

Virgin Islands Water and Power Authority
STATEMENT OF WORK
St. Thomas and St. John Islands Submarine Cable Project
07/11/2018 – Revision 01

I. GENERAL

The Virgin Islands Water and Power Authority (VIWAPA) has identified the need to mitigate outages caused by inclement weather in the wake of the 2017 Hurricanes Irma and Maria. Included in the mitigation projects that VIWAPA has identified are two (2) distinct new 69 kV submarine cable installations for St. Thomas and St. John islands. The St. Thomas installation will comprise cable segments from Krum Bay to Havensight; from Havensight to Estate Bovoni; and from Estate Bovoni to Red Hook. The St. John installation will consist of a cable from Cruz Bay to Coral Bay. There is also an existing double circuit (2) 34 kV three-phase submarine cable circuit that connects St. Thomas Island to St. John Island from the landing points of Red Hook and Cruz Bay, respectively, which is planned to remain in service.

Leidos' proposed scope of services to support VIWAPA's outage mitigation projects is described in the following five phases:

- **Project Development Services:** Existing data and management plan. The plan for this first phase is to discuss the scope of services with VIWAPA, obtain missing documentation, and execute an agreed-upon management plan that works for VIWAPA and Leidos;
- **Studies:** Interconnection impact studies, the proposed 69 kV cable selection study, and analysis of the existing dual 34 kV cable inter-tie between St. Thomas and St. John;
- **Survey:** Specifications to support the collection of topographical, geotechnical, and bathymetric survey data that will be utilized in detailed design (Surveys will be by others.);
- **Detailed Engineering:** Design, calculations, drawings, and specifications to support the proposed construction of 69 kV submarine and terrestrial underground cable segments, vaults and trifurcating joints; and
- **Construction Monitoring Services:** Responses to contractors' Request for Information (RFIs), participation in construction meetings, periodic site visits during construction as required, and as-built documentation.

The project scope for the submarine cable design route is summarized further below. This summary mirrors what was provided by VIWAPA's environmental consultant, BIOImpact, in their 2016 Desktop Study. Table 1 summarizes the information and includes all forecasted alignment lengths known to date.

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Table 1
St. Thomas and St. John Approximate 69kV Cable Segments

Terminal	Latitude (N)	Longitude (W)	Ahead Segment (mi)
Krum Bay	18°19'57.02"	64°57'42.35"	5.5
Havensight	18°19'50.11"	64°55'26.95"	5.0
Bovoni	18°18'13.22"	64°52'39.28"	9.5
Red Hook	18°19'41.73"	64°50'50.37"	-
Cruz Bay	18°19'42.93"	64°47'54.38"	20
Coral Bay	18°20'48.48"	64°42'45.15"	-

Krum Bay to Red Hook Section

The Krum Bay to Red Hook submarine cable will start near the proposed Randolph Harley 69 kV substation near Krum Bay. Approximate coordinates are 18°19'57.02" N latitude and 64°57'42.35" W longitude. The cable will leave the Krum Bay substation to the south of the existing 34 kV Krum Bay to Water Island cable and come off the bank into the western side of the West Gregerie Channel. The cable will turn southward, avoiding the obstruction deeper in the channel. The cable will then turn easterly off the end of Water Island avoiding the pilot boarding areas and anchorage B. After crossing the entrance to Charlotte Amalie Harbor at more than 50 feet (ft), the cable will turn to the north, staying to the east of the channel, and continue up onto Rohde Bank to the east of the reef. Then, the cable will go to the east of Rupert Rock and approach the shoreline to the southeast of the cruise ship dock near Havensight. Leidos will delineate the anchored positions of vessels and work with the harbormaster during detailed design.

The approximate coordinates for the Havensight landing are 18°19'50.11" N latitude and 64°55'26.95" W longitude. The approximate length of this cable subsection is 5.5 miles. There are no active submarine cables within the pathway. There is a cable shown on the chart, but no active cables are shown on the more recent chart. The cable avoids all areas of reef, and primarily crosses sand, seagrass and a section of rubble/colonized pavement off Muhlenfels Point. Corals are relatively sparse in this area and should be easily avoided.

Both terminuses of this route section are over hard substrate, riprap and bedrock; therefore, cable burial is not a good option and articulated pipe should be utilized out to sand on both landings. Cables will need to be anchored to the substrate to prevent movement and damage to benthic organisms. In Krum Bay, the cable will require routing around the scattered coral.

From Havensight, the submarine cable will run on the sea floor south of St. Thomas Island to the east and run into another proposed terrestrial landing near Estate Bovoni. The

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approximate Estate Bovoni landing coordinates are 18°18'13.22" N latitude and 64°52'39.28" W longitude. The approximate length of this cable subsection is 5.0 miles.

VIWAPA intends to construct a power generating plant within Estate Bovoni to provide backup redundancy for St. Thomas and St. John. The proposed cable would run parallel to and east of the cable coming from Krum Bay out to the south along the eastern side of the Charlotte Amalie Harbor entrance channel. The cable would then continue to the south/southeast past United States Geological Survey (USGS) marker R "2" avoiding the pilot boarding area to the southwest. The cable would then turn more easterly and follow the Mangrove Lagoon sewage effluent pipeline into the shore in Estate Bovoni. The cable would parallel the riprap-covered line to the east into the shoreline, where it will cross a narrow area of riprap into the shoreline.

The cable will not cross any existing cables and is primarily in areas of sand, seagrass, and a section of rubble/colonized pavement off Muhlenfels Point. Corals are relatively sparse in this area and should be easily avoided.

Both terminuses of this route section are over hard substrate, riprap and bedrock; therefore, cable burial is not an option and articulated pipe should be utilized out to sand on both landings. Cables will need to be anchored to the substrate to prevent movement and damage to benthic organisms.

The cable will come out of the Estate Bovoni site on the eastern side of the Mangrove Lagoon sewage effluent pipeline and follow just to the east of the pipeline to the south to a depth of approximately 45 ft, where it turns to the southeast to avoid Packet Rock and its associated hard bottom and reef system. The cable turns due east at approximately 70 to 75 ft and tracks east around the south of Cow and Calf Rocks. Then, the cable turns to pass to the east of Current Rock between St. Thomas and Great St. James Islands. The cable goes around Cabrita Point at a depth of approximately 75 ft of water and then turns back to the west paralleling the VIWAPA Waterline into the Red Hook landing.

The route turns to the north prior to crossing the St. Thomas-St. Martin cable and the Magens Bay-Maiquetia (1966) cable. The route will cross the viNGN Great Bay-Christiansted fiber optic cable off of Great Bay. The route crosses several Innovative Telephone (formerly known as Vitelco) cables between St. Thomas and St. John; some of the cables are still active, and some are no longer in use. There are no good records of the location of all of the Innovative Telephone cables and some of the cables have been relocated and damaged by storms.

The route will also cross VIWAPA's Cabrita Power Cable and the Great Bay Power Cable, which both go between St. Thomas and St. John. The cable will also cross the VIWAPA Great Bay and Little St. James electrical cables. No other obstructions or issues are noted on most up-to-date charts on the National Oceanic and Atmospheric Administration (NOAA) Office of Coastal Survey Maps or on their latest obstruction list.

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The cable will pass through the Cas Cay and Mangrove Lagoon Marine Reserves and through the St. James Reserve. Leidos will work closely with VIWAPA's environmental consultant to mitigate noise and manage permitting issues and environmental constraints to determine if this is the most suitable route. The cables coming out of Great Bay and Red Hook all cross through these environmentally sensitive areas.

Both terminuses of this route section are over hard substrate, riprap and cobble; therefore, cable burial is not an option and articulated pipe should be utilized out to sand on both landings. Cables will need to be anchored to the substrate to prevent movement and damage to benthic organisms.

Approximate coordinates for the Red Hook landing are 18°19'41.73" N latitude and 64°50'50.37" W longitude. The existing 34 kV cable landings from St. John Island are located here at the proposed Red Hook 69 kV submarine cable landing. A 34 kV duct bank exists and runs to existing 34 kV East End Substation approximately 1.34 miles to the west. As part of this scope, Leidos will evaluate the feasibility of using this existing duct bank to pull the proposed 69 kV circuit into the existing East End Substation, which lies at coordinates 18°19'21.30" N latitude and 64°51'41.98" W longitude. Refer to Task 2.1 Power Flow Study, Task 4.5 Terrestrial Plan and Profile Drawings, and Task 4.9 Final Thermal Capacity calculations for more information.

The length of this cable subsection is approximately 9.5 miles. Thus, the total estimated cable length from Krum Bay to Red Hook is 20 miles.

Red Hook to Cruz Bay Section

Dual 34 kV submarine cables connect the East End Substation near Red Hook to the existing 34 kV Substation near Cruz Bay. Per VIWAPA's request, these cables will be analyzed for load flow. The preliminary power flow to be analyzed between St. Thomas and St. John will be 20 MW in both directions. If acceptable steady state and transient limits are not met, a retrofit of these cables with a single 69 kV submarine cable or another alternative will be proposed and engineered by Leidos as an Additional Service; this is not in the current Leidos scope of work. Retrofit design is not included in this proposal. Refer to Phase 2 for more details regarding the load flow analysis.

The 2016 Desktop Study did not address the sea floor conditions for the existing 34 kV cables connecting Red Hook and Cruz Bay. The available NOAA charts show the existing 34 kV cables and an additional cable running northwest to southeast through the Pillsbury Sound. If the Power Flow Study indicates that a 69 kV submarine cable is needed to replace the existing dual 34 kV submarine cables, then a proposed 69 kV submarine should parallel the existing 34 kV cables and cross the existing cable running NW to SE in the Pillsbury Sound. Maximum water depth is anticipated to be 104 ft.

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Cruz Bay to Coral Bay Section

The Cruz Bay to Coral Bay submarine cable will originate in the proposed 69 kV Substation near Cruz Bay and terminate in the proposed 69 kV substation near Coral Bay on the east end of St. John. Approximate coordinates for the Cruz Bay landing are 18°19'42.93" N latitude and 64°47'54.38" W longitude. Approximate coordinates for Coral Bay Substation are 18°20'48.48" N latitude and 64°42'45.15" W longitude. This section of submarine cable will run to the south side of St. John. There are many existing coral beds to the south of St. John. In order to mitigate permitting of the cable, it may be advantageous to route the line south of the corals, which would place it closer to the Insular Shelf. Thus, the approximate cable length for this segment may be 20 miles or more.

The 2016 Desktop Study by BIOImpact did not cover this potential route. The assertion of the existing corals south of St. John was provided by a local environmental consultant. Per NOAA Chart No. 25641, the cable route may be in water depths of up to 30 fathoms (180 ft) in order to navigate clear of existing corals. Per the chart, no existing cables will cross over the proposed path.

The approximate distances and power transfer capabilities discussed in this proposal and the demands for St. Thomas and St. John islands discussed in the *2011 R59-11 Interconnection Feasibility Study* by Siemens PTI are within the established power transfer capabilities of 3-core ("3/c") AC power submarine cable. Final validation of this assertion and selection of nominal voltage rating, cable size (kcmil or mm²) and insulation type will be determined as part of the Power Systems Analysis and Cable Selection Study portions of this scope.

II. SCOPE OF SERVICES TO BE PROVIDED BY LEIDOS

Phase 1 – Project Development Services

Task 1.1: Obtain Documentation

The Leidos project team will attend a kick-off teleconference with VIWAPA, during which time Leidos' scope of services, the data and documentation required from VIWAPA and others as applicable, and the overall project schedule will be reviewed and agreed upon. Protocols for communication between Leidos and VIWAPA will also be established.

Data needs identified during the kick-off meeting will be submitted in writing to VIWAPA. Leidos anticipates VIWAPA will provide data, information, and documents in a format that minimizes the amount of documentation synthesis required.

Deliverables

- Detailed data requests;
- Planning criteria provided by VIWAPA;

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- Project kickoff teleconference meeting;
- Submittal of proposed milestone deliverables; and
- Determination of VIWAPA review periods for adjustments and build out of the engineering schedule.

Task 1.2: Project Management Plan

Leidos' assigned Project Manager for the submarine project is Aaron Caldwell, P.E. He will be responsible for the overall execution of the scope of services as outlined in the proposal. Leidos utilizes the principles of the Project Management Institute. We believe that project management is more than simply tracking the schedule of a project; it is a method and system for organizing the many activities to finish the project on time and within budget, and structuring a project to prevent scope drift. These core activities are performed so that the completed project will accomplish the original objectives, while allowing us to best track and manage the design, cost, and construction of the project.

To successfully deliver the submarine project, Leidos requires a comprehensive understanding of VIWAPA's objectives, challenges, organization, and the awareness of how various project elements must be implemented in a coordinated fashion. Our contributions to and role on the project will be executed in a manner that verifies project priorities are understood and being supported. To accomplish this, detailed project initiation and planning efforts are required through a Project Management Plan. Initial planning will lay the groundwork for a successful project outcome and includes creating and verifying all processes to be used, and that scope, schedule, and budgets are defined and understood by the stakeholders.

Critical to the success of any large project is the ability to manage the activities of large teams and multiple independent production groups. Expectations for each entity must be clearly identified, each group needs to be given information and data inputs to allow them to perform their work, and oftentimes multiple work products need to be aggregated and consolidated to produce a final project deliverable. This requires clear definition of roles and responsibilities, collaboration, internal reviews, coordination with various third parties for data input and external reviews, and execution of aggressive proper quality control (QC) and peer review processes.

The success of each project revolves around five focus areas:

- Detailed up-front project planning;
- Hands-on management of the work effort;
- Demonstrated engineering expertise;
- Strong VIWAPA relations and communication; and

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- Sound financial and business principles managed with ethical conduct.

These focal points are driven and guided by our experienced project managers and lead engineers, who serve as the team leads for each VIWAPA engagement. It is the project manager's and lead engineer's primary task to guide and manage processes focused on ensuring the success of each project. The detailed up-front planning will serve as the first step and is handled through the Project Management Plan. The Project Management Plan will include Leidos's quality assurance process, which is also shared below.

Quality Assurance

Leidos has achieved successful project delivery through a rigorous quality assurance (QA) and Quality Control (QC) program that focuses highly on detail in each aspect of the project design. A QC team is established for the project and consists of independent technical experts that will perform formal reviews of deliverables and provide subject matter expert advice on project challenges as they arise. Our detailed review extends from point-to-point validation through cross-discipline coordination, an aspect important to this project that involves access road design, substation design, and transmission line design.

Leidos has a strong history of communicating to and resolving design issues with VIWAPA in a proactive manner. Our approach to resolving project issues is to employ sound engineering judgment and industry best practices. Throughout the design process, VIWAPA engineers and operations staff will be consulted for input where preferences or unusual circumstances may affect design decisions. Leidos' engineering staff will correspond with the points of contact designated by VIWAPA. Upon contract award and approval to proceed by VIWAPA, Leidos will prepare the engineering packages chronologically as defined by phases for VIWAPA's review. Review comments will be addressed and returned to VIWAPA with the next subsequent submittal for verification that comments have been adequately incorporated.

The Leidos' QC process was designed to ensure that performance measures are in place to monitor quality and performance throughout the project in order to meet the previously identified requirements. Our QC process focuses very heavily on up-front project planning, including developing a detailed project approach that shall be verified by the assigned Technical Lead.

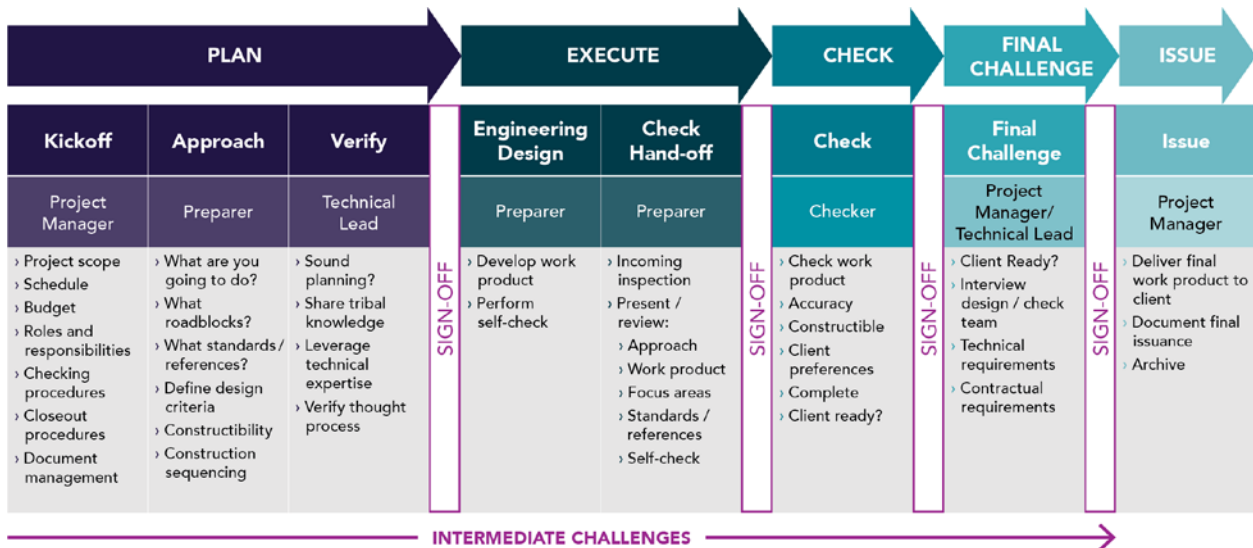
The general flow of the QC process is shown in Figures 1 and 2, followed by a detailed overview of each QC process.

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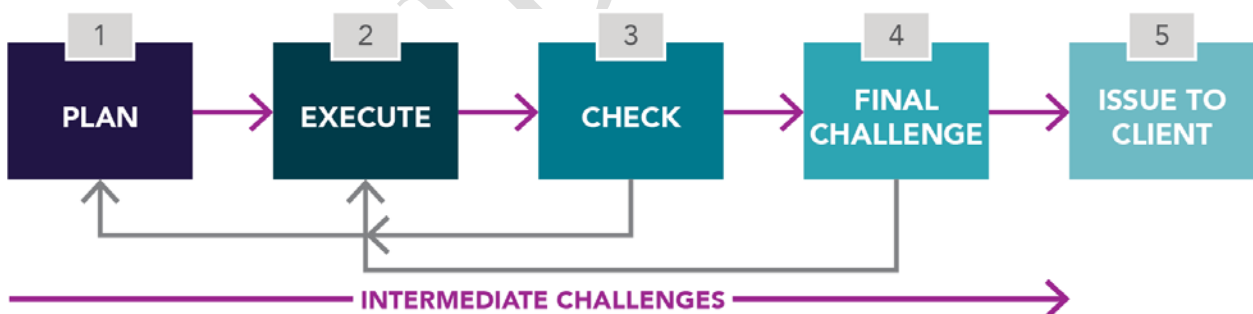
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Figure 1. Quality Control Process



At the initiation of each project, the project manager reads and understands the contractual requirements so that the project's scope and associated approaches, standards, lessons learned, and VIWAPA preferences are defined and that the project team is selected to meet the QC requirements of the project.

Figure 2. Project Lifecycle



- The preparer of the work package meets with the project manager and the technical lead to verify the scope of work package and discuss the conceptual **PLAN** for the project.
- The preparer then **EXECUTES** the work and performs self-checks prior to submitting the work product to a formal check phase.
- The individual identified to check the package performs a complete **CHECK** of every document that represents or incorporates work involved in the scope of work. The check process verifies that the results presented are accurate, reasonable, complete, and consistent with the stated requirements of the assignment as set forth in the Project Quality Plan.

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- Following the check, the project deliverable is **CHALLENGED** for accuracy, completeness, and adherence to scope by the challenge review team.

Quality assurance is performed to verify that all work is performed in accordance with the established QC requirements. Leidos conducts periodic independent audits to ensure that the established quality processes are being followed.

Deliverables

- Project Management Plan;
- Quality Management Plan.

Assumptions

After project award, VIWAPA and Leidos will determine which project team members will require licensure in the Virgin Islands. All Leidos' key personnel are registered Professional Engineers in the United States and have the ability to obtain Virgin Islands registration.

Phase 2 – Studies

Task 2.1: Power Flow Study

The Power Flow Study will utilize the power flow model (base case) in Siemens PTI's PSS/E format provided by VIWAPA. A 2020 or the best available power flow case will be used for the study. Leidos will update the base case to include the planned generation and transmission projects and recent system upgrades that are not present in the base case. The load level will also be adjusted based on the feedback from the VIWAPA planning staff. The updated base case will serve as a "benchmark" case for the study. Leidos will collect the typical modeling parameters for the proposed submarine cables from vendors and add them in the benchmark case to create a "study case." Additional cases may need to be derived to appropriately reflect realistic yet stressed system conditions with optimal combination of load and generation dispatch. Typically, planning studies include analysis under peak load system conditions to ensure that peak system load can be served in a reliable manner, taking into account appropriate generation level, reliability must-run units and reserve. In addition to the peak load, a light load scenario may also need to be simulated to uncover any voltage concerns. Leidos will work with VIWAPA to define the study scenarios in the study kick-off meeting; these include up to two generation dispatch conditions and one additional sensitivity study scenario.

The power flow analysis will be conducted using Siemens PTI's PSS/E and Power Gem's TARA software tools. Thermal loading and steady state voltage performance will be analyzed under single and multiple contingency events involving transmission elements and generation plants. Results will show transmission facilities that approach or exceed the equipment ratings under normal system and contingency conditions. Voltage analysis results will indicate if any substation or buses are outside the acceptable voltage range. The

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study case results will be compared with the benchmark case results to identify degradation in reliability caused by the new facilities, taking into account the VIWAPA planning criteria. Thermal loadings and steady state voltage results will be reported for the scenarios simulated under this analysis.

Deliverables

- Thermal loading and steady state voltage summary results; and
- PSS/E pre-project and post-project cases.

Key Assumptions

- VIWAPA technical staff will be available to support the project and requested feedback will be provided in a timely manner.
- VIWAPA will provide a solved base case in PSS/E format.
- If retrofit or redesign engineering is required for the 34 kV cable, a separate proposal for this work will be provided by Leidos. No detailed design engineering for this cable is included in this proposal.

Task 2.2: Dynamic Stability Analysis

Utilizing the PSS/E model(s) for dynamic stability analysis, Leidos will perform analyses of potential system events or contingencies of interest based on discussion and agreement between Leidos and VIWAPA. Leidos will create script files describing these events using the system protection model or generic information provided by the VIWAPA technical staff and analyze the system response to these events. Leidos will use industry-accepted generic wind and solar photovoltaic (PV) dynamic models to represent such resources on the VIWAPA system unless VIWAPA has vendor-specific detail models. Various system characteristics, including bus voltages, generator rotor angles, system frequency and other indicators of system stability, will be monitored during the simulations. These monitored characteristics will be plotted over the time frame of the power system equipment dynamic response (typically 10 to 20 seconds) and provided to VIWAPA, along with a summary of contingencies that resulted in specific system problems. The stability study will be performed on the study case and benchmark case to compare the system performance with and without the proposed submarine cables.

Additionally, Leidos will conduct a voltage stability study for a 20 MW transfer from St. Thomas Island (East end sub) to St. John Island (existing 34 kV STJ Sub). Key system buses will be monitored to review voltage performance. PV plots will be developed for this analysis and nose points will be identified for the voltage stability limits. Thermal limitations will also be identified because of this transfer. Leidos will develop solutions to the stability issues identified in the study.

Deliverables

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- Dynamic stability and voltage stability results;
- PV analysis plots;
- Dynamic system performance plots; and
- Study model.

Key Assumptions

- VIWAPA will provide an initialized system dynamic model in PSS/E format.
- Proposal includes one generation dispatch condition and one sensitivity scenario if needed.
- Stability study assumes simulations of up to 10 contingency events.

Task 2.3: Protection Review and Short Circuit Analysis

Leidos will model the proposed submarine cables in the short circuit model provided by VIWAPA. Change in the fault current at the cable termination points will be determined and reviewed against the existing breaker capabilities. Leidos will also develop a conceptual protection scheme for the proposed cables. Using the revised short circuit model and the conceptual scheme, we will develop preliminary recommendations for protective relay set points, evaluate primary and backup protection and coordination with surrounding protective elements. The study will include an evaluation and recommendations for Current Transformer ratios to be used in the protection scheme.

Deliverables

- Summary of short circuit results; and
- Preliminary recommendations for protective relay set points.

Key Assumptions

VIWAPA will provide a short circuit database for this task.

Task 2.4: Mitigation Development

If the study results show criteria violations, Leidos will work with VIWAPA to identify potential solution options to address the issues. If the system performance is limited by the existing 34 kV cable, one such solution option would be to replace the existing cable with new 69 kV cable. Other solutions could involve upgrading the existing infrastructure, revising protection settings, adding new dynamic reactive support equipment (e.g., static VAR compensator [SVC] or Statcom), upgrading existing relays and breakers to achieve faster clearing time, changing operating practices, and installing energy storage, etc. A planning-level cost estimate to implement such solutions will also be presented. We assume that AC submarine cables will be adequate for the proposed application given the distances involved between the proposed termination points. However, if the study results show a

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fatal flaw in the AC design, Leidos will provide a revised study scope and budget to complete the study as Additional Services utilizing DC cable design.

Deliverables

- Conceptual mitigation options; and
- Results with proposed mitigation applied, if applicable.

Task 2.5: Study Report

Results of Tasks 2.1 through 2.4 will be documented in a study report. The report will include study methodology, assumptions, and results along with explanation and solution options if applicable. Leidos will submit a draft report for VIWAPA to review. Leidos will be available to discuss the draft report on the phone if requested by VIWAPA. After receiving comments on the draft report, a final version will be issued to incorporate the feedback received on the draft version as appropriate.

Upon completion of the Cable Selection Study (see Task 2.6), we will review the cable modeling parameters used in Task 2.5 and compare them against the selected cable to check if the previously used modeling assumptions are still valid.

Deliverables

- Study Report.

Assumptions

If the modeling parameters change significantly, a sensitivity study will be performed to evaluate the impact of the change on the study results. It is assumed this is not required; therefore, a sensitivity study is not part of the Leidos scope of work.

Task 2.6: Cable Selection Study

Leidos will conduct a Cable Selection Study. The Power Systems Analysis Study (load flow) is a prerequisite to this calculation to verify the preferred AC voltage and determine a minimum conductor size. If the project schedule demands that the Cable Selection Study be started prior to the completion of the Power Systems Study, then reasonable assumptions may be made such as 69 kV AC, 3/c copper cable sized from 250 kcmil to 400 kcmil. Any re-work due to invalid assumptions would be at VIWAPA's risk and the additional work would be performed as Additional Services as described in Section III of this Statement of Work.

The study would include economic life cycle cost estimates of different cable types. Leidos will consider a combination of up to 20 cables varying in size (kcmil), type (copper or aluminum, compacted, oxidized), and insulation type (XLPE or EPR). Leidos would request inputs from VIWAPA that would include the utility's cost of money (interest rate) and the desired life expectancy for economic analysis. Other inputs that Leidos will determine will

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be full load current, load factor, I²R losses, dielectric losses, cable costs and installation costs. The results of the calculations will yield the life cycle costs of the different proposed submarine cable options and allow VIWAPA to make the best economical decision. The Leidos final report will provide a resulting recommendation.

Other content of the study will include discussion and recommendations for armoring, options such as single or double armoring, and optical fibers for communication. Leidos will take into consideration inputs from VIWAPA personnel, the 2016 Desktop Study by BIOImpact, Inc., existing NOAA nautical charts, and other data. Preliminary thermal capacity calculations would be included as part of this study

Deliverables

- Cable selection study report with recommendations.

Key Assumptions

- Interconnection System Impact Study to be complete as a prerequisite for this task.
- Due to the evaluation of 20 cables, it is assumed that iterations between the System Impact Study and cable selection will not be required.

Task 2.7: Permitting and Environmental Review

Environmental and permitting information is expected to be provided by BIOImpact, Inc., or by others, under contract to VIWAPA. Leidos will utilize the provided data to understand the sensitive areas of the project, which include biological, cultural, environmental, aviation, and critical crossings of existing facilities and utilities.

Leidos will review available Environmental Impact Studies, permitting, and other available documentation provided by VIWAPA that will serve as input for the existing alignment that was provided in the Desktop Study by BioImpact, Inc. Any known restrictions will be identified in the alignment segments and discussed with VIWAPA as part of the preliminary desktop alignment review as part of Task 2.8.

Leidos will support these tasks through a statement of need and can provide technical information, exhibits, facility descriptions, and recommendations for alignment adjustments.

The footprint of the submarine cable route is planned to traverse the inner shelf surrounding St. Thomas and St. John islands. The alignment is planned to inhabit the sea bottom with coral and other aquatic species. It is anticipated that in some areas the cable will self-bury, and in other areas the cable can be buried by underwater trenching machines; however, this depends on sea bottom conditions being amenable to excavation and the feasibility of the permitting agencies to approve sea floor trenching. In some areas, the cable may traverse coral beds and the Environmental Impact Services (EIS) team, determined by VIWAPA, will need to identify where these conflicts may occur. In either case, the survey will inform the permitting task and permitting will inform the routing. Leidos will work with the EIS team

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to avoid coral beds and other valuable undersea features with more accurate routing. Leidos will make every effort to avoid impacts to environmentally sensitive areas. However, if impacts are unavoidable, permitting and mitigation measures will be done by VIWAPA and their environmental consultant.

Deliverables

- Provide technical data and attend meetings upon request; and
- Generate inputs for desktop alignment review.

Key Assumptions

- Leidos understands BIOImpact is working on the permitting and environmental noted above. Therefore, it is assumed that Leidos will support the environmental effort through coordination with BIOImpact but will not be required to solicit bids for another environmental firm nor will Leidos be responsible for filing permits or environmental analysis.
- Due to the sensitive nature of the permitting phase of any project, Leidos assumes permits will be filed by BIOImpact, Inc. or VIWAPA. Therefore, Leidos budgeted 336 hours to support BIOImpact and VIWAPA through attending meetings, providing requested data and drawings, adjusting alignments, and general support for this task. Hours allotted for this task includes:
 - Review of ten (10) permit applications pertinent to engineering;
 - Review of the draft and final environmental impact studies;
 - Attending four (1) hour long meetings;
 - Revising the alignment on ten (10) plan view drawings; and
 - Providing up to ten (10) additional drawings.
- BIOImpact confirmed they have a bathymetric survey for their purposes but it will likely not be adequate for detailed design. Therefore, VIWAPA will not require the bathymetric survey for permitting or environmental reviews.
- Sensitive areas such as cultural, biological, environmental, or locally determined as significant will be identified at this stage for Leidos to implement into the existing alignment design given in the 2016 Desktop Study provided by BIOImpact.
- BIOImpact or VIWAPA will file permit applications to support the following tasks. Any requests for Additional Services by Leidos will be sent in writing for work exceeding the hours and tasks outlined above.
 - Establish contact with the following agencies to determine permitting requirements:
 - United States Department of Commerce (NOAA/National Marine Fisheries Services;
 - Environmental Protection Agency;

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- United States Department of the Interior (Fish and Wildlife Services;
- United States Coast Guard;
- United States Army Corps of Engineers, the lead agency in the process;
- Department of Natural and Environmental Resources;
- Division of Coastal Zone Management;
- Division of Environmental Protection;
- Division of Fish & Wildlife;
- State Historic Preservation Office;
- Division of Comprehensive Coastal Planning; and
- U. S. Virgin Islands Legislature.
- List of Permits that are based on responses from the above agencies.
- File known permits for the following:
 - Town and Country Planning;
 - The Planning Board; and
 - Conservation Fisheries.
- Cable route and landing permits for the following:
 - Coastal Zone Management Major Land and Water Permit; and
 - Water Quality Certificate.

Task 2.8 Route and Landing Site Selection Review

Evaluation of the preferred route provided in the 2016 Desktop Study that was prepared by BIOImpact will be the basis of the route and landing site selection review. Leidos will review the proposed route and begin the plan views for the route, terrestrial landings, and terrestrial alignments. At this stage, Leidos will review existing and publically available documentation to determine challenge areas and to determine whether the alignment provided can be utilized within the solicitation of surveying in Phase 3.

Deliverables

- Reviewed alignment plan views with callouts for any challenges determined.

Key Assumptions

- Sea floor depth will not be great enough to compromise the cable design recommendation and tension limits will be adequate for the floor depths anticipated.
- There are six proposed landing locations with contingency for up to two more alternate locations. If more landing locations and additional length of the submarine route are required for consideration, Leidos will support in Additional Services.
- Assuming the alignment provided in the 2016 Desktop Study is maintained and drawing scales of 1"=200' are utilized, then production of up to 88 sheets for the plan views are included.

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- Right of Way (ROW) determination and procurement will be handled by VIWAPA. Leidos will review the alignment proposed and discuss any proposed alterations with VIWAPA. VIWAPA will then determine if the change is acceptable and coordinate those changes with the VIWAPA real estate department. VIWAPA to provide Leidos with maps identifying any ROW issues during this design task so adjustments can be made.
- Data provided in the 2016 Desktop Study has since been modified, such as website links, and those can be easily obtained for the purposes of this exercise.
- Any data within the 2016 Desktop Study that is not legible and determined necessary, such as the maps, will be easily obtained in a legible format.
- This task is created to solely review existing information and begin drawings of VIWAPA's proposed alignment. If there are other alignment options outside of the 2016 Desktop Study, those will be submitted by VIWAPA to the Leidos' project manager in writing and covered as Additional Services to the desktop alignment review. These optional points include additional or modified substation or terminations locations, terrestrial landings, and diversions to the alignment.
 - Due to the existing reviews performed on these alignments, no major alterations to the alignments are anticipated.
 - Leidos assumes that one additional option or link will be requested as part of this exercise, resulting in two options for each alignment. In addition to the 88 plan and profile sheets, leidos will generate up to 10 additional sheets in locations determined to be of significant interest to VIWAPA. Most of the evaluations will be done through Google Earth™ until determined to be viable options. These 10 additional drawings are part of Task 2.7, not in addition to.
 - Leidos' scope will be limited to up to 48 miles of submarine cable routing. Approximately 40 total miles were identified in the 2016 Desktop Study; therefore, 48 miles provides 10 percent margin for differences in the ocean floor and the alignments.

Phase 3 – Survey Specifications

Task 3.1: Bathymetric Survey Specification

Leidos will work with VIWAPA and other stakeholders such as VIWAPA's environmental consultant of choice, BIOImpact, and utilize existing sea floor data to develop preliminary route options for the segments discussed in Section I. Leidos will obtain existing bathymetry survey information from BIOImpact or others to evaluate if the survey data are fit for the purpose of detailed engineering and construction of the submarine cable project. Based on preliminary conversations with BIOImpact, the existing survey does not appear to be suitable for engineering or construction. Therefore, Leidos shall prepare a more detailed

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bathymetric survey specification for the proposed preferred route, which may be used to obtain quotations for the bathymetric survey. The bathymetric survey shall be accomplished by others and is not included under this scope. Leidos will coordinate with VIWAPA's bathymetric surveyor. The coordinate system shall be UTM Zone 20 North.

Leidos will evaluate oceanographic mapping (survey) bids, provide recommendations, and work closely with the surveyor during the course of the project. Leidos' scope will be limited to the support of the bathymetric survey for the 40 miles of route identified in Section I and an additional 8 miles of bathymetric survey, if required. If it is necessary to obtain more than 48 miles of bathymetric survey, Leidos will support this effort as Additional Services.

Deliverables

- Bathymetric Survey Specification;
- Review proposals and provide recommendation; and
- Provide responses to two rounds of questioning during the bid process.

Key Assumptions

- VIWAPA will provide solicitation requirements and preferred companies.
- Review of no more than three companies that will bid on the work.
- Surveyor will coordinate with VIWAPA's environmental consultant to assure environmental requirements are fulfilled.
- Field safety requirements will be provided by VIWAPA.
- VIWAPA will determine the awarded firm and execute the contract for the awarded contractor at VIWAPA's discretion.
- Survey Specification will follow guidelines set forth in IEEE 1120.
- Leidos assumes a 300 ft wide corridor shall be sufficient. Survey specification will include instruction for multi beam sonar, side profiles, magnetometer sensors and gravity penetrometers.
- VIWAPA will manage the awarded firm through the execution of the specification and work. Further, VIWAPA will provide the output of that contract required for Leidos to perform the work.

Task 3.2: Topographical Survey Specification

A terrestrial survey is required in order to spot (locate) the vaults and the centerline route of the submarine cable after landfall as well as required runs of 3- 1/c 69 kV land cables. Leidos will include a survey specification as part of our scope. The topographical survey specification will stipulate boundaries of survey and will allow VIWAPA to solicit bids for the topographical surveying required to construct the project. If the existing 34 kV duct

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bank between the Red Hook 34 kV landing and the East End Substation are not suitable for the installation of the proposed 69 kV cables, then a new terrestrial route will need to be surveyed. Specifications will direct the surveyor to gather pertinent property plat information and tie into the survey. The coordinate system will be the same as utilized with the bathymetric survey.

CI/ASCE 38-02 will form a basis of the topographical survey specifications sub-grade investigation.

Leidos will use the survey during detailed engineering and work with the surveyor to stake the vault and terrestrial cable centerline locations by providing the surveyor with staking sheets.

Deliverables

- Topographical Survey Specification;
- Review proposals and provide recommendation; and
- Provide responses to two rounds of questioning during the bid process.

Key Assumptions

- Route and landing site review task to be complete as a prerequisite to this task.
- VIWAPA will provide solicitation requirements and preferred companies.
- Review of no more than three companies that will bid on the work.
- Surveyor will coordinate with VIWAPA's environmental consultant to assure environmental requirements are fulfilled.
- Field safety requirements will be provided by VIWAPA.
- VIWAPA will manage the awarded firm through the execution of the specification and work. Further, VIWAPA will provide the output of that contract required for Leidos to perform the detailed design work.

Task 3.3: Geotechnical Survey Specification

Leidos will prepare a geotechnical specification for the purpose of soliciting bids by VIWAPA for a geotechnical investigation. Geotechnical data will be required for the terrestrial routes of the submarine cable, the underground 1/c non armored segments, the vaults and the riser structures. Data such as soil type and density, water table level, soil electrical resistivity, and thermal resistivity values will be required for the engineering of the project.

Leidos will evaluate bids of geotechnical consultants and make a recommendation.

Deliverables

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- Geotechnical Specification;
- Review proposals and provide recommendation; and
- Provide responses to two rounds of questioning during the bid process.

Key Assumptions

- Route and landing site review task to be complete as a prerequisite to this task.
- VIWAPA will provide solicitation requirements and preferred companies.
- Surveyor will coordinate with VIWAPA's environmental consultant to assure environmental requirements are fulfilled.
- Field safety requirements will be provided by VIWAPA.
- Review of no more than three companies that will bid on the work.
- VIWAPA will manage the awarded firm through the execution of the specification and work. Further, VIWAPA will provide the output of that contract required for Leidos to perform the detailed design work.

Phase 4 – Detailed Design

Task 4.1: Cable Specification and Procurement

Leidos will provide a submarine cable material, installation and testing specification, which may be used to procure and install the submarine cable. Once the critical parameters of the cable such as size, conductor type, insulation type, nominal voltage and armoring are determined from the Power Systems Analysis Report and the Cable Selection Study, provided by Leidos, a submarine cable specification will be written. The 3/c cable (Leidos presumes 3/c core cable will ultimately be selected for the purpose of this scoping document as it will provide superior results for sheath voltage rise and electromagnetic field effects) will be trifurcated into three single conductor cables (1/c). The three 1/c cables will also be included in the cable specification.

Leidos believes that it is advantageous to procure the 3/c submarine cable and the 1/c underground cables from the same vendor.

The cable specification will provide the manufacturer with limits and boundaries for voltage; amperes; AC/DC resistance; longitudinal tension; transmission line constants such as zero, positive and negative sequence impedance; capacitive reactance; normal and emergency operating temperatures; sidewall pressure strength; maximum ocean depth; armor dimensions and details; sheath voltage limit/details; short circuit capability; and other important parameters.

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The specification will include a testing and acceptance section that will outline details for high potential testing, jacket integrity testing, discharge testing and impedance/capacitive reactance testing.

The specification for the submarine cable will include sections dedicated to the installation/laying of the cable. Parameters covered shall include the special cable laying vessels (or barges) and auxiliary submersibles, cable tensions during laying operations, positioning on the sea floor, sea floor trenching, installation of articulated pipe and anchors, marine life impact mitigation and shore landings. The specification will require the cable installer to calibrate, compile, and submit as an accurate construction record a GPS coordinate trail of the entire cable route.

Although it is desirable for the submarine cable runs to be complete with no submarine sections containing splices, Leidos will include language to adequately cover submarine splices in the event that they are necessary and unavoidable.

Deliverables

- Submarine Cable Technical Specification;
- Terrestrial Underground Cable Specification;
- Review proposals and provide recommendation;
- Provide responses to two rounds of questioning during the bid process;
- Review of up to two rounds of submittals from the cable manufacturer and provide comments. This does not include coordination for design inputs that will be carried out under detailed design. Leidos will, however, provide reviews based on the specification requirements.

Key Assumptions

- Power Flow Study, Dynamic Stability Analysis, Protection and Short Circuit Analysis and Mitigation Development will be complete as a prerequisite for this task.
- Cable Selection Study will be complete as a prerequisite for this task and the cable parameters determined by VIWAPA's requirements but also preferences and from the Cable Selection Study.
- Cable manufacturer will install/lay the cable with their vessel or barge or subcontract and be responsible for laying operations.
- Cable segments will be laid as one complete segment with no splices. If splices are required they will be installed by the manufacturer or included in their subcontracts.
- VIWAPA will provide solicitation requirements, including safety procedures, and preferred companies.
- Detailed review of no more than three short-listed companies that will bid on the work.

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- VIWAPA will manage the awarded firm through the execution of the specification and work. Further, VIWAPA will provide the output of that contract required for Leidos to perform the work.

Task 4.2: Cable Bonding

Leidos will prepare sheath voltage rise calculations, bonding diagrams, and drawings of on-shore bonding, and grounding and sheath voltage limiting details.

Deliverables

- Cable sheath voltage calculations;
- Cable Bonding Diagram; and
- Cable Submittals.

Key Assumptions

- Power Flow Study, Dynamic Stability Analysis, Protection and Short Circuit Analysis and Mitigation Development will be complete as a prerequisite for this task.
- Cable Selection Study will be complete as a prerequisite for this task.
- Three revisions of a single bonding diagram are assumed.
- The cable vendor will review, accept, and comply with the bonding diagram or provide comments to ensure an adequate design.

Task 4.3: Submarine Plan and Profiles

Utilizing the bathymetric survey provided by others, Leidos will develop sea floor plan and profile drawings of the preferred route. Profile drawings scope shall be limited to 40 miles of route plus 20 percent extra or a total of 48 miles. Drawings for additional submarine route length or changes to the preferred route are considered out of scope and shall be performed as Additional Services.

Submarine cable route and sea floor profile drawings will include the centerline route with inflection points coordinates in the Transverse Mercator (UTM) Zone 20 North system. Sea floor profile will include sea floor substrate type and obstructions including hard, denser soils such as bedrock, existing submarine cables and utilities, crevices, large rocks, coral reefs and ship wrecks. Leidos will consider options regarding coral reefs and environmentally restrictive areas and will cross over/through such as a last resort in order to allow for ease of environmental permitting. Environmental consulting will be by others and is not included as part of this scope. Leidos will work closely with VIWPA's Environmental consultant of choice.

Drawings will indicate when sections need to be trenched and include details of the trench. Drawings will also include locations for articulated pipe, anchors as well as cable/utility

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crossings and details of the crossing mitigation measures. Drawings will be in AutoCAD version 2016.

Deliverables

- Plan and Profile Drawings.

Key Assumptions

- Route and landing site selection review and bathymetric survey specification tasks above are prerequisites and all calculations are completed before initiating this phase.
- Submarine Plan and Profile drawings will be no greater than 40 miles or include more than 88 sheets. Up to 15 additional sheets have been accounted for to review potential changes to the alignment; however, most preliminary evaluations will be done through publically available programs until it is determined the alternate is a viable option.
- It is assumed that the alignment provided by VIWAPA will not cross tidal paths or create surf action that could damage the cable. Further, it is also assumed that a viable path for the cable along the rip-rap can be achieved with minimal impact. Designing mitigation measures to circumvent these challenges could be achieved but may be provided as Additional Service.
- Due to the unknown nature of sediment transfer and changing ocean current, beyond the inputs identified in the bathymetric survey, the change in ocean floor over time is considered outside Leidos control. This includes deeply buried cable impeding the recovery of cable segments or causing detriment to the ampacity, oceanic landslides that could damage the cable, and undermining of the cable causing increased tensions. Leidos recommends supplemental survey of the alignment after construction to monitor the sediment deposits and determine mitigation measures. These specifications and mitigation measures can be included as an Additional Service. This is an Additional Service because it may be included with the Environmental contract in place to monitor environmental impacts after installation that is typical for these projects.
- Rock outcroppings lying beneath the surface layer of the ocean floor are assumed to be discovered in the bathymetric survey for avoidance but in no case would cumulatively, with other alterations, alter the alignment more than 10% of the planned length.
- Soft soils are not anticipated on the ocean floor. If present, the design allows for cumulative alterations, along with other alterations, of the alignment up to 10% of the planned length. If sinking is anticipated, mitigation measures for this will be available at an Additional Service to prevent catenary action.
- Activities occurring on the ocean floor, such as anchoring, shell fish harvesting, and dredging will be adequately covered and conveyed to Leidos as avoidance areas in the

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bathymetric survey, permit documents received, and EIS. If present, the design allows for cumulative alterations, along with other alterations, of the alignment up to 10% of the planned length.

Task 4.4: Submarine Specifications, Calculations, and Drawings

Cable laying operations are covered under Task 4.1 Cable Specification. Many details for shoreline installation, sea bed excavation, and anchoring will be requested as part of proposals to furnish and install the cable. In addition to the Submarine Plan and Profiles Task (Task 4.3), other drawings will be required for construction. Anticipated additional drawings to be provided by Leidos are listed in the list of deliverables below.

Deliverables

- Trenching details drawings;
- Articulated pipe details;
- Anchor details;
- Submarine floor obstacle mitigation details; and
- Route monumentation and marking.

Assumptions

- VIWAPA to provide existing system phasing diagrams.
- VIWAPA to provide boiler plate front end specifications (in CSI Div 00).
- VIWAPA will provide solicitation requirements, including safety procedures, and preferred companies.

Task 4.5: Terrestrial Plan and Profile Drawings

Utilizing the topographical survey and subsurface investigation (by others) and geotechnical investigation (by others), Leidos will design the underground terrestrial transmission line from the Red Hook landing to the East End Substation (assumed to be 1.34 miles). Also included in our scope are the cable runs from the shore landing trifurcating vaults to the proposed GIS Substation buildings. Refer to the Cable Vaults Task (Task 4.7) for more information related to the vaults.

For scoping purposes, Leidos assumes that the trifurcating vault locations will be within 500 yards of the GIS building with the exception of the aforementioned Red Hook to East End Substation cable run. Additional design of terrestrial underground transmission duct banks and associated tasks can be provided as an additional service (not part of the current Leidos scope).

For the Red Hook to East End Substation underground transmission segment, there is an existing 34 kV underground duct bank running between these two terminus points. Leidos

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will evaluate the feasibility of utilizing this duct bank to pull in the proposed underground transmission line, including condition assessment, conduit fill, pulling calculations, and thermal calculations. As part of our scope of work, we will evaluate the existing 34 kV duct bank; the design of any new duct and/or conduit required to tie into this existing duct bank will be considered an Additional Service. This landing is assumed to be less than 500 total yards. Leidos will prepare drawings and specifications for work to tie/merge into the duct bank.

If it is determined that the existing 34 kV duct bank is not suitable to pull the new cables, then Leidos will provide services to engineer and design the approximate 1.34-mile route as an Additional Service (not part of current scope).

Refer to Task 4.2 Cable Bonding for discussion of sheath voltage rise calculations and Task 4.7 Cable Vaults for information regarding cable transitions and phasing.

Deliverables

- Plan and profile drawings;
- Duct bank cross section drawings;
- Miscellaneous detail drawings;
- Preliminary terrestrial cable thermal capacity calculations (if required refer to 2.6 and 4.9); and
- Cable pulling calculations.

Key Assumptions

- Existing 34 kV duct bank is suitable for new underground transmission cables.
- With the exception of the Red Hook landing that has an anticipated 1.34-mile underground segment, the cable landings will all be within 500 yards of terminations or have adequate space for a vault where splicing would occur.

Task 4.6: Terrestrial Landing Locations and Drawings

Leidos will provide drawings as part of this task to support the cable installation for terrestrial landings. It is presumed that articulated pipes will be required for the terrestrial landings. Articulated pipe will be installed over the cable off shore prior to the cable route making landfall. Cable and pipe will be installed in trench and buried as it makes landfall. Consideration will be given to the length of articulated pipe and trenching based upon survey and environmental conditions. On land, the submarine cable will possibly be routed into splice vaults. Refer to Cable Vaults task for more information

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Deliverables

- Terrestrial landing Plans and Profiles; and
- Terrestrial landing detail drawings.

Key Assumptions

- Most if not all landings will be through hard substrate, rip rap and bedrock with the assumption of cable laying on these surfaces. The assumption is based on Leidos' understanding of historical permitting and will likely propose use of articulated pipe over these areas to protect not only the environment but also the cable. Based on the results of future permitting discussions, Leidos will also be prepared to discuss;
- Directional drilling, horizontal drilling, or temporary relocation through and of rip-rap or other strata would be evaluated by a local geotechnical firm that understands local practices, soil types, and procedures.
- With the exception of the Red Hook landing that has an anticipated 1.34-mile underground segment, the cable landings will all be within 500 yards of terminations or have adequate space for a vault where splicing to a terrestrial cable would occur.
- It is assumed that each termination will also be within 500yds of a suitable beach slope for adequate landing of the cable.

Task 4.7: Cable Vault Details and Drawings

Included in this scope is the design of terrestrial vaults for the landings. It is anticipated that a 3/c power cable will be specified for the project. Inside the vaults the 3/c submarine cable will be trifurcated (split into three) with the use of a trifurcating joint and spliced/split into three 1/c non-armored underground cables. Leidos design scope will include vault placement, geotechnical assessment, vault design, cable racking, phasing diagrams, sheath bonding, grounding details and signage.

Leidos' scope will include design and drawings to route the three 1/c non-armored cables through a duct bank and into new GIS Substation building(s), by others (Leidos' scope ends here). It will be the responsibility of the GIS substation engineer and/or contractor to design and specify the GIS cable termination enclosure and to complete the cable installation from the last vault to the cable terminations. If the site of the GIS Substation is well defined, Leidos can plan to situate the last vault in an advantageous location and coil the land cable with sufficient slack to be able to easily install the the cable run to the terminations.

If the GIS substation building is located within 200 yards of the cable landfall, it may be feasible and more cost effective to bring the 3/c submarine on land, buried in articulated pipe all the way into the GIS substation. Leidos will evaluate the feasibility and provide

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VIWAPA with a recommendation. For purposes of scoping and our engineering, we are assuming trifurcation vaults will be required at all terrestrial landings.

Per the 2016 Desktop Study, the project is located in a seismic zone. Leidos will utilize USGS data to derive accelerations in the earth to determine impacts on vaults and take mitigation of the accelerations into account for the design. In addition, we will address fault lines with the project team and, if the submarine or land cable crosses any such lines, we will work to design a means to bridge the fault line with enough slack so as not to be damaged for a specified movement. At this time, it is unknown if we will cross any such fault lines; therefore, we will perform this work as an additional service to VIWAPA.

Note: For underground profiling and duct bank cross sections, refer to the Terrestrial Plan and Profile Drawings section.

Deliverables

- Vault Butterfly Drawings;
- Vault Isometric Drawings;
- Vault Racking Drawings;
- Vault Grounding Drawings;
- Vault Signage Drawings; and
- Vault Earthworks details.

Key Assumptions

- With the exception of the Red Hook landing that has an anticipated 1.34-mile underground segment, the cable landings will all be within 500 yards of terminations or have adequate space for a vault where splicing would occur.
- VIWAPA will provide solicitation requirements, including safety procedures and preferred companies. This would apply to either prefabricated or vaults cast in place.
- Leidos will attempt to design the best feasible ground grid using the native soil electrical resistivity and tools such as ground rods, counterpoise and chemical measures to achieve this goal. Any chemical measures, if considered, would need to adhere to environmental codes. Leidos cannot guarantee optimal ground grid resistances are achieved; however, Leidos will work within best engineering practices to achieve this goal.

Task 4.8: Terrestrial Specifications, Calculations and Drawings

Included in this scope is the creation of a terrestrial underground construction specification. This specification will cover summary of work, concrete mix design, concrete form work, steel reinforcement, conduits, conduit spacers, trenching and excavation, backfill, vault materials and manufacture, grounding, testing, safety, temporary facilities, environmental

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controls, clearing, pavement repair, traffic control, clean-up and submittals. Leidos will also prepare a phasing diagram for the complete project.

Deliverables

- Terrestrial underground construction specification; and
- Phasing diagram.

Key Assumptions

- VIWAPA to provide existing system phasing diagrams.
- VIWAPA to provide boiler plate front end specifications (in CSI Div 00).
- VIWAPA will provide solicitation requirements, including safety procedures, and preferred companies.

Task 4.9: Final Submarine and Terrestrial Thermal Capacity Calculations

Preliminary calculations are to be performed under Task 2.6 Cable Selection Study.

Per Task 4.5, an additional preliminary calculation for the terrestrial underground run from Red Hook landing to the East End Substation shall be accomplished if it is concluded that the existing 34 kV duct bank is not fit for the pulling of the new cable.

After Phase 2, Phase 3, and Phase 4 and Tasks 4.1 through 4.8 are complete, Leidos will prepare a final thermal capacity calculation in a report format for all of the submarine and underground segments.

The Neher-McGrath methodology will be employed. The calculations and report will tabulate summer normal, summer emergency, winter normal, and winter emergency ratings.

Deliverables

- Final submarine and terrestrial thermal capacity report.

Key Assumptions

- Phase 2 completed as a prerequisite for this task.
- Phase 3 completed as a prerequisite for this task.
- Tasks 4.1 through 4.8 completed as a prerequisite for this task.
- Awarded cable manufacturer to provide all submittals per Task 4.1.

Task 4.10 - Calculation of Transmission Line Constants

Leidos will stipulate the cable power transfer requirements to selected cable manufacturers for determining the cable line constants. The power transfer requirements will include maximum steady state MVA, contingency MVA specifications, and limits for voltage

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regulation, no load voltage rise and temperature rise. Line constants will be a function of insulation type and dimensions, shielding and armoring metallic sheaths, and other cable and core construction specifics. Generally, cable manufacturers can provide this information in preliminary form suitable for system studies early in the project. Later, more refined constants will be available.

Deliverables

- Final unit cable constants (R, L, and C) and total impedances in symmetrical components.

Key Assumptions

- Design MVA values are final both for steady state and contingency scenarios.

Task 4.11 – Issued for Construction Package (IFC)

It should be noted that much of the submarine cable construction scope of the project will be covered in the Cable Specification (Task 4.1). For the remaining balance of work not covered by Task 4.1, Leidos will issue an IFC package covering items such as the Terrestrial underground scope and cable landings scope not covered in the Cable Specification.

The IFC package will consist of all the deliverables listed in Tasks 4.2 to 4.8, as well as permits, cable manufacturer submittals, miscellaneous vendor submittals such as vault manufacturer, the final cable thermal capacity report from Task 4.9; and, for reference, the final topographical survey, bathymetric survey and geotechnical report. Leidos' scope includes a meeting with VIWAPA to review the complete IFC package in detail.

Deliverables

- IFC package;
- Construction Specification (Terrestrial only); and
- One meeting to discuss VIWAPA's requirements for a solicitation specification supporting the work.

Key Assumptions

- Leidos will review proposals and provide a recommendation for up to three bidders.
- VIWAPA will solicit the awarded contractor at sole discretion.
- VIWAPA will provide solicitation requirements, including safety procedures, and preferred companies. This is also assumed to be provided at an early stage of detailed design and incorporated into the design for the terrestrial technical specifications.
- At IFC, Leidos assumes this task will be comprised of compiling existing designs with little to no additional drawings, calculations, or designs required.

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Phase 5 – Construction Monitoring Services

Following construction contractor selection and contracting, Leidos will review design drawings, equipment specification and data sheets, and other documents prepared by the contractor. Leidos will confirm that the design is consistent with the technical requirements of the project, the intended purpose of the project, and the overall contract requirements.

Task 5.1: Attend Construction Monitoring Kick-Off Meeting

One Leidos representative will participate in a construction monitoring kick-off meeting at the project site with the project participants to explain the purpose and scope of the owners engineering services and to establish working arrangements; communications; documentation requirements; and reporting, certification, and payment procedures.

Deliverables

- Meeting attendance and meeting minutes.

Key Assumptions

- The meeting is assumed to occur with VIWAPA shortly after construction award.
- VIWAPA is to determine agenda and whom will attend.

Task 5.2: Construction Support

Leidos will attend monthly project review meetings at the project site during the construction period and on a weekly basis via teleconference throughout the execution phase to assess progress in engineering, procurement and construction activities and to review VIWAPA's, contractor's, or construction manager's presentation of items such as areas of concern, change orders, and recovery schedules. The task includes the following:

Deliverables

- Provide RFI responses as provided by the contractor;
- Conduct monthly on-site visits to the project site while in construction for observation of the work in progress to determine if the project is proceeding in general accordance with the contractual design concepts and the project schedule;
- Update engineering schedule to include any outstanding deliverables or RFI's;
- Review change orders as applicable; and
- Review the status of delivery commitments associated with the major procurement contracts for conformity with the project schedule. Major procurement contracts are those contracts for major equipment and/or long lead time equipment, which are critical to the completion of the project.

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Key Assumptions

- Review of the contractor's schedule is assumed to occur once a month.
- Contractor to revise and maintain the construction schedule.
- It is anticipated that Leidos will support 40 RFI responses and spend 500 hours supporting these efforts.
- The updated engineering schedule will be provided to cover any outstanding deliverables that were not required as part of the IFC submittal. Leidos will revise this schedule to best accommodate the construction schedule provided by the contractor. These coordinated efforts are expected to take no more than 40 hours and account for four updated engineering schedules.
- Construction is assumed to take nine months and planned nine visits for one engineer to visit on a monthly basis.
- Up to three Leidos' personnel will attend the weekly hour-long meetings via teleconference for a total of 39 meetings.
- Minutes and coordination of the meeting will be supplied by the construction contractor.
- It is anticipated that Leidos will review up to six change orders and spend 120 hours supporting that effort.
- Contractor change orders will be received by VIWAPA. VIWAPA will then call on Leidos for technical support and make recommendations based on our engineering opinion. VIWAPA will take that recommendation under consideration and make the final determination and notification to the contractor.

Task 5.3: Reviews and Punch Lists

Leidos will maintain detailed involvement with the project through site visits and continued engagement to review the performance and progress through the project.

Deliverables

- Review a selected sample of the proposed work and QA/QC plans;
- Periodically review selected QC reports and field laboratory test reports;
- Review the punch list and check its status as necessary;
- Consult with VIWAPA, contractor, or construction manager in advance of scheduled major inspections, tests or the start of important work phases; and
- Substantial completion activities, including , including the review of turnover package information (i.e., construction QA/QC documents, as-built drawings, punch list, etc.); and final completion -

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- Leidos will monitor commissioning activities and development of punch lists and review turnover packages as such packages are accepted by VIWAPA from the contractors;
- Leidos will confirm successful completion of performance testing. Leidos will review the substantial completion notice and punch lists provided by the contractor and confirm that the conditions for substantial completion have been met;
- Following achievement of substantial completion, Leidos will monitor successful completion of punch list items by telephone; review the contractor's final completion notice; make one final visit to the project site (if necessary) to verify that all punch list items have been completed; and then confirm to VIWAPA that the requirements for final completion have been met.

Key Assumptions

- Comments on contractor submittals for general QA items or material reports, such as lift plans, concrete performance, and ground test reports, will be provided to VIWAPA with the intention of recommended practice. There will be no direction provided by Leidos to the contractor.
 - Leidos anticipates review of up to 10 QA/QC or compliance reports from the contractor and will provide recommendations to VIWAPA. This effort is anticipated to take 250 engineering hours.
 - Leidos will review up to 10 material reports and provide recommendations to VIWAPA. It is anticipated that these reviews will total 40 engineering hours.
- During the week of energization, one Leidos senior electrical engineer is planned to be on site during that event.
- Hazardous material reviews are not part of this scope but can be supported through additional services.
- Due to multiple vendors and contractors, Leidos anticipates significant logistical effort to compile a running punch list. This is not a schedule, but tracked progress for a living punch list that can be addressed once construction nears completion. This type of support is assumed for Leidos to assess substantial completion and estimated to require 120 hours to support.

Task 5.4: As-built Documentation

Leidos will receive construction modifications (red lines) from the contractor and account for all RFIs that resulted in changes during construction. With these inputs, Leidos will update the necessary as-built documentation for VIWAPA.

Deliverables

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- At a minimum, Leidos will as-built the following drawings and re-submit to VIWAPA:
 - Plan and Profile Drawings;
 - Vault Drawings;
 - Bonding Diagram; and
 - Duct bank detail drawings and transitions.
- As-built documents for other known revised calculations or drawings.

Key Assumptions

- Contractor will provide VIWAPA all design changes made during construction and VIWAPA will send to Leidos within 30 days of construction completion.
- Leidos assumes that 88 plan and profiles, two vault drawings, one bonding diagram, two duct bank detail drawings, and two transition drawings will require updating. This effort is assumed to take 450 hours to complete the title block revisions, compile changes, adjust for minor changes from the contractor's red lines.
- An additional 50 hours are included for anticipated updates from the contractor's red lines not covered in the RFI process.

III. ADDITIONAL SERVICES

At the written direction of VIWAPA, and to the extent not provided for in this agreement, Leidos will perform additional studies and analyses not specifically set forth herein. Such services will be in addition to those specified in Section II of this Statement of Work and will be compensated for separately on the same basis of payment specified in the agreement. If, and to the extent that there are delays in providing data or material adjustments to the schedule, financial information provided by VIWAPA, and to policies of VIWAPA, or errors or omissions in the records provided by VIWAPA, as determined by Leidos and with the concurrence of VIWAPA, additional services provided by Leidos as a result thereof shall be considered additional services under this Section III. Such services will be in addition to those specified in Section II of this Statement of Work and will be compensated for separately on the same basis of payment specified in the agreement.

IV. DESIGNATED KEY PERSONNEL

Another important element for the successful execution of the project is having highly qualified and available technical and project management staff engaged. The identified key personnel for this project are listed in Table 2:

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Table 2
Key Project Personnel

Name	Company	Title
Clinton Hedrington	VIWAPA	Chief Operating Officer, Electric System
Niel Vanterpool	VIWAPA	Transmission and Distribution Director
Ashley Bryan	VIWAPA	Transmission and Distribution Project Manager
Selvin Dottin	Leidos	Account Manager
Aaron Caldwell	Leidos	Project Manager
Bill Battle	Leidos	Principal Transmission Line Engineer
Paul Dorvel	Leidos	Principal Transmission Line Engineer
Diwakar Tewari	Leidos	Principle Transmission Planning Analysis Consultant
Humberto Branco	Leidos	Senior Transmission Planning Analysis Consultant
Amy Dempsey	BIOImpact	President

V. Basis for the Scope of Work

Leidos provides the following as a summary for the customer furnished items and key technical assumptions that serve as a necessary basis for the estimate provided in the business proposal.

Customer Furnished Items

- This proposal is submitted to VIWAPA for the St. Thomas and St. John Islands Submarine Cable project in good faith, with the assumption that Leidos will perform services in accordance with the attached descriptions and technical specifications at the proposed good faith estimate and other terms and conditions to be mutually negotiated in a separate professional services agreement (Contract) between both parties, and subject to the stipulation that such an agreement be reached within a reasonable period of time, which shall in no event exceed 60 days after award.
- FEMA payment requirements;
- Hiring and management services supporting all companies involved in the data recovery and construction will be handled by VIWAPA. These services will support the bathymetric surveyor, the geotechnical surveyor, the topographical surveyor, the

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submarine cable manufacturer and installer, the terrestrial cable manufacturer, the vault manufacturer (if pre-fabricated), and the contractor providing the terrestrial installation and procurement supporting that installation;

- Furnished reports, including material specs, material testing, field reports, field analysis, recovery data, and technical documentation will be provided by VIWAPA;
- All Permits and Environmental survey reports;
- ROW maps identifying problem properties along the proposed alignment;
- Reviews of deliverables within 10 business days.

Key Technical Assumptions

- Leidos assumes that the data provided through VIWAPA furnished surveys will support the design as described above (e.g. planned for 40 miles and budgeted for variations up to 48miles). Significant variations in the survey data are not anticipated and if they occur, those variations can be supported through Additional Services.