BCA Beach Licence for encroachment on the foreshore and floor of the sea in connection with:

- **Construction and Maintenance of two (2) breakwaters**
- **Coastline Reclamation using 3,339 cubic metres of material**
- **Capital Dredging of 2,377 cubic metres of material**

at Negril, Westmoreland by National Works Agency; Date Received: 25 January 2013

Application Number
2013-10017-BL00003

Designer
CEAC Solutions Ltd.: Christopher Burgess, M.Sc Engineering, Professional Engineer (PE/01:06:15/0376)

Date Received
25 January 2013

Location
Negril, Westmoreland

Figure 1: Showing Site Location

Background
In 2007 Smith Warner International Ltd (SWIL) was commissioned to undertake a study of the erosion problem in Negril. The study determined that the erosion problem in Negril has worsened owing to a series of hurricanes and severe swell events, in addition to other factors which some believe include the erection of seawalls and other infrastructure along the shoreline. SWIL assessed

the erosion trends and found that the beach widths along the entire length of coastline vary by about +/- 30m annually. Over the last 40 years the beach along Long Bay was said to have been dominated with erosion totaling approximately 40m. There were some periods of accretion.

The study outlined recommendations for combating the issue, including soft engineering solutions such as the rehabilitation of coral and seagrass, beach nourishment and hard engineering solutions such as a series of nearshore breakwaters, reef balls (artificial reefs). An integrated solution was also proposed which included nearshore breakwaters and beach nourishment.

The Planning Institute of Jamaica (PIOJ), in recognizing Jamaica's vulnerability to climate change hazards and in particular, Negril's vulnerability, applied to the Adaptation Fund for financing to support mitigation/adaptation activities. The Government of Jamaica received support from the Adaptation Fund and has implemented the "Enhancing the Resilience of the Agriculture Sector and Coastal Areas to Protect Livelihoods and Improve Food Security Project" . Component 1 of the project is the "Construction of Breakwater Structures Offshore Negril (Negril Breakwaters)" sub-project, which was formulated to protect the Negril coastal area.

This application is for the construction and maintenance of two (2) breakwater structures, to combat the severe erosion Negril has been experiencing. This proposal represents the first phase of a modified version of the SWIL recommended integrated solution (modified by CEAC Solutions Ltd). The breakwaters are expected to protect the northern and central sections of Long Bay, which has been found to be experiencing more severe chronic erosion than the southern section.

Description of the Environment

The Long Bay shoreline in Negril has a concave shape stretching from Bloody Bay in the north to west end just beyond the south Negril River. The overall length is approximately 7 km with an average beach width of approximately 15 m. Fronting Long Bay, there is a 500 m long patch reef 1.4 km offshore in front of the central and widest section of beach. There is also a fringing reef situated 0.6-1.6km seaward of the outer shelf of the reef.

The overall rate of erosion in Long Bay has been observed to be between 0.2 m/year and 1.4 m/year. Over the past 45 years, a maximum of 62.6 metres of erosion has been recorded for the Negril beach. The available monitoring results also indicate that the central section of the beach is the most vulnerable to long term as well as short term erosion.

<u>Water Quality and Heavy Metals</u>

Seven (7) water quality parameters were measured in situ and eighteen (18) stations were sampled within Long Bay. An analysis of the physical-chemical variables revealed that there was little variation between the stations with the exception of one station (Station 1). The variations were attributed to the influence of the South Negril River at Station 1 and this was demonstrated in the lower temperature, salinity, specific conductivity and TDS. The anomalies observed at Station 1 may be attributable to the agricultural activities taking place within the Morass and the runoff which may enter the South Negril River

Sediment samples were collected at seven (7) stations within the Bay and assessed for heavy metal content. The levels of heavy metals at each station were generally insignificant in comparison to average levels found in Jamaican soils.

Water Circulation and Wind

Information on currents was collected using two (2) drogue tracking missions and deploying an Acoustic Doppler Current Profiler (ADCP) on the sea floor for approximately one month. ADCP measured currents were generally in a north-south direction and the average recorded speeds were below 0.214/s. The current speeds observed were generally higher for the falling tide than for rising tide sessions.

Shoreline Sediment and Erosion

Grain size analysis was conducted of shoreline sediments/sand samples collected from both the beach face and back of the beach at six (6) locations along the shoreline. All the samples analyzed had a uniformity coefficient less than 6 with poorly graded particle sizes; indicating relatively high wave energy at the shoreline. The respondents revealed that hoteliers and residents manually relocate or reshape sand accreted and deposited debris after the passing of a storm event thereby minimizing the short term recovery time.

Biological Community

Benthic surveys were conducted within the footprint of the proposed breakwaters and the adjacent reef communities. The proposed locations of both the northern and southern breakwaters occur in pavement zone areas. The low-relief, high wave action, heavy usage by divers and fishermen along with other natural and anthropogenic stresses have caused this community to be dominated by macroalgae, with low coral species diversity and few other invertebrates. The algal community is primarily composed of fleshy macroalgae and turf, with little calcareous (*Halimeda*) or coralline algae present. Analysis indicates a coral community with a percentage cover less than or equal to 1% in footprints of the proposed breakwaters. This coral community is dominated by small encrusting coral species and soft corals (various species of seawhips and fans) as well as sponges.

Seagrass beds of varying densities were located within the backreef and consisted mainly of *Thalassia sp*. and *Syringodium sp*. Areas of mixed beds were also observed in close proximity to the reef crest. The phytoplankton community of Long Bay, Negril is highly diverse and dominated by small diatom species. 17% of the species comprising the community are classified as rare with 7% classified as potentially toxic. Phytoplankton abundance and biomass concentrations are both low despite the high number of species and this data combined with the moderately high diversity values suggests that the water quality of the area is presently mesotrophic (moderately nutrient rich).

Fish counts were also conducted and these indicated that the lowest numbers of fish species (10 species) were observed within the North and South breakwater area when compared to the recreational dive sites, Throne Room and Shark reef, which showed the highest species diversity of 23 and 25 respectively.

Description of Project

The proposal involves the construction of two (2) offshore breakwaters approximately 1,500 – 1,600m offshore, in 3.0m to 4.1m of water depth (see Figure 1). The Northern Breakwater is proposed to be 516m long, ranging in width from 15m at its narrowest to 23m at its widest . The Southern Breakwater is proposed to be 422m long, ranging in width from 20m at its narrowest to 23m at its widest. The tips of the breakwaters are designed to extend over a range of +/- 0.43m above mean sea level (depending on the tide). The actual seafloor footprint of the breakwaters is 10,192m^2 for the northern breakwater and 9,071m^2 for the southern breakwater. The design life of the project is 36 years (up to 2050. It should be noted that the design considerations did not take

into account the operation of the breakwaters past 2050 due to the uncertainties of climate change (the IPCC at this time is only able to provide predictions up to 2050). The installation of the breakwaters is also projected to result in approximately 109,400 cubic metres of accretion over 80% (4.95km) of the shoreline, with an average shoreline growth of 13.5 meters per annum.

The breakwaters were designed with the following considerations:

- To withstand a 1 in 100 year return period deep water wave conditions with minimal damage (Structural damage number of less than 2 to 3).
- To meet Climate Change predictions from the Intergovernmental Panel on Climate Change (IPCC) Special Report: Emissions Scenarios A1B or A1 scenario.
- Employ the use of locally available materials (boulder stones)

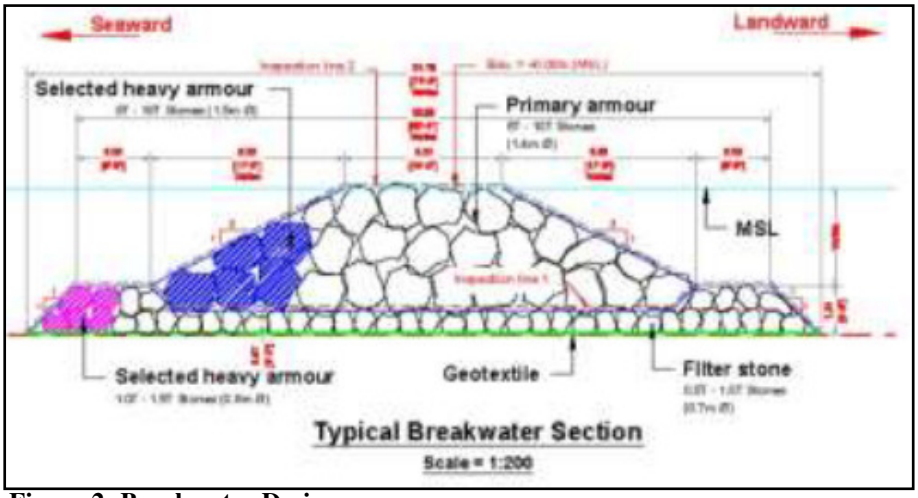

Figure 2: Breakwater Design

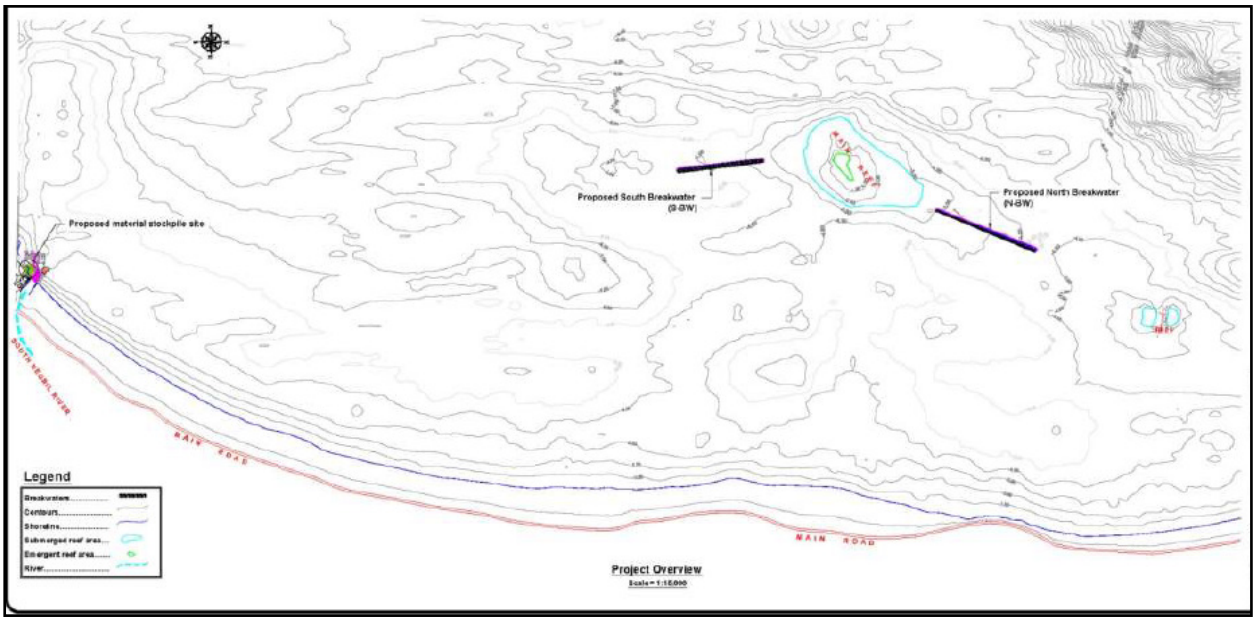

Figure 3: Proposed Placement of Breakwaters

Phase 1: Land Reclamation for Stockpile/Staging Area

A shoreline stockpile/staging area is proposed to be constructed by reclaiming land (47m X 30m), to facilitate the loading of barges with boulders for transportation to the construction site. The proposed area is located adjacent to the mouth of the South Negril River, south of the southern groyne, and will require a total volume 3,339 m^3 of material. The proponent has indicated that 2,377m^3 of this material is to be sourced by dredging a section of the Caribbean Sea in front of the proposed reclamation area (see Figure 4), deepening the area by 3.0m to allow for the operation draft of the barges. The dredging will be conducted using a long-reach excavator with shaping bucket from land or from the barge (if necessary).The remaining fill required (962m^3) is to be purchased from a licensed quarry.

Phase 2: Construction of Breakwaters

The breakwaters are proposed to be constructed using 45,014 tonnes of boulders. It is expected that 113 barge trips (2 trips per day) from the staging area will be required (with an expected weight of 400 tonnes on the barge per load). The construction is expected to last for six (6) months and approximately 2,923 truck/trailer loads of boulders will be required, resulting in 24 truck/trailer trips per day, for the six (6) months.

The proposed works include the following:

- Removal of bio-physical features (corals and associated invertebrates) in footprint, and relocation of same:
    - *"the footprint of the breakwaters will be cleared of all species as per the requirements of…and verified by NEPA"*
- Placement of turbidity barriers:
    - *"Curtains 6' to 8' deep will be deployed around the work areas and anchored properly. These will be adjusted daily or as required to move with the work and replace damaged sections in order to maintain water quality requirements."*
    - NB: The Agency will require that curtains at least 9' deep be deployed, due to the depth at the proposed site of the breakwaters. This has been included as a condition.
- Placement of Geotextile:
    - *"Geotextile will be placed in the footprint in 10m segments."*
- Retrieval of Boulders from Stockpile Area:
    - *"Supply barges will dock alongside the southern groyne of the South Negril River. The three boulder stone classes will be loaded on the barge either by a crane on land or by loaders."*
- Placement of Boulders in Footprint:
    - *"Placement will be initiated with the filter stones on the…geotextile. The shapes will be achieved and surveyed by the contractor for accuracy to the designs. This will be undertaken by a grapple with mechanical mechanism. A spudded barge with minimum capacity of 600 tonnes will be used for this purpose with a minimum capacity of 130 tonnes."*

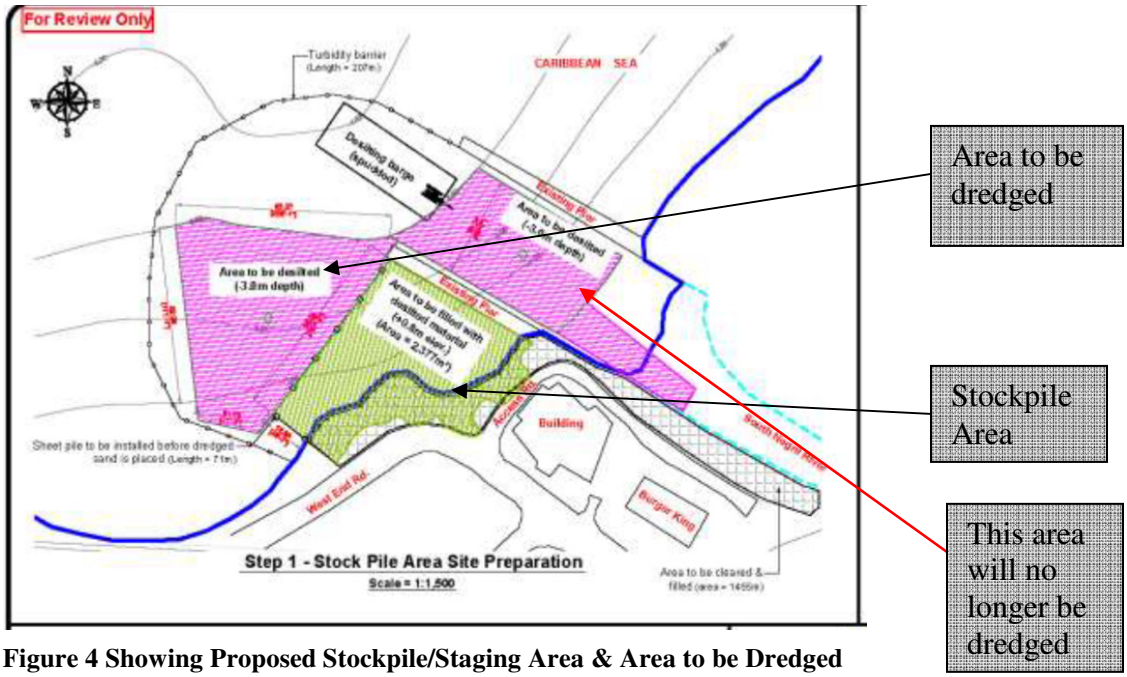

Figure 4 Showing Proposed Stockpile/Staging Area & Area to be Dredged

In designing the project the Engineering Considerations were assessed by the University of Delaware. The results of the modeling are as follows:

1. THE PHYSICAL MODEL TEST

Test Location: Centre for Applied Coastal Research Ocean Engineering Laboratory, University of Delaware

Aim: To optimize the cross section of the Negril breakwater designed by CEAC Solutions Co. with more confidence

Note: The wide and shallow shelf offshore of the Negril breakwater was not simulated in this physical model testing. The cross-shore distance for breaking wave energy dissipation was shorter than that required by the geometric similitude. This test is primarily a stability test.

Based on the results of physical model testing it was concluded that;

- For the protection of the seaward slope, crest, and landward slope of the breakwater, an armour layer of two-stone thickness consisting of 5 to 9 ton stones will be sufficient.
- The wider gradation of 5 to 13 ton stones will also be sufficient if larger stones can be placed in an interlocking manner.
- For the toe protection and the base layer below the armour layer, it is safer to replace the proposed 0.3 to 0.6 ton stones with 0.5 to 0.9 ton stones.
- The stone densities of the armour stones in the model testing were slightly greater than that computed by CSHORE for the prototype conditions (approximately 3.0 ton/m^3 - 2.5 ton/m^3). However, this had negligible effects on performance. Modifications were made based on the results of the model to account for the lower stone densities available locally.
- The structures are expected to reduce wave transmission over and through the breakwater from the incident storm wave energy

- For sufficiently small waves under normal conditions, the incident waves will not always break on the stone crest and most of the incident wave energy will be transmitted landward. Thus in terms of water quality and ecological considerations, the submerged breakwaters are not expected to adversely affect the landward flow of water.

Through quarry surveys the range of specific densities and stone sizes available locally were determined and this was also considered in the design process.

The Pre-scale model that was used to test the structural analysis for the 100 year return design wave indicated that:

- The proposed cross section would be statically stable with a very low stability number (<1)
- Climate change impact of the order of change in damage was predicted to be very small compared to storm surge conditions
- Wave breaking conditions and transmission indicated that approximately 72% of the wave energy will be reflected and dissipated within the structure while 28% will be transmitted over.

Level of Development
There has been no development to date.

Environmental Impact Assessment
Based on the number of significant impacts of this project, an Environmental Impact Assessment was requested in April 2013. The EIA was submitted to the Agency on the 29 April 2014. The public consultation was held on the 29 July 2014. A second public meeting was required by the Agency, and this was held on the 10 November 2014. The major potential impacts identified, and the mitigation measures proposed in the EIA and other relevant documentation submitted in support of the project are outlined below:

Potential Impacts/Mitigation Measures

Potential Impact	**Mitigation Measures as outlined in the EIA**
Construction	
Dust emissions from: - Construction equipment and transportation - Fugitive dust from construction and staging area and stored raw materials - Creation of the staging area - Construction of the contractors' office, mess hall and equipment yard - The quarry from which the boulders are obtained	- Staging areas and immediate surrounding roadways should be dampened every 4-6 hours, or within reason, to prevent a dust nuisance, and on hotter days, this frequency should be increased - Minimize cleared areas to those that are needed to be used - Cover equipment when not in use and/or wet construction materials - Where unavoidable, construction workers working in dusty areas should be provided and fitted with N95 respirators Additionally, the Agency will require that only licensed and compliant quarries can be used as the source for the boulders (see SC# 20 of Breakwater Licence)
Noise pollution and vibration nuisance from:	**The EIA considered noise pollution and vibration nuisance**

- **Pile driving of sheet piles, filling and dredging during the preparation and construction of the staging area** - **Use of heavy equipment during construction** - **Movement of trucks to deliver the boulders** - **Delivery of boulders (offloading of trucks) and loading of boulders on the barge (front end loader to barge)** - **Operation of the barge to transport the boulders to the construction site** - **Daily activities of the quarries (including excavation, removal of topsoil, drilling and blasting of rock, etc)**	**as cumulative impacts (existing + project-related). Cumulatively, the noise levels exceed the NEPA daytime standard (Residential including hotels: 55 dBA) at the same locations as those of the existing traffic for both the Negril to Sheffield main road and the Norman Manley Boulevard. The increase in noise levels (over the existing) along both thoroughfares was less than 3 dBA (the level at which persons perceive an increase in noise levels). The increases along the Norman Manley Boulevard are much less (<1 dBA) than those along the Negril to Sheffield main road (2.2 dBA). Furthermore, those areas which were found to be non-compliant with the NEPA standard are residences, which would reduce the likelihood of persons being impacted, as it is not expected that most persons will be at home during the day. This, coupled with the fact that the increase in noise levels is less than 3 dBA, reduces the potential for noise nuisance. The levels of increase along the Norman Manley Boulevard are <1 dBA, and therefore will not be noticed.** **The mitigation proposed includes:** - **Use equipment that has low noise emissions as stated by the manufacturers** - **Use equipment that is properly fitted with noise reduction devices such as mufflers, especially in areas with sensitive receptors such as the stockpile area** - **Operate noise generating equipment during regular working hours (e.g. 7am-7pm) to reduce the potential noise nuisance during the night** - **Construction workers operating equipment that generates noise should be equipped with appropriate PPE to include where noise of ≥ 80 dBA continuously for 8 hours or more should use ear muffs and noise levels 70-80 dBA should wear earplugs.** **Additionally, the Agency will require that the work is carried out only during the hours of 9:00 AM – 5:00 pm Mondays to Saturdays (See SC# 5 & 32 of the Reclamation Licence, and SC# 21 of the Breakwater Licence)**
Reduced water quality (increased turbidity, sedimentation and possible run-off from land) from: - Storage of material - The docking of the barge - Placement of geotextile - Placement of armour stones, toe stones and filter stones at the site	- A sediment basin should be constructed onsite at the staging area in order to intercept storm water before it is discharged to the sea. Typical EPA best management principles recommend the ponds be sized to hold the first flush which equates to 0.25 inches of runoff per impervious acre of contributing drainage area, with an absolute minimum of 0.1 inches per impervious acre. The

These areas could also be affected by wave action and currents resulting in transportation of turbidity and silt down current	runoff will then flow into an oil water separator and then discharged into the river/sea. - All boulders should be properly washed before being loaded on the barge for transport to the breakwater site - The use of silt screens/turbidity barriers at the proposed breakwater site and staging site/stockpile area is recommended so as to reduce the amount of suspended solids in the marine environment - Monitoring of the water quality of the area should be considered fortnightly during and after construction up to a period of one month after completion
The original proposal for the Desilting of the mouth of the South Negril River had the potential to increase turbidity, damage aquatic vegetation and animals and impact the hydrological regime within the great morass. **The activity was also to facilitate the fishermen's entry to the fishing beach.**	- **A hydrological study was proposed to examine these potential impacts but this proposal has since been withdrawn by the applicant**
The transportation of stones from the quarry via trucks may aggravate the traffic situation, as the proposed staging area is located along a roadway that is prone to traffic congestion. This may also reduce the safety level for motorists that traverse this route.	**Safety of motorists is of great concern and the following steps should be taken to mitigate or reduce accidents on the roads leading to the site:** - **Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, should be placed along the main road for the duration of the construction and operational period.** - **Flagmen should be utilized to minimize the likelihood of accidents when heavy units are entering the roadway** - **Suitable traffic controls at the entrance to the site and materials should be brought from the quarries during off-peak periods as much as possible.** - **A road traffic management and safety plan should be submitted prior to the construction phase.**
The increase in the number of heavy vehicles along the roadways has the potential to add significant stresses to the base and sub-base of the road. This has the potential to affect the structural integrity of the paved roads, which may result in failure.	- A scale should be placed on site to ensure the trucks transporting material for the project are within the appropriate weight limits as prescribed by the NWA (the NWA has a standard for loads per axel that all trucks exert on roads), (see SC# 35 of Reclamation Licence). - A maintenance plan should be put in place to address the issue of road degradation over the construction period. This is needed because it is anticipated that even though the trucks may be within the weight limits, the roads, especially in the unpaved areas, will deteriorate with continued use by trucks.
Pollution of the marine and riverine environment due	- All refuelling facilities within the camp should be situated

to the improper storage and use of materials (boulders, fuel, hydraulic fluids and oils).	on impermeable surfaces served by an oil trap, run-off collection system. - Boulders transported to the site will be free of sediments that may become mobile in storm water.
Proliferation of rodents and insects due to improper collection, storage and disposal of solid waste, which may: - Become a health issue - Cause nuisance to local businesses - Enter the surrounding sea and river and affect marine wildlife and the livelihoods of those who depend on the beach	A solid waste management plan should be developed for the work site to include the following: - Skips and bins should be strategically placed within the staging area - The skips and bins should be adequately designed and covered to prevent access by vermin and minimise odour. - The skips and bins should be emptied regularly to prevent overfilling - Disposal of the contents of the skips and bins should be done at an approved disposal site - Rejected boulders should be removed from the site (the Agency will require that this be done immediately – see SC# 38 of the Reclamation Licence).
Pollution of the marine environment from improper collection/disposal of wastewater generated at the campsite	- Portable sanitary conveniences during construction for the workers for control of sewage waste. A ratio of approximately 25 workers per chemical toilet should be used. The specific layout will be a requirement of the contractor
Reduction of the biodiversity of the phytoplankton community due to loss of rare species or increase in the abundance of other species due to increased turbidity, increase in nutrient concentrations, and other changes in the surrounding environment. This can negatively impact the organisms of higher trophic levels that are dependent on phytoplankton for survival	- Monitoring of the water quality and phytoplankton community of the area fortnightly during and after the construction phase of the proposed development up to a period of one month after completion to ensure any unacceptable changes in physico-chemical parameters can be quickly detected. - Use of silt screens or curtains to reduce impacts of suspended solids and increased turbidity.
Increased growth of potentially toxic and harmful phytoplankton species present in the community due to changes in physico-chemical parameters. This can result in blooms that can negatively impact on marine organisms of higher trophic levels, restrict the exploitation of commercially important marine species in the area, lead to the loss of fishermen's livelihood, negatively impact on the tourist industry through reduced aesthetic value of the are s well as reduced recreational use of the area and possibly leading to human poisonings	- Monitoring of the water quality and phytoplankton community of the area fortnightly during and after the construction phase of the proposed development up to a period of one month after completion to ensure any unacceptable changes in physico-chemical parameters can be detected and the required actions taken.
Increased potential of accidents/harm to marine mammals & reptiles (porpoises, dolphins & hawksbill turtles) and other users due to increased maritime traffic during construction	- Sensitization and education of all construction personnel about marine fauna including, proper procedures in the event of an accident/interaction is essential to the protection of these animals. The use of a spotter may also

	be necessary in order to avoid collisions with marine life and also other users in the area
Disruptions to the food supply or foraging grounds of the marine mammals and reptiles due to construction and presence of the breakwaters. The activities may also potentially temporarily deter marine species (fish, dolphins, turtles)	- The EIA did not outline a mitigation measure during the construction phase. - The proponent in one of their responses stated *"The ends of the breakwater proximal to the reef have a 20 to 40 metres gap. The gaps between the breakwaters and the natural reef should allow for species migration and reduce the effects of habitat fragmentation."* In the long term, during the operation, the spaces will facilitate movement and the foraging for food.
Inundation of fishing and tour areas with sediment and the covering of small fishes, eggs and other benthic organisms due to the construction activities. Turbidity may also be detrimental to marine plants and other organisms that depend on clear water for survival	- Use of silt screens or curtains to reduce impacts of suspended solids and increased turbidity
Smothering and/or excess sedimentation, accidental loss of material, ship groundings and other incidents during construction, or along the proposed transportation route of ships and barges, are risks to the backreef community which is comprised of several patch reefs and large seagrass beds.	Ensuring the following: - Proper securing mechanisms in place on barges for boulders - Proper functioning of barge doors, silt screens and other equipment - All material is properly washed and suitable for placements in the marine environment - Proper safety and maritime regulations are adhered to at all times - The use of a spotter and appropriate demarcating measures may also be necessary to minimize these risks
Habitat fragmentation during and after the construction phases. This may occur between the seagrass beds in the lagoon and surrounding reefs. This may affect larval distribution, migration of juveniles or other mobile invertebrates	**No mitigation measure proposed in document, however this was raised by an external reviewer, to which the proponent's consultant responded:** - ***"The ends of the breakwater proximal to the reef have a 20 to 40 metres gap. The gaps between the breakwaters and the natural reef should allow for species migration and reduce the effects of habitat fragmentation."***
Increased employment during the construction phase (50 persons directly employed, 75 persons indirectly employed during the project lifespan)	- This was identified as positive impact
Loss off jobs due to the location of the staging area, and the traffic impacts which will cause disruption to business on the West End *(raised by stakeholders)*	**This was asked of the proponent's consultant, who responded thus:** ***"The activities associated with the delivery of boulders to the stockpile area will involve trucks laden with boulders, heading west from the Negril round-a-bout, entering the stockpile area and leaving eastwards behind Burger King up to Norman Manley***

	Boulevard. There is a potential for traffic congestion caused from the transportation of the boulders which could have an impact on businesses in the immediate areas and West End. It should be noted that this exercise does not involve digging or trenching as was the case of the pipe laying activity carried out along West End. Therefore it is anticipated that the dislocation experienced during that project will not happen. The anticipated 24 trucks per day will not have a significant impact on traffic or cause any dislocation, therefore the impact on existing jobs or businesses will be limited. ***<u>Mitigation</u>*** ***I. Ensure that a traffic management plan is developed and implemented.*** ***II. Trucks should not be allowed to travel in a convoy*** ***III. Trucks should not be parked along the public roadway*** ***IV. Schedule delivery during off peak as practical as possible"***
Disruption of watersports, fishing and other maritime activities during construction	- The fishing public and watersports personnel (dive operators, glass bottom boat tours, etc) should be kept informed as to the operation plans for the works and the times at which it will be carried out within defined locations. This will ensure that users of the area have enough information to avoid being within the vicinity of the works, the staging area and the travel route of the barges - Provisions should be made to ensure that the barge uses a prescribed navigation route when moving to and from the breakwaters. - The Agency will require that this route and the projected transportation times be communicated to the watersport interests in the area (see SC# 5 of the Breakwater Licence)
Inaccessibility of snorkelling sites used by the hotels and watersports operators located near to the breakwaters during construction	- A Stakeholders Engagement Committee should be established to keep the community informed about the progress of the project and to create a mechanism to report grievances. The committee should include a representative of the water sport association and representatives of the Hotel/Villa associations.
Reduced visibility and/or noise at dive, snorkel and glass bottom boat sites outside of the construction zone as a result of construction activities	- Use of silt screens or curtains to reduce impacts of suspended solids and increased turbidity

Increased distances to be travelled by vessels to access various dive/snorkel sites and island tours and cruises. This may cause additional expenses in the operational costs of watersports operators	- A Stakeholders Engagement Committee should be established to keep the community informed about the progress of the project and to create a mechanism to report grievances. The committee should include a representative of the water sport association and representatives of the Hotel/Villa associations.
Interruption to the usual flow of marine traffic (fishers using the South Negril River to get access to the sea) during the de-silting of the mouth of the river	- Employing a fisheries liaison officer to ensure that the concerns of the fishermen are brought to the attention of the contractors and that the contractors take steps to address these concerns - A Stakeholders Engagement Committee should be established to keep the community informed about the progress of the project and to create a mechanism to report grievances. The committee should include a representative of the fishing cooperation **It should be noted that the proposal for desilting has been withdrawn**
Destruction of existing coastal structures which are used by divers to run organized scuba and dive tours due to the transportation of the stones from the stockpile area to the construction area	- Utilizing licensed and experienced barge operators to reduce the incidence of damage to existing coastal structures - Ensuring that there is adequate presence of navigation aids for the barge operators such as buoys
Potential negative visual impact of the staging area being almost in the town centre	- No specific mitigation given, however it is proposed that a Stakeholders Engagement Committee should be established to keep the community informed about the progress of the project and to create a mechanism to report grievances.
Operation	
Moderate wave protection of 2,000-2,500m of shoreline, and accretion in some areas of potentially up to 48m in the long term	- This was identified as a positive impact
Decrease in water quality of Long Bay due to increased flushing times caused by the placement of the breakwaters, resulting in increased nutrient concentrations, turbidity and organic matter within the Bay area which could cause an increase in algal blooms	- Not discussed in the mitigation section, however the EIA outlines that these changes are not significant enough to cause noticeable changes in the quality of bay based on the current loadings. *"The flushing times of 3.29 up to 3.72 days appear to be sufficient to delay the onset of eutrophication in the Bay. These flushing times will not allow the formation of phytoplankton or algae to accumulate in numbers large enough to cause eutrophication. Similarly the predicted increases in flushing time as a result of the proposed structures are small enough to be negligible given that it is not applicable across the bay, but in some locations."* - In a subsequent correspondence the proponent's consultant has indicated that: *"A flushing time of 7 days is considered critical when it comes to*

	eutrophication. Based on the anticipated flushing times as a result of the implementation of the breakwaters, there will be no impact on the water quality in the Bay."
Reduction in current speeds (20%) in the bay, and reduced wave heights in the central section of the bay, will result in safer swimming conditions.	- This was identified as a positive impact
Habitat fragmentation between seagrass beds in the lagoon and surrounding reefs, which may affect larval distribution/dispersion, migration of juveniles or other mobile invertebrates **Use of seagrass beds as a foraging ground may be affected (turtles or other animals may be hindered or their feeding patterns disrupted)**	**No mitigation measure proposed in document, however this was raised by an external reviewer, to which the proponent's consultant responded:** - ***"The ends of the breakwater proximal to the reef have a 20 to 40 metres gap. The gaps between the breakwaters and the natural reef should allow for species migration and reduce the effects of habitat fragmentation."***
Accretion of sand in seagrass beds	This is not anticipated to have adverse impacts on the beds. The rate of accretion should not exceed the seagrass growth rate
Potential negative visual impact at Long Bay Beach, when the structures may become visible at low tide	At a distance of approximately 1.5-1.6 km from land, it is not anticipated that the structure will be visible using the naked human eye. The tips of the breakwaters will be allowed to protrude only 0.43 to -0.43m above mean sea level. Based on the documentation received from the proponent, an observer with "eagle eye" vision will only be able to see the structure from 115m away. The structure will however be visible to snorkelers and other watersport activities in the area.
Loss of coral reef habitats	**Hard and soft corals on suitable substrate (not growing on pavement) and mobile invertebrates within the footprint of the breakwater structures will have to be relocated to an area of similar conditions (light penetration, wave action and depth) where possible.** **Further, the Agency anticipates that the structure will act as suitable substrate for recruitment over time.**

The following represents some other impacts which were mentioned in the EIA:

1. Aggregation of fish around the breakwater can cause:
   a. Greater damage to existing fish populations if the area is unregulated (due to overfishing) OR
   b. Increased ecological volume in the area, and colonization of the structures
   c. The breakwaters may also function as a snorkel site of interest, if the fish aggregate around the structures and fishing is restricted in the area.

2. Rock Blasting at quarries:
   a. Fragments of rocks being propelled into the air from explosions on site, have the potential to create hazards if propelled into nearby residences, resulting in harm or death

b. Fumes (toxic & non-toxic) being released into the atmosphere as a result of the use of explosives for blasting. Residences may be affected by dust and fumes within 100m
c. Deposited dust affecting residents (deposition on cars, homes, or other surfaces)
d. Vibrations caused by blasting affecting structures within close proximity to the blasting location

The Agency having assessed the potential impacts outlined in the EIA and considered the comments and feedback of the stakeholders has identified the following as the major impacts associated with the project:

1. Traffic
2. Noise/Vibration
3. Loss of coral
4. Habitat Loss/Fragmentation
5. Desilting of the South Negril River

These have been highlighted in the table above.

Analysis of Alternatives

Ten (10) project alternatives were identified and discussed in the EIA:

1. The "No-Action" Alternative – In this scenario, there would be no change to the existing situation. The main impact of this alternative would be the continued erosion along Long Bay beach; based on the modeled results, 37m wide, along 6km of beach is expected to be eroded over the next 36 years (up to 2050).

2. The Project as Proposed – "*the breakwaters are designed to provide moderate wave protection… and accretion in some areas of potentially up to 48m in the long term. Negril's main tourist attraction will therefore be improved and this would potentially lead to increased visitor arrivals to Negril, and increased income in the area. The boulders used in breakwater construction would potentially create snorkeling sites due to fish aggregation and coral recruitment and improved boat access at the South Negril river mouth due to de-silting. Further, employment opportunities during the construction phase will arise. On the other hand, negative impacts are anticipated* [including] *destruction of natural marine habitats from the laying of boulders on the seafloor, potential habitat fragmentation between the seagrass beds in the lagoon and surrounding reefs, longer travelling distances for marine vessels in order to access various dive/snorkel sites and island tours and cruises, visual impact of above-water portions of breakwater structures, increased accident potential for marine vessels running aground of the breakwaters."*

3. Different Breakwater Configurations – four (4) configurations of the breakwaters were developed for this project, and they fall into two (2) categories: Nearshore, and Integrated Solution Phase 1 (reef extension). Smith Warner International Limited (SWIL) and CEAC Solutions Ltd developed a configuration for each category.

4. The Project as Proposed, with Different Staging Area Locations – three (3) staging area locations were considered. These are: the South Negril river mouth, the North Negril river mouth, and Savanna-la-mar.

5. The Project as Proposed, with Improved Aesthetics – *"vegetating the sections of the breakwaters that are above water could make the breakwaters more aesthetically pleasing, giving them the appearance of*

"offshore island cays." This would however require snad/sediment to be placed atop the breakwater structures which could be easily washed away during severe wave climate conditions."

6. Reefball Breakwater Design – *"the typical reefball design would be entirely submerged, 1m from the water's surface. They will therefore not be as effective as the proposed breakwaters in attenuating waves or in reducing the transmission of wave energy and are therefore not a preferred option for mitigating beach erosion. In addition, the reefballs are not heavy enough to withstand harsh wave climate."*

7. South Negril River Desilting Options – there are two (2) options:
    a. "*Desilting the shallowest sections of the South Negril River mouth. This would decrease the likelihood of the dessication of the morass. However the area needed to accommodate the barfe may not be enough if only the shallowest sections are dredged. This would result in having to source material elsewhere which would increase the overall cost of the project.*
    b. *Desilting the mouth of the South Negril River. In addition, a small channel will also be dredged so that fishermen still have access to the sea and the hydraulics of the river is minimally affected. This option is preferred because it will allow for the construction of the breakwaters to take place without any additional cost and without hindering the livelihood of the fisherfolk.*

    It is highly recommended that the client conduct a thorough study on the hydrological relationship between drainage features and the morass in the area, in order to identify the potential impacts of desilting the South Negril River. This must be undertaken prior to any desilting works."

NB: It should be noted that subsequent to the submission of the EIA, the proposal to desilt the river was withdrawn by the proponent.

8. Coral and Sponge Relocation – *"the nature of hardness of the substrate combined with the small size and fragility of the majority of coral colonies located in this area make these colonies less than suitable for relocation. The tools necessary, the potential impact to both the surrounding environment and the relocation site, the high wave energy in shallow water environments (which makes it easy to dislodge newly relocated colonies), the potential smothering of small colonies by rapidly growing macroalgae, the expense of relocation activities all combine to suggest that not all corals potentially impacted by the project should be relocated. A Natural Resource Valuation (NRV) should be conducted in order to guide the process of what should be relocated, and a cost benefit analysis provided. Instead of relocating all coral colonies we suggest that findings of the NRV be used to determine the value of this area and as such how much the client should put towards management of the area instead of the relocation activities. By funding the management of the area, there should be an overall improvement in the remaining natural environment, which is unlikely if left unmanaged. It is our opinion that coral and sponge colonies growing on the pavement should not be relocated.*"

9. Beach Nourishment – *"…this alternative…has hardly been used in the Caribbean because it is an expensive undertaking and because hurricanes frequent the region and has the effect of 'eating away' the new beach. [It] is advantageous because it restores and widens the recreational beach. It also retains the natural appearance of the beach. This option however has many disadvantages including the fact that:*
    c. *The sand often erodes faster than the natural sand on the beach. Research suggests that nourished beaches erode two or three times faster than natural beaches, but this rate can vary for our project area in Negril. Nourished beaches are also susceptible to storm events and our study in climate change has shown that the frequency and magnitude of storm events impacting our project area is expected to increase over the next 50 years.*
    d. *This activity is expensive and must be repeated periodically.*
    e. *The beach turns into a construction zone during nourishment.*

The sand used to nourish the beach must have similar sediment properties to native sand. This limits the possible sources of sand.

Our analysis has revealed that 95% (5.9km) of the Long Bay beach is in erosion mode. The most vulnerable sections are the central and northern sections with erosion widths averaging 27m. If this area of the beach was to be replenished to an additional depth of 0.5m then 796,500m^3 of sand would be required.

…The beach nourishment alternative is not recommended for protecting and stablising the Long Bay shoreline as it will cost at least four times the proposed project and will not be as stable (exposed to storms/hurricanes)."

10. Hybrid Alternative – *"this alternative combines the Project as proposed (whereby the Southern breakwater is 417m and the Northern breakwater is 517m) with the South Negril River as the staging area, accompanied by the desilting of the mouth of the River and dredging of a small channel so that fisherfolk would still have access to the sea."*

The EIA outlines that **alternative 10** is the preferred alternative as it achieves the project objectives, is anticipated to improve stakeholders' livelihood (fisherfolk, hotel operators, watersports operators) and reduce potential impacts.

Relevant Guidelines, Standards and Regulations
Beach Control Act, 1956
Beach Control Act (Licensing) Regulations, 1956
NRCA Act, 1991
NRCA Coral Reef Protection and Preservation Policy and Regulation, Draft 1996
Fishing Industry Act, 1975

Application History and Extent of Review (Summary)

Task	Date	Action
IRC	15 February 2013	▪ The application is to be screened as an EIA will likely be required
Letter to applicant	12 April 2013	▪ Advising that an EIA would be required, and providing Terms of Reference
EIA Submitted	29 April 2014	▪ Preliminary review conducted
Letter to applicant	5 May 2014	▪ Noting deficiencies after preliminary review of EIA
Response from applicant	21 May 2014	▪ The response was reviewed by the Agency
EIA circulated by email	20 May 2014	▪ Sent to JHTA, Port Authority, JIEP, JIE
EIA circulated by email	21 May 2014	▪ Dept. of Life Sciences, UWI, Dept of Geography and Geology, UWI, Centre for Marine
EIA circulated by hard copy	22 May 2014	▪ NEPT, NGIALPA, NCRPS,
EIA circulated by hard copy	27 May 2014	▪ Negril Library, Hanover PC, Westmoreland PC
EIA circulated by	10 June 2014	▪ Faculty of Science & Sports (Utech), MGD

hard copy		
Letter from Port Authority	21 July 2014	▪ Expressing support of the project
Letter to applicant requesting clarification/additional information	29 July 2014	▪ Collated comments received from various branches of the Agency sent for response
Public Consultation	29 July 2014	▪ Held at Negril Community Centre with approximately 130 people in attendance
Letter to applicant requesting clarification/additional information	12 September 2014	▪ Collated comments received from public subsequent to public consultation reviewed and sent to client for response
Letter from applicant	15 September 2014	▪ Responding to letter of 29 July 2014 requesting additional information
Letter from applicant responding to letter of 12 September	1 October 2014	▪ The proposal for the de-silting of the mouth of the South Negril River is withdrawn ▪ The staging area will be removed after the project is completed ▪ The Agency's review of this letter found that the responses were inadequate, and suggested a lack of understanding of some of the requirements of the Agency and hence a meeting was proposed
EIA Committee Meeting	7 October 2014	▪ The applicant will be required to go back to the public with the proposed changes, as the de-silting and the staging area would have been for the benefit of the fishermen ▪ The Public Education branch should be asked to go to Negril to find out how well the stakeholders have been sensitized to the project, and ascertain their level of understanding and/or support. ▪ A meeting should be held with the applicant to clarify the Agency's requirements as per the letter of 12 September 2014
Meeting with applicant	13 October 2014	▪ Meeting outlined the requirements in the Agency letters and provided clarity as to what was requested. The applicant indicated that responses would be submitted by the 17 October 2014.
IRC	17 October 2014	▪ A second public consultation is to be held
Letter from applicant	20 October 2014	▪ Providing updated responses
Internal Meeting	28 October 2014	▪ The approach to be taken discussed and agreed upon.
Meeting with applicant and consultants	29 October 2014	▪ Applicant advised that 10 November 2014 is the date proposed for the second public consultation ▪ The public will be given 4 days to provide written comments (to the 14 November) ▪ The final EIA is to be submitted on the 17 November

		2014
IRC	31 October 2014	▪ Recommendation of approval for submission to the TRC
TRC	4 November 2014	▪ The Maintenance Plan for the structures is to be requested ▪ Approval recommended for submission to the NRCA
Second Pubic Presentation	10 November 2014	▪ Held at Negril Community Centre with approximately 70 people in attendance

Comments from the Public/Stakeholders

The comments received as a result of the circulation of the document to various agencies and entities, as well as those received from the general public have been outlined in Appendix I.

The major issues raised by the public were as follows:

- Beach nourishment as the preferred solution instead of breakwaters (The Negril Beach Restoration Committee has indicated in letter received 30 August 2014 that they object to the breakwater and believe that beach nourishment is the preferred option)
- Dredging of the mouth of the South Negril River
- Future use of the staging area
- Position of the staging area – will cause loss of jobs, will cause traffic disturbance
- Maintenance of the structures (NWA is not trusted to maintain the structures)
- The qualifications/ability of the engineers/designers (no coastal engineers identified)
- The reliability/accuracy of the modeling and the results
- The stability of the structures in a storm (will the boulders move towards shore, and possibly onto the hotel properties?)
- The impact on the visual amenity (the structures will mar the view of the horizon)

The project has also been the subject of several articles/items in the news media and a list of the articles have been provided in the Appendix II

Relevant Information

<u>Modification of Proposal</u>

The original proposal included the desilting the mouth of the South Negril River, deepening the area by 3.0m, to obtain approximately 2,377m^3 of material. These works would have been undertaken in conjunction with the dredging of the Caribbean Sea (to obtain the same volume of material). This material would have been used to supplement the material dredged from the sea, for the construction of the staging area. The desilting of the mouth of the river would also serve as a compensatory measure, to allow for navigation of the river by the fishers, facilitating their entry to the fishing beach. The EIA however noted that a hydrological study was recommended, to ensure that the dredging activity would not negatively affect the hydrology of the Morass (resulting in desiccation of same).

The proposal also included the retention of the stockpile/staging area subsequent to the completion of the construction works. The EIA recommended that the area could be used by the fishermen, however the applicant would have to determine who would manage the area.

At the Public Meeting held on the 29 July 2014, and in comments received from members of the public subsequent to the said meeting, the issue of these activities was raised several times. The major concern was that the desilting of the river would result in the drying out of the Morass, and that a hydrological study would be required before any decision can be taken regarding the dredging. The consultants indicated that the study was outside of the scope of the EIA, and therefore would not be done at this stage. Several persons also queried what the future use of the staging area would be. This was put to the applicant in the Agency's letter dated 12 September 2014, with a request for a Closure Plan, as well as an indication of who would manage the area.

In letter dated 1 October 2014, the applicant indicated that the proposal to desilt the mouth of the South Negril River is being withdrawn. Similarly, the proposal to retain the staging area is also being withdrawn, and the area will be returned to its original state subsequent to the completion of the works.

NB. The application was circulated to the WRA for comments, with a request that the proposal to de-silt the mouth of the South Negril River be given special consideration. The WRA responded in letter dated 11 September 2014, advising that the dredging may cause:

- accelerated drainage of the already drying Morass, and possibly lowering of the water table in the adjacent aquifers
- increased incursion of saltwater along the invert level of the river affecting the Great Morass
- a backwater effect with implications for increased storm surge or severe high seas impact

The revised proposal has been re-circulated to the WRA for their comments

By virtue of the change in the proposal the applicant was required to go back to the public by way of a second public meeting.

<u>Second Public Meeting</u>

This meeting was held the 10 November 2014. Approximately seventy (70) persons attended. Dissatisfaction was expressed at the fact that the meeting was called for such minor changes and it was stated that the information could have been conveyed via email. The stakeholders reiterated many of the issues raised at the previous meeting which include:

- The qualification of the engineers who designed the project (the stakeholders have indicated that the consulting engineer is not a coastal engineer)
- The traffic disruption to the West End
- Alternative solutions not being considered (the stakeholders indicated that they had consulted with a Dutch firm (Van Oord) who are experts in beach nourishment, and a meeting was held, however none of the government entities invited [NEPA, NWA, PIOJ] attended. The NWA requested a copy of the presentation of the Van Oord proposal).
- The length of time (4 days) given for the submission of written comments (this was reiterated in letter dated 11 November 2014 from the Negril Chamber of Commerce, requesting that the regular thirty (30) day period be allowed. An emailed response was provided clarifying that there is no established guideline with respect to follow-up meetings. The four (4) days were deemed satisfactory).
- The PIOJ indicating to the media that works were expected to begin in 2015, which suggested that a decision had already been taken by the NRCA.

<u>Coral Relocation</u>

The EIA determined that <1% of the footprint of the breakwater is covered by live coral. The majority of this is encrusting coral located on pavement, which makes relocation difficult, if not impossible. It was therefore not recommend that the coral (and other sessile invertebrates) located on pavement be relocated. The EIA also stated, "*A Natural Resource Valuation (NRV) should be conducted in order to guide the process of what should be relocated, and a cost benefit analysis provided. Instead of relocating all coral colonies we suggest that findings of the NRV be used to determine the value of this area and as such how much the client should put towards management of the area instead of the relocation activities. By funding the management of the area, there should be an overall improvement in the remaining natural environment, which is unlikely if left unmanaged."* The applicant commissioned a Rapid Natural Resource Valuation and the main findings of the NRV are as follows:

> With correct engineering designs, the environmental adverse impacts of the footprint of the breakwater should be offset by the long term benefits. Aggressive coral rehabilitation and co management of the Negril Marine Park should be a part of the project. The construction project as currently defined does not include a combined approach for arresting the problem of coastal erosion. This combined approach being a combination of the hard engineering solution (breakwater) done in conjunction with a somewhat softer solution of beach nourishment. This approach would probably be the most optimal as it is likely that beach nourishment on its own may have shorter life span and comes with its own disruption in coastal use and loss in aesthetics. One would have to consider the estimated time before sea level rise and erosion from high wave energy would return the beaches to their current state. However it is understood that the budget for this project does not allow for a combined approach. As mentioned previously, a combination of activities are required post breakwater construction to ensure that coastal erosion and coastal ecosystem degradation are halted.

Recommendation

Based on a review of the BCA Application Form and supplementary information provided, the Technical Review Committee recommends that Beach Licences be **granted** for this application subject to the following specific conditions:

Specific Conditions

Coastline Reclamation using 3,339m^3 of Material

1. The Licensee shall comply with all the representations made in the application number 2013-10017-BL00003 dated 25 January 2013 received and date stamped 25 January 2013 by the Natural Resources Conservation Authority; documents titled "Final Report for Identification of Hard and Soft Engineering Structures for Negril, Jamaica" dated April 2012 and "Programme Proposal" both received and date stamped 28 January 2013 by the Natural Resources Conservation Authority, "Original Engineering Design Report Break Water Structures Offshore Negril, Westmoreland Jamaica" dated January 2014 received and date stamped 19 March 2014 by the Natural Resources Conservation Authority, "Environmental Impact Assessment For The Construction Of Two Breakwaters At Long Bay Negril, Westmoreland" dated April 2014 received and date stamped 29 April 2014 by the Natural Resources Conservation Authority, "Specifications Negril Breakwater Project Supply and Placement Tender Document" and "Specifications Negril Breakwater Project Supply Tender Document" both received and date stamped 13 October 2014 by the Natural Resources

Conservation Authority; letter dated 21 May 2014 from CL Environmental signed by Carlton Campbell received and date stamped 22 May 2014 by the Natural Resources Conservation Authority, letter dated 15 September 2014 from National Works Agency signed by Andrew Sturridge received and date stamped 16 September 2014 by the Natural Resources Conservation Authority (and accompanying document), letter dated 1 October 2014 from National Works Agency signed by E. G. Hunter received and date stamped 18 October 2014 by the Natural Resources Conservation Authority; drawing titled "Overview of Proposed CEAC Integrated Solution #4 Modified – Phase 1" received and date stamped 25 January 2013 by the Natural Resources Conservation Authority and any accompanying addenda.

2. The Licensee shall ensure that all correspondence, notifications, plans, reports or any other documents being submitted to the Agency pursuant to any General and/or Specific Condition of the Licence are addressed to Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 and can be submitted mail and/or email at EnforcementManager@nepa.gov.jm.

3. The Licensee shall submit proof of ownership, as well as executed lease/tenure agreement (if applicable) of the parcel(s) adjacent to the area to be reclaimed, within thirty (30) days of the date of issue of this Licence, and is to be received and approved by the Agency prior to the commencement of the works.

4. The Licensee shall apply for approval from the Authority for any change in the construction of the Stock Pile (Staging) Area prior to construction and such changes shall not be implemented without the prior written approval of the Authority

5. The Licensee shall, in writing, notify the Manager, Enforcement Branch of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5, or by email: EnforcementManager@nepa.gov.jm, in writing of the date of commencement of the Works, at least seven (7) working days prior to commencement, so that the activities can be monitored.

6. The Licensee shall submit in writing to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 information relating to the source of the material to be used in the Works at least one (1) month prior to the use of the material. This information shall include but not be limited to the following:
   - Documentation on the source, characteristics and country of origin of the material
   - Documentation indicating purchase/export/import of material to be used in beach reclamation works
   - Certification that the material carries no pollutants and/or biological contaminants; and
   - A copy of the Quarry Licence

7. The Licensee shall submit detailed plans to the Agency for the construction of the Stock Pile (Staging) Area with details of the Caribbean Sea and South Negril River boundaries including geo-referenced coordinates for the location of the corners of the sheet pile wall site within

thirty (30) days of the date of issue of the Permit of prior to the commencement of construction.

8. The Licensee shall inform the National Environment and Planning Agency in writing at least two weeks prior to the commencement of the following construction activities for the Stock Pile (Staging) Area to allow for inspection:
    a. Setting out of sheet pile
    b. Start of sheet piling
    c. End of sheet piling
    d. Start of site filling
    e. End of site filling
    f. Start of dredging in front of sheet piles (Caribbean Sea)
    g. End of dredging in front of sheet piles (Caribbean Sea)
    h. Completion of construction of Stock Pile Area

9. The Licensee shall provide a written weekly report on the status of the construction of the Stock Pile (Staging) Area to the National Environment and Planning Agency (NEPA), no later than the Monday of the following week.

10. The Permittee shall erect signs to indicate the location of the over burden storage area and the storm water detention pond. The signs shall be a minimum dimension of 1.5m wide, 1.0m high with title lettering 100mm high and secondary lettering 50mm high. The signs shall display the following words:

Stock Pile (Staging Area) – Storm Water Detention Pond

BCA Beach Licence Number -------

Stock Pile (Staging Area) – Overburden Storage Area

BCA Beach Licence Number -------

11. The Licensee shall ensure that all pile driving activities are carried out between the hours of 9:00 a.m. and 5:00 p.m from Mondays to Saturdays. There shall be no pile driving works on Sundays and Public Holidays. Any work to be done outside of this period will require the explicit written permission of the Authority.

12. The Licensee and/or its agents shall erect and maintain a continuous sediment control device (silt curtain, bubble curtain) around the Licensed Area to restrict and control the movement of and to prevent the escape of sediment generated by the Works into the adjacent marine environment before the commencement of the Works.

13. The sediment control devices (silt curtain, bubble curtain) outlined in Specific Condition 11 above, shall remain in place until turbidity values within and around 10 metres of the Licensed Area fall below 15 NTUs or ambient conditions surrounding the cordoned off area, whichever is higher.

14. In the event that the sediment control devices (silt curtain, bubble curtain) outlined in Specific Condition 11 are damaged, destroyed or otherwise rendered ineffective by waves, currents and/or other meteorological events, the Works shall be suspended until the disturbance has passed and the necessary repairs are carried out.

15. Prior to hurricanes or tropical storms, work shall be halted and turbidity values allowed to fall below 15 NTUs or ambient condition, whichever is higher. Sediment control devices (silt curtain, bubble curtain) shall then be removed and the Licensed Area adequately secured to prevent any undue runoff into the adjacent marine environment.

16. The Licensee shall submit to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5, a Traffic Management plan within thirty (30) days of the date of issue of this Licence **and** prior to the works.

17. The Licensee shall submit to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5, a Waste Management plan within thirty (30) days of the date of issue of this Licence **and** prior to the start of the works.

18. The Licensee shall ensure that any waste generated from the activity is disposed of at a municipal dumpsite with the approval of the National Solid Waste Management Authority (NSWMA). A copy of the approval from the NSWMA must be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or EnforcementManager@nepa.gov.jm prior to the commencement of dredging activities.

19. The Licensee shall obtain the express written approval of the Authority prior to any changes in the volume of material used in the reclamation activities in excess of the volume stated in this Licence.

20. The Licensee and/or its agents shall not permit the discharge of waste, including but not limited to sullage waste, oil, oily waste, trade or sewage effluent, chemicals or any poisonous noxious or polluting matter into the water or on the ground, as a result of the Works.

21. The Licensee shall submit a storm water drainage plan to the Manager, Enforcement Branch, National Environment & Planning Agency, 10 Caledonia Avenue, Kingston 5 for approval, within thirty (30) days of the date of issue of this Licence.

22. The Licensee shall ensure that the storm water drainage plan for the Stock Pile (Staging) Area is implemented in accordance with the approval granted as per Specific Condition 20.

23. The Licensee shall develop a detailed Maintenance Plan for the drainage system to include but not be limited to scour protection, erosion and sediment control, cleaning of silt traps and cleaning of detention ponds, frequency of pond and drain cleaning. This Maintenance Plan shall be submitted to the Manager, Enforcement Branch, National Environment & Planning Agency, 10 Caledonia Avenue, Kingston 5 for approval within thirty (30) days of the date of issue of this Licence.

24. The Licensee shall ensure that all man-made storm drains shall be effectively intercepted with silt management features such as adequately sized silt traps to minimize excessive sediment flows to the South Negril River and the marine environment. Maintenance of these drainage features (silt traps) shall be included in the maintenance plan for the drainage network.

25. The Licensee shall ensure that there is no refueling of any marine vessel at the Licensed Area, unless specifically provided for in a Licence from the Authority.

26. The Licensee shall immediately notify the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 of any spillage of or accident with any hazardous chemicals, inclusive of all hydrocarbons and environmentally damaging material and shall report on the clean-up activities as per MARPOL 73/78, Annex I, Regulation 26 within twenty-four (24) hours of the incident

27. Any sensitive organisms, including but not limited to corals, seagrass and associated invertebrates (urchins, star fish, sea cucumbers), found within the Licenced Area shall be relocated to an undisturbed area on the floor of the sea immediately adjoining the Licensed Area, prior to commencement of the Works, to the satisfaction of the Authority.

28. The Licensee shall undertake and submit weekly monitoring reports to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 of the reclamation works. This information shall include, but shall not be limited to:
    a. The date, exact place and time of sampling or measurement for water quality inclusive of ambient water turbidity and turbidity during construction and maintenance works.
    b. The person(s) responsible for performing the sampling or measurement.
    c. The date(s) analyses were performed; and
    d. The analytical techniques or methods used.

29. All equipment, left over material, equipment parts and any other material incidental to the reclamation activities shall be dismantled and removed from the floor of the sea and from shore-based facilities at the completion of the Works and in any event, prior to the expiry of this Licence.

30. The Licensee shall develop a Restoration Plan for the Stock Pile (Staging) Area and submit a copy to the Manager of the Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or EnforcementManager@nepa.gov.jm for approval by the Authority within six (6) months of the commencement of the Works.

31. The Licensee shall ensure that upon the completion of the construction activities described in Beach Licence Lxxxx, the material including but not limited to boulders, aggregates or other waste material from the Stockpile (Staging) Area is removed to the approved dump site and this area is returned to its original state, to the satisfaction of the Agency.

32. Pursuant to Specific Condition 30 the Licensee shall prior to the removal of the Stockpile (Staging) Area, notify the Authority at least two (2) weeks in advance of the works to be undertaken.

33. The Licensee shall ensure that all boulders and/or fill material are delivered between the hours of 9:00 a.m. and 5:00 p.m. from Mondays to Saturdays. There shall be no offloading of trucks on Sundays and Public Holidays. Any work to be done outside of this period will require the explicit written permission of the Authority.

34. The Licensee shall ensure that truck operators are trained regarding the application of engine brakes within the town of Negril and shall best as possible avoid or reduce their use in order to reduce the noise impact generated as a consequence.

35. The Licensee shall ensure that all trucks delivering boulders/aggregates to the site are assessed for oil leaks, noise, faulty exhaust etc. and deemed fit before they are included in the project and a copy of the inspection reports shall be made available to the Agency upon request.

36. The Licensee shall ensure that in the event of an accident involving the delivery trucks that the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 is immediately notified by email and a written report is to be submitted within seven (7) days of the incident.

37. The Licensee shall ensure that a truck scale to facilitate weighing is placed at the staging area prior to any receipt of boulders/aggregates.

38. Any material used for the Works, with the exception of the boulders/aggregates shall be appropriately washed and screened to reduce the amount of fine-grained materials that is placed into the marine environment directly or indirectly. Areas designated for washing of the material shall be approved by the Authority prior to commencement of the Works.

39. The Licensee shall ensure that unwashed boulders/aggregates are not accepted and that trucks delivering such material are not be allowed to unload at the site.

40. The Licensee shall in the event of the unloading of unwashed boulders/aggregates remove the material from the site within 24-48 hours.

41. The granting of this Licence does not relieve the Licensee from complying with any other statutory obligation or from applying for and obtaining any permission, certification, permit or licence required by law. These include but are not limited to Building Permission under the Building Act, Planning Permission under the Town and Country Planning Act and

Environmental Permits and Environmental Licences under the Natural Resources Conservation Authority Act.

42. The Licensee shall not commence construction of the construction site offices without the requisite Building Permission.

Coral and Seagrass Relocation

i. The Licensee shall prepare for the approval of the Authority at least one (1) month prior to the commencement of the dredging and reclamation works, a Coral and Seagrass Relocation Plan. This shall include but is not limited to:
   a. The georeferenced location, size and pictures of all corals and seagrass beds to be relocated;
   b. A rationale for the exclusion of any individuals/colonies which will not be relocated;
   c. The georeferenced location and pictures of the proposed coral relocation sites;
   d. Detailed methodology for the relocation of corals and seagrass, including methods for harvesting, transporting and replanting/anchoring;
   e. Existing physicochemical conditions at the reclamation site and proposed relocation sites including nutrients, light, salinity, temperature, waves, currents, sediment depth and sediment type;
   f. Statement of existing anthropogenic impacts at both the reclamation site and proposed relocation site;
   g. A proposed schedule for the completion of the works;
   h. Proposed sediment control mechanism;
   i. The name and credentials of the qualified professional or entity conducting the relocation at each site; and
   j. Sample format for monitoring reports.

ii. The Licensee shall demarcate the working footprint of each relocation (receptor) site and shall ensure that the sites are adequately prepared for reception of corals.

iii. The Licensee shall not commence relocation until the prepared area as per specific condition ii has been inspected and approved by the Authority

iv. The Licensee shall erect suitable sediment control devices around the dredge site and at each relocation site where the bathymetry is to be modified by infilling or other deposition activities.

v. The Licensee shall apply for permission to deploy any encroachment which may be necessary to modify the existing conditions at the receptor sites in preparation for relocation of corals.

vi. The License shall ensure that the coral colonies being relocated are stored with no less than 10cm of space between each unit to prevent competition.

vii. The Licensee shall inform the Agency in writing, within five (5) working days, of completion of each relocation activity, per site, to allow for inspection of the area.

viii. The Licensee shall ensure that the qualified professional hired to supervise the relocation works conducts a training of not less than one (1) day inclusive of field and lecture sessions for all persons to be used to do the relocation of corals.

ix. The Licensee shall inform the Agency in writing of changes in the qualified professional or entity that is to supervise the relocation activity.

x. The Licensee shall ensure that detailed daily logs of the relocation activities for each site are maintained and submitted to the Agency within 7 working days of completion of each site. Daily logs are to include, but should not be limited to the following:
    a. The location and total number of each coral species harvested and anchored (receptor site);
    b. Dated photographic evidence of all works; and
    c. A gridded map of donor and receptor sites showing daily coral relocation activities.

xi. The Licensee shall submit a minimum of five (5) monitoring reports on the status of the relocated seagrass and corals for a period of not less than one year subject to the following schedule:
    a. Thirty days after the completion of replanting works at each site (time zero for each phase and site);
    b. Quarterly (every three months) thereafter.

xii. Pursuant to specific condition xi above, the monitoring report shall include but not be limited to:
    a. The name(s) of the person responsible for monitoring;
    b. Location of relocation sites;
    c. Photographs showing progression at the relocation sites over time;
    d. Time and date of monitoring and analysis;
    e. Description as needed of supplemental planting activities conducted and the georeferenced locations of these;
    f. Fish counts in the replanted areas; and
    g. An indication on the current status, percentage survival and success of the plantings to include:
        i. Water quality (suspended solids and nutrients);
        ii. Aerial extent and coverage over time using photographic inventory (annual aerial/satellite imagery coinciding with the reporting period);
        iii. Bioturbation and causes; and
        iv. Qualitative assessment of natural recruitment and expansion by relocated units.

xiii. The Licensee shall be liable and responsible for all planting sites until the targeted goal within the restoration areas of 65% areal coverage due only to the planting units or 80% total coverage (including natural recruitment and other species providing coverage) is met.

xiv. The Licensee shall ensure that any coral colonies which are fragmented during the relocation works are relocated in their entirety.

xv. The granting of this Licence does not relieve the Licensee from complying with any other statutory obligation or from applying for and obtaining any permission, certification, permit or

licence required by law. These include but are not limited to Building Permission under the Building Act, Planning Permission under the Town and Country Planning Act and Environmental Permits and Environmental Licences under the Natural Resources Conservation Authority Act.

Dredging of 2,377m^3 of Material

1. The Licensee shall comply with all the representations made in the application number 2013-10017-BL00003 dated 25 January 2013 received and date stamped 25 January 2013 by the Natural Resources Conservation Authority; documents titled "Final Report for Identification of Hard and Soft Engineering Structures for Negril, Jamaica" dated April 2012 and "Programme Proposal" both received and date stamped 28 January 2013 by the Natural Resources Conservation Authority, "Original Engineering Design Report Break Water Structures Offshore Negril, Westmoreland Jamaica" dated January 2014 received and date stamped 19 March 2014 by the Natural Resources Conservation Authority, "Environmental Impact Assessment For The Construction Of Two Breakwaters At Long Bay Negril, Westmoreland" dated April 2014 received and date stamped 29 April 2014 by the Natural Resources Conservation Authority, "Specifications Negril Breakwater Project Supply and Placement Tender Document" and "Specifications Negril Breakwater Project Supply Tender Document" both received and date stamped 13 October 2014 by the Natural Resources Conservation Authority; letter dated 21 May 2014 from CL Environmental signed by Carlton Campbell received and date stamped 22 May 2014 by the Natural Resources Conservation Authority, letter dated 15 September 2014 from National Works Agency signed by Andrew Sturridge received and date stamped 16 September 2014 by the Natural Resources Conservation Authority (and accompanying document), letter dated 1 October 2014 from National Works Agency signed by E. G. Hunter received and date stamped 18 October 2014 by the Natural Resources Conservation Authority; drawing titled "Overview of Proposed CEAC Integrated Solution #4 Modified – Phase 1" received and date stamped 25 January 2013 by the Natural Resources Conservation Authority and any accompanying addenda.

2. The Licensee shall ensure that all correspondence, notifications, plans, reports or any other documents being submitted to the Agency pursuant to any General and/or Specific Condition of the Licence are addressed to Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 and can be submitted mail and/or email at EnforcementManager@nepa.gov.jm.

3. The Licensee shall at least seven (7) working days prior to the commencement of the dredging activity, submit a schedule to the Manager, Enforcement Branch of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or by email at EnforcementManager@nepa.gov.jm.

4. Any changes in the schedule referred to in Specific Condition 3 shall be submitted to the Manager, Enforcement Branch of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or EnforcementManager@nepa.gov.jm, at least seven (7) working days prior to the implementation of the change.

5. Any sensitive organisms, including but not limited to corals and seagrass, found within the proposed work area are to be relocated to an undisturbed area on the floor of the sea immediately adjoining the dredging site prior to the initiation of any works.

6. The Licensee shall not commence dredging until the relocation sites are inspected and approved and the relocation as per specific condition 5 has been completed.

7. The Licensee shall ensure that no more than 2,377 cubic metres of material is removed from that area of the seafloor identified as "Area to be desilted" in drawing titled "Step 1 – Stock Pile Area Site Preparation" found on page 86 of document titled "Environmental Impact Assessment For The Construction Of Two Breakwaters At Long Bay Negril, Westmoreland" dated April 2014 received and date stamped 29 April 2014 by the Natural Resources Conservation Authority.

8. The Licensee shall demarcate the working footprint of the proposed dredged site at least seven (7) working days prior to commencement of dredging works so the activity can be monitored.

9. The Licensee shall ensure that there is no de-silting or other alteration of the South Negril River for any activity in regards to the implementation of the Breakwaters described in Beach Licence Lxxx.

10. The Licensee shall ensure that turbidity values no more than 10 metres outside of the Licensed Area do not exceed 15 NTUs or ambient conditions, whichever is higher.

11. The Licensee shall prior to the start of the dredging activity implement and maintain effective sediment control measures (eg. silt or bubble curtains), around the Licensed Area to restrict and control the movement of and to prevent the escape of sediment generated by the Works into the adjacent marine environment..

12. The Licensee shall conduct daily inspections of the sediment control measures implemented, to ensure they are functioning properly. If any of these measures are found to be deffective or damaged, the works shall be suspended until the necessay repairs or corrective measures are effected.

13. The Licensee shall ensure that 48 hours prior to hurricanes or tropical storm events, works are halted and turbidity values allowed to fall below 15 NTUs or ambient conditions. Installed sediment control measures should then be removed and the works area adequately secured to prevent any adverse impact on the adjacent marine environment.

14. The Licensee shall ensure that the active dredge site is continuously monitored to ensure that dredging activity does not impact any marine flora or fauna including but not limited to corals or seagrass within close proximity.

15. The Licensee shall ensure that equipment being used in the dredging activity is not placed on corals, seagrass beds or other marine flora and fauna and is placed no less than 2 metres from any living corals.

16. The Licensee shall obtain the expressed written approval of the Authority prior to any changes in volumes of dredging material in excess of the volume stated in this Licence.

17. The Licensee shall ensure proper design, operation and maintenance of all equipment used to remove and transport dredge material to the reclamation site described in Beach Licence Lxxxx.

18. The Licensee shall ensure that all the dredge material is used in the reclamation of the staging area described in Beach Licence Lxxx and there shall be no other use or disposal authorized.

19. In case of accidental spills of the dredge spoil the Licensee shall immediately cease all dredging works and immediately notify the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5.

20. The Licensee shall immediately notify the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 of any spillage of or accident with any hazardous chemicals, inclusive of all hydrocarbons and environmentally damaging material and shall report on the clean-up activities as per MARPOL 73/78, Annex I, Regulation 26 within twenty-four (24) hours of the incident

21. The Licensee or its agents shall not permit the discharge of waste, including but not limited to sullage waste, oily waste or chemicals or any poisonous, noxious or polluting matter into the water or on the ground, as a result of the dredging activity.

22. The Licensee shall ensure that there is no refueling of any marine vessel at the dredge site unless provided for specifically in a Licence from this Authority.

23. Dredging shall be in accordance with the Natural Resources Conservation Authority's Guidelines for the Planning and Execution of Coastal and Eustrurine Dredging Works and the Disposal of the Dredged Materials a copy of which can be found at www.nepa.gov.jm/publications/guidelines/Guideline-for-Coastal-Dredging-Works.pdf.

24. The Licensee and its agents shall ensure that there is no blasting or use of explosives in the Licensed Area.

25. The Licensee shall submit to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5, a Waste Management plan within thirty (30) days of the date of issue of this Licence.

26. The Licensee shall ensure that any waste generated as a consequence of the dredging activity is disposed of at a municipal dumpsite with the approval of the National Solid Waste Management Authority (NSWMA). A copy of the approval from the NSWMA must be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or by email to EnforcementManager@nepa.gov.jm prior to the commencement of dredging activities.

27. The Licensee shall undertake and submit weekly monitoring reports to the Manager, Enforcement Branch of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or by email to EnforcementManager@nepa.gov.jm of the dredging works. This information shall include, but shall not be limited to:
    - The date, exact place and time of sampling or measurement for water quality inclusive of ambient water turbidity and turbidity during dredging works;
    - The person(s) responsible for performing the sampling or measurement;
    - The date(s) analyses were performed;
    - Analytical techniques or methods used;
    - The results of these water quality analysis;
    - Logs of the total volume of material removed per day, time of commencement and end of dredging per day and depth from which material was dredged;
    - Details of any environmental incidents, including spills or damage to sensitive marine organisms and corrective actions taken; and
    - Details of assessments of the implemented sediment control measures.

28. The Licensee shall submit for the approval of the Agency, a detailed Environmental Monitoring and Mitigation Plan prior to the commencement of the dredging activities. This Plan shall include, but shall not be limited to:
    - Person(s) responsible for environmental management;
    - Details for the monitoring of water quality;
    - Measures to be employed to control water turbidity and prevent the escape of suspended particles into the surrounding environment, including but not limited to operational and engineering control measures;
    - Contingency measures to be employed to clean up of any accidental spills – fuel or hazardous material and sediment – that may occur; and
    - Sample format for monitoring reports.

29. All equipment, left over material, equipment parts and any other material incidental to the dredging activities shall be dismantled and removed from the floor of the sea and from shore based facilities following the completion of the dredging works.

30. The Licensee shall ensure that all vessels to be used in the dredging operations receive the requisite approval from the Maritime Authority of Jamaica (MAJ). A copy of the approval from the MAJ shall be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or EnforcementManager@nepa.gov.jm prior to the commencement of dredging activity.

Coral and Seagrass Relocation

i. The Licensee shall prepare for the approval of the Authority at least one (1) month prior to the commencement of the dredging and reclamation works, a Coral and Seagrass Relocation Plan. This shall include but is not limited to:
    k. The georeferenced location, size and pictures of all corals and seagrass beds to be relocated;
    l. A rationale for the exclusion of any individuals/colonies which will not be relocated;
    m. The georeferenced location and pictures of the proposed coral relocation sites;

n. Detailed methodology for the relocation of corals and seagrass, including methods for harvesting, transporting and replanting/anchoring;
o. Existing physicochemical conditions at the dredge site and proposed relocation sites including nutrients, light, salinity, temperature, waves, currents, sediment depth and sediment type;
p. Statement of existing anthropogenic impacts at both the dredge site and proposed relocation site;
q. A proposed schedule for the completion of the works;
r. Proposed sediment control mechanism;
s. The name and credentials of the qualified professional or entity conducting the relocation at each site; and
t. Sample format for monitoring reports.

ii. The Licensee shall demarcate the working footprint of each relocation (receptor) site and shall ensure that the sites are adequately prepared for reception of seagrass and corals.

iii. The Licensee shall not commence relocation until the prepared area as per specific condition ii has been inspected and approved by the Authority.

iv. The Licensee shall erect suitable sediment control devices around the dredge site and at each relocation site where the bathymetry is to be modified by infilling or other deposition activities.

v. The Licensee shall apply for permission to deploy any encroachment which may be necessary to modify the existing conditions at the receptor sites in preparation for relocation of seagrass or corals.

vi. The License shall ensure that the coral colonies being relocated are stored with no less than 10cm of space between each unit to prevent competition.

vii. The Licensee shall inform the Agency in writing, within five (5) working days of completion of each relocation activity, per site, to allow for inspection of the area.

viii. The Licensee shall ensure that the qualified professional hired to supervise the relocation works conducts a training of not less than one (1) day inclusive of field and lecture sessions for all persons to be used to do the relocation of both corals and seagrass.

ix. The Licensee shall inform the Agency in writing of changes in the qualified professional or entity that is to supervise the relocation activity.

x. The Licensee shall ensure that detailed daily logs of the relocation activities are maintained and submitted to the Agency within 7 working days of completion of each site. Daily logs are to include, but should not be limited to the following:
    a. The location and total area of each seagrass species harvested (donor site) and planted (receptor site);
    b. The location and total number of each coral species harvested and anchored (receptor site);
    c. Dated photographic evidence of all works; and

d. A gridded map of donor and receptor sites showing daily seagrass and coral relocation activities.

xi. The Licensee shall submit a minimum of five (5) monitoring reports on the status of the relocated seagrass and corals for a period of not less than one year subject to the following schedule:
    a. Thirty days after the completion of replanting works at each site (time zero for each phase and site);
    b. Quarterly (every three months) thereafter.

xii. Pursuant to specific condition xi above, the monitoring report shall include but not be limited to:
    a. The name(s) of the person responsible for monitoring;
    b. Location of relocation sites;
    c. Photographs showing progression at the relocation sites over time;
    d. Time and date of monitoring and analysis;
    e. Description as needed of supplemental planting activities conducted and the georeferenced locations of these;
    f. Fish counts in the replanted areas; and
    g. An indication on the current status, percentage survival and success of the plantings to include:
        i. Total area of planted beds;
        ii. Areal coverage, transplanted unit survival, shoot density and leaf length (The first monitoring is to use a 50% population assessment that must then be mathematically assessed to determine the optimal sample size to be used in all future monitoring events per site);
        iii. Water quality (suspended solids and nutrients);
        iv. Aerial extent and coverage over time using photographic inventory (annual aerial/satellite imagery coinciding with the reporting period);
        v. Bioturbation and causes; and
        vi. Qualitative assessment of natural recruitment and expansion by relocated units.

xiii. The Licensee shall ensure that if there is not 40% coverage of each seagrass planting site by the end of first 6 months that supplemental planting is done.

xiv. The Licensee shall be liable and responsible for all planting sites until the targeted goal within the restoration areas of 65% areal coverage due only to the planting units or 80% total coverage (including natural recruitment and other species providing coverage) is met.

xv. The Licensee shall ensure that any coral colonies which are fragmented during the relocation works are relocated in their entirety.

xvi. The granting of this Licence does not relieve the Licensee from complying with any other statutory obligation or from applying for and obtaining any permission, certification, permit or license required by law. These include but are not limited to Building Permission under the Building Act, Planning Permission under the Town and Country Planning Act and Environmental Permits and Environmental Licences under the Natural Resources Conservation Authority Act

Construction of Two Breakwaters

1. The Licensee shall comply with all the representations made in the application number 2013-10017-BL00003 dated 25 January 2013 received and date stamped 25 January 2013 by the Natural Resources Conservation Authority; documents titled "Final Report for Identification of Hard and Soft Engineering Structures for Negril, Jamaica" dated April 2012 and "Programme Proposal" both received and date stamped 28 January 2013 by the Natural Resources Conservation Authority, "Original Engineering Design Report Break Water Structures Offshore Negril, Westmoreland Jamaica" dated January 2014 received and date stamped 19 March 2014 by the Natural Resources Conservation Authority, "Environmental Impact Assessment For The Construction Of Two Breakwaters At Long Bay Negril, Westmoreland" dated April 2014 received and date stamped 29 April 2014 by the Natural Resources Conservation Authority, "Specifications Negril Breakwater Project Supply and Placement Tender Document" and "Specifications Negril Breakwater Project Supply Tender Document" both received and date stamped 13 October 2014 by the Natural Resources Conservation Authority; letter dated 21 May 2014 from CL Environmental signed by Carlton Campbell received and date stamped 22 May 2014 by the Natural Resources Conservation Authority, letter dated 15 September 2014 from National Works Agency signed by Andrew Sturridge received and date stamped 16 September 2014 by the Natural Resources Conservation Authority (and accompanying document), letter dated 1 October 2014 from National Works Agency signed by E. G. Hunter received and date stamped 18 October 2014 by the Natural Resources Conservation Authority; drawing titled "Overview of Proposed CEAC Integrated Solution #4 Modified – Phase 1" received and date stamped 25 January 2013 by the Natural Resources Conservation Authority and any accompanying addenda.

2. The Licensee shall ensure that all correspondence, notifications, plans, reports or any other documents being submitted to the Agency pursuant to any General and/or Specific Condition of the Licence are addressed to Manager, Enforcement Branch, National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 and can be submitted mail and/or email at EnforcementManager@nepa.gov.jm.

3. The Licensee shall notify the Manager, Enforcement Branch of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 or email: EnforcementManager@nepa.gov.jm, in writing of the date of commencement of the Works at least seven (7) working days prior to commencement so that these activities can be monitored.

4. The Licensee shall, in writing, notify the Hotel and Watersports Operators of Norman Manley Boulevard and Lighthouse Road, of the route to be taken by the barge and the proposed times of operation, prior to the commencement of the works. A copy of each correspondence shall be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5, or emailed: EnforcementManager@nepa.gov.jm, prior to the commencement of the works.

5. The Licensee and/or its agents shall ensure that there is no extraction of water from the South Negril River except with the expressed written approval of the Water Resources Authority. If approved, a copy of the approval shall be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5, or emailed: EnforcementManager@nepa.gov.jm, prior to the commencement of extraction activities.

6. The Licensee shall ensure that there is no de-silting or alteration of the South Negril River for any activity in respect of the construction of the Breakwaters.

7. The Licensee and/or its agents shall erect and maintain continuous sediment control devices (silt curtain, bubble curtain) around the Licensed Area at least 3.0m in depth (where the depth at the Licensed Area is greater than 3.0m), to restrict and control the movement of and to prevent the escape of sediment generated by the Works into the adjacent marine environment before the commencement of the Works.

8. The sediment control devices (silt curtain, bubble curtain) deployed as per Specific Condition 7 above shall remain in place until turbidity values within and around 10 metres of the Licensed Area fall below 15 NTUs or ambient conditions outside the cordoned off area, whichever is higher.

9. In the event that the sediment control devices (silt curtain, bubble curtain) outlined in Specific Condition 7 are damaged, destroyed or otherwise rendered ineffective by waves, currents and/or other meteorological events, the Works shall be suspended until the disturbance has passed and the necessary repairs are carried out.

10. Prior to hurricanes or tropical storms work shall be halted and turbidity values allowed to fall below 15 NTUs or ambient conditions, whichever is higher. Sediment control devices shall then be removed and the Licensed Area adequately secured to prevent any undue runoff into the adjacent marine environment.

11. The Licensee shall submit to the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5, a Waste Management plan within thirty (30) days of the date of issue of this Licence.

12. The Licensee shall ensure that the solid waste generated from the construction and maintenance activity is disposed of at a municipal dumpsite and shall obtain the approval of the National Solid Waste Management Authority (NSWMA) prior to such disposal. A copy of the approval from the NSWMA shall be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5 or emailed: EnforcementManager@nepa.gov.jm prior to the commencement of the Works.

13. The Licensee and/or its agents shall ensure that there is no blasting or use of explosives in the Licensed Area.

14. The Licensee and/or its agents shall not permit the discharge of waste, including but not limited to sullage waste, solid waste, oil, oily waste, trade or sewage effluent, chemicals or any poisonous noxious or polluting matter into the water or on the ground.

15. The Licensee shall immediately notify the Manager, Enforcement Branch (email: EnforcementManager@nepa.gov.jm), National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5 of any spillage of or accident with any hazardous chemicals, inclusive of all hydrocarbons and environmentally damaging material and shall report on the

clean-up activities as per MARPOL 73/78, Annex I, Regulation 26 within twenty-four (24) hours of the incident

16. The Licensee and/or its shall ensure that there is no refuelling of any marine vessel associated with the construction of the breakwaters at the Licensed Area except in areas specifically designated as such and which are subject to the relevant Licences required.

17. The Licensee and/or its agents shall not erect any lighting or signage on the encroachments created save and except for markers to alert marine vessels to the presence of the encroachments as required by the relevant authorities including the Port Authority of Jamaica and the Maritime Authority.

18. Any sensitive organisms, including but not limited to corals (which are not located on "pavement" substrate), seagrass and associated invertebrates (urchins, star fish, sea cucumber), found within the Licensed Area shall be relocated to an undisturbed area on the floor of the sea immediately adjoining the Licensed Area, prior to commencing the Works, to the satisfaction of the Authority.

19. Pursuant to Specific Condition 18 above, the Licensee shall ensure that any coral of the *Acropora sp.* found within the Licensed area, regardless of substrate, shall be relocated to an undisturbed area on the floor of the sea immediately adjoining the Licensed Area, prior to commencing the Works, subject to Specific Condition 25, to the satisfaction of the Authority.

20. The Licensee shall ensure that the boulders used for the construction of the breakwaters are obtained from a Licensed Quarry. A copy of the Licence shall be submitted to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5, or emailed to EnforcementManager@nepa.gov.jm, no less than fourteen (14) days prior to the commencement of the works.

21. The Licensee shall ensure that all construction activities are carried out between the hours of 9:00 a.m. and 5:00 p.m from Mondays to Saturdays. There shall be no construction activity on Sundays and Public Holidays. Any work to be done outside of this period will require the explicit written permission of the Authority.

22. The Licensee shall submit a Maintenance Plan for the encroachments to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5, or emailed to EnforcementManager@nepa.gov.jm,, for the approval of the Authority, within thirty (30) days of the date of issue of this Licence.

23. The maintenance of the encroachments shall be in accordance with the Natural Resources Conservation Authority's Guidelines for the Planning, Construction and Maintenance of Facilities for Enhancement and Protection of Shorelines, a copy of which can be found at http://www.nepa.gov.jm/symposia_03/Policies/Guidelines_ProtectionShore.pdf.

24. The Licensee shall undertake and submit weekly monitoring reports to the Manager, Enforcement Branch, National Environment and Planning Agency 10 Caledonia Avenue, Kingston 5, or emailed to EnforcementManager@nepa.gov.jm, of the construction and maintenance works. This monitoring report shall include, but shall not be limited to:

a) The date, exact place and time of sampling or measurement for water quality inclusive of ambient water turbidity and turbidity during construction and maintenance works;
b) The person(s) responsible for performing the sampling or measurement;
c) The date(s) analyses were performed; and
d) The analytical techniques for methods used.

25. All equipment, left over materials, equipment parts and any other material incidental to the construction or maintenance activity shall be dismantled and removed from the floor of the sea and from shore based facilities at the completion of the activity and in any event, prior to the expiry of this Licence.

26. <u>Coral and Seagrass Relocation</u>

i. The Licensee shall prepare for the approval of the Authority at least one (1) month prior to the commencement of the works, a Coral Relocation Plan. This shall include but is not limited to:
   a. The georeferenced location, size and pictures of all corals to be relocated;
   b. A rationale for the exclusion of any individuals/colonies which will not be relocated;
   c. The georeferenced location and pictures of the proposed coral relocation sites;
   d. Detailed methodology for the relocation of corals, including methods for harvesting, transporting and replanting/anchoring;
   e. Existing physicochemical conditions at the construction site and proposed relocation site including nutrients, light, salinity, temperature, waves, currents, sediment depth and sediment type;
   f. Statement of existing anthropogenic impacts at both the dredge site and proposed relocation site;
   g. A proposed schedule for the completion of the works;
   h. Proposed sediment control mechanism;
   i. The name and credentials of the qualified professional or entity conducting the relocation at each site; and
   j. Sample format for monitoring reports.

ii. The Licensee shall demarcate the working footprint of each relocation (receptor) site and shall ensure that the sites are adequately prepared for reception of corals.

iii. The Licensee shall not commence relocation until the prepared area as per specific condition ii has been inspected and approved by the Authority.

iv. The Licensee shall erect suitable sediment control devices around the construction site and at each relocation site where the bathymetry is to be modified by infilling or other deposition activities.

v. The Licensee shall apply for permission to deploy any encroachment which may be necessary to modify the existing conditions at the receptor sites in preparation for relocation of corals.

vi. The License shall ensure that the coral colonies being relocated are stored with no less than 10cm of space between each unit to prevent competition.

vii. The Licensee shall inform the Agency in writing, within five (5) working days of completion of each relocation activity, per site, to allow for inspection of the area.

viii. The Licensee shall ensure that the qualified professional hired to supervise the relocation works conducts a training of not less than one (1) day inclusive of field and lecture sessions for all persons to be used to do the relocation of both corals and seagrass.

ix. The Licensee shall inform the Agency in writing of changes in the qualified professional or entity that is to supervise the relocation activity.

x. The Licensee shall ensure that detailed daily logs of the relocation activities are maintained and submitted to the Agency within 7 working days of completion of each site. Daily logs are to include, but should not be limited to the following:
    a. The location and total number of each coral species harvested and anchored (receptor site);
    b. Dated photographic evidence of all works; and
    c. A gridded map of donor and receptor sites showing daily coral relocation activities.

xi. The Licensee shall submit a minimum of five (5) monitoring reports on the status of the relocated corals for a period of not less than one year subject to the following schedule:
    a. Thirty days after the completion of relocation works at each site (time zero for each phase and site);
    b. Quarterly (every three months) thereafter.

xii. Pursuant to specific condition x above, the monitoring report shall include but not be limited to:
    a. The name(s) of the person responsible for monitoring;
    b. Location of relocation sites;
    c. Photographs showing progression at the relocation sites over time;
    d. Time and date of monitoring and analysis;
    e. Description as needed of supplemental planting activities conducted and the georeferenced locations of these;
    f. Fish counts in the replanted areas; and
    g. An indication on the current status, percentage survival and success of the relocated corals to include:
        i. Water quality (suspended solids and nutrients);
        ii. Aerial extent and coverage over time using photographic inventory (annual aerial/satellite imagery coinciding with the reporting period);
        iii. Bioturbation and causes; and
        iv. Qualitative assessment of natural recruitment and expansion by relocated units.

xiii. The Licensee shall be liable and responsible for all planting sites until the targeted goal within the restoration areas of 65% areal coverage due only to the planting units or 80% total coverage (including natural recruitment and other species providing coverage) is met.

xiv. The Licensee shall ensure that any coral colonies which are fragmented during the relocation works are relocated in their entirety.

xv. The granting of this Licence does not relieve the Licensee from complying with any other statutory obligation or from applying for and obtaining any permission, certification, permit or licence required by law. These include but are not limited to Building Permission under the

Building Act, Planning Permission under the Town and Country Planning Act and Environmental Permits and Environmental Licences under the Natural Resources Conservation Authority Act.

Appendix

Comments received on the EIA

No	Stakeholder	Issues Raised				
		General	**Modelling**	**South Negril River**	**Other**	**Notes**
1	Ravidya Burrowes (received 22 May)					Due to the length of the document (25 pages) it was not feasible to include the comments in this table. The document is therefore being presented separately. Please also note that these comments were circulated to the Consultant (29 May) and a response was received (9 June). These are captured otherwise
2	Nicolette Courte (non-resident; received 4 June)	Would be disruptive to local businesses, a questionable solution, will be an eyesore, will cause more ecological harm than good				
3	JET/Environmental Law Alliance Worldwide (received 6 June)	The EIA Should Clarify What the Breakwaters Can Accomplish: The introduction "suggests that the rationale behind the creation of these breakwaters is to protect coastal communities, which certainly has merit,				Due to the length of this document, it was not feasible to include the specific wording in this table. A summary has therefore been presented.

		even if breakwaters are not the best way to ensure coastal protection." The introduction then goes on to "[make] it clear that tourism is a—if not the—primary driver behind this project… this project appears to be designed to protect the lucrative tourism that occurs at Long Bay. Project proponents should be clear about this rationale, so that the public is not misled into believing that constructing two breakwaters will mitigate the impacts of sea level rise. In the Negril region, preventing beach erosion is an understandable goal, but it may not be a tenable one with the solution proposed by this EIA…. If natural vegetation and living structures are superior to manmade ones, then every effort should be made to protect and enhance the growth				

		of these species in Long Bay. This EIA does not follow that logic." Impacts to Living Marine Resources are Likely to be Substantial but are Inadequately Represented 'The EIA describes the operational impacts from the breakwaters on the reefs and seagrasses as follows: "There is a potential for habitat fragmentation after the construction phases. This may occur between the seagrass beds in the lagoon and surrounding reefs. This may affect larval distribution/dispersion, migration of juveniles or other mobile invertebrates. The use of the seagrass beds as a foraging ground may also be affected, that is, turtles and other animals may be hindered or their feeding patterns disrupted.				

		The rate of sand accretion in seagrass bed areas as a result of the breakwaters is not anticipated to have adverse effects on the beds. The rate of accretion should not exceed the rate of seagrass growth rate."7 These two paragraphs represent the entire section on operational impacts on reefs and seagrass beds—the naturally protective resources available in the area—associated with this project. If seagrasses and corals are integral to shoreline protection, then this discussion of impacts seems inadequate at best, and it would behoove the project proponents to expand it…. …it appears that—from the insufficient description of the impacts, combined with the clear recognition of the importance of these natural habitats—the				

		project proponents have not seriously investigated or considered the negative effects that construction of these two breakwaters will cause.' Mitigation Efforts are lacking the mitigation efforts proposed for the living marine resources that will be destroyed by this project do not match the severity of the potential biological loss. It appears that the EIA—with the exception of silt screens to be hung during dredging activities and promises to halt construction under poor weather conditions—does not included specific mitigations for the affected species. In the mitigation chapter, the EIA states that relocation is likely to cause "more damage than good."10 That conclusion may be accurate. What is distressing, however, is				

		that no other mitigation efforts are proposed instead. In a project where damage is certain, it seems appropriate to expect some form of feasible mitigation, and some dedication of funding to ensure that mitigation and monitoring occur.				
4	EMB (received 4 July)	The EIA was somewhat voluminous and provided a challenging reader experience in the distillation of the wealth of information provided. Most of the supporting information (e.g. data tables, figures and explanatory notes) presented in this EIA would have been better placed in an appendix rather in the body text of the document as this would aid to succinctly provide information to the reader on the potential impact of the proposed activity. it was clearly evident that most of the supporting	*Scale Model Testing:* Section 3.3.1.5 articulated the scale model testing was done to simulate varying wave climates and the anticipated performance of the proposed breakwaters. Although these test were conducted by a reputable institution (Ocean Engineering Laboratory the University of Delaware) the actual results of this testing process was never presented in the document. A summary of the findings were presented in one paragraph however, a comprehensive report from the testing laboratory on the tests conducted would have been more instructive to the reader on the potential performance of these structures. It is recommended that this information be provided as an appendix to the document. *Oceanographic and Hydrodynamic*	*Desilting of Mouth of South Negril River and Construction of Staging site:* The EIA support the construction of a staging area for the stockpiling and transportation of material to the proposed breakwater site. There was however no recommendations for the decommissioning and rehabilitation of this site after the construction period. The authors also suggested hydrological studies to examine the potential impacts of the desilting process on the adjoining morass; although outside the scope of the current study, at the very least a preliminary assessments could have been done outline the probable impacts of this proposed activity. This activity is likely to have a long term socio-economic and	*Heavy Metals in Sediments:* Section 4.1.2 outlines that sediments were collected at seven locations within Long Bay, how were these sites selected? What method was used for the analysis of heavy metals? Who conducted this analysis? The analysis compares the heavy metal concentration with those based in land based sources however, the impacts of heavy metal contaminants in a marine environment tend to be more pronounced and readily incorporated in the human food chain. It is therefore recommended that The credentials of the testing lab, methods used for testing be provided. A comparison of the findings of the test with international standards for heavy metal concentration in marine	These comments were sent to the Consultant to be addressed, in letter dated 29 July 2014.

		data was acquired over a relatively short time interval The validity of some models were difficult to ascertain in some instances as the model limitations and assumptions were not presented in the document	*Modelling:* These models seem to have been driven with data sourced from global data sources such as NOAA (long term wind and waves) and Weather Underground (wind). This data was also supported by data collection in close proximity to the proposed breakwaters over a short time period (one month – current data, four days- drogue study). The model results all give results on the wave climate and current pattern on Long Bay as a whole, given that global dataset was used to setup these models the following questions should be answered: 1. What is the level of accuracy of the models when downscaled to the local area i.e. Negril and in particular the proposed breakwater site? 2. Are there observed seasonal variation in the hydrodynamics of Long Bay? What are the main drivers of this variability? 3. How does the operational wave climate of the models compare to the actual data collected by the ADCP in the field study?	environmental impact and so the potential impacts should be clearly ventilated and assessed.	sediments (e.g. those used to in association with dredging applications). A comparison of heavy the metal concentration compare to sediments found in other ports and harbours around Jamaica.	

			4. What was the rationale for the placement of the ADCP meters in the selected location behind the reef? Were any other locations considered? 5. What was the rationale for a one month current study? Were longer time periods considered? 6. Given that field data was only collected during hurricane season (near peak for Jamaica) can this information be used to reliably inform the oceanic patterns during the "winter" season?			
5	Protected Areas Branch (received 7 July 2014)	The public consultation process and socio-economic surveys for this Environmental Impact Assessment (EIA) should be improved and submitted as Addenda. A key stakeholder group (hoteliers) seemed to have been almost totally excluded from the surveys conducted. The survey instruments need also to be reviewed to ensure that the respondents will be adequately informed of			**Page 64; Section 3.3.1.3 Design Considerations-Materials** There is no indication of the composition of the boulders to be used in the project, their weathering potential and the impact this will have on turbidity. **Page 322; Negril Marine Park** The version of the Negril Marine Park Zoning Plan referenced in the document is not the most current. The information presented is therefore inaccurate. The main zones listed no longer include a diving zone or a motorized zone. The statement	These comments were sent to the Consultant to be addressed, in letter dated 29 July 2014.

		the nature of the project and its potential impacts.			that the proposed breakwaters fall within the diving zone is therefore also incorrect. **Page 323; Figure 4-115** The Orange Bay Special Fishery Conservation Area is not clearly outlined. **Page 327; Section 4.3.5 Social Impact Assessment** The hoteliers, Jamaica Hotel and Tourist Association, the Negril Chamber of Commerce and residents along Long Bay should have been interviewed/contacted if this was not the case. It is recommended that the assessment indicate the numbers of hoteliers interviewed and the feedback received from this and other groups. **Pages 351-352; Table 5-1** The impact on watersports operations and other activities and the impact on fish and invertebrate displacement are stated as being of medium and small significance respectively. How was this determined especially in light of the impact that the loss of biodiversity is likely to have on the livelihoods of watersports operators who use the area to conduct activities (diving,	

					snorkeling) that depend on the maintenance of the area's biodiversity (reefs, seagrass, fish, etc.). When interviewed, were these operators adequately informed of the potential negative impacts? **Page 403; Section 7.3.1 Community Engagement** There are several other agencies that should be included eg. the Urban Development Corporation. **Page 405; Section 8.0 Identification and Analysis of Alternatives** Alternatives 9 and 10 (discussed on pages 412 and 413) are not listed.	
6	Janet Hyde/Spatial Planning Division (received 15 July)			5.0 Section 2.21 It is suggested that government lands on the north side of the river may be a more optimal location for the stockpile site. It is contended that it may have less environmental impacts and its restoration after construction would be easier than the proposed stockpile site. The proposed stockpiling use however at this site from a planning standpoint would be inimical to the ambiance of the famous seven mile Negril beach	1.0 Section 2.7: Reference is made by to absence of long term monitoring of the beach to determine cyclical variations in beach morphology. The response by CLC indicating that NEPA has been undertaking beach profile monitoring does not adequately address the query raised regarding the existence of sufficient time series data. 2.0 Section 2.11 Whilst it is acknowledged, as indicated in CLC's response, that the	These comments were specifically making reference to CL Environmental's response to Dr. Ravidya Burrowes' comments, and not on the EIA itself.

				strip. 6.0 Section 2.22 The request for information to be provided on the restoration and decommissioning of the staging area is noted. While CCL has indicated that the site will be repurposed and that NWA will determine the future Management body, the use of the property must be in keeping with the Negril Green Island Area Development order's zoning.	long term erosion trend has to be assessed, due consideration also has to be given to the annual seasonal changes and the necessary adjustment made for same. It is being suggested that CLC amend its response and replace "course" with "coarse". 3.0 Section 2.17 The document noted that according to section 3.3.1.1 on page 61 of the EIA …"the breakwaters were designed to….. ***provoke*** beach growth". It is being recommended that due consideration be given to replacing the word highlighted. 4.0 Section 2.19 As recommended in the document the pertinent information on the actual seafloor footprint of the breakwater must be included in the EIA and not be restricted to the illustration /drawings only as was done by CLC. 7.0 Section 2.2.6 It is mentioned that Section 4.1.11.2 of the EIA addresses the impact of Cross Shore Sediment Transport under the section Baseline Description which examines the existing environment and hence	

					cannot refer to the role of the break waters which currently do not exist. It is however expected that the existing cross shore sediment transport currently occurring without the breakwaters will also be included in this section on baseline description. The decision by CLC to rearrange the information on the impact of the breakwater to elsewhere in the document is therefore not a complete response. 8. Section 2.3.1 It is recommended that Beach nourishment and breakwater be added as one of the possible alternatives. CLC's response to the query regarding the possibility of a combination of beach nourishment and breakwater would suggest that there is a likelihood that no serious consideration is being given to inclusion of beach nourishment with the breakwater as one of the alternatives in the EIA. 9. Section 2.3.5 CLC's response in respect of preventing the creation of fine sediment or particulate matter from the erosion of the limestone boulders is noted. The water required for the power washing of	

					the limestone boulders and the disposal of such waste material must be appropriately addressed in the relevant section of the EIA.	
7	Jamaica Environment Trust (received 7 August)	o	o Data on currents seems to have been collected over a short period (1-3 months) o Size of breakwater: See Page 66 of the EIA. The project proponents had a model of the project built to scale at the Ocean Engineering Laboratory at the University of Delaware and tested the breakwaters' influence on wave energy. The objective was to use a breakwater large enough to withstand the design storm with only a minimal amount of damage, specifically: "To withstand the 1 in 100 year return period deep water wave conditions with very minimal damage; structural damage number of less than 2 to 3." Typically, a damage level of 2 to 3 is acceptable from an engineering standpoint, whereas the proposed breakwaters have a "very low damage level <1". With respect to a breakwater, according to the reference cited in the EIA a structural damage number of less than 2 to 3 is	o Under no circumstances should this work go ahead without the prior completion of a hydrological study of the impacts of dredging the South Negril River on the integrity of the Negril Morass. o The section on traffic impacts was inadequate and misleading. It is well known that in general trucks have a much greater impacts on traffic flows, air quality, and noise pollution than cars o JET does not support the dredging and filling of a coastal area in the town of Negril, however degraded and small. This is an irreversible land use change that sends an inconsistent message to business people and residents about the importance of protection of the coastline and the need for strict adherence to setback limits	o Reference is made to studies done by SmithWarner and the RiVamp study, all of which refer to ecosystem damage in Negril and make recommendations as to how these can be reversed. It is not clear why breakwaters are being contemplated instead of repair to the damage and restoration of ecosystem functions o The impacts of possible silt plumes are not addressed o It was not mentioned that the work is being contemplated in a protected area o The results of the social study were unclear, as high percentages of respondents had not heard of breakwaters and did not know what they were, but a majority were said to be in support. No documentary evidence was presented as to how the issue was described to the respondents. o The environmental impacts of beach nourishment were described, but there was no mention of the much shorter time frame during which these	Some comments are specifically in reference to the public meeting.

			equivalent to the 0-5% damage to the armour layer of the breakwater. This suggests an overdesign of the proposed structures, for which there is no justification or cost benefit analysis given. The project could be designed to achieve a less ambitious, but still desirable, objective of intermediate (rather than very minimal) damage during a 1 in 100 year storm. Using the minimal damage objective results in the need for far larger breakwaters, with much bigger boulder sizes than is needed, raising the cost of the project above what would be economically justified in terms of return on investment or level of threat. It may indeed be the case that this size of breakwater is needed, but the reasons for this should be stated. Furthermore, Section 4.1.9 of the EIA describes the substrate underneath the proposed breakwaters as being hard bottom or pavement. It seems, therefore, that the complex and costly scour protection system		impacts would take place, compared to the building of breakwaters.	

			included in the proposed breakwater may not be necessary. ○ Wave modeling –Breakwater sheltering: See Page 150-165 of the EIA. The model used (STWAVE) to predict how wave energies resulting from the breakwaters is considered to be a poor choice of model, as there are more advanced models available (such as MIKE21) that will account for wave refraction and diffraction more accurately than STWAVE. Further, there is no mention of the grid size that was utilized in the simulations. It is JET's recommendation that for an investment of this size, an advanced wave model that includes wave diffraction (such as MIKE21) should have been used in order to get a more accurate prediction. If the scale model shows that the planned breakwaters reduce wave heights by half, THEN the model used by project proponents should have used a transmission coefficient of 0.5 to represent the amount of wave heights that crosses the breakwaters, rather than a transmission coefficient of 0.25.			

			). Page 65 of the EIA states: "Structural stability analysis indicated that the 100 year design will essentially be statistically stable with breaking wave conditions and transmission of 0.53." It is not then understood why the wave model used in the EIA (STWAVE) assumed that the breakwaters would reduce wave heights by 75% (that is, reduce wave heights during a hurricane from 4 metres to 1 metre). In JET's opinion, the sheltering effects of the breakwaters have been overstated. ○ Wave Modeling – Shoreline Erosion Predictions: See Section 4.1.11.2 of the EIA "Cross-shore sediment transport (sBEACH)" beginning on page 176. Figure 4-51: "sBEACH results show that at the central node under the projected climate conditions with the breakwaters in place, the breakwaters greatly reduced the amount of storm waves brought to the shoreline and that the wave height landward of the breakwater is predicted to be 0% of the waves approaching it. Not only is this			

			in direct conflict with the physical model results (50% wave height reduction), it is also in direct conflict with the STWAVE results (75% wave height reduction). This seems to invalidate all the predictions of shoreline erosion presented in the EIA. Further, there is an inconsistency in the Table of Findings, which present results for a 50 year hurricane, whereas the figures refer to the 100 year event. See Table 4-45 SBEACH erosion results for the existing 50 year scenario and for the 50 year scenario with breakwaters and climate change and compare this with Figures 4-48 to 4-52. The results of the sBEACH modeling therefore seem questionable. ○ Wave Modeling – Shoreline Morphology Predictions: The GENESIS model validation is contrary to the observed beach movement. The period selected for "validation" (2000-2006) coincides closely with air photography (1999 – 2005). The beach position data (from air photography) suggests accretion occurring during that period,			

			whereas GENESIS predicts erosion. This suggests a lack of confidence in the model validation and indicates that insufficient time has been spent to achieve a proper verification effort. See Table 4-39 Summary of shoreline change between 1968 and 2013 for Long Bay, Negril and see how the shoreline accreted at more than half of the points along the shoreline between 1999 and 2005. The model set-up conditions (grid spacing and transmission coefficients) are not specified and these could have a significant influence on the predicted impacts – these should be stated so they can be evaluated. Further, GENESIS utilizes a depth profile (Dean's profile) that does not coincide with the situation in Negril. The Dean profile is an equilibrium profile of the seabed that describes a relationship between the distance offshore and the water depth using a simple mathematical 5 expression. GENESIS uses this theoretical relationship in its calculations, as it is unable to utilize the exact			

			conditions in Negril. The conditions at Negril consist of a steep, non-uniform offshore slope rising from over 200 m depth to less than 7m. This subsequently transitions to a wide flat nearshore lagoon that extends over two kilometres from the shoreline. This profile cannot be properly represented using Dean's mathematical formulation. The EIA states that the effective grain size of 0.34mm was utilized, and this would force the equilibrium profile to have a water depth of 7m at a distance of 350m from the shoreline, whereas the conditions in Negril indicate that this water depth is approximately 2km from the shoreline. In addition, the presence of the natural reef that occurs between the north and south breakwaters fundamentally affects the waves and coastal processes in Negril. It is not clear from the EIA if the offshore contours and natural reef have been (somehow) represented in the GENESIS model set up, as there is no mention of an external wave model, which is			

			recommended in the User Manual for situations where the contours are not regular or the model extent is large. o Hydrodynamic Modeling RMA10 – the grid utilized to evaluate breakwater structure impacts is inadequate. The grid resolution is so simplistic that it is difficult to see how confident conclusions can be drawn. At the north breakwater, for example, there is only a single element used to represent the seabed between the structure and the shoreline. The resulting boundary effects would therefore completely mask the impacts of the structure, making inferences and reasonable conclusions impossible. Such inattention to the basic rules of finite element grid construction casts serious doubts on any of the model results.			
8	Susan LaSpina (non-resident; received 13 August)	o There is much that can be done naturally to support the beach in terms of restricting oversized construction projects, replanting seagrass, supporting		o The damage to the roads caused by the trucks carrying materials, the noise and the traffic, the unsightly mess will all have a negative impact on the tourism of the area.	o There are many people who live marginally, livelihoods dependent on those who come to visit the area known for its natural beauty and laid back atmosphere. This atmosphere will be changed irrevocably with overdevelopment	Excerpts from letter dated 27 May 2014 to The Hon. Robert Pickersgill

		the growth of cypress/ mangrove trees in the nearby river and propagation of vegetation to help slow down erosion ○			and with that change is the risk of losing an entire generation of frequent visitors who support it. ○ The disruption and aftermath of this proposed project will be most detrimental. People will stop coming. This translates into a real loss of millions of dollars annually and will definitely have a negative impact on the local economy. ○ During construction the local business will suffer as not many can afford to practically shut down for a few years without suffering permanent loss. ○ The large hotels/properties – many of which are owned by foreign based conglomerates will have greater resources to ride it out. They might even profit in the long run as one by one the smaller, locally owned properties being to fail and can be bought for a fraction of their true worth. If such a thing happens and construction is allowed to continue unchecked, Negril could very well become a caricature of itself, more like Disney than reality as the All Inclusives take over the beach and provide their version of the "Jamaican Experience." The small businesses and local workers will find	

					themselves exploited, further marginalized and even replaced by foreign workers. Income generated will not benefit the local economy but will rather find its way to foreign bank accounts.	
9	Nicolette Courte (non-resident; received 13 August)	○ This will be very disruptive to local businesses, is a questionable solution at best, and will be a terrible eyesore ○ The proposed breakwater will cause more ecological harm than good				Excerpts from letter dated 25 May 2014 to The Hon. Robert Pickersgill
10	Andre Courte (non-resident; received 19 August)	○ It would be a great tragedy to destroy the environment in such a manner. ○ Breakwaters have proved to be ineffective in other parts of the world				Excerpts from letter dated 26 May 2014 to The Hon. Robert Pickersgill
11	Negril Stakeholders Against The Breakwater Project (received 26 August)	The persons involved in the design of these breakwaters are not coastal engineers. While a coastal engineer is at the university of Delaware, the laboratory there only tested the integrity of the structure and they were not involved in its design.	There are…obvious errors in the modelling done. This leads us to doubt if they will actually cause any accretion of sand and wonder what protection, if any, they will achieve	The proposed dredging of the river is also something that we strongly disagree with. It is only after we raised the issues that we are now being told that the National Water Resources personnel will be looking into this. In the past, when this has been done, it only leads to more beach erosion and pollutants	The beach nourishment requested by the community, is the first solution offered by the Smith Warner report of 2007, and they are qualified coastal engineers. Beach nourishment is the preferred solution the community has asked for, as it will buy time to address the restoring of the damaged ecosystems.	Excerpts and questions from letter dated 12 August 2014 to Mr. Peter Knight.

		Based on the assessment JET had done on the design of these breakwaters, they are overbuilt and thus possibly a waste of grant funding. NEPA's tender for a consultant to review the design and monitor the project from start to finish has not been awarded, and this is of grave concern as there is no peer review of the design, and no one qualified to monitor it should it get the green light. The community learnt of this project late, as funding was approved from 2012 but it was in early 2014 that the facts came to light in Negril. Our quaint resort town should not be used as an experimental location for the construction of these massive breakwaters. They have never before built any sea defense this size in Jamaica; much less have it designed by consultants who are not qualified for		entering the sea. The proposed dumping up of the coastline would only set a dangerous precedent, while destroying the natural beauty of the resort town. Stakeholders and community members are dead set against this being done.		

		this job. The community is adamant and resolute that they are seeking sound environmental solutions to the problem of erosion and these proposed breakwaters are not a part of those solutions.				
12	Questions from Negril Stakeholders Against The Breakwater Project (received 26 August)	○ Where is the peer review of the design? Who will monitor this project on behalf of NEPA? Who on the design team is a coastal engineer? Who are the engineers at NWA and what experience do they have? ○ Is this EIA adequate and normal? It consists of 537 pages but: 1. 32 pages describe the project 2. 8 pages analyse alternatives 3. 5 pages address environmental management and monitoring 4. 48 pages are legal and administrative reviews 5. Just over half of		○ Where are the results of the hydrological survey assessment as recommended by the EIA before any dredging of the river can be done? Dredging can result in bank erosion, beach erosion, change in salinity of the water, increased pollutants coming into the sea, change in the ecosystems in the Morass and sea. ○ What will happen to the dumped up area after the project? If left, who does it belong to? If dismantled, what effect will all that sand, silt and marl have on the surrounding environment? The Public Consultation meeting said that they might consider only dredging a channel instead of the entire mouth of the river. So, where will the rest of the	○ The hot spots of erosion are inconsistent – EIA says north is worst area and Smith Warner report says South is worst. Which is correct? Is there long term monitoring? Where are those results? ○ Why was the water not tested for the presence of enterococcus? This is the indicator species for bacterial contamination in saltwater. ○ Was the quality of the stones assessed and confirmed to have a specific gravity of 2.5 as specified in the EIA as what is required? Preferred quarry (based on the wording from the Quarry assessment in the EIA) mines dolomitic limestone. This is a harder form of limestone, but some parts can be softer in water – will this cause more of a sediment plume than expected? What happens if boulders are	

		the document is baseline descriptions o There is not enough emphasis on 1. The determining causes of erosion 2. documenting the stakeholder consultation process 3. assessing the negative impacts, their management and monitoring o o EIA says structures will protect the central bay. We cannot read the map. More specifications and a better map needed o EIA was done and used seagrass satellite mapping imagery from 2006 – is there no newer information? How accurate is this in 2014? o Who is responsible for maintaining these structures? Is there a budget and equipment		material to create the dumped up area come from? Are there additional costs associated with this? o Who will have to pay for the destruction of the already bad roads after 24 – 28 truck loads per day, of boulders ranging in size from 5 tons to 13 tons each for 9 months, travel on them? o The solutions to the traffic snarl in Negril that would result from this project have not been properly thought out. How will West End get deliveries, have garbage collected, get water deliveries, police or ambulance move freely? As it did during the sewage project, it will be shut down and people will lose business. This will lead to an increase in crime in the area.	broken during transportation? Will they be replaced? Where will the water come from to wash these stones during severe drought? Does the wash water go back into the sea? Has a supplier been selected? Where is location of the storage area outside of Negril for these stones? o How will boulders be placed in the water at the site of the breakwaters, which is 4 meters (13 feet) deep? With a grapple? What kind of barge is being used? Is it a hopper barge? o How many jobs will this project provide for local persons? What qualifications will these jobs require and how long will they be employed for? o Will these structures cause sand to accrete on the beach? If yes, then where specifically? Where will this sand come from? Sand production in Negril is low as all major sources of sand have been removed/reduced (seagrass, coral reef and parrotfish). Also, the movement of sand is in the nearshore zone according to the Smith Warner Report of 2007. These breakwaters are not in that zone. o Will there be more seagrass	

		for this? This budget would be hard to estimate – looking at records for maintenance of breakwaters in the USA on the Marine Corps of Engineers website, it varies significantly. However, repairs are constantly being done and are often costly and time consuming. The Urban Development Corporation admitted at a meeting in Negril that the breakwaters in Montego Bay at Walter Fletcher beach have not been maintained. They have been damaged over the years from storms and hurricanes. According to the UDC they have now actually caused more erosion than they have prevented. ○ EIA says structures are designed for 37 years. What happens after 37 years? Will they be removed or left in the			blowouts due to these breakwaters? Motorized vessels will have to travel closer to the shore, where seagrass beds are located. ○ The core of the breakwater is made up of smaller stones. They are light in weight and can only be used in calm weather. What happens if a storm comes along and they get dispersed all over in Long Bay and on the beach? Who will clean this up and who pays to start over? They will create finer dust in the sea. What will protect the coral reef, seagrass beds, fish from this dust. It will stick to the gills of the fish and suffocate them, stop the coral from feeding and smother the seagrass. The sediment plume will also block out sunlight in the area. ○ The breakwaters will reduce flushing in Long Bay by 22%. Where is the proof that this will not cause stagnation and cloudiness of the water? When storms bring seagrass on to the beach, will these structures hamper the natural tide flow to take them back out to sea? Will the breakwaters affect the currents of Long Bay and where	

		sea ○ Breakwaters will offer moderate protection for 2000 to 2500 meters (up to 1.5 miles). Long Bay is 7 km or 5 miles long. What happens to the other 3.5 miles of beach? ○ RiVamp study is mentioned in the EIA. It introduces a more in-depth analysis of near shore ecosystems. Why is there no mention of the fact that this study talks about protecting and restoring coastal ecosystems as essential to stemming erosion? ○ What will be the visual impact from the sections of breakwater which are emergent and partially emergent? How high above mean sea level are the structures and what length and width of structure is visible? The diagrams do not show this clearly.			is the diagram, to show this? ○ What happens if a storm or a hurricane comes along during construction? Storage site will be vulnerable as well as building site. Who will be responsible? Is there any insurance for this? ○ The surveys done for the EIA are questionable. The largest group was the community group and 89.7% did not know about the project and 63.7% did not know what a breakwater was. Yet 94.5% said they were needed. What was told to the persons about breakwaters for them to conclude that they are needed? There is nothing in the EIA that shows this information. Furthermore, why were no hoteliers a part of the surveys? Why was the West End not part of the surveys? ○ The focus group meetings were summarized and very brief. The largest group of 23 persons had the shortest summary in the EIA – they had nothing to say about this project? Most of the members of this particular group signed this letter, so that cannot be correct.	

		○ Adaptation Fund grant for this is US$5.48 million. EIA says it will cost US$6.9 million. Where is the balance of money coming from? ○ ○ Where in the world have breakwaters similar to these in size, distance from shore and depth of water been built before and what were the results? ○				
13	Carolyn Wright (Councilor of JHTA Negril Chapter/ member of Negril Beach Restoration Committee; received 28 August)	○ There has been a lack of sufficient consultation with the community in advance of the project decision ○ The importance of the need to do something is recognized, but it should not be something at all costs	Modeling on sand movements if breakwaters are implemented is inadequate	○ There will be disruption to the community (traffic flow, etc) ○ The impact on the morass as a result of any level of draining of the South Negril River to facilitate the proposed barge loading area is a concern ○ Dumping up of the area behind Burger King/corner of West End road is a concern	○ Location of the breakwaters is a concern	As per email dated 28 August, these concerns were raised at the Negril Chapter JHTA meeting in July 2014. **A letter was received on the 1 September from Sophie Grizzle Romuel indicating that Ms. Wright's opinions are her own, and not representative of the JHTA, as no vote had been taken.
14	Daniel Gizzle (Chairman, Negril Beach Restoration Committee; received 30	○ 90% of stakeholders are against breakwaters ○ 10% gave support for the breakwater on the condition that money				Excerpts from email dated 30 August 2014 (after the comment period from the public had closed. Mr. Grizzle indicated that he had been off

	August)	will be found to do beach nourishment ○ The NBRC objects to the breakwater and believe that beach nourishment is the preferred option. ○ All of Jamaica's immediate neighbours in the region are moving away from breakwaters and opting for beach nourishment which may be more expensive but potentially less damaging to the environment. ○ In the USA, Florida, the Carolinas and New Jersey used this method which has provided great economic returns for their area.				the island)
15	Jamaica Institute of Environmental Professionals (received 1 September)	Was proper research conducted to ensure that this is not a maladaptive measure? And just not building a breakwater as it fits an adaption measure? Is there recourse if breakwater is found to be destructive?	Will existing groynes and breakwaters with in the vicinity be removed? Existing groynes and other coastal structures factored into the modelling? To determine combined impact?	○ The location of the stockpile area is of concern particularly as it relates to traffic congestion and the mitigative measures do not include improving the roads and traffic flow in this area. Under normal circumstances the round-a-bout area is	○ The proposed life of the breakwater only 37 years due to extrapolation uncertainty beyond 2050? Also, sea-level rise is deemed marginal up 2050. What will happen beyond 2050? Is there a plan (along with funds) identified or in place to reassess and or upgrade the structure? Or	

				congested with buses, taxis and other traffic. There is a heavy emphasis on the impact of noise, but I think traffic congestion and road safety needs to be addressed more thoroughly. o "A detailed hyrdrological study is required to identify the effects of desilting operation on the morass (outside the scope of this project)". Will this study be carried out before the desilting works is carried out?	breakwaters just become ineffective and out of commission? o What is the recourse should shoreline retreat (erosion) continue post deployment of the breakwater? o Where will sand for the accretion come from? Will another area of sand be impacted? 1. How will the coastline and by extension development not in line with the breakwater be impacted? o Was sediment transport study carried out? o Was a benthic survey of the impact zone (as opposed to the foot print only) carried out, including the path the vessel (and barge) will traverse? A predetermined path for vessels to traverse should be outlined to minimize negative impacts should in the event of load such as boulders topple over or a 'ship' grounding. o How was the value of pavement substrate and associate corals (small though be it) valued? o Aesthetic/hedonic value of Negril factored in the design? o Questionnaires were administered to the community, fishers,	

					watersports operators, retail operators and tourists, however, the owners and operators of the hotels and the persons employed in the hotels and restaurants etc were not interviewed. Questionnaires administered to the hoteliers etc would provide information on their knowledge and understanding of the environmental issues, the impact of the erosion on their earning potential and the impact on the persons working in these establishments. The focus groups did not provide this type of information. o The socioeconomic impacts have not been addressed. This project will affect the livelihood of owners and workers in the tourist industry, positively or negatively depending on whether the breakwater works or not. The primary reason for constructing the breakwaters is to stop the beach erosion that threatens the viability of the hotel in the area. Nowhere does the document speak to the how the project will affect the Negril area and the tourism product. o There is an indication that employment would be positively	

					impacted by the project as jobs will be created, but will this be offset by the potential loss of jobs in the hotel industry during and after the implementation of the project.	
16	Centre for Marine Sciences, UWI (received 1 September)		○ "Anecdotal information on the major hurricanes and storms… used to calibrate and verify models used in design". Was hard data from Met Office/NOAA's National Hurricane Centre or any other source used in the calibration of the models?	○ Sewage Pollution: Studies by Lapointe et al (2011) have shown that sewage pollution from the South Negril River have impacted the growth of macroalgae along the west end of Negril. It is possible that with the dredging and subsequent increased flow from the river, this nutrient loading problem will be made worst. ○ What are the plans for stockpile site after the completion of the project? Will there be an attempt to restore the site with vegetation or are there plans to convert it to commercial use? ○ Based on the potential impact of the increased outflows from the South Negril River having an adverse effect on the reefs along the West End of Negril, water quality	○ Monitoring – Water Quality – what measures will be put in place to ensure that water quality standards are maintained. It is not enough to just to monitor, we could be presiding over the decline in water quality. ○ An extensive study was done on the potential impact of noise during the project. I think this is a disproportionate the potential impact. ○ Page 241: The table provides data for 2012 only. Historic data should be included to determine whether, for example coral cover was increasing or declining prior to the project. Monitoring during and after project construct would them be able to show changes/trends as a result of project implementation. ○ Some comment should be made as to how the coral cover in Negril compares with the other sites in the Negril (see page 241) area and at other sites in Jamaica.	These comments are said to exclude those of Professor Webber, as he is associated with CL Environmental who prepared this EIA

				monitoring stations should also be established along the coastline in this area. Reference is made to the high faecal coliform levels observed at station 3. o Consideration also needs to be given to the sediment plume arising from the stockpile site and the potential of increase sedimentation along the West End of Negril. o Benthic communities along the West End should also have been assessed. o The assessment of the Eastern Groyne (photos) shows a number of fair sized coral colonies and other benthic organisms supporting a diverse fish population. Are we to assume that his area will be destroyed with the dredging of the South Negril River and the establishment of the stockpile area?	Coral cover in the areas assessed appears to be extremely low (generally less than 2% and 8.5% at the dive sites). o It is crucial that the locations with the Acropora palmata be conserved as these on now listed on the CITES endangered species list. o Given that the NSWMA is "not on target" with its collection of garbage what measures will be put in place to ensure that the project does adequately disposes of the garbage generated? o The social survey is intended to "garner feedback from persons whose livelihoods or recreational activity depend on the beach and bay", however, only fishers, watersports operators, tourists and shops/stalls operators were administered questionnaires. Based on the summary that highlights the importance of Negril as a destination for visitors (6,984 rooms in 2012) why then were the hoteliers not a significant component of this investigation. o Inclusion of the hoteliers in a focus group does not provide the information on the impact of the project on their livelihood (as	

					would a questionnaire) and the potential impact (including financial) to the future of tourism in this area. ○ What of the other human and social impacts, eg need for housing, sewage, garbage disposal, transportation etc.	
17	Professor Simon Mitchell, Department of Geography and Geology, UWI (received 2 September)	○ The erosion at Long Bay, Negril, is probably largely a natural phenomenon resulting from natural shoreline retreat of a beach built against an extensive soft backshore area (Morass). Similar phenomena are seen in uninhabited beach sections in south-eastern St. Thomas. At Negril, this erosion becomes critical because the hotels represent a "line in the sand" against which natural erosion can be measured. Such erosion is exasperated by global sea-level and local subsidence (compaction of underlying peat).	○ (p. 146). How ere extremal wave heights determined? ○ (p. 176). It is difficult to see how building structures will not lead to new patterns of beach accretion and erosion along Long Bay due to changing patterns of wave refraction. This does not show up in the model results (Table 4.45). Extreme events are always likely to lead to erosion followed by rebuilding of the beach profile; what is not clear to me from the models is how the breakwaters will affect the equilibrium beach profile around Long Bay.	○	○ On p. 75, the nature of the foundations of the proposed breakwaters is discussed. The use of the term 'rock' is highly ambiguous. A proper geological assessment of the foundations of the breakwaters should have been undertaken. The statement "pavement type floor" is ambiguous; what does it physically refer to (coral pavement behind a reef, or a physical description)? ○ The description of materials from the potential quarries is unacceptable (p. 76). A proper geological/geotechnical classification of the materials should have been undertaken. This is further outlined by the quality requirements on p. 77. The use of the terms "rocks" and "stones" indicates a lack of understanding of appropriate geological/geotechnical terms.	

		○ I do not think the EIA appropriately addresses the potential impact of the construction either in terms of the construction process or the potential effects of the proposed development.			On p. 77 the statement between "limestone quarries" and "marl quarries" is not backed up (after all both are limestone) and although the geology is mentioned, no data is presented. ○ (p. 123 onwards) The consultants state that they use the Unified Soil Classification System (USCS), which they do not. The USCS classifies soils based on texture and grain size and is represented by a two-letter symbol (one representing grain size and one representing characteristics [e.g., sorting, plasticity, etc.]). Instead the EIA uses grain size analysis using either a ½ phi (φ) or phi (φ) size stack (ASTM is a series of standard sieve sizes not what they used!). There is no indication of how the mean, standard deviation, skewness or kurtosis were determined (was it a graphic method or by the method of moments? – on page 128 it appears the graphical method was used – the statement is that "this is the best method to use" but this is incorrect if all the sample falls in the sand range when the method of moments is superior). No indication is give as to	

					whether the distributions are unimodal, bimodal or polymodal, this would directly relate to the interpretation of the other statistics. The grainsize graph shows sand ranging from 0.075 mm to 4.2 mm [estimated from the graph] which is incorrect (sand as a grain size ranges from 0.0625 to 2 mm, whereas under the USCS sand ranges from 0.075 mm to 4.75 mm). Further, the x-axis should be in phi and the y-axis should be a normal probability scale. In Table 4.11, the percentage of silt (which should be less than 0.0625 mm) is inconsistent with the percentage ">0.06 mm to <6 mm". The consultants do not seem to understand the classification schemes they are using. ○ (p. 138) Visual observation to indicate substrate type is not suitable. Cores should have been obtained to determine whether the "pavement" is early submarine cementation of a rock substrate. The type of rock substrate (e.g., Coastal Group, White Limestone, etc.) would enable a better understanding of developing foundations for the	

					construction. o No data is presented on the health of the carbonate producing communities in Long Bay and how this might be related to beach erosion. If sediment production is a major issue, then physical solutions without beach nourishment will not be effective.	

Response to Ravidya Burrowes' Comments

Comment	**CL Environmental Response**
This report was accessed online on May 8th 2014 at the NEPA website2. The entire report is 426 pages not including the prefacing material and appendices. More than half (257 pages) of the document is dedicated to descriptions of the baseline environment. In comparison, only 32 pages describe the project, and 54 pages are dedicated to impact assessment, and significantly less to analysing alternatives (8 pages) and environmental management and monitoring (5 pages). The legal and administrative review is 48 pages long. It would have been preferable to have much more emphasis on determining the causes of impacts, documenting stakeholder consultation process, assessing negative impacts, and managing and monitoring these impacts.	Structure of report can be revised in order to put more emphasis on areas suggested.
EIAs are public documents which should be aimed at ensuring that all stakeholders have a grasp of the key issues pertaining to the environmental footprint of the project and what is needed to manage this effectively. It is recommended that much of the modelling, data, report reviews *etc.* could be placed in technical appendices, so that the most key information needed for decision could be better emphasized in the main report.	To be looked at. Figures are important to be in body especially if depicts direct/ important findings.
The Public Beach and protection of the main road from shoreline erosion should be primary targets of these works (See Figure 1). Was UDC consulted as a key stakeholder?	UDC was invited to the focus group meeting; however they did not attend.
Much more information on the specific location is needed. A map at a much bigger scale showing the bathymetry, proximity to the existing shallow reef and seagrass meadows in this area, the specific hotels that are directly opposite to the proposed footprint *etc.*	We will examine to see if a larger scale map can be added to the report. It is already on a tabloid sheet, so any larger scale might result in some areas being lost. If it can be done then an additional map with more detail to be added.
Table 3-1 on page 62 indicates that the breakwaters would offer protection to the central	Several engineering and technical reports were reviewed and used as a means of calibrating and verifying

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section of the bay, but much more specific information on the extent of coverage/ benefit is needed. It is noted that information related to this is presented on pages 181-188, in connection with the Genesis modeling that was done. Discussions need to be cross-referenced.	our design process. These include two preliminary engineering reports by Smith Warner International (SWIL) in 2007 and CEAC Solutions Ltd in 2012, and two NEPA studies undertaken in 2012 by Robinson and McKenzie. All reports identified the central and northern sections of the Long Bay Beach as the most vulnerable to shoreline erosion, with the central section being the most critical. In designing the breakwaters a long term shoreline change analysis was conducted for the 1968 – 2013 period. The shoreline position of the Long Bay Beach was monitored over the period and a general trend of erosion was identified. The overall erosion rate was deduced to be between 0.2 – 1.4 m/yr. The results also indicated that the central section of the beach is most vulnerable to short term and long term erosion. An alongshore transport modelling exercise was undertaken for three scenarios: without breakwater, with proposed breakwaters and with a modified configuration with a longer southern breaker and shorter northern breakwater. The investigation was conducted to determine the long term shoreline trends due to the operational, swell and hurricane wave climate; and the necessity for providing protective structures (breakwaters). The investigations revealed that the proposed configuration was optimal and produced the greatest area of accretion in comparison to the other options. The beach is expected to have nominal growth of 84,000 m^2, in particular the most vulnerable sections of the beach, the central and northern sections. Approximately 80% of the shoreline will accrete (4.95 km) with an average shoreline growth of 13.5m. This growth will be realized after a number of swell events have occurred to mobilize the sand.
Review of existing studies – page 63. Based on the fact that there has been no long-term monitoring of the beach to determine the range of seasonal or cyclical change in the hotspots, the numbers indicating extent of erosion are queried.	NEPA conducts beach profile monitoring. CEAC Solutions used this NEPA data in their analysis.
Section 1.2 (page 2) addresses the basis or rationale for the project. The main reason given is the erosion trend, which it is stated to be a 40-year problem, documented in numerous studies.	No action needed.
The EIA does not mention the management responses mentioned in that report (Department of Geography and Geology study), which included beach nourishment, protection of the biogenic sediment producers (seagrass meadows) and management of back beach hydrology as alternatives to the use of breakwaters and groynes.	To be included.
The SWIL report (Preliminary Engineering Report – Beach Restoration Works at Negril 2007 for Negril Coral Reef Preservation Society) —assessed erosion trends by utilizing beach profile data, historical aerial photographs and recent satellite imagery". SWIL examined a series of aerial photos (1968, 1980. 1991, 2003 and 2006) but did not indicate the months these photographs were taken. The 2007 SWIL Report indicated that there	No action required.

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was beach loss of 1 to 2 meters over the past 20 to 40 years, which was in contradiction to the findings of the 2000 UWI Report, which found no major erosion before the 1990's based on aerial photo analysis of photos between 1940 and 1990 (done by Edward Robinson).	
It is noted that the difference between winter erosion cycles and summer accretion along the beach can be significant. Looking at the photos in Figure 1 (at back of this report), if one examined only the 2012 and 2013 photos, one would have to conclude there is a major erosion problem at this location (south side of the Public Beach at Long Bay). However, if one saw the 2003 photo (February) it would be apparent that this could well be a seasonal cycle.	The report focused on a broader time scale of years. Whilst inter-annual fluctuations are common across the Caribbean, it is the underlying erosion 1 to 10 year scale that is of concern. The data available is also relatively course to undertake historical studies on a monthly basis accurately as the time of the photo/tide range would then become relevant/important (+/- 8 to 15 meters).
Robinson et al (2012) using 2008 data confirmed earlier findings of two "hotspots" roughly correlating to the Section 1 and Section 3 of the UWI 2000 study.	No action required.
The RiVamp study (2010 UNEP) was also mentioned in the EIA, which relied heavily on the previous work, and introduced a more in depth analysis of nearshore ecosystems in vulnerability to erosion, which was first suggested in the 2000 UWI study. The EIA does not mention that study suggested that protecting and restoring coastal eco-systems was essential to stem erosion.	The following is included in first paragraph of page 8 (Introduction). "The study also emphasised the importance of the coastal ecosystems and specifically coral reefs and sea grasses protecting the shoreline. It found that beach areas with coral reefs and thick sea grasses located seaward statistically experienced less erosion in the past." This will be reiterated in relevant section.
According to the EIA, the 2012 CEAC Study "explored various solutions for the erosion problem in Negril". These are not detailed. This study apparently is the basis for the preferred works, which involves the two breakwaters on either side of the shallow reef.	In the 2012 CEAC study, both hard and soft solutions were considered. The options for the hard solutions were presented in section 8.3 of the EIA – Alternative 3-Different Breakwater Configurations. Four (4) configurations were presented: 1. 2 breakwaters 400m long approximately 300m from the shoreline, in 3.6m of water. 2. 3 breakwaters 264, 350 and 400m long approximately 240m from the shoreline in 2.9 – 3.8m of water. 3. 4 breakwaters, 3 of them 400m long and the other 500m long, they were 1,500m from the shoreline in 4 – 6m of water. 4. 2 breakwaters 480 and 600m long in 4 – 4.2m of water, approximately 1,500 from the shoreline. Nearshore solutions were not pursued because the consultations with hoteliers, PC and water sports stakeholders in February 2012 indicated that near shore structures were not compatible with Negril's tourism product either in the construction or operational phase. Our analysis determined that Option 4 provided the most benefit. This option was further evaluated and modified for the EIA submitted. The 2 breakwaters are now proposed to be 417 and 517m long. In terms of the soft solutions, seagrass restoration was investigated based on the stated objectives of the initial PIOJ submission/proposal. The assessment of artificial reefs and beach nourishment were

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	considered in the 2012 SWIL study. At the time 30m of beach nourishment in Long Bay and 20m in Bloody Bay were estimated to cost USD 12.5 Million which was well outside the project budget of USD5.0 Million. For the seagrass replanting option 100,000 m^2 of planting was proposed. At the time this would have cost USD1.0 Million. The focus was also kept on seagrass restoration in the context of both budgetary constraints and the local efforts underway at the time. However this approach was not thought to be prudent based on the meetings held with stakeholders, where they stated that they desired approach was to make seagrass replanting a local institutional capacity activity and to focus resources on protection from extreme waves, the installation of breakwaters. This additional explanation can be added to the alternatives.
The breakwaters will not protect the entire beach, and will likely only "provide effective protection to the shoreline of central Long Bay".	The breakwaters will provide protection for the central and northern parts of the bay. Based on historical information, those parts (central and north) are the most affected, hence the placement of breakwaters. Priority areas with limited funds.
It appears to be the consensus from the various cited studies that the natural reef system in the central part of the bay serves as a natural breakwater, and has resulted in protection of the beach in that area *etc.*	No action required.
Section 3.3.1.1. on page 61 indicates that the breakwaters "were designed to provide effective sheltering of the shoreline and provoke beach growth as much as possible in order to provide the maximum benefit to all stakeholders." It is assumed that the two proposed breakwaters that extend the reef would offer shelter to the hot spot areas of the beach. The reviewer finds this to be a fair assumption, although it is not expressly stated in the EIA.	To be stated more clearly in report.
The data provided on the design of the breakwater and sizing of the boulders seems to be standard, and appropriate for the scenario.	No action required.
A clear statement on the actual seafloor footprint (in unit area) of the breakwaters is needed.	The actual seafloor footprint of the breakwaters is 10,192m^{m2} for the northern breakwater and 9,071m^2 for the southern breakwater. This information on the drawings in the EIA, however we can add it as a table to the report.
A number of quarries were surveyed to determine the suitability for supply of the armor stones (page 75). The results are given on page 76 in Table 3-4. The following is noted: • The EIA does not indicate which quarry was selected, and on what basis. Presumably Nationwide Design Co. will be used, judging from on the bias in language (subjective) used to describe them in the table and on page 78. ‖*Nationwide Design Co however is reported to have the most suitable rocks for the project and is known for delivering outstanding work*‖. **It is understood that at this time no supplier**	At this time, no supplier has been selected. An initial assessment of the quarries in proximity to the project site was conducted to determine their potential to carry out the work. A quarry was not selected in the EIA because the National Works Agency (NWA) has decided that they will make it the responsibility of the contractor selected to source the material and ensure that the material meets the desired specifications. The contractor can obtain the material from any quarry he believes will provide him with armour stone of the determined quantity and specifications at an affordable price. The NWA will be responsible for accepting the armour stone on the

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has been selected. • The quality of the stone produced by the quarries is not assessed in terms of the material requirements (specific gravity of 2.5 for more than 90% etc.) stated on page 77. If an objective survey was done to select the quarry, it would be useful to see the data in respect of the material properties, available quantities etc.	site based on the contractor's record and/ or by laboratory and/ or field testing procedures carried out. The results of which will be presented by the contractor.
The location of the stockpile site seems suitable, and is also less likely to present a nuisance or visual intrusion in respect of tourism activities. However use of the government lands on the north side of the river may have less of environmental impact as it would require no dredging of the river or foreshore encroachment (reclamation). A construction screen could be erected to minimize visual intrusion of the staging area and loading works at the end of the famous beach. Restoration of the site after completion of the construction would also be more straightforward.	We disagree that government lands to the north will have less environmental impact. The area will have to be dredged; vegetation would have to be removed to create a road to the area. Apart from environmental impacts, that area forms part of the famous Negril 7 miles beach (in fact 7 km), it is where the Negril craft market, NEPT and other offices are and would result in more dislocation and annoyance. The use of a construction screen will be added to the mitigation.
Some description of decommissioning and restoration of the staging area should be given.	The site will be re-purposed and won't be decommissioned. NWA will determine the future management body. This information will be added to the report.
Page 96 Samples should have been tested for Enterococcus as this is the recommended indicator species for bacterial contamination in saltwater.	Not included in the TOR's; however agreed that should be considered in future assessments.
A basic description of the geomorphology/physiography of the beach and foreshore area seems to be absent. Although this may be well covered in the literature, it should be described here as it is at the core of the reason for the breakwaters in the first place. It is insufficient to rely on data on beach widths that are not current. Also, no monthly or quarterly data sets exist – this could have been very useful in characterizing the geomorphology of the beach system. Page 166-171 examines imagery for 1968, 1991, 1999, 2005 and 2013. Again, the months in which the photos were taken are not identified, except for September 2013. Use of imagery in this way does not yield useful data, as winter beaches can be completely different from summer beaches, or a beach after a storm event can also be completely different. See Figure 1.	Description of the geomorphology/physiography of the beach to be added using existing literature.
Page 175 – application of the Brunn Rule. Some clarification is needed in respect of the specific segment of Long Bay Beach to which the analysis is being applied. It is clear from cited previous work that the different segments have behaved differently historically, and the entire beach cannot be treated as a single isotropic unit.	The Bruun Model was used to arrive at an estimate for long term erosion trends at four (4) shoreline positions along the beach. The beach was not treated as a single isotropic unit. Table 4-44 on page 174 of the EIA outlines the erosion rate determined at the different shoreline positions.
Section 4.1.11.2 Cross-shore sediment transport examines the impact of the breakwaters on the beach. This is not part of the baseline description and should properly form part of the impact assessment section.	Can be rearranged.

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Figure 4-47 on page 178 shows three nodes (south, central and north). Some information is needed to explain/clarify why there are two profile directions for South, and three for the other two.	The profile directions at each node are limited by the shape of the shoreline. Waves approaching from the West, North West and South West are able to directly impact the Central and Northern nodes. Waves from the South Western would not directly impact the Southern node because the land mass directly south blocks the waves from reaching the node.
Does the model take into account the direction of approaching waves during the storms or does it assume there is only one possible approach direction? Is storm surge taken into account in the model? Is beach hydrology taken into account?	Each possible direction of approaching waves was considered in the model. So, for example, the South Western waves were not considered for the Southern node. At each node profiles were cut from deep water to land up to a maximum depth of 45m, from each wave direction considered. Storm surge was also considered for all the directions examined. If you are considering storm water runoff, then no, it was not considered.
Page 183 – title of the caption for Table 4-46 needs to be checked (predations). Also "Sept Away"	To be amended.
The performance and testing of the GENESIS model seem very good, and the findings indicated on page 186 should be strongly emphasized earlier in the report, possibly in Section 1 as part of the justification. This important information does not belong in Section 4 as part of the baseline.	To be restructured.
Was the option of breakwater with beach nourishment in the northern part not evaluated? While prevention of continued shoreline loss is desirable, immediate enhancement of the central and northern nodes could also be reasonably contemplated as a third option.	The option of breakwater and beach nourishment was not evaluated. The primary reason it was not evaluated in the design process is because the project budget from Adaptation Fund was known to be insufficient to cover the breakwater options that would be a priority in a sustainable framework. For beach nourishment sand is usually dredged from an offshore source and pumped on land. It may also be acquired from a third party. This alternative is popular in other parts of the world but has hardly been used in the Caribbean because it is an expensive undertaking and because hurricanes frequent the region and has the effect of 'eating away' the new beach. Beach nourishment is advantageous because it restores and widens the recreational beach. It also retains the natural appearance of the beach. This option however has many disadvantages including the fact that: • The sand often erodes faster than the natural sand on the beach. Research suggests that nourished beaches erode two or three times faster than natural beaches, but this rate can vary for our project area in Negril. Nourished beaches are also susceptible to storm events and our study in climate change has shown that the frequency and magnitude of storm events impacting our project area is expected to increase over the next 50 years. • This activity is expensive and must be repeated periodically. • The beach turns into a construction zone during nourishment. • The sand used to nourish the beach must have similar sediment properties to the native sand. This

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	limits the possible sources of sand. Our analysis has revealed that 95% (5.9km) of the Long Bay beach is in erosion mode. The most vulnerable sections are the central and northern sections with erosion widths averaging 27m. If this area of the beach was to be replenished to an additional depth of 0.5m then 796,500 m^3 of sand is required. It costs approximately 25 – 40 USD per cubic metre to dredge nearshore for beach nourishment, and it costs approximately 120 – 150 USD per cubic metre to acquire the sand from a third party source such as the Bahamas. It will thus cost approximately 19,900,000 – 31,900,000 USD for dredging and 95,600,000 – 119,500,000 USD from a third party. This would be a one off nourishment cost; additional resources would be needed to replenish the beach following a severe storm event. This alternative is not recommended for protecting and stabilising the Long Bay shoreline. Can be added to alternatives.
Page 205 Enhancement of beach safety and increase in optimized calm/ recreational conditions are positive impact that should be highlighted in the appropriate section.	This is included in the Operational Impacts matrix and also under section 5.2.1.2.
Page 206-208 Section 4.1.12.5 Flushing Analysis – also belongs in the impacts section. Graphs on pages 209-212 could be appended.	Agreed. Changes to be made to report.
Page 213 Suspended Solids – should be in the impacts section as well. We disagree with using the higher threshold of 15 mg/l instead of the local guidelines of 10 mg/l on the basis of international guidelines for lakes and the reefs. Visual aesthetics is very important in this area because of tourism. The higher standard (i.e. lower value) would be better. The approach and analysis of the possible scale of the impact appears to be sound.	Agreed. Changes to be made to report.
Aside from surface dirt being on the boulders, there could also be softer parts of the limestone that becomes soft in water and disperses so that will also be a possible source of fine sediment. Power washing before transport could possibly help with this, but if the boulders are broken during transport and delivery this could open new sources of fine material.	There are three (3) ways in which this issue will be addressed: 1. At source, the contractor is required to wash the stones, identify and remove unsuitable stones. So stones with too much softer limestone should be identified. 2. At site, stones brought in to be checked on site before they go in the water. 3. Any stones that enter the water with these 'soft parts' that have escaped these checks will be a negligible source of fine sediments.
Page 217 - The analysis is unclear because the plumes would like emanate from the staging area, from the barges in transit to the breakwater site, and at various locations from the partially constructed breakwaters during construction. It is difficult to see from Table 4-62, but it seems to be modelling plumes with breakwaters in place. The main reef located between the two construction sites is of concern, as well as the visual aesthetics of the main bathing areas inshore of the construction sites.	The plumes were modelled with the breakwaters in place. Our analysis shows that the currents have been minimally affected by the breakwaters so the plumes won't affect the bathing areas. Also, turbidity barriers are to be used around the construction sites so as to minimise the impact of plumes on the water quality. This was mentioned in the report (see pages 82 and 216).
There should also be some discussion on whether turbidity barriers will be used, and how	As stated earlier, turbidity barriers will be used at the breakwater sites. This was stated on page 82 and

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this will affect the final residual impact. The only mitigation mentioned is the washing of the boulders. Where will this be, and what will the impact of that be?	216. They will also be used at the stockpile area during the desilting of the South Negril River exercise. The boulders/ stones used during construction are to be washed at the source (quarry) to prevent sediments from entering the sea. This is a requirement outlined in the construction specifications.
Geology of the foreshore and back beach hydrology along the beach should be described. Existing depths of sand should be documented.	To be included in description of the geomorphology/physiography mentioned earlier. This data will be obtained from existing literature.
Was a benthic assessment done in the reclamation area south of the South Negril River as well?	Pages 264 – 267 details the assessment. In addition, grab samples were taken to both look at the heavy metal constituents of the sediments in the reclamation and proposed dredge area (pgs. 106 -108) and to examine the benthos as visibility was poor in some sections. This supplemented the roving snorkelling surveys conducted and glass bottom boat surveys in the area.
Insufficient attention was paid to the marine invertebrate community, specifically foraminiferans, crustaceans, molluscs, echinoids *etc.* These form a very important marine community in the hard ground, reef and seagrass meadows. They contribute to both the commercial fisheries and carbonate sediment production. These are only mentioned in passing and are most likely to be impacted by changes in the physico-chemical environment of the nearshore area.	The changes in the physico-chemical environment are expected to be minimal as the residence time changes will be small. The invertebrate community is not expected to be significantly impacted.
It should be noted that with the exception of Porites sp. there is an absence of branching corals in this area. Rehabilitating the diversity with branching corals needs to be taken into account by a Natural Resource Valuation Study.	No action needed.
Page 273 A. palmata was not mentioned in the coral survey. Why? It is unclear why the reef discussed under seagrass is different, and not part of the reef discussion.	The Back Reef section heading is missing. To be amended.
Figure 4-87 page 268. Seagrass Mapping. It is not really acceptable to do a seagrass mapping in 2014 based on 2006 satellite imagery. Google Earth has more recent imagery (March 2013).	This map was taken from another study. Seagrass mapping was not undertaken for the purposes of this EIA. Two reasons why Google imagery is not a preferred mapping basis: • Mapping seagrass beds from satellite imagery has the potential to produce inaccurate results (owing to confusion with other macrophytes, reef and other benthos). • Google imagery is not to be used for commercial gains.
Many of the social parameters (such as housing and telecommunications, electricity use, water supply, services) and presented are unlikely to be impacted by the project.	The social setting is considered important inclusion and forms the part of any social assessment. Additionally it is a part of the TORs.
Some kind of visual resources valuation should be done	The breakwaters are approximately 1.5km from the shoreline. The random protrusion of the tips of the armour stone are beyond the limits of normal vision capabilities from the shoreline. Most of the structure will be placed with a crest elevation of MSL. This is critical in order to have the desired effects of stabilizing the beach and reducing the wave energy reaching the beach. The lower the structure crest is the less effective it will be. There are practicalities that must be borne in mind in the use of a gradation of

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	sizes of quarried/irregular armour stone, on an uneven sea floor. The tips of the stones will be allowed to extend over a range of +0.43 to -0.43 meters relative to Mean Sea Level based upon the pre-tender specification requirements. It must be noted that the occurrence of the projections is random and only expected to occur for approximately 10 to 22% of the total crest of the breakwaters. An observer with "eagle eye" vision will only be able to resolve the crest from 115 meters or closer. Also, relative to the popular dive/snorkel sites, Shark and Throne, the breakwaters are over 1,000m away. This is well outside of the capacities of vision of both normal and "eagle eye" observers. It is therefore unlikely that the popular water sports activities will be visually affected by the random protrusions of the armour stones on the crest, placed at Mean Sea Level.
Some winter season counts of numbers of persons using the beach would have been useful, perhaps beachfront hotel occupancy data for the past 12 months to get a real idea of recreational use of the beach. An analysis of occupancy variability over a year would also help identify slower periods when the construction could be scheduled.	This would have been ideal; however time did not permit for a 1 year survey. While additional information may be requested from JHTA/Min. Tourism, the construction is slated for 11 months, so it will be difficult to avoid working in the winter season months. It should also, be noted that there is no real off season in Negril.
An idea of water sports usage would also be valuable as the breakwaters could impact recreational vessel movement.	This was asked in the social survey and represented as best as possible on pages 334 and 336 to 339. Dive sites were illustrated in Figure 4-113.
Page 327, Section 4.3.5 entitled —Social Impact Assessment outlines the level of stakeholder consultations done as part of the EIA process. This included a survey of 355 stakeholders, and 4 focal group meetings. The EIA does not specifically mention hotel operators or land owners of the lands facing the project site as a stakeholder group. Normally when a beach license is being sought, the adjacent land owners have to submit a letter indicating their approval of the proposed sea floor use.	A cross section of hoteliers along Long Bay was invited to the Focus Group meeting and many came. But, the beach licence application process is different and as such the opportunity for others to comment.
Page 331 Tourists identified —beach erosion and deterioration of the reef as the main environmental concerns; it would have been interesting to know how many of these had been to Jamaica previously, as prior knowledge of the environment would add credibility to their opinion on the matter.	Previous visits to Negril were included in the survey. The results will be added.
Was any attempt made to determine the eco-system services (livelihoods) provided by the specific area where the breakwaters are to be placed, the reef and the foreshore area to be reclaimed as a staging area, and whether persons felt these services could be replaced? This could form part of the Natural Resource Valuation recommended by the EIA.	This could.
Some indication of a multi-criteria approach (MCA) to impact assessment. This approach seems to be primarily applied to summary tables (351-354), from which conclusions and analyses of the impacts are not easily extracted or understood by stakeholders.	The method of impact identification and discussion used in the EIA has been utilised in other studies. Impacts are assessed based on criteria outlined on pages 349 – 350, summarized in the Impact Matrices (351 – 354) and described further in subsequent sections. The main benefit of this method is that stakeholders can readily get an overview of the potential impacts identified by referring to the impact

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	matrices. . There are various methods of representing the impact assessment section in an EIA. This is one such way. We have used this method before in several other studies without complaints by stakeholders, client or other interested parties. This method is in keeping with World Bank standards and has been used in IFC funded projects.
No indication of methods used for impact identification.	The impacts outlined in the EIA were determined based on: • Years of experienced by various consultants working in their fields, • Documented impacts from similar projects, • data collected, • Analysis of processes in the proposed project, • Information generated from models, • Concerns raised from stakeholders in the social surveys and focus group meetings and • Discussions among the EIA Study team. This will be added to the report to supplement the criteria already listed on pages 349 – 350.
Qualitative assessments of the impacts are given on pages 355-395. Specific comments on each impact are given below.	No action required.
Construction Impacts Rock Blasting – impact identified not assessed. Insufficient information on specific quarry and route to determine scale of impact and environmental receptors. No mitigation measures identified. It is understood that the full range of off-site impacts cannot be properly evaluated until the supplier is identified.	The impact of rock blasting on local residents and structures has been identified in section 5.1 Construction and section 7.0 Recommended Mitigation. Some recommended mitigation activities include: operating the blasting machine during regular working hours to reduce the potential of creating a noise nuisance during the night. More detailed information relating to the specific quarry and route to site cannot be evaluated because that is outside the scope of the EIA. A quarry has not been selected. As stated before in question 2.20 the National Works Agency (NWA) will make it the responsibility of the contractor selected to source the material and ensure that the material meets the desired specifications.
Air Quality – discussion appears to be generic construction (grubbing, aggregate screening) which does not apply to this project.	Some are relevant but careful review will be undertaken.
Noise Pollution and Vibration Nuisance (pages 356—377) properly assessed for various project site locations with application of MCA approach and quantitative modelling. More than half of all of the impact assessment falls under this category, which seems disproportionate given the level of concern with noise.	Imbalance is noted. However, even though the level of concern regarding noise seems low, this should not negate the importance of potential impacts (since many may not be aware of potential noise pollution).
Water Quality – the assessment of plumes needs to be summarized or included here (the casual reference to section 4.1.12.6 is not acceptable). Some discussion on how and if the	The currents in the bay move predominantly in a southerly direction during the rising tides and northerly during the falling tides. On slow wind days (1.0m/s) the current speeds are generally below 6cm/s. On

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baseline parameters are expected to change as a result of the project implementation is also needed.	average and fast days the current speeds will go up to as much as 9 and 12 cm/s respectively in the bay. The greatest speeds are generally in the central and northern section of Long Bay. The construction of the breakwaters will see mild decreases in current speeds in most areas and similar mild increase in the southerly areas of Long Bay, for an overall average decrease of around 13 percent and corresponding marginal increases in the flushing times. Differences in the currents between the pre and post-project scenario are more noticeable in the slow and average wind conditions. Flushing times will increase by 13 to 16% (to 3.4 to 4.1 days), and will be well within estimated required time limits (6 to 7 days) to prevent eutrophication. The proposed structures are therefore not expected to have an adverse effect on the flushing time of the bay. Beach safety will not be jeopardized by the proposed structures. Currents are actually slowed marginally and this will improve beach safety during adverse wind conditions. Sediment dispersion modeling underlines the importance of washing the boulders before delivery to site. Should the boulders not be washed and inadequate turbidity control measures are in place then a turbidity plume may result from the operations. This plume is expected to remain offshore and meet the NEPA guidelines for distance further than 400 to 500 meters away from the operations. The background water quality parameters are not expected to change in the long term as a result of proposed breakwaters.
De-silting the mouth of the South Negril River. This impact cannot be properly assessed as no baseline information has been provided in respect of the services provided by the river, the aquatic and benthic ecology within the impact zone and the hydraulic modeling scenarios for before and after dredging. Moreover, if there is a rapidly release of polluted river water into the marine area, it could potentially impact the beach area. Deepening of the river could potentially result in bank erosion, upstream shift in the mixing zone (between salt and freshwater) and shift in eco-systems. Has there been any investigation to determine whether the river can be dredged to 3 m (i.e. is there 3 m of sand above the bedrock). A separate and more permanent solution is needed to prevent beach sand from entering the river mouth from the north side and periodically blocking the river with sand bars. The statement on page 397 that the hydrological study is outside the scope of the project is confusing as the dredging is part of the project.	A detailed hydrological study is required to identify the effects of the desilting operation on the morass. This additional work is outside the scope of the project but the recommendation has been submitted to the NWA so that they will have this information before construction begins. Once this is carried out before construction then the information can be incorporated into the construction methodology so that the effect of the operation on the residents and marine environment is minimised.
Opening up the channel may have water quality consequences as well due to the variable quality of water near the river mouth (impacted by the sewage treatment plant).	See comment above.
Road Classification and Capacity (page 378-9) – a proper traffic impact assessment could	Agreed. NWA said that this would be undertaken.

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be undertaken as the number of trips per day is known.	
Material Storage and Equipment Operation – there is one sentence indicating the potential. No attempt is made to properly evaluate this impact.	Approximate numbers can be added, however, we are of the opinion that the potential impact has been highlighted.
Drainage – inadequate. Land use and drainage along the segment of beach being targeted is needed.	This is beyond the approved scope of work and TORs. The impact to the morass has been raised and partially considered in the layout of the desilting of the mouth of south river. Whilst it is known that the near shore water quality can be affected by the property drainage. The water quality programme did not highlight any significant problematic parameter e.g. nitrogen or phosphorous. It should be stressed however that long term monitoring needs to be conducted to ensure near-shore WQ is not compromised and that potential problem areas can be identified and addressed accordingly.
Solid waste generation – some idea of quantities, types, expected disposal etc. should be given.	Approximate numbers can be added, however, we are of the opinion that the potential impact has been highlighted.
Will construction equipment and vehicles be serviced and maintained at the site? How will the marine area and river be protected from site run-offs. Upon seeking clarification from the EIA consultant, we were advised that ***The provision of a sedimentation pond and oily water separator will intercept runoff from the stockpile area.***	No action required as this was stated in the EIA.
During construction of the breakwaters, how will the boulders be moved from the barge to the sea floor and structure? Will the grapple drop them into place? The EIA consultant advises that the boulders will not be dropped into place. Some more information on how the first line of boulders located +4 m below sea-level will be lowered into place is needed as dropping these sizeable boulders will produce some waves, albeit from 1.5 km away from the shoreline.	An excavator with a grapple attachment will be used to place the boulders on the sea floor (pgs. 83 – 84). No action required.
The makes some startling statements in respect to possible impacts of phytoplankton. Of concern is the last paragraph/sentence which suggests there is a real threat of impact on tourism, recreational use and —human poisonings". Some assessment of the actual risk and magnitude of these impacts occurring and how they can be mitigated is needed. It is noted that these statements are made with no scientific references being made, and appear to be highly speculative.	Not speculative; it is the type of phytoplankton species that can cause human poisonings. References which were apparently not included: Anderson, D.M. 1989. Toxic algal blooms and red tides: A global perspective. In Red tides: biology, environmental science and toxicology, ed. T. Okaichi, D.M. Anderson, and T. Nemeto., 11–16. Elsevier Science Inc. New York. Anderson, D.M., P. Anderson, V.M. Bricelj, J.J. Cullen, and J.E. Rensel. 2001. Monitoring and management strategies for harmful algal blooms in coastal waters. APEC #201-MR-01.1, Asia Pacific Economic Program, Singapore and Intergovernmental Oceanographic Commission Technical Series, No. 59, Paris. Anderson, D.M., P.M. Glibert, and J.M. Burkholder. 2002. Harmful algal blooms and eutrophication: Nutrient sources, composition, and consequences. Estuaries 25:704–26. Anderson, D.M., and A.W. White. 1992. Marine biotoxins at the top of the food chain. Oceanus 35 (3):

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	55–61. Anderson, P. 1996. Design and implementation of some harmful algal monitoring systems. IOC Technical Series, No. 44. UNESCO, Paris. Baden, D.G., and V.L. Trainer. 1993. Mode of action of toxins of seafood poisoning. In Algal toxins in seafood and drinking water, ed. I. R. Falconer., 49–74. Academic Press, London. Granéli, E. and J.T. Turner. 2006. An introduction to Harmful Algae. In Ecology of harmful algae. Ecological studies: analysis and synthesis, vol. 189, ed. E. Granéli and J.T. Turner, 3–8. New York: Springer-Verlag. Hallegraeff, G.M. 2004. Harmful algal blooms: a global overview. In: Manual on Harmful Marine Microalgae, ed. G.M. Hallegraeff, D.M. Anderson and A.D. Cembella., 25–49. UNESCO, France. Juranovic, L.R., and D.L. Park. 1991. Foodborne toxins of marine origin: Ciguatera. In Reviews of environmental contamination and toxicology. Vol. 117: 52–94. Springer-Verlag New York Inc. Kao, C.Y. 1993. Paralytic shellfish poisoning. In Algal toxins in seafood and drinking water, ed. I.R. Falconer., 75–86. Academic Press, London. Landsberg, J.H., S. Hall, J.N. Johannessen, K.D. White, S.M. Conrad, J.P. Abbott, L.J. Flewelling, R.W. Richardson, R.W. Dickey, E.L.E. Jester, S.M. Etheridge, J.R. Deeds, F.M. Van Dolah, T. A. Leighfield, Y. Zou, C.G. Beaudry, R.A. Benner, P.L. Rogers, P.S. Scott, K. Kawabata, J.L. Wolny, and K.A. Steidinger. 2006. Saxitoxin puffer fish poisoning in the United States, with the first report of Pyrodinium bahamense as the putative toxin source. Environ Health Perspect 114 (10): 1502–07. Moestrup, Ø. (ed.). 2004. IOC Taxonomic reference list of toxic algae, Intergovernmental Oceanographic Commission of UNESCO; ioc.unesco.org/hab/data.htm. (accessed December 15, 2008). Ranston, E.R. 2008. A guide to the identification of the potentially toxic dinoflagellates of Jamaican coastal waters. PhD. Thesis. The Department of Life Sciences. The University of the West Indies, Mona, Jamaica. Steidinger, K. A. 1993. Some taxonomic and biological aspects of toxic Dinoflagellates. In Algal toxins in seafood and drinking water, ed. I. Falconer., 1–28. Academic Press, London. Tindall, D.R., R.W. Dickey, R.D. Carlson, and G. Morey-Gaines. 1984. Ciguatoxigenic dinoflagellates from the Caribbean Sea. Seafood Toxins, Am. Chem. Soc. Symposium Ser., no. 262:225–240, ed. E.P. Ragelis. Washington, D.C. Turner, J.T., and P.A. Tester. 1997. Toxic marine phytoplankton, zooplankton grazers, and pelagic food webs. Limnol Oceanogr 42 (5, part 2): 1203–14. Zingone, A., and H.O. Enevoldsen. 2000. The diversity of harmful algal blooms: a challenge for science and management. Ocean Coast Manage 43:725–48.

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Aside from a passing mentioned of sea turtles in 4.2.1 (page 237) no baseline information is provided in respect of marine megafaunas before 5.1.2.2. (page 380). While it is likely that the impact of recreational use of Long Bay has already had a major deleterious impact on the nearshore activities of these animals here, some idea of the baseline population and seasonality would be helpful in understanding the nature of the impact.	Agreed. Attempts were made to get literature on numbers; but these were unsuccessful.
Reef Community: the actual impact area needs to be quantified. The impact of the proposed reclamation site also needs to be addressed. Using the dimensions given for the breakwaters, the combined seafloor footprint is expected to be of the order of 4 to 5.3 acres.	The estimated total number of hard coral, soft coral and sponges are given in the EIA. These numbers were calculated by using the total impact area of each breakwater as stated in the EIA. Surveys of the reclamation area did not identify any sensitive flora or fauna in the footprint.
The impact of creation of a new hard substrate (breakwaters) with new niches (including intertidal zones) needs to be addressed. Hard substrates will encourage algae and invertebrates.	Fish and other animals were discussed. It is agreed that this should be added, though not in great detail. Succession and colonization rates and or species expected to utilize the breakwaters cannot be stated in detail as this will be depended on the dynamics present post construction.
The two breakwaters represent a 4m+ high (above the sea floor) continuous barrier (516 m and 422 m+ m) to species moving shore normal. The potential for habitat fragmentation and barrier effects needs to be addressed. **The EIA consultants advise that there will be a 20 m to 40 m gap between the breakwaters and the reef as a means of mitigating fragmentation.**	The ends of the breakwater proximal to the reef have a 20 to 40 metres gap. The gaps between the breakwaters and the natural reef should allow for species migration and reduce the effects of habitat fragmentation. See Sections 5.1.2 pg. 381 and 5.2.2.2 pg. 386 and in the Impact Matrices. No action required.
The impact of hydrodynamic changes on the seagrass lagoon ecosystem inshore the breakwater needs to be assessed.	Neither the circulation patterns nor the background water quality will have any significant change. This will mean therefore the anticipated effect of these structures on any inshore seagrass ecosystem is not expected to be significant enough to warrant an all-out assessment.
Maritime Operations and Location businesses – the numbers of operators impacted by having to circumnavigate the breakwater structures, which with the intervening reef will represent a continuous structure of 2 km. The timing and duration of construction will also impact navigation (both recreational and business) in the area, and should be disclosed here. What mitigation measures are proposed? The presence of these structures could lead to motorized vessels travelling closer to shore creating waves (from wake speeds) in the lagoon which could affect beaches and seagrass (blowouts). If they travel further off-shore there would be increases in gas costs and potential impacts on offshore eco-systems	CL does not agree that there will be an increase in motorized vessels travelling closer to shore. It should be noted that the breakwaters are at 1.6 km from the shoreline. The vessels that are currently travelling closer to shore will continue. The exclusion zone during construction will be determined in conjunction with the Port Authority.
Visual impact. This assessment is completely unacceptable. The construction activities would be centre stage and visible from all the hotels.	See Sections 5.1.3.3 and 5.2.3.2 and Impact Table.
Erosion: The statement of 40 years of erosion is contradicted in the literature. • The EIA/plan needs to be more specific about which specific sections have lost 20	See figure 1.6 and 1.7 in design report. See accretion pattern in report figure 4.16. If fine sand is in the littoral cell it will have potential to settle at first. However, finer sand will also have a

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m to 70 m of shoreline. There is no indisputable evidence of this. • Where specifically is expected to show the accretion? • This will also have a cumulative impact on the seagrass meadow between the shoreline and the breakwater. Where will the sand come from to cause this accretion? • A baseline of summer and winter profiles for the target area is needed, and should not be based on aerial photography or model outputs but actual measurements in the field. These have to be tied to GPS controlled station pegs. • Given that they will created more sheltered lagoonal conditions on the landward side, what is the potential for the breakwaters to result in significantly finer material (very fine sands, silts or muds) being deposited near the bathing areas, as is the case in Bloody Bay?	much greater potential to be removed first in swell and storm events. They will not accumulate long term.
Current Flow and Flushing: The statement made here is insufficient, considering the extensive resources spent on modeling flows and flushing, and the level of concern expressed on this matter by stakeholders. The salient findings of the model runs should be summarized and some idea of the significance of this impact given (page 200 to 203)	The currents in the bay move predominantly in a southerly direction during the rising tides and northerly during the falling tides. On slow wind days (1.0m/s) the current speeds are generally below 6cm/s. On average and fast days the current speeds will go up to as much as 9 and 12 cm/s respectively in the bay. The greatest speeds are generally in the central and northern section of Long Bay. The construction of the breakwaters will see mild decreases in current speeds in most areas and similar mild increase in the southerly areas of Long Bay, for an overall average decrease of around 22 percent and corresponding marginal increases in the flushing times. Differences in the currents between the pre and post-project scenario are more noticeable in the slow and average wind conditions. Flushing times will increase by 13 to 16% (to 3.4 to 4.1 days), and will be well within estimated required time limits (6 to 7 days) to prevent eutrophication. The proposed structures are therefore not expected to have an adverse effect on the flushing time of the bay. Beach safety will not be jeopardized by the proposed structures. Currents are actually slowed marginally and this will improve beach safety during adverse wind conditions. Sediment dispersion modeling underlines the importance of washing the boulders before delivery to site. Should the boulders not be washed and inadequate turbidity control measures are in place then a turbidity plume may result from the operations. This plume is expected to remain offshore and meet the NEPA guidelines for distance further than 400 to 500 meters away from the operations. This information is in the EIA.
The stability of the boulder structure during high magnitude storm events is of concern to stakeholders and should be addressed. Again, considerable	The breakwaters were designed to be stable in the design storm, the 100 year return period storm event, with a damage level of 2. This means that 1 or 2 stones may shift in the structure during the design event.

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resources have been spent on testing this and the information should be relayed in a straightforward and simple way to the stakeholders	The stones may shift, they will not roll towards the shoreline. Also, scale model testing was conducted and it showed that if 1 or 2 stones shift, the structure will settle into place and become even more stable. And finally, if any shift it will be along the seaward face of the structure and not the landward face, on the side of the shoreline.
Reef and Seagrass Community. The following statement is made (page 386): —The rate of sand accretion in the seagrass bed areas as a result of the breakwaters is not anticipated to have adverse effects on the beds. The rate of accretion should not exceed the rate of seagrass growth rate". This statement requires some level of scientific substantiation from field observation, experiment or even published literature. As it stands it appears to be very speculative. Although the impact on biogenic sediment production should be assessed, the EIA has offered no baseline evaluation of biogenic sediment production in this area.	A research of the literature will be done. Biogenic sediment production was not a part of the TOR's for the EIA. It is the understanding that for the preferred solution to be arrived at, all previous studies *etc.* would have looked at this. Some information from the UWI Geology Report may be added to the report.
Changes in nearshore hydrodynamics are likely to impact beach sand sediment processes. Metrics would include carbonate sediment production rates (no baseline provided), sediment grain size distributions, biogenic constituent analysis (no baseline provided).	See chapter 5 of the engineering report. It shows the anticipated changes in hydrodynamics to be minimal. Therefore biogenic processes are not expected to be adversely impacted.
A photomontage or artist's impression should be given to that the visual impact can be better appreciated.	Ok.
The main environmental impact that is described again is noise (388 to 394) the investigation of which is disproportionate to the concern.	See previous comments on noise under impacts.
Cumulative effects of these breakwaters on the marine eco-systems of Long Bay are not described, despite the fact that these ecosystems in particular have been impacted for more than 50 years by tourism development and storms.	To be looked at.
Page 401-402 speaks to mitigation by ensuring proper functioning of barge doors. What is the mechanism by which the boulders will be placed on the sea floor? It was suggested earlier it would be a grapple.	Typo, it should say barge. An excavator with a grapple attachment will be used to place the boulders on the sea floor.
Phytoplankton, monitoring is given as a mitigation measures. In the event that unacceptable changes are detected by the monitoring exercise, what would be the trigger and contingency?	The trigger could be a change in the physico-chemical parameters of the water column mainly via an increase in nutrient concentrations from disturbance of the sediment, and decrease in the light concentrations from an increase in turbidity of the water column. The contingency would be to keep disturbance of the water column to a minimum in terms of stirring up sediment and increasing turbidity This of course will be quite difficult hence the frequent monitoring of the phytoplankton concentrations once every 2 weeks during the construction phase and once per month after construction. This will allow any increases or decreases in phytoplankton species to be detected early

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	before reaching critical stages. If critical stages are exceeded mitigation measures would depend on the species that have exceeded the concentration limits as some are more harmful than others as well as the extent of the increased concentration of the species over the limits. The extent of blooms of species would also be taken into consideration as some blooms can be isolated while others may travel with the current and impact fishing areas and high human use areas. Mitigation in such cases can include closure of fishing and swimming areas and beaches. In very serious cases a stop work order may be issued on the construction site.
Is there not a danger of having snorkelers use the breakwater – what if part of the structure becomes unstable (due to dissolution, earthquake, storm wave action)?	See comments 2.67.
How will visual intrusion be addressed in the construction phase?	The construction is occurring ≈1.6 km away from the shoreline. This means that those at the shoreline will see the construction process but they won't see it clearly. In a letter submitted to NEPA on May 5th we indicated that at more than 1 km away from the shoreline the breakwaters will not be visible to those at the shoreline. During construction it is expected that this will still be the case with the barge and excavator. Additional mitigation measures proposed include: • Ensure that the barges *etc.* are properly maintained and are not in a state of disrepair. • Add signs on them to inform.
No Action Alternative – the conclusion of inevitable and continuous erosion if no action is taken is indisputable although no specific analysis was done in respect of climate change responses alone (sea level rise, more frequent storms). The ability of the beach to recover from storm events will become more difficult if there is less sediment being produced and if the storms are become frequent. It must be borne in mind that several scientists are of the opinion that erosion began accelerating in the 1990's, which was also the time of accelerated development in the back beach area	Our analysis has revealed that shoreline erosion is primarily being caused by 1) the increase in the frequency and intensity of storm events, and 2) sea level rise. Between the 1060's and the 1990's only 3 category 5 hurricanes occurred, since then the Negril shoreline has experienced 6 category 5 events, see Figure below. It is expected that climate change will cause a continued increase in the intensity and frequencies of these events and sea level rise. Development in the back of beach area will have an impact on the rate of erosion, but an albeit minor one when compared to the effect of climate change. The breakwaters, on the other hand, will have the effect of stabilising the beach by reducing the impact of these events, so that beach growth can occur.

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	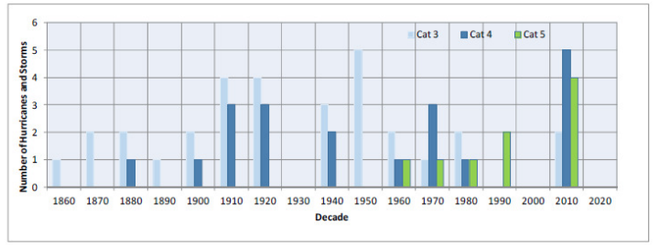 Figure 3.3 Trend in the number and intensity of the category 3 to 5 storms that have passed within 300 km of the project site between 1852 and 2013
The normative criteria for selection of the preferred option should be outlined, and each option compared against this standard set of criteria.	To be done.
Option 3 examines nearshore (~300 m) versus offshore (1500 m). The CEAC nearshore option: • Could be designed to protect the most vulnerable section in the same way that the integrated reef solution would do. • Could be designed to be submerged at low tide as well, thus being less visually intrusive. • Protects almost as much of the shore (92% or 1,855 m) compared to 2,009 m of shoreline protected by the CEAC integrated reef option. • Uses 28,000 m^3 of armour stone, which is almost 40% less than the offshore option. This would translate to less construction time, less truck traffic, and less road and quarry impacts, and more options for staging and construction methodology. • Would have a smaller sea floor footprint: the total length of the structure would be very similar (marginally shorter), but would like have a smaller width as it would have less height (2.9 to 3.8 m compared to 3.6 m to 4.7 m water depth). The impacted seafloor footprint would likely be 3.9 acres (15,881) compared to 5 acres (20,332 m2) the larger off-shore structures. • Would be less likely to impact coral reefs and more likely to impact already disturbed seagrass beds. • Would be less of a navigational barrier at 300 m offshore than, since vessels should not really be within that distance of the beach anyway.	The offshore option was preferred because: • It is a more integrated solution for extending the reef system, • It was preferred by the stakeholders at the time because it is focused on addressing the central and northern sections of Long Bay, and because this option is more aesthetically pleasing.

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• Costs less than the offshore option (2.8 compared to 4.4 – million USD), which would leave funds available for beach nourishment. • Was not evaluated to determine what the average accretion potential would be compared to the offshore option.	
The main reason for selection the offshore options included stakeholder preference and the fact that it considered by the design engineer to be a "more integrated solution for extending the reef system".	No action.
Two options are evaluated for the staging area site, with the South Negril River having less impact and lower cost. However, it is recommended that a site on the north side of the river on public lands, not requiring any reclamation or dredging be considered. The locating criteria for the staging area should be outlined.	The locating criteria for the staging area considered: • The proximity of the proposed staging area to the construction site, • The magnitude of damage to vegetation when setting up the site; and • The current usage of the proposed site. The site on the north side of the river on public lands, although close to the construction site, is currently pristine, with vegetation and grass, and is currently used for beach and social activities by the public. The site proposed is also in close proximity to the site but it is currently devoid of vegetation and grass, and so will cost less to get the site to its pre-construction position after construction than the alternative site. The dredging and land reclamation activities also provide additional benefits that the North site does not provide. It will: • Provide convenient access for a barge, the dredging that is required is minimal; • Be used as a monitoring station during and after construction. • Provide better access to the fisher folk that use the River to access the sea. The mouth of the river makes it difficult for boats to traverse and by desilting a channel in the mouth of the river it makes it more convenient for those that use the river as a transportation route.
Beach nourishment option. It is disputable that beach nourishment is less popular in the Caribbean, and that this is because of the expense and frequency of hurricanes. It is also disputable that 95% of the beach is in —erosion mode‖. The same most vulnerable sections of the beach that are being protected by the breakwaters could be nourished. There are also good preliminary indications that there are abundant suitable sands available for dredging. This analysis is skewed to present the nourishment option unfavorably. Although there is research to show that beaches that are undergoing rapid rates of erosion may not be the best candidates, it is arguable that Negril is not in fact undergoing rapid rates of erosion.	A case study by UNESCO (http://www.unesco.org/csi/pub/source/ero19.htm) outlined that beach nourishment has been little used in the Caribbean. A study by the Atlantic States Marine Fisheries Commission (http://w.asmfc.org/uploads/file/beachNourishment.pdf) also indicated that beach nourishment may not be cost-effective for beaches with high erosion rates, like Negril. Beach nourishment can also encourage further development along unstable shorelines which can reduce its benefit. In Negril construction along the shoreline is often unregulated and unless heavily monitored by the regulatory authorities it is very likely that this practice will continue on the 'nourished' section of beach.
Has any systematic attempt been made to determine the actual extent of encroachment into	No.

Comment	CL Environmental Response
the active beach zone by permanent structures? Not all of the buildings along Long Bay are insufficiently set-back. Many of those that encroach are small bars and temporary structures that can be removed in the interest of the public good, especially as they will eventually succumb to erosion of their foundations.	
Other soft engineering like back beach land use controls and seagrass conservation need to be considered. Also beach hydrology engineering is a very effective non-intrusive option that has not been considered in Jamaica at all. Please see: http://www.snh.org.uk/publications/on-line/heritagemanagement/erosion/appendix_1.13.shtml	Another aspect of the Climate Adaptation Project included the replanting of seagrass. Back beach land use controls and beach hydrology can be discussed.
The best hybrid alternative would be smaller breakwaters with beach nourishment focusing on the UDC public beach area.	We are not in agreement. While beach nourishment can be done, the reduction in size of the breakwaters would result in a reduction in the area of the shoreline protected from storms, etc. thereby enabling the erosion problem to continue.
The alternatives should not be listed 1 through 10 as they are not alternatives to each other.	They are in fact alternatives. We can add the beach hydrology engineering as an alternative and maybe look at revising the categories as hard and soft solutions.
The beach should be monitored at least quarterly. Pre-construction baseline summer and winter profiles are needed for comparison. There should be steel marker pegs put in place for beach profile monitoring. Grain size and constituent monitoring should also be done at least annually as they parameters are likely to change with a change in hydrodynamic conditions as well. The target areas and areas immediately outside the target areas should be monitored.	Agreed.
Page 346-7 identified a number of issues raised at the focal group meeting. **Fundamental Issues** • Breakwater design and location • Location of stockpile area; river dredging for fill; adequacy of space for trucks in stockpile area: traffic congestion and safety at staging area entrance and route. • Beneficiary areas (points of erosion) • Construction scheduling overlapping with a peak tourism period • Impact of breakwaters on livelihoods, flows and marine life. • Visual impact of breakwaters **More easily addressed Issues** Monitoring period	No action required.

Comment	CL Environmental Response
• Need for markers to prevent boating accidents • Pollution: air and noise • Emergency procedures (fire)	
The following issues have also been raised by the landowners/hoteliers at the meeting held in Kingston on the subject of the Negril Breakwaters: • Fears that the boulders mobilize during a large storm as they are not anchored to the sea floor and would end up on the beach or would cause more damage. • Visual intrusion of the structures at low tide. • Impact of construction traffic on tourism and roads. • Preference for sand nourishment as an option to rehabilitate the beach and the lack of proper consultation with stakeholders prior to selecting	No action required.
A table cross-referencing the EIA in respect of each issue would be helpful.	It could be.

Matrix Outlining Issues Raised and the Responses Provided in Respect of the Application for the Construction of Two Breakwaters at Long Bay, Negril by the National Works Agency (NWA)

The following represents a comprehensive listing of the issues identified, the information and/or clarification requested and the responses provided by the NWA.

	Issue	NWA Response	Comments
	GENERAL		
1	The rationale for the project is to be strengthened. It therefore follows that the basis of the decision to pursue the breakwaters as the initial solution should be clearly elucidated and this should be accompanied by the relevant justification.	The rationale for the project will be enhanced by providing a summary of the report "**Identification of Hard and Soft Engineering Structures for Negril, Jamaica**" submitted to the Planning Institute of Jamaica by CEAC Solutions Limited. The report will also be referenced. See updated script attached.	The Agency offers no objection to the response provided.
2	Clarification is needed in regards to the statement made about the project life of the structure. Does this statement imply that the structure will be structurally sound for only 37 years? Does it imply that maintenance will be required after 37 years, or is the structure to be removed after 37 years?	The consultant mentioned on page 138 that the design life of the project is 37 years. The design life of a component or product is the period of time during which the item is expected by its designers to work within its specified parameters. The uncertainties associated with climate change makes it unwise to predict too far into the future so the designer thinks it best to revisit the design parameters in 2050.	The Agency offers no objection to the response provided.

3	The 2007 study conducted by Smith Warner International Limited (SWIL) indicated that erosion was most severe along the southern section of Long Bay, while the EIA indicates that the northern section has experienced the most severe erosion. This needs to be explained, with the distinction made between chronic or long-term erosion versus erosion caused by storm events.	On page 133 the CEAC Solutions mention that SWIL did a study on one swell event and the results of the analysis of this one event were presented and their conclusions highlighted. CEAC solutions' conclusions regarding erosion in the Negril Bay are based on a myriad of other sources of data which include beach profiles, aerial photographs, other specific storm events over a continuous 6 year period etc. A more comprehensive data set has informed the CEAC conclusion.	The Agency offers no objection to the response provided.
4	The document states that the Unified Soil Classification System (USCS) was used, however this system of classification was not used. The USCS classifies soils based on texture and grain size and is represented by a two-letter symbol (one representing grain size and one representing characteristics [e.g., sorting, plasticity, etc.]). Instead the EIA uses grain size analysis using either a ½ phi (φ) or phi (φ) size stack (ASTM is a series of standard sieve sizes, which is not what was used). There is no indication of how the mean, standard deviation, skewness or kurtosis were determined (was it a graphic method or by the method of moments? – on page 128 it appears the graphical method was used – the statement is that "this is the best method to use" but this is incorrect if all the sample falls in the sand range then the method of moments is superior). No indication is given as to whether the distributions are unimodal, bimodal or polymodal, this would directly relate to the interpretation of the other statistics. The grain size graph shows sand ranging from 0.075 mm to 4.2 mm [estimated from the graph] which is incorrect (sand has a grain size range from 0.0625 to 2 mm, whereas under the USCS, sand ranges from 0.075 mm to 4.75 mm). Further, the x-axis should be in phi and the y-axis should be a normal probability scale. In Table 4.11, the percentage of silt (which should be less than 0.0625 mm) is inconsistent with the percentage ">0.06 mm to <6 mm". Clarification is therefore being sought with respect to the actual classification scheme used in the assessment and hence the conclusions and discussions may need to be revised.	The UCSC size ranges were used and not the full classification of soil type that includes plasticity. Nonetheless given that the samples are all sand the plasticity index characteristics are irrelevant and thus both grain size and sorting used to define the samples. ASTM standard sieves consisting of 16 sieves were used (3/4, 1/2 , 3/8, 4, 6, 8, 10, 16, 20, 30, 40, 50, 60, 80, 100, 200 and Pan) but not the typical 8 ASTM "stack" used in most laboratories. The reason for this is because of the relative close grading of the particles of beach sand and the need to have more information on each significant grain size for analytical purposes. Method of moments was used to determine mean, skewness, and kurtosis. "Percentage >0.06mm and <6.0 mm" refers to amount of sand. Comments on format of graph noted. No further classification designation is required for the purposes of the coastal processes analysis. We have defined the grain size distribution and sorting and the naming convention is relevant to the definition of the engineering solutions.	The Agency offers no objection to the response provided.
5	The source of the water to be used for the washing of the stones should be clearly identified; likewise the treatment/use of the resultant waste water should be identified.	Some quarries already have existing stone washing facilities. Sources of water can be public water system (NWC), wells, ponds or rivers depending on the location of the quarry. The Environmental Specifications developed for the supply contracts outline the needs	The Agency offers no objection to the response provided.

		of the project. Page 15 of the Specifications for Supply of boulders provided to your agency outlines the need to wash. See excerpt below "1.5.6 Excavation, Sorting and Washing The Contractor shall notify the Engineer when material appearing to be unsuitable is encountered. The area identified shall be stripped of Overburden. The Contractor shall be responsible to control the fracturing, excavation and handling the solid rock such that optimum usage of the materials is achieved to meet the specifications. Where the material deviates from the specifications for material quality it shall be retested and verified to conform to the relevant quality requirements. The material shall be sorted in the quarries into the respective size classes and washed of any impurities that may have a deleterious effect. The boulders shall be free from dirt, mud, marl or other material that may unnecessarily discolour the marine environment or result in dust nuisance during transportation, storage or otherwise. Washing facilities must not result in any damage, nuisance or deposits in water courses or other surface or groundwater bodies and shall be conducted in a manner that is acceptable to the local environmental regulators" Page 18 of the Specifications outline the need for a water quality management plan for riverine, coastal area etc.	
	IMPACTS OF CONSTRUCTION		
6	The potential impact of a storm, or other extreme weather event occurring during the construction of the breakwaters, including but not limited to at the construction site and proposed storage area should be assessed and the results of such an assessment provided.	The sites are expected to be affected by storm surges and winds associated with the storms. The Specifications developed for the project outline the conditions for preparing emergency management plans for natural and manmade disasters. These plans will cover hurricanes to deal with storm surge, early warning systems to enhance site preparation and clearance depending on the magnitude of the storm anticipated.	The Agency offers no objection to the response provided.

		Page 4 of the Specification outlines the submittals for project risk management and includes the development of emergency management plans to deal with all foreseen eventualities. Page 7 of Placement Specifications outlines the need to plan project to minimize exposure. This will ensure the movement of boulders in incomplete sections will not become dislodged during storms.	
7	The foundation of the proposed breakwaters is described as "pavement type floor." The specific nature of the substrate (e.g. coastal group, white limestone, yellow limestone, etc) should be clearly indicated. Further the impact of the specific nature of the substrate on the design, stability, integrity and projected lifespan of the project. Additionally a discussion on what measures may be required in the event that the substrate is found to be less suitable for construction and the resultant impacts and mitigation is to be included. Note, in the event that approval is granted geotechnical assessments to confirm the nature of the substrate will be required prior to the commencement of construction.	Please visit page 75 of EIA report for an explanation of the geotechnical considerations. Page 244 outlines that the substrate is carbonate rock. The NWA is of the view based on the results of the investigation of the substrate of the area along with the incorporation of geotextile in the design that geotechnical studies are not of paramount importance. The use of geotextile will serve to stabilize the structure under the conditions of settling that are expected for the substrate in the footprint of the breakwater. A geotechnical assessment when requested after permitting will cause undue delays and unplanned expenditure and the NWA will therefore seek to have such conditions removed from the environmental permit if included.	The Agency offers no objection to the response provided.
	IMPACT OF THE BREAKWATERS		
8	A clear statement is to be provided regarding the effects of reduced flushing on the nearshore wave and current patterns. Such a statement should seek to address the possible impacts such as stagnation and eutrophication within the broader Negril Bay.	Please see page 208 for changes in flushing anticipated in the post-construction regime. Some currents will be reduced resulting in increases in the time of flushing. The EIA outlines that these changes are not significant enough to cause noticeable changes in the quality of bay based on the current loadings. 1. "The flushing times of 3.29 up to 3.72 days appear to be sufficient to delay the onset of eutrophication in the Bay. These flushing times will not allow the formation of phytoplankton or algae to accumulate in numbers large enough to cause eutrophication. Similarly the predicted increases in flushing time as a result of the proposed structures are small enough to be negligible given that it is not applicable across the bay, but in some locations." ***A flushing time of 7 days is considered***	The Agency offers no objection to the response provided.

		critical when it comes to eutrophication. Based on the anticipated flushing times as a result of the implementation of the breakwaters, there will be no impact on the water quality in the Bay. This finding will be highlighted explicitly in the final EIA	
9	A clear statement regarding the projected accretion of sand due to the installation of the breakwaters is to be provided. This statement should also seek to identify the source of the sand which is expected to accrete and indicate how the coastline (and developments) outside of the zone of influence of the breakwaters may be affected?	Please see pages 184 to 187 of the EIA and/or 106 and 107 of the Engineering Report. The source of sand will be mobilized nearshore sediments previously eroded from the beach face and dune. The shoreline outside of the zone of influence of the breakwaters will continue to experience the underlying shoreline erosion trends.	While the document says that the selected option (for breakwater configuration) will result in 109,400 cubic meters of accretion over 80% (4.95km) of the shoreline, with an average shoreline growth of 13.5 meters, it is not clear with the proposed timeline for same. The NWA is required to indicate clearly, in the final EIA, the timeline within which this accretion is expected. It was indicated that the expected time is 7 years.
	SOCIAL IMPACT ASSESSMENT		
10	The Social Impact Area (SIA) was said to be a 4km radius around the project site. Figure 4-95 shows that sections of Whitehall and Westlands (The West End) are included in the SIA, however the description of the SIA indicated that the West End was to the south of the SIA, and therefore excluded. Clarification is therefore required here. Additionally with a clear preference of staging area indicated it is evident that the project will also impact the west end and hence information on these stakeholders must also be provided. The SIA therefore needs to address possible negative impacts of the construction, including but not limited to the possible losses/gains with respect to employment in the various sectors as a consequence of the construction activities, across the Negril Community.	The statement should have read: **"Social Impact Area** **The Social Impact Area (SIA) for this study was demarcated as four (4) kilometres from the proposed breakwater footprints. As seen in Figure 4 95, this impact area traverse two parishes, namely Hanover in its northern section and Westmoreland in its southern, and encompasses sections of three communities, namely Orange Bay, Negril and Sheffield. Though the general area is stereotypically referred to as Negril, distinct settlements including Whitehall and Westland (colloquially known as "West End") located in the south of the SIA. " Pg. 287** **What that is saying is that sections of Negril which include**	The Agency offers no objection to the response provided.

		Westland "West End" were surveyed. **Pages 378, 379 e.t.c. address impacts at the campsite.** **<u>Existing Jobs</u>** The activities associated with the delivery of boulders to the stockpile area. This will involve trucks laden with boulders, heading west from the Negril round-a-bout, entering the stockpile area and leaving eastwards behind Burger King up to Norman Manley Boulevard. There is a potential for traffic congestion caused from the transportation of the boulders which could have an impact on businesses in the immediate areas and West End. It should be noted that this exercise does not involve digging or trenching as was the case of the pipe laying activity carried out along West End. Therefore it is anticipated that the dislocation experienced during that project will not happen. The anticipated 24 trucks per day will not have a significant impact on traffic or cause any dislocation, therefore the impact on existing jobs or businesses will be limited. **<u>Mitigation</u>** V. Ensure that a traffic management plan is developed and implemented. VI. Trucks should not be allowed to travel in a convoy VII. Trucks should not be parked along the public roadway III. Schedule delivery during off peak as practical as possible	
11	The minutes of all focus group discussions (including lists of all participants) are required to facilitate further review and determination of the extent of consultation had with the various stakeholders. It should also be noted that these minutes are to be appended as appendices to the final EIA.	See Appendix 14 of EIA and we are sending the recordings of the sessions if you require further information. NB: The recordings have to be considered private as the audience gave us permission to record when they were told the recordings were not to be used for public distribution but as reference material for accuracy of reporting the findings from the meeting. These shall not be a part of any issuance for requests under the Access To Information (ATI). Distribution of recordings must be limited to priority persons within the NEPA only.	The Agency offers no objection to the response provided.

12	The script used in administering the survey, with particular emphasis on the explanation provided to surveyed participants as to the concept of breakwaters, is required to be submitted to facilitate a review by the Agency. It should also be noted that the script so used is to be appended to the appendix of the final EIA.	The following was covered with the socio team administering the questionnaires by having a training meeting. i. What is an EIA and why we do it, the process and legal requirements including the role of relevant organisations. ii. What a social survey entails and examples and experiences we have all had when conducting surveys. iii. Back ground on beach erosion and problems in Negril. iv. Background on Negril having a socially active community and people may ask more questions than they can answer and to direct them to the company and website v. What are breakwaters versus groynes. vi. Who CEAC our partners were and explained about a model to reduce the problem vii. How the breakwaters would be built. viii. The kind of background work we did in conducting this EIA. ix. We used maps to explain placement of the breakwaters and staging area. Each team member was given a map depicting the Negril area showing both locations which they could use to help orientate the interviewee. x. They were each given a summary paragraph guiding them how to introduce themselves and what to say about the project. Summarized in the paragraph at the top of each survey instrument. See below: "**Hello, my name is ……I am part of an environmental team from CL Environmental conducting a perception survey of the proposed Negril breakwater project. It is being proposed that two breakwaters will be constructed offshore Long Bay beach for shoreline protection and in order to mitigate the erosion problem. This project falls under a larger Adaptation Fund Programme involving a number of government agencies including NEPA, PIOJ, NWA, MOAF and MOT."** **"You were randomly selected to take part in this survey and**	The Agency offers no objection to the response provided.

		your participation in this interview is voluntary. You do not have to answer any questions that you are not comfortable with. There is no right or wrong answers." **"I can assure you of full confidentiality in this survey. Your identity and responses will be kept confidential and your privacy will be protected. I will not use your name, only a code number, to identify your information in my formal analysis and reports."** xi. They were told that alternatives were explored but this deemed the best. We did not discuss the alternatives in detail. xii. We went over each question with the survey team to ensure that each person had the same understanding of what the question was getting at. xiii. There was a question and answer time at the end of the session to clarify any queries or concerns each person had.	
13	Based on a review of the SIA, questionnaires were not administered to hoteliers, and the hoteliers did not appear to be a significant component of the SIA. A justification for this is required.	Under Section 4.3.5 it was stated that two techniques were employed to engage stakeholders. These were using a survey instrument (structured interview) and by focus groups. Due to the importance of the hotel sector in Negril, we decided to use the focus group technique to engage this stakeholder group. Section 4.3.5.3 outlines the outlines the difference between the using questionnaires and focus groups in engagement of stakeholders. With using the focus group technique there was no need to engage individual hoteliers by using questionnaires. A point of note is that persons who were interviewed by using the questionnaire technique were not included in the focus groups as this would result in cross counting and errors in the analysis. Please note that a survey is a representative sample, and is not expected to every perceivable stakeholder. The adequacy of the Negril survey is confirmed by the very close correlation with the issues that were raised at the public meeting. There were no issues raised that were not identified in the results of the social survey.	The Agency offers no objection to the response provided.
	DESILTING OF SOUTH NEGRIL RIVER		
14	Studies by Lapointe et al (2011) have shown that sewage pollution from the	a. If high nutrient loads exist in the South Negril River and we	The Agency offers no objection to the

	South Negril River have impacted the growth of macroalgae along the west end of Negril. Clarification is required with respect to the following: a. Will the dredging and subsequent increased flow from the river exacerbate the nutrient loading problem? b. Is nutrient level the limiting factor in the rate of macroalgal growth?	increase outflows from the river by cleaning the mouth then it follows that increased amounts of nutrients will enter the bay. b. While I cannot comment on the specifics of west end there are a number of factors that can limit algal growth which include level of light penetration, water temperature and nutrient loads. While the South Negril River may be contributing nutrients loads to the bay, the water results in the EIA have also confirmed that there are other sources of nutrients which include upwells, possible surface runoff from properties along the coastline and possible groundwater intrusion along the coastline. The results of the water quality testing for the EIA indicate that there are no nutrient limitations.	response provided.
15	The Agency wishes to establish whether or not "desilting" or "capital dredging" of the South Negril River will be undertaken. As such the following information is hereby requested: a. What was the original design depth of the South Negril River? b. Will the proposed activity seek to return the mouth of the river to this original depth or does it seek to increase the depth of the river beyond this original depth?	The original aim of the de-silting of the south river mouth was to provide improved access to the south Negril river for not only the fisherfolk but all users of the river. The material won during de-silting would also serve to reduce the project cost by being reused to create the storage platform for boulders at the storage site. The myriad of issues arising from the inclusion of such an activity in the project seems to be counterproductive as the need as arisen for detail hydraulic and hydro-geological studies, additional environmental studies etc. Based on the appending requirements the NWA is no longer interested in de-silting the river and will import all material to prepare storage area and this material will be removed at the end of the project. The site will be returned to it original state.	The Agency offers no objection to the response provided.
	STAGING AREA		
16	Clarification with respect to the future use of the staging area is being requested. The EIA indicates that the area will be left for future use. Please note that a closure plan for this area is therefore required, along with a clear indication of what future use(s) is/are being contemplated. In preparing said closure plan and in the contemplation of the future uses and or development of said lands, the Negril Green Island Area Development order's zoning must	The site will be returned to its original state upon completion of the breakwater construction project. A Closure plan will be provided in the final EIA.	The Agency offers no objection to the response provided.

	be considered and this must be designed in collaboration with the Negril Green Island Area Local Planning Authority.		
	MODELLING		
17	What was the methodology used to determine the extremal wave heights?	Please see Hurricane waves – Methodology page 140, subsequent pages outline all modelling done for wave climate specifications. The point chosen was 4.5km offshore. The point was located at the following coordinates: · Latitude: 18.31 degrees North and Longitude: 78.38 degrees West. The database of hurricanes, dating back to 1886, was searched for storms that passed within a 300km radius from an offshore point approximately 4.5km west of the long bay shoreline. The following procedure was carried out. 1. Extraction of Storms and Storm Parameters from the historical database. A historical database of storms was searched for all storms passing within a search radius of 300km radius of the site. 2. Application of the JONSWAP Wind-Wave Model. A wave model was used to determine the wave conditions generated at the site due to the rotating hurricane wind field. This is a widely applied model and has been used for numerous engineering problems. The model computes the wave height from a parametric formulation of the hurricane wind field. 3. Application of Extremal Statistics. Here the predicted maximum wave height from each hurricane was arranged in descending order and each assigned an exceedence probability by Weibull's distribution. 4. A bathymetric profile from deepwater to the site was then defined and each hurricane wave transformed along the profile. The wave height at the nearshore end of the profile was then extracted from the model and stored in a database. All the returned nearshore values were then subjected to an Extremal Statistical analysis and assigned exceedance probabilities with a Weibull distribution.	The Agency offers no objection to the response provided.
18	"Anecdotal information on the major hurricanes and storms… [was] used to	Data from the Met Office and the NOAA were used to develop and	The Agency offers no objection to the

	calibrate and verify models used in design". Clarification is required on whether or not data from Met Office/NOAA's National Hurricane Centre or any other source was also used in the calibration of the models. To what degree was anecdotal information relied upon and what is the degree of confidence that can be applied to the stated results.	run models. The Anecdotal data verifies whether the outputs of the models match up to what was seen by the people who experienced the storms. If both data sets coincide then the models have predicted outcomes effectively.	response provided.
19	Clarification is being sought as to whether or not existing coastal encroachments were factored into the modeling to ensure that the combined impacts were taken into consideration, especially with respect to the sediment transport and deposition regimes that will be established post construction.	Yes, existing coastal encroachments such as groynes and jetties in the project area were incorporated in designs. The surveys of the beaches that were inputted in the models were effective in picking up all the relevant information needed for the modelling and design process.	The Agency offers no objection to the response provided.
20	The Agency has been advised that a detailed Engineering Report was prepared in conjunction with the EIA, which includes but is not limited to the methodology employed in the selection of stones for the breakwater structures. The Agency requests the inclusion of a summary of this report, similar to that which was presented at the Public Presentation, in the final EIA document.	The NWA will add the slides from the public presentation pertaining to the design report to the final EIA.	The Agency offers no objection to the response provided.
	Other		
21	*Heavy Metals in Sediments:* Section 4.1.2 outlines that sediments were collected and were analysed for heavy metal content, although the methods for testing the samples was provided in the response letter the following issues are still outstanding: o The name, location and accreditation of the laboratory that conducted the test were not provided. o It was noted that the analysis compares the heavy metal concentration found in the sediments of Long Bay, Negril with land based sources. Giving that the impacts of heavy metal contaminants in a marine environment tend to be more pronounced and readily incorporated in the human food chain then a comparison with other marine based sediments would provide useful insight. The information provided in the letter does not adequately address this issue and ascribes what could be considered as a very subjective classification of "sufficiently low" concentrations of heavy metal in the sediments. The substantive question therefore remains would the sediments collected in Long Bay, Negril be considered	**Heavy metals standards:** The heavy metal concentrations are within the average soil concentrations in Jamaica as listed in the Soil Atlas of Jamaica and had lower concentrations when compared with sediment concentrations at three other marine areas around Jamaica (see tables below). Comparison with other international ports and harbours has also shown that the concentrations obtained in Negril were well below those obtained at the other locations. Total Petroleum Hydrocarbon (TPH) is not considered a heavy metal; however, the concentrations obtained in Negril were in compliance with the NRCA standard of 1000 mg/KG except at one station (S2) which recorded 1,100 mg/KG. Values for comparisons with other jurisdictions are presented in the attachment.	The Agency offers no objection to the response provided.

	contaminated with heavy metals under any international standard. o It is noted that a comparison of heavy the metal concentration in Long Bay to sediments found in other ports and harbours around Jamaica was done, the results of this comparison should therefore be provided.		

Appendix II: List of Newspaper Articles

Date	**Published by**	**Title**
2 May 2014	Observer	Hoteliers say no to breakwater project
4 May 2014	The Gleaner	Beyond the Negril Noise*****
11 May 2014	The Gleaner	Beyond The Negril Beach Spin
12 May 2014	Observer	Using boulders to curtail Negril beach erosion is ill-advised, says Wheatley
14 May 2014	Observer	Relocate Negril hotels, says scientist
14 May 2014	The Gleaner	Worry Over Future Of Adaptation Fund Project
18 May 2014	The Gleaner	Negril Stakeholders Open To Meeting On Breakwaters Plan
26 May 2014	The Gleaner	Talking Negril Beach To Death*****
28 May 2014	Observer	'We Won't Wreck our Town'
9 July 2014	The Gleaner	No Headway In Negril Dispute (letter to the Editor)
4 August 2014	JIS	Environmental Stakeholders in Negril Support Breakwater Plan*****
6 August 2014	Observer	'Not enough money'
8 August 2014	The Gleaner	NRCA To Make Decision On Negril Breakwaters
22 August 2014	The Gleaner	PIOJ promises more dialogue on Negril breakwaters
22 August 2014	Observer	Negril breakwater project needs greater transparency, says Wheatley
2 October 2014	The Gleaner	No NRCA Decision Yet On Negril Breakwaters
3 October 2014	Fox News	Famed 7-mile beach in Jamaica erodes in what some fear is future for other Caribbean hotspots
3 October 2014	The Detroit News	Famed beach in Jamaica slowly vanishing to erosion
3 October 2014	Yahoo! News (AP)	Famed beach in Jamaica slowly vanishing to erosion
4 October 2014	The Gleaner	Were Breakwater Consultations A Scam? (letter to the Editor)

*** Articles expressing support for the project**