Rabigh 3 Independent Water Project (IWP), Saudi Arabia

Environmental & Social Impact Assessment

Volume 1: Non-Technical Summary (NTS)

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1 INTRODUCTION

This document presents a 'non-technical summary' of the Environmental and Social Impact Assessment (ESIA) for the proposed Rabigh 3 Independent Water Project (the "Project"), located at the west coast of Saudi Area near Rabigh.

This ESIA Report will be submitted to the 'General Authority of Meteorology and Environmental Protection' (GAMEP; formerly known as the Presidency of Meteorology and Environment (PME) as well to the international lenders. The submission in Saudi Arabia will be made by GAMEP registered consultant Al Masader Al Dualiyah (AMAD) who work closely and in association with 5 Capitals.

The primary aim of the ESIA is to identify and assess predicted impacts that may occur as a result of the projects construction and operational activities, and to specify mitigation and management measures to avoid or minimize these impacts wherever possible.

The process of completing the ESIA is comprised of the following key stages:

- Collation of baseline information through desktop review, and compilation of relevant environmental and social data for the project site.
- Execution and analysis of scientifically robust field survey data and modeling of proposed project effluent discharges.
- Identification, assessment and categorisation of potential impacts.
- Identification of applicable mitigation, management and monitoring measures to avoid & minimise identified impacts.
- Identification of any residual significant effects.

2 PROJECT SUMMARY

In order to expand and improve the delivery of water services in the Kingdom of Saudi Arabia (KSA), the government of KSA through Water & Electricity L.L.C (WEC); the principal buyer of portable water within KSA is restructuring and developing the water sector in the Kingdom. This is with the intent of placing greater reliance on the private sector to deliver and manage water capacity in the Kingdom.

WEC is currently managing three (3) existing projects in KSA two of which are Independent Water and Power Projects (IWPP) and one is an Independent Water Project (IWP). However, in order to continue with the implementation of the privatisation programme designed to encourage private sector participation in Saudi Arabia, a 600,000m^3 seawater desalination plant; the Rabigh3 IWP will be constructed at the west coast of Saudi Arabia near Rabigh.

2.1 Project Location

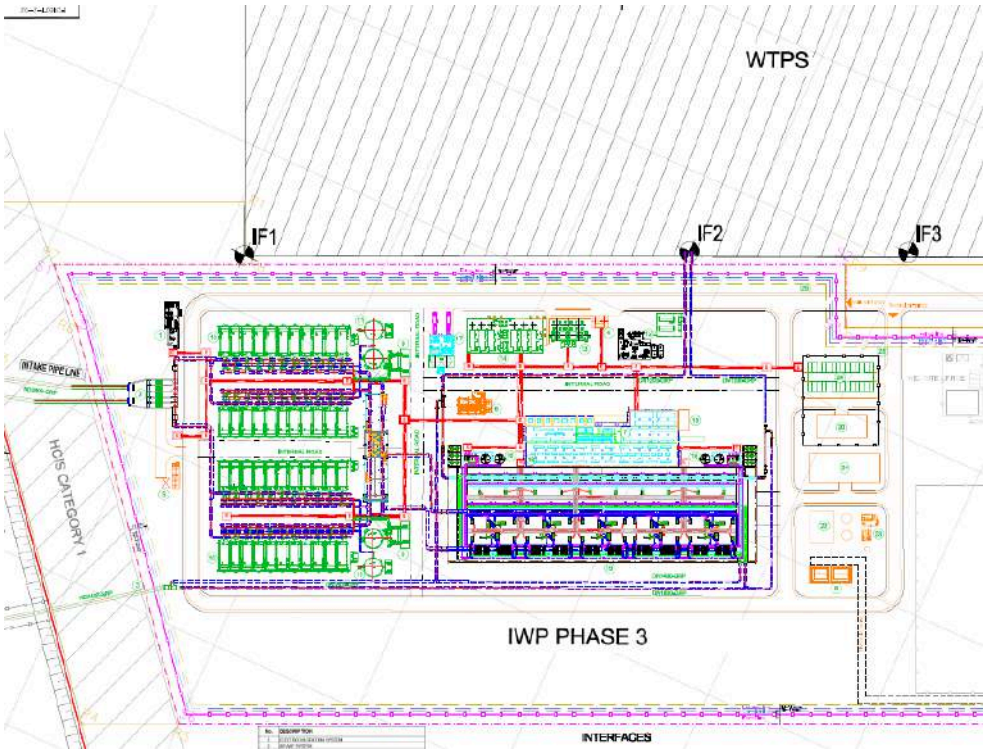
The proposed Project will be located approximately 18km south of the town of Rabigh on the Red Sea coast of Saudi Arabia. The site is located approximately 6km, 2km & 1km south of the already existing Petro Rabigh Refinery, the SEC Rabigh Power Station and the SEC Rabigh 1 IPP respectively and approximately 300m & 7km north of the Rabigh 2 IPP power plant and the existing Arabian Cement Factory respectively.

2.2 Project Layout

The intake system and pre-treatment system of the desalination plant will be located in the west region of the Project site close to the Red Sea while the RO system, post-treatment system and electrical facilities will be located at the centre of the project site. Other buildings will be situated towards the east of the project site.

The Water Transmission and Pumping Station (WTPS) Area north of the Rabigh 3 IWP project site is outside the scope of this Project and is not to be developed as part of this project as SWCC is reponsible for the construction of this facility, for which construction is on-going (at time of writing).

Figure 2-1 Project Layout



2.3 Project Description

The project will be developed as an Independent Water Project (IWP) using Reverse Osmosis (RO) Technology with a daily portable water capacity of 600,000m^3 (approximately 132MIGD) and will be developed on a Build Own and Operate (BOO) basis. The annual average availability of the Plant is proposed to be equal or better than 98% and it is expected to operate for 25-years.

The desalination plant main facilities to be developed included:

- Seawater Intake System including seawater screening and pumping station;
- Pre treatment System;
- Reverse Osmosis Plant with recovery systems;
- Post treatment system and;
- Outfall facilities.

2.3.1 Seawater Intake System

The seawater intake system will comprise of two (2) submarine pipelines, 460m long with internal diameter of 2600mm. The intake riser will be located at a seabed depth of not less than -12 mCD. It will be equipped with seawater resistant screens and the water velocity through the screens will be approximately 0.15m/s which is compliant with the US EPA intake velocity of 0.15m/s to prevent entrainment of marine life. Shock chlorination will be employed in the intake system to control biological growth in the pipelines.

2.3.2 Pre-Treatment System

Following the intake of seawater, the seawater will be treated via a combination of coagulation and flocculation of suspended matter using ferric chloride and two stages of dual media pressurised filtration (DMPF). The pre-treatment system will be designed such that organic and inorganic particulate and colloidal matter present in the raw seawater will be removed.

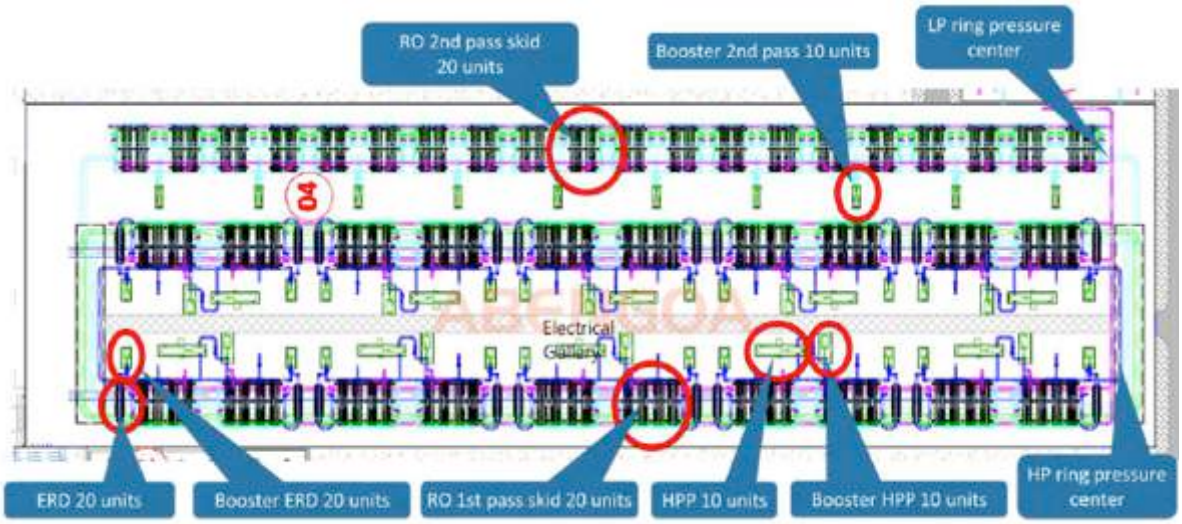
Cartridge filtration of maximum 5µm will be installed as a final step in the pre-treatment system to remove materials such as fine sand. This will act as a safety filtration so that no particle will be entrained through the pumps into the Reverse Osmosis System.

2.3.3 Reverse Osmosis System

The reverse osmosis (RO) system performs the main function of separating the salt from the seawater. The separation is achieved by pushing the water through membranes, with high pressure being used to drive the process. The RO system will consist of twenty (20) independent

trains with a capacity of 30,000m³ per day for each train. The RO membranes will separate the water into two streams; the permeate (which has passed through the membrane and has had most of the dissolved constituents removed) and the concentrate/brine (which contains the dissolved solids). Following the reverse osmosis process, the seawater concentrate (brine) will be returned to the ocean and the permeate will be treated to make it potable.

Figure 2-2 Main Features & Components of the RO System



Source: EPC Contractor Proposal

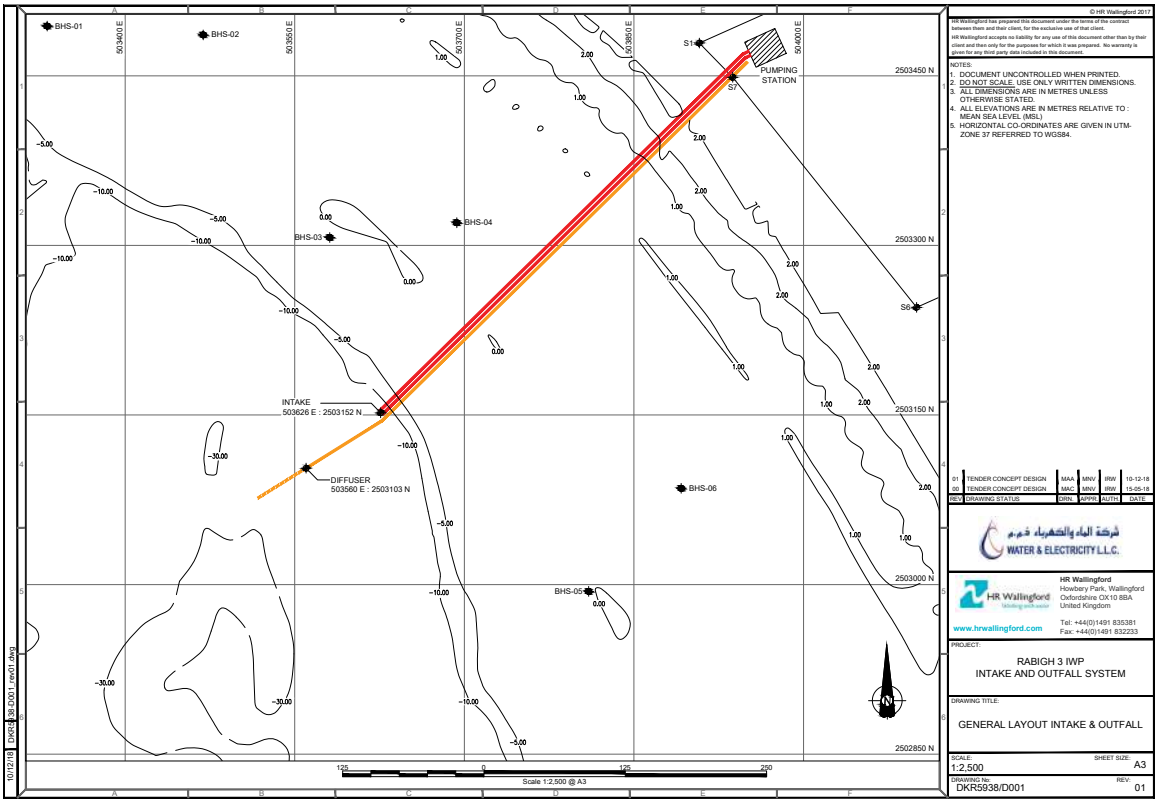
2.3.4 Post Treatment System

The permeate from the reverse osmosis system will be treated for re-mineralisation in a post treatment plant using limestone filters (CaCO3) or lime water ($Ca(OH)_2$). The product water will be treated to meet KSA portable water standards.

2.3.5 Outfall Facilities

In order to return the seawater concentrate (brine) to the ocean, one discharge pipe will be located between -22 and -24 mCD with a total length of 580m. The pipeline will feature multiport diffusers to ensure thorough mixing and dispersion of the concentrate plume. The locations of the intake and outfall pipeline routes are presented in the figure below.

Figure 2-3 Proposed Intake and Outfall Alignment



2.3.6 Project Facilities

Auxiliary facilities to be developed with the Project included:

- Electrical connection to be secured through an Energisation Agreement with National Grid S.A (NGSA) and an Electricity Supply Agreement with SEC.
- Wastewater Treatment System to collect, treat/clarify domestic and sanitary wastewater streams through screening, primary sedimentation, biological clarification (nitrification & de-nitrification), secondary sedimentation and effluent disinfection prior to discharge.
- Fire alarm and detection, fire protection, fire fighting systems.
- Air conditioning and ventilation System
- Compressed air system for instrument and service requirements;
- Chemical dosing plant and;
- Storage tanks.

The intake system and pre-treatment system of the desalination plant will be located in the west region of the project site close to the sea while the RO system, post-treatment system and electrical facilities will be located at the centre of the project site. An area south east of the

Project site has been dedicated for the construction laydown area and an area north east of the site has been dedicated for contractor laydown area.

2.3.7 Associated Facilities

Gas Insulated Switchgear - Substation (GIS)

The Project will include the construction a new indoor 380/110kV Gas Insulated Substation located in the eastern extent of the WEC plot for the Project. This is to be constructed by the EPC Contractor and will be operated by the Saudi Electricity Company (SEC).

Access Roads

Access to the Project site will be via a new access road that will be constructed to connect the site to the existing public road approximately 200m east of the Project boundary. This new access road is anticipated to be 7m wide with 1.5m shoulder on each side with asphalt surface.

Water Export infrastructure

The portable water exporting facilities or Water Transmission and Pumping Station (WTPS) facility to be located north of the Project site is outside the scope of the client. The SWCC is responsible for constructing the water transmission facilities required to transfer the potable water generated by the desalination plant to Makkah Al-Mokarramah, Jeddah, and Mastorah.

The Project Company however will provide the equipment required to connect the desalination plant at the Water Delivery Point to the WTPS. Such equipment included:

- Two (2) water connection pipelines
- All required motorized valves, bypass valves and drain valves;
- All required bypass line(s) and sampling point(s)
- I&C connections to local interface panel; and
- Pipeline supports, steel structures of pipe bridges, foundations

2.4 ESIA Requirements

2.4.1 Requirements for EIA in Saudi Arabia

The first Environmental Standards established in KSA; Environmental Protection Standards (1401H, 1981G) provide a basis for the evaluation and regulation of existing industrial and urban activities in KSA. They also provided guidance to assist in the planning, design, implementation and operation of future facilities (i.e. through EIA). Further to the Environmental

Protection Standards, the General Environmental Regulations (GER) (2001G) were introduced to provide details regarding the interaction of the competent agency (GAMEP) and the implementation of the standards.

The statutory EIA process has been established to ensure that environmental considerations are accounted for at design stage for relevant projects (for Construction & Operation) and this is detailed in the GER Appendix 2.1.

The GER Appendix 2.1 categorises projects depending on their typical environmental impacts, as below:

- **Category 1** – Projects with Limited Environmental Impacts
- **Category 2** – Projects with Significant Environmental Impacts
- **Category 3** – Projects with Serious Environmental Impacts

In accordance with the categorisations detailed in the GER Appendix 2.1, the project is expected to align with Category 3: Water Desalination Plants; which requires a comprehensive EIA.

2.4.2 Lenders Requirements

It is understood that ACWA Power are seeking Project finance from International Financial Institutions (IFIs) that are expected to be signatories of the Equator Principles (a voluntary set of principles established to manage environmental and social investment risks), or have investment policies that are consistent with the IFC Performance Standards. As such, this Environmental and Social Impact Assessment has been prepared to align with the requirements of the Equator Principles, IFC Performance Standards and IFC EHS Guidelines.

3 Overview of Local Environment

Rabigh Municipality owns the land on which the Project is to be developed and SWCC has entered into a land lease agreement with Rabigh Municipality. In order for the Project Company to be able to develop the Project, The Project Company will enter into a Sub Lease Agreement (SLA) with SWCC after which the Project Company will be granted an easement and right of way upon, over and within the site for the purpose of the Project.

The site condition is undeveloped and topography of the project site is characterised by shoreline/beach and flat coastal plain/sand sheets interspersed with fine gravel and sparse low lying vegetation. The shoreline at the project site is made up of a shallow narrow reef that begins approximately 100m from the shore and stretches for about 300m. The area from the shoreline to the reef comprises a reef flat, with shallow water.

Findings from site visits and review of satellite imagery have identified the storage of dredged materials at the shoreline of the project site. These dredged materials are not from this Project and the purpose for their presence is not known, although the storage appears to also extend to areas north of the proposed Project area.

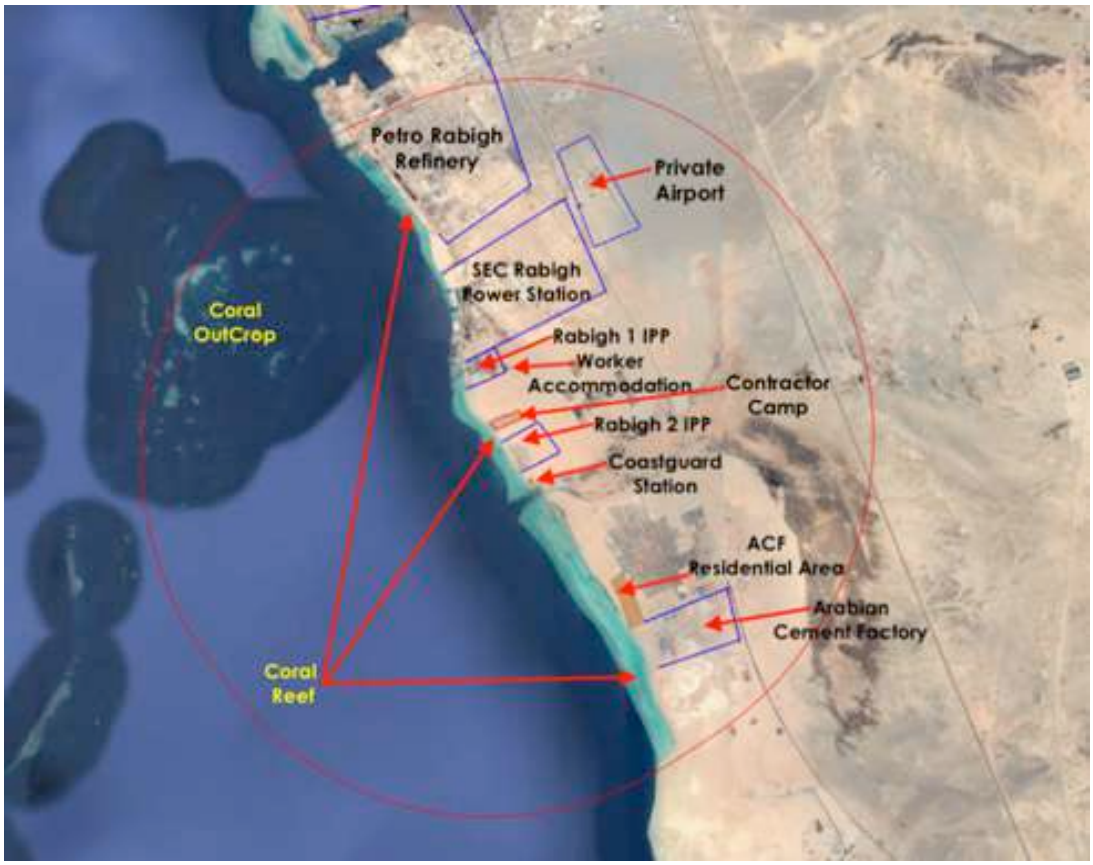
Although the review of satellite imagery has identified that there are presently no residential areas or other on-going anthropogenic uses within the project footprint, the ESIA has identified and assessed potential project impacts upon local receptors within 10km of the Project site. A 10km radius has been considered as the expected range of potential impacts from the project are not likely to exceed this zone. These receptors are presented in the table below

Table 3-1 Potential Project Receptors Within 10km of the Project Site

Receptor Type	Receptor	Distance from the Project Site
Ecological	Coral reef & other marine life	Adjacent to the project site and alongside the Red Sea coastline
	Coral Outcrop	Approximately 6.5km north west of the project site
Residential	Future residents of Rabigh 3 IWP contractor camp	Within the north eastern region of Project site.
	Rabigh 1 IPP Worker Accommodation	Approximately 1km north of the project site
	Arabian Cement Residential Area	Approximately 5.6km south of the project site
Commercial/ Institutional	Coastguard station	Approximately 1.7km south of the project site
	Private Airport	Approximately 5.6km north east of the project site
Industrial	Petro Rabigh Refinery	Approximately 6km north of the project site

Receptor Type	Receptor	Distance from the Project Site
	SEC Rabigh Power Station	Approximately 2km north of the project site
	SEC Rabigh 1 IPP	Approximately 1km north of the project site
	Rabigh 2 1PP	Approximately 300m south of the project site
	Arabian Cement Factory	Approximately 7km south of the project site

Figure 3-1 Potential Local Receptors Within 10km of the Project site (ref. Project site in red polygon)



4 CONTENT OF ESIA

The ESIA follows on from the Environmental & Social Scoping (ESS) study prepared for the project in September 2018. The ESS identified potential impacts associated with the project and defined the level of assessment required during the ESIA phase. The outcome of the ESS identified the primary assessment requirements for the ESIA as follows:

- **Air Quality:** Measurement of background air pollutants; as a precautionary approach for pollutants that may be relevant to construction phase and to assess potential impacts associated with gaseous and dust emissions during construction of the Project.
- **Noise and Vibration:** to confirm baseline noise conditions in the project area and at identified receptors prior to construction works. To assess potential impacts associated with construction activities and operation of the project; including impacts relating to the movement of construction vehicles.
- **Marine Ecology & Water Quality:** to identify any sensitive marine habitats and marine flora and fauna species of conservation status within the vicinity of the project, including areas in the project marine footprint that may be subject to construction and operational impacts. To assess potential impacts associated with offshore construction works and to define the dispersion characteristics and areas of mixing zone of the brine discharge during operation.
- **Terrestrial Ecology:** to define any sensitive terrestrial habitats at or within the vicinity of the project, to identity any terrestrial flora & fauna species of importance and to assess potential impacts associated with construction and operational phase of the project.
- **Geology, Soils and Groundwater:** to undertake a preliminary land contamination survey and as a precautionary approach to analyse baseline soil quality.
- **Waste and Wastewater Management:** To identify the types of waste and wastewater that will likely be generated during the construction and operational phases of the project. To set out mitigation and management measures established by Good International Industry Practice (GIIP) that can filter into the construction and operational phase Environmental & Social Management Systems (ESMS) to effectively manage waste and wastewater.
- **Community Health, Safety and Security:** To provide an overview of the risks relating to community health, safety and security and identify suitable mitigation measures to avoid/minimise such risks.
- **Archaeology & Cultural Heritage**: To identify any unknown or undiscovered artefacts or items of cultural heritage within the site, to assess impacts upon such features (if identified) and to outline appropriate mitigation and management measures related to such features.

- **Socio-Economic**: To consider the local socio-economic context and identify how changes in current land-use condition may result in impacts for the local population and local/regional economy.
- **Landscape and Visual Amenity:** To assess the anticipated change to the current landscape condition & likely visual impacts for nearby receptors as a result of the Project development and to provide suitable mitigation measures to minimise any such impacts.
- **Labour and Working Conditions:** To provide an overview of the risks relating to Labour & Working Conditions and to identify suitable mitigation measures to avoid/minimise such risks.
- **Cumulative Impacts**: To consider cumulative impacts relating to project impacts in combination with existing environmental & social conditions, as well as any known and confirmed future developments in the projects areas of influence.

Applicable mitigation, management and monitoring measures have been included in all sections of the ESIA to ensure appropriate risk management, avoidance of potential impacts and good practice through the development of the future Construction and Operational Environmental & Social Management Plans (i.e. CESMP and OESMP).

In order to present the ESIA in a logical format, it has been divided into several volumes:

- **Volume 1**: Non-Technical Summary
- **Volume 2**: Main Text, Tables, Figure and Plates
- **Volume 3**: Framework Environmental and Social Management Plan
- **Volume 4**: Appendices

5 SUMMARY OF MAIN ENVIRONMENTAL IMPACTS

5.1 Air Quality

As the Project is located within the Rabigh industrial zone with several key anthropogenic sources of emissions, short term continuous ambient air quality monitoring and long term ambient air quality monitoring was conducted at the Project site to assess the potential for construction based impacts of upon nearby sensitive receptors, to better understand baseline air quality conditions that may affect site personnel and to provide an indication of longer-term pollutant concentration in the Project area.

The short term continuous ambient air quality monitoring was conducted at one (1) location within the Project site for 1 week from 10th to 17th November 2018. During the monitoring period, the concentration of carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3) and particulate matter ($PM_{2.5}$ and PM_{10}) were monitored.

The medium-term ambient air quality monitoring was undertaken within and outside the Project site at three (3) locations between 6th September 2018 and 4th October 2018 for three (3) weeks using diffusion tubes to monitor the concentration of NO_2, SO_2, O_3 & VOC (BTEX and Top 5 VOCs).

Some differences in the data obtained for NO_2, SO_2 and O_3 during the short and medium term monitoring campaign was observed in the results. The medium-term monitoring data were noted to have slightly elevated concentration of the pollutants than the short term monitoring data. This can be attributable to the monitoring locations chosen for the medium term monitoring as the predominant wind direction; north west and westerly wind direction result in emissions being directed towards areas where the diffusions tubes were installed and directed away from areas where the short term ambient continuous monitoring station was set-up. Thereby potentially resulting in a slightly elevated concentration of pollutant at the medium-term monitoring location.

The survey results obtained during both short and medium term monitoring confirmed that the air shed is currently fully compliant with KSA ambient air quality standards.

Temporary construction impacts on air quality as a result of the development of the Project may occur due to increased dust generation during site preparatory works, vehicle movements on unpaved surfaces and exhaust fumes from construction vehicles and equipment use. However, the expected range of such impacts is likely to be within a zone of 1km from the Project site. Such impacts are common for construction activities in desert environments and can be appropriately managed through the implementation of a robust CESMP. Dust emission impacts and gaseous emissions impacts from exhaust of vehicles have

been assessed as minor impacts and may be noticeable at the Rabigh 3 IWP contractor camp, the Rabigh 1 IPP Worker accommodation area approximately 500m from the site access road and the Rabigh 2 IPP approximately 300m south of the Project boundary. Mitigation, management and monitoring measures have been proposed in the ESIA to prevent and minimise such impact to as low as practicable.

As the operation of the plant will not include combustion related activities, there will be no direct emissions to the local air-shed as such, the project is not expected to result in any impacts to air quality.

5.2 Noise and Vibration

As there are several anthropogenic noise sources within the Project area, noise survey was conducted to confirm the baseline noise level prior to the commencement of construction works. The noise survey was conducted on the 4th October 2018 at four (4) representative locations within the Project site and one (1) location at identified residential receptor outside the Project site (Rabigh 1 IPP Worker Accommodation) using a calibrated Cirrus CR: 811C sound level meter (S/N D20575FD).

Observations from the noise survey identified few anthropogenic noise influences; particularly the intermittent passing of HGV vehicles at the access road which leads to the site and the on-going construction activities at the northern boundary of the Project site.

The results obtained from the noise survey ranged between 47.0dB(A) to 59.2dB(A) and when compared with applicable KSA & WHO established noise standards, the highest noise level recorded (59.2dB(A)) was higher than the KSA daytime noise limits established for A3-Light industrial site in residential areas of 55dB(A) as the monitoring location was at the Rabigh 1 IPP Worker Accommodation Area. Other noise levels were however well within the KSA daytime noise limits established for A4-Medium Density Industry site (65dB(A)) as well as the WHO daytime industrial noise limits of 70dB(A).

The construction phase of the Project is anticipated to result in temporary and short duration increases in noise levels which will primarily be associated with earthworks from site preparation as well as the movement and operation of heavy machinery/equipment and construction vehicles. Temporary impacts related to construction processes on the site are not expected to be discernible above the KSA maximum possible façade construction noise limit at receptor location besides the future contractor camp to be situated within the site. As a worst-case, the ESIA has predicted that any temporary noise impacts due to increased construction traffic, would likely be limited to 3dB(A); which would require a doubling of traffic flows on site access road.

Mitigation, management and monitoring measures have been proposed in the ESIA to prevent and minimise noise impacts to as low as practicable.

During operations of the Project, although certain components such as the pumping stations, RO buildings, etc. may generate noise the Project is not expected to be a significant source of noise. These components with the potential to generate noise will be located at the middle of the Project site as such there will be a minimum distance of 150m from the source of noise to the northern and southern boundary of the Project site. Where noise from the Central Control Room (CCR) (max. 50dB(A)), open air installations (max. 85dB(A)) and other machine rooms and workshops (max.85dB (A)) as specified by WEC is taken into account, the cumulative noise level at the site would be would be 61.2dB(A) at a distance of 150m without any further attenuation from intervening structures. The distance to the nearest receptor from the project boundary is 300m (Rabigh 2 IPP). The assessment undertaken has considered loses of noise as a result of propagation over distance and a basic assessment of distance propagation and ground absorbance at the nearest receptor location would reduce 61.2dB(A) to 33.8dB(A) at this receptor location; without any further attenuation from intervening structures.

When considering intervening structures outside the Project site, noise will most likely reduce by a further 5-10dB(A) at the point of reception as such, any noise generated as a result of operation of the plant) will unlikely be discernible above background noise levels at all receptor locations.

There are no significant vibration sources and so vibration resulting from the Project is not expected.

5.3 Marine Ecology & Water Quality

In addition to the baseline marine environment data obtained during the 2012 & 2016 marine survey conducted at the Project site, 5 Capitals undertook a project-specific marine survey during November 2018 incorporating seawater and sediment sampling & analysis within the marine footprint of the Project site to validate data obtained during previous surveys and to identify existing baseline conditions for benthic habitats & species, marine fauna and ambient water & sediment quality.

Marine habitats in reef flat area closest to the shoreline identified primarily rocky seabed with sparse hard corals, towards the south east of the project area, the seafloor comprises mainly sandy substrate with increased coverage by marine vegetation such as seagrass. At the offshore zone where the reef slope transitions to the deeper reef base further out to sea, a mixture of soft and hard corals are present throughout the area to depths of approximately 20 metres.

A total of 32 reef dwelling marine species and 1 pelagic species were recorded within the project area in addition to 5 soft and 16 hard coral species were recorded within the project area during the survey. The majority of the fish species were noted along the reef slope and reef base which due to the diversity and density of coral structures can be described as the most important marine habitat for fish species at the project site.

Ambient water quality in the project area itself has relatively few influences, however the primary source of discharge approximately 1km to the north is the Rabigh 1 IPP and the Rabigh 2 IPP 300m south of the Project site respectively. These industrial facilities discharge thermal effluent and potentially other treated wastewater streams into the marine environment.

Analysis of seawater samples obtained at the Project site during 2015 and 2016 revealed that a number of parameters, particularly nitrate, nitrite, sulphate, copper, zinc, arsenic & cobalt were above the KSA Red Sea Standard for Industrial Zone. This high concentration of chemical indicators, nutrients and heavy metals is attributed to the continuous industrial discharge of these pollutants from the industrial facilities north & south of the Project site. Although some exceedance in pollutant concentration were recorded, the results of additional seawater quality analysis during 2018 indicate a reduction in concentrations of arsenic, cobalt, copper and zinc. Concentrations of chloride, phosphate and sulphate were detected in increased concentrations. Overall the observations indicated that the ambient seawater quality at the Project site is generally of good quality as the exceedances previously recorded although anthropogenic in nature were not recorded during this monitoring period.

Although turbidity was recorded to be below the established standards, during periods of high winds (monsoon season) it is anticipated that turbidity and suspended solids will increase due to the strong wave action in the local area.

Installation of the project intake and outfall pipeline system will require an amount of dredging through the shallow shoreline reef flat which contains rocky outcrops and sandy seabed areas. Such dredging activities will alter the sea bed resulting in temporary loss of associated benthic fauna and cause localised adverse impacts to water chemistry associated with increases in suspended sediments in the water column. Increases in suspended sediments as a result of dredging activities have been modelling by HR Wallingford using SEDPLUME-RW. The study predicted that w*ithin a few hundred metres of the dredging*: higher concentration increases of Total Suspended Solids (TSS) in the water column more than 5 mg/l, and deposition of the order of centimetres (over a six day period). *Up to 1 km south-east along the coast from the dredging*: concentration increases of a few mg/l, deposition of 1 or 2 mm (over a 6-day period). *Between 1 km and 1.6 km south-east along the coast from the dredging*: patchy concentration increases of a few mg/l, deposition of below 0.5 mm (over a 6-day period). *More than 1.6 kilometres SE along the coast from the dredging*: minimal effects.

The resulting impacts of increased TSS will lead to an increase in turbidity level. Suspended sediments can negatively impact the production and growth of existing organisms as light penetration through the water column is decreased as a result of increased turbidity thereby resulting in a reduction in photosynthetic activity of marine flora (e.g. seagrass) and epifauna (i.e. coral).

Specific impacts to large marine fauna such as fish species will be minimal, as they will likely avoid the area during the construction period to neighbouring unaffected reef areas.

During operation of the Project, brine effluent will be discharged into the marine environment and in order to assess the impact of this hyper dense saline water on the marine environment, predictive modelling of the brine dispersion was conducted.

Results of the brine modelling confirmed that a change in salinity of no more than 0.5ppt will be achieved within 100m of the outfall diffuser (2 % of the background salinity), which is compliant with the required PME established mixing zone standards.

The effluent water produced in the wastewater treatment plant may contain certain residual trace concentrations of pollutants (e.g. chlorine). Modelling of residual chloride discharges predicts an increased concentration of less than 0.015 mg/l, achieved within the mixing zone of the outfall diffuser. ACWA Power is required to meet World Bank/IFC standards where the maximum chlorine discharge allowed is 0.2mg/l and PME established mixing zone standards (0.1mg/l). Therefore, modelling predicts the permissible discharge limits to marine environment as defined in the KSA industrial and municipal wastewater discharge standards will be met.

5.4 Terrestrial Ecology

The Project site can be categorised into three (3) main habitat types which included:

- Coastal Plain/ sand sheets with peaks approximately 1.25m interspersed with fine gravels and sparse low lying shrubs
- Shoreline/Beach with unconsolidated sand and no vegetation and;
- Intertidal Zone.

With the exception of previously graded area within the eastern region of the Project site and dredged materials at the shoreline area, the habitat at the project site can be classified as 'Natural' habitat, as it has not been significantly modified as a result of human activities.

Figure 5-1 Main Habitat Types at the Project Site

Coastal Plan/Sand Sheet Habitat

Shoreline Beach Habitat

Intertidal Zone (at low tide with exposed rock)

Modified habitat at shoreline of the Project site.

Transect ecological survey was conducted in September 2018 to identify the ecological condition within the Project site and to identify the presence of flora and fauna species within the Project site. During the survey, eleven (11) flora species, a dead crustacean species, a burrow entrance that may have been created by a lizard as well as several lizard, bird and animal tracks were noted suggesting that the site may support reptiles, avifauna and mammals.

The flora species are largely native, commonly found in the region either classified under the IUCN Red List of Least Concern or not yet assessed for the IUCN Red list

Site preparatory works will result in an adverse impact for all habitats within the Project footprint due to levelling of the site and removal of vegetation. Fauna at the project site and local areas may be disturbed due to the loss of the habitat and temporary effects of noise and vibration during construction. This may result in a flight response from the project area and fauna species

will be required to migrate away from the works to find suitable alternative habitat in the surrounding area. Impacts to terrestrial ecology during construction phase will be managed through the implementation of a robust Construction Environmental & Social Management Plan (CESMP)

During operations, it is anticipated that impacts to any on site vegetation will be minimal due to the likely paving and hard standing construction over the majority of the site. As such, the only activities that could negatively impact the ecology of the site would be through indirect measures, relating to poor management practices of any designated landscaped areas, inadequate storage and handling of hazardous materials/wastes, chemicals and fuels. Impacts to terrestrial ecology during the operational phase will be managed through the implementation of a robust Operational Environmental & Social Management Plan (OESMP).

5.5 Geology, Soils and Groundwater

Due to the presence of dredged materials at the shoreline of the Project site and the presence of vehicle activity within the eastern region of the site, a soil investigation survey was conducted in September 2017 to identify evidence of potential contamination in site soils and to identify existing soil quality condition and characteristics.

As there are no established standards for soil in KSA, the soil analysis results obtained were compared against a good practice standard; the Dutch standards and comparison with this standard revealed that the soil quality at the project site is compliant with all established standards and the site can be said to be a greenfield site.

As identified in the scoping report, given the presence of local industry within the Project area and storage of large volumes of fuels for the power plant facilities, there is a potential source-pathway receptor linkage with underlying groundwater. As a precautionary approach, a groundwater quality survey was conducted at one location within the Project site to confirm the existing quality of the groundwater. During the survey, groundwater was encountered at approximately 4.45m depth. Analysis of the groundwater sample revealed compliance with KSA ambient groundwater standards with the exception of lead and copper which had concentrations above the established KSA ambient limits.

Although the results obtained for soil analysis indicated that soil contamination were not detected in the samples analysed, the ESIA has outlined mitigation, management and monitoring measures to prevent/minimise impacts such as cross-contamination of soils, contamination of groundwater, accidental spillage & leakage or various chemical products and inadequate waste management. Such impacts can further be managed by effective implementation of a Construction Environmental and Social Management Plan (CESMP) and Operational Environmental and Social Management Plan (OESMP) respectively.

5.6 Waste and Wastewater Management

Construction of the Project may result in the generation of sand and possibly rubble waste due to excavations, packaging wastes, unused materials and small quantities of hazardous wastes (such as paint and oil cans).

During operations, there will be relatively few solid waste streams, although wastewater sludge, used reverse osmosis filters and other maintenance wastes may be generated in small quantities on a continued basis. Other wastes will be minimal and varied, but may contain small quantities of hazardous components (e.g. lubricating oils, paints etc.).

Brine wastewater will be generated during operations and will be discharged directly to the Red Sea where it will mix and dilute with seawater to background concentrations within the projects mixing zone.

Wastewater during operations will include brine wastewater, storm water, and sanitary wastewater. Brine wastewater will be discharged directly to the Red Sea where it will mix and dilute with seawater to background concentrations within the projects mixing zone. A dedicated wastewater treatment plant will be available on-site to handle and treat sanitary wastewater prior to discharge or use for irrigation as per local regulations.

The ESIA outlines appropriate mitigation and management measures that can be implemented to suitably manage waste during both project phases.

5.7 Community Health, Safety & Security

All construction projects have potential risks relating to public safety that could arise, particularly in regard to the use of high powered equipment, heavy construction machinery, excavations, transportation amongst others, including fire and pollution releases. Public risks during construction have the potential to result in isolated incidents, which could be of a devastating magnitude to a person or group of people in the wrong place at the wrong time.

Risks that could be experienced include worker influx & disease and security incidents related to public trespassing to the construction site. Risks will be appropriately assessed and prepared for in the construction & operational phase 'Emergency Preparedness and Response Plan' and training. Furthermore, security staff who will provide 24/7 security control across the Project site will be engaged during both the operation and construction phase.

5.8 Archaeology and Cultural Heritage

Archaeological remains or other sites of potential cultural interest were not observed within the Project footprint during site visits. Although there are no archaeological artefacts within

the site or areas that may have archaeology significance in close proximity to the site, there is still a potential for encountering unknown buried archaeology within the Project site during excavations. As such, the project will require a 'Chance Finds Procedure' in the construction phase ESMS in the unlikely event that any items of archaeological significance are uncovered during construction.

During the operational phase of the Project, there will be no potential impact to archaeology as excavations will not be required and the site will be static.

5.9 Socio-Economic

The land on which the Project is to be developed has been leased from the Rabigh Municipality by SWCC. Given that the Project Company land will sub-lease the land from SWCC, there is no requirement for involuntary resettlement of compensation. There are also no identified settlements or any evidence of land use within the project area likely to be attributable to indigenous peoples.

As a major infrastructure project in Saudi Arabia the project has various positive social and economic benefits. The primary economic impact during construction is likely to result in employment creation as well as the direct monetary uplift to the families of those employed. Money paid to workers will also stimulate the local economy via the multiplier effect. In addition to the direct monetary impact of employment created during construction, there also exists the potential for the project to promote the dissemination of construction and construction support skills from expatriate workers into the local labour force.

A secondary impact that is likely to arise from spending on local and foreign goods and services during the construction process. The nature of the development, and specialised nature of required materials, suggests that these will be sourced internationally, apart from construction materials (e.g. concrete, cabling, etc.).

5.10 Landscape and Visual Amenity

Over the years, the landscape character of the project area has undergone changes in landscape character from an undeveloped open coastal plain to a more industrialised feel, sight & smell. This change is visually apparent due to the presence of large superstructures (e.g. stack structures, overhead transmission lines, etc.) that create a vertical anthropogenic intrusion into the existing landscape and has resulted in an amount of disturbance to the visual envelope of receptors overlooking the site.

Although the construction phase of the project will result in changes to the landscape character of the project site during levelling, grading, etc., and may have an impact on the

visual envelope of receptors due to the addition of lighting to illuminate the area at night, such impacts are expected to be minor as the construction works will embed with the industrial feel of the Rabigh area and will unlikely result in any noticeable changes.

The operational phase of the Project will not result in changes to the landscape character or visual envelope of receptors overlooking the Project site as although lighting impacts will occur, this will be the same as the construction phase.

Mitigation and management measures related to the use of lighting have been included to the ESIA to minimise potential visual impact at night due to the introduction of lighting to this area.

5.11 Labour and Working Conditions

In the operation and construction phases, ACWA Power's HR Policy will provide the basis for upon which the projects HR Policy will be developed. KSA Labour Law as well as International ILO and UN conventions requirements will additionally be met in regard to Labour and Working Conditions. Factors such as occupational health and safety will be addressed.

5.12 Cumulative Impacts

The ESIA has assessed cumulative impacts of several environmental and social parameters. For instance, construction air quality, construction noise impacts and operational marine discharges have considered the measured baseline conditions in combination with the predicted process contributions.

However, although there are plans to develop the Project's Water Transmission and Pumping Station (WTPS) and the Rabigh Phase 4, there are no documented development plans or strategies for these future Projects. As such, future cumulative impact assessment has not been undertaken in the ESIA. Therefore the assessment of cumulative impacts with reference to this Project has only gone as far as those cumulative impacts upon specific receptors as a result of the proposed project and existing impacts form other local industrial facilities

6 Environmental & Social Management & Monitoring

Volume 3 of the ESIA provides a framework for the development of the Environmental and Social Management System (ESMS) for the construction and operational phases of the project. The framework has been developed to ensure that all Environmental and Social Impacts associated with both the construction and operational phases are appropriately identified

and controlled through the development of a robust construction and operational phase ESMS.

Both the construction and operational phase ESMS will need to incorporate mitigation and monitoring requirements established within Volume 2 of the ESIA as well as any and all future requirements defined by the Statutory Environmental Body (GAMEP) and the project lenders.

The primary documents guiding the environmental and social management of the construction and operational phases will be the Construction Environmental & Social Management Plan (CESMP) and the Operational Environmental & Social Management Plan (OESMP) respectively.

6.1 Independent Monitoring

The project will be subject to periodic independent monitoring in accordance with the requirements of the lenders, as per Equator Principle 9. The scope of the independent audits will include the implementation of the projects ESMS and will evaluate on-site activities and documented controls and monitoring efforts, with respect to the projects compliance obligations.

7 SIGNIFICANCE OF IMPACTS

Following the implementation of the design-based and additional recommended mitigation and management measures as identified in the ESIA, there are no residual impacts of major negative significance through this assessment.