
CHAPTER 6

6.0 ENVIRONMENTAL MANAGEMENT

6.1 Introduction

The environmental management plan for the proposed *btl* Fiber Optic Submarine Cable Project will involve the identification of the mitigation measures along with the required performance indicators and monitoring plan. Furthermore, in order to carry out these activities, the developer will implement an Environmental Management Plan aimed at overseeing the environmental aspect of the entire operation which will include the installation/trenching and post installation/trenching phase. Furthermore, this EMS will be a tracking tool for all the environmental objectives and targets set forth by the Department of the Environment in terms of its ECP.

6.2 EMP Outline

An **Environmental Management Plan** (EMP) is a set of processes and practices that organizations or companies use to reduce their environmental impact. It involves a continual cycle of planning, implementing, reviewing, and improving processes and actions to meet both its business and environmental goals. The EMP also reflects *btl's* emphasis on continuous improvement in operations by measuring and evaluating its environmental performance.

In considering the proposed project, the proponents will implement an EMP to further aid in achieving its environmental goals and objectives. This action first includes the identification of the impacts, its mitigation measures and proposed monitoring plans along with the required contingency management plans.

6.2.1 Required Key EMP Elements

The organization's EMP must demonstrate the following key elements:

- Setting an environmental policy,
- Determining significant environmental impacts,
- Setting goals for compliance and environmental performance,
- Assigning responsibility,
- Implementing and documenting programs,
- Evaluating and measuring effectiveness, and
- Demonstrating performance.

These key elements are essential in carrying out a successful EMP that will benefit the project in all its environmental endeavors. This section will facilitate the necessary framework for the project to meet its environmental goals and in so doing, promote the existence and conservation of the natural surroundings in which the project site is to be located.

6.2.2 Benefits

There are a range of benefits associated with operating an effective EMP:

6.2.2.1 Financial

- Cost savings through the reduction of waste and more efficient use of natural resources (water, gas and fuels).
- Avoiding fines and penalties from not meeting environmental legislation by identifying environmental risks and addressing weaknesses.
- Reduction in insurance costs by demonstrating better risk management.

6.2.2.2 Operational and Internal

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- Improved overall performance and efficiency.
- More efficient, less hazardous production processes.
- Improved consistency by reducing waste and disruption of production.
- More clearly defined staff responsibilities.
- Improved internal communications and morale, often leading to sound environmental solutions suggested by staff, proves seriousness of the company.

6.2.2.3 External

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- Better public perception of the organization, leading to successful projects.
- Reduction of the impact (e.g. noises, smells, dust) of your activities on the local residents, leading to more community support.

6.2.2.4 Benefits of third party verification

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- Ensures that the EMP is consistent according to set protocols.
- Provides credibility and integrity in reporting and publishing environmental information.
- Demonstrates commitment to environmental transparency and accountability.

6.3 Impact Mitigation Measures

Impact mitigation is a critical component of the EIA process. It aims to prevent adverse impacts from happening and to keep those that do occur within an acceptable level. Opportunities for impact mitigation will occur throughout the project cycle.

The objectives of mitigation are to:

- find better alternatives and ways of doing things;
- enhance the environmental and social benefits of a proposal;
- avoid, minimize or remedy adverse impacts; and
- Ensure that residual adverse impacts are kept within acceptable levels.

This chapter provides a summary of the key potential residual impacts of the preferred option and recommended mitigation measures intended to reduce the potential negative impacts resulting from actions of the installation activities period. This key is by no means limited and other issues may be added as the EMP is being implemented.

6.3.1 Mitigation Measures In Relation To Project Activities

There will be two (2) sets of activities associated with the proposed project: which includes the activities of the Phase 1 of Stage 2, the section from the coast of mainland Belize to where the outcrop of the bedrock is behind San Pedro (See Fig 2.2) and that of Phase 2 which is through bedrock from the outcrop behind San Pedro to landing manhole on San Pedro (See Figs 2.3 & 2.4).

The issues of concern related to the project are the navigation of the barge and vessels at the project corridor site, as well as the installation activity itself which poses a threat of physical harm and injury. This is especially relevant to boat traffic in the area and the installation and under-brushing of vegetation on the corridor of the transmission lines. The mitigative responses to this are in large part in relation to the placement of navigational aids such as buoys and lights to alert and ward off mariners, and the proper use of equipment and safety procedures when installing the FOC overhead cables on the posts next to the BEL high tension wire.

The primary aquatic impacts arising from the project activities are expected to be an increase in sedimentation and turbidity, as well as an increase in BOD and Hydrogen Sulphide. The impact of the activities is to be moderate (See Table 5.1). This has been as a function of the modest scale of the operations, the consistency of the seafloor material to be disturbed and consequently the mobility of the sediments, as well as the location of the proposed operations.

The issues associated with the activities are sedimentation and turbidity impacts to the marine environment. The mitigative response to these impacts is to reduce the plume by only operating during the dry weather, which means low current flows. The deployment of a sediment curtain would not work since the plough is in constant motion and the ability for the curtain to work would be hampered due to constant movement. Other related responses include activities

designed to ameliorate the re-suspension of sediments, as well as measures that would reduce the physiological stress on sessile and slow moving benthic organisms.

The impacts from the trenching operations are expected to be localized and should be confined to the areas immediately associated with the site in the near-shore environment. The following table summarizes the proposed mitigation measures that will be implemented by the proposed project for all approved operations.

Table 6.1: Mitigation Responses in relation to Project Impacts

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1.0 Actual activities using Plough Jetter and their dredging equipments (excavator, back hoe)	1a. Disturbance of seafloor and suspension of fine sediments and re-deposition of coarse fraction.	1a1. Direct physical destruction of benthic habitat, and attenuation of light impeding photosynthesis of sea-grass, macro-algae and other autotrophs	1a1a. Maintain the project corridor as narrow as possible.
			1a1b. Decrease time frame over which operation is to take place to avoid daily re-suspension of sediments.
			1a1c. Applying velocity reduction measures where jetter is concerned such as baffles to precipitate solids and curtail turbid influences in jet stream.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1.0 Actual Activities Contd.			1a1d. Ameliorate re-suspension of sediments by confining dredging operations to calmer sea states.
		1a2. “Blanketing” or smothering effects on benthic habitat and sessile and slow-moving invertebrates.	1a2a. Institute monitoring program to ensure that light penetration at seafloor is at least 25% of surface irradiance
	1b. Decrease in Dissolved Oxygen and increase in BOD.	1b1. Physiological stress and lethal effects on benthic invertebrates and to a lesser extent, fin-fishes.	1b1a. Completion of activity in as short a time-frame as possible, especially in regards to bedrock areas.
	1c. Increase in temperatures brought about by the re-suspension of sediments with a ‘specific heat capacity’ capable of raising water temperatures by as much as 4 – 6°C.	1c1. Lethal and sub-lethal effects on sessile and slow-moving benthic invertebrates.	1c1a. Proper deployment and use of jetter to ensure that suspended sediments at sites are at the minimum and that any re-deposited sediments are not further disturbed.
2.0 Navigation and anchoring of vessel and barge, along with the plough.	2a. Navigational hazard.	2a1. Threat of injury and possibly death associated with boat traffic.	2a1a. Ensure that marker buoys and navigational lights are deployed and activated on barge, plough and vessel – Buoys are to be large and bright Navigational lights are to be fully operational from 6:00 p.m. to 6:00 a.m. on a daily basis.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
3.0 Deployment of SFOC	3a. Possible Navigational Hazard	3a1. Threat of injury and possibly death associated with boat traffic, and possible damage to boat engines or FOC	3a1a. Placement of lighted marker buoys every 2 km along entire area, and placement of relevant signage in areas close to shore.

6.3.2 Mitigation Measures in Relation to Domestic Effluent Impacts

The primary impacts associated with domestic effluents are: increased nutrients and fecal coliform in the water column as a result of inadvertent discharge, mismanagement, lack of environmental ethics, vessel holding tank malfunctions etc.

The situation of increased nutrients in the water column is generally referred to as eutrophication. This relates to the macro-nutrients, which are ‘phosphates’ and ‘nitrates’. These are generally derived from gray water effluents, as well as sewage effluents from the flushing of toilets. In general a major source of macro-nutrients in gray water effluents is from detergents. This is also not as relevant to the proposed project due to the fact that the time frame and the amount of people involved will be minimal.

Table 6.2: Summary of Impacts Associated with Human Wastes and Domestic Effluents

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Human Waste and Domestic Effluents	1a. Nutrient enrichment from the injection of macro-nutrients into the environment.	1a1. Stimulus to plant growth in the water column, in the case of the latter this includes phytoplankton, sea grass, and macro-algae including the possibility of the overgrowth of reefs by macro-algae.	1a1a. Ensure that the holding tank on board the vessel is in proper condition and that the bilge is not emptied to sea

6.3.3 Mitigation Measures in Relation to Solid Waste Management

The solid waste accruing from the general commissioning of the operation includes organic and inorganic components that cover all stages of the proposed project. The organic component includes in large part discarded and unconsumed food from the vessels galley followed by the ‘green’ waste produced as a result of the underbrush clearance processes. The inorganic waste includes wastes that are either classified as combustible and non combustible.

The installation activities will not produce much waste, with only minimal amounts of protective covering of the FOC and the reels on which the cable is wound. Additionally, during the construction of the manholes at both the exit point and landing point have the capacity to generate some PVC piping, masonry slabs and farm boards as waste.

The only impact of note would be in regards to the land-based ecosystems. These impacts relates to the fact that there is to be little or no discarded food lying around in a way that would be available to feral animals, given the regular collection, bagging, composting and disposal of this category of waste.

Table 6.3: Mitigation Measures in Relation to Solid Wastes

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Commissioning of the installation/trenching processes of the proposed project including the relevant amenities.	1a. Accumulation of solid waste that could impact the receiving environment. General discarding of cans, bottles and plastics in general from foods, general packing materials and other utilitarian inorganic functions.	1a1. Attraction of feral animals such as rats, crocodiles, and birds to the area to scavenge and in effect shift the ecological balance in a way not induced by nature.	1a1a. Separation of discard and refuse into organic and inorganic waste. Organic waste will be minimal, thus of not much importance, also noting the time frame of only 15 weeks. The inorganic waste will be compacted and ferried to nearest land fill/dump site.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
Con't			1a1b. The waste from construction will be separated accordingly and used as land fill where applicable.
		1b1. Habitat for mosquitoes and other insect pests, as well as aesthetic pollution from odor and unsightly accumulation of solid waste.	1b1a. Separation of waste as previously described.
		1b2. Entanglement and ingestion of plastics floating in the water column by sea turtles, birds and other fauna in the area.	1b2a. Judicious collection, confinement and disposal of solid wastes as described above.

6.3.4 Mitigation Measures in Relation to Energy Generation

The main impacts associated with the energy generation process are petroleum and noise pollution that will arise as a result of the installation phase of the project. This is especially true considering the only source of energy generation available to the project proponent – diesel generators, which are usually installed as a part of the engine block and used as the source of energy for the vessel and barge..

The petroleum pollution issue is of great importance considering the operation of the diesel engines of the vessel and the generators. This method of energy generation is also interlinked with the sourcing and transportation of the required fuel for its operation. In considering the custodial chain of petroleum management, the proponent will be required to implement mitigation measures in every phase of the fuel management program.

The noise pollution issue is of minor relevance than the petroleum pollution issue, in regard to energy generation. The scope of the proposed project and indeed the overall energy requirement of the initiative have resulted in a categorization of the ‘primary impacts’ as ‘moderate adverse’. This noise pollution is already addressed since it is located inside the engine room of the vessel to be used.. The mitigation measures for these are discussed in the following table.

Table 6.4: Mitigation Measures in relation to Energy Generation

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Operation of generators to generate electricity.	1a. Excessive noise pollution to immediate surrounding areas	1a1. Increase in ambient noise levels as a result of energy generation use	1a1a. Attenuate noise levels by enclosing generators with sound attenuation material and by the proper use of mufflers and other sound reduction devices designed to minimize the ambient impact.
	1b. Soil pollution due to hydrocarbon spills/leaks	1b1. Contamination of waterways and soil on direct contact	1b1a. Contain all fuel in double walled fuel tanks on board the vessel and if in drums, to be stored below deck.
			1b1b. Develop a contingency plan to address any spills and leaks that can occur both on land and at sea during transportation.
	1c. Air pollution due to generation process	1c1. Air pollution can impact on the ambient residential air, especially during prevalent winds.	1c1a. Develop and implement a preventative maintenance manual to address all concerns related to repair and operation of the equipments

6.3.5 Mitigation Measures In Relation To Socio-Economic Concerns

Projects of any kind can modify or enhance the economic viability of any given area. The social impact assessment in principle includes the processes of evaluating the intended and unintended consequences of the development, and identifying and articulating the mitigative measures that are to be put in place to circumvent and ameliorate the impacts (See Tables 6.5A and 6.5B).

Relevant in this regard are the issues of the disruption and erosion of economic activities in the area: The most pertinent being cargo vessel navigation, sport fishing and possible visitation decline of the nearby marine reserve. The decline in the productivity of fishing grounds has been dealt with in Table 6.6 below.

This project site will increase and enhance potential investment to San Pedro Town. In addition the area behind the island is used as a general sea-lane for general marine traffic as well as a general ‘sea lane’ for transporting tourists to and from Ambergris Caye. The navigational issues dealing with the relationship of these activities are outlined in following tables. In addition, the growing tourism industry has the need for both reliable and fast telecommunication services to cater to the industry’s demands.

Table 6.5A: Mitigations In Relation to Socio-Economic Concerns

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Activities Installation	1a. Temporary and minimal increase in amount of people moving into the area.	1a1. Increased demand on services in the area.	1a1a. installation will be planned and strictly scheduled such that only the absolute amounts of people necessary are in the area at any given time.
			1a1b. Boats that can are a part of the operation will house the staff and workers, thus no strain will be put on the present transportation infrastructure or service for the area.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Installation Activities Contd.			1a1e. Proper temporary sanitary and hygienic facilities will be provided on site.
	1b. Movement of materials and supplies and heavy equipment into the area.	1b1. Human health and safety issues.	1b1a. Navigation of boats to and from the caye observing and international and national sea lane rules and navigational protocol, and ensuring that equipment and supplies are securely stored and fastened during transportation.
			1b1b. Safe and secure mooring of boats when loading and offloading equipment and supplies.
			1b1c. Response to injury includes first aid kit on-site, and in severe case the deployment of boat to ferry injured party (ies) into Belize City.
			1b1d. Berthing of plough securely with adequate lighting at nights, and buoys and warning flags.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1. Installation Activities Cont'd.	1c. Employment of foreigners and persons not from immediate areas and Belize City.	1c1. Lack of economic opportunities to people in the overall region.	1c1a. Hiring people from immediate area including the districts and Belize City in circumstances where requisite skills and competencies are available at competitive costs.
	1d. Health and safety issues.	1d1. Disease coupled with accident and incidents	1d1a. Implementation of a health and safety plan to address these issues especially during the installation stage.
	1e. Increase in marine traffic.	1e1. Increase in number of boats coming to the project site.	1e1a. Ensure that the proper management of vessels coming to the site is managed and coordinated, by use of radio and other types of communication.
2. Resource use conflicts	2a. Potential loss of sport fishing grounds	2a1. Potential decline in recruitment sport fishers and tour guides to the area.	2a1a. Much of activities behind the island is away from the sport fishing grounds.
			3a1b. Activities to be completed within the shortest possible time to limit negative impacts in both space and time.
	3b. Potential disruption of tourist activities.	3b1. Relates mainly to boat traffic through area.	3b1a. Installation of buoys, beacons and other navigational aids to ward off marine traffic from the trenching activity

Table 6.5B: Possible mitigation measures for the other social related impacts

Potential Impact	Mitigation measure	Comments
1. Short term access to traditional fishers rights to the fishing grounds and sport fishers as tour guides.	Developer to negotiate with fishers for a win-win situation.	Conflict resolution techniques can be used.
2. Direct damage to the various habitats (shallow waters in the flats) that will result in damage to biodiversity that will negatively impact the livelihoods of fishers and tour guides.	Developer to do least disturbance to prevent damages.	Developer has capacity to do this. Conflict resolution can be used.

6.3.6 Other related Impacts

The proposed project will also have other impacts that can be attributed to a negative outcome if not addressed or correctly mitigated. These impacts can have a cumulative effect if not successfully mitigated and addressed by the proposed development.

These impacts include the need for proper safety and health practices, water usage related issues, concepts issues, marine traffic and environmental disturbance. The mitigative responses to these impacts include the implementation of several plans to ameliorate and circumvent the negative effects associated with the development. Such plans will focus on specific objectives of each impact and coordinate the mitigation measures accordingly.

Table 6.6: Mitigation Measures in Relation to Other Impacts

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
1.0 Water usage related issue	1a Loss of potable water (minimal)	1a1. Reduce water availability and loss of profitability	1a1a. Project not long term and not of the magnitude to warrant a plan
			1a1b. Develop a contingency plan for water shortage (s) and water contamination if so is the case.

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
2.0 Marine Traffic	2a.Increased number of users and marine vessels to the area	2a1. Impact on natural environment by increased boat usage.	2a1a. The movement of marine vessels to the area should be regulated.
		2b1. Safety for traditional users and other users.	2b1a. All watercraft activities be regulated and designated markers in places in special impact areas. Users will practice common courtesy at sea.
			2b1b. Safe and secure mooring of crafts and barges etc.
			2b1c. All watercraft activities will be monitored and regulated.
			2b1d.Hazardous areas and areas of specific importance will be demarcated.
			2b1e. Discussions with the Harbor Master and Belize Sugar Industries and by broadcasting and publishing notices.
3.0 Environmental Disturbances	3.a. Noise pollution from the operation of equipment and machinery.	3.a.1 Nuisance and disturbance to humans and wildlife from construction activities	3a1a. All equipment such as a power generator etc., be enclosed to minimize noise impacts.
			3a1b. Transportation of materials to and around the site should be carried out effectively

Development Activity	Primary Impacts or Environmental Disturbance	Secondary and Tertiary Level Environmental Impacts	Mitigation Measures
	3b. Airborne pollutants from proposed construction and operational activities	3b1. Same as above, incremental airborne pollutants to atmosphere.	3b1a. Operation of heavy machinery (trencher, excavator, back hoe) and equipment operated during daylight hours
4.0 The clearance of underbrush vegetation for project activities	4a: The displacement of flora and fauna in the area.	4a1: Birds that migrate will need to find another area to rest.	4a1a: not of a large magnitude to require measures.
	4b: The displacement of reptiles in the area, such as crocodiles and snakes	4b1: Removal of habitat	4b1b: Use existing corridor already in place by BEL transmission power lines and poles..
	4c: The displacement of Nursery areas for fish, lobsters and other marine life.	4c1: The removal of sea grass and siltation from settling of suspended sediment plume.	4c1c: Ensuring the protection of the 66 ft reserve, the corridor to be located in areas of low sea-grass density
	4d: The displacement of sport fish and food fish in the area	4d1: The loss of dividends to commercial and sport fishermen due to the degradation of habitats for the fish.	4d1d: Ensure that areas to be utilized are not listed as utilized areas by fishermen, and to conduct the operations during periods that are closed seasons, especially for lobster and conch.
5.0 Transportation (Land)	5a. Increase environmental impact due to movement of persons to and from the project site.	5a1. Health and safety concerns relating to congestion	5a1a: Limit number of 'vehicles' that enter the corridor area

6.4 Environmental Monitoring

Comprehensive or targeted monitoring can be used as an integral component of responsible life-cycle environmental management of major projects, plans or programs. Current EIA process

considerations are focused on the use of monitoring in conjunction with the implementation of mitigation measures. Additional valid purposes of environmental monitoring include, but are not limited to, establishing a baseline conditions, documenting and managing experienced impacts, evaluating the effectiveness of mitigating measures, and validating impact-prediction techniques (Canter, 1993).

6.4.1 Purpose of Environmental Monitoring

Numerous purposes (and implied benefits) can be delineated pre- and/or post-EIA environmental monitoring. For example, Marcus (1979) identified the following six general purposes or case of information gleaned from the conduction of post-EIA monitoring:

1. Environmental monitoring provides information that can be used for documentation of the impacts that result from a proposed action; this information enables more-accurate prediction of impacts associated with similar federal actions.
2. The monitoring system could warn agencies of unanticipated adverse impacts or sudden changes in impact trends.
3. The monitoring system could provide an immediate warning whenever a preselected impact indicator approaches a predetermined critical level.
4. Environmental monitoring provides information which could be used by agencies to control the timing, location, and level of impacts of a project. Control measures would involve preliminary of regulation and enforcement measures.
5. Environmental monitoring provides information which could be used for evaluating the effectiveness of implemented mitigation measures.
6. Environmental monitoring provides information which could be used to verify predicted impacts and thus validate impact prediction techniques. Based on these findings, the techniques for example, mathematical models could be modified or adjusted, as appropriate.

6.4.2 Principles of Environmental Monitoring

The principles underlying environmental monitoring as it relates to any given development is to observe for any changes over time that may be associated with the development. These changes would in principle vary over time in both magnitude and direction. In the case of the latter it is important to understand that changes in environmental parameters and functions may be positive or negative.

Thus in principle a monitoring plan does not necessarily focus on the perceived or anticipated negative changes precipitated by a given development, or indeed vice versa where the focus may be on the positive or beneficial changes only. The parameters chosen are those that have been identified in the analytical process as being affected in the most significant way by the development.

6.4.3 Specific Monitoring Plan

The proposed monitoring plan for the project will entail those parameters and ecosystem components that have been identified through the mitigation matrix and other mitigation factors. Additionally, the monitoring program will start weeks before the project starts so as to have baseline data, and carried out throughout the length of the project and weeks after the completion. This will ensure that the true picture of the water quality is gathered, and the potential impacts, if any, are properly dealt with expeditiously. These issues include:

- Water Quality monitoring (Marine and Effluent)
- Waste Management (Minimal)
- Soil contamination (spills)
- Biodiversity
- Environmental Health and Safety
- Engineering aspects
- Socio economic influence

6.4.3.1 Surface Water Quality Monitoring Program

As with so many of the EIA's, the marine component plays an important role in the overall scheme of the proposed development. With this in mind, it is critical to conserve the marine environment and its resources in order to promote a healthy and stable marine ecosystem around the proposed project.

Pollution from all the different sources can pose a serious threat to the marine ecosystem and therefore considering the negative impacts, the proposed project plans to incorporate a comprehensive water quality monitoring program. This program, which will further be developed by the proponent in conjunction with the consultants and DOE. This will form part of the EMP and also of the water resources management plan previously discussed in Section 3.2. In-Situ water analysis will be conducted on a daily basis for the following parameters using the recommended protocol required by the *Effluent Limitations Regulations* (this regulation recommends the use of the Standard Methods for the Analysis of Water and Wastewater):

a) *In situ Measurements*

- | | |
|--------------------|----------------|
| • Salinity | • Turbidity |
| • Temperature | • Ph |
| • Dissolved Oxygen | • Conductivity |

This information will be gathered on an hourly basis at predetermined locations. The format will be as per Fig. 6.1, and data recorded as per Table 6.8a.

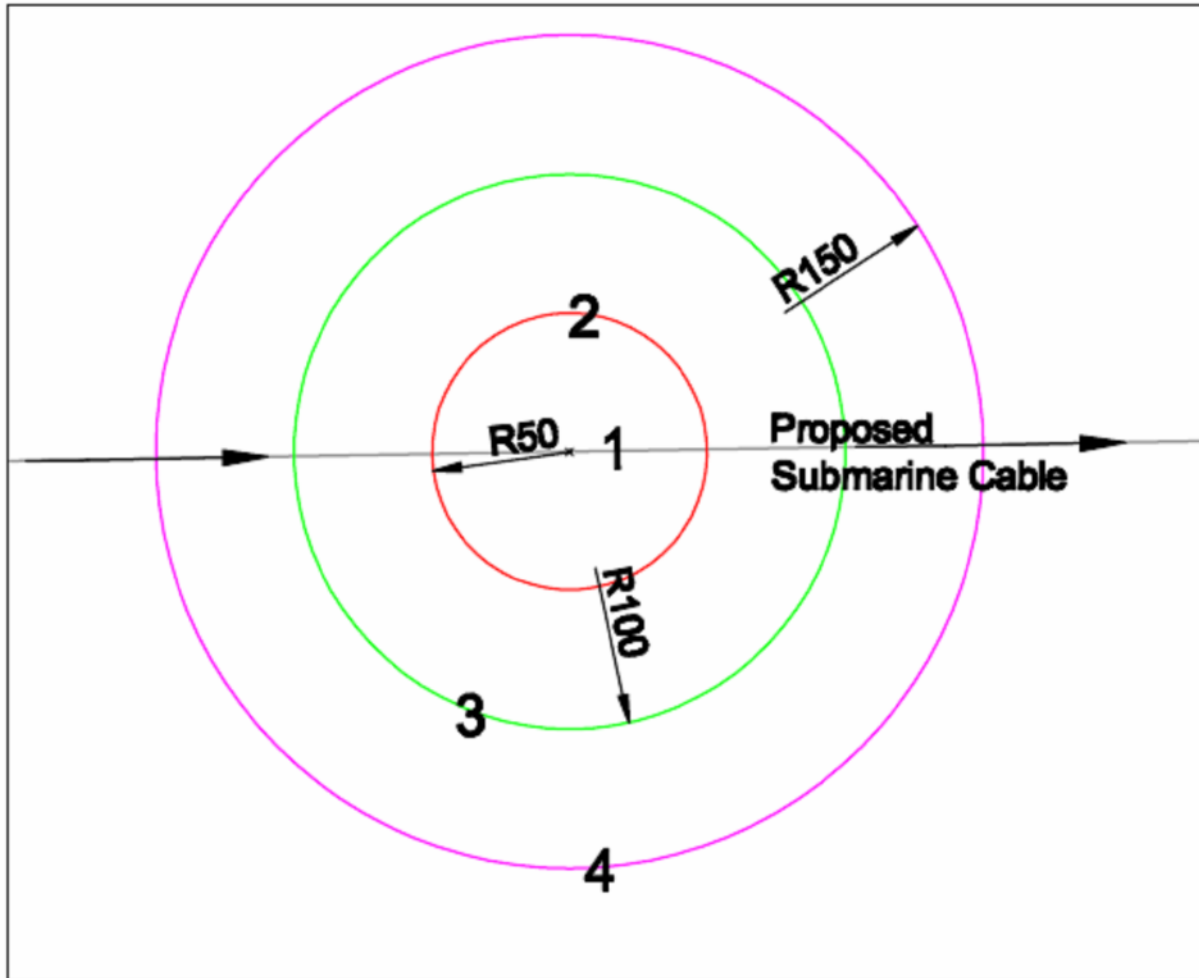
b) Weather conditions

- Maximum wind speed
- Wind direction from
- Daily rainfall
- Tidal information

This information will be also be gathered once a day, so that it coincides with the in-situ information, especially the tidal information as per Table 6.8b.

Table 6.7: Monitoring Plan for Surface Waters

Parameter	Frequency	Geographic Area	Priority	Agency Responsible
Temperature	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	DOE, CZMAI or HCMR
Salinity	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	DOE, CZMAI or HCMR
Turbidity	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	DOE, CZMAI or HCMR
pH	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	DOE, CZMAI or HCMR
Dissolved Oxygen	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	DOE /Fisheries, CZMAI or HCMR
	Daily	Incorporate previous monitoring sites along with project corridor areas	High Priority	Public Health



Insitu Water Sample Monitoring Limits

Fig. 6.1: In-Situ monitoring Schematic

Fig. 6.1 shows the methodology that will be employed to monitor the project activities using in-situ water sampling. There will be 4 readings taken for each determined site, one on the actual line, and the subsequent 3 readings will be at intervals of 50 meters. All readings will be down downstream from the project line.

In some extraordinary cases, such as behind San Pedro, or when approaching area close to Hol Chan, the sampling radius would be increased.

The above mentioned data gathering is important due to the fact that the weather information and sea state is key to the project activities. This information should be gathered on a daily basis, and it should be stated and noted that whenever the wind speeds are at 20 knots or more for extended periods, all operations should cease until further notice.

Additionally, in regards to the in-situ monitoring, daily monitoring should begin 2 (two) weeks prior to operations. This is to ensure that a daily baseline data for the project area has been taken so as to compare the data gathered during the operations.

6.4.3.2 Solid Waste Monitoring Plan

The proposed development plans to undertake a simple solid waste monitoring plan in order to address all the relevant issues that can arise from the collection, storage and disposal of garbage. Indicators will be developed to keep track of this activity and report any incident/accident to the local authorities, which will be minimal since the amount of waste that will be produced is minimal and short term. Such examples include inadvertent spillage during barging, flying or 'blowing' away of uncontained garbage etc.

Management Issues

Waste generated by most projects normally includes paper and cardboard items, glass and aluminum products, plastic items, organic waste, building materials, and used oils and fats. Hazardous wastes may include batteries, solvents, paints, antifouling agents, and some packaging wastes. Foreign residents, guests, and tourists typically may generate up to twice as much solid waste per capita as local residents, resulting in increased stress on local waste management infrastructure.

The following principles of waste reduction should also be considered as part of a formal Waste Management Plan:

- Use of refillable, bulk dispensers (e.g. toiletries) rather than individually packaged products; Working with suppliers to limit use of, and establish recycling for, product packaging;
- Limiting use of plastic bags;
- Providing appropriate receptacles;
- Use of glass or biodegradable items instead of disposable plastic items (e.g. straws, cups);
- Disposing of wastes only after all waste prevention and recycling strategies have been explored and maximized.

The proposed project will carefully evaluate its options and implement a waste minimization strategy to cope with the anticipated generated volume. Options however, are limited, especially considering the location of the vessels at the time and the quantity of waste produced.

6.4.3.3 Biodiversity Monitoring Program

The objectives of the monitoring programs are to minimize and reduce the environmental impacts on wildlife and their habitats, and to minimize detrimental effects on protected or endangered species.

A checklist will be prepared in order to ensure the monitoring of species. In the event of an important sightings e.g. manatees, or crocodiles, the checklist will be completed by the different observers who will be on board the support vessel to document and observe any sightings of important species. This will be done daily for the duration of the project during the trenching phase. For the overhead stage it will not be necessary since the cable will be installed on already existing poles that are located on a cleared corridor. In addition, the following will be conducted.

- A checklist will be developed in order to ensure data collection in terms of the abundance of local species. In the event of an important sighting e.g. manatees, crocodiles or other important species, the sighting will be recorded.
- Assist in any way possible by ensuring that animals if found within the trenching corridor are protected from injury.
- Establish communications with relevant Government Departments or NGOs in the event for the need for relocation of wildlife (e.g. crocodiles).
- Minimize effects on the receiving environment by minimizing the negative impacts that may hamper potential navigational interests.
- Confinement of the project activities to as small an area as possible.
- Establish monitoring program for biological communities for a period of three years. This should focus on features which are likely to reflect changes in environmental conditions.

Table 6.9: Proposed Biodiversity Monitoring Plan

Parameters	Frequency	Critical Levels	Area/Locale	Priority	Agency Responsible
Biodiversity					
Sea-grass biomass and density	Once a year for 2 yrs.	Sea-grass biomass and density to be observed over time for any discernible trend that may be associated with the proposed development.	Project corridor. Additional areas could include the adjacent 20 – 30 ft or area determined by the authorities.	Moderate Priority	Fish. Dept.

6.4.3.4 Social Monitoring

Due to the increase in the demand for reliable and fast telecommunication services in the country, this project will result in positive benefits for Ambergris Caye and to the country on a whole. It is expected that the upgrade will allow the tourism aspect on the island to reach its optimum level, by providing faster and more reliable service to the tourism sector in the form of faster downloads, easier access to websites and pages, real time streaming and a larger load capacity.

Table 6.10: Social Monitoring Issues

Parameter	Frequency	Critical Level	Geographic Area	Priority	Agency Responsible
Fisheries Landings	Quarterly	Assess to sport fishing and fisher catch	Tidal Flats and Laguna de Boca Ciega. Other areas west of the project site.	High Priority	Fish. Dept.
Services	Annually	Acceptable/non acceptable	Commercial and residential component	High Priority	BTB, BTIA

6.4.3.5 Other Monitoring Plans

The proposed project will also implement other monitoring plans as part of their EMP program. These plans will be further expanded as the project develops and gradually comes to light. The following tables summarize the proposed monitoring plan that will aid in both the yearly environmental audit and reporting scheme.

Table 6.11: Proposed Monitoring Plan

Parameter	Frequency	Critical Level	Geographic Area	Priority	Agency Responsible
Engineering Aspects					
Safety considerations in relation to navigational lights, marker buoy for the dredge.	Installation phase activities to be done on a daily basis.	All lights aboard the vessels, barge and plough as well as beacons marking the path of the SFOC must be functional, and all marker buoys must be deployed appropriately.	Associated with the barge, plough and SFOC.	High Priority	Port Authority

Parameter	Frequency	Critical Level	Geographic Area	Priority	Agency Responsible
Engineering Aspects					
Technical integrity of project activities.	Activity to be done on a daily basis.	Inspection of corridor and SFOC burial integrity.	Done along the entire path of the corridor.	High Priority	CZMAI, Fish. Dept.
		Inspection of shore-based installation of overhead FOC.	Done along corridor of transmission poles.	High Priority	DOE, CZMAI, Fish. Dept., Lands

Sediment Transport

Sedimentation of the waterways will always be an ongoing natural process that occurs in the environment. These natural processes however, can at times be accelerated by anthropogenic activities which most often require human intervention. The source for these accelerated progressions vary and are often associated with tourism related activity. The following table describes the Sediment Monitoring Program for the proposed project.

Table 6.12: Sediment Entrapment and Project Activities

Parameters	Frequency	Critical Levels	Area/Locale	Priority
Rate of sediment re-deposition in the mainland coastal areas	Semi-annually	When Stage 2 starts.	Survey bathymetric profile across corridor area	High Priority
Monitor Human Safety Especially in Relation to Marker Buoys and Navigational Lights (Loss/Malfunction)	Daily Basis	The vessel, barge and plough are to be adequately invested with marker buoys and navigational lights at all times	Entire equipment being used are to be marked by navigational buoys and lights	High Priority

6.4.4 Performance Indicators

In the general context of the monitoring plan, there must be established target goals and. The performance indicators are tools that the proposed project along with the developer will be required to utilize in order to mitigate and instill conservation measures previously discussed. Collectively these measures and actions can be beneficial towards sustainable development. On the whole, the performance indicators must be ultimately dictated by the critical levels of the aforementioned monitoring plan along with any other indicator that may be of importance.

6.5 Conclusion

The Council on Environmental Quality (CEQ) on the other hand provides that “Whenever a proposed project will result in potential significant adverse environmental impacts, measures must be taken which will limit or avoid that impact. These may include conditions of approval, revisions to the project, and, less frequently, approving an alternative project with fewer impacts. Where such measures are imposed, there must be a program for monitoring or reporting on the project’s compliance with those measures”.

The proposed project will have its degree of impact on the receiving environment, therefore based on these assumptions, the different monitoring programs plan to include as much activities that are related to the development and operation of the proposed subdivision. Once Environmental Clearance has been granted, the Environmental Compliance Plan will request a more formal and detailed monitoring program from the different activities.

Likewise, the mitigation plan presented in this document must also be included in the ECP. Furthermore the Department of the Environment, along with other interested parties, will be required to monitor the project site in all its stages and to ensure that the monitoring program and mitigation measures presented in the tables above are properly put in place and functioning as planned.