a Town Meeting was held at the Gymnasium at Eight Mile Rock High School in the evening.

- September 17, 2008 Mr. Philip Weech of BEST and Nakira Whilchombe of GBPA Environmental Department witnessed a blast in Area 3.

The minutes of the Town Hall meetings are presented in **Appendix 17.**

Chapter 11: Conclusion

The Area 4 project was part of the initial Martin Marietta plan for the development of the Bahama Rock facility. The assets purchased from Dravo Bahama Rock in mid 1995 were coupled with an additional acquisition of 800-acres of land from the Bahama Cement Company. The vision to enlarge the harbour required the construction of a state-of-the-art aggregate processing plant and relocation of a large electric dragline from the United States. The ability to quickly excavate process and ship large volumes of aggregates allowed for the rapid expansion of Freeport Harbour. The Area 4 Project represents the furthest westward expansion of the Harbour

The terrestrial environment of Area 4 will be transformed to a 135-acre basin. The result of this will be the loss of 161.1 acres of Pine Whitelands. 0.8 acres of Freshwater wetlands, 0.8 acres of Coppice, 3.7 acres of Slope/Coastal Strand and 5.5 acres of previously human disturbed lands. The mangrove habitat at the edge of a tributary of Hawksbill Creek will be preserved and a 75.0 ft protective buffer of predominately Coppice and Slope/Coastal Strand will be delineated.

A component of the EIA was the preparation of a Ground Water Resource Assessment and Modeling Report. This study involved the installation of groundwater monitoring wells at various locations to determine characteristics of the hydrogeology of the area. Additionally, multiple sampling events were conducted from October 2007 to September 2008 to determine the aerial extent and thickness of the freshwater lens. In a separate study it was found that some persons in the Eight Mile Rock community do not have a municipal water connection and rely on private wells for bathing and cleaning purposes.

Groundwater modeling was performed for three scenarios to determine the size and quality of the freshwater lens. The Ground Water Resources Assessment & Modeling report concluded that at both fifty percent and full project completion the freshwater lens will decrease in both size and shape. This will result in an expected increase in salinity over time in some of the private wells. Bahama Rock has committed to provide a municipal water connection to those private well users if the wells are adversely impacted. Bahama Rock will monitor freshwater lens changes

throughout the life of the project. It should be noted that the freshwater lens immediately south of Area 4 will be reduced in size but not eliminated.

Noise will be reduced through the construction of a 15.0 foot berm on the southern property boundary. Computer modeling has indicated that overall, all noise projections for all excavation locations within Area 4 are less than the World Bank standards. While some noise may exceed the ambient community levels during initial work in the site, the construction of the berm will reduce the effect upon the adjacent community. Bahama Rock is committed to monitoring noise to ensure that this does not result in a nuisance to the nearby communities particularly in the nighttime hours.

Dust emissions from the site and particularly the haul roads will be controlled through dust suppression techniques such as the use of a water truck and fixed sprinkler systems.

The Area 4 plan incorporates a temporary detour of the Warren J. Levarity Highway only during the construction of a bridge to the west of the Bahama Rock facility. The bridge is required so that haul trucks can transit safely to and from Area 4 without traffic interference. This bridge will be permitted through the relevant Port Authority department. In addition, the project will provide for a 150 foot wide east-west right-of-way through Bahama Rock properties parallel to Hawksbill Creek ending near the Seagrape community. This 15.0 foot elevated road base enables the construction of a dual carriageway through the Eight Mile Rock Community. The road base also provides protection from northern flood events.

Blast vibrations will be controlled through the refined blasting techniques that have been incorporated into Bahama Rock's standard operating procedures. An open water buffer trench will be constructed on the south side of the Area 4 property for supplemental vibration protection. Expected ground vibrations will remain below the 0.2 inches per second peak particle velocity target level based on calculated predictions.

The Area 4 project allows Bahama Rock and the Freeport Harbour Company to plan and coordinate the development of Freeport Harbour in a balanced approach. This allows Bahama

Rock to meet sustainable aggregate production levels while advancing completion of the Freeport Harbour Master Plan. Approval of the Area 4 project will provide long term opportunities within the Freeport Harbour for mixed use development. Furthermore, Area 4 approval permits continued availability of construction aggregate throughout the Bahamas and the Region for the next decade.