5.1.3. SITE 3: DIDO VALLEY

5.1.3.1. Location of the Site

The location for the proposed SWRO plant and associated infrastructure is shown in Figure 13.

Figure 13: Dido Valley Site Location

For this site, preliminary investigation suggests that adequate water depth can only be reached relatively far from the shoreline. Refer to photos and layout drawing included elsewhere in this document. The intake pipeline design for this may require beach and surfzone crossing. Supplier shall design the pipeline material and anchoring accordingly.

Tenderers are encouraged to inspect the site and surrounding areas in order to ensure suitability of the proposed site. Tenderers are responsible for validating proposed sites and routes.

5.1.3.2. Raw water Data

The anticipated seawater quality is shown below in Table 1C.

Table 1C: Estimated Raw Sea Water Quality

Parameter	Unit	Value (estimate)
Algae	mg/L	unknown
K	mg/L	630
Na	mg/L	11222
Ca	mg/L as Ca	530
Mg	mg/L	1314
NH4	mg/L as N	4.93
SO4	mg/L	2505

Parameter	Unit	Value (estimate)
Cl	mg/L	19333
Nitrate	mg/L as N	0.1
F	mg/L	0.6
Cond	mg/L	4917
pH		7.6
Al	mg/L	0.01
Ba	mg/L	0.043
B	mg/L	4.22
Fe	mg/L	0.033
Mn	mg/L	0.027
Si	mg/L	13.8
Sr	mg/L	10.3
TDS	mg/L	41533
TSS	mg/L	15 (max)
Temp min	Deg C	10
Temp max	Deg C	20
Heavy metals		Unknown

5.1.3.3. Specifications

5.1.3.3.1. Mechanical and Electrical

Abstraction Pump Installation

1. General

Each desalination plant shall include a separate raw water supply or abstraction pumping system. This pumping system will pump sea water from the intake or abstraction position in the sea to the raw water tanks situated on the Desalination Plant Site.

The pump station is intended to be installed on an off-shore float ±250m from the coast line, behind the wave line. Submersible pump sets with dedicated rising mains to the shore shall be supplied and installed. The layout and configuration of the installation and equipment orientation shall consider required free passages and space for repairs and maintenance of the equipment, including the handling of the respective materials. The installation shall provide for suitable anchors to ensure that rough ocean conditions will not damage the equipment. The float / barge are described under the Marine specification. All pipework and manifolds must be supplied to connect with the rising main.

The position of the pump station shall consider available area, high level sea water mark, access and pump type and its respective technical constraints such as NPSH. This will be approved in conjunction with the Engineer and the Client.

Proposed position and orientation of the system is shown on schematic layout plans attachgedas Annexure 7.

All applicable datasheets included in the tender document related to equipment covered under this plant must be completed and submitted as part of the tender.

All work carried out, as well as equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

Pricing of the plant shall make allowances for each and every applicable aspect: Design, Supply, Delivery,

Installation (Including Handling and Rigging), Commissioning, Testing, Operation and Maintenance for the contract duration, Signage, decommissioning and removal if necessary.

Refer the General Electrical Section for compliance and regulatory standards, as well as general installation and control specifications.

2. Mechanical Installation

The pump station shall be fitted with a minimum of two (2) pumps acting in a duty/standby arrangement. This system is envisaged to operate as a "Tank Filling System". Pumps shall be sized to pump the required raw water flow/flowrate required to suit the desalination plant raw water requirements. Total pressure head shall be calculated to suit, using the guideline system hydraulic information below.

Each pump set will be connected to a dedicated rising main to the beach, where it will be connected to a manifold, connected to a common rising main to the raw water tank, as described under the civil section of the specification.

Raw water abstraction pump system – Estimated hydraulic information:

Maximum Flow Required (per pump installation) – To Suit Desalination Plant Raw Water Flow Requirements: Estimated at 5.0 Mℓ/day over 24 hours = 60 ℓ/s or 216 m^3/hr	
Estimated Suction pipework	
Suction static head	N/A
Estimate length of pipe	N/A
Estimated Delivery pipework	
Delivery static head	10.5 m
Estimate length of pipe	750 m
End pressure head required	5 m

Rising Main, delivery pipework, valves and fittings shall be sized to have a maximum flow velocity of 1.5 m/s. All pipework and fittings shall be rated to handle the shut-off pressure of the proposed pump sets.

All pipework and associated fittings / couplings shall be manufactured of a material conducive to handling the medium being pumped. Pipework and fittings shall allow for tappings / sockets / saddles for process gauges and instrumentation where required.

Each pump shall include its own suction foot valve if applicable, suction (if applicable) and delivery isolating valves, non-return valves, air release valve, connections to suction and rising main pipework all as per rational design by the Supplier. All pipework and valves shall be properly supported and so arranged that all stresses created in the pipework by static and dynamic forces, including recoil shock, will be taken up by suitable anchors.

A main isolating valve shall be installed on the delivery pipework before connecting to the rising main.

A suitably sized and pressure rated mechanical type water meter shall be optimally installed before the entrance to the raw water holding tanks.

Suction /Abstraction point shall make allowances for:

- Intake Sieve/Strainer with mesh and all related aspects sized to suit
- Orientation for accommodation of sand and other suspended solids
- Minimum constant submergence and vortices formation.
- Anchoring of intake pipe and structure
- Access for maintenance and cleaning

Further information can be found in Marine specification (part PB) of the specification.

Pump Set Characteristics / Considerations:

- Installed in a frame to support the pump set and pipework in the water
- Materials conducive to the pumped medium or protective coatings to ensure maximum reliability
- Suitability (and design / operation constraints) to operation with Variable Frequency Drives (VFDs)
- Motor sizing shall ensure that the pump does not overload the motor in runout conditions

3. Electrical Control and Instrumentation

3.1 Electrical:

The site is located on the main site area. A dedicated MCC (6kA, rated for the full load with VFDs) will have to be installed within the site area (either dedicated container or suitably and practically shared), fed from the main site distribution kiosk.

It must be noted that the abstraction pumps will be located on a floating barge, 250m from shore, with a motor cable run of roughly 700m. Special attention will have to be given to the cable sizing, harmonic mitigation, cable type selection as well as cable connection housing/kiosk.

3.2 Control Philosophy:

The abstraction pumps must be level controlled from the raw water intake tank at the main plant site by means of analogue signals. Additional discrete emergency control must be provided in case the normal control mechanism fails for both high and low level protection. The tank must be kept as full as possible at all times.

All required pump protection must be provided for between the pump/motor configuration and the MCC. This could include motor overheat (thermistor, OTC or PT100), moisture ingress (seal fail), no-flow protection, high pressure protection, pipe-break detection as well as suction control and suction low level protection.

The pumps must alternate their pumping cycle every 3 hours, with the standby pump acting as a standby pump in case the duty pump fails.

3.3 Instrumentation:

a) Flow Meter and Detection

An electromagnetic flow meter of the highest billing class must be installed inline before the raw water tank at the plant, linked to the PLC for monitoring and trending purposes.

The flow meter can further be used for no-flow protection, or dedicated no-flow protection devices provided per pumpset.

b) Pressure Sensor

A common outlet analogue pressure sensor must be installed for monitoring of system and pump pressures, linked to the PLC for monitoring and trending purposes.

c) Level Control

An analogue level sensor must be installed in the raw water tank, with separate discrete high and low level emergency level backups. Alternatively two separate analogue level sensing technologies can be installed, one primary and the other backup (and suitable for calibration purposes).

Potable Water Booster Pump Installation

1. General

Each desalination plant shall include a booster pumping system supplying pressurized potable water from the clear water tanks into the municipal reticulation system.

Where possible, this pump station and its ancillary mechanical equipment shall be built into a container for ease of delivering, installation and positioning on site. The size and configuration of the container and equipment orientation within it shall consider required free passages and space for repairs and maintenance of the equipment installed inside of it, including the handling of the respective materials. This container shall include applicable ventilation required and painted to suit the natural surrounding area.

Should the plant be small enough, it can be built into another applicable/suitable portion of the plant with all functional features as specified.

All applicable datasheets included in the tender document related to equipment covered under this plant must be completed and submitted as part of the tender.

All work carried out, as well as equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

Pricing of the plant shall make allowances for each and every applicable aspect: Design, Supply, Delivery, Installation (Including Handling and Rigging), Commissioning, Testing, Operation and Maintenance for contract duration, Signage, decommissioning and removal if necessary.

2. Mechanical Installation

This pump station is envisaged to be a of the constant pressure booster pump system type, able to deliver constant pressure into the reticulation network irrespective of deviating flow to a maximum flow equivalent to the maximum instantaneous flow delivered by the desalination unit.

This shall be done with a one (1) or a combination of 1, 2 or 3 duty pumps and one standby pump. The total flow stipulated shall be divided equally across the chosen number of duty pumps so as to remain at or as close to best efficiency of pump/s selected and operating.

I.e. Pumps shall be driven by VFDs and a controller suitable for determining the number of pumps operating and the respective speeds in order to maintain the constant pre-set pressure.

Booster pump system – Estimated hydraulic information:

Maximum Flow Required (per pump installation) – 23 ℓ/s or 82 m^3/hr	
Estimated Suction pipework	
Suction static head	3.0 m (flooded)
Estimate length of pipe	10 m
Estimated Delivery pipework	
Delivery static head	2.5 m
Estimate length of pipe	50 m
End pressure head required at injection point / Constant Pressure into network	55 m

All pipework and associated fittings / couplings shall be manufactured of a material conducive to handling the medium being pumped. Pipework and fittings shall allow for tappings / sockets / saddles for process gauges and instrumentation where required.

Suction pipework, valves and fittings shall be sized to have a maximum flow velocity of 1.2 m/s. Rising Main, delivery pipework, valves and fittings shall be sized to have a maximum flow velocity of 1.5 m/s. All pipework

and fittings shall be rated to handle the shut-off pressure of the proposed pump sets. Provision shall be made for all pipe connections to be on the outside of the containers with the relative suction and delivery pipes.

Each pump shall include its own suction and delivery isolating valves, non-return valves, air release valve, connections to suction and rising main pipework all as per rational design by the Supplier. All pipework and valves shall be properly supported and so arranged that all stresses created in the pipework by static and dynamic forces, including recoil shock, will be taken up by suitable anchors.

A suitably sized and pressure rated mechanical type water meter shall be optimally installed before the connection to the rising main of this system.

A main isolating shall be installed on the suction and delivery pipework/manifolds before connecting to the product water supply tank and rising main respectively. The installation shall make provision for surge protection devices as well as bypass for the pump installation to prevent excessive pressure head conditions and spikes.

Pumps/Booster Pump Set Characteristics/Considerations:

- Vertical Multistage pumps for smaller area footprint. – If Possible
- Installed on a baseplate with vibration damper mounting – If Applicable
- Space type coupling for back pull-out without disconnecting pump volute – If applicable
- Materials conducive to the pumped medium or protective coatings to ensure maximum reliability
- Suitability (and design constraints) to operation with Variable Frequency Drives (VFDs)
- Motor sizing shall ensure that the pump does not overload the motor in runout conditions
- Minimal Energy / Shock losses in Manifold pipework.

3. Electrical Control and Instrumentation

3.1. Electrical

The site is located on the main site area. A dedicated MCC (6kA, rated for the full load with VFDs) will have to be installed within the pump container, fed from the main site distribution kiosk.

3.2. Control Philosophy

This potable booster pump station is absolutely key in the overall operation and effectiveness of the entire plant.

The pumps will be used to pump the potable water into an existing water reticulation network, at a specified constant pressure band. The pump configuration must be controlled to PID within this pressure band (as per the mechanical specification requirements).

The PID loop must be adjustable on all three parameters, including reaction time to pressure fluctuations, delay timers for spikes and fully networked control with the VFDs' minimum, maximum and ramping speeds.

Should the booster set's inherent PLC or control system not be able to provide these functional parameters, then dedicated PLC control must be scripted.

All required pump protection must be provided for between the pump/motor configuration and the MCC. This could include motor overheat (thermistor, OTC or PT100), moisture ingress (seal fail), no-flow protection, high pressure protection, pipe-break detection as well as suction control (analogue from the Clearwater tank) and suction low level protection.

The pumps must alternate their pumping cycle every 3 hours, with the standby pump acting as a standby pump in case the duty pump(s) fails.

3.3 Instrumentation

a) Flow Meter and Detection:

An electromagnetic flow meter of the highest billing class must be installed at the pump station, linked to a PLC for monitoring and trending purposes. This meter will further be utilized to calculate and indicate daily, weekly and monthly pumping trends. These values will also have to be transmitted to the Client.

The flow meter can further be used for no-flow protection, or dedicated no-flow protection devices provided per pumpset.

b) Pressure Sensor:

A common outlet analogue pressure sensor must be installed for monitoring of system and pump pressures, linked to the PLC for monitoring and trending purposes. This pressure sensor is critical for the overall plant operation and injection pressures.

Additional pressure sensors must be installed at the injection point, all battery backed-up with communication protocols back to the RO plant's main control room. These sensors must be used for research to determine the system characteristics before any pumping is done, as well for logging and trending of what the system is doing while the pumps are running. These values will also have to be transmitted to the Client.

One sensor must be installed on the new pipeline tie-in point, one upstream of the tie-in and other down-stream of the tie-in. Provision is made on the new bulk pipeline with a housing and connection point. The other two sensors must be installed as close as possible to the tie-in point and must include for all connection requirements, enclosure, security and Client coordination to ensure a safe and reliable installation, transmitting accurate data continuously.

c) Level Control:

An analogue level sensor must be installed in the Clearwater discharge tank, with separate discrete high and low level emergency level backups. Alternatively two separate analogue level sensing technologies can be installed, one primary and the other backup (and suitable for calibration purposes).

Brine Pump Installation

1. General

Each Desalination plant shall have a pump station/system to handle the brine/waste generated from it. This brine will be collected in a holding tank and pumped into the identified discharge point.

Subject to decided orientation of the Brine Tank and plant layout, these pumps could be of the submersible type on a typical auto-coupling installation within the tank or dry centrifugal type housed in a containerised installation or if small enough, housed/built into another applicable/suitable portion of the plant with all functional features as specified.

If containerised, this pump station and its ancillary mechanical equipment shall be built into a container for ease of delivering, installation and positioning on site. The size and configuration of the container and equipment orientation within it shall consider required free passages and space for repairs and maintenance of the equipment installed inside of it, including the handling of the respective materials. This container shall include applicable ventilation as required and painted to suit the natural surrounding area.

All applicable datasheets included in the tender document related to equipment covered under this plant must be completed and submitted as part of the tender.

All work carried out, as well as equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

Pricing of the plant shall make allowances for each and every applicable aspect: Design, Supply, Delivery, Installation (Including Handling and Rigging), Commissioning, Testing, Operation and Maintenance for contract duration, Signage, decommissioning and removal if necessary.

2. Mechanical Installation

The pump station shall be fitted with a minimum of two (2) pumps acting in a duty/standby arrangement. This system is envisaged to operate as a “Tank Emptying System”. Pumps shall be sized to pump the required or expected flow / flowrate of brine discharge from the desalination plant. **Note:** This flowrate however limited to a maximum that the discharge point can handle, as provisionally stated in the hydraulic information below. For this reason flowrate flexibility by means of Variable Frequency Drives (VFDs) will be required. Total pressure head shall be calculated to suit (Based on the maximum flow), using the guideline system hydraulic information below.

Brine Pump System – Estimated hydraulic information:

Maximum Flow Required (per pump installation) – To Suit Desalination Plant Brine Disposal Rate Flow Requirements: Estimated at 3 Mℓ/day over 24 hours = 35 ℓ/s or 126 m^3/hr	
Estimated Suction pipework	
Suction static head	2.0 m (flooded)
Estimate length of pipe	10 m
Estimated Delivery pipework	
Delivery static head	5.5 m
Estimate length of pipe	450 m
End pressure head required	0 to 2 m

All pipework and associated fittings / couplings shall be manufactured of a material conducive to handling the medium being pumped. Pipework and fittings shall allow for tappings / sockets / saddles for process gauges and instrumentation where required.

Suction pipework, valves and fittings shall be sized to have a maximum flow velocity of 1.2 m/s. Rising Main, delivery pipework, valves and fittings shall be sized to have a maximum flow velocity of 1.5 m/s. All pipework and fittings shall be rated to handle the shut-off pressure of the proposed pump sets.

Each pump shall include its own suction and delivery isolating valves, non-return valves, air release valve, connections to suction and rising main pipework all as per rational design by the Supplier.

A suitably sized and pressure rated mechanical type water meter shall be optimally installed before the connection to the rising main of this system.

A main isolating shall be installed on the suction (If Applicable) and delivery pipework/manifolds before connecting to the brine tank and rising main respectively.

Brine Pumps Characteristics/Considerations:

- Submersible auto-coupling Type Installation for smallest area footprint. – If Applicable
- Installed on a baseplate with vibration damper mounting – If Applicable
- Spacer type coupling for back pull-out without disconnecting pump volute – If applicable
- Materials conducive to the pumped medium or protective coatings to ensure maximum reliability
- Suitability (and design constraints) to operation with Variable Frequency Drives (VFDs)
- Motor sizing shall ensure that the pump does not overload the motor in runout conditions
- Minimal Energy/Shock losses in Manifold pipework.

3. Electrical Control and Instrumentation

3.1 Electrical:

The site is located on the main site area. A dedicated MCC (6kA, rated for the full load with VFDs) will have

to be installed within the pump container, fed from the main site distribution kiosk.

3.2 Control Philosophy:

The brine pumps must continuously pump brine from the suction brine discharge tank into the sewer outfall system.

The pumps must be level controlled from the suction tank, pumping when there is brine and only stop when the tank is drawn down. The pumps must operate on a selected fixed speed, determined in conjunction with the sewer outfall capacity capability. Additional discrete emergency control must be provided in case the normal control mechanism fails for low level protection.

All required pump protection must be provided for between the pump/motor configuration and the MCC. This could include motor overheat (thermistor, OTC or PT100), moisture ingress (seal fail), no-flow protection, high pressure protection, pipe-break detection as well as suction control and suction low level protection.

The pumps must alternate their pumping cycle every 3 hours, with the standby pump acting as a standby pump in case the duty pump fails.

3.3 Instrumentation:

a) Flow Meter and Detection

An electromagnetic flow meter of the highest billing class must be installed at the pump station, linked to a PLC for monitoring and trending purposes.

The flow meter can further be used for no-flow protection, or dedicated no-flow protection devices provided per pumpset.

b) Pressure Sensor

A common outlet analogue pressure sensor must be installed for monitoring of system and pump pressures, linked to the PLC for monitoring and trending purposes.

c) Level Control

An analogue level sensor must be installed in the brine discharge tank, with separate discrete high and low level emergency level backups. Alternatively two separate analogue level sensing technologies can be installed, one primary and the other backup (and suitable for calibration purposes).

5.1.3.3.2. Marine

1. Site Visit

A site visit was carried out in August 2017 at Dido Valley, situated between Glencairn and Simon's Town.

PHOTO	NOTES
	**Site Visit Location** Dido Valley is situated between Glencairn and Simon's Town in False Bay.
	**Beach** The narrow beach, situated between two rocky outcrops, is approximately 400 m in length. This photo is facing north-east.

	**Beach and Seawall** A seawall is situated along the back of the beach, clearly visible towards the southern end. This photo is facing south-west with Simon's Town in the back ground.
	**Rocky Shoreline** South of the beach is a hard rocky coastline with a patch of grass between the railway line and rocks. This photo is facing south-west with Simon's Town in the back ground.

2. Bathymetry

No detailed bathymetry is available at present. Bathymetry based on admiralty charts is shown in Figure 14.

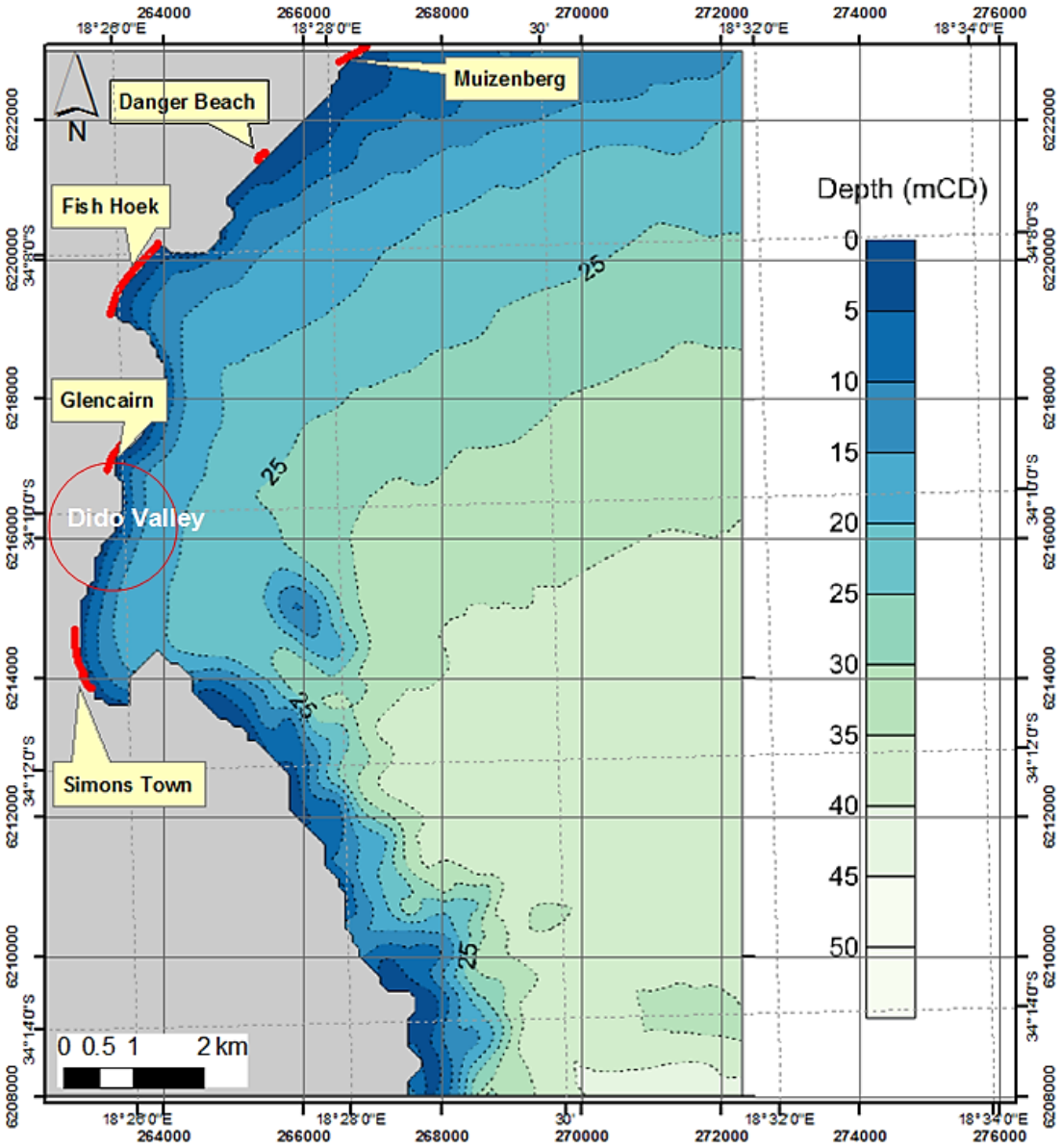


Figure 14: Bathymetry based on Admiralty Charts (Source: WorleyParsons (2013)[2])

3. Wind Data

Wind data measured at Roman Rock (Simon's Town) is presented in Figure 15. The data indicates that the predominant winds are from 150º (SSE) followed by the 120º (ESE) direction. Some north-westerly and westerly components (300º and 270º) are also present. The average wind speed is 8.1 m/s (15.7 knots).

2 WorleyParsons 2013. Provision of Professional Services to Model Sediment Dynamics in False Bay and to Provide Recommendations for the Remedial Options for the Glencairn Railway Line. 269660-00-CS-REP-0002, 28 November 2013

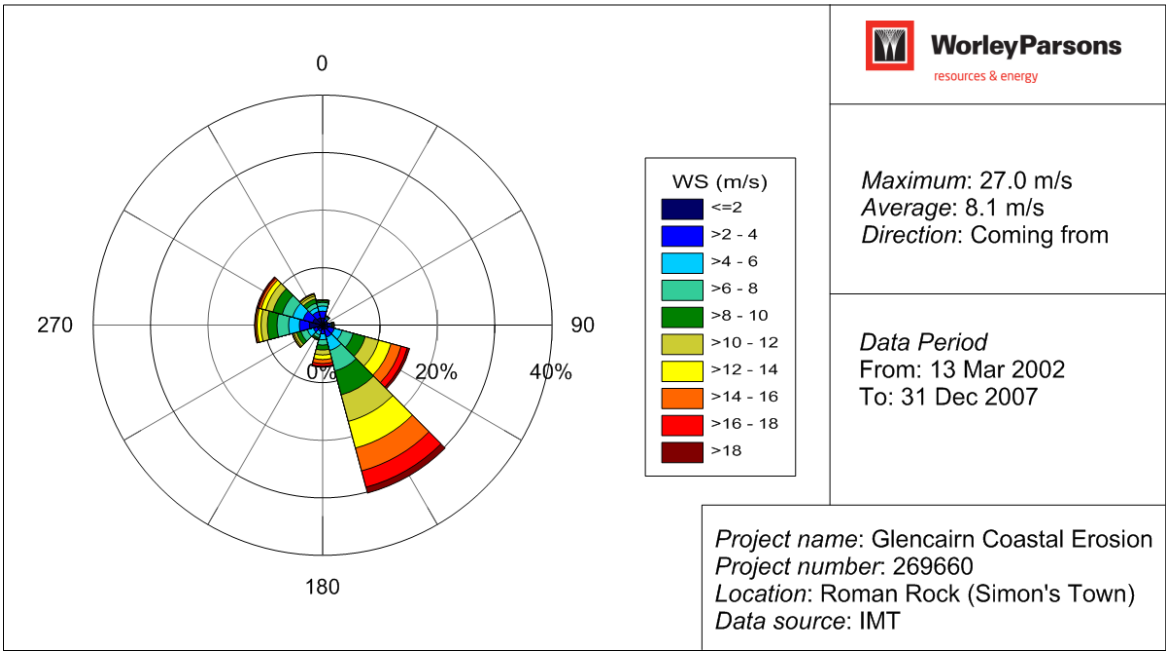
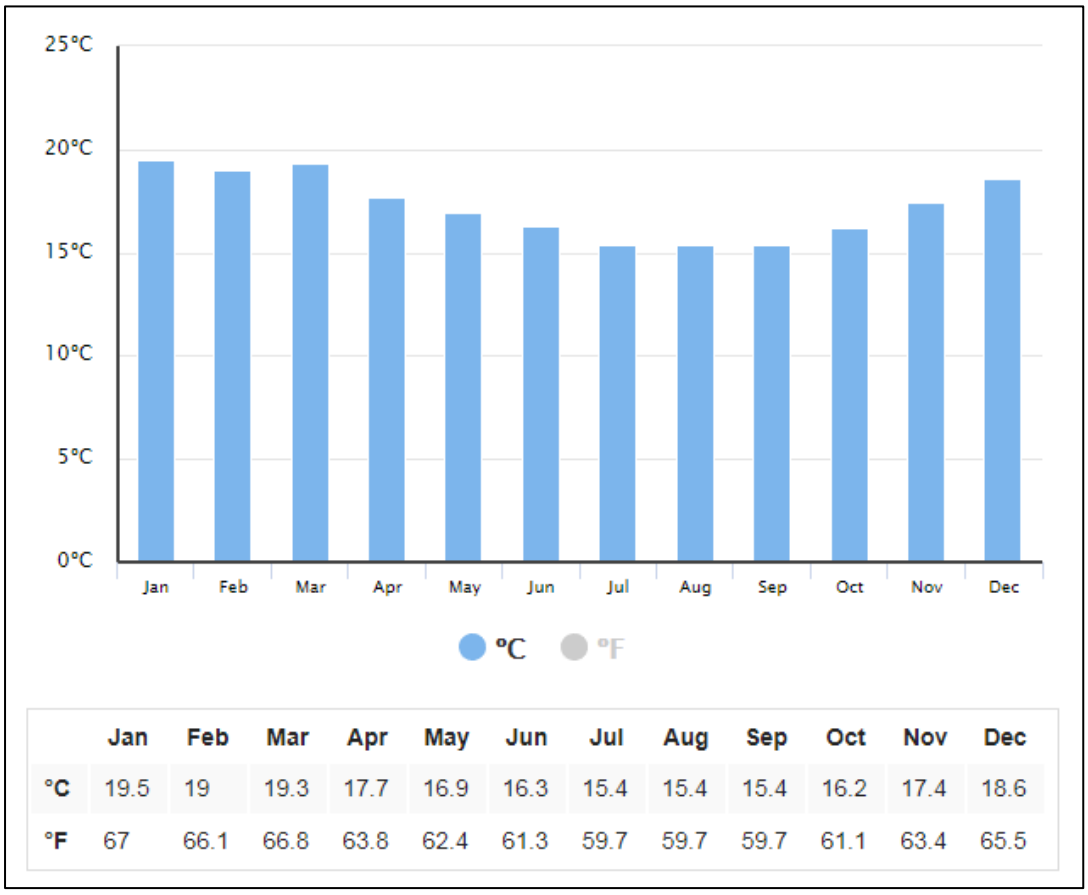


Figure 15: Annual Wind Rose at Roman Rock (Simon's Town) (WorleyParsons, 2013)

4. Seawater Temperature

The monthly average, maximum and minimum seawater temperatures for Simon's Town are shown below (Source: https://www.seatemperature.org)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	19.5	19	19.3	17.7	16.9	16.3	15.4	15.4	15.4	16.2	17.4	18.6
°F	67	66.1	66.8	63.8	62.4	61.3	59.7	59.7	59.7	61.1	63.4	65.5

Figure 16: Average Monthly Sea Temperatures for Simon's Town

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min °C	16.8	17	16.6	15.2	15.2	15.3	14.1	14.1	14.6	14.8	16.3	16.8
Max °C	21.3	20.7	20.9	19.8	19	17.7	16.1	16.5	16.3	17.3	19	20.2
Min °F	62.2	62.6	61.8	59.3	59.3	59.5	57.3	57.3	58.3	58.7	61.3	62.3
Max °F	70.3	69.2	69.6	67.7	66.2	63.9	61	61.7	61.4	63.2	66.2	68.4

Figure 17: Maximum and Minimum Monthly Sea Temperatures

5. Water Levels

The tidal levels related to Chart Datum (CD) at Cape Town and Simon's Town is given in Table 2C.

Table 2C: Tidal Levels of Simon's Town and Cape Town (SANHO, 2017)

Location	LAT	MLWS	MLWN	ML	MHWN	MHWS	HAT
Simon's Town	0	0.24	0.73	1	1.29	1.79	2.09

6. Waves

Indicative wave conditions at the project site were estimated at Glencairn, just north-east of the project site at a seabed level of -5 m CD.

It should be noted that the annual conditions and derived extreme estimated have not been validated and are provided as an indication only. It is incumbent on the Supplier to ascertain wave conditions at the site to the level required for any design or operational procedure.

Indicative Annual Wave Climate

The indicative wave climate at Glencairn (adjacent to Dido Valley), at a sea bed level of -5 m CD, is presented in Figure 18. The average wave height is 0.6 m and the maximum wave height is 2.9 m.

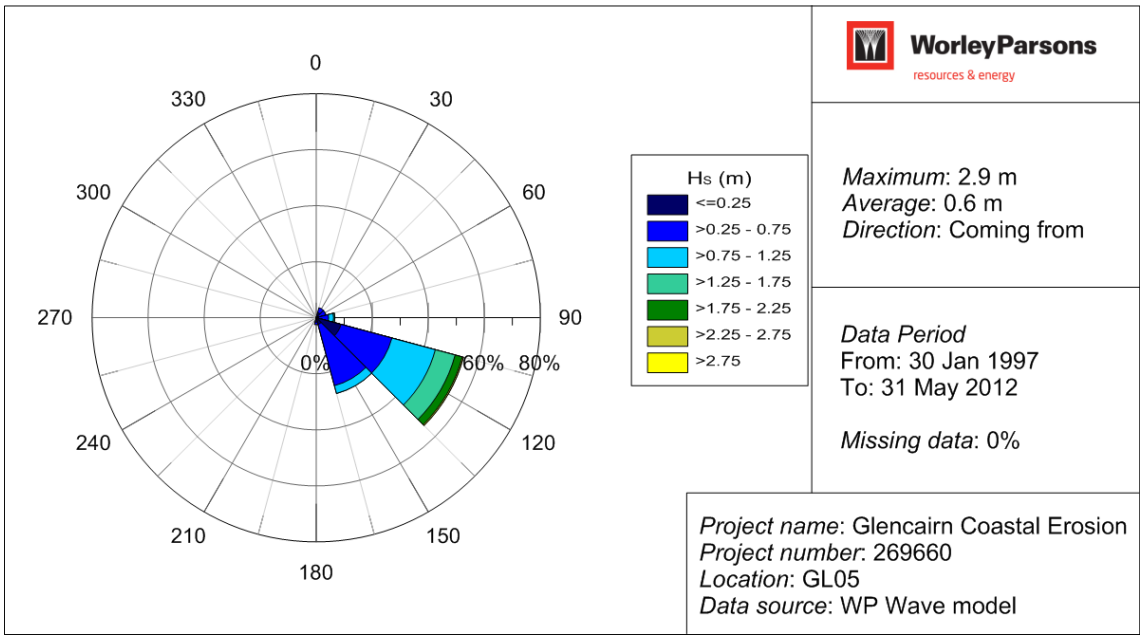


Figure 18: Annual wave rose Glencairn, -5 m CD (Source: WorleyParsons, 2013)

Indicative Extreme waves

Indicative extreme waves with their associated average return intervals (ARI) are presented inTable 3C.

Table 3C: Extreme waves for at Glencairn, -5 m CD (Source: WorleyParsons, 2013)

ARI (yrs)	Average Wave Height, H_{mo} (m)	Peak Wave Period, T_p (s)	90% confidence interval
1	2.6	6.7	±0.06
5	2.8	7.0	±0.14
10	2.9	7.1	±0.18
25	3.0	7.3	±0.23
50	3.2	7.4	±0.27
100	3.3	7.5	±0.31

7. Currents

Tidal currents along the project site are relatively weak (<0.2 m/s) (WorleyParsons, 2013). Currents are mostly driven by wind and waves. No measure data is available at present.

8. Seastate and Design Basis

In addition to information and design data provided in the Operational and Site Conditions Section elsewhere in this document, all elements part of the marine infrastructure (pipeline, sinkers, anchors, buoys, floaters, etc.) shall be designed considering a 1:20 years return period for waves (storms).

9. Marine pipeline and intake structure

The scope of work includes:

- Detail design of marine raw water pipeline system, intakes, anchoring, sinkers, raising and all necessary ancillary structures and equipment.
- Submission of Design drawings and construction methodology statement.
- Submission of final “As-built” drawings.

- Submission of detailed calculations for intake head, pipeline, anchors, sinkers, etc.
- Supply, transport and install of marine pipelines and ancillary structure including anchoring, sinkers, weighting, etc.
- Specify, supply and install Aids to Navigation system
- Design and construct suitable wave protection of the pipelines on the shore side
- Supply and place sand bags to protect the pipelines along shore/beach crossing

10. Raw water intake pipeline route

Possible routes for this site may require crossing rocky bed as well as beach crossing.

The suitability of such routes shall be investigated and validated by the Supplier. The layout drawing depicts the route for reference only. Supplier may select the alternative that better suits the design and minimize impacts on the activities of the recreational beach area.

Suppliers shall recommend pipeline materials, sizes and types that suit their designs. Supplier shall be responsible for designing suitable measures to protect the pipelines from damage caused by wave actions and boat propellers and ensure pipeline stability employing appropriate methods such as anchors, collars, concrete coating, sinkers, chains, etc.

Special attention shall be taken for ensure the stability and protection of the section of the pipeline crossing the surfzone.

Supplier's design of the intake head, pipeline and ancillary structure need to be stable based on the 1:20 year storm conditions.

The final intake head and pipeline design and ancillary structures are to be approved by the Engineer prior to construction.

11. Pipe type, size and class

Pipe type and size shall be selected as to minimize the marine growth, prevent sediment deposition and mitigate the potential reduction in hydraulic efficiency of the pipeline. Pipe material shall be able to prevent damage during installation.

12. Intake head structure

Intake structure shall be designed to limiting the intake velocities and ensure horizontal flow.

The intake structure comprises of solid roof panels, screens, frame and a connection to the pipeline.

The design shall make provision for reverse flow out the intake heads for cleaning of marine growth.

The following shall apply:

- Sufficient number of separate intake points
- Intake points/heads sufficiently stable against wave and current action
- Total required extraction rate of intake system: 324 cu.m/h
- Max through-screen velocity shall be 0.15 m/s
- Intake head configuration shall prevent vertical flow (i.e. velocity cap)
- Bar opening width shall be 100mm
- Allowance has to be made for 50% marine growth on intake bar screens, therefore through screen velocities shall be calculated on 50 mm bar openings

- Top of intake heads (i.e. top of velocity cap) located at min -2.5 m CD
- Bottom of Intake screen (i.e. bottom of extraction point) shall not be lower than 1.5 m above seabed
- Recommended Intake screen bars length (between 300 and 500 mm)

The table below depicts an example of calculation for screen sizing of the intake head. Suppliers shall submit their own detailed calculation.

Example: Screen dimensions		
v (Through screen velocity - **requirement)**	0.15	m/s
Q (total extraction = 18.2 Ml/day - **requirement**)	0.21	m^3/s
A	1.40	m^2
Bar opening width (100mm **requirement**)	0.1	m
Bar opening length (**recommended** 300 - 500 mm)		m
Required bar opening area (based on above)		m^2
$Area_{50}$ (**required** bar opening area - allowing 50% clogged up due to marine growth)	0.0175	m^2
Nr of openings (based on above)	80	no
Bar width (example - using 40 mm rods)	0.04	m
Bar length (based on above)		m
Above for total flow rate (No of risers per intake pipe)		
Therefore, each individual intake head diameter (example)		m

13. Concrete weighting/anchors/sinkers

Suitable means to ensure stability of the pipeline shall be installed at appropriate intervals. Adequate measures shall be provided to ensure necessary connection between the pipelines and anchors/sinkers in order to prevent sliding of the weights.

Materials and pre-cast reinforced concrete fabrication shall comply with concrete specification provided elsewhere in this document

14. Pipe fabrication, tests, welding, assembly, joints

Refer to pipeline specification included elsewhere in this document

15. Buoys

Supplier shall design the Aids to Navigation system suitable to the proposed intake and pipeline design. Cautionary isolated danger marker buoy(s) part of the AtoN system shall have self-contained led light with GPS synchronization. The light color and flashing parameters shall comply with IALA guidelines as well as SAMSA. Consultation to harbor master of adjacent harbor(s) is fundamental in order to ensure consistency between with the existing AtoN system(s).

The minimum buoyance shall be defined talking into account the met-ocean conditions at the site as well as any additional mass of other elements that might be connected to the buoy.

The buoy(s) shall be moored on sinker blocks (either reinforced concrete or cast iron)

The mass of the mooring block shall as well as type and size of chains, shackles and cables shall be defined based on the site specific met-ocean conditions and 1:20 year's wave height.

16. Sand bags

It's anticipated that sandbags may be necessary to provide stability and protection to overland and shore crossing sections of the intake pipeline.

Sand bags shall be EnviroRock 3PL Geocontainer or similar.

17. Corrosion protection

All structural steelwork shall be painted and protected by cathodic protection by sacrificial anodes. The anode design, composition, electrochemical characteristics and installation specifications shall be in accordance with ISO 15589. The anodes shall be sized for a 5 year design life.

18. Submersible pumps

For this site the design shall make allowance for locating submersible pumps at the intake location, i.e., at a location offshore. To make it possible floater equipment shall be designed including all required ancillary equipment in order to ensure a stable platform suitable to cater for the pumps weights in submerged condition (one pump per pipeline) as well as coping with waves and currents. This includes:

- Mass anchors, chains, shackles
- Navigation lights, beacons
- Platform for ease of maintenance of the pumps

It's paramount that any floating device launched to an offhsore site does not interfer with naviagtion channels or routes.

The requirement for offshore submersible pumps shall be verified and validated by the Supplier.

5.1.3.3.3. Occupational Health and Safety

Refer to Particular Specification PH: Occupational Health and Safety Specification.

Brief Description of the Project

The proposed 2 Mℓ/d containerized desalination plant, pump station and generators will be located within the naval grounds off Main Road, 2km north of Simon's Town (refer to Locality Plan). The proposed plant footprint is in the order of 90m x 50m and will have a maximum element height of approximately 6,5m.

The raw water abstraction pipe works will consist of 1 x Ø250mm HDPE PE 100 PN 10 pipes and is located north and east of the proposed plant. The raw water abstraction submersible pump unit will be located approximately 200m offshore. Onshore the raw water abstraction pipe works route towards the plant will predominately be above ground, passing underneath the rail line in an existing storm water main north of the site. The onshore raw water abstraction pipe works will be held in position by means of sandbags along the route. All road crossings will be underground and access to various erven will be arranged for by means of steel/concrete ramps where possible.

The potable water produced will be injected into the existing network west of the proposed site on the upstream side of the existing booster pump station. The existing water network is located along the eastern sidewalk of Main Road. Brine produced in the process will be discharged via a dedicated brine discharge pipe to the False Bay marine outfall sewer main west of the site. The brine discharge pipe works will consist of 1 x Ø200mm HDPE PE 100 PN10 pipe.

5.1.3.3.4. Environmental Management

Refer to Particular Specification PJ: Environmental Management Specification.