

ANNEXURE 7D: FUNCTIONAL SPECIFICATIONS

(Information provided by the City of Cape Town)

This specification is the functional specification of the **Harmony Park** marine works. The works comprise two phases that need to be completed in accordance with the time frames stipulated in this document. The guaranteed Phase 1 and Phase 2 daily volumes have previously been provided in this document. Phase 1 and Phase 2 construction operations are expected to commence simultaneously. Phase 1 is a temporary facility in order to provide water within the Phase 1 timeframe. Once Phase 2 is operational all the Phase 1 works (such as pipelines and intake/ outfall structures) not utilized for Phase 2 purposes shall be decommissioned. At the end of its stipulated operational time period the Phase 2 marine works (such as the pipelines and intake/ outfall structures) shall also be decommissioned.

Boundaries of potential extraction zones and discharge locations are specified in tender drawings. All these marine related concept design drawings should be interpreted as schematic only and is issued for information purposes only (unless indicated differently such as minimum criteria for the outfall point location as well as the location of the shore/ beach crossing). Therefore any reference to intake/ outfall pipeline routes, intake and outfall configurations and pump station location is schematic only and the Supplier shall develop his own concepts and perform design thereof in order to meet, amongst others, the water quality criteria. Should the Supplier wish to utilize the drawings and concepts contained in this tender then he shall verify and validate the concepts and pipeline routes prior to performing design thereof.

The Supplier should take cognisance of the fact that all design related information such as levels, pipe sizes, etc shall be verified by him prior to using it.

All designs shall be based on acceptable design standards and norms. Unless specified in this document the Supplier shall be responsible for specifying the return period and calculating the related extreme environmental event(s).

1. General

The scope of work includes the following with regards to all marine components, including but not limited to seawater intake, marine pipelines, outfall structure(s), safety beacons and navigation buoys:

- Design, supply, installation and operation of all marine components required to meet the Phase 1 and Phase 2 target values.
- The Supplier's design of the intake head, pipeline and ancillary structure needs to be such that he will guarantee the specified volumes for the specified period.
- The extraction structure and pipeline(s) shall ensure that the required feedwater volumes are extracted.
- Specify, supply and install Aids to Navigation system.
- Submission of detailed design and installation calculations.
- Submission of design drawings, construction methodology statement and control testing.
- Submission of final "as-built" drawings.
- Decommissioning of all marine components which comprise removal of all structures.

2. Seawater intake structure

Two possible areas (Alternative 1 and Alternative 2) for extraction have been identified and demarcated on Tender drawings. Phase 1 and Phase 2 intake structures shall be allowed to be located within Alternative 1 and/or Alternative 2 demarcated areas.

After verification of the suitability of these areas, the Intake structure(s) shall be located within the allocated area and the intake pipeline(s) shall be designed and located in such a manner that it does not impact on normal recreational activities (i.e. form a physical hazard/barrier and hinder access).

The intake structure shall be designed to limit intake velocities at the extraction point and ensure horizontal flow.

The intake structure comprise 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:

- Intake structures shall be sufficiently stable against wave and current action.
- Total required extraction rate of intake system: Phase 1: 0.051 m³/s (based on 2MI/d and 45% recovery); Phase 2: 0.21 m³/s (based on 8MI/d and 45% recovery).
- Max through-screen velocity shall be 0.15 m/s.
- Intake head configuration shall prevent vertical flow (i.e. velocity cap).
- Bar opening/ screen width shall be 100mm.
- Allowance has to be made for 50% marine growth for Phase 2 (and 20% for Phase 1) on intake bar screens, therefore through screen velocities shall be calculated on 50 mm screen openings for Phase 2 and 80mm screen openings for Phase 1.
- Nearshore intake location (Alternative 1): Intake structure(s) shall be located at minimum 3 m water depth within the nearshore location and the extraction point (screens) of the intake structure(s) shall be located minimum 1 m above the seabed.
- Offshore intake location (Alternative 2): Intake structure(s) shall be located at sufficient depth to ensure top of intake structure(s) located minimum 5 m below the surface at all time and bottom of extraction point (intake screens) located minimum 2.5 m above the seabed.

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

Example: Screen dimensions – 8 MI/day		
v (Through screen velocity - requirement)	0.15	m/s
Q (total extraction = 17.8 MI/day - requirement)	0.21	m ³ /s
A	1.37	m ²
Bar opening width (100mm requirement)	0.1	m
Bar opening length (recommended 300 - 500 mm)	0.5	m
Required bar opening area (based on above)	0.05	m ²
Area ₅₀ (required bar opening area - allowing 50% clogged up due to marine growth)	0.025	m ²
Nr of openings (based on above)	55	no
Bar width (example - using 40 mm rods)	0.04	m
Above for total flow rate (Assume 2 separate intakes)		
Therefore, each individual intake head diameter (example)	1.2	m

3. Marine intake and outfall pipelines

Possible pipeline routes for this site may require crossing rocky bed area.

The suitability of such routes shall be investigated and validated by the Supplier. The layout drawing depicts the route for reference only. The Supplier shall verify and select an alternative that better suits his design and/ or installation method and minimize impacts on any recreation related activities. Pipelines through the shoreline (beach crossing) shall only be located in the zone indicated on the drawings. The distance and offsets between these pipelines shall be decided on by the Supplier.

The Supplier shall select the number of intake and outfall pipelines, pipeline materials, sizes and types that suit his designs. The Supplier shall be responsible for designing suitable measures to protect the pipelines from damage caused by wave action, boat propellers and other external forces, and ensure pipeline stability employing appropriate methods such as anchors, collars, concrete coating, sinkers, chains, etc.

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.

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

4. Brine outlet structure

The schematic discharge locations of the brine outfalls for Phases 1 and 2 are indicated on the tender drawings. These drawings are purely indicative, directed at achieving adequate water depths for the mixing and dispersion of brine. Respondents are invited to develop alternative arrangements that ensure adequate dispersion and also minimize brine accumulation in the nearshore and re-circulation to the intake location. Should respondents choose to utilize the configurations adopted in the tender concepts then they shall verify these routes, locations and dimensions prior to adopting them.

Despite the above, it is important to note that the following restrictions regarding minimum depth and distance from shore apply to the position of the Phase 1 and Phase 2 outfall point:

- Phase 1: The Supplier shall discharge the brine at a minimum depth of -1.5 m CD and a minimum distance of 200 m from the coastline (measured from the +1 m CD depth contour and indicated on the drawings). This will ensure, amongst others, that no brine is discharged or spills over into the small rocky pools.
- Phase 2: the discharge location of the brine outfall for phase 2 shall be at a minimum depth contour of -5.0 m CD and a distance of 600 m from the coastline (measured from +1 m CD). This is to ensure, amongst others that the Supplier shall discharge beyond the rocky reef.

The following shall be applicable to the brine outlet discharge structure/ point in the surf zone:

- It is recommended for the brine outlet structure to be submerged below the water surface at all times.
- It is recommended that the open end of the outlet structure be raised above the seabed.

5. Buoys

The Supplier shall design the Aids to Navigation system suitable for 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 colour and flashing parameters shall comply with IALA guidelines as well as SAMSA requirements. Consultation with the harbour master of adjacent harbour(s) is fundamental in order to ensure consistency with the existing AtoN system(s).

The minimum buoyancy shall be defined taking 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 as well as type and size of chains, shackles and cables shall be defined based on the site specific met-ocean conditions.

6. 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 suitable design life.

7. Concrete structures and ancillary works

The Supplier shall conduct a visual conditional inspection of the Harmony Park tidal pool upon contract award. The assessment shall identify any cavities, holes, broken valves, excessive seepage through the tidal wall, and assess if this leaked water may impact the water quality at the extraction point(s) in the nearshore (Alternative 1) extraction zone. If required, these leakages shall be repaired. Prior to any repairs, the number of repairs and repair methodology shall be submitted to the Client for approval.

8. Protection

Any protection works, whether short term or long term, shall be performed in such a manner that the works are protected adequately for the periods stipulated in the document.

9. Decommissioning

All Phase 1 marine structures (such as pipelines, etc) not incorporated into Phase 2 shall be decommissioned within 3 weeks after Phase 2 has been commissioned.

All Phase 2 marine work shall be decommissioned after it had been operational for a period of two years after Phase 1 became operational. The area shall be reinstated to the condition in which it was, prior to commencement of Phase 2 operations. All marine work shall be fully decommissioned within 6 weeks after completion of the stipulated operational period.