REPORT OF INVESTIGATION AND FINDINGS

IN THE CASE OF
SUBMERSIBLE FIBER OPTIC CABLE
BROWARD COUNTY, FLORIDA

ANTLANTICA – 1, SEGMENT 1 AND SEGMENT 2
AND BICS SEGMENT 1

Prepared for

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1.0 ACRONYMS

AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
FCC	Federal Communications Commission
FDEP	Florida Department of Environmental Protection
GMC	General Machine Corp., Washington, D.C. - Forensic Consultants & Experts
IEEE	Institute of Electrical and Electronic Engineers
NFPA	National Fire Protection Association (A commercial standards development activity accredited by ANSI)
NFPA 70	National Electric Code (NEC)[1]
RAI	Request for Additional Information

2.0 DEFINITIONS

Definitions are in accordance with the nomenclature and terms established by the Authorities Having Jurisdiction, the National Electric Code (NEC), the National Electric Safety Code (NESC), and IEEE STD 100[2] unless otherwise specified. Definitions appended with the initials "GMC" indicates a special purpose definition developed by the preparing activity.

Approved - Acceptable to the Authority Having Jurisdiction (AHJ).

Authority Having Jurisdiction - The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

Exhibits – Documents, photographs, drawings, sketches, and any form of information or data that is case specific, supplied as part of a forensic report package, and whose relevance or impact to the case are identified and/or discussed in detail in the body of the report. *GMC*

Photo Exhibits – A subset of "Exhibits" that communicates information through the use of images. *GMC*

References – Documents, photographs, drawings, sketches, and any form of information or data, generally available in the public domain, that are not case specific and which are used to formulate and support the opinions, findings or conclusions made in this report. *GMC*

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[1] The National Electrical Code (NEC), Reference 3.9, comprehensively addresses electrical safety regulations. The purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity. The NEC contains provisions considered necessary for safety and applies to the installation of electric conductors and equipment within or on public or private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards; carnival, parking, and other lots; and industrial substations. The NEC serves as the basis for electrical building codes across the United States.

[2] IEEE Dictionary of Electrical and Electronics Terms – 5th Edition 1992

3.0 LIST OF REFERENCES

The following references were consulted in preparing this document. Where regulations, codes, standards or law references are identified, the edition, revision, or version approved and/or affirmed and in effect at the time of the installation, is the form applied, unless otherwise specified. Sources for the commercial standard references are furnished in Appendix A. References denoted with an asterisk, " * " are selected references included herein.

ANSI Accredited Commercial Consensus Standards

3.1 American Society of Testing and Materials, ASTM E 620 - 1997, Standard Practice for Reporting Opinions of Technical Experts

3.2 American Society of Testing and Materials, ASTM E 678 - 1998, Standard Practice for Evaluation of Technical Data

3.3 American Society of Testing and Materials, ASTM E 1020 - 1996, Standard Practice for Reporting Incidents

3.4 American Society of Testing and Materials, ASTM E 1732 - 1996, Standard Terminology Relating to Forensic Science

3.5 American Society of Testing and Materials, ASTM E 1188-1995, Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator

3.6 Institute of Electrical and Electronic Engineers, National Electric Safety Code (NESC), C2-1977

3.7 Institute of Electrical and Electronic Engineers, IEEE Guide to the Factors to Be Considered in the Planning, Design, and Installation of Submarine Power and Communications Cables

3.8 International Electrotechnical Commission (IEC), Optical Fibre cables – Part 3: Sectional specification, Outdoor Cables 60794-3

3.9 National Fire Protection Association, NFPA 70 - National Electric Code (NEC), 1999

Private Guidelines, Recommendations, Standard Practices

3.10 International Cable Protection Committee publication, *Fishing and Submarine Cables Working Together*

4.0 LIST OF EXHIBITS

The findings and conclusions made in this document are primarily based on the exhibits identified herein:

4.1 GlobaLink – Marine to Shore Cable Installation – June 29, 2000 RAI Response

4.2 Environmental And Engineering Report for Atlantica–1 Telecommunications Cables Segment 1 and Segment 2, City of Boca Raton, Palm Beach County, Florida

4.3 RAI Atlantica–1 Telecommunications Cables Segment 1 and Segment 2, City of Boca Raton, Palm Beach County, Florida

4.4 BICS Segment1 – Florida Shore End Environmental and Engineering Report August 2000

5.0 GENERAL

5.1 This report has been prepared in accordance with the applicable standard practices identified in references 3.1 through 3.5.

5.2 This forensic investigation was conducted by General Machine Corp (GMC) of Fairfax Station, Virginia at the request of Public Employees for Environmental Responsibility (PEER) of Washington, D.C.

5.3 Reference and exhibit excerpts included in this report may have been condensed to save space. Such omitted language was determined to be extraneous to the report topic. However, review of the full text may assist understanding for the context and overall significance of the included language to the report topic at hand. Therefore, the user is encouraged to examine the referenced language in its entirety to ensure a complete and accurate understanding of the issues.

6.0 USE OF EXHIBITS, PHOTO-EXHIBITS, AND DRAWINGS

6.1 The Exhibits, Photo-Exhibits, and Drawings are part of this Forensic Report package and shall not be used separately. They are provided to assist trier-of-fact understanding of the critical factors, and to support the findings, opinions and conclusions rendered in this report.

7.0 AUTHORITIES HAVING JURISDICTION AND REGULATORY APPLICABILITY

The Federal Communications Commission (FCC) governs the cable utility. Other governing authorities include: the U.S. Army Corp. of Engineers, the U.S. Department of Commerce, the U.S. Department of Interior, the U.S. Department of Environmental Protection, while the cable installation across the Florida reef system is controlled by the State of Florida, Department of Environmental Protection (FDEP). There are no specific regulatory requirements addressing the installation of submersible cables; however, FDEP has permitting authority for the reef system and for utilities desiring to install equipment within areas of FDEP jurisdiction. FDEP's stated mission is:

> "to protect, conserve, and manage Florida's coastal and aquatic ecosystems through environmental education, resource management, scientific research, environmental monitoring, and partnerships."

8.0 PURPOSE AND SCOPE

The purpose of this report is to review and assess the installation details and installation methods for fiber optic communication cables submersed in navigable waters about the shore line area of Broward County and Palm Beach County, Florida, and which are used to provide the transfer of data and information for commercial, residential, industrial and critical infrastructure facilities, including infrastructure emergency support facilities, such as, fire rescue, hospitals, and law enforcement services. This report assesses and explains the risks to continuity and reliability of communication services, given the installation method of draping fiber optic cables atop of shallow water reefs in lieu of burial; determines the likelihood for damage to the fiber optic cables given the installation method; and determines the likelihood for consequent damage to the reefs during installation and in future cable maintenance efforts. The scope of this report is limited to the review of the cable installation from the shoreline to approximately 550 feet ocean ward.

9.0 BASIS FOR FINDINGS, OPINIONS AND CONCLUSIONS

The findings, opinions and conclusions furnished in this report are based on recommended practices governing installation methods and requirements applied to power and communications cables in similar applications. There is little in the way of commercial consensus or non-consensus standards specifically addressing the installation of submersible communications cables; however, certain relevant guidance and standard practices are evaluated and presented as applicable to the subject installation.

Where AHJ regulations are silent, electrical design, installation, operating and safety practices or procedures identified in American National Standards Institute (ANSI) accredited voluntary consensus or non-consensus commercial standards[3], practices, guidelines, or recommendations, and/or other accepted and reasonably available[4] industry standards, practices, guidelines, or recommendations, are used to establish safe, practical system criteria and sound workmanlike methods and practices consistent with the level-of-safety prescribed in regulation by the AHJ. Additional methods may be used to support findings, opinion, and conclusions, including, lab testing and other established means of analyses. Such means are identified where used. Such assessments contrast the conditions found to other affirmed or accepted standard practices or recommendations that could possibly fulfill the performance intention originally established by the AHJ. Other standards reviewed for reasonable application include non-traditional, or esoteric practices and standards, such as US DOD standards or foreign accredited standards sponsored by UN signatory countries. Such standards and practices shall be identified where used.

[3] Office of Management and Budget (OMB); OMB Circular A-119, *Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities*

[4] Title 1, Code of Federal Regulations - Volume 1, Chapter II, General Provisions, Office of the Federal Register, Part 51 (1 CFR §51)

10.0 BACKGROUND

10.1 General

Florida is the only state in the continental United States to have extensive shallow coral reef formations near its coasts. These reefs extend from near Stuart, on the Atlantic coast, to the Dry Tortugas, west of Key West, in the Gulf of Mexico. Substantial reef development occurs seaward of the Florida Keys. Approximately 6,000 coral reefs are found in the Dry Tortugas.[5]

The fiber optic communication cables are planned to cross the reef system at Boca Raton. Questions have been raised regarding potential threats to the reef system owing to the cable installation of the cables atop the reefs, instead of beneath the reefs by directional drilling. Additional future risks to the reef system are posed because of exposure of the cables to surface fishing equipment, anchors, nets, etc. The application subject involves non-repeated submarine fiber optic telecommunications cables linking islands of the Bahamas with the continental United States. This review assesses system cables running into and out of Boca Raton, Florida - comprising Segments 1 and 2 of the Atlantica-1 system, originating at Tuckerton, New Jersey, and Segment 1 of the Bahamas Internet Cable System (BICS), terminating at Grand Bahamas Island. The Boca Raton location serves as a junction to connect the Atlantica-1 system with the BICS cable system feeding the Bahamas chain. Three submersible cable systems access and egress through the Boca Raton reef habitat.

[5] http://www.dep.state.fl.us/

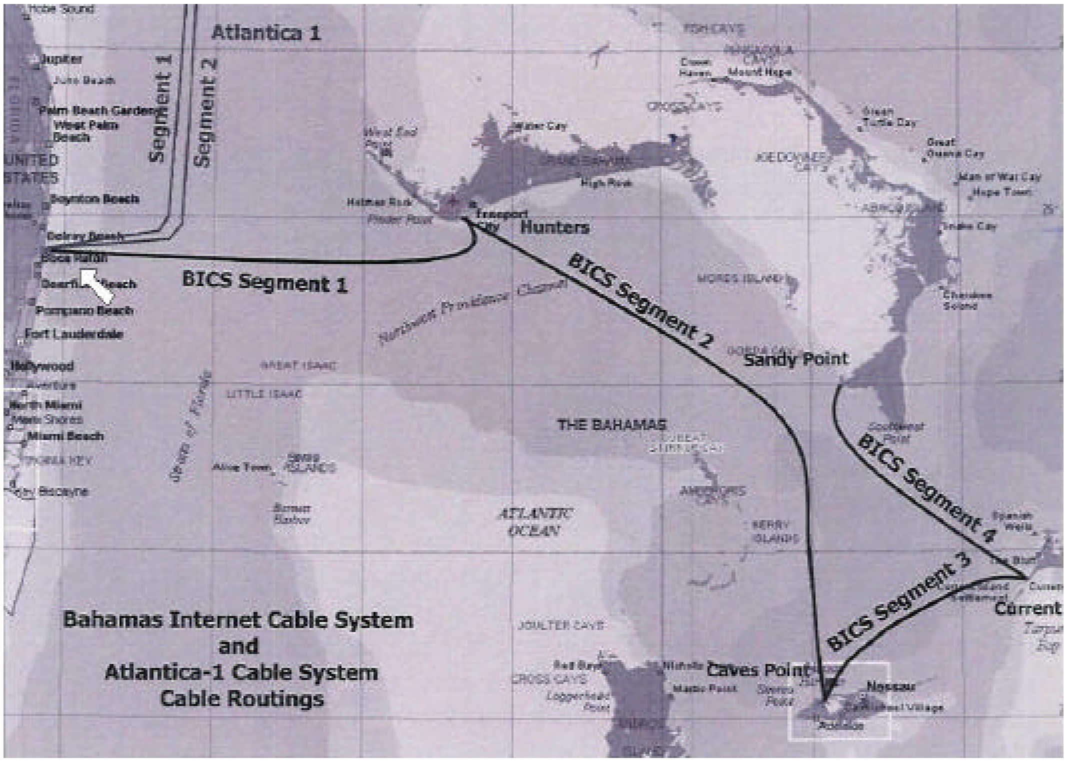

Figure No.1 - Telecommunication chain showing the two segments of the Atlantica-1 System joining with the BICS system and the downstream feeds to the Bahamas. White arrow delineates the scope of this report.

10.2 Installation

The installation plans to bore a tunnel from the land location to a distance about 275 feet from the shore station, and house the cables in a steel conduit. The cables breakout of the steel conduit at about 275 feet and simply laid on a relatively flat bottom. Figure No. 2 illustrates the route. From about 450 feet to about 530 feet, the cable crosses over the top of reefs as delineated in Figures numbers 3 and 4 until it reaches a gradually sloping and relatively flat sea bottom on its way to the ocean floor.

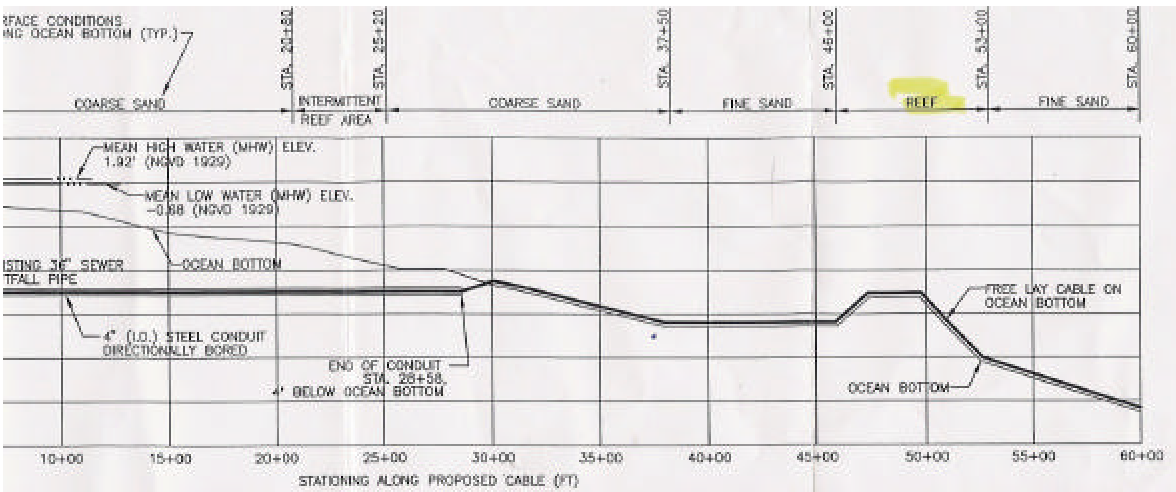

Figure No. 2 elevation of the fiber optic cable and relative position of the reef.

11.0 FACTORS

11.1 Fishing activities pose a risk to submersible cables

Fishing activities are the greatest threat to submersible cables. Fishing nets, anchors, and other equipment can snag and damage submersible cables. Damage to submersible cables frequently occurs during retrieval operations of fishing lines, when the snagged utility cable is raised along with the fishing line. Exposed fiber optic cables are at even greater risk than exposed power cables because it is not necessary to severe the line to cause damage. Merely bending the fiber optic cable beyond its rated bend radius can damage the delicate internal glass fibers. Additionally, the force exerted to raise a snagged cable may exceed the longitudinal pull rating of the cable – introducing another possible failure factor to snagged cables. The cable company states an awareness of the problems posed by fishing activities, while also recognizing that the cables are located in is an active fishing area. Although the cable company acknowledges these risks, they offer no means to mitigate such problems, and instead, appear to push the problem to the State, by recommending the State initiate and enforce an exclusion zone - a solution that would require State monetary resources. This solution is determined to be impractical as well as unnecessary.

Figure Nos. 3 and 4 illustrate the exposure submersed cables pose to fishing equipment - presenting a clear opportunity for snagging and collection of debris.

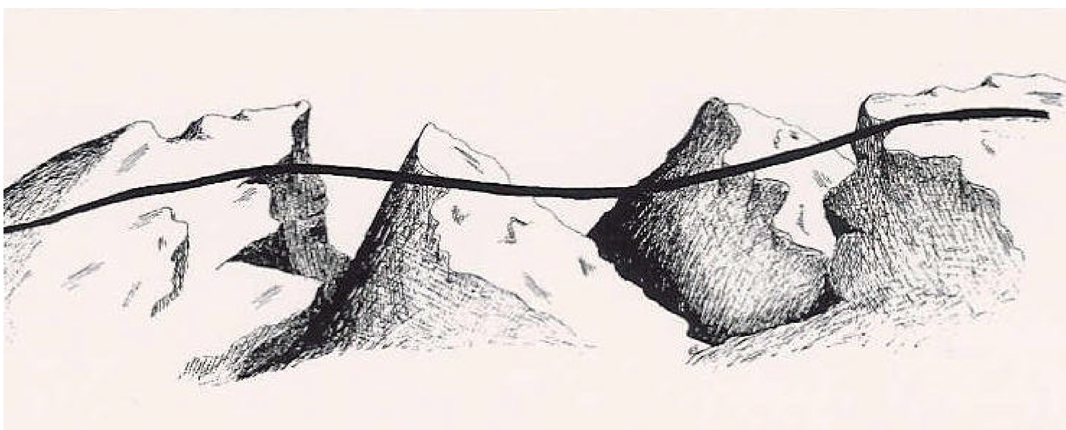

Figure No. 3 – Submersed cable laid over rocks presents the risk of snagging fishing lines, anchors, and other equipment.

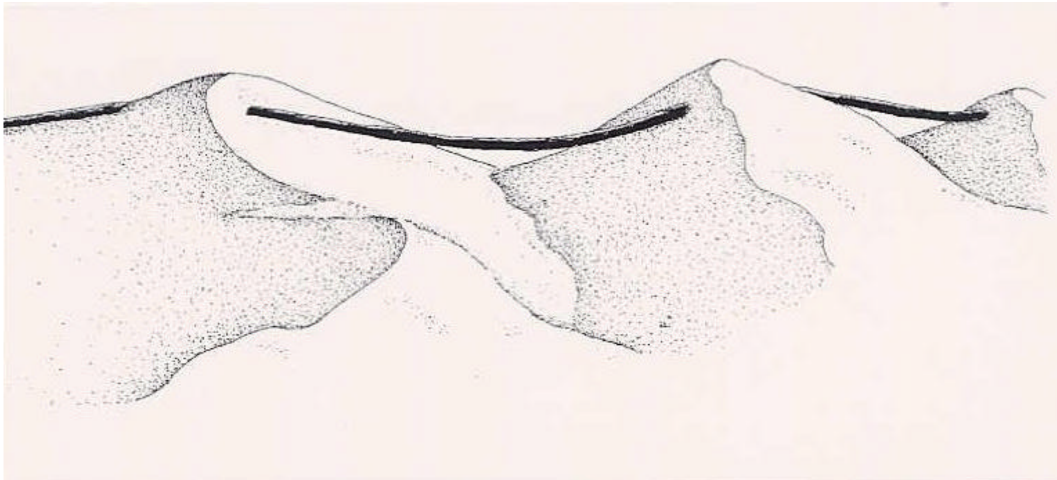

Figure No. 4 – Over sandy bottom, inadequately buried submersed cables also risk fishing equipment entanglement and collection of undesired drifting debris, such as sea weeds and garbage (e.g., plastic bags, discarded fishing line, etc.)

11.2 Fishing Activities cause more than sixty-six percent of all submarine cable faults

"Damage to cables causes big problems. More than two-thirds of all submarine cable faults are caused by fishing. When a vessel catches a cable, the results for the fisherman may include danger to the vessel and crew, lost gear, lost catch and lost fishing time. The fisherman may also be held liable for the cost of the repair and he may face criminal charges." Reference 3.9, Page 3, Par.1

11.3 Fiber Optic Cables are more susceptible to damage owed to snagging.

"One disadvantage of fibre optics is that glass is more fragile than copper. Any sharp bend will cause fibres to crack and signals to be lost. The minimum bend radius for fibre submarine cables is usually about 1 to 1.5 m (3 - 5 feet). A trawl door, beam trawl or dredge striking a fibre cable can easily render it useless without actually parting it." Reference 3.9, Page 5, Par.2

11.4 Acknowledgement of the fishing activities about the subject reef system is affirmed by the cable company

The cable company acknowledges the risk of damage to the fiber optic cable by fishing activities, and states in their proposal

"Normally, we observe fishing activities, but rarely divers in this area." Exhibit 4.2, page 18, par.1

11.5 The cable company further states the risks of damage to submersible cables by fishing activities

"All submarine cables are susceptible to failure from external sources, such as fishing activity and anchor maul. This risk can be reduced through careful planning and implementation of the cable." Exhibit 4.4, Page 21

However, the cable company does not offer or discuss any company initiatives to mitigate such risks.

11.6 Cable company proposal to push responsibility for protecting cable to the State

The cable companies hope to offset cable susceptibility to fishing danage by proposing that the Florida State Government establish and enforce a prohibited anchorage" zone Exhibit 4.4, Annex C, page C1

"The owner should make strong representations to the governments to have the cable route declared a prohibited anchorage."

-and-

"Hydrographic charts could be personalized to highlight the route and carry suitable warnings and be distributed with other promotional items"

As will be described later, such means are unwarranted, while serving to push the problem to the State. Such a solution appears unworkable as well as unacceptable, as it is unlikely that the State has the necessary resources to continually patrol the affected area and thwart fishing, or other recreational, or work activities that may jeopardize the cables.

11.7 Repair of cable is difficult, costly, and can incur further damage to the reef

Repair of damaged communication is a major effort, requiring specialized heavy equipment to operate about and above the reef area. Once the cable break is located - which in itself is a laborious and grand effort - both ends of the damaged cables must be raised, spliced, and re-laid. Further damage to the reef would be incurred by such operations. Additional reef damage can be caused by thrusters, anchrors, lines, weights, etc., necessary to keep the repair vessel on station while performing repairs.

"In addition, when a cable is damaged, the resulting break in communication causes great trouble and expense, with interrupted telephone calls and broken data transmission. Cable ships are kept on standby around the world to deal with these problems." Reference 3.9, Page 3, Par.2

- and -

"The repair of a submarine cable is difficult and costly. Shore side instruments, which monitor the condition of the cable, determine the location of the fault, or at least identify which repeaters, lie on each side of it. A cable ship is mobilised and sails to the site to find the cable, which may have been moved from its original location. A Remotely Operated Vehicle (ROV) which moves underwater near the seabed monitoring electrical currents may help find and retrieve the cable." Reference 3.9, Page 3, Par.3

- and -

"Once the fault is located, the cable is cut and lifted to the surface with a grapnel, just as fishermen use a grapnel to recover lost gear. When an end of the cable has been brought aboard, the damaged part is removed and a new section added with extra length to compensate for the water depth. After all sections have been spliced together, the cable is lowered to the seabed. Attempts may be made to lay the cable flat on the seabed and later bury it. However, the section, which was added to compensate for water depth, may remain on top of the seabed for some time. The cable's tendency to twist may cause loops to stand a few metres above the bottom. Until the cable can be buried with an ROV, it is especially vulnerable to further damage." Reference 3.9, Page 3, Par.4

- and -

"Even when damage occurs in shallow water close to a cable ship, the total cost of repair often exceeds US$ 1 million. In remote areas, it may take several days for a ship just to reach the site of the damage. Repairs are more difficult in deep water so some cable faults are much more costly. Aside from the expense of the repair, telecommunications companies must pay to restore the interrupted traffic on other facilities, which further adds to the cost of the repair."

11.8 The Ultimate Bearer of Cable Repair Costs are Governments, Businesses and Users

Although the cable companies perform cable repairs, the high costs associated with such repairs are the costs of doing business. In this regard, it is reasonable to expect that such costs would invariably be passed on to the governments and consumers. Additionally, the services provided by such communications lines are strategic utilities, as well as being vital to the economic and critical infrastructure of the United States and other linked countries. The primary means of linking countries separated by water is through subsea telecommunications lines. Additionally, subsea cable solutions also offer an attractive, cost-effective method to link adjacent land-locked terminations, such as in this case, New Jersey to Florida, via the Antlantica–1 Segments 1 and 2. Connecting terminations through subsea cables eliminates issues relating to digging, ice-damage, and many easement matters. Therefore, connecting terminals through high-density fiber optic cables via subsea cables provides many first-cost and life-cycle economic benefits, while also eliminating many of the technical concerns facing the crossing of cables over land.

"The number of cables laid on the seabed is increasing rapidly with the growth of telecommunications, and so is damage due to fishing activity. Submarine cables now carry more than two-thirds of all telecommunications that cross oceans. Each time a cable is damaged, calls are interrupted and data transfers are broken. The high cost of cable breaks must eventually be paid by the governments, businesses, and people who use cables." Reference 3.9, Page 1, Par.3

11.9 The Fiber Optic Cable is Serving Critical Functions

In testimony to Congress, the Director of the National Institute of Standards and Technology (NIST) identified the need to *"take aggressive remedial action to minimize future losses"* of critical infrastructure facilities and systems, and for the private sector to *"strengthen building codes and standards"* as a means of fulfilling internal security objectives[6]. Critical infrastructure systems as defined by the President's Critical Infrastructure Assessment Office (CIAO[7]) are systems *"whose incapacity or destruction would have a debilitating impact on the defense or economic security of the nation."* [8]

The CIAO identifies vital services as:

- Telecommunications
- Electric Power Systems
- Gas and Oil
- Banking and Finance
- Transportation

[6] Dr. Arden L. Bennet Jr. before the Committee on Science, House of Representatives United States Congress, March 6, 2002

[7] Created on May 1998 in response to Presidential Decision Directive No. 63

[8] Executive Order 13231 - Critical Infrastructure Protection, October 16, 2001

- Water Supply Systems
- Government Services and Emergency Systems
- Agriculture
- National Icons and Monuments

The CIAO listing of "Telecommunications" as the first item, illustrates the importance and strategic role telecommunications lines serve in the well-being of the United States. Such telecommunications cables serve many financial and banking institutions, emergency services, governments, airports, defense activities, and other important commerce functions.

Telecommunications cables exposed in such a way such as to faciliate wilful or accidental harm, does not appear to satisfy the performance objectives stated by the CIAO. In this particular case, where the telecommunications cables are physically exposed and easily accessible, they become potential targets for vandals, terrorists, as well as unnecessary and costly obstructions to well-meaning fishermen. Additionally, exposed submersed cables collecting undesired flotsam, such as fishing nets, rope, garbage, fishing hooks and other debris, pose a risk of injury to recreational divers who often frequent the reef landscape.

Another advantage recognized by the cable owners which fiber optic cable offers over alternative methods, such as satellite communications, is enhanced security of data and information. The owner states:

"Another detrimental factor concerning satellite transmissions is the ability of unauthorized parties to monitor data, creating a serious security problem in transmitting senstive communications for governments and businesses. A "land line", [sic] such as the Atlantica-1 Cable using the latest in fiber optic technology, is the only viable alternative to provide the combination of low installation and operation and maintenance costs, short construction time period, high transmission volume, and dependable, secure communications with high clarity that is necessary for voice and data transmission." Exhibit 4.2, Page 37, Par. 3 & 4

In their justification for using sub-sea fiber optic cables in lieu of other "lineless" methods, the owner identifies "security" of data for governments and businesses as a desirable advantage. This declaration correctly states an important and long-recognized advantage provided by fiber optic cables, while also establishing critical data transfer and other functions served.

11.10 Subsea Telecommunications Cables Do Not Fulfill Criteria as Emergency Backup Service

Exhibit 4.2 identifies the Antlantica-1 cables as a potential emergency backup service to provide continuity of services should another cable fail. However, the installation method exposes cables to fishing and other damage, potentially disrupting service, and removing the primary criterion of `reliability' for such services, because of a likely and foreseeable failure method – namely, damage owed to simple fishing activities.

"The construction of this cable system will add to the fiber optic cable diversity goals, providing additional routing alternatives in the event a trans-Atlantic telecommunications cable is out of service due to maintenance operations, accidental or intentional damage, or natural disaster." Exhibit 4.2, Page 1, Par. 1

The assertions made in this statement are flawed because standard electrical engineering practices for defining redundant or emergency backup system features require greater reliability of the alternative connection path rather than a network architecture applying many redundant but unreliable conduits. As recognized by the cable owner, "intentional damage" is possible and a genuine concern. Any plan to wilfully disrupt telecommunications to the terminations served by the cables could with primitive means, target and damage the Atlantica-1 and BICS segments. In this case, claims regarding enhanced reliabilty and continuity of services are problematic and misleading. The cables cannot be relied upon to fullfill emergency backup services, and because of an apparent and likely failure method, the cables serve to denigrate system reliability rather than enhance system reliability.

11.11 Commercial Consensus Standards Require All Cables Be Adequately Protected From Physical Harm

Two inductry sources confirm the need for fiber optic cables to be protected from physical harm.

"Submarine Crossing
Submarine crossing should be routed, installed, or both so they will be protected from erosion by tidal actions or currents. They should not be located where ships normally anchor." Reference 3.6, Page 176 § 320.B

-and-

"300.4 Protection against Physical Damage. Where subject to physical damage, conductors shall be adequately protected." Reference 3.9., Page 106, § 300.4

Inasmuch as the applications addressed by references 3.6 and 3.9 are often mapped to power distribution applications, such provisions are generally applied, understood and accepted industry-wide to be appropriate for all electrical and signal conductors, including fiber optic cables.

11.12 Cable Company Proposal Does Not Demonstrate Requisite Care in Avoiding Physical Obstacles That Can Harm Cables

Routing of the cables atop the coral reefs exposes them to possible damage. This is inconsistent with standard practices governing submersed cables. Extra care and alternative routings should be strongly considered to avoid problems owing to snagging of cables, and denigration of system reliability.

"Cable route planners try hard to avoid rocky areas where burial is not possible. If such places cannot be avoided, some modern ploughs can actually cut through rocky sediment to bury cables. In other rough areas where burial is not feasible, some cable sections remain exposed, spanning gaps between rocks." Reference 3.9, Page 10, Par.1

12.0 Findings and Recommendations

There does not appear to be any disagreement that the installation method to route the fiber optic cables atop the reef system incurs considerable of physical cable damage. Statements made by the cable owners and expressed in industry guidance confirm findings that cables are susceptible to damage by fishing and other surface operations where cables could be snagged. Such methods serve to not only denigrate reliability and incur unnecessary maitenance and repair cost, also but threaten coral reefs because of likely repeated mobilization of ships, barges, and other heavy machinery to raise, repair and then lower the cables. In such evolutions, the act of raising the cables would damage reef structures. Morover, the additional slack of the repaired cables would likely present "loops", contributing to future interferences, and the likely increased need for subsequent repair efforts.

Exposure to fishing equipment and the liklihood of "snags" would increase as time passes. As debris, such as fishing nets, fishing lines, etc. accumulate around the cable, the liklihood of an undesired incident would also be amplified.

Exposed cables also presents a risk to recreational divers who often frequent the reefs. Accumulated debris, such as fishing lines, hooks, and so forth, present increased chances for entanglement and other injuries to sport divers.

The installation presents an apparent and likely risk to reliability and continuity of telecommunication services, some of which are deemed critical. It is unclear why a telecommunication service would not take greater care to guard against cable interferences and damage, particularly in consideration of the high costs of maintenance and repair.

Risks to cable service and coral reefs could be easily reduced. Presently, the cable breaks out of the protected conduit at 275 feet from shore, traverses 150 feet oceanward until it reaches the reef structure at 450 feet, and then travereses 75 feet atop a jagged reef structure – exposed to fishing equipment, anchors, etc. It is plausible and apparently cost-effective for the cable companies to extend the underground boring oceanward and cross beneath the reef, avoiding future risks to both the reef and to cable service. Such efforts would also require boring vertically from the 50 foot depth to about 90 feet – an additional 40-feet in depth. This is well within the range and capabilities of typical boring equipment, and would incur little added costs.

It is recommended that the cable companies and FDEP seriously consider this alternative method of installation for the BICS and Antlantica-1, and AT&T cables.

APPENDIX A, SOURCES FOR COMMERCIAL STANDARDS

American Society for Testing & Materials (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428 – 2959
(610) 832 - 9585

Institute of Electrical and Electronic Engineers (IEEE)
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331
(732) 562-5591

National Fire Protection Association (NFPA)
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
(617) 770-3000