

PROPOSAL TO

Mr. Brice Gordon

For

**25,000 GPD CONTAINERIZED SEAWATER  
REVERSE OSMOSIS SYSTEM**

**Great St. James Island**  
UNITED STATES VIRGIN ISLANDS

30 JUNE 2018  
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## Table of Contents

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<b>OVERVIEW</b>	<b>3</b>
<b>PERFORMANCE PARAMETERS</b>	<b>5</b>
<b>PROPOSED PROCESS DESCRIPTION</b>	<b>7</b>
<b>COMMERCIAL TERMS</b>	<b>23</b>
<b>ACCEPTANCE OF PROPOSAL</b>	<b>25</b>
<b>TERMS AND CONDITIONS</b>	<b>26</b>

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## OVERVIEW

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Gemini Seawater Systems LLC (GSS) is pleased to present this proposal for the design, fabrication, installation and commissioning of a 25,000 gallon per day (GPD) seawater reverse osmosis desalination plant for The Saint James Group to supply water for Great St. James, USVI. This system will be supplied in a modified 20-foot-long shipping container. It is our understanding that this plant will provide water for the island until a subsurface pipeline is installed from Little St. James Island at which time the system could be decommissioned and sold or could remain on the island to serve as a standby water supply.

The overall treatment process will consist of seawater pumping from the existing intake, media filtration, cartridge filtration, the addition of a trace quantity of a scale inhibitor, membrane separation, and post treatment consisting of upflow calcium carbonate for the addition of an alkalinity and hardness followed by chlorination. Disposal of the membrane concentrate and media filter backwash, will be via the existing outfall.

The desalination system will consist of a single skid mounted unit rated to produce 25,000 US GPD within a 24-hour day. It will consist of two pressure vessels, each designed to hold up to three Toray TM820M-400 spiral wound elements. The system will be designed to incorporate an automatic flushing feature that reduces the chance of scale formation or equipment corrosion during periods of shutdown.

The proposed membrane feed pump is a Danfoss APP8.2 positive displacement axial piston pump constructed from 2205/2507 duplex stainless steel. Operating in parallel with the membrane feed pump will be a single ERI energy recovery device. This design provides the lowest possible energy usage and the greatest degree of flexibility, while maintaining a residual pressure on the membrane concentrate to eliminate the need for re-pumping for disposal.

All low-pressure piping systems will be constructed using schedule 80 PVC, while all high-pressure piping is made from Zeron 100, a high quality super duplex stainless steel developed specifically for seawater.

The plant controls are identical to those being installed on the Little St. James unit, designed to allow monitoring and control of each individual unit process from the control panel or remotely via a broadband Internet connection. The control system will be PLC based with a touch screen interface. The overall plant includes all the necessary instrumentation, motor starters, and controls for a complete, integrated system.

The membrane post treatment process included in this proposal consists of one calcite bed and one liquid chemical feed system for disinfection of the finished water.

Based on the stated assumptions for feedwater quality, this plant will produce finished water with total dissolved solids (TDS) in the range of 350 to 500 parts per million (ppm), well within US Safe Drinking Water Act.

The system would be furnished in a new 20 foot-long shipping container modified to include 2-inches of insulated refrigeration panels, lighting, man door, and split air conditioning unit. The exterior of the container will be painted white to reduce heat loading, but the color could be changed to blend the container into the nature colors of the island.

The price for the entire system is US\$213,810, FOB Gainesville, Florida. This price includes a new seawater intake pumping system, pretreatment, 25,000 GPD SWRO unit, post treatment, installation tools and labor, commission labor and consumables and operation and maintenance manual. This price does not include the seawater intake, outfall, storage tanks or field piping and conduits, trenching and restoration cost.

## PERFORMANCE PARAMETERS

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In the proposed plant design, seawater will be obtained from an open seawater intake located on the south side of the island and treated to US SDWA Standards. The proposed desalination process was developed based on a **membrane flux rate**<sup>1</sup> of 10.4 GFD. All hydraulic loading rates and pipe sizing have been done assuming a maximum **recovery rate**<sup>2</sup> of 40 percent. Table 1 summarizes the design criteria used to size the proposed equipment.

Table 1  
**Proposed System Design Criteria**

Parameter	Design Value
<b>Plant Daily Output, US GPD</b>	25,000
<b>Feedwater Stream</b>	
Quantity, normal operating, GPM	43.4
Maximum Total Dissolved Solids, mg/L	36,000
Design Feedwater Temperature	24° - 33° C
<b>Permeate Stream</b>	
Design Flowrate, GPM	17.4
Design Recovery, %	40
Total Dissolved Solids, mg/L	Less than 500
<b>Concentrate Stream</b>	
Quantity, normal operating, GPM	26.0
Backwash Flowrate, GPM	74 - 100
<b>Power Requirements</b> <sup>3</sup>	
Three-phase voltage	208
Estimated unit power consumption, KWH/KGal	17.8

<sup>1</sup> Defined as the membrane production rate per square foot of active membrane area and expressed in terms of gallons per square foot of active membrane per day or GFD.

<sup>2</sup> The recovery rate is the volumetric efficiency of the system as defined as the volume of water produced as a percentage of the feedwater. A 40 percent recovery system produces 40 gallons of permeate for every 100 gallons of seawater pumped into the membrane array.

<sup>3</sup> Detailed breakdown for the estimated power consumption is presented on the next page.

**Exhibit 1  
Plant Power Summary 25,000 GPD<sup>1</sup>**

**Great St. James Desalination System**

<b>Plant Capacity:</b>	<b>25,000</b>	<b>GPD</b>											
<b>Electrical Power:</b>	<b>208</b>	<b>VAC</b>	<b>60 Hz</b>										
<b>Total Operating Loads</b>	<b>Motor</b>		<b>Actual Load</b>	<b>Actual Load</b>		<b>Line Load</b>	<b>Operating Hours</b>						
<u>Source</u>	<u>Rating, KW</u>	<u>Quantity</u>	<u>KW each</u>	<u>KW, total</u>	<u>eff., %</u>	<u>KW</u>	<u>per Day</u>	<u>PF</u>	<u>Amps</u>	<u>KVA</u>	<u>KWH/D</u>	<u>KWH/KG</u>	
Feedwater Supply Pump	3.7	1	2.7	2.7	89.0%	3.0	24	80.0%	10.5	3.8	73	2.91	
Membrane Feed Pump	14.9	1	7.6	7.6	91.0%	8.3	24	99.0%	23.3	8.4	200	7.99	
ER Boost Pump	3.7	1	1.0	1.0	88.0%	1.1	24	99.0%	3.2	1.1	27	1.08	
<b>Subtotal 208 VAC 3 Phase</b>				<b>11.3</b>		<b>12.5</b>			<b>37.0</b>	<b>13.3</b>	<b>299.5</b>	<b>12.0</b>	
<b>Single Phase Power:</b>	<b>110</b>	<b>VAC</b>	<b>60 Hz</b>										
Control Power					99.0%	1.0	24	100%	9.1	1.0	24	0.96	
Container Power					99.0%	5.0	24	100%	45.5	5.0	120	4.80	
<b>Subtotal 110 VAC Single Phase</b>						<b>6.0</b>	<b>KW</b>		<b>54.9</b>	<b>6.0</b>	<b>145.0</b>		
<b>Equivalent 208 VAC 3 Phase Amps</b>									<b>16.8</b>				
<b>Single and 3 Phase Total</b>						<b>18.5</b>	<b>KW</b>		<b>53.8</b>	<b>6.0</b>	<b>444</b>		
											<b>Estimated Power Consumption, KWH/KG</b>		<b>17.8</b>

<sup>1</sup> Based on published information for the various components used in the system. Actual performance may vary depending on equipment age and membrane operating pressure. Energy is based on membrane operating pressure of 760 psi, energy recovery boost pump operating pressure of 35 psi, includes intake pump and assumes container power transformer operating at full capacity. In reality, the container power will be substantially lower.

## PROPOSED PROCESS DESCRIPTION

The overall treatment process will consist of seawater pumping, media filtration, cartridge filtration, the addition of a trace quantity of a scale inhibitor, membrane separation, and post treatment consisting of an upflow calcite bed followed by a chemical feed system chlorination. Disposal of the membrane concentrate and media filter backwash will be via an outfall.

The system will be designed to allow monitoring and control from a main control panel or remotely via a broadband Internet connection. The control system will be PLC based with a touch screen interface. The overall system includes all the necessary instrumentation, motor starters, and controls for a complete, integrated system. The system will be supplied in a 20-foot shipping container equipped with air conditioning and lighting. The system will be furnished to operate on a 208-volt three phase power supply.

## RAW WATER SUPPLY

Table 2 presents the seawater composition used for the system design along with the projected finished water compositions. In general, actual permeate quality will vary, depending on feed water salinity and temperature and the degree of membrane fouling.

Table 2  
**Water Quality Profile**

Constituent	Feedwater	Membrane Concentrate	Membrane Permeate	Finished Water
Calcium, mg/l as ion	400	689	0.7	12.8
Magnesium, mg/l as ion	1,300	2,240	2.2	2.2
Sodium, mg/l as ion	10,800	18,573	67	77
Potassium, mg/l as ion	390	670	2.7	2.7
Bicarbonate, mg/l as ion	140	237	1.2	33
Sulfate, mg/l as ion	2,700	4,651	6.1	6.1
Chloride, mg/l as ion	19,400	33,423	107	110
Carbon Dioxide, mg/l as CO <sub>2</sub>	2.4	2.4	2.4	0.1
Silica, mg/l as SiO <sub>2</sub>	15	25.8	0.1	10
TDS, mg/l	35,106	60,517	187	254
pH, unit	7.8	8.0	5.9	8.2

To meet the flow and pressure requirements of the system pretreatment, an intake pump, intake priming system and related piping will be provided and installed in a shelter (provided by The Saint James Group). The scope of supply includes the following:

Intake Pump

Number provided..... 1

Manufacturer ..... Ampco  
Model..... ZC2 2" x 1.5"  
Pump Fluid End..... 2205 Duplex Stainless Steel  
Motor Rating, HP..... 5

Intake Pump Suction Isolation ..... Butterfly  
Manufacturer ..... Asahi  
Size ..... 3"  
Material of Construction ..... PVC  
Number provided..... 1

Intake Pump Discharge Isolation ..... Ball  
Manufacturer ..... Asahi  
Size ..... 2"  
Material of Construction ..... PVC  
Number provided..... 1

Intake Pump Discharge Check ..... Vertical Positioned Swing  
Manufacturer ..... Asahi  
Size ..... 2"  
Material of Construction ..... PVC  
Number provided..... 1

Intake Pump VFD  
Number Provided ..... 1  
Manufacturer ..... Danfoss  
Model..... VLT® Aqua Drive  
NEMA Rating ..... 4X  
Motor Rating, HP..... 5  
Voltage ..... 208 VAC  
Phases ..... Three

Electrical Disconnect  
Location..... Intake Pump  
Manufacturer ..... Bryant or equal  
Rating ..... 30 amp  
Enclosure ..... non-metallic NEMA 4  
Number provided..... 1

Pressure Indicator  
Location..... Intake Pump Suction  
Manufacturer ..... WIKA or equal  
Range..... -30" Hg - 0 - 30 psig  
Material of Construction ..... 316 SSSL Wetted

Seawater Intake Priming Pump  
 Number Provided ..... 1  
 Manufacturer ..... Tsurumi  
 Model..... 50TM2.4S  
 Pump Fluid End..... Titanium  
 Motor Rating, HP..... 0.5

Priming Solution Isolation  
 Type ..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 1.5"  
 Material of Construction .....PVC  
 Number Provided ..... 1

Priming Vacuum Line Isolation  
 Type ..... Y-Check  
 Manufacturer ..... GF  
 Size ..... 1/2"  
 Material of Construction .....PVC  
 Number Provided ..... 1

Priming Vacuum Line Isolation  
 Type ..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 1/2"  
 Material of Construction .....PVC  
 Number Provided ..... 2

Priming Eductor  
 Manufacturer ..... Pardee  
 Size ..... 1.5"  
 Material of Construction ..... Glass reinforced polyethylene  
 Number Provided ..... 1

Priming Tank  
 Manufacturer ..... Chem-Tainer  
 Capacity .....67 gallons  
 Size .....24"(L) x 18"(W) x 36"(H), 3/16" wall thickness  
 Material of Construction ..... high density polyethylene  
 Number Provided ..... 1

**INTERCONNECTING PIPING & CONDUITS**

The following information is provided to assist with planning and facility layout. The following sizes and

materials are recommended for this project based on the buildout requirements.

Seawater Supply – Intake Pump Station to Plant

Material..... HDPE  
Outside Diameter ..... 3"  
Pipe Rating..... DR17  
Connections ..... Fused or compression coupling

Membrane Concentrate – Plant to Outfall

Material..... HDPE  
Outside Diameter ..... 3"  
Pipe Rating..... DR17  
Connections ..... Fused or compression coupling

Finished Water– Plant to Storage

Material.....PVC  
Outside Diameter ..... 1.5"  
Pipe Rating..... Schedule 80  
Connections ..... Glued and 150 lbs flanged

**MEDIA FILTRATION**

Media filtration is used to protect the membrane system from suspended solids present in the seawater. The media filtration system would consist of the following:

Media Filters

Diameter, feet..... 2.5  
Number required ..... 2  
Side Shell, feet ..... 5  
Material of Construction .....Glass reinforced plastic  
Maximum Design Pressure ..... 100 psig  
Design ..... ASME Code, but not code stamped  
Media.....Anthracite, garnet sand, and pea gravity  
Filter Loading Rate, GPM/ft<sup>2</sup> ..... 4.4  
Backwash Loading Rate, GPM/ft<sup>2</sup> ..... 15-20  
Backwash Flowrate, GPM..... 74 - 98  
Backwash Source .....Seawater Intake Pump

Media Filter Face Piping Valves

Feed Isolation Valve  
Size ..... 2-inch  
Type ..... Ball  
Backwash Inlet Isolation Valve

Size ..... 2-inch  
 Type ..... Ball  
**Filter Housing Vent**  
 Size ..... 1/2-inch  
 Type ..... Ball  
**Backwash to Drain Isolation Valve**  
 Size ..... 2-inch  
 Type ..... Ball  
**Filtered Outlet Isolation Inlet**  
 Size ..... 2-inch  
 Type ..... Ball  
**Forward Rinse Isolation Valve**  
 Size ..... 2-inch  
 Type ..... Ball  
 Manufacturer ..... Asahi or equal  
 Material of Construction ..... PVC

**Pressure Transmitter**  
 Location ..... Media Filter Influent Header  
 Manufacturer ..... WIKA or Equal  
 Range ..... 0 - 100 psig  
 Material of Construction ..... 316 SSTL Wetted  
 Number Provided ..... 1

**Pressure Transmitter**  
 Location ..... Media Filter Effluent Pressure  
 Manufacturer ..... WIKA or Equal  
 Range ..... 0 - 100 psig  
 Material of Construction ..... 316 SSTL Wetted  
 Number Provided ..... 1

**Pressure Indicator** ..... Media Filter Inlet and Outlet  
 Manufacturer ..... WIKA  
 Size ..... 4-1/2"  
 Range ..... 0 to 100 psig  
 Material of Construction ..... 316 SSTL Wetted and Phenolic Case  
 Liquid Fill ..... Glycerin  
 Number Provided ..... 1

**Switching Valve** ..... Swagelok SS-43XGS4  
 Number Provided ..... 1

## SCALE CONTROL

Most naturally occurring waters precipitate calcium carbonate when concentrated. During the RO process, the dissolved solids, including these sparingly soluble salts, are concentrated by the RO membranes. If any of these salts are allowed to precipitate, the resulting scale can foul the RO membranes. Through the use of scale inhibitors, the potential for the seawater to form a scale during the treatment process is minimized. The chemical injection pump fluid end will be supplied to permit the use of sulfuric acid instead of the scale inhibitor to enhance post treatment operation. The pretreatment system will include a chemical injection system that will consist of the following:

### Chemical Feed System

Chemical ..... Scale Inhibitor  
Number provided..... 1  
Manufacturer ..... Grundfos  
Head and Fittings ..... PVDF  
Fluid End .....PVDF  
Check Valves .....Ceramic

### Day Tank

Volume ..... 100 liters  
Material of Construction ..... Linear Polyethylene  
Manufacturer ..... Grundfos

### Calibration Column

Location..... Scale Inhibitor Feed System  
Manufacturer .....ProMinent  
Capacity ..... 0 to 250 mL  
Number Provided ..... 1

### Isolation Valve

Location..... Chemical Pump Suction  
Manufacturer ..... Asahi  
Type ..... Ball  
Size ..... 1/4"  
Number Provided ..... 2

### Chemical Makeup Water Supply

Source ..... RO Permeate  
Size ..... 3/4"  
Material.....Schedule 80 PVC  
Isolation..... Ball Valve

## CARTRIDGE FILTRATION

Five-micron polypropylene cartridge filters are provided to protect the high-pressure pump, energy recovery unit and the RO membrane in the event of an upset in the seawater supply. The RO unit is equipped with a single housing mounted on the unit and equipped with inlet, outlet and drain valves to permit cleaning during element replacement to avoid the introduction of suspended material into the high-pressure pump and energy recovery unit. The RO unit will be equipped with the following:

Cartridge Filter Housing Inlet Isolation Valve  
 Size .....2"  
 Type .....Ball  
 Manufacturer .....Asahi  
 Material of Construction .....PVC  
 Number Provided .....1

Cartridge Filter  
 Quantity on Line, each .....1  
 Manufacturer .....Eden Excel  
 Number of Elements per Housing .....10  
 Cartridge Length, inches .....40  
 Material of Construction .....FRP  
 Trim .....316 SSSL

Cartridge Filter Housing Vent  
 Size .....¼"  
 Type .....Ball Valve  
 Manufacturer .....Asahi  
 Material of Construction .....PVC  
 Number Provided .....1

Cartridge Filter Housing Drain and Flush  
 Size .....2"  
 Type .....Ball  
 Manufacturer .....Asahi  
 Material of Construction .....PVC  
 Number Provided .....1

Cartridge Filter Housing Outlet  
 Size .....2"  
 Type .....Ball  
 Manufacturer .....Asahi  
 Material of Construction .....PVC

Pressure Transmitter  
 Location ..... Cartridge Filter Effluent  
 Manufacturer .....WIKA  
 Range .....0 - 100 psi

Material of Construction ..... 316 SSTL Wetted  
 Number Provided ..... 1

Pressure Indicator ..... Cartridge Filter Inlet and Outlet  
 Manufacturer ..... WIKA  
 Size ..... 4-1/2"  
 Range ..... 0 to 100 psig  
 Material of Construction ..... 316 SSTL Wetted and Phenolic Case  
 Liquid Fill ..... Glycerin  
 Number Provided ..... 1

Switching Valve ..... Swagelok SS-43XGS4  
 Number Provided ..... 1

**HIGH PRESSURE PUMP**

The reverse osmosis unit will use a high-pressure pump and energy recovery system to pressurize the pretreated feedwater to approximately 760 psi although the exact operating pressure of the membranes is dependent on feedwater temperature, salinity, and degree of membrane fouling. GSS proposes the following membrane feed pumping system for this project:

Number Provided ..... 1  
 Manufacturer ..... Danfoss  
 Model ..... APP8.2  
 Pump Fluid End ..... 2205/2507 Super Duplex Stainless Steel  
 Estimated Operating Speed ..... 1,000 rpms  
 Driver  
 Motor Rating, HP ..... 20  
 Motor Enclosure ..... TEFC  
 Rating ..... Severe Duty/VFD

Motor Starter/Controller  
 Number Provided ..... 1  
 Manufacturer ..... Danfoss  
 Model ..... VLT® Aqua Drive  
 NEMA Rating ..... 4X  
 Motor Rating, HP ..... 20  
 Voltage ..... 208 VAC  
 Phases ..... Three  
 Number provided ..... 1

## ENERGY RECOVERY

Operating in parallel with the high-pressure pump will be an energy recovery system consisting of a single ERI pressure exchanger unit and boost pump. This design results in the pressure exchanger operating at 58 percent of its rated capacity at 40 percent recovery. The energy recovery system will consist of the following:

Number Provided ..... 1

Manufacturer .....Energy Recovery Inc.

Model.....PX-45S

### Materials of Construction

Rotor .....Ceramic

Shell ..... FRP

High-pressure connections.....AL6XN

Low-pressure connections..... SCH 80 PVC

### Energy Recovery Boost Pump

Number Provided ..... 1

Manufacturer ..... ERI or equal

Model.....HP-8503

Pump Fluid End.....AL6XN Stainless Steel

Motor Rating, HP..... 5

Enclosure ..... TEFC

Rating ..... Inverter Duty

### ER Pump VFD

Number Provided ..... 1

Manufacturer ..... Danfoss

Model..... VLT® Aqua Drive

NEMA Rating .....4X

Motor Rating, HP..... 5

Voltage .....480 VAC

Phases ..... Three

### ER Discharge Back Pressure Regulating Valve

Manufacturer ..... Asahi

Size ..... 1.5-inch

Type ..... Globe Valve

Number Provided ..... 1

### ER Discharge Check Valve

Manufacturer ..... Asahi

Size ..... 1.5-inch  
Type ..... Swing Check Valve  
Number Provided ..... 1

## RO MEMBRANE ARRAY

The RO membrane skid designed to produce 25,000 GPD will consist of the following:

### Pressure Vessel

Manufacturer ..... Progressive Composite Technologies or equal  
Model.....PRO-8-1000-SP-3  
Total Number of Vessels provided: ..... 2

### Membrane

Manufacturer ..... Toray  
Membrane Model ..... TM820M-400 or equal  
Membrane Type ..... Cross Linked Fully Aromatic Polyamide Composite Seawater  
Number of Elements per Vessel, each ..... 3  
Total Number of Elements ..... 6  
Average Membrane flux, gfd ..... 10.4  
Estimated Membrane Life, years ..... 4

Pressure Indicator ..... Membrane Feed and Concentrate and ER Discharge  
Manufacturer ..... WIKA  
Size ..... 4-1/2"  
Range ..... 0 to 1,500 psig  
Material of Construction ..... 316 SSTL Wetted and Phenolic Case  
Liquid Fill ..... Glycerin  
Number Provided ..... 1

Switching Valve ..... Swagelok SS-43ZF2  
Number Provided ..... 1

### Sample Valves

Manufacturer ..... GF  
Size ..... 1/4"  
Type ..... Ball Labcock Valve  
Features ..... Full ported to permit membrane probing  
Total Number Provided ..... 5  
Locations ..... Individual Pressure Vessel, Incoming Feedwater, Overall Permeate and Concentrate

Instrumentation ..... Concentrate Low/Plant Discharge (TPDES Permit) Pressure Flow  
Manufacturer ..... ABB or equal  
Type ..... Magnetic  
Connections ..... 1" 150-pound Flange Insert  
Range, GPM ..... 0 to 50  
Number Provided ..... 1

Instrumentation ..... Plant Discharge (TPDES Permit) pH and Temperature  
Manufacturer ..... Shark or equal  
Range, pH units ..... 1 to 13  
Range, temperature ..... 0 to 100 Deg C  
Number Provided ..... 1

Instrumentation ..... Permeate Flow  
Manufacturer ..... ABB or equal  
Type ..... Magnetic  
Connections ..... 1.5" 150-pound Flange Insert  
Range, GPM ..... 0 to 50  
Number Provided ..... 1

Instrumentation ..... Conductivity  
Manufacturer ..... Myron L or equal  
Range, mS/cm ..... 0 to 2,000  
Features ..... Digital Display with Adjustable High Alarm Set point  
Number Provided ..... 1

Permeate Vacuum Release Valve

Manufacturer ..... IPEX  
Size ..... 3/4-inch  
Type ..... Vacuum Release  
Number Provided ..... 1

Permeate Check Valve

Manufacturer ..... GF  
Size ..... 1.5-inch  
Type ..... Y-Pattern Check Valve  
Number Provided ..... 1

Concentrate Check Valve

Manufacturer ..... GF

Size ..... 1.5-inch  
 Type ..... Y-Pattern Check Valve  
 Number Provided ..... 1

High Pressure Piping

Material.....Zeron 100 Super Duplex Stainless Steel  
 Connections ..... Victaulic Type Clamps  
 Material of Construction ..... 2507 Duplex Stainless Steel  
 Pressure Rating ..... 1,200 psi

Low Pressure Piping

Material.....Schedule 80 PVC  
 Connections ..... Victaulic Type Clamps

Fasteners ..... 316 Stainless Steel  
 Structural Frames.....Structural Aluminum  
 Finish – Metal Preparation ..... Sand blasted  
 Finish ..... Powder Coated (Electrostatic Resin Baked to 400 Degrees F.)  
 Piping Supports..... Fiberglass  
 Conduits .....PVC or Fiberglass

**POST TREATMENT**

The membrane post treatment process will consist of an upflow calcite contactor and one chemical feed systems for the addition of sodium hypochlorite.

Calcium Carbonate Contactor

Diameter, inches ..... 24  
 Side Shell, inches..... 60  
 Material of Construction ..... FRP  
 Empty Bed Contact Time, minutes ..... 6.8  
 Number provided..... 1

Calcium Carbonate Face Piping Valves

Manufacturer ..... Asahi or equal

Feed Isolation Valve

Size ..... 1.5"  
 Type ..... Ball

By Pass Valve

Size ..... 1.5"  
 Type ..... Ball

Discharge Isolation Valve  
 Size ..... 1.5"  
 Type ..... Ball  
 Material of Construction .....PVC

Chemical Feed System  
 Chemical .....Sodium Hypochlorite  
 Number provided..... 1  
 Manufacturer ..... Grundfos  
 Head and Fittings ..... PVC  
 Fluid End ..... Acrylic  
 Check Valves .....PVC

Day Tank  
 Volume ..... 100 liters  
 Material of Construction ..... Linear Polyethylene  
 Manufacturer ..... Grundfos

Level Transmitter  
 Location..... Finished Water Storage Tank  
 Manufacturer ..... WIKA or Equal  
 Range..... 0 - 20 feet  
 Material of Construction .....316 SSTL Wetted  
 Number Provided ..... 1

**AUTOMATIC FLUSHING/CLEANING**

Scale and corrosion problems can occur when a SWRO unit is shut down while the concentrated brine remains in the system. To minimize this problem, the system incorporates an automatic flushing feature that consists of a zero-recovery flush during the shutdown with the addition of stored permeate from the cleaning system. This added injection of low salinity water further reduces the potential for corrosion within the high pressure and energy recovery booster pumps.

For periodic cleaning of the membrane elements, the permeate storage tank and flush pump are used to recirculate cleaning solutions through the pressure vessels. Cleaning connections to the membrane system are made using removable piping spools and Victaulic type grooved connections. The flush/cleaning system will consist of the following:

Permeate Flush Isolation Valve  
 Manufacturer ..... Asahi  
 Size ..... 1.5-inch  
 Type ..... Y-Pattern Check Valve  
 Number Provided ..... 1

Permeate Valve..... Zero Recovery Flush Valve  
 Manufacturer ..... GF or equal  
 Size ..... 1.5-inch  
 Type ..... Ball Valve  
 Features ..... Power to Open and Power to Close  
 Number Provided per RO unit..... 1

Cleaning Pump  
 Number Provided ..... 1  
 Manufacturer ..... Ampco or equal  
 Model..... Ampco ZC2 2" x 1.5"  
 Pump Fluid End..... 316 Stainless Steel  
 Motor Rating, HP ..... 5  
 Enclosure ..... TEFC

Cleaning/Flush Tank  
 Volume .....200 gallons  
 Material of Construction ..... Polyethylene

Suction Isolation ..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 2-inch  
 Material of Construction .....PVC  
 Number Provided ..... 1

Tank Recycle ..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 2-inch  
 Material of Construction .....PVC  
 Number Provided ..... 1

Discharge Isolation..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 2-inch  
 Material of Construction .....PVC  
 Number Provided ..... 1

Tank Drain..... Ball  
 Manufacturer ..... Asahi  
 Size ..... 2-inch  
 Material of Construction .....PVC  
 Number Provided ..... 1

## CONTAINER

The equipment will be provided in a modified 20-foot shipping container. A new ISO shipping container will be customized by Gulfstream Container of Miami. The container will be equipped with the following:

1. One each, man door
2. 2-inch interlocking insulated refrigeration panels
3. Pipe sleeve cutouts with stainless steel plates
4. Mini split unit air conditioning system
5. 5 KVA transformer with breaker panel for single phase power
6. Exterior painted white (or other desired color)

## SYSTEM CONTROLS

The plant controls will be designed for complete automation or manual operation. All plant functions would be monitored and controlled by a programmable logic controller. All operating data and plant status would be displayed on a human machine interface (HMI) touch screen mounted on the control panel. In the event of a parameter excursion, the panel would display the alarm and would initiate contact with the plant supervisor via the internet. Contact would include as email, cell phone and text messaging using the internet connection. The touch screen would log the alarm event for future inspection. The control system features are summarized in Table 3.

## ELECTRICAL SYSTEM

All three phase power components will be provided and installed in either the main power distribution panel or as variable frequency drives (VFD) mounted in NEMA 4 enclosures to permit mounting on the wall next to the power distribution panel. All three-phase equipment will be furnished to operate on a 480-volt, three phase power supply. The following table provides an overview of the three-phase electrical loads.

Unit Type	Load or Rating
Main Circuit Breaker	
Power Monitor	
VFD <sup>5</sup> (Intake Pump)	5 HP motor
VFD (ER Boost Pump)	5 HP motor
VFD Starter (High Pressure Pump)	20 HP motor
FV <sup>6</sup> Starter (Cleaning Pump)	5 HP motor
Feeder Breaker (1.0 kVA Transformer)	15 amp, 2 pole

<sup>5</sup> Variable frequency drive

<sup>6</sup> Full voltage (across the line)

Table 3  
**Control System Features**

Feature	Shutdown	Display Condition	Comment
Under voltage and loss of phase monitor	Yes	Yes	Auto reset capability
Seawater supply pump failure to start		Yes	VFD fault
Media filter influent pressure	No	Yes	(Optional Equipment)
Media filter differential pressure	Yes	Yes	(Optional Equipment)
Cartridge filter differential pressure	Yes	Yes	
Membrane feed pump suction pressure	Yes	Yes	Adjustable start up override
Membrane feed pressure	Yes	Yes	
Membrane feed pump failure to start		Yes	VFD fault
ER Boost Pump failure to start	Yes	Yes	PX balancing and TPDES Permit Compliance
Plant discharge flow	Yes	Yes	
Membrane permeate flow	Yes	Yes	
Membrane differential pressure	Yes	Yes	
High membrane permeate conductivity	Yes	Yes	Adjustable time delay on fault to permit rinse up
Post treatment interlock			Controls chemical addition.
Pretreatment interlock			Controls chemical addition
Plant discharge pH and temperature	No	No	TPDES Permit Compliance
Potable water tank level	Yes	Yes	Direct readout of finished water level and adjustable set points to operate RO system in automatic mode
Cleaning/Flush tank low level	Yes	Yes	
Cleaning/Flush Pump failure to start	Yes	Yes	
Alarm conditions			

# COMMERCIAL TERMS

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## PRICES

Prices for various equipment and services detailed in this proposal by contract are as follows:

Description	Price (US\$)
<b><i>Provide the following services and furnish and install the proposed desalination system consisting of the following:</i></b>	
<i>Purchasing, Fabrication and Crating of the equipment consisting of the following:</i>	
✓ <i>Seawater supply pumping system and related controls and instrumentation</i>	<b>\$20,090</b>
✓ <i>Pretreatment: media filtration, cartridge filtration and scale inhibitor feed system</i>	<b>\$23,080</b>
✓ <i>25,000 GPD seawater RO unit axial piston membrane feed pump and isobaric energy recovery system, post operational flush/cleaning system and electrical and control system designed for 208 VAC power</i>	<b>\$127,860</b>
✓ <i>Membrane post treatment calcite bed and chlorination, finished water level monitoring and TPDES permit instrumentation</i>	<b>\$8,690</b>
✓ <i>Containerization</i>	<b>\$29,000</b>
✓ <i>Project management, start-up chemicals and other consumables, installation tools, plant design, and equipment installation</i>	<b>\$5,090</b>
<b>TOTAL PRICE</b>	<b>\$213,810</b>

The above prices are FOB Gainesville, Florida and valid for thirty (30) days from the date of this proposal.

## PAYMENT TERMS

The following payment schedule is proposed for this project:

<i>Milestone</i>	<i>Payment</i>
Acceptance of proposal	\$106,905
Equipment ready for shipment	\$85,524
Completion of equipment installation and commissioning	\$21,381
<b>Total Base Amount</b>	<b>\$213,810</b>

## SCHEDULE

The equipment will be ready for shipment in approximately 16 to 18 weeks after notice the proceed and payment received. Installation of the equipment can be accomplished in one week. This schedule assumes normal lead time for the proposed equipment. We will make every effort to shorten the schedule if possible.

## **SERVICES PROVIDED BY THE SAINT JAMES GROUP**

During the construction phase of the project, The Saint James Group will provide the following at no charge to GSS:

1. All permitting required for the construction and operation of the facility;
2. Piping and conduit, trenching and restoration for all buried interconnecting pipelines and electrical conduits;
3. If necessary to support the larger plant, any modifications to the feedwater intake per agreed specifications;
4. If necessary to support the larger plant, any modifications to the plant outfall per agreed specifications;
5. Shipment from Gainesville, Florida to project site;
6. All costs and labor associated with clearance of the equipment into the USVI;
7. All consumables for the operation of the plant. GSS will provide sufficient consumables for the first month of operation;
8. Final design, supply and construction of the container mounting platform;
9. Full access to the project site. Working hours will be coordinated with staff;
10. Equipment staging area within 100 feet of the plant site;
11. Electrical power to the container power panel; and
12. Equipment for offloading of the system at the project site.

# ACCEPTANCE OF PROPOSAL

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This proposal when signed by both parties below, shall be considered as a Contract between the parties, and shall be binding upon the parties and their respective successors and assigns may be amended or modified only by further writings signed by both parties.

This contract sets forth the entire agreement of the parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether oral or written, related to the subject meter hereof.

The total price of the proposed system is \$\_\_\_\_\_ and the following items (from the Pricing page) are not included in the Contract and have been deleted and initiated by Owner.

_____	_____	_____
_____	_____	_____
_____	_____	_____

IN WITNESS WHEREAS, the parties have executed this Contract the date and year first written below.

ACCEPTED BY:

(OWNER)

GEMINI SEAWATER SYSTEMS (SUPPLIER)

8916 SW 44<sup>th</sup> Lane

Gainesville, FL 32608

Representative:

Representative: Dean Bedford

Email:

Email: \_\_\_\_\_

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Printed name Above

\_\_\_\_\_  
Printed Name Above

# TERMS AND CONDITIONS

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This proposal by Gemini Seawater Systems ("GSS") to The Saint James Group \_\_\_\_\_ ("Purchaser") (collectively, "the Parties") includes the following Terms and Conditions. Upon acceptance of the proposal by Purchaser, the proposal will function as the agreement between the Parties ("the Agreement").

1. **Definitions:**
  - a. "Equipment" means all equipment specified in this proposal.
  - b. "Services" means all engineering, design, procurement, project management, fabrication, installation and commissioning included in this proposal that is required to supply the system specified in the proposal.  
"Site" means the property of The Saint James Group, Great St. James Island, USVI, the area immediately surrounding such property, and any other locations in USVI where work is performed in connection with the Agreement.
2. **Term of Proposal:** This proposal will automatically expire 30 days from the date identified on the cover page unless the proposal is accepted by Purchaser or the Parties otherwise expressly agree in writing. GSS reserves the right to modify or withdraw this proposal at any time and for any reason, prior to acceptance by Purchaser.
3. **Quotations of Prices:** All prices quoted by GSS are F.O.B. point of origin unless otherwise indicated. If GSS is requested or required to perform any additional services beyond those set forth in this proposal, Purchaser agrees to pay GSS's then-standard rate for those additional services, as well as any incidental and related expenses incurred by GSS.
4. **Warranties by GSS:** For the period ending twelve months after Equipment start-up or eighteen months after shipment, whichever occurs earlier, GSS warrants that Equipment manufactured, sold, or otherwise provided by GSS will conform in all material respects to any descriptions, plans or specifications included in the Agreement, and will be free of defects in material and workmanship. GSS warrants that any Services will be performed in a good and workmanlike manner. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND GSS MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OTHER THAN AS EXPRESSLY STATED IN THIS AGREEMENT.
  - a. **Conditions on Warranties:** Any performance warranties stated elsewhere in the Agreement shall apply only if Equipment is operated in accordance with GSS's instructions when operated on water or other liquid having characteristics specified in the Agreement. Components and materials of the type that need replacement periodically due to normal wear and tear, such as membranes, frames, gaskets, filter cartridges, pump seals and fuses, are warranted against defects only as of the shipment date, unless expressly stated otherwise. Warranties do not apply to damage or wear resulting from accidents, negligence, abuse, or misuse by Purchaser or third parties: from failure to follow GSS's instructions for installation, operation or maintenance; or from alterations or repairs not performed in accordance with GSS's instructions.
  - b. **Inspection Required for Warranty:** If Purchaser wishes to make a warranty claim, Purchaser shall return to GSS any item for which the warranty claim is to be made.
  - c. **Assignment of Warranties:** GSS shall assign to Purchaser any manufacturer's warranties of Equipment or materials purchased from others, to the extent they are assignable, and Purchaser's sole recourse shall be against the manufacturer.
  - d. **Claims on Warranties:** Purchaser shall promptly notify GSS of any warranty claim, and Purchaser's sole remedy shall be the repair or replacement (at GSS's election) of defective Equipment or the correction of deficient Services.
5. **Method of Payment:** GSS shall present any fees incurred and charges owed by Purchaser by commercial invoice against Purchaser's letter of credit. Purchaser shall make all payments to GSS in full in lawful, free, and unblocked currency of the United States of America ("U.S.A.") at the time GSS delivers Equipment to Purchaser, unless GSS and Purchaser mutually agree otherwise in writing. GSS reserves the right to review Purchaser's credit prior to shipping Equipment, and GSS's obligation to ship Equipment shall be subject to GSS's approval of Purchaser's credit. GSS may require Purchaser to make full or partial payment in advance. In the event that GSS requires advance payment, pro rata payments shall become due at the time the Equipment is shipped, unless the parties mutually agree otherwise in writing. If Purchaser is located outside the U.S.A. or its territories, Purchaser shall deliver an irrevocable letter of credit in GSS's favor confirmed by a first class U.S.A. bank upon acceptance of Purchaser's order.
  - a. **Delay of Payment:** If payment is not made in full within thirty (30) days after invoice, any unpaid amount shall bear interest at the rate of 1.5 percent per month or the maximum lawful rate, if lower than 1.5 percent. Purchaser shall reimburse cost, including reasonable attorney's fees, incurred by the GSS to collect overdue amounts.
  - b. **Dispute of Invoice:** If Purchaser disputes any portion of an invoice, Purchaser shall notify GSS, specifically identify the disputed portions in writing, and pay the undisputed portion within 30 days of receiving the invoice.
6. **Limitation of Liability:** The collective liability of GSS, its subcontractors, and its employees, officers, directors, and agents in connection with the Agreement and all Equipment and Services provided thereunder shall be limited to the amount actually paid by Purchaser to GSS for such Equipment and Services. GSS shall not be liable for any special, indirect, incidental, consequential, or punitive damages, including lost profits or loss of use.

7. **Indemnification of Purchaser:** GSS shall indemnify and hold harmless Purchaser, its directors, agents, and employees against all claims and damages, including reasonable attorney's fees, that proximately result from acts or omissions of GSS, its directors, agents, employees, or subcontractors, in connection with any bodily injury, sickness, disease, or death or damage to property resulting from work performed in connection with this Agreement.
8. **Indemnification of GSS:** Purchaser shall indemnify and hold harmless GSS, its directors, agents, employees, and subcontractors against all claims and damages, including reasonable attorney's fees, that proximately result from acts or omissions of Purchaser, its directors, agents, employees, or contractors other than GSS, in connection with any bodily injury, sickness, disease, or death or damage to property that may occur at the Site, in connection with work performed under this Agreement, or in connection with Purchaser's obligations under this Agreement.
9. **Right of Inspection:** GSS shall provide Purchaser or its designated representative a reasonable opportunity to inspect any Equipment prior to delivering the Equipment to a carrier for shipment. If Purchaser elects to inspect any Equipment, Purchaser shall bear all costs associated with the inspection. If Purchaser fails to promptly inspect the Equipment, Purchaser will be deemed to have waived its right of inspection.
10. **Payment of Taxes and Fees, Duties, and Fees:** Purchaser shall pay all taxes, duties, and fees imposed on GSS, GSS's subcontractors and agents, and Purchaser for the production, sale, shipment, or use of Equipment or the provision of any Services in connection with the Agreement.
11. **Shipment of Equipment:** Purchaser shall provide GSS with complete shipping instructions at least 21 days before the estimated delivery date and shall arrange for receiving, unpacking, and installing the Equipment to be shipped. The term "estimated delivery date" refers to the date of shipment, which is estimated based on conditions prevailing at the time of quotation. Unless GSS expressly agrees otherwise, GSS does not guarantee the estimated delivery date. Any products offered by GSS from stock are subject to prior sale. Unless otherwise agreed, Purchaser will pay all shipping costs, fees, and insurance.
12. **Assignment of Title and Risk of Loss:** GSS shall maintain title and bear the risk of loss until the Equipment is delivered to the carrier for shipment. Upon delivery of Equipment to the carrier for shipment, title and risk of loss shall pass to Purchaser upon delivery of Equipment to the carrier for shipment. Notwithstanding the transfer of title and risk of loss, Purchaser grants and GSS maintains a security interest in all Equipment until GSS has received full payment. If Purchaser delays a shipment for any reason, payment shall become due on the date GSS is prepared to make shipment, and Purchaser shall bear the risk of loss and pay all expenses and fees associated with transporting and storing the Equipment during the time that shipment is delayed.
13. **Exportation of Equipment:** If Equipment is to be exported to any location outside the U.S.A., GSS's acceptance is subject to GSS's ability to reasonably obtain, without unduly burdensome efforts, any applicable and necessary export licenses or permits.
14. **Compliance with U.S. Export Regulations:** Purchaser will not, directly or through an intermediary, export any Equipment (including related technology and information) to any country that is subject to embargo or similar restriction under U.S. Export Regulations, or transfer it to a national of any such country or to any other person or company restricted from receiving it, or put it to a prohibited end use, or transfer it with knowledge or reason to believe that it is intended for a prohibited destination, recipient or use.
15. **Force majeure:** GSS shall not be responsible for any delays, damages, or failures to perform due to circumstances beyond its reasonable control, including those caused by Purchaser. Purchaser shall extend the time for performance by GSS by a period commensurate with the amount of delay caused by such circumstances.
16. **Ownership of Documents:** All plans, drawings, specifications and other documents furnished by GSS in connection with Equipment shall remain the property of GSS, and Purchaser warrants that no use will be made of such documents except to facilitate Purchaser's installation, operation and maintenance of Equipment. Such documents shall be provided to Purchaser's employees only on a need-to-know basis and shall not be provided to third parties without GSS's written consent.
17. **Retention of Intellectual Property Rights:** Unless otherwise expressly agreed in writing, GSS retains all right, title, and interest to any intellectual property contained in this proposal, including but not limited to any plans, drawings, specifications, data sheets, or other materials subject to copyright; trade secrets; patented subject matter; and confidential business information.
18. **Reliance on Information:** GSS will be deemed to have reasonably relied on any representations made or information provided by Purchaser as to the intended use of any Equipment and the characteristics of any liquids to be treated by such Equipment, regardless of whether such representations are made or such information is provided prior to, on, or after the date of the Agreement.
19. **Payment for Cancelled Orders:** If Purchaser cancels an order, Purchaser shall deliver a payment to GSS. The payment shall include a pro rata payment to GSS for all work completed prior to and on the date of cancellation, inventory obtained for the cancelled order, work in progress related to the order, allowances for overhead and profit, and reasonable costs of winding up the work, terminating subcontractors, and closing out the project.
20. **Return of Equipment:** Purchaser may not return any Equipment to GSS without GSS's prior written authorization.
21. **Termination and Suspension of Agreement:** If Purchaser is in breach of the Agreement or if Purchaser is overdue on any payment owed to GSS under this Agreement or any other agreement between GSS and Purchaser, GSS is entitled to terminate the Agreement or to suspend any shipment.

22. **Prohibition against Assignment:** This proposal has been prepared specifically for Purchaser, and the Agreement, its proposals and provisions, and any rights and obligations contained therein may not be sold, assigned, or transferred without the express written consent of GSS.
23. **Choice of Law and Venue:** The Agreement shall be governed and construed in accordance with the laws of the State of Florida, U.S.A.
24. **Language of Contract:** If the Agreement is prepared or presented in any language other than English, the English language version of the Agreement shall govern its interpretation.
25. **Entirety of Agreement:** Upon acceptance of proposal by Purchaser, GSS's written proposal and these Terms and Conditions constitute the entire Agreement between the Parties. The Agreement may be modified or amended only by a writing signed by an authorized representative of the party against which enforcement is being sought. These Terms and Conditions shall prevail over any inconsistent terms and conditions included in Purchaser's order, unless GSS expressly agrees to such terms and conditions in a signed writing.